

ETIAM Nexus

DICOM Conformance Statement

Product Version: [5.90](#)

ACETIAM

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1 Revision History

Date	Version	Author	Comment
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August 28, 2008	2.0.0	Jonathan NÉ	New version
May 2011	3.00	Jonathan NÉ	Update
July 2012	3.00	Jonathan NE	Update
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2 Introduction

2.1 Intended Audience

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the DICOM 3.0 Standard and with the terminology and concepts which are used in those Standard.

2.2 Scope and Field of Application

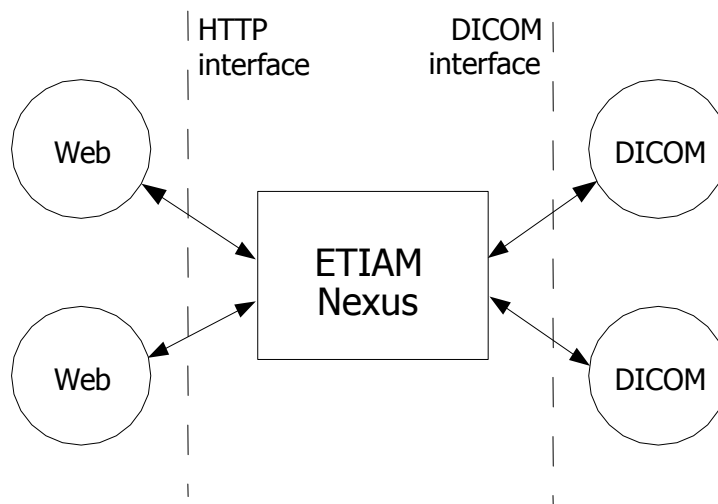
This document is the DICOM Conformance Statement for the ETIAM Nexus medical imaging product provided by ETIAM. It describes how ETIAM Nexus collaborates with other Medical Imaging devices and applications that conform to the DICOM 3.0 standard.

This statement is conformant with the recommended format as described in PS 3.2 of the DICOM standard. It should be read in conjunction with the DICOM standard and its addenda.

2.3 System Overview

ETIAM Nexus is the name of a product provided by ETIAM for management of medical image informations in Radiological Department. Among these products, ETIAM Nexus aims at improving management of images and related diagnostic informations created or used by already installed equipments. To achieve these objectives, ETIAM Nexus focus mainly on short/long term storage, web access, and automatic distribution of DICOM images and related informations.

Moreover, ETIAM Nexus relies on DICOM and HTTP standards to be successfully integrated with the other DICOM products in the one hand, and to allow its use from web applications on the other:



From an external user point of view, ETIAM Nexus provides two main interfaces:

A DICOM interface which is used to store DICOM objects, to answer the queries for stored objects retrieval, to send DICOM objects in response to automatic or user requested routing requests, and to test the DICOM connection to remote applications.

An HTTP interface which is mainly used to answer the queries for stored objects retrieval and to display images.

The DICOM interface is described in this document.

2.4 References

[DICOM]

The Digital Imaging and Communications in Medicine (DICOM) standard: NEMA PS 3.1 – to 3.16 and Supplements.

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

2.5 Acronyms and Abbreviations

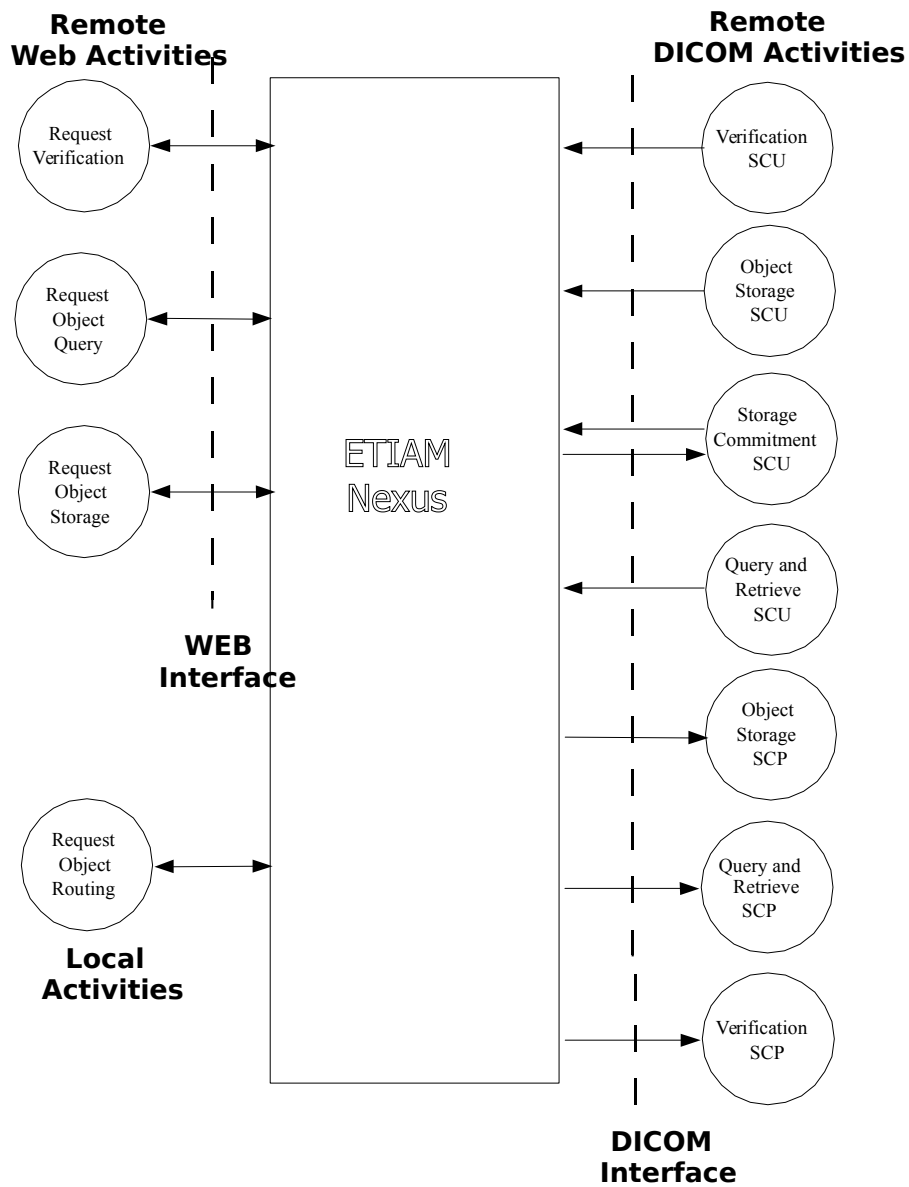
The following acronyms and abbreviations are used in this document:

- ACR American college of Radiology
- ANSI American National Standards Institute
- DICOM Digital Imaging and Communication in Medicine
- DIMSE DICOM Message Service Element
- DIMSE-C DICOM Message Service Element-Composite
- DIMSE-N DICOM Message Service Element-Normalized
- NEMA National Electrical Manufacturers Association
- PDU Protocol Data Unit
- SCP Service Class Provider
- SCU Service Class User
- SOP Service Object Pair
- TCP/IP Transmission Control Protocol/Internet Protocol
- UID Unique Identifier

3 Implementation Model

3.1 Application Data Flow Diagram

The Application Data Flow Diagram for the ETIAM Nexus is depicted below:



ETIAM Nexus implements a local Application Entities which interact with remote and local Real-World Activities:

1. ETIAM Nexus Application Entity accepts associations and requests for DICOM services from remote Application Entities that handle the remote Real-World Activities.
2. ETIAM Nexus Application Entity initiates associations with remote Application Entities and requests them for DICOM services when local Real-World Activities need those remote Real-World Activity occurs.

3.2 Functional Definitions of AE's

This Application Entity supports the following functionalities:

- Servicing of DICOM connection diagnostic requests from remote Applications Entities using Verification Service as an SCP.
- Transfer of objects from remote Applications Entities to the ETIAM Nexus for storage using the Storage Services as an SCP.
- Servicing of remote queries regarding the objects stored on the ETIAM Nexus using the Query/Retrieve Services as an SCP.
- Servicing of DICOM commitment towards the objects stored on the ETIAM Nexus using the Storage Commitment Services as an SCP.
- Diagnostic of DICOM connections using Verification Service as an SCU, in response to diagnostic requests from local or remote Web Activities.
- Export of stored objects from the ETIAM Nexus in response to remote move requests from remote applications using Storage Services as an SCU.
- Export of stored objects from the ETIAM Nexus using Storage Service as an SCU, in response to storage requests from local or remote Web Activities.
- Retrieve objects locally from a PACS using Query/Retrieve as an SCU.

After being started, this Application Entity acts as an SCP and is always waiting for an association request from a remote Application Entity. It will accept associations with Presentation Contexts for SOP Classes of the Service Classes: Verification, Storage, Query/Retrieve, and Storage Commitment.

This Application Entity also acts as an SCU and can send association requests to remote Application Entities with Presentation Contexts for SOP Classes of the Service Classes: Verification and Storage.

All network communications and object transfers between local Application Entities and remote Application Entities are accomplished using the DICOM protocol over a network using the TCP/IP protocol stack.

3.3 Sequencing of Real-World Activities

Not applicable.

4 AE Specification

4.1 AE ETIAM Nexus - Specification

This Application Entity provides Standard Conformance to the following DICOM V3.0 SOP Classes as an SCP and an SCU:

Table 1: Supported SOP Class for Verification SCP/SCU

SOP Class Name	SOP Class UID
Verification SOP Class	1.2.840.10008.1.1

Table 2: Supported SOP Classes for Image Storage SCP/SCU

SOP Class Name	SOP Class UID
BreastTomosynthesisImageStorage	1.2.840.10008.5.1.4.1.1.13.1.3
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Digital Intra Oral XRay Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.3
Digital Intra Oral Xray Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.3.1
Digital Mammography Xray Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography Xray Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.2.1
Digital XRay Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital XRay Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Enhanced MR Image Storage Supplement 49	1.2.840.10008.5.1.4.1.1.4.1
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
Multiframe Secondary Capture Byte Image Storage	1.2.840.10008.5.1.4.1.1.7.2
Multiframe Secondary Capture Single Bit Image Storage	1.2.840.10008.5.1.4.1.1.7.1
Multiframe Secondary Capture True Color Image Storage	1.2.840.10008.5.1.4.1.1.7.4
Multiframe Secondary Capture Word Image Storage	1.2.840.10008.5.1.4.1.1.7.3
NM Image Storage	1.2.840.10008.5.1.4.1.1.20
Ophthalmic photography 16 bits image storage	1.2.840.10008.5.1.4.1.1.77.1.5.2
Ophthalmic photography 8 bits image storage	1.2.840.10008.5.1.4.1.1.77.1.5.1
PET Image Storage	1.2.840.10008.5.1.4.1.1.128
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1
US Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4
VL Slide Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3

