No. MIIUS0037EA

TOSHIBA

DICOM CONFORMANCE STATEMENT

FOR

DIAGNOSTIC ULTRASOUND SYSTEM

MODEL USWS-900A ULTRAEXTEND™ V1.00

TOSHIBA MEDICAL SYSTEMS CORPORATION

© TOSHIBA MEDICAL SYSTEMS CORPORATION 2009
ALL RIGHTS RESERVED

Trademarks

"UltraExtend" is a trademark of Toshiba Medical Systems Corporation.
This document may include trademarks or registered trademarks of other companies.

IMPORTANT!

(1) No part of this document may be copied or reprinted, in whole or in part, without written permission.

(2) The contents of this document are subject to change without prior notice and without our legal obligation.

*

1. CONFORMANCE STATEMENT OVERVIEW

The software package *UltraExtend*™ supports medical staff in their daily activity. It serves for organizing, visualizing, processing, measuring, storing and transferring image and non-image data that was previously acquired during medical examinations.

UltraExtend™ supports several DICOM Service Classes (using the OFFIS DICOM Toolkit DCMTK © OFFIS e.V. 1993-2009) to provide the following functionalities.

— Receives from different modalities DICOM data in order to be stored in the database, viewed, analyzed or transferred to a PACS system.
— Implements a GUI to visualize the contents of a DICOMDIR and imports study data selected by the user.
— Finds and retrieves DICOM data from a PACS.
— Transfers DICOM data to a PACS in order to be stored and requests storage commitment for the files stored.

Table 1-1 contains an overview of the main network services supported by *UltraExtend*™. Table 1-2 lists the supported media services.

Table 1-1
NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Secondary Capture Image Storage	Yes	Yes
Ultrasound Image Storage	Yes	Yes
Ultrasound Multi-frame Image Storage	Yes	Yes
Enhanced SR Storage	Yes	Yes
Storage Commitment		
Storage Commitment Push Model	Yes	No
Query/Retrieve		
Study Root Q/R Information Model – Find	Yes	No
Study Root Q/R Information Model – Move	Yes	No

Table 1-2
MEDIA SERVICES

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

*

2. TABLE OF CONTENTS

1. CONFORMANCE STATEMENT OVERVIEW i

2. TABLE OF CONTENTS ..... a

3. INTRODUCTION 1

3.1 AUDIENCE 1

3.2 REMARKS 1

3.3 DEFINITIONS, TERMS AND ABBREVIATIONS 1

3.4 REFERENCES 1

4. NETWORKING 2

4.1 IMPLEMENTATION MODEL 2
4.1.1 Application Data Flow 2
4.1.2 Functional Definition of AEs 3
4.1.3 Sequencing of Real-World Activities 4

4.2 AE SPECIFICATIONS 5
4.2.1 Storage SCU AE Specification 5
4.2.2 Storage Commitment SCU AE Specification 10
4.2.3 Q/R SCU AE Specification 19
4.2.4 Storage SCP AE Specification 25

4.3 NETWORK INTERFACES 29
4.3.1 Physical Network Interface 29
4.3.2 Additional Protocols 29

4.4 CONFIGURATION 30
4.4.1 AE Title/Presentation Address Mapping 30
4.4.2 Parameters 30

5. MEDIA INTERCHANGE 31

5.1 IMPLEMENTATION MODEL 31
5.1.1 Application Data Flow 31
5.1.2 Functional Definition of AEs 31
5.1.3 Sequencing of Real-World Activities 31
5.1.4 File Meta Information for Implementation Class and Version 31

5.2 AE SPECIFICATIONS 32
5.2.1 Offline-Media AE Specification 32

5.3 AUGMENTED AND PRIVATE APPLICATION PROFILES 33

5.4 MEDIA CONFIGURATION 33

6. SUPPORT OF CHARACTER SETS 34

6.1 OVERVIEW 34

6.2 CHARACTER SETS 34

6.3 CHARACTER SET CONFIGURATION 34

7. SECURITY 35

8. ANNEXES 36

8.1 IOD CONTENTS 36

8.1.1 Created SOP Instances 36

8.1.2 Usage of Attributes from received IOD's 36

8.1.3 Attribute Mapping 36

8.1.4 Coerced/Modified Fields 36

8.2 DATA DICTIONARY OF PRIVATE ATTRIBUTES 36

8.3 CONTROLLED TERMINOLOGY AND TEMPLATES 36

8.4 GRAYSCALE IMAGE CONSISTENCY 36

8.5 STANDARD EXTENDED/SPECIALIZED/PRIVATE SOP CLASSES 36

8.6 PRIVATE TRANSFER SYNTAXES 36

*

3. INTRODUCTION

3.1 AUDIENCE

This document is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

3.2 REMARKS

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication with Toshiba Medical Systems and other vendors' Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [DICOM]. However, by itself it is not guaranteed to ensure the desired interoperability and a successful interconnectivity.

The user should be aware of the following important issues:

— The comparison of different conformance statements is the first step towards assessing interconnectivity between Toshiba Medical Systems and non-Toshiba Medical Systems equipment.
— Test procedures should be defined to validate the desired level of connectivity.
— The DICOM standard will evolve to meet the users' future requirements. Toshiba Medical Systems is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.

3.3 DEFINITIONS, TERMS AND ABBREVIATIONS

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard.

Abbreviations and terms are as follows:

AE	Application Entity
DICOM	Digital Imaging and Communications in Medicine
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
IOD	Information Object Definition
ISO	International Standards Organization
NEMA	National Electrical Manufacturers Association
PDU	Protocol Data Unit
SCU	Service Class User
SCP	Service Class Provider
SOP	Service-Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier
VR	Value Representation

