Planmed

DICOM Conformance Statement

Planmed Verity Manager
Version 1.3.0

Document revision 1.1
October 22, 2012

Planmed

1 CONFORMANCE STATEMENT OVERVIEW

Verity Manager is application software for controlling Planmed Verity Extremity CT scanner and for acquiring images. It is also able to display images received over the network or from an interchange media or a file set in local file system. Verity Manager supports sending images across the network to other systems. It supports querying a remote system for a list of DICOM objects that may then be retrieved to the local system.

Table 1.1: NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Enhanced CT Image Storage	Yes	Yes
CT Image Storage	Yes	No
Query/Retrieve		
Patient Root Query/Retrieve Information Model – FIND	Yes	No
Patient Root Query/Retrieve Information Model – MOVE	Yes	No
Study Root Query/Retrieve Information Model – FIND	Yes	No
Study Root Query/Retrieve Information Model – MOVE	Yes	No
Workflow Management		
Modality Worklist Information Model – FIND	Yes	No
Storage Commitment Push Model	Yes	No
Modality Performed Procedure Step	Yes	No

Table 1.2: MEDIA SERVICES

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disc – Recordable		
General Purpose CD-R	Yes	Yes
DVD		
General Purpose DVD-RAM	Yes	Yes

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3 INTRODUCTION

3.1 REVISION HISTORY

Document Version	Date of Issue	Author	Reviewed by	Description
1.0	November 25, 2011	Sami Mäläskä	Erkki Lehto	First Issue
1.1	October 22, 2012	Erkki Lehto	Pekka Strömmer	Reviewed for software version 1.3

3.2 AUDIENCE

This document is written for the people that need to understand how Planmed Verity Manager will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

3.3 REMARKS

The scope of this DICOM Conformance Statement is to facilitate integration between Verity Manager and other products supporting DICOM communication. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

- The comparison of different Conformance Statements is just the first step towards assessing interconnectivity and interoperability between the product and other DICOM conformant equipment.
- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

3.4 TERMS AND DEFINITIONS

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Abstract Syntax	the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.
Application Entity (AE)	an end point of a DICOM information exchange, Including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple

	Application Entities.
Application Entity Title	the externally known name of an Application Entity, used to identify a DICOM application to other DICOM applications on the network. Application Context – the specification of the type of communication used between Application Entities. Example: DICOM network protocol.
Association	a network communication channel set up between Application Entities.
Attribute	a unit of information in an object definition; a data element identified by a tag. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).
Information Object Definition (IOD)	the specified set of Attributes that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The Attributes may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.
Module	a set of Attributes within an Information Object Definition that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.
Negotiation	first phase of Association establishment that allows Application Entities to agree on the types of data to be exchanged and how that data will be encoded. Presentation Context – the set of DICOM network services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.
Protocol Data Unit (PDU)	a packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.
Security Profile	a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an Application Entity to ensure confidentiality, integrity, and/or availability of exchanged DICOM data
Service Class Provider (SCP)	role of an Application Entity that provides a DICOM network service; typically, a server that performs operations requested by another Application Entity (Service Class User). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP),

	Radiology Information System (modality worklist SCP).
Service Class User (SCU)	role of an Application Entity that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)
Service/Object Pair (SOP) Class	the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management. Service/Object Pair (SOP) Instance – information object; a specific occurrence of information exchanged in a SOP Class. Examples: a specific x-ray image.
Tag	a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the "group" and the "element". If the "group" number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]
Transfer Syntax	encoding used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), little endian explicit value representation.
Unique Identifier (UID)	a globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.
Value Representation (VR)	the format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

3.5 BASICS OF DICOM COMMUNICATION

This section describes terminology used in this Conformance Statement for the non-specialist. The key terms used in the Conformance Statement are highlighted in *italics* below. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Two *Application Entities* (devices) that want to communicate with each other over a network using DICOM protocol must first agree on several things during an initial network "handshake". One of the two devices must initiate an *Association* (a connection to the other device), and ask if specific services, information, and encoding can be supported by the other device (*Negotiation*).

DICOM specifies a number of network services and types of information objects, each of which is called an *Abstract Syntax* for the Negotiation. DICOM also specifies a variety of methods for encoding data, denoted *Transfer Syntaxes*. The Negotiation allows the initiating Application Entity to propose combinations of Abstract Syntax and Transfer Syntax to be used on the Association; these combinations are called *Presentation Contexts*. The receiving Application Entity accepts the Presentation Contexts it supports.

For each Presentation Context, the Association Negotiation also allows the devices to agree on *Roles* – which one is the *Service Class User* (SCU - client) and which is the *Service Class Provider* (SCP - server). Normally the device initiating the connection is the SCU, i.e., the client system calls the server, but not always.

The Association Negotiation finally enables exchange of maximum network packet (PDU) size, security information, and network service options (called *Extended Negotiation* information).

