



Technical Publications

**Direction DOC2390561
Revision 4**

Vscan Air (Version 1.1) DICOM CONFORMANCE STATEMENT

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1. Overview

Vscan Air is a mobile based system used for acquiring ultrasound diagnostic medical images. The system implements the necessary DICOM services to download work list from an information system, save acquired US images to a network storage device.

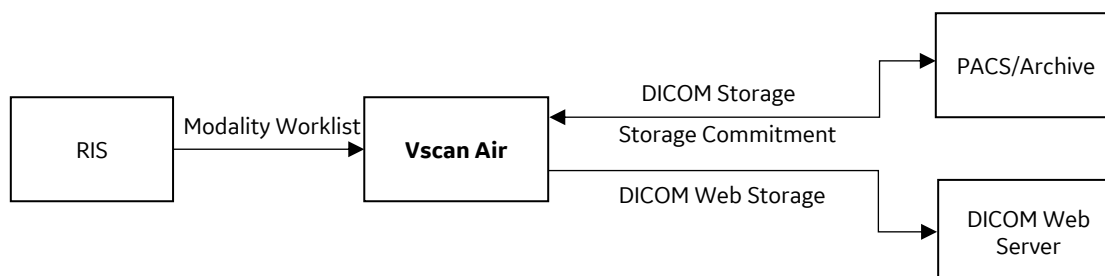


Figure 1.1-1: Overview of Implemented Services

1.1 Content and Transfer

Table 1.1-1 lists all Storage SOP Classes and the supported transfer mechanisms as well as how the Instances are used.

The Transfer Syntax Set column in **Table 1.1-2** lists the set of Transfer Syntaxes in **Table 1.1-2** that are applicable to Storage SOP Classes. The DIMSE and Media Services Columns in **Table 1.1-1** indicates the roles supported for each SOP class. The Function Column indicate how the instances are used by the system:

- **Create:** The system creates instances of the SOP Class. The type of the created SOP Class is indicated by one of the following codes:
 - S: Standard SOP Class
 - SE: Standard Extended SOP Class
 - SP: Specialized SOP Class
 - P: Private SOP Class
- **Display:** The system displays the instances of the SOP Class to the user, either by displaying image IODs natively or by applying another IOD on top of the images (e.g., a Presentation State or CAD SR).
- **Process:** The system processes the instances of the SOP Class to derive some further information that is made available to the user (e.g. a CAD processing algorithm, or a 3D Rendering).
- **Archive:** The system stores the instances of the SOP class to long term storage and makes them available at a later point according to the data retention policies of the institution

Table 1.1-1: Storage SOP Classes

SOP Classes		Transfer Syntax Set	DIMSE		DICOM Web		Media Services			Function			
			SCU	SCP	UA	OS	FSC	FSU	FSR	Create	Display	Process	Archive
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	L, U	Y	N	Y	N	N	N	N	Y	N	N	N
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	L, U	Y	N	Y	N	N	N	N	Y	N	N	N

Table 1.1-2: Supported Transfer Syntaxes

Transfer Syntax Set	Transfer Syntax	Transfer Syntax UID	DICOM web Bulk data Media Type
Lossy compressed Transfer Syntax Set (L)	JPEG Baseline (Process 1) lossy compressed	1.2.840.10008.1.2.4.50	Not valid
Uncompressed Transfer Syntax Set (U)	Implicit Value Representation Little Endian native	1.2.840.10008.1.2	Not valid
	Explicit Value Representation Little Endian native	1.2.840.10008.1.2.1	Not valid
	Explicit Value Representation Big Endian	1.2.840.10008.1.2.2	Not valid

1.2 DIMSE Services

1.2.1 Verification

Table 1.2-1: Verification SOP Class

SOP Classes		Transfer Syntax		User of Service (SCU)	Provider of Service (SCP)
Verification	1.2.840.10008.1.1	Implicit Little Endian	1.2.840.10008.1.2	Y	N
		Explicit Little Endian	1.2.840.10008.1.2.1	Y	N
		Explicit Big Endian	1.2.840.10008.1.2.1	Y	N

1.2.2 Storage

For details on supported Storage SOP Classes refer to Section **1.1 Content and Transfer** capabilities.

1.2.3 Workflow Management

Table 1.2-2: Workflow Management SOP Classes

SOP Classes		Transfer Syntax		User of Service (SCU)	Provider of Service (SCP)
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Explicit VR Little Endian	1.2.840.10008.1.2.1	Y	N
		Explicit VR Big Endian	1.2.840.10008.1.2.2	Y	N
		Implicit VR Little Endian	1.2.840.10008.1.2	Y	N
Storage Commitment Push Model	1.2.840.10008.1.20.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	Y	N
		Explicit VR Big Endian	1.2.840.10008.1.2.2	Y	N
		Implicit VR Little Endian	1.2.840.10008.1.2	Y	N

1.3 DICOM Web Services

1.3.1 Study Service

Table 1.3-1: Study Service

SOP Classes	Transaction	Resources	User Agent	Origin Server
Study Web Service	Store (STOW-RS)	All Studies	N	N
		Study	Y	N
		Bulkdata	N	N

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3. Introduction

3.1 Revision History

Revision	Date	Reason for change
1.	11-Nov-2020	Initial release
2.	21-Jan-2021	- Modified Storage Commitment Services, Section 5.2.4.1 - Updated default values for Calling AET and Called AET in Section 6.2-1 - Updated values for Implementation Context UID and Implementation Version Name in Table 7.1-1
3.	03-Dec-2021	- Added sections 1.3 DICOM Web Services, 5.3 Supported DICOM Web Services, 6.3 Configuration for DICOM Web Services, 7.3.3 DICOM Web Services.
4.	11-Apr-2022	- Corrected Revision number in Header , Copyright year and Section Section 5.2.2.1.

3.2 Audience

This document is intended for hospital staff, health system integrators, Research and Development, sales, and service. It is assumed that the reader has a working knowledge of the DICOM® Standard. The document structure was designed for easier access to relevant information for different user groups:

- Clinical Users, who want to get an overview of the implemented interoperability features of the system can refer to Section **4 Implementation Model**.
- Personnel involved in Sales can use the information in Section **0 Technical**

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- **Overview** to assess the compatibility between different systems involved in a sales situation.
- System Integrators can use information in Section **6 DICOM® Configuration** during system installation and also information from Section **5 Service and Interoperability Description** for details regarding the implemented services.
- Field Service engineers can use the details from Section **5 Service and Interoperability Description** and from Section **7 Network and Media** for troubleshooting.
- Hospital IT staff, focusing on security can use the details provided in Section **8 Security** regarding implemented Security features.
- Research Personnel may be interested in using information provided in Annex **A Information Object Definitions (IODs)** to get detailed imaging information.

3.3 Remarks

The scope of this DICOM® Conformance Statement is to facilitate integration between Vscan Air and other DICOM® products. The Conformance Statement should be read and understood in conjunction with the DICOM® Standard [1]. 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, it is the user's responsibility to perform the following validation activities:

- The comparison of conformance statements from the Vscan Air and other DICOM® conformant equipment is the first step towards assessing interconnectivity and interoperability between those systems.

Test procedures should be defined and executed to validate the required level of interoperability with specific DICOM® conformant 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) A representation of the external behavior of an application process in terms of DICOM network services, Web services and/or media exchange capabilities implemented in one or more roles. A single device may have multiple Application Entities.

Application Entity Title (AET) 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. Examples: MR Image IOD, CT Image IOD, Print Job IOD. The Attributes within an IOD 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).

Media Application Profile The specification of DICOM® information objects and encoding exchanged on removable media (e.g., CDs).

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.

