OKI

DICOM Conformance Statement

for C711 DICOM
(DICOM Embedded Printer)

DICOM 3.0 Conformance Statement

Summary:

This document is the DICOM Conformance Statement of the Print Service Class Provider (SCP) software installed on OKI C711 DICOM printers.
This Oki Data Corporation product: OKI C711 DICOM implements the necessary DICOM services to facilitate the Print (SCP) Imaging Management in the healthcare departments, managing Print imaging over a network on LED Imaging Printer Systems. It enables the capabilities to capture images at any networked DICOM modality and then print them anywhere they're needed in the medical facility.
Furthermore, before sending the images to be printed the OKI C711 DICOM will apply image processing, using presentation parameters and LUT to improve the image presentation quality and consistency. Moreover, it will manage the printing presentation format and the Printer queue and Configuration.
Table A.1-1 provides an overview of the network services supported by OKI C711 DICOM.

Table A.1-1 NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Print Management		
Grayscale Print Management Meta	No	Yes
Color Print Management Meta	No	Yes
Presentation LUT	No	Yes
Print Job	No	Yes
Verification	No	Yes
Transfer		
US Image Storage	No	Yes
Ophthalmic Image Storage	No	Yes
Endoscopic Image Storage	No	Yes

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1 Introduction
1.1 Scope and field of application

This document describes OKI Print SCP (hereinafter referred to as "Print SCP") conformance to the DICOM 3.0 standard.
It contains a short description of the applications involved and provides technical information about the data exchange capabilities of the equipment. The main elements describing these capabilities are the supported DICOM SOP Classes, Roles, Information Object Definitions (IOD) and Transfer Syntaxes. It should be read in conjunction with the DICOM standard and its addenda.
This statement is conformant with the recommended format as described in PS 3.2 of the DICOM standard. Print SCP acts as a SCP for the following SOP Classes:

- Basic Grayscale Print Management Meta SOP Class
- Basic Color Print Management Meta SOP Class
- Verification SOP Class
- Print Job SOP Class
- Presentation LUT SOP Class
- Basic Film Session SOP Class
- Basic Film Box SOP Class
- Basic Grayscale Image Box SOP Class
- Basic Color Image Box SOP Class
- US Image Storage SOP Class
- Ophthalmic Image Storage SOP Class
- Endoscopic Image Storage SOP Class

1.2 Acronyms and abbreviations

The following acronyms and abbreviations are used in this document:
- ACR: American College of Radiology
- ANSI: American National Standards Institute
- DICOM: Digital Imaging and Communications in Medicine
- DIMSE: DICOM Message Service Element
- DIMSE-C: DICOM Message Service Element – Composite
- DIMSE-N: DICOM Message Service Element – Normalized
- NEMA: National Electrical Manufacturers Association
- 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

1.2.1 Terms and Definitions

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

Abstract Syntax – the information agreed 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, 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), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), 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.

1.3 References

[DICOM]
 Digital Imaging and Communications in Medicine

DICOM standard:
 NEMA PS 3.1 to 3.14 and Supplements
 National Electrical Manufacturers Association (NEMA) – Publication Sales - 1300 N. 17th Street, Suite 1847
 Rosslyn, Va. 22209, United States of America

1.4 Intended audience

This Conformance Statement is intended for:

 Potential users
 System integrators of medical equipment
 Software designers implementing DICOM interfaces

1.5 Note to the reader

This document is written for the people that need to understand how OKI C711 DICOM 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.
Comparison of this Conformance Statement and the Conformance Statement of another device may show that the other device conforms to this Conformance Statement.
In that case, the other device may be interoperable with this product, but no guarantee is given.
DICOM only deals with communications; it is not a standard that specifies what is needed for certain applications to run on a device.

