



InDex® Archive
version 3.0

DICOM Conformance Statement

This conformance statement applies to version 3.0 of the InDex® Archive product. Future versions of the product should maintain compatibility with this conformance statement, but will include added features and enhancements.

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0 Introduction

This section provides information about the purpose, scope and contents of the InDex® Archive DICOM conformance statement.

0.1 Purpose

This document contains the DICOM Conformance Statement for the InDex® Archive, the secure DICOM storage and retrieval system of InSiteOne, Inc. The Archive is intended to receive patient and image data over the network and store it for retrieval. This document enumerates the compliance to the DICOM 3.0 standard (formally called the NEMA PS 3.X-1993 standards). The compliance has been specified through the Service Classes, Information Objects and Communication Protocols supported by the implementation.

0.2 Intended Audience

This document is intended for potential clients, system integrators and software designers interested in acquiring and working with the InDex® Archive. The document assumes familiarity with the DICOM Standard as defined by ACR-NEMA. It should be interpreted in conjunction with the published standard.

0.3 General

The InDex® Archive is a product of InSiteOne, Inc., USA. The DICOM application will evolve in the future to meet user requirements and to incorporate new features and technologies. InSiteOne, Inc. plans to adapt its software to future versions of the DICOM standard. This may result in changes to the support of the communications features listed in this Conformance Statement. The user should ensure that other devices conform to the evolving standard. Failure to do so could result in the loss of function and/or connectivity.

InSiteOne, Inc. reserves the right to make changes to its products or to discontinue its delivery. This Conformance Statement by itself does not guarantee successful interconnection. It is the responsibility of the user to carry out additional validation tests to ensure the functionality, performance, accuracy and stability of the transmitted image and patient data.

InSiteOne, Inc. will make every effort to keep the InDex® Archive Product backwards compatible with previous versions of the product and continue to support retired DICOM capabilities where feasible.

0.4 Terminology

Big Endian: A form of byte ordering where multiple byte binary values are encoded with the most significant byte encoded first and the remaining bytes encoded in decreasing order of significance.

Little Endian: A form of byte ordering where multiple byte binary values are encoded with the least significant byte encoded first; and the remaining bytes encoded in increasing order of significance.

Pixel Data: Graphical data (e.g. images or overlays) of variable pixel-depth encoded in the Pixel Data Element.

Standard Data Element: A Data Element defined in the DICOM Standard, and therefore listed in the DICOM Data Element Dictionary in PS 3.6.

Private Data Element: Additional Data Element, defined by an implementer, to communicate information that is not contained in Standard Data Elements.

Data Element Tag: A unique identifier for a Data Element composed of an ordered pair of numbers (a Group Number followed by an Element Number). Sometimes the word “Tag” is used to indicate a Data Element Tag.

Transfer Syntax: A set of encoding rules that allow Application Entities to unambiguously negotiate the encoding techniques (e.g. Data Element structure, byte ordering, compression) they are able to support, thereby allowing these Application Entities to communicate.

Unique Identifier: A string of characters that uniquely identifies a wide variety of items; guaranteeing uniqueness across multiple countries, sites, vendors and equipment.

Service Class User: The role played by a DICOM Application Entity which invokes operations and performs notifications on a specific Association.

Service Class Provider: The role played by a DICOM Application Entity which performs operations and invokes notifications on a specific Association.

Service Class: A collection of SOP Classes which are related in that they are described together to accomplish a single application.

Service-Object Pair (SOP) Class: The union of a specific set of DIMSE Services and one related Information Object Definition (as specified by a Service Class Definition) which completely defines a precise context for communication.

Service-Object (SOP) Instance: A concrete occurrence of an Information Object and a communication context. The word “Instance” is sometimes used to indicate an SOP Instance. This Conformance Statement sometimes uses the abbreviation IOD to indicate an SOP Instance.

Presentation Context: A specific SOP Class and a list of Transfer Syntaxes supported by an Application Entity for that SOP Class.

0.5 Abbreviations

ACR: American College of Radiology

AE: Application Entity

ASCII: American Standard Code for Information Interchange

DICOM: Digital Imaging and Communications in Medicine

DIMSE: DICOM Message Service Element

IOD: Information Object Definition

JPEG: Joint Photographic Experts Group

NEMA: National Electrical Manufacturers Association

PDU: Protocol Data Unit

RAID: Redundant Array of Independent Disks

RLE: Run Length Encoding

SCP: Service Class Provider

SCU: Service Class User

SOP: Service Object Pair

TCP/IP: Transmission Control Program/Internet Protocol

UID: Unique Identifier

VM: Value Multiplicity

VR: Value Representation

1 Implementation Model for the InDex® Archive

InDex® Archive Stores and Retrieves DICOM images.

1.1 Application Data Flow Diagram

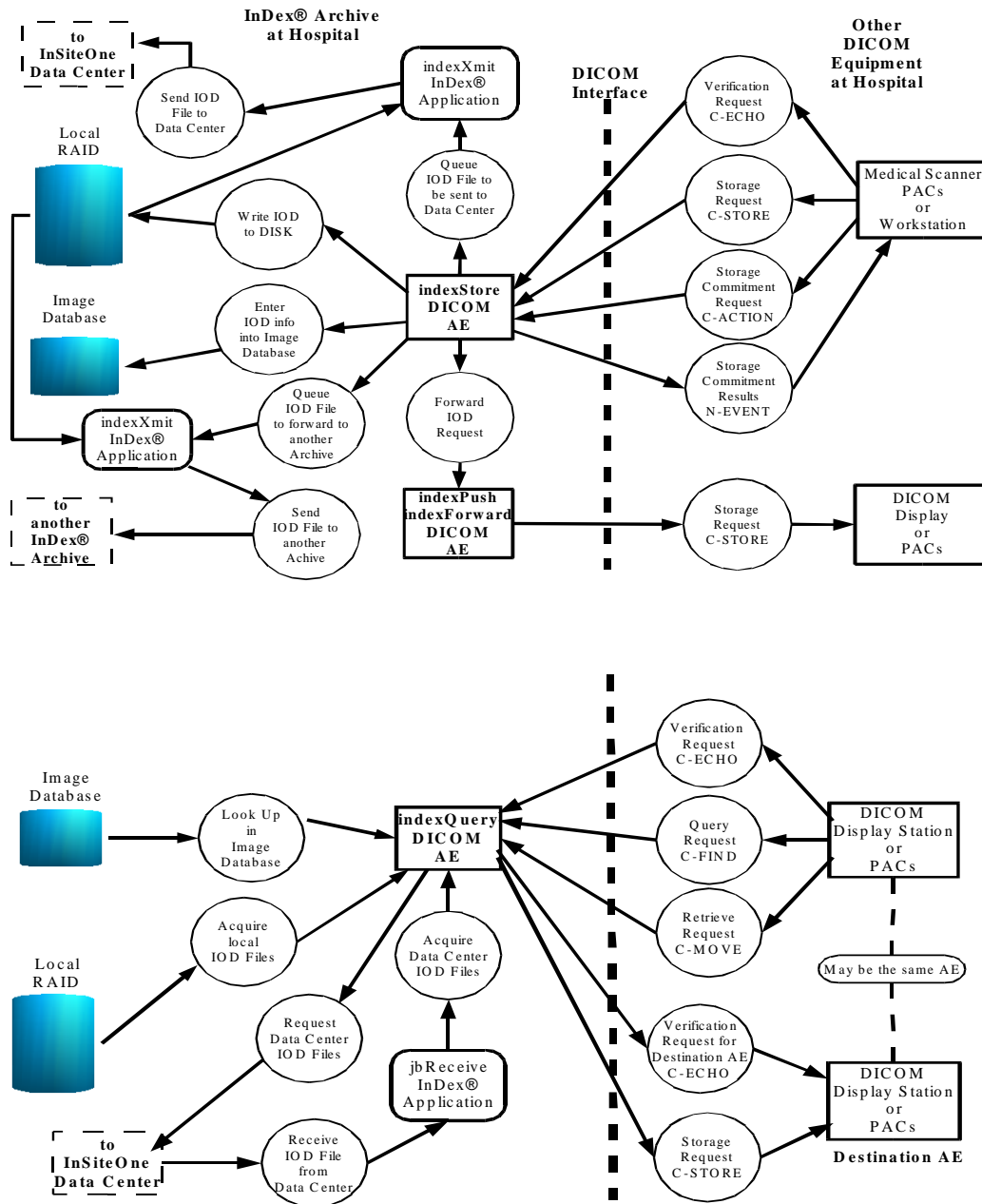


Figure 1.1-1 InDex® Archive Implementation Model

A Remote AE (e.g. a modality such as a catscan or a workstation) sends one or more IOD Store Requests (usually a Study) to the indexStore AE. The indexStore AE stores the IOD on its local RAID/SANS and adds an entry to its Database for each IOD. This Database is used by the indexQuery AE. In the background, the InDex® Archive will forward IOD's to one of InSiteOne's remote Data Centers where they will be transferred to long term storage in a Jukebox for near term retrieval by the indexQuery AE.

