

**Philips Medical Systems
DICOM Conformance Statement**

**EasyAccess 5.1 on HP-UX
EasyAccess/Lite 5.1.on HP-UX
EasyVision DX/CL/RG 5.1 on NT and HP-UX**

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**Philips
Medical
Systems**



PHILIPS

Issued by:

Philips Medical Systems Nederland B.V.

Integrated Clinical Solutions, Marketing & Communications

Building QP-2

P.O. Box 10.000

5680 DA Best

The Netherlands

Tel: +31 40 2762818

Tel: +31 40 2762673

Email: dicom@best.ms.philips.com

Internet (with the latest versions of Conformance Statements and other DICOM information)

<http://www.philips.com/ms/solution/connect>

[ftp://ftp.philips.com/pub/ms/dicom/Conformance Stmtnts](ftp://ftp.philips.com/pub/ms/dicom/Conformance_Stmtnts)

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1. Introduction

This document describes the DICOM support of the following Philips products:

- The EasyVision NT products: EasyVision/DX, EasyVision/RG and EasyVision/CL. The EasyVision products do not differ from a DICOM point of view, and they will all be referred to as “EasyVision” in this document.
- EasyAccess
- EasyAccess/Lite

The document should be read together with the DICOM standard [1]. Definitions and terms are used in this document according to the DICOM standard. It is assumed that the reader is familiar with the DICOM standard.

1.1 References

- [1] Digital Imaging and Communications in Medicine (DICOM). NEMA Standard Publications PS 3.1-14 and Supplements.
- [2] EasyVision Installation Guide, SECTRA document number 3-97.559
- [3] EasyVision System Administrators Guide, SECTRA document number 3-97.535
- [4] EasyVision User's Documentation, SECTRA document number 3-97.486
- [5] EasyAccess Installation Guide, SECTRA document number 3-97.379
- [6] EasyAccess System Administrators Guide, SECTRA document number 3-97.471
- [7] EasyAccess Installation Guide, SECTRA document number 3-98.1032
- [8] EasyAccess System Administrators Guide, SECTRA document number 3-98.1136

1.2 Version History

1.2.1 Version 10.0

Version valid for EasyVision 2.2, EasyAccess 2.2 and EasyAccess/Lite 2.2. Changes from 9.0:

- Case insensitive matching for patient names is now used by Q/R SCP (case sensitive previously). Other attributes than patient name is still case sensitive.
- It is no longer possible to sort the images in a stack after import. The image order will be the same as the order in which the slices are received.

2. Implementation model

EasyVision, EasyAccess and EasyAccess/Lite are three separate products, but they are described together in this conformance statement. The reason for this is that EasyVision is totally dependent on EasyAccess and that EasyAccess/Lite includes both EasyAccess and EasyVision. In addition, EasyAccess has no user interface. EasyVision is the user interface for EasyAccess. So the products are tightly coupled and functionality is spread over EasyVision and EasyAccess.

EasyVision is available on the Windows NT operating systems. EasyAccess/Lite is only available on HP-UX. Most parts of EasyAccess are available on HP-UX only, but the EasyAccess part of EasyAccess 2.2 (including STORE SCP and Q/R SCP) will be available on Solaris on Sun at a later date. This Conformance Statement only applies to the HP-UX version of EasyAccess.

EasyVision is a multi-modality viewing station for radiology images. It allows the user (among other things) to:

- Send images to a remote application (e.g. a workstation).
- Print images that are on-line and known to the EasyAccess database.

EasyAccess is the name of a database system for handling various objects in a PACS environment. These objects can be images, requests, patient data, examinations etc. It provides (among other things) the following features:

- It replies on communication tests from remote applications.
- It allows remote applications (modalities and image workstations) to send images to it.
- It allows remote applications to query the EasyAccess database and retrieve images.

EasyAccess/Lite is a smaller version of EasyAccess with an EasyVision included. The database part has the same function as EasyAccess with the limitation that only a few clients can connect to it. The exact number of clients depends on the license key.

There are four different types of application entities (AEs), which together implement the DICOM functions, of the three above-mentioned products.

Q/R SCP is the AE responsible for receiving queries and sending images to other application entities as a response to a move request. The Q/R SCP AE is connected to the EasyAccess product. There is only one Q/R SCP AE.

PRINT SCU is the AE responsible for sending print request to DICOM printers. It is connected to the EasyVision product. There is only one PRINT SCU AE per EasyVision.

- Query/Retrieve

The Q/R SCP acts as Storage SCU only when using Query/Retrieve.

2.2.1 Print Management SCU

As described in the EasyVision User's Documentation [4] the EasyVision workstation user chooses images to print from the matrix or image windows. When the user has collected the images to print, he or she issues the print command. This will open the print previewer. From the previewer the user can do some further arrangement for the print, choose the printer to print to and send the images to this printer. When this happens the PRINT SCU AE is activated, acts as a SCU and initiates an association with the remote AE, supporting DICOM Print Management as SCP (a DICOM printer).

