Philips Medical Systems
DICOM Conformance Statement

DICOM Archive 4.1

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1. INTRODUCTION

This document describes the DICOM support by the following SECTRA products:

- IDS4 workstation
- WISE database system
- WISE/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 3.1-13 and Supplements.

[2] IDS4 Installation Guide, SECTRA document number 3-97.559

[3] IDS4 System Administrators Guide, SECTRA document number 3-97.535

[4] IDS4 User's Documentation, SECTRA document number 3-97.486

[5] WISE Installation Guide, SECTRA document number 3-97.379

[6] WISE System Administrators Guide, SECTRA document number 3-97.471

1.2 VERSION HISTORY

6.0

Version valid for IDS4 2.0, WISE 2.1 and WISE/Lite 1.1.

7.0

Version valid for IDS4 2.0.1, WISE 2.1.1 and WISE/Lite 1.1.1. Changes from 6.0:

- (0028,0004) Photometric Interpretation MONOCHROME1 is now supported by IDS4 (not supported previously).
- The first LUT in a (0028,3000) Modality LUT sequence is now handled by IDS4 (not supported at all previously). All but the first LUT are ignored.
- (2010,0010) Image Display Format is now STANDARD\1,1 always (being STANDARD\C,R with C and R between 1 and 5 previously). Partition of the image window for printing more than one image per film is still supported but the images are sent to the printer as one big image. Because of this the implementation version name of the PRINT AE is changed to "SECTRA_DCMPR_2_1".

8.0

Version valid for IDS4 2.0.2, WISE 2.1.2 and WISE/Lite 1.1.2.

Changes from 7.0:

- Watermarking feature has been fixed from 7.0.

Philips DICOM Archive release 4.1

Philips document number: 4522 220 84771. Released functionality for DICOM Archive release 4.1.

2. IMPLEMENTATION MODEL

IDS4, WISE and WISE/Lite are three separate products, but they are described together in this conformance statement. The reason for this is that IDS4 is totally dependent on WISE and that WISE/Lite includes both WISE and IDS4. IDS4 communicates with WISE through the WISE API. So the products are tightly coupled and functionality is spread over IDS4 and WISE.

IDS4 is available on both the HP-UX and Windows NT operating systems. WISE and WISE/Lite are only available on HP-UX.

IDS4 is a multi-modality viewing station for radiology images. It allows the user (among other things) to:

- View images that are on-line and known to the WISE database.

WISE 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:

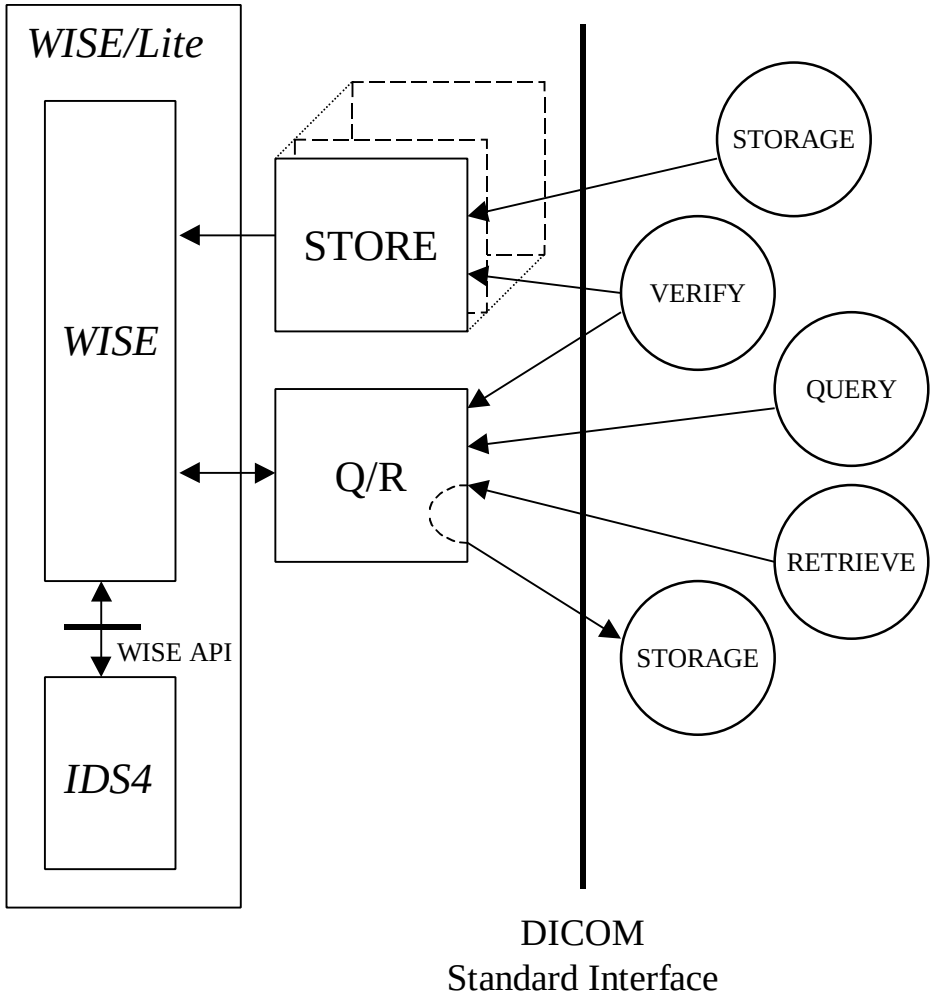
- It replies on communication tests from remote applications.
- It receives images sent from remote applications (modalities and image workstations).
- It allows remote applications to query the WISE database and retrieve images.

