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Technical Information

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DICOM Conformance Statement

Hipax DICOM Print Manager 2.0.0

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Steinhart Medizinsysteme GmbH
Medical Imaging, Archiving, and Communication

Steinhart Medizinsysteme GmbH

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Conformance Statement Overview

This product, Hipax Print Manager, implements the necessary DICOM services to facilitate the Print Jobs (SCP/SCU) for Management in the healthcare departments. It enables the capabilities to capture images at any networked DICOM modality, administrate them and then send them anywhere they were needed in the medical facility.

Table 1.1: Network Services Supported

SOP Classes	User of Service	Provider of Service
Verification SOP Class	No	Yes
Basic Grayscale Print Management Meta SOP class	Yes	Yes
Basic Color Print Management Meta SOP class	Yes	Yes
Basic Annotation Box SOP Class	Yes	Yes
Print Job SOP Class	Yes	Yes
Presentation LUT SOP Class	Yes	Yes
Print Queue Management SOP Class	Yes	Yes

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1. Use of the DICOM Print Manager

The Hipax DICOM Print Manager can be used for DICOM print job management. The application is able to administrate DICOM print jobs and to emit them bit by bit corresponding to the capability of the used printer. Print jobs can also be buffered and redirected. Thus, the Print Manager prevents that print jobs are cancelled and lost because of a capacity overload of the printer.

Furthermore, the Hipax DICOM Print Manager allows the user to process the same print job on different DICOM printers. To make this, the physical printers are related to one or several groups, called logical printers, using mapping and constraints, e.g. depending on the film size ID, medium type, or destination.

Additionally Hipax DICOM Print Manager includes the functionality of a DICOM print server for Windows paper printers.

2. Introduction to this Document

2.1 Purpose and Intended Audience of this Document

This document is a DICOM Conformance Statement for the DICOM Services of the Hipax Print Manager software. The user of this document is involved with system integration and/or software design. We assume that the reader is familiar with the terminology and concepts that are used in the DICOM 3.0 standard and the IHE Technical Framework.

Readers not familiar with DICOM 3.0 terminology should first read the appropriate parts of the DICOM standard itself, prior to reading this conformance statement. Although the use of this conformance statement in conjunction with the DICOM 3.0 standard is intended to facilitate communication with Steinhart Medizinsysteme GmbH software, it is not sufficient to guarantee, by itself, the inter-operation of the connection.

2.2 General Remarks

2.2.1 Integration and Validation Activities

The integration of any device into a system of interconnected devices goes beyond the scope of the DICOM 3.0 standard and this conformance statement when *interoperability* is desired. The responsibility for analyzing the applications requirements and developing a solution that integrates the Hipax software with other vendors. systems is the user's responsibility and should not be underestimated. In some circumstances it might be necessary to perform a validation to make sure that functional interoperability between the Hipax software and non-Hipax devices works as expected. The user should ensure that any non-Hipax provider accepts responsibility for any validation required for their connection with the Hipax software.

2.2.2 Future Evolution

As the DICOM 3.0 standard evolves to meet the user's growing requirements and to incorporate new features and technologies, Steinhart Medizinsysteme GmbH will follow the evolution of the standard. This evolution of the standard may require changes to devices that have implemented DICOM 3.0. The user should ensure that any non-Hipax provider, who connects with Hipax devices, also plans for future evolution of the DICOM standard. A refusal to do so may result in the loss of functionality and/or connectivity between the different products.

