INTUITION
ADVANCED VISUALIZATION

Intuition
DICOM Conformance Statement

Version 4.9.0

Revision A

English

TERARECON
A ConcertAI Company

Chapter 1:   Overview

Intuition is a 2D / 3D / 4D enterprise client-server solution. The primary functions of Intuition are to receive, transmit, post-process, display and manipulate reports and medical images to / from acquisition and other DICOM devices. Intuition solution as a complete product comprises of AquariusNet server and the Intuition client image viewing applications, as well as AquariusAPS server, AquariusGate server, other associated tools and binaries to deliver the above functions. Each of these servers delivers a distinct set of functions.

- AquariusNet server is a central processing 2D/3D/4D image server streaming real-time interactively rendered images to networked computers running the Intuition client application. AquariusNet server has AquariusNet Image Server (AIS) and AquariusNet DICOM Server (ADS) components.

- AquariusAPS server is a post-processing server. It processes the DICOM messages received from modalities or other DICOM devices to derive processed images and meta-information such as centerlines, bone masks or spherical objects. It then routes the processed images and meta-information wrapped in a secondary captured image with private tags to other devices, optionally with the original incoming DICOM messages. AquariusAPS server has an AquariusAPS DICOM Server (AAS) component.

- AquariusGATE server receives DICOM messages over a network, and re-transmit those messages to one or more targets, potentially using a different transfer syntax. Additionally, •AquariusGATE server also implements query / retrieve functions to obtain data from other DICOM nodes (for pre-fetching purposes). AquariusGate server has an AquariusGate DICOM Server (AGS) component.

As such, all these servers communicate with other machines on the network using DICOM. The purpose of this document is to describe the conformance of the AquariusNet Image Server (AIS), AquariusNet DICOM Server (ADS), AquariusAPS DICOM Server (AAS), AquariusGATE DICOM Server (AGS) to the DICOM Standard as described by the NEMA in the edition 2023a.

1.1 Content and Transfer

The Intuition server supports following Storage SOP Class.

Table 1.1: Storage SOP Classes

SOP Classes		Transfer Syntax	DIMSE Service		Media Services			Function			
			SCU	SCP	FSC	FSU	FSR	Create	Display	Process	Archive
Media Storage Directory Storage	1.2.840.10008.1.3.10	NI	Y	Y	Y	Y	Y	S	N	N	Y
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y

Table 1.1: Storage SOP Classes

SOP Classes		Transfer Syntax	DIMSE Service		Media Services			Function			
			SCU	SCP	FSC	FSU	FSR	Create	Display	Process	Archive
Digital X-Ray Image Storage for Presentation	1.2.840.10008.5.1.4.1.1.1.1	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
Digital X-Ray Image Storage for Processing	1.2.840.10008.5.1.4.1.1.1.1.1	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
Digital Mammography X-Ray Image Storage for Presentation	1.2.840.10008.5.1.4.1.1.1.2	U	Y	Y	Y	N	Y	S	Y	Y	Y
Digital Mammography X-Ray Image Storage for Processing	1.2.840.10008.5.1.4.1.1.1.2.1	U	Y	Y	Y	N	Y	S	Y	Y	Y
Digital Intra Oral X-Ray Image Storage	1.2.840.10008.5.1.4.1.1.1.3	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
US Multi-Frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
US Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
IVUS (Volcano) Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y

Table 1.1: Storage SOP Classes

SOP Classes		Transfer Syntax	DIMSE Service		Media Services			Function			
			SCU	SCP	FSC	FSU	FSR	Create	Display	Process	Archive
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	U	Y	Y	Y	N	Y	S	Y	Y	Y
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
X-Ray Fluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
X-Ray Angiographic BiPlane Image Storage	1.2.840.10008.5.1.4.1.1.12.3	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
NM Image Storage	1.2.840.10008.5.1.4.1.1.20	U	Y	Y	Y	N	Y	S	Y	Y	Y
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
Opthalmic Tomography Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.4	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
Ophthalmic Photography 8 bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	U;LL;L	Y	Y	Y	N	Y	S	Y	Y	Y
Key Object Selection Storage	1.2.840.10008.5.1.4.1.1.88.59	NI	Y	Y	Y	N	Y	S	Y	Y	Y
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	U	Y	Y	Y	N	Y	S	Y	Y	Y
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	U	Y	Y	Y	N	Y	S	Y	Y	Y
Radiation Therapy Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	U	Y	Y	Y	N	Y	S	Y	Y	Y

Note: The above list of supported SOP Class is the system default. Additional SOP Classes can be added to the Intuition server via the configurable dynamic service list at run time.

DICOM Web Service is N/A.

Abbreviations

S: Standard SOP Class.

Y: Yes.

N: No.

U, LL, L, NI: Refer to Table 1.2

Table 1.2: Supported Transfer Syntaxes

Transfer Syntax Set	Transfer Syntax Name	Transfer Syntax UID
Lossless Compressed Transfer Syntax Set (LL)	JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1])	1.2.840.10008.1.2.4.70
	JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90
	RLE Lossless	1.2.840.10008.1.2.5
Lossy Compressed Transfer Syntax Set (L)	JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50
	JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51
	JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91
Non-image Transfer Syntax Set (NI)	Implicit VR Little Endian	1.2.840.10008.1.2
	Explicit VR Little Endian	1.2.840.10008.1.2.1
Uncompressed Transfer Syntax Set (U)	Implicit VR Little Endian	1.2.840.10008.1.2
	Explicit VR Little Endian	1.2.840.10008.1.2.1

1.1.1 Structured Reporting Root Template IDs

N/A

1.2 DIMSE Services

1.2.1 Verification

Table 1.3: Verification SOP Class

SOP Classes		Transfer Syntax		SCU	SCP
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	Yes
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	Yes

1.2.2 Storage

See section 1.1 for more details.

1.2.3 Workflow Management

Table 1.4: Workflow Management SOP Classes

SOP Classes		Transfer Syntax		SCU	SCP
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	Yes
		Explicit VR Little Endian	1.2.840.10008.1.2.1	No	Yes
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	
		Explicit VR Little Endian	1.2.840.10008.1.2.1	No	Yes

1.2.4 Query / Retrieve

Table 1.5: Query Retrieve SOP Classes

SOP Classes		Transfer Syntax		SCU	SCP
Patient Root Query/ Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	Yes
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	Yes
Study Root Query/ Retrieve - Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	Yes
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	Yes
Patient Root Query/ Retrieve Information Model - MOVE	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	Yes
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	Yes
Study Root Query/ Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	Yes
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	Yes

1.2.5 Printing

Table 1.6: Printing SOP Classe

SOP Classes		Transfer Syntax		SCU	SCP
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	Yes
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	No
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	No
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	No

Table 1.6: Printing SOP Classe

SOP Classes		Transfer Syntax		SCU	SCP
Print Job	1.2.840.10008. 5.1.1.14	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	No
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	No

1.3 DICOM Web Services

Not available.

1.4 Media Services

Table 1.7: Supported Media Application Profiles

Media Storage Application Profile	FSC	FSR	FSU
STD-CTMR-CD	Yes	Yes	No
STD-CTMR-DVD	Yes	Yes	No
STD-GEN	Yes	Yes	No

1.5 Real Time Video Service

Not available

1.6 De-identification Profiles

N/A

1.7 Specific Character Sets

Table 1.8: Supported Specific Character Sets

Defined term	IANA	Description
Single-Byte Character Sets without Code Extension		
ISO_IR 100	ISO-8859-1	Latin alphabet No. 1
ISO_IR 138	ISO-8859-8	Hebrew
Single-Byte Character Sets with Code Extension		
ISO 2022 IR 127	ISO-8859-6	Arabic
ISO 2022 IR 126	ISO-8859-6	Greek
ISO 2022 IR 6	ISO 646	Default repertoire
ISO 2022 IR 13	ISO-2022-JP	Japanese (ISO IR 13, JIS X 0201: Katakana)
Multi-Byte Character Sets without Code Extensions		
GB18030	GB18030	Chinese
Multi-Byte Character Sets with Code Extensions		
ISO 2022 IR 87	ISO-2022-JP	Japanese (JIS X0208: Kanji)
ISO 2022 IR 159	JIS_X0212-1990	Japanese (JIS X0212: Supplementary Kanji)
ISO 2022 IR 149	ISO-2022-KR	Korean (KSX1001:Hangul & Hanja)

Table of Contents

Appendix A ANNEXES 1

Chapter 3:   Introduction

3.1 Revision History

Following table provides revision history of this DICOM conformance statement:

Table 3.1: Revision History

Revision #	Description	Date of Release
1	Initial draft for Intuition Server	28-Mar-2023

3.2 Audience

This DICOM conformance statement is intended for following audiences:

- Hospital staff or Customer
- System integrator of medical equipment
- DICOM Software engineer or designer
- Marketing or Sales personal with DICOM knowledge

3.3 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 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:

- Test procedures should be defined to validate the desired level of connectivity.
- The DICOM standard will evolve to meet the users' future requirements

3.4 Terms and Definition

Terms and definitions used in this document are defined within the different parts of the DICOM standard.

