ITH icoserve
technology for healthcare GmbH

DICOM 3.0 CONFORMANCE STATEMENT
InboundServer, icoview, icoframe, icoadmin
Version Habicht

3.0.0.0

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Revision History

Revision Number	Date	Author	Reason for Change
3.0.0.0	27/12/2010	Peter Klotz	Habicht version number change
2.0.1.7	13/12/2010	Peter Klotz	Updated keys for icoview C-FIND requests
2.0.1.6	10/12/2010	Christian Fremgen	Updated keys for icoview C-FIND requests
2.0.1.5	10/12/2010	Peter Klotz	Updated supported SOP classes
2.0.1.4	16/09/2010	Peter Klotz	Mention that Person Name fields are matched case-insensitive
2.0.1.3	15/09/2010	Peter Klotz, Michael Theurl	Major overhaul of InboundServer parts
2.0.1.2	14/09/2010	Michael Theurl	Changed Storage Commitment and added Modality Performed Procedure Step description
2.0.1.1	07/05/2010	Peter Klotz	Corrected typos
2.0.1.0	23/06/2009	Christian Fremgen	Initial Habicht version as copy of Glockner 2.0.0.2, corrected used character set for icoframe
2.0.0.2	11/05/2009	Peter Klotz	Corrected C-STORE Transfer Syntaxes
2.0.0.1	25/03/2009	Christian Fremgen	List of supported storage SOP classes for icoview AE is the same as for InboundServer AE
2.0.0.0	04/03/2009	Peter Klotz	Switched from DicomServer to InboundServer
1.7	27/02/2009	Andreas Brunner	Added icoadmin
1.6	29/02/2008	Christian Fremgen	Document update
1.5	21/01/2008	Michael Theurl	Corrected spelling
1.4	18/12/2007	Samrend Saboor	Document update
1.3	27/02/2007	Samrend Saboor	Minor changes in DicomServer implementation. Added icoview and icoframe.
1.2	11/12/2006	Markus Schwab	Minor update
1.1	25/07/2006	Samrend Saboor	Major update due to new release
1.0	27/10/2003	Thomas Pellizzari	Initial revision

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1 Introduction

1.1 Purpose of this document

This document is the DICOM 3.0 Conformance Statement for four products out of the icoserve product portfolio – InboundServer, icoview, icoframe and icoadmin. The statement is meant to formally describe the DICOM capabilities of these four products.

InboundServer is the central solution portfolio for medical data processing in the icoserve Advanced Image Management (icoserve AIM). As hospital-wide solution for PACS, image and document management, icoserve AIM collects all image data and documents within your hospital processing them into the multimedia electronic patient record.

icoview is icoserve's versatile multi-modality displaying system for DICOM images. It is able to retrieve and display DICOM images either from specified directories or CD media or from icoserve AIM or with Query/Retrieve from third party PACS systems. Additionally icoview supports printing these images. Further, it is possible to export DICOM images, series or studies on CD media.

icoframe is able to retrieve DICOM images, series and studies from specified directories or CD media and import them into the icoserve AIM.

icoadmin is a Web 2.0 portal which enclosures Internet-Browser-based solutions in the icoserve AIM. It offers a possibility for downloading DICOM images from the icoserve AIM and storing it on a specified directory. This happens by the so called Web Access to DICOM Persistent Objects (WADO), as specified in DICOM 2009 PS 3.18.

1.2 Intended Audience

This document is intended for e.g. network administrators, hospital staff or software designer who are familiar with system integration and/or software design.

Further, the terms used in this document are defined according to the DICOM standard. Thus, we assume that the user is also familiar with the terminology and concepts that are used in the DICOM 3.0 standard.

Readers not familiar with DICOM 3.0 terminology should first read the appropriate parts of the DICOM standard itself, prior to reading this conformance statement.

