
DICOM

Conformance Statement

Q-Station R1.1

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PHILIPS

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1 DICOM CONFORMANCE STATEMENT OVERVIEW

Q-Station is interoperable with systems providing a DICOM interface. Clinical users can select patient image data for basic viewing; post processing, data transfer or print. Q-Station stores medical data in its local storage. The local storage has a limited capacity and is not intended for long term archiving purposes.

Table 1: Network Services

| SOP Class | | User of Service (SCU) | Provider of Service (SCP) |
|--|-------------------------------|-----------------------|---------------------------|
| Name | UID | | |
| Other | | | |
| Verification SOP Class | 1.2.840.10008.1.1 | Yes | Yes |
| Print Management | | | |
| Basic Grayscale Print Management Meta SOP Class | 1.2.840.10008.5.1.1.9 | Yes | No |
| >Basic Film Box SOP Class | 1.2.840.10008.5.1.1.2 | Yes | No |
| >Basic Film Session SOP Class | 1.2.840.10008.5.1.1.1 | Yes | No |
| >Basic Grayscale Image Box SOP Class | 1.2.840.10008.5.1.1.4 | Yes | No |
| >Printer SOP Class | 1.2.840.10008.5.1.1.16 | Yes | No |
| Basic Color Print Management Meta SOP Class | 1.2.840.10008.5.1.1.18 | Yes | No |
| >Basic Color Image Box SOP Class | 1.2.840.10008.5.1.1.4.1 | Yes | No |
| >Basic Film Box SOP Class | 1.2.840.10008.5.1.1.2 | Yes | No |
| >Basic Film Session SOP Class | 1.2.840.10008.5.1.1.1 | Yes | No |
| >Printer SOP Class | 1.2.840.10008.5.1.1.16 | Yes | No |
| Presentation LUT Shape SOP Class | 1.2.840.10008.5.1.1.23 | Yes | No |
| Query/Retrieve | | | |
| Patient Root Query/Retrieve Information Model - FIND SOP Class | 1.2.840.10008.5.1.4.1.2.1.1 | Yes | No |
| Patient Root Query/Retrieve Information Model - MOVE SOP Class | 1.2.840.10008.5.1.4.1.2.1.2 | Yes | No |
| Study Root Query/Retrieve Information Model - FIND SOP Class | 1.2.840.10008.5.1.4.1.2.2.1 | Yes | No |
| Study Root Query/Retrieve Information Model - MOVE SOP Class | 1.2.840.10008.5.1.4.1.2.2.2 | Yes | No |
| Transfer | | | |
| Ultrasound Multi-frame Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.3.1 | Yes | Yes |
| Ultrasound Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.6.1 | Yes | Yes |
| Secondary Capture Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.7 | Yes | Yes |
| General ECG Waveform Storage SOP Class | 1.2.840.10008.5.1.4.1.1.9.1.2 | Yes | Yes |
| Basic Text SR SOP Class | 1.2.840.10008.5.1.4.1.1.88.11 | Yes | Yes |
| Enhanced SR SOP Class | 1.2.840.10008.5.1.4.1.1.88.22 | Yes | Yes |
| Comprehensive SR SOP Class | 1.2.840.10008.5.1.4.1.1.88.33 | Yes | Yes |
| Encapsulated PDF Storage | 1.2.840.10008.5.1.4.1.1.104.1 | Yes | Yes |

Table 2: Media Services

| Media Storage Application Profile | Write Files (FSC / FSU) | Read Files (FSR) |
|---|--------------------------------|-------------------------|
| Compact Disk – Recordable | | |
| General Purpose CD-R Interchange | Yes / No | Yes |
| STD-US-SC-MF-CD-R | Yes/No | Yes |
| DVD | | |
| General Purpose DVD Interchange with JPEG | Yes / No | Yes |
| USB | | |
| General Purpose USB Interchange with JPEG | Yes / Yes | Yes |

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3 INTRODUCTION

The introduction specifies product and relevant disclaimers as well as any general information that the vendor feels is appropriate.

3.1 Revision History

The revision history provides dates and differences of the different releases.

Table 3: Revision History

| Document Version | Date of Issue | Author | Description |
|------------------|------------------|-----------|--|
| A | February 7, 2011 | IOCC-Best | Initial release for this Q-Station update. New Document Number used. |

3.2 Audience

This Conformance Statement is intended for:

- (Potential) customers
- System integrators of medical equipment
- Marketing staff interested in system functionality
- Software designers implementing DICOM interfaces

It is assumed that the reader is familiar with the DICOM standard.

3.3 Remarks

The DICOM Conformance Statement is contained in chapter 4 through 8 and follows the contents and structuring requirements of DICOM PS 3.2.

This DICOM Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

- **Interoperability**
Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into an IT environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment.
It is the user's responsibility to analyze thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.
- **Validation**
Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement.
Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

- **New versions of the DICOM Standard**

The DICOM Standard will evolve in future to meet the user’s growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery.

The user should ensure that any non-Philips provider linking to Philips equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

3.4 Definitions, Terms and Abbreviations

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA PS 3.3 and PS 3.4.

The word Philips in this document refers to Philips Healthcare. The term Q-Station is used in this document to refer to Q-Station 1.0.

The following acronyms and abbreviations are used in this document.

| | |
|---------|---|
| ACC | American College of Cardiology |
| ACR | American College of Radiology |
| AE | Application Entity |
| ANSI | American National Standard Institute |
| AP | Application Profile |
| BOT | Basic Offset Table |
| CD | Compact Disc |
| CD-R | CD-Recordable |
| CD-M | CD-Medical |
| DCR | Dynamic Cardio Review |
| DICOM | Digital Imaging and Communications in Medicine |
| DIMSE | DICOM Message Service Element |
| DIMSE-C | DIMSE-Composite |
| DIMSE-N | DIMSE-Normalized |
| EBE | DICOM Explicit VR Big Endian |
| ELE | DICOM Explicit VR Little Endian |
| FSC | File-set Creator |
| FSR | File-set Reader |
| FSU | File-set Updater |
| GUI | Graphic User Interface |
| HIS | Hospital Information System |
| HL7 | Health Level Seven |
| ILE | DICOM Implicit VR Little Endian |
| IOD | Information Object Definition |
| ISIS | Information System – Imaging System |
| Na | Not applicable |
| NEMA | National Electrical Manufacturers Association |
| PDU | Protocol Data Unit |
| RWA | Real-World Activity |
| SC | Secondary Capture |
| SCM | Study Component Management |
| SCP | Service Class Provider |
| SCU | Service Class User |
| SOP | Service Object Pair |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| UID | Unique Identifier |
| US | Ultrasound |
| USMF | Ultrasound Multi-frame |

3.5 References

[DICOM] Digital Imaging and Communications in Medicine, Part 1 – 18
(NEMA PS 3.1– PS 3.18),
National Electrical Manufacturers Association (NEMA)
Publication Sales 1300 N. 17th Street, Suite 1847
Rosslyn, Virginia. 22209, United States of America
Internet: <http://medical.nema.org/>

Note that at any point in time the official standard consists of the most recent yearly edition of the base standard (currently 2008) plus all the supplements and correction items that have been approved as Final Text.

4 NETWORKING

This section contains the networking related services (vs. the media related ones).

4.1 Implementation model

The implementation model consists of three sections:

- The application data flow diagram, specifying the relationship between the Application Entities and the “external world” or Real-World Activities,
- A functional description of each Application Entity, and
- The sequencing constraints among them.

4.1.1 Application Data Flow

Q-Station R1.1 implements one network application entity: the Q-Station Network AE.

The following figure shows the networking application data flow as a functional overview of the application entity. On the left the local Real-World Activities are presented, whereas on the right the remote Real-World Activities are presented.

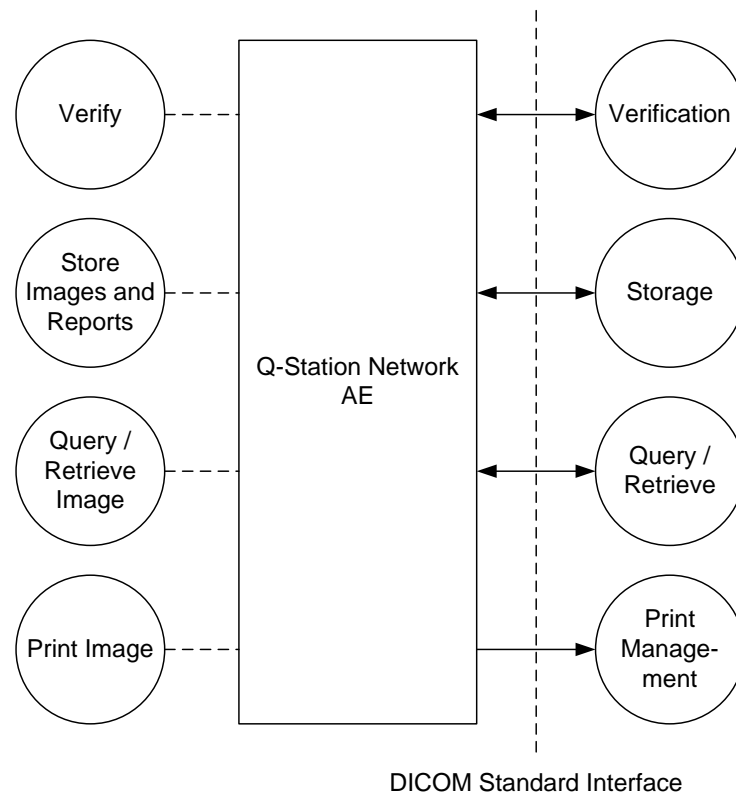


Figure 1: Application Data Flow Diagram

Q-Station R1.1 incorporates the following functionality:

- Import images to a local database;
- Export images from the local database to a network DICOM node;
- Query and retrieve images from a remote DICOM node;
- Query and retrieve images from the local database;
- Print grayscale and color images from the local database on a DICOM printer.

4.1.2 Functional Definition of AE's

This section contains a functional definition for each individual local Application Entity. This describes in general terms the functions to be performed by the AE, and the DICOM services used to accomplish these functions. In this sense, "DICOM services" refers not only to DICOM Service Classes, but also to lower level DICOM services, such as Association Services.

4.1.2.1 Functional Definition of Q-Station Network AE

Q-Station incorporates the following functionality:

- The Q-Station Network AE can verify application level communication by using the Verification service both as SCU and SCP (Verify).
- The Q-Station Network AE can store images by using the Storage service both as SCU and SCP (Store Image).
- The Q-Station Network AE can find and move images by using the Query/Retrieve service as SCU (Query/Retrieve Image).
- The Q-Station Network AE can print images by using the Print Management service as SCU (Print Image).

4.1.3 Sequencing of Real World Activities

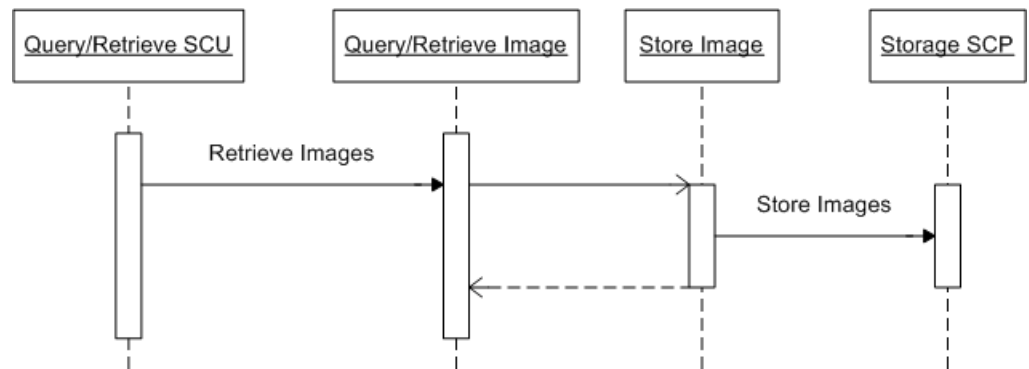


Figure 2: Sequencing of Retrieve

4.2 AE Specifications

The next section in the DICOM Conformance Statement is a set of application entity specifications. There are as many of these subsections as there are different AE's in the implementation.

4.2.1 Q-Station Network AE

Detail of this specific Application Entity is specified in this section.

4.2.1.1 SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 4: SOP Classes for Q-Station Network AE

| SOP Class Name | SOP Class UID | SCU | SCP |
|--|-------------------------------|-----|-----|
| Verification SOP Class | 1.2.840.10008.1.1 | Yes | Yes |
| Basic Grayscale Print Management Meta SOP Class | 1.2.840.10008.5.1.1.9 * | Yes | No |
| >Basic Film Box SOP Class | 1.2.840.10008.5.1.1.2 | Yes | No |
| >Basic Film Session SOP Class | 1.2.840.10008.5.1.1.1 | Yes | No |
| >Basic Grayscale Image Box SOP Class | 1.2.840.10008.5.1.1.4 | Yes | No |
| >Printer SOP Class | 1.2.840.10008.5.1.1.16 | Yes | No |
| Basic Color Print Management Meta SOP Class | 1.2.840.10008.5.1.1.18 * | Yes | No |
| >Basic Color Image Box SOP Class | 1.2.840.10008.5.1.1.4.1 | Yes | No |
| >Basic Film Box SOP Class | 1.2.840.10008.5.1.1.2 | Yes | No |
| >Basic Film Session SOP Class | 1.2.840.10008.5.1.1.1 | Yes | No |
| >Printer SOP Class | 1.2.840.10008.5.1.1.16 | Yes | No |
| Presentation LUT Shape SOP Class | 1.2.840.10008.5.1.1.23 * | Yes | No |
| Ultrasound Multi-frame Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.3.1 | Yes | Yes |
| Ultrasound Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.6.1 | Yes | Yes |
| Secondary Capture Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.7 | Yes | Yes |
| General ECG Waveform Storage SOP Class | 1.2.840.10008.5.1.4.1.1.9.1.2 | Yes | Yes |
| Basic Text SR SOP Class | 1.2.840.10008.5.1.4.1.1.88.11 | Yes | Yes |
| Enhanced SR SOP Class | 1.2.840.10008.5.1.4.1.1.88.22 | Yes | Yes |
| Comprehensive SR SOP Class | 1.2.840.10008.5.1.4.1.1.88.33 | Yes | Yes |
| Encapsulated PDF Storage | 1.2.840.10008.5.1.4.1.1.104.1 | Yes | Yes |
| Patient Root Query/Retrieve Information Model - FIND SOP Class | 1.2.840.10008.5.1.4.1.2.1.1 | Yes | No |
| Patient Root Query/Retrieve Information Model - MOVE SOP Class | 1.2.840.10008.5.1.4.1.2.1.2 | Yes | No |
| Study Root Query/Retrieve Information Model - FIND SOP Class | 1.2.840.10008.5.1.4.1.2.2.1 | Yes | No |
| Study Root Query/Retrieve Information Model - MOVE SOP Class | 1.2.840.10008.5.1.4.1.2.2.2 | Yes | No |

* Presentation LUT Shape SOP Class is only used in the Print Meta SOP Classes

Note: Any SOP specific behavior is documented later in the conformance statement in the applicable SOP specific conformance section.

4.2.1.2 Association Policies

Each AE specification contains a description of the general association establishment and acceptance policies of the AE.

4.2.1.2.1 General

The DICOM standard application context has specified.

Table 5: DICOM Application Context

| | |
|--------------------------|-----------------------|
| Application Context Name | 1.2.840.10008.3.1.1.1 |
|--------------------------|-----------------------|

4.2.1.2.2 Number of Associations

The number of simultaneous associations that an Application Entity may support as a Initiator or Acceptor is specified.

Table 6: Number of Associations as an Association Initiator for Q-Station Network AE

| | |
|---|---|
| Maximum number of simultaneous associations | 4 |
|---|---|

Table 7: Number of Associations as an Association Acceptor for Q-Station Network AE

| | |
|---|-------------------------------|
| Maximum number of simultaneous associations | Limited to configured devices |
|---|-------------------------------|

4.2.1.2.3 Asynchronous Nature

If the implementation supports negotiation of multiple outstanding transactions this is stated here, along with the maximum number of outstanding transactions supported.

Table 8: Asynchronous Nature as an Association Initiator for Q-Station Network AE

| | |
|---|---|
| Maximum number of outstanding asynchronous transactions | The Q-Station Network AE does not support asynchronous operations and will not perform asynchronous window negotiation. The only exceptions are for reports from Print Management operations. |
|---|---|

4.2.1.2.4 Implementation Identifying Information

The value supplied for Implementation Class UID and version name are documented here.

Table 9: DICOM Implementation Class and Version for Q-Station Network AE

| | |
|-----------------------------|----------------------|
| Implementation Class UID | 1.3.46.670589.5.2.10 |
| Implementation Version Name | 81.302.3.2 |

4.2.1.2.5 Communication Failure Handling

The behavior of the AE during communication failure is summarized in next table.

