# Conformance Statement for
# ISG Hardcopy Server as DICOM Print Management SCU

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| | | | |
|---|---|---|---|
| Author | **Darek Tomaszewski** | _____ | _____ |
| Program Manager | John Collins * | _____ | _____ |
| Platforms Director | Loris Sartor | | |
| Architect DcS, ArS, HcS | Gerrit Visser† | | |
| Project Leader | David Ty† | | |
| Account Manager | Peter Bak | | |

† *Mandatory reviewers.*

* *The signature of the Program Manager attests that the mandatory reviewers have approved this document.*

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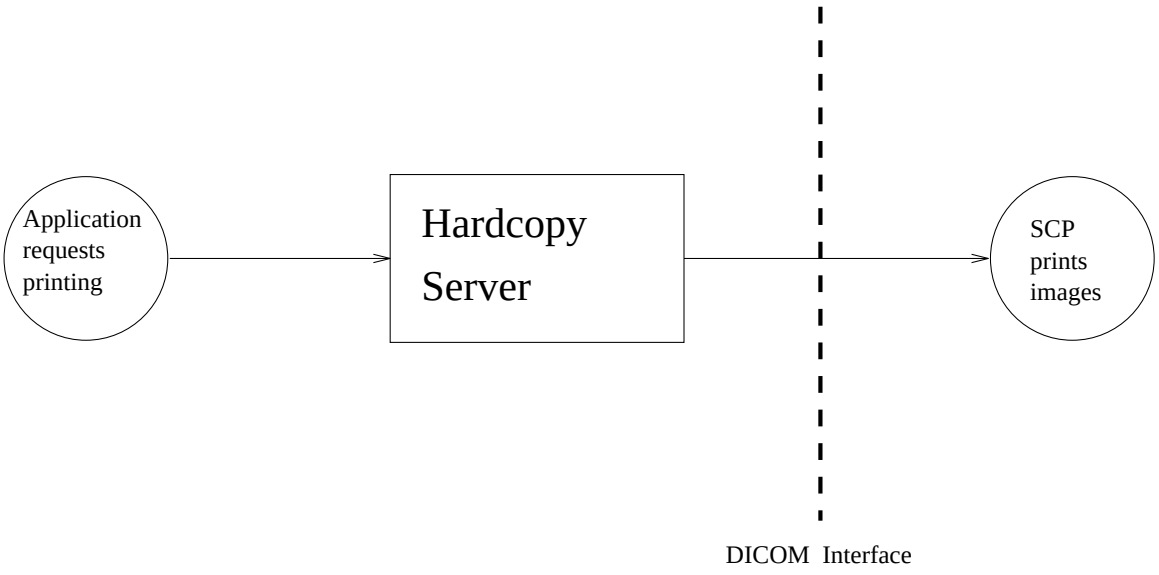
# 1. Introduction

The ISG Hardcopy Server (*hcserver*) supports printing to DICOM Print Management SCP. The *hcserver* acts as an SCU of the DICOM print management SOP classes. It uses a configuration file for specifying the behaviour specific to different DICOM SCPs.

# 2. Implementation Model

## 2.1. Application Data Flow Diagram

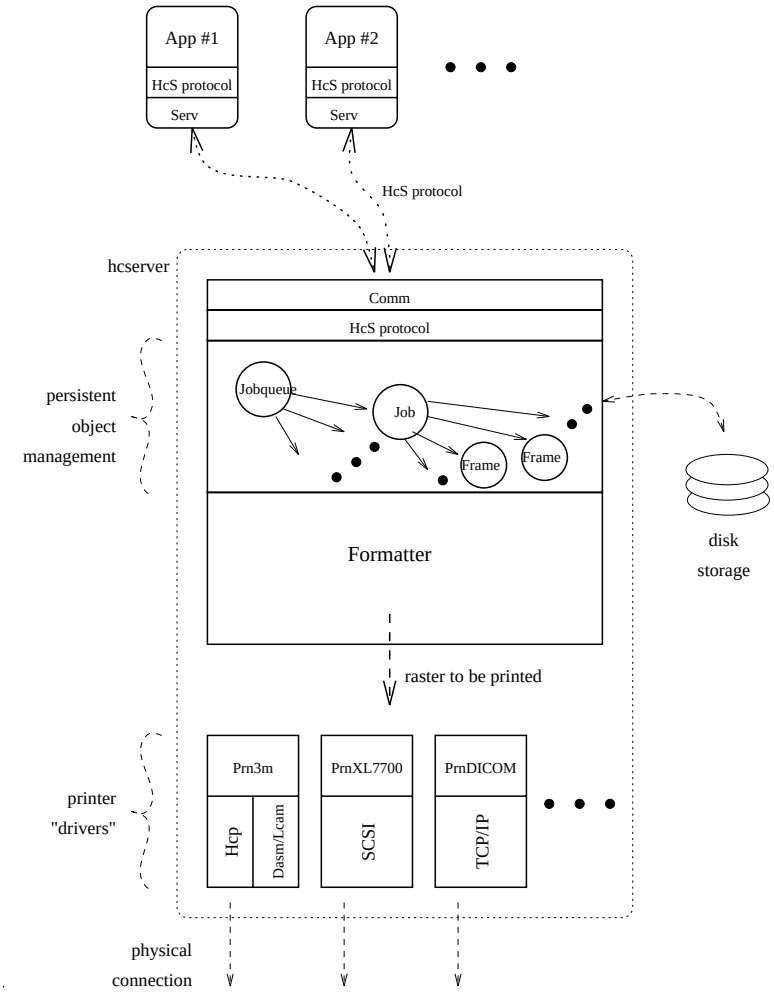
The relationship of the *hcserver* use of DICOM to real world activities is presented in the following diagram.



