

e.soft express 2.0



DICOM Conformance Statement

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Document and Release History

Document History

Version	Date of Issue	Change & Reason of Change/Change Request/CHARM
R 1.0	February, 2004	e.soft express 2.0

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1 Introduction

1.1 Overview

The Conformance Statement describes the DICOM interface for e.soft express™ products in terms of PS 3.2 of [DICOM].

This introduction describes the application's implemented DICOM functionality in general terms.

The e.soft express is an NM Imaging Modality viewing software. The e.soft DICOM network implementation acts as SCP for the DICOM Storage and an SCU for Query/Retrieve. Verification is supported in SCU (only via a configuration environment) and SCP role.

1.2 Audience

This document is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

1.3 Remarks

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality as SCU and SCP, respectively.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication with e.soft express and other vendors' Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM 3.0 Standard [DICOM]. However, by itself it is not guaranteed to ensure the desired interoperability and a successful interconnectivity.

The user should be aware of the following important issues:

- The comparison of different conformance statements is the first step towards assessing interconnectivity between e.soft express and non-e.soft equipment.
- Test procedures should be defined and tests should be performed by the user to validate the connectivity desired. DICOM itself and the conformance parts do not specify this.
- The standard will evolve to meet the users' future requirements. Siemens is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.

1.4 Definitions, Terms and Abbreviations

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

Additional Abbreviations and terms are as follows:

AE	DICOM Application Entity
ASCII	American Standard Code for Information Interchange

DB	Database
DCS	DICOM Conformance Statement
IOD	DICOM Information Object Definition
e.soft	Multimodality Workstation
NEMA	National Electrical Manufacturers Association
PDU	DICOM Protocol Data Unit
R	Required Key Attribute
RWA	Real-World Activity
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM server)
SOP	DICOM Service-Object Pair

1.5 References

[DICOM] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1-3.15, 2001

2 Implementation Model Verification

The e.soft express DICOM Configuration application requests Verification to verify the ability of a foreign DICOM application on a remote node to respond to DICOM messages.

Responding to Verification requests from remote nodes is handled by the Storage SCP application.

2.1 Application Data Flow Diagram

The e.soft express DICOM network implementation acts as SCU for the C-ECHO DICOM network service. The product target Operating System is Microsoft Windows XP Professional.

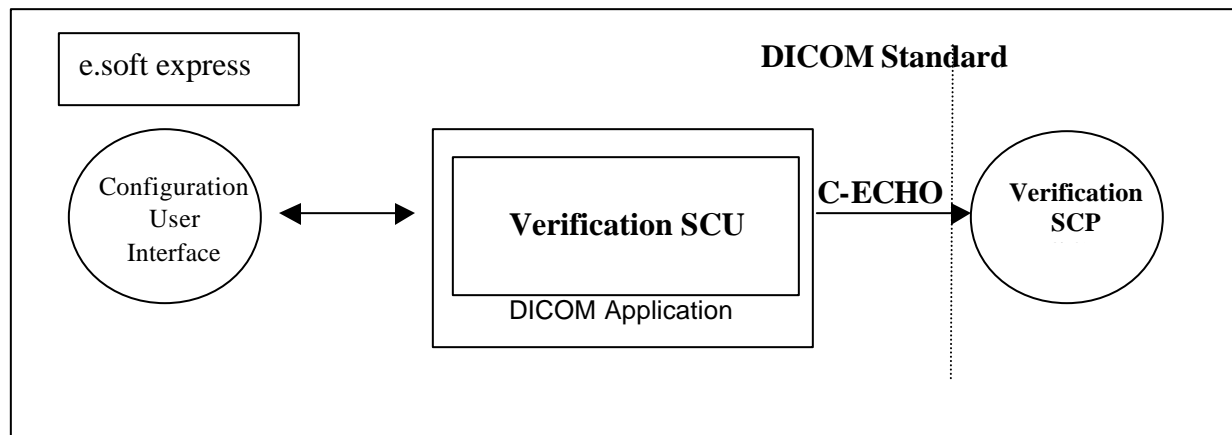


Figure 1: Application Data Flow Diagram –Verification SCU.

The e.soft express DICOM Configuration application opens an association when a “verification” of a remote application is requested during a configuration session. This can be done when entering new data for remote application configuration or to verify existing configuration data.

2.2 Sequencing of Real-World Activities

Newly entered data have to be saved first, before a “verification” of these data is possible.

3 Application Entity Specification Verification

3.1 Verification AE Specification

3.1.1 Association Establishment Policies

The e.soft express DICOM Configuration application attempts to open an association for verification request whenever the “verification” function is activated during configuration of a remote DICOM application.

3.1.1.1 Number of Associations

The e.soft express DICOM Configuration application initiates one association at a time to request verification.