- Origin Server** Refers to the program that can originate authoritative responses to HTTP requests for a given target resource. The term "server" refers to any implementation that receives a webservice request message from a user agent.
- Presentation Context** The set of DICOM® network services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.
- Private SOP Class** A SOP Class that is not defined in the DICOM Standard but is published in an implementation's Conformance Statement.
- 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 Class (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 Instance (SOP Instance)** An information object; a specific occurrence of information exchanged in a SOP Class. Examples: a specific x-ray image.
- Specialized SOP Class** A SOP class that is derived from the standard, and that is specialized by additional type 1, 1C, 2, 2C or 3 attributes, by enumeration of specific permitted values for Attributes, or by enumeration of specific permitted Templates. The additional Attributes may either be drawn from the Data Dictionary in PS3.6, or may be Private Attributes.
- Standard SOP Class** A SOP class defined in the standard, and that is implemented and used without any modifications.
- Standard Extended SOP Class** A SOP class that is defined in the standard, and that is extended by additional type 3 attributes. The additional Attributes may either be drawn from the DICOM Data Dictionary in PS3.6, or may be Private Attributes.
- 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** The 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.
- User Agent** A client in a network protocol used in communications within a client-server distributed computing system. In particular, the Hypertext Transfer Protocol (HTTP) identifies the client software originating the request, using a user-agent header, even when the client is not operated by a user
- 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 Abbreviations

AE	Application Entity
AET	Application Entity Title
CAD	Computer Aided Detection
DICOM®	Digital Imaging and Communications in Medicine
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISO	International Organization for Standardization
MWL	Modality Worklist
NEMA	National Electrical Manufacturers Association
NTP	Network Time Protocol
OID	Object Identifier
OS	Origin Server
PDU	Protocol Data Unit
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
SPS	Scheduled Procedure Step
TCP/IP	Transmission Control Protocol/Internet Protocol
TID	Template Identifier
VR	Value Representation

UID Unique Identifier

3.6 References

1. NEMA PS3 Digital Imaging and Communications in Medicine (DICOM®) Standard, available free at <http://www.dicomstandard.org/current>
2. IHE Radiology Technical Framework available at https://www.ihe.net/resources/technical_frameworks/#radiology

4. Implementation Model

This section of DICOM Conformance Statement specifies the Vscan Air compliance to DICOM requirements for networking features. Vscan Air application allows for the following DICOM functionality.

- Sending Verification Echo messages to DICOM Verification SCP.
- Convert JPEG images to DICOM Ultrasound Image and transfer them to DICOM SCP.
- Convert MP4 images to US Multi-frame Images and transfer them to DICOM SCP.
- Querying and retrieving DICOM Modality Worklist from a Worklist SCP (RIS)

4.1 Application Entities and Data Flow

The network application model for Vscan Air is shown in **Figure 4.1-1**.

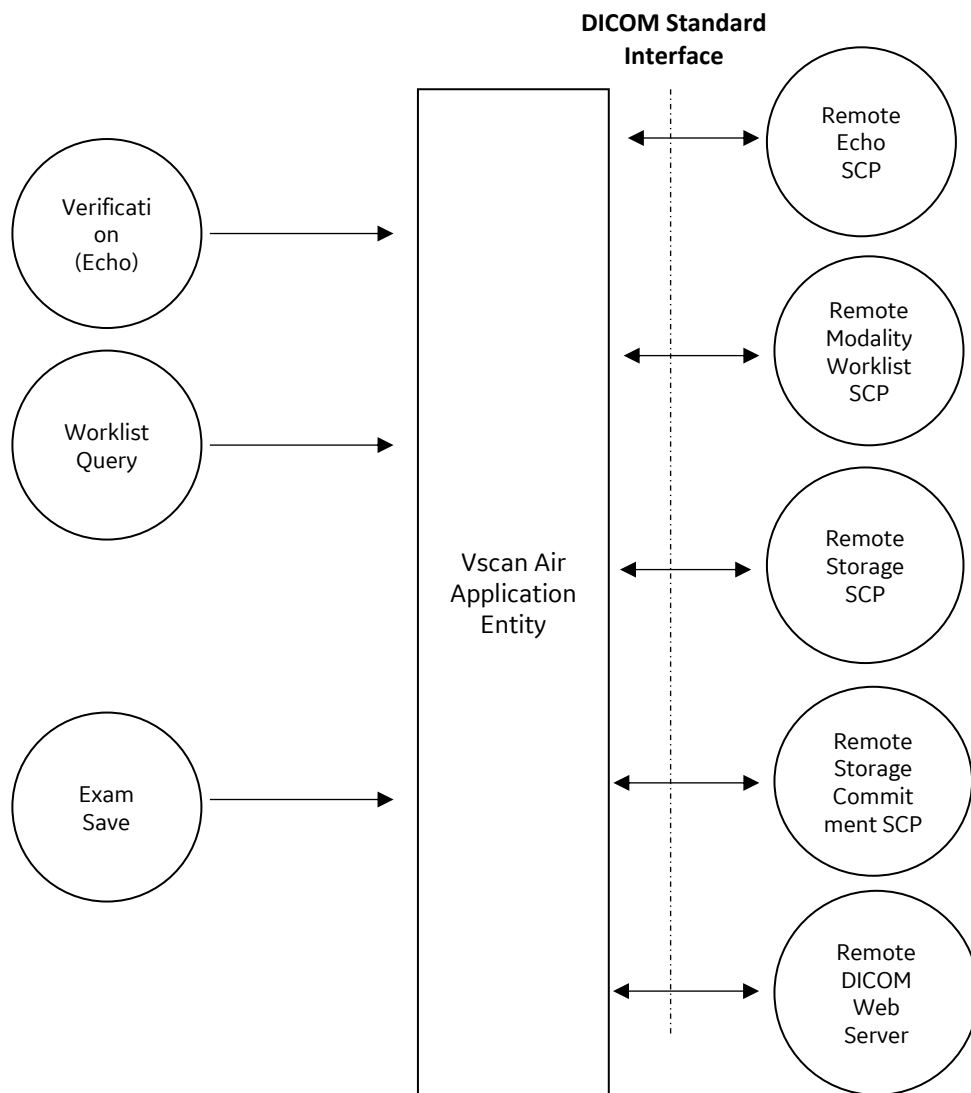


Figure 4.1-1: Vscan Air Application Data Flow Diagram

There are three local real-world activities that occur in Vscan Air – **Verification (Echo)**, **Worklist Query**, **Exam Save**.

Verification: Initiates a connection with the DICOM SCP, posts a Verification request and closes the connection.

Worklist Query: Initiates a connection with the DICOM SCP, performs a query and retrieves the matching entries to the product.

Exam save: Initiates a connection with the DICOM SCP and transmits images and results to the DICOM SCP. If Storage Commitment is configured a commitment request will be sent for the images.

4.1.1 Functional Definition of Vscan Air Application Entity

4.1.1.1 Functional Definition of Vscan Air Application Entity

The Vscan Air Application Entity supports the following functions to support Workflow and Storage services:

- **Verification (Echo)** initiates a DICOM verification (Echo) to assist in network diagnosis
- **Worklist Query** initiates a DICOM worklist query to receive Modality Worklist information
- **Exam Save** initiates a DICOM association to send images
- **Exam Save** initiates a DICOM association to request Storage Commitment of images from remote AE

Vscan Air uses C-ECHO to verify connectivity status of remote Workflow and Storage servers.

Worklist information in Vscan Air is updated on operator request for **Worklist Query**. US modality is used as default query criteria in C-FIND requests sent to remote AEs. Additional changes to modality worklist search include scheduled date information which is configurable in Vscan Air.

Vscan Air uses C-STORE requests to send images to remote AE for **Exam Save**. If the remote AE is configured for Storage Commitment, Vscan Air sends N-ACTION requests and will be capable of receiving N-EVENT-REPORT from remote AEs. Vscan Air is capable of sending N-ACTION requests and receiving N-EVENT-REPORT in different associations.

5. Service and Interoperability Description

5.1 Mapping of Services to Application Entities

Table 5.1-1 provides an overview of the Application Entities and the Services supported by each AE.

Table 5.1-1: Service to AE Mapping

Application Entity	Supported Services	Role						
		SCU	SCP	Origin Server	User Agent	FSC	FSU	FSR
Vscan Air Application Entity	Verification	Y	N	N	Y	N	N	N
	Basic Worklist Management	Y	N	N	N	N	N	N
	Storage	Y	N	N	Y	N	N	N
	Storage Commitment	Y	N	N	N	N	N	N

5.2 Supported DIMSE Services

The following sections define the details of the supported DIMSE services in Vscan Air product.

5.2.1 Verification Service

5.2.1.1 SCU of the Verification SOP Class

As a Service Class User of the Verification SOP Class, the Vscan Air uses the C-ECHO-RQ message to verify the application level communication with peer DICOM AEs.

5.2.2 Basic Worklist Management Service

5.2.2.1 SCU of the Modality Worklist Information Model – FIND SOP Class

As a Service Class User of the Modality Worklist Information Model – FIND SOP Class, the Vscan Air uses the C-FIND-RQ message to query the SCP. It supports the Query Keys listed in **Table 5.2-1**.