3.4 REFERENCES

[DICOM] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1-3.18, 2008

4. NETWORKING

4.1 IMPLEMENTATION MODEL

4.1.1 Application Data Flow

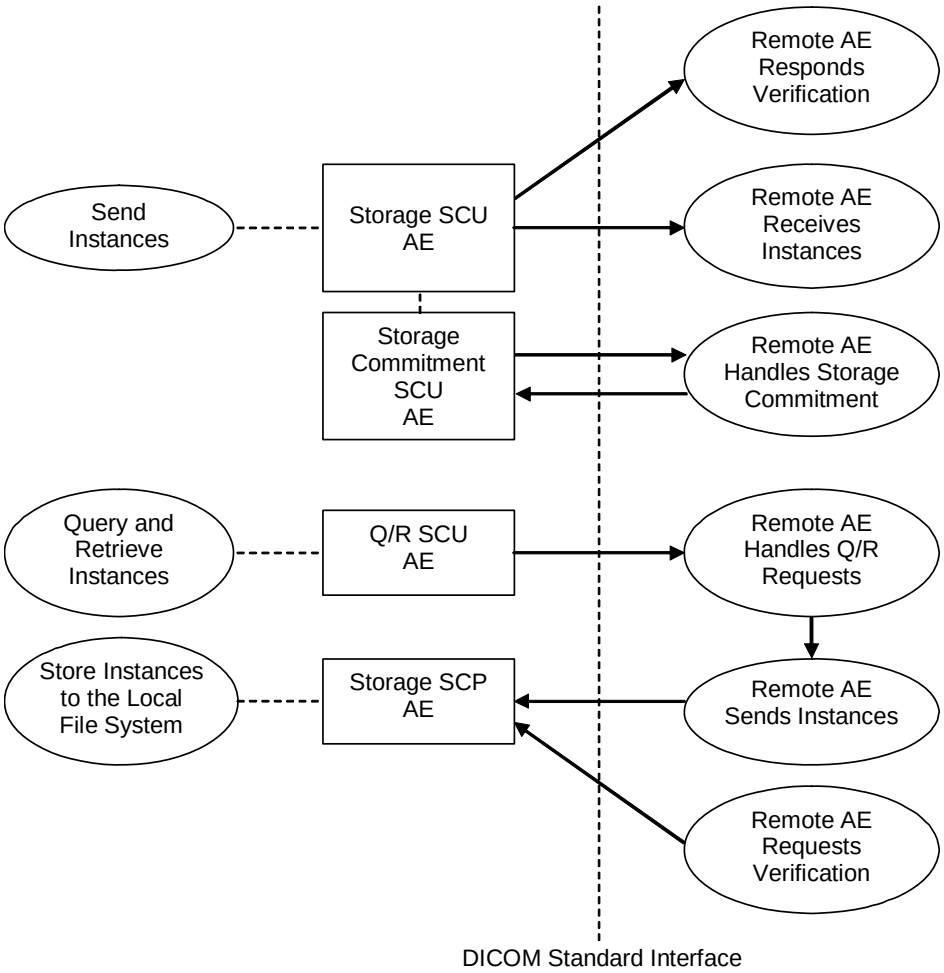

Figure 4.1-1
APPLICATION DATA FLOW DIAGRAM

— The Storage SCU AE sends instances to a remote AE. It is associated with the local real-world activity “Send Instances”. “Send Instances” is performed on user request for specific instances selected. If the remote AE is configured as a Storage Commitment SCP AE, the Storage SCU AE will send a storage commitment request to the Storage Commitment SCU AE. The Storage SCU AE can also issue C-ECHO requests as a Verification SCU.

— The Storage Commitment SCU AE will request Storage Commitment and if a commitment is successfully obtained will record this information in the local database.

— The Q/R SCU AE queries a remote AE for lists of studies and retrieves selected studies. It is associated with the local real-world activity “Query and Retrieve Instances”.

— The Storage SCP AE receives incoming instances. It is associated with the local real-world activity “Store Instances to the Local File System”. “Store Instances to the Local File System” stores the received instances to the local file system. The Storage SCP AE can also respond to C-ECHO requests as a Verification SCP.

4.1.2 Functional Definition of AEs

4.1.2.1 Functional Definition of Storage SCU AE

The existence of a send-job queue entry with associated network destination will activate the Storage SCU AE. An association request is sent to the destination AE and on successful negotiation of a Presentation Context the instance transfer is started. If the instance transfer fails, the Storage SCU AE will retry this send-job automatically. If the remote AE is configured as a Storage Commitment SCP AE, the Storage SCU AE will send a storage commitment request to the Storage Commitment SCU AE. The Storage SCU AE can also issue C-ECHO requests as a Verification SCU before the instance transfer.

4.1.2.2 Functional Definition of Storage Commitment SCU AE

The Storage Commitment SCU AE will request Storage Commitment and if a commitment is successfully obtained will record this information in the local database.

4.1.2.3 Functional Definition of Q/R SCU AE

The Q/R SCU AE is activated when the user selects a remote node to query and enters some key information, Patient’s Name, Patient ID and/or Study Date. The user can select studies to be retrieved. The instances will be received at the Storage SCP AE.

4.1.2.4 Functional Definition of Storage SCP AE

The Storage SCP AE waits for another application to connect at the presentation address configured for its Application Entity Title. The Storage SCP AE will accept Associations with Presentation Contexts for SOP Classes of the Verification and Storage Service Classes. Any instances received on such Presentation Contexts will be stored to the local file system.

4.1.3 Sequencing of Real-World Activities

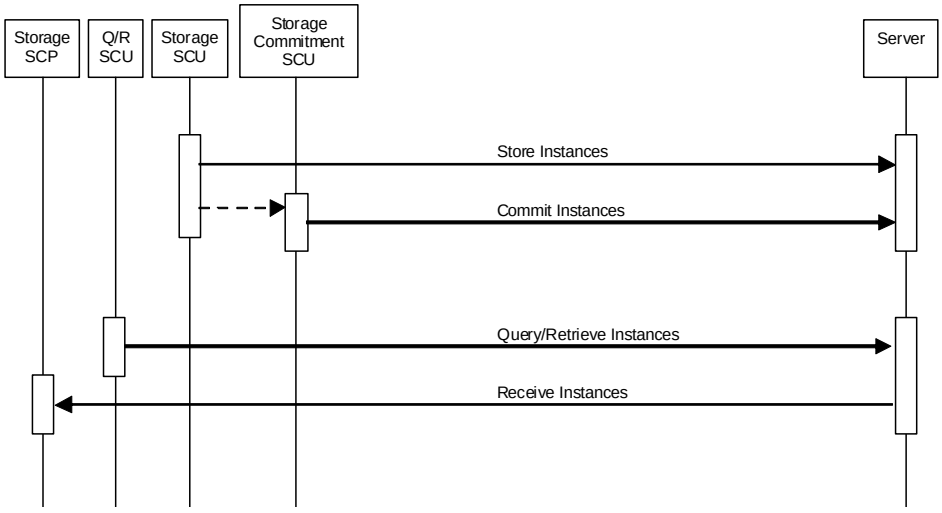

Figure 4.1-2
SEQUENCING CONSTRAINTS

4.2 AE SPECIFICATIONS

4.2.1 Storage SCU AE Specification

4.2.1.1 SOP Classes

The Storage SCU AE provides Standard Conformance to the following SOP Classes:

Table 4.2-1
SOP CLASSES FOR THE STORAGE SCU AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7		
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1		
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1		
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22		

4.2.1.2 Association Policies

4.2.1.2.1 General

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

Table 4.2-2
DICOM APPLICATION CONTEXT FOR THE STORAGE SCU AE

Application Context Name	1.2.840.10008.3.1.1.1

4.2.1.2.2 Number of Associations

There is no inherent limit to the number of associations other than limits imposed by the computer's operating system.

Table 4.2-3
NUMBER OF ASSOCIATIONS INITIATED FOR THE STORAGE SCU AE

Maximum number of simultaneous associations	Unlimited

4.2.1.2.3 Asynchronous Nature

The Storage SCU AE does not support asynchronous communication (multiple outstanding transactions over a single association).

Table 4.2-4
ASYNCHRONOUS NATURE FOR THE STORAGE SCU AE

Maximum number of outstanding asynchronous transactions	1

4.2.1.2.4 Implementation Identifying Information

The implementation information for the Storage SCU AE is:

Table 4.2-5
DICOM IMPLEMENTATION CLASS AND VERSION FOR THE STORAGE SCU AE

Implementation Class UID	1.2.276.0.7230010.3.0.3.5.4
Implementation Version Name	OFFIS_DCMTK_354

4.2.1.3 Association Initiation Policy

4.2.1.3.1 Activity – Send Instances

4.2.1.3.1.1 Description and Sequencing of Activities

The Storage SCU AE attempts to initiate a new Association in order to issue a Verification request (C-ECHO) if needed.

The Storage SCU AE attempts to initiate a new Association in order to issue a Storage request (C-STORE). If the job contains multiple instances then multiple C-STORE requests will be issued over the same Association. If the instance transfer fails, the Storage SCU AE will retry this send-job automatically.