3.5 Abbreviation

Abbreviations and terms are as follows:

AE	Application Entity
AET	Application Entity Title
AAS	AquariusAPS DICOM Server
ADS	AquariusNet DICOM Server (aka. Intuition DICOM Server)
AGS	AquariusGate DICOM Server (aka. IntutionGate DICOM server)
AIS	AquariusNet Image Server (aka. Intuition Image Server)
ASCE	Association Control Service Element
DCS	DICOM Conformance Statement
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
ELE	Explicit VR Little Endian
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
IANA	Internet Assigned Numbers Authority
ILE	Implicit VR Little Endian
IOD	Information Object Definition
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISO	International Standard Organization
NEMA	National Electrical Manufacturers Association
NTP	Network Time Protocol
PDU	Protocol Data Unit
SCU	Service Class User (DICOM client)
SCP	Service Class Provider (DICOM server)
SOP	Service-Object Pair
U	Unique Key Attribute

3.6 References

[1] National Electrical Manufacturers Association (NEMA), Rosslyn, VA USA. PS3 / ISO 12052 Digital Imaging and Communications in Medicine (DICOM) Standard. http://www.dicomstandard.org.

Chapter 4:   Implementation Model

4.1 Application Entities and Data Flow

ADS and AAS implements an Application Entity (AE) which acts as C-STORE / C-FIND / C-MOVE / C-ECHO SCP. The diagram below depicts communications as they might occur between an SCU AE and an ADS AE
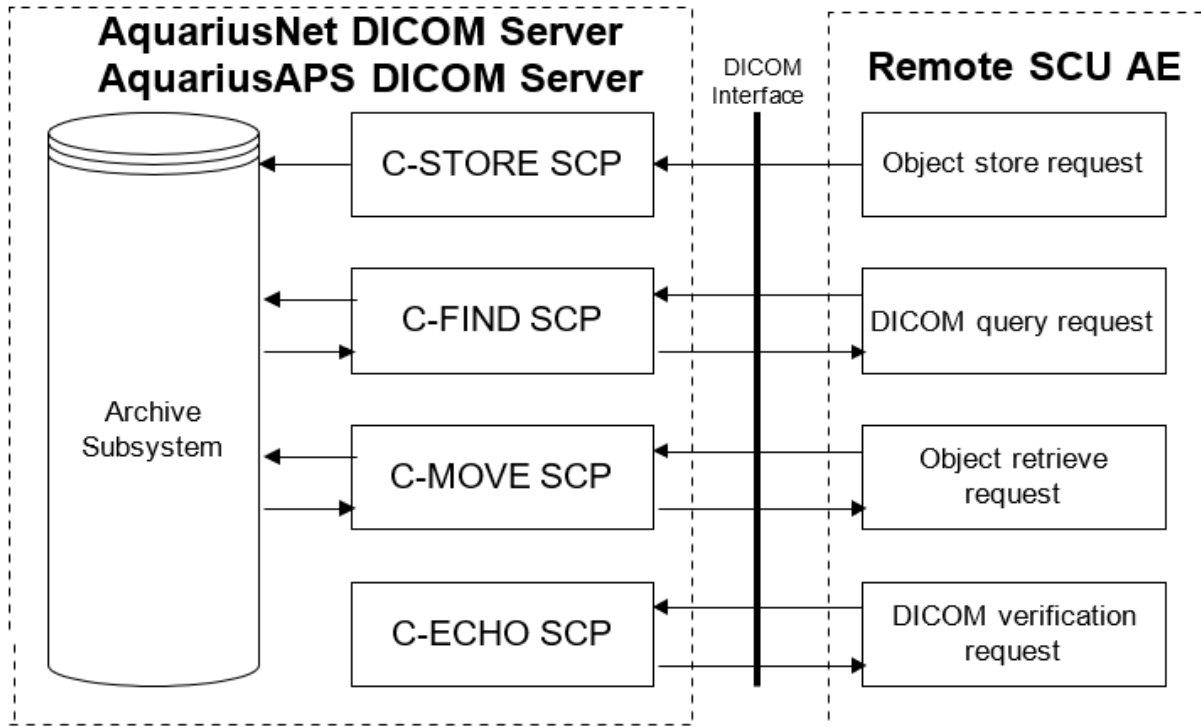
Figure 4-1 Application Entities and Data Flow

AIS implements an Application Entity (AE) which acts as a Query / Retrieve Service Class User (SCU). This AE sends queries originating from AIS clients to all known DICOM servers on the network and returning the query results to the clients. When a client requests images for retrieval, AIS sends a move request to one of the DICOM servers, loads the retrieved images and supplies the client with 2D, 3D and 4D representations of the images through an interactive rendering session. When the images are received, they are not stored permanently. AIS also has Storage SCU capability.

Following diagram provide information about AIS SCU communication with remote server.