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2.2.3 Acronyms and Abbreviations

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard. Abbreviations and terms are as follows:

AE	DICOM Application Entity
AET	Application Entity Title
ASCE	Association Control Service Element
DICOM	Digital Imaging and Communications in Medicine
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
GSDF	Grayscale Standard Display Function
GSPS	Grayscale Softcopy Presentation State
IE	Information Entity
IOD	(DICOM) Information Object Definition
ISO	International Standard Organization
MPPS	Modality Performed Procedure Step
MSPS	Modality Scheduled Procedure Step
PDU	DICOM Protocol Data Unit
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM server)
SOP	DICOM Service-Object Pair
UID	Unique Identifier
VR	Value Representation

2.2.4 Related Documents

- ACR-NEMA Digital Imaging and Communications in Medicine (DICOM) V3.0. 2003.
- IHE Radiology Technical Framework Revision 5.5 . Final Text, November 20, 2003

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3. Networking

3.1 Implementation Model

3.1.1 Application Data Flow Diagram

Print Composer SCU sends print jobs and print management information:
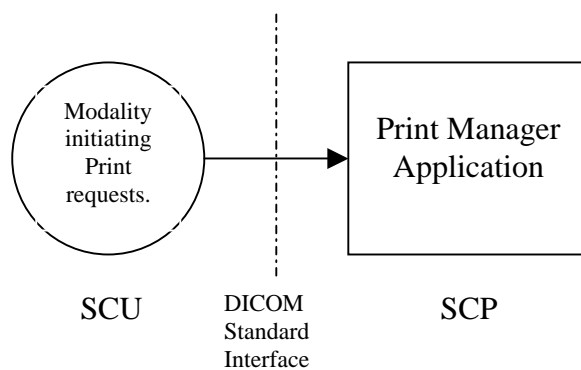
Hipax Print Manager receives print job, print management information and sends them to printers:
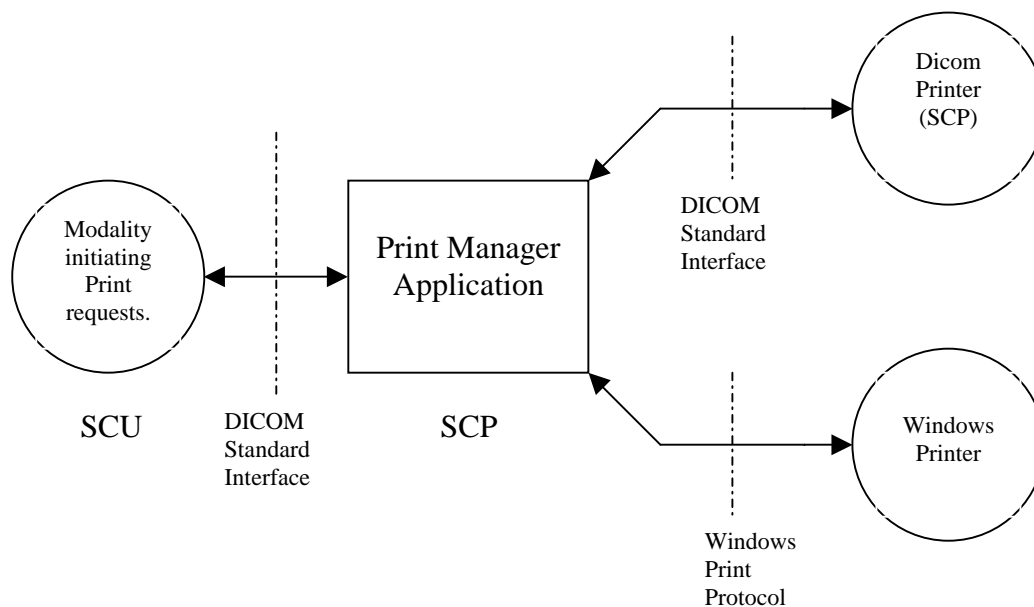
Printer receives print jobs and print management information and returns print-status information which can be returned to the modality.

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4. DICOM Conformance

4.1 Hipax Print Manager

4.1.1 Implementation Identifying Information
The information listed in Table 4.1 is used to identify the Hipax Print Manager.

Table 4.1: Hipax Print Manager identifying information.

Implementation Version Name	HIPAXDICOM3V5000
Implementation Class UID	1.2.276.0.5420030101.5.0.0.0
DICOM Application Context Name	1.2.840.10008.3.1.1.1

4.1.2 Supported SOP Classes
Hipax Print Manager provides standard conformance to the DICOM 3.0 Meta SOP Classes and DICOM 3.0 Optional SOP Classes as SCP listed in Table 4..