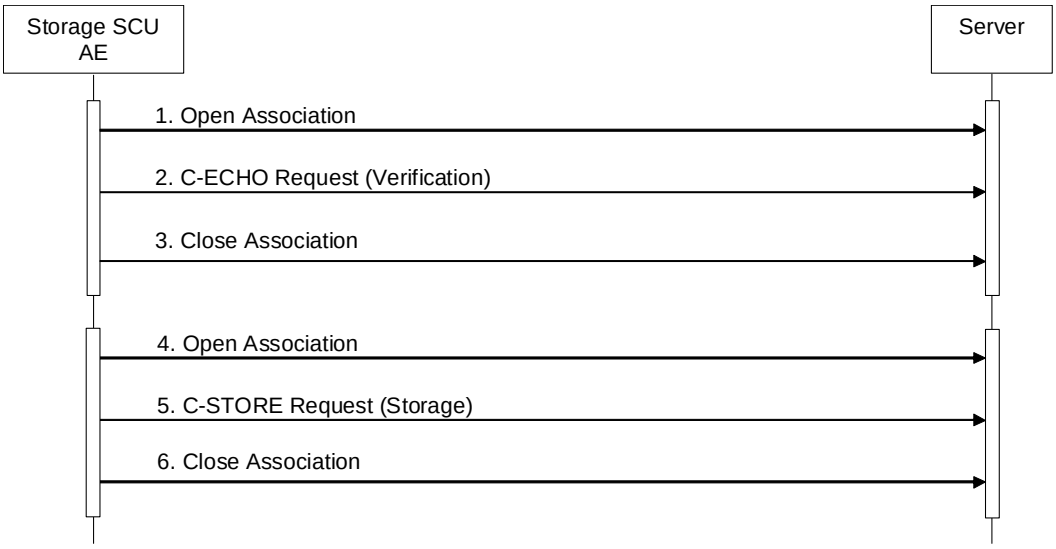

Figure 4.2-1
SEQUENCING OF ACTIVITY – SEND INSTANCES

A possible sequence of interactions between the Storage SCU AE and a Server (e.g. a storage or archive device supporting the Verification and Storage SOP Classes as an SCP) is illustrated in the Figure above:

1. The Storage SCU AE opens an Association with the Server.
2. The Storage SCU AE issues a Verification request (C-ECHO) and the Server replies with a C-ECHO response (status success).
3. The Storage SCU AE closes the Association with the Server.
4. The Storage SCU AE opens an Association with the Server
5. Acquired images are transmitted to the Server using a Storage request (C-STORE) and the Server replies with a C-STORE response (status success).
6. The Storage SCU AE closes the Association with the Server.

4.2.1.3.1.2 Proposed Presentation Contexts

The Storage SCU AE will propose the Presentation Contexts shown in the following table:

Table 4.2-6
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY SEND INSTANCES

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG Baseline (Process 1) JPEG Lossless, Non-Hierarchical, First-Order Prediction RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5		
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG Baseline (Process 1) JPEG Lossless, Non-Hierarchical, First-Order Prediction RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5		
US Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG Baseline (Process 1) JPEG Lossless, Non-Hierarchical, First-Order Prediction RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5		
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2		

4.2.1.3.1.3 SOP Specific Conformance for Verification SOP Class

The Storage SCU AE provides standard conformance to the Verification Service Class as an SCU. It is initiated automatically at the “Send Instances” activity.

The behavior of Storage SCU AE when encountering status codes in a C-ECHO response is summarized in the table below:

Table 4.2-7
VERIFICATION C-ECHO RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Status Code	Behavior
Success	Success	0000	The Storage SCU AE judges the remote AE is present and active on the network.

The behavior of Storage SCU AE during communication failure is summarized in the table below:

Table 4.2-8
VERIFICATION COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	The association is aborted and the send job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application.
Association aborted by the SCP or network layers	The send job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application.

4.2.1.3.1.4 SOP Specific Conformance for Storage SOP Classes

The Storage SCU AE provides standard conformance to the Storage Service Class as an SCU.

The behavior of Storage SCU AE when encountering status codes in a C-STORE response is summarized in the table below:

Table 4.2-9
STORAGE C-STORE RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Status Code	Behavior
Success	Success	0000	Ignored
Refused	Out of Resources	A7xx	Retry storage later
Error	Data Set does not match SOP Class	A9xx	Retry storage later
	Cannot understand	Cxxx	Retry storage later
Warning	Coercion of Data Elements	B000	Ignored
	Data Set does not match SOP Class	B007	Ignored

The behavior of Storage SCU AE during communication failure is summarized in the table below:

Table 4.2-10
STORAGE COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	The association is aborted and the send job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application.
Association aborted by the SCP or network layers	The send job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application.

If the instance transfer fails, the Storage SCU AE will retry this send-job automatically.

The contents of Storage SOP Instances conform to the DICOM files that have either been created by our application or imported from a DICOMDIR or received via DICOM network services.

4.2.2 Storage Commitment SCU AE Specification

4.2.2.1 SOP Classes

The Storage Commitment SCU AE provides Standard Conformance to the following SOP Classes:

Table 4.2-11
SOP CLASSES FOR THE STORAGE COMMITMENT SCU AE

SOP Class Name	SOP Class UID	SCU	SCP
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	No

4.2.2.2 Association Policies

4.2.2.2.1 General

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

Table 4.2-12
DICOM APPLICATION CONTEXT FOR THE STORAGE COMMITMENT SCU AE

Application Context Name	1.2.840.10008.3.1.1.1

4.2.2.2.2 Number of Associations

There is no inherent limit to the number of associations other than limits imposed by the computer's operating system.

Table 4.2-13
NUMBER OF ASSOCIATIONS INITIATED FOR THE STORAGE COMMITMENT SCU AE

Maximum number of simultaneous associations	Unlimited

The Storage Commitment SCU AE accepts associations to receive N-EVENT-REPORT notifications for the Storage Commitment Push Model SOP Class.

Table 4.2-14
NUMBER OF ASSOCIATIONS ACCEPTED FOR THE STORAGE COMMITMENT SCU AE

Maximum number of simultaneous associations	Unlimited

4.2.2.2.3 Asynchronous Nature

The Storage Commitment SCU AE does not support asynchronous communication (multiple outstanding transactions over a single association).

Table 4.2-15
ASYNCHRONOUS NATURE FOR THE STORAGE COMMITMENT SCU AE

Maximum number of outstanding asynchronous transactions	1

4.2.2.2.4 Implementation Identifying Information

The implementation information for the Storage Commitment SCU AE is:

Table 4.2-16
DICOM IMPLEMENTATION CLASS AND VERSION FOR THE STORAGE COMMITMENT SCU AE

Implementation Class UID	1.2.276.0.7230010.3.0.3.5.4
Implementation Version Name	OFFIS_DCMTK_354

4.2.2.3 Association Initiation Policy

4.2.2.3.1 Activity – Commit Sent Instances

4.2.2.3.1.1 Description and Sequencing of Activities

If the remote AE is configured as a Storage Commitment SCP AE, the Storage Commitment SCU AE will, after all instances have been sent, transmit a single storage commitment request (N-ACTION). On receiving the N-ACTION response the Storage Commitment SCU AE will release the association. The notification of storage commitment (N-EVENT-REPORT) will be received over a separate association.