2.2.3 Verification SCP

A STORE SCP AE and the Q/R SCP AE supports verification of the DICOM communication from a remote AE.

2.2.4 Query/Retrieve SCP

When the Q/R SCP AE receives a query (C-FIND request) it will search in the EasyAccess database for information matching the conditions in the request message. It will search both on-line and in the archive. It returns any found information to the requesting remote AE. When the Q/R SCP AE receives a retrieve request (C-MOVE request) it will search for images in the EasyAccess database identified by the conditions in the request message. It will search both on-line and in the archive. If any images are found the Q/R SCP AE will change into a Storage SCU and send the images found to the requested destination AE. If the retrieve request refers to images in the archive the images will be fetched from the archive and temporarily put on-line. When the retrieve is done, the temporary images on-line will be removed. Only C-MOVE requests are handled in order to supply retrieve functionality, not C-GET requests.

2.2.5 Storage SCP

A STORE SCP AE supports transferring images from a remote application entity to EasyAccess.

To avoid misunderstanding it pays to clarify that this DICOM Storage SCP service will act as DICOM Storage SCP service for both EasyAccess and EasyVision. Since EasyAccess acts as a database for EasyVision, everything that is stored in EasyAccess is available from an EasyVision workstation. There is no way to store images on the host where EasyVision runs through the DICOM interface. Images must be stored in EasyAccess first. The storage of images onto the EasyVision host computer is handled by the EasyVision pre-loading function.

2.3 Sequencing of Real-World Activities

Before the user can print images or issue send commands from EasyVision or retrieve images from the EasyAccess database, the images must be present in the EasyAccess database, e.g. they must have been sent with DICOM Storage to EasyAccess.

3. PRINT SCU AE Specification

The PRINT SCU AE provides Standard Conformance to the following DICOM SOP Class as a SCU:

Table 1. Supported SOP classes as SCU

SOP Class Name	SOP Class UID
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9

3.1 Association Establishment Policies

General

The maximum PDU size that the PRINT SCU AE will use is 16 Kbytes.

Number of Associations

The PRINT SCU AE can only handle one association at a time. One print request has to be finished before the next can be started.

Asynchronous Nature

The PRINT SCU AE does not support asynchronous operations and will not perform asynchronous window negotiation.

Implementation Identifying Information

The PRINT SCU AE will provide an implementation class UID that is 1.2.752.24.3.1.3.1.0 and an implementation version name of "SECTRA_DCMR_2_1".

3.2 Association Initiation Policy

Real-World Activity - Print Command

Associated Real-World Activity

As described in the EasyVision User's Documentation [4] the EasyVision workstation user chooses images to print from the matrix or image windows. When the user has collected the images to print, he or she issues the print command. This will open the print previewer. From the previewer the user can do some further arrangement for the print, choose the printer to print to and send the images to this printer. When this happens the PRINT SCU AE is activated, acts as an SCU and initiates an association with a remote AE, hopefully supporting DICOM Print Management as SCP (a DICOM printer).

Proposed Presentation Contexts

Table 2. Proposed Presentation Contexts for the Print Command

Presentation Context Table					
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	SCU	None

SOP-Specific Conformance

The PRINT SCU AE supports the following mandatory SOP classes which are defined under the Basic Grayscale Print Management Meta SOP Class.

Table 3. Mandatory SOP Classes

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	1.2.840.10008.5.1.1.16

No optional SOP classes are supported.

The PRINT SCU AE uses the following DIMSE Service Elements:

Table 4. DIMSE Service Elements

SOP Class	DIMSE Service Element
Basic Film Session SOP Class	N-CREATE, N-DELETE
Basic Film Box SOP Class	N-CREATE, N-DELETE, N-ACTION
Basic Grayscale Image Box SOP Class	N-SET
Printer SOP Class	N-GET

N-EVENT-REPORT is not supported. Receiving an N-EVENT-REPORT message will break the communication between EasyVision and Printer.

Immediately after establishing an association, the PRINT SCU AE will execute an N-GET on the Printer SOP Class. This operation can be configured into two modes, one for fetching all available printer attributes and one for fetching a minimal set of printer attributes.

If configured to fetch all attributes, the following attributes will be requested:

Table 5. Attributes, when fetching all available attributes

Attribute name	Tag	Optional according to standard
Printer Status	(2110,0010)	NO
Printer Status Info	(2110,0020)	NO
Printer Name	(2110,0030)	YES
Manufacturer	(0008,0070)	YES
Manufacturer Model Name	(0008,1090)	YES
Device Serial Number	(0018,1000)	YES
Software Versions	(0018,1020)	YES
Date Of Last Calibration	(0018,1200)	YES
Time Of Last Calibration	(0018,1201)	YES

If configured to fetch a minimum set of attributes, the following attributes will be requested:

Table 6. Attributes, when fetching minimum set of attributes

Attribute name	Tag	Optional according to standard
Printer Status	(2110,0010)	NO
Printer Status Info	(2110,0020)	NO
Printer Name	(2110,0030)	YES

If the Printer Status tag is returned as NORMAL, the print job will continue immediately.

