



DICOM Conformance Statement

Rialto Connect 3.0

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Overview

Rialto Connect is a self-contained networked information system used for querying and retrieving of diagnostic medical images and reports. The system conforms to the DICOM 3.0 standard to allow the sharing of medical information with other digital imaging systems.

NETWORK SERVICES

DICOM SOP Class Name	User of Service (SCU)	Provider of Service (SCP)	Display
Transfer			
US Image Storage	Yes	Yes	No
US Multi-frame Storage	Yes	Yes	No
<i>US Multi-frame Storage (Retired)</i>	Yes	Yes	No
Computed Radiography Image Storage	Yes	Yes	No
Digital X-Ray Image Storage - For Presentation	Yes	Yes	No
Digital X-Ray Image Storage - For Processing	Yes	Yes	No
Digital Mammography X-Ray Image Storage - For Presentation	Yes	Yes	No
Digital Mammography X-Ray Image Storage - For Processing	Yes	Yes	No
Digital Intra-oral X-Ray Image Storage - For Presentation	Yes	Yes	No
Digital Intra-oral X-Ray Image Storage - For Processing	Yes	Yes	No
CT Image Storage	Yes	Yes	No
Enhanced CT Image Storage	Yes	Yes	No
MR Image Storage	Yes	Yes	No
Enhanced MR Image Storage	Yes	Yes	No
Secondary Capture Image Storage	Yes	Yes	No
X-Ray Angiographic Image Storage	Yes	Yes	No
X-Ray Radiofluoroscopic Image Storage	Yes	Yes	No
Nuclear Medicine Image Storage	Yes	Yes	No
VL Endoscopic Image Storage	Yes	Yes	No
VL Microscopic Image Storage	Yes	Yes	No
VL Slide-Coordinates Microscopic Image Storage	Yes	Yes	No
VL Photographic Image Storage	Yes	Yes	No

Positron Emission Tomography Image Storage	Yes	Yes	No
RT Image Storage	Yes	Yes	No
<i>Nuclear Medicine Image Storage (Retired)</i>	Yes	Yes	No
Multi-frame Grayscale Byte Secondary Capture Image Storage	Yes	Yes	No
Multi-frame Grayscale Word Secondary Capture Image Storage	Yes	Yes	No
Multi-frame Color Secondary Capture Image Storage	Yes	Yes	No
Grayscale Softcopy Presentation State Storage	Yes	Yes	No
Hardcopy Grayscale Image Storage SOP Class	Yes	Yes	No
Hardcopy Color Image Storage SOP Class	Yes	Yes	No
Basic Text SR	Yes	Yes	No
Enhanced SR	Yes	Yes	No
Comprehensive SR	Yes	Yes	No
Key Object Selection Document	Yes	Yes	No
Multi-frame Single Bit Secondary Capture Image Storage	Yes	Yes	No
<i>X-Ray Angiographic Bi-Plane Image Storage (Retired)</i>	Yes	Yes	No
<i>VL Image Storage (Retired)</i>	Yes	Yes	No
<i>VL Multiframe Image Storage (Retired)</i>	Yes	Yes	No
Mammography CAD SR	Yes	Yes	No
RT Dose Storage	Yes	Yes	No
RT Structure Set Storage	Yes	Yes	No
RT Beams Treatment Record Storage	Yes	Yes	No
RT Plan Storage	Yes	Yes	No
RT Brachy Treatment Record Storage	Yes	Yes	No
RT Treatment Summary Record Storage	Yes	Yes	No
12-lead ECG Waveform Storage	Yes	Yes	No
General ECG Waveform Storage	Yes	Yes	No
Ambulatory ECG Waveform Storage	Yes	Yes	No
Hemodynamic Waveform Storage	Yes	Yes	No
Cardiac Electrophysiology Waveform Storage	Yes	Yes	No
Basic Voice Audio Waveform Storage	Yes	Yes	No

Procedure Log Storage	Yes	Yes	No
Encapsulated PDF Storage	Yes	Yes	No
Query/Retrieve			
Patient Root Q/R – FIND	Yes	Yes	N/A
Patient Root Q/R - MOVE	Yes	Yes	N/A
Study Root Q/R – FIND	Yes	Yes	N/A
Study Root Q/R - MOVE	Yes	Yes	N/A
Verification			
Verification	Yes	Yes	N/A

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1 Introduction

1.1 Revision History

Document Version	Date	Author	Description
1.0	24 January 2012	Karos Health	Approved.

1.2 Audience

This document is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader is familiar with the terminology and concepts that are used in the DICOM 3.0 standard and the appropriate IHE Profiles.

1.3 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 Rialto Connect and other vendors' medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM 3.0 standard. However, it is not guaranteed to ensure the desired interoperability and successful interconnectivity with existing DICOM systems.

The user should be aware of the following important issues:

- The comparison of different conformance statements is the first step towards assessing interconnectivity between Rialto and other vendors' equipment.
- Test procedures should be defined to validate the desired level of connectivity.
- The DICOM 3.0 standard will evolve to meet the users' future requirements. Karos Health reserves the right to make changes to its products or to discontinue its delivery.