WISE/Lite is a smaller version of WISE with an IDS4 included. The database part has the same function as WISE with the limitation that only a few clients can connect to it. The exact number of clients depends on the license key.

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

STORE is the AE responsible for receiving images. It is connected to the WISE product. There can be between one and four STORE AEs set up, each with its own AE title.

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



2.1 APPLICATION DATA FLOW DIAGRAM

There are two different types of application entities (AEs): STORE and Q/. There is exactly one Q/R AE, but there can be between one and four STORE AEs. The Implementation Model of the application entities and the relation to the products IDS4, WISE and WISE/Lite is shown in the figure above.

2.2 FUNCTIONAL DEFINITIONS OF AE'S

A STORE AE acts as a SCP of the following DICOM Service Classes:

- Verification
- Storage

The Q/R AE acts as a SCP of the following DICOM Service Classes:

- Verification
- Query/Retrieve

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

2.2.2 VERIFICATION

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

2.2.3 QUERY/RETRIEVE

When the Q/R AE receives a query (C-FIND request) it will search in the WISE database for information matching the conditions in the request message. It returns any found information to the requesting remote AE.

When the Q/R AE receives a retrieve request (C-MOVE request) it will search for images in the WISE database identified by the conditions in the request message. If any images are found the Q/R AE will change into a Storage SCU and send the images found to the requested destination AE. Only C-MOVE requests are handled in order to supply retrieve functionality, not C-GET requests.

2.2.4 STORAGE

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

To avoid misunderstanding it pays to clarify that this DICOM Storage SCP service will act as DICOM Storage SCP service for both WISE and IDS4. Since WISE acts as a database for IDS4, everything that is stored in WISE is available from an IDS4 workstation. There is no way to store images on the host where IDS4 runs through the DICOM interface. Images must be stored in WISE first. The storage of images onto the IDS4 host computer is handled by the IDS4 pre-loading function.

2.3 SEQUENCING OF REAL-WORLD ACTIVITIES

Before the user can print images from IDS4 or retrieve images from the WISE database with Q/R the images has to be in the WISE database.

4 STORE AE SPECIFICATION

4.1 ASSOCIATION ESTABLISHMENT POLICIES

4.1.1 GENERAL

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

4.1.2 NUMBER OF ASSOCIATIONS

Each STORE AE can handle five simultaneous associations at a time. Up to four STORE AEs can be set up, meaning that up to 20 simultaneous C-STORE associations can be handled by WISE at the same time. For WISE/Lite only a few associations can be handled. The exact number of associations depends on the license key.

4.1.3 ASYNCHRONOUS NATURE

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

4.1.4 IMPLEMENTATION IDENTIFYING INFORMATION

A STORE AE will provide an Implementation Class UID that is 1.2.752.24.3.3.25.7. The implementation version name of the Storage SCP is "W_STORE_SCP_1.2".

4.2 ASSOCIATION INITIATION POLICY

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

4.3 ASSOCIATION ACCEPTANCE POLICY

A STORE AE will reject associations from applications that do not address it, i.e. specify an incorrect called AE title.

A STORE AE accepts associations for the following events:

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

4.3.1 VERIFICATION OF THE COMMUNICATION

4.3.1.1 Associated Real-World Activity

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

4.3.1.2 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

4.3.1.3 SOP Specific Conformance to Verification SOP class

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

4.3.1.4 Presentation Context Acceptance Criterion

There are no specific rules for acceptance.