The supported matching types listed in the Matching Type column of **Table 5.2-1** are:

- SINGLE_VALUE: SCU can request Single Value matching
- UID: SCU can request UID matching
- WILDCARD: SCU can request Wildcard matching
- RANGE: SCU can request Range matching
- SEQUENCE: SCU can request Sequence matching
- RETURN_KEY: SCU can request attribute as a return value (i.e. Universal matching)

For the Query Value Source column in **Table 5.2-1**, the following values are supported:

- FIXED: The query value cannot be modified by the user or by configuration
- GENERATED: The query value is generated by the system
- CONFIGURATION: The query value is dependent on system configuration
- USER: The query value is entered by the user
- EMPTY: The query value is left empty to indicate it is a return key only

For the Display on UI, the following values are supported:

- D: The return value is displayed on the main UI by default
- C: The return value is displayed on the main UI if configured
- N: The return value is never displayed

Table 5.2-1: Supported C-FIND Query Parameters for Modality Worklist -SCU

Attribute Name	Tag	Matching Type	Query Value Sources	Value	Display on UI	Comments
SOP Common Module						
Specific Character Set	(0008,0005)	RETURN_KEY	EMPTY		N	
Scheduled Procedure Step						
Schedule Procedure Step Sequence	(0040,0100)	SEQUENCE				
> Modality	(0008,0060)	SINGLE_VALUE	FIXED	US	N	
> Scheduled Station AE Title	(0040,0001)	RETURN_KEY	EMPTY		N	
> Scheduled Procedure Step Start Date	(0040,0002)	RANGE	USER		N	Query Value is configurable by user on product GUI
> Scheduled Procedure Step Start Time	(0040,0003)	RETURN_KEY	EMPTY		N	
> Scheduled Performing Physician's Name	(0040,0006)	RETURN_KEY	EMPTY		N	
> Scheduled Procedure Step Description	(0040,0007)	RETURN_KEY	EMPTY		N	
> Scheduled Protocol Code Sequence	(0040,0008)	RETURN_KEY	EMPTY		N	
>> Code Value	(0008,0100)	RETURN_KEY	EMPTY		N	
>> Coding Scheme Designator	(0008,0102)	RETURN_KEY	EMPTY		N	
>> Coding Scheme Version	(0008,0103)	RETURN_KEY	EMPTY		N	
>> Code Meaning	(0008,0104)	RETURN_KEY	EMPTY		N	
> Scheduled Procedure Step ID	(0040,0009)	RETURN_KEY	EMPTY		N	
> Scheduled Station Name	(0040,0010)	RETURN_KEY	EMPTY		N	
> Scheduled Procedure Step Location	(0040,0011)	RETURN_KEY	EMPTY		N	
Requested Procedure						
Referenced Study Sequence	(0008,1110)	RETURN_KEY	EMPTY		N	

Attribute Name	Tag	Matching Type	Query Value Sources	Value	Display on UI	Comments
> Referenced SOP Class UID	(0008,1150)	RETURN_KEY	EMPTY		N	
> Referenced SOP Instance UID	(0008,1155)	RETURN_KEY	EMPTY		N	
Requested Procedure Description	(0032,1060)	RETURN_KEY	EMPTY		N	
Requested Procedure Code Sequence	(0032,1064)	RETURN_KEY	EMPTY		N	
> Code Value	(0008,0100)	RETURN_KEY	EMPTY		N	
> Code Scheme Designator	(0008,0102)	RETURN_KEY	EMPTY		N	
> Code Scheme Version	(0008,0103)	RETURN_KEY	EMPTY		N	
> Code Meaning	(0008,0104)	RETURN_KEY	EMPTY		N	
Study Instance UID	(0020,000D)	RETURN_KEY	EMPTY		N	
Requested Procedure ID	(0040,1001)	RETURN_KEY	EMPTY		N	
Names of Intended Recipients of Results	(0040,1010)	RETURN_KEY	EMPTY		N	
Requested Procedure Comments	(0040,1400)	RETURN_KEY	EMPTY		N	
Imaging Service Request						
Accession Number	(0008,0050)	RETURN_KEY	EMPTY		N	
Referring Physician's Name	(0008,0090)	RETURN_KEY	EMPTY		N	
Requesting Physician	(0032,1032)	RETURN_KEY	EMPTY		N	
Requesting Service	(0032,1033)	RETURN_KEY	EMPTY		N	
Imaging Service Request Comments	(0040,2400)	RETURN_KEY	EMPTY		N	
Visit Identification						
Admission ID	(0038,0010)	RETURN_KEY	EMPTY		N	
Issuer of Admission ID	(0038,0011)	RETURN_KEY	EMPTY		N	
Institution Name	(0008,0080)	RETURN_KEY	EMPTY		N	
Institution Address	(0008,0081)	RETURN_KEY	EMPTY		N	
Visit Status						
Current Patient Location	(0038,0300)	RETURN_KEY	EMPTY		N	
Visit Relationship						
Referenced Patient Sequence	(0008,1120)	RETURN_KEY	EMPTY		N	
> Referenced SOP Class UID	(0008,1150)	RETURN_KEY	EMPTY		N	

Attribute Name	Tag	Matching Type	Query Value Sources	Value	Display on UI	Comments
> Referenced SOP Instance UID	(0008,1155)	RETURN_KEY	EMPTY		N	
Patient Identification						
Patient's Name	(0010,0010)	RETURN_KEY	EMPTY		D	
Patient ID	(0010,0020)	RETURN_KEY	EMPTY		D	
Issuer of Patient ID	(0010,0021)	RETURN_KEY	EMPTY		N	
Other Patient Ids	(0010,1000)	RETURN_KEY	EMPTY		N	
Other Patient Names	(0010,1001)	RETURN_KEY	EMPTY		N	
Patient Demographic						
Patient's Birth Date	(0010,0030)	RETURN_KEY	EMPTY		D	
Patient's Birth Time	(0010,0032)	RETURN_KEY	EMPTY		N	
Patient's Sex	(0010,0040)	RETURN_KEY	EMPTY		D	
Patient's Size	(0010,1020)	RETURN_KEY	EMPTY		N	
Patient's Weight	(0010,1030)	RETURN_KEY	EMPTY		N	
Patient's Address	(0010,1040)	RETURN_KEY	EMPTY		N	
Ethnic Group	(0010,2160)	RETURN_KEY	EMPTY		N	
Patient Comments	(0010,4000)	RETURN_KEY	EMPTY		N	
Patient Medical						
Medical Alerts	(0010,2000)	RETURN_KEY	EMPTY		N	
Additional Patient History	(0010,21B0)	RETURN_KEY	EMPTY		N	
Pregnancy Status	(0010,21C0)	RETURN_KEY	EMPTY		N	
Contrast Allergies	(0010,2110)	RETURN_KEY	EMPTY		N	

5.2.3 Storage Service

5.2.3.1 SCU of Storage SOP classes

As a Service Class User of the Storage Service Class, the Vscan Air uses the C-STORE-RQ message to request storage of DICOM objects by a remote SCP. Storage requests are triggered by user. An automatic trigger of a storage request of an image instance, C-STORE-RQ can be enabled by user through product UI. Vscan Air application considers each exam as a study.

Refer to **Table 1.1-1** for the list of supported SOP Classes.

For details regarding the IODs created by the system, refer to Annex **A Information Object Definitions (IODs)**.

5.2.4 Storage Commitment Service

5.2.4.1 SCU of the Storage Commitment Push Model SOP Class

As a Service Class User of the Storage Commitment SOP Class, the Vscan Air uses the N-ACTION-RQ message to request storage commitment from a remote SCP. N-ACTION-RQ is sent per image acquired by the system. In turn, it receives N-EVENT-REPORT-RQ messages from the SCP indicating success or failure of the request. Vscan-Air stops listening for N-EVENT-REPORT messages from SCP when device is not connected to network. Vscan Air restarts listening for N-EVENT-REPORT messages from SCP when the

device is re-connected to the network. Vscan Air resends N-ACTION-RQ for all the instances which are waiting for N-EVENT-REPORT from SCP when reconnected to network. When any SCP sends N-EVENT-REPORT messages to Vscan Air, it is assumed that the device is assigned with a static/fixed IP address in the network.

As the SCU of the Storage Commitment Push Model SOP Class, Vscan Air supports committing all Storage SOP Classes listed in **Table 1.1-1**.

Table 5.2-2: Failure Behavior for Storage Commitment SCU

Status Code	Description	Behavior
0000H	Success	
Any other status code	Failed	The request for storage commitment is marked as failed.

5.3 Supported DICOM® Web Services

5.3.1 Studies Web Service

Vscan Air supports a restful storage service as a user agent.

5.3.1.1 Supported Media Types

5.3.1.1.1 DICOM Media Types

Studies Web service supports all the DICOM media types, supported by DIMSE storage service of Vscan Air.

Table 1.1-1 lists the supported DICOM Storage SOP Classes / Transfer Syntaxes.

5.3.1.2 Store Transaction (STOW-RS)

Store transaction service as a user agent uses the same IODs as DIMSE storage service. Please refer to Annex A for the details of IODs created by the system.

5.3.1.2.1 User Agent

The Store transaction user agent can request resources listed in Table 5.3-1:

Table 5.3-1: Resources Store Transaction – User Agent

Resource	Comments
Study	Sends request to store a representation of an instance that belong to the Study

The Store transaction user agent supports Header Fields listed in Table 5.3-2:

Table 5.3-2: Header Fields for Store Transaction – User Agent

Header Field	Supported values	Comments
Content-type	multipart/related; type="application/dicom";	Supported DICOM SOP Classes are same as DIMSE storage service

5.4 Specific Character Sets

In addition to the default character repertoire, the values for Specific Character Set (0008, 0005) listed in are supported.