When the indexStore AE receives IOD's it can forward them to other Remote AE's based on configuration parameters using the indexPush AE or indexForward AE.

The Remote AE can send Storage Commitment Requests of those IOD's to the indexStore AE. The indexStore AE will wait for the IOD's to arrive at an InSiteOne Data Center before it takes action on the Storage Commit request. The indexStore AE will then send the results of the Storage Commit Request back to the requesting Remote AE.

After IOD's have been received and entered into the Database, a Remote AE (e.g. a display station) can send a Query/Retrieve Request to the indexQuery AE to examine these IOD's. If the Remote AE requests retrieval of IOD's, the indexQuery AE retrieves those IOD's, either locally or from an InSiteOne Data Center, and sends them to the specified Destination AE using its DICOM Storage Service.

Any Remote AE can verify the operational readiness and capabilities of either the indexStore AE or the indexQuery AE by using their DICOM Verification Services.

1.2 Functional Definitions of Application Entities

The InDex® Archive has four Application Entities (AE's) which act as a Storage Service Class Provider and User, a Storage Commitment Provider and a Query/Retrieval Provider.

1.2.1 indexStore Application Entity

The indexStore AE provides the Storage, Storage Commitment and Verification DICOM Services.

1.2.2 indexPush/indexForward Application Entity

The indexPush/indexForward AE use Storage Services to forward IOD's to Remote AE's (e.g. display stations and workstations) based on the configuration information. The indexPush AE does not guarantee delivery; whereas, the indexForward AE does guarantee delivery.

1.2.3 indexQuery Application Entity

The indexQuery AE provides the Query/Retrieval and Verification DICOM Services to find Patients, Studies, Series and Images in the InDex® Archive Database and forward the requested IOD's to a Destination AE using the DICOM Storage Service.

1.3 Sequence of Real World Activities

A Storage Commitment Request can be sent on the same association as the Store Request or later on a separate association.

The indexStore AE will not send a Response to a Storage Commitment Request until the requested IOD's are sent to an InSiteOne Data Center. This normally will occur within a few hours but could take an extended period of time depending on configuration.

When the indexPush AE forwards IOD's to another Remote AE there is a configurable limit on the number of times it will try sending the IOD's. As a result, there is no guaranteed delivery of these forwarded IOD's.

When the indexForward AE forwards IOD's to another Remote AE the delivery is guaranteed. The indexForward AE will periodically retry sending any IOD's until it succeeds. The option of whether to use the indexPush AE or the indexForward AE to forward IOD's is configurable by Destination AE.

A Query/Retrieve Request can not retrieve a Study until after it has been entered in the Database which occurs some time after the Originating AE sends the study and the Association is released.

2 Application Entity Specifications

2.1 indexStore Application Entity - Specification

The indexStore AE provides standard conformance to the DICOM V3.0 SOP Classes listed in Table 2.1-1 as an SCP. See DICOM v3.0 PS 3.4 Appendices A, B and J for detailed specifications of the Verification, Storage, and Storage Commitment Services.

Table 2.1-1 SOP Classes Supported by the indexStore AE	
SOP Class Name (SCP)	SOP Class UID
Verification	1.2.840.10008.1.1
Storage Commitment Push Model	1.2.840.10008.1.20.1
Stored Print Storage	1.2.840.10008.5.1.1.27
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Digital Mammography Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3

**Table 2.1-1
SOP Classes Supported by the indexStore AE**

SOP Class Name (SCP)	SOP Class UID
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9
12-Lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
X-Ray Angiographic Bi-plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50
Key Object Selection	1.2.840.10008.5.1.4.1.1.88.59
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128
Standalone PET Curve Storage	1.2.840.10008.5.1.4.1.1.129
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5

2.1.1 Association Establishment Policy

2.1.1.1 General

The maximum number of Presentation Contexts which can be offered is 128. The maximum PDU length offered/accepted is configurable. The default is 65536 bytes.

2.1.1.2 Number of Associations

The indexStore AE supports multiple Associations at one time. The limit is based on the size of the InDex® Archive and how many Associations the indexQuery AE has opened. This limit is typically 25 on a small InDex® Archive Configuration.

The indexStore AE is limited to 5 pending Association Requests. Once an Association is negotiated and accepted it is no longer pending and not counted in this limit.

2.1.1.3 Asynchronous Nature

The indexStore AE does not support asynchronous operations and will not perform asynchronous window negotiation.

2.1.1.4 Implementation Identifying Information

Implementation Class UID is “2.16.840.1.114107.1.1.1.x.x”.

Implementation Version Name is “indexStore x.x.x”.

2.1.2 Association Initiation Policy

2.1.2.1 Storage Commitment Results are Available

2.1.2.1.1 Associated Real World Activity

When all the DICOM Files referenced by a pending Storage Commit Request have been forwarded to an InSiteOne Data Center or found not to exist, a response to the Commit Request is formulated and the indexStore AE attempts to send an N-EVENT-REPORT to the requesting Remote AE. If it is unable to send the results to the Remote AE, it will periodically retry to initiate the Association. It will give up after 60 days (or some other limit as configured).

2.1.2.1.2 Proposed Presentation Contexts

Table 2.1.2.1.2-1 Proposed Presentation Contexts for Storage Commitment SOP Class					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Storage Commitment Push Model	1.2.840.10008.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

2.1.2.1.2.1 Conformance to Storage Commitment Push Model SOP Class (SCP)

Although the indexStore AE is initiating the Association, it uses Role Negotiation to indicate that it is the Provider (SCP) and not the User (SCU). The results of a Storage Commitment Request will always be sent on a separate Association and not on an Association initiated by a Storage Commitment SCU.

The Storage Media File Set ID attributes (0008,1150) and (0008,1155) are not supported. The Retrieve AE attribute (0008,0054) is not supported. See Section 2.1.3.3.2.1 (Association Acceptance Policy) for the remaining conformance issues.

If the indexStore AE is unable to connect to the Originating AE then the indexStore AE will periodically retry to connect to the Originating AE for up to 60 days (a configurable limit).

If an error status is given in the N-EVENT-REPORT-RSP, this error will be logged and no attempt will be made to resend the transaction. This is usually caused by an expired Transaction UID.

The only Failure Reason (0008,1197) ever given by the indexStore AE is 0112H (No Such Object Instance) which indicates the requested Instance UID was not in the InDex® Archive Database and thus never successfully received by the indexStore AE. The recommended action is to resend the IOD with that Instance UID. The indexStore AE does not verify that the SOP class corresponds to the Instance UID (Failure Reason 0119H). A duplicate Transaction UID is reported when the N-ACTION-RQ is sent with an N-ACTION-RSP error status of 0210H (Duplicate Invocation) rather than as failure reason 0131H (Duplicate Transaction UID).

2.1.2.2 Forwarding is Specified for the Originating AE

2.1.2.2.1 Associated Real World Activity

The indexStore AE will initiate an instance of the indexPush AE or indexForward AE to forward the IOD's received from the Originating AE to a Destination AE, as configured. The indexPush AE may be initiated with a retry option based on configuration parameters. If the retry option is present then the indexPush AE will repeatedly try to send the IOD's for the configured number of times (see Section 2.2 - indexPush Application Entity – Specifications). If the indexForward AE instead of the indexPush AE is used for forwarding to the given Destination AE, then the indexForward AE will periodically retry sending any IOD until it succeeds, guaranteeing delivery.

The IOD's forwarded may be for one or more studies but will be for only one patient. There is no guarantee that the IOD's represent a complete study or that they will be delivered in any particular order.

2.1.3 Association Acceptance Policy

2.1.3.1 Remote AE Sends a Verification Request

2.1.3.1.1 Associated Real World Activity

A Remote AE sends a Verification Request (C-ECHO-RQ) to the indexStore AE which always responds with a status of zero (0).

2.1.3.1.2 Presentation Context Table

Table 2.1.3.1.2-1 Acceptable Presentation Contexts for Verification SOP Class					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

2.1.3.1.2.1 Conformance to Verification SOP Class (SCP)

The Verification Service conforms to the DICOM V3.0 Standard.