1.3 Remarks

This Conformance Statement should help to validate the integration of InboundServer, icoview, icoframe and icoadmin within a DICOM environment. This statement is not intended to replace the validation with other DICOM equipment to ensure proper exchange of information intended. Thus, it is still important to ensure the proper interoperability of the intended DICOM integration.

The user should be aware of the following important issues:

- The comparison of different Conformance Statements should be the first step towards the assessment of the interoperability within a DICOM environment

- Test procedures should be defined to validate the desired level of connectivity.

2 Implementation Model

2.1 Application Data Flow Diagram

2.1.1 icoview Application Data Flow Diagram

icoview provides a user interface for reading (i.e. FSR) and exporting (i.e., FSC) DICOM files from portable media (e.g. CDs), network directories or the local file system. These functions are integral components of the icoview. However, within the context of this Conformance Statement the reading functionality is referred to as icoview-FSR Application Entity (AE) and the exporting functionality as icoview-FSC AE.

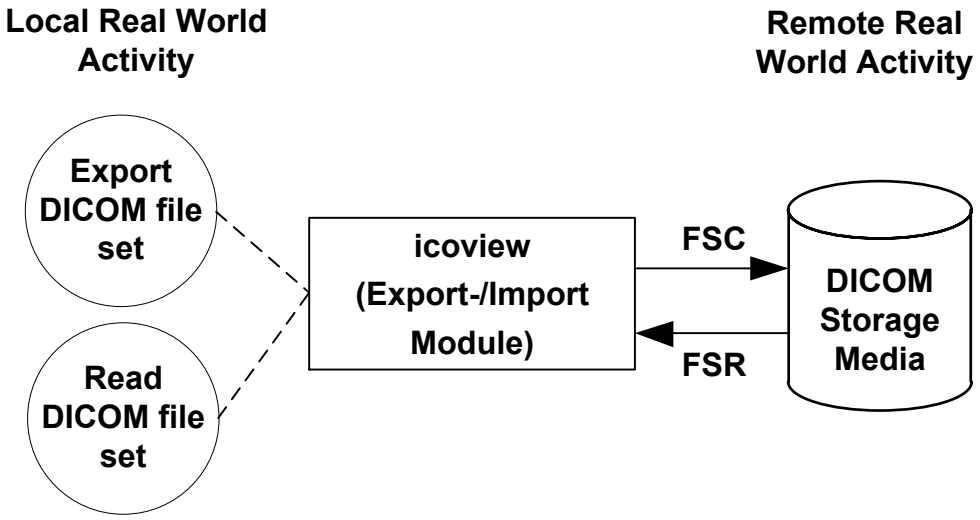

Figure 1: icoview FSC and icoview FSR Application Data Flow Diagram

Additionally icoview provides the ability to query third party PACS systems and retrieve data from them. icoview also provides report reading capabilities for Structured Reports and the possibility to apply Grayscale Softcopy Presentation States (GSPS) as defined in DICOM 2009 PS 3.3. For display consistency the DICOM Grayscale Standard Display Function (GSDF) as described in DICOM 2009 PS 3.14 is supported. In this Conformance Statement the capabilities of icoview as an image display are referred to as icoview-ID AE.

