CODONICS

Infinity™ Medical Image Server

DICOM Server Conformance Statement

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1 Introduction

1.1 Scope and audience

This document is a DICOM Conformance Statement for Infinity. Infinity is a DICOM server that can store DICOM images from modalities and DICOM clients can access it to retrieve these images.
This document has been written using the guidelines provided in the DICOM standard [2 – part 2].

1.2 References

[1]   Infinity Installation and Configuration Guide
[2]   ACR/NEMA Standards Publications, No PS3, DICOM Standards:
      Part 1 – Introduction
      Part 2 – Conformance
      Part 3 – Information Object Definitions
      Part 4 – Service Class Specifications
      Part 5 – Data Structures and Encoding
      Part 6 – Data Dictionary
      Part 7 – Message Exchange
      Part 8 – Network Communication Support
      Part 9 – Point-to-Point Communication Support for Message Exchange
      Part 10 – Media Storage and File Format for Media Interchange
      Part 11 – Media Storage Application Profiles
      Part 12 – Storage Functions and Media Formats for Data Interchange
      Part 13 – Print Management Point-to-Point Communication Support

1.3 Acronyms and abbreviations

The following symbols and abbreviations are used in this conformance statement:

ACR:	American College of Radiology
AE:	DICOM Application Entity
DICOM:	Digital Imaging and Communication in Medicine
DIMSE:	DICOM Message Service Element
GSPS:	Grayscale Softcopy Presentation State
HIS:	Hospital Information System
IOD:	DICOM Information Object Definition
ISO:	International Standard Organization
KO:	Key Object Selection Document
MPPS:	Modality Performed Procedure Step
MWL:	Modality Work List
NEMA:	National Electrical Manufacturers Association
RIS:	Radiology Information System
PDU:	DICOM Protocol Data Unit
SCP:	DICOM Service Class Provider
SCU:	DICOM Service Class User
SOP:	DICOM Service-Object Pair
TCP/IP:	Transmission Control Protocol / Internet Protocol
UID	Unique Identifier
VR :	Value Representation

2 Implementation model

The primary functions provided by Infinity are:

1. Respond to verification requests from a DICOM Verification SCU.
2. Accept objects from a DICOM storage service class user. Place the objects in an images folder. Maintain an object database containing attributes of the objects.
3. Respond to requests from DICOM Query/Retrieve service class users for retrieval of objects.
4. Act as a DICOM Storage Service class user in response to prefetching or routing requests for sending objects to a remote DICOM AE.

2.1 Application data flow diagram

2.1.1 Respond to verification requests
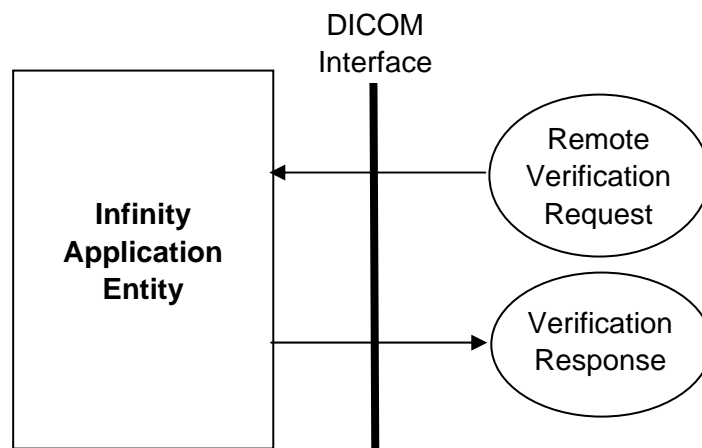
2.1.2 Accept objects received from a DICOM SCU
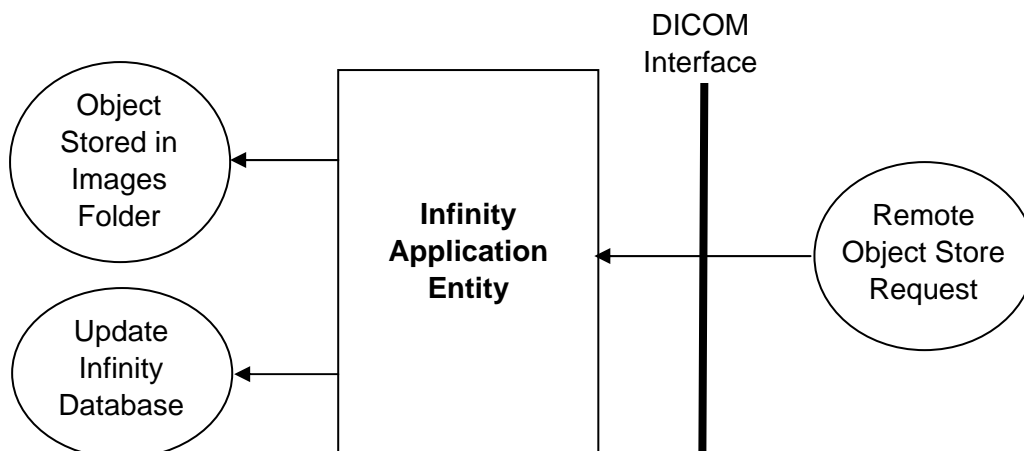
2.1.3 Accept Storage Commitment Requests
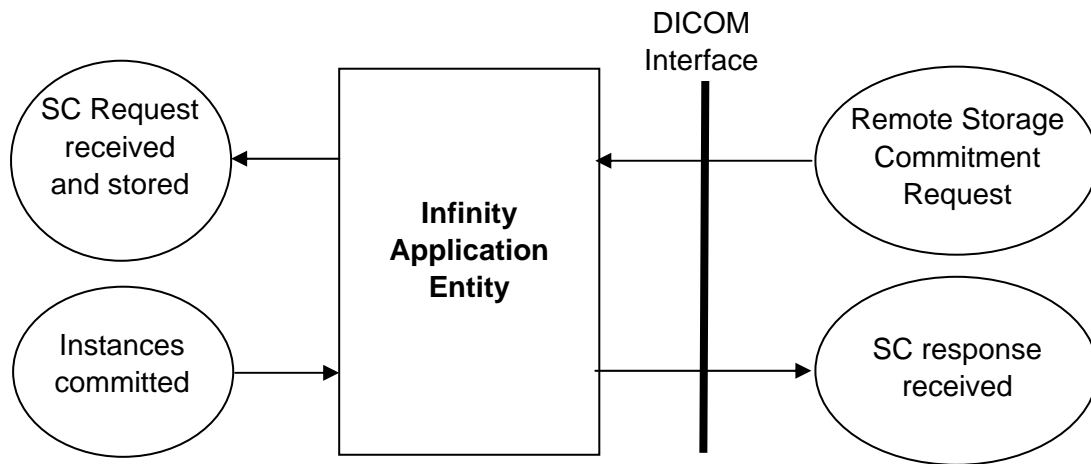
The response can be sent in the same or in a different association.