4.3.1.5 Transfer Syntax Selection Policies

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

4.3.2 TRANSFER OF IMAGES FROM A REMOTE SYSTEM TO THE WISE DATABASE

4.3.2.1 Associated Real-World Activity

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

4.3.2.2 Accepted Presentation Contexts

Table 9: Supported Storage SOP classes for A STORE 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

Note: Any of the Storage SOP classes listed in Table 7.

4.3.2.3 SOP Specific Conformance to STORE SOP classes

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

A STORE AE requires that the attribute (0010,0020), Patient ID, is non-empty. If it 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 as patient ID. A Patient ID containing only spaces is fails to store by SCP.

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

WISE will store all images it receives. If one image is sent twice to a STORE AE it will be stored two times in WISE. This implicates that two images with the same SOP Instance UID will be sent if a MOVE request is received by the Q/R AE on that image.

For more detailed information of how specific attributes are handled by WISE and IDS4, see Appendix I.

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, $-(2^{32}-1) = x = (2^{32}-1)$, WISE will truncate all bits above the 32^{nd} position.

Non DICOM compliant objects (mandatory attributes missing) are sometimes rejected by the storage SCP.

DICOM color images are not handled transparent by all sub components of the storage SCP.

Regarding viewing capabilities of IDS4 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 IDS4. 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 WISE. They can then not be viewed on IDS4 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, IDS4 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.

4.3.2.4 Presentation Context Acceptance Criterion

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

4.3.2.5 Transfer Syntax Selection Policies

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

5 Q/R AE SPECIFICATION

5.1 ASSOCIATION ESTABLISHMENT POLICIES

5.1.1 GENERAL

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

5.1.2 NUMBER OF ASSOCIATIONS

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

5.1.3 ASYNCHRONOUS NATURE

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

5.1.4 IMPLEMENTATION IDENTIFYING INFORMATION

The Q/R 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_1.2".

5.2 ASSOCIATION INITIATION POLICY

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

5.2.1 COPY IMAGES FROM THE WISE DATABASE TO A REMOTE AE

5.2.1.1 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.

5.2.1.2 Proposed Presentation Context

Table 11: Supported Storage SOP classes for the Q/R 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 9.

5.2.1.3 C-STORE SCU Conformance

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

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

5.3 ASSOCIATION ACCEPTANCE POLICY

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

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

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

5.3.1 VERIFICATION OF THE COMMUNICATION

5.3.1.1 Associated Real-World Activity

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

5.3.1.2 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

5.3.1.3 SOP Specific Conformance to Verification SOP class

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

5.3.1.4 Presentation Context Acceptance Criterion

There are no specific rules for acceptance.

5.3.1.5 Transfer Syntax Selection Policies

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

5.3.2 QUERY OF THE WISE DATABASE

5.3.2.1 Associated Real-World Activity

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

5.3.2.2 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

5.3.2.3 SOP Specific Conformance to FIND SOP classes

The Q/R 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.
- Existence of optional keys is not supported, only unique and required keys are handled (see appendix II).

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.

5.3.2.4 Presentation Context Acceptance Criterion

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

5.3.2.5 Transfer Syntax Selection Policies

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

5.3.3 RETRIEVE IMAGES FROM THE WISE DATABASE

5.3.3.1 Associated Real-World Activity

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

5.3.3.2 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

5.3.3.3 SOP Specific Conformance to MOVE SOP classes

The Q/R 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 AE where a C-FIND request will show images present in the WISE database but where a C-MOVE will give no images. This happens for some cases of partial deletion from IDS4 of patient data in the WISE 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.

5.3.3.4 Presentation Context Acceptance Criterion

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

5.3.3.5 Transfer Syntax Selection Policies

The Q/R 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, STORE and Q/R provide DICOM 3.0 TCP/IP Network Communication Support as defined in part 8 of the DICOM Standard.

6.2 TCP/IP STACK

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

The AE PRINT on HP-UX uses the TCP/IP stack built into the HP-UX operating system.

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

6.2.1 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

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 WISE System Administrator's Guide [6].

8.1 AE TITLE/PRESENTATION ADDRESS MAPPING

8.1.1 LOCAL AE TITLES AND PRESENTATION ADDRESSES

STORE The AE title of each AE can be configured. This is done running the setup program `/opt/sectra/config/si_setup` as described in the WISE Installation Guide [6]. Four AEs can be set up. The default AE title is DICOM_STORAGE.

The listen port of each AE can be also configured. This is specified in `.pro` files located in `/etc/opt/sectra/storage`. The default is 1027.

Setting up the STORE AEs one can choose between setting up an AE receiving single images or setting up an AE collecting images to stacks. The latter type of AE must be used if image stacks are to be viewed as stacks (and not as individual images) on an IDS4.

