

## Technical Publications



# **DICOM Conformance Statements for Vision Tools Workspace**

**Storage, Query/Retrieve and Basic Worklist**

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Vision Tools User Guide. ©

## Document Information

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## 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 MillenSys 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 MillenSys 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 a 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

|                  |                                                                                             |
|------------------|---------------------------------------------------------------------------------------------|
| ▪ <b>ACC</b>     | <b>A</b> merican <b>C</b> ollege of <b>C</b> ardiology                                      |
| ▪ <b>ACR</b>     | <b>A</b> merican <b>C</b> ollege of <b>R</b> adiology                                       |
| ▪ <b>ASCII</b>   | <b>A</b> merican <b>S</b> tandard <b>C</b> ode for <b>I</b> nformation <b>I</b> nterchanges |
| ▪ <b>AE</b>      | <b>A</b> pplication <b>E</b> ntity                                                          |
| ▪ <b>ANSI</b>    | <b>A</b> merican <b>N</b> ational <b>S</b> tandards <b>I</b> nstitute                       |
| ▪ <b>DICOM</b>   | <b>D</b> igital <b>I</b> maging and <b>C</b> ommunication in <b>M</b> edicine               |
| ▪ <b>DIMSE</b>   | <b>DICOM</b> <b>M</b> essage <b>S</b> ervice <b>E</b> lement                                |
| ▪ <b>DIMSE-C</b> | <b>DICOM</b> <b>M</b> essage <b>S</b> ervice <b>E</b> lement - <b>C</b> omposite            |
| ▪ <b>DIMSE-N</b> | <b>DICOM</b> <b>M</b> essage <b>S</b> ervice <b>E</b> lement - <b>N</b> ormalized           |
| ▪ <b>HIS</b>     | <b>H</b> ospital <b>I</b> nformation <b>S</b> ystem                                         |
| ▪ <b>HL7</b>     | <b>H</b> ealth <b>L</b> evel <b>7</b>                                                       |
| ▪ <b>IE</b>      | <b>I</b> nformation <b>E</b> ntity                                                          |
| ▪ <b>IOD</b>     | <b>I</b> nformation <b>O</b> bject <b>D</b> efinition                                       |
| ▪ <b>ISO</b>     | <b>I</b> nternational <b>S</b> tandard <b>O</b> rganization                                 |
| ▪ <b>NEMA</b>    | <b>N</b> ational <b>E</b> lectric <b>M</b> anufacturers <b>A</b> ssociation                 |
| ▪ <b>PDU</b>     | <b>P</b> rotocol <b>D</b> ata <b>U</b> nit                                                  |
| ▪ <b>RIS</b>     | <b>R</b> adiology <b>I</b> nformation <b>S</b> ystem                                        |
| ▪ <b>SCP</b>     | <b>S</b> ervice <b>C</b> lass <b>P</b> rovider                                              |
| ▪ <b>SCU</b>     | <b>S</b> ervice <b>C</b> lass <b>U</b> ser                                                  |
| ▪ <b>SOP</b>     | <b>S</b> ervice <b>O</b> bject <b>P</b> air                                                 |
| ▪ <b>TCP/IP</b>  | <b>T</b> ransmission <b>C</b> ontrol <b>P</b> rotocol/ <b>I</b> nternet <b>P</b> rotocol    |
| ▪ <b>UID</b>     | <b>U</b> nique <b>I</b> dentifier                                                           |

## 2. Implementation Model

The MillenSys Vision Tools Workspace PACS Server is PC Windows based software program used to work with MillenSys Vision Tools Products.

Vision Tools Workspace PACS Server Store SCP is designed to receive images from remote devices, using DICOM C-Store, maintaining the saving of these images in a local database which contains the whole demographic patient data as well as the study, series and image important information.

Vision Tools Workspace PACS Server 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.

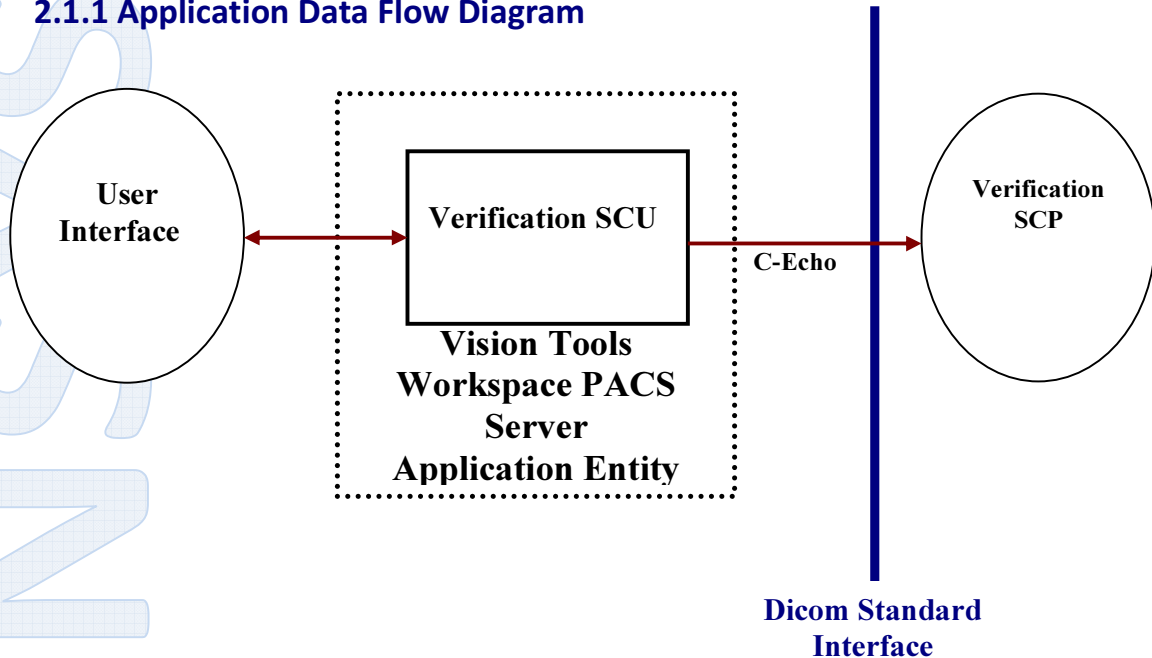
Vision Tools Workspace PACS Server Query/Retrieve SCP could perform the Query/Retrieve Service (Find/Move) with the remote AE, using DICOM C-Find/C-Move; it accepts the Query requests and generates the Response by using of the local database. The response is send to the requesting AE.