2 Implementation model

2.1 Application data flow

Print SCP is a DICOM printing solution that can receive images from DICOM modalities and render the images on paper by using Print SCU capabilities.
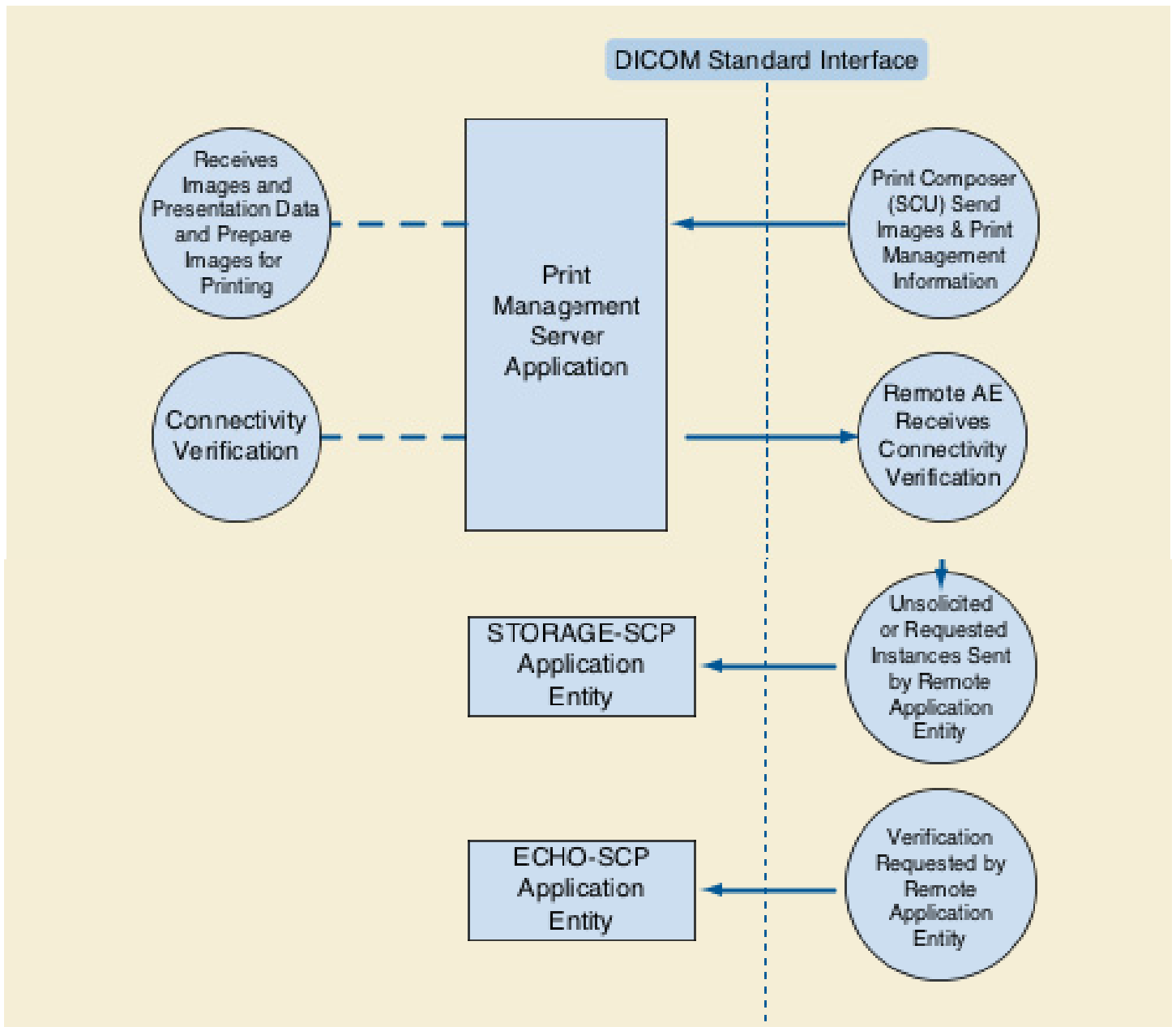
The Print Server is receiving the Images with the Presentation information, it Apply it on the images and creates a print-job within the print queue, containing one or more film pages composed from images selected by the client Print SCU. Furthermore, it also manages the Printer Status and Configuration.

2.2 Functional Definition of Print Server (SCP) Application Entity

The Print Server System acquires the images with the demographics and presentation information from the connected Print Composer (SCU) that is Grouped with a Workstation or an Archive device. Studies are temporarily stored on memory. The images are then processed and formatted and finally queued as a print job on the Printer queue. If the Printer is not operating normally (e.g. film Magazine empty), then the printer will be set to an error state and can be restarted by the user via the control panel interface.
The Print Server Management includes:

- DICOM Association and Negotiation Management
- Image Buffering
- Image Processing (Windowing level, P-LUT, GSDF, etc.)
- Image Formatting (Film sheet format)
- Printing

Furthermore, the Print Server provides in addition a Service operation of checking the networking connectivity to it's Print SCU using the Verification SOP Class.

2.3 Functional definitions of Application Entities
2.3.1 Verification Service as SCP

Print SCP waits for another application to connect at the presentation address configured in the network settings.
When another application connects, Print SCP expects it to be a DICOM application. Print SCP will accept associations with Presentation Contexts for SOP Classes of the Verification Service Class.

2.3.2 Print services as SCP

Once started, Print SCP waits for association requests. For each accepted request, it processes on the association the received print commands compatible with the SOP Classes it supports.
Associations are released either on Print SCU request or when an error condition occurs that leads to an association abort.