1.4 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
AET	Application Entity Title
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
GSDP	Grayscale Standard Display Function
GUI	Graphical User Interface
HIS/RIS	Hospital Information System / Radiology Information System
HL7	Health Level 7
IHE	Integrating the Healthcare Enterprise
IHE-TF	Integrating the Healthcare Enterprise Technical Framework
IOD	Information Object Definition
ISO	International Standard Organization
PDU	DICOM Protocol Data Unit
LUT	Look-up Table

P-LUT	Presentation Look-up Table
SCP	Service Class Provider
SCU	Service Class User
SOP	DICOM Service-Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
TLS	Transport Layer Security
UID	Unique Identifier
VR	Value Representation

1.5 References

- [DICOM] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1- 3.18, 2009
- [IHE-TF] IHE Radiology Technical Framework, HIMSS/RSNA, Vol. I – IV, Revision 10.0, February 18, 2011
- [IHE-TF] IHE IT Infrastructure Technical Framework, HIMSS/RSNA, Vol. I – III, Revision 8.0, August 19, 2011

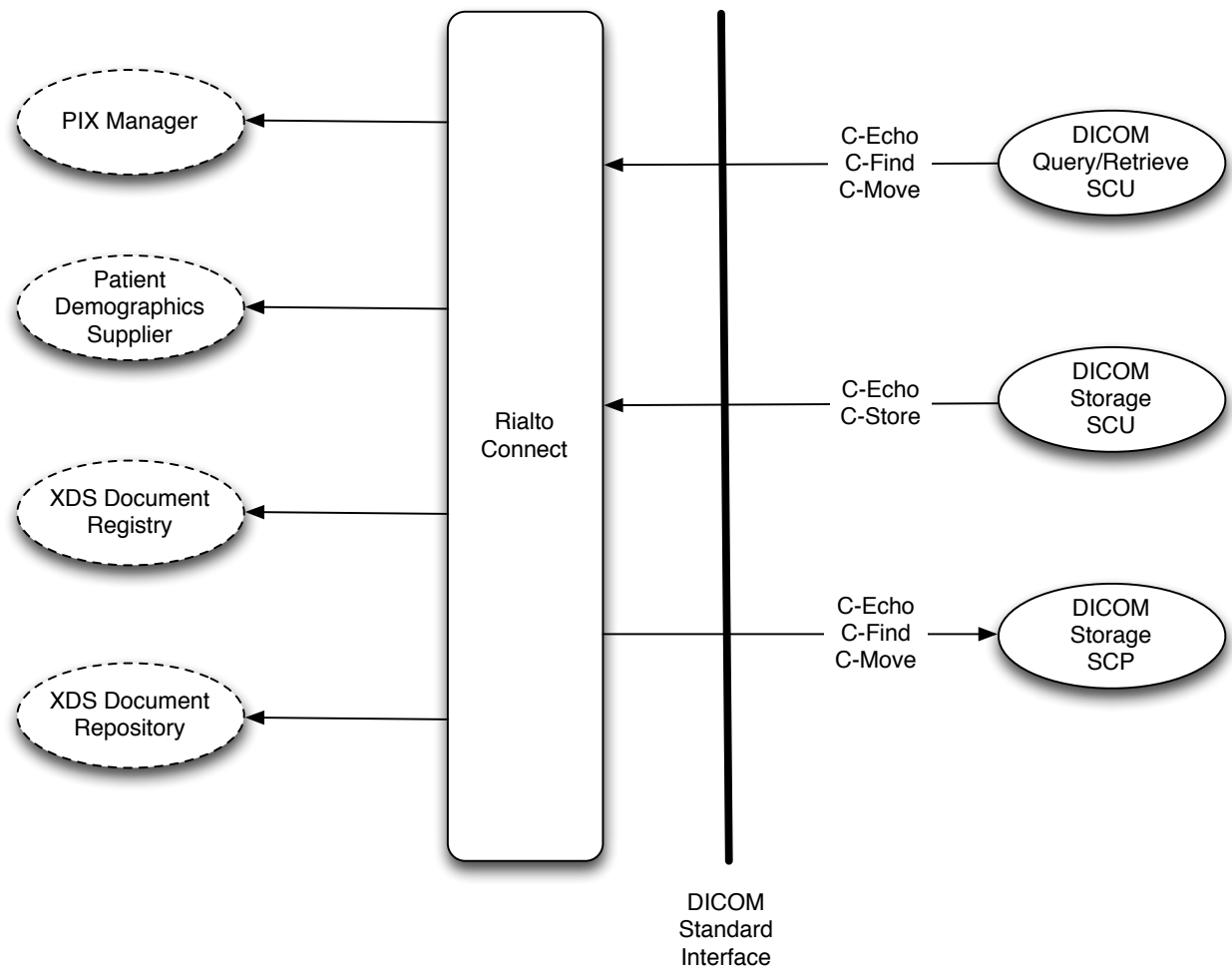
2 Networking

2.1 Implementation Model

2.1.1 Application Data Flow

Rialto Connect can be used to query for and retrieve diagnostic images and reports from a clinical information exchange. Rialto Connect will accept DICOM query and retrieve requests and convert them into the appropriate PIX, PDQ, XDS and DICOM requests required to query and retrieve images. Rialto Connect will accept DICOM store requests for retrieved images and reports and localize them as required before forwarding them back to the original requestor.

Application Data Flow Diagram



Rialto Connect implements the DICOM Verification, Query/Retrieve and Storage Service Classes.

2.1.2 Functional Definitions of AEs

2.1.2.1 Functional Definition of Rialto Connect AE

The Rialto Connect Application Entity waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the Rialto Connect Application Entity expects it to be a DICOM application.

The Rialto Connect Application Entity will accept Associations with Presentation Contexts for SOP Classes of the Verification, Query/Retrieve and Storage Service Classes.

Rialto Connect will translate Query requests into queries of a Patient Demographics Supplier, a Patient Identifier Cross-Reference Manager, XDS Document Registry, an XDS Document Repository and a DICOM Storage SCP as required.

Rialto Connect will translate Retrieve requests into Retrieve requests of a DICOM Storage SCP.

Rialto Connect will forward Storage requests to a DICOM Storage SCP. Some attributes (e.g. Patient ID, Issuer of Patient ID, Accession Number) may be coerced during forwarding.