Vision Tools Workspace PACS Server Query/Retrieve SCU could find and Retrieve images from remote AE SCP, using DICOM C-Find/C-Move; the user could define the matching critical and remote AE which is predefined in the DICOM connecting remote AEs.

Vision Tools Workspace PACS Server 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



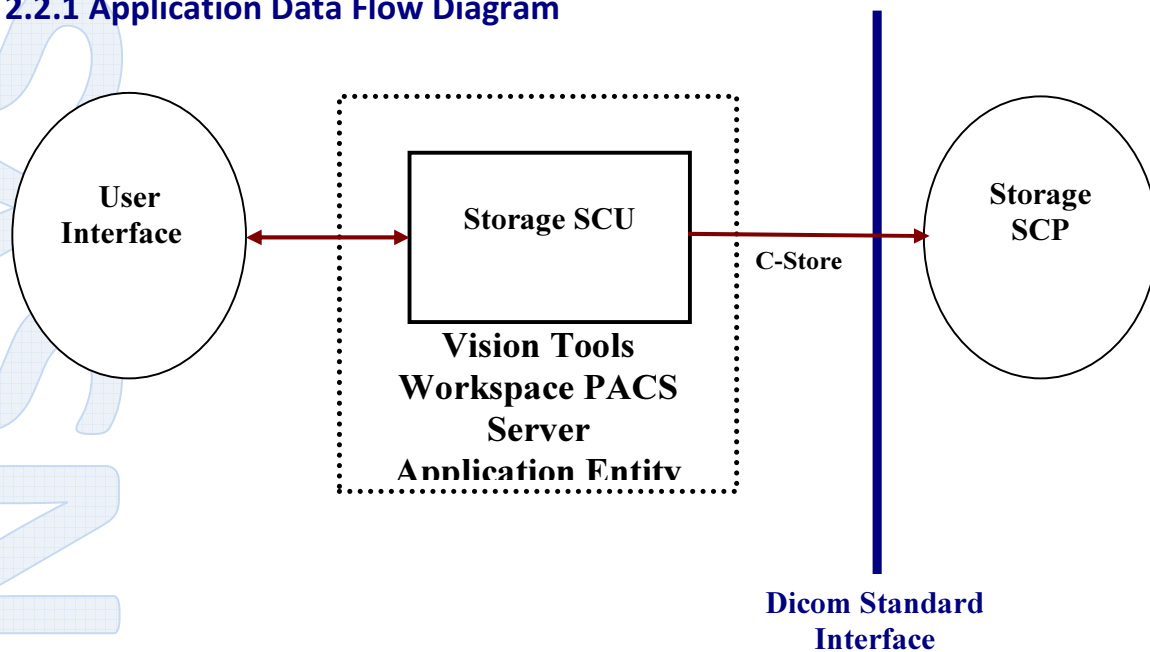
**Figure 1: Application data flow diagram of verification SCU**

### 2.1.2 Functional Definitions of AE's

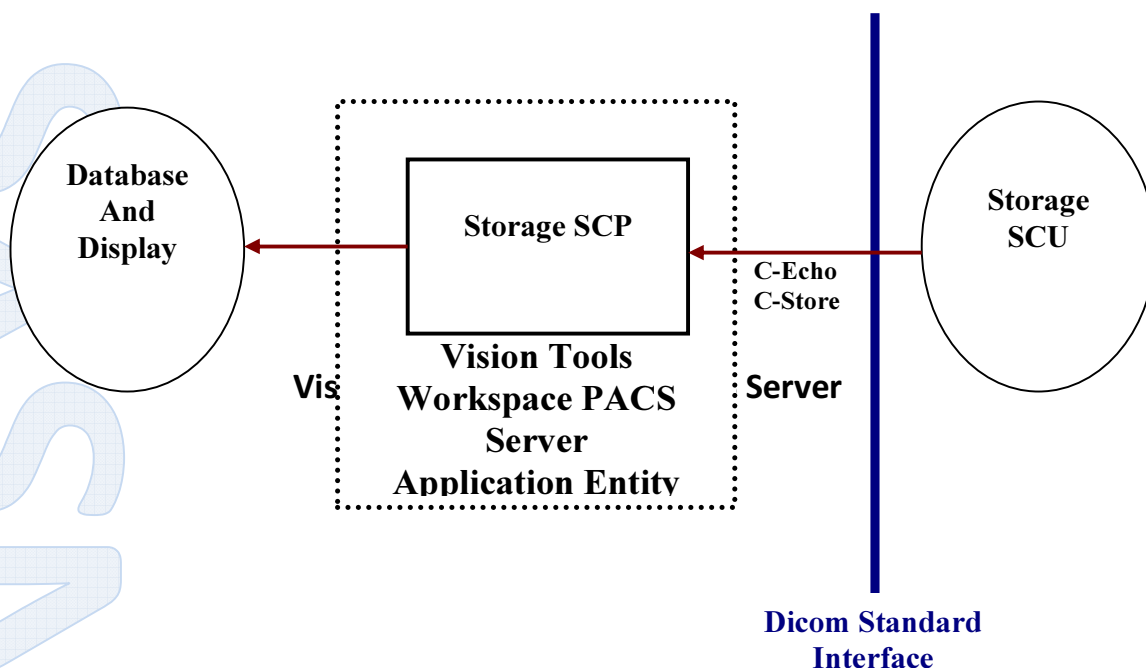
The Echo function provides an easy way to determine if the remote AE is available. When C-Echo Function is used, an association which includes a Presentation Context for Verification Class is proposed. A successful response indicates that the remote AE is available. The association is immediately closed.