2.1.4 Respond to C-FIND queries
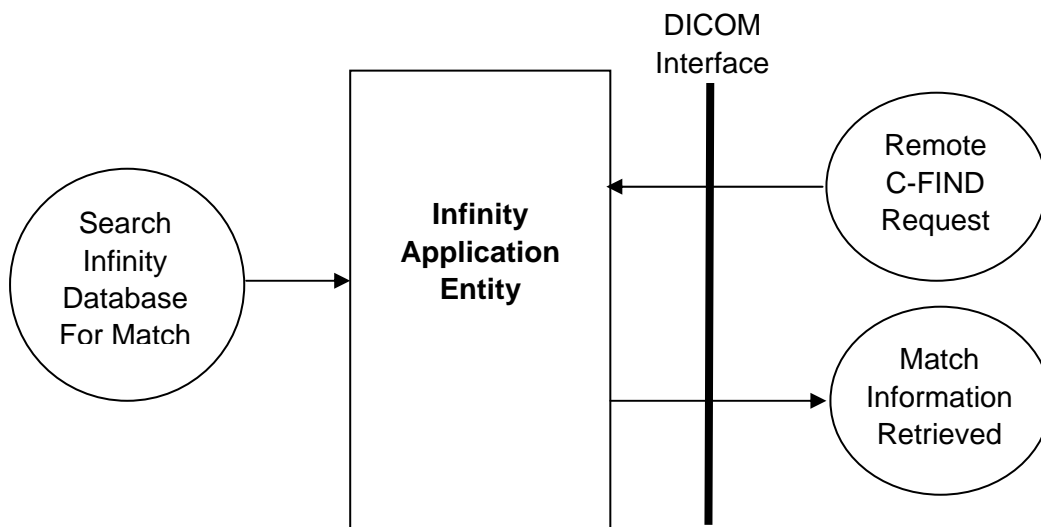
2.1.5 Respond to C-MOVE queries
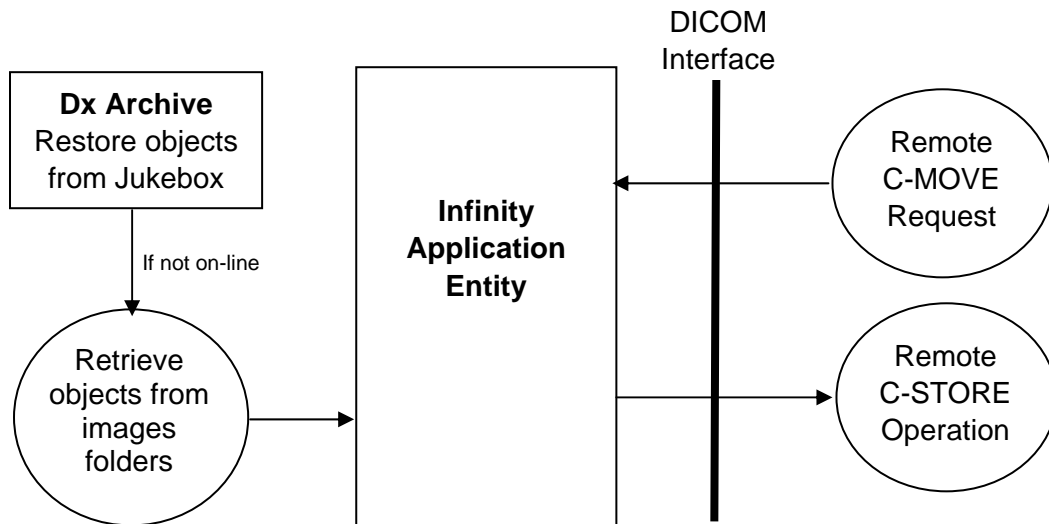
2.2 Functional definition of Application Entities

Infinity application entity acts as a Service Class Provider (SCP) for the following service classes:
- Verification Service Class
- Storage Service Class
- Query/Retrieve Service Class
- Storage Commitment Service Class

Infinity application entity acts as a Service Class User (SCU) for the following service classes:
- Verification Service Class
- Storage Service Class
- Storage Commitment Service Class

2.3 Sequencing of Real World Activities

Not applicable.