Table 4.2: Supported SOP Classes.

SOP Class UID	SOP Classes Name	SCU	SCP
1.2.840.10008.5.1.1.9	Basic Grayscale Print Management Meta SOP class	Yes	Yes
1.2.840.10008.5.1.1.18	Basic Color Print Management Meta SOP class	Yes	Yes
1.2.840.10008.1.1	Verification SOP Class	No	Yes
1.2.840.10008.5.1.1.15	Basic Annotation Box SOP Class	Yes	Yes
1.2.840.10008.5.1.1.14	Print Job SOP Class	Yes	Yes
1.2.840.10008.5.1.1.23	Presentation LUT SOP Class	Yes	Yes
1.2.840.10008.5.1.1.26	Print Queue Management SOP Class	Yes	Yes

4.1.3 Supported Transfer Syntaxes
Hipax Print Manager provides support for each of the SOP Classes listed in Table 4. with the following Transfer Syntaxes:

Table 4.3: Supported Transfer Syntaxes.

Name	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2
DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1
DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2

4.1.4 Number of Associatons
The number of simultaneous Associations supported by the SCP is virtually unlimited. The number of simultaneous Associations will influence the performance of the system. Default the number of simultaneous Associations is set to 20 and is configurable.

4.1.5 Asynchronous Nature
Maximum Number of outstanding asynchronous transactions: 1

4.1.6 Accepted Presentation Contexts

Table 4.4: Presentation Contexts Accepted/Proposed by Hipax Print Manager.

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name**	**UID**		
Basic Grayscale Print Management Meta SOP class	1.2.840.10008.5.1.1.9	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP SCU	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Basic Color Print Management Meta SOP class	1.2.840.10008.5.1.1.18	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP SCU	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Verification SOP Class	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP SCU	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Print Job SOP Class	1.2.840.10008.5.1.1.14	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP SCU	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP SCU	None
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		

Table 4.4 (continue): Presentation Contexts Accepted/Proposed by Hipax Print Manager.

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Print Queue Management SOP Class	1.2.840.10008.5.1.1.26	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP SCU	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		

4.1.7 SOP Specific Conformance

4.1.7.1 Specific Conformance for Verification SOP Class

The Hipax Print Manager provides standard conformance to the DICOM Verification Service Class as a SCP. The following status code is returned in response to a C-ECHO.

Table 4.5: C-ECHO Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	

4.1.7.2 Specific Conformance to Grayscale Print Management Meta SOP Class:

The Hipax Print Manager supports the following mandatory SOP classes as defined by the Basic Grayscale Print Management Meta SOP Class:

Table 4.6: SOP Classes for Basic Grayscale Print Management Meta SOP Class.

SOP Class Name	SOP Class UID	SCU	SCP
Basic Film Session	1.2.840.10008.5.1.1.1	Yes	Yes
Basic Film Box	1.2.840.10008.5.1.1.2	Yes	Yes
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	Yes	Yes
Printer	1.2.840.10008.5.1.1.16	Yes	Yes

4.1.7.2.1 Specific Conformance for Basic Film Session SOP Class

The Hipax Print Manager accepts all DICOM Print related attributes. Any DICOM Print related attributes that are received by Hipax Print Manager are sent to the associated printer without change. Attributes not related to DICOM Print are not sent to the associated printers.

The Hipax Print Manager provides support for the following DIMSE Services:

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

Hipax Print Manager only supports one Basic Film Session per Association. However, a sequential Film Session on the same Association is allowed after deleting the previous Film Session.

4.1.7.2.1.1 Film Session SOP Class Operations for N-CREATE

The Hipax Print Manager provides the following support for the Film Session attributes sent by the N-CREATE DIMSE service:

Table 4.7: Film Session SOP Class Operations for N-CREATE.

Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received
Number of Copies	(2000,0010)		
Print Priority	(2000,0020)		
Medium Type	(2000,0030)		
Film Destination	(2000,0040)		
Film Session Label	(2000,0050)		
Memory Allocation	(2000,0060)		
Owner ID	(2100,0160)		
Proposed Study Seq.	(2130,00A0)		
>Patient.s Name	(0010,0010)		
>Patient ID	(0010,0020)		
>Patient.s Birth Date	(0010,0030)		
>Patient.s Birth Time	(0010,0032)		
>Patient.s Sex	(0010,0040)		
>Other Patient ID	(0010,1000)		
>Other Patient Names	(0010,1001)		
>Patient.s Age	(0010,1010)		
>Patient.s Size	(0010,1020)		
>Patient Weight	(0010,1030)		
>Ethnic Group	(0010,2160)		
>Occupation	(0010,2180)		
>Add. Patient.s History	(0010,21B0)		
>Patient Comments	(0010,4000)		
>Study ID	(0020,0010)		
>Series Number	(0020,0011)		
>Study Instance UID	(0020,000D)		
>Study Date	(0008,0020)		
>Study Time	(0008,0030)		
>Accession Number	(0008,0050)		
>Ref. Physician.s Name	(0008,0090)		
>Study Description	(0008,1030)		
>Name of Physician Reading Study	(0008,1060)		
>Admitting Diagnosis Description	(0008,1080)		

The following status codes are returned in response to a N-CREATE:

Table 4.8: N-CREATE Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	Invalid Attribute Value	$0106	Invalid Attribute Value
Failure	Class-Instance Conflict	$0119	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

The following status codes are returned in response to a N-SET:

Table 4.9: N-SET Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	Invalid Attribute Value	$0106	Invalid Attribute Value
Failure	Class-Instance Conflict	$0119	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

The following status codes are returned in response to a N-ACTION:

Table 4.10: N-ACTION Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure		$C600	Film Session SOP Instance hierarchy does not contain Film Box SOP Instances
Failure		$C601	Returned if the support for the Print Job Class was negotiated and the creation of the Print Job Instance failed.

The following status codes are returned in response to a N-DELETE:

Table 4.11: N-DELETE Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

4.1.7.2.2 Specific Conformance for Basic Film Box SOP Class

The Hipax Print Manager accepts all DICOM Print related attributes. Any DICOM Print related attributes that are received by Hipax Print Manager are sent to the associated printer without change. Attributes not related to DICOM Print are not sent to the associated printers.

The Hipax Print Manager provides support for the following DIMSE Services:

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

4.1.7.2.2.1 Basic Film Box SOP Class Operations for N-CREATE

The Hipax Print Manager provides the following support for the Basic Film Box attributes sent by the N-CREATE DIMSE service:

Table 4.12: Basic Film Box SOP Class Operations for N-CREATE.

Attribute	Tag	Valid Range	Default Value
Image Display Format	(2010,0010)	STANDARD ROW COL	
Annotation Display Format ID	(2010,0030)	ANNOTATION (Supported if the Annotation SOP Class is accepted)	
Film Orientation	(2010,0040)		
Film Size ID	(2010,0050)		
Magnification Type	(2010,0060)		
Smoothing Type	(2010,0080)		
Border Density	(2010,0100)		
Empty Image Density	(2010,0110)		
Minimum Density	(2010,0120)		
Maximum Density	(2010,0130)		
Trim	(2010,0140)		
Configuration Information	(2010,0150)		
Illumination	(2010,015E)		
Reflective Ambient Light	(2010,0160)		

The following status codes are returned in response to a N-CREATE:

Table 4.13: N-CREATE Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	Invalid Attribute Value	$0106	Invalid Attribute Value
Failure	Class-Instance Conflict	$0119	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

The following status codes are returned in response to a N-SET:

Table 4.14: N-SET Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	Invalid Attribute Value	$0106	Invalid Attribute Value
Failure	Class-Instance Conflict	$0119	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

The following status codes are returned in response to a N-ACTION:

Table 4.15: N-ACTION Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure		$C600	Film Session SOP Instance hierarchy does not contain Film Box SOP Instances
Failure		$C602	Returned if the support for the Print Job Class was negotiated and the creation of the Print Job Instance failed.