The Application Entities, having negotiated the Association parameters, may now commence exchanging data. Common data exchanges include queries for worklists and lists of stored images, transfer of image objects and analyses (structured reports), and sending images to film printers. Each exchangeable unit of data is formatted by the sender in accordance with the appropriate *Information Object Definition*, and sent using the negotiated Transfer Syntax. There is a Default Transfer Syntax that all systems must accept, but it may not be the most efficient for some use cases. Each transfer is explicitly acknowledged by the receiver with a *Response Status* indicating success, failure, or that query or retrieve operations are still in process.

Two Application Entities may also communicate with each other by exchanging media (such as a CD-R). Since there is no Association Negotiation possible, they both use a *Media Application Profile* that specifies "pre-negotiated" exchange media format, Abstract Syntax, and Transfer Syntax.

3.6 ABBREVIATIONS

AE	Application Entity
AET	Application Entity Title
CAD	Computer Aided Detection
CD-R	Compact Disk Recordable
CT	Computed Tomography
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine

DIT	Directory Information Tree (LDAP)
DN	Distinguished Name (LDAP)
DNS	Domain Name System
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
GSPS	Grayscale Softcopy Presentation State
HIS	Hospital Information System
HL7	Health Level 7 Standard
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISO	International Organization for Standards
LUT	Look-up Table
MPPS	Modality Performed Procedure Step
MSPS	Modality Scheduled Procedure Step
MTU	Maximum Transmission Unit (IP)
MWL	Modality Worklist
O	Optional (Key Attribute)
OSI	Open Systems Interconnection
PACS	Picture Archiving and Communication System
PDU	Protocol Data Unit
R	Required (Key Attribute)
RIS	Radiology Information System.
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
SPS	Scheduled Procedure Step
SR	Structured Reporting
TCP/IP	Transmission Control Protocol/Internet Protocol
U	Unique (Key Attribute)

UL	Upper Layer
VR	Value Representation

3.7 REFERENCES

NEMA PS3 Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/

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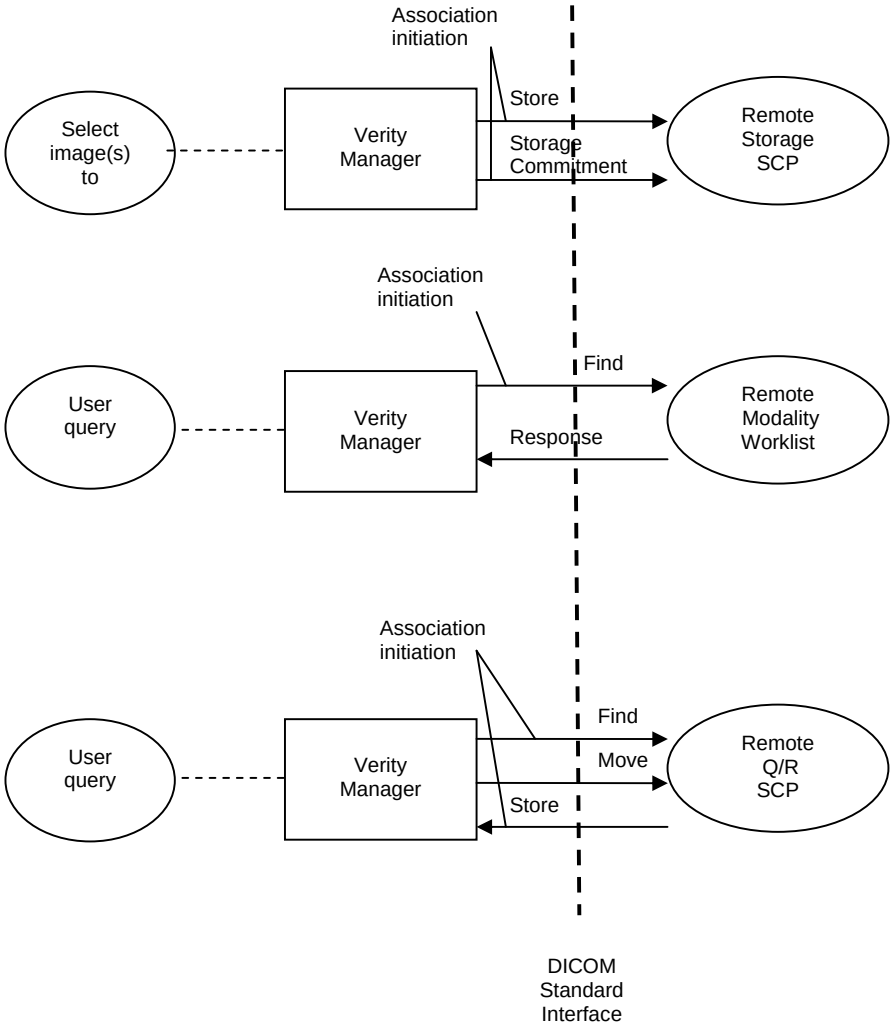
4 NETWORKING

4.1 IMPLEMENTATION MODEL

4.1.1 Application data flow



4.1.2 Functional Definition of Verity Manager AE

All communications and image transfer with remote application is accomplished utilizing the DICOM protocol over a network using the TCP/IP protocol stack.