3 Application Entity specifications

3.1 Infinity AE Specifications

Verification SOP Class

The **Infinity** AE provides standard conformance to the following DICOM V3.0 Service Object Pair (SOP) Class as a Verification Service Class User (SCU) and Provider (SCP). As an SCU it sends an Echo request when routing an image to a remote AE. As an SCP it sends an Echo response when it receives an Echo request from a remote AE.

Table 1: Valid SCU/SCP Verification SOP Class for Infinity AE

SOP Class UID	SOP Class Name
1.2.840.10008.1.1	Verification SOP Class

Storage SOP Classes

The **Infinity** AE provides standard conformance to the following DICOM V3.0 SOP Classes as an SCP when servicing requests to store objects. It also supports these SOP Classes as an SCU when servicing move requests and routing requests.

Table 2: Valid SCU/SCP Storage SOP Classes for Infinity AE

SOP Class UID	SOP Class Name	Transfer Syntax Group
1.2.840.10008.5.1.4.1.1.1	Computed Radiography Image Storage	A
1.2.840.10008.5.1.4.1.1.1.1	Digital X-Ray Image Storage – For Presentation	A
1.2.840.10008.5.1.4.1.1.1.1.1	Digital X-Ray Image Storage – For Processing	A
1.2.840.10008.5.1.4.1.1.1.2	Digital Mammography X-Ray Image Storage – For Presentation	A
1.2.840.10008.5.1.4.1.1.1.2.1	Digital Mammography X-Ray Image Storage – For Processing	A
1.2.840.10008.5.1.4.1.1.1.3	Digital Intra-oral X-Ray Image Storage - For Presentation	A
1.2.840.10008.5.1.4.1.1.1.3.1	Digital Intra-oral X-Ray Image Storage - For Processing	A
1.2.840.10008.5.1.4.1.1.2	CT Image Storage	A
1.2.840.10008.5.1.4.1.1.2.1	Enhanced CT Image Storage	A
1.2.840.10008.5.1.4.1.1.3	Ultrasound Multi-frame Image Storage (retired)	A
1.2.840.10008.5.1.4.1.1.3.1	Ultrasound Multi-frame Image Storage	A
1.2.840.10008.5.1.4.1.1.4	MR Image Storage	A
1.2.840.10008.5.1.4.1.1.4.1	Enhanced MR Image Storage	A
1.2.840.10008.5.1.4.1.1.4.2	MR Spectroscopy Storage	B
1.2.840.10008.5.1.4.1.1.5	Nuclear Medicine Image Storage (retired)	A
1.2.840.10008.5.1.4.1.1.6	Ultrasound Image Storage (retired)	A
1.2.840.10008.5.1.4.1.1.6.1	Ultrasound Image Storage	A
1.2.840.10008.5.1.4.1.1.7	Secondary Capture Image Storage	A
1.2.840.10008.5.1.4.1.1.7.1	Multi-frame Single Bit Secondary Capture Image Storage	A
1.2.840.10008.5.1.4.1.1.7.2	Multi-frame Grayscale Byte Secondary Capture Image Storage	A
1.2.840.10008.5.1.4.1.1.7.3	Multi-frame Grayscale Word Secondary Capture Image Storage	A
1.2.840.10008.5.1.4.1.1.7.4	Multi-frame True Color Secondary Capture Image Storage	A
1.2.840.10008.5.1.4.1.1.9	Standalone Overlay Storage	B