The application using the Hardcopy Server requests printing to a print device. The Hardcopy Server initiates an association with a DICOM print SCP for the purpose of printing the job requested by the application. The Hardcopy Server can handle simultaneous associations with a number of DICOM print SCPs.

## 2.2. Functional Definition of Application Entities

The model of the *hcserver* is presented in the following diagram.




Multiple client applications are connected to an instance of the Hardcopy server. Each connection can be made locally, if both the client and the server are executing on the same machine, or remotely, when the client and the server are running on different machines connected via networking.

The Hardcopy server consists of a Comm layer, which handles the communications, and a layer for interpreting the HcS command and data protocol. Commands and data result in various objects being created:

Jobqueue A jobqueue in the model of IAP Hardcopy server consists of several jobs, queued in priority and FIFO order. This permits pre-emptive printing of high priority jobs, if desired.

Job A job is composed of several frames, each of which defines a physical region of a film and the contents thereof. A job has an associated set of formatting commands. which specify such details as film layout, number of copies, choice of printer, and other parameters that pertain to the entire job.

Frame A frame is a set of formatting commands, such as commands to display an image with overlay text and graphics, the location of the image on the film, and other relevant information required for printing images onto films.

When a job appears at the front of a queue, the Formatter will prepare the job prior to sending it to the printer. Image viewing transformations are applied, contrast and brightness adjustment are performed, and text and graphics overlays are added. A formatted image is passed to the appropriate printer driver, which handles the physical link to the printer, the data communication between the host computer and the printer, and the processing of status and error messages from the printer.

For printing to a DICOM print server, a DICOM print SCU driver is provided. Multiple instances of DICOM print SCU driver can co-exist, and each instance handles the association with one DICOM print server.

## 2.3. Sequencing of Real-World Activities

N/A.

# 3. Application Entity (AE) Specifications

The *hcserver* represents a single Application Entity. It acts independently of other DICOM applications that may be running on the same system. The *hcserver* can support printing to multiple DICOM printers at the same time, each printer being uniquely identified by an Application Entity Title.

## 3.1. AE Print User - Specification

The *hcserver* provides Standard Conformance to the following DICOM 3.0 SOP Classes as an SCU:

| SOP Class Name | SOP Class UID |
|---|---|
| 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 |

### 3.1.1. Association Establishment Policies

#### 3.1.1.1. General

The *hcserver* maintains a separate association with each DICOM SCP. It releases the association with DICOM SCP if no operation is done on the association in a selected time period.

#### 3.1.1.2. Number of Associations

There is no limit on the number of associations maintained simultaneously with one or different DICOM SCPs.

#### 3.1.1.3. Asynchronous Nature

The *hcserver* does not support asynchronous operations and will not perform asynchronous window negotiation.

#### 3.1.1.4. Implementation Identifying Information

The *hcserver* implementation class UID is 2.16.124.113531.1.3.1, the implementation version name is ISG_HCS_V1.0.96.

### 3.1.2. Association Initiation Policy

The *hcserver* maintains a list of valid print servers and can present that list to the applications upon request. When the application submits a print job designated for a listed print server to the *hcserver*, the *hcserver* will request an association with the selected print server.

#### 3.1.2.1. Printing encoded with Implicit or Explicit VR

##### 3.1.2.1.1. Associated Real-World Activity

The application's print request causes the *hcserver* to initiate an Association.