4.1.2.1 Storage and Storage Commitment

Verity Manager establishes an association with a remote AE selected by the user just prior to sending a C-STORE request to that AE.

If Storage Commitment is configured to be used in Verity Manager, it opens another association for sending a Storage Commitment request for the stored SOP instances to the remote AE.

Verity Manager can be configured to wait for Storage Commitment N-EVENT-REPORT in the same association that has issued the N-ACTION. Verity Manager also accepts a request for establishing an association for the N-EVENT-REPORT later.

4.1.2.2 Worklist

Verity Manager establishes an association with a remote AE selected by the user for Modality Worklist services. When an association is requested with a SCP, Verity Manager responds with a list of SOP Class UIDs that it will accept. If a Find request is sent then it will wait for find responses.

4.1.2.3 Retrieve

Verity Manager establishes an association with a remote AE selected by the user for Q/R services. When an association is requested with a SCP, Verity Manager responds with a list of SOP Class UID’s that it will accept. If a Find request is sent then it will wait for Find responses. If a Move request is sent, it will wait for a Move response.

4.1.2.4 MPPS

The Verity Manager DICOM Modality Performed Procedure Step (MPPS) SCU service is used together with DICOM Modality Worklist SCU service. If Verity Manager MPPS service is configured to be used, it will send study ID, status of study, dates, patient name in starting the exposure, and dates and complete list of images including X-ray parameters to the server after the study has been accepted.

4.2 AE SPECIFICATION

4.2.1 Implementation identifying information

Table 4.2-1
DICOM IMPLEMENTATION CLASS AND VERSION FOR VERITY MANAGER

Implementation Class UID	2.16.840.1.113669.632.10.99.4
Implementation Version Name	VerityManager11

4.2.2 Application context name

The DICOM standard application context name for DICOM 3.0 is always proposed when initiating associations:

Table 4.2-2
DICOM APPLICATION CONTEXT FOR VERITY MANAGER

Application Context Name	1.2.840.10008.3.1.1.1

4.2.3 Storage Specification

4.2.3.1 SOP Classes

Verity Manager provides Standard Conformance to the following Storage SOP Classes:

Table 4.2-3
SOP CLASSES FOR AE STORAGE

SOP Class Name	SOP Class UID	SCU	SCP
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes

4.2.3.2 Association Policies

4.2.3.2.1 Number of Associations

Table 4.2-4
NUMBER OF ASSOCIATIONS INITIATED FOR STORAGE

Maximum number of simultaneous associations	1

Table 4.2-5
NUMBER OF ASSOCIATIONS ACCEPTED FOR STORAGE

Maximum number of simultaneous associations	1

4.2.3.2.2 Asynchronous Nature

Verity Manager does not support asynchronous communication (multiple outstanding transactions over a single Association).

4.2.3.3 Association Initiation Policy

4.2.3.3.1 Activity – Send Image

Verity Manager initiates a new association for the appropriate Storage Service Class that corresponds to the image requested to be transferred. The association is closed when the image has been sent to the remote DICOM network node.
Verity Manager internally stores CT images as Enhanced CT Image IOD but images can be optionally sent using CT Image IOD.

4.2.3.3.1.1 Description and Sequencing of Activities

A user can select studies and request them to be sent to one or more predefined destinations. Each request is forwarded to the job queue and processed individually.

When the “Auto storage” option is active, the acquired images will be forwarded to the network job queue for a pre-configured auto-send target destination(s). “Auto storage” is triggered by the Accept Study user action. Storage is invoked by the job control interface that is responsible for processing network archival tasks. The job consists of data describing the instances marked for storage and the destinations. An internal daemon process triggered by a job for a specific network destination initiates a C-STORE request to store images. If the process successfully establishes an Association to a remote Application Entity, it will transfer each marked instance one after another via the open Association. Status of the transfer is reported through the job control interface. Only one job will be active at a time. If the C-STORE Response from the remote Application contains a status other than Success or Warning, the Association is aborted. The software will retry the failed job for configured number of times (3 by default).

Verity Manager attempts to initiate a new Association in order to issue a C-STORE request. If the job contains multiple images then a new Association will be requested for each image. If the Remote AE is configured as an archive device the Storage AE will, after all images and presentation states have been sent, transmit a single Storage Commitment request (N-ACTION) in a new Association. Upon receiving the N-ACTION response Verity Manager will delay releasing the Association for a configurable amount of time. If no N-EVENT-REPORT is received within this time period the Association will be immediately released (i.e. notification of Storage Commitment success or failure will be received over a separate association). However, the Storage AE is capable of receiving an N-EVENT-REPORT request at any time during an association provided a Presentation Context for the Storage Commitment Push Model has been successfully negotiated (i.e. the N-ACTION is sent at the end of one association and the N-EVENT-REPORT is received during an association initiated for a subsequent send job or during an association initiated by the Remote AE for the specific purpose of sending the N-EVENT-REPORT).