## 2.2 Storage

### 2.2.1 Application Data Flow Diagram



**Figure 2: Application data flow diagram of Storage SCU**



**Figure 3: Application data flow diagram of Storage SCP**

## 2.2.2 Functional Definitions of AE's

### 2.2.2.1 Storage SCP

Vision Tools Workspace PACS Server C-Store SCP (image receiving software) waits for another application to connect at the presentation address configured for its Application Entity Title. The application that connects must be a DICOM application. Associations are accepted with Presentation Contexts for SOP Classes of the Storage Service Class, or the Verification Service Class. It will receive images on the Storage Service Class Presentation Contexts and insert image information into local database. Images which are sent could be saved normally as they were sent or they could be compressed first, this is an option which the administrator could change per modality (AE) from settings.

### 2.2.2.2 Storage SCU

When using Vision Tools Workspace PACS Server 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 Query and Retrieve

### 2.3.1 Application Data Flow Diagram

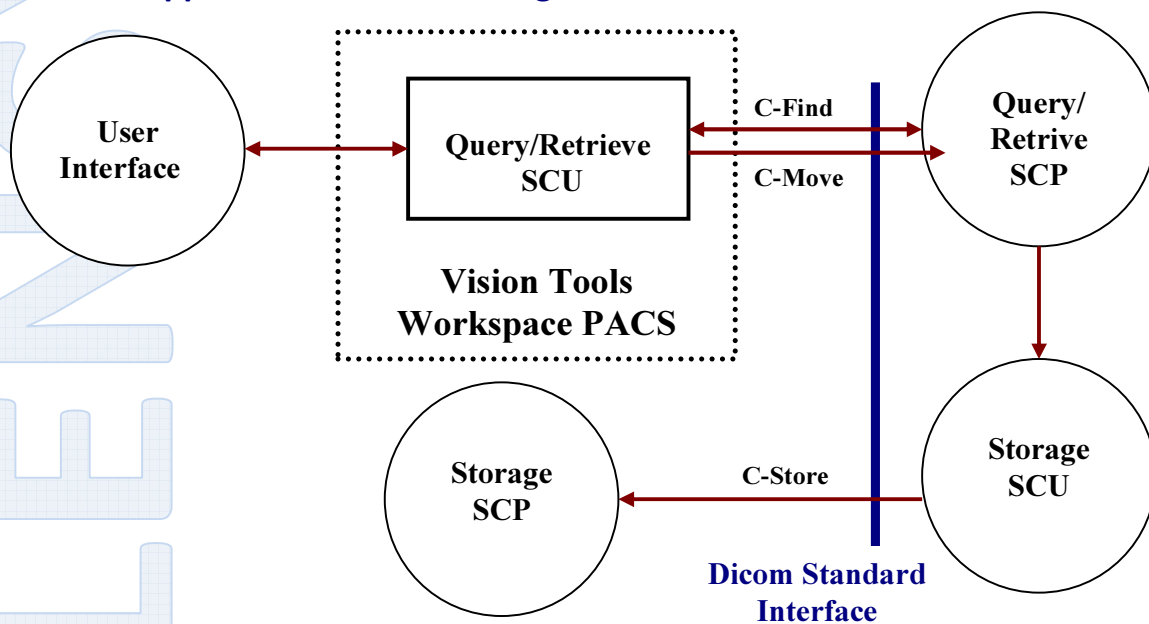
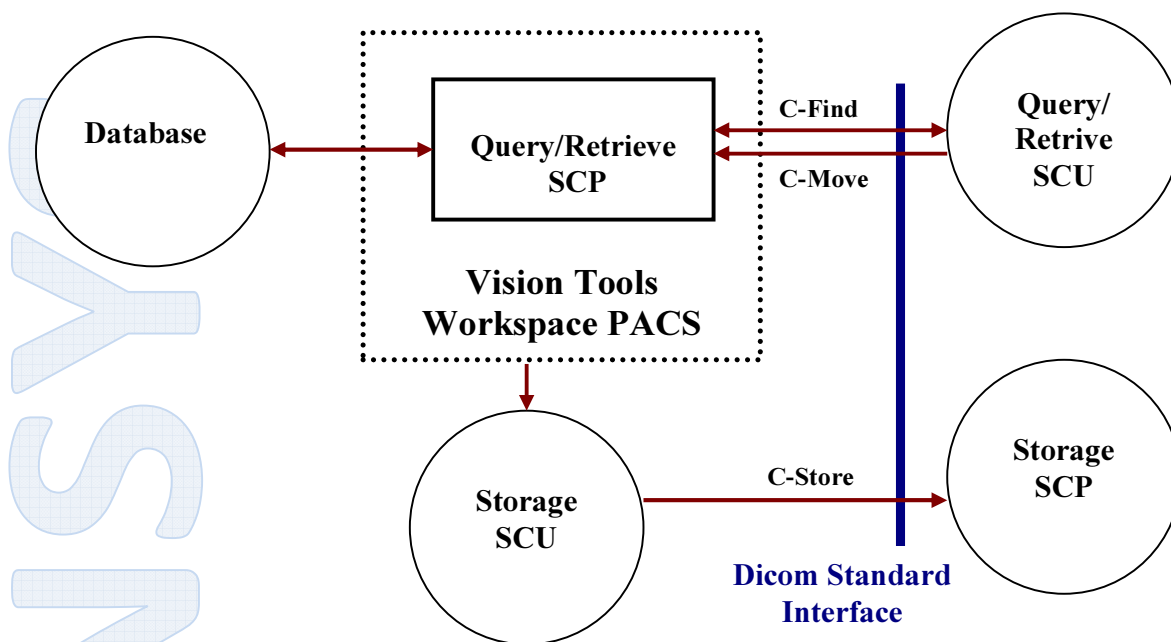


Figure 4: Application data flow diagram of Query/Retrieve SCU



**Figure 5: Application data flow diagram of Query/Retrieve SCP**

## **2.3.2 Functional Definitions of AE's**

### **2.3.2.1 Query/Retrieve SCP**

Vision Tools Workspace PACS Server C-Find/C-Move SCP waits for another application to connect at the presentation address configured for its Application Entity Title. The application that connects must be a DICOM application. Associations are accepted with Presentation Contexts for SOP Classes of the Query/Retrieve Service Class, or the Verification Service Class. As a result of the Find or Move request sent by Remote AE the Vision Tools Workspace PACS Server Query/Retrieve SCP will search the database for the received matching criteria, and generates a response to the requesting AE. If request is C-Move Request a new association is created with the moving Destination with all the supported Storage Service Class, Files is then sent to this destination, association is closed directly after files sending.