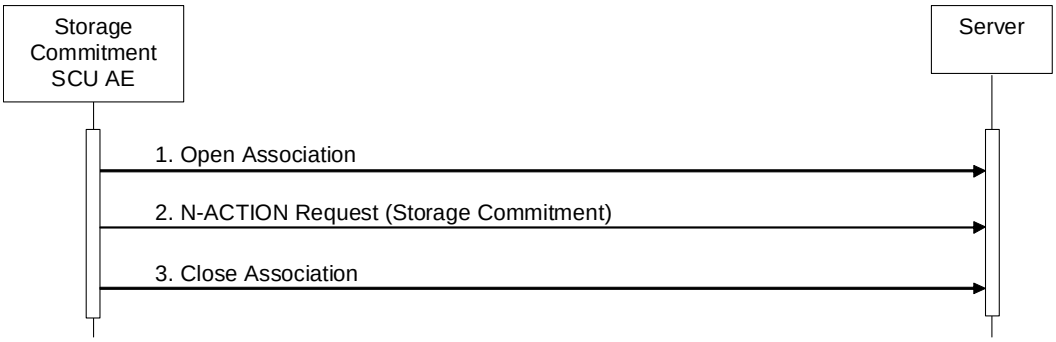

Figure 4.2-2
SEQUENCING OF ACTIVITY – COMMIT SENT INSTANCES

A possible sequence of interactions between the Storage Commitment SCU AE and a Server (e.g. a storage or archive device supporting the Storage Commitment SOP Classes as an SCP) is illustrated in the Figure above:

1. The Storage Commitment SCU AE opens an association with the Server.
2. A storage commitment request (N-ACTION) is transmitted to the Server to obtain storage commitment of previously transmitted instances. The Server replies with an N-ACTION response indicating the request has been received and is being processed.
3. The Storage Commitment SCU AE closes the association with the Server.

Note: The N-EVENT-REPORT will be sent over a separate association initiated by the Server.
(see Section 4.2.2.4.1)

4.2.2.3.1.2 Proposed Presentation Contexts

The Storage Commitment SCU AE will propose the Presentation Contexts shown in the following table:

Table 4.2-17
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY COMMIT SENT INSTANCES

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

A Presentation Context for the Storage Commitment Push Model will only be proposed if the remote AE is configured as a Storage Commitment SCP AE.

4.2.2.3.1.3 SOP Specific Conformance for Storage Commitment SOP Class

4.2.2.3.1.3.1 Storage Commitment Operations (N-ACTION)

The Storage Commitment SCU AE provides standard conformance to the Storage Commitment Service Class as an SCU.

The Storage Commitment SCU AE will request storage commitment for instances of the Storage SOP Classes if the remote AE is configured as a Storage Commitment SCP AE and a presentation context for the Storage Commitment Push Model has been accepted.

The behavior of Storage SCU Commitment AE when encountering status codes in an N-ACTION response is summarized in the table below:

Table 4.2-18
STORAGE COMMITMENT N-ACTION RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Status Code	Behavior
Success	Success	0000	The request for storage commitment is considered successfully sent. There are no limitations regarding the lifetime of the Transaction UID.
*	*	Any other status code	The association is aborted and the request for storage commitment is marked as failed.

The behavior of Storage Commitment AE during communication failure is summarized in the table below:

Table 4.2-19
STORAGE COMMITMENT COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	The association is aborted and the send job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application.
Association aborted by the SCP or network layers	The send job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application.

4.2.2.4 Association Acceptance Policy

4.2.2.4.1 Activity – Receive Storage Commitment Response

4.2.2.4.1.1 Description and Sequencing of Activities

The Storage Commitment SCU AE will accept associations in order to receive responses to a storage commitment request.

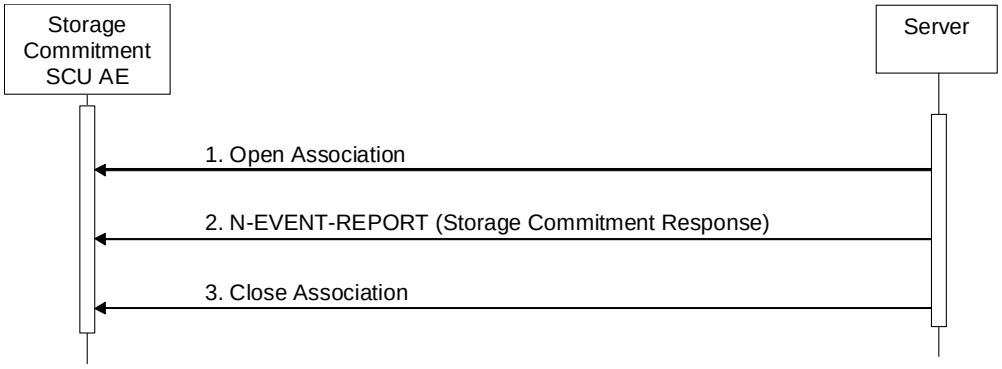

Figure 4.2-3
SEQUENCING OF ACTIVITY - RECEIVE STORAGE COMMITMENT RESPONSE

A possible sequence of interactions between the Storage Commitment SCU AE and a Server (e.g. a storage or archive device supporting Storage Commitment SOP Classes as an SCP) is illustrated in the Figure above:

1. The Server opens an association with the Storage Commitment SCU AE.
2. The Server sends an N-EVENT-REPORT request notifying the Storage SCU AE of the status of a previous storage commitment request. The Storage SCU AE replies with an N-EVENT-REPORT response confirming receipt.
3. The Server closes the association with the Storage Commitment SCU AE.

The Storage Commitment SCU AE may reject association attempts as shown in the table below. The Result, Source and Reason/Diag columns represent the values returned in the appropriate fields of an ASSOCIATE-RJ PDU (see PS 3.8, Section 9.3.4). The contents of the Source column is abbreviated to save space and the meaning of the abbreviations are:

a) 1 – DICOM UL service-user

b) 2 – DICOM UL service-provider (ASCE related function)

c) 3 – DICOM UL service-provider (Presentation related function)

Table 4.2-20
ASSOCIATION REJECTION REASONS

Result	Source	Reason/Diag	Explanation
2 – rejected-transient	c	2 – local-limit-exceeded	The (configurable) maximum number of simultaneous associations has been reached. An association request with the same parameters may succeed at a later time.
2 – rejected-transient	c	1 – temporary-congestion	No associations can be accepted at this time due to the real-time requirements of higher priority activities (e.g. during image acquisition no associations will be accepted) or because insufficient resources are available (e.g. memory, processes, threads). An association request with the same parameters may succeed at a later time.
1 – rejected-permanent	a	2 – application-context-name-not-supported	The association request contained an unsupported Application Context Name. An association request with the same parameters will not succeed at a later time.
1 – rejected-permanent	a	7 – called-AE-title-not-recognized	The association request contained an unrecognized Called AE Title. An association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the association initiator is incorrectly configured and attempts to address the association acceptor using the wrong AE Title.
1 – rejected-permanent	a	3 – calling-AE-title-not-recognized	The association request contained an unrecognized Calling AE Title. An association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the association acceptor has not been configured to recognize the AE Title of the association initiator.
1 – rejected-permanent	b	1 – no-reason-given	The association request could not be parsed. An association request with the same format will not succeed at a later time.

4.2.2.4.1.2 Accepted Presentation Contexts

The Storage Commitment SCU AE will accept Presentation Contexts shown in the table below.

Table 4.2-21
ACCEPTABLE PRESENTATION CONTEXTS FOR ACTIVITY RECEIVE STORAGE COMMITMENT RESPONSE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

4.2.2.4.1.3 SOP Specific Conformance for Storage Commitment SOP Class

4.2.2.4.1.3.1 Storage Commitment Notifications (N-EVENT-REPORT)

The Storage Commitment SCU AE provides standard conformance to the Storage Commitment Service Class as an SCU.