4.2.3.3.1.2 Proposed Presentation Contexts

The presentation contexts that are proposed by Verity Manager for the Send Image operation are specified in the following table:

Table 4.2-6
PRESENTATION CONTEXT TABLE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

All these SOP classes conform to the standard Storage Services as specified in the DICOM Standard.

4.2.3.3.1.3 SOP Specific Conformance

Verity Manager sends the attributes of CT image listed in Annex 8.1. All the mandatory (type 1 and type 2) attributes are sent.

Verity Manager can also act in the role of C-STORE SCP for receiving SOP instances to be used as priors during image acquisition.

4.2.4 Modality Worklist Specification

4.2.4.1 SOP Classes

Verity Manager provides Standard Conformance to the following SOP Classes:

Table 4.2-11
SOP CLASSES FOR MODALITY WORKLIST (MWL)

SOP Class Name	SOP Class UID	SCU	SCP
Modality Worklist Find	1.2.840.10008.5.1.4.31	Yes	No

4.2.4.2 Association Policies

4.2.4.2.1 General

The maximum PDU size is 65,536 bytes.

4.2.4.2.2 Number of Associations

Table 4.2-12
NUMBER OF ASSOCIATIONS INITIATED FOR MWL

Maximum number of simultaneous associations	1

4.2.4.2.3 Asynchronous Nature

Verity Manager does not support asynchronous communication (multiple outstanding transactions over a single Association) for Modality Worklist

4.2.4.3 Association Initiation Policy

4.2.4.3.1 Find and Move

4.2.4.3.1.1 Description and Sequencing of Activities

Verity Manager opens an association and performs C-FINDs. Once the association has been established, Verity Manager will send a Find message to the Modality Worklist SCP and wait for respond. The association is closed when the initiator requests that it be closed or after an error.

4.2.4.3.1.2 Accepted Presentation Contexts

Worklist Management Acceptable Find execution presentation contexts for Verity Manager are:

Table 4.2-13
ACCEPTABLE PRESENTATION CONTEXTS FOR MWL

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Modality Worklist Find	1.2.840.10008.5.1.4.31	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

4.2.4.3.1.3 SOP Specific Conformance for SOP Class(es)

The following attributes can be used as search criteria in C_FIND_RQ:

- (0008,0060) Modality
- (0040,0001) Scheduled Station AE Title
- (0040,0002) Scheduled Procedure Step Start Date (date range can be used)
- (0010,0010) Patient's name
- (0010,0020) Patient ID
- (0008,0050) Accession Number

Verity Manager reads the following attributes from a C_FIND_RSP message:

- (0008,0005) Specific Character Set
- (0020,000D) Study Instance UID
- (0008,0050) Accession Number

- (0010,0010) Patient's name
- (0010,0020) Patient ID
- (0010,0030) Patient's Birth Date
- (0010,0040) Patient's Sex
- (0008,0060) Modality
- (0008,0090) Referring Physician Name
- (0040,1001) Requested Procedure ID
- (0040,1002) Reason For Requested Procedure
- (0040,1003) Requested Procedure Priority
- (0032,1032) Requesting Physician
- (0032,1060) Requested Procedure Description
- (0032,1064) Requested Procedure Code Sequence
- (0008,1110) Referenced Study Sequence
- (0040,0100) Scheduled Procedure Step Sequence

4.2.5 Query/Retrieve Specification

4.2.5.1 SOP Classes

Verity Manager provides Standard Conformance to the following SOP Classes:

Table 4.2-14
SOP CLASSES FOR QUERY/RETRIEVE

SOP Class Name	SOP Class UID	SCU	SCP
Patient Root Query/Retrieve Information Model – Find	1.2.840.10008.5.1.4.1.2.1.1	Yes	No
Patient Root Query/Retrieve Information Model - Move	1.2.840.10008.5.1.4.1.2.1.2	Yes	No
Study Root Query/Retrieve Information Model – Find	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root Query/Retrieve Information Model - Move	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

4.2.5.2 Association Policies

4.2.5.2.1 General

The maximum PDU size is 65,536 bytes.

4.2.5.2.2 Number of Associations

Table 4.2-15
NUMBER OF ASSOCIATIONS AS AN ASSOCIATION INITIATOR FOR QUERY/RETRIEVE

Maximum number of simultaneous associations	1

4.2.5.2.3 Asynchronous Nature

Verity Manager does not support asynchronous communication (multiple outstanding transactions over a single Association) for Query/Retrieve

4.2.5.3 Association Initiation Policy

4.2.5.3.1 Find and Move

4.2.5.3.1.1 Description and Sequencing of Activities

Verity Manager initiates an association for the appropriate Query/Retrieve Service Class that corresponds to the set of images requested to be transferred. Once the association has been established, Verity Manager sends Find Q/R message (C-FIND). After response has been received, Verity Manager sends a request for a Move Service (C-MOVE) and waits for an incoming Storage association. The association is closed when all queries or moves have been sent to the remote DICOM network node.