2.3.3 Store services as SCP

Once started, Print SCP waits for association requests. For each request, it accept associations with Presentation Contexts for SOP Classes of the Storage Service Class, and processes to the print commands listed and viewed through the user interface.
Associations are released either on Print SCU request or when an error condition occurs that leads to an association abort.

2.4 Sequencing of real-world activities
2.4.1 Print services as SCP
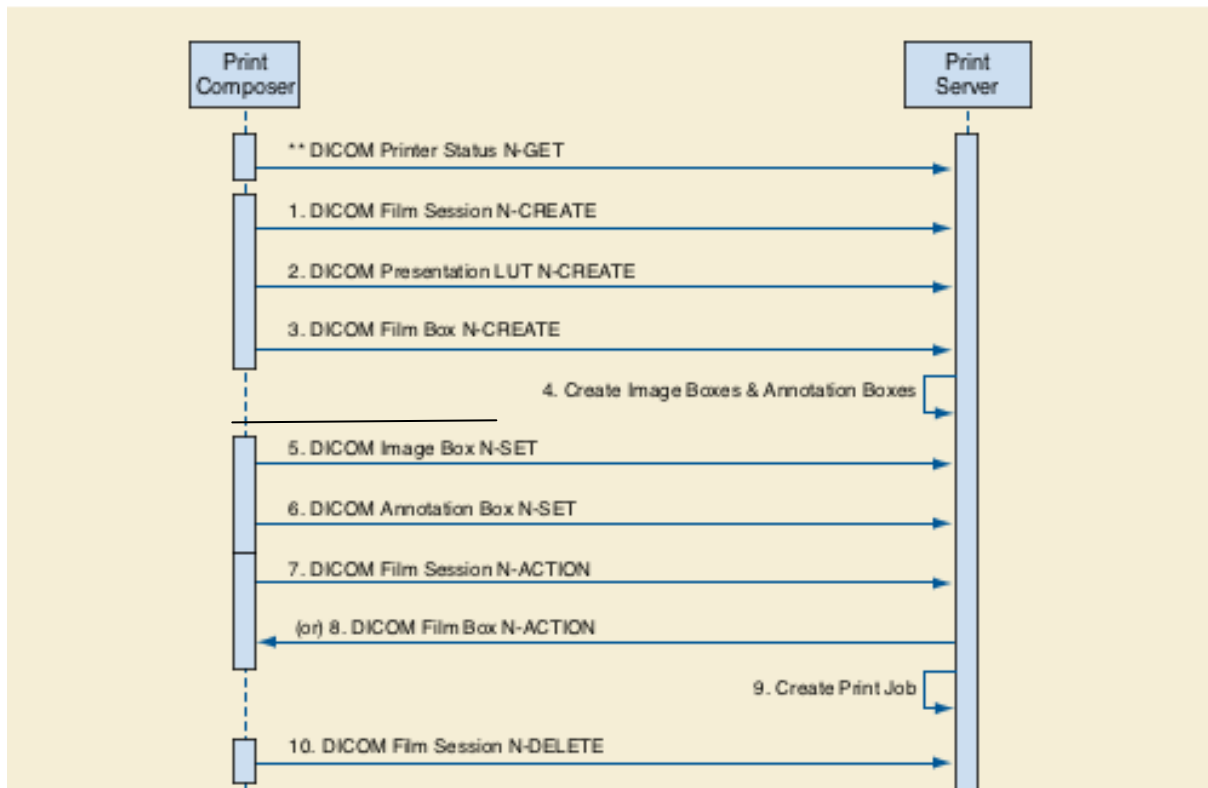
Figure 2.2.3-2. Print Server Management Sequence

The Print Server Management workflow activities in the sequence order as described in Figure 2.2.3-2 apply:

1. DICOM Film Session N-CREATE
2. DICOM Presentation LUT N-CREATE
3. DICOM Film Box N-CREATE
4. Create Image Boxes & Annotation Boxes
5. DICOM Image Box N-SET
6. DICOM Annotation Box N-SET
7. DICOM Film Session N-ACTION, A print job is created for each Film Session N-action.
8. DICOM Film Box N-ACTION, A print job is created for each Film Box N-action.
9. Create Print Job
10. DICOM Film Session N-DELETE.

2.4.2 Store services as SCP

All SCP activities are performed asynchronously in the background and not dependent on any sequencing.

3 Application Entity specifications

In its default configuration, Print SCP exists as a single Application Entity (AE) "OKI". You can add several Application Entity Titles (AET), define each of those and add rules for color adjustment.

As far as the association acceptance is concerned, Print SCP does not check any matching between its AET and the called AET of the incoming DICOM association.

