



MILLENSYS



DICOM Conformance Statement
for
Vision Tools RADVIEW
Storage SCU, Query\Retrieve SCU
Basic Modality Worklist SCU

© Copyright by MILLENSYS

MILLENSYS Contacts

- **Main Office**

Address :

Telephone/Fax :

36 Ahmed El-Zomor Street, Nasr City, Cairo, Egypt

+20 2 22713860

+20 2 22754867

+20 2 22879403

- **Internet :**

Web site:

www.millensys.com

- **Email :**

Sales Department

Support Department

sales@millensys.com

support@millensys.com

All material contained in this document is copyright Millennium Systems 2008.

MillenSys and Vision Tools Logo are trademarks of Millennium Systems.

Microsoft and Windows are trademarks of Microsoft Corporation in the United States and other countries.

The information presented in this document is correct at time of going to press. However, it is subject to change without notice.

This document may not be photocopied, reproduced or translated into another language, in whole or in part, without the consent of Millennium Systems.

Vision Tools User Guide. ©

Document Information

| | | |
|--|-------------------|---|
| Author | Eng.Ahmed Hussein | Tel: +20 2 22754867 E-Mail: a_hussein@millensys.com |
| Editing&layout | Eng.Hossam Rady | Tel: +20 2 22713860 E-Mail: h_rady@millensys.com |
| For questions regarding the technical content of this document, please contact: | Eng.Ahmed Hussein | Tel: +20 2 22754867 E-Mail: a_hussein@millensys.com |

Table 1:Document Information Table

Table of Content

| | |
|---|-----------|
| 1. INTRODUCTION | 8 |
| 1.1 OVERVIEW | 8 |
| 1.2 SCOPE AND FIELD OF APPLICATION | 8 |
| 1.3 INTENDED AUDIENCE | 8 |
| 1.3.1 <i>Integration</i> | 8 |
| 1.3.2 <i>Validation</i> | 9 |
| 1.3.3 <i>Future Evolution</i> | 9 |
| 1.4 REFERENCES | 9 |
| 1.5 DEFINITIONS | 9 |
| 1.6 ACRONYMS, ABBREVIATIONS AND SYMBOLS | 10 |
| 2. IMPLEMENTATION MODEL | 11 |
| 2.1 VERIFICATION | 12 |
| 2.1.1 <i>Application Data Flow Diagram</i> | 12 |
| 2.1.2 <i>Functional Definitions of AE's</i> | 12 |
| 2.2 STORAGE | 13 |
| 2.2.1 <i>Application Data Flow Diagram</i> | 13 |
| 2.2.2 <i>Functional Definitions of AE's</i> | 13 |
| 2.2.2.1 Storage SCU | 13 |
| 2.3 BASIC WORKLIST | 14 |
| 2.3.1 <i>Application Data Flow Diagram</i> | 14 |
| 2.3.2 <i>Functional Definitions of AE's</i> | 14 |
| 2.4 QUERY AND RETRIEVE | 14 |
| 2.4.1 <i>Application Data Flow Diagram</i> | 15 |
| 2.4.2 <i>Functional Definitions of AE's</i> | 15 |
| 2.4.2.1 Query/Retrieve SCU | 15 |
| 3. AE SPECIFICATIONS | 15 |
| 3.1 AE VERIFICATION SPECIFICATIONS | 16 |
| 3.1.1 <i>Association Initiation Policy</i> | 16 |
| 3.1.1.1 Real-World Activity - Verification SCU | 16 |
| 3.1.1.1.1 Associated Real-World Activity - Verification SCU | 16 |
| 3.1.1.1.2 Proposed Presentation Contexts - Verification SCU | 16 |
| 3.1.1.1.3 SOP Specific Conformance Statement - Verification SCU | 16 |
| 3.2 STORAGE AE SPECIFICATIONS | 16 |
| 3.2.1 <i>Association Establishment Policies</i> | 17 |
| 3.2.1.1 General | 17 |
| 3.2.1.2 Number of Association | 17 |
| 3.2.1.3 Asynchronous Nature | 17 |
| 3.2.1.4 Implementation Identifying Information | 17 |
| 3.2.2 <i>Association Initiation Policy</i> | 17 |
| 3.2.2.1 Real-World Activity - Storage SCU | 17 |
| 3.2.2.1.1 Associated Real-World Activity - Storage SCU | 17 |
| 3.2.2.1.2 Proposed Presentation Contexts - Storage SCU | 17 |
| 3.3 BASIC WORKLIST AE SPECIFICATION | 18 |
| 3.3.1 <i>Association Establishment Policies</i> | 19 |
| 3.3.1.1 General | 19 |
| 3.3.1.2 Number of Associations | 19 |

| | |
|---|-----------|
| 3.3.1.3 Asynchronous Nature | 19 |
| 3.3.1.4 Implementation Identifying Information | 19 |
| 3.3.2 Association Initiation Policy | 19 |
| 3.3.2.1 Real World Activity | 20 |
| 3.3.2.1.1 Associated Real-World Activity | 20 |
| 3.3.2.1.2 Proposed Presentation Contexts – Find SCU | 20 |
| 3.3.2.1.3 SOP Specific Conformance Statement | 20 |
| 3.4 QUERY/RETRIEVE AE SPECIFICATION | 23 |
| 3.4.1 Association Establishment Policies | 23 |
| 3.4.1.1 General | 24 |
| 3.4.1.2 Number of Associations | 24 |
| 3.4.1.3 Asynchronous Nature | 24 |
| 3.4.2 Association Initiation Policy | 24 |
| 3.4.2.1 Real World Activity - Find SCU | 24 |
| 3.4.2.1.1 Associated Real-World Activity - Find SCU | 24 |
| 3.4.2.1.2 Proposed Presentation Contexts - Find SCU | 24 |
| 3.4.2.1.3 SOP Specific Conformance Statement - Find SCU | 25 |
| 3.4.2.2 Real World Activity - Move SCU | 26 |
| 3.4.2.2.1 Associated Real-World Activity - Move SCU | 26 |
| 3.4.2.2.2 Proposed Presentation Contexts - Move SCU | 27 |
| 3.4.2.2.3 SOP Specific Conformance Statement - Move SCU | 27 |
| 4. COMMUNICATION PROFILE | 28 |
| 4.1 SUPPORTED COMMUNICATION STACKS | 29 |
| 4.1.1 OSI Stack | 29 |
| 4.1.2 TCP/IP Stack | 29 |
| 4.1.2.1 API | 29 |
| 4.1.2.2 Physical Media Support | 29 |
| 4.1.3 Point-to-Point Stack | 29 |
| 5. CONFIGURATION | 29 |
| 5.1 AE TITLE / PRESENTATION ADDRESS MAPPING | 30 |
| 5.2 CONFIGURABLE PARAMETERS | 30 |
| 5.2.1 Storage | 31 |
| 5.2.2 Time out Parameters | 31 |
| 5.3 DEFAULT PARAMETERS | 31 |