The status in a C-ECHO-RSP is always 0 (success).

2.1.3.1.3 Presentation Context Acceptance Criterion

The indexStore AE will accept any Presentation Context for the Verification SOP Class which proposes “Explicit VR Little Endian” or “Implicit VR Little Endian” as a Transfer Syntax. Any other Presentation Contexts for the Verification SOP Class will be rejected. If more than one Presentation Context is accepted, the SCU can choose which Presentation Context to use.

2.1.3.1.4 Transfer Syntax Selection Policies

The indexStore AE will give preference to “Explicit VR Little Endian” over “Implicit VR Little Endian” as a Transfer Syntax.

2.1.3.2 Remote AE sends an IOD Store Request

2.1.3.2.1 Associated Real World Activity

A Remote AE (SCU) sends a DICOM Store Request (C-STORE-RQ) to the indexStore AE for one or more IOD’s (e.g. image objects). Usually all the IOD’s sent in one Association are for a single study, but this is not a requirement. If the IOD is sent using an accepted encoding (e.g. JPEG Lossless, RLE, etc.) then the IOD will be stored unchanged using that encoding. If the IOD is sent uncompressed then it is compressed using JPEG-LS. The indexStore AE stores the object in a DICOM compatible file which is encapsulated in a non-DICOM encryption layer along with non-DICOM MD5 signatures on a local RAID/SANS. A success is reported to the Remote AE if the IOD is successfully stored. The Remote AE can also send Storage Commit Requests on the same Association.

After the Remote AE has sent all the IOD’s and released the connection, or after an IOD has arrived with a new Patient Name, then the received IOD’s are added to the Database on the InDex® Archive. A duplicate policy is applied to any IOD which has an Instance UID that already exists in the Database. The original duplicate policy discarded any IOD’s which had a duplicate Instance UID. The new duplicate policy, which can be enabled starting in version 2.5, will discard duplicate IOD’s only if they are byte-for-byte exact duplicates. Otherwise, the new IOD will be added to the Database, replacing the previous IOD.

After the IOD’s have been added to the Database, they are queued to be copied to an InSiteOne Data Center. The IOD’s are sent encrypted and in a manner which guarantees reliable and accurate delivery. This process is non-DICOM and beyond the scope of this document. At an InSiteOne Data Center, the IOD’s are staged on a RAID/SANS before being copied to permanent storage (e.g. DVD Storage) and checked into a Jukebox for remote access by the indexQuery AE. Two separate permanent copies of the IOD are made. All copies are encrypted.

The InDex® Archive can be configured to indicate that any IOD received from a given Remote AE (by AE Title) is to be forwarded to one or more other Remote AE’s. In this case the indexStore AE will schedule this delivery. See the Association Initiation section 2.1.2.2 for indexStore and the indexPush/indexForward AE section 2.2 for further details of this process.

The InDex® Archive can also be configured to forward IOD's to other InDex® Archives at the same site or other sites. In this case the indexStore AE queues the IOD's for forwarding to these remote InDex® Archives. This forwarding process send IOD's in an encrypted format and in a manner which guarantees reliable and accurate delivery. This process is non-DICOM and beyond the scope of this document.

2.1.3.2.2 Presentation Context Table

The Presentation Contexts listed below represent the default Presentation Contexts. The actual Presentation Contexts can be configured (see Section 5).

Table 2.1.3.2.2-1 Acceptable Presentation Contexts for Storage SOP's				
Abstract Syntax		Transfer Syntax (See Table)	Role	Ext. Neg.
SOP Class Name	SOP Class UID			
Stored Print Storage	1.2.840.10008.5.1.1.27	2.1.3.2.2-3	SCP	None
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29	2.1.3.2.2-3	SCP	None
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30	2.1.3.2.2-3	SCP	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	2.1.3.2.2-4	SCP	None
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	2.1.3.2.2-4	SCP	None
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	2.1.3.2.2-4	SCP	None
Digital Mammography Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	2.1.3.2.2-4	SCP	None
Digital Mammography Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	2.1.3.2.2-4	SCP	None
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	2.1.3.2.2-4	SCP	None
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	2.1.3.2.2-4	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	2.1.3.2.2-3	SCP	None
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	2.1.3.2.2-3	SCP	None
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	2.1.3.2.2-4	SCP	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	2.1.3.2.2-4	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	2.1.3.2.2-3	SCP	None
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	2.1.3.2.2-3	SCP	None

**Table 2.1.3.2.2-1
Acceptable Presentation Contexts for Storage SOP's**

Abstract Syntax		Transfer Syntax (See Table)	Role	Ext. Neg.
SOP Class Name	SOP Class UID			
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	2.1.3.2.2-4	SCP	None
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	2.1.3.2.2-4	SCP	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	2.1.3.2.2-4	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	2.1.3.2.2-3	SCP	None
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	2.1.3.2.2-3	SCP	None
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	2.1.3.2.2-3	SCP	None
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	2.1.3.2.2-3	SCP	None
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8	2.1.3.2.2-2	SCP	None
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	2.1.3.2.2-2	SCP	None
12-Lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	2.1.3.2.2-2	SCP	None
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	2.1.3.2.2-2	SCP	None
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	2.1.3.2.2-2	SCP	None
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10	2.1.3.2.2-2	SCP	None
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11	2.1.3.2.2-2	SCP	None
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	2.1.3.2.2-2	SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	2.1.3.2.2-4	SCP	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	2.1.3.2.2-4	SCP	None
X-Ray Angiographic Bi-plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	2.1.3.2.2-4	SCP	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	2.1.3.2.2-4	SCP	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	2.1.3.2.2-4	SCP	None

Table 2.1.3.2.2-1 Acceptable Presentation Contexts for Storage SOP's				
Abstract Syntax		Transfer Syntax (See Table)	Role	Ext. Neg.
SOP Class Name	SOP Class UID			
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	2.1.3.2.2-4	SCP	None
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	2.1.3.2.2-4	SCP	None
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	2.1.3.2.2-4	SCP	None
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	2.1.3.2.2-2	SCP	None
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	2.1.3.2.2-2	SCP	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	2.1.3.2.2-2	SCP	None
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	2.1.3.2.2-2	SCP	None
Key Object Selection	1.2.840.10008.5.1.4.1.1.88.59	2.1.3.2.2-2	SCP	None
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	2.1.3.2.2-2	SCP	None
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	2.1.3.2.2-4	SCP	None
Standalone PET Curve Storage	1.2.840.10008.5.1.4.1.1.129	2.1.3.2.2-2	SCP	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	2.1.3.2.2-4	SCP	None
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	2.1.3.2.2-2	SCP	None
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	2.1.3.2.2-2	SCP	None
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	2.1.3.2.2-2	SCP	None
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	2.1.3.2.2-2	SCP	None

Table 2.1.3.2.2-2 Transfer Syntaxes without Compression	
Transfer Syntax Name	Transfer Syntax UID
Little Endian Implicit	1.2.840.10008.1.2
Little Endian Explicit	1.2.840.10008.1.2.1

Table 2.1.3.2.2-3 Transfer Syntaxes with Lossless Compression	
Transfer Syntax Name	Transfer Syntax UID
Little Endian Implicit	1.2.840.10008.1.2
Little Endian Explicit	1.2.840.10008.1.2.1
JPEG Lossless, Default	1.2.840.10008.1.2.4.70
RLE Lossless	1.2.840.10008.1.2.5

**Table 2.1.3.2.2-4
Transfer Syntaxes with Lossy and Lossless Compression**

Transfer Syntax Name	Transfer Syntax UID
Little Endian Implicit	1.2.840.10008.1.2
Little Endian Explicit	1.2.840.10008.1.2.1
JPEG Lossy, Baseline	1.2.840.10008.1.2.4.50
JPEG Lossless, Default	1.2.840.10008.1.2.4.70
RLE Lossless	1.2.840.10008.1.2.5

2.1.3.2.2.1 Conformance to Storage SOP Classes (SCP)

The indexStore AE provides Level 2 (Full) storage of all IOD’s received. The InDex® Archive does not support multi-byte encoding for character data. An IOD received using multi-byte encoding may not preserve all character data. Any data received using the “Implicit VR Little Endian” Transfer Syntax will assign a VR of “UN” for all Private Data Tags. It is recommended that Remote AE’s always use the “Explicit VR Little Endian” Transfer Syntax or one of the encoded syntaxes (e.g. JPEG or RLE.) which are always “Explicit VR”.