4.2.5.3.1.2 Proposed Presentation Contexts

Table 4.2-16
PROPOSED PRESENTATION CONTEXTS FOR QUERY/RETRIEVE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Information Model – Find	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Patient Root Query/Retrieve Information Model - Move	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

Table 4.2-17
EXTENDED NEGOTIATION AS A SCU

SOP Class Name	SOP Class UID	Extended Negotiation

4.2.5.3.1.3 SOP Specific Conformance

The following attributes can be used as search criteria in C_FIND_RQ.
- (0010,0010) Patient's name
- (0010,0020) Patient ID
- (0010,0030) Patient’s Birth Date
- (0008,0020) Study Date

Verity Manager reads the following attributes from a C_FIND_RSP message:
- (0010,0010) Patient's name
- (0010,0020) Patient ID

- (0010,0030) Patient's Birth Date
- (0008,0020) Study Date
- (0020,0010) Study ID
- (0008,1030) Study Description
- (0008,0050) Accession Number
- (0008,0060) Modality
- (0020,000E) Series Instance UID
- (0020,0011) Series Number

4.2.6 MPPS Specification

4.2.6.1 SOP Classes

Verity Manager provides Standard Conformance to the following SOP Classes:

Table 4.2-18
SOP CLASS(ES) FOR MPPS

SOP Class Name	SOP Class UID	SCU	SCP
Modality Performed Procedure Step	1.2.840.10008.5.1.4.1.2.1.1	Yes	No

4.2.6.2 Association Policies

4.2.6.2.1 General

The maximum PDU size is 65,536 bytes.

4.2.6.2.2 Number of Associations

Table 4.2-19
NUMBER OF ASSOCIATIONS AS AN ASSOCIATION INITIATOR FOR MPPS

Maximum number of simultaneous associations	1

4.2.6.2.3 Asynchronous Nature

Verity Manager does not support asynchronous communication (multiple outstanding transactions over a single Association) for MPPS.

4.2.6.3 Association Initiation Policy

4.2.6.3.1 Image acquisition

4.2.6.3.1.1 Description and Sequencing of Activities

Verity Manager will initiate association as a MPPS when the local operator requests to start a new study for acquire a set of images for a patient selected via Worklist.

When the association has been established Verity Manager invokes either an N-CREATE or N-SET request to the server. When starting a new study Verity Manager sends N-CREATE request to the server. When status of the MPPS instance is to be updated, Verity Manager will initiate the MPPS N-SET service request to update the status of the MPPS instance. The COMPLETE status will be finally delivered with the MPPS N-SET request after all associated images have been acquired.

4.2.6.3.1.2 Proposed Presentation Contexts

Table 4.2-20
PROPOSED PRESENTATION CONTEXTS FOR MPPS

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None

4.2.6.3.1.3 SOP Specific Conformance

The following attributes are provided

- (0008,0050) Accession Number
- (0008,0060) Modality
- (0008,1050) Performing Physician’s Name

- (0010,0010) Patient’s Name
- (0010,0020) Patient ID
- (0010,0030) Patient’s Birth Date
- (0010,0040) Patient’s Sex

- (0018,0060) KVp
- (0018,8151) X-Ray Tube Current in uA
- (0018,1150) Exposure Time (msec)
- (0018,1030) Protocol Name

- (0020,000D) Study Instance UID
- (0020,0010) Study ID
- (0020,000E) Series Instance UID
- (0040,1001) Requested Procedure ID
- (0040,0253) Performed Procedure Step ID
- (0040,0241) Performed Station AE Title
- (0040,0242) Performed Station Name
- (0040,0244) Performed Procedure Step Start Date
- (0040,0245) Performed Procedure Step Start Time

- (0040,0252) Performed Procedure Step Status
- (0040,0250) Performed Procedure Step End Date
- (0040,0251) Performed Procedure Step End Time
- (0040,0340) Performed Series Sequence
- (0040,0301) Total Number of Exposures
- (0040,0270) Scheduled Step Attribute Sequence

4.3 NETWORK INTERFACES

4.3.1 Physical Network Interface

Verity Manager 3 runs on Windows XP and Windows 7 platforms and utilizes their TCP/IP support. Hence it is able to use any (TCP/IP) Physical Network Interface that Windows supports.

4.3.2 Additional Protocols

Verity Manager supports TCP/IP protocol only.

4.3.3 Ipv4 and Ipv6 Support

IPv4 is supported.
IPv6 has not been tested and therefore not yet supported.

4.4 CONFIGURATION

4.4.1 AE Title/Presentation Address Mapping

Presentation address mapping is configured in Verity Manager 3/DICOM Settings. Please see Verity Manager Installation Manual for details.