Print SCP provides standard conformance to the following DICOM V3.0 SOP Classes as an SCP:

SOP Class Name	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
Printer SOP Class	1.2.840.10008.5.1.1.16
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
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23
Storage Service Class	1.2.840.10008.4.2
Ultrasound Image Storage Class	1.2.840.10008.5.1.4.1.1.6
Ultrasound Image Storage Class	1.2.840.10008.5.1.4.1.1.6.1
Secondary Capture Image Storage Class	1.2.840.10008.5.1.4.1.1.7
Endoscopic Image Storage Class	1.2.840.10008.5.1.4.1.1.77.1.1
Photographic Image Storage Class	1.2.840.10008.5.1.4.1.1.77.1.4
Ophthalmic Photography 8-Bit Image Storage Class	1.2.840.10008.5.1.4.1.1.77.1.5.1

3.1 Association establishment policies
3.1.1 General

Before any SOP Classes can be exchanged between the SCU AE and the PMS (SCP), an association stage takes place to negotiate and exchange the capabilities of the SCU and SCP. The Store Management SCU and SCP or the Print Management SCU and SCP establish an association by using the Association Services of the DICOM Upper Layer. During association establishment, the DICOM Store Management AE or the Print Management AE negotiates with the supported SOP classes.

Only the SCU AE shall release an association. The released association may be aborted by the SCU or the SCP. The SCU AE attempts to initiate a new association for each store or print session. This means that when no operation is done on the association, the SCU should release the association.

A DICOM entity can only send DIMSE messages to instances that are created on the same association.

The Maximum PDU Length offered by Print SCP (SCP) at association establishment time can be configured by the user, and may range between the following minimum and maximum values:

> Minimum value for Maximum PDU Length: 8192 bytes
> Maximum value for Maximum PDU Length: 131072 bytes

3.1.2 Number of associations

In its standard configuration, The OKI C711 DICOM will accept Up to 3 simultaneous delivery Associations for Print-SCP and will accept 1 simultaneous delivery Associations for Store-SCP. If an attempt is made to open more than 3 simultaneous Associations for Print-SCP, the Print Server System will reject the additional Associations (A-ASSOCIATE-RJ).

If an attempt is made to open more than 1 simultaneous Associations Store-SCP, the Print Server System will reject the additional Associations (A-ASSOCIATE-RJ).

Number of Associations as a SCP for PRINT-SCP

Maximum number of simultaneous Associations	3

Number of Associations as a SCP for STORAGE-SCP

Maximum number of simultaneous Associations	1

3.1.3 Asynchronous nature

The OKI C711 DICOM does not support asynchronous operations.

3.2 Association initiation by real-world activity

The OKI C711 DICOM never initiates an association, since it acts as a SCP from a DICOM protocol point of view.

3.3 Association acceptance policy

The OKI C711 DICOM accepts DICOM associations according to the DICOM Meta SOP Classes and SOP Classes it supports. Print SCP does not perform any check on the called AET at association acceptance time.

3.3.1 Real-world activity: Print Management and Verification SCP

3.3.1.1 Associated real-world activity

The application entity waits for incoming associations. No operator action is required to receive DICOM print jobs or verification requests.

3.3.1.2 Presentation

The OKI C711 DICOM accepts the following Presentation Contexts:

ACCEPTED PRESENTATION CONTEXTS FOR PRINT SERVER MANAGEMENT ACTIVITY

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Basic Grayscale Print Management Meta SOP	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Basic Color Print Management Meta SOP	1.2.840.10008.5.1.1.18	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Presentation LUT	1.2.840.10008.5.1.1.23	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Printer	1.2.840.10008.5.1.1.16	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

ACCEPTED PRESENTATION CONTEXTS FOR STORE SERVER MANAGEMENT ACTIVITY

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Storage Service Class	1.2.840.10008.4.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Ultrasound Image Storage Class	1.2.840.10008.5.1.4.1.1.6	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Ultrasound Image Storage Class	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Secondary Capture Image Storage Class	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Endoscopic Image Storage Class	1.2.840.10008.5.1.4.1.1.77.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Photographic Image Storage Class	1.2.840.10008.5.1.4.1.1.77.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Ophthalmic Photography 8-Bit Image Storage Class	1.2.840.10008.5.1.4.1.1.77.1.5.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

3.3.1.3 SOP Specific Conformance
3.3.1.3.1 SOP Specific Conformance for Storage SOP Class

STORAGE-SCP provides standard conformance to the Storage Service Class.
No Presentation State will be applied by default.
The Mask Subtraction transformation is not supported by this
implementation. It is not possible display Presentation States containing
the Mask Subtraction Sequence (0028,6100).
All of the Image Storage SOP Classes listed.