2.2 AE Specifications

2.2.1 Rialto Connect AE Specification

2.2.1.1 SOP Classes

The Rialto Connect Application Entity provides Standard Conformance to the following SOP Classes:

SOP Classes for Rialto Connect AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	Yes	Yes
Hardcopy Grayscale Image Storage SOP Class	1.2.840.10008.5.1.1.29	Yes	Yes
Hardcopy Color Image Storage SOP Class	1.2.840.10008.5.1.1.30	Yes	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	Yes
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	Yes
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	Yes
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	Yes
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	Yes
Ultrasound Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes	Yes
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	Yes	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes

Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Yes	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Yes	Yes
Multi-frame Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	Yes
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	Yes
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	Yes
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Yes	Yes
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Yes	Yes
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Yes	Yes
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes
X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
VL Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.1	Yes	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	Yes
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	Yes
VL Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.2	Yes	Yes
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	Yes	Yes
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Yes	Yes
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes

RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	Yes
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Yes	Yes
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	Yes	Yes
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Yes	Yes
Patient Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	Yes
Patient Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	Yes
Study Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes
Study Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes

2.2.1.2 Association Establishment Policy

2.2.1.2.1 General

The Rialto Connect AE can both accept and propose Association Requests. The Rialto Connect AE will accept and propose Association Requests for the Verification, Query/Retrieve and Storage Services.

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

DICOM application context name for Rialto Connect AE

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

2.2.1.2.2 Number of Associations

The Rialto Connect AE can support multiple simultaneous Associations requested by peer AEs. Default is 10. This value can be configured through the configuration GUI.

Number of Associations accepted by Rialto Connect AE

Maximum number of simultaneous Associations	10 (Configurable)
---	-------------------

2.2.1.2.3 Asynchronous Nature

The Rialto Connect AE does not support asynchronous communication. Multiple outstanding transactions are not supported. It allows up to one invoked and one performed operation on an Association (it is synchronous).

Asynchronous Nature as SCP for Rialto Connect AE

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

2.2.1.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

DICOM Implementation Class and Version for Rialto Connect AE

Implementation Class UID	1.2.40.0.13.1.1
Implementation Version Name	dcm4che-2.0

2.2.1.3 Association Initiation Policy

2.2.1.3.1 Activity - Verify External Peer AE

Description and Sequencing of Activities

The Rialto Connect AE will initiate a new Association when a user wishes to verify an external Peer. The Rialto Connect AE will send a C-ECHO Request to a configured destination.

Proposed Presentation Contexts

A list of Transfer Syntaxes can be configured for each AET. The default Transfer Syntaxes are the Transfer Syntax of the originally received instance plus the [Default TS List].

The following Transfer Syntaxes are represented by the term [Default TS List]:

[Default TS List] Transfer Syntax List for Rialto Connect AE

Name List	UID List
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1

The Rialto Connect AE will propose Presentation Contexts as shown in the following table:

Proposed Presentation Contexts by the Rialto Connect AE

Abstract Syntax		Transfer Syntax	Role	Ext. Neg.
Name	UID			
Verification SOP Class	1.2.840.10008.1.1	[Default TS List]	SCU	None

SOP Specific Conformance

Specific Conformance for Verification SOP Class

Standard conformance is provided to the DICOM Verification Service Class as an SCU. The Verification Service as an SCU is actually only supported as a diagnostic service tool for network communication issues.

Rialto Connect AE Communication Failure Behavior

Exception	Behavior
Timeout expiry for an expected DICOM Message Request (DIMSE level timeout).	The Association is aborted by issuing a DICOM A-ABORT. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Logs.
Timeout expiry for an expected DICOM PDU or TCP/ IP packet (Low-level timeout).	The Association is aborted by issuing a DICOM A-ABORT. The appropriate Status will be sent in the C-STORE Response.

	Error indication message is output to the Service Logs.
Association A-ABORTed by the SCU or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure).	The Association is aborted by issuing a DICOM A-ABORT. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Logs.

2.2.1.3.2 Activity - Send Images Requested by an External Peer AE

Description and Sequencing of Activities

The Rialto Connect AE will initiate a new Association when an external Peer has performed a valid C-STORE Request. The Rialto Connect AE will modify and forward the C-STORE Request to a configured destination.

Proposed Presentation Contexts

A list of Transfer Syntaxes can be configured for each AET. The default Transfer Syntaxes are the Transfer Syntax of the originally received instance plus the [Default TS List].

The following Transfer Syntaxes are represented by the term [Default TS List]:

[Default TS List] Transfer Syntax List for Rialto Connect AE

Name List	UID List
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1

The following Transfer Syntaxes are represented by the term [Extended TS List]:

[Extended TS List] Transfer Syntax List for Rialto Connect AE

Name List	UID List
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1
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 Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57
JPEG Lossless, Non- Hierarchical, First-Order Prediction (Process 14 [Selection Value 1])	1.2.840.10008.1.2.4.70
JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80
JPEG-LS Lossy (Near-Lossless) Image Compression	1.2.840.10008.1.2.4.81
JPEG 2000 Lossless Image Compression	1.2.840.10008.1.2.4.90
JPEG 2000 Lossy Image Compression	1.2.840.10008.1.2.4.91
RLE Lossless	1.2.840.10008.1.2.5

The Rialto Connect AE will propose Presentation Contexts as shown in the following table:

Proposed Presentation Contexts by the Rialto Connect AE

Abstract Syntax		Transfer Syntax	Role	Ext. Neg.
Name	UID			
Hardcopy Grayscale Image Storage SOP Class	1.2.840.10008.5.1.1.29	[Extended TS List]	SCU	None
Hardcopy Color Image Storage SOP Class	1.2.840.10008.5.1.1.30	[Extended TS List]	SCU	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	[Extended TS List]	SCU	None
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	[Extended TS List]	SCU	None
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	[Extended TS List]	SCU	None
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	[Extended TS List]	SCU	None
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	[Extended TS List]	SCU	None
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	[Extended TS List]	SCU	None
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	[Extended TS List]	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	[Extended TS List]	SCU	None
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	[Extended TS List]	SCU	None
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	[Extended TS List]	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	[Extended TS List]	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	[Extended TS List]	SCU	None
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	[Extended TS List]	SCU	None
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	[Extended TS List]	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	[Extended TS List]	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	[Extended TS List]	SCU	None
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	[Extended TS List]	SCU	None
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	[Extended TS List]	SCU	None
Multi-frame Grayscale Word Secondary	1.2.840.10008.5.1.4.1.1.7.3	[Extended TS List]	SCU	None