Table 10: Communication Failure Behavior

| Exception | Behavior |
|---------------|---|
| ARTIM Timeout | The association setup fails; the reason is logged and reported to the user. |

4.2.1.3 Association Initiation Policy

This describes the conditions under which the AE will initiate an association. The behavior of the AE during association rejection is summarized in next table.

Table 11: DICOM Association Rejection Handling

| Result | Source | Reason/Diagnosis | Behavior |
|------------------------|---------------------------|--|---|
| 1 – rejected-permanent | 1 – DICOM UL service-user | 1 – no-reason-given | Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 1: REJECT_SOURCE_dul_user, 1: REJECT_REASON _no_reason_given) |
| | | 2 – application-context-name-not-supported | Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 1: REJECT_SOURCE_dul_user, 2: REJECT_REASON _application_context_not_support) |
| | | 3 – calling-AE-title-not-recognized | Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 1: REJECT_SOURCE_dul_user, 3: REJECT_REASON _calling_aetitle_not_recognized) |
| | | 7 – called-AE-title-not-recognized | Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 1: REJECT_SOURCE_dul_user, 7: REJECT_REASON _called_aetitle_not_recognized) |

| | | | |
|--|--|------------------------------------|---|
| | 2 – DICOM UL service-provider (ACSE related function) | 1 – no-reason-given | Association is not established. The following error is logged. Error: UserRecoverable: impl.dicom.access.PEER: Associationrejected by peer (1: REJECT_RESULT _permanent, 2: REJECT_SOURCE _dul_provider (acse), 1: REJECT_REASON _no_reason_given) |
| | | 2 – protocol-version-not-supported | Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 2: REJECT_SOURCE _dul_provider (acse), 2: REJECT_REASON _application_context_not_support) |
| | 3 – DICOM UL service-provider (presentation related function) | 1 – temporary-congestion | Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 3: REJECT_SOURCE _dul_provider (presentation), 1: REJECT_REASON _no_reason_given) |
| | | 2 – local-limit-exceeded | Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 3: REJECT_SOURCE _dul_provider (presentation), 2: REJECT_REASON _application_context_not_support) |

| Result | Source | Reason/Diagnosis | Behavior |
|------------------------|---|--|--|
| 2 – rejected-transient | 1 – DICOM UL service-user | 1 – no-reason-given | Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 1: REJECT_REASON_no_reason_given) |
| | | 2 – application-context-name-not-supported | Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 2: REJECT_REASON_application_context_not_support) |
| | | 3 – calling-AE-title-not-recognized | Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 3: REJECT_REASON_calling_aetitle_not_recognized) |
| | | 7 – called-AE-title-not-recognized | Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 7: REJECT_REASON_called_aetitle_not_recognized) |
| | 2 – DICOM UL service-provider (ACSE related function) | 1 – no-reason-given | Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 2: REJECT_SOURCE_dul_provider (acse), 1: REJECT_REASON_no_reason_given) |
| | | 2 – protocol-version-not-supported | Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 2: REJECT_SOURCE_dul_provider (acse), 2: REJECT_REASON_application_context_not_support) |
| | 3 – DICOM UL service-provider (presentation related function) | 1 – temporary-congestion | Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 3: REJECT_SOURCE_dul_provider (presentation), 1: REJECT_REASON_no_reason_given) |
| | | 2 – local-limit-exceeded | Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 3: REJECT_SOURCE_dul_provider (presentation), 2: REJECT_REASON_application_context_not_support) |

The behavior of the AE during association abort is summarized in Table 12.

Table 12: DICOM Association Abort Handling

| Source | Reason/Diagnosis | Behavior |
|-------------------------------|--------------------------------|---|
| 0 – DICOM UL service-user | 0 – reason-not-specified | <p>When received, Q-Station terminates the connection with the following log: Association ABORTED by peer (0: ABORT_SOURCE_dul_user, 0: ABORT_REASON_not_specified).</p> <p>Sent when:</p> <ul style="list-style-type: none"> • N-EVENT-REPORT for printing received with status FAILURE. • Abort is issued to an executing job that utilizes this network connection (ExportNetwork/ ArchiveNetwork/ DICOMCopy/ DICOMMove) • Any other problem than ones specified for Q-Station Network AE SCU in the rows below. (Examples: Problem while decoding the DICOM stream, SCU was unable to send the Response to SCP, Error writing to SCU stream). |
| 2 – DICOM UL service-provider | 0 – reason-not-specified | <p>When received, Q-Station Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 0: ABORT_REASON_not_specified)</p> <p>Sent when:</p> <ul style="list-style-type: none"> • There are problems in SCU/SCP role negotiation. • Any other problem than ones specified for Q-Station Network AE SCU in the rows below. (Example: Problem while decoding the DICOM |
| | 1 – unrecognized-PDU | <p>When received, the Q-Station Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 1: ABORT_REASON_unrecognized_pdu).</p> <p>Sent when:</p> <ul style="list-style-type: none"> • An unrecognized PDU type is received⁴. |
| | 2 – unexpected-PDU | <p>When received, the Q-Station Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 2: ABORT_REASON_unexpected_pdu).</p> <p>Sent when:</p> <ul style="list-style-type: none"> • The received PDU type is not expected in the current state of connection⁵. |
| | 4 – unrecognized-PDU parameter | <p>When received, the Q-Station Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 4: ABORT_REASON_unrecognized_pdu_parameter).</p> <p>Sent when:</p> <ul style="list-style-type: none"> • An unrecognized Associate PDU item is received. |

| Source | Reason/Diagnosis | Behavior |
|--------|---------------------------------|--|
| | 5 – unexpected-PDU parameter | <p>When received, the Q-Station Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 5: ABORT_REASON _unexpected_pdu_parameter).</p> <p>Sent when:</p> <ul style="list-style-type: none"> • One of the Associate PDU items is received more than once². • One of the Associate PDU items is received unexpectedly². |
| | 6 – invalid-PDU-parameter value | <p>When received, the Q-Station Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 6: ABORT_REASON _invalid_pdu_parameter).</p> <p>Sent when:</p> <ul style="list-style-type: none"> • One of the Associate PDU items is received more than once³. • One of the Associate PDU items is not received³. • There is mismatch in the application context names between the SCU and the SCP. • Illegal Asynchronous Operations Window invoke value is received. • Illegal Asynchronous Operations Window perform value is received. • Unknown presentation context id is received. • Unknown abstract syntax is received. • The length or the format of a received PDU item is invalid. |

The behavior of the AE during DICOM communication failure is summarized in Table 13.

Table 13: DICOM Command Communication Failure Behavior

| Exception | Behavior |
|----------------|---|
| Reply Time-out | The association is aborted using A-ABORT and command marked as failed. The reason is logged and reported to the user. |

4.2.1.3.1 (Real-World) Activity – Verification as SCU

4.2.1.3.1.1. Description and Sequencing of Activities

The Q-Station Network AE implements the Verification service class / Verification SOP class to verify application level communication.

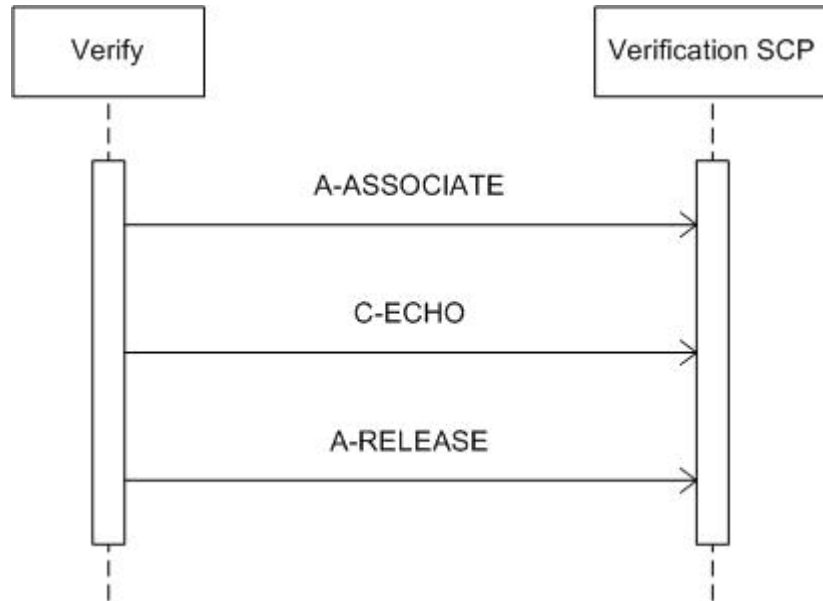


Figure 4: Data Flow Diagram – Verify

4.2.1.3.1.2 Proposed Presentation Contexts

Table 14: Proposed Presentation Contexts for (Real-World) Activity – Verification as SCU

| Presentation Context Table | | | | | |
|----------------------------|-------------------|---------------------------|---------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Verification SOP Class | 1.2.840.10008.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |

4.2.1.3.1.3 SOP Specific Conformance for Verification SOP Class

The Q-Station Network AE provides standard conformance to the DICOM Verification service class.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 15.

4.2.1.3.1.3.1 Dataset Specific Conformance for Verification C-ECHO SCU

Table 15: C-ECHO Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|-----------------|--|
| Success | 0000 | Confirmation | The SCP has successfully returned a verification response. |

4.2.1.3.2 (Real-World) Activity – Print Management as SCU

4.2.1.3.2.1 Description and Sequencing of Activities

The Q-Station Network AE implements the Print Management service class as part of the Print component to send selected images to a printer (SCP).

As a result, the Q-Station Network AE will initiate an association to the selected printer and use it to send the Print Service Elements of the Print SOP Classes. If the association could not be established, the Q-Station Network AE will retry to establish an association every 20 seconds during the next hour.

Q-Station allows having a print preview first.

In case of a print job association the printer status is requested in that association. The received printer status is displayed in the Printer Status Tool. On a failure printer status the Q-Station Network AE will retry and request the printer status every 20 seconds during the next hour.

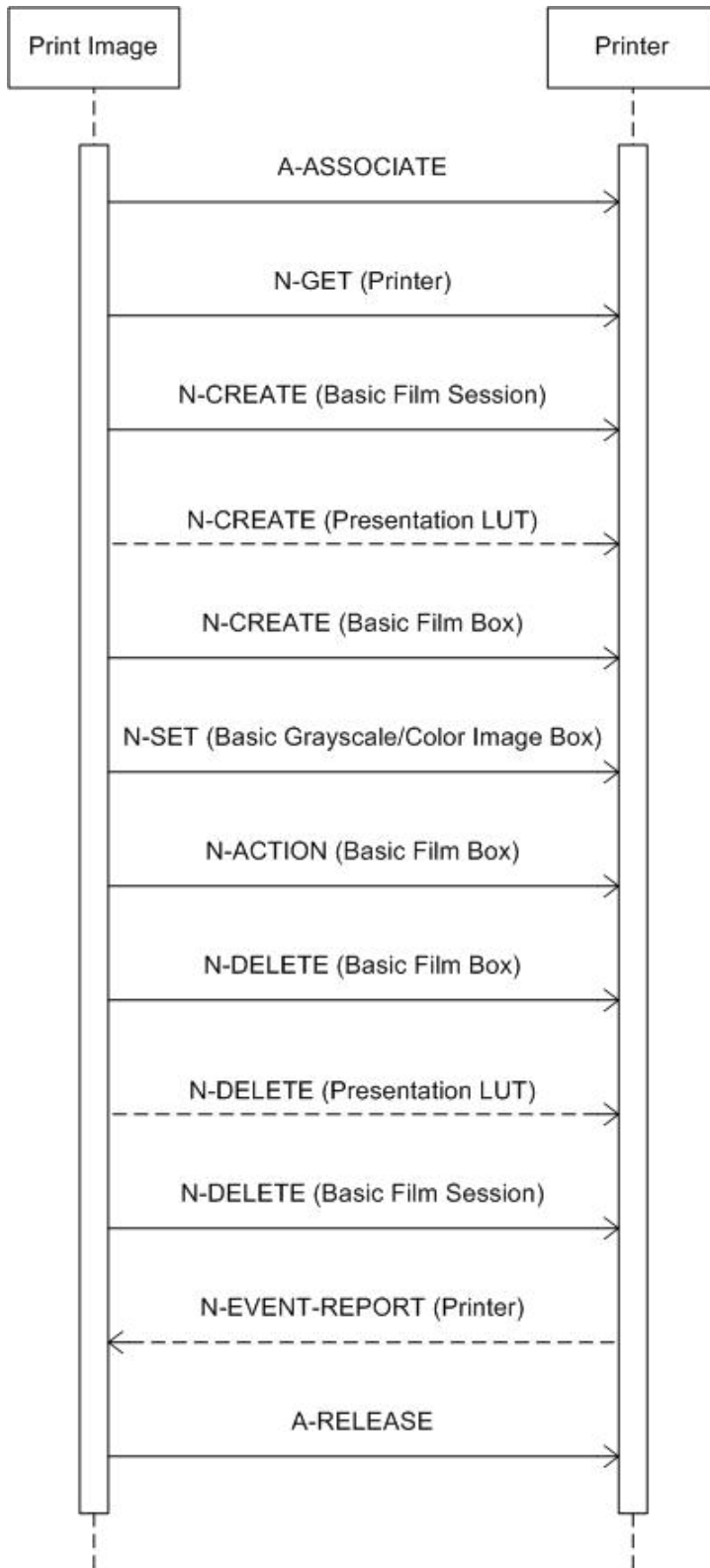


Figure 5: Data Flow Diagram – Print Image

4.2.1.3.2.2 Proposed Presentation Contexts

Table 16: Proposed Presentation Contexts for (Real-World) Activity – Print Management as SCU

| Presentation Context Table | | | | | |
|---|-------------------------|---------------------------|---------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Basic Grayscale Print Management Meta SOP Class | 1.2.840.10008.5.1.1.9 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| >Basic Color Image Box SOP Class | 1.2.840.10008.5.1.1.4.1 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| >Basic Film Box SOP Class | 1.2.840.10008.5.1.1.2 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| >Basic Film Session SOP Class | 1.2.840.10008.5.1.1.1 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| >Printer SOP Class | 1.2.840.10008.5.1.1.16 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| Presentation LUT Shape SOP Class | 1.2.840.10008.5.1.1.23 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| Basic Color Print Management Meta SOP Class | 1.2.840.10008.5.1.1.18 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| >Basic Film Box SOP Class | 1.2.840.10008.5.1.1.2 | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| >Basic Film Session SOP Class | 1.2.840.10008.5.1.1.1 | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| >Basic Grayscale Image Box SOP Class | 1.2.840.10008.5.1.1.4 | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| >Printer SOP Class | 1.2.840.10008.5.1.1.16 | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| Presentation LUT Shape SOP Class | 1.2.840.10008.5.1.1.23 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |

See section 8.1 for specification for each IOD created (including private IOD's).

4.2.1.3.2.3 SOP Specific Conformance for Print Management Meta SOP Classes

Q-Station provides standard conformance to the Basic Grayscale Print Management Meta SOP Class and the Basic Color Print Management Meta SOP Class. Note that associations are proposed for either color or grayscale printing, not for both.

The following optional SOP classes from these Meta SOP classes are not supported:

- Print Job SOP class (can be used to get a notification that a job is ready);
- Basic Annotations Box SOP class;
- Reference Image Box SOP class.

The grayscale standard display function adjusts the brightness such that equal changes in P-Values will result in the same level of perceptibility.

DICOM color print is supported as Planar Interleaved method as well as Pixel Interleaved. The Planar Interleaved method is mandatory according to DICOM standard and means that each color plane (R, G, B) is rendered separately. So each image must be rendered three times. This means that Planar Interleaved will be time consuming. For this reason the default method for DICOM color print will be set to Pixel Interleaved, where as the printer supports this.

The applied order of Print Service Elements (DIMSE's) is specified in Figure 5. Refer to section 8.1.1 for a description of the applied optional attributes in these Service Elements (i.e. non-mandatory attributes as Print SCU). Note that the Service Elements order is not specified by the DICOM standard.

Overlay, Annotation (showing the values of some major identifying attributes) and Shutter information is processed in the images sent to the printer (i.e. burnt-in into the image).

The Status Codes of DIMSE Responses (Success, Warning, Failure) as returned by the printer will also be logged (for service purposes) and are mapped onto general print job status messages towards the operator. These User Interface messages indicate:

- "Job Completed" and has the meaning that the print job is accepted by the printer; the actual printing will be done afterwards.
- "Print Error" indicates that a failure occurred during the DICOM Print. Also, most warning cases (like default printer values applied on optional print attributes) are interpreted as a print error because this will mostly result in a different print quality or print layout than expected.

The following implementation remarks are important to achieve successful printing:

- The number of Film Boxes per Film Session is one.
- The number of images per Film Box is one.
- The images to be printed on one film are rendered by Q-Station Network AE into one logical image. This logical image is very large, depending on the pixel matrix size (pixels per line, lines per image), use of color or not. A rough indication is 20 MBytes for grayscale and 80 Mbytes for color. One should take this into account when selecting the DICOM printer and the printer configuration (e.g. the amount of memory).