SOP Class Name	SOP Class UID
VL Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1
VL Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1
VL Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1
XRy Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
XRy Fluoroscopy Image Storage	1.2.840.10008.5.1.4.1.1.12.2
RETIRED_Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30
RETIRED_Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29
RETIRED_Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.5
RETIRED_Standalone PET Curve Storage	1.2.840.10008.5.1.4.1.1.129
RETIRED_Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6
RETIRED_Ultrasound Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3
RETIRED_VL Image Storage	1.2.840.10008.5.1.4.1.1.77.1
RETIRED_VL MultiFrame Image Storage	1.2.840.10008.5.1.4.1.1.77.2
RETIRED_Xray Angiographic Bi Plane Image Storage	1.2.840.10008.5.1.4.1.1.12.3
Breast Projection XRy Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.13.1.4
Breast Projection XRy Image Storage For Processing	1.2.840.10008.5.1.4.1.1.13.1.5

Table 3: Supported SOP Classes for Non Image Storage SCP/SCU

SOP Class Name	SOP Class UID
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3
Arterial Pulse Waveform Storage	1.2.840.10008.5.1.4.1.1.9.5.1
Autorefration Measurements Storage	1.2.840.10008.5.1.4.1.1.78.2
Basic Structured Display Storage	1.2.840.10008.5.1.4.1.1.131
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65
Colon CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.69
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.3
Encapsulated CDA Storage	1.2.840.10008.5.1.4.1.1.104.2
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1
Enhanced MR Color Image Storage	1.2.840.10008.5.1.4.1.1.4.3
Enhanced PET Image Storage	1.2.840.10008.5.1.4.1.1.130
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22
Enhanced US Volume Storage	1.2.840.10008.5.1.4.1.1.6.2
General Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.2
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2
Generic Implant Template Storage	1.2.840.10008.5.1.4.43.1
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1
Implant Assembly Template Storage	1.2.840.10008.5.1.4.44.1
Implantation Plan SR Document Storage	1.2.840.10008.5.1.4.1.1.88.70
Implant Template Group Storage	1.2.840.10008.5.1.4.45.1
Intraocular Lens Calculations Storage	1.2.840.10008.5.1.4.1.1.78.8
Intravascular Optical Coherence Tomography Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.14.1
Intravascular Optical Coherence Tomography Image Storage For Processing	1.2.840.10008.5.1.4.1.1.14.2

SOP Class Name	SOP Class UID
Keratometry Measurements Storage	1.2.840.10008.5.1.4.1.1.78.3
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59
Lensometry Measurements Storage	1.2.840.10008.5.1.4.1.1.78.1
Macular Grid Thickness And Volume Report Storage	1.2.840.10008.5.1.4.1.1.79.1
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2
Ophthalmic Axial Measurements Storage	1.2.840.10008.5.1.4.1.1.78.7
Ophthalmic Thickness Map Storage	1.2.840.10008.5.1.4.1.1.81.1
Ophthalmic Visual Field Static Perimetry Measurements Storage	1.2.840.10008.5.1.4.1.1.80.1
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40
Pseudo Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66
Real World Value Mapping Storage	1.2.840.10008.5.1.4.1.1.67
Respiratory Waveform Storage	1.2.840.10008.5.1.4.1.1.9.6.1
RT Beams Delivery Instruction Storage	1.2.840.10008.5.1.4.34.7
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1
Spectacle Prescription Report Storage	1.2.840.10008.5.1.4.1.1.78.6
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3
Subjective Refraction Measurements Storage	1.2.840.10008.5.1.4.1.1.78.4
Surface Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.5
Twelve Lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1
Visual Acuity Measurements Storage	1.2.840.10008.5.1.4.1.1.78.5
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6
XA XRF Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.5
Xray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67
RETIRED_Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9
RETIRED_Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10
RETIRED_Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8
RETIRED_Stored Print Storage	1.2.840.10008.5.1.4.1.1.11
RETIRED_Stored Print Storage	1.2.840.10008.5.1.1.27
DRAFT_SR Audio Storage	1.2.840.10008.5.1.4.1.1.88.2
DRAFT_SR Comprehensive Storage	1.2.840.10008.5.1.4.1.1.88.4
DRAFT_SR Detail Storage	1.2.840.10008.5.1.4.1.1.88.3
DRAFT_SR Text Storage	1.2.840.10008.5.1.4.1.1.88.1
DRAFT_Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1
DRAFT_RT Beams Delivery Instruction Storage	1.2.840.10008.5.1.4.34.1
DICOS_CT Image Storage	1.2.840.10008.5.1.4.1.1.501.1
DICOS_Digital Xray Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.501.2.1
DICOS_Digital Xray Image Storage For Processing	1.2.840.10008.5.1.4.1.1.501.2.2

SOP Class Name	SOP Class UID
DICOS_Threat Detection Report Storage	1.2.840.10008.5.1.4.1.1.501.3
DICONDE_Eddy Current Image Storage	1.2.840.10008.5.1.4.1.1.601.1
DICONDE_Eddy Current Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.601.2