The following status codes are returned in response to a N-DELETE:

Table 4.16: N-DELETE Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

4.1.7.2.3 Specific Conformance for Basic Grayscale Image Box SOP Class

The Hipax Print Manager accepts all DICOM Print related attributes. Any DICOM Print related attributes that are received by Hipax Print Manager are sent to the associated printer without change. Attributes not related to DICOM Print are not sent to the associated printers.

The Hipax Print Manager provides support for the following DIMSE Services:

- N-SET

4.1.7.2.3.1 Basic Grayscale Image Box SOP Class Operations for N-SET

The Hipax Print Manager provides the following support for the Basic Grayscale Image Box attributes sent by the N-SET DIMSE service:

Table 4.17: Basic Grayscale Image Box SOP Class Operations for N-SET.

Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received
Magnification Type	(2010,0060)		
Smoothing Type	(2010,0080)		
Minimum Density	(2010,0120)		
Maximum Density	(2010,0130)		
Image Position	(2020,0010)		
Polarity	(2020,0020)		
Requested Image Size	(2020,0030)		
Basic Grayscale Image Sequence	(2020,0110)		
>Samples Per Pixel	(0028,0002)		
>Photometric Interpretation	(0028,0004)		
>Rows	(0028,0010)		
>Columns	(0028,0011)		
>Pixel Aspect Ratio	(0028,0034)		
>Bits Allocated	(0028,0100)		
>Bits Stored	(0028,0101)		
>High Bit	(0028,0102)		
>Pixel Representation	(0028,0103)		
>Pixel Data	(7FE0,0010)		
Ref. Presentation LUT Seq.	(2050,0500)		
>Ref. SOP Class UID	(0008,1150)		
>Ref. SOP Instance UID	(0008,1155)		

The following status codes are returned in response to a N-SET:

Table 4.18: N-SET Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	Invalid Attribute Value	$0106	Invalid Attribute Value
Failure	Class-Instance Conflict	$0119	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

4.1.7.2.4 Specific Conformance for Printer SOP Class

The Hipax Print Manager provides support for the following DIMSE Services:

- N-EVENT-REPORT
- N-GET

4.1.7.2.4.1 Printer SOP Class Operations for N-EVENT-REPORT

At any time during the Association, Hipax Print Manager may send an N-EVENT-REPORT to the SCU to report the printer status (which is a combined status of all associated printers). Sending a N-EVENT-REPORT is disabled by default. It is also possible to configure Hipax Print Manager so that the printer status attribute WARNING and FAILURE is sent along with more detailed Printer Status Information. Sending WARNINGS and FAILURES is disabled by default.

The ADPM provides the following support for the Printer attributes sent by the N-EVENT-REPORT DIMSE service

Table 4.19: N-EVENT-REPORT Request Attributes.

Printer Status (2110,0010)	Printer Status Info (2110,0020)	Meaning
NORMAL	NORMAL	Normal printer operation
FAILURE (*)	UNKNOWN	
WARNING (*)	BAD SUPPLY MGZ	Film supply tray open.
WARNING (*)	COVER OPEN	The printer top cover is open.
WARNING (*)	SUPPLY EMPTY	The printer film tray is empty. Spooling of print jobs is still possible.
WARNING (*)	FILM JAM	Film jam.

(*) Warnings and failures are not returned by default. Enabling warnings and failures is explained in the user Manual.

Any other attributes provided by any associated printer will also be forwarded to the associated SCU if failures and warnings are enabled.

4.1.7.2.4.2 Printer SOP Class Operations for N-GET

At any time during the association, Hipax Print Manager application may receive an N-GET request asking for the printer status. It is also possible to configure Hipax Print Manager so that the printer status attributes WARNING and FAILURE is sent along with more detailed Printer Status Information. The sending of WARNINGS and FAILURES is disabled by default.