Table 5.4-1: Supported Specific Character Sets

Defined Term	IANA	Character Set Description
Single-Byte Character sets without Code Extensions		
ISO_IR 100	ISO-8859-1	Latin alphabet No. 1
ISO_IR 13	ISO-2022-JP	Japanese
Multi-Byte Character sets without Code Extensions		
GB18030	GB18030	Simplified Chinese
ISO_IR 192	UTF-8	Unicode UTF-8

6. DICOM® Configuration

Vscan Air provides GUI to the users, to configure remote DICOM servers.

6.1 General Configuration parameters

Table 6.1-1: General Configuration parameters

Parameter	Configurable	Default Value	Comment
Timeout waiting for acceptance or rejection response to an Association Open Request (Application Level Timeout)	N	3 seconds	Value is not configurable by the user on product GUI
Timeout waiting for a response to an Association release request (Application Level Timeout)	N	3 seconds	Value is not configurable by the user on product GUI
General DIMSE level time-out values	N	10 seconds	Value is not configurable by the user on product GUI
Maximum number of simultaneous associations accepted	N	1	Value is not configurable by the user on product GUI
Specific Character Set	Y	ISO_IR 192	Refer to 5.4 for the list of character sets supported by Vscan Air

6.2 Configuration for DIMSE Services

The tables in the following subsections show the configuration parameters required for DIMSE Services.

In the Configurable column the following terms are used:

- USER: the parameter is configurable by the USER
- SERVICE: the parameter is configurable by SERVICE
- NO: the parameter is not configurable (it has a fixed value). The value is required for the configuration of the remote system
- N/A: the parameter is not applicable for the local or the remote system

In order to identify whether Vscan Air is a SCP and / or a SCU, the following applies:

- SCP: the (Secured) Local Called AET is different than N/A in the Configurable column
- SCU: the (Secured) Remote Called AET is different than N/A in the configurable column

6.2.1 Basic Worklist Management Service configuration

Table 6.2-1: Worklist Service Parameters

Remote Worklist service configuration Parameters			
Parameter	Configurable	Default Value	Comment
Calling AET (SCU)	USER	AE_Vscan_Air	User configuration option, available in Vscan Air GUI
Called AET (SCP)	USER		User configuration option, available in Vscan Air GUI

Remote Worklist service configuration Parameters			
Host	USER		User configuration option, available in Vscan Air GUI
Port	USER		User configuration option, available in Vscan Air GUI
Secured Port	USER		User configuration option, available in Vscan Air GUI
Maximum worklist response count	USER		User configuration option. Vscan Air allows user to configure maximum worklist responses which the SCU can support. Maximum allowed responses are 1000
Default Modality Type	NO	US	Vscan Air uses US as default modality to query the remote DMWL SCP

Note: Vscan Air does supports configuration of multiple worklist remote hosts and there is no limitation other than the ones mandated by the operating system.

6.2.2 Storage Service configuration

Table 6.2-2: Storage Service Parameters

Remote Storage service configuration parameters			
Parameter	Configurable	Default Value	Comment
Calling AET (SCU)	USER	AE_Vscan_Air	User configuration option, available in Vscan Air GUI
Called AET (SCP)	USER		User configuration option, available in Vscan Air GUI
Host	USER		User configuration option, available in Vscan Air GUI
Port	USER		User configuration option, available in Vscan Air GUI
Secured Port	USER		User configuration option, available in Vscan Air GUI

Note: Vscan Air supports configuration of multiple storage remote hosts and there is no limitation other than the ones mandated by the operating system.

6.2.3 Storage Commitment Service configuration

Table 6.2-3: Storage Commitment Service Configurations

Remote Storage service configuration parameters			
Parameter	Configurable	Default Value	Comment
Calling AET (SCU)	USER	AE_Vscan_Air	User configuration option available in Vscan Air GUI.
Called AET (SCP)	USER		User configuration option available in Vscan Air GUI.
Host IP Address	NO		Host IP Address is available in Vscan Air GUI, not user configurable.
Port	USER	1024	User configuration option available in Vscan Air GUI.
Secured Port	USER	1025	User configuration option available in Vscan Air GUI.
Time out	USER	3 Days	User configuration option available in Vscan Air GUI. Jobs will be marked as failed if no response is received in this timeout.

6.3 Configuration for DICOM Web Services

6.3.1 Studies Web Service

6.3.1.1 Store transaction (STOW-RS) Configuration

The following table shows the configuration parameter required for Studies Web Service.

In the Configurable column the following terms are used:

- USER: the parameter is configurable by the USER
- SERVICE: the parameter is configurable by SERVICE
- NO: the parameter is not configurable (it has a fixed value). The value is required for the configuration of the remote system.
- N/A: the parameter is not applicable for the local or the remote system

In order to identify whether Vscan Air is an origin server and / or a User agent, the following applies:

- Origin Server: the (Secured) Local Retrieve Imaging Doc Set URL is different than N/A in the Configurable column
- User Agent: the (Secured) Remote Retrieve Imaging Doc Set URL is different than N/A in the configurable column

Table 6.3-1: Store transaction parameters

Remote Store transaction configuration parameters			
Parameter	Configurable	Default Value	Comment
Store remote origin server URL	USER		User configuration option available in Vscan Air GUI.

7. Network and Media Communication Details

7.1 General

The cross interaction between different AEs is depicted in below **Figure 7.1-1: Real world activity and cross AE interaction.**

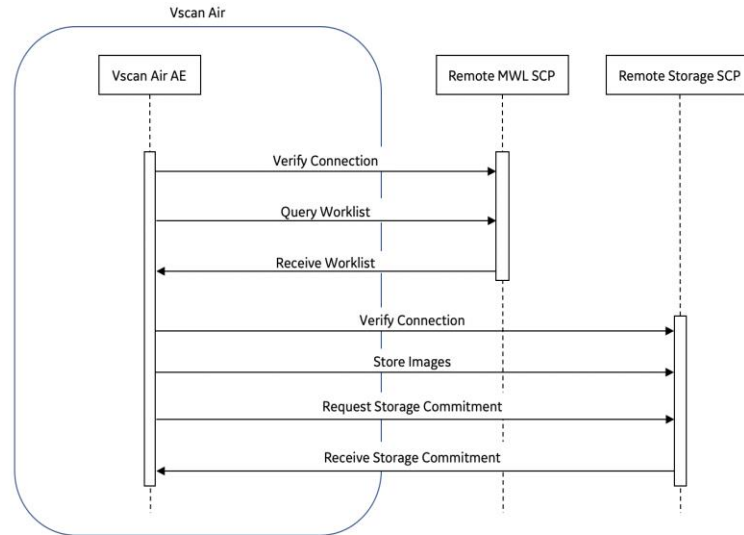


Figure 7.1-1: Real world activity and cross AE interaction

7.1.1 General Association Parameters

Table 7.1-1 lists the general association parameters applicable to all the AEs in the system

Table 7.1-1: General Association Parameters

	Name	Value
Networking Services	Application Context Name	1.2.840.10008.3.1.1.1
	Implementation Class UID	1.2.276.0.7230010.3.0.3.6.5
	Implementation Version Name	OFFIS_DCMTK_365
	Maximum PDU Length	Default: 16384
	ARTIM Timeout	3 seconds
	Maximum number of simultaneous Associations as Association Initiator	3
	Maximum number of simultaneous Associations as association acceptor	1
	Maximum number of outstanding asynchronous transactions	1

7.2 AE Specifications

7.2.1 Vscan Air Application Entity

This section captures information for Vscan Air Application Entity.

7.2.1.1 Sequencing of Real-World Activities

Below Figure 7.2-1 represents the sequencing of Verification (Echo), real-world activity.

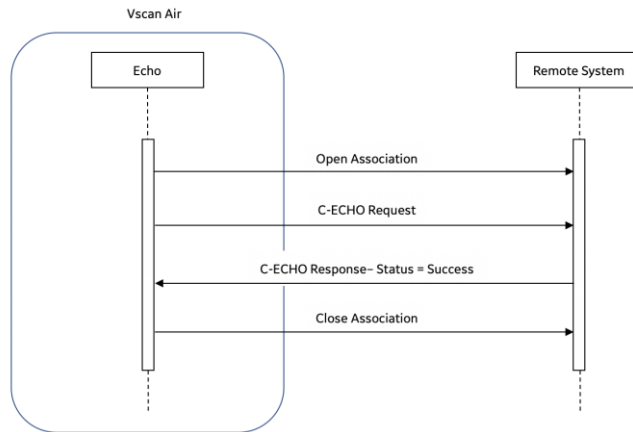


Figure 7.2-1: Sequencing of Verification (Echo) Real-World Activity

Below **Figure 7.2-2** represents the sequencing for Worklist Query, real-world activity.