##### 3.1.2.1.2. Proposed Presentation Contexts

The *hcserver* will propose one of the presentation contexts listed in the Presentation Context Table.

| Presentation Context Table | | | | | |
|---|---|---|---|---|---|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name | UID | | |
| Basic GrayScale Print Management | 1.2.840.10008 .5.1.1.9 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
| Basic Color Print Management | 1.2.840.10008 .5.1.1.18 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

###### 3.1.2.1.2.1. SOP Specific Conformance to Basic Grayscale Print Management Meta SOP Class

The *hcserver* supports the following mandatory SOP classes which are defined under the Basic Grayscale Print Management Meta SOP Class:

| Name | UID |
|---|---|
| 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 |
| Printer SOP Class | 1.2.840.10008.5.1.1.14 |

The *hcserver* supports the following optional SOP class attributes and DIMSE services for the Basic Grayscale Print Management Meta SOP Class.

| SOP Class | DISME Service | Optional Attribute | Tag |
|---|---|---|---|
| Basic Film Session SOP Class | N-CREATE | 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) |
| Basic Film Box SOP Class | N-CREATE | Film Orientation | (2010,0040) |
| | | Film Size ID | (2010,0050) |
| | | Magnification Type | (2010,0060) |
| | | Max Density | (2010,0130) |
| | | Configuration Information | (2010,0150) |
| | | Smoothing Type | (2010,0080) |
| | | Border Density | (2010,0100) |
| | | Empty Image Density | (2010,0110) |
| | | Min Density | (2010,0120) |
| | | Trim | (2010,0140) |
| | N-DELETE | | |
| Basic Grayscale Image Box SOP Class | N-SET | Polarity | (2020,0020) |
| Printer SOP Class | N-GET | | |

#### 3.1.2.1.2.1.1. Basic Film Session SOP Class (1.2.840.10008.5.1.1.1) attributes

The *hcserver* supports the following mandatory and optional attribute values in this SOP class:

| Attribute Name | Tag | Supported values |
|---|---|---|
| Number of Copies | (2000,0010) | Integer String |
| Print Priority | (2000,0020) | HIGH, MED, LOW |
| Medium Type | (2000,0030) | PAPER, CLEAR FILM, BLUE FILM |
| Film Destination | (2000,0040) | MAGAZINE, PROCESSOR |
| Film Session Label | (2000,0050) | Long String |
| Memory Allocation | (2000,0060) | Integer String |

#### 3.1.2.1.2.1.2. Basic Film Box SOP Class (1.2.840.10008.5.1.1.2) attributes

The *hcserver* supports the following mandatory and optional attribute values in this SOP class:

| Attribute Name | Tag | Supported values |
|---|---|---|
| Image Display Format | (2010,0010) | STANDARD, ROW, COL, SLIDE, SUPERSLIDE, CUSTOM |
| Film Orientation | (2010,0040) | PORTRAIT, LANDSCAPE |
| Film Size ID | (2010,0050) | 8INX10IN, 10INX14IN, 14INX14IN,24CMX24CM,10INX12IN, 11INX14IN, 14INX17IN, 24CMX30CM |
| Magnification Type | (2010,0060) | REPLICATE, BILINEAR, CUBIC, NONE |
| Smoothing Type | (2010,0080) | SCP specific |
| Border Density | (2010,0100) | BLACK, WHITE, i where i represents the desired density in hundredths of OD |
| Empty Image Density | (2010,0110) | BLACK, WHITE, i where i represents the desired density in hundredths of OD |
| Min Density | (2010,0120) | Unsigned Short |
| Max Density | (2010,0130) | Unsigned Short |
| Trim | (2010,0140) | YES, NO |
| Configuration Information | (2010,0150) | SCP specific |

#### 3.1.2.1.2.1.3. Basic Grayscale Image Box SOP Class (1.2.840.10008.5.1.1.4) attributes

The *hcserver* supports the following mandatory and optional attributes in this SOP class:

| Attribute Name | Tag | Supported values |
|---|---|---|
| Image Position | (2020,0010) | Unsigned Short |
| Polarity | (2020,0020) | NORMAL, REVERSE |
| Magnification Type | (2010,0060) | REPLICATE, BILINEAR, CUBIC, NONE |
| Smoothing Type | (2010,0080) | SCP specific |
| Requested Image Size | (2020,0030) | Unsigned Short |
| Preformatted Grayscale Image Sequence | (2020,0110) | |
| >Samples Per Pixel | (0028,0002) | 1 |
| >Photometric Interpretation | (0028,0004) | MONOCHROME1, MONOCHROME2 |
| >Rows | (0028,0010) | Unsigned Short |
| >Columns | (0028,0011) | Unsigned Short |
| >Pixel Aspect Ratio | (0028,0034) | 1:1 |
| >Bits Allocated | (0028,0100) | 8 |
| >Bits Stored | (0028,0101) | 8 |
| >High Bit | (0028,0102) | 7 |
| >Pixel Representation | (0028,0103) | 0000H (unsigned integer) |
| >Pixel Data | (7FE0,0010) | Other Byte String |