1.2.840.10008.5.1.4.1.1.9.1.1	12-lead ECG Waveform Storage	B
1.2.840.10008.5.1.4.1.1.9.1.2	General ECG Waveform Storage	B
1.2.840.10008.5.1.4.1.1.9.1.3	Ambulatory ECG Waveform Storage	B
1.2.840.10008.5.1.4.1.1.9.2.1	Hemodynamic Waveform Storage	B
1.2.840.10008.5.1.4.1.1.9.3.1	Cardiac Electrophysiology Waveform Storage	B
1.2.840.10008.5.1.4.1.1.9.4.1	Basic Voice Audio Waveform Storage	B
1.2.840.10008.5.1.4.1.1.11.1	Grayscale Softcopy Presentation State Storage	B
1.2.840.10008.5.1.4.1.1.11.2	Color Softcopy Presentation State Storage	B
1.2.840.10008.5.1.4.1.1.11.3	Pseudo-Color Softcopy Presentation State Storage	B
1.2.840.10008.5.1.4.1.1.11.4	Blending Softcopy Presentation State Storage	B
1.2.840.10008.5.1.4.1.1.12.1	X-Ray Angiographic Image Storage	A
1.2.840.10008.5.1.4.1.1.12.1.1	Enhanced XA Image Storage	A
1.2.840.10008.5.1.4.1.1.12.2	X-Ray Radiflouroscopic Image Storage	A
1.2.840.10008.5.1.4.1.1.12.2.1	Enhanced XRF Image Storage	A
1.2.840.10008.5.1.4.1.1.12.3	X-Ray Angiographic Bi-plane Image Storage (retired)	A
1.2.840.10008.5.1.4.1.1.13.1.1	X-Ray 3D Angiographic Image Storage	A
1.2.840.10008.5.1.4.1.1.13.1.2	X-Ray 3D Craniofacial Image Storage	A
1.2.840.10008.5.1.4.1.1.20	Nuclear Medicine Image Storage	A
1.2.840.10008.5.1.4.1.1.66	Raw Data Storage	B
1.2.840.10008.5.1.4.1.1.66.1	Spatial Registration Storage	B
1.2.840.10008.5.1.4.1.1.66.2	Spatial Fiducials Storage	B
1.2.840.10008.5.1.4.1.1.66.3	Deformable Spatial Registration Storage	B
1.2.840.10008.5.1.4.1.1.66.4	Segmentation Storage	B
1.2.840.10008.5.1.4.1.1.67	Real World Value Mapping Storage	B
1.2.840.10008.5.1.4.1.1.77.1.1	VL Endoscopic Image Storage	A
1.2.840.10008.5.1.4.1.1.77.1.1.1	Video Endoscopic Image Storage	A
1.2.840.10008.5.1.4.1.1.77.1.2	VL Microscopic Image Storage	A
1.2.840.10008.5.1.4.1.1.77.1.2.1	Video Microscopic Image Storage	A
1.2.840.10008.5.1.4.1.1.77.1.3	VL Slide-Coordinates Microscopic Image Storage	A
1.2.840.10008.5.1.4.1.1.77.1.4	VL Photographic Image Storage	A
1.2.840.10008.5.1.4.1.1.77.1.4.1	Video Photographic Image Storage	A
1.2.840.10008.5.1.4.1.1.77.1.5.1	Ophthalmic Photography 8 Bit Image Storage	A
1.2.840.10008.5.1.4.1.1.77.1.5.2	Ophthalmic Photography 16 Bit Image Storage	A
1.2.840.10008.5.1.4.1.1.77.1.5.3	Stereometric Relationship Storage	A
1.2.840.10008.5.1.4.1.1.77.1.5.4	Ophthalmic Tomography Image Storage	A
1.2.840.10008.5.1.4.1.1.88.11	Basic Text SR	B
1.2.840.10008.5.1.4.1.1.88.22	Enhanced SR	B
1.2.840.10008.5.1.4.1.1.88.33	Comprehensive SR	B
1.2.840.10008.5.1.4.1.1.88.40	Procedure Log	B
1.2.840.10008.5.1.4.1.1.88.50	Mammography CAD SR	B
1.2.840.10008.5.1.4.1.1.88.59	Key Object Selection Document	B
1.2.840.10008.5.1.4.1.1.88.65	Chest CAD SR	B
1.2.840.10008.5.1.4.1.1.88.67	X-Ray Radiation Dose SR	B
1.2.840.10008.5.1.4.1.1.104.1	Encapsulated PDF Storage	B
1.2.840.10008.5.1.4.1.1.128	Positron Emission Tomography (PET) Image Storage	A
1.2.840.10008.5.1.4.1.1.129	Standalone PET Curve Storage (retired)	B
1.2.840.10008.5.1.4.1.1.481.1	Radiotherapy (RT) Image Storage	A

1.2.840.10008.5.1.4.1.1.481.2	Radiotherapy (RT) Dose Storage	B
1.2.840.10008.5.1.4.1.1.481.3	Radiotherapy (RT) Structure Set Storage	B
1.2.840.10008.5.1.4.1.1.481.4	Radiotherapy (RT) Beams Treatment Record Storage	B
1.2.840.10008.5.1.4.1.1.481.5	Radiotherapy (RT) Plan Storage	B
1.2.840.10008.5.1.4.1.1.481.6	Radiotherapy (RT) Brachy Treatment Record Storage	B
1.2.840.10008.5.1.4.1.1.481.7	Radiotherapy (RT) Summary Treatment Record Storage	B
1.2.840.10008.5.1.4.1.1.481.8	RT Ion Plan Storage	B
1.2.840.10008.5.1.4.1.1.481.9	RT Ion Beams Treatment Record Storage	B

Query/Retrieve SOP Classes

The **Infinity** AE provides standard conformance to the following DICOM V3.0 SOP Classes as a Query/Retrieve SCP when servicing queries about objects that have been stored. Extended negotiation for relational queries is not supported.