List of Figures

| | |
|--|----|
| FIGURE 1: APPLICATION DATA FLOW DIAGRAM OF VERIFICATION SCU | 12 |
| FIGURE 2: APPLICATION DATA FLOW DIAGRAM OF STORAGE SCU | 13 |
| FIGURE 3: APPLICATION DATA FLOW DIAGRAM OF BASIC WORKLIST SCU | 14 |
| FIGURE 4: APPLICATION DATA FLOW DIAGRAM OF QUERY/RETRIEVE SCU | 15 |

MILLENSYS

List of Tables

| | |
|---|-----------|
| TABLE 1: DOCUMENT INFORMATION TABLE | 3 |
| TABLE 2: INITIALIZING PRESENTATION CONTEXTS STORAGE..... | 18 |
| TABLE 3: SOP CLASS FOR BASIC WORKLIST | 19 |
| TABLE 4: INITIALIZING PRESENTATION CONTEXTS BASIC WORKLIST | 20 |
| TABLE 5: SCHEDULED PROCEDURE STEP AND PATIENT IDENTIFICATION SEARCH KEYS..... | 21 |
| TABLE 6: SCHEDULED PROCEDURE STEP, PATIENT IDENTIFICATION, IMAGING SERVICE REQUEST, PATIENT DEMOGRAPHICS, VISIT STATUS, VISIT IDENTIFICATION RETURN KEYS | 22 |
| TABLE 7: SOP CLASSES FOR QUERY/RETRIEVE | 23 |
| TABLE 8: INITIALIZING PRESENTATION CONTEXTS QUERY..... | 25 |
| TABLE 9: PATIENT ROOT AND STUDY ROOT QUERY ATTRIBUTES | 26 |
| TABLE 10: INITIALIZING PRESENTATION CONTEXTS RETRIEVE..... | 27 |
| TABLE 11: PATIENT ROOT AND STUDY ROOT QUERY/RETRIEVE ATTRIBUTES | 28 |

MILLENSYS

1. Introduction

This chapter provides general information about the purpose, scope and contents of this Conformance Statement

1.1 Overview

This conformance statement refers to a Vision Tools family of products (Diagnostic and Viewing workstation) that are based on the same communication software. This document refers to each of the above products as a *System*. Unless otherwise indicated.

1.2 Scope and Field of Application

The scope of this DICOM Conformance Statement is to facilitate data exchange with equipment of Millennium Systems. This document specifies the compliance to the DICOM standard (formally called the NEMA PS 3.X standards). It contains a short description of the applications involved and provides technical information about the data exchange capabilities of the equipment.

The main elements describing these capabilities are: the supported DICOM Service Object Pair (SOP) Classes, Roles, Information Object Definitions (IOD) and Transfer Syntaxes.

The field of application is the integration of the Millennium Systems equipment into an environment of medical devices. This Conformance Statement should be read in conjunction with the DICOM standard and its addenda [DICOM].

1.3 Intended Audience

This Conformance Statement is intended for:

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

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

1.3.1 Integration

The integration of any device into a system of interconnected devices goes beyond the scope of the DICOM 3.0 standard and this conformance statement when *interoperability* is desired. The responsibility for analyzing the applications

requirements and developing a solution that integrates the MillenSys equipment with other vendors' systems is the user's and should not be underestimated.

1.3.2 Validation

Testing the complete range of possibilities between the MillenSys devices and non-MillenSys devices, before the connection is declared operational, is deemed to be a necessity. The user should ensure that any non-MillenSys provider accepts full responsibility for all validation required for their connection with the MillenSys devices. The accuracy of image data once it has crossed the interface between MillenSys and non-MillenSys devices as well as the stability of the image data for the intended applications is the responsibility of the non-MillenSys provider.

1.3.3 Future Evolution

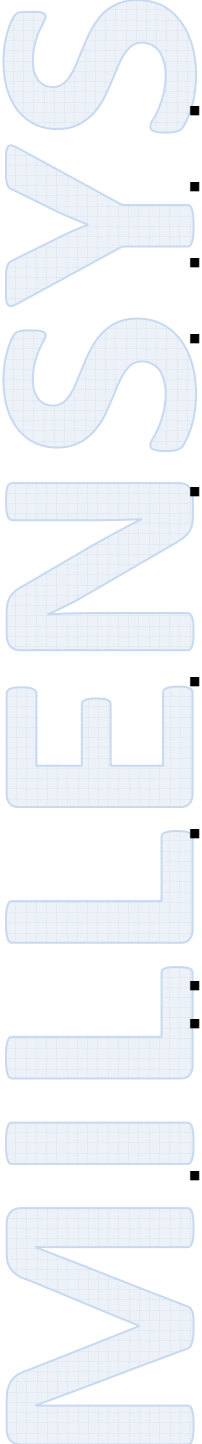
As the DICOM 3.0 standard evolves to meet the user's growing requirements and to incorporate new features and technologies, MillenSys will follow the evolution of the standard. This evolution of the standard may require changes to MillenSys devices that have implemented DICOM 3.0. The user should ensure that any non-MillenSys provider, who connects with MillenSys devices, also plans future evolution of the DICOM standard. A refusal to do so may reflect in the loss of functionality and/or connectivity between the different products.