If the status is WARNING, the user will be notified and the value of the Printer Status Info tag will be displayed. The print job is then continued.

If the status is FAILURE, the user will be notified and the value of the Printer Status Info tag will be displayed. The print job is then aborted.

The PRINT SCU AE supports the following SOP class attributes:

Table 7. SOP Class Attributes

SOP Class, DIMSE Service Element	Attribute name	Tag	Optional according to standard	Configurable	Default value
Basic Film Session N-CREATE	Number of Copies	(2000,0010)	YES	YES	1
Basic Film Session N-CREATE	Print Priority	(2000,0020)	YES	YES	MED
Basic Film Session N-CREATE	Medium Type	(2000,0030)	YES	YES	BLUE FILM
Basic Film Session N-CREATE	Film Destination	(2000,0040)	YES	YES	MAGAZINE
Basic Film Box N-CREATE	Image Display Format	(2010,0010)	NO	NO	STANDARD\1,1
Basic Film Box N-CREATE	Film Orientation	(2010,0040)	YES	YES	PORTRAIT
Basic Film Box N-CREATE	Film Size ID	(2010,0050)	YES	YES	14INX17IN
Basic Film Box N-CREATE	Magnification Type	(2010,0060)	YES	YES	(none)
Basic Film Box N-CREATE	Max Density	(2010,0130)	YES	YES	(none)
Basic Film Box N-CREATE	Configuration Information	(2010,0150)	YES	YES	(none)
Basic Film Box N-CREATE	Smoothing Type	(2010,0080)	YES	YES	(none)
Basic Film Box N-CREATE	Border Density	(2010,0100)	YES	YES	BLACK
Basic Film Box N-CREATE	Empty Image Density	(2010,0110)	YES	YES	BLACK
Basic Film Box N-CREATE	Min Density	(2010,0120)	YES	YES	(none)
Basic Film Box N-CREATE	Trim	(2010,0140)	YES	YES	YES
Basic Grayscale Image Box N-SET	Polarity	(2020,0020)	YES	YES	NORMAL

Several images per film can be printed. They are arranged in EasyVision, which composes them and sends them as one big image (Image Display Format "STANDARD\1,1").

3.3 Association Acceptance Policy

The PRINT SCU AE does not handle incoming associations.

4.

4.

4. STORE SCP AE Specification

4.1 Association Establishment Policies

General

The maximum PDU-length, which a STORE SCP AE will use, is configurable. The default is 16 Kbytes. Configuration can only be done by Philips authorized personnel.

Number of Associations

Each STORE SCP AE can handle five simultaneous associations at a time by default. Any number of STORE SCP AEs can be set up, meaning that a great number of C-STORE associations can be handled by EasyAccess at the same time. For EasyAccess/Lite, only a few associations can be handled. The exact number of associations depends on the license key.

Asynchronous Nature

A STORE SCP AE will only allow a single outstanding operation on an association. Therefore, a STORE SCP AE will not perform asynchronous operations window negotiation.

Implementation Identifying Information

A STORE SCP AE will provide an Implementation Class UID that is 1.2.752.24.3.3.25.7. The implementation version name of a STORE SCP AE is "W_STORE_SCP_1.3".

4.2 Association Initiation Policy

A STORE SCP AE will not initiate any associations with a remote AE.

4.3 Association Acceptance Policy

A STORE SCP AE **rejects** associations in the following situations:

- Association requests from applications that do not address it, i.e. specify an incorrect called AE title.
- Association requests from hosts with host names not known to the STORE SCP AE host.
- For image transfers if it is already processing the maximum number of associations that it can handle (default: 5).
- For image transfers and if configured so, if the EasyAccess server is not responding.

A STORE SCP AE **accepts** associations for the following events:

- Verification of the DICOM communication between a remote system and a STORE SCP AE.
- Transfer of images from a remote system to the EasyAccess database.

Verification of the Communication

Associated Real-World Activity

A remote system wants to verify the DICOM communication with a STORE SCP AE.

Accepted Presentation Contexts

Table 8. Acceptable Presentation Contexts for Verification

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Verification	1.2.840.10008.1.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Verification	1.2.840.10008.1.1	DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

SOP Specific Conformance to Verification SOP class

A STORE SCP AE provides standard conformance to the DICOM Verification Service Class.

Presentation Context Acceptance Criterion

There are no specific rules for acceptance.

Transfer Syntax Selection Policies

A STORE SCP AE prefers Big Endian ordering before Little Endian, and prefers explicit before implicit VR.

Transfer of Images from a Remote System to the EasyAccess database

Associated Real-World Activity

A remote system wants to store images in the EasyAccess database.

Accepted Presentation Contexts

Table 9. Supported Storage SOP classes for A STORE SCP AE as SCP.