The Q-Station Network AE does not send an attribute list to the printer. Therefore the mandatory attributes listed in section 8.1.1 are the only attributes that are required to be supported by the printer.

4.2.1.3.2.1 SOP Specific Conformance for Basic Color Print Management Meta

SOP Class

Image Box

4.2.1.3.2.1.1 Dataset Specific Conformance for Basic Color Image Box N- SET SCU

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 17.

Table 17: N-SET Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|---------------------|--|--|
| Success | 0000 | Image successfully stored in image box. | The print job continues and completes. |
| Failure | Xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | B604 | Image size is larger than image box size, the image has been de-magnified. | The print job continues and the warning is logged. |
| | B605 | Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead. | The print job continues and the warning is logged. |
| | B609 | Image size is larger than the image box size. The image has been cropped to fit. | The print job continues and the warning is logged. |
| | B60A | Image size or combined print image size is larger than the image box size. Image or combined print image has been decimated to fit. | The print job continues and the warning is logged. |
| | 0107 | (not defined) | The print job continues and the warning is logged. |
| | 0116 | | |
| | B600 | | |
| | B601 | | |
| | B602 | | |
| | B603 | | |
| B606 | | | |
| B608 | | | |
| Xxxx | (any other warning) | Print job fails, the warning is logged, and the association is released. | |

Film Box

4.2.1.3.2.1.2 Dataset Specific Conformance for Basic Film Box N-ACTION SCU

Table 18: N-ACTION Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|-----------------------|---------------------|---|--|
| Success | 0000 | Film accepted for printing. | The print job continues and completes. |
| Failure | Xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | B603 | Film Box SOP Instance hierarchy does not contain Image Box SOP Instances (empty page). | The print job continues and the warning is logged. |
| | B604 | Image size is larger than image box size, the image has been de-magnified. | The print job continues and the warning is logged. |
| | B609 | Image size is larger than the image box size. The image has been cropped to fit. | The print job continues and the warning is logged. |
| | B60A | Image size or combined print image size is larger than the image box size. Image or combined print image has been decimated to fit. | The print job continues and the warning is logged. |
| | 0107 | (not defined) | The print job continues and the warning is logged. |
| | 0116 | | |
| | B600 | | |
| | B601 | | |
| | B602 | | |
| | B605 | | |
| B606 | | | |
| B608 | | | |
| xxxx | (any other warning) | Print job fails, the warning is logged, and the association is released. | |

4.2.1.3.2.1.3 Dataset Specific Conformance for Basic Film Box N- CREATE SCU

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 19.

Table 19: N-CREATE Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|--|--|
| Success | 0000 | Film Box successfully created. | The print job continues and completes. |
| Failure | xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | B605 | Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead. | The print job continues and the warning is logged. |
| | 0107 | (not defined) | The print job continues and the warning is logged. |
| | 0116 | | |
| | B600 | | |
| | B601 | | |
| | B602 | | |
| | B603 | | |
| | B604 | | |
| | B606 | | |
| | B608 | | |
| | B609 | | |
| | B60A | | |
| | xxxx | (any other warning) | Print job fails, the warning is logged, and the association is released. |

4.2.1.3.2.1.4 Dataset Specific Conformance for Basic Film Box N-DELETE SCU

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 20.

Table 20: N-DELETE Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|-----------------|--|
| Success | 0000 | - | Continue with print job. |
| Failure | xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | xxxx | (any warning) | Print job fails, the warning is logged, and the association is released. |

Film Session

4.2.1.3.2.1.5 Dataset Specific Conformance for Basic Film Session N-CREATE SCU

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 21.

Table 21: N-CREATE Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|------------------------------------|--|
| Success | 0000 | Film session successfully created. | The print job continues and completes. |
| Failure | xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | B600 | Memory allocation not supported. | The print job continues and the warning is logged. |
| | 0107 | (not defined) | The print job continues and the warning is logged. |
| | 0116 | | |
| | B601 | | |
| | B602 | | |
| | B603 | | |
| | B604 | | |
| | B605 | | |
| | B606 | | |
| | B608 | | |
| B609 | | | |
| B60A | | | |
| | xxxx | (any other warning) | Print job fails, the warning is logged, and the association is released. |

4.2.1.3.2.1.6 Dataset Specific Conformance for Basic Film Session N- DELETE SCU

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 22.

Table 22: N-DELETE Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|-----------------|--|
| Success | 0000 | - | Continue with print job. |
| Failure | xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | xxxx | (any warning) | Print job fails, the warning is logged, and the association is released. |

Printer

4.2.1.3.2.1.7 Dataset Specific Conformance for Printer N-EVENT-REPORT SCU

Table 23: N-EVENT-REPORT Status Handling Behavior

| Event Type Name | Event Type ID | Behavior |
|-----------------|---------------|---|
| Normal | 1 | The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0 Event Type ID = 1 Information is logged: N-EVENT-REPORT received, type: NORMAL |
| Warning | 2 | The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0 Event Type ID = 2 Warning is logged: N-EVENT-REPORT received, type: WARNING Status info: <Status info> |

| | | |
|---------|---|--|
| Failure | 3 | <p>The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0 Event Type ID = 3</p> <p>Error is Logged: N-EVENT-REPORT received, type: FAILURE Status info: <Status info></p> <p>Printer status is set to DICOM_PRINTER_STATUS_FAILURE</p> <p>The print job retries the print operation.</p> |
|---------|---|--|

All possible status responses are provided in Table 24.

Table 24: N-EVENT-REPORT Status Response

| Service Status | Code | Further Meaning | Description |
|----------------|------|-----------------|-----------------------|
| Success | 0000 | - | The result is logged. |

4.2.1.3.2.1.8 Dataset Specific Conformance for Printer N-GET SCU

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 25.

Table 25: N-GET Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|--|--|
| Success | 0000 | Successful command | The print job continues and completes. |
| Failure | Xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | 0001 | Requested optional attributes are not supported. | The print job continues and the warning is logged. |
| | Xxxx | (any other warning) | Print job fails, the warning is logged, and the association is released. |

4.2.1.3.2.2 SOP Specific Conformance for Basic Grayscale Print Management Meta SOP Class

Image Box

4.2.1.3.2.2.1 Dataset Specific Conformance for Basic Grayscale Image Box N-SET SCU

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 26.

Table 26: N-SET Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|--|--|
| Success | 0000 | Successful command | The print job continues and completes. |
| Failure | xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | B604 | Image size is larger than image box size, the image has been de-magnified. | The print job continues and the warning is logged. |
| | B609 | Image size is larger than the image box size. The image has been cropped to fit. | The print job continues and the warning is logged. |

| | | | |
|--|------|---|--|
| | B60A | Image size or combined print image size is larger than the image box size. Image or combined print image has been decimated to fit. | The print job continues and the warning is logged. |
| | 0107 | (not defined) | The print job continues and the warning is logged. |
| | 0116 | | |
| | B600 | | |
| | B601 | | |
| | B602 | | |
| | B603 | | |
| | B605 | | |
| | B606 | | |
| | B608 | | |
| | xxxx | (any other warning) | Print job fails, the warning is logged, and the association is released. |

Film Box

4.2.1.3.2.2.2 Dataset Specific Conformance for Basic Film Box N-ACTION SCU

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 27.

Table 27: N-ACTION Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|-----------------------|-------------|---|--|
| Success | 0000 | Film accepted for printing. | The print job continues and completes. |
| Failure | xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | B603 | Film Box SOP Instance hierarchy does not contain Image Box SOP Instances (empty page). | The print job continues and the warning is logged. |
| | B604 | Image size is larger than image box size, the image has been de-magnified. | The print job continues and the warning is logged. |
| | B609 | Image size is larger than the image box size. The image has been cropped to fit. | The print job continues and the warning is logged. |
| | B60A | Image size or combined print image size is larger than the image box size. Image or combined print image has been decimated to fit. | The print job continues and the warning is logged. |
| | 0107 | (not defined) | The print job continues and the warning is logged. |
| | 0116 | | |
| | B600 | | |
| | B601 | | |
| | B602 | | |
| | B605 | | |
| B606 | | | |
| B608 | | | |
| | xxxx | (any other warning) | Print job fails, the warning is logged, and the association is released. |

4.2.1.3.2.2.3 Dataset Specific Conformance for Basic Film Box N- CREATE SCU

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 28.

Table 28: N-CREATE Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|--|--|
| Success | 0000 | Film Box successfully created. | The print job continues and completes. |
| Failure | xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | B605 | Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead. | The print job continues and the warning is logged. |
| | 0107 | (not defined) | The print job continues and the warning is logged. |
| | 0116 | | |
| | B600 | | |
| | B601 | | |
| | B602 | | |
| | B603 | | |
| | B604 | | |
| | B606 | | |
| | B608 | | |
| | B609 | | |
| | B60A | | |
| | xxxx | (any other warning) | |

4.2.1.3.2.2.4 Dataset Specific Conformance for Basic Film Box N-DELETE SCU

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 29.

Table 29: N-DELETE Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|--------------------|--|
| Success | 0000 | Successful command | The print job continues and completes. |
| Failure | xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | xxxx | (any warning) | Print job fails, the warning is logged, and the association is released. |

Film Session

4.2.1.3.2.2.5 Dataset Specific Conformance for Basic Film Session N- CREATE SCU

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 30.

Table 30: N-CREATE Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|------------------------------------|--|
| Success | 0000 | Film session successfully created. | The print job continues and completes. |
| Failure | xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | B600 | Memory allocation not supported. | The print job continues and the warning is logged. |
| | 0107 | (not defined) | The print job continues and the warning is logged. |
| | 0116 | | |
| | B601 | | |
| | B602 | | |
| | B603 | | |
| | B604 | | |
| | B605 | | |
| | B606 | | |
| | B608 | | |
| | B609 | | |
| | B60A | | |
| | xxxx | | |

4.2.1.3.2.2.6 Dataset Specific Conformance for Basic Film Session N- DELETE SCU

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 31.

Table 31: N-DELETE Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|-----------------|--|
| Success | 0000 | - | Continue with print job. |
| Failure | xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | xxxx | (any warning) | Print job fails, the warning is logged, and the association is released. |

Printer

4.2.1.3.2.2.7 Dataset Specific Conformance for Printer N-EVENT-REPORT SCU

Table 32: N-EVENT-REPORT Status Handling Behavior

| Event Type Name | Event Type ID | Behavior |
|-----------------|---------------|--|
| Normal | 1 | The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0 Event Type ID = 1 Information is logged: N-EVENT-REPORT received, type: NORMAL |
| Warning | 2 | The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0 Event Type ID = 2 Warning is logged: N-EVENT-REPORT received, type: WARNING Status info: <Status info> |
| Failure | 3 | The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0 Event Type ID = 3 Error is Logged: N-EVENT-REPORT received, type: FAILURE Status info: <Status info> Printer status is set to DICOM_PRINTER_STATUS_FAILURE The print job retries the print operation. |

All possible status responses are provided in Table 33.

Table 33: N-EVENT-REPORT Status Response

| Service Status | Code | Further Meaning | Description |
|----------------|------|-----------------|-----------------------|
| Success | 0000 | - | The result is logged. |

4.2.1.3.2.2.8 Dataset Specific Conformance for Printer N-GET SCU

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 34.

Table 34: N-GET Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|--------------------|--|
| Success | 0000 | Successful command | The print job continues and completes. |
| Failure | xxxx | (any failure) | Print job fails, the error is logged, and the association is released. |
| Warning | xxxx | (any warning) | Print job fails, the warning is logged, and the association is released. |

4.2.1.3.3 (Real-World) Activity – FIND as SCU

4.2.1.3.3.1 Description and Sequencing of Activities

Q-Station Network AE initiates associations to systems to query their databases using the C-FIND command.

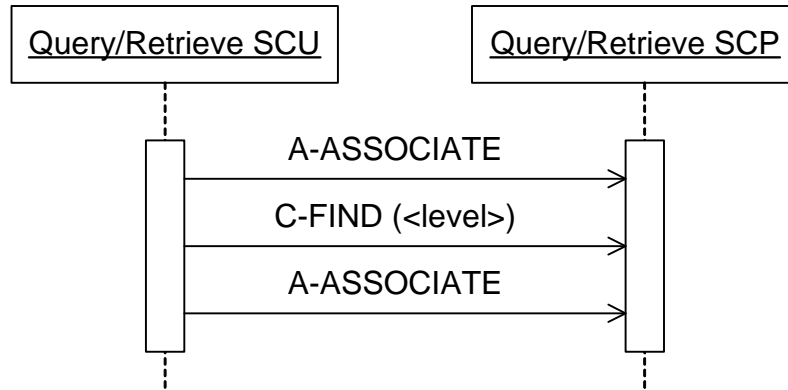


Figure 6: Data Flow Diagram – FIND as SCU

Q-Station implements the Query/Retrieve service class to find selected studies per Query/Retrieve SCP. When querying a remote database, Q-Station initiates an association to the selected peer entity, sends a C-FIND request and receives the related C-FIND responses. The association is released after a specific time-out.

4.2.1.3.3.2 Proposed Presentation Contexts

Table 35: Proposed Presentation Contexts for (Real-World) Activity – FIND as SCU

| Presentation Context Table | | | | | |
|--|-----------------------------|---------------------------|---------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Patient Root Query/Retrieve Information Model - FIND SOP Class | 1.2.840.10008.5.1.4.1.2.1.1 | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| Study Root Query/Retrieve Information Model - FIND SOP Class | 1.2.840.10008.5.1.4.1.2.2.1 | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |

4.2.1.3.3.3. SOP Specific Conformance for Patient Root Query/Retrieve Information Model - FIND SOP Class

4.2.1.3.3.3.1 Dataset Specific Conformance for Patient Root Q/R Information Model - FIND SOP Class SCU

Table 36: Requested Query Keys for Patient Root Q/R Information Model - FIND SOP Class SCU

| Attribute Name | Tag | VR | Type Of Matching | Comment |
|--------------------------|-----------|----|-----------------------------------|---------|
| Query/Retrieve Level | 0008,0052 | CS | Single Value | |
| Q/R Patient level | | | | |
| Patient ID | 0010,0020 | LO | Single Value, Universal, WildCard | |
| Patient's Name | 0010,0010 | PN | Single Value, Universal, WildCard | |
| Q/R Study level | | | | |
| Study Date | 0008,0020 | DA | Range, Single Value, Universal | |
| Accession Number | 0008,0050 | SH | Single Value, Universal, WildCard | |
| Patient's Name | 0010,0010 | PN | Single Value, Universal, WildCard | |
| Patient ID | 0010,0020 | LO | Single Value, Universal, WildCard | |
| Study ID | 0020,0010 | SH | | |
| Q/R Series level | | | | |
| Modality | 0008,0060 | CS | Single Value Matching | |
| Study Instance UID | 0020,000D | UI | Single Value, Universal, WildCard | |
| Series Instance UID | 0020,000E | UI | Single Value, Universal, WildCard | |
| Series Number | 0020,0011 | IS | Single Value, Universal, WildCard | |

4.2.1.3.3.4 SOP Specific Conformance for Study Root Query/Retrieve Information Model - FIND SOP Class SCU

4.2.1.3.3.4.1 Dataset Specific Conformance for Study Root Q/R Information Model - FIND SOP Class SCU

Table 37: Supported Query Keys for Study Root Q/R Information Model - FIND SOP Class SCU

| Attribute Name | Tag | VR | Type Of Matching | Comment |
|-------------------------|-----------|----|-----------------------------------|---------|
| Query/Retrieve Level | 0008,0052 | CS | Single Value | |
| Q/R Study level | | | | |
| Study Date | 0008,0020 | DA | Range, Single Value, Universal | |
| Accession Number | 0008,0050 | SH | Single Value, Universal, WildCard | |
| Patient's Name | 0010,0010 | PN | Single Value, Universal, WildCard | |
| Patient ID | 0010,0020 | LO | Single Value, Universal, WildCard | |
| Study ID | 0020,0010 | SH | | |
| Q/R Series level | | | | |
| Modality | 0008,0060 | CS | Single Value Matching | |
| Study Instance UID | 0020,000D | UI | Single Value, Universal, WildCard | |
| Series Instance UID | 0020,000E | UI | Single Value, Universal, WildCard | |
| Series Number | 0020,0011 | IS | Single Value, Universal, WildCard | |

4.2.1.3.4 (Real-World) Activity – MOVE as SCU

4.2.1.3.4.1 Description and Sequencing of Activities

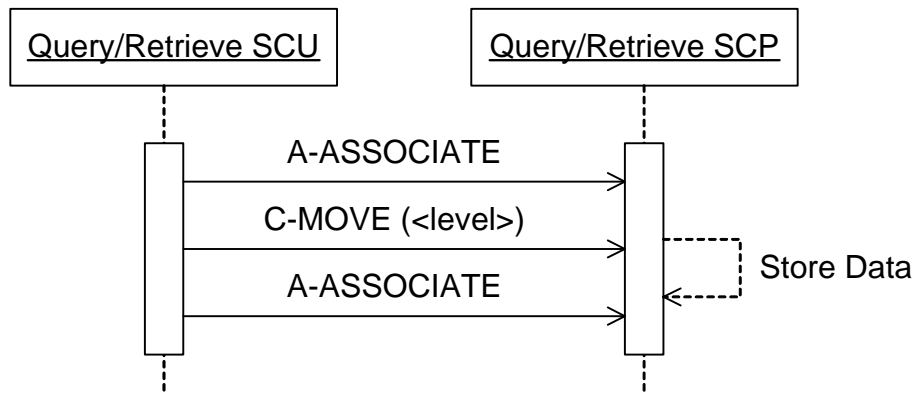


Figure 7: Data Flow Diagram – MOVE as SCU

Q-Station implements the Query/Retrieve service class to move selected studies per Query/Retrieve SCP. After receiving C-FIND responses one is able to copy all or selected images in a patient folder from a remote database to the local database. Q-Station initiates an association to the selected peer entity, sends a C-MOVE request and receives the related C-MOVE responses. The association is released after the final C-MOVE response (when all selected images have been transmitted).