The indexStore AE provides Level 1 Digital Signature support.

IOD’s sent to the indexStore AE using one of the accepted encoded Transfer Syntaxes (e.g. JPEG, RLE, etc.) are stored unchanged with that encoding. IOD’s sent with uncompressed Pixel Data are stored using JPEG-LS encoding, if appropriate. IOD’s without Pixel Data are stored uncompressed. If the JPEG Lossy tag is included in the IOD, it is preserved along with the JPEG Lossy Ratio tag.

All IOD’s which are sent to the indexStore AE encoded (e.g. JPEG) are uncompressed with the appropriate InSiteOne decoders to verify that they can be decoded by the indexQuery AE. If this decoding fails, then an error status of C101H (Cannot Understand) is sent back to the Remote AE and the Image IOD is saved for further investigation but is not entered into the Database.

All IOD’s with Pixel Data which are sent uncompressed are compressed using JPEG-LS, then uncompressed and verified against the original Pixel Data. If the original Pixel Data does not match the uncompressed Pixel Data, then the original uncompressed Pixel Data is stored as is.

IOD’s which are successfully stored on the InDex® Archive and entered into the Database can be accessed through the indexQuery AE. The IOD’s will be preserved locally and at InSiteOne Data Centers for the durations specified in the customer contract. On an ongoing basis, at least two separate permanent copies of each IOD are maintained and are periodically checked for integrity.

The possible error statuses in the C-STORE-RSP are:

A711H Out of Resources (Max IOD Limit of 2048 reached)

The indexStore AE has received too many IOD's for the same Patient in one Association. The Error Comment (0000,0902) indicates the limit.

The operator should send one Study/Series/Image at a time to relieve this problem.

A712H Out of Resources (Unable to Store Image)

The InDex® Archive has run out of storage space or some other resource.

The operator should notify Technical Services at InSiteOne and resend the Study after the problem has been resolved.

C101H Cannot Understand (Unable to Decode IOD)

The indexStore AE Decoder was unable to decode the image which was sent compressed. The Error Comment (0000,0902) will indicate this problem and the Offending Element (0000,0901) will specify the Image Pixel Data (7FE0,0010).

The indexStore AE will log this event and save the IOD for investigation, but not enter it into the Database.

The operator should resend the object using an uncompressed Transfer Syntax.

2.1.3.2.3 Presentation Context Acceptance Criterion

The indexStore AE will accept any Presentation Context for a Storage SOP Class listed in Table 2.1.3.2.2-1 which proposes one of the Transfer Syntaxes listed in Table 2.1.3.2.2-2, 2.1.3.2.2-3 or 2.1.3.2.2-4, as appropriate. Any other Presentation Contexts for Storage SOP Classes will be rejected. If more than one Presentation Context is accepted for an SOP Class, then the SCU can choose which Presentation Context to use. Since the Presentation Contexts can be configured, the described criteria are only for the default Presentation Contexts.

2.1.3.2.4 Transfer Syntax Selection Policies

When a Presentation Context proposes more than one Transfer Syntax, then the first acceptable proposed Transfer Syntax as given in Table 2.1.3.2.2-2, 2.1.3.2.2-3 or 2.1.3.2.2-4 will be accepted. Since the Presentation Contexts can be configured, this represents only the default policy.

2.1.3.3 Remote AE Sends a Storage Commitment Request

2.1.3.3.1 Associated Real World Activity

A Remote AE sends a Storage Commit Request (N-ACTION-RQ) for any IOD's which have been successfully stored (C-STORE operation) in the InDex® Archive. This request includes a Transaction UID (0008,1195) which uniquely identifies the Storage

Commitment Request along with a list of Instance UID's of the IOD's for which Storage Commitment is requested. This request will be queued on the InDex® Archive until each of the referenced DICOM files is either sent to an InSiteOne Data Center or determined not to exist.

2.1.3.3.2 Presentation Context Table

Table 2.1.3.3.2-1 Acceptable Presentation Contexts for Storage Commitment SOP Class					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

2.1.3.3.2.1 Conformance to Storage Commitment Push Model SOP Class (SCP)

Any SOP Instances successfully Committed by the indexStore AE will be preserved for the duration as determined by the contract with InSiteOne, Inc.

The IOD's are stored on the local InDex® Archive and sent to an InSiteOne Data Center shortly after they are received. At an InSiteOne Data Center, the IOD's are staged on RAID/SANS until they are transferred to permanent media (e.g. DVD media). No SOP Instance is Committed until a copy of it has reached an InSiteOne Data Center RAID/SANS. The InDex® Archive does not wait until the IOD is transferred to permanent storage before replying to a Storage Commit Request since many Storage Commitment Users (SCU's) will only hold a Storage Commitment Transaction for a few days at most. By default, the Storage Commitment Requests are processed on a nightly basis.

The Storage Media File Set ID attributes (0088,0130) and (0088,0140) are ignored if present in the request. The Referenced Study Component Sequence Attribute (0008,1111) is ignored if present. The Study Component Sequence has been retired in the 2001 DICOM Standard.

The possible error statuses in the N-ACTION-RSP are:

0120H Missing Attribute

The N-ACTION-RQ is missing a required attribute. The Attribute Identifier List (0000,1005) will identify the attribute as one of the following:

- (0008,1195) Transaction UID
- (0008,1199) Referenced SOP Sequence
- (0008,1150) Referenced SOP Class UID
- (0008,1155) Reference SOP Instance UID

The operator should notify the vendor for the Originating AE to resolve this problem.

0210H Duplicate Invocation (Duplicate Transaction UID)

The indexStore AE has received an N-ACTION-RQ with the same Transaction UID (0008,1195) as in a previous request.

This is ignored since the operator probably resent the same transaction twice. If this is not the case, the operator should notify the vendor for the Originating AE.

0213H Resource Limit

The indexStore AE was unable to queue the Storage Commit Request. This could be because the InDex® Archive is out of disk space or some other resource.

The operator should notify Technical Services at InSiteOne and resend the Storage Commitment Request after the problem has been resolved.

2.1.3.3.2 Conformance to Storage Commitment Pull Model SOP Class (SCP)

This SOP Class is not supported by the indexStore AE. It has been retired in the 2001 DICOM Standard.

2.1.3.3.3 Presentation Context Acceptance Criterion

The indexStore AE will accept any Presentation Context for the Storage Commitment Push Model SOP Class which proposes “Explicit VR Little Endian” or “Implicit VR Little Endian” as a Transfer Syntax. Any other Presentation Contexts for this SOP Class will be rejected. If more than one Presentation Context is accepted for this SOP Class, then the SCU can choose which Presentation Context to use.

2.1.3.3.4 Transfer Syntax Selection Policies

The indexStore AE will give preference to “Explicit VR Little Endian” over “Implicit VR Little Endian” as a Transfer Syntax.

2.2 indexPush/indexForward Application Entity - Specification

The indexPush/indexForward AEs provides standard conformance to the DICOM V3.0 SOP Classes as listed in Table 2.2-1 as an SCU.

Table 2.2-1	
SOP Classes Supported by the indexPush/indexForward AE as an SCU	
SOP Class Name (SCU)	SOP Class UID
Stored Print Storage	1.2.840.10008.5.1.1.27
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Digital Mammography Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9
12-Lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
X-Ray Angiographic Bi-plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2

Table 2.2-1	
SOP Classes Supported by the indexPush/indexForward AE as an SCU	
SOP Class Name (SCU)	SOP Class UID
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50
Key Object Selection	1.2.840.10008.5.1.4.1.1.88.59
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128
Standalone PET Curve Storage	1.2.840.10008.5.1.4.1.1.129
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5

2.2.1 Association Establishment Policy

2.2.1.1 General

The maximum number of Presentation Contexts which can be offered is 128. The maximum PDU length offered/accepted is configurable. The default is 65536 bytes.

2.2.1.2 Number of Association

Multiple instances of the indexPush/indexForward AE's can be active at any given time to the same or different Remote AE's.

2.2.1.3 Asynchronous Nature

The indexPush/indexForward AE's do not support asynchronous operations and will not perform asynchronous window negotiation.

2.2.1.4 Implementation Identifying information

Implementation Class UID is "2.16.840.1.114107.1.1.2.x.x".

Implementation Version Name is "indexPush x.x.x".