SOP Class Name	SOP Class UID
CR Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
US Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
US Multi-Frame Image Storage (Retired version)	1.2.840.10008.5.1.4.1.1.3
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1
US Image Storage (Retired version)	1.2.840.10008.5.1.4.1.1.6
SC Image Storage	1.2.840.10008.5.1.4.1.1.7
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
X-Ray Angiographic Bi-Plane Image Storage	1.2.840.10008.5.1.4.1.1.12.3
NM Image Storage	1.2.840.10008.5.1.4.1.1.20

Table 10. Acceptable Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Note	Note	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Note	Note	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

Note	Note	DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
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Note: Any of the Storage SOP classes listed in Table 9.

SOP Specific Conformance to STORE SOP classes

A STORE SCP AE provides standard conformance to the DICOM Storage Service Class as SCP.

A STORE SCP AE needs a value of the attribute (0010,0020), Patient ID. If the attribute is empty it will use the attribute (0010,0010), Patient Name, as patient ID. If the patient name is empty as well it will use the request number (see [3]) as patient ID.

When the attribute value of the Examination ID contains leading zeros, the Image SOP instances is rejected.

Image SOP instances that have a pixel matrix size of 1024 row by 512 columns are rejected by EasyAccess.

Image SOP instances having a RGB (color) image and the Pixel Value attribute Value Representation (VR) of OB are converted to VR OW.

The Value Presentation for private attributes is not saved, the VR Unknown (UN) is exported.

If the image storage should fail on the EasyAccess side, a status of refused, "Out of resources", will be returned to the association initiator.

EasyAccess can be configured to overwrite images with same SOP Instance UID or to store all images it receives. Default is the first alternative, to overwrite images with same SOP Instance UID. If the second alternative is used and the same image is sent twice to a STORE SCP AE it will be stored two times in EasyAccess. This implicates that two images with the same SOP Instance UID will be sent if a MOVE request is received by the Q/R SCP AE on that image.

For more detailed information about the handling of specific attributes by EasyAccess and EasyVision, see Appendix A.

If DICOM attributes are illegal, no responsibilities for consequences are taken. The following consequence has been noted:

- If (0020,0011) Series Number is outside the allowed range, $-(2^{32}-1) = x = (2^{32}-1)$, EasyAccess will truncate all bits above the 32nd position.

Regarding viewing capabilities of EasyVision the following points must be noted

- Multi-frame images can not be viewed by default. There is an option when installing the DICOM Storage SCP to split multi-frame images to individual images. If this is used, the images can be viewed as a stack in EasyVision. However, moving the images with Q/R will in this case not give multi-frame images but the frames as individual images. If this option is not used (which is the default) multi-frame images are stored unaltered in EasyAccess. They can then not be viewed on EasyVision but the can be retrieved as multi-frame images with Q/R.
- XA Bi-plane images can not be viewed.
- Images with non-square pixels are viewed as square pixels; i.e. (0028,0034) Pixel Aspect Ratio is always assumed 1/1.
- Regarding color images, EasyVision can only view those with (0028,0004), Photometric interpretation, equal to RGB with 24 bits (8 bits per channel) or (0028,0004), Photometric interpretation, equal to PALETTE_COLOR.
- The first LUT in a Modality LUT sequence (attribute (0028,3000), Modality LUT Sequence, etc.) is handled. The rest (second, third and so on) is ignored.
- Overlays (attribute (60xx,0040), Overlay Type, etc.) are not handled.

- Patient Name attribute values that contains the reserved DICOM PN value representation characters “\” and “=” are not handled correctly: the “\” character is changed into a “?”, the “=” is unchanged.
- Image SOP instances that contains a pixel data size that is less pixel then the matrix size (row * columns) is specifying are accepted but can not be displayed (white image on the display of the EasyVision).

Presentation Context Acceptance Criterion

The intersection between the proposed and acceptable Presentation Contexts is taken for the established association.

Transfer Syntax Selection Policies

A STORE SCP AE prefers Big Endian ordering before Little Endian, and prefers explicit before implicit VR.

5. Q/R SCP AE Specification

5.1 Association Establishment Policies

General

The maximum PDU-length that the Q/R SCP AE will use is configurable. Default is 16 Kbytes. Configuration can only be done by Philips authorized personnel.

Number of Associations

The Q/R SCP AE can handle at most 100 simultaneous associations at a time. For EasyAccess/Lite, only a few associations can be handled. The exact number of associations depends on the license key.

Asynchronous Nature

The Q/R SCP AE will only allow a single outstanding operation on an association. Therefore, the Q/R SCP AE will not perform asynchronous operations window negotiation.

Implementation Identifying Information

The Q/R SCP AE will provide an Implementation Class UID that is 1.2.752.24.3.3.25.7. The implementation version name is "W_QR_SCP_1.3".

5.2 Association Initiation Policy

The Q/R SCP AE can initiate an association as a result of retrieve request if it results in copying images of images known to the EasyAccess database to a remote AE.