Capture Image Storage				
Multi-frame Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	[Extended TS List]	SCU	None
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	[Default TS List]	SCU	None
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	[Default TS List]	SCU	None
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	[Default TS List]	SCU	None
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	[Default TS List]	SCU	None
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	[Default TS List]	SCU	None
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	[Default TS List]	SCU	None
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	[Default TS List]	SCU	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	[Extended TS List]	SCU	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	[Extended TS List]	SCU	None
X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	[Extended TS List]	SCU	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	[Extended TS List]	SCU	None
VL Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.1	[Extended TS List]	SCU	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	[Extended TS List]	SCU	None
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	[Extended TS List]	SCU	None
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	[Extended TS List]	SCU	None
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	[Extended TS List]	SCU	None
VL Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.2	[Extended TS List]	SCU	None
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	[Default TS List]	SCU	None
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	[Default TS List]	SCU	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	[Default TS List]	SCU	None
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	[Default TS List]	SCU	None
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	[Default TS List]	SCU	None
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	[Default TS List]	SCU	None
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	[Default TS List]	SCU	None
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	[Extended TS List]	SCU	None

RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	[Extended TS List]	SCU	None
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	[Default TS List]	SCU	None
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	[Default TS List]	SCU	None
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	[Default TS List]	SCU	None
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	[Default TS List]	SCU	None
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	[Default TS List]	SCU	None
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	[Default TS List]	SCU	None

SOP Specific Conformance

Specific Conformance Storage SOP Classes

The Rialto Connect AE will exhibit the following behavior according to the Status Code value returned in a C-STORE Response from a destination C-STORE SCP:

Rialto Connect AE C-STORE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The remote Storage SCP has successfully stored the exported SOP Instance. The appropriate Status will be sent in the C-STORE Response. Success indication message is output to the Service Log.
Refused	Out of Resources	A700 – A7FF	This is treated as a permanent Failure. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.
Error	Cannot Understand	C000 – CFFF	This is treated as a permanent Failure. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.
Warning	Coercion of Data Elements	B000	Image transmission is considered successful. The appropriate Status will be sent in the C-STORE Response. Success indication message is output to the Service Log.
Warning	Data Set does not match SOP Class	B007	Image transmission is considered successful. The appropriate Status will be sent in the C-STORE Response. Warning indication message is output to the Service Logs.
Warning	Elements Discarded	B006	Image transmission is considered successful. The appropriate Status will be sent in the C-STORE Response.

			Success indication message is output to the Service Log.
Warning	Attribute List Error	0107	Image transmission is considered successful. The appropriate Status will be sent in the C-STORE Response. Success indication message is output to the Service Log.
Warning	Attribute Value Out of Range	0116	Image transmission is considered successful. The appropriate Status will be sent in the C-STORE Response. Success indication message is output to the Service Log.
*	*	Any other status code	This is treated as a permanent Failure. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.

Rialto Connect AE Communication Failure Behavior

Exception	Behavior
Timeout expiry for an expected DICOM Message Request (DIMSE level timeout).	The Association is aborted by issuing a DICOM A-ABORT. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Logs.
Timeout expiry for an expected DICOM PDU or TCP/ IP packet (Low-level timeout).	The Association is aborted by issuing a DICOM A-ABORT. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Logs.
Association A-ABORTed by the SCU or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure).	The Association is aborted by issuing a DICOM A-ABORT. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Logs.

2.2.1.3.3 Activity – Query/Retrieve Requested by an External Peer AE

Description and Sequencing of Activities

The Rialto Connect AE may initiate a new Association when an external Peer has performed a valid C-FIND Request. The Rialto Connect AE may modify and forward the C-FIND Request to a configured destination, and in that case, a new Association will be initiated. The Rialto Connect AE may translate the C-FIND Request into a set of queries to a Patient Demographics Supplier, a Patient Identifier Cross-Reference Manager, an XDS Document Registry and an XDS Document Repository, and in that case, a new Association will not be initiated.

The Rialto Connect AE will initiate a new Association when an external Peer has performed a valid C-MOVE Request. The Rialto Connect AE may modify and forward the C-MOVE Request to a configured destination.

Proposed Presentation Contexts

A list of Transfer Syntaxes can be configured for each AET. The default Transfer Syntaxes are the Transfer Syntax of the originally received instance plus the [Default TS List].

The following Transfer Syntaxes are represented by the term [Default TS List]:

[Default TS List] Transfer Syntax List for Rialto Connect AE

Name List	UID List
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Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1

The Rialto Connect AE will propose Presentation Contexts as shown in the following table:

Proposed Presentation Contexts by the Rialto Connect AE

Abstract Syntax		Transfer Syntax	Role	Ext. Neg.
Name	UID			
Patient Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	[Default TS List]	SCU	Relational
Patient Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	[Default TS List]	SCU	Relational
Study Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	[Default TS List]	SCU	Relational
Study Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	[Default TS List]	SCU	Relational

SOP Specific Conformance

Specific Conformance for Query SOP Classes

The Rialto Connect AE supports hierarchical and relational queries as an SCU.