This Application Entity provides Standard Conformance to the following DICOM V3.0 SOP Classes as an SCP:

Table 4: Supported SOP Classes for Query and Retrieve SCP/SCU

SOP Class Name	SOP Class UID
Patient Root Query And Retrieve Information model - Find	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query And Retrieve Information model - Move	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query And Retrieve Information model - Find	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query And Retrieve Information model - Move	1.2.840.10008.5.1.4.1.2.2.2

Table 5: Supported SOP Classes for Storage Commitment SCP

SOP Class Name	SOP Class UID
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1

4.1.1 Association Establishment Policies

4.1 .1 .1 General

The services shall offer a maximum PDU size defaulted to 16kB (16,384 bytes) and may be configured from a minimum of 8kB (8192 bytes).

4.1 .1 .2 Number of Associations

This Application Entity can support multiple associations simultaneously. The maximum number of simultaneous associations is set to 20 as a default and is configurable prior to runtime.

4.1 .1 .3 Asynchronous Nature

This Application Entity does not support asynchronous operations.

4.1 .1 .4 Implementation Identifying Information

This Application Entity responds with the following implementation identifying parameters:

Table 6: Application Identification Information for the ETIAM Nexus

Name	SOP Class UID
Implementation Class UID	1.2.250.1.59.3.0.3.5.3
Application Context Name	1.2.840.10008.3.1.1.1
Implementation Version Name	ETIAM_DCMTK_3.5.3

4.1.2 Association Initiation by Real-World

ETIAM Nexus AE initiates an association for a Diagnostic of DICOM connections using Verification Service, in response to diagnostic requests from local or remote Web Activities.

This Application Entity will also attempt to initiate association to export stored objects from the ETIAM Nexus using Storage Service, in response to remote move requests from other Application Entities; or in response to storage requests from local or remote Web Activities. ETIAM Nexus AE initiates an association for the appropriate Storage SOP Class(es) that corresponds to the set of objects that have been requested for transfer.

4.1 .2 .1 Real World Activity: Verification SCU

4.1.2.1.1 Associated Real-World Activity

Remote Web Activities can request a diagnostic for DICOM connections to a remote AE using Verification Service. ETIAM Nexus AE initiates an association for an ECHO request to the remote AE using Verification Service. The association is closed either when a correct response is received or when a time-out occurs.

4.1.2.1.2 Proposed Presentation Contexts

ETIAM Nexus supports the Verification SOP Class fully as specified in the DICOM Standard. The presentation context proposed by the ETIAM Nexus AE for the Echo Check is specified in the table below:

Table 7: Verification Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 1	See Table 1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.1.2.1.2.1 SOP Specific Conformance for Verification SOP Class

Not applicable

4.1 .2 .2 Real World Activity : Storage SCU

Local Activities or remote Web Activities can request to export stored objects from the ETIAM Nexus to a third application specialized in image visualization and manipulation. A real-world activity Storage request could also come from a Remote AE asking to retrieve a set of images. ETIAM Nexus AE initiates an association for the appropriate Storage Sop Class(es) that corresponds to the set of objects that have been requested for transfer. The association is closed when all objects have been sent to the remote DICOM network node. The client may abort the association as a result of operator request or when an error occurs.

4.1.2.2.1 Associated Real-World Activity for Send Object operations

ETIAM Nexus AE will initiate associations for the following reasons:

- A valid C-MOVE request that identifies one or more images known by the ETIAM Nexus is received from a Remote AE and an association is initiated to perform the C-STORE sub-operation with the destination specified in the C-MOVE request.

- A Web application or a local routing activity (local activity) requests that a set of objects be sent to a remote AE and an association is initiated to perform the C-STORE operation.

4.1.2.2.2 Proposed Presentation Contexts for Send Object operations

The presentation contexts that may be proposed by the ETIAM Nexus AE for a Storage operation are specified in the table below.

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

Table 8: Storage Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See table 2	See table 2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
		RLE Lossless Encoding	1.2.840.10008.1.2.5		
		JPEG Lossless Compressed	1.2.840.10008.1.2.4.70		
		JPEG Lossy 8 Bit Compressed	1.2.840.10008.1.2.4.50		
		JPEG Lossy 12 Bit Compressed	1.2.840.10008.1.2.4.51		
		MPEG2 Main Profile	1.2.840.10008.1.2.4.100		
		JPEG2000 Lossless Only	1.2.840.10008.1.2.4.90		
		JPEG2000	1.2.840.10008.1.2.4.91		
		MPEG4 High Profile Level 4.1	1.2.840.10008.1.2.4.102		
		MPEG4 BD compatible High Profile Level 4.1	1.2.840.10008.1.2.4.103		
		See table 3	See table 3		
DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1				
DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2				
DICOM Explicit VR Big Endian					

ETIAM Nexus applies the following rules for its proposed presentation contexts:

- All uncompressed transfer syntaxes are proposed for Storage operations.
- If an image is encoded, its corresponding native transfer syntax is proposed also, and will be preferred by SCU if both compressed and uncompressed transfer syntaxes are accepted by SCP.
- If SCP does not accept encoded transfer syntaxes, ETIAM Nexus will uncompress the related images on the fly.