AquariusNet Image Server

AquariusNet Image Server
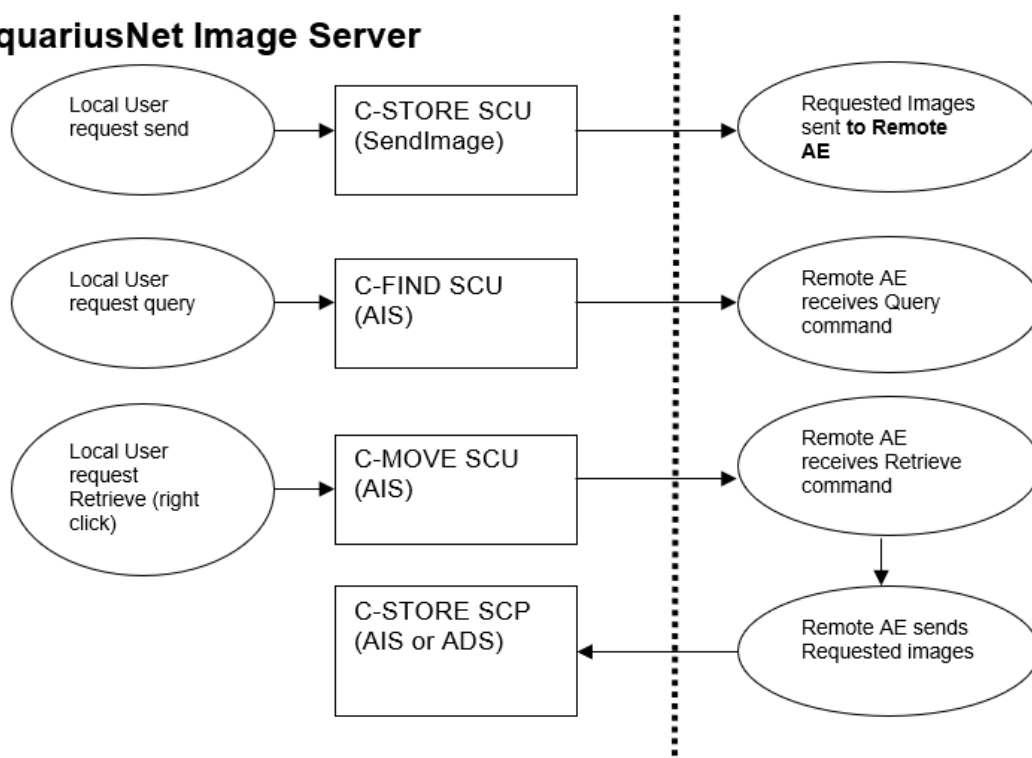
Figure 4-2

The diagram below depicts communications as they might occur between an SCU AE and an AGS AE.
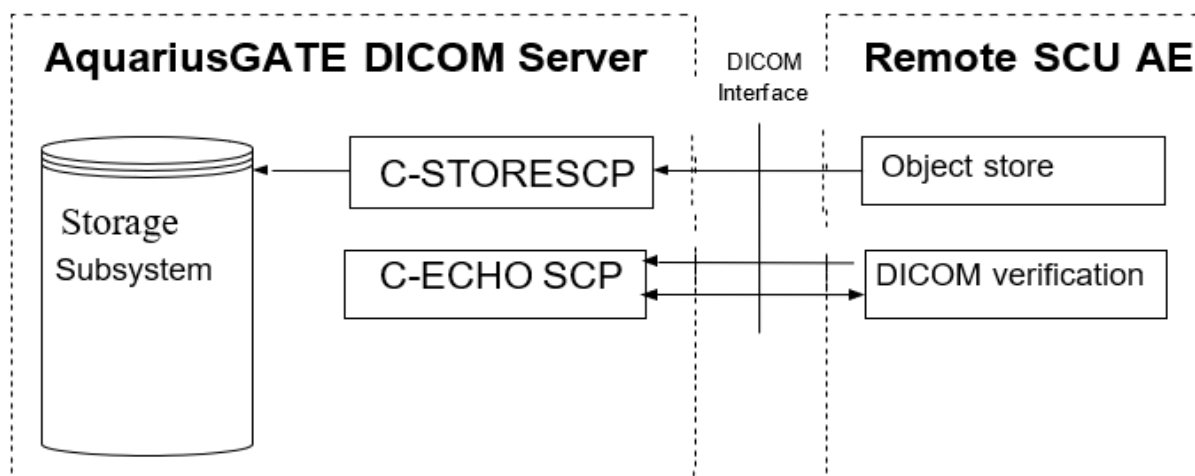
Figure 4-3

AGS also implements an Application Entity (AE) which acts as a Query / Retrieve Service Class User (SCU).

Following diagram provide information about AquariusGate SCU communication with remote server.
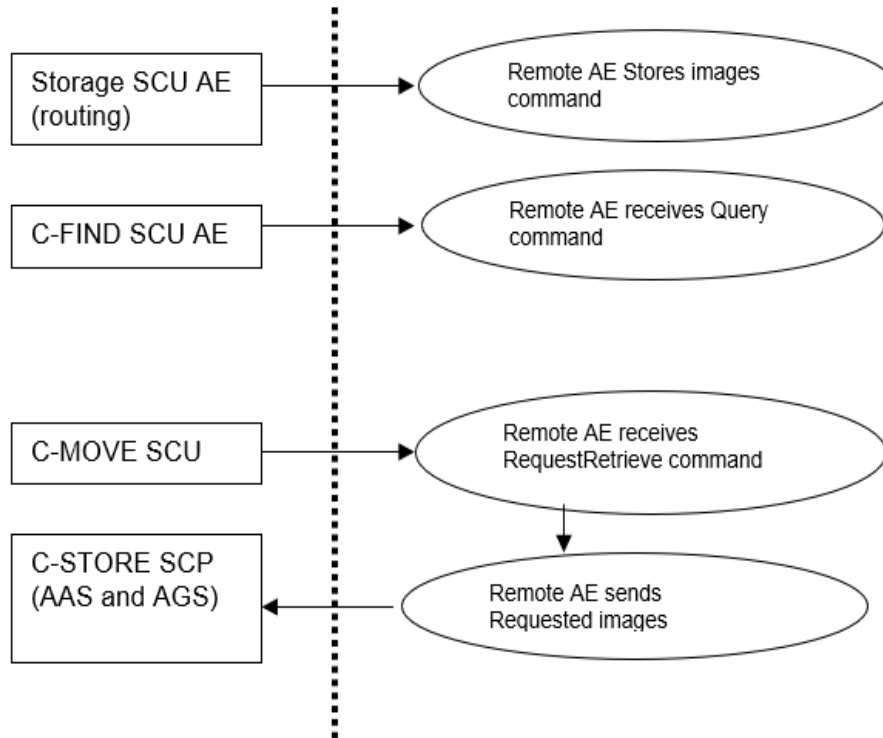
Figure 4-4

4.1.1 Functional Definitions of ADS / AIS / AAS

1. Storage of received SOP instances sent to ADS and AAS by a remote SCU AE.
2. ADS / AAS responds to queries about stored instances from a remote SCU AE.
3. ADS / AAS transmits of stored instances to a remote SCU AE triggered by a retrieve request.
4. SendImage transmits the stored instances to a remote SCP AE triggered by an auto-routing rule (in response to a storage request made to a specific AE).
5. ADS / AAS responds to verification requests for troubleshooting connectivity problems.
6. AIS acts as an SCU for the C-Find, C-Move and C-Store services.
7. AIS also acts as an SCP of the C-Store service during sub-operations of C-Move requests.

4.1.2 AGS Network related functions

1. Storage of received SOP instances sent to AGS by a remote SCU AE.
2. SendImage transmits the stored instances to a remote SCU AE triggered by an auto-routing rule (in response to a storage request made to a specific AE).
3. AGS responds to verification requests for troubleshooting connectivity problems.
4. AGS acts as an SCU for the C-Find, C-Move and C-Store services.

5.   AGS also acts as an SCP of the C-Store service during sub-operations of C-Move requests.

4.1.3 Sequencing Real World Activity

No assumptions are made about the sequencing of real-world activities.

Chapter 5:   Service and Interoperability Description

5.1 Mapping of Services to Application Entities

Table 5.1: Service to AE Mapping

Application Entity	Supported Services	Role			
		DIMSE		DICOM Media	
		SCU	SCP	FSC	FSR
ADS	Storage	Y	Y	N	N
	Query / Retrieve	Y	Y	N	N
	Print	Y	N	N	N
	Storage Commitment	Y	Y	N	N
AIS	Storage	Y	N	Y	Y
	Query / Retrieve	Y	Y	N	N
	Print	Y	N	N	N
AAS	Storage	Y	Y	N	N
	Query / Retrieve	Y	Y	N	N
	Print	Y	Y	N	N
AGS	Storage	Y	Y	N	N
	Query / Retrieve	Y	N	N	N
	Print	Y	N	N	N

5.2 Supported DIMSE Services

5.2.1 Basic Worklist Management Service

N/A

5.2.2 Modality Performed Procedure Step Service

N/A

5.5.3 Unified Worklist and Procedure Step Service

N/A

5.5.4 Instance Availability Notification Service

Table 5.2: Behaviour of Instance Availability Values SCP

Value	Behaviour
ONLINE	AIS continue on process
NEARLINE	AIS mark the data, warn, and issue retry
OFFLINE	AIS mark the data and warn

5.2.5 Storage Service

5.2.5.1 SCU of the Storage SOP Classes

As a Service Class User of the Storage Service Class, the Intuition uses C-STORE-RQ message to request storage. ADA / AIS / AAP / AGS support the transfer syntaxes listed in Section 1.1. For a given SOP, the original syntax is used first, then Implicit VR Little Endian if original syntax not acceptable by requested storage of DICOM objects by a remote SCP.

Table 5.3: Transcoding of Transfer Syntax

Stored Transfer Syntax	Sent transfer Syntax		
	Implicit VR Little Endian	**Explicit VR Little Endian**	**Compressed Syntax**
Implicit VR Little Endian		Supported	Supported
Explicit VR Little Endian	Supported		Supported
Compressed Syntax	Supported	Supported	

5.2.5.2 SCP of the Storage SOP Classes

As a Serv ice Class Provider of the Storage Service Class, the Intuition accept the C-STORE-RQ message from remote SCUs. See Section 1.1 Content and Transfer in the Overview for list of supported SOP Classes by default.