Hipax Print Manager sends the following attributes in response to an N-GET request:

Table 4.20: Printer SOP Class N-GET Request Attri butes.

Attribute	Tag	Valid Range
Printer Status	(2110,0010)	NORMAL FAILURE WARNING
Printer Status Info	(2110,0020)	NORMAL UNKNOWN
Printer Name	(2110,0030)	
Manufacturer	(0008,0070)	
Manufacturer Model Name	(0008,1090)	
Device Serial Number	(0018,1000)	
Software Versions	(0018,1020)	
Date Last Calibration	(0018,1200)	
Time Last Calibration	(0018,1201)	

Table 4.21: N-GET Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	Class-Instance Conflict	$0119	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

4.1.7.3 Specific Conformance to Color Print Management Meta SOP Class:

The Hipax Print Manager supports the following mandatory SOP classes as defined by the Basic Color Print Management Meta SOP Class:

Table 4.22: SOP classes for Basic Color Print Management Meta SOP Class.

Name	UID	SCU	SCP
Basic Film Session	1.2.840.10008.5.1.1.1	Yes	Yes
Basic Film Box	1.2.840.10008.5.1.1.2	Yes	Yes
Basic Color Image Box	1.2.840.10008.5.1.1	Yes	Yes
Printer	1.2.840.10008.5.1.1.16	Yes	Yes

4.1.7.3.1 Specific Conformance for Basic Film Session SOP Class

Refer to the 'Basic Film Session SOP Class' for 'Basic Grayscale Print Management'.

4.1.7.3.2 Specific Conformance for Basic Film Box SOP Class

Refer to the 'Basic Film Box SOP Class' for 'Basic Grayscale Print Management'.

4.1.7.3.3 Specific Conformance for Basic Color Image Box SOP Class

The Hipax Print Manager accepts all DICOM Print related attributes. Any DICOM Print related attributes that are received by Hipax Print Manager are sent to the associated printer without change. Attributes not related to DICOM Print are not sent to the associated printers.

The Hipax Print Manager provides support for the following DIMSE Services:

- N-SET

4.1.7.3.3.1 Basic Color Image Box SOP Class Operations for N-SET

The Hipax Print Manager provides the following support for the Basic Color Image Box attributes sent by the N-SET DIMSE service:

Table 4.23: Basic Color Image Box SOP Class Operations for N-SET.

Attribute	Tag	Valid Range
Magnification Type	(2010,0060)	
Smoothing Type	(2010,0080)	
Minimum Density	(2010,0120)	
Maximum Density	(2010,0130)	
Image Position	(2020,0010)	
Polarity	(2020,0020)	
Requested Image Size	(2020,0030)	
Basic Color Image Sequence	(2020,0111)	
>Samples Per Pixel	(0028,0002)	
>Photometric Interpretation	(0028,0004)	
>Planar Configuration	(0028,0006)	
>Rows	(0028,0010)	
>Columns	(0028,0011)	
>Pixel Aspect Ratio	(0028,0034)	
>Bits Allocated	(0028,0100)	
>Bits Stored	(0028,0101)	
>High Bit	(0028,0102)	
>Pixel Representation	(0028,0103)	
>Pixel Data	(7FE0,0010)	

The following status codes are returned in response to a N-SET:

Table 4.24: N-SET Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	Invalid Attribute Value	$0106	Invalid Attribute Value
Failure	Class-Instance Conflict	$0119	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

4.1.7.3.4 Specific Conformance for Basic Color Printer SOP Class

Refer to the 'Basic Film Box SOP Class' for 'Basic Grayscale Print Management'.

4.1.7.4 Specific Conformance to Basic Annotation Box SOP Class

The Hipax Print Manager provides standard conformance to the DICOM Basic Annotation Box SOP Class.

The Hipax Print Manager accepts all DICOM Print related attributes. Any DICOM Print related attributes that are received by Hipax Print Manager are sent to the associated printer without change. Attributes not related to DICOM Print are not sent to the associated printers.