The behavior of Storage Commitment SCU AE when receiving Event Types within the N-EVENT-REPORT is summarized in the table below.

Table 4.2-22
STORAGE COMMITMENT N-EVENT-REPORT BEHAVIOUR

Event Type Name	Event Type ID	Behavior
Storage Commitment Request Successful	1	The Storage Commitment SCU AE permits the operator(s) to delete the Referenced SOP Instances under Referenced SOP Sequence (0018,1199), or deletes the Instances from the local database automatically.
Storage Commitment Request Complete – Failures Exist	2	The Storage Commitment SCU AE requests the Storage SCU AE to send the Referenced SOP Instances under Failed SOP Sequence (0018,1198).

The reasons for returning specific status codes in an N-EVENT-REPORT response are summarized in the table below.

Table 4.2-23
STORAGE COMMITMENT N-EVENT-REPORT RESPONSE STATUS REASONS

Service Status	Further Meaning	Status Code	Reasons
Success	Success	0000	The storage commitment result has been successfully received.
Failure	Unrecognized Operation	0211H	The Transaction UID in the N-EVENT-REPORT request is not recognized (was never issued within an N-ACTION request).

Failure	Invalid Argument Value	0115H	One or more SOP Instance UIDs with the Referenced SOP Sequence (0008,1199) or Failed SOP Sequence (0008,1198) was not included in the Storage Commitment Request associated with this Transaction UID. The unrecognized SOP Instance UIDs will be returned within the Event information of the N-EVENT-REPORT response.

4.2.3 Q/R SCU AE Specification

4.2.3.1 SOP Classes

The Q/R SCU AE provides Standard Conformance to the following SOP Classes:

Table 4.2-24
SOP CLASSES FOR THE Q/R SCU AE

SOP Class Name	SOP Class UID	SCU	SCP
Study Root Q/R Information Model – Find	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root Q/R Information Model – Move	1.2.840.10008.5.1.4.1.2.2.2		

4.2.3.2 Association Policies

4.2.3.2.1 General

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

Table 4.2-25
DICOM APPLICATION CONTEXT FOR THE Q/R SCU AE

Application Context Name	1.2.840.10008.3.1.1.1

4.2.3.2.2 Number of Associations

There is no inherent limit to the number of associations other than limits imposed by the computer's operating system.

Table 4.2-26
NUMBER OF ASSOCIATIONS INITIATED FOR THE Q/R SCU AE

Maximum number of simultaneous associations	Unlimited

4.2.3.2.3 Asynchronous Nature

The Q/R SCU AE does not support asynchronous communication (multiple outstanding transactions over a single association).

Table 4.2-27
ASYNCHRONOUS NATURE FOR THE Q/R SCU AE

Maximum number of outstanding asynchronous transactions	1

4.2.3.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 4.2-28
DICOM IMPLEMENTATION CLASS AND VERSION FOR THE Q/R SCU AE

Implementation Class UID	1.2.276.0.7230010.3.0.3.5.4
Implementation Version Name	OFFIS_DCMTK_354

4.2.3.3 Association Initiation Policy

4.2.3.3.1 Activity – Query and Retrieve Instances

4.2.3.3.1.1 Description and Sequencing of Activities

The Q/R SCU AE is activated when the user selects a remote node to query and enters some key information, Patient's Name, Patient ID and/or Study Date. The user can select series to be retrieved. The instances will be received at the Storage SCP AE.

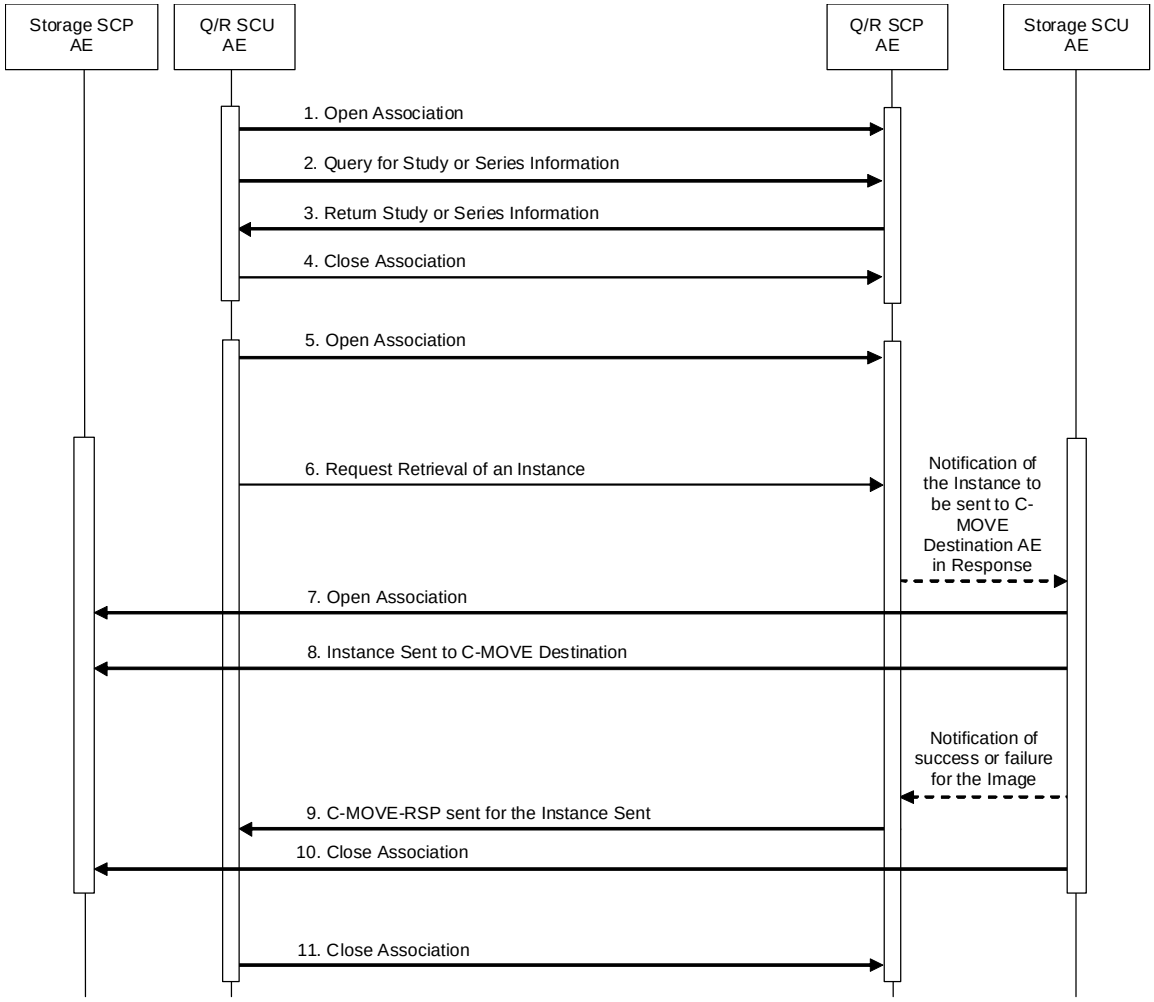

Figure 4.2-4
SEQUENCING OF ACTIVITY – QUERY AND RETRIEVE INSTANCES

The following sequencing constraints illustrated in the Figure above:

1. The Q/R SCU AE opens an association with the Q/R SCP AE.
2. The Q/R SCU AE sends a C-FIND-RQ Message.
3. The Q/R SCP AE returns a C-FIND-RSP Message to the Q/R SCU AE with matching information. A C-FIND-RSP is sent for each entity matching the identifier specified in the C-FIND-RQ. A final C-FIND-RSP is sent indicating that the matching is complete.
4. The Q/R SCU AE closes the association.
5. The Q/R SCU AE opens an association with the Q/R SCP AE.
6. The Q/R SCU AE sends a C-MOVE-RQ Message. The Q/R SCP AE notifies the Storage SCU AE to send the Composite SOP Instances to the peer C-MOVE Destination AE as indicated in the C-MOVE-RQ.
7. The Storage SCU AE opens an association with the C-MOVE Destination AE.
8. The Storage SCU AE sends instances to the C-MOVE Destination AE. The Storage SCU AE indicates to the Q/R SCP AE whether the transfer succeeded or failed.
9. The Q/R SCP AE then returns a C-MOVE-RSP indicating this success or failure.
10. The Storage SCU AE closes the association.
11. The Q/R SCU AE closes the association.

4.2.3.3.1.2 Proposed Presentation Contexts

The Q/R SCU AE will propose Presentation Contexts shown in the following table:

Table 4.2-29
PROPOSED PRESENTATION CONTEXTS FOR REAL-WORLD ACTIVITY QUERY AND RETRIEVE INSTANCES

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Study Root Q/R Information Model – Find	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Study Root Q/R Information Model – Move	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2		

4.2.3.3.1.3 SOP Specific Conformance for Q/R Find SOP Classes

The Q/R SCU AE provides standard conformance to the Query/Retrieve Find SOP Classes as an SCU.

The behavior of the Q/R SCU AE when encountering status codes in a Q/R C-FIND response is summarized in the table below:

Table 4.2-30
THE Q/R SCU AE C-FIND RESPONSE STATUS BEHAVIOR

Service Status	Further Meaning	Status Code	Behavior
Success	Matching is complete – no final identifier is supplied	0000	Current query is terminated, remaining queries continue
Refused	Out of Resources	A700	Current query is terminated, remaining queries continue
Error	Data Set does not match SOP Class	A900	Current query is terminated, remaining queries continue
	Unable to process	Cxxxx	Current query is terminated, remaining queries continue
Cancel	Matching terminated due to Cancel request	FE00	Ignored
Pending	Matches are continuing – Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	FF00	Answer data are used to populate browser and trigger recursive lower level queries
	Matches are continuing – Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Answer data are used to populate browser and trigger recursive lower level queries

The behavior of the Q/R SCU AE during communication failure is summarized in the table below.

Table 4.2-31
Q/R FIND COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	The association is aborted and the study or series query is marked as failed. The reason is logged and reported to the user.
Association aborted by the SCP or network layers	The study or series query is marked as failed. The reason is logged and reported to the user.

All queries are initiated at the highest level of the information model (the STUDY level), and then for each response received, recursively repeated at the next lower levels (the SERIES and then IMAGE levels), in order to completely elucidate the “tree” of instances available on the remote AE.

The table below provides a description of the Q/R SCU AE C-FIND Request Identifier.

Table 4.2-32
STUDY ROOT REQUEST IDENTIFIER FOR C-FIND

Name	Tag	Types of Matching
Study Level		
Study Date	(0008,0020)	U, R
Patient’s Name	(0010,0010)	S, *
Patient ID	(0010,0020)	S, *
Study Instance UID	(0020,000D)	UNIQUE
Modalities in Study	(0008,0061)	S
Study Description	(0008,1030)	S, *
Patient’s Birth Date	(0010,0030)	U, R
Series Level		
Series Instance UID	(0020,000E)	UNIQUE
Instance Level		
SOP Instance UID	(0008,0018)	UNIQUE
SOP Class UID	(0008,0016)	UNIQUE

Types of Matching:

The types of Matching supported by the Q/R SCU AE. An “S” indicates the identifier attribute uses Single Value Matching, an “R” indicates Range Matching, an “*” indicates wildcard matching, and a “U” indicates Universal Matching. “UNIQUE” indicates that this is the Unique Key for that query level, in which case Universal Matching or Single Value Matching is used depending on the query level.

4.2.3.3.1.4 SOP Specific Conformance for Q/R Move SOP Classes

The Q/R SCU AE provides standard conformance to the Query/Retrieve Move SOP Classes as an SCU.

The behavior of the Q/R SCU AE when encountering status codes in a Q/R C-MOVE response is summarized in the table below:

Table 4.2-33
THE Q/R SCU AE C-MOVE RESPONSE STATUS BEHAVIOR

Service Status	Further Meaning	Status Code	Behavior
Success	Sub-operations complete – No Failures	0000	Retrieval is terminated
Refused	Out of Resources – Unable to calculate number of matches	A701	Retrieval is terminated
	Out of Resources – Unable to perform sub-operations	A702	Retrieval is terminated
	Move Destination unknown	A801	Retrieval is terminated
Error	Data Set does not match SOP Class	A900	Retrieval is terminated
	Unable to process	Cxxx	Retrieval is terminated
Warning	Sub-operations complete – One or more Failures	B000	Retrieval is terminated
Pending	Sub-operations are continuing	FF00	Retrieval continues

The behavior of the Q/R SCU AE during communication failure is summarized in the table below.

Table 4.2-34
Q/R MOVE COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	The association is aborted using A-ABORT and the retrieve is marked as failed. The reason is logged and reported to the user if an interactive query.
Association aborted by the SCP or network layers	The retrieve is marked as failed. The reason is logged and reported to the user if an interactive query.

4.2.3.4 Association Acceptance Policy

The Q/R SCU AE does not accept associations.

4.2.4 Storage SCP AE Specification

4.2.4.1 SOP Classes

The Storage SCP AE provides Standard Conformance to the following SOP Classes:

Table 4.2-35
SOP CLASSES FOR THE STORAGE SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7		
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1		
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1		
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22		

4.2.4.2 Association Policies

4.2.4.2.1 General

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

Table 4.2-36
DICOM APPLICATION CONTEXT FOR THE STORAGE SCP AE

Application Context Name	1.2.840.10008.3.1.1.1

4.2.4.2.2 Number of Associations

There is no inherent limit to the number of associations other than limits imposed by the computer's operating system.

Table 4.2-37
NUMBER OF ASSOCIATIONS ACCEPTED FOR THE STORAGE SCP AE

Maximum number of simultaneous associations	Unlimited

4.2.4.2.3 Asynchronous Nature

The Storage SCP AE does not support asynchronous communication (multiple outstanding transactions over a single association).

Table 4.2-38
ASYNCHRONOUS NATURE FOR THE STORAGE SCP AE

Maximum number of outstanding asynchronous transactions	1

4.2.4.2.4 Implementation Identifying Information

The implementation information for the Storage SCP AE is:

Table 4.2-39
DICOM IMPLEMENTATION CLASS AND VERSION FOR THE STORAGE SCP AE

Implementation Class UID	1.2.276.0.7230010.3.0.3.5.4
Implementation Version Name	OFFIS_DCMTK_354

4.2.4.3 Association Initiation Policy

The Storage SCP AE does not initiate associations.

4.2.4.4 Association Acceptance Policy

The Storage SCP AE accepts associations only if they have valid Presentation Contexts. If none of the requested Presentation Contexts are accepted then the association request itself is rejected. It can be configured to only accept associations with certain hosts (using TCP/IP address) and/or AE Titles.