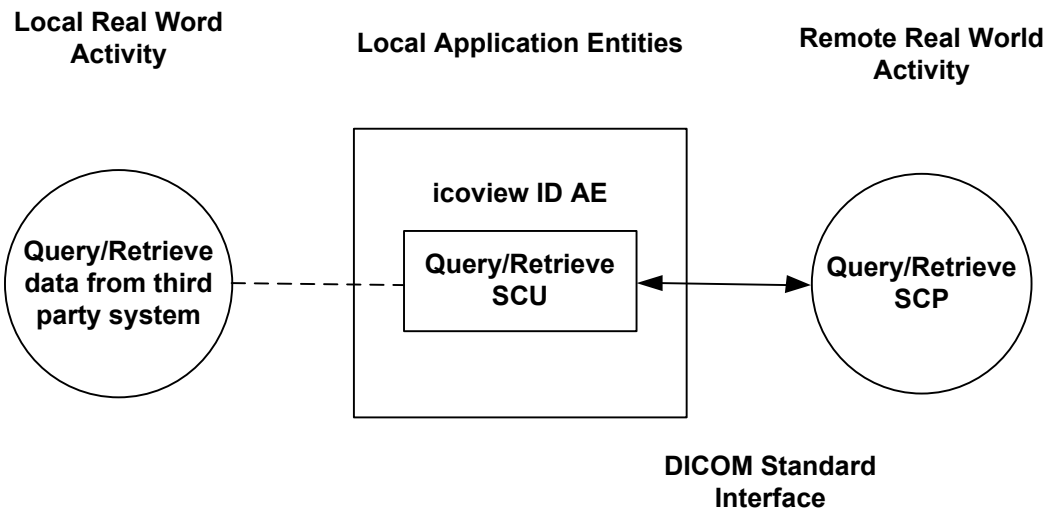

Figure 2: icoview ID AE Application Data Flow Diagram

2.1.2 icoframe Appplication Data Flow Diagram

icoframe is able to read (i.e. FSR) DICOM files from portable media (e.g. CDs), network directories or the local file system. Loaded DICOM file sets can be imported directly into the icoserve AIM. Within the context of this Conformance Statement the importing functionality of icoframe is referred to as icoframe-FSR AE.

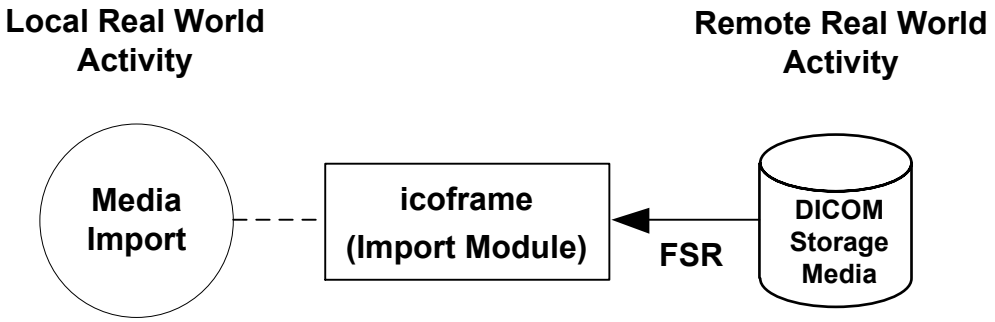

Figure 3: icoframe Application Data Flow Diagram

2.1.3 icoadmin Application Data Flow Diagram

icoadmin is able to offer a download of DICOM images from icoserve AIM to the application that performs the WADO request. The downloaded files can be stored anywhere on a portable media (e.g. CDs), network directory or the local file system.

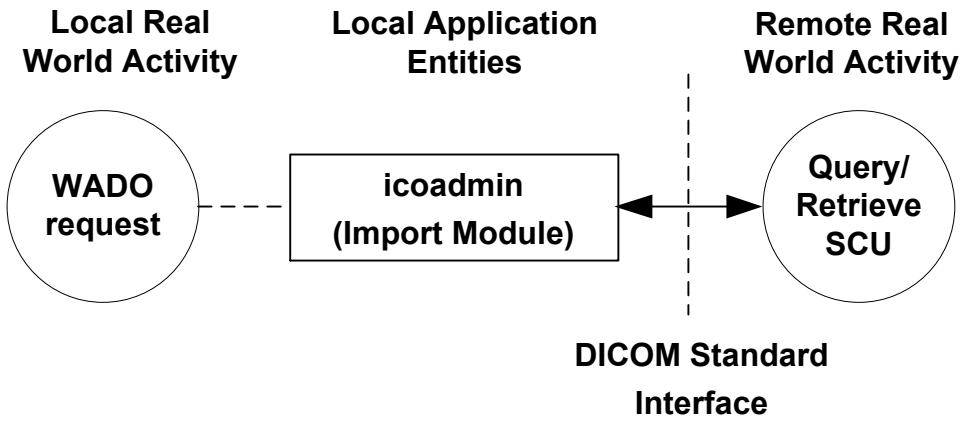

Figure 4: icoadmin Application Data Flow Diagram

2.1.4 InboundServer Application Data Flow Diagram

InboundServer is implemented as a single AE which provides a set of different services. For each of these services InboundServer can act in a specific role.