1.4 References

The **D**igital **I**maging and **C**ommunications in **M**edicine (DICOM) standard (NEMA PS 3.X):

National Electrical Manufacturers Association (NEMA),
Publication Sales 1300 N. 17th Street, Suite 1847, Rosslyn, Va. 22209,
United States of America.

1.5 Definitions

- 
- **Association Establishment** - An Association Establishment is the first phase of communication between two DICOM Application Entities (AEs). The AEs use the Association Establishment to negotiate how data will be encoded and the type of data to be exchanged.
 - **Called Application Entity Title** - The Called AE Title defines the intended receiver of an Association.
 - **Calling Application Entity Title** - The Calling AE Title defines the requestor of an Association.
 - **DICOM Message Service Element (DIMSE)** - A DIMSE defines the services and protocols utilized by an Application Entity to exchange messages.
 - **Information Object Definition (IOD)** - An IOD is the data model which is an abstraction of the real-world information. This data model defines the nature and attributes relevant to the class of real-world objects represented.
 - **Service Class Provider (SCP)** - A SCP plays the **server** role to perform operations and invoke notifications during an Association. An example of a Storage Class Provider would be an image storage device. In this case, the image storage device is storing the image that was sent by a Service Class User.
 - **Service Class User (SCU)** - A SCU plays the **client** role to invoke operations and perform notifications during an Association. An example of a SCU would be an image acquisition device. In this case, the image acquisition device will create and send DICOM image by requesting that a SCP store the image.
 - **Service/Object Pair (SOP) Class** - A SOP Class is defined by the union of an Information Object Definition and set of DIMSE Services. A DICOM Application Entity may support one or more SOP Classes. Each SOP Class is uniquely identified by a SOP Class UID.
 - **SOP Instance** - A specific occurrence of an Information Object.
 - **Transfer Syntax** – The Transfer Syntax is a set of encoding rules that allow DICOM Application Entities to negotiate the encoding techniques (e.g. data element structure, byte ordering, compression) they are able to support. The Transfer Syntax is negotiated during Association Negotiation.
 - **Unique Identifier (UID)** – A UID is a globally unique, ISO compliant. ASCII – numeric string. It guarantees uniqueness across multiple countries, sites, vendors and equipment.

1.6 Acronyms, Abbreviations and Symbols

S
Y
S
T
E
M
S
M
I
L
L
E
N
S
Y
S

- **ACC** American College of Cardiology
- **ACR** American College of Radiology
- **ASCII** American Standard Code for Information Interchanges
- **AE** Application Entity
- **ANSI** American National Standards Institute
- **DICOM** Digital Imaging and Communication in Medicine
- **DIMSE** DICOM Message Service Element
- **DIMSE-C** DICOM Message Service Element - Composite
- **DIMSE-N** DICOM Message Service Element - Normalized
- **HIS** Hospital Information System
- **HL7** Health Level 7
- **IE** Information Entity
- **IOD** Information Object Definition
- **ISO** International Standard Organization
- **NEMA** National Electric Manufacturers Association
- **PDU** Protocol Data Unit
- **RIS** Radiology Information System
- **SCP** Service Class Provider
- **SCU** Service Class User
- **SOP** Service Object Pair
- **TCP/IP** Transmission Control Protocol/Internet Protocol
- **UID** Unique Identifier

2. Implementation Model

The MillenSys RADVIEW is PC Windows NT-based software program used to work with MillenSys Vision Tools Products.

RADVIEW Store SCU has the ability to send images, using DICOM C-Store, to a remote AE which is predefined in the DICOM connecting remote AEs.

RADVIEW Modality Worklist SCU is used to retrieve the Worklist from any HIS/RIS Worklist SCP, using DICOM C-Find, according to the search critical that the user defines, the results is displayed and saved to be used later to import Patient data into Vision tools Directory and Image Tool.