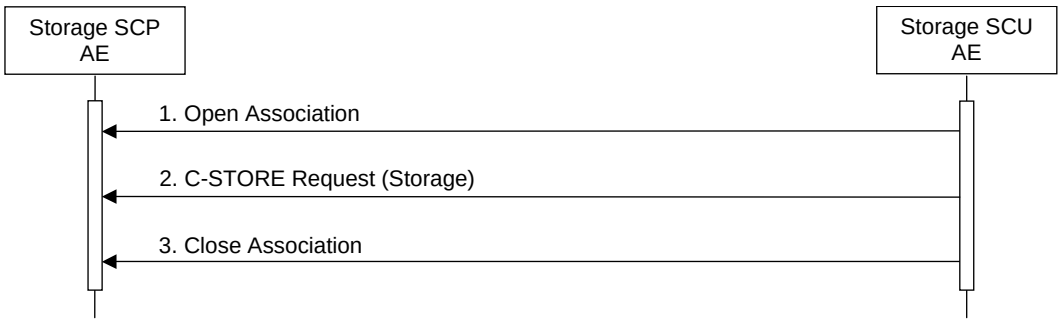

Figure 4.2-5
SEQUENCING OF ACTIVITY – STORE IMAGES TO THE LOCAL FILE SYSTEM

A possible sequence of interactions between the Storage SCP AE and a Storage SCU AE is illustrated in the Figure above:

1. The Storage SCU AE opens an association with the Storage SCP AE.
2. The Storage SCU AE sends images to the Storage SCP AE using a storage request (C-STORE) and the Storage SCP AE replies with a C-STORE response (status success).
3. The Storage SCU AE closes the association with the Storage SCP AE.

The Storage SCP AE may reject association attempts as shown in the Table 4.2-20.

4.2.4.4.1.1 Accepted Presentation Contexts

The Storage SCP AE always prefers compressed transfer syntaxes (if not otherwise configured), followed by the uncompressed ones in the following order.

If not otherwise configured, the explicit transfer syntax with the machine byte order is preferred, followed by the explicit transfer syntax with the inverse byte order and the implicit little endian transfer syntax.

Any of the presentation contexts shown in the following table are acceptable to the Storage SCP AE.

Table 4.2-40
ACCEPTED PRESENTATION CONTEXTS BY THE STORAGE SCP AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG Baseline (Process 1) JPEG Lossless, Non-Hierarchical, First-Order Prediction RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5		
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG Baseline (Process 1) JPEG Lossless, Non-Hierarchical, First-Order Prediction RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5		
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG Baseline (Process 1) JPEG Lossless, Non-Hierarchical, First-Order Prediction RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5		
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2		

4.2.4.4.1.2 SOP Specific Conformance for Verification SOP Class

The Storage SCP AE provides standard conformance to the Verification SOP Class as an SCP.

4.2.4.4.1.3 SOP Specific Conformance for Storage SOP Classes

The associated Activity with the Storage service is the storage of medical data received over the network on a designated hard disk. The Storage SCP AE will return a failure status if it is unable to store the instances on to the hard disk.

The Storage SCP AE is Level 0 conformant as a Storage SCP.

Table 4.2-41
THE STORAGE SCP AE C-STORE RESPONSE STATUS RETURN REASONS

Service Status	Further Meaning	Status Code	Reason
Success	Success	0000	Operation performed properly
Refused	Out of Resources	A700	Indicates that there was not enough storage space to store the image
Error	Data Set does not match SOP Class	A900	Indicates that the Data Set does not encode an instance of the SOP Class specified
	Cannot understand	C005	Indicates that the Data Set cannot be parsed into elements
	Failed	C000	The operation was not successful
Warning	Coercion of Data Elements	B000	Newer sent
	Elements Discarded	B006	Newer sent
	Data Set does not match SOP Class	B006	Newer sent

4.3 NETWORK INTERFACES

4.3.1 Physical Network Interface

This product supports a single network interface. One of the following physical network interfaces will be available depending on installed hardware options:

Table 4.3-1
SUPPORTED PHYSICAL NETWORK INTERFACES

Ethernet 1000baseT
Ethernet 100baseT
Ethernet 10baseT

4.3.2 Additional Protocols

None.

4.4 CONFIGURATION

4.4.1 AE Title/Presentation Address Mapping

Mapping from Application Entity Titles to Presentation Addresses can be configured within the *UltraExtend*™ application and is stored in the database.

Table 4.4-1
AE TITLE CONFIGURATION TABLE

Application Entity	Default AE Title	Default TCP/IP Port
Q/R SCU	IMPROOF	Not Applicable
Storage SCU		
Storage SCP		50104 (for receiving C-ECHO and N-EVENT-REPORT)
Storage Commitment SCU		

4.4.2 Parameters

Table 4.4-1 contains the configurable parameters of the AEs. *UltraExtend*™ uses the OFFIS DICOM Toolkit DCMTK. Some low-level parameters, like PDU size and connection time-out are not configurable within *UltraExtend*™, the default values used in DCMTK are taken.

Table 4.4-2
CONFIGURATION PARAMETERS TABLE

Parameter	Configurable (Yes/No)	Default Value
General parameters		
Support of Big Endian transfer syntax in association negotiations	Yes	True
Prefer explicit transfer syntax in association negotiations (see Section 4.2.4.4.1.1)	Yes	True
List of supported SOP Classes	Yes	None
Networking roles of this AE	Yes	None
Maximum PDU size the AE can send/receive	No	16 KB
Storage SCU/SCP parameters		
Support of JPEG transfer syntax in association negotiations	Yes	True
Support of RLE transfer syntax in association negotiations	Yes	True
Additional parameters of the *UltraExtend*™ SCP host		
Time out for an echo request	Yes	1000 ms
Maximum number of simultaneous associations for store	Yes	1
Minimum amount of free disk space	Yes	500 MB
Abort echo request after a failed ping	Yes	True
Supported Modalities for Query/Retrieve	Yes	US, SC, SR

5. MEDIA INTERCHANGE

5.1 IMPLEMENTATION MODEL

5.1.1 Application Data Flow

Conceptually, the media storage service which is implemented in the *UltraExtend*™ may be modelled as follows:

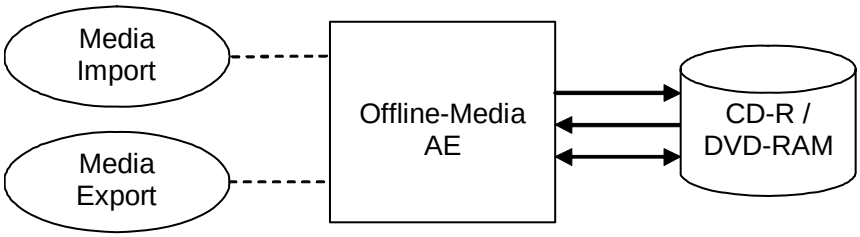

Figure 5.1-1
APPLICATION DATA FLOW DIAGRAM FOR MEDIA STORAGE

The *UltraExtend*™ product is capable of importing/exporting studies to/from DICOM media. A DICOM conformant data format layer is created when a non-conformant media is specified as DICOM Media export location.

5.1.2 Functional Definition of AEs

5.1.2.1 Functional Definition of Offline-Media AE

5.1.2.2 Media Import – FSR

The Media Import application entity reads a user-selected PS 3.10 compliant DICOM file (generally a DICOMDIR) from the local file system or from PS 3.12 compliant DICOM media.