Q/R The AE title can be configured. This is done when running the setup program `/opt/sectra/config/si_setup` as described in the WISE Installation Guide [6]. Default is QR_SCP_WISE. 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 AE can also be configured. This is specified in a `.pro` file located in `/etc/opt/sectra/qr_wise`. The default is 7632.

8.1.2 REMOTE AE TITLES AND PRESENTATION ADDRESSES

STORE The remote Applications Entity's AE-title does not have to be specified. A STORE AE will accept any AE-title.

Q/R The remote Applications Entity's AE-title, host name and port number are specified in a `.app` file located in `/etc/opt/sectra/qr_wise.` The remote host must also be specified in the `/etc/hosts` file. Note that all C-MOVE destinations also have to be specified. The setup is described in detail in the WISE Installation Guide [6].

9 SUPPORT OF EXTENDED CHARACTER SETS

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

APPENDIX I - ATTRIBUTE LIST FOR STORE

This list contains the DICOM attributes that are used by a STORE AE by default. Please note that the default behaviour can be changed for both WISE and IDS4. The comments give indication what the attributes are used for. If an attribute is not present in this list it is still stored by WISE but ignored by IDS4.

For the PRINT AE attributes, see table 5. For supported attributes as keys for the Q/R AE in a C-FIND request, see appendix II.

Table 16: Attribute List for a STORE AE

DICOM Attribute	Comment
(0008,0005) Specific Character Set	"ISO_IR 100" is supported.
(0008,0008) Image Type	Is used for determining default window setting in IDS4 if no window is included in the image.
(0008,0018) SOP Instance UID	Stored in WISE image data
(0008,0020) Study Date	1. Stored in WISE examination data if value not found in RIS 2. Shown in all IDS4 image windows if present and (0008,0023) and (0008,0022) and (0008,0021) not present.
(0008,0021) Series Date	Shown in all IDS4 image windows if present and (0008,0023) and (0008,0022) not present.
(0008,0022) Acquisition Date	Shown in all IDS4 image windows if present and (0008,0023) not present.
(0008,0023) Image Date	If present, shown in all IDS4 image windows.
(0008,0030) Study Time	1. Stored in WISE examination data if value not found in RIS 2. Shown in all IDS4 image windows if present and (0008,0033) and (0008,0022) and (0008,0021) not present.
(0008,0031) Series Time	Shown in all IDS4 image windows if present and (0008,0033) and (0008,0032) not present.
(0008,0032) Acquisition Time	Shown in all IDS4 image windows if present and (0008,0033) not present.
(0008,0033) Image Time	If present, shown in all IDS4 image windows.
(0008,0041) Data Set Subtype (retired)	If present, must by default be the same for all images within a stack.

(0008,0050) Accession Number	1. Stored in WISE examination data. 2. Default attribute for examination number in WISE. Used for connecting the image to RIS entities.
(0008,0060) Modality	1. Stored in WISE examination data 2. Stored in WISE image data. 3. By default, must be equal for all stacks within an examination. 4. Defines modality for modality specific settings in IDS4
(0008,0080) Institution Name	Stored in WISE examination data.
(0008,1030) Study Description	Stored in WISE examination data.
(0008,1140) Referenced Image Sequence	Used by WISE in default method for locating scanograms.
(0008,1155) Referenced SOP Instance UID	Used by WISE in default method for locating scanograms.
(0010,0010) Patient Name	1. Stored in WISE patient data if value not found in RIS. 2. By default, must be equal for all stacks within an examination.
(0010,0020) Patient ID	1. Must be set. If not, (0010,0010) Patient Name is used as Patient ID in WISE. If both (0010,0020) Patient ID and (0010,0010) Patient Name are empty the request number is used as Patient ID in WISE. 2. Stored in WISE patient data if value not found in RIS. 3. Used as request number in WISE if attribute for request number (default: (0020,0010) Study ID) is empty. 4. By default, must be equal for all stacks within an examination.
(0010,0030) Patient's Birth Date	1. Stored in WISE patient data if value not found in RIS. 2. By default, must be equal for all stacks within an examination.
(0018,0010) Contrast/Bolus Agent	Shown in IDS4 image window for all CT images
(0018,0015) Body Part Examined	Stored in WISE examination data.
(0018,0020) Scanning Sequence	Shown in IDS4 image window for all MR images if (0018,0024) not present.
(0018,0024) Sequence Name	If present, shown in IDS4 image window for all MR images
(0018,0050) Slice Thickness	Shown in IDS4 image window for all CT and MR images
(0018,0060) KVP	Shown in IDS4 image window for all CT images