4.2.1.3.4.2 Proposed Presentation Contexts

Table 38: Proposed Presentation Contexts for (Real-World) Activity – MOVE as SCU

| Presentation Context Table | | | | | |
|--|-----------------------------|---------------------------|---------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Patient Root Query/Retrieve Information Model - MOVE SOP Class | 1.2.840.10008.5.1.4.1.2.1.2 | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |
| Study Root Query/Retrieve Information Model - MOVE SOP Class | 1.2.840.10008.5.1.4.1.2.2.2 | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |

4.2.1.3.4.3 SOP Specific Conformance for Patient Root Query/Retrieve Information Model - MOVE SOP Class

4.2.1.3.4.3.1 Dataset Specific Conformance for Patient Root Q/R Information Model - MOVE SOP Class SCU

Table 39: Identifiers for Patient Root Q/R Information Model - MOVE SOP Class

SCU

| Attribute Name | Tag | VR | Comment |
|---------------------------------------|-----------|----|---------|
| Patient Root Information Model | | | |
| Query/Retrieve Level | 0008,0052 | CS | |
| Q/R Patient level | | | |
| Patient ID | 0010,0020 | LO | |
| Q/R Study level | | | |
| Patient ID | 0010,0020 | LO | |
| Study Instance UID | 0020,000D | UI | |
| Q/R Series level | | | |
| Patient ID | 0010,0020 | LO | |
| Study Instance UID | 0020,000D | UI | |
| Series Instance UID | 0020,000E | UI | |

4.2.1.3.4.4 SOP Specific Conformance for Study Root Query/Retrieve Information Model - MOVE SOP Class

4.2.1.3.4.4.1 Dataset Specific Conformance for Study Root Query/Retrieve Information Model - MOVE SOP Class SCU

Table 40: Identifiers for Study Root Query/Retrieve Information Model - MOVE SOP Class SCU

| Attribute Name | Tag | VR | Comment |
|-------------------------------------|-----------|----|---------|
| Study Root Information Model | | | |
| Query/Retrieve Level | 0008,0052 | CS | |
| Q/R Study level | | | |
| Study Instance UID | 0020,000D | UI | |
| Q/R Series level | | | |
| Study Instance UID | 0020,000D | UI | |
| Series Instance UID | 0020,000E | UI | |

4.2.1.3.5 (Real-World) Activity – Image Export

4.2.1.3.5.1 Description and Sequencing of Activities

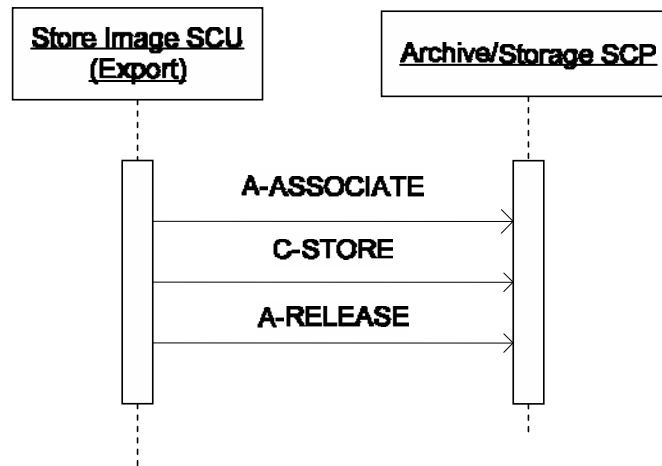


Figure 8: Data Flow Diagram – Store Image – Storage as SCU

Q-Station implements the Storage service class as part of Q-Station to store selected images to an archive or other storage SCP. All actual selected images are exported using one and the same association. Q-Station waits for synchronous report until, after a configurable time passed, it will release the association

4.2.1.3.5.2 Proposed Presentation Contexts

Table 41: Proposed Presentation Contexts for (Real-World) Activity – Image Export

| Presentation Context Table | | | | | |
|--|-------------------------------|------------------|--------------------|------|------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Negotiation |
| Name | UID | Name List* | UID List | | |
| Ultrasound Multi-frame Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.3.1 | Not configurable | Ref. section 4.4.2 | SCU | None |
| Ultrasound Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.6.1 | Not configurable | Ref. section 4.4.2 | SCU | None |
| Secondary Capture Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.7 | Not configurable | Ref. section 4.4.2 | SCU | None |
| General ECG Waveform Storage SOP Class | 1.2.840.10008.5.1.4.1.1.9.1.2 | Not configurable | Ref. section 4.4.2 | SCU | None |
| Basic Text SR SOP Class | 1.2.840.10008.5.1.4.1.1.88.11 | Not configurable | Ref. section 4.4.2 | SCU | None |
| Comprehensive SR SOP Class | 1.2.840.10008.5.1.4.1.1.88.33 | Not configurable | Ref. section 4.4.2 | SCU | None |
| Enhanced SR SOP Class | 1.2.840.10008.5.1.4.1.1.88.22 | Not configurable | Ref. section 4.4.2 | SCU | None |
| Encapsulated PDF Storage | 1.2.840.10008.5.1.4.1.1.104.1 | Not configurable | Ref. section 4.4.2 | SCU | None |

* Note: The Transfer syntax is not configurable, it will be as negotiated.

4.2.1.3.5.3. SOP Specific Conformance for Storage SOP Classes

Q-Station can be configured to stop the transfer of data when Q-Station receives an unsuccessful store response. Furthermore Q-Station can be configured in such a way that images can be converted to Secondary Captures.

Q-Station will transmit all optional or private image attributes. Also Q-Station can create attributes that are not in the image: these new attributes are exported along with the image (e.g. when the SCP does not support presentation state objects).

The object supplier shall be responsible for the presence of DICOM UIDs. The export job will transparently exchange this UID when the image is exported in 'DICOM 2000' format (i.e. separate Presentation State).

The following choices are supported concerning the export of private objects:

- The object can be exported as a private SOP class instance.
- The object is not exported at all.

Following remarks hold for the standard DICOM SOP Classes:

- Q-Station supports the following Photometric Interpretations for non-compressed images:
 - MONOCHROME1;
 - MONOCHROME2;
 - PALETTE COLOR;
 - RGB;
 - YBR_FULL;
 - YBR_FULL_422;
 - YBR_PARTIAL_422;
 - YBR_ICT;
 - YBR_RCT.
- Q-Station can convert Transfer Syntaxes from internal to external values. So Q-Station can convert from internally JPEG compressed/uncompressed pixel data to external JPEG compressed/uncompressed pixel data.
- JPEG Lossless (NH-FOP) compresses all bits denoted by the attribute DICOM_BITS_ALLOCATED. Therefore, any overlays encoded in the pixel data are also encoded and decoded.
- In case of both source (internal) and target compressed pixel data, decompression of the source pixel data and compression to the target pixel data only takes place in the following cases:
 - The source and target compression formats are different; or:
 - The source pixel data is multi-frame without a BOT.
- The BOT in compressed pixel data is filled if:
 - this is explicitly configured; or:
 - group length attributes are configured.

Q-Station allows import of mixed series: a series containing a maximum of 2 Secondary Capture images in addition to images from another SOP class.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 43.

Table 42: C-STORE Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|--|--|
| Success | 0000 | Storage is complete | Progress of the export job is updated and connection is retained for the next store. If the store of all the SOP instances is completed then the connection is released. |
| Failure | A7xx | Refused – Out of resources | Error is logged and the export job fails. Connection is released. |
| | A9xx | Error – Data set does not match SOP class | Error is logged and the export job fails. Connection is released. |
| | Cxxx | Error – Cannot understand | Error is logged and the export job fails. Connection is released. |
| Warning | B000 | Coercion of data elements | Warning is logged and the export job continues. Connection is not released. |
| | B006 | Elements discarded | Warning is logged and the export job continues. Connection is not released. |
| | B007 | Data set does not match SOP class | Warning is logged and the export job continues. Connection is not released. |

4.2.1.4 Association Acceptance Policy

This describes the conditions under which the AE will initiate an association. The behavior of the AE during association rejection is summarized in next table

4.2.1.4.1 (Real-World) Activity – Verification as SCP

4.2.1.4.1.1 Description and Sequencing of Activities

Q-Station accepts Associations from configured systems that wish to verify application level communication using the C-ECHO command.

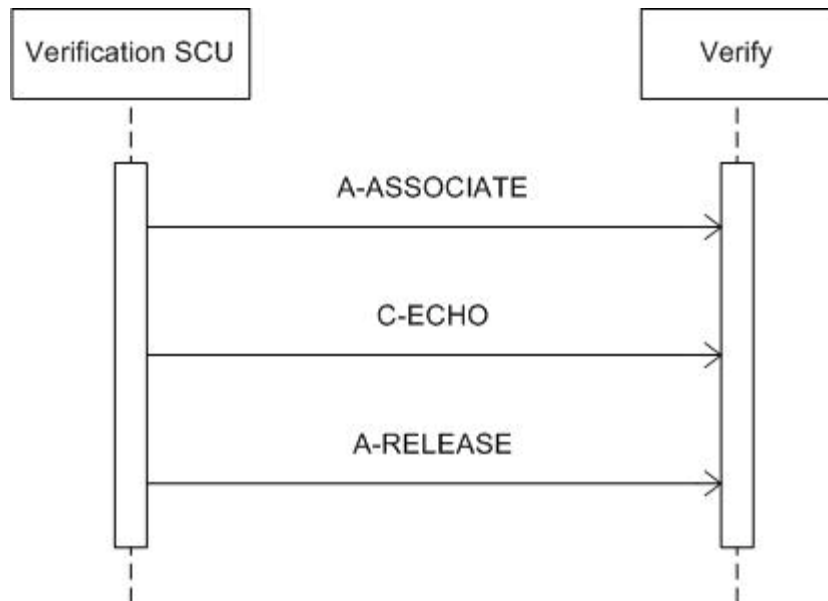


Figure 11: Data Flow Diagram – Verify

4.2.1.4.1.2 Accepted Presentation Contexts

Q-Station accepts all contexts in the intersection of the proposed and acceptable Presentation Contexts. This means that multiple proposed presentation contexts with

the same SOP class but different transfer syntaxes are accepted by Q-Station as far as those transfer syntaxes are part of the acceptable transfer syntaxes. There is no check for duplicate contexts and these are therefore accepted.

Table 43: Acceptable Presentation Contexts for (Real-World) Activity – Verification as SCP

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

4.2.1.4.1.3 SOP Specific Conformance for Verification SOP Class

4.2.1.4.1.3.1 Dataset Specific Conformance for Verification C-ECHO SCP

Q-Station provides standard conformance to the DICOM Verification service class. All possible status responses are described in Table 44.

Table 44: Q-Station C-ECHO Status Response

| Service Status | Code | Further Meaning | Description |
|----------------|------|-----------------|-----------------------------------|
| Success | 0000 | Confirmation | Confirm the verification request. |

4.2.1.4.2 (Real-World) Activity – FIND as SCP

Q-Station does not support Find as SCP.

4.2.1.4.3 (Real-World) Activity – MOVE as SCP

Q-Station does not support Move as SCP.

4.2.1.4.4 (Real-World) Activity – Image Import

4.2.1.4.4.1 Description and Sequencing of Activities

Q-Station accepts associations from configured systems that wish to store images in the Q-Station database using the C-STORE command.

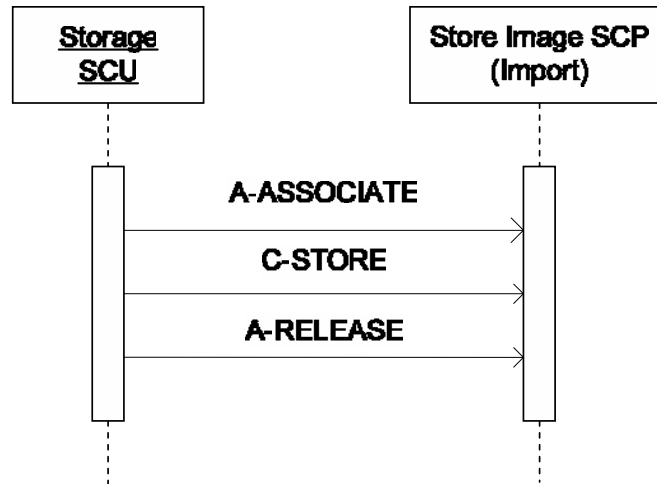


Figure 14: Data Flow Diagram – Store Image – Storage as SCP

4.2.1.4.4.2 Accepted Presentation Contexts

Q-Station accepts all contexts in the intersection of the proposed and acceptable Presentation Contexts. This means that multiple proposed presentation contexts with the same SOP class but different transfer syntaxes are accepted by Q-Station as far as those transfer syntaxes are part of the acceptable transfer syntaxes. There is no check for duplicate contexts and these are therefore accepted.

Table 45: Acceptable Presentation Contexts for (Real-World) Activity – Image Import

| Presentation Context Table | | | | | |
|--|-------------------------------|------------------|--------------------|------|------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Negotiation |
| Name | UID | Name List* | UID List | | |
| Ultrasound Multi-frame Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.3.1 | Not configurable | Ref. section 4.4.2 | SCP | None |
| Ultrasound Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.6.1 | Not configurable | Ref. section 4.4.2 | SCP | None |
| Secondary Capture Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.7 | Not configurable | Ref. section 4.4.2 | SCP | None |
| General ECG Waveform Storage SOP Class | 1.2.840.10008.5.1.4.1.1.9.1.2 | Not configurable | Ref. section 4.4.2 | SCP | None |
| Basic Text SR SOP Class | 1.2.840.10008.5.1.4.1.1.88.11 | Not configurable | Ref. section 4.4.2 | SCP | None |
| Comprehensive SR SOP Class | 1.2.840.10008.5.1.4.1.1.88.33 | Not configurable | Ref. section 4.4.2 | SCP | None |
| Enhanced SR SOP Class | 1.2.840.10008.5.1.4.1.1.88.22 | Not configurable | Ref. section 4.4.2 | SCP | None |
| Encapsulated PDF Storage | 1.2.840.10008.5.1.4.1.1.104.1 | Not configurable | Ref. section 4.4.2 | SCP | None |

* Note: The Transfer syntax is not configurable, it will be as negotiated.

4.2.1.4.4.3 SOP Specific Conformance for Storage SOP Classes

Q-Station will only accept associations from configured systems. Q-Station may provide level 2 (full) conformances, depending on the implemented database. All possible status responses are described in Table 46.

Remarks:

- Pixel data will be stored as received.
- A non-empty BOT may be present in imported JPEG encoded pixel data.
- Value Representation 'UN' (Unknown) is supported, and shall be used for any attributes not known to Q-Station and received per implicit transfer (ILE).
- Images must contain the minimum set of attributes prescribed by DICOM. Otherwise the default behavior is that the image is rejected and the association aborted.

Table 46: Q-Station C-STORE Status Response

| Service Status | Code | Further Meaning | Description |
|----------------|------|-------------------------------|---|
| Success | 0000 | - | Successful completion of the store request. |
| Failure | A700 | Refused – Out of resources | Not enough resources available to do a store. |
| | C000 | Error – Cannot understand | Any other exception generated during the store. |

4.3 Network Interfaces

4.3.1 Physical Network Interfaces

Protocols used:

- The TCP/IP stack from the Windows operating system is used.
- DICOM V3.0 TCP/IP is supported.

4.3.2 Additional Protocols

No additional protocols are used.

4.4 Configuration

Any implementation's DICOM conformance may be dependent upon configuration, which takes place at the time of installation. Issues concerning configuration is addressed in this section.

4.4.1 AE Title/Presentation Address Mapping

4.4.1.1 Local AE Titles

The Q-Station User Interface only allows one AE to be configured.