Table 5-4 defines the conformance levels of Intuition

Table 5.4: Levels of Conformance

Levels of Conformance	2 (FULL)
Level of Digital Signature Support	1 (may not preserve)

Table 5.5: Behaviour When Storing Instances

Action upon Receiving	Condition	System Behavior
Attribute Validation	Minor DICOM inconsistency	Log warning message

Table 5.5: Behaviour When Storing Instances

	Duplicate Instance	Reject(default) or overwrite
	Conflict series instance UID	New UID to store or reject
	DICOM validation error	Send failure code on association
	Success	Store
Patient Information	Mismatch	Reject

5.2.6 Storage Commitment Service

5.2.6.1 SCU of the Storage Commitment SOP Class

PUSH model (1.2.840.10008.1.20.1) is used.

5.2.6.2 SCP of the Storage Commitment SOP Class

The ADS service will listen on the same port for Storage and Storage Commitment Requests. Once a request has been received, a job is created to send the Storage Commitment response.

When the job has been created successfully, a successful acknowledgment (0x0000) to the request is send.

If not all instances were found; the job will be retried to check for the instances again. If the check is not successful after a certain amount of retries, a negative response is sent.

Table 5.6: Failure Condition on Storage Commitment

Status Code	Description	Conditions
0110	Processing failure: A general failure in processing the operation	
0112	No such object instance	
0114	No such argument	
0115	Invalid argument value	
0118	No such sop class	
0119	Class instance conflict	
0122	Reference SOP Class not supported	
0123	No such action type	
0131	Duplicated transaction UID	
0210	Duplicate invocation	
0211	Unrecognised operation	
0212	Mis-types argument	

Table 5.6: Failure Condition on Storage Commitment

Status Code	Description	Conditions
0213	Resource limitation	

5.2.7 Query/Retrieve Service Class

Refer to Table 5 for Query/Retrieve SOP classes

5.2.7.1 SCU of Q/R Information Model - Find SOP Class

Table 5.7: Supported C-FIND Attribute Matching for SCU

Attribute Name	Tag	Matching Type	Query Value Source	Display on UI
Study Level				
Patient's Name	(0010,0010)	WILDCARD	USER	Display
Patient ID	(0010,0020)	WILDCARD	USER	Display
Birth Date	(0010,0030)	SINGLE_VALUE	EMPTY	Display
Patient Sex	(0010,0040)	SINGLE_VALUE	EMPTY	Display
Other Patient ID	(0010,1000)	SINGLE_VALUE	USER	Display
Study ID	(0020,0010)	WILDCARD	USER	Display
Study Instance UID	(0020,000D)	UNIVERSAL	USER	No
Study Date	(0008,0020)	RANGE	USER	Display
Study Time	(0008,0030)	SINGLE_VALUE	EMPTY	Display
Accession Number	(0008,0050)	WILDCARD	USER	Display
Referring Physician's Name	(0008,0090)	WILDCARD	EMPTY	Display
Number of Study Related Series	(0020,1206)	UNIVERSAL	EMPTY	Display
Modalities in Study	(0008,0061)	SINGLE_VALUE	USER	Display
Number of Study Related Instances	(0020,1208)	UNIVERSAL	EMPTY	Display
Study Description	(0008,1030)	WILDCARD	USER	Display
Institution Name	(0008,0080)	WILDCARD	USER	Display
Series Level				
Series Number	(0020,0011)	UNIVERSAL	EMPTY	Display
Study Instance UID	(0020,000D)	SINGLE_VALUE	USER	No
Series Instance UID	(0020,000E)	UNIVERSAL	EMPTY	No

Table 5.7: Supported C-FIND Attribute Matching for SCU

Attribute Name	Tag	Matching Type	Query Value Source	Display on UI
Study Level				
Modality	(0008,0060)	UNIVERSAL	EMPTY	Display
Number of Series Related Instances	(0020,1209)	UNIVERSAL	EMPTY	Display
Series Description	(0008,103E)	UNIVERSAL	EMPTY	Display
Body Part Examined	(0018,0015)	UNIVERSAL	EMPTY	Display
Series Date	(0008,0021)	UNIVERSAL	EMPTY	Display
Series Time	(0008,0031)	UNIVERSAL	EMPTY	Display
Instance Level				
SOP Instance UID	(0008,0018)	UNIVERSAL	EMPTY	Display
Study Instance UID	(0020,000D)	SINGLE_VALUE	USER	Display
Series Instance UID	(0020,000E)	SINGLE_VALUE	USER	Display
Instance Number	(0020,0013)	SINGLE_VALUE	USER,GENERATED	Display

5.2.7.2 SCU of Q/R Information Model – MOVE SOP Class

Table 5.8: Supported C-Move Attribution Matching for SCU

Attribute Name	Tag	Matching Type	Retrieve Value Source
Study Level			
Move Destination	(0000,0600)	SINGLE_VALUE	USER
Study Instance UID	(0020,000D)	SINGLE_VALUE	USER
Series Level			
Move Destination	(0000,0600)	SINGLE_VALUE	USER
Study Instance UID	(0020,000D)	SINGLE_VALUE	USER
Series Instance UID	(0020,000E)	SINGLE_VALUE	USER
Image Level			
Move Destination	(0000,0600)	SINGLE_VALUE	USER
Study Instance UID	(0020,000D)	SINGLE_VALUE	USER
Series Instance UID	(0020,000E)	SINGLE_VALUE	USER
SOP Instance UID	(0008,0018)	SINGLE_VALUE	USER

Each time only one entity can be retrieved at one STUDY, one SERIES, or one Image.

C-MOVE can be cancelled before job completed at STUDY or SERIES level.

Intuition supports sending matching instances to a different AE Title.

In case no C-STORE request received or not succeed at STUDY level or SERIES level, C-MOVE request will be retried in a configured time frame.

5.2.7.3 SCP of Q/R Information Model - Find SOP Class

C-FIND SCP support all matching keys listed in Table 5-7.

Intuition does not support Extended Negotiation in C-FIND SCP.

If received C-FIND-CANCEL (C_CANCEL_FIND_RQ, 0x0FFF) request, Intuition will send back C_FIND_CANCEL_REQUEST_RECEIVED (0xFE00) and close the association.

If a request unable to process, Intuition will send back C_FIND_FAILURE_UNABLE_TO_PROCESS (0xC001).

5.2.7.4 SCP of Q/R Information Model - MOVE SOP Class

Intuition ADS and AAS receives the C-MOVE-RQ and in turn uses the C- STORE-RQ sub operation to send matching SOP Instances to the Move Destination AE included in the C-MOVE-RQ.

Refer to Table 1-1 for C-MOVE supported Storage SOP Classes.

Refer to Table 5-8 for C-MOVE supported level.

When received incoming C-MOVE request and its C-STORE suboperation, Intuition send all instances to C-MOVE destination with one association.

If received C-MOVE-CANCEL (C_CANCEL_MOVE_RQ, 0x0FFF), Intuition send back C_MOVE_CANCEL_REQUEST_RECEIVED (0xFE00) to C-MOVE requester and stop the C-STORE sub operation.

Intuition AIS and AGS do not support MOV E SCP.

5.2.8 Print management Service

The Print Management Service Classes define an application-level class of services to support printing of images on a hardcopy medium. The Intuition print application supports the print management DIMSE services to act as SCU.