2.1 Verification

2.1.1 Application Data Flow Diagram

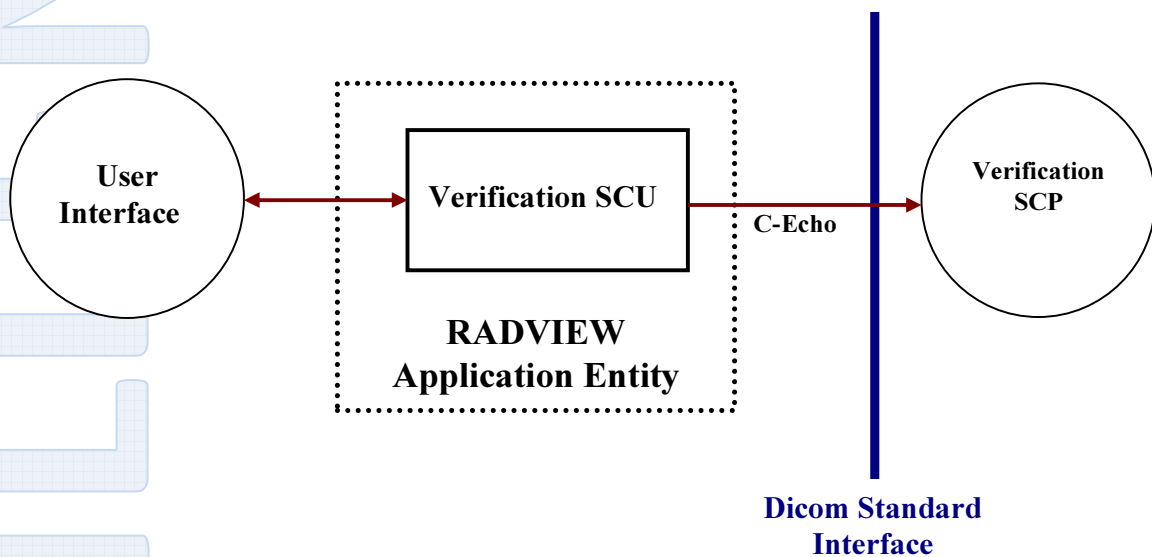


Figure 1: Application data flow diagram of verification SCU

2.1.2 Functional Definitions of AE's

The Echo function provides an easy way to determine if the remote AE is available. When C-Echo Function is used, an association which includes a Presentation Context for Verification Class is proposed. A successful response indicates that the remote AE is available. The association is immediately closed.

2.2 Storage

2.2.1 Application Data Flow Diagram

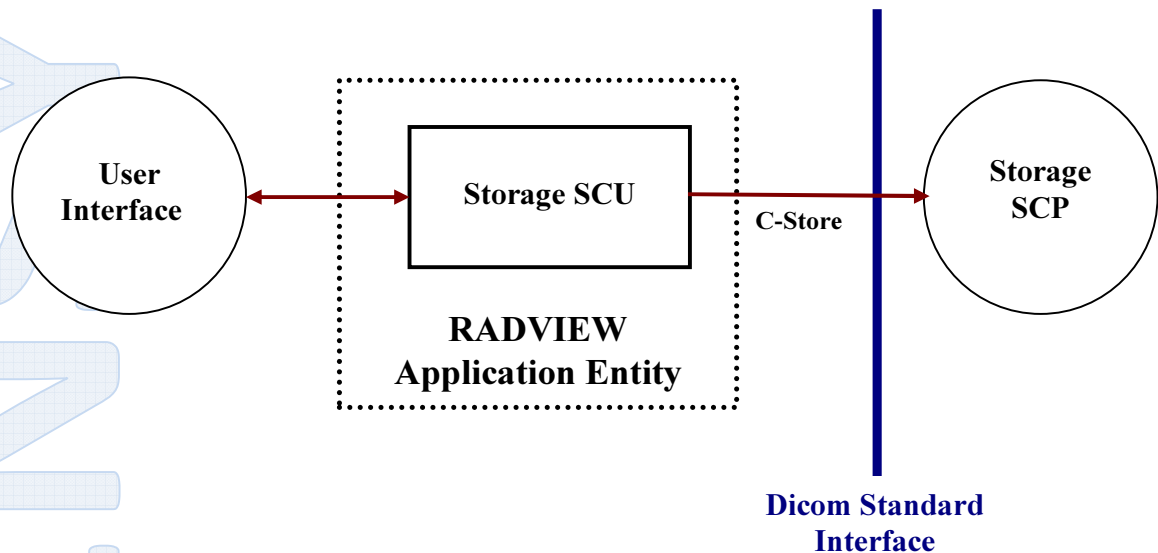


Figure 2: Application data flow diagram of Storage SCU

2.2.2 Functional Definitions of AE's

2.2.2.1 Storage SCU

When using RADVIEW C-Store SCU, the user select files to send to remote AE, from the presentation context of each file the SCP will include a list of Presentation Contexts which is proposed to the destination AE. The destination AE determines which of these Presentation Contexts it can support. The image send software then goes through the list of files Selected by the user. For each file, it determines the Presentation Context to be used and checks to see if this Presentation Context is supported by the destination AE. If so, the file is transferred. When all files have been processed the association is closed.

2.3 Basic Worklist

2.3.1 Application Data Flow Diagram

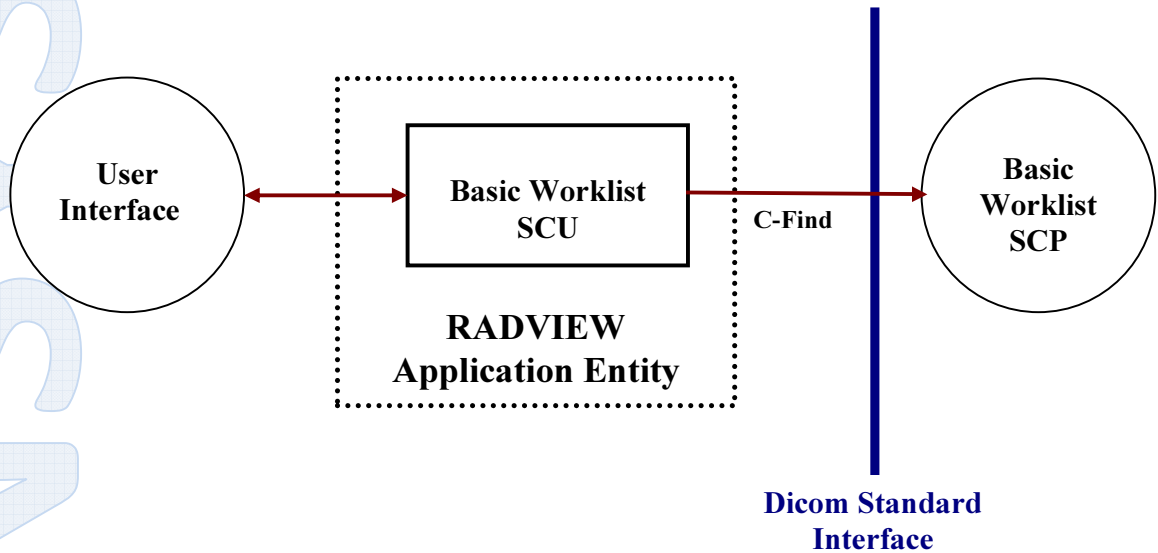


Figure 3: Application data flow diagram of Basic Worklist SCU

2.3.2 Functional Definitions of AE's

RADVIEW Basic Modality Worklist SCU is implemented as a single application entity as a Service Class User for requesting demographic information. The DICOM C-Find Modality Worklist Service is used to retrieve demographic information. Create a DICOM basic worklist management data request. Then Initiate a DICOM association to send the request. Then, issue a C-Find request and wait for the worklist responses, after receiving response a list is generated containing the patient demographic data and a Close Association request is sent.