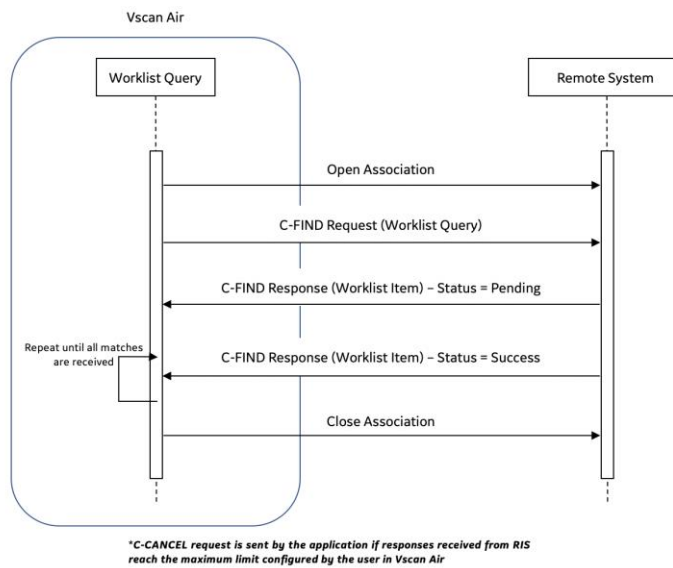


Figure 7.2-2: Sequencing of Worklist Query, Real-World Activity

Below **Figure 7.2-3** represents the real-world activities for Save Exam.

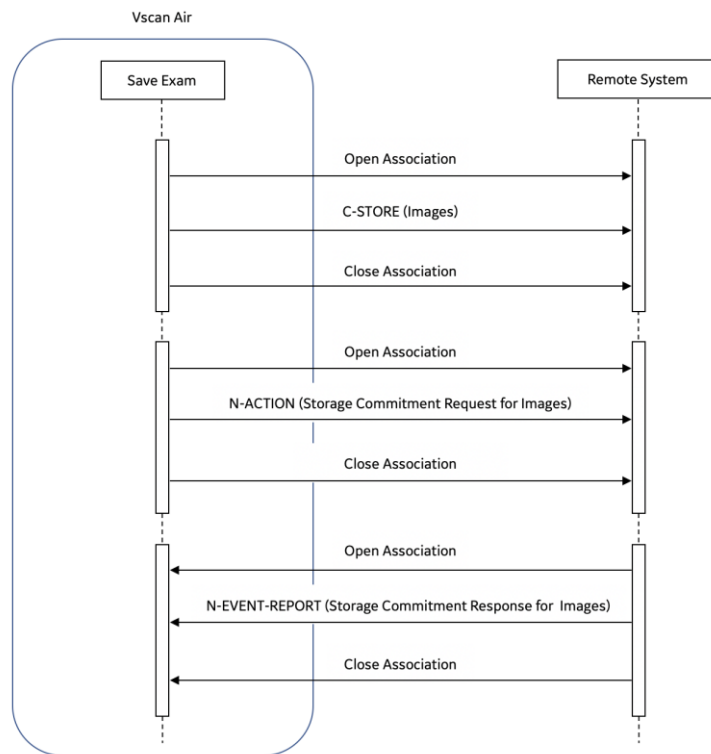


Figure 7.2-3: Sequencing of Save Exam, Real-World Activity

7.2.1.2 Association Parameters for Vscan Air AE

Below **Table 7.2-1** captures information about association parameters for Vscan Air

Table 7.2-1: Association Parameters for Vscan Air

	Name	Value
Networking Services	Application Context Name	1.2.840.10008.3.1.1.1
	Implementation Class UID	1.2.276.0.7230010.3.0.3.6.5
	Implementation Version Name	OFFIS_DCMTK_365
	Maximum PDU Length	Default: 16384
	ARTIM Timeout	3 seconds
	Maximum number of simultaneous Associations as association initiator	1
	Maximum number of simultaneous Associations as association acceptor	1
	Maximum number of outstanding asynchronous transactions	1

7.2.1.3 Association Initiation

This section details the association policies of the Application Entity when it is initiating an association.

7.2.1.3.1 Real-World activity for Verification (Echo)

System allows user to assist in network diagnosis of remote configurations by clicking a “Verify” button on device configuration page. System reports failure, if any SOP class requested by the system are not supported by the remote server.

System initiates association only when user triggers to verify remote connectivity.

7.2.1.3.2 Real-World activity for Worklist Query

System is capable of retrieving Scheduled Procedure steps from remote server using a Broad Query. The Modality Worklist SCP is queried based on a set of pre-defined query attributes as mentioned in **Table 5.2-1**.

System does not initiate any association automatically for Modality Worklist activity and is only initiated when user triggers to receive scheduled exams from the GUI. Maximum number of records that can be received by Vscan Air is configurable by user and shall be within 1000 records. If there is a timeout encountered, system aborts the query.

7.2.1.3.3 Real-World activity for Save Exam

System supports data transfer in more than one possible way. User may select ‘single or multiple media files from the same exam’ or ‘multiple exams’ and initiate transfer to single or multiple pre-configured storage destinations.

Each object (media) is entered into the Job Queue and a separate C-STORE request is used for every single media to transfer. If the system receives a status other than SUCCESS as part of C-STORE response from the remote application entity, the association is aborted and relevant Job is marked as failed. System sends the storage commitment requests if a storage commitment SCP is configured by the user using Vscan Air GUI. If the system receives a status other than SUCCESS as part of storage commitment request, the relevant job is marked as failed.

Below are the possible ways where association is initiated by the system to transfer data from the system to remote servers:

- Initiated manually by the user
- Initiate automatically by the system when storage commitment server is configured

Note: System does not support transfer triggered by the remote entities (Ex: C-MOVE or C-GET)

7.3 Status Codes Behavior and Handling

7.3.1 General AE communication Failure Behavior and Handling

7.3.1.1 Communication Failure Behavior

Below **Table 7.3-** defines the behavior of the application when there is a communication failure because of the below exceptions.

Table 7.3-1: DICOM Communication Failure Behavior

Exception	Behavior
Timeout	The ongoing Verification, Basic Worklist Management service and Storage service is considered as failed.

Exception	Behavior
Association aborted	The ongoing Verification, Basic Worklist Management service and Storage service is considered as failed.
Network Disconnect	The ongoing Verification, Basic Worklist Management service is considered as failed. Storage service will be retried.

7.3.1.2 Communication Failure Handling

Below **Table 7.3-** defines the how communication failures are handled in the application.

Table 7.3-1: DICOM Communication Failure Handling

Exception	Behavior
Timeout	Association will be dropped.
Association aborted	
Network Disconnect	

7.3.2 DIMSE Services

7.3.2.1 Verification Service

This section describes the behavior of the system to support Verification Service.

7.3.2.1.1 SCU of the Verification SOP Class – C-ECHO

Below **Table 7.3-2.1** defines the behavior of the application when it receives various status codes in the C-ECHO-RSP for the Verification Service.

Table 7.3-2.1: Status Codes for C-ECHO of the Verification SOP Class – C-ECHO

Status Class	Further Meaning	Status Code	Behavior
Success	Success	0000H	Association is released. Verification SUCCESS message is displayed to user.
*	Any other status code	*	Association is aborted using A-ABORT. Verification failure message is displayed to user.

7.3.2.2 Basic Worklist Management Service

This section describes the behavior of the system to support Basic Worklist Management Service.

7.3.2.2.1 SCU of the Modality Worklist Information Model FIND SOP Class – C-FIND

Below **Table 7.3-2.2** defines the behavior of the application when it receives various status codes in the C-FIND-RSP for the Modality Worklist Service.

Table 7.3-2.2: Status Codes for C-FIND of the MWL Information Model SOP Class – SCU

Status Class	Further Meaning	Status Code	Behavior
Success	Matching is complete – No final identifier is supplied	0000H	System replaces the existing worklists with the new responses
Failure	Refused: Out of resources	A700H	Association is aborted using A-ABORT. Existing worklists are not replaced
	SOP Class Not Supported	0122H	Same as “Refused”
	Error: Identifier does not match SOP Class	A900H	Same as “Refused”
	Error: Unable to process	C000 – CFFFH	Same as “Refused”
Cancel	Matching terminated due to cancel request	FE00H	System sends cancel request once worklist size reaches user specified limit and existing worklist is replaced by the new worklist which is received till cancel response is encountered.
Pending	Matching is continuing – Current match is supplied and any optional keys were supported in the same matter as required keys	FF00H	Continue receiving worklists
	Matching is continuing – Warning that one or more optional keys were not supported for existence for this identifier	FF01H	Continue receiving worklists
*	Any other status code	*	Same as “Refused”

7.3.2.3 Storage Service

This section describes the behavior of the system to support Storage Service.