4.1.2.2.2.1 SOP Specific Conformance for Storage SOP Class

ETIAM Nexus preserves all private attributes that are encoded according to the DICOM Standard. Private attributes are always stored and are treated as Type 3 attributes. If a client of the ETIAM Nexus stores private attributes using an Implicit VR, these attributes will be archived with UN (unknown) VR. The UN VR will be present in subsequent exports of this object when explicit VR is negotiated.

When performing C-STORE operations behalf of a remote web application request to send an object to a remote DICOM Application Entity and a failed, refused or warning response is received, the ETIAM Nexus AE notifies the HTTP operator that the operation did not complete successfully. Successful C-STORE operations are not reported.

4.1 .2 .3 Real World Activity : Query And Retrieve SCU

4.1.2.3.1 Associated Real-World Activity

The associated Real World Activity for ETIAM Nexus Query and Retrieve SCU is the retrieving of remote studies.

4.1.2.3.2 Proposed Presentation Contexts

The presentation context proposed by the ETIAM Nexus AE for the Query and Retrieve is specified in the table below:

Table 9: Storage Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See table 4	See table 4	DICOM Implicit VR Little Endian DICOM Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

4.1.2.3.3 SOP Specific Conformance statement

ETIAM Nexus provides standard conformance to the DICOM Query and Retrieve Service Class. ETIAM Nexus requests the following matching key types:

Key type matching	
SV	Single value Matching
WC	Wild card Matching
RM	Range Matching

Table 10: Query and Retrieve matching key types

Description	Tag	Match
Patient ID	(0010,0020)	SV
Patient's Name	(0010,0010)	SV / WC
Patient's Sex	(0010,0040)	SV
Study Date	(0008,0020)	RM
Accession Number	(0008,0050)	SV
Study Description	(0008,1030)	SV
Modalities in Study	(0008,0061)	WC

ETIAM Nexus will query for the following attributes:

Table 11: Query Attributes

Description	Tag
Patient ID	(0010,0020)
Patient's Name	(0010,0010)
Patient's Birth Date	(0010,0030)
Patient's Sex	(0010,0040)
Study Instance UID	(0020,000D)
Study ID	(0020,0010)
Study Date	(0008,0020)
Study Time	(0008,0030)
Accession Number	(0008,0050)
Referring Physician's Name	(0008,0090)
Study Description	(0008,1030)
Series Instance UID	(0020,000E)
Series Number	(0020,0011)
Modality	(0008,0060)
SOP Instance UID	(0008,0018)

4.1.3 Association Acceptance Policy

This Application Entity accepts associations for the Verification Service, Storage Services, Storage Commitment Service, and Query And Retrieve Services.

4.1.3.1 Real World Activity Verification

This Application Entity waits for an association request and accepts associations to do, among other things, the Verification Service.

The association is aborted if an error occurs and is closed when the initiator requests that it be closed.

4.1.3.1.1 Associated Real-World Activity

An echo response is performed by the ETIAM Nexus server application after it receives a DICOM Echo request.

4.1.3.1.2 Presentation Context Table

Only the presentation context listed in the table below will be accepted by the ETIAM Nexus for the Verification SOP Class.

Table 12: Verification Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See table 1	See table 1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

4.1.3.1.2.1 SOP specific Conformance for SOP Class Verification

ETIAM Nexus AE provides standard conformance to the DICOM Verification Service Class.

4.1.3.1.3 Presentation Context Acceptance Criterion

4.1.3.1.4 Transfer Syntax Selection Policies

ETIAM Nexus Server only supports the Implicit VR Little Endian transfer syntax. Any proposed Presentation Context which includes the Implicit VR Little Endian transfer syntax will be accepted. Any proposed Presentation Context that does not include the Implicit VR Little Endian transfer syntax will be rejected.

4.1.3.2 Real-World Activity Storage

ETIAM Nexus Application Entity waits for an association request and accepts association to do, among other things, the Image Storage Service. The association is aborted after an error or closed when the initiator requests that it be closed.

4.1.3.2.1 Associated Real-World Activity

Once the association has been established, the ETIAM Nexus AE waits for transmission of conformant Storage Service messages. Objects received are stored in local disk and attributes of the objects are saved in a long-term database. The association is closed after an error or when the initiator requests that it be closed. The association is also closed when there is no activity (i.e. no messages received) for a configurable amount of time.

4.1.3.2.2 Presentation Context Table

The presentation contexts that will be accepted by the ETIAM Nexus AE for the Receive Object operation are specified in the table below.

Table 13: Storage Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See table 2	See table 2	DICOM Implicit VR Little Endian DICOM Explicit VR Little Endian DICOM Explicit VR Big Endian RLE Lossless Encoding JPEG Lossless Compressed JPEG Lossy 8 Bit Compressed JPEG Lossy 12 Bit Compressed MPEG2 Main Profile JPEG2000 Lossless Only JPEG2000	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.5 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.100 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91	SCP	None
See table 3	See table 3	DICOM Implicit VR Little Endian DICOM Explicit VR Little Endian DICOM Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

4.1.3.2.2.1 SOP Specific Conformance for SOP Class Storage

ETIAM Nexus AE conforms to the SOP's of the Storage SOP Class at Level 2 (Full). No elements are discarded or coerced by the ETIAM Nexus AE. In the event of a successful C-STORE operation, the object has successfully been written to disk as a standard (UNIX) file in ETIAM Nexus Image Cache.