3.3.1.3.1.1 Presentation Context Acceptance Criterion

STORAGE-SCP will always accept any Presentation Context for the
supported SOP Classes with the supported Transfer Syntaxes. More than
one proposed Presentation Context will be accepted for the same Abstract

Syntax if the Transfer Syntax is supported, whether or not it is the same as another Presentation Context.

3.3.1.3.1.2 Transfer Syntax Selection Policies

STORAGE-SCP prefers Implicit Transfer Syntaxes.

3.3.1.3.2 SOP Specific Conformance for Printer SOP Class

The Printer SOP Class is used to monitor the status of the printer.
The following DIMSE services are supported:

- N-GET

N-GET is used to retrieve an instance of the Printer SOP Class. The attributes of N-GET are shown in the following table:

Tag	Name	Comment
(2110,0010)	Printer Status	Returns the Printer Status
(2110,0020)	Printer Status Info	Returns the Printer Status
(2110,0030)	Printer Name	Returns the name: OKI DM PRINTER
(0008,0070)	Manufacturer	Returns the manufacturer: Oki Data Corp
(0008,1090)	Manufacturer Model Name	Returns the model : C711 DICOM
(0018,1000)	Device Serial Number	Returns the printer serial number
(0018,1020)	Software Version(s)	Returns the software release
(0018,1200)	Date of Last Calibration	Returns the date of calibration
(0018,1201)	Time of Last Calibration	Returns the time of calibration

3.3.1.4 SOP Specific Conformance for Basic Film Session SOP Class

The following DIMSE services are supported:

    N-CREATE
    N-SET
    N-ACTION
    N-DELETE

Film Session SOP Class Operations for N-CREATE
N-CREATE is sent by the SCU AE to create a Basic Film Session SOP instance when an association has been established. If N-CREATE fails, an error message will be returned by the SCP AE. N-CREATE causes the Basic Film Session to be created and its attributes initialized.

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The Basic Film Session SOP instances shall be created before the Film Box SOP Instances are created. Print SCP provides the following support for the attributes contained in the N-CREATE DIMSE Service of the Basic Film Session SOP Class:

Tag	Name	Value
(2000, 0010)	Number of Copies	Any integer between 1 and 99 Default 1
(2000, 0020)	Print Priority	Ignored, DEFAULT: MED
(2000, 0030)	Medium Type	Ignored, DEFAULT: PAPER
(2000, 0040)	Film Destination	Ignored, DEFAULT: PROCESSOR
(2000, 0050)	Film Session Label	Ignored
(2000, 0060)	Memory Allocation	Ignored
(2100, 0160)	Owner ID	Ignored, DEFAULT: MSD

The SCP will return one of the following status codes for FILM SESSION SOP CLASS N-CREATE RESPONSE:

Code	Status	Comment
0x0000	Success	Film session successfully created.

Film Session SOP Class Operations for N-SET

N-SET is used to update an instance of the Basic Film Session SOP Class. The following attributes may be updated:

Tag	Name
(2000,0010)	Number of Copies
(2000,0020)	Print Priority
(2000,0030)	Medium Type
(2000,0040)	Film Destination
(2000,0050)	Film Session Label
(2000,0060)	Memory Allocation
(2100,0160)	Owner ID

The SCP will return one of the following status codes for FILM SESSION SOP CLASS N-SET RESPONSE:

Code	Status	Comment
0x0000	Success	Film session has been successfully updated.

Film Session SOP Class Operations for N-ACTION

The receipt of the N-ACTION will result in submitting a print job to print all the films of the film session in the order that they were received. The Film Session N-ACTION arguments are defined in the DICOM Standard PS 3.4, table H.4-3.

The SCP will return one of the following status codes for Film Session SOP Class N-ACTION Response:

Code	Status	Comment
0x0000	Success	Film session has been successfully accepted for printing.

Film Session SOP Class Operations for N-DELETE
The Print Server Management behavior and specific status codes sent for the N-DELETE of a specific Film Session is described in the following table:

The SCP will return one of the following status codes for Film Session SOP Class N-DELETE Response:

Code	Status	Comment
0x0000	Success	The SCP has completed the operation successfully. Film session has been successfully deleted.

3.3.1.5 SOP Specific Conformance for Basic Film Box SOP Class

The following DIMSE services are supported:

    N-CREATE
    N-SET
    N-ACTION
    N-DELETE

Basic Film Box SOP Class Operations for N-CREATE
The OKI C711 DICOM provides the following support for the Film Box attributes sent by the N-CREATE DIMSE service.