By default the different services are accessible through one predefined AE title of an actual InboundServer instance.

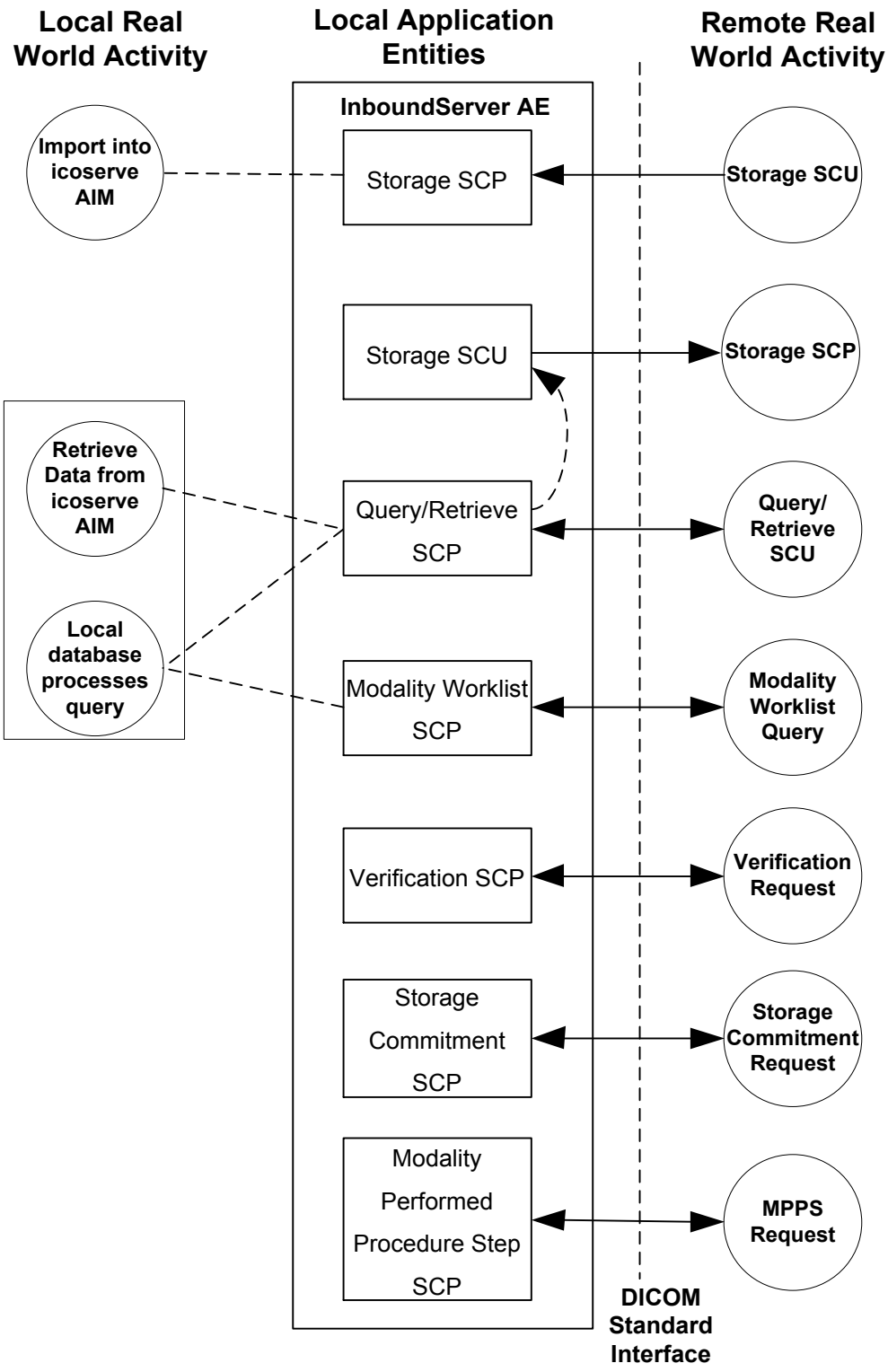

Figure 5: Inbound Server Application Data Flow Diagram

2.2 Functional Definition of AEs

2.2.1 icoview

The icoview-FSR AE is able to read and icoview-FSC AE is able to write user-selected DICOM files like DICOMDIR or image objects which are compliant to DICOM 2009 PS 3.10. These files can be located either on the local file system or DICOM 2009 PS 3.12 compliant media. Both AEs support the General Purpose CD-R Interchange Profile.

The icoview-FSC AE allows the usage of any other third party CD editing software which can write directory structures to CDs. Thus, the icoview-FSC AE basically is able to write DICOM file sets also to DVD-RAM.

The icoview-ID AE is able to query third party PACS systems using the C-FIND Service and retrieve data using the C-MOVE Service according to DICOM 2009 PS 3.7. The third party PACS systems can be queried using the Study Root Query/Retrieve Information Model as defined in DICOM 2009 PS 3.4, C.3.2. For C-FIND SCU and C-MOVE SCU baseline behavior is supported.

The icoview-ID AE is able to render images and structured reports received using Query/Retrieve or icoview-FSR AE. All three general structured report document classes are supported. They are specified in DICOM 2009 PS 3.3. The contents are rendered as text with references to other instances. Referenced images can be shown and referenced GSPS can be applied. All spatial transformations, presentation LUTs and textual annotations are supported. Section 3.1 describes the supported SOP Classes for icoview-ID.

2.2.2 icoframe

The icoframe-FSR AE is able to read user-selected DICOM files like DICOMDIR or image objects which are compliant to DICOM 2009 PS 3.10. These files can be located either on the local file system or DICOM 2009 PS 3.12 compliant media.

2.2.3 icoadmin