The Basic Annotation Box SOP Instance is created by a N-CREATE of the Film Box SOP Class, if the "Annotation Display Format ID" attribute (2010,0030) has the value "ANNOTATION".

The Hipax Print Manager provides support for the following DIMSE Services:

- N-SET

Hipax Print Manager sends the following attributes in response to an N-SET request:

Table 4.25: Basic Annotation Box SOP Class N-SET Request Attributes.

Attribute	Tag	Valid Range
Annotation Position	(2030,0010)	1-6 (One for each Annotation Box)
Text String	(2030,0020)	Refer to explanation below

The following status codes are returned in response to a N-SET:

Table 4.26: N-SET Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	Class-Instance Conflict	$0119	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

4.1.7.5 Specific Conformance to Print Job SOP Class

The Hipax Print Manager provides standard conformance to the DICOM Print Job SOP Class.

The Print Job SOP Instance is created by a N-ACTION of the Film Session SOP Class or the N-ACTION of the Film Box SOP Class. The Print Job instance is deleted after all films are printed or in event of an error.

The following DIMSE Service are supported:

- N-EVENT REPORT
- N-GET

4.1.7.5.1 Print Job SOP Class N-EVENT-REPORT

N-EVENT-REPORT is used to report execution status changes to the SCU in an asynchronous way. N-EVENT-REPORT is disabled by default. Following Event Types and ID's are supported:

Table 4.27: Print Job SOP Class N-EVENT-REPORT.

Event Type Name	Event Type ID	Description
PENDING	1	Print job is pending
PRINTING	2	Print job is being printed
DONE	3	Print job is printed
FAILURE	4	Print job failed

The following values are supported for "Execution Status Info" attribute:

Table 4.28: Supported Attributes.

Attribute	Tag	Valid Range
Execution Status Info	(2100,0030)	Refer to Table 4.7: Execution Status Info
Print Job ID	(2100,0010)	
Film Session Label	(2000,0050)	
Printer Name	(2110,0030)	HipaxDicomPrint

The following values are supported for "Execution Status Info" attribute:

Table 4.29: Supported Attributes.

Execution Status Info	Execution Status Info	Meaning
PRINTING	"NORMAL"	
DONE	"NORMAL"	
FAILURE	"INVALID PAGE DES"	The specified page layout cannot be printed or other page description errors have been detected.
FAILURE	„INSUFFIC MEMORY"	There is not enough memory available to complete this.

4.1.7.5.2 Print Job SOP Class N-GET Request

N-GET is used to retrieve an instance of the Print Job SOP Class. Hipax Print Manager sends the following attributes in response to a Print Job N-GET request:

Table 4.30: Print Job SOP Class N-GET Request Attributes.

Attribute	Tag	Valid Range
Execution Status	(2100,0020)	PENDING PRINTING DONE FAILURE
Execution Status Info	(2100,0030)	Refer to Table 4.7: Execution Status Info
Print Priority	(2000,0020)	LOW MED HIGH
Creation Date	(2100,0040)	Date of print job creation
Creation Time	(2100,0050)	Time of print job creation
Originator	(2100,0070)	Calling AE Title
Printer Name	(2110,0030)	

4.1.7.6 Specific Conformance to Presentation LUT SOP Class

The Hipax Print Manager provides standard conformance to the DICOM Presentation LUT Service Class.

The Hipax Print Manager provides support for the following DIMSE Services:

- N-CREATE
- N-DELETE

4.1.7.6.1 Presentation LUT SOP Class N-CREATE Request

N-CREATE is used to create a Presentation LUT SOP Instance. The Hipax Print Manager provides the following support for the Presentation LUT SOP Class attributes sent by the N-CREATE DIMSE service:

Table 4.31: Presentation LUT SOP Class N-Create Request Attributes.