7.3.2.3.1 SCU of the Storage SOP Classes – C-STORE

Table 7.3-3 defines the behavior of the application when it receives various status codes in the C-STORE-RSP for the Storage Service.

Table 7.3-3: Status Codes for C-STORE of the Storage SOP Class – SCU

Status Class	Further Meaning	Status Code	Behavior
Success	Success	0000H	If configured, Storage Commitment request is initiated, else Job is marked as completed.
*	Any other status code	*	Association is aborted using A-ABORT. Job is marked as failed.

7.3.2.4 Storage Commitment Service

This section describes the behavior of the system to support Storage Commitment Service.

7.3.2.4.1 SCU of the Storage Commitment Push Model SOP Class

Below **Table 7.3-4** lists the behavior of Vscan Air for each possible

Table 7.3-4: Status Codes for N-ACTION of the Storage Commitment Push Model SOP Class – SCU

Status Class	Further Meaning	Status Code	Behavior
Success	Success	0000H	System waits for N-EVENT-REPORT
*	Any other status code	*	Association is aborted using A-ABORT. Job is marked as failed.

Below **Table 7.3-5** lists the behavior of Vscan Air for each possible Failure Reason (0008,1197) in the Failed SOP Sequence (0008,1198) upon receiving an N-EVENT-REPORT request from the SCP with and Event Type ID of 2 (Storage Commitment Request Complete – Failure Exist).

Table 7.3-5: Status Codes for N-EVENT of the Storage Commitment Push Model SOP Class – SCU

Status Class	Further Meaning	Status Code	Behavior
Success	Success	0000H	System marks Job as completed successfully
*	Any other status code	*	Storage Commitment status shall be marked as failed in the system

Vscan Air expects to receive the N-EVENT-REPORT request in a configurable timeframe after the N-ACTION is sent.

Note: System shall wait for a given period of time before receiving N-EVENT report from server before marking it as failure.

7.3.3 DICOM Web Services

7.3.3.1 General Status Codes

This section describes the common status code behavior and handling all the supported transaction.

7.3.3.1.1 Common transaction as user agent

Status Class	Status Code	Behavior
Success	200 (Success)	System marks Job as completed successfully
	201 (Created)	System marks Job as completed successfully
	202 (Accepted)	System marks Job as completed successfully
	203 (Non-Authoritative Information)	System marks Job as completed successfully
	204 (No-Content)	System marks Job as completed successfully
Client Error	400 (Bad Request)	System marks the Job as failed
	401 (Unauthorized)	System marks the Job as failed
	403 (Forbidden)	System marks the Job as failed
	404 (Not Found)	System marks the Job as failed
Server Error	500 (Internal Server Error)	System marks the Job as failed
	501 (Not Implemented)	System marks the Job as failed
Any Other Error	Other Error code	System marks the Job as failed

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8. Security

8.1 Introduction

This section describes security features implemented and supported by Vscan Air.

8.2 DICOM[®] Security Profile Availability

8.2.1 Secure Transport Connection Profiles

Vscan Air does not generate or distribute any certificate. It allows user to import certificates from device local storage to the system through UI available in device configuration of the system. If TLS connection is chosen, peer authentication is optional and can be enabled by user. Vscan Air assists user to validate the imported server and client certificate for certificate expiry date and client certificate-key mismatch.

Below **Table 8.2-1** defines the secure transport connection profiles in Vscan Air.

Table 8.2-1: Secure Transport Connection Profiles

Profile	Creator/Sender	Consumer/Receiver	Reference
Basic TLS Secure Transport Connection Profile	Y	N	B.1.1
AES TLS Secure Transport Connection Profile	Y	N	B.1.1
BCP 195 TLS Secure Transport Connection Profile	Y	N	B.1.1
Non-Downgrading BCP 195 TLS Secure Transport Connection Profile	Y	N	B.1.1
Extended BCP 195 TLS Profile Secure Transport Connection Profile	Y	N	B.1.1
IHE ATNA Unencrypted TLS Profile Secure Transport Connection Profile	Y	N	B.1.1
None	Y	N	B.1.1

Appendices

A. Information Object Definitions (IODs)

This section provides the detailed content of the IODs natively created by Vscan Air, i.e. images created by an acquisition modality.

Throughout the tables listed in Annex **A**, the following codes are used for the source and presence columns.

In the source column, the following values are supported:

- **FIXED:** the value is pre-defined and cannot be modified
- **GENERATED:** the value is generated by the system
- **CONFIGURATION:** the value is copied from system configuration
- **MWL:** the value is copied from modality worklist
- **USER:** the value is entered by the user
- **SCANNED:** the value is read from a barcode scanner or similar device
- **EMPTY:** the attribute is sent without value

The presence columns reflect the usage of the module, functional group macros, attributes or value in the Vscan Air implementation and is not necessarily the same as defined in the DICOM standard. For the presence column the following values are supported:

- **ALWAYS:** the module, functional group macro, attributes or value is always present
- **CONDITIONAL:** the presence of the module, functional group macro, attributes or value is dependent on a condition, the condition must be listed in the Conditions columns
- **EMPTY:** the attribute is present but without a value (zero length)

A.1 Information Shared across multiple IODs

A.1.1 Shared Modules

All IODs generated by the system use the following common modules or a subset of them, as defined in the IOD specific subsections below **Table A-1.1**

Table A-1.1: Shared Modules

Attribute Name	Tag	Source	Presence (Attribute)	Presence (Value)	Value	Conditions	Comment
Patient Module							
Patient's Name	(0010,0010)	MWL/USER	ALWAYS	CONDITIONAL		Value empty if not entered by user and not present in worklist	
Patient ID	(0010,0020)	MWL/USER	ALWAYS	CONDITIONAL		Value empty if not entered by user and not present in worklist	

Attribute Name	Tag	Source	Presence (Attribute)	Presence (Value)	Value	Conditions	Comment
Patient's Birth Date	(0010,0030)	MWL/USER	ALWAYS	CONDITIONAL		Value empty if not entered by user and not present in worklist	
Patient's Birth Time	(0010,0032)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
Patient's Sex	(0010,0040)	MWL/USER	ALWAYS	CONDITIONAL		Value empty if not entered by user and not present in worklist	
Patient's Size	(0010,1020)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
Patient's Weight	(0010,1030)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
Patient Comments	(0010,4000)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
Patient's Address	(0010,1040)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
Additional Patient History	(0010,21b0)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
Other Patient IDs	(0010,1000)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
General Study Module							
Study Date	(0008,0020)	GENERATED	ALWAYS	ALWAYS			Is set to examination date
Study Time	(0008,0030)	GENERATED	ALWAYS	ALWAYS			Is set to examination time
Accession Number	(0008,0050)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
Physicians of Records	(0008,1048)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	

Attribute Name	Tag	Source	Presence (Attribute)	Presence (Value)	Value	Conditions	Comment
Referring Physician's Name	(0080,0090)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
Study Description	(0080,1030)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
Study ID	(0020,0010)	GENERATED	ALWAYS	ALWAYS			Is set to examination ID which is uniquely generated by equipment.
Study Instance UID	(0020,000D)	GENERATED/ MWL	ALWAYS	ALWAYS			Value is taken from MWL if present, uniquely generated by system otherwise.
Referenced Study Sequence	(0008,0010)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
> Referenced SOP Class UID	(0008,1150)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
> Referenced SOP Instance UID	(0008,1155)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
Procedure Code Sequence	(0008,1032)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
> Code Value	(0008,0100)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
> Coding Scheme Designator	(0008,0102)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
> Coding Scheme Version	(0008,0103)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
> Code Meaning	(0008,0104)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	

Attribute Name	Tag	Source	Presence (Attribute)	Presence (Value)	Value	Conditions	Comment
Admission ID	(0038,0010)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
General Series Module							
Series Date	(0008,0021)	GENERATED	ALWAYS	ALWAYS			Is set to examination date
Series Time	(0008,0031)	GENERATED	ALWAYS	ALWAYS			Is set to examination time
Modality	(0008,0060)	FIXED	ALWAYS	ALWAYS	US		
Requested Attributes Sequence	(0040,0275)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
>Requested Procedure ID	(0040,1001)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
>Scheduled Procedure Step ID	(0040,0009)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
>Scheduled Procedure Step Description	(0040,0007)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
>Scheduled Protocol Code Sequence	(0040,0008)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
>> Code Value	(0008,0100)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
>> Coding Scheme Designator	(0008,0102)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
>> Coding Scheme Version	(0008,0103)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
>> Code Meaning	(0008,0104)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
Series Instance UID	(0020,000E)	GENERATED	ALWAYS	ALWAYS			Uniquely generated by system
Series number	(0020,0011)	GENERATED	ALWAYS	ALWAYS			Is set to device generated Series Number.