The icoadmin AE waits for a WADO request from another application (e.g. an Internet Browser). If this happens, icoadmin queries the icoserve AIM for the requested DICOM image and returns it to the requesting application.

2.2.4 InboundServer

InboundServer AE waits for another application to connect and initiate a DICOM association. When another application connects, InboundServer AE expects it to be a DICOM application. InboundServer AE implements several DICOM Service Classes. In total the following services are provided by this AE:

- Verification SCP answers communication tests from remote applications – C-ECHO
- Storage SCP implements the answer to external C-STORE requests. It is able to receive incoming DICOM image files sent by remote DICOM applications (e.g., modalities or workstations) and add them to the icoserve AIM database.

- The Query/Retrieve SCP implements the answer to C-FIND and C-MOVE requests. Remote applications can request queries on Patient-, Study-, Series- or Image-level using the Patient Root or Study Root query model.InboundServer AE functions as a Storage SCU when responding to a C-MOVE request.
- Modality Worklist SCP allows remote applications (e.g., modalities) to query the AIM database for modality worklists.
- Storage Commitment SCP implements the answer to external N-ACTION requests and sends back the N-EVENT-REPORT response. The response can be sent on either the incoming or on a newly established association.
- Modality Performed Procedure Step SCP implements the answer to external N-CREATE/N-SET requests and forwards the received requests to all configured destinations. The forwarding can be disabled.

On association startup the calling AET is looked up in the database to determine a corresponding configuration. This configuration determines the InboundServer behavior in several aspects including the number of services provided and the data accessible to the requesting AE.

2.3 Sequencing of Real-World Activities

The services of icoview- and icoframe-AEs can be requested at any time by the user through the user interface.