The following AE specific information must be available to configure a local AE:

- AE title.
- Port number (note that normally all local Q-Station AE's will have a different port number).

The Hostname and IP Address are set from the host PC. The host must be set to use IPv4.

4.4.1.2 Remote AE Title/Presentation Address Mapping

One or more remote AE's may be configured.

The following AE specific information must be available to configure a remote AE:

- AE title.
- Hostname or IP address (or both).
- Port number.

4.4.2 Parameters

In Table 47 an overview is given of some important configuration attributes related to the DICOM behavior of Q-Station.

Table 47: Configuration Parameters table

| Parameter | Configurable | Default Value |
|--|--------------|--|
| General Parameters | | |
| Time-out waiting for acceptance or rejection response to an association Open request. (Application level time-out / ARTIM) | Yes | 60 [s] (set 0 for no time-out) |
| General DIMSE level time-out values | No | - |
| Time-out waiting for response to TCP/IP connect request. (Low-level time-out) | OS | - |
| Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level time-out) | OS | - |
| Time-out for waiting for data between TCP/IP packets. (Low-level time-out) | OS | - |
| Any changes to default TCP/IP settings, such as configurable stack parameters. | OS | - |
| AE Specific Parameters | | |
| Size constraint in maximum object size | No | - |
| Maximum PDU size the AE can send and receive | No | 0 |
| Association time-out SCP | No | 0 (no time-out) |
| Association time-out SCU | No | 0 (no time-out; set -1 for immediate time-out, or else value in [s]) |
| AE specific DIMSE level time-out values | No | 300 [s] (set 0 for no time-out) |
| Number of simultaneous associations by service and/or SOP class | No | 1 per service/SOP class |
| SOP Class support | No | All supported SOP classes |
| Transfer Syntax support* | No | ELE 1.2.840.10008.1.2.1 EBE 1.2.840.10008.1.2.2 ILE 1.2.840.10008.1.2 JPEG Lossless (NH-FOP) 1.2.840.10008.1.2.4.70 JPEG Baseline 1.2.840.10008.1.2.4.50 JPEG Extended 1.2.840.10008.1.2.4.51 JPEG 2000 (Lossless Only) 1.2.840.10008.1.2.4.90 JPEG 2000 1.2.840.10008.1.2.4.91 RLE 1.2.840.10008.1.2.5 |

* All transfer syntaxes are proposed for every SOP class.

5 MEDIA INTERCHANGE

5.1.1 Application Data Flow Diagram

Q-Station implements one media application entity: Q-Station.

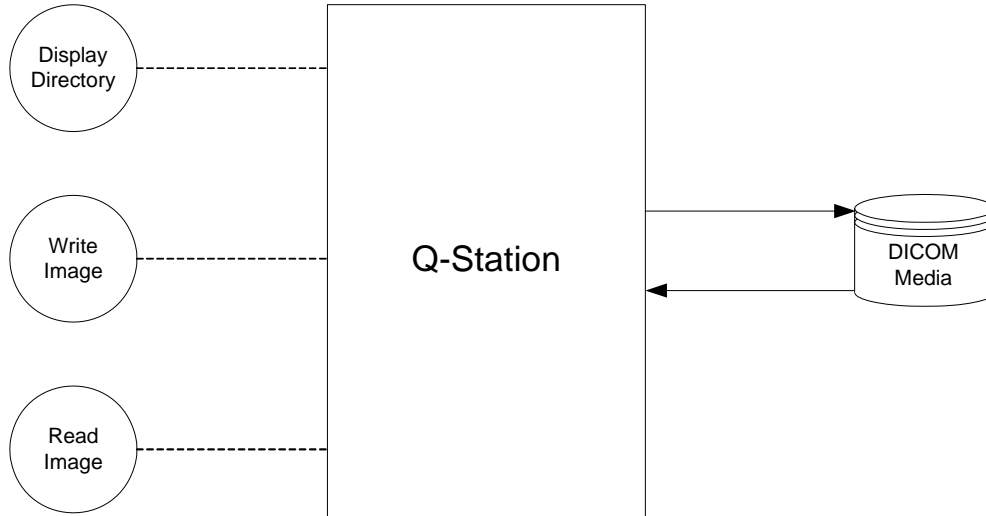


Figure 15: Application Data Flow Diagram

DICOM Media is defined per Application Profile as specified in Table 51.

5.1.2 Functional Definitions of AE's

Q-Station implements the following functions for DICOM media.

- Write a DICOM file-set onto the medium.
- Create a DICOMDIR file.
- Read the DICOMDIR file from the medium.
- Read selected images from the medium.

5.1.3 Sequencing of Real World Activities

Not applicable.

5.1.4 File Meta Information for Implementation Class and Version

The following values are assigned to the File Meta Information attributes (see PS 3.10) that pertain to the Implementation Class and Version.

Table 48: DICOM Implementation Class and Version for Q-Station

| | |
|-------------------------------|----------------------|
| File Meta Information Version | 00, 01 |
| Implementation Class UID | 1.3.46.670589.5.2.10 |
| Implementation Version Name | 81.302.3.2 |

5.2 AE Specifications

5.2.1 Q-Station

Q-Station provides standard conformance to the DICOM interchange option of the media storage service class, and follows the specifications as defined in the DICOM standard – Media Storage and File Format for Data Interchange (PS 3.10) and Media Storage Application Profiles (PS 3.11).

Q-Station supports multi-patient and multi-session for CD-R media (both reading and writing). Table 49 shows for each Application Profile in the first column the real-world activities in the second column, the roles required for each of these real-world activities in the third column, and the related service class option in the fourth column.

Table 49: AE Related Application Profiles, Real-World Activities, and Roles

| Supported Application Profile | Real-World Activity | Roles | SC Option |
|-------------------------------|---------------------|---------|-------------|
| STD-GEN-CD | Display Directory | FSR | Interchange |
| | Read Image | FSR | Interchange |
| | Write Image | FSC | Interchange |
| STD-US-SC-MF-CD-R | Display Directory | FSR | Interchange |
| | Read Image | FSR | Interchange |
| | Write Image | FSC | Interchange |
| STD-GEN-DVD-JPEG | Display Directory | FSR | Interchange |
| | Read Image | FSR | Interchange |
| | Write Image | FSC | Interchange |
| STD-GEN-USB-JPEG | Display Directory | FSR | Interchange |
| | Read Image | FSR | Interchange |
| | Write Image | FSC/FSU | Interchange |

5.2.1.1 File Meta Information for Q-Station

Q-Station has no specific File Meta Information.

5.2.1.2 Real-World Activities

5.2.1.2.1 Display Directory

Q-Station will act as a FSR when reading the directory of the medium. This allows the System Integrator to see the results in an overview of the patients, studies, series presentation states and images.

Q-Station will not access DICOM media when either:

- Patient ID is absent; or
- Study Instance UID has no value; or
- Series Instance UID has no value.

5.2.1.2.1.1 Media Storage Application Profile

Refer to Table 49.

5.2.1.2.2 Read Image

Q-Station will act as a FSR when reading all/selected images from DICOM media.

5.2.1.2.2.1 Media Storage Application Profile

Refer to Table 49.

5.2.1.2.3 Write Image

Q-Station acts as an FSC when writing DICOM objects onto CD/DVD or USB DICOM media. Q-Station can also store private attributes.

Q-Station additionally acts as an FSU when writing DICOM objects onto USB.

When Q-Station has to write objects to DICOM media, it can encounter the following situation.

The objects were previously received via C-STORE operations. Some attributes in the received images have a zero-length value (type 2 attributes). However, the Application Profile specifies some of these attributes as type 1: they must have a value. In such cases Q-Station supplies a value for the following attributes (if necessary):

- Patient ID;
- Study ID;
- Series Number;
- Instance number;
- Study Date;
- Study Time.

The mechanism of generating a value for Patient ID is to create a new value (i.e. Study Instance UID) for each new study written to the medium, even if this study belongs to a patient recorded earlier.

Study ID is assigned the value of the first Requested Procedure ID (0040,1001) encountered in the Request Attributes Sequence (0040,0275).

5.2.1.2.3.1 Media Storage Application Profile

See Table 50 for a Private SOP Class used for Media Export of Draft Reports.

Table 50: IODs, SOP Classes and Transfer Syntaxes for Media Write

| Information Object Definition | SOP Class UID | Transfer Syntax | Transfer Syntax UID |
|-------------------------------|-----------------------|-----------------|---------------------|
| Private Draft Report Storage | 1.3.46.670589.2.8.1.1 | ILE | 1.2.840.10008.1.2 |

5.3 Augmented and Private Application Profiles

5.3.1 Augmented Application Profiles

5.3.1.1 Augmented Application Profile Descriptions

5.3.1.1.1 SOP Class Augmentations

Draft Reports are stored to media using a Private SOP class which is an augmentation to the standard AP.

5.3.1.1.2 Directory Augmentations

Instances of the private SOP classes may be written on the media. This requires a Directory Record Type (0004,1430) with the value "PRIVATE" and configuration of the required Private Record UID. This UID is used to define a non-standard type of Directory Record by reference to its position in a private extension to the DICOM Basic Directory IOD Information Model.

5.3.1.1.3 Other Augmentations

Not applicable.

5.3.2 Private Application Profiles

Not applicable.

5.4 Media Configuration

DICOM Media Configuration choices are on Q-Station using the Tools>Customize

CD/DVD Write Preferences dialog box. It contains the following choices:

Media Type: CD or DVD

Multiple patients on Media: Yes or No

DICOM Viewer: Yes or No

No other configuration options are available.

6 SUPPORT OF CHARACTER SETS

Q-Station supports all character sets currently defined by DICOM except for the multi-byte character sets without code extensions. Thus Q-Station supports the following character repertoires.

Table 51: Supported DICOM Character Sets of Q-Station

| Character Set Description | Defined Term | ESC Sequence | ISO Registration Number | Code Element | Character Set |
|---|--------------|--------------|-------------------------|--------------|-------------------------------|
| Single-byte Character Sets without Code Extensions | | | | | |
| Default repertoire | - | - | ISO-IR 6 | G0 | ISO 646 |
| Japanese | ISO_IR 13 | - | ISO-IR 14 | G0 | JIS X 0201: Romaji |
| | | - | ISO-IR 13 | G1 | JIS X 0201: Katakana |
| Latin alphabet No. 1 | ISO_IR 100 | - | ISO-IR 6 | G0 | ISO 646 |
| | | - | ISO-IR 100 | G1 | Supplementary set of ISO 8859 |
| Latin alphabet No. 2 | ISO_IR 101 | - | ISO-IR 6 | G0 | ISO 646 |
| | | - | ISO-IR 101 | G1 | Supplementary set of ISO 8859 |
| Latin alphabet No. 3 | ISO_IR 109 | - | ISO-IR 6 | G0 | ISO 646 |
| | | - | ISO-IR 109 | G1 | Supplementary set of ISO 8859 |
| Latin alphabet No. 4 | ISO_IR 110 | - | ISO-IR 6 | G0 | ISO 646 |
| | | - | ISO-IR 110 | G1 | Supplementary set of ISO 8859 |
| Greek | ISO_IR 126 | - | ISO-IR 6 | G0 | ISO 646 |
| | | - | ISO-IR 126 | G1 | Supplementary set of ISO 8859 |
| Arabic | ISO_IR 127 | - | ISO-IR 6 | G0 | ISO 646 |
| | | - | ISO-IR 127 | G1 | Supplementary set of ISO 8859 |
| Hebrew | ISO_IR 138 | - | ISO-IR 6 | G0 | ISO 646 |
| | | - | ISO-IR 138 | G1 | Supplementary set of ISO 8859 |
| Cyrillic | ISO_IR 144 | - | ISO-IR 6 | G0 | ISO 646 |
| | | - | ISO-IR 144 | G1 | Supplementary set of ISO 8859 |
| Latin alphabet No. 5 | ISO_IR 148 | - | ISO-IR 6 | G0 | ISO 646 |
| | | - | ISO-IR 148 | G1 | Supplementary set of ISO 8859 |
| Thai | ISO_IR 166 | - | ISO-IR 6 | G0 | ISO 646 |
| | | - | ISO-IR 166 | G1 | TIS 620-2533 (1990) |

| Single-byte Character Sets with Code Extensions | | | | | |
|---|-----------------|--------------------|------------|----|----------------------------------|
| Default repertoire | ISO 2022 IR 6 | ESC 02/08 04/02 | ISO-IR 6 | G0 | ISO 646 |
| Japanese | ISO 2022 IR 13 | ESC 02/08 04/10 | ISO-IR 14 | G0 | JIS X 0201: Romaji |
| | | ESC 02/09 04/09 | ISO-IR 13 | G1 | JIS X 0201: Katakana |
| Latin alphabet No. 1 | ISO 2022 IR 100 | ESC 02/08 04/02 | ISO-IR 6 | G0 | ISO 646 |
| | | ESC 02/13 04/01 | ISO-IR 100 | G1 | Supplementary set of ISO 8859 |
| Latin alphabet No. 2 | ISO 2022 IR 101 | ESC 02/08 04/02 | ISO-IR 6 | G0 | ISO 646 |
| | | ESC 02/13 04/02 | ISO-IR 101 | G1 | Supplementary set of ISO 8859 |
| Latin alphabet No. 3 | ISO 2022 IR 109 | ESC 02/08 04/02 | ISO-IR 6 | G0 | ISO 646 |
| | | ESC 02/13 04/03 | ISO-IR 109 | G1 | Supplementary set of ISO 8859 |

| Character Set Description | Defined Term | ESC Sequence | ISO Registration Number | Code Element | Character Set |
|---------------------------|-----------------|--------------------|-------------------------|--------------|----------------------------------|
| Latin alphabet No. 4 | ISO 2022 IR 110 | ESC 02/08 04/02 | ISO-IR 6 | G0 | ISO 646 |
| | | ESC 02/13 04/04 | ISO-IR 110 | G1 | Supplementary set of ISO 8859 |
| Greek | ISO 2022 IR 126 | ESC 02/08 04/02 | ISO-IR 6 | G0 | ISO 646 |
| | | ESC 02/13 04/06 | ISO-IR 126 | G1 | Supplementary set of ISO 8859 |
| Arabic | ISO 2022 IR 127 | ESC 02/08 04/02 | ISO-IR 6 | G0 | ISO 646 |
| | | ESC 02/13 04/07 | ISO-IR 127 | G1 | Supplementary set of ISO 8859 |
| Hebrew | ISO 2022 IR 138 | ESC 02/08 04/02 | ISO-IR 6 | G0 | ISO 646 |
| | | ESC 02/13 04/08 | ISO-IR 138 | G1 | Supplementary set of ISO 8859 |
| Cyrillic | ISO 2022 IR 144 | ESC 02/08 04/02 | ISO-IR 6 | G0 | ISO 646 |
| | | ESC 02/13 04/12 | ISO-IR 144 | G1 | Supplementary set of ISO 8859 |
| Latin alphabet No. 5 | ISO 2022 IR 148 | ESC 02/08 04/02 | ISO-IR 6 | G0 | ISO 646 |
| | | ESC 02/13 04/13 | ISO-IR 148 | G1 | Supplementary set of ISO 8859 |
| Thai | ISO 2022 IR 166 | ESC 02/08 04/02 | ISO-IR 6 | G0 | ISO 646 |
| | | ESC 02/13 05/04 | ISO-IR 166 | G1 | TIS 620-2533 (1990) |

The preferred character set can be configured. If not configured, the default character set shall be ISO-IR 100.

When an unsupported character set is received it shall be tried and decoded according the preferred character set.

Unsupported characters shall be displayed as “?”.

7 SECURITY

7.1 Security Profiles

Q-Station does not fully support DICOM security profiles. However, it does support security measures that will be used for the generation of audit records. Q-Station components for security measures are:

- Audit Trail Component

7.1.1 Audit Trail Component

The Audit Trail Component of Q-Station allows security officers in an institution to audit activities, to detect non-compliant behavior in the enterprise, and to facilitate detection of improper creation, access, modification and deletion of Protected Health Information (PHI), where PHI data is considered as information records (Registration, Order, Study/Procedure, Reports and to a lesser degree Images/Presentation States), and not the flow of information between the systems.

The messages are created and sent to a syslog server according to the syslog protocol. The time that is used will be the local time of the system. The syslog server is an element of the Hospital infrastructure.

7.2 Association Level Security

Q-Station accepts associations only from known applications or an application whose “calling AE Title” is defined in its configuration file. Q-Station will reject association requests from unknown applications, i.e. applications that offer an unknown “calling AE title”. An application entity (AE) is known if – and only if – it is defined during configuration of Q-Station, which is done via the configuration application.

7.3 Application Level Security

Q-Station supports security measures for:

- generation of audit trail records
- access control and user authentication.