3.1.1.2 Asynchronous Nature

The e.soft express DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

3.1.1.3 Implementation Identifying Information

Implementation Class UID	1.3.12.2.1107.5.9.20000101
Implementation Version Name	SMS_NMG_EEXP20

3.1.2 Association Initiation Policy

The e.soft express DICOM Configuration application attempts to initiate a new association for

- DIMSE C-ECHO service operations.

3.1.2.1 Associated Real-World Activity - Verification

3.1.2.1.1 Associated Real-World Activity – Request Verification “verification”

The associated Real-World activity is a C-ECHO request initiated by the Configuration environment whenever a “verification” is requested. If an association to a remote Application Entity is successfully established, Verification with the configured AET is requested via the open association. If the C-ECHO Response from the remote Application contains a status other than “Success” this will be indicated in the configuration environment and the association is closed.

3.1.2.1.2 Proposed Presentation Contexts

The e.soft express DICOM application will propose Presentation Contexts as shown in the following table:

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

3.1.2.1.3 SOP Specific Conformance – Verification SCU

The Application conforms to the definitions of the Verification SCU in accordance to the DICOM Standard.

3.1.3 Association Acceptance Policy

The Verification SCP is part of the Storage SCP – see section.

4 Implementation Model Storage

The e.soft express DICOM Application Entity accepts association requests for Storage from Remote Application Entities.

4.1 Application Data Flow Diagram

The e.soft express DICOM network implementation acts as an SCP for the C-STORE DICOM network service and as SCP for the C-ECHO DICOM network service. The product target Operating System is Microsoft Windows XP Professional

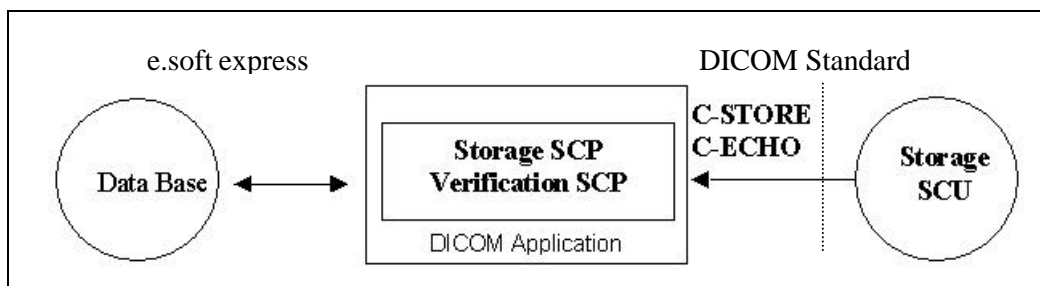


Figure 2: Application Data Flow Diagram – Storage SCU.

4.2 Functional Definitions of Application Entities

The Storage SCP component of the e.soft express DICOM application is operating as background server process. The Storage SCP component is existing when the target machine is started and waits for Storage association requests. Upon accepting an association with a negotiated Presentation Context it starts to receive the Composite Image Objects and imports them to the local database. Verification requests will be processed and responded by Storage SCP component.

4.3 Sequencing of Real-World Activities

Not applicable.

5 Application Entity Specification Storage

5.1 Storage AEs Specification

The e.soft express Storage service class user/service class provider applications use one AE when receiving associations from remote DICOM nodes.

e.soft express provides Standard Conformance to the following DICOM V3.0 SOP Classes as an SCP:

SOP Class Name	SOP Class UID
Computed Tomography Image Storage	1.2.840.10008.5.1.4.1.1.2
Magnetic Resonance Image Storage	1.2.840.10008.5.1.4.1.1.4
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
PET Image Storage	1.2.840.10008.5.1.4.1.1.128
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7

e.soft express provides Private Conformance to the following DICOM V3.0 conform private SOP Classes as an SCP:

SOP Class Name	SOP Class UID
CSA Non-Image Storage	1.3.12.2.1107.5.9.1

5.1.1 Association Establishment Policies

5.1.1.1 General

The associated Real-World activity is a C-Store request received by e.soft express. After accepting an association from the remote node DICOM AE, the e.soft express background process receives the images via the open association. After the association is closed by the sender, e.soft express will transfer the images into the e.soft express database.

5.1.1.2 Number of Associations

The e.soft express DICOM receiver application is able to accept multiple associations at a time. It can handle up to 10 associations in parallel.

5.1.1.3 Asynchronous Nature

The e.soft express DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

5.1.1.4 Implementation Identifying Information

Implementation Class UID	1.3.12.2.1107.5.9.20000101
Implementation Version Name	SMS_NMG_EEXP20

5.1.2 Association Initiation Policy

If a job with network destination gets active in the job list or a retrieve sub-operation is processed the e.soft DICOM application attempts to initiate a new association for

- DIMSE C-STORE service operations

5.1.2.1 Associated Real-World Activity - Receive

5.1.2.1.1 Associated Real-World Activity – Receiving Images from a Remote Node

The e.soft express receiving process will accept an association and will receive any images transmitted on that association and will store the images on disk in its own database.