The print SCU is implemented using the module AQNetPrint. ADS, AGS, AIS, and AAS can initiate the printing functions using this module. The data flow and the possible use cases are depicted in the following diagram.
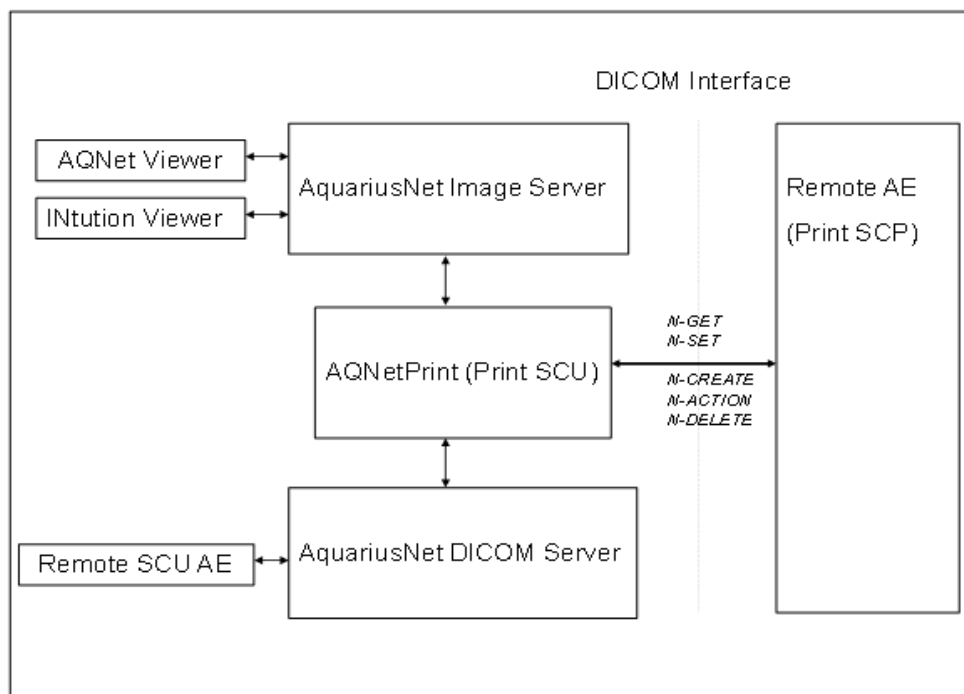
AQNetPrint is invoked by the client viewers through AqNet Image Server (AIS) whenever an image is ready to be printed on film. The client viewers send the image data along with necessary configuration information viz. layout, image size etc. to AQNetPrint, which is needed to compile a film-sheet. The Print SCU in-turn forwards the request to the Print SCP Remote AE. A printing job queue is maintained and would be re-tried in the event of failures.

AQNetPrint would also be invoked by ADS, AGS, or AAS whenever the server is configured to send print requests to Print SCP Remote AE automatically if the tag filter conditions are met.

AQNetPrint checks the printer status using N-GET service request for the Printer SOP Class before printing. Using N-CREATE/N-SET Services for the related Basic Print SOP Classes the film sheet is set up for printing and the images are transferred to the printer device. It issues deletion request on images immediately after the printing is completed and also closes the DICOM association.

Intuition provides for setting-up the printer configuration using the web administration interface. The printer configuration includes printer AE Title, default printer parameters among other information. Default film and image box configuration can be added for supporting auto-filming feature. In addition, it is also possible to associate / restrict a printer access only for a given group of users.

No assumptions are made about the sequencing of real-world activities except that the printer information should need to be pre-configured into Intuition Server before invoking the print function.

AQNetPrint supports all the two Uncompressed Transfer Syntaxes in Table 1-2.

AQNetPrint application initiates one association at a time for each different print device configured.

AQNetPrint does not support asynchronous communication.

AQNetPrint implemented with following identifying parameters:

Table 5.9: Parameters

Implementation Version Name	Implementation Class UID
TERARECONDEC01	1.2.840.113654.2.3.1995.2.10.2

5.2.8.1 SCU of the Basic Grayscale Print Management Meta SOP Class - SCU

Table 5.10: Basic Grayscale Print Management Meta SOP Class - SCU

SOP Class Name	SOP Class UID
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
- Basic Film Session SOP Class	1.2.840.10008.5.1.1.1
- Basic Film Box SOP Class	1.2.840.10008.5.1.1.2
- Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4
- Printer SOP Class	1.2.840.10008.5.1.1.16

5.2.8.1.1 Basic Film Session SOP Class

Table 5.11: Services for the Basic Film Session SOP Class - SCU

DIMSE Service Element	Purpose
N-CREAT	Create the Film Session
N-SET	Update the Film Session
N-DELETE	Delete the Film Session
N-ACTION	Print all Film Boxes in the Film Session

Table 5.12: Supported N-CREATE & N-SET Attributes for Basic Film Session SOP Class - SCU

Attribute Name	Tag	Values	Default
Number of Copies	2000,0010	range or fixed value	1
Print Priority	2000,0020	HIGH, MED, LOW	HIGH
Medium Type	2000,0030	CLEAR FILM, BLUE FILM, PAPER	
Film Destination	2000,0040	MAGAZINE, PROCESSOR, PAPER	PROCESSOR
Film Session Label	2000,0050		0

5.2.8.1.2 Basic Film Box SOP Class

Table 5.13: Services for the Basic Film Session SOP Class - SCU

DIMSE Service Element	Purpose
N-CREAT	Create the Film Box in a previously created Film Session
N-SET	Update the Film Box
N-DELETE	Delete the Film Box
N-ACTION	Print all Film Box

Table 5.14: Supported N-CREATE & N-SET Attributes for Basic Film Box SOP Class - SCU

Attribute Name	Tag	Values	Default
Image Display Format	2010,0010	STANDARD\C,R	STANDARD\1, 1
Film Orientation	2010,0040	PORTRAIT, LANDSCAPE	PORTRAIT
Film Size ID	2010,0050	8INX10IN, 8_5INX11IN, 10INX12IN, 10INX14IN, 11INX14IN,14INX14IN, 14INX17IN, 24CMX24CM, 24CMX30CM, A4, A3	
Magnification Type	2010,0060	REPLICATE, BILINEAR, CUBIC, NONE	CUBIC
Border Density	2010,0100	BLACK, WHITE	BLACK
Configuration Information	2010,0150		
Referenced SOP Class UID	0008,1150	1.2.840.10008.5.1.1.1	
Referenced SOP Instance UID	0008,1155		

5.2.8.1.3 Basic Grayscale Image Box SOP Class

Table 5.15: Services for the Basic Grayscale Image Box SOP Class

DIMSE Service Element	Purpose
N-SET	Set Image Attributes for a previously created Film Box

Table 5.16: Supported N-SET Attributes for the Basic Grayscale Image Box SOP Class - SCU

Attribute Name	Tag	Values	Default
Image Box Position	2020,0010	Possible position value or range	
Requested Image Size	2020,0030	width, x-dimension, in mm	
Basic Grayscale Image Sequence	2020,0110		
>Samples per Pixel	0028,0002	1	
>Photometric Interpretation	0028,0004	MONOCHROME1, MONOCHROME2	
>Rows	0028,0010		
>Columns	0028,0011		
>Pixel Spacing	0028,0030		
>Bits Allocated	0028,0100	8,16	8
>Bits Stored	0028,0101	8,12	8
>High Bit	0028,0102	7,11	7
>Pixel Representation	0028,0103	0	0
>Pixel Data	7FE0,0010		

5.2.8.1.4 Printer SOP Class

Table 5.17: Services for the Printer SOP Class

DIMSE Service Element	Purpose
N-GET	Retrieve printer information and status

Table 5.18: Supported N-GET Attribute for the Printer SOP Class

Attribute Name	Tag	Behavior
Printer Status	2110,0010	NORMAL, Warning, Failure
Printer Status Info	2110,0020	
Printer Name	2110,0030	

Table 5.18: Supported N-GET Attribute for the Printer SOP Class

Attribute Name	Tag	Behavior
Manufacturer	0008,0070	
Manufacturer Model name	0008,1090	
Software Version	0018,1020	

5.2.8.2 SCU of the Basic Color Print management Meta SOP Class

Table 5.19: Basic Color Print Management Meta SOP Classes

SOP Class Name	SOP Class UID
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18
- Basic Film Session SOP Class	1.2.840.10008.5.1.1.1
- Basic Film Box SOP Class	1.2.840.10008.5.1.1.2
- Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1
- Printer SOP Class	1.2.840.10008.5.1.1.16

5.2.8.2.1 Basic Film Session SOP Class

See Section 5.2.8.1.1.

5.2.8.2.2 Basic Film Box SOP Class

See Section 5.2.8.1.2.