5.1.2.3 Media Export – FSC and FSU

The Media Export application entity is able to create a new DICOMDIR or update an existing one.

Furthermore, DICOM image or structured report instances can also be stored to media on user interaction.

5.1.3 Sequencing of Real-World Activities

A DICOMDIR is created at first study export. The existing DICOMDIR is updated at exporting further studies.

5.1.4 File Meta Information for Implementation Class and Version

The implementation information written to the File Meta Header in each file is:

Table 5.1-1
DICOM IMPLEMENTATION CLASS AND VERSION FOR MEDIA STORAGE

File Meta Information Version	1
Implementation Class UID	1.2.276.0.7230010.3.0.3.5.4
Implementation Version Name	OFFIS_DCMTK_354

5.2 AE SPECIFICATIONS

5.2.1 Offline-Media AE Specification

The Offline-Media AE provides standard conformance to the DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed below:

Table 5.2-1
APPLICATION PROFILES, ACTIVITIES AND ROLES FOR OFFLINE-MEDIA

Application Profiles Supported	Real World Activity	Role	SC Option
STD-GEN-CD, STD-GEN-DVD-RAM, File-Set under the STD-US class of Application Profiles	Media Import	FSR	Interchange
	Media Export	FSC, FSU	Interchange

5.2.1.1 File Meta Information for the Application Entity

See Table 5.1-1: File Meta Information for Media Export AE.

5.2.1.2 Real-World Activities

5.2.1.2.1 Activity – Media Import

Studies can be imported from DICOM Media import locations on user interaction: switch to the Import tab and enter a valid DICOM Media. The list of studies contained in the DICOMDIR is read and displayed. The user can then select one or more studies to be imported into the local database.

5.2.1.2.1.1 Media Storage Application Profiles

The Media Import application entity supports the STD-US class of Application Profiles (PS 3.11).

5.2.1.2.1.1.1 Options

The Media Import application entity supports the SOP Classes and Transfer Syntaxes listed in the table below:

Table 5.2-2
IODS, SOP CLASSES AND TRANSFER SYNTAXES FOR MEDIA IMPORT AE

IOD	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Media Storage Directory Storage	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1

5.2.1.2.2 Activity – Media Export

The Media Export AE implements the Interchange Option of the DICOM Media Storage functionality. It does not support the Directory Information Module. It can play the following roles at handling with file sets: File Set Creator (FSC) role, File Set Updater (FSU) role.

5.2.1.2.2.1 Media Storage Application Profiles

The Media Export application entity supports the STD-US class of Application Profiles (PS 3.11).

5.2.1.2.2.1.1 Options

The Media Export application entity supports the SOP Classes and Transfer Syntaxes listed in the table below:

Table 5.2-3
IODS, SOP CLASSES AND TRANSFER SYNTAXES FOR MEDIA EXPORT AE

IOD	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Media Storage Directory Storage	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian JPEG Baseline (Process 1) JPEG Lossless, Non-Hierarchical, First-Order Prediction RLE Lossless	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian JPEG Baseline (Process 1) JPEG Lossless, Non-Hierarchical, First-Order Prediction RLE Lossless	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Explicit VR Little Endian	1.2.840.10008.1.2.1

5.3 AUGMENTED AND PRIVATE APPLICATION PROFILES

Not applicable.

5.4 MEDIA CONFIGURATION

Not applicable.

6. SUPPORT OF CHARACTER SETS

6.1 OVERVIEW

UltraExtend™ supports a couple of extended character sets defined in the DICOM 3.0 standard, including single-byte and multi-byte character sets as well as code extension techniques using ISO 2022 escapes.

Support extends to correctly decoding and displaying the correct symbol for all names and strings found in the DICOMDIR, in storage instances from media and received over the network, and in the local database.

No specific support for sorting of strings other than in the default character set is provided in the browsers.

6.2 CHARACTER SETS

In addition to the default character repertoire, the Defined Terms for Specific Character Sets in Table 6.2-1 are supported.

Table 6.2-1
SUPPORTED SPECIFIC CHARACTER SET DEFINED TERMS

Character Set Description	Defined Term
Latin alphabet No. 1	ISO_IR 100
Latin alphabet No. 2	ISO_IR 101
Latin alphabet No. 3	ISO_IR 109
Latin alphabet No. 4	ISO_IR 110
Latin alphabet No. 5	ISO_IR 148
ÂSCII	ISO_IR 6
UTF-8	ISO_IR 192
Cyrillic	ISO_IR 144
Arabic	ISO_IR 127
Greek	ISO_IR 126
Hebrew	ISO_IR 138
Chinese	GB18030
Default repertoire	ISO 2022 IR 6
Japanese	ISO 2022 IR 13
Japanese	ISO 2022 IR 87
Japanese	ISO 2022 IR 159
Korean	ISO 2022 IR 149

The Q/R SCU AE supports those extended character sets in the attributes of Patient ID, Patient's Name and Study Description.

6.3 CHARACTER SET CONFIGURATION

Whether or not characters are displayed correctly depends on the presence of font support in the underlying operating system. Typically, it may be necessary for the user to add some Unicode fonts to their system configuration in order to correctly display characters that would not typically be used in the default locale.

7. SECURITY

UltraExtend™ does not support any specific security measures.

Application level security: not supported.

Association level security: any Calling AE Titles and/or IP addresses may open an Association for Verification. Only AE Titles that own a license and are known to *UltraExtend*™ will be allowed to open an association for storage, query and retrieval purposes.

8. ANNEXES

8.1 IOD CONTENTS

8.1.1 Created SOP Instances

During DICOM Media Export *UltraExtend*™ creates DICOMDIR instances. The structure of a DICOMDIR object underlies the Basic Directory IOD.

8.1.2 Usage of Attributes from received IOD's

The local database, remote query and directory browsers use the conventional identification attributes to distinguish patients, studies, series and instances. In particular, it can be configured which fields should have equal values for two patients to be treated as the same in the browser and in the local database.

The criteria for comparing two patients are configurable at installation or service time. Here are the possible options. Two patients are considered to be identical if the following fields have equal values:

1. PatientID
2. PatientID + FamilyName + GivenName
3. PatientID + FamilyName + GivenName + DateOfBirth
4. PatientID + FamilyName + GivenName + DateOfBirth + Sex

Option 1 applies by default.

Studies, series and instances will be uniquely identified by their UIDs.

No coercion of fields and no patient reconciliation happen automatically: in case a discrepancy occurs between patient/study data already existing in the database and patient/study data of the received file, a new patient/study will be created for the received data. The merge of the two studies can be made later by the user.

If two patients have the same values for all identification fields they will be treated as the same in the browser and the local database. If only part of these coincide, they will be treated as two separate patients and the user has the possibility to perform patient reconciliation and merge the two patients.

8.1.3 Attribute Mapping

Not applicable.

8.1.4 Coerced/Modified Fields

Not applicable.

8.2 DATA DICTIONARY OF PRIVATE ATTRIBUTES

Not applicable.

8.3 CONTROLLED TERMINOLOGY AND TEMPLATES

Not applicable.

8.4 GRAYSCALE IMAGE CONSISTENCY

Not applicable.

8.5 STANDARD EXTENDED/SPECIALIZED/PRIVATE SOP CLASSES

Not applicable.

8.6 PRIVATE TRANSFER SYNTAXES

Not applicable.