Table 3: Valid SCP Query/Retrieve SOP Class for Infinity AE

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.2.1.1	Patient Root Query/Retrieve Information Model – Find
1.2.840.10008.5.1.4.1.2.1.2	Patient Root Query/Retrieve Information Model – Move
1.2.840.10008.5.1.4.1.2.1.3	Patient Root Query/Retrieve Information Model – Get
1.2.840.10008.5.1.4.1.2.2.1	Study Root Query/Retrieve Information Model – Find
1.2.840.10008.5.1.4.1.2.2.2	Study Root Query/Retrieve Information Model – Move
1.2.840.10008.5.1.4.1.2.2.3	Study Root Query/Retrieve Information Model – Get

Storage Commitment SOP Class

The **Infinity** AE provides standard conformance to the following DICOM V3.0 Service Object Pair (SOP) Class as a Storage Commitment Service Class User (SCU) and Provider (SCP). As an SCP, it services storage commitment requests about objects that have been or will be stored. As an SCU, it sends a storage commitment request after routing images to a remote AE.

Table 4: Valid SCU/SCP Storage Commitment SOP Class for Infinity AE

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

3.1.1 Association establishment policies for Infinity AE

3.1.1.1 General

All associations with the **Infinity** AE shall be established using the DICOM 3.0 Application Context. A single DICOM Application Context Name is defined for this version of the DICOM standard. This name is "**1.2.840.10008.3.1.1.1**".

The **Infinity** AE accepts association for the following purposes:
- Supports the **C-ECHO** service to allow end-to-end verifications.
- Supports the **C-STORE** service to store objects into the database.
- Supports the **C-FIND** service to search the database.
- Supports the **C-MOVE** service to retrieve objects from the database.
- Supports the **C-GET** service to retrieve objects from the database.
- Supports the **Storage Commitment** service to commit storage of objects into the database.

The **Infinity** AE initiates associations for the following purposes:
- Invokes the **C-STORE** service to send objects as sub-operations of a remote C-MOVE service request.
- Invokes the **C-ECHO** service before invoking a C-STORE (can be disabled by configuration).
- Invokes the **Storage Commitment** service after invoking a C-STORE to be sure that the instances are really managed by the remote system (can be disabled by configuration).

The maximum length PDU negotiation shall be included in all association establishments.

The SCU/SCP role negotiation is supported for storage commitment service.

Refer to the following paragraph for extensions, specializations, and privatizations management.

3.1.1.2 Number of associations

The number of simultaneous DICOM associations that is accepted is theoretically unlimited, but is actually limited by the Windows NT operating system. A new process or a new thread is created for each new association.

3.1.1.3 Asynchronous nature

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

3.1.1.4 Implementation identifying information

By default, the **Infinity** Application Entity is identified by:
- Implementation Class UID: **1.2.250.1.38.1.3.1.1.1**
- Implementation Version Name: **DXS2_0**

3.1.2 Association initiation for Infinity AE

The **Infinity** AE initiates an association for the appropriate Storage SOP Class(es) that corresponds to the set of objects that have been requested for transfer. The association is closed when all objects have been sent to the remote DICOM AE.

Following the configuration, the **Infinity** AE will initiate an association for the Verification Services before responding to a routing request.

Following the configuration, the **Infinity** AE will initiate an association for the Storage Commitment Services after responding to a routing request.

3.1.2.1 Verify Communication with a Remote System

The **Infinity** AE initiates an association for the echo service. The association is closed either when a correct response is received or when a time-out occurs.

3.1.2.1.1 Associated real-world activity

The **Infinity** AE does not perform the routing or prefetching request if the DICOM Echo failed.

3.1.2.1.2 Proposed Presentation Contexts

Infinity supports the Verification SOP Class fully as specified in the DICOM Standard.

The presentation context proposed by the **Infinity** AE for the Echo Check operation is specified in the following table:

Table 5: Echo Check Presentation Contexts of Infinity

Presentation Context Table					
Abstract Syntax		Transfer Syntax			Extended
Name	UID	Name	UID	Role	Negotiation
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.1.2.1.3 SOP specific conformance

None.

3.1.2.2 Send Objects to a Remote System

The **Infinity** AE initiates associations for the transfer of objects to a DICOM Image Storage Server. The types of objects that can be transferred correspond to the SOP Classes listed in table 2.

3.1.2.2.1 Associated real-world activity

The **Infinity** AE will initiate associations for the following reasons:
1. A C-MOVE request is received from a remote DICOM AE and an association is initiated to perform the C-STORE sub-operation.

3.1.2.2.2 Proposed Presentation Contexts

The presentation contexts that may be proposed by the **Infinity** AE for the Object operation are specified in table 5.

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

Table 6: Send Object Presentation Contexts of Infinity

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			**Extended Negotiation**
Name	**UID**	**Name**	**UID**	**Role**	
See Note A	See Note A	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Little Endian, JPEG baseline encoded	1.2.840.10008.1.2.4.50		
		Explicit VR Little Endian, JPEG baseline encoded	1.2.840.10008.1.2.4.51		
		Explicit VR Little Endian, JPEG loss less encoded	1.2.840.10008.1.2.4.70		
		Explicit VR Little Endian, RLE loss less	1.2.840.10008.1.2.5		
See Note B	See Note B	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

Note A: Include all abstract syntaxes from table 2 marked as 'Transfer Syntax Group A'.
Note B: Include all abstract syntaxes from table 2 marked as 'Transfer Syntax Group B'.