2.4 Query and Retrieve

2.4.1 Application Data Flow Diagram

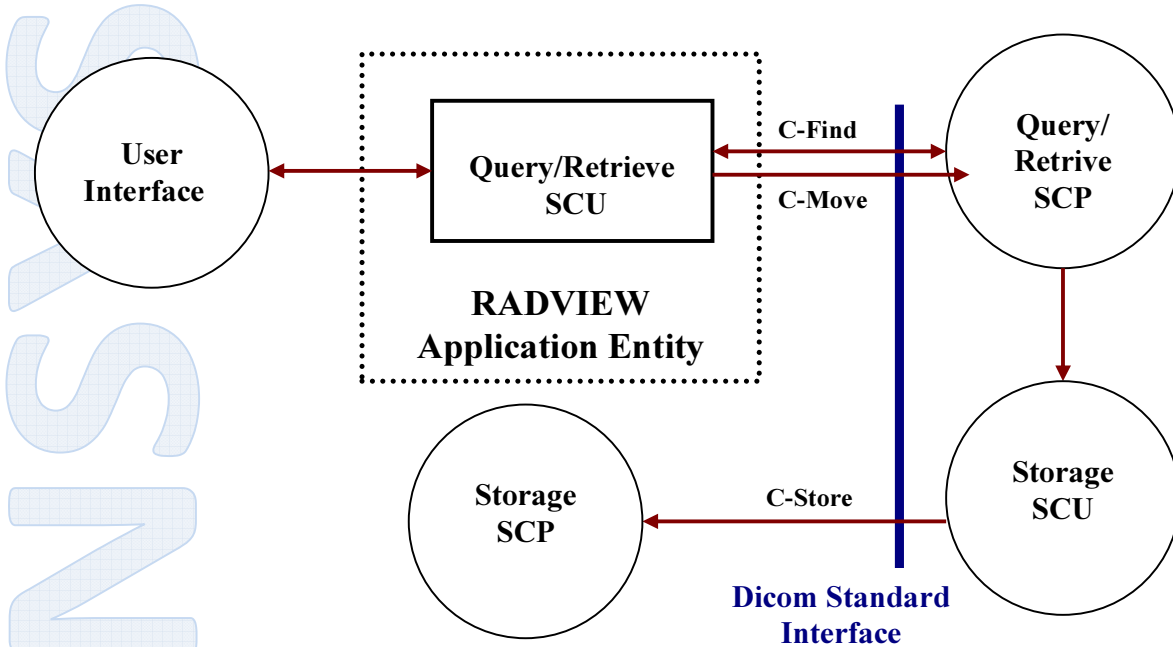


Figure 4: Application data flow diagram of Query/Retrieve SCU

2.4.2 Functional Definitions of AE's

2.4.2.1 Query/Retrieve SCU

When using RADVIEW C-Find/C-Move SCU, an association which includes the Presentation Contexts of the selected Query Level defined by the user from the DICOM Query/Retrieve information models (i.e. Patient Root, Study Root, and Patient/Study Only). If Query/Retrieve SCP accepts the request. Then, a request directory information at any of these levels is sent depending on the user choice. A new association is created for each directory search, and is immediately closed as soon as the requested information is received. The operator may also request that a patient, study, series or image be retrieved from the remote AE by pressing the Move button. A new association is initiated for the request, which remains open until all files have been received. The actual file transfer occurs on a separate association initiated by the remote AE

3. AE Specifications



3.1 AE Verification Specifications

3.1.1 Association Initiation Policy

The RADVIEW DICOM Service Tool application attempts to initiate a new association for

- DIMSE C-ECHO Service operation.

3.1.1.1 Real-World Activity - Verification SCU

3.1.1.1.1 Associated Real-World Activity - Verification SCU

The associated Real-World activity is a C-ECHO request initiated by the DICOM Service Tool application. If the process successfully establishes an association to a remote Application Entity, it will send the C-ECHO-Request via the open association to verify that the remote Application Entity is responding to DICOM messages.

3.1.1.1.2 Proposed Presentation Contexts - Verification SCU

The RADVIEW DICOM application will propose Presentation Contexts as shown in the following table:

| Presentation Context Table | | | | | |
|----------------------------|-------------------|---------------------------|-------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID | | |
| Verification | 1.2.840.10008.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |

Table 2: Initializing Presentation Context Verification

3.1.1.1.3 SOP Specific Conformance Statement - Verification SCU

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

3.2 Storage AE Specifications

3.2.1 Association Establishment Policies

3.2.1.1 General

The configuration of the RADVIEW DICOM application defines the Application Entity Titles, the port numbers and of course the host name and net address.

3.2.1.2 Number of Association

The RADVIEW DICOM application initiates several associations at a time, one for each transfer request being processed.

3.2.1.3 Asynchronous Nature

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

3.2.1.4 Implementation Identifying Information

The RADVIEW DICOM software provides a single Implementation Class UID of

- <" 1.2.826.0.1.3680043.2.773">
- and an Implementation Version Name of
- <"RADVIEW 8.X">.

3.2.2 Association Initiation Policy

The RADVIEW DICOM application attempts to initialize a new association for

- DIMSE C-STORE Service operations.

3.2.2.1 Real-World Activity - Storage SCU

3.2.2.1.1 Associated Real-World Activity - Storage SCU

The RADVIEW will send C-STORE request to the Remote AE. if the association accepted, Entity, it will transfer each image one after another via the open association. If the C-STORE Response from the remote Application contains an error status the association is aborted.