Attribute Name	Tag	Source	Presence (Attribute)	Presence (Value)	Value	Conditions	Comment
General Equipment Module							
Institution Name	(0008,0080)	MWL	CONDITIONAL	ALWAYS		Included only if present in worklist	
Manufacturer	(0008,0070)	FIXED	ALWAYS	ALWAYS	GE Healthcare		
Manufacturer's Model Name	(0008,1090)	FIXED	ALWAYS	ALWAYS	Vscan Air		
Software Versions	(0018,1020)	FIXED	ALWAYS	ALWAYS			Is set to Vscan Air software version.
Station Name	(0008,1010)	USER	ALWAYS	ALWAYS			Taken from system configuration
General Image Module							
Image Type	(0008,0008)	FIXED	ALWAYS	ALWAYS	ORIGIN AL\PRI MARY		
Content Date	(0008,0023)	GENERATED	ALWAYS	ALWAYS			Set to Image date
Content Time	(0008,0033)	GENERATED	ALWAYS	ALWAYS			Set to Image time
Time Zone Offset from UTC	(0008,0201)	GENERATED	CONDITIONAL	ALWAYS		Included only for DICOM Web Service	
Instance Number	(0020,0013)	GENERATED	ALWAYS	ALWAYS		Included only for DICOM Web Service	value which is incremented for each image within a series
Lossy Image Compression	(0028,2110)	FIXED	CONDITIONAL	ALWAYS	01	Included if image is lossy compressed	
Lossy Image Compression Ratio	(0028,2112)	GENERATED	CONDITIONAL	ALWAYS		Included if image is lossy compressed	
Lossy Image Compression Method	(0028,2114)	GENERATED	CONDITIONAL	ALWAYS		Included if image is lossy compressed	

A.1.2 SOP Common module

Below **Table A-1.2** describes the SOP Common module used in multiple IODs in Vscan Air

Table A-1.2: SOP Common Module

Attribute Name	Tag	Source	Presence	Value	Conditions	Comment
Specific Character Set	(0008,0045)	USER	ALWAYS	See Section 5.3.1 for supported values		
SOP Class UID	(0008,0016)	FIXED	ALWAYS	Set to 1.2.840.10008.5.1.4.1.1.6.1 1.2.840.10008.5.1.4.1.1.3.1	Set to 1.2.840.10008.5.1.4.1.1.6.1 for Single frame US Image Set to 1.2.840.10008.5.1.4.1.1.3.1 for Multi frame US Image	
SOP Instance UID	(0008,0018)	GENERATED	ALWAYS			Uniquely generated by system.

A.2 Ultrasound Region Calibration Module

Below **Table A-2** describes the US Region Calibration Module used by Ultrasound Image IOD and Ultrasound Multi-Frame IOD.

Table A-2: Ultrasound Region Calibration Module

Attribute Name	Tag	Source	Presence (Attribute)	Presence (Value)	Value	Conditions	Comment
Sequence of Ultrasound Regions	(0018,6011)	GENERATED	ALWAYS	ALWAYS			
>Region Spatial Format	(0018,6012)	GENERATED	ALWAYS	ALWAYS	1		The spatial organization of the data within the region.
>Region Data Type	(0018,6014)	GENERATED	ALWAYS	ALWAYS	Set to 1 for B-Mode Image 2 for CF-Mode		The type of data within the region.

Attribute Name	Tag	Source	Presence (Attribute)	Presence (Value)	Value	Conditions	Comment
>Region Location Min X0	(0018,6018)	FIXED	ALWAYS	ALWAYS	0		
>Region Location Min Y0	(0018,601A)	FIXED	ALWAYS	ALWAYS	0		
>Region Location Max X1	(0018,601C)	GENERATED	ALWAYS	ALWAYS	Image width -1		
>Region Location Max Y1	(0018,601E)	GENERATED	ALWAYS	ALWAYS	Image height -1		
>Reference Pixel X0	(0018,6020)	GENERATED	ALWAYS	ALWAYS			Varies with scanning mode
>Reference Pixel Y0	(0018,6022)	GENERATED	ALWAYS	ALWAYS			Varies with scanning mode
>Physical Units X Direction	(0018,6024)	GENERATED	ALWAYS	ALWAYS	03		
>Physical units Y Direction	(0018,6026)	GENERATED	ALWAYS	ALWAYS	03		
>Physical Delta X	(0018,602C)	GENERATED	ALWAYS	ALWAYS			Varies with scanning mode
>Physical Delta Y	(0018,602E)	GENERATED	ALWAYS	ALWAYS			Varies with scanning mode

A.3 Ultrasound Image IOD

Below **Table A-3** describes the Ultrasound Image IOD used in Vscan Air.

Table A-3: Ultrasound Image IOD

Attribute Name	Tag	Source	Presence (Attribute)	Presence (Value)	Value	Conditions	Comment
Samples per pixel	(0028,0002)	GENERATED	ALWAYS	ALWAYS	3		
Photometric Interpretation	(0028,0004)	GENERATED	ALWAYS	ALWAYS	YBR_FULL_422		
Planar Configuration	(0028,0006)	GENERATED	ALWAYS	ALWAYS	0		
Rows	(0028,0010)	GENERATED	ALWAYS	ALWAYS			Value depends on scanning mode and configuration setup
Columns	(0028,0011)	GENERATED	ALWAYS	ALWAYS			Value depends on

Attribute Name	Tag	Source	Presence (Attribute)	Presence (Value)	Value	Conditions	Comment
							scanning mode and configuration setup
Bits Allocated	(0028,0100)	GENERATED	ALWAYS	ALWAYS	8		
Bits Stored	(0028,0101)	GENERATED	ALWAYS	ALWAYS	8		
High Bit	(0028,0102)	GENERATED	ALWAYS	ALWAYS	7		
Pixel Representation	(0028,0103)	GENERATED	ALWAYS	ALWAYS	0		
Pixel Data	(7FE0,0010)	GENERATED	ALWAYS	ALWAYS			Pixel Data of image.

A.4 Ultrasound Multi-Frame Image IOD

Table A-4 describes the Ultrasound Image IOD used in Vscan Air.

Table A-4: Ultrasound Multi-Frame Image IOD

Attribute Name	Tag	Source	Presence (Attribute)	Presence (Value)	Value	Conditions	Comment
Samples per pixel	(0028,0002)	GENERATED	ALWAYS	ALWAYS	3		
Photometric Interpretation	(0028,0004)	GENERATED	ALWAYS	ALWAYS	YBR_FULL_422		
Planar Configuration	(0028,0006)	GENERATED	ALWAYS	ALWAYS	0		
Rows	(0028,0010)	GENERATED	ALWAYS	ALWAYS			Value depends on scanning mode and configuration setup
Columns	(0028,0011)	GENERATED	ALWAYS	ALWAYS			Value depends on scanning mode and configuration setup
Bits Allocated	(0028,0100)	GENERATED	ALWAYS	ALWAYS	8		
Bits Stored	(0028,0101)	GENERATED	ALWAYS	ALWAYS	8		
High Bit	(0028,0102)	GENERATED	ALWAYS	ALWAYS	7		
Pixel Representation	(0028,0103)	GENERATED	ALWAYS	ALWAYS	0		
Pixel Data	(7FE0,0010)	GENERATED	ALWAYS	ALWAYS			Pixel Data of image.
Samples per pixel	(0028,0002)	GENERATED	ALWAYS	ALWAYS	3		

A.4.1 Ultrasound Multi-Frame Image Specific Modules

Table A-4.1 describes the Ultrasound Multi-Frame Image Specific Module used in Ultrasound Multi-Frame IOD in Vscan Air.

Table A-4.1: Ultrasound Multi-Frame Image Specific Modules

Attribute Name	Tag	Source	Presence (Attribute)	Presence (Value)	Value	Conditions	Comment
Multi-Frame Module							
Number of Frames	(0028,0008)	GENERATED	ALWAYS	ALWAYS			Set to the number of frames in image
Frame increment pointer	(0028,0009)	GENERATED	ALWAYS	ALWAYS			Set to Frame Time
Cine Module							
Start trim	(0008,2142)	GENERATED	ALWAYS	ALWAYS			
Stop trim	(0008,2143)	GENERATED	ALWAYS	ALWAYS			
Recommended Display Frame Rate	(0008,2144)	GENERATED	ALWAYS	ALWAYS			Set to Cine Rate
Cine Rate	(0018,0040)	GENERATED	ALWAYS	ALWAYS			
Frame Delay	(0018,1066)	FIXED	ALWAYS	ALWAYS	0		
Effective Duration	(0018,0072)	GENERATED	ALWAYS	ALWAYS			Set to duration of Cine loop in seconds
Preferred Playback Sequencing	(0018,1244)	FIXED	ALWAYS	ALWAYS	0		
Frame Time	(0018,1063)	GENERATED	ALWAYS	ALWAYS			Is set to the interframe time

B. Security Details

B.1 DICOM[®] Security Profile Details

B.1.1 Secure Transport Connection Details

Table B-1.1 describes the supported Secure transport connection profiles, cipher suites and the precedence order for cipher suites.