4.4.1.1 Local AE Titles

Table 4.4-1
AE TITLE CONFIGURATION TABLE

Application Entity	Default AE Title	Default TCP/IP Port
Verity Manager	PLANMED_AWS_1	10410

4.4.1.2 Remote AE Title/Presentation Address Mapping

Please see Verity Manager Installation Manual for details.

5 SUPPORT OF CHARACTER SETS

Character set "ISO_IR 100" is used by default. Other character set can be configured to be used if necessary.

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6 SECURITY

Verity Manager does not implement any of the "Secure Use Profiles" defined in PS 3.15 (section 6.1 and Annex A), nor does it implement any of the "Secure Transport Connection Profiles" as defined in PS 3.15 (section 6.2 and Annex B).
Verity Manager does not implement the "Digital Signature Profile" as defined in PS 3.15 (section 6.3 and Annex C), and the "Media Storage Security Profiles" as defined in PS 3.15 (section 6.4 and Annex D) are not applicable to Verity Manager.

7 ANNEXES

7.1 IOD CONTENTS

7.1.1 Created SOP Instance(s)

Table 8.1-1 specifies the attributes of a Enhanced CT image transmitted by Verity Manager application.

The abbreviations used in “Presence of Module” column are:

VNAP	Value Not Always Present (attribute sent zero length if no value is present)
ANAP	Attribute Not Always Present
ALWAYS	Always Present
EMPTY	Attribute is sent without a value

The abbreviations used in the “Source” column are:

MWL	the attribute value source Modality Worklist
USER	the attribute value source is from User input
AUTO	the attribute value is generated automatically
MPPS	the attribute value is the same as that use for Modality Performed Procedure Step
CONFIG	the attribute value source is a configurable parameter

Table 7.1-1a
IOD OF CREATED ENHANCED CT IMAGE SOP INSTANCES

IE	Module	Reference	Presence of Module
Patient	Patient	Table 7.1-2	ALWAYS
Study	General Study	Table 7.1-3	ALWAYS
	Patient Study	Table 7.1-4	ANAP
Series	General Series	Table 7.1-5	ALWAYS
	CT Series	Table 7.1-6	ALWAYS
Frame of Reference	Frame of Reference	Table 7.1-7	ALWAYS

Equipment	General Equipment	Table 7.1-8	ALWAYS
	Enhanced General Equipment	Table 7.1-8	
Image	Image Pixel	Table 7.1-10	ALWAYS
	Multi-frame Functional Groups	Table 7.1-11	ALWAYS
	Multi-frame Dimension	Table 7.1-12	ALWAYS
	Acquisition Context	Table 7.1-13	ALWAYS
	Enhanced CT Image	Table 7.1.14	ANAP
	SOP Common	Table 7.1-17	ANAP

Table 7.1-1b
IOD OF CREATED CT IMAGE SOP INSTANCES

IE	Module	Reference	Presence of Module
Patient	Patient	Table 7.1-2	ALWAYS
Study	General Study	Table 7.1-3	ALWAYS
	Patient Study	Table 7.1-4	ANAP
Series	General Series	Table 7.1-5	ALWAYS
Equipment	General Equipment	Table 7.1-8	ALWAYS
Image	General Image	Table 7.1-9	ALWAYS
	Image Plane	Table 7.1-18	ALWAYS
	Image Pixel	Table 7.1-10	ALWAYS
	CT Image	Table 7.1-15	ANAP
	VOI LUT	Table 7.1-16	ANAP
	SOP Common	Table 7.1-17	ALWAYS

Table 7.1-2
PATIENT MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient Name	(0010,0010)	PN	From Modality Worklist or user input. Values supplied via Modality Worklist will be entered as received. Values supplied via user input will contain all the components that the user entered. Maximum 64 characters.	ALWAYS	MWL / USER
Patient ID	(0010,0020)	LO	From Modality Worklist or user input. Maximum 64 characters.	ALWAYS	MWL / USER
Patient's Birth Date	(0010,0030)	DA	From Modality Worklist or user input	VNAP	MWL / USER
Patient's Sex	(0010,0040)	CS	From Modality Worklist or user input	VNAP	MWL / USER
Patient Comments	(0010,4000)	LT	From User Input. Maximum 1024 characters.	VNAP	USER

Table 7.1-3
GENERAL STUDY MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	From Modality Worklist or generated	ALWAYS	MWL or AUTO
Study Date	(0008,0020)	DA		ALWAYS	AUTO
Study Time	(0008,0030)	TM		ALWAYS	AUTO
Referring Physician's Name	(0008,0090)	PN	From Modality Worklist or user input	VNAP	MWL / USER
Study ID	(0020,0010)	SH	From Modality Worklist or generated	ALWAYS	AUTO
Accession Number	(0008,0050)	SH	Accession number for the study	VNAP	MWL / USER
Study Description	(0008,1030)	LO	From user input	ANAP	MWL/USER