3.2.2.1.2 Proposed Presentation Contexts - Storage SCU

The RADVIEW DICOM application will propose Presentation Contexts as shown in the following table:

| Presentation Context Table | | | | | |
|-----------------------------------|---------------------------|---------------------------|---------------------|-------------|-----------------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID | | |
| CR Image Storage Service Class | 1.2.840.10008.5.1.4.1.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| SC Image storage Service Class | 1.2.840.10008.5.1.4.1.1.7 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| Verification | 1.2.840.10008.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |

Table 2: Initializing Presentation Contexts Storage

3.3 Basic Worklist AE Specification

The basic modality worklist SCU requests that the remote SCP performs a match of all keys specified in the query against the information in its worklist database. RADVIEW DICOM product provide Standard Conformance to the following DICOM V3.0 SOP Class as an SCU:

| SOP Class Name | SOP Class UID |
|--|-----------------------------|
| Basic Modality Worklist Information Model – FIND | 1.2.840.10008.5.1.4.1.2.1.1 |

Table 3: SOP Class for Basic Worklist

3.3.1 Association Establishment Policies

3.3.1.1 General

The configuration of the RADVIEW DICOM basic worklist application defines the Application Entity Titles, the port numbers and of course the host name and net address.

3.3.1.2 Number of Associations

The RADVIEW DICOM application initiates one/several association(s) at a time, one for each transfer request being processed.

3.3.1.3 Asynchronous Nature

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

3.3.1.4 Implementation Identifying Information

The RADVIEW DICOM software provides a single Implementation Class UID of

- <"1.2.826.0.1.3680043.2.773">
- and an Implementation Version Name of
- <"RADVIEW 8.X">.

3.3.2 Association Initiation Policy

The basic modality worklist SCU establish an association by using the DICOM association services.

During association establishment the negotiation of SOP classes to exchange the capabilities of the SCU and the SCP is not supported.

The following DIMSE-C operation is supported as SCU:

- C-FIND

3.3.2.1 Real World Activity

3.3.2.1.1 Associated Real-World Activity

The associated Real-World activity is to initiate query requests to an SCP by using the DICOM Worklist Information Model.

3.3.2.1.2 Proposed Presentation Contexts – Find SCU

| Presentation Context Table | | | | | |
|--|-----------------------------|--|---|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID | | |
| Basic Modality Worklist Information Model – FIND | 1.2.840.10008.5.1.4.1.2.1.1 | 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 | Not supported |

Table 4: Initializing Presentation Contexts Basic Worklist

3.3.2.1.3 SOP Specific Conformance Statement

Search Key Attributes of the Worklist C-FIND

The RADVIEW DICOM worklist SCU supports worklist queries with all required search keys. The following tables describe the search keys that the SCU supports.

| Attribute name | Tag | Type | Query Value |
|---------------------------------------|-------------|------|-----------------------------|
| Scheduled Procedure Step | | | |
| Scheduled Procedure Step Sequence | (0008,0005) | R | |
| > Scheduled Station AE Title | (0040,0100) | R | Single value or Null |
| > Scheduled Procedure Step Start Date | (0040,0001) | R | Today Today-Null |
| > Scheduled Procedure Step Start Time | (0040,0002) | R | This Time This Time-Null |
| >Modality | (0008,0060) | R | Single value or Null |
| >Scheduled Performing Physician Name | (0040,0006) | R | Single value or Null |
| Patient Identification | | | |
| Patient's Name | (0010,0010) | R | Single value-Null |
| Patient's ID | (0010,0020) | R | Single value-Null |

Table 5: Scheduled Procedure Step and Patient Identification Search keys

Return Key Attributes of the Worklist C-FIND

The RADVIEW DICOM worklist SCU supports worklist queries with return key attributes of all types. The following tables describe the return keys that the SCU support

| Attribute name | Tag | Return Key Type | Displayed in User Interface |
|---------------------------------------|-------------|-----------------|-----------------------------|
| Sop Common | | | |
| Specific Character Set | (0008,0005) | IC | |
| Scheduled Procedure Step | | | |
| Scheduled Procedure Step Sequence | (0008,0005) | 1 | - |
| > Scheduled Station AE Title | (0040,0100) | 1 | Yes |
| > Scheduled procedure Step Start Date | (0040,0001) | 1 | Yes |
| > Scheduled procedure Step Start Time | (0040,0002) | 1 | Yes |
| >Modality | (0008,0060) | 1 | Yes |
| >Scheduled Performing Physician | (0040,0006) | 2 | Yes |

| | | | |
|--|-------------|----|-----|
| Name | | | |
| >Scheduled Procedure Step Description | (0040,0007) | 1C | Yes |
| >Scheduled Station Name | (0040,0010) | 2 | Yes |
| >Scheduled Procedure Step Location | (0040,0011) | 2 | Yes |
| >Pre-Medication | (0040,0012) | 2C | Yes |
| >Scheduled Procedure Step ID | (0040,0009) | 1 | Yes |
| Requested Procedure ID | | | |
| Requested Procedure ID | (0040,1001) | 1 | Yes |
| Requested Procedure Description | (0032,1060) | 1C | Yes |
| Study Instance UID | (0020,000D) | 1 | Yes |
| Requested Procedure Priority | (0040,1003) | 2 | Yes |
| Patient Transport Arrangement | (0040,1004) | 2 | Yes |
| Imaging Service Request | | | |
| Accession Number | (0008,0050) | 2 | Yes |
| Requesting Physician | (0032,1032) | 2 | Yes |
| Referring Physician's Name | (0008,0090) | 2 | Yes |
| Visit Identification | | | |
| Admission ID | (0038,0010) | 2 | Yes |
| Visit Status | | | |
| Current Patient Location | (0038,0300) | 2 | Yes |
| Patient Identification | | | |
| Patient's Name | (0010,0010) | 1 | Yes |
| Patient's ID | (0010,0020) | 1 | Yes |
| Patient Demographic | | | |
| Patient's Birth Date | (0010,0030) | 2 | Yes |
| Patient's Sex | (0010,0040) | 2 | Yes |
| Patient's Weight | (0010,1030) | 2 | Yes |
| Confidentiality Constraint on Patient Data | (0040,3001) | 2 | Yes |
| Patient Medical | | | |
| Patient State | (0038,0500) | 2 | Yes |
| Pregnancy Status | (0010,21C0) | 2 | Yes |
| Medical Alerts | (0010,2000) | 2 | Yes |
| Contrast Allergies | (0010,2100) | 2 | Yes |
| Special Needs | (0038,0050) | 2 | Yes |