8 ANNEXES OF APPLICATION "Q-Station"

8.1 IOD Contents

8.1.1 Created SOP Instance

This section specifies each IOD created by Q-Station, including the attribute name, tag, VR, and value (range, condition and source).

Defined abbreviations are:

| | |
|-------------|---|
| ALWAYS | the module shall always be present |
| EMPTY | the (mandatory) module shall not contain any attributes |
| CONDITIONAL | the module may be present under specified condition |
| NEVER | the module shall never be present |
| ALWAYS | the attribute shall always be present with value |
| ANAP | the attribute shall be present with value under specified condition |
| EMPTY | the attribute shall always be present without value |
| ANAPEV | the attribute shall be present without value under specified condition |
| VNAP | the attribute shall always be present, either with or without value |
| ANAPCV | the attribute shall be present, either with or without value, under specified condition |
| AUTO | the attribute value is generated automatically |
| CONFIG | the attribute value source is a configurable parameter |
| COPY | the attribute value source is another SOP instance |
| FIXED | the attribute value is hard-coded in the application |
| IMPLICIT | the attribute value source is a user-implicit setting |
| USER | the attribute value source is explicit user input |

8.1.1.1 Basic Directory IOD

Table 52: Modules of the Basic Directory IOD

| Information Entity | Module Name | Usage |
|--------------------|--------------------------------|--------|
| Media | File-set Identification Module | ALWAYS |
| | Directory Information Module | ALWAYS |

Table 53: Created Basic Directory IOD Attributes

| Name | Tag | VR | Definition | Comment |
|---|-----------|----|-----------------|---------|
| File-set Identification Module | | | | |
| File-set ID | 0004,1130 | CS | ALWAYS, AUTO | - |
| Specific Character Set of File-set Descriptor File | 0004,1142 | CS | ANAP, AUTO | - |
| Directory Information Module | | | | |
| Offset of the First Directory Record of the Root Directory Entity | 0004,1200 | UL | ALWAYS, AUTO | - |
| Offset of the Last Directory Record of the Root Directory Entity | 0004,1202 | UL | ALWAYS, AUTO | - |
| File-set Consistency Flag | 0004,1212 | US | ALWAYS, AUTO | - |
| Directory Record Sequence | 0004,1220 | SQ | ALWAYS, AUTO | - |
| > Offset of the Next Directory Record | 0004,1400 | UL | ANAP, AUTO | - |

| Name | Tag | VR | Definition | Comment |
|---|-----------|----|---------------------|---------|
| > Record In-use Flag | 0004,1410 | US | ANAP, AUTO | - |
| > Offset of Referenced Lower-Level Directory Entity | 0004,1420 | UL | ANAP, AUTO | - |
| > Directory Record Type | 0004,1430 | CS | ANAP, AUTO | - |
| > Referenced File ID | 0004,1500 | CS | ANAP, AUTO | - |
| > Referenced SOP Class UID in File | 0004,1510 | UI | ANAP, AUTO | - |
| > Referenced SOP Instance UID in File | 0004,1511 | UI | ANAP, AUTO | - |
| > Referenced Transfer Syntax UID in File | 0004,1512 | UI | ANAP, AUTO | - |
| > Patient Keys | | | | |
| > Specific Character Set | 0008,0005 | CS | ANAP, AUTO | - |
| > Patient's Name | 0010,0010 | PN | VNAP, USER | - |
| > Patient ID | 0010,0020 | LO | ALWAYS, USER | - |
| > Patient's Birth Date | 0010,0030 | DA | VNAP, USER | - |
| > Patient's Sex | 0010,0040 | CS | VNAP, USER | - |
| > Study Keys | | | | |
| > Specific Character Set | 0008,0005 | CS | ANAP, AUTO | - |
| > Study Date | 0008,0020 | DA | ALWAYS, AUTO | - |
| > Study Time | 0008,0030 | TM | ALWAYS, AUTO | - |
| > Accession Number | 0008,0050 | SH | VNAP, USER | - |
| > Modalities in Study | 0008,0061 | CS | ALWAYS, AUTO | - |
| > Referring Physician's Name | 0008,0090 | PN | VNAP, USER | - |
| > Study Description | 0008,1030 | LO | EMPTY, AUTO | - |
| > Study Instance UID | 0020,000D | UI | ANAP, AUTO | - |
| > Study ID | 0020,0010 | SH | ALWAYS, AUTO | - |
| > Series Keys | | | | |
| > Specific Character Set | 0008,0005 | CS | ANAP, AUTO | - |
| > Series Date | 0008,0021 | DA | ALWAYS, AUTO | - |
| > Series Time | 0008,0031 | TM | ALWAYS, AUTO | - |
| > Modality | 0008,0060 | CS | ALWAYS, AUTO | - |
| > Series Description | 0008,103E | LO | ALWAYS, AUTO | - |
| > Body Part Examined | 0018,0015 | CS | ALWAYS, IMPLICIT | - |
| > Series Instance UID | 0020,000E | UI | ALWAYS, AUTO | - |
| > Series Number | 0020,0011 | IS | ALWAYS, AUTO | - |
| > Image Keys | | | | |
| > Specific Character Set | 0008,0005 | CS | ANAP, AUTO | - |

| Name | Tag | VR | Definition | Comment |
|---------------------------------|-----------|----|-----------------|-----------------------|
| > Image Type | 0008,0008 | CS | ALWAYS, AUTO | - |
| > SOP Instance UID | 0008,0018 | UI | ALWAYS, AUTO | - |
| > Instance Number | 0020,0013 | IS | ALWAYS, AUTO | - |
| > Presentation Keys | | | | |
| > Specific Character Set | 0008,0005 | CS | ANAP, AUTO | - |
| > Referenced Series Sequence | 0008,1115 | SQ | ALWAYS, AUTO | - |
| >> Referenced Image Sequence | 0008,1140 | SQ | ANAP, AUTO | - |
| >>> Referenced SOP Class UID | 0008,1150 | UI | ALWAYS | - |
| >>> Referenced SOP Instance UID | 0008,1155 | UI | ALWAYS | - |
| >> Series Instance UID | 0020,000E | UI | ALWAYS | - |
| > Instance Number | 0020,0013 | IS | ALWAYS, AUTO | - |
| > Content Label | 0070,0080 | CS | ALWAYS | - |
| > Content Description | 0070,0081 | LO | VNAP | - |
| > Presentation Creation Date | 0070,0082 | DA | ALWAYS | - |
| > Presentation Creation Time | 0070,0083 | TM | ALWAYS | - |
| > Content Creator's Name | 0070,0084 | PN | VNAP | - |
| > Private Keys | | | | |
| > | - | - | - | As per configuration. |

8.1.1.3 Basic Film Session IOD

Table 54: Modules of the Basic Film Session IOD

| Information Entity | Module Name | Usage |
|--------------------|--|-------------------|
| Image | SOP Common Module | EMPTY |
| Film | Basic Film Session Presentation Module | ALWAYS (N-CREATE) |
| | Basic Film Session Relationship Module | EMPTY |

Table 55: Created Basic Film Session IOD Attributes

| Name | Tag | VR | Definition | Comment |
|---|-----------|----|---------------------|---------|
| Basic Film Session Presentation Module | | | | |
| Number of Copies | 2000,0010 | IS | ALWAYS, IMPLICIT | - |
| Print Priority | 2000,0020 | CS | ALWAYS, AUTO | - |
| Medium Type | 2000,0030 | CS | ALWAYS, IMPLICIT | - |
| Film Destination | 2000,0040 | CS | ALWAYS, AUTO | - |
| Film Session Label | 2000,0050 | LO | ALWAYS, AUTO | - |

8.1.1.4 Presentation LUT Shape IOD

Table 56: Modules of the Presentation LUT Shape IOD

| Information Entity | Module Name | Usage |
|--------------------|-------------------------|------------------------|
| Image | SOP Common Module | EMPTY |
| Film | Presentation LUT Module | CONDITIONAL (N-CREATE) |

Table 57: Created Presentation LUT Shape IOD Attributes

| Name | Tag | VR | Definition | Comment |
|--------------------------------------|-------------|----|-------------------------|------------|
| Presentation LUT Shape Module | | | | |
| Presentation LUT Shape | (2050,0020) | CS | CONDIT ONAL, AUTO | "IDENTITY" |

8.1.1.5 Basic Film Box IOD

Table 58: Modules of the Basic Film Box IOD

| Information Entity | Module Name | Usage |
|--------------------|------------------------------------|-------------------|
| Image | SOP Common Module | EMPTY |
| Film | Basic Film Box Presentation Module | ALWAYS (N-CREATE) |
| | Basic Film Box Relationship Module | ALWAYS |
| | Presentation LUT Shape Module | CONDITIONAL |

Table 59: Created Basic Film Box IOD Attributes

| Name | Tag | VR | Definition | Comment |
|---|-------------|----|---------------------------------|---------|
| Basic Film Box Presentation Module | | | | |
| Image Display Format | (2010,0010) | ST | ALWAYS, AUTO | - |
| Film Orientation | (2010,0040) | CS | ALWAYS, IMPLICIT / CONFIG | - |
| Film Size ID | (2010,0050) | CS | ALWAYS, IMPLICIT / CONFIG | - |
| Magnification Type | (2010,0060) | CS | ALWAYS, AUTO | - |
| Max Density | (2010,0130) | US | ALWAYS, AUTO | - |
| Trim | (2010,0140) | CS | ALWAYS, AUTO | - |
| Configuration Information | (2010,0150) | ST | ALWAYS, AUTO | - |
| Illumination | (2010,015e) | US | ALWAYS, AUTO | - |
| Reflected Ambient Light | (2010,0160) | US | ALWAYS, AUTO | - |
| Basic Film Box Relationship Module | | | | |
| Referenced Film Session Sequence | (2010,0500) | SQ | ALWAYS, AUTO | - |
| > Referenced SOP Class UID | (0008,1150) | UI | ALWAYS, AUTO | - |
| > Referenced SOP Instance UID | (0008,1155) | UI | ALWAYS, AUTO | - |
| Presentation LUT Shape Relationship Module | | | | |

| | | | | |
|--------------------------------------|-------------|----|-------------------|---|
| Referenced Presentation LUT Sequence | (2050,0500) | SQ | CONDITIONAL, AUTO | - |
| > Referenced SOP Class UID | (0008,1150) | UI | ALWAYS, AUTO | - |
| > Referenced SOP Instance UID | (0008,1155) | UI | ALWAYS, AUTO | - |

8.1.1.6 Basic Grayscale Image Box IOD

Table 60: Modules of the Basic Grayscale Image Box IOD

| Information Entity | Module Name | Usage |
|--------------------|-------------------------------------|----------------|
| Image | SOP Common Module | EMPTY |
| | Image Box Pixel Presentation Module | ALWAYS (N-SET) |

Table 61: Created Basic Grayscale Image Box IOD Attributes

| Name | Tag | VR | Definition | Comment |
|--|-------------|----------|------------------|---------|
| Image Box Pixel Presentation Module | | | | |
| Image Position | (2020,0010) | US | ALWAYS, AUTO | - |
| Polarity | (2020,0020) | CS | ALWAYS, AUTO | - |
| Basic Grayscale Image Sequence | (2020,0110) | SQ | ALWAYS, AUTO | - |
| > Samples per Pixel | (0028,0002) | US | ALWAYS, AUTO | - |
| > Photometric Interpretation | (0028,0004) | CS | ALWAYS, IMPLICIT | - |
| > Rows | (0028,0010) | US | ALWAYS, IMPLICIT | - |
| > Columns | (0028,0011) | US | ALWAYS, IMPLICIT | - |
| > Bits Allocated | (0028,0100) | US | ALWAYS, AUTO | - |
| > Bits Stored | (0028,0101) | US | ALWAYS, IMPLICIT | - |
| > High Bit | (0028,0102) | US | ALWAYS, AUTO | - |
| > Pixel Representation | (0028,0103) | US | ALWAYS, AUTO | - |
| > Pixel Data | (7FE0,0010) | OB OW | ALWAYS, AUTO | - |

8.1.1.7 Basic Color Image Box IOD

Table 62: Modules of the Basic Color Image Box IOD

| Information Entity | Module Name | Usage |
|--------------------|-------------------------------------|----------------|
| Image | SOP Common Module | EMPTY |
| | Image Box Pixel Presentation Module | ALWAYS (N-SET) |

Table 63: Created Basic Color Image Box IOD Attributes

| Name | Tag | VR | Definition | Comment |
|--|-------------|----------|------------------|---------|
| Image Box Pixel Presentation Module | | | | |
| Image Position | (2020,0010) | US | ALWAYS, AUTO | - |
| Polarity | (2020,0020) | CS | ALWAYS, AUTO | - |
| Basic Color Image Sequence | (2020,0111) | SQ | ALWAYS, AUTO | - |
| > Samples per Pixel | (0028,0002) | US | ALWAYS, AUTO | - |
| > Photometric Interpretation | (0028,0004) | CS | ALWAYS, IMPLICIT | - |
| > Planar Configuration | (0028,0006) | US | ALWAYS, AUTO | - |
| > Rows | (0028,0010) | US | ALWAYS, IMPLICIT | - |
| > Columns | (0028,0011) | US | ALWAYS, IMPLICIT | - |
| > Bits Allocated | (0028,0100) | US | ALWAYS, AUTO | - |
| > Bits Stored | (0028,0101) | US | ALWAYS, IMPLICIT | - |
| > High Bit | (0028,0102) | US | ALWAYS, AUTO | - |
| > Pixel Representation | (0028,0103) | US | ALWAYS, AUTO | - |
| > Pixel Data | (7FE0,0010) | OB OW | ALWAYS, AUTO | - |

8.1.1.8 Printer IOD

Table 64: Modules of the Printer IOD

| Information Entity | Module Name | Usage |
|--------------------|-------------------|---------------|
| Image | SOP Common Module | EMPTY |
| Printer | Printer Module | EMPTY (N-GET) |

Table 65: Created Printer IOD Attributes

| Name | Tag | VR | Definition | Comment |
|-----------------------|-----|----|------------|---------|
| Printer Module | | | | |
| - | - | - | - | - |

8.1.1.9 Secondary Capture IOD

Table 66: SC Image Patient Module Attributes

| Name | Tag | VR | Definition | Comment |
|----------------------|-------------|----|--------------|---|
| Patient's Name | (0010,0010) | PN | ALWAYS, AUTO | |
| Patient ID | (0010,0020) | LO | ALWAYS, AUTO | |
| Patient's Birth Date | (0010,0030) | DA | VNAP | Attribute must be present in original study |
| Patient's Sex | (0010,0040) | CS | VNAP | Attribute must be present in original study |
| Patient's Size | (0010,1030) | DS | VNAP | Attribute must be present in original study |
| Patient's Weight | (0010,1040) | DS | VNAP | Attribute must be present in original study |
| Patient Comments | (0010,4000) | LT | VNAP | |

Table 67: SC Image General Study Module Attributes

| Name | Tag | VR | Definition | Comment |
|----------------------------|-------------|----|--------------|---|
| Study Instance UID | (0020,000D) | UI | ALWAYS, AUTO | |
| Study Date | (0008,0020) | DA | ALWAYS, AUTO | |
| Study Time | (0008,0030) | TM | ALWAYS, AUTO | |
| Referring Physician's Name | (0008,0090) | PN | VNAP | Attribute must be present in original study |
| Study ID | (0020,0010) | SH | ALWAYS, AUTO | |
| Accession Number | (0008,0050) | SH | VNAP | Attribute must be present in original study |
| Study Description | (0008,1030) | LO | VNAP | Attribute must be present in original study |

Table 68: SC Image General Series Module Attributes

| Name | Tag | VR | Definition | Comment |
|--|-------------|----|--------------|---|
| Modality | (0008,0060) | CS | ALWAYS, AUTO | |
| Series Instance UID | (0020,000E) | UI | ALWAYS, AUTO | |
| Series Number | (0020,0011) | IS | ALWAYS, AUTO | |
| Series Date | (0008,0021) | DA | ALWAYS, AUTO | |
| Series Time | (0008,0031) | TM | ALWAYS, AUTO | |
| Protocol Name | (0018,1030) | LO | ANAP | Attribute must be present in original study |
| Operator's Name | (0008,1070) | PN | VNAP | Attribute must be present in original study |
| Referenced Performed Procedure Step Sequence | (0008,1111) | SQ | ALWAYS, AUTO | |
| > Referenced SOP Class UID | (0008,1150) | UI | ANAP | Only if SQ has one or more items |
| > Referenced SOP Instance UID | (0008,1155) | UI | ANAP | Only if SQ has one or more items |

| | | | | |
|---|-------------|----|------|--|
| Performed Procedure Step ID | (0040,0253) | SH | ANAP | |
| Performed Procedure Step Start Date | (0040,0244) | DA | ANAP | |
| Performed Procedure Step Start Time | (0040,0245) | TM | ANAP | |
| Performed Procedure Step Description | (0040,0254) | LO | ANAP | |
| Comments on the Performed Procedure Steps | (0040,0280) | ST | ANAP | |