5.1.2.1.2 Accepted Presentation Context – Receiving Images

The e.soft DICOM application will accept Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Computed Tomography Image	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None
Magnetic Resonance Image	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None
Nuclear Medicine Image	1.2.840.10008.5.1.4.1.1.20	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None
PET Image	1.2.840.10008.5.1.4.1.1.128	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None
Secondary Capture Image	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None
CSA Non-Image Storage	1.3.12.2.1107.5.9.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None

5.1.2.1.3 SOP-specific Conformance Statement – Receiving Images

Upon successful receiving a C-STORE-RQ, the e.soft express DICOM receiver returns the status SUCCESS.

5.1.2.1.4 Presentation Context Acceptance Criterion

The e.soft express DICOM application will accept any number of verification or storage SOP classes that are listed above. In the event that the e.soft DICOM application runs out of resources, it will reject the association request.

5.1.2.1.5 Transfer Syntax Selection Policies

The e.soft express DICOM application currently supports the Implicit VR Little Endian, the Explicit VR Little Endian and Explicit VR Big Endian Transfer Syntaxes

6 Implementation Model Query / Retrieve

The query/retrieve service class defines an application-level class of services which facilitates the management of images and patient data against the well-defined information model of DICOM and allows a DICOM AE to retrieve images from a remote DICOM node. The e.soft express DICOM query/retrieve application supports the query/retrieve services to act as SCU.

6.1 Application Data Flow Diagram

The e.soft express DICOM network implementation acts as SCU for the query/retrieve network service. The product target Operating System is Microsoft Windows XP Professional.

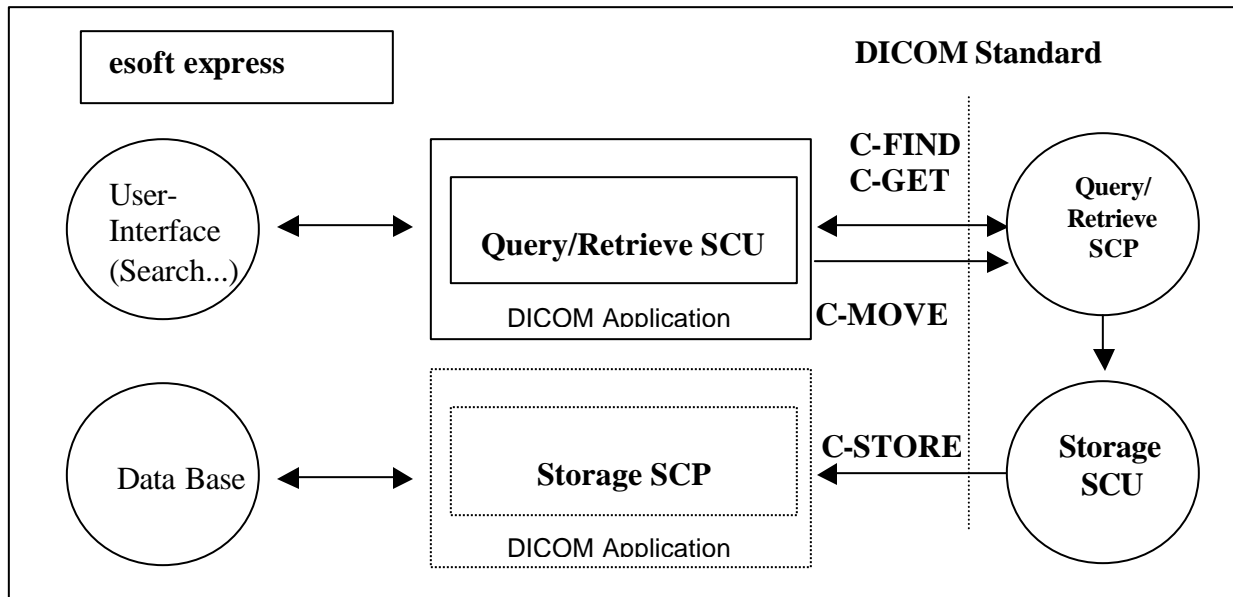


Figure 3: Application Data Flow Diagram – Query/Retrieve SCU.

6.2 Functional Definitions of Application Entities

The e.soft express DICOM query/retrieve SCU requests the remote query/retrieve SCP to perform a search and match to the keys specified in the request in order to display the results in the e.soft express user interface. Depending on user action (Import) the e.soft express DICOM SCU sends a C-GET or a C-MOVE DIMSE service to initiate a C-STORE sub-operation on the SCP to start an image transfer from remote Storage SCU (running on Query/Retrieve SCP) to the e.soft express Storage SCP.