BASIC FILM BOX SOP CLASS N-CREATE REQUEST ATTRIBUTES

Attribute	Tag	Valid Range	Default Value if not sent by SCU or invalid value received
Image Display Format	(2010,0010)	STANDARD\C,R	STANDARD\1,1
Referenced Film Session Sequence	(2010,0500)	N/A	N/A
> Referenced SOP Class UID	(0008,1150)	SOP Class UID	Mandatory, no default
> Referenced SOP Instance UID	(0008,1155)	SOP Instance UID	Mandatory, no default
Referenced Image Box Sequence	(2010,0510)	N/A	N/A
> Referenced SOP Class UID	(0008,1150)	SOP Class UID	Mandatory, no default
> Referenced SOP Instance UID	(0008,1155)	SOP Instance UID	Mandatory, no default
Film Orientation	(2010,0040)	PORTRAIT LANDSCAPE	PORTRAIT
Film Size Id see Note 1	(2010,0050)	A4 8.5INX 11IN 8.5INX35IN 8.5INX47IN	A4
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	BILINEAR
Max Density	(2010,0130)	0 - 100%	100%
Smoothing Type See note 2	(2010,0080)	NORMAL SHARP	Configurable
Border Density See note 3	(2010,0100)	WHITE BLACK	WHITE
Empty Image Density See note 4	(2010,0110)	WHITE BLACK	WHITE
Trim	(2010,0140)	YES NO	NO
Reference Presentation LUT Sequence	(2050,0500)	N/A	N/A
>Referenced SOP Class UID	(0008,1150)	SOP Class UID	Mandatory if sequence is present, no default
>Referenced SOP Instance UID	(0008,1155)	SOP Instance UID	Mandatory if sequence is present, no default
Illumination	(2010,015E)	Any valid value in the unit of cd/m^2	2000, Mandatory if Presentation LUT is supported
Reflective Ambient Light	(2010,0160)	Any valid value in the unit of cd/m^2	10, Mandatory if Presentation LUT is supported

Note 1: All input request size except 8_5X35IN or 8_5X47IN are translated to A4/Letter

Note 2: Smoothing Type - this attribute allows the SCU to specify the various smoothing effects provided by the interpolation algorithm in the OKI C711 DICOM.

Note 3: Border Density - allows the density of the areas surrounding and between images on the film to be either Black or white.

Note 4: Empty Image Density - allows the density of the areas of empty images on the film to be either Black or white.

SCP Pixel Matrix for a Pixel Size of 0.117 mm (216dpi)

With Text as Header

Film Size	Rows	Columns
A4 (Portrait)	1707	2379
A4 (Landscape)	2379	1707
Letter (Portrait)	1758	2268
Letter (Landscape)	2268	1758
215 x 900 (Portrait)	1758	7542
215 x 900 (Landscape)	7542	1758
215 x 1200 (Portrait)	1758	10095
215 x 1200 (Landscape)	10095	1758

With Logo as Header

Film Size	Rows	Columns
A4 (Portrait)	1707	2310
A4 (Landscape)	2310	1707
Letter (Portrait)	1758	2160
Letter (Landscape)	2160	1758
215 x 900 (Portrait)	1758	7434
215 x 900 (Landscape)	7434	1758
215 x 1200 (Portrait)	1758	9987
215 x 1200 (Landscape)	9987	1758

The SCP will return one of the following status codes for FILM BOX SOP CLASS N-CREATE RESPONSE:

Code	Status	Comment
0x0000	Success	Film Box was successfully created.

Basic Film Box SOP Class Operations for N-SET

N-SET DIMSE service allows to update the following attributes of an existing Basic Film Box SOP Instance:

Tag	Name
(2010,0010)	Image Display Format
(2010,0040)	Film Orientation

(2010,0050)	Film Size ID
(2010,0060)	Magnification Type
(2010,0080)	Smoothing Type
(2010,0100)	Border Density
(2010,0110)	Empty Image Density
(2010,0120)	Minimum Density
(2010,0130)	Maximum Density
(2010,0140)	Trim
(2010,0150)	Configuration Information
(2050,0500)	Referenced Presentation LUT Sequence
(0008,1150)	>Referenced SOP Class UID
(0008,1155)	>Referenced SOP Instance UID

The SCP will return one of the following status codes for FILM BOX SOP CLASS N-SET RESPONSE:

Code	Status	Comment
0x0000	Success	Film Box was successfully created.

Basic Film Box SOP Class Operations for N-Action

The OKI C711 DICOM provides the support for submitting the print job for printing the specific Film Box. The Film BOX N-ACTION arguments are defined in the DICOM Standard PS 3.4, table H.4-8.
The SCP will return one of the following status codes for FILM BOX SOP CLASS N-ACTION Response:

Code	Status	Comment
0x0000	Success	Film Box was successfully printed.