Copy Images from the EasyAccess database to a Remote AE

Associated Real-World Activity

When a retrieve (C-MOVE) request is received and images matching supplied conditions are found Q/R will turn into a Storage SCU and initiate an association with the requested destination AE. If the association is accepted, image transfer will take place.

Proposed Presentation Context

Table 11. Supported Storage SOP classes for the Q/R SCP AE as SCU.

SOP Class Name	SOP Class UID
CR Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
US Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
US Multi-Frame Image Storage (Retired version)	1.2.840.10008.5.1.4.1.1.3
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1
US Image Storage (Retired version)	1.2.840.10008.5.1.4.1.1.6
SC Image Storage	1.2.840.10008.5.1.4.1.1.7
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
X-Ray Angiographic Bi-Plane Image Storage	1.2.840.10008.5.1.4.1.1.12.3
NM Image Storage	1.2.840.10008.5.1.4.1.1.20

Table 12. Proposed Presentation Contexts for Copy Images from Q/R

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Note	Note	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Note	Note	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Note	Note	DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

Note: Any of the Storage SOP classes listed in Table 11.

C-STORE SCU Conformance

A STORE SCP AE provides standard conformance to the DICOM Storage Service Class as SCU.

The Q/R SCP AE offers any transfer syntaxes that are defined in its configuration file.

5.3 Association Acceptance Policy

The Q/R SCP AE will reject associations from applications that do not address it, i.e. specify an incorrect called AE title. The Q/R SCP AE will also reject associations with C-MOVE requests from hosts not present in the `/etc/hosts` file.

The Q/R SCP AE accepts associations for the following events:

- Verification of the DICOM communication between a remote system and the Q/R SCP AE
- Query of the EasyAccess database
- Retrieve images from the EasyAccess database

Verification of the Communication

Associated Real-World Activity

A remote system wants to verify the DICOM communication with the Q/R SCP AE.

Accepted Presentation Contexts

Table 13. Acceptable Presentation Contexts for Verification

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Verification	1.2.840.10008.1.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Verification	1.2.840.10008.1.1	DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

SOP Specific Conformance to Verification SOP class

The Q/R SCP AE provides standard conformance to the DICOM Verification Service Class.

Presentation Context Acceptance Criterion

There are no specific rules for acceptance.

Transfer Syntax Selection Policies

The Q/R SCP AE prefers Big Endian ordering before Little Endian, and prefers explicit before implicit VR.

Query of the EasyAccess Database

Associated Real-World Activity

A remote system wants to query the EasyAccess database using the C-FIND command.

Accepted Presentation Contexts

Table 14. Acceptable Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	Yes
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.1.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	Yes
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.1.1	DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	Yes
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.2.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	Yes
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.2.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	Yes
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.2.1	DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	Yes
Patient/Study Only Query/Retrieve Information Model – FIND	1.2.840.10008.3.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	Yes
Patient/Study Only Query/Retrieve Information Model – FIND	1.2.840.10008.3.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	Yes
Patient/Study Only Query/Retrieve Information Model – FIND	1.2.840.10008.3.1	DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	Yes

SOP Specific Conformance to FIND SOP classes

The Q/R SCP AE provides standard conformance to the DICOM FIND SOP classes as SCP with the exceptions below:

- Range matching on date and time is not supported.
- Fractions of seconds are ignored.
- At the most 100 matches are returned. This hit limit can be configured. If more items than the hit limit in the EasyAccess database matches, zero matches are returned.
- Existence of optional keys is not supported, only unique and required keys are handled (see appendix B).
- Case insensitive matching is used for patient name. For all other attributes, case sensitive matching is used.

In case of no matching examinations, a response of *SUCCESS* is sent.

If range values (time and date values including the “-“ character) are used a response “Unable to process” (C001) is returned to the association initiator.

Presentation Context Acceptance Criterion

The intersection between the proposed and acceptable Presentation Contexts is taken for the established association.

Transfer Syntax Selection Policies

The Q/R SCP AE prefers Big Endian ordering before Little Endian, and prefers explicit before implicit VR.

Retrieve Images from the EasyAccess Database

Associated Real-World Activity

A remote application entity wishes to retrieve images from the EasyAccess database using the C-MOVE command.

Accepted Presentation Contexts

Table 15. Acceptable Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	Yes
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	Yes
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	Yes
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	Yes
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	Yes
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	Yes
Patient/Study Only Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	Yes
Patient/Study Only Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	Yes
Patient/Study Only Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	Yes

SOP Specific Conformance to MOVE SOP classes

The Q/R SCP AE provides standard conformance to the DICOM MOVE SOP classes as SCP.

In case of no matching examinations, a response of *SUCCESS* is returned to the association initiator.

There are unusual cases for the current implementation of the Q/R SCP AE where a C-FIND request will show images present in the EasyAccess database but where a C-MOVE will give no images. This happens for some cases of partial deletion from EasyVision of patient data in the EasyAccess database.

If the association to the move destination is rejected a response “Unable to process” (C001) is returned to the association initiator.