Patient Root C-FIND SCU Supported Elements

SOP Common - Attribute Name	Tag	VR	Types of Matching
Specific Character Set	0008,0005	CS	NONE
Patient Level - Attribute Name	Tag	VR	Types of Matching
Patient's Name	0010,0010	PN	S,*,U
Patient ID	0010,0020	LO	S,*,U
Patient's Birth Date	0010,0030	DA	S,U,R
Patient's Sex	0010,0040	CS	S,U
Study Level - Attribute Name	Tag	VR	Types of Matching
Study Instance UID	0020,000D	UI	S,L
Study ID	0020,0010	SH	S,*,U
Study Date	0008,0020	DA	S,*,U,R
Study Time	0008,0030	TM	S,*,U,R
Accession Number	0008,0050	SH	S,*,U
Modalities In Study	0008,0061	CS	S,*,U
Study Description	0008,1030	LO	S,*,U

Series Level - Attribute Name	Tag	VR	Types of Matching
Series Instance UID	0020,000E	UI	S,L
Series Number	0020,0011	IS	S,*,U
Modality	0008,0060	CS	S,*,U
Image Level - Attribute Name	Tag	VR	Types of Matching
SOP Instance UID	0008,0018	UI	S,L
SOP Class UID	0008,0016	UI	S
Instance Number	0020,0013	IS	S,U

Study Root C-FIND SCU Supported Elements

SOP Common - Attribute Name	Tag	VR	Types of Matching
Specific Character Set	0008,0005	CS	NONE
Study Level - Attribute Name	Tag	VR	Types of Matching
Patient's Name	0010,0010	PN	S,*,U
Patient ID	0010,0020	LO	S,*,U
Patient's Birth Date	0010,0030	DA	S,U,R
Patient's Sex	0010,0040	CS	S,U
Study Instance UID	0020,000D	UI	S,L
Study ID	0020,0010	SH	S,*,U
Study Date	0008,0020	DA	S,*,U,R
Study Time	0008,0030	TM	S,*,U,R
Accession Number	0008,0050	SH	S,*,U
Modalities In Study	0008,0061	CS	S,*,U
Study Description	0008,1030	LO	S,*,U
Series Level - Attribute Name	Tag	VR	Types of Matching
Series Instance UID	0020,000E	UI	S,L
Series Number	0020,0011	IS	S,*,U
Modality	0008,0060	CS	S,*,U
Image Level - Attribute Name	Tag	VR	Types of Matching
SOP Instance UID	0008,0018	UI	S,L

SOP Class UID	0008,0016	UI	S
Image Type	0008,0008	CS	S,*,U
Instance Number	0020,0013	IS	S,U

Types of Matching:

The C-FIND SCU supports the following types of Matching: An "S" indicates the identifier attribute uses Single Value Matching, an "R" indicates Range Matching, an "*" indicates wildcard matching, a 'U' indicates Universal Matching, and an 'L' indicates that UID lists are supported for matching. "NONE" indicates that no matching is supported, but that values for this Element are requested to be returned (i.e. universal matching).

Rialto Connect C-FIND Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	Matching is complete. No final identifier is supplied.
Error	Processing Failure	0110	This status is returned due to internal errors such as a processing failure from the forwarded C-FIND SCP. The appropriate Status will be sent in the C-FIND Response. Error indication message is output to the Service Log.
Cancel	Matching terminated due to Cancel Request	FE00	The C-FIND SCU sent a Cancel Request. This has been acknowledged and the search for matches has been halted. Cancel indication message is output to the Service Log.
Pending	Matches are continuing and current match is supplied	FF00	Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming. Pending indication message is output to the Service Log.

Specific Conformance for Retrieve SOP Classes

Rialto Connect C-MOVE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	Matching is complete. No final identifier is supplied.
Error	Processing Failure	0110	This status is returned from the forwarded C-MOVE SCP.
Error	Unable to perform sub-operations	A702	This status is returned from the forwarded C-MOVE SCP.
Error	Move Destination unknown	A801	The Destination Application Entity named in the C-MOVE Request is unknown to the forwarded C-MOVE SCP. Error indication message is output to the Service Log.
Error	Identifier does not match SOP Class	A900	This status is returned from the forwarded C-MOVE SCP.
Error	Unable to process	Cxxx	The Move Destination AET is missing in the C-MOVE

			Request. Error indication message is output to the Service Log.
Pending	Sub-operations are continuing	FF00	A Response with this Status Code is sent every time a Composite SOP Instance has been successfully sent to the C-MOVE Destination AE.

Rialto Connect Service Communication Failure Behavior

Exception	Behavior
Timeout expiry for an expected DICOM Message Request (DIMSE level timeout). I.e. the XDS Discover/Retrieve Server SCP AE is waiting for the next C-FIND or C-MOVE Request on an open Association but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Service Log.
Timeout expiry for an expected DICOM PDU or TCP/ IP packet (Low-level timeout). I.e. The XDS Discover/Retrieve Server AE is waiting for the next message PDU but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Service Log.
Association aborted by the SCU or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	Error message is output to the Service Log.

2.2.1.4 Association Acceptance Policy

2.2.1.4.1 Activity - Handling Verification Requests

Description and Sequencing of Activities

The Rialto Connect AE accepts Associations only if they have valid Presentation Contexts. If none of the requested Presentation Contexts are accepted, the Association Request itself is rejected. It can be configured to only accept Associations from certain Application Entities.

If the Rialto Connect AE receives a DICOM C-ECHO request, the response will be sent over the same Association used to send the DICOM C-ECHO request.

The Rialto Connect AE may reject Association attempts as shown in the table below. The Result, Source and Reason / Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU (see PS 3.8).

Association Rejection Reasons

Result	Source	Reason / Diag	Description
2 - rejected transient	provider	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.
1 - rejected permanent	user	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	user	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.

Accepted Presentation Contexts

Rialto Connect AE will accept Presentation Contexts as shown in the following table:

A list of Transfer Syntaxes can be configured for each AET. The default Transfer Syntaxes are the Transfer Syntax of the originally received instance plus the [Default TS List].