2.2.2 Association Initiation Policy

2.2.2.1 Images are to be Forwarded to a Remote AE

2.2.2.1.1 Associated Real World Activity

The InDex® Archive can be configured to forward IOD's received from an Originating AE to one or more Destination AE's. If this configuration option is set, the indexStore AE will invoke individual instances of either the indexPush AE or the indexForward AE for each Destination AE. The option of whether to use the indexPush AE or the indexForward AE to forward IOD's is configurable by Originating AE or Destination AE.

The indexPush AE is invoked with a list of all the IOD's to forward. The list includes the IOD's that indexStore AE accepted from the Association with the Originating AE. To process the list, indexPush AE will negotiate an Association with the Destination AE and send a C-STORE Request for each IOD.

The indexPush AE is configured with a limit on the number of times it will try sending the IOD's. As a result, the indexPush AE does not guarantee delivery of IOD's to a Destination AE.

The indexForward AE is invoked once for each Destination AE and continually scans for new IOD's to process. If the indexForward AE fails to send any IOD, it will periodically retry sending that IOD until it succeeds. Thus, the indexForward AE guarantees delivery of IOD's to the Destination AE.

2.2.2.1.2 Proposed Presentation Contexts

The proposed Presentation Contexts listed below represent the default Presentation Contexts. The actual Presentation Contexts proposed can be configured (see Section 5). Custom configurations of proposed Presentation Contexts can be made based on the Destination AE Title.

Table 2.2.2.1.2-1				
Acceptable Presentation Contexts for indexPush/indexForward Storage SOP Classes				
Abstract Syntax		Transfer Syntax	Role	Ext. Neg.
SOP Class Name	SOP Class UID	(See Table)		
Stored Print Storage	1.2.840.10008.5.1.1.27	2.2.2.1.2-3	SCU	None
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29	2.2.2.1.2-3	SCU	None
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30	2.2.2.1.2-3	SCU	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	2.2.2.1.2-4	SCU	None

**Table 2.2.2.1.2-1
Acceptable Presentation Contexts for indexPush/indexForward Storage
SOP Classes**

Abstract Syntax		Transfer Syntax (See Table)	Role	Ext. Neg.
SOP Class Name	SOP Class UID			
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	2.2.2.1.2-4	SCU	None
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	2.2.2.1.2-4	SCU	None
Digital Mammography Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	2.2.2.1.2-4	SCU	None
Digital Mammography Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	2.2.2.1.2-4	SCU	None
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	2.2.2.1.2-4	SCU	None
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	2.2.2.1.2-4	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	2.2.2.1.2-3	SCU	None
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	2.2.2.1.2-3	SCU	None
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	2.2.2.1.2-4	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	2.2.2.1.2-4	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	2.2.2.1.2-3	SCU	None
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	2.2.2.1.2-3	SCU	None
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	2.2.2.1.2-4	SCU	None
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	2.2.2.1.2-4	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	2.2.2.1.2-4	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	2.2.2.1.2-3	SCU	None
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	2.2.2.1.2-3	SCU	None
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	2.2.2.1.2-3	SCU	None
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	2.2.2.1.2-3	SCU	None
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8	2.2.2.1.2-2	SCU	None

**Table 2.2.2.1.2-1
Acceptable Presentation Contexts for indexPush/indexForward Storage
SOP Classes**

Abstract Syntax		Transfer Syntax (See Table)	Role	Ext. Neg.
SOP Class Name	SOP Class UID			
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	2.2.2.1.2-2	SCU	None
12-Lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	2.2.2.1.2-2	SCU	None
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	2.2.2.1.2-2	SCU	None
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	2.2.2.1.2-2	SCU	None
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10	2.2.2.1.2-2	SCU	None
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11	2.2.2.1.2-2	SCU	None
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	2.2.2.1.2-2	SCU	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	2.2.2.1.2-4	SCU	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	2.2.2.1.2-4	SCU	None
X-Ray Angiographic Bi-plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	2.2.2.1.2-4	SCU	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	2.2.2.1.2-4	SCU	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	2.2.2.1.2-4	SCU	None
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	2.2.2.1.2-4	SCU	None
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	2.2.2.1.2-4	SCU	None
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	2.2.2.1.2-4	SCU	None
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	2.2.2.1.2-2	SCU	None
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	2.2.2.1.2-2	SCU	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	2.2.2.1.2-2	SCU	None
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	2.2.2.1.2-2	SCU	None
Key Object Selection	1.2.840.10008.5.1.4.1.1.88.59	2.2.2.1.2-2	SCU	None
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	2.2.2.1.2-2	SCU	None
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	2.2.2.1.2-4	SCU	None
Standalone PET Curve Storage	1.2.840.10008.5.1.4.1.1.129	2.2.2.1.2-2	SCU	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	2.2.2.1.2-4	SCU	None

**Table 2.2.2.1.2-1
Acceptable Presentation Contexts for indexPush/indexForward Storage
SOP Classes**

Abstract Syntax		Transfer Syntax (See Table)	Role	Ext. Neg.
SOP Class Name	SOP Class UID			
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	2.2.2.1.2-2	SCU	None
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	2.2.2.1.2-2	SCU	None
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	2.2.2.1.2-2	SCU	None
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	2.2.2.1.2-2	SCU	None

**Table 2.2.2.1.2-2
Transfer Syntaxes without Compression**

Transfer Syntax Name	Transfer Syntax UID
Little Endian Implicit	1.2.840.10008.1.2
Little Endian Explicit	1.2.840.10008.1.2.1

**Table 2.2.2.1.2-3
Transfer Syntaxes with Lossless Compression**

Transfer Syntax Name	Transfer Syntax UID
Little Endian Implicit	1.2.840.10008.1.2
Little Endian Explicit	1.2.840.10008.1.2.1
JPEG Lossless, Default	1.2.840.10008.1.2.4.70
RLE Lossless	1.2.840.10008.1.2.5

**Table 2.2.2.1.2-4
Transfer Syntaxes with Lossy and Lossless Compression**

Transfer Syntax Name	Transfer Syntax UID
Little Endian Implicit	1.2.840.10008.1.2
Little Endian Explicit	1.2.840.10008.1.2.1
JPEG Lossy, Baseline	1.2.840.10008.1.2.4.50
JPEG Lossless, Default	1.2.840.10008.1.2.4.70
RLE Lossless	1.2.840.10008.1.2.5

2.2.2.1.2.1 Conformance to Storage SOP Classes (SCU)

The indexPush/indexForward AE's forward all elements from each original IOD including all optional and private members, as received by the indexStore AE. In order to assure DICOM compliance, the originating modality of each IOD must be DICOM compliant.

On success of any C-STORE Request, the indexPush AE and the indexForward AE will go on to the next IOD to process, if any. IndexForward AE will remove the IOD File from its queue and go on to the next queued IOD File.

If a failure status occurs from a C-STORE Request, the indexPush AE will retry sending the failed IOD for the configured number of times. The indexForward AE will continually retry to send a failed IOD, without limit.

Some elements of an IOD may be modified if the Pixel Data needs to be encoded (e.g. JPEG Lossy) or decoded. For example, the Photometric Interpretation will be changed to YBR_FULL_422 if JPEG Lossy is used. The following attributes may be modified or added by the InSiteOne Encoders and Decoders:

Photometric Interpretation (0028,0004)

Planar Configuration (0028,0006)

SOP Instance UID (JPEG Lossy only)

Lossy Image Compression (0028,2110)

Lossy Image Compression Ratio (0028,2112)

If a stored JPEG Lossy IOD is forwarded uncompressed then it will be converted to an interleaved RGB image.

If a stored RLE Lossless or JPEG Lossless IOD is forwarded uncompressed then it will be Planar if the Photometric Interpretation is YBR_FULL, otherwise it will be Interleaved.

The Lossy Image Compression Attribute and the original Lossy Image Compression Ratio Attribute will always be preserved in an IOD no matter whether it is decoded or re-encoded.

2.2.2.1.3 Transfer Syntax Selection Policies

When multiple Presentation Contexts are accepted with the same SOP Class, then any IOD with that SOP Class will use the following criteria for choosing a Transfer Syntax:

1. If the IOD is stored with a compressed Transfer Syntax and that is one of the accepted Transfer Syntaxes, then it will be sent as is.
2. Otherwise, if any of the accepted Transfer Syntaxes support compression, then the first accepted Presentation Context with a compression Transfer Syntax will be selected where the IOD can be successfully converted to that Transfer Syntax.
3. Otherwise, if a Presentation Context with “Explicit VR Little Endian” is accepted for the IOD’s SOP Class, it will be used.
4. Otherwise, the “Implicit VR Little Endian” Transfer Syntax will be used.