Table 7.1-4
PATIENT STUDY MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Age	(0010,1010)	AS	From Modality Worklist or user input	ANAP	MWL/USER
Patient's Size	(0010,1020)	DS	From Modality Worklist	ANAP	MWL
Patient's Weight	(0010,1030)	DS	From Modality Worklist	ANAP	MWL
Occupation	(0010,2180)	SH		ANAP	MWL

Table 7.1-5
GENERAL SERIES MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	"CT"	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Generated	ALWAYS	AUTO
Series Number	(0020,0011)	IS	Generated	ALWAYS	AUTO
Laterality	(0020,0060)	CS		ANAP	USER
Series Date	(0008,0021)	DA		ALWAYS	AUTO
Series Time	(0008,0031)	TM		ALWAYS	AUTO
Protocol Name	(0018,1030)	LO		ANAP	USER
Series Description	(0008,103E)	LO		ANAP	MWL/USER
Operators' Name	(0008,1070)	PN		ANAP	USER
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	Identifies the MPPS SOP Instance to which this image is related if MPPS is used	ANAP	AUTO

>Referenced SOP Class UID	(0008,1150)	UI	MPPS SOP Class UID	ANAP	AUTO
>Referenced SOP Instance UID	(0008,1155)	UI	MPPS SOP Instance UID	ANAP	AUTO
Body Part Examined	(0018,0015)	CS		ALWAYS	USER

Table 7.1-6
CT SERIES MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	"CT"	ALWAYS	AUTO

Table 7.1-7
FRAME OF REFERENCE MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Position Reference Indicator	(0020,1040)	LO	-	EMPTY	AUTO

Table 7.1-8
GENERAL EQUIPMENT MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	Planmed	VNAP	AUTO
Institution Name	(0008,0080)	LO		VNAP	CONFIG
Institution Address	(0008,0081)	ST		VNAP	CONFIG
Station Name	(0008,1010)	SH		ANAP	CONFIG
Institutional Department Name	(0008,1040)	LO		ANAP	CONFIG
Manufacturer's Model Name	(0008,1090)	LO		ALWAYS	AUTO
Device Serial Number	(0018,1000)	LO		ALWAYS	AUTO
Software Versions	(0018,1020)	LO		ANAP	AUTO
Date of Last Calibration	(0018,1200)	DA		ANAP	AUTO
Time of Last Calibration	(0018,1201)	TM		ANAP	AUTO
Pixel Padding Value	(0028,0120)	US		ANAP	AUTO

Table 7.1-9
GENERAL IMAGE MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS		ALWAYS	AUTO
Patient Orientation	(0020,0020)	CS		VNAP	AUTO
Content Date	(0008,0023)	DA		ALWAYS	AUTO
Content Time	(0008,0033)	TM		ALWAYS	AUTO
Image Type	(0008,0008)	CS	(ORIGINAL, PRIMARY,VOLUME) or (ORIGINAL, PRIMARY, AXIAL) / Standard CT	ANAP	AUTO
Acquisition Date	(0008,0022)	DA		ALWAYS	AUTO
Acquisition Time	(0008,0032)	TM		ALWAYS	AUTO
Source Image Sequence	(0008,2112)	SQ		ANAP	AUTO
> Referenced SOP Class UID	(0008,1150)	UI		ANAP	AUTO
> Referenced SOP Instance UID	(0008,1155)	UI		ANAP	AUTO
>Spatial Locations Preserved	(0028,135A)	CS		ANAP	
Image Comments	(0020,4000)	LT		ANAP	USER
Burned In Annotation	(0028,0301)	CS	“NO”	ALWAYS	USER
Lossy Image Compression	(0028,2110)	CS	“00”	ALWAYS	AUTO
Presentation LUT Shape	(2050,0020)	CS		ALWAYS	AUTO

Table 7.1-10
IMAGE PIXEL MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples per Pixel	(0028,0002)	US	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	MONOCHROME1 or MONOCHROME2	ALWAYS	AUTO
Rows	(0028,0010)	US		ALWAYS	AUTO
Columns	(0028,0011)	US		ALWAYS	AUTO
Bits Allocated	(0028,0100)	US	16	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	12 or 16	ALWAYS	AUTO
High Bit	(0028,0102)	US	11 or 15	ALWAYS	AUTO

Pixel Representation	(0028,0103)	US	0 (Unsigned)	ALWAYS	AUTO
Pixel Data	(7FE0,0010)			ALWAYS	AUTO

Table 7.1-11
MULTI-FRAME FUNCTIONAL GROUPS

Attribute Name	Tag	VR	Value	Presence of Value	Source
Shared Functional Groups Sequence	(5200,9229)	SQ		ALWAYS	AUTO
Per-frame Functional Groups Sequence	(5200,9230)	SQ		ALWAYS	AUTO