The following Transfer Syntaxes are represented by the term [Default TS List]:

[Default TS List] Transfer Syntax List for Rialto Connect AE

Name List	UID List
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1

Accepted Presentation Contexts for Rialto Connect AE

Abstract Syntax		Transfer Syntax	Role	Ext. Neg.
Name	UID			
Verification SOP Class	1.2.840.10008.1.1	[Default TS List]	SCP	None

Specific Conformance for Verification SOP Class

Rialto Connect provides standard conformance to the DICOM Verification Service Class as an SCP. The status code for the C-ECHO is described in the following table:

Rialto Connect C-Echo Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	The C-ECHO request is accepted

2.2.1.4.2 Activity - Handling Query and Retrieval Requests

Description and Sequencing of Activities

The Rialto Connect AE accepts Associations only if they have valid Presentation Contexts. If none of the requested Presentation Contexts are accepted, the Association Request itself is rejected. It can be configured to only accept Associations from certain Application Entities.

If the Rialto Connect AE receives a DICOM C-FIND request, the response(s) will be sent over the same Association used to send the DICOM C-FIND request. In a DIR based imaging environment, the Rialto Connect AE may forward a DICOM C-FIND request to an External Peer AE over a newly created Association and report in the DICOM C-FIND response(s) any success or failure statuses of the forwarded request. In an XDS based imaging exchange environment, the Rialto Connect AE may translate the DICOM C-FIND request into a series of queries to a Patient Demographics Supplier, a Patient Identifier Cross-reference Manager, an XDS Document Registry and an XDS Document Repository.

If the Rialto Connect AE receives a DICOM C-MOVE request, the response(s) will be sent over the same Association used to send the DICOM C-MOVE request. The Rialto Connect AE may forward a DICOM C-MOVE request to an External Peer AE over a newly created Association and report in the DICOM C-FIND response(s) any success or failure status of the forwarded request.

The Rialto Connect AE may reject Association attempts as shown in the table below. The Result, Source and Reason / Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU (see PS 3.8).

Association Rejection Reasons

Result	Source	Reason / Diag	Description
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2 - rejected transient	provider	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.
1 - rejected permanent	user	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	user	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.

Accepted Presentation Contexts

A list of Transfer Syntaxes can be configured for each AET. The default Transfer Syntaxes are the Transfer Syntax of the originally received instance plus the [Default TS List].

The following Transfer Syntaxes are represented by the term [Default TS List]:

[Default TS List] Transfer Syntax List for Rialto Connect AE

Name List	UID List
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1

Rialto Connect AE will accept Presentation Contexts as shown in the following table:

Accepted Presentation Contexts for Rialto Connect AE

Abstract Syntax		Transfer Syntax	Role	Ext. Neg.
Name	UID			
Patient Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	[Default TS List]	SCP	Relational
Patient Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	[Default TS List]	SCP	Relational
Study Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	[Default TS List]	SCP	Relational
Study Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	[Default TS List]	SCP	Relational

SOP Specific Conformance

Specific Conformance for Query SOP Classes

The Rialto Connect AE supports hierarchical queries and relational queries. There are no attributes, which are always returned by default. Only those attributes requested in the query identifier are returned.

Patient Root Information Model

All required search keys on the Patient and Study levels are supported.

Study Root Information Model

All the required search keys on the Study level are supported.

Patient Root C-FIND SCP Supported Elements

SOP Common - Attribute Name	Tag	VR	Types of Matching
Specific Character Set	0008,0005	CS	NONE
Patient Level - Attribute Name	Tag	VR	Types of Matching
Patient's Name	0010,0010	PN	S,*,U
Patient ID	0010,0020	LO	S,*,U
Patient's Birth Date	0010,0030	DA	S,U,R
Patient's Sex	0010,0040	CS	S,U
Study Level - Attribute Name	Tag	VR	Types of Matching
Study Instance UID	0020,000D	UI	S,L
Study ID	0020,0010	SH	S,*,U
Study Date	0008,0020	DA	S,*,U,R
Study Time	0008,0030	TM	S,*,U,R
Accession Number	0008,0050	SH	S,*,U
Modalities In Study	0008,0061	CS	S,*,U
Study Description	0008,1030	LO	S,*,U
Referring Physician's Name	0008,0090	PN	S,*,U

Study Root C-FIND SCP Supported Elements

SOP Common - Attribute Name	Tag	VR	Types of Matching
Specific Character Set	0008,0005	CS	NONE
Study Level - Attribute Name	Tag	VR	Types of Matching
Patient's Name	0010,0010	PN	S,*,U
Patient ID	0010,0020	LO	S,*,U
Patient's Birth Date	0010,0030	DA	S,U,R
Patient's Sex	0010,0040	CS	S,U
Study Instance UID	0020,000D	UI	S,L
Study ID	0020,0010	SH	S,*,U
Study Date	0008,0020	DA	S,*,U,R
Study Time	0008,0030	TM	S,*,U,R

Accession Number	0008,0050	SH	S,*U
Modalities In Study	0008,0061	CS	S,*U
Study Description	0008,1030	LO	S,*U
Referring Physician's Name	0008,0090	PN	S,*U

Types of Matching:

The types of Matching supported by the C-FIND SCP. An "S" indicates the identifier attribute uses Single Value Matching, an "R" indicates Range Matching, an "*" indicates wildcard matching, a 'U' indicates Universal Matching, and an 'L' indicates that UID lists are supported for matching. "NONE" indicates that no matching is supported, but that values for this Element are requested to be returned (i.e. universal matching).

Rialto Connect C-FIND Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	Matching is complete. No final identifier is supplied.
Error	Processing Failure	0110	This status is returned due to internal errors such as a processing failure response returned from the external peer AE that the request was forwarded to. The appropriate Status will be sent in the C-FIND Response. Error indication message is output to the Service Log.
Cancel	Matching terminated due to Cancel Request	FE00	The C-FIND SCU sent a Cancel Request. This has been acknowledged and the search for matches has been halted. Cancel indication message is output to the Service Log.
Pending	Matches are continuing and current match is supplied	FF00	Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming. Pending indication message is output to the Service Log.