The object filename on the disk has the following syntax : MM-UID.dcmwhere:

- MM is a two letter code for the modality (US, CT, ...)
- UID is the SOP Instance UID of the image

ETIAM Nexus AE responds to a C-STORE request with one of these response codes:

Table 14: C-STORE Response Codes

Service Status	Status Description	Status Code (0000,0900)	Related Fields*
Refused	Out of Resources - There were insufficient resources to process the request. The request was not processed.	A700H	(0000,0902)
Error	Data Set does not match SOP Class - A required attribute is not present in the message. The request was not	A900H	(0000,0901) (0000,0902)
	Cannot understand - The message was not properly DICOM-encoded. The request was not processed.	C000H	(0000,0902)
Success	Image successfully stored	0000H	None

* Related fields:

- (0000,0901) Contains a list of attribute tags missing.
- (0000,0902) Contains a short description of the condition.

4.1.3.2.3 Presentation Context Acceptance Criterion

Each of the presentation contexts listed in Table above will be accepted by the ETIAM Nexus. However, if encoded transfer syntax acceptance is disabled, no such transfer syntax will be accepted.

4.1.3.2.4 Transfer Syntax Selection Policies

ETIAM Nexus Application Entity selects the use of proposed transfer syntaxes in this order: Lossy JPEG 8 Bit Compressed (1.2.840.10008.1.2.4.50), Lossy JPEG 12 Bit Compressed (1.2.840.10008.1.2.4.51), Default lossless JPEG Compressed (1.2.840.10008.1.2.4.70), RLE Encoding (1.2.840.10008.1.2.5), Explicit VR Little Endian (1.2.840.10008.1.2.1), Explicit VR Big Endian (1.2.840.10008.1.2.2), and Implicit VR Little Endian (1.2.840.10008.1.2).

Any proposed Presentation Context which includes one of these transfer syntax will be accepted. Any proposed Presentation Context that does not include one of these transfer syntax will be rejected.

Files stored by the ETIAM Nexus on disk use the Little Endian Explicit Transfer Syntax if the dataset is sent using a non-encoded Transfer Syntax. In other cases, the negotiated Transfer Syntax is used for disk storage.

4.1.3.3 Real-world Activity Query And Retrieve

ETIAM Nexus AE waits for an association request and accepts associations to do, among other things, the DICOM Query/Retrieve service. The association is closed after an error or when the initiator requests that it be closed. The association is also closed when there is no activity (IE, no messages received) for a configurable amount of time.

4.1.3.3.1 Associated Real-World activity

Once the association has been established, the ETIAM Nexus waits for transmission of conformant Query/Retrieve Service messages. If a valid C-FIND is received, the ETIAM Nexus long-term database is searched and the requested information is returned to the Query/Retrieve SCU. If a valid C-MOVE request is received, then the ETIAM Nexus long-term database is searched for the requested objects and they are sent to the remote AE node specified by the SCU.

4.1.3.3.2 Presentation Context Table

The presentation contexts that will be accepted by the ETIAM Nexus AE for the Receive Object operation are specified in the table below.

Table 15: Find and Move Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See table 4	See table 4	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2		

4.1.3.3.2.1 SOP Specific Conformance to the Patient Root Query/Retrieve Information Model

ETIAM Nexus AE conforms to baseline behavior of the SOP Classes of the Patient Root SOP Class Group listed in Table 4 as an SCP, supporting both the C-FIND and C-MOVE operations. C-FIND and C-MOVE requests are handled on a first-received, first-processed basis; the Priority Service Parameter is ignored.

C-FIND SCP Conformance

Queries against the standard Patient Root Query/Retrieve Information Model are supported to return attribute values of Objects known to the ETIAM Nexus, as recorded in its database.

Optional keys supported for the Patient Root Q/R Model are listed in the table below. The support differs based on the query level specified in the required Level Tag (0008,0052).

Table 16: Optional Attributes Supported for the Patient Root Q/R Model

Level	Description	Tag	Type
PATIENT	Patient ID	(0010,0020)	U
	Patient's Name	(0010,0010)	R
	Patient's Birth Date	(0010,0030)	O
	Patient's Birth Time	(0010,0032)	O
	Patient's Sex	(0010,0040)	O
	Other Patient IDs	(0010,1000)	O