3.1.2.2.3 SOP specific conformance

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

3.1.2.3 Verify the Committed Storage of Instances on a Remote System

When **Infinity** completes the transmission on instances for a routing request, it can optionally verify whether the instances have not only been received but also stored and committed successfully.

3.1.2.3.1 Proposed Presentation Contexts

Infinity supports the Storage Commitment Push Model SOP Class fully as specified in the DICOM Standard.

The presentation context proposed by the **Infinity** AE for the Storage Commitment operation is specified in the following table:

Table 7: Storage Commitment Push Model Presentation Contexts of Infinity

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.1.2.3.2 SOP specific conformance

After the storage commitment request has been sent, **Infinity** will immediately close the association and will not wait for a reply from the SCP. Thus the N-EVENT-REPORT must occur on a different association than the N-ACTION command.

If a report is received, **Infinity** will check if the transmission was successful. If not, **Infinity** will retry the transmission (C-STORE and storage commitment) a configurable amount of times. If it still fails, the routing request goes to an error state. If no report is received after a configurable time out, **Infinity** considers that the transmission was not successful.

Upon success, the routing request goes to a successful state.

3.1.3 Association acceptance policy for Infinity AE

The **Infinity** Application Entity accepts associations for the Verification Service, Storage Services, Query/Retrieve Services and Storage Commitment Service.

Infinity rejects association requests from application of which the AE Title is not registered within **Infinity**. The same applies to the case where the remote system uses a wrong AE Title to connect with **Infinity**.

An association is closed when there is no activity (i.e., no message received) for a configurable amount of time.

3.1.3.1 Verify Communication with a Remote System

The **Infinity** Application Entity waits for an association request and accepts associations to do, among other things, the Verification Service. The association is aborted if an error occurs and is closed when the initiator requests that it be closed.

3.1.3.1.1 Associated real-world activity

Infinity performs an echo response after it receives a DICOM Echo request.

3.1.3.1.2 Accepted Presentation Contexts

Only the presentation context listed in the following table will be accepted by **Infinity** for the Verification SOP Class.

Table 8: Echo Response Presentation Contexts of Infinity

Presentation Context Table					
Abstract Syntax		Transfer Syntax			Extended Negotiation
Name	UID	Name	UID	Role	
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

3.1.3.1.3 SOP Specific Conformance

Infinity AE provides standard conformance to the DICOM Verification Service Class.

3.1.3.1.4 Presentation Context Acceptance Criterion

The shown presentation context above is always accepted.

3.1.3.2 Receive Objects from a Remote System

The **Infinity** Application Entity waits for an association request and accepts associations to do, among other things, the Image Storage Service. The association is aborted if an error occurs and is closed when the initiator requests that it be closed.

3.1.3.2.1 Associated real-world activity

Once the association has been established, the **Infinity** AE waits for transmission of conformant Storage Service messages. Objects received are decoded, most important attributes are stored in the database, and the file is store in a local folder.

3.1.3.2.2 Accepted Presentation Contexts

The presentation contexts that will be accepted by the **Infinity** AE for the Receive Object operation are listed in following table:

Table 9: Receive Object Presentation Contexts of Infinity

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			**Extended Negotiation**
Name	**UID**	**Name**	**UID**	**Role**	
See Note A	See Note A	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Little Endian, JPEG baseline encoded	1.2.840.10008.1.2.4.50		
		Explicit VR Little Endian, JPEG baseline encoded	1.2.840.10008.1.2.4.51		
		Explicit VR Little Endian, JPEG loss less encoded	1.2.840.10008.1.2.4.70		
		Explicit VR Little Endian, RLE loss less	1.2.840.10008.1.2.5		
See Note B	See Note B	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

Note A: Include all abstract syntaxes from table 2 marked as 'Transfer Syntax Group A'.
Note B: Include all abstract syntaxes from table 2 marked as 'Transfer Syntax Group B'.

3.1.3.2.3 SOP Specific Conformance

The **Infinity** AE conforms to the SOP's of the Storage SOP Class at Level 2 (Full). No elements are discarded or coerced by **Infinity** AE. In addition private attributes will be stored and included when the object is sent out again.
The **Infinity** AE responds to a C-STORE request with one of these response codes:

Table 10: C-STORE Response Codes

Service Status	Status Description	Status Code (0000,0900)	Related Fields
Refused	**Out of Resources** – There were insufficient resources to process the request. The request was not processed.	A765	(0000,0902) contains a short description of the condition.
Success		0000	None

3.1.3.2.4 Presentation context acceptance criterion

The shown presentation context above is always accepted.

3.1.3.2.5 Transfer syntax selection policies

The **Infinity** AE selects the first proposed transfer syntax as soon as it is compatible with table 7.

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3.1.3.3 Query the Infinity Database and Retrieve Objects

The **Infinity** Application Entity waits for an association request and accepts associations to do, among other things, the DICOM Query/Retrieve Service. The association is closed after an error or when the initiator requests that it be closed.

3.1.3.3.1 Associated real-world activity

Once the association has been established, **Infinity** waits for transmission of conformant Query Service messages. If a valid Find is received, then the **Infinity** database is searched and the requested information is returned to the Query SCU. If a valid Move request is received, then the **Infinity** database is searched for the requested objects and they are sent to the remote network node specified by the SCU. If a valid Get request is received, then the **Infinity** database is searched for the requested objects and they are sent to the SCU.