Specific Conformance for Retrieve SOP Classes

The Rialto Connect AE supports hierarchical and relational retrieves.

Rialto Connect C-MOVE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	Matching is complete. No final identifier is supplied.
Error	Processing Failure	0110	This status is returned due to internal errors such as a processing failure response returned from the external peer AE that the request was forwarded to. The appropriate Status will be sent in the C-MOVE Response. Error indication message is output to the Service Log.
Error	Unable to perform	A702	C-STORE sub-operations cannot be performed due to failure

	sub-operations		of an Association Request or a C-MOVE Request. Error indication message is output to the Service Log.
Error	Move Destination unknown	A801	The Destination Application Entity named in the C-MOVE Request is unknown to external peer AE that the request was forwarded to. Error indication message is output to the Service Log.
Error	Identifier does not match SOP Class	A900	The C-MOVE identifier contains invalid Elements or values, or is missing mandatory Elements or values for the specified SOP Class or retrieval level. Error indication message is output to the Service Log.
Error	Unable to process	Cxxx	The Move Destination AET is missing in the C-MOVE Request. Error indication message is output to the Service Log.
Pending	Sub-operations are continuing	FF00	A Response with this Status Code is sent every time a Composite SOP Instance has been successfully sent to the C-MOVE Destination AE.

Rialto Connect Service Communication Failure Behavior

Exception	Behavior
Timeout expiry for an expected DICOM Message Request (DIMSE level timeout). I.e. the Query/Retrieve Server SCP AE is waiting for the next C-FIND or C-MOVE Request on an open Association but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Service Log.
Timeout expiry for an expected DICOM PDU or TCP/ IP packet (Low-level timeout). I.e. The Query/Retrieve Server AE is waiting for the next message PDU but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Service Log.
Association aborted by the SCU or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	Error message is output to the Service Log.

2.2.1.4.3 Activity - Receive Images

Description and Sequencing of Activities

The Rialto Connect AE accepts Associations only if they have valid Presentation Contexts. If none of the requested Presentation Contexts are accepted, the Association Request itself is rejected. It can be configured to only accept Associations from certain Application Entities.

If the Rialto Connect AE receives a DICOM C-STORE request, the response will be sent over the same Association used to send the DICOM C-STORE request. The Rialto Connect AE may forward a DICOM C-STORE request to an External Peer AE over a newly created Association and report in the DICOM C-STORE response the success or failure status of the forwarded request.

The Rialto Connect AE may reject Association attempts as shown in the table below. The Result, Source and Reason / Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU (see PS 3.8).

Association Rejection Reasons

Result	Source	Reason / Diag	Description
--------	--------	---------------	-------------

2 - rejected transient	provider	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.
1 - rejected permanent	user	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	user	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.

Accepted Presentation Contexts

The following Transfer Syntaxes are represented by the term [Default TS List]:

[Default TS List] Transfer Syntax List for Rialto Connect AE

Name List	UID List
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1

The following Transfer Syntaxes are represented by the term [Extended TS List]:

[Extended TS List] Transfer Syntax List for Rialto Connect AE

Name List	UID List
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1
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 Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57
JPEG Lossless, Non- Hierarchical, First-Order Prediction (Process 14 [Selection Value 1])	1.2.840.10008.1.2.4.70
JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80
JPEG-LS Lossy (Near-Lossless) Image Compression	1.2.840.10008.1.2.4.81
JPEG 2000 Lossless Image Compression	1.2.840.10008.1.2.4.90
JPEG 2000 Lossy Image Compression	1.2.840.10008.1.2.4.91
RLE Lossless	1.2.840.10008.1.2.5

Rialto Connect AE will accept Presentation Contexts as shown in the following table:

Accepted Presentation Contexts for Rialto Connect AE

Abstract Syntax		Transfer Syntax	Role	Ext. Neg.
Name	UID			
Hardcopy Grayscale Image Storage SOP Class	1.2.840.10008.5.1.1.29	[Extended TS List]	SCP	None
Hardcopy Color Image Storage SOP Class	1.2.840.10008.5.1.1.30	[Extended TS List]	SCP	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	[Extended TS List]	SCP	None
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	[Extended TS List]	SCP	None
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	[Extended TS List]	SCP	None
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	[Extended TS List]	SCP	None
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	[Extended TS List]	SCP	None
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	[Extended TS List]	SCP	None
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	[Extended TS List]	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	[Extended TS List]	SCP	None
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	[Extended TS List]	SCP	None
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	[Extended TS List]	SCP	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	[Extended TS List]	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	[Extended TS List]	SCP	None
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	[Extended TS List]	SCP	None
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	[Extended TS List]	SCP	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	[Extended TS List]	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	[Extended TS List]	SCP	None
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	[Extended TS List]	SCP	None
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	[Extended TS List]	SCP	None
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	[Extended TS List]	SCP	None

Multi-frame Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	[Extended TS List]	SCP	None
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	[Default TS List]	SCP	None
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	[Default TS List]	SCP	None
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	[Default TS List]	SCP	None
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	[Default TS List]	SCP	None
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	[Default TS List]	SCP	None
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	[Default TS List]	SCP	None
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	[Default TS List]	SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	[Extended TS List]	SCP	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	[Extended TS List]	SCP	None
X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	[Extended TS List]	SCP	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	[Extended TS List]	SCP	None
VL Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.1	[Extended TS List]	SCP	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	[Extended TS List]	SCP	None
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	[Extended TS List]	SCP	None
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	[Extended TS List]	SCP	None
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	[Extended TS List]	SCP	None
VL Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.2	[Extended TS List]	SCP	None
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	[Default TS List]	SCP	None
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	[Default TS List]	SCP	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	[Default TS List]	SCP	None
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	[Default TS List]	SCP	None
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	[Default TS List]	SCP	None
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	[Default TS List]	SCP	None
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	[Default TS List]	SCP	None
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	[Extended TS List]	SCP	None

RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	[Extended TS List]	SCP	None
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	[Default TS List]	SCP	None
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	[Default TS List]	SCP	None
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	[Default TS List]	SCP	None
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	[Default TS List]	SCP	None
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	[Default TS List]	SCP	None
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	[Default TS List]	SCP	None

SOP Specific Conformance

Specific Conformance for the Storage SOP Classes

The associated activity with the Storage service is the storage of DICOM data received over the network on a designated storage repository. The Rialto Connect AE will return a failure status if it is unable to forward the received instance(s).