Table 7.1-12
MULTI-FRAME DIMENSION MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Dimension Organization Sequence	(0020,9221)	SQ		ANAP	AUTO
Dimension Index Sequence	(0020,9222)	SQ		ANAP	AUTO

Table 7.1-13
ACQUISITION CONTEXT MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Acquisition Context Sequence	(0040,0555)	SQ		EMPTY	AUTO

Table 7.1-14
ENHANCED CT IMAGE MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	(0008,0008)	CS		ALWAYS	AUTO

Acquisition DateTime	(0008,002A)	DT		ALWAYS	AUTO
Samples per Pixel	(0028,0002)	US	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	MONOCHROME1 or MONOCHROME2	ALWAYS	AUTO
Bits Allocated	(0028,0100)	US	12 or 16	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	12 or 16	ALWAYS	AUTO
High Bit	(0028,0102)	US	11 or 15	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	0 (unsigned)	ALWAYS	AUTO
Pixel Intensity Relationship	(0028,1040)	CS	LIN	ALWAYS	AUTO
Pixel Intensity Relationship Sign	(0028,1041)	SS	-1	ALWAYS	AUTO
Rescale Intercept	(0028,1052)	DS	0	ALWAYS	AUTO
Rescale Slope	(0028,1053)	DS	1	ALWAYS	AUTO
Rescale Type	(0028,1054)	LO	US	ALWAYS	AUTO
Presentation LUT Shape	(2050,0020)	CS	IDENTITY or INVERSE	ALWAYS	AUTO
Lossy Image Compression	(0028,2110)	CS	00	ALWAYS	AUTO
Patient Orientation	(0020,0020)	CS		ALWAYS	AUTO
Burned In Annotation	(0028,0301)	CS	YES or NO	ALWAYS	AUTO
Window Center	(0028,1050)	DS		ALWAYS	AUTO
Window Width	(0028,1051)	DS		ALWAYS	AUTO

Table 7.1-15
CT IMAGE MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	(0008,0008)	CS		ALWAYS	AUTO
Acquisition DateTime	(0008,002A)	DT		ALWAYS	AUTO
Samples per Pixel	(0028,0002)	US	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	MONOCHROME1 or MONOCHROME2	ALWAYS	AUTO
Bits Allocated	(0028,0100)	US	12 or 16	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	12 or 16	ALWAYS	AUTO
High Bit	(0028,0102)	US	11 or 15	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	0 (unsigned)	ALWAYS	AUTO
Pixel Intensity Relationship	(0028,1040)	CS	LIN	ALWAYS	AUTO
Pixel Intensity Relationship	(0028,1041)	SS	-1	ALWAYS	AUTO

Sign					
Rescale Intercept	(0028,1052)	DS	0	ALWAYS	AUTO
Rescale Slope	(0028,1053)	DS	1	ALWAYS	AUTO
Rescale Type	(0028,1054)	LO	HU	ALWAYS	AUTO
Presentation LUT Shape	(2050,0020)	CS	IDENTITY or INVERSE	ALWAYS	AUTO
Lossy Image Compression	(0028,2110)	CS	00	ALWAYS	AUTO
Patient Orientation	(0020,0020)	CS		ALWAYS	AUTO
Burned In Annotation	(0028,0301)	CS	YES or NO	ALWAYS	AUTO
Window Center	(0028,1050)	DS		ALWAYS	AUTO
Window Width	(0028,1051)	DS		ALWAYS	AUTO

Table 7.1-16
VOI LUT MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Window Center	(0028,1050)	DS		ALWAYS	AUTO
Window Width	(0028,1051)	DS		ALWAYS	AUTO
Window Center and Width Explanation	(0028,1055)	LT		ANAP	AUTO

Table 7.1-17
SOP COMMON MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.2.1or 1.2.840.10008.5.1.4.1.1.2	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI		ALWAYS	AUTO
Instance Creation Date	(0008,0012)	DA		ALWAYS	AUTO
Instance Creation Time	(0008,0013)	TM		ALWAYS	AUTO
Instance Number	(0020,0013)	IS		VNAP	AUTO

Table 7.1-18
IMAGE PLANE MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Pixel Spacing	(0028,0030)	DS		ALWAYS	AUTO
Image Orientation (Patient)	(0020,0037)	DS		ALWAYS	AUTO
Image Position (Patient)	(0020,0032)	DS		VNAP	AUTO
Slice Thickness	(0018,0050)	DS		VNAP	AUTO

7.1.2 Usage of Attributes from received IOD's

The attributes Verity Manager uses from received IOD's are detailed in AE presentations above.

7.2 DATA DICTIONARY OF PRIVATE ATTRIBUTES

Verity Manager version 1.1 does not create any private attributes.

7.3 STANDARD EXTENDED/SPECIALIZED/PRIVATE SOP CLASSES

Verity Manager does not implement any Specialized or Private SOP Classes.

7.4 PRIVATE TRANSFER SYNTAXES

Verity Manager does not implement any private Transfer Syntaxes.