5.2.8.2.3 Basic Color Image Box SOP Class

See Section 5.2.8.1.3.

5.2.8.2.4 Printer SOP Class

See Section 5.2.8.1.4.

5.2.8.3 SCU of the Basic Annotation Box SOP Class

AQNetPrint burns the annotation onto the image pixels before sending the image data to the Print SCP remote AE. Limited configuration is possible on annotation position on the image.

5.2.8.4 SCU of the Print Job SOP Class

Refer to Table 5-17 for supported N-GET attribute.

5.2.8.5 SCU of the Presentation LUT SOP Class

N/A

5.2.8.6 SCU of the Printer Configuration Retrieval SOP Class

See Section 5.2.8.1.4.

Intuition does not support SCP of Print.

5.3 Supported DICOM Web Services

N/A

5.4 Media Service

5.4.1 File Set Creator (FSC)

Intuition supports FSC for Media Application Profiles listed in Section 1.4 with SOP Classes listed in Section 1.1.

5.4.2 File Set Reader (FSR)

Intuition supports FSR for Media Application Profiles listed in Section 1.4 with SOP Classes listed in Section 1.1.

5.4.3 File Set Updater (FSU)

N/A

5.5 Real Time Video

N/A

5.6 Cross Service Consideration

N/A

5.7 Specific Character Sets

Intuition supports Specific Character Sets listed in Section 1.7.

Chapter 6:   Configuration

ADS, AIS, AAS, and AGS are configured by login onto the Web administration page hosted by the respective servers. It is password protected and intended to be used by Intuition service engineers or authorized and trained customers. The detailed configuration information is available in the configuration page of web.

Throughout all subsections the following Values can be used in the "Configurable" column:

•   USER: The parameter is configurable by the user

•   SERVICE: The parameter is configurable by service personnel.

•   FIXED The parameter is not configurable. The value is required for the configuration of the remote system.

•   N/A: The parameter is not applicable for the local or remote system.

6.1 General Configuration Parameters

Table 6-1 lists general configuration parameters applicable across all supported DICOM Services.

Table 6.1: General Configuration Parameters

Parameter	Configurable	Default Value	Comments
General Parameters			
associationRequestTimeout	SERVICE	30	Seconds to wait for association request or peer to shut down (0, 600)
associationReplyTimeout	SERVICE	10	Seconds to wait for a reply to an associate request (0, 600)
connectTimeout	SERVICE	10	seconds to wait for a network connect to be accepted (0, 600)
inactivityTimeout	SERVICE	7200	seconds to wait in between packets of data received over network after initial packet of data in a message is received (0, 36000)
writeTimeout	SERVICE	300	seconds to wait for a network write to be accepted (0, 600)
releaseTimeout	SERVICE	10	seconds to wait for a reply to an associate release (0,600)

Table 6.1: General Configuration Parameters

Parameter	Configurable	Default Value	Comments
TCP/IP Settings			
maxDICOMTCPIPSendBufferSize InKB	SERVICE	256K	TCP/IP send buffer size
maxDICOMTCPIPReceiveBufferS izeInKB	SERVICE	256K	TCP/IP receive buffer size
DICOM Service Parameters			
maxAssociations	SERVICE	25	Maximum simultaneous associations number (0,50)

6.2 Configuration of DIMSE Services

"Local Configuration Parameters" are the parameters for the product described in this DICOM Conformance Statement.

"Remote Configuration Parameters" is the information needed for this product to interface with a remote system.

6.2.1 Basic Worklist Management Service Configuration

N/A

6.2.2 Modality Performed Procedure Step Service Configuration

No additional configuration

6.2.3 Unified Worklist and Procedure Step Service Configuration

N/A

6.2.4 Instance Availability Notification Service Configuration

Table 6.2: IAN Service Parameters

Local Configuration Parameters – Instance Availability Notification Service			
Parameter	Configurable	Default Value	Comments
timeoutOnRetrieveNear line	SERVICE	5	AIS only

6.2.5 Storage Service Configuration

Table 6.3: Storage Service Parameter

Local Configuration Parameters – Storage Service			
Parameter	**Configurable**	**Default Value**	**Comments**
AUTOVOX	FIXED		
AqNET_Local_00	FIXED		
AqPE_Local_00	FIXED		
AqAPS_Local_00	FIXED		AAS only
Calling AE Title (SCU)	SERVICE	<hostname>-AQNET	
Called AE Titles (SCP)	SERVICE	<HOSTNAME>_AE	
Port	SERVICE	105	Receive and store data
TLS-Secured Port	SERVICE	105	
Supported Transfer Syntax (SCP)	SERVICE	See Table 1-2	Can force to accept ILE or ELE only
Supported storage SOP classes (SCP)	SERVICE	See Table 1-1	Can ass storage SOP Classes
MaxSendRetries (SCU)	SERVICE	5	Max retry times if C-STORE failed
Remote Configuration Parameters – Storage Service			
Calling AE Title (SCU)	SERVICE	<hostname>-AQNET	
Called AE Title (SCP)	SERVICE	<HOSTNAME>_AE	
Port	SERVICE	104	Bind with Calling AE
Port	SERVICE	105	Bind with called AE
Host	SERVICE		

6.2.6 Storage Commitment Service Configuration

No additional configuration

6.2.7 Query / Retrieve Service Configuration

Table 6.4: Query Retrieve Service Parameters

Local Configuration Parameters – Query / Retrieve Service			
Parameter	**Configurable**	**Default Value**	**Comments**
dontSendCMoveRSP (SCP)	SERVICE	0	Send Response to CMove SCU 0 – Send; 1 – Not send
sendCMovePendingWithZeroRemaining (SCP)	SERVICE	0	Send progress to CMove SCU. 0 – send; 1 – not send.
MaxRetrieveRetries (SCU)	SERVICE	0- AIS 2- Auto	Retry times after CMove fail
Remote Configuration Parameters – Query / Retrieve Service			
Calling AE Title (SCU)	SERVICE	<Host>-AQNET	Remote server used to allow Query / Rereieve
Called AE Title (SCP)	SERVICE	<Host>_AE	Remote server used to Query / Retrieve
Port	SERVICE	104	Bind with calling AE
Port	SERVICE	105	Bind with called AE
TLS-Secured Port	SERVICE		Bind same as regular DICOM communication

6.2.8 Print Management Service Configuration

Table 6.5: Print management Service Parameters

Local Configuration Parameters – Print Management Service			
Parameter	**Configurable**	**Default Value**	**Comments**
Calling AE Title (SCU)	FIXED	<Host>-AQNET	
maxPrintRetries	SERVICE	5	Retry numbers after print fail
Remote Configuration Parameters – Print Management Service			
Called AE Title (SCP)	SERVICE		
Port	SERVICE	106	
Host	SERVICE		

6.3 Configuration of DICOM Web Services

N/A

6.4 Configuration of Media Storage Service

N/A

6.5 Configuration of Real Time Video Service

N/A

6.6 Configuration of Audit Trail – Syslog

N/A

Chapter 7:   Network and Media Communication Details

7.1 General

ADS, AIS, AAS, and AGS use the MergeCOM-3 Advanced DICOM Toolkit to communicate over the TCP/IP protocol stack on any physical interconnection media supporting the TCP/IP stack. The Toolkit inherits the TCP/IP stack from the host operating system upon which it executes.

Both IPv4 and IPv6 are supported. Defaulted to use IPv4 only. With simple configuration change, all DICOM communication can be switched to IPv6 only or IPv4 / IPv6 dual mode.

7.1.1 General Association Parameters

Table 7.1: General Association Parameters

	Name	Value
Networking Services	Application Context Name	1.2.840.10008.3.1.1.1
	Implementation Class UID	2.16.840.1.113669.632.21.1
	Implementation Version Name	AQNET460-513
	Maximum PDU Length	Default: 131072
	ARTIM Timeout	Default: 30s
	Maximum number of simultaneous Associations as Association Initiator	Default: 24
	Maximum number of simultaneous Associations as Association Acceptor	Default: 25
	Maximum number of outstanding asynchronous Transactions	N/A
	seriesCompleteTimeout	Default 5. (2 – 300)
Media Services	Media Storage SOP Class UID	1.2.840.10008.1.3.10
	File Meta Information Version	0
	Implementation Class UID	2.16.840.1.113669.632.21.1
	Implementation Version Name	AQNET460-513
	File-set ID	TR_DCMDIR_FSU

7.2 Specifications

No extended negotiation is supported in Intuition.