If the move destination is unknown (not defined in the configuration file) a response “Destination unknown” (A801) is returned to the association initiator.

For other errors a response "Out of resources" (A702) is returned to the association initiator.

Presentation Context Acceptance Criterion

The intersection between the proposed and acceptable Presentation Contexts is taken for the established association.

Transfer Syntax Selection Policies

The Q/R SCP AE prefers its Big Endian ordering before Little Endian, and prefers explicit before implicit VR.

6. Communication Profiles

6.1 Supported Communication Stacks

AEs PRINT SCU, STORE SCP and Q/R SCP provide DICOM 3.0 TCP/IP Network Communication Support as defined in part eight of the DICOM Standard.

6.2 TCP/IP Stack

AEs STORE SCP and Q/R SCP uses the TCP/IP stack built into the HP-UX operating system.

The AE PRINT SCU on NT uses the TCP/IP stack built into the Windows NT operating system.

Physical Media Support

AEs PRINT, STORE and Q/R are neutral to the physical medium over which TCP/IP executes. It can e.g. be used with fiber optics, token ring, Ethernet and twisted pair.

6.3 OSI Stack

Not supported.

6.4 Point-To-Point Stack

Not supported.

7. Extensions / Specializations / Privatizations

Not applicable

8. Configuration

PRINT SCU For the PRINT SCU AE a configuration file is provided, located at `/opt/sectra/share/config/config/general/def/dicom_printer.def`. Configuration is specified in the EasyVision System Administrator's Guide [3].

STORE and Q/R The AEs reference standard configuration files used by the MergeCOM Tool Kit and the program `/opt/sectra/config/si_setup`. For further information see the EasyAccess Installation Guide [7] and System Administrator's Guide [8].

8.1 AE Title/Presentation Address Mapping

Local AE Titles and Presentation Addresses

PRINT The AE title of the PRINT SCU AE can be configured at the installation in the above-mentioned file. The default AE title is `DICOM_PRINT_SCU`.

STORE SCP The AE title of each AE can be configured. This is done running the administration program `/opt/sectra/bin/dcm_adm` as described in the EasyAccess Installation Guide [7]. Any number of AEs can be set up. The default AE title is `DICOM_STORAGE`.

The listen port of each AE can be also configured with the administration program `/opt/sectra/bin/dcm_adm`. You can either set a listen port yourself or let the program automatically select a free listen port.

Q/R SCP The AE title can be configured. This is done when running the setup program `/opt/sectra/config/si_setup` as described in the EasyAccess Installation Guide [6]. Default is `QR_SCP_EasyAccess`. This AE title is also used when the Q/R SCP turns into a Storage SCU as a result of a C-MOVE request.

The listen port of the Q/R SCP AE can also be configured. This is specified in the `qr_scp.pro` file located in `/etc/opt/sectra/qr_wise`. The default is 7632.

Remote AE Titles and Presentation Addresses

PRINT SCU The remote Applications Entity's AE-title, host name and port number are specified in the above-mentioned configuration file. Each remote AE is specified in its own section of the file. Default AE title is `PRINT_SERVER_SCP`.

STORE SCP The remote Applications Entity's AE-title does not have to be specified. A STORE SCP AE will accept any AE-title. However the remote hosts host name must be known to the STORE SCP hosts, e.g. be present in the `/etc/hosts` file.

Q/R SCP The remote Applications Entity's AE-title, host name and port number are specified in the `qr_scp.app` file located in `/etc/opt/sectra/qr_wise`. The remote host's host name must be known to the Q/R SCP host, e.g. be present in the `/etc/hosts` file. Note that all C-MOVE destinations also have to be specified. The setup is described in detail in the EasyAccess Installation Guide [7].

9. Support of Extended Character Sets

The **PRINT SCU AE** provides no support for extended character sets. However, note that all text in the images is passed to the printer in the image data itself. This means that all overlay text appears on the printed medium in the same way as on the screen. EasyVision handles most character repertoires used in Western Europe.

A **STORE SCP AE** and the **Q/R SCP AE** supports the extended character set *ISO_IR 100*, which is the Latin alphabet number 1, supplementary set.

Appendix A. Attribute List for Store SCP

This list contains the DICOM attributes that are used by a STORE SCP AE by default. Please note that the default behavior can be changed for both EasyAccess and EasyVision. The comments give indication what the attributes are used for. If an attribute is not present in this list it is still stored by EasyAccess but ignored by EasyVision.

For the PRINT SCU AE attributes, see Table 7. For supported attributes as keys for the Q/R SCP AE in a C-FIND request, see appendix B.