### **2.3.2.2 Query/Retrieve SCU**

When using Vision Tools Workspace PACS Server 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.

## 2.4 Basic Worklist

### 2.4.1 Application Data Flow Diagram

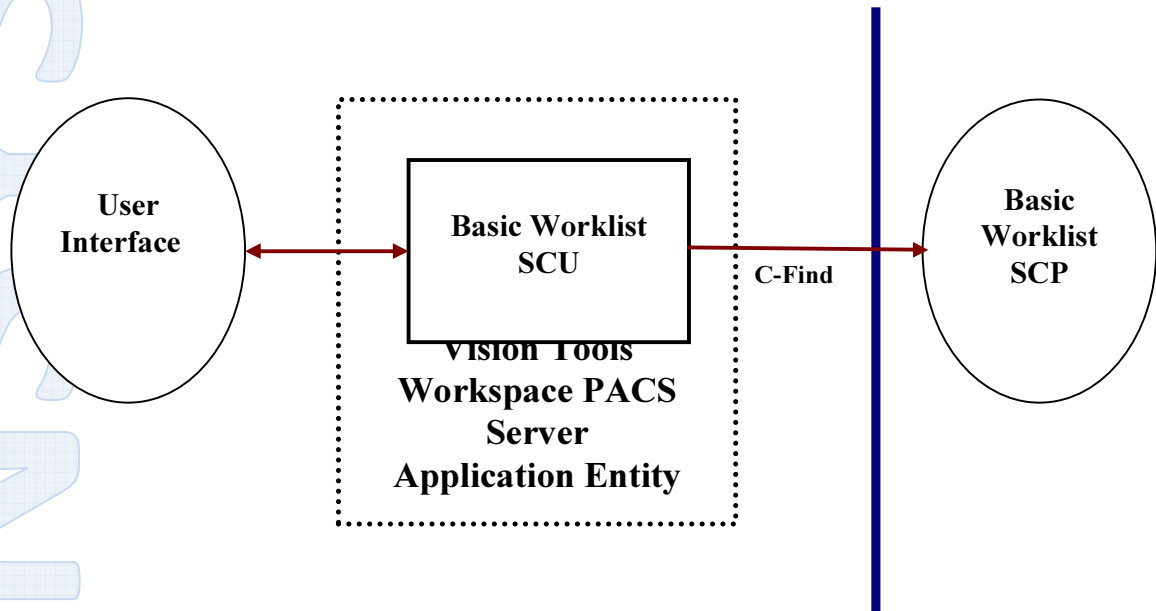


Figure 6: Application data flow diagram of Basic Worklist SCU  
 Dicom Standard Interface

### 2.4.2 Functional Definitions of AE's

Vision Tools Workspace PACS Server 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.

## 3. AE Specifications

### 3.1 AE Verification Specification

#### 3.1.1 Association Initiation by Real-World Activity

The Vision Tools Workspace PACS Server 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 Vision Tools Workspace PACS Server DICOM application will propose Presentation Contexts as shown in the following table:

| <b>Presentation Context Table</b> |                   |                           |                   |             |                             |
|-----------------------------------|-------------------|---------------------------|-------------------|-------------|-----------------------------|
| <b>Abstract Syntax</b>            |                   | <b>Transfer Syntax</b>    |                   | <b>Role</b> | <b>Extended Negotiation</b> |
| <b>Name</b>                       | <b>UID</b>        | <b>Name List</b>          | <b>UID</b>        |             |                             |
| 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 Vision Tools Workspace PACS Server 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 Vision Tools Workspace PACS Server DICOM application initiates several associations at a time, one for each transfer request being processed.

#### 3.2.1.3 Asynchronous Nature

The Vision Tools Workspace PACS Server DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

#### 3.2.1.4 Implementation Identifying Information

The Vision Tools Workspace PACS Server DICOM software provides a single Implementation Class UID of

- <">

and an Implementation Version Name of

- <"Vision Tools Workspace PACS Server\_Ver2.0">.

### 3.2.2 Association Initialized by Real World

The Vision Tools Workspace PACS Server 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 Vision Tools Workspace PACS Server 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 Vision Tools Workspace PACS Server 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<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |
| CT Image storage Service Class               | 1.2.840.10008.5.1.4.1.1.2    | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |
| MR Image storage Service Class               | 1.2.840.10008.5.1.4.1.1.4    | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |
| US Multi - Frame Image storage Service Class | 1.2.840.10008.5.1.4.1.1.3.1  | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |
| US Image Storage Service Class               | 1.2.840.10008.5.1.4.1.1.6.1  | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |
| NM Image storage Service Class               | 1.2.840.10008.5.1.4.1.1.20   | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |
| XA Image storage Service Class               | 1.2.840.10008.5.1.4.1.1.12.1 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |
| XRF Image storage Service Class              | 1.2.840.10008.5.1.4.1.1.12.2 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |

|                                              |                                                                                                                                                                                                    |                                                                                  |                                                                 |     |      |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------|-----|------|
| PET Image storage Service Class              | 1.2.840.10008.5.1.4.1.1.128                                                                                                                                                                        | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU | None |
| Standalone PET curve storage Service Class   | 1.2.840.10008.5.1.4.1.1.129                                                                                                                                                                        | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU | None |
| RT storage Service Classes                   | 1.2.840.10008.5.1.4.1.1.481.1<br>1.2.840.10008.5.1.4.1.1.481.3<br>1.2.840.10008.5.1.4.1.1.481.4<br>1.2.840.10008.5.1.4.1.1.481.5<br>1.2.840.10008.5.1.4.1.1.481.6<br>1.2.840.10008.5.1.4.1.1.481.7 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU | None |
| VL Storage Service Classes                   | 1.2.840.10008.5.1.4.1.1.77.1.1<br>1.2.840.10008.5.1.4.1.1.77.1.2<br>1.2.840.10008.5.1.4.1.1.77.1.3<br>1.2.840.10008.5.1.4.1.1.77.1.4                                                               | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU | None |
| SC Image storage Service Class               | 1.2.840.10008.5.1.4.1.1.7                                                                                                                                                                          | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU | None |
| WAVE-FORM Storage Service Classes            | 1.2.840.10008.5.1.4.1.1.9.1<br>1.2.840.10008.5.1.4.1.1.9.1.1<br>1.2.840.10008.5.1.4.1.1.9.1.3<br>1.2.840.10008.5.1.4.1.1.9.2.1<br>1.2.840.10008.5.1.4.1.1.9.3.1<br>1.2.840.10008.5.1.4.1.1.9.4.1   | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU | None |
| DX Image Storage Service Classes             | 1.2.840.10008.5.1.4.1.1.1.1<br>1.2.840.10008.5.1.4.1.1.1.1.1                                                                                                                                       | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU | None |
| DX Mammography Image Storage Service Classes | 1.2.840.1001.2.840.10008.5.1.4.1.1.2.108.5.1.4.1.1.1.2                                                                                                                                             | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU | None |
| Verification                                 | 1.2.840.10008.1.1                                                                                                                                                                                  | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU | None |