Table B.1.1: Secure Transport Connection Profiles and Cipher Suites

Profile	Cipher Suite	Default Preference Order (From 1=preferred to n=less preferred)
Basic TLS Secure Transport Connection Profile	TLS_RSA_WITH_3DES_EDE_CBC_SHA	1
AES TLS Secure Transport Connection Profile	TLS_RSA_WITH_AES_128_CBC_SHA	1
	TLS_RSA_WITH_3DES_EDE_CBC_SHA	2
BCP 195 TLS Secure Transport Connection Profile	TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256	1
	TLS_DHE_RSA_WITH_AES_128_GCM_SHA256	2
	TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384	3
	TLS_DHE_RSA_WITH_AES_256_GCM_SHA384	4
	TLS_RSA_WITH_AES_128_CBC_SHA	5
	TLS_RSA_WITH_3DES_EDE_CBC_SHA	6
Non-Downgrading BCP 195 TLS Secure Transport Connection Profile	TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256	1
	TLS_DHE_RSA_WITH_AES_128_GCM_SHA256	2
	TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384	3
	TLS_DHE_RSA_WITH_AES_256_GCM_SHA384	4
Extended BCP 195 TLS Profile Secure Transport Connection Profile	TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256	1
	TLS_DHE_RSA_WITH_AES_128_GCM_SHA256	2
	TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384	3
	TLS_DHE_RSA_WITH_AES_256_GCM_SHA384	4
	TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384	5
	TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256	6
IHE ATNA Unencrypted TLS Profile Secure Transport Connection Profile	SSL_RSA_WITH_NULL_SHA	1
None	No cipher suites supported	NA

B.2 DICOM[®] Web Services Security Features

DICOM Web Services in Vscan Air supports Basic Authentication, One-way authentication and Mutual authentication. Https transactions are supported with the import of certificates in to Vscan Air. Vscan Air does not generate or distribute any certificate. It allows user to import certificates from device local storage to the system through UI available in device configuration of the system. Basic and Mutual authentication is optional and can be enabled by user. Vscan Air assists user to validate the imported server and client certificate for certificate expiry date and client certificate-key mismatch. Vscan Air does not provide mechanism for time synchronization with the DICOM web server.

C. Mapping

Table C-1 describes the mapping of attributes between Modality Worklist and Instances in Vscan Air.

Following values are supported in the Scenario column of

Table C-1

- **SCHEDULED:** the image acquisition was scheduled or defined as an encounter by a remote workflow service and procedure details have been communicated in the MWL query
- **UNSCHEDULED:** the image acquisition was performed without Modality Worklist information

Following values are supported in the Value Source column of

Table C-1

- **FIXED:** the value is pre-defined and cannot be modified
- **GENERATED:** the value is generated by the system
- **SRC_INSTANCE:** the value is copied from previously created instances
- **MWL:** the value is copied from modality worklist
- **USER:** the value is entered by the user
- **SCANNED:** the value is read from a barcode scanner or similar device
- **EMPTY:** the attribute is sent without value

The Destination column uses either ROOT, if the attribute is added to the root of the instance of list the attribute Tag of the Sequence, the attribute will be added to. The comment column can be used to provide additional information regarding the values added to the IOD.

Table C-1: Modality Worklist and Instance Mapping

Attribute Name	Tag	Scenario	Image		Comments
			Value Source	Destination Tag	
Schedule Procedure Step Sequence	(0040,0100)	SCHEDULED			Not Mapped
> Modality	(0008,0060)	SCHEDULED	FIXED	ROOT	Not Mapped. Value is always fixed to "US".
		UNSCHEDULED	FIXED		
> Scheduled Station AE Title	(0040,0001)	SCHEDULED	USER	ROOT	Not Mapped. Value is set to Vscan Air AE Title as configured by user in device configuration.
> Scheduled Procedure Step Description	(0040,0007)	SCHEDULED	MWL	(0040,0275)	

Attribute Name	Tag	Scenario	Image		Comments
			Value Source	Destination Tag	
> Scheduled Protocol Code Sequence	(0040,0008)	SCHEDULED	MWL	(0040,0275)	
>> Code Value	(0008,0100)	SCHEDULED	MWL	(0040,0008)	
>> Coding Scheme Designator	(0008,0102)	SCHEDULED	MWL	(0040,0008)	
>> Coding Scheme Version	(0008,0103)	SCHEDULED	MWL	(0040,0008)	
>> Code Meaning	(0008,0104)	SCHEDULED	MWL	(0040,0008)	
> Scheduled Procedure Step ID	(0040,0009)	SCHEDULED	MWL	(0040,0275)	
Referenced Study Sequence	(0008,1110)	SCHEDULED	MWL	ROOT	
> Referenced SOP Class UID	(0008,1150)	SCHEDULED	MWL	(0008,1110)	
> Referenced SOP Instance UID	(0008,1155)	SCHEDULED	MWL	(0008,1110)	
Requested Procedure Description	(0032,1060)	SCHEDULED	MWL	ROOT	Mapped to Study Description
Requested Procedure Code Sequence	(0032,1064)	SCHEDULED	MWL	ROOT	Mapped to Procedure Code Sequence
> Code Value	(0008,0100)	SCHEDULED	MWL	(0032,1064)	
> Code Scheme Designator	(0008,0102)	SCHEDULED	MWL	(0032,1064)	
> Code Scheme Version	(0008,0103)	SCHEDULED	MWL	(0032,1064)	
> Code Meaning	(0008,0104)	SCHEDULED	MWL	(0032,1064)	
Study Instance UID	(0020,000D)	SCHEDULED	MWL	ROOT	
		UNSCHEDULED	GENERATED		
Requested Procedure ID	(0040,1001)	SCHEDULED	MWL	ROOT	
Names of Intended Recipients of Results	(0040,1010)	SCHEDULED	MWL	ROOT	Mapped to Physician(s) of Record
Accession Number	(0008,0050)	SCHEDULED	MWL	ROOT	
Referring Physician's Name	(0008,0090)	SCHEDULED	MWL	ROOT	
Admission ID	(0038,0010)	SCHEDULED	MWL		
Issuer of Admission ID	(0038,0011)	SCHEDULED	MWL	ROOT	
Institution Name	(0008,0080)	SCHEDULED	MWL	ROOT	

Attribute Name	Tag	Scenario	Image		Comments
			Value Source	Destination Tag	
Institution Address	(0008,0081)	SCHEDULED	MWL	ROOT	
Referenced Patient Sequence	(0008,1120)	SCHEDULED	MWL	ROOT	
> Referenced SOP Class UID	(0008,1150)	SCHEDULED	MWL	(0008,1120)	
> Referenced SOP Instance UID	(0008,1155)	SCHEDULED	MWL	(0008,1120)	
Patient's Name	(0010,0010)	SCHEDULED	MWL	(0010,0010)	
		UNSCHEDULED	USER		
Patient ID	(0010,0020)	SCHEDULED	MWL	(0010,0020)	
		UNSCHEDULED	USER		
Issuer of Patient ID	(0010,0021)	SCHEDULED	MWL	ROOT	
Other Patient Ids	(0010,1000)	SCHEDULED	MWL	ROOT	
Other Patient Names	(0010,1001)	SCHEDULED	MWL	ROOT	
Patient's Birth Date	(0010,0030)	SCHEDULED	MWL	ROOT	
		UNSCHEDULED	USER		
Patient's Birth Time	(0010,0032)	SCHEDULED	MWL	ROOT	
Patient's Sex	(0010,0040)	SCHEDULED	MWL	ROOT	
		UNSCHEDULED	USER		
Patient's Size	(0010,1020)	SCHEDULED	MWL	ROOT	
Patient's Weight	(0010,1030)	SCHEDULED	MWL	ROOT	
Ethnic Group	(0010,2160)	SCHEDULED	MWL	ROOT	
Patient Comments	(0010,4000)	SCHEDULED	MWL	ROOT	
Additional Patient History	(0010,21B0)	SCHEDULED	MWL	ROOT	
Pregnancy Status	(0010,21C0)	SCHEDULED	MWL	ROOT	
Contrast Allergies	(0010,2110)	SCHEDULED	MWL	ROOT	

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