3.1.3.3.2 Accepted Presentation Contexts

The presentation contexts that will be accepted by the **Infinity** AE for the Query/Retrieve operations are listed in following table:

Table 11: Query/Retrieve Response Presentation Contexts of Infinity

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			**Extended**
Name	**UID**	**Name**	**UID**	**Role**	**Negotiation**
Patient Root Query/Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Patient Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Patient Root Query/Retrieve Model – GET	1.2.840.10008.5.1.4.1.2.1.3	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Query/Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Query/Retrieve Model – GET	1.2.840.10008.5.1.4.1.2.2.3	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None

3.1.3.3.3 SOP Specific Conformance

Infinity supports only hierarchical queries.
Infinity supports the C-CANCEL request during a query operation.
The following table identifies the match support used by the **Infinity** AE. The values in this table indicate how the **Infinity** AE processes the received query attribute data.

Table 12: Matching Key Types

RV	Range Value match
SV	Single Value match
WC	Wild Card match
RET	Return value only

Infinity AE supports the following elements for Query/Retrieve service. DICOM attributes not listed in these tables are handled in that a zero-length attribute will be returned in response to a query for the specified attribute.

Table 13: Supported keys for Patient Root Query/Retrieve

Level (0008,0052)	Description	Tag	Support
PATIENT	Patient's Name	(0010,0010)	WC
	Patient ID	(0010,0020)	WC
	Patient's Birth Date	(0010,0030)	RET
	Patient's Sex	(0010,0040)	RET
STUDY	Study Date	(0008,0020)	RV
	Study Time	(0008,0030)	RET
	Accession Number	(0008,0050)	WC
	Study ID	(0020,0010)	WC
	Study Instance UID	(0020,000D)	SV
	Modalities in Study [1]	(0008,0061)	SV
	Referring	(0008,0090)	RET
	Study Description	(0008,1030)	RET
	Number of Study Related Series	(0020,1206)	RET
	Number of Study Related Instances	(0020,1208)	RET
SERIES	Modality	(0008,0060)	SV
	Series Description	(0008,103E)	RET
	Body Part Examined	(0018,0015)	RET
	Series Number	(0020,0011)	SV
	Series Instance UID	(0020,000E)	SV
	Number of Series Related Instances	(0020,1209)	RET
COMPOSITE OBJECT INSTANCE	Instance Number	(0020,0060)	SV
	SOP Instance UID	(0008,0018)	SV
	SOP Class UID	(0008,0016)	RET
IMAGE SPECIFIC	Rows	(0028,0010)	RET
	Columns	(0028,0011)	RET
	Bits Allocated	(0028,0100)	RET
	Number of Frames	(0028,0008)	RET
GSPS SPECIFIC	Presentation Label	(0070,0080)	RET
	Presentation Description	(0070,0081)	RET
	Presentation Creation Date	(0070,0082)	RET
	Presentation Creation Time	(0070,0083)	RET
	Presentation Creator's Name	(0070,0084)	RET
KO SPECIFIC	Content Date	(0008,0023)	RET
	Content Time	(0008,0033)	RET

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	Concept Name Code Sequence	(0040,A043)	RET
	Observation Date Time	(0040,A032)	RET

Table 14: Supported keys for Study Root Query/Retrieve

Level (0008,0052)	Description	Tag	Support
STUDY	Patient's Name	(0010,0010)	WC
	Patient ID	(0010,0020)	WC
	Patient's Birth Date	(0010,0030)	RET
	Patient's Sex	(0010,0040)	RET
	Study Date	(0008,0020)	RV
	Study Time	(0008,0030)	RET
	Accession Number	(0008,0050)	WC
	Study ID	(0020,0010)	WC
	Study Instance UID	(0020,000D)	SV
	Modalities in Study [1]	(0008,0061)	SV
	Referring	(0008,0090)	RET
	Study Description	(0008,1030)	RET
	Number of Study Related Series	(0020,1206)	RET
	Number of Study Related Instances	(0020,1208)	RET
SERIES	Modality	(0008,0060)	SV
	Series Description	(0008,103E)	RET
	Body Part Examined	(0018,0015)	RET
	Series Number	(0020,0011)	SV
	Series Instance UID	(0020,000E)	SV
	Number of Series Related Instances	(0020,1209)	RET
COMPOSITE OBJECT INSTANCE	Instance Number	(0020,0060)	SV
	SOP Instance UID	(0008,0018)	SV
	SOP Class UID	(0008,0016)	RET
IMAGE SPECIFIC	Rows	(0028,0010)	RET
	Columns	(0028,0011)	RET
	Bits Allocated	(0028,0100)	RET
	Number of Frames	(0028,0008)	RET
GSPS SPECIFIC	Presentation Label	(0070,0080)	RET
	Presentation Description	(0070,0081)	RET
	Presentation Creation Date	(0070,0082)	RET
	Presentation Creation Time	(0070,0083)	RET
	Presentation Creator's Name	(0070,0084)	RET
KO SPECIFIC	Content Date	(0008,0023)	RET
	Content Time	(0008,0033)	RET
	Concept Name Code Sequence	(0040,A043)	RET
	Observation Date Time	(0040,A032)	RET

(1) Modalities in Study: if the query contains multiple values, studies containing one of the modality listed will match.