**Table 3: Initializing Presentation Contexts Storage**

### 3.2.3 Association Acceptance Policy

The Vision Tools Workspace PACS Server DICOM application attempts to accept a new association for

- DIMSE C-ECHO Service operations.
- DIMSE C-STORE Service operations.

#### 3.2.3.1 Real-World Activity - Storage SCP

##### 3.2.3.1.1 Associated Real-World Activity - Storage SCP

The Vision Tools Workspace PACS Server receiving process will accept an association and will receive any images transmitted on that association and will store the images on disk in the local database.

##### 3.2.3.1.2 Proposed Presentation Contexts - Storage SCP

The Vision Tools Workspace PACS Server 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<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP  | None                 |
| CT Image storage Service Class               | 1.2.840.10008.5.1.4.1.1.2   | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP  | None                 |
| MR Image storage Service Class               | 1.2.840.10008.5.1.4.1.1.4   | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP  | None                 |
| US Multi - Frame Image storage Service Class | 1.2.840.10008.5.1.4.1.1.3.1 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP  | None                 |

|                                            |                                                                                                                                                                                                    |                                                                                  |                                                                 |     |      |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------|-----|------|
| US Image Storage Service Class             | 1.2.840.10008.5.1.4.1.1.6.1                                                                                                                                                                        | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP | None |
| NM Image storage Service Class             | 1.2.840.10008.5.1.4.1.1.20                                                                                                                                                                         | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP | None |
| XA Image storage Service Class             | 1.2.840.10008.5.1.4.1.1.12.1                                                                                                                                                                       | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP | None |
| XRF Image storage Service Class            | 1.2.840.10008.5.1.4.1.1.12.2                                                                                                                                                                       | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP | None |
| PET Image storage Service Class            | 1.2.840.10008.5.1.4.1.1.128                                                                                                                                                                        | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP | None |
| Standalone PET curve storage Service Class | 1.2.840.10008.5.1.4.1.1.129                                                                                                                                                                        | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP | None |
| RT storage Service Classes                 | 1.2.840.10008.5.1.4.1.1.481.1<br>1.2.840.10008.5.1.4.1.1.481.3<br>1.2.840.10008.5.1.4.1.1.481.4<br>1.2.840.10008.5.1.4.1.1.481.5<br>1.2.840.10008.5.1.4.1.1.481.6<br>1.2.840.10008.5.1.4.1.1.481.7 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP | None |
| VL Storage Service Classes                 | 1.2.840.10008.5.1.4.1.1.77.1.1<br>1.2.840.10008.5.1.4.1.1.77.1.2<br>1.2.840.10008.5.1.4.1.1.77.1.3<br>1.2.840.10008.5.1.4.1.1.77.1.4                                                               | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP | None |
| SC Image storage Service Class             | 1.2.840.10008.5.1.4.1.1.7                                                                                                                                                                          | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP | None |
| WAVE-FORM Storage Service Classes          | 1.2.840.10008.5.1.4.1.1.9.1<br>1.2.840.10008.5.1.4.1.1.9.1.1<br>1.2.840.10008.5.1.4.1.1.9.1.3<br>1.2.840.10008.5.1.4.1.1.9.2.1<br>1.2.840.10008.5.1.4.1.1.9.3.1<br>1.2.840.10008.5.1.4.1.1.9.4.1   | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP | None |
| DX Image Storage Service Classes           | 1.2.840.10008.5.1.4.1.1.1.1<br>1.2.840.10008.5.1.4.1.1.1.1.1                                                                                                                                       | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP | None |
| DX Mammography Image                       | 1.2.840.1001.2.840.10008.5.1.4.1.1.2.108.5.1.4.1.1.1.2                                                                                                                                             | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP | None |

| Storage Service Classes |                   |                                                                                  |                                                                 |     |      |
|-------------------------|-------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------|-----|------|
| Verification            | 1.2.840.10008.1.1 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP | None |

**Table 4: Accepting Presentation Contexts Storage**

### 3.2.3.1.3 SOP Specific Conformance Statement - Storage SCP

The DICOM receiver returns the status

- **Success** (0000): upon successful operation
- **Refused** (A700): This error status indicates a lack of Resources (e.g. not enough disk space) on the <xxx> modality.
- **Error** (A900 or C000): An error occurred while processing the image which makes it impossible to proceed. The Image will not be stored and the association aborted.

If an image with the same SOP Instance UID (as that image being received) is already present in the database then the received image will be ignored. So if a remote node sends twice the same image (same SOP Instance UID) then there will still be only one image (the first) in the database of the DICOM receiver.

### 3.2.3.1.4 Presentation Context Acceptance Criterion - Storage SCP

The Vision Tools Workspace PACS Server DICOM application will accept any number of verification or storage SOP classes that are listed above. There is no limit on the number of presentation contexts accepted except for the DICOM limit. In the event that the Vision Tools Workspace PACS Server DICOM application runs out of resources, it will reject the association request.

### 3.2.3.1.5 Transfer Syntax Selection Policies - Storage SCP

The Vision Tools Workspace PACS Server DICOM application supports

- The Implicit VR Little Endian.
- The Explicit VR Little Endian.
- Explicit VR Big Endian.

Any proposed presentation context which includes one of these transfer syntaxes will be accepted. Any proposed presentation context that does not include one of these transfer syntaxes will be rejected.

## 3.3 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 send to the requesting SCU or to a different storage destination.