Table 69: SC General Equipment Module Attributes

| Name | Tag | VR | Definition | Comment |
|---------------------------|-------------|----|-----------------|---------|
| Manufacturer | (0008,0070) | LO | ALWAYS, AUTO | |
| Institution Name | (0008,0080) | LO | ALWAYS, AUTO | |
| Station Name | (0008,1010) | SH | ALWAYS, AUTO | |
| Manufacturer's Model Name | (0008,1090) | LO | VNAP | |
| Device Serial Number | (0018,1000) | LO | ALWAYS, AUTO | |
| Software Versions | (0018,1020) | LO | ALWAYS, AUTO | |

Table 70: SC Equipment Module Attributes

| Name | Tag | VR | Definition | Comment |
|-----------------|-------------|----|-----------------|---------|
| Conversion Type | (0008,0064) | CS | ALWAYS, AUTO | |
| Modality | (0008,0050) | CS | ALWAYS, AUTO | |

Table 71: SC General Image Module Attributes

| Name | Tag | VR | Definition | Comment |
|--------------------------------|-------------|----|------------------|---------|
| Instance Number | (0020,0013) | IS | ALWAYS, AUTO | |
| Patient Orientation | (0020,0020) | CS | ALWAYS, EMPTY | |
| Image Type | (0008,0008) | CS | ALWAYS, AUTO | |
| Image Comments | (0020,4000) | LT | ALWAYS, AUTO | |
| Lossy Image Compression | (0028,2110) | CS | ALWAYS, AUTO | |
| Lossy Image Compression Ratio | (0028,2112) | DS | ANAP | |
| Lossy Image Compression Method | (0028,2114) | CS | ANAP | |
| Presentation Intent Type | (0008,0068) | CS | ALWAYS, AUTO | |

Table 72: SC Image Pixel Module Attributes

| Name | Tag | VR | Definition | Comment |
|----------------------------|-------------|----|-----------------|---------|
| Samples per Pixel | (0028,0002) | US | ALWAYS, AUTO | |
| Photometric Interpretation | (0028,0004) | CS | ALWAYS, AUTO | |
| Row | (0028,0010) | US | ALWAYS, AUTO | |

| | | | | |
|----------------------|-------------|------------|-----------------|--|
| Columns | (0028,0011) | US | ALWAYS, AUTO | |
| Bits Allocated | (0028,0100) | US | ALWAYS, AUTO | |
| Bits Stored | (0028,0101) | US | ALWAYS, AUTO | |
| High Bit | (0028,0102) | US | ALWAYS, AUTO | |
| Pixel Representation | (0028,0103) | US | ALWAYS, AUTO | |
| Pixel Data | (7FE0,0010) | OB / OW | ALWAYS, AUTO | |
| Planar Configuration | (0028,0006) | US | ALWAYS, AUTO | |

Table 73: SC Image Module Attributes

| Name | Tag | VR | Definition | Comment |
|---------------------------|-------------|----|-----------------|---------|
| Date of Secondary Capture | (0018,1012) | DA | ALWAYS, AUTO | |
| Time of Secondary Capture | (0018,1014) | TM | ALWAYS, AUTO | |

Table 74: SC SOP Common Module Attributes

| Name | Tag | VR | Definition | Comment |
|------------------------|-------------|----|-----------------|---------|
| SOP Class UID | (0008,0016) | UI | ALWAYS, AUTO | |
| SOP Instance UID | (0008,0018) | UI | ALWAYS, AUTO | |
| Instance Creation Date | (0008,0012) | DA | ALWAYS, AUTO | |
| Instance Creation Time | (0008,0013) | TM | ALWAYS, AUTO | |
| Instance Number | (0020,0013) | IS | ALWAYS, AUTO | |

Table 75: SC Private Attributes

| Name | Tag | VR | Definition | Comment |
|-------------------|-------------|----|------------|---------|
| Private Attribute | (2001,0010) | LO | ANAP | |
| Private Attribute | (2001,1063) | CS | ANAP | |

Table 76: Encapsulated PDF Patient Module Attributes

| Name | Tag | VR | Definition | Comment |
|----------------------|-------------|----|-----------------|---|
| Patient's Name | (0010,0010) | PN | ALWAYS, AUTO | |
| Patient ID | (0010,0020) | LO | ALWAYS, AUTO | |
| Patient's Birth Date | (0010,0030) | DA | VNAP | Attribute must be present in original study |
| Patient's Sex | (0010,0040) | CS | VNAP | Attribute must be present in original study |

Table 77: Encapsulated PDF General Study Module Attributes

| Name | Tag | VR | Definition | Comment |
|----------------------------|-------------|----|-----------------|---|
| Study Instance UID | (0020,000D) | UI | ALWAYS, AUTO | |
| Study Date | (0008,0020) | DA | ALWAYS, AUTO | |
| Study Time | (0008,0030) | TM | ALWAYS, AUTO | |
| Referring Physician's Name | (0008,0090) | PN | VNAP | Attribute must be present in original study |
| Study ID | (0020,0010) | SH | ALWAYS, AUTO | |
| Accession Number | (0008,0050) | SH | VNAP | Attribute must be present in original study |

Table 78: Encapsulated PDF Encapsulated Document Series Attributes

| Name | Tag | VR | Definition | Comment |
|-------------------------------------|-------------|----|-----------------|---------|
| Modality | (0008,0060) | CS | ALWAYS, AUTO | |
| Series Instance UID | (0020,000E) | UI | ALWAYS, AUTO | |
| Series Number | (0020,0011) | IS | ALWAYS, AUTO | |
| Performed Procedure Step ID | (0040,0253) | IS | ALWAYS, AUTO | |
| Performed Procedure Step Start Date | (0040,0244) | DA | ALWAYS, AUTO | |
| Performed Procedure Step Start Time | (0040,0245) | TM | ALWAYS, AUTO | |

Table 79: Encapsulated PDF General Equipment Module Attributes

| Name | Tag | VR | Definition | Comment |
|---------------------------|-------------|----|-----------------|---------|
| Manufacturer | (0008,0070) | LO | ALWAYS, AUTO | |
| Manufacturer's Model Name | (0008,1090) | LO | VNAP | |
| Software Versions | (0018,1020) | LO | ALWAYS, AUTO | |

Table 80: Encapsulated PDF SC Equipment Module Attributes

| Name | Tag | VR | Definition | Comment |
|-----------------|-------------|----|-----------------|---------|
| Conversion Type | (0008,0064) | CS | ALWAYS, AUTO | |
| Modality | (0008,0050) | CS | ALWAYS, AUTO | |

Table 81: Encapsulated PDF Encapsulated Document Module Attributes

| Name | Tag | VR | Definition | Comment |
|------------------------------------|-------------|----|-----------------|---------|
| Instance Number | (0020,0013) | IS | ALWAYS, AUTO | |
| Content Date | (0008,0023) | DA | ALWAYS, AUTO | |
| Content Time | (0008,0033) | TM | ALWAYS, AUTO | |
| Acquisition DateTime | (0008,002A) | DT | ALWAYS, AUTO | |
| Burned In Annotation | (0028,0301) | CS | ALWAYS, AUTO | |
| Source Image Sequence | (0042,0013) | SQ | ALWAYS, AUTO | |
| Document Title | (0042,0010) | ST | ALWAYS, AUTO | |
| Concept Name Code Sequence | (0040,A043) | SQ | ALWAYS, AUTO | |
| MIME Type of Encapsulated Document | (0042,0012) | LO | ALWAYS, AUTO | |
| Encapsulated Document | (0042,0011) | OB | ALWAYS, AUTO | |

Table 82: Encapsulated PDF SOP Common Module Attributes

| Name | Tag | VR | Definition | Comment |
|------------------------|-------------|----|-----------------|---------|
| Specific Character Set | (0008,0005) | CS | ALWAYS, AUTO | |
| SOP Class UID | (0008,0016) | UI | ALWAYS, AUTO | |
| SOP Instance UID | (0008,0018) | UI | ALWAYS, AUTO | |
| Instance Creation Date | (0008,0012) | DA | ALWAYS, AUTO | |
| Instance Creation Time | (0008,0013) | TM | ALWAYS, AUTO | |
| Instance Number | (0020,0013) | IS | ALWAYS, AUTO | |

Table 83: Encapsulated PDF Private Attributes

| Name | Tag | VR | Definition | Comment |
|-------------------|-------------|----|------------|---------|
| Private Attribute | (2001,0010) | LO | ANAP | |
| Private Attribute | (2001,1063) | CS | ANAP | |

Table 84: Private Draft Report Patient Module Attributes

| Name | Tag | VR | Definition | Comment |
|----------------------|-------------|----|-----------------|---|
| Patient's Name | (0010,0010) | PN | ALWAYS, AUTO | |
| Patient ID | (0010,0020) | LO | ALWAYS, AUTO | |
| Patient's Birth Date | (0010,0030) | DA | VNAP | Attribute must be present in original study |
| Patient's Sex | (0010,0040) | CS | VNAP | Attribute must be present in original study |
| Patient's Size | (0010,1020) | DS | VNAP | |
| Patient's Weight | (0010,1030) | DS | VNAP | |
| Patient Comments | (0010,4000) | LT | VNAP | |

Table 85: Private Draft Report General Study Module Attributes

| Name | Tag | VR | Definition | Comment |
|----------------------------|-------------|----|-----------------|---|
| Study Instance UID | (0020,000D) | UI | ALWAYS, AUTO | |
| Study Date | (0008,0020) | DA | ALWAYS, AUTO | |
| Study Time | (0008,0030) | TM | ALWAYS, AUTO | |
| Referring Physician's Name | (0008,0090) | PN | VNAP | Attribute must be present in original study |
| Study Description | (0008,1030) | LO | VNAP | |
| Study ID | (0020,0010) | SH | ALWAYS, AUTO | |
| Accession Number | (0008,0050) | SH | VNAP | Attribute must be present in original study |

Table 86: Private Draft Report Encapsulated Document Series Attributes

| Name | Tag | VR | Definition | Comment |
|--|-------------|----|-----------------|---------|
| Series Date | (0008,0021) | DA | ALWAYS, AUTO | |
| Series Time | (0008,0031) | TM | ALWAYS, AUTO | |
| Modality | (0008,0060) | CS | ALWAYS, AUTO | |
| Series Instance UID | (0020,000E) | UI | ALWAYS, AUTO | |
| Series Number | (0020,0011) | IS | ALWAYS, AUTO | |
| Referenced Performed Procedure Step Sequence | (0008,1111) | SQ | ALWAYS, AUTO | |
| > Referenced SOP Class UID | (0008,1150) | UI | ALWAYS, AUTO | |
| > Referenced SOP Instance UID | (0008,1155) | UI | ALWAYS, AUTO | |
| Performed Procedure Step ID | (0040,0253) | IS | ALWAYS, AUTO | |
| Performed Procedure Step Start Date | (0040,0244) | DA | ALWAYS, AUTO | |

| | | | | |
|--|-------------|----|-----------------|--|
| Performed Procedure Step Start Time | (0040,0245) | TM | ALWAYS, AUTO | |
| Comments on the Performed Procedure Step | (0040,0280) | ST | VNAP | |

Table 87: Private Draft Report Encapsulated Document Module Attributes

| Name | Tag | VR | Definition | Comment |
|------------------------------------|-------------|----|-----------------|---------|
| Instance Number | (0020,0013) | IS | ALWAYS, AUTO | |
| Content Date | (0008,0023) | DA | ALWAYS, AUTO | |
| Content Time | (0008,0033) | TM | ALWAYS, AUTO | |
| Acquisition DateTime | (0008,002A) | DT | ALWAYS, AUTO | |
| Document Title | (0042,0010) | ST | ALWAYS, AUTO | |
| Concept Name Code Sequence | (0040,A043) | SQ | ALWAYS, AUTO | |
| Completion Flag | (0040,A491) | CS | ALWAYS, AUTO | |
| Verification Flag | (0040,A493) | CS | ALWAYS, AUTO | |
| MIME Type of Encapsulated Document | (0042,0012) | LO | ALWAYS, AUTO | |
| Encapsulated Document | (0042,0011) | OB | ALWAYS, AUTO | |

Table 88: Private Draft Report SOP Common Module Attributes

| Name | Tag | VR | Definition | Comment |
|------------------|-------------|----|-----------------|---------|
| SOP Class UID | (0008,0016) | UI | ALWAYS, AUTO | |
| SOP Instance UID | (0008,0018) | UI | ALWAYS, AUTO | |
| Instance Number | (0020,0013) | IS | ALWAYS, AUTO | |

Table 89: Private Draft Report Private Attributes

| Name | Tag | VR | Definition | Comment |
|-------------------|-------------|----|-----------------|---------|
| Private Attribute | (2001,0010) | LO | ALWAYS, AUTO | |
| Private Attribute | (2001,1063) | CS | ALWAYS, AUTO | |
| Private Attribute | (2007,001F) | LO | ALWAYS, AUTO | |
| Private Attribute | (2007,1F11) | OB | ALWAYS, AUTO | |
| Private Attribute | (2007,1F12) | SQ | ALWAYS, AUTO | |

8.1.2 Usage of Attributes from Received IOD

Q-Station only accepts all valid DICOM IOD's specified in this document.
Some SOP Classes will not be viewable because they are application dependant.

8.1.3 Attribute Mapping

8.1.3.1 Mapping Rules for Exporting Q-Station Images According to DICOM Presentation State and DICOM Composite Images

For DICOM image export, the Presentation State information is applied to the image(s) and its attributes are sent out as DICOM composite.

8.1.4 Coerced/Modified fields

Upon export of composite instances a de-normalization can take place by assembling data from the various entities in the hierarchy. The selection of the attributes takes place based upon what is present in Q-Station at the initiation of the export. A description is given in the following subsections per instance level.

8.1.4.1 Patient

If the patient ID attribute is absent during instance import (has no value – zero-length) the following mapping will take place.

1. When a Patient ID is absent and one of Patient's Name/Patient's Birth Date are absent then a new UID is generated for Patient ID.
Otherwise Patient ID is generated by appending "EMPTYPatientID_" + <Patient's Name> + "_" + <Patient's Birth Date>.
It will be ensured that all instances belonging to a particular study will get the same Patient ID.
2. For Storage SCP, when two or more SOP Instances have the same Patient ID and different values for Patient's Name/Patient's Birth Date, then a new Patient ID is created by appending "!" + <UID> to the Patient ID. The original Patient ID is added to the Other Patient IDs.

8.1.4.2 Study

During import, the value of Study ID attribute is determined as follows:

1. Retrieved from the composite image.
2. If not present in the composite image, Study ID is assigned the value of the first Requested Procedure ID (0040,1001) encountered in the Request Attributes Sequence (0040,0275) in the composite image.
3. Otherwise Study ID remains empty.

During Export, in the absence of Study attribute values, the Examination attributes will be taken as a best guess for the following Study attributes.

Table 90: Mapping of Study Attributes

| Examination Attribute | Value | DICOM Attribute |
|------------------------|-----------------------------|---|
| Study Date (0008,0020) | Has value | Study date (0008,0020) is sent out |
| | Not present or has no value | Study date (0008,0020) is filled with Performed Procedure Step Start Date (0040,0244) |
| Study Time (0008,0030) | Has value | Study Time (0008,0030) is sent out |
| | Not present or has no value | Study Time (0008,0030) is filled with Performed Procedure Step Start Time (0040,0245) |

This implies that upon export of each Examination, within the same Study, different values for these attributes may be sent out. The receiving station, e.g. a PACS system, will apply its own rules for guaranteeing consistency of its own database.

8.1.4.3 Examination

If all of the Performed Procedure Step attributes in Table 91 are missing from the composite image, then the mapping is as specified.

Table 91: Mapping of Examination attributes

| Performed Procedure Step Attribute | Tag | Composite image Attribute | Tag |
|--------------------------------------|-----------|---------------------------|-----------|
| Performed Procedure Step Start Date | 0040,0244 | Study Date | 0008,0020 |
| Performed Procedure Step Start Time | 0040,0245 | Study Time | 0008,0030 |
| Performed Procedure Step ID | 0040,0253 | Study ID | 0020,0010 |
| Performed Procedure Step Description | 0040,0254 | Study Description | 0008,1030 |

8.2 Data Dictionary of Private Attributes

See section 8.1.1.

8.3 Coded Terminology and Templates

Q-Station does not implement any specific support for coded terminology and templates.

8.4 Grayscale Image consistency

Q-Station does not implement any specific support for grayscale image consistency.

8.5 Standard Extended/Specialized/Private SOPs

8.5.1 Specialized SOP Classes

Q-Station supports only one Private SOP Class, 1.3.46.670589.2.8.1.1, used only for storing of Draft Reports to DICOM Media. It is not used for network storage as only Approved reports may be exported via DICOM, and those are only in Encapsulated PDF.