7.2.1 Application Entity of ADS, AAS, and AGS

7.2.1.1 Sequencing of Real-World Activities for ADS, AAS, and AGS

1), Responds to verification requests for troubleshooting connectivity problems.

2), Storage of received SOP instances from a remote SCU AE.

3), Responds to queries about stored instances from a remote SCU AE.

4), Transmits of stored instances to a remote SCU AE triggered automatically by a retrieve request.

5), Transmits the stored instances to a remote SCP AE triggered by an auto-routing rule.

6), Delete stored instances after some days in ADS and AAS, or some hours or immediately if not needed in AGS.

7.2.1.2 Association Parameters of ADS, AAS, and AGS

See Table 7-1.

7.2.1.3 Association Initiation of ADS, AAS, and AGS

Real-world Activities - C-STORE SCU

ADS, AAS and AGS may initiate C-STORE SCU when attempting to send SOP Instances to remote AE with retry mechanism.
ADS and AAS may initiate C-STORE SCU in response to remote C-MOVE request.
When association initiated as C-STORE SCU, the transfer syntaxes can be proposed using table 1-1 with transfer syntax U, L, or LL. If the transfer syntax is accepted by SCP, the instance may be sent using one of the syntaxes negotiated based on the compress settings in the routing configuration.
All instances in a series will be sent with the same association.

7.2.1.4 Association Acceptance of ADS, AAS, and AGS

Real-World Activity – C-ECHO SCP

ADS, AAS, and AGS accept associations for requests using Verification Service in Table 1-3, and responds an echo response. The association will be close either by the initiator or aborted by this SCP if certain error condition arises.

Real-World Activity – C-STORE SCP

ADS, AAS, and AGS accept C-STORE association request as SCP. The acceptable presentation contexts listed in Table 1-1 with transfer syntax U, L, or LL. The association will be closed either by the initiator or aborted by this SCP if certain error condition arises. The received instances are stored to disk. Some attributes of the stored instances are kept in a database.

Real-World Activity – C-FIND and C-MOVE SCP

 ADS and AAS accept C-FIND and C-MOVE association request as SCP, serve C-MOVE requests at IMAGE, SERIES and STUDY levels as specified in attribute (0008,0052). Patient level move is not supported. The acceptable presentation conetxts listed in Table 1-5.

7.2.2 Application Entity of AIS

7.2.2.1 Sequencing of Real-World Activities for AIS

1.   Acts as an SCU for the C-Find, C-Move and C-Store services.
2.   Acts as an SCP of the C-Store service during sub-operations of C-Move requests.

7.2.2.2 Association Parameters of AIS

See Table 7-1.

7.2.2.3 Association Initiation

7.2.2.3.1 Real-World Activity – C-FIND SCU

AIS initiates an C-FIND association when performing query study list or series list.

7.2.2.3.2 Real-World Activity – C-MOVE SCU

AIS initiates C-MOVE operation based on Table 1-5 to retrieve SOP instance data.

7.2.2.3.3 Real-World Activity – C-STORE SCU

AIS initiates C-STORE associations as SCU when sending DICOM data to local or remote server due to a user's request.

7.2.2.4 Association Acceptance of AIS

7.2.2.4.1 Real-World Activity – C-STORE SCP

AIS accept C-STORE association from remote server which is triggered by AIS C-MOVE SCU, and store the received SOP instance data as cache for future rendering purpose.

7.3 Status Codes

7.3.1 General AE Communication and Failure Behavior and Handling

7.3.1.1 Communication Failure Behavior as Association Initiator

Table 7.2: DICOM Communication Failure Behavior as Association Initiator

Failure	Failure Behaviour
Timeout	Log a TIMEOUT (4082) message and terminate
Connection Failed	Log a CONNECTION_FAILED (4113) message and terminate. Possibly IP or host issue
Negotiation Aborted	Log a NEGOTIATION_ABORTED (4116) message and terminate, Possibly transfer syntax or data issue
Association Rejected	Log an ASSOCIATION_REJECTED (4003) message and terminate. Possibly image or storage issue.
Association aborted	Log ASSOCIATION_ABORTED (4001) message and terminate
Network Disconnect	Log a NETWORK_SHUT_DOWN (4054) message and terminate

7.3.1.2 Communication Failure Handling as Association Acceptor

Table 7.3: DICOM Communication Failure Handling as Association Acceptor

Exception	Failure Response
Failure during processing of an Association request	Log a message and abort association.
Unrecognized Called AE	Log a message on different level depends on command, and reject association
Exceed limit for number of connections supported	Log remote IP / Host / AET and reject association with reason TRANSIENT_LOCAL_LIMIT_EXCEEDED

7.3.2 DIMSE Services

7.3.2.1 Basic Worklist Management Service

Refer to Table 7-6 and Table 7-8 for C-FIND status code

7.3.2.2 Modality Performed Procedure Step Service

Table 7.4: Status Codes for N-CREATE of the Modality Performed Procedure Step

Service Status	Further Meaning	Status Code	Behavior
Success	Success	0000	

7.3.2.3 Unified Worklist and Procedure Step Service

N/A

7.3.2.4 Instance Availability Notification Service

N/A

7.3.2.5 Storage Service

Table 7.5: Status Codes C-STORE for the Storage SOP Classes – SCU

Service Status	Further Meaning	Status Code	Behavior (Treated as)
Success	Success	0000	Success
Warning	Coercion of Data Elements	B000	Warning or Success
	Data Set does not match SOP Class	B007	Unknown or Success
	Elements Discarded	B006	Unknown or Success
Failure	SOP Class not supported	0112	Unknown
	Invalid Object Instance	0117	Unknown
	Duplicate Invocation	0210	Unknown
	Unrecognized Operation	0211	Unknown
	Mistyped Argument	0212	Unknown
	Not authorized	0214	Unknown
	Out of Resources	A700-A7FF	Fail
	Data Set does not match SOP Class	A900-A9FF	Fail
	Cannot Understand	C000-CFFF	Fail
Other status	Processing failure	0110	Fail
	Duplicate SOP	0111	Unknown
	SOP Class not supported	0112	Fail
	Duplicate SOP	D000	Unknown

Note: Unknown and Fail will be retried and finally failed.

Table 7.6: Status Codes C-STORE of the Storage Class - SCP

Service Status	Further Meaning	Status Code	Related Fields	Condition (and Comments on Related Fields)
Success	Success	0000		

Table 7.6: Status Codes C-STORE of the Storage Class - SCP

Service Status	Further Meaning	Status Code	Related Fields	Condition (and Comments on Related Fields)
Warning	Coercion of Data Elements	B000	N/A	
	Data Set does not match SOP Class	B007	N/A	
	Elements Discarded	B006	N/A	
Refused	Refused: Out of Resources	A700	Not enough space	Request not processed
Failure	Error: Data Set does not match SOP Class	A900	Conflicted Patient name, Conflicted Series Instance UID, Photometric error, not find previous series information, not expected ultrasonic data	Request not processed
	Error: Cannot understand	C000	Not understand service and command	Request not processed
Other	Processing Failure	0110	Fail to convert to file	Request not processed
	Duplicate SOP instance	0111	An instance with this SOP Instance UID has been stored previously	Request not processed

7.3.2.6 Storage Commitment Service

Table 7.7: Status Codes for N-ACTION and N-EVENT-REPORT for Storage Commitment PUSH Mode

Service Status	Further Meaning	Status Code	Behavior
Success		0000	
Failure	Processing Failure	0110	Fail to set series
	No such SOP Instance	0112	Unable to get instance