Level	Description	Tag	Type
	Other Patient Names	(0010,1001)	O
	Ethnic Group	(0010,2160)	O
	Number of Patient Related Studies	(0020,1200)	O
	Number of Patient Related Series	(0020,1202)	O
	Number of Patient Related Images	(0020,1204)	O
STUDY	Study Instance UID	(0020,000D)	U
	Study ID	(0020,0010)	R
	Study Date	(0008,0020)	R
	Study Time	(0008,0030)	R
	Accession Number	(0008,0050)	R
	Referring Physician's Name	(0008,0090)	R
	Study Description	(0008,1030)	O
	Name of Physician's Reading Study	(0008,1060)	O
	Admitting Diagnoses Description	(0008,1080)	O
	Patient's Age	(0010,1010)	O
	Patient's Size	(0010,1020)	O
	Patient's Weight	(0010,1030)	O
	Occupation	(0010,2180)	O
	Other Study Numbers	(0020,1070)	O
	Interpretation's Author	(4008,010C)	O
Number of Study Related Series	(0020,1206)	O	
Number of Study Related Images	(0020,1208)	O	
SERIES	Series Instance UID	(0020,000E)	U
	Series Number	(0020,0011)	R
	Modality	(0008,0060)	R
	Series Date	(0008,0021)	O
	Series Time	(0008,0031)	O
	Series Description	(0008,103E)	O
	Protocol Name	(0018,1030)	O
	Operator's Name	(0008,1070)	O
	Performing Physician's Name	(0008,1050)	O
	Number of Series Related Instances	(0020,1209)	O
IMAGE	SOP Instance UID	(0008,0018)	U
	SOP Class UID	(0008,0016)	O
	Instance Number	(0020,0013)	R
	Rows	(0028,0010)	O
	Columns	(0028,0011)	O
	Bits Allocated	(0028,0100)	O
	Number of Frames	(0028,0008)	O
	Completion Flag	(0040,A491)	O
	Verification Flag	(0040,A493)	O
	Content Date	(0008,0023)	O
	Content Time	(0008,0033)	O
	Verification Date Time	(0040,A030)	O
	Presentation Label	(0070,0080)	O
	Presentation Description	(0070,0081)	O
	Presentation Creation Date	(0070,0082)	O
Presentation Creation Time	(0070,0083)	O	
Presentation Creator's Name	(0070,0084)	O	

C-MOVE SCP Conformance

ETIAM Nexus AE supports C-MOVE sub-operations for each of the Storage Service Class SOP Classes list in Table 2: Supported SOP Classes for Image Storage SCP/SCU and Table 3: Supported SOP Classes for Non Image Storage SCP/SCU.

When performing C-STORE operations on behalf of a C-MOVE request from a remote DICOM Application Entity, periodic C-MOVE PENDING response messages are sent to the C-MOVE SCU for each object. ETIAM Nexus AE notifies the remote C-MOVE SCU about the number of successful, failed, refused or warning messages received from the remote C-STORE SCP.

4.1.3.3.2.2 SOP Specific Conformance to the Study Root Query/Retrieve Information Model

ETIAM Nexus AE conforms to baseline behavior of the SOP Classes of the Study Root SOP Class Group listed in Table 4 as an SCP, supporting both the C-FIND and C-MOVE operations. C-FIND and C-MOVE requests are handled on a first-received, first-processed basis; the Priority Service Parameter is ignored.

C-FIND SCP Conformance

Queries against the standard Study Root Query/Retrieve Information Model are supported to return attribute values of Objects known to the ETIAM Nexus product, as recorded in its Database.

Optional keys supported for the Study Root Q/R Model are listed in the table below. The support differs based on the query level specified in the required Level Tag (0008,0052).

Table 17: Optional Attributes Supported for the Study Root Q/R Model

Level	Description	Tag	Type
STUDY	Study Instance UID	(0020,000D)	U
	Study ID	(0020,0010)	R
	Patient ID	(0010,0020)	R
	Patient's Name	(0010,0010)	R
	Study Date	(0008,0020)	R
	Study Time	(0008,0030)	R
	Accession Number	(0008,0050)	R
	Referring Physician's Name	(0008,0090)	R
	Study Description	(0008,1030)	O
	Patient's Birth Date	(0010,0030)	O
	Patient's Birth Time	(0010,0032)	O
	Patient's Sex	(0010,0040)	O
	Name of Physician's Reading Study	(0008,1060)	O
	Admitting Diagnoses Description	(0008,1080)	O
	Occupation	(0010,2180)	O
	Interpretation's Author	(4008,010C)	O
	Other Patient IDs	(0010,1000)	O
	Other Patient Names	(0010,1001)	O
	Other Study Numbers	(0020,1070)	O
	Ethnic Group	(0010,2160)	O
	Patient's Age	(0010,1010)	O
	Patient's Size	(0010,1020)	O
	Patient's Weight	(0010,1030)	O
	Number of Patient Related Studies	(0020,1200)	O
	Number of Patient Related Series	(0020,1202)	O
	Number of Patient Related Images	(0020,1204)	O
Number of Study Related Series	(0020,1206)	O	
Number of Study Related Images	(0020,1208)	O	
SERIES	Modality	(0008,0060)	R
	Series Number	(0020,0011)	R
	Series Instance UID	(0020,000E)	U
	Series Date	(0008,0021)	O
	Series Time	(0008,0031)	O
	Series Description	(0008,103E)	O
	Protocol Name	(0018,1030)	O
	Operator's Name	(0008,1070)	O

Level	Description	Tag	Type
	Performing Physician's Name	(0008,1050)	O
	Number of Series Related Instances	(0020,1209)	O
IMAGE	SOP Instance UID	(0008,0018)	U
	SOP Class UID	(0008,0016)	O
	Instance Number	(0020,0013)	R
	Rows	(0028,0010)	O
	Columns	(0028,0011)	O
	Bits Allocated	(0028,0100)	O
	Number of Frames	(0028,0008)	O
	Completion Flag	(0040,A491)	O
	Verification Flag	(0040,A493)	O
	Content Date	(0008,0023)	O
	Content Time	(0008,0033)	O
	Verification Date Time	(0040,A030)	O
	Presentation Label	(0070,0080)	O
	Presentation Description	(0070,0081)	O
	Presentation Creation Date	(0070,0082)	O
	Presentation Creation Time	(0070,0083)	O
	Presentation Creator's Name	(0070,0084)	O

C-MOVE SCP Conformance

ETIAM Nexus AE supports C-MOVE sub-operations for each of the Storage Service Class SOP Classes list in Table 2: Supported SOP Classes for Image Storage SCP/SCU and Table 3: Supported SOP Classes for Non Image Storage SCP/SCU.