2.2.3 Association Acceptance Policy

The indexPush/indexForward AE's are strictly Storage Service Class Users (SCU's) and do not accept Associations.

2.3 indexQuery Application Entity - Specification

The indexQuery AE provides standard conformance to the DICOM V3.0 SOP Classes listed in Table 2.3-1 as an SCP.

Table 2.3-1	
SOP Classes Supported by the indexQuery AE as an SCP	
SOP Class Name (SCP)	SOP Class UID
Verification	1.2.840.10008.1.1
Patient Root Q/R Information Model FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Q/R Information Model MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Q/R Information Model FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Q/R Information Model MOVE	1.2.840.10008.5.1.4.1.2.2.2

The indexQuery AE provides standard conformance to the same DICOM V3.0 SOP Classes as a Storage SCU as do the indexPush/indexForward AE. See Table 2.2-1.

2.3.1 Association Establishment Policy

2.3.1.1 General

The maximum number of Presentation Contexts which can be offered is 128. The maximum PDU length offered/accepted is configurable. The default is 65536 bytes.

2.3.1.2 Number of Associations

The indexQuery AE supports multiple Associations at one time. The limit is based on the size of the InDex® Archive and how many Associations the indexStore AE has opened. This limit is typically 25 on a small InDex® Archive configuration.

The indexQuery AE is limited to 5 pending Association Requests. Once an Association is negotiated and accepted it is no longer pending and not counted in this limit.

2.3.1.3 Asynchronous Nature

The indexQuery AE does not support asynchronous operations and will not perform asynchronous window negotiation.

2.3.1.4 Implementation Identifying Information

Implementation Class UID is “2.16.840.1.114107.1.1.3.x.x”.

Implementation Version Name is “indexQuery x.x.x”.

2.3.2 Association Initiation Policy

2.3.2.1 Images are Requested for Delivery to a Destination AE

2.3.2.1.1 Associated Real World Activity

The indexQuery AE will lookup in the InDex® Archive Database all the IOD’s which match the C-MOVE Request criteria. The list of matching IOD’s will be sorted by Patient Name, Study Date (most recent study first), Study UID, Series UID and Instance Number.

In processing the C-MOVE Request, the indexQuery AE will initiate an Association with the Destination AE as a Storage SCU. Then the indexQuery AE will send C-STORE Requests for each matching IOD and send a C-MOVE-RSP to the Originating AE giving the count of successful and failed C-STORE Requests. After the indexQuery AE has attempted to store all the IOD’s, it will close the Association with the Destination AE and send the final C-MOVE-RSP to the Originating AE with the final status.

2.3.2.1.2 Proposed Presentation Contexts

The indexQuery AE proposes the same Presentation Contexts as the indexPush/indexForward AE given in table 2.2.2.1.2-1. These Presentation Contexts can be configured and custom Presentation Context tables can be used based on the Destination AE Title.

2.3.2.1.2.1 Conformance to Storage SOP Classes (SCU)

The indexQuery AE sends all elements from each original IOD including all optional and private members, as received by the indexStore AE. In order to assure DICOM compliance, the originating modality of each IOD must be DICOM compliant.

On success of any C-STORE-RQ, the indexQuery AE will send a C-MOVE-RSP to the Originating AE with a pending status (FF00H) and the completed sub-operations (0000,1021) will be incremented.

If any failure status occurs from a C-STORE-RQ the indexQuery AE will send a C-MOVE-RSP to the Originating AE with a pending status (FF00H) and the failed sub-operations (0000,1022) will be incremented.

All elements in the original IOD will be forwarded including all optional and private members.

Some elements may be modified if the Pixel Data needs to be encoded (e.g. JPEG Lossy) or decoded. See Section 2.2.2.1.2.1 for details.

2.3.2.1.3 Transfer Syntax Selection Policies

The indexQuery AE has the same Storage SCU Selection Policy as do the indexPush/indexForward AE's. See Section 2.2.2.1.3.

2.3.3 Association Acceptance Policy

2.3.3.1 Remote AE Sends a Verification Request

2.3.3.1.1 Associated Real World Activity

A Remote AE sends a Verification Request (C-ECHO-RQ) to the indexQuery AE which always responds with a status of zero (0).

2.3.3.1.2 Presentation Context Table

Table 2.3.3.1.2-1 Acceptable Presentation Contexts for Verification SOP Class					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

2.3.3.1.2.1 Conformance to the Verification SOP Class (SCP)

The Verification Service conforms to the DICOM V3.0 Standard.

The indexQuery AE always sends a Verification Response (C-ECHO-RSP) with the status of zero (0), success.

2.3.3.1.3 Presentation Context Acceptance Criterion

The indexQuery AE will accept any Presentation Context for the Verification SOP Class which proposes "Explicit VR Little Endian" or "Implicit VR Little Endian" as a Transfer Syntax. Any other Presentation Contexts for the Verification SOP Class will be rejected. If more than one Presentation Context is accepted, the SCU can choose which Presentation Context to use.

2.3.3.1.4 Transfer Syntax Selection Policies

The indexQuery AE will give preference to "Explicit VR Little Endian" over "Implicit VR Little Endian" as a Transfer Syntax.

2.3.3.2 Remote AE Requests Query/Retrieve Find Services

2.3.3.2.1 Associated Real World Activity

A Remote AE (e.g. display station) sends a C-FIND Request at the Patient, Study, Series or Image Level. The indexQuery AE will search the Database for all matching instances. The Database has primary indexes for the following DICOM attributes:

- Patient ID (0010,0020)
- Patient Name (0010,0010)
- Accession Number (0008,0050)
- Study ID (0020,0010)
- Study Instance UID (0020,000D)
- Study Date (0008,0020)
- Series Instance UID (0020,000E)

If no value is given for any of these primary index attributes then the query search will be limited to a configurable number of most recent days. This limit does not apply to the Patient Query Level.

If more than a maximum number of matches are found then an “Out of Resources” error status is returned to the Remote AE and no further action is taken. The maximum number of matches is configurable; the default is 10,000.

The matches are sorted by Patient Name, Study Date (most recent first), Study UID, Series UID and Image Number (Instance Number).

Each of the resulting matches is sent back to the Remote AE with all the requested attributes which are available for the given query level (see Section 2.3.3.2.2.2).

2.3.3.2.2 Presentation Context Table

Table 2.3.3.2.2-1 Acceptable Presentation Contexts for indexQuery FIND SOP Classes					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Patient Root Q/R FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Study Root Q/R FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

2.3.3.2.2.1 Conformance to Query/Retrieve Find SOP Classes (SCP)

The indexQuery AE conforms to the DICOM V3.0 standard as a Query/Retrieve Service Class Provider (SCP).

The indexQuery AE does not support Extended Negotiation and therefore does not negotiate Relational Queries. However, the indexQuery AE will accept wildcards, date ranges and UID list matching for any of the DICOM keys above the specified Query/Retrieve Level.

The indexQuery AE is case insensitive when matching all supported “PN” VR attributes. It is also case insensitive for the “Study Description” (0008,1030), “Modality” (0008,0060) and “Modality in Studies” (0008,0061) attributes.

If no value is given for any of these primary index attributes then the query search will be limited to a configurable number of most recent days. This is used to force a limit on the Database search. This limit can be overridden by specifying any study date or date range including “19800101-”. This limit does not apply to the Patient Query Level.

If more than a maximum number of matches are found then an “Out of Resources” error status is returned to the Remote AE and no further action is taken. If this occurs the operator should refine the query criteria to reduce the number of matches and resend the query request. The maximum number of matches is configurable; the default is 10,000.

To process a C-FIND-RQ, each matching instance is sent as a C-FIND-RSP to the Originating AE with a Pending Status (FF00H), and the requested attributes for that instance are populated. Only those attributes listed in Table 2.3.3.2.2.2-1 through 2.3.3.2.2.2-7 are returned.

The following error status can be given in a C-FIND-RSP:

A700H Out of Resources (Unable to calculate number of matches)

The indexQuery AE found more than the maximum number of matches. No results will be sent back to the Originating AE. The “Error Comment” (0000,0902) will indicate the limit. The limit is configurable; the default is 10,000.

The operator should refine the Query criteria to reduce the number of matches and resend the request.