7.3.2.7 Query / Retrieve Service

7.3.2.7.1 SCU of the Query / Retrieve FIND SOP Classes – C-FIND

Table 7.8: Status Codes C-FIND for Query / Retrieve FIND SOP Classes - SCU

Service Status	Further Meaning	Status Code	Behavior
Success	Matching is complete – No final identifier is supplied	0000	
Failure	Refused: Out of Resources	A700	Log message REFUSED_NO_RESOURCES
	Error: Identifier does not match SOP Class	A900	Log INVALID_DATASET
	Error: Unable to process	C000-CFFF	Log UNABLE_TO_PROCESS
	SOP Class Not Supported	0122	Log "Received bad response status" with status code
Cancel	Matching terminated due to cancel	FE00	Terminate
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	FF00	Log "C_FIND_PENDING received"
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence for this Identifier	FF01	Log "C_FIND_PENDING received"

7.3.2.7.2 SCU of the Query / Retrieve MOVE SOP Classes – CMOVE

Table 7.9: Status Codes C-MOVE for Query / Retrieve MPVE SOP Classes - SCU

Service Status	Further Meaning	Status Codes	Related Fields	Behavior
Success	Sub-operations Complete - No Failures	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023	Log progress depends on configuration
Warning	Sub-operations Complete - One or more Failures	B000	(0000,1020) (0000,1022) (0000,1023	Log failed instance information
Failed	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)	Log failed instance information
	Out of Resources - Unable to perform sub-operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	
	Move Destination unknown	A801	(0000,0902)	
	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902	
	Unable to process	Cxxx	(0000,0901) (0000,0902	
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023	Terminate
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023	Log progress depends on configuration

7.3.2.7.3 SCP of the Query / Retrieve FIND SOP Classes – C-FIND

Table 7.10: Status Codes C-FIND for Query/Retrieve FIND SOP Classes - SCP

Service Status	Further Meaning	Status Code	Condition
Success	Matching is complete - No final identifier is supplied	0000	Normal

Table 7.10: Status Codes C-FIND for Query/Retrieve FIND SOP Classes - SCP

Service Status	Further Meaning	Status Code	Condition
Failure	Refused: Out of Resources	A700	N/A
	Error: Identifier does not match SOP Class	A900	Miss higher level key
	Error: Unable to process	C000	Wrong Q/R level, AE, Unable to respond, Unable to open / empty message
	SOP Class Not Supported	0122	N/A
Cancel	Matching terminated due to cancel	FE00	Received CANCEL command
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Processing between matches
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence for this Identifier	FF01	N/A

7.3.2.7.4 SCP of the Query / Retrieve MOVE SOP Classes C-MOVE

Table 7.11: Status Codes C-MOVE for Query / Retrieve MOVE SOP Classes - SCP

Service Status	Further Meaning	Status Codes	Related Fields sent in the response	Condition	Action on the Store due the condition
Success	Sub-operations Complete - No Failures	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Completed	Stored
Warning	Sub-operations Complete - One or more Failures	B000	(0000,1020) (0000,1022) (0000,1023)	>= one instance failed or warned	Partially stored
Failed	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)	N/A	
	Out of Resources - Unable to perform sub-operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	C-STORE association failed, or failed to check C-MOVE cancel command	Not stored

Table 7.11: Status Codes C-MOVE for Query / Retrieve MOVE SOP Classes - SCP

Service Status	Further Meaning	Status Codes	Related Fields sent in the response	Condition	Action on the Store due the condition
	Move Destination unknown	A801	(0000,0902)	Destination AE not contains in C-MOVE command, or not configured in server	No store
	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)	Unable to get service, command, Q/R level, Higher level instance UID, or general UID	No store
	Unable to process	Cxxx	(0000,0901) (0000,0902)	Invalid C-MOVE level / requested UID. Invalid C-MOVE root or level	No store
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Received cancel request	Partial store
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Processed instances < Total instances	Storing

7.3.2.8 Print Management Service

Table 7.12: Management Service

Service Status	Further Meaning	Status Code	Behavior
Success	Success	0000	
Warning / Failure	All other code	0110,0112,…	Fail or retry

7.3.3 DICOM Web Services

N/A

Chapter 8:   Security

8.1 Introduction

It is assumed that Intuition servers are used within a secured environment. It is assumed that a secured environment includes at a minimum:

1.   Intuition servers.

2.   Firewall or router protections to ensure that Intuition only has network access to approved external hosts and services.

3.   Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels (for example, a Virtual Private Network (VPN))

Other network security procedures such as automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of this conformance statement.

Intuition servers may also support TLS 1.3 on all DICOM related communications IN ADS, AIS, AAS, and AGS, Including C-FIND, C-MOVE, and C-STORE.

8.2 External Network Requirements

Intuition uses additional non-DICOM network protocols:

1.   Basic Network Address Management

2.   DNS Services

8.3 TCP Port Configuration

See Section 6 for information on the usage of port for DICOM.

8.4 DICOM Security Profiles Support

8.4.1 Secure Use and User Identity Profiles

N/A

8.4.2 Secure Transport Connection Profiles

Table 8.1: Secure Transport Connection Profiles

Profile	Secure AE	Sender	Receiver
Modified BCP 195 RFC 8996 TLS Secure Transport Connection Profile	ALL	Y	Y

Table 8.2: Secure Transport Connection Profiles and Cipher Suites

Profile	Cipher Suite	Default Preference order
Modified BCP 195 RFC 8996 TLS Secure Transport Connection Profile	TLS_AES_256_GCM_SHA384	1
	TLS_CHACHA20_POLY1305_SHA256	2
	TLS_AES_128_GCM_SHA256	3
	TLS_AES_128_GCM_SHA256	4
	TLS_AES_128_CCM_8_SHA256	5

8.4.3 Media Storage Security Profiles

N/A

8.4.4 Attribute Confidentiality Profiles

N/A

8.4.5 Distal Signature Profiles

N/A

8.5 User Identity Negotiation Support

N/A

8.6 Web Service Security Features

N/A

Appendix A: ANNEXES

Data Dictionary of Private attribute

AIS may add 'Aquarius Scene' private module to Secondary Capture Image IOD for extension. This module contains Study / Series / SOP Instance UADS and some application specific data. Data that specifies the patient directly are not included.

Table A.1: Application Specific Data

Private Groups Table			
Module	**Tag**	**Description**	**Range of Private Tags**
Aquarius Scene	0077,0000	Private	0077, 0000 – 00FF
Private Tags Table				
Module	Tag	Description	VR	VM
Aquarius Scene	Original Series/Study UID (0077,0010)	Private	UI	1-N
Aquarius Scene	Original SOP UID (0077,0012)	Private	UI	1-N
Aquarius Scene	Referenced Volume ID (0077,0014)	Private	LO	1-N
Aquarius Scene	Binary Data Name SCS (0077,0016)	Private	CS	1
Aquarius Scene	Binary Data Name (0077,0020)	Private	LO	1-N
Aquarius Scene	Number of SOP Instance UID (0077,0022)	Private	CS	1-N
Aquarius Scene	Number of Series Instance UID (0077,0024)	Private	CS	1-N
Aquarius Scene	Number of Binary data (0077,0026)	Private	US	1
Aquarius Scene	Binary Data Type (0077,0028)	Private	CS	1-N
Aquarius Scene	Binary Data Size (0077,0030)	Private	UL	1-N
Aquarius Scene	Binary Data Subtype (0077,0032)	Private	LO	1-N
Aquarius Scene	Additional Information (0077,0040)	Private	LO	1-N
Aquarius Scene	First Binary Data (0077,0050)	Private	OB	1

Table A.1: Application Specific Data

Private Groups Table				
Module	**Tag**	**Description**	**Range of Private Tags**	
Aquarius Scene	First Thumbnail (0077,0060)	Private	OB	1
Aquarius Scene	Algorithm ID (0077,0070)	Private	LO	1
Aquarius Scene	Volume ID (0077,0080)	Private	LO	1
Aquarius Scene	COF Object UID (0077,0084)	Private	LO	1-N
Aquarius Scene	Workflow Scene status (0077,0086)	Private	LO	1-N
Aquarius Scene	Reference SOP Instance UADS (0077,0088)	Private	UI	1-N
Aquarius Scene	COF Refinement Level (0077,0090)	Private	FL	1