Vision Tools Workspace PACS Server DICOM application provides Standard Conformance to the following DICOM V3.0 SOP Classes as SCU and SCP:

| 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 5: SOP Classes for Query/Retrieve**

### 3.3.1 Association Establishment Policies

#### 3.3.1.1 General

The configuration of the Vision Tools Workspace PACS Server DICOM Query/Retrieve 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 Vision Tools Workspace PACS Server DICOM application initiates several association at a time, one for each Query/Retrieve request being processed.

### 3.3.1.3 Asynchronous Nature

The Vision Tools Workspace PACS Server DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

## 3.3.2 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.

### 3.3.2.1 Real World Activity - Find SCU

#### 3.3.2.1.1 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.

#### 3.3.2.1.2 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<br>Query/Retrieve<br>Information<br>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 6: Initializing Presentation Contexts Query**

### 3.3.2.1.3 SOP Specific Conformance Statement - Find SCU

The Vision Tools Workspace PACS Server 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 Vision Tools Workspace PACS Server Query application supports as an SCU:

| Attribute name       | Tag         | Type                                                   | Matching                         | User Input  | Return Value Displayed |
|----------------------|-------------|--------------------------------------------------------|----------------------------------|-------------|------------------------|
| <b>Patient Level</b> |             |                                                        |                                  |             |                        |
| Patient Name         | (0010,0010) | R                                                      | Wild Char                        | Enter Value | yes                    |
| Patient ID           | (0010,0020) | U-Patient Root<br>R-Study Root<br>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                    |
| <b>Study Level</b>   |             |                                                        |                                  |             |                        |
| 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<br>value-Null | Enter Value | yes                    |
| Study Time           | (0008,0030) | R                                                      | Single value-Range<br>value-Null | Enter Value | yes                    |
| Accession Number     | (0008,0050) | R                                                      | Single value                     | Enter Value | yes                    |
| <b>Series Level</b>  |             |                                                        |                                  |             |                        |
| 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 |
| <b>Image Level</b> |             |   |              |             |     |
| SOP Instance UID   | (0008,0018) | U | Single value | Enter Value | yes |
| Image Number       | (0020,0013) | R | Single value | Enter Value | yes |

**Table 7: Patient root and Study root query attributes**

The Find SCU can decode the following responses:

- **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.

### 3.3.2.2 Real World Activity - Move SCU

#### 3.3.2.2.1 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.

#### 3.3.2.1.2 Proposed Presentation Contexts - Move SCU

| <b>Presentation Context Table</b>                           |                             |                           |                     |             |                             |
|-------------------------------------------------------------|-----------------------------|---------------------------|---------------------|-------------|-----------------------------|
| <b>Abstract Syntax</b>                                      |                             | <b>Transfer Syntax</b>    |                     | <b>Role</b> | <b>Extended Negotiation</b> |
| <b>Name</b>                                                 | <b>UID</b>                  | <b>Name List</b>          | <b>UID</b>          |             |                             |
| <b>Patient Root Query/Retrieve Information Model – MOVE</b> | 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               |
| <b>Study Root Query/Retrieve Information Model- MOVE</b>    | 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               |
| <b>Patient/Study Only Query/Retrieve Information</b>        | 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               |

|              |  |  |  |  |  |
|--------------|--|--|--|--|--|
| Model - MOVE |  |  |  |  |  |
|--------------|--|--|--|--|--|

**Table 8: Initializing Presentation Contexts Retrieve**

### 3.3.2.1.3 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 |
|----------------------|-------------|--------------------------------------------------------|-------------------------------------------|-------------|------------------------|
| <b>Patient Level</b> |             |                                                        |                                           |             |                        |
| Patient Name         | (0010,0010) | R                                                      | Universal                                 | Enter Value | Yes                    |
| Patient ID           | (0010,0020) | U-Patient Root<br>R-Study Root<br>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                    |
| <b>Study Level</b>   |             |                                                        |                                           |             |                        |
| 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<br>-Range<br>Value-Universal | Enter Value | Yes                    |
| Study Time           | (0008,0030) | R                                                      | Single value<br>-Range<br>Value-Universal | Enter Value | Yes                    |
| Accession Number     | (0008,0050) | R                                                      | Universal                                 | Enter Value | Yes                    |
| <b>Series Level</b>  |             |                                                        |                                           |             |                        |
| 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 9: Patient root and Study root query/retrieve attributes**

The Find SCU can decode the following responses:

- **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.
- **Pending (FF00):** Sub-operation are Continue.

### 3.3.3 Association Initiation Policy

#### 3.3.3.1 Real World Activity - Find SCP

##### 3.3.3.1.1 Associated Real-World Activity - Find SCP

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

##### 3.3.2.1.2 Proposed Presentation Contexts - Find SCP

| 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 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP  | Not supported        |
| Study Root Query/Retrieve Information Model- FIND          | 1.2.840.10008.5.1.4.1.2.2.1 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP  | Not supported        |
| Patient/Study Only Query/Retrieve Information Model - FIND | 1.2.840.10008.5.1.4.1.2.3.1 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP  | Not supported        |

**Table 10: Accepting Presentation Contexts Query**
**3.3.2.1.3 SOP Specific Conformance Statement - Find SCP**

The Vision Tools Workspace PACS Server 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 Vision Tools Workspace PACS Server Query application supports as an SCP:

| Attribute name             | Tag         | Type                                                   | Matching                           |
|----------------------------|-------------|--------------------------------------------------------|------------------------------------|
| <b>Patient Level</b>       |             |                                                        |                                    |
| Patient Name               | (0010,0010) | R                                                      | Wild char-single value-universal   |
| Patient ID                 | (0010,0020) | U-Patient Root<br>R-Study Root<br>U-Patient/Study Only | Wild char-single value-universal   |
| Ethnic Group               | (0010,2160) | O                                                      | Wild char-single value-universal   |
| Patient's Birth Date       | (0010,0030) | O                                                      | Single value-range value universal |
| Patient's Sex              | (0010,0040) | O                                                      | Wild char-single value-universal   |
| <b>Study Level</b>         |             |                                                        |                                    |
| Study Instance UID         | (0020,000D) | U                                                      | Wild char-single value-universal   |
| Study ID                   | (0020,0010) | R                                                      | Wild char-single value-universal   |
| Study Date                 | (0008,0020) | R                                                      | Single value-Range value-universal |
| Study Time                 | (0008,0030) | R                                                      | Single value-Range value-universal |
| Accession Number           | (0008,0050) | R                                                      | Wild char-single value-universal   |
| Referring Physician's Name | (0008,0090) | O                                                      | Wild char-single value-universal   |
| Study Description          | (0008,1030) | O                                                      | Wild char-single value-universal   |
| Patient's Age              | (0010,1010) | O                                                      | Wild char-single value-universal   |
| Patient's Size             | (0010,1020) | O                                                      | Wild char-single value-universal   |
| Patient's Weight           | (0010,1030) | O                                                      | Wild char-single value-universal   |
| <b>Series Level</b>        |             |                                                        |                                    |
| Series Instance UID        | (0020,000E) | U                                                      | Wild char-single value-universal   |
| Series Number              | (0020,0011) | R                                                      | Wild char-single value-universal   |
| Modality                   | (0008,0060) | R                                                      | Wild char-single value-universal   |
| Series Date                | (0008,0021) | O                                                      | Single value-Range value-universal |
| Series Time                | (0008,0031) | O                                                      | Single value-Range value-universal |
| Performing Physician Name  | (0008,1050) | O                                                      | Wild char-single value-universal   |
| Manufacture Model Name     | (0008,1090) | O                                                      | Wild char-single value-universal   |
| Series Description         | (0008,103E) | O                                                      | Wild char-single value-universal   |
| Body Part Examined         | (0018,0015) | O                                                      | Wild char-single value-universal   |
| <b>Image Level</b>         |             |                                                        |                                    |
| SOP Instance UID           | (0008,0018) | U                                                      | Wild char-single value-universal   |
| Image Number               | (0020,0013) | R                                                      | Wild char-single value-universal   |
| Acquisition Date           | (0008,0022) | O                                                      | Single value-Range value-universal |
| Acquisition Time           | (0008,0032) | O                                                      | Single value-Range value-universal |
| Contrast Bolus Agent       | (0010,4000) | O                                                      | Wild char-single value-universal   |

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

The Remote DICOM AE can cancel the query by sending a C\_CANCEL\_FIND\_RQ message. If the Find SCP receives C\_CANCEL\_FIND\_RQ before it has completed the processing of the matches it shall stop the database matching process and return a status of Cancelled to the Remote DICOM AE.

The Find SCP returns 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.

### 3.3.3.2 Real World Activity - Move SCP

#### 3.3.3.2.1 Associated Real-World Activity - Move SCP

The associated Real-World activity is to respond to query request of a SCP with the query model Patient Root or Study Root or Patient/Study Only. The Storage Class Conformance statement describe the C-Store Service which is generated by C-Move.

#### 3.3.2.2.2 Proposed Presentation Contexts - Move SCP

| 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 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP  | Not supported        |
| Study Root Query/Retrieve Information Model- MOVE          | 1.2.840.10008.5.1.4.1.2.2.2 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP  | Not supported        |
| Patient/Study Only Query/Retrieve Information Model - MOVE | 1.2.840.10008.5.1.4.1.2.3.2 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCP  | Not supported        |

**Table 12: Accepting Presentation Contexts Query**

**3.3.2.2.3 SOP Specific Conformance Statement - Move SCP**

The Vision Tools Workspace PACS Server 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 Vision Tools Workspace PACS Server Query application supports as an SCP:

| Attribute name                    | Tag         | Type                                                                           | Matching                           |
|-----------------------------------|-------------|--------------------------------------------------------------------------------|------------------------------------|
| <b>Patient Level</b>              |             |                                                                                |                                    |
| <b>Patient Name</b>               | (0010,0010) | <b>R</b>                                                                       | Wild char-single value-universal   |
| <b>Patient ID</b>                 | (0010,0020) | <b>U</b> -Patient Root<br><b>R</b> -Study Root<br><b>U</b> -Patient/Study Only | Wild char-single value-universal   |
| <b>Ethnic Group</b>               | (0010,2160) | <b>O</b>                                                                       | Wild char-single value-universal   |
| <b>Patient's Birth date</b>       | (0010,0030) | <b>O</b>                                                                       | Single value-range value-universal |
| <b>Patient's Sex</b>              | (0010,0040) | <b>O</b>                                                                       | Wild char-single value-universal   |
| <b>Study Level</b>                |             |                                                                                |                                    |
| <b>Study Instance UID</b>         | (0020,000D) | <b>U</b>                                                                       | Wild char-single value-universal   |
| <b>Study ID</b>                   | (0020,0010) | <b>R</b>                                                                       | Wild char-single value-universal   |
| <b>Study Date</b>                 | (0008,0020) | <b>R</b>                                                                       | Single value-Range value-universal |
| <b>Study Time</b>                 | (0008,0030) | <b>R</b>                                                                       | Single value-Range value-universal |
| <b>Accession Number</b>           | (0008,0050) | <b>R</b>                                                                       | Wild char-single value-universal   |
| <b>Referring Physician's Name</b> | (0008,0090) | <b>O</b>                                                                       | Wild char-single value-universal   |
| <b>Study Description</b>          | (0008,1030) | <b>O</b>                                                                       | Wild char-single value-universal   |
| <b>Patient's Age</b>              | (0010,1010) | <b>O</b>                                                                       | Wild char-single value-universal   |
| <b>Patient's Size</b>             | (0010,1020) | <b>O</b>                                                                       | Wild char-single value-universal   |
| <b>Patient's Weight</b>           | (0010,1030) | <b>O</b>                                                                       | Wild char-single value-universal   |
| <b>Series Level</b>               |             |                                                                                |                                    |
| <b>Series Instance UID</b>        | (0020,000E) | <b>U</b>                                                                       | Wild char-single value-universal   |
| <b>Series Number</b>              | (0020,0011) | <b>R</b>                                                                       | Wild char-single value-universal   |