#### 3.1.2.1.2.1.4. Printer SOP Class (1.2.840.10008.5.1.1.14) attributes

The *hcserver* makes use of the following attributes and attribute values in this SOP class:

| Attribute Name | Tag | Supported values |
|---|---|---|
| Printer Status | (2110,0010) | NORMAL, WARNING, FAILURE |
| Printer Status Info | (2110,0020) | SUPPLY EMPTY, SUPPLY LOW, RECEIVER FULL, FILM JAM |
| Printer Name | (2110,0030) | Long String |
| Manufacturer | (0008,0070) | Long String |
| Manufacturer Model Name | (0008,1090) | Long String |
| Device Serial Number | (0018,1000) | Long String |
| Software Versions | (0018,1020) | Long String(s) |

#### 3.1.2.1.2.2. SOP Specific Conformance to Basic Color Print Management Meta SOP Class

The *hcserver* supports the following mandatory SOP classes which are defined under the Basic Color Print Management Meta SOP Class.

| Name | UID |
|---|---|
| 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 |
| Printer SOP Class | 1.2.840.10008.5.1.1.14 |

The optional SOP class attributes and DIMSE services for the Basic Film Session,Basic Film Box and Printer SOP classes are listed in the SOP Specific Conformance section for the Basic Grayscale Print Management Meta SOP Class.

The *hcserver* supports the following optional SOP class attributes and DIMSE services for the Basic Color Image Box SOP Class.

| SOP Class | DISME Service | Optional Attribute | Tag |
|---|---|---|---|
| Basic Color Image Box SOP Class | N-SET | Polarity | (2020,0020) |

#### 3.1.2.1.2.2.1. Basic Color Image Box SOP Class (1.2.840.10008.5.1.1.4.1) attributes

The *hcserver* supports the following attributes in this SOP class:

| | | |
|---|---|---|
| Image Position | (2020,0010) | Unsigned Short |
| Polarity | (2020,0020) | NORMAL, REVERSE |
| Magnification Type | (2010,0060) | REPLICATE, BILINEAR, CUBIC, NONE |
| Smoothing Type | (2010,0080) | SCP specific |
| Requested Image Size | (2020,0030) | Unsigned Short |
| Preformatted Color Image Sequence | (2020,0111) | |
| >Samples Per Pixel | (0028,0002) | 3 |
| >Photometric Interpretation | (0028,0004) | RGB |
| >Rows | (0028,0010) | Unsigned Short |
| >Columns | (0028,0011) | Unsigned Short |
| >Pixel Aspect Ratio | (0028,0034) | 1:1 |
| >Bits Allocated | (0028,0100) | 8 |
| >Bits Stored | (0028,0101) | 8 |
| >High Bit | (0028,0102) | 7 |
| >Pixel Representation | (0028,0103) | 0000H (unsigned integer) |
| >Pixel Data | (7FE0,0010) | Other Byte String |

### 3.1.3. Association Acceptance Policy

The *hcserver* does not accept associations.

# 4. Communication Profiles

## 4.1. TCP/IP Stack

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

### 4.1.1. TCP/IP API

The *hcserver* uses the TCP/IP stack upon which it executes.

### 4.1.2. Physical Media Support

The *hcserver* is indifferent to the physical medium over which TCP/IP executes.

# 5. Extensions/Specifications/Privatisations

N/A.

# 6. Configuration

The *hcserver* configuration is loaded into the running server.

## 6.1. AE Title/ Presentation Address Mapping

A DICOM print server is identified by a "printer name" with associated parameters such as AE title, host name and port number. The IP address corresponding to a given host name is determined using the name lookup database mechanisms provided on the hosting platform.

## 6.2. Definition of Target Print Servers

The list of target print servers is loaded into the running *hcserver*.

## 6.3. Configurable Parameters

The following parameters may be configured for the *hcserver*

Application Entity Title (Default ISG_PRINT_SCU).

Film layout formats.

Association timeout.

## 6.4. Support of Extended Character Sets

The *hcserver* provides no support for extended character sets in the communication with DICOM SCPs.

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