Basic Film Box SOP Class Operations for N-DELETE

The OKI C711 DICOM provides the support for deleting the last created Film Box.
The SCP will return one of the following status codes for FILM BOX SOP CLASS N-DELETE Response:

Code	Status	Comment
0x0000	Success	Film Box was successfully deleted.

4 SOP Specific Conformance for Basic Grayscale Image Box SOP Class

The following DIMSE services are supported:

- N-SET
- True Size Printing

True size printing is controlled by the DICOM tag (2020,0030) requested image size. The software calculates the size (width in MM) of the image, based on the pixel spacing and sends that value to the printer.

IMAGE BOX SOP CLASS N-SET REQUEST ATTRIBUTES

The OKI C711 DICOM provides the following support for the attributes contained in the N-SET DIMSE Service of the Basic Grayscale Image Box SOP Class:

Tag	Name	Value
(2020,0010)	Image Position	
(2020,0020)	Polarity	NORMAL or REVERSE
(2010,0060)	Magnification Type	Ignored. Always BILINEAR
(2010,0080)	Smoothing Type	NORMAL or SHARP
(2020,0030)	Requested image size	The width in mm. It is calculated based on pixel spacing.
(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
(0028,0101)	>Bits Stored	8
(0028,0102)	>High Bit	7
(0028,0103)	>Pixel Representation	
(0028,0034)	>Pixel Aspect Ratio	
(7FE0,0010)	>Pixel Data Mandatory	

The SCP will return one of the following status codes for IMAGE BOX SOP CLASS N-SET RESPONSE:

Code	Status	Comment
0x0000	Success	Image Box was successfully set.

5 SOP Specific Conformance for Basic Color Image Box SOP Class

The following DIMSE services are supported:

- N-SET

IMAGE BOX SOP CLASS N-SET REQUEST ATTRIBUTES

The OKI C711 DICOM provides the following support for the attributes contained in the N-SET DIMSE Service of the Basic Color Image Box SOP Class:

Tag	Name	Value
(2020,0010)	Image Position	
(2020,0020)	Polarity	NORMAL or REVERSE
(2010,0060)	Magnification Type	Ignored. Always BILINEAR
(2010,0080)	Smoothing Type	NORMAL
(2020,0030)	Requested image size	The width in mm. It is calculated based on pixel spacing.
(2020,0110)	Basic Color 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	
(0028,0034)	>Pixel Aspect Ratio	
(7FE0,0010)	>Pixel Data Mandatory	

The SCP will return one of the following status codes for IMAGE BOX SOP CLASS N-SET RESPONSE:

Code	Status	Comment
0x0000	Success	Image Box was successfully set.

6 Specific Conformance for Presentation LUT Box SOP class

The OKI C711 DICOM supports the Presentation LUT SOP class as SCP. Print SCU may negotiate this support and create a Presentation LUT instance prior to the creation of Film Boxes or Image Boxes. Multiple Presentation LUT instances are supported in an association, but only one instance will be supported for each image.

The SCU shall send either Presentation LUT Sequence or the Presentation LUT Shape. These values are mutually exclusive and the action will result in an error if neither or both are present. The presence of the Presentation LUT instance overrides any data set in the Configuration Information attribute (2010,0150) of the Film Box or Image Box.

The Print Server Management System provides support for the following DIMSE Services:

- N-CREATE
- N-DELETE

Presentation LUT Box SOP class operation for N-CREATE

The Print Server Management System supports the following attributes of the N-CREATE DIMSE Service of the Presentation LUT SOP Class:

PRESENTATION LUT SOP CLASS N-CREATE REQUEST ATTRIBUTES

Attribute & Usage	Tag	Supported Values	Default Values if not sent by SCU or invalid value received
Presentation LUT Sequence	(2050,0010)		None.
>LUT Descriptor	(0028,3002)	The first value is the number of entries in the lookup table. The second value represents the first mapped value of the LUT. The third value shall be 10-16 (which represents the bit depth of each LUT entries.	First value should be the number of LUT entries. Second value should be 0 The third value default is 12.
>LUT Explanation	(0028,3003)		None.
>LUT Data	(0028,3006)		None.
Presentation LUT Shape	(2050,0020)	Enumerated values: IDENTITY, LIN OD, INVERSE	None.

The Print Server Management behavior and specific status codes sent for the N-CREATE of a specific Presentation LUT is described in the following table:

PRESENTATION LUT SOP CLASS N-CREATE RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed successfully the creation of the Presentation LUT.

Presentation LUT Box SOP class operation for n-DELETE

When a N-DELETE DIMSE service is requested with a specific Presentation LUT SOP instance, the Print Server Management System will not delete the specified Presentation LUT SOP instance as long as there are outstanding references to it. Otherwise, it deletes the specified Presentation LUT SOP instance.