When performing C-STORE operations on behalf of a C-MOVE request from a remote DICOM application entity, periodic C-MOVE PENDING response messages are sent to the C-MOVE SCU for each object. ETIAM Nexus AE notifies the remote C-MOVE SCU about the number of successful, failed, refused or warning messages received from the remote C-STORE SCP.

4.1.3.3.3 Presentation context acceptance criterion for Find and Move operations

Each of the presentation contexts listed in Table 15 will be accepted by the ETIAM Nexus.

4.1.3.3.4 Transfer syntax selection policies for Find and Move Execution operations

ETIAM Nexus Application Entity selects the use of proposed transfer syntaxes in this order: Explicit VR Little Endian (1.2.840.10008.1.2.1), Explicit VR Big Endian (1.2.840.10008.1.2.2), and Implicit VR Little Endian (1.2.840.10008.1.2).

4.1.3.4 Real-World Activity Storage Commitment

The ETIAM Nexus Application Entity waits for an association request and accepts associations to do, among other things, the DICOM Storage Commitment service. The association is closed after an error or when the initiator requests that it be closed.

4.1.3.4.1 Associated Real-World Activity

Once the association has been established, the ETIAM Nexus waits for the request for storage commitment that includes a list of references to one or more SOP instances. the ETIAM Nexus will receive the request and respond to the N-ACTION request. the ETIAM Nexus checks that the SOP instances requested for storage commitment have been received and an immediate N- EVENT-REPORT message is created and sent to the requesting SCU.

4.1.3.4.2 Presentation Context

The presentation contexts that will be accepted by the ETIAM Nexus AE for the Storage Commitment operation are specified in the table below.

Table 18: Storage Commitment Presentation Contexts of the ETIAM Nexus

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID	SCP	None
See table 6	See table 6	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2		

4.1.3.4.2.1 SOP Specific Conformance to the Storage Commitment Service Class

ETIAM Nexus supports the action information in the table below for the Storage Commitment Service Class as an SCP.

Table 19: Storage Commitment Request - Action Information

Action Type Name	Action Type ID	Attribute Name	Attribute Tag
Storage Commitment Request	1	Transaction UID	(0008,1195)
		Referenced SOP Sequence	(0008,1199)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)

If the ETIAM Nexus has successfully completed storage commitment, the ETIAM Nexus issues an N-EVENT-REPORT to the requesting SCU that it has successfully committed the requested SOP Instances. ETIAM Nexus supports the event information in the table below for the Storage Commitment Service Class as an SCP.

Table 20: Storage Commitment Result - Request Successful

Event Type Name	Event Type ID	Attribute Name	Attribute Tag
Storage Commitment Result Request Successful	1	Transaction UID	(0008,1195)
		Referenced SOP Sequence	(0008,1199)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)
		>Retrieve AE Title	(0008,0054)

If the ETIAM Nexus cannot successfully complete storage commitment for one or more referenced SOP Instances, the ETIAM Nexus issues an N-EVENT-REPORT to the requesting SCU that includes the Failed SOP sequence indicating which SOP instances could not be committed. ETIAM Nexus supports the event information in the table below for the Storage Commitment Service Class as an SCP.

Table 21: Storage Commitment Result - Failures Exist

Event Type Name	Event Type ID	Attribute Name	Attribute Tag
Storage Commitment Result Failures Exist	2	Transaction UID	(0008,1195)
		Referenced SOP Sequence	(0008,1199)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)
		>Retrieve AE Title	(0008,0054)
		Failed SOP Sequence	(0008,1199)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)
		>Failure Reason	(0008,1197)

ETIAM Nexus-Server AE initiates an association as an SCP with the remote AE using the SCU/SCP role negotiation, and send the N-EVENT-REPORT..

4.1.3.4.3 Presentation context acceptance criterion for Storage Commitment operations

Each of the presentation contexts listed in Table 18 will be accepted by the ETIAM Nexus-Server AE.

4.1.3.4.4 Transfer syntax selection policies for Storage Commitment operations

ETIAM Nexus Application Entity selects the use of proposed transfer syntaxes in this order: Explicit VR Little Endian (1.2.840.10008.1.2.1), Explicit VR Big Endian (1.2.840.10008.1.2.2), and Implicit VR Little Endian (1.2.840.10008.1.2).

5 Communication Profiles

5.1 TCP/IP Stacks

ETIAM Nexus provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

5.1.1 TCP/IP API

ETIAM Nexus use the TCP/IP stack from the Linux system upon which it executes.

5.1.2 Physical Media Support

ETIAM Nexus is indifferent to the physical medium over which TCP/IP executes; it inherits this from the system upon which it executes.

6 Extensions/Specializations/Privatizations

Not Applicable.

7 Configuration

ETIAM Nexus configuration is included in the application WEB user interface.

8 Support of Extended Character Sets

ETIAM Nexus supports Extended Character Set "ISO_IR 100" Latin Alphabet N° 1, supplementary set.