Table 6: Scheduled Procedure Step, Patient Identification, Imaging Service Request, Patient Demographics, Visit Status, Visit Identification Return keys

The worklist SCU interpret the following status codes:

- **Success (0000):** Success.
- **Refused (A702):** Unable to perform sub operation (due to failure of a C-STORE).
- **Refused (A802):** Move destination unknown.

- **Refused (A700):** General refusal status.
- **Warning (B000):** General warning status.
- **Failure (C000):** General failure status.

3.4 Query/Retrieve AE Specification

The Query/Retrieve SCU request that the remote SCP perform a match of all keys specified in the request, against the information in its database and the identified images will be moved or retrieved to the same or a different storage association.

The Query/Retrieve SCP responds to queries based on the records based on its database and images will be sent to the requesting SCU or to a different storage destination.

MiPACS DICOM application provides Standard Conformance to the following DICOM V3.0 SOP Classes as SCU:

| SOP Class Name | SOP Class UID |
|--|-----------------------------|
| Patient Root Query/Retrieve Information Model – FIND | 1.2.840.10008.5.1.4.1.2.1.1 |
| Patient Root Query/Retrieve Information Model – MOVE | 1.2.840.10008.5.1.4.1.2.1.2 |
| Patient Root Query/Retrieve Information Model – GET | 1.2.840.10008.5.1.4.1.2.1.3 |
| 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 |
| Patient/Study Only Query/Retrieve Information Model – FIND | 1.2.840.10008.5.1.4.1.2.3.1 |
| Patient/Study Only Query/Retrieve Information Model – MOVE | 1.2.840.10008.5.1.4.1.2.3.2 |
| Patient/Study Only Query/Retrieve Information Model – GET | 1.2.840.10008.5.1.4.1.2.3.3 |

Table 7: SOP Classes for Query/Retrieve

3.4.1 Association Establishment Policies

3.4.1.1 General

The configuration of the RADVIEW DICOM Query/Retrieve application defines the Application Entity Titles, the port numbers and of course the host name and net address.

3.4.1.2 Number of Associations

The RADVIEW DICOM application initiates several associations at a time, one for each Query/Retrieve request being processed.

3.4.1.3 Asynchronous Nature

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

3.4.2 Association Initiation Policy

The Query/Retrieve SCU and SCP establish an association by using the DICOM association services. During association establishment the Query/Retrieve application entities negotiate the supported SOP classes to exchange the capabilities of the SCU and the SCP.

The following DIMSE-C operations are supported as SCU:

- C-FIND Service operation.
- C-MOVE Service operation.

3.4.2.1 Real World Activity - Find SCU

3.4.2.1.1 Associated Real-World Activity - Find SCU

The associated Real-World activity is to initiate query request to an SCP with the query model Patient Root or Study Root or Patient/Study Only.

3.4.2.1.2 Proposed Presentation Contexts - Find SCU

| Presentation Context Table | | | | | |
|--|-----------------------------|---------------------------|---------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID | | |
| Patient Root Query/Retrieve Information Model – FIND | 1.2.840.10008.5.1.4.1.2.1.1 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | Not supported |
| Study Root Query/Retrieve Information Model- FIND | 1.2.840.10008.5.1.4.1.2.2.1 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | Not supported |
| Patient/Study Only Query/Retrieve Information Model - FIND | 1.2.840.10008.5.1.4.1.2.3.1 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | Not supported |

Table 8: Initializing Presentation Contexts Query

3.4.2.1.3 SOP Specific Conformance Statement - Find SCU

The RADVIEW DICOM Query/Retrieve SCU supports hierarchical queries with all mandatory and required search keys. The following tables describe the search keys for the different query models that the RADVIEW Query application supports as an SCU:

| Attribute name | Tag | Type | Matching | User Input | Return Value Displayed |
|----------------------|-------------|--|------------------|-------------|------------------------|
| Patient Level | | | | | |
| Patient Name | (0010,0010) | R | Wild Char | Enter Value | yes |
| Patient ID | (0010,0020) | U-Patient Root R–Study Root U-Patient/Study Only | Wild Char | Enter Value | yes |
| Patient's Birth Date | (0010,0030) | O | universal (NULL) | - | yes |
| Patient's Sex | (0010,0040) | O | Single value | Enter Value | yes |
| Study Level | | | | | |
| Study Instance UID | (0020,000D) | U | Single value | Enter Value | yes |
| Study ID | (0020,0010) | R | Single value | Enter Value | yes |

| | | | | | |
|---------------------|-------------|---|-------------------------------|-------------|-----|
| Study Date | (0008,0020) | R | Single value-Range value-Null | Enter Value | yes |
| Study Time | (0008,0030) | R | Single value-Range value-Null | Enter Value | yes |
| Accession Number | (0008,0050) | R | Single value | Enter Value | yes |
| Series Level | | | | | |
| Series Instance UID | (0020,000E) | U | Single value | Enter Value | yes |
| Series Number | (0020,0011) | R | Single value | Enter Value | yes |
| Modality | (0008,0060) | R | Single value | Enter Value | yes |
| Image Level | | | | | |
| SOP Instance UID | (0008,0018) | U | Single value | Enter Value | yes |
| Image Number | (0020,0013) | R | Single value | Enter Value | yes |

Table 9: Patient root and Study root query attributes

The Find SCU can decode the following responses:

- **Success (0000):** Success.
- **Refused (A700):** Failed Out of Resources.
- **Refused (A900):** Identifier does not match sop class.
- **Cancel (FE00):** Terminating due to Cancel Request.
- **Pending (FF00):** Pending Request.