Consistent Presentation of Grayscale Images

The OKI C711 DICOM supports the DICOM standard (PS 3-14) Grayscale Standard Display Function (GSDF) for Consistent Presentation of Displayed and Printed Images. The Image Consistency is achieved through the support of the Presentation LUT (transforming the image pixels value in to the Standard Presentation P-values) and then Transforming the Image pixel values from the standard Presentation (P-value) space to the Optical Density space. Calibrating the Imager Printer Device to adjust the Printer Imager characteristic curve to fit the GSDF curve. The OKI C711 DICOM Service Manual describes in details the Imager Printer calibration to the DICOM GSDF curve.

7 Communication Profiles
7.1 Supported Communications Stacks

The OKI C711 DICOM supports a single network interface. One of the following physical network interfaces will be available depending on installed hardware options:

SUPPORTED PHYSICAL NETWORK INTERFACES

Ethernet 100baseT
Ethernet 10baseT

7.1.1 Additional Protocols

DHCP can be used to obtain TCP/IP network configuration information (e.g. own TCP/IP address, net-mask, default gateway, DNS server, etc.).
Support for DHCP can be configured via the Printer Control Panel. If DHCP is not in use, TCP/IP network configuration information can be manually configured via the Printer Control Panel.
DNS can be used for address resolution. If DHCP is not in use, the identity of a DNS server can be configured via the Printer Control Panel. If a DNS server is not in use, local mapping between hostname and TCP/IP address can be manually configured via the Printer Control Panel.

7.1.2 IPv4 and IPv6 Support

This product supports IPv4.

7.2 TCP/IP Stack

Print SCP inherits its TCP/IP stack from the OKI printer system upon which it is executed.

7.3 Physical Media Support

Print SCP is irrelevant of the physical medium over which TCP/IP executes; it inherits this from the system upon which it is executed.

8 Extensions/Specialization/Privatization

No extensions defined.

9 Configuration
9.1 AE Title/Presentation Address Mapping

Print SCP configuration is included in the application user interface through the setup dialog.

The Field Service Engineer can configure the IP Address via the Printer Control Panel. A Default AE Titles "OKI" are provided. The other AE Titles must be configured during installation. The local AET used by each individual application can be configured independently of the AET used by other local applications. If so configured, all local AE's are capable of using the same AET or different AET.

AE TITLE CONFIGURATION TABLE

Application Entity	Default AE Title	Default TCP/IP Port
PRINT-SCP	OKI	11112
STORE-SCP	OKI	11112

9.2 Parameters

A large number of parameters related to Print Management, Communications and general operation can be configured using the user interface.

The following table shows those configuration parameters relevant to DICOM communication. See the OKI C711 DICOM Configuration Service Manual for details on general configuration capabilities.

CONFIGURATION PARAMETERS TABLE

Parameter	Configurable (Yes/No)	Default Value
General Parameters		
Max PDU Receive Size	Yes	128 KB
Max PDU Send Size (If the receiver supports a smaller Max PDU Receive Size then the Max PDU Send Size will be reduced accordingly for the duration of the Association. Max PDU Receive Size information is exchanged during DICOM Association Negotiation in the Maximum Length Sub-Item of the A-ASSOCIATION-RQ and A-ASSOCIATE-AC)	Yes	128 KB
Time-out waiting for an acceptance or rejection response to an Association Request (Application level Timeout).	No	150 s
Maximum number of simultaneous Associations	No	3

Parameter	Configurable (Yes/No)	Default Value
Supported Transfer Syntaxes	No	Implicit VR Little Endian
Print Server Management		
Default Print parameters: Contrast, Border Density, Smoothing factor, Polarity, Orientation, etc.	Yes	Configurable
Number of times a failed print-job may be retried	No	NA
Delay between retrying failed print-jobs	No	NA
Printer Bit-depth Configurable: 8 , 10, 12 or 16	Yes	8
Custom Format	No	NA
Media Type: Reflective (Paper)	Yes	Paper
Media size Configurable: A4, A3, Letter, Tabloid, 8_5X35IN, 8_5X47IN, 12X35IN and 12X47IN	Yes	A4
Maximum number of printable pixel matrix per supported Media size	No	See page 23.
Maximum Pixel size	No	0.117 mm (216dpi)
Maximum number of collated films in a film session	Yes	10
Support N-EVENT-REPORT (On/Off for either Printer, Print Job or both).	No	NA
Handling of print jobs when requested Media Type and/or Film Size are not currently installed. The options are: 1. Queue the print job until the film matching the requested Media Type and/or Film Size is loaded. 2. Print on the film currently loaded in the printer.	Yes	Queue the print job until the paper matching the requested Media Size is loaded

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