2.3.3.2.2.2 Conformance to Patient Root Query/Retrieve FIND SOP Class (SCP)

Table 2.3.3.2.2.2-1 Patient Level Attributes for C-FIND			
Description	Tag	Type	Q/R
Patient Name	(0010,0010)	R	Q/R ¹
Patient ID	(0010,0020)	U	Q/R ¹
Patient Birth Date	(0010,0030)	O ²	Q/R
Patient Birth Time	(0010,0032)	O	Q/R
Patient’s Sex	(0010,0040)	O ²	Q/R
Ethnic Group	(0010,2160)	O	Q/R
Number of Patient Related Studies	(0020,1200)	O	R
Number of Patient Related Series	(0020,1202)	O	R
Number of Patient Related Instances	(0020,1204)	O	R

Table 2.3.3.2.2.2-2 Study Level Attributes for C-FIND			
Description	Tag	Type	Q/R
Study Date	(0008,0020)	R	Q/R ¹
Study Time	(0008,0030)	R	Q/R
Accession Number	(0008,0050)	R	Q/R ¹
Study ID	(0020,0010)	R	Q/R ¹
Study Instance UID	(0020,000D)	U	Q/R ¹
Study Status ID	(0032,000A)	O	Q/R
Referring Physician Name	(0008,0090)	O ²	Q/R
Interpretation Author	(4008,010C)	O	Q/R
Study Description	(0008,1030)	O	Q/R
Patient’s Age	(0010,1010)	O	R
Patient’s Size	(0010,1020)	O	R
Patient’s Weight	(0010,1030)	O	R
Occupation	(0010,2180)	O	Q/R
Number of Study Related Series	(0020,1206)	O ²	R

¹ This DICOM field is indexed in the Database for rapid lookup.

**Table 2.3.3.2.2.2-2
Study Level Attributes for C-FIND**

Description	Tag	Type	Q/R
Number of Study Related Instances	(0020,1208)	O ²	R
Modalities in Study	(0008,0061)	O ²	Q/R

**Table 2.3.3.2.2.2-3
Series Level Attributes for C-FIND**

Description	Tag	Type	Q/R
Modality	(0008,0060)	R	Q/R
Series Number	(0020,0011)	R	Q/R
Series Instance UID	(0020,000E)	U	Q/R ¹
Number of series related Instance	(0020,1209)	O ²	R
Request Attribute Sequence	(0040,0275)	O ²	Q/R
> Requested Procedure ID	(0040,1001)	O ²	Q/R
> Scheduled Procedure Step ID	(0040,0009)	O ²	Q/R
Performed Procedure Step Start Date	(0040,0244)	O ²	Q/R
Performed Procedure Step Start Time	(0040,0245)	O ²	Q/R

**Table 2.3.3.2.2.2-4
Image Level Attributes for C-FIND**

Description	Tag	Type	Q/R
Instance Number	(0020,0013)	R	Q/R
SOP Instance UID	(0008,0018)	U	Q/R ¹
SOP Class UID	(0008,0016)	O ²	Q/R
Overlay Number	(0020,2022)	O	R
Curve Number	(0020,0024)	O	R
LUT Number	(0020,0026)	O	R
Slice Location	(0020,1041)	O	R
Samples Per Pixel	(0028,0002)	O	R
Photometric Interpretation	(0028,0004)	O	R
Planar Configuration	(0028,0006)	O	R
Number of Frames	(0028,0008)	O ²	R
Rows	(0028,0010)	O ²	R
Columns	(0028,0011)	O ²	R
Bits Allocated	(0028,0100)	O ²	R
Pixel Representation	(0028,0103)	O	R
Lossy Image Compression	(0028,2110)	O	R
Lossy Image Compression Ratio	(0028,2112)	O	R

² This is required by IHE.

**Table 2.3.3.2.2.2-5
Instance Level Attributes for C-FIND
Presentation State (“PR”)**

Description	Tag	Type	Q/R
Presentation Label	(0070,0080)	O ²	R
Presentation Description	(0070,0081)	O ²	R
Presentation Creation Date	(0070,0082)	O ²	R
Presentation Creation Time	(0070,0083)	O ²	R
Presentation Creator’s Name	(0070,0084)	O ²	R
Referenced Series Sequence	(0008,1115)	O ²	R
> Series Instance UID	(0020,000E)	O ²	R
> Referenced Image Sequence	(0008,1140)	O ²	R
>> Referenced SOP Class UID	(0008,1150)	O ²	R
>> Referenced SOP Instance UID	(0008,1155)	O ²	R

**Table 2.3.3.2.2.2-6
Instance Level Attributes for C-FIND
Key Object Selection (“KY”) and Structured Reports (“SR”)**

Description	Tag	Type	Q/R
Content Date	(0008,0023)	O ²	R
Content Time	(0008,0033)	O ²	R
Observation DateTime	(0040,A032)	O ²	R
Referenced Request Sequence	(0040,A370)	O ²	R
> Study Instance UID	(0020,000D)	O ²	R
> Accession Number	(0008,0050)	O ²	R
> Requested Procedure ID	(0040,1000)	O ²	R
> Requested Procedure Code Sequence	(0032,1064)	O ²	R
>> Code Value	(0008,0100)	O ²	R
>> Coding Scheme Designator	(0008,0102)	O ²	R
>> Coding Scheme Version	(0008,0103)	O ²	R
>> Code Meaning	(0008,0104)	O ²	R
Concept Name Code Sequence	(0040,A043)	O ²	Q/R
> Code Value	(0008,0100)	O ²	Q/R
> Coding Scheme Designator	(0008,0102)	O ²	Q/R
> Coding Scheme Version	(0008,0103)	O ²	R
> Code Meaning	(0008,0104)	O ²	R

**Table 2.3.3.2.2.2-7
Instance Level Attributes for C-FIND
Structured Reports (“SR”)**

Description	Tag	Type	Q/R
Completion Flag	(0040,A491)	O ²	Q/R
Verification Flag	(0040,A493)	O ²	Q/R
Verifying Observer Sequence	(0040,A073)	O ²	Q/R

**Table 2.3.3.2.2.2-7
Instance Level Attributes for C-FIND
Structured Reports (“SR”)**

> Verifying Organization	(0040,A027)	O ²	R
> Verification DateTime	(0040,A030)	O ²	Q/R
> Verifying Observer Name	(0040,A075)	O ²	Q/R
> Verifying Observer Identification Code Sequence	(0040,A088)	O ²	R

2.3.3.2.2.3 Conformance to Study Root Query/Retrieve FIND SOP Class (SCP)

This SOP Class supports the attributes described in Tables 2.3.3.2.2.2-2 through 2.3.3.2.2.2-7.

2.3.3.2.3 Presentation Context Acceptance Criterion

The indexQuery AE will accept any Presentation Context for the Query/Retrieve Find SOP Classes listed in Section 2.3.3.2.2 which proposes “Explicit VR Little Endian” or “Implicit VR Little Endian” as a Transfer Syntax. Any other Presentation Contexts for a Query/Retrieve Find SOP Class will be rejected. If more than one Presentation Context is accepted for the same SOP Class, the SCU can choose which Presentation Context to use.

2.3.3.2.4 Transfer Syntax Acceptance Policies

The indexQuery AE will give preference to “Explicit VR Little Endian” over “Implicit VR Little Endian” as a Transfer Syntax.

2.3.3.3 Remote AE Requests Query/Retrieve Move Services

2.3.3.3.1 Associated Real World Activity

A Remote AE (e.g. display station) sends a C-MOVE Request at the Patient, Study, Series or Image Level giving an AE Title for the Destination AE (0000,0600). The indexQuery AE will search the Database for all matching instances. The Database has primary indexes for the following DICOM attributes:

- Patient ID (0010,0020)
- Patient Name (0010,0010)
- Accession Number (0008,0050)
- Study ID (0020,0010)
- Study Instance UID (0020,000D)
- Study Date (0008,0020)
- Series Instance UID (0020,000E)

If no value is given for any of these primary index attributes then the query search will be limited to a configurable number of most recent days. This limit does not apply to the Patient Query Level.

If more than the maximum number of matches are found then an “Out of Resources” error status is returned to the Remote AE and no further action is taken. The maximum number of matches is configurable; the default is 10,000.

The matches are sorted by Patient Name, Study Date (most recent first), Study UID, Series UID and Image Number (Instance Number).

The matching files are retrieved, either locally or from an InSiteOne Data Center, and delivered to the Destination AE specified in the C-MOVE Request.

The latency for Study retrieval from local RAID is a factor of the size of the Study and the availability and speed of the local network. The latency for Study retrieval from an InSiteOne Data Center is a factor of the access speed of the near line storage media (e.g. a DVD Jukebox) and the availability and speed of the network connection between the customer site and the InSiteOne Data Center.