Table 16. Attribute List for a STORE SCP AE

DICOM Attribute	Comment
(0008,0005) Specific Character Set	"ISO_IR 100" is supported.
(0008,0008) Image Type	<ol style="list-style-type: none"> 1. Is used for determining default window setting in EasyVision if no window is included in the image. 2. Used by <code>w_store</code> in default scanogram finding method, and method "-S A"
(0008,0018) SOP Instance UID	<ol style="list-style-type: none"> 1. Stored in EasyAccess image data 2. Required attribute for compression. 3. Used in <code>w_store</code> to overwrite equivalent image (if <code>-k</code> is not specified).
(0008,0020) Study Date	<ol style="list-style-type: none"> 1. Stored in EasyAccess examination data if value not found in RIS 2. Shown in all EasyVision image windows if present and (0008,0023) and (0008,0022) and (0008,0021) not present.
(0008,0021) Series Date	Shown in all EasyVision image windows if present and (0008,0023) and (0008,0022) not present.
(0008,0022) Acquisition Date	Shown in all EasyVision image windows if present and (0008,0023) not present.
(0008,0023) Image Date	If present, shown in all EasyVision image windows.
(0008,0030) Study Time	<ol style="list-style-type: none"> 1. Stored in EasyAccess examination data if value not found in RIS 2. Shown in all EasyVision image windows if present and (0008,0033) and (0008,0022) and (0008,0021) not present.
(0008,0031) Series Time	Shown in all EasyVision image windows if present and (0008,0033) and (0008,0032) not present.
(0008,0032) Acquisition Time	Shown in all EasyVision image windows if present and (0008,0033) not present.
(0008,0033) Image Time	If present, shown in all EasyVision image windows.
(0008,0050) Accession Number	<ol style="list-style-type: none"> 1. Stored in EasyAccess examination data. 2. Default attribute for examination number

	in EasyAccess. Used for connecting the image to RIS entities.
(0008,0060) Modality	<ol style="list-style-type: none"> 1. Stored in EasyAccess examination data 2. Stored in EasyAccess image data. 3. Defines modality for modality specific settings in EasyVision (e.g. information in images and selecting default print partition).
(0008,0080) Institution Name	Stored in EasyAccess examination data.
(0008,1030) Study Description	Stored in EasyAccess examination data.
(0008,1140) Referenced Image Sequence	Used by EasyAccess in default method for locating scanograms.
(0008,1155) Referenced SOP Instance UID	Used by EasyAccess in default method for locating scanograms.
(0010,0010) Patient Name	Stored in EasyAccess patient data if value not found in RIS.
(0010,0020) Patient ID	<ol style="list-style-type: none"> 1. Must be set. If not, (0010,0010) Patient Name is used as Patient ID in EasyAccess. If both (0010,0020) Patient ID and (0010,0010) Patient Name are empty, the request number is used as Patient ID in EasyAccess. 2. Stored in EasyAccess patient data if value not found in RIS. 3. Used as request number in EasyAccess if attribute for request number (default: (0020,0010) Study ID) is empty.
(0010,0030) Patient's Birth Date	Stored in EasyAccess patient data if value not found in RIS.
(0018,0010) Contrast/Bolus Agent	Shown in EasyVision image window for all CT images
(0018,0015) Body Part Examined	Stored in EasyAccess examination data.
(0018,0020) Scanning Sequence	Shown in EasyVision image window for all MR images if (0018,0024) not present.
(0018,0024) Sequence Name	If present, shown in EasyVision image window for all MR images
(0018,0050) Slice Thickness	Shown in EasyVision image window for all CT and MR images
(0018,0060) KVP	Shown in EasyVision image window for all CT images
(0018,0080) Repetition Time	Shown in EasyVision image window for all MR images
(0018,0081) Echo Time	Shown in EasyVision image window for all MR images
(0018,0083) Number of Averages	Shown in EasyVision image window for all MR images
(0018,1041) Contrast/Bolus Volume	Shown in EasyVision image window for all CT and MR images
(0018,1100) Reconstruction Diameter	Shown in EasyVision image window for all CT and MR images
(0018,1120) Gantry/Detector Tilt	Shown in EasyVision image window for all CT images
(0018,1150) Exposure Time	Shown in EasyVision image window for all CT images