Attribute	Tag	Valid Range
Presentation LUT sequence	(2050,0010)	
>LUT Descriptor	(0028,3002)	
>LUT Explanation	(0028,3003)	
>LUT Data	(0028,3006)	
Presentation LUT Shape	(2050,0020)	IDENTITY LIN OD

The following status codes are returned in response to a N-CREATE:

Table 4.32: N-CREATE Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	Invalid Attribute Value	$0106	Invalid Attribute Value

4.1.7.6.2 Presentation LUT SOP Class N-DELETE Request

Used to delete a Presentation LUT SOP Instance. The following status codes are returned in response to a N-DELETE:

Table 4.33: N-DELETE Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

4.1.7.7 Specific Conformance to Print Queue Management SOP Class

The Hipax Print Manager provides standard conformance to the DICOM Queue Management Service Class.

The Printer Queue Management SOP Class is used to monitor and manipulate the print queue of the printer. The Printer Queue Management SOP instance is created by Hipax Print Manager during the start-up of the application and has a SOP instance UID of: **1.2.840.10008.5.1.1.25**. The print queue is restored after application startup.

The Hipax Print Manager provides support for the following DIMSE Services:

- N-EVENT-REPORT
- N-GET
- N-ACTION

4.1.7.7.1 Print Queue SOP Class N-EVENT-REPORT

N-EVENT-REPORT is used to report execution status changes to the SCU in an asynchronous way. N-EVENT-REPORT is disabled by default. The following Event Names and Event Type ID's are supported:

Table 4.34: N-EVENT-REPORT Event Type ID's.

Event Type Name	Event Type ID	Description
HALTED	1	Queue operation is halted
FULL	2	Queue is full
NORMAL	3	Queue is operational

4.1.7.7.2 Print Queue SOP Class N-GET Request

N-GET is used by the SCU to retrieve an instance of the Print Queue Management SOP Class from Hipax Print Manager. Hipax Print Manager provides the following support for the Print Queue Management SOP Class attributes sent by the N-GET DIMSE service:

Table 4.35: Print Job SOP Class N-GET Request Attributes.

Attribute	Tag	Valid Range
Queue Status	(2120,0010)	FULL HALTED NORMAL
Print Job Description Sequence	(2120,0050)	
>Print Job ID	(2100,0010)	
>Execution Status	(2100,0020)	PENDING PRINTING DONE FAILURE
>Execution Status Info	(2100,0030)	Refer to Table 4.6: Execution Status Info
>Creation Date	(2100,0040)	Date of print job creation
>Creation Time	(2100,0005)	Time of print job creation
>Print Priority	(2000,0020)	
>Origin AE	(2100,0070)	Calling AE Title
>Destination AE	(2100,0140)	Called AE Title
>Printer Name	(2110,0030)	
>Film Destination	(2000,0040)	
>Film Session Label	(2000,0050)	
>Medium Type	(2000,0030)	
>Number Of Films	(2100,0170)	
>Referenced Print Job Sequence	(2120,0070)	
>>Referenced SOP Class UID	(0008,1150)	
>>Referenced SOP Instance UID	(0008,1155)	

The following status codes are returned in response to a N-GET:

Table 4.36: N-GET Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

4.1.7.7.3 Print Queue SOP Class N-ACTION Request

N-ACTION is used by the SCU to manipulate the Print Managers queue content. Following "Event Types" are supported:

Table 4.37: "Event Types" supported.

Event Type Name	Event Type ID	Description
PRIORITIZE	1	Change priority of queue entry
DELETE	2	Delete queue entry

The Hipax Print Manager provides the following support for the Print Queue Management SOP Class attributes sent by the N-ACTION DIMSE service:

Table 4.38: Supported Attributes.

Attribute	Tag	Valid Range
Print Job ID	(2100,0010)	
Print Priority	(2000,0020)	HIGH LOW
Owner ID	(2100,0160)	

The following status codes are returned in response to a N-ACTION:

Table 4.39: N-ACTION Response Status.

Service Status	Further Meaning	Error Code	Reason
Success	Success	$0000	Operation successfully completed
Failure	SOP Class Not Supported	$0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

4.2 Network Interfaces

The Hipax Print Manager provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8 of the DICOM Standard.

5. Media Interchange

Not supported.

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