2.3.3.3.2 Presentation Context Table

Table 2.3.3.3.2-1					
Acceptable Presentation Contexts for indexQuery MOVE SOP Classes					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Patient Root Q/R MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Study Root Q/R MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

2.3.3.3.2.1 Conformance to Query/Retrieve Move SOP Classes (SCP)

The indexQuery AE conforms to the DICOM V3.0 standard as a Query/Retrieve Service Class Provider (SCP).

The indexQuery AE does not support Extended Negotiation and therefore does not negotiate Relational Queries.

The indexQuery AE is case insensitive when matching all supported “PN” VR attributes.

The indexQuery AE proposes the same Presentation Contexts as the indexPush AE and the indexForward AE given in table 2.2.2.1.2-1 when acting as a Storage Service Class User (SCU) for C-MOVE Requests.

For each IOD that the indexQuery AE attempts to send to the Destination AE, a C-MOVE-RSP will be sent to the Originating AE with a pending status (FF00H) and either the the number of completed sub-operations (0000,1021) or the number of failed sub-operations (0000,1022) is incremented and the number of remaining sub-operations (0000,1020) is decremented.

The following error statuses can be given in the final C-MOVE-RSP:

A701H Out of Resources (Unable to calculate number of matches)

The indexQuery AE found more than the maximum number of matches. No IOD's will be moved to the Destination AE. The "Error Comment" (0000,0902) will indicate the actual limit. The limit is configurable; the default is 10,000.

The operator should refine the Move criteria to reduce the number of matches and resend the request.

A801H Move Destination Unknown

The InDex® Archive does not have the specified Destination AE Title in its configuration.

The operator can try sending the request with a different Destination AE.

The operator can contact InSiteOne Technical Services to have this Destination AE Title added. Then the operator can resend the C-MOVE Request.

C801H Unable to Process

The indexQuery AE was unable to connect to the Destination AE.

The operator should verify that the correct Destination AE was specified and that it is operational. After the problem is resolved, the operator should resend the request.

Alternatively, the Host IP Address or Port Number may not be properly configured in the InDex® Archive. Contact InSiteOne Technical Services to verify the configuration.

B000H Sub-operations Complete - One or More Failures

One or more of the requested IOD's was not successfully sent to the Destination AE. The Failed UID List (0008,0058) will list the SOP Instance UID's of all IOD's which were not sent to the Destination AE.

One of the following reasons could be responsible for the failure:

1. The connection to the Destination AE has dropped. This may be caused by a network problem or a timeout. The operator should verify that the Destination AE is still operational and resend the request.

2. The destination AE does not accept IOD's for a given SOP Class. The operator could send the IOD's to a different Destination AE which can process an IOD with that SOP Class.
3. The Destination AE returned an error status for a C-STORE-RQ. If the problem persists the operator should contact the vendor for the Destination AE. InSiteOne Technical Services can determine the failure status returned by the Destination AE.
4. The indexQuery AE timed out waiting for an IOD to arrive from an InSiteOne Data Center. The time-out is configurable; the default is 600 seconds. This may be caused by a network problem or congestion at an InSiteOne Data Center. Even though the C-MOVE-RQ returned with failed sub-operations, the InSiteOne Data Center will continue to send the failed IOD's to the InDex® Archive. Therefore, the operator may wish to send the request later. If the problem persists, the operator should contact InSiteOne Technical Services.
5. The IOD was not found on the InDex® Archive nor at any of the InSiteOne Data Centers; or the indexQuery AE was unable to read the IOD. The operator should contact InSiteOne Technical Services.

Unfortunately, DICOM has no mechanism for reporting which of these failures caused the problem. If the operator is unable to resolve the problem, the operator should contact InSiteOne Technical Services.

2.3.3.3.2.2 Conformance to Patient Root Query/Retrieve MOVE SOP Class (SCP)

Table 2.3.3.3.2.2-1 Patient Level Attributes for C-MOVE		
Description	Tag	Type
Patient ID	(0010,0020)	U

Table 2.3.3.3.2.2-2 Study Level Attributes for C-MOVE		
Description	Tag	Type
Study Instance UID	(0020,000D)	U

Table 2.3.3.3.2.2-3 Series Level Attributes for C-MOVE		
Description	Tag	Type
Series Instance UID	(0020,000E)	U

**Table 2.3.3.3.2.2-4
Image Level Attributes for C-MOVE**

Description	Tag	Type
SOP Instance UID	(0008,0018)	U

2.3.3.3.2.3 Conformance to Study Root Query/Retrieve MOVE SOP Class (SCP)

This SOP Class supports the attributes described in Tables 2.3.3.3.2.2-2 through Table 2.3.3.3.2.2-4.

2.3.3.3.3 Presentation Context Acceptance Criterion

The indexQuery AE will accept any Presentation Context for the Query/Retrieve Move SOP Classes listed in Section 2.3.3.3.2 which proposes the “Explicit VR Little Endian” or “Implicit VR Little Endian” Transfer Syntaxes. Any other Presentation Contexts for a Query/Retrieve Move SOP Class will be rejected. If more than one Presentation Context is accepted for the same SOP Class, the SCU can choose which Presentation Context to use.

2.3.3.3.4 Transfer Syntax Acceptance Policies

The indexQuery AE will give preference to “Explicit VR Little Endian” over “Implicit VR Little Endian” as a Transfer Syntax.

3 Communications Profile

3.1 Supported Communications Stacks

3.2 TCP/IP Stack

The InDex® Archive provides DICOM TCP/IP network communications support as defined in DICOM V3.0 PS 3.8 Network Communications Support for Message Exchange.

3.2.1 API

The TCP/IP Stack is inherited from the Linux Operating System.

3.2.2 Physical Media Support

The InDex® Archive supports 10/100 BaseT and Gigabit networks.

4 Extensions/Specializations/Privatizations

None.

5 Configuration

5.1 AE Title/Presentation Address Mapping

The InDex® Archive DICOM configuration file has sections that provide a mapping of an AE Title to a presentation address. A presentation address consists of an AE Title, IP Address and Port Number (SCP only).

Example:

AE Title: indexStore-Pxxx	IP: 10.2.2.5	Port: 10104
AE Title: indexQuery-Pxxx	IP: 10.2.2.5	Port: 14444
AE Title: indexPush-Pxxx	IP: 10.2.2.5	

The configuration file also defines Remote DICOM Application Entities which interact with the InDex® Archive as SCP's or SCU's. The AE's are defined in terms of AE Title, IP Address, Port (for SCP's) and a Forwarding list (optional). The Forwarding list specifies the Remote AE's or InDex® Archives (collectively, "Destination AE's") to which all IOD's received from the specified AE (the "Originating AE") will be forwarded.

Example:

AE Title: GE-CATSCAN-422	IP: 10.1.0.5	Forwarding: RADWORKS-1,EFILM-3
AE Title: ER1-XRAY-143	IP: 10.4.1.7	Forwarding: ER1-DICOMEYE
AE Title: RADWORKS-1	IP: 10.1.0.14	Port: 104
AE Title: ER1-DICOMEYE	IP: 10.4.1.3	Port: 1377
AE Title: EFILM-3	IP: 10.2.1.6	Port: 10276

5.2 Configurable Parameters

The following can be configured:

- Association Time-out Values
- SCP read/write Time-out Values for the indexStore AE and the indexQuery AE
- SCU read/write Time-out Values for the indexPush AE and the indexForward AE
- Maximum PDU Length
- Duplicate Policy
- Forwarding Retry Policy
- Maximum Matches on C-FIND/C-MOVE
- Maximum number of recent days to search for a C-FIND-RQ or C-MOVE-RQ if no value is given for any of the primary index attributes
- Maximum number of days that the indexStore AE will try to send results of a Storage Commitment Request back to the requester

In addition, the allowed Transfer Syntaxes for each SOP Class supported by the InDex® Archive can be configured on a system wide basis. Furthermore, the allowed Transfer Syntaxes can be overridden for specific Destination AE Titles. This applies to forwarding by the indexPush/indexForward AE's and C-MOVE operations by the indexQuery AE.

6 Support of Extended Character Sets

The InDex® Archive has no special support for Extended Character Sets.

The indexStore AE will accept any IOD regardless of its Character Set.

The indexQuery AE may not match attributes using an Extended Character Set (e.g. Patient Name) but will still match all UID's and all attributes that use only the standard ASCII characters.

The indexPush/indexForward AE will forward IOD's with the original Character Set, as it was received by the indexStore AE.

7 Codes and Controlled Terminology

None.

8 Security Profiles

No Security Profiles Supported.