6.3 Sequencing of Real-World Activities

Retrieve of images is only possible if results from a previous “Search...” operation exist and those entities can be selected for “Import”.

7 Application Entity Specification Query/Retrieve

7.1 Query/Retrieve Service AEs Specification

The Query/Retrieve SCU requests that the remote SCP performs a match of all keys specified in the request, against the information in its database and the identified images will be moved over a different (C_GET or C-MOVE) storage association.

e.soft express provides Standard Conformance to the following DICOM V3.0 SOP Classes as an SCU:

SOP Class Name	SOP Class UID
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Study Root Query/Retrieve Information Model - GET	1.2.840.10008.5.1.4.1.2.2.3

Note: See also the Storage DICOM Conformance Statement of the e.soft express DICOM application to compare for conformance of the C-STORE sub-operation generated by the C-GET or C-MOVE DIMSE services. Furthermore compare the supported Storage Service SOP classes described in the Storage DICOM Conformance Statement of the Modality to which the images shall be transferred to.

7.1.1 Association Establishment Policies

7.1.1.1 General

With the "Search..." function the query data are input and the DICOM query/retrieve application is started. A query request will be sent out to one remote node that can be selected from a list of configured Query Providers and the response data will be displayed for the user. Upon request (Import), the retrieval of selected items is initiated.

7.1.1.2 Number of Associations

The e.soft express DICOM application initiates a single association at a time. The e.soft DICOM application is able to accept multiple associations at a time. It can handle up to 10 associations in parallel.

7.1.1.3 Asynchronous Nature

The e.soft express DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

7.1.1.4 Implementation Identifying Information

Implementation Class UID	1.3.12.2.1107.5.9.20000101
Implementation Version Name	SMS_NMG_EEXP20

7.1.2 Association Initiation Policy

The query user interface will request the query-data from user and triggers one C-FIND request to the selected remote node. The response data will be displayed in the query UI for further data navigation.

When requesting Import of related items, with C_MOVE specified, the browser requests the retrieve application to send the C-MOVE request to the related remote node. Images will then be received by the Storage SCP as described in the related section.

7.1.2.1 Real World Activity - Find SCU

7.1.2.1.1 Associated Real-World Activity - Find SCU “Search”

The associated Real-World activity is to fill out a query form with search data and pass it as query to the network application which issues a C-FIND over a previously built association. The remote SCP will respond with related data-entries that will be passed to a browser application. When data transfer is finished the association is closed.

7.1.2.1.2 Proposed Presentation Contexts - Find SCU

The e.soft express DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Study Root Query/Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

It is configurable which of the two query models (or both) are to be used by the e.soft DICOM Query SCU application. If both Abstract Syntaxes are configured, The C-FIND SCU will use the Patient Root Model only for C-FIND requests on PATIENT level. For all other levels it will use the STUDY root model.

7.1.2.1.2.1 Conformance Statement Find SCU

The e.soft express DICOM Query/Retrieve SCU supports hierarchical Study and Series level queries. The interactive querying of attributes on IMAGE level is not supported by the Query SCU, hence retrieval of individual Objects is possible. The search keys for the Study Level query model that the SCU supports

Attribute name	Tag	Type	Matching	User input	return value display
Study Level					
Patient Name	(0010,0010)	R	Wildcard	enter value	yes
Patient ID	(0010,0020)	R	Wildcard	enter value	yes
Study Date	(0008,0020)	R	universal (Null)	enter value	yes
Accession Number	(0008,0050)	R	universal (Null)	enter value	yes

8 Communication Profiles

8.1 Supported Communication Stacks

The e.soft express DICOM application provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

The product target Operating System is Microsoft Windows XP Professional.

8.1.1 TCP/IP Stack

The e.soft express DICOM application uses the TCP/IP stack from the target operating system upon which it executes. It uses the MergeCOM-3 subroutine library from Merge Technologies Inc. that is based on a Berkeley socket interface.

8.1.2 API

The e.soft express DICOM application uses the MergeCOM library that is based on a TCP/IP socket interface.

8.1.3 Physical Media Support

The e.soft express DICOM application is indifferent to the physical medium over which TCP/IP executes; it inherits this from the target operating system upon which it executes.

9 Configuration

9.1 AE Title /Presentation Address Mapping

The e.soft express maps Application Entity Titles to hostname and port number via an internal configuration method.

The AE Titles can be changed with the configuration, the port number for Storage SCP is 104.

9.2 Configurable Parameters

- The Application Entity, hostname and port numbers.
- PDU size is set to 16384

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