(0018,1151) X-ray Tube Current	Shown in EasyVision image window for all CT images
(0018,1164) Imager Pixel Spacing	Used for calibrating the image in EasyVision if (0028,0030) is not set.
(0018,1210) Convolution Kernel	Shown in EasyVision image window for all CT images
(0018,1602) Shutter Left Vertical Edge	Is used for EasyVision cropping.
(0018,1604) Shutter Right Vertical Edge	Is used for EasyVision cropping.
(0018,1606) Shutter Upper Horizontal Edge	Is used for EasyVision cropping.
(0018,1608) Shutter Lower Horizontal Edge	Is used for EasyVision cropping.
(0018,1610) Center of Circular Shutter	If present and (0018,1602) - (0018,1608) not present, defines an EasyVision square cropping.
(0018,1612) Radius of Circular Shutter	If present and (0018,1602) - (0018,1608) not present, defines an EasyVision square cropping.
(0018,5100) Patient Position	Shown in EasyVision image window for all CT and MR images
(0020,000D) Study Instance UID	Stored in EasyAccess examination data.
(0020,000E) Series Instance UID	<ol style="list-style-type: none"> 1. Stored in EasyAccess image data. 2. Is used for non-default method for identifying scanogram images if "-s u" option is used with w_store. 3. By default, must be equal for all images within a stack.
(0020,0010) Study ID	<ol style="list-style-type: none"> 1. Stored in EasyAccess examination data. 2. Default attribute for request number in EasyAccess. Used for connecting the image to RIS entities.
(0020,0011) Series Number	<ol style="list-style-type: none"> 1. Stored in EasyAccess image data 2. Is used for non-default method for identifying scanogram images if "-s s" option is used with w_store.
(0020,0012) Acquisition Number	Default attribute for sorting stacks within a study.
(0020,0013) Image Number	<ol style="list-style-type: none"> 1. Stored in EasyAccess image data 2. Is used for non-default method for identifying scanogram images if "-s I" option is used with w_store. 3. Shown in EasyVision image window for all CT and MR images
(0020,0020) Patient Orientation	Always shown in EasyVision image windows for showing anatomical orientation of the image (anterior, posterior, right, left, head, foot). Must be present to be able to view the anatomical orientation of the image.
(0020,0032) Image Position (Patient)	Important attribute for showing location of images in scanograms in EasyVision. Needs to be present in both the stack and in the scanogram. See also (0020,0037) and (0028,0030).
(0020,0037) Image Orientation (Patient)	Important attribute for showing location of images in scanograms in EasyVision. . Needs to be present in both the stack and in

	the scanogram. See also (0020,0032) and (0028,0030).
(0020,0052) Frame of Reference UID	Is used for non-default method for identifying scanogram images if "-S A" option is used with <code>w_store</code> .
(0028,0002) Samples per Pixel	If not set, 1 is assumed in EasyVision.
(0028,0004) Photometric Interpretation	MONOCHROME1, MONOCHROME2, PALETTE_COLOR and RGB are supported by EasyVision. If this attribute is not set, MONOCHROME2 is used by EasyVision.
(0028,0006) Planar Configuration	If not set, 000 is assumed by EasyVision.
(0028,0008) Number of Frames	If not set, 1 is assumed by EasyVision.
(0028,0010) Rows	Must be set to be viewable in EasyVision.
(0028,0011) Columns	Must be set to be viewable in EasyVision
(0028,0030) Pixel Spacing	<ol style="list-style-type: none"> Used for calibrating the image in EasyVision. If empty (0018,1164) is used. Important attribute for showing location of images in scanograms in EasyVision. Needs to be present in both the stack and in the scanogram. See also (0020,0032) and (0020,0037).
(0028,0034) Pixel Aspect Ratio	Not used. 1/1 assumed by EasyVision.
(0028,0100) Bits Allocated	Must be set to be viewable in EasyVision
(0028,0101) Bits Stored	Must be set and less than (0028,0100) Bits Allocated to be viewable in EasyVision.
(0028,0102) High Bit	<ol style="list-style-type: none"> If not set, (Bit Stored)-1 is used by EasyVision. If set, must be between greater than 0 and less than or equal to Bits Allocated. If not, (Bits Stored)-1 is used by EasyVision.
(0028,0103) Pixel Representation	If not set, 0000H (unsigned integer) is assumed by EasyVision.
(0028,1050) Window Center	If not set, the default in IDS is half the bit depth.
(0028,1051) Window Width	If not set, the default in EasyVision is the bit depth.
(0028,1052) Rescale Intercept	Is used for calculating Hounsfield units of CT images in EasyVision.
(0028,1053) Rescale Slope	Is used for calculating Hounsfield units of CT images in EasyVision.
(0028,3000) Modality LUT Sequence	The first LUT in a sequence is used by EasyVision, the rest is ignored.
(0028,3002) LUT Descriptor	Must be set if (0028,3000) Modality LUT Sequence is used.
(0028,3006) LUT Data	Must be set if (0028,3000) Modality LUT Sequence is used.

Appendix B. Key List for Q/R C-FIND Requests

These tables contain the DICOM keys that are supported by the Q/R SCP AE in a C-FIND request. Note that only these keys are supported. No optional keys are supported.

Table 17. PATIENT Level

Key	Tag	Type	Comment
Patient's Name	(0010,0010)	Required	
Patient ID	(0010,0020)	Unique	

Table 18. STUDY Level

Key	Tag	Type	Comment
Study Date	(0008,0020)	Required	Range matching not supported
Study Time	(0008,0030)	Required	Range matching not supported
Accession Number	(0008,0050)	Required	
Study ID	(0020,0010)	Required	
Study Instance UID	(0020,000D)	Unique	

Table 19. SERIES Level

Key	Tag	Type	Comment
Modality	(0008,0060)	Required	
Series Number	(0020,0011)	Required	
Series Instance UID	(0020,000E)	Unique	

Table 20. IMAGE Level

Key	Tag	Type	Comment
Image Number	(0020,0013)	Required	
SOP Instance UID	(0008,0018)	Unique	