3.4.2.2 Real World Activity - Move SCU

3.4.2.2.1 Associated Real-World Activity - Move SCU

The associated Real-World activity is to initiate query request to an SCP with the query model Patient Root or Study Root or Patient/Study Only.

3.4.2.2.2 Proposed Presentation Contexts - Move SCU

| Presentation Context Table | | | | | |
|--|-----------------------------|---------------------------|---------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID | | |
| Patient Root Query/Retrieve Information Model – MOVE | 1.2.840.10008.5.1.4.1.2.1.2 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | Not supported |
| Study Root Query/Retrieve Information Model- MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | Not supported |
| Patient/Study Only Query/Retrieve Information Model - MOVE | 1.2.840.10008.5.1.4.1.2.3.2 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | Not supported |

Table 10: Initializing Presentation Contexts Retrieve

3.4.2.2.3 SOP Specific Conformance Statement - Move SCU

At association establishment time the C-MOVE presentation context shall be negotiated. The C-STORE sub-operations must be done on a different association to transfer images to another SCP of the Storage Service Class.

| Attribute name | Tag | Type | Matching | User Input | Return Value Displayed |
|----------------------|-------------|--|------------------------|-------------|------------------------|
| Patient Level | | | | | |
| Patient Name | (0010,0010) | R | Universal | Enter Value | Yes |
| Patient ID | (0010,0020) | U-Patient Root R–Study Root U-Patient/Study Only | Wild Char-Single value | Enter Value | Yes |
| Patient's Birth date | (0010,0030) | O | Universal (NULL) | - | Yes |
| Patient's Sex | (0010,0040) | O | Universal | - | Yes |

| Study Level | | | | | |
|---------------------|-------------|---|---|-------------|-----|
| Study Instance UID | (0020,000D) | U | Single value | Enter Value | Yes |
| Study ID | (0020,0010) | R | Universal | Enter Value | Yes |
| Study Date | (0008,0020) | R | Single value -Range Value- Universal | Enter Value | Yes |
| Study Time | (0008,0030) | R | Single value -Range Value- Universal | Enter Value | Yes |
| Accession Number | (0008,0050) | R | Universal | Enter Value | Yes |
| Series Level | | | | | |
| Series Instance UID | (0020,000E) | U | Single Value | Enter Value | Yes |
| Series Number | (0020,0011) | R | Universal | Enter Value | Yes |
| Modality | (0008,0060) | R | Universal | Enter Value | Yes |
| Image Level | | | | | |
| SOP Instance UID | (0008,0018) | U | Single value | Enter Value | Yes |
| Image Number | (0020,0013) | R | Universal | Enter Value | Yes |

Table 11: Patient root and Study root query/retrieve attributes

The Move SCU can decode the following responses:

- **Success (0000):** Success.
- **Refused (A701):** Unable to count no of match.
- **Refused (A702):** Unable to perform sub operation.
- **Refused (A802):** Move destination unknown.
- **Cancel (FE00):** Terminating due to Cancel Request.
- **Warning (B000):** General warning status.
- **Failure (C000):** General failure status.
- **Pending (FF00):** Sub-operations are Continue.

4. Communication Profile

4.1 Supported Communication Stacks

The RADVIEW DICOM applications provide DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.1.1 OSI Stack

Not Supported.

4.1.2 TCP/IP Stack

The RADVIEW DICOM application uses the TCP/IP stack from the Windows NT system upon which it executes.

4.1.2.1 API

The RADVIEW DICOM application is based on a TCP/IP socket interface.

4.1.2.2 Physical Media Support

The RADVIEW DICOM application is indifferent to the physical medium over which TCP/IP executes; it inherits this from the Windows NT system upon which it executes. Supported physical media includes:

- IEEE 802.3-1995(Fast Ethernet) 100BASE-TX.
- IEEE 802.3-1995 10BASE-TX.

4.1.3 Point-to-Point Stack

Not Supported.

5. Configuration

5.1 AE Title / Presentation Address Mapping

To ensure unique identification the hostname should be part of the AE Titles (e.g. Mi_myhost).

The string can be up to 16 characters long and must not contain any extended characters, only 7 bit ASCII characters (excluding control characters) are allowed according to DICOM standard.

Local AE Titles and Presentation Addresses

The local AETs can be configured using the Service application.

The following AETs can be entered:

- One common AET for Storage AE, Query/Retrieve and Basic Worklist AE SCU.

Storage and Query/Retrieve SCP listen on port 104.

Storage, Query/Retrieve and Worklist SCU use port 106.

Remote AE Titles and Presentation Addresses

For remote AETs, host names, IP addresses and port numbers can be configured using the Service application. For each AET a list of supported services can also be configured.

5.2 Configurable Parameters

5.2.1 Storage

The Service application can be used to set the AETs, port numbers, host names, IP addresses and capabilities for the remote nodes' (SCP's). The user can select operator and compression types for each SCP separately.

5.2.2 Time out Parameters

The Service application can be used to set all the following time out constants to a certain value depending on user input

- Time-out for accepting/rejecting an association request.
- Time-out for responding to an association open/close request.
- Time-out for accepting a message over network.
- Time-out for waiting for data between TCP/IP-packets.
- Time-out for waiting for receiving request\response for Storage, Query/Retrieve and Basic Worklist SCP/SCU.

5.3 Default Parameters

- maximal PDU size is set to 16384 Bytes