(0018,0080) Repetition Time	Shown in IDS4 image window for all MR images
(0018,0081) Echo Time	Shown in IDS4 image window for all MR images
(0018,0083) Number of Averages	Shown in IDS4 image window for all MR images
(0018,1041) Contrast/Bolus Volume	Shown in IDS4 image window for all CT and MR images
(0018,1100) Reconstruction Diameter	Shown in IDS4 image window for all CT and MR images
(0018,1120) Gantry/Detector Tilt	Shown in IDS4 image window for all CT images
(0018,1150) Exposure Time	Shown in IDS4 image window for all CT images
(0018,1151) X-ray Tube Current	Shown in IDS4 image window for all CT images
(0018,1164) Image Pixel Spacing	Used for calibrating the image in IDS4 if (0028,0030) is not set.
(0018,1210) Convolution Kernel	Shown in IDS4 image window for all CT images
(0018,1602) Shutter Left Vertical Edge	Is used for IDS4 cropping.
(0018,1604) Shutter Right Vertical Edge	Is used for IDS4 cropping.
(0018,1606) Shutter Upper Horizontal Edge	Is used for IDS4 cropping.
(0018,1608) Shutter Lower Horizontal Edge	Is used for IDS4 cropping.
(0018,1610) Center of Circular Shutter	If present and (0018,1602) - (0018,1608) not present, defines an IDS4 square cropping.
(0018,1612) Radius of Circular Shutter	If present and (0018,1602) - (0018,1608) not present, defines an IDS4 square cropping.
(0018,5100) Patient Position	Shown in IDS4 image window for all CT and MR images
(0020,000D) Study Instance UID	Stored in WISE examination data.
(0020,000E) Series Instance UID	1. Stored in WISE image data. 2. Is used for non-default method for identifying scanogram images if "-S U" option is used with w_import. 3. By default, must be equal for all images within a stack.
(0020,0010) Study ID	1. Stored in WISE examination data. 2. Default attribute for request number in WISE. Used for connecting the image to RIS entities. 3. By default, must be equal for all stacks within an examination.
(0020,0011) Series Number	1. Stored in WISE image data

	2. Is used for non-default method for identifying scanogram images if "-S S" option is used with w_import. 3. By default, must be equal for all stacks within an examination.
(0020,0012) Acquisition Number	Default attribute for sorting stacks within a study.
(0020,0013) Image Number	1. Stored in WISE image data 2. Is used for non-default method for identifying scanogram images if "-S I" option is used with w_import. 3. Default field for identifying image order within a stack. 4. Shown in IDS4 image window for all CT and MR images
(0020,0020) Patient Orientation	Always shown in IDS4 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 IDS4. 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 IDS4. . Needs to be present in both the stack and in the scanogram. See also (0020,0032) and (0028,0030).
(0020,1041) Slice Location	Default field to be used if stacks are to be split by WISE if slices are of different thickness (+split option to diccollect).
(0028,0002) Samples per Pixel	If not set, 1 is assumed in IDS4.
(0028,0004) Photometric Interpretation	MONOCHROME1, MONOCHROME2, PALETTE_COLOR and RGB are supported by IDS4. If this attribute is not set, MONOCHROME2 is used by IDS4.
(0028,0006) Planar Configuration	If not set, 000 is assumed by IDS4.
(0028,0008) Number of Frames	If not set, 1 is assumed by IDS4.
(0028,0010) Rows	Must be set to be viewable in IDS4.
(0028,0011) Columns	Must be set to be viewable in IDS4
(0028,0030) Pixel Spacing	1. Used for calibrating the image in IDS4. If empty (0018,1164) is used. 2. Important attribute for showing location of images in scanograms in IDS4. 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 IDS4.
(0028,0100) Bits Allocated	Must be set to be viewable in IDS4
(0028,0101) Bits Stored	Must be set and less than (0028,0100) Bits Allocated to be viewable in IDS4.
(0028,0102) High Bit	1. If not set, (Bit Stored)-1 is used by IDS4. 2. If set, must be between greater than 0 and less than or equal to Bits Allocated. If not, (Bits Stored)-1 is used by IDS4.
(0028,0103) Pixel Representation	If not set, 0000H (unsigned integer) is assumed by IDS4.
(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 IDS4 is the bit depth.
(0028,1052) Rescale Intercept	Is used for calculating Hounsfield units of CT images in IDS4.
(0028,1053) Rescale Slope	Is used for calculating Hounsfield units of CT images in IDS4.
(0028,3000) Modality LUT Sequence	The first LUT in a sequence is used by IDS4, 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 II - KEY LIST FOR Q/R C-FIND REQUESTS

These tables contain the DICOM keys that are supported by the Q/R 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	