C-FIND Response Codes
The **Infinity** AE responds to a C-FIND request with one of these response codes:

Table 15: C-FIND Response Codes

Service Status	Status Description	Status Code (0000,0900)	Related Fields
Refused	**Out of Resources** – There were insufficient resources to process the request. The request was not processed.	A700	(0000,0902) contains a short description of the condition.
Failed	**Unable to Process** – A condition arose which prevented the processing of the request.	C000	(0000,0902) contains a short description of the condition.
Cancel	**Matching terminated** – No more response messages will be sent as a result of a Cancel request from the SCU.	FE00	None
Success	**Matching is complete** – No final identifier is supplied	0000	None
Pending	**Matches are continuing** – Current match is supplied	FF00	Identifier
	Matches are continuing – Warning that one or more Optional Keys were not supported	FF01	Identifier

C-MOVE Response Codes
The **Infinity** AE responds to a C-MOVE request with one of these response codes:

Table 16: C-MOVE Response Codes

Service Status	Status Description	Status Code (0000,0900)	Related Fields*
Refused	**Out of Resources** – Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources – Unable to perform sub-operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
	Move Destination unknown	A801	(0000,0902)
Failed	**Identifier does not match SOP Class** – A required attribute is not present in the message. The request was not processed.	A900	(0000,0902)
	Unable to Process – A condition arose which prevented the processing of the request.	C002	(0000,0902)
Cancel	**Sub-operations terminated** due to Cancel indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	**Sub-operations complete** – One or more Failures were encountered	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	**Sub-operations complete** – No Failure	0000	None

Pending	**Sub-operations are continuing**	FF00	(0000,1020)
			(0000,1021)
			(0000,1022)
			(0000,1023)

*Related fields:

(0000,0902): Contains a text description of the error detected.

(0000,1020): The number of remaining C-STORE sub-operation to be invoked for the operation.

(0000,1021): The number of C-STORE sub-operation associated with this operation which have been completed successfully.

(0000,1022): The number of C-STORE sub-operation associated with this operation which have failed.

(0000,1022): The number of C-STORE sub-operation associated with this operation which generated warning responses.

3.1.3.3.4 Presentation Context Acceptance Criterion

The shown presentation contexts above are always accepted.

3.1.3.4 Commit Storage of Images in Infinity

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

3.1.3.4.1 Associated Real World Activity

Infinity can confirm the storage of instances on the local system when it is asked to do so.

3.1.3.4.2 Accepted Presentation Contexts

The presentation contexts that will be accepted by the **Infinity** AE for the Storage Commitment operation are listed in following table:

Table 17: Storage Commitment Presentation Contexts of Infinity

Presentation Context Table					
Abstract Syntax		Transfer Syntax			Extended
Name	UID	Name	UID	Role	Negotiation
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	SCU/SCP role

3.1.3.4.3 SOP specific conformance

While the SCU keeps the association alive, **Infinity** will send the N-EVENT-REPORT in the same association. While the initial association is alive, **Infinity** will first wait for a configurable interval (30 seconds by default). It will then verify periodically (same as interval) whether the requested objects are stored.

After the SCU closes the association, **Infinity** will open a new association to the SCU for transmitting the N-EVENT-REPORT response back to the storage commit inquirer. SCU/SCP role negotiation for storage commitment SOP class is included in the association negotiation.

If the requested instances are stored on the system after a configurable time out, the N-EVENT-REPORT is sent back with a list of committed objects and a list of uncommitted objects.

Infinity does not support the optional Storage Media File-Set ID and UID attributes.
Infinity does not support the optional Retrieve AE Title.

3.1.3.4.4 Presentation context acceptance criterion

The shown presentation context above is always accepted.

4 Communication Profiles

4.1 Supported Communications Stacks

Infinity provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8.

4.2 TCP/IP Stack

Infinity inherits the TCP/IP stack from the MS Windows system upon which it executes.

4.3 Physical Media Support

Infinity is indifferent to the physical medium over which TCP/IP executes; they inherit this from the MS Windows system upon which they execute.

5 Extensions / Specializations / Privatizations

Private SOP classes are supported, but must be configured on the system to be accepted.
No private transfer syntaxes are supported.

6 Configuration

See [1] for full details.

7 Support of extended character sets

Infinity supports the following character sets:

Table 18: Character sets

Code Element	Description
ISO-IR 6	Default character set
ISO-IR 100	Latin alphabet n°1
ISO-IR 13	Japanese katakana (phonetic) characters (94 characters)
ISO-IR 87	Japanese kanji (ideographic), hiragana (phonetic), and katakana (phonetic) characters (94^2 characters, 2-byte)

8 Security

8.1 Security Profiles

Infinity supports secure DICOM communication in conformance with the Basic TLS Secure Transport Connection Profile. This support is an option of the installation setup and can be disabled.

8.2 Association Level Security

By default, **Infinity** accepts association requests from only registered calling AE Titles. This behavior can be disabled in the configuration file by an administrator.

8.3 Application Level Security

Infinity requires user authentication in order to access to the user interface functionalities. The user must be an administrator (defined in **Infinity**).