The Rialto Connect AE does not have any dependencies on the number of Associations used to send images to it. Images belonging to more than one Study or Series can be sent over a single or multiple Associations. Images belonging to a single Study or Series can also be sent over different Associations. There is no limit on either the number of SOP Instances or the maximum amount of total SOP Instance data that can be transferred over a single Association.

Rialto Connect AE C-STORE Response

Rialto Connect C-STORE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	The Composite SOP Instance was successfully received, verified, and forwarded to an external AE.
Error	Processing Failure	0110	This status is returned due to internal errors such as a processing failure response from the external AE that the request was forwarded to. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.
Error	Duplicate SOP Instance UID	D000	This status is returned if the instance already exists in the external AE and the external AE is configured to refuse duplicate instances. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.
Warning	Data Set does not match SOP class	B007	This status is returned if the C-STORE Request specifies Attributes that are not specific as part of the Storage SOP class. Image transmission is considered successful. The appropriate SUCCESS Status will be sent in the C-STORE Response.

Warning indication message is output to the Service Log.

Rialto Connect Service Communication Failure Behavior

Exception	Behavior
Timeout expiry for an expected DICOM Message Request (DIMSE level timeout). I.e. The Storage Server SCP AE is waiting for the next C-STORE Request on an open Association but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Service Log. If some Composite SOP Instances have already been successfully received, they are maintained in the database. They are not automatically discarded because of a later failure. Error message is output to the Service Log.
Timeout expiry for an expected DICOM PDU or TCP/ IP packet (Low-level timeout). I.e. The Storage Server SCP AE is waiting for the next C-STORE Data Set PDU but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Service Log. If a C-STORE Data Set has not been fully received, the data already received is discarded. If some Composite SOP Instances have already been successfully received over the Association, they are maintained in the database. Error message is output to the Service Log.
Association aborted by the SCU or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	Error message is output to the Service Log. If some Composite SOP Instances have already been successfully received, they are maintained in the database. They are not automatically discarded because of a later failure.

2.3 Network Interfaces

2.3.1 Supported Communication Stacks

DICOM Upper Layer over TCP/IP is supported.

2.3.1.1 TCP/IP Stack

Rialto inherits its TCP/IP stack from the installed Java Runtime Environment.

2.3.2 Physical Network Interface

Rialto is indifferent to the physical medium over which TCP/IP executes; it inherits this from the Java Runtime Environment.

2.4 Configuration

2.4.1 AE Title/Presentation Address Mapping

2.4.1.1 Local AE Titles

The local AE Titles and TCP ports are configurable through the Rialto Connect configuration interface.

AE Title Configuration Table

Application Entity	Default AE Title	Default TCP/IP Port
Rialto Connect	RIALTO_CONNECT	4104

2.4.1.2 Remote AE Titles

Remote AE Titles, TCP/IP Addresses and ports can be configured through the Rialto Connect configuration interface. In the default configuration, Association Requests with any Calling AET will be accepted.

2.4.2 Configuration Parameters

The following table shows the Rialto configuration parameters relevant to DICOM communication. Refer to the Rialto Connect Service Manual for details on general configuration capabilities.

Configuration Parameter Table

Parameter	Configurable (Yes/No)	Default Value
General		
Maximum number of simultaneous Associations	Yes	10
Time-out waiting for A-ASSOCIATE RQ on open TCP/IP connection (ARTIM timeout)	Yes	5s
Time-out waiting on an open association for the next message (DIMSE timeout)	Yes	1h
Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout)	No	no timeout
Time-out waiting on an open association for the next message after sending A-RELEASE RSP or A-ABORT RQ (Closing timeout)	Yes	500ms
Maximum PDU size the AE can receive	Yes	16352
Maximum PDU size the AE can send	No	65535
Pack Command and Data PDVs in one PDU	Yes	false
Support for the Basic TLS Secure Transport Connection Profile	Yes	off
Accepted TLS Ciphers	Yes	-

3 Media Interchange

Rialto Connect does not support Media Storage.

4 Support of Extended Character Sets

Rialto Connect supports ISO_IR 100 (ISO 8859-1 Latin 1) as an extended character set.

5 Security

5.1 Security Profiles

Rialto Connect supports secure DICOM communication in conformance with the Basic TLS Secure Transport Connection Profile. At default configuration, the TLS option is deactivated.

5.2 Association Level Security

Rialto Connect can be configured to accept Association Requests from only a limited list of Calling AE Titles and IP addresses.

5.3 Application Level Security

Rialto Connect web based administration module can be configured to require user authentication in order to access the user interface functionalities.

6 Annexes

6.1 IOD Contents

6.1.1 Created SOP Instances

Rialto Connect does not create SOP Instances.

6.1.2 Usage of Attributes from received IOD's

Rialto Connect does not have any application specific dependencies on certain fields.

6.1.3 Coerced/Modified fields

Rialto Connect may coerce any DICOM fields, including but not limited to the Patient ID (0010,0010) and the Issuer of Patient ID (0010,0021) fields.