8.6 Private Transfer Syntaxes

Q-Station does not support any private transfer syntaxes.

9 ANNEXES OF APPLICATION "QLAB"

9.1 IOD Contents

9.1.1 Created SOP Instance

This section specifies each IOD created by Q-LAB, including the attribute name, tag, VR, and value (range, condition and source).

Defined abbreviations are:

| | |
|-------------|---|
| ALWAYS | the module shall always be present |
| EMPTY | the (mandatory) module shall not contain any attributes |
| CONDITIONAL | the module may be present under specified condition |
| NEVER | the module shall never be present |
| ALWAYS | the attribute shall always be present with value |
| ANAP | the attribute shall be present with value under specified condition |
| EMPTY | the attribute shall always be present without value |
| ANAPEV | the attribute shall be present without value under specified condition |
| VNAP | the attribute shall always be present, either with or without value |
| ANAPCV | the attribute shall be present, either with or without value, under specified condition |
| AUTO | the attribute value is generated automatically |
| CONFIG | the attribute value source is a configurable parameter |
| COPY | the attribute value source is another SOP instance |
| FIXED | the attribute value is hard-coded in the application |
| IMPLICIT | the attribute value source is a user-implicit setting |
| USER | the attribute value source is explicit user input |

9.1.1.1 List of Created SOP Classes

Table 93: List of Created SOP Classes

| SOP Class Name | SOP Class UID |
|--|-------------------------------|
| Ultrasound Multi-frame Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.3.1 |
| Secondary Capture Image Storage SOP Class | 1.2.840.10008.5.1.4.1.1.7 |
| Comprehensive SR SOP Class | 1.2.840.10008.5.1.4.1.1.88.33 |

9.1.1.2 Ultrasound Multi-frame Image Storage IOD

Note: The existence of certain attributes in exported images depends on the source system of the image.

Table 94: MF Patient Module Attributes

| Name | Tag | VR | Definition | Comment |
|----------------------|-------------|----|--------------|-------------------|
| Patient's Name | (0010,0010) | PN | ALWAYS, COPY | From source image |
| Patient ID | (0010,0020) | LO | ALWAYS, COPY | From source image |
| Patient's Birth Date | (0010,0030) | DA | ALWAYS, COPY | From source image |
| Patient's Sex | (0010,0040) | CS | VNAP, COPY | From source image |
| Patient's Size | (0010,1030) | DS | VNAP, COPY | From source image |

| | | | | |
|------------------|-------------|----|---------------|-------------------|
| Patient's Weight | (0010,1040) | DS | VNAP, COPY | From source image |
| Patient Comments | (0010,4000) | LT | VNAP, COPY | From source image |

Table 95: MF General Study Module Attributes

| Name | Tag | VR | Definition | Comment |
|----------------------------|-------------|----|-----------------|-------------------|
| Study Instance UID | (0020,000D) | UI | ALWAYS, COPY | From source image |
| Study Date | (0008,0020) | DA | ALWAYS, COPY | From source image |
| Study Time | (0008,0030) | TM | ALWAYS, COPY | From source image |
| Referring Physician's Name | (0008,0090) | PN | VNAP, COPY | From source image |
| Study ID | (0020,0010) | SH | ALWAYS, COPY | From source image |
| Accession Number | (0008,0050) | SH | VNAP, COPY | From source image |
| Study Description | (0008,1030) | LO | VNAP, COPY | From source image |

Table 96: MF General Series Module Attributes

| Name | Tag | VR | Definition | Comment |
|--|--------------|----|-----------------|------------------------|
| Modality | (0008,0060) | CS | ALWAYS, COPY | From source image |
| Series Instance UID | (0020,000E) | UI | ALWAYS, COPY | From source image |
| Series Number | (0020,0011) | IS | ALWAYS, COPY | From source image |
| Series Date | (0008,0021) | DA | ALWAYS, COPY | From source image |
| Series Time | (0008,0031) | TM | ALWAYS, COPY | From source image |
| Protocol Name | (0018,1030) | LO | VNAP, COPY | From source image |
| Operator's Name | (0008,1070) | PN | VNAP, COPY | From source image |
| Series Description | (0008, 103E) | LO | VNAP, COPY | From source image |
| Referenced Performed Procedure Step Sequence | (0008,1111) | SQ | ALWAYS, COPY | From source image |
| > Referenced SOP Class UID | (0008,1150) | UI | ALWAYS, COPY | From source image |
| > Referenced SOP Instance UID | (0008,1155) | UI | ALWAYS, COPY | From source image |
| Performed Procedure Step ID | (0040,0253) | SH | ALWAYS, COPY | From Study ID |
| Performed Procedure Step Start Date | (0040,0244) | DA | ALWAYS, COPY | From Study Date |
| Performed Procedure Step Start Time | (0040,0245) | TM | ALWAYS, COPY | From Study Time |
| Performed Procedure Step Description | (0040,0254) | LO | ALWAYS, COPY | From Study Description |
| Comments on the Performed Procedure Steps | (0040,0280) | ST | VNAP, COPY | From source image |

Table 97: MF General Image Module Attributes

| Name | Tag | VR | Definition | Comment |
|--------------------------------|-------------|----|--------------|-------------------|
| Instance Number | (0020,0013) | IS | ALWAYS, COPY | From source image |
| Patient Orientation | (0020,0020) | CS | ANAP, EMPTY | Empty if present |
| Image Type | (0008,0008) | CS | ALWAYS, COPY | From source image |
| Image Comments | (0020,4000) | LT | VNAP, COPY | From source image |
| Content Date | (0008,0023) | DA | ALWAYS, COPY | From source image |
| Content Time | (0008,0033) | TM | ALWAYS, COPY | From source image |
| Lossy Image Compression | (0028,2110) | CS | ANAP, COPY | From source image |
| Lossy Image Compression Ratio | (0028,2112) | DS | ANAP, COPY | From source image |
| Lossy Image Compression Method | (0028,2114) | CS | ANAP, COPY | From source image |
| Presentation Intent Type | (0008,0068) | CS | ALWAYS, AUTO | From source image |

Table 98: MF Image Pixel Module Attributes

| Name | Tag | VR | Definition | Comment |
|----------------------------|-------------|---------|--------------|------------------------------------|
| Samples per Pixel | (0028,0002) | US | ALWAYS, AUTO | Subject to Association Negotiation |
| Photometric Interpretation | (0028,0004) | CS | ALWAYS, AUTO | Subject to Association Negotiation |
| Row | (0028,0010) | US | ALWAYS, COPY | From source image |
| Columns | (0028,0011) | US | ALWAYS, COPY | From source image |
| Bits Allocated | (0028,0100) | US | ALWAYS, COPY | From source image |
| Bits Stored | (0028,0101) | US | ALWAYS, COPY | From source image |
| High Bit | (0028,0102) | US | ALWAYS, COPY | From source image |
| Pixel Representation | (0028,0103) | US | ALWAYS, COPY | From source image |
| Pixel Data | (7FE0,0010) | OB / OW | ALWAYS, COPY | From source image |
| Planar Configuration | (0028,0006) | US | ANAP, COPY | From source image |

Table 99: MF CINE Module Attributes

| Name | Tag | VR | Definition | Comment |
|--------------------------------|-------------|----|--------------|---|
| Frame Time | (0018,1063) | DS | ANAPCV, COPY | Mutually exclusive with Frame Time Vector |
| Frame Time Vector | (0018,1065) | DS | ANAPCV, COPY | Mutually exclusive with Frame Time |
| Recommended Display Frame Rate | (0008,2144) | IS | ANAP, COPY | From source image |
| Cine Rate | (0018,0040) | IS | ANAP, COPY | From source image |
| Series Duration | (0018,0072) | DS | ANAP, COPY | From source image |

Table 100: MF MODULE Attributes

| Name | Tag | VR | Definition | Comment |
|-------------------------|-------------|----|-----------------|-------------------|
| Number of Frames | (0028,0008) | IS | ALWAYS, COPY | From source image |
| Frame Increment Pointer | (0028,0009) | AT | ALWAYS, COPY | From source image |

Table 101: MF SOP Common Module Attributes

| Name | Tag | VR | Definition | Comment |
|------------------------|-------------|----|-----------------|-------------------|
| SOP Class UID | (0008,0016) | UI | ALWAYS, COPY | From source image |
| SOP Instance UID | (0008,0018) | UI | ALWAYS, COPY | From source image |
| Instance Creation Date | (0008,0012) | DA | ALWAYS, COPY | From source image |
| Instance Creation Time | (0008,0013) | TM | ALWAYS, COPY | From source image |
| Instance Number | (0020,0013) | IS | ALWAYS, COPY | From source image |

9.1.1.3 Secondary Capture IOD**Table 102: SC Image Patient Module Attributes**

| Name | Tag | VR | Definition | Comment |
|----------------------|-------------|----|-----------------|---|
| Patient's Name | (0010,0010) | PN | ALWAYS, AUTO | |
| Patient ID | (0010,0020) | LO | ALWAYS, AUTO | |
| Patient's Birth Date | (0010,0030) | DA | VNAP | Attribute must be present in original study |
| Patient's Sex | (0010,0040) | CS | VNAP | Attribute must be present in original study |
| Patient's Size | (0010,1030) | DS | ANAP | Attribute must be present in original study |
| Patient's Weight | (0010,1040) | DS | ANAP | Attribute must be present in original study |
| Patient Comments | (0010,4000) | LT | VNAP | |

Table 103: SC Image General Study Module Attributes

| Name | Tag | VR | Definition | Comment |
|----------------------------|-------------|----|-----------------|---|
| Study Instance UID | (0020,000D) | UI | ALWAYS, AUTO | |
| Study Date | (0008,0020) | DA | ALWAYS, AUTO | |
| Study Time | (0008,0030) | TM | ALWAYS, AUTO | |
| Referring Physician's Name | (0008,0090) | PN | VNAP | Attribute must be present in original study |
| Study ID | (0020,0010) | SH | ALWAYS, AUTO | |
| Accession Number | (0008,0050) | SH | VNAP | Attribute must be present in original study |
| Study Description | (0008,1030) | LO | VNAP | Attribute must be present in original study |

Table 104: SC Image General Series Module Attributes

| Name | Tag | VR | Definition | Comment |
|---|--------------|----|-----------------|--|
| Modality | (0008,0060) | CS | ALWAYS, AUTO | |
| Series Instance UID | (0020,000E) | UI | ALWAYS, AUTO | |
| Series Number | (0020,0011) | IS | ALWAYS, AUTO | |
| Series Date | (0008,0021) | DA | ALWAYS, AUTO | |
| Series Time | (0008,0031) | TM | ALWAYS, AUTO | |
| Protocol Name | (0018,1030) | LO | ANAP | Attribute must be present in original study |
| Operator's Name | (0008,1070) | PN | VNAP | Attribute must be present in original study |
| Series Description | (0008, 103E) | LO | ALWAYS, AUTO | |
| Referenced Performed Procedure Step Sequence | (0008,1111) | SQ | ALWAYS, AUTO | |
| > Referenced SOP Class UID | (0008,1150) | UI | ANAP | Only if SQ has one or more items |
| > Referenced SOP Instance UID | (0008,1155) | UI | ANAP | Only if SQ has one or more items |
| Performed Procedure Step ID | (0040,0253) | SH | ANAP | |
| Performed Procedure Step Start Date | (0040,0244) | DA | ANAP | |
| Performed Procedure Step Start Time | (0040,0245) | TM | ANAP | |
| Performed Procedure Step Description | (0040,0254) | LO | ANAP | |
| Comments on the Performed Procedure Steps | (0040,0280) | ST | ANAP | |

Table 105: SC Equipment Module Attributes

| Name | Tag | VR | Definition | Comment |
|-----------------|-------------|----|-----------------|---------|
| Conversion Type | (0008,0064) | CS | ALWAYS, AUTO | |
| Modality | (0008,0050) | CS | ANAP | |

Table 106: SC General Image Module Attributes

| Name | Tag | VR | Definition | Comment |
|--------------------------------|-------------|----|------------------|---------|
| Instance Number | (0020,0013) | IS | ALWAYS, AUTO | |
| Patient Orientation | (0020,0020) | CS | ALWAYS, EMPTY | |
| Image Type | (0008,0008) | CS | ALWAYS, AUTO | |
| Image Comments | (0020,4000) | LT | ALWAYS, AUTO | |
| Lossy Image Compression | (0028,2110) | CS | ALWAYS, AUTO | |
| Lossy Image Compression Ratio | (0028,2112) | DS | ANAP | |
| Lossy Image Compression Method | (0028,2114) | CS | ANAP | |
| Presentation Intent Type | (0008,0068) | CS | ALWAYS, AUTO | |

Table 107: SC Image Pixel Module Attributes

| Name | Tag | VR | Definition | Comment |
|----------------------------|-------------|------------|-----------------|---------|
| Samples per Pixel | (0028,0002) | US | ALWAYS, AUTO | |
| Photometric Interpretation | (0028,0004) | CS | ALWAYS, AUTO | |
| Row | (0028,0010) | US | ALWAYS, AUTO | |
| Columns | (0028,0011) | US | ALWAYS, AUTO | |
| Bits Allocated | (0028,0100) | US | ALWAYS, AUTO | |
| Bits Stored | (0028,0101) | US | ALWAYS, AUTO | |
| High Bit | (0028,0102) | US | ALWAYS, AUTO | |
| Pixel Representation | (0028,0103) | US | ALWAYS, AUTO | |
| Pixel Data | (7FE0,0010) | OB / OW | ALWAYS, AUTO | |
| Planar Configuration | (0028,0006) | US | ALWAYS, AUTO | |

Table 108: SC Image Module Attributes

| Name | Tag | VR | Definition | Comment |
|---------------------------|-------------|----|-----------------|---------|
| Date of Secondary Capture | (0018,1012) | DA | ALWAYS, AUTO | |
| Time of Secondary Capture | (0018,1014) | TM | ALWAYS, AUTO | |

Table 109: SC SOP Common Module Attributes

| Name | Tag | VR | Definition | Comment |
|------------------------|-------------|----|-----------------|---------|
| SOP Class UID | (0008,0016) | UI | ALWAYS, AUTO | |
| SOP Instance UID | (0008,0018) | UI | ALWAYS, AUTO | |
| Instance Creation Date | (0008,0012) | DA | ALWAYS, AUTO | |
| Instance Creation Time | (0008,0013) | TM | ALWAYS, AUTO | |
| Instance Number | (0020,0013) | IS | ALWAYS, AUTO | |

Table 110: SC Private Attributes

| Name | Tag | VR | Definition | Comment |
|-------------------|-------------|----|------------|---------|
| Private Attribute | (2001,0010) | LO | ANAP | |
| Private Attribute | (2001,1063) | CS | ANAP | |

9.1.1.4 Comprehensive SR IOD

Implemented using Template ID 5200 for Adult Echo with private tags.

Appendix A – Structured Reporting

A.1 Wall Motion Analysis (TID 5204)

This template is invoked as many times as the number of the Wall Motion stages done for the stress study. Use of the template TID 5204 in the context of Q-Station 1.0 is described in the following table.

| No | NL | REL WITH PARENT | VT | Concept Name | Comments |
|----|-----|-----------------|-----------|--|---|
| 1 | | | CONTAINER | EV (121070, DCM, "Findings") | |
| 2 | > | HAS CONCEPT MOD | CODE | EV (121058, DCM, "Procedure reported") | DT (P5-B3121, SRT, "Echocardiography for Determining Ventricular Contraction") |
| 6 | > | CONTAINS | NUM | DT (125202, DCM, "LV Wall Motion Score Index") | Q-Station 1.0 computes the Wall Motion Score index from the assessment done on the Wall segments for that particular stage. |
| 7 | >> | HAS CONCEPT MOD | CODE | EV (G-E048, SRT, "Assessment Scale") | Q-Station 1.0 uses the 5 Point Segment Finding Scale for Wall motion score index. Concept from BCID 12238 is used here. |
| 8 | > | CONTAINS | CONTAINER | EV (121070, DCM, "Findings") | |
| 9 | >> | HAS CONCEPT MOD | CODE | EV (G-C0E3, SRT, "Finding Site") | DT (T-D0772, SRT, "Myocardial Wall") |
| 10 | >> | CONTAINS | CODE | EV (LN, 18179-2, "Wall Segment") | Q-Station 1.0 performs Wall motion analysis based on 17-segment assessment. Concepts for the segments are taken from the BCID 3717. |
| 11 | >>> | HAS PROPERTIES | CODE | EV (F-32050, SRT, "Cardiac Wall Motion") | Concepts from DCID 3703 are used here. This row will be present only if row 12 is absent. |
| 12 | >>> | HAS PROPERTIES | CODE | EV (G-C504, SRT, "Associated Morphology") | Concepts from DCID 3704 are used here. This row will be present only if row 11 is absent. |
| 13 | >>> | HAS PROPERTIES | NUM | DT (G-C1E3, SRT, "Score") | |

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