|                                  |             |          |                                    |
|----------------------------------|-------------|----------|------------------------------------|
| <b>Modality</b>                  | (0008,0060) | <b>R</b> | Wild char-single value-universal   |
| <b>Series Date</b>               | (0008,0021) | <b>O</b> | Single value-Range value-universal |
| <b>Series Time</b>               | (0008,0031) | <b>O</b> | Single value-Range value-universal |
| <b>Performing Physician Name</b> | (0008,1050) | <b>O</b> | Wild char-single value-universal   |
| <b>Manufacture Model Name</b>    | (0008,1090) | <b>O</b> | Wild char-single value-universal   |
| <b>Series Description</b>        | (0008,103E) | <b>O</b> | Wild char-single value-universal   |
| <b>Body Part Examined</b>        | (0018,0015) | <b>O</b> | Wild char-single value-universal   |
| <b>Image Level</b>               |             |          |                                    |
| <b>SOP Instance UID</b>          | (0008,0018) | <b>U</b> | Wild char-single value-universal   |
| <b>Image Number</b>              | (0020,0013) | <b>R</b> | Wild char-single value-universal   |
| <b>Acquisition date</b>          | (0008,0022) | <b>O</b> | Single value-Range value-universal |
| <b>Acquisition time</b>          | (0008,0032) | <b>O</b> | Single value-Range value-universal |
| <b>Contrast bolus agent</b>      | (0010,4000) | <b>O</b> | Wild char-single value-universal   |

**Table 13: Patient root and Study root query/retrieve attributes**

The Remote DICOM AE can cancel the query by sending a C\_CANCEL\_MOVE\_RQ message. If the Find SCP receives C\_CANCEL\_MOVE\_RQ before it has completed the processing of the matches it shall stop the database matching process and return a status of Cancelled to the Remote DICOM AE.

The Move SCP returns 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 Basic Worklist AE Specification

The basic worklist SCU requests that the remote SCP performs a match of all keys specified in the query against the information in its worklist database.

Vision Tools Workspace PACS Server DICOM product provide Standard Conformance to the following DICOM

V3.0 SOP Class as an SCU:

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

**Table 14: SOP Class for Basic Worklist**

#### 3.4.1 Association Establishment Policies

##### 3.4.1.1 General

The configuration of the Vision Tools Workspace PACS Server DICOM basic worklist 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 Vision Tools Workspace PACS Server DICOM application initiates one/several association(s) at a time, one for each transfer request being processed.

##### 3.4.1.3 Asynchronous Nature

The Vision Tools Workspace PACS Server DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

##### 3.4.1.4 Implementation Identifying Information

The Vision Tools Workspace PACS Server DICOM software provides a single Implementation Class UID of

- <">

and an Implementation Version Name of

- <">.

### 3.4.2 Association Initiation Policy

The 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

#### 3.4.2.1 Real World Activity

##### 3.4.2.1.1 Associated Real-World Activity

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

##### 3.4.2.1.2 Proposed Presentation Contexts - Move SCP

| Presentation Context Table                 |                             |                                                                                  |                                                                 |      |                      |
|--------------------------------------------|-----------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------|------|----------------------|
| Abstract Syntax                            |                             | Transfer Syntax                                                                  |                                                                 | Role | Extended Negotiation |
| Name                                       | UID                         | Name List                                                                        | UID                                                             |      |                      |
| Modality Worklist Information Model – FIND | 1.2.840.10008.5.1.4.1.2.1.1 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU  | Not supported        |

**Table 15: Initializing Presentation Contexts Basic Worklist**

### 3.4.2.1.3 SOP Specific Conformance Statement

#### Search Key Attributes of the Worklist C-FIND

The Vision Tools Workspace PACS Server 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                 |
|---------------------------------------|-------------|------|-----------------------------|
| <b>Scheduled Procedure Step</b>       |             |      |                             |
| 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<br>Today-Null         |
| > Scheduled Procedure Step Start Time | (0040,0002) | R    | This Time<br>This Time-Null |
| >Modality                             | (0008,0060) | R    | Single value or Null        |
| >Scheduled Performing Physician Name  | (0040,0006) | R    | Single value or Null        |
| <b>Patient Identification</b>         |             |      |                             |
| Patient's Name                        | (0010,0010) | R    | Single value-Null           |
| Patient's ID                          | (0010,0020) | R    | Single value-Null           |

**Table 16: Scheduled Procedure Step and Patient Identification Search keys**

#### Return Key Attributes of the Worklist C-FIND

The Vision Tools Workspace PACS Server 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 |
|---------------------------------|-------------|-----------------|-----------------------------|
| <b>Sop Common</b>               |             |                 |                             |
| Specific Character Set          | (0008,0005) | IC              |                             |
| <b>Scheduled Procedure Step</b> |             |                 |                             |
| Scheduled Procedure Step        | (0008,0005) | 1               | -                           |

|                                            |             |    |     |
|--------------------------------------------|-------------|----|-----|
| <b>Sequence</b>                            |             |    |     |
| > 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 Name       | (0040,0006) | 2  | Yes |
| >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 |
| <b>Requested Procedure ID</b>              |             |    |     |
| 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 |
| <b>Imaging Service Request</b>             |             |    |     |
| Accession Number                           | (0008,0050) | 2  | Yes |
| Requesting Physician                       | (0032,1032) | 2  | Yes |
| Referring Physician's Name                 | (0008,0090) | 2  | Yes |
| <b>Visit Identification</b>                |             |    |     |
| Admission ID                               | (0038,0010) | 2  | Yes |
| <b>Visit Status</b>                        |             |    |     |
| Current Patient Location                   | (0038,0300) | 2  | Yes |
| <b>Patient Identification</b>              |             |    |     |
| Patient's Name                             | (0010,0010) | 1  | Yes |
| Patient's ID                               | (0010,0020) | 1  | Yes |
| <b>Patient Demographic</b>                 |             |    |     |
| 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 |
| <b>Patient Medical</b>                     |             |    |     |
| 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 17: 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.

## 4. Communication Profile

### 4.1 Supported Communication Stacks

The Vision Tools Workspace PACS Server DICOM application 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 Vision Tools Workspace PACS Server DICOM application uses the TCP/IP stack from the Windows NT system upon which it executes.

##### 4.1.2.1 API

The Vision Tools Workspace PACS Server DICOM application is based on a TCP/IP socket interface.

##### 4.1.2.2 Physical Media Support

The Vision Tools Workspace PACS Server 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 Titels 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 and Query/Retrieve AE SCP.
- 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 and Query Retrieve**

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