The services of the icoadmin AE can also be requested at any time by the user or the application that performs the WADO request.

The services of the InboundServer-AE must be requested according to the Service Class specifications in DICOM 2009 PS 3.3.

3 Application Entitiy Specifications

3.1 icoview

Icoview-FSC and icoview-FSR, solely provide functionalities for handling DICOM media. Thus, they are described separately in 4.1.4 File Meta Information. Icoview-ID is described in the next section.

3.1.1 Supported SOP Classes for icoview-ID AE

The icoview-ID AE provides standard conformance to the same list of SOP Classes as the InboundServer AE as SCP (see 4.4). Additionally the SOP classes in the following tables are supported.

Table 1: Supported Query/Retrieve SOP classes

SOP Class Name	SOP Class UID	SCP	SCU
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	-	Y
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	-	Y

Table 2: Supported Print Management SOP classes

SOP Class Name	SOP Class UID	SCP	SCU
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	-	Y
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	-	Y
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15	-	Y

3.1.2 Association Establishment Policies

3.1.2.1 General

icoview-ID AE supports TCP/IP. Upon a user requesting a C-FIND operation it will attempt to establish an association with a remote AE. The host, port and remote application entity title are defined within the user configuration dialog. The maximum PDU size accepted is 16384.

3.1.2.2 Number of Associations

icoview-ID AE supports a single association for C-FIND operations. So only one C-FIND operation is in progress at any time. It must be finished or canceled to allow a new C-FIND. Only one C-MOVE at a time will open an association to a remote AE at any time.

3.1.2.3 Asynchronous Nature

The icoview-ID AE will only allow a single outstanding operation on each association. Therefore it will not perform asynchronous negotiation.

3.1.2.4 Implementation Identifying Information

The icoview-ID AE will provide an
Implementation Class UID: 1.2.276.0.7230010.3.0.3.5.5
and an
Implementation Version Name: OFFIS_DCMTK_355

3.1.2.5 Association Initiation Policy by Real-World Activity

Icoview-ID AE initiates an association with a remote AE for C-FIND and C-MOVE requests. As a default the DICOM Implicit VR Little Endian Transfer Syntax (UID = "1.2.840.10008.1.2") as defined in DICOM 2009 PS 3.5, 10.1 is used. The accepted Transfer Syntaxes upon a sub association within a C-MOVE are defined in Table 3.

Table 3: Supported Storage SOP classes

SOP Class Name	SOP Class UID
Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.1
Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.2

3.2 icoframe

The icoframe-FSR solely provides functionalities for handling DICOM media. Thus, it is described separately in 5.1.4 File Meta Information.

3.3 icoadmin

The icoadmin AE solely provides functionality for retrieving DICOM media.

3.4 InboundServer AE Specification

3.4.1 Supported SOP Classes and Transfer Syntaxes

The InboundServer AE provides Standard Conformance to the following DICOM V3.0 SOP classes as a SCP and/or SCU:

Table 4: Supported Storage SOP classes

SOP Class Name	SOP Class UID	SCP	SCU
Stored Print Storage	1.2.840.10008.5.1.1.27	Y	Y
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29	Y	Y
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30	Y	Y
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Y	Y
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Y	Y
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Y	Y
Digital Mammography X- Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Y	Y
Digital Mammography X- Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Y	Y
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Y	Y
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Y	Y
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Y	Y
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Y	Y
Ultrasound Multiframe Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Y	Y

Table 4: Supported Storage SOP classes

SOP Class Name	SOP Class UID	SCP	SCU
Ultrasound Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Y	Y
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Y	Y
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Y	Y
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Y	Y
Enhanced MR Color Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4.3	Y	Y
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	Y	Y
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Y	Y
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Y	Y
Enhanced US Volume Storage	1.2.840.10008.5.1.4.1.1.6.2	Y	Y
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Y	Y
Multiframe Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Y	Y
Multiframe Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Y	Y
Multiframe Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Y	Y
Multiframe True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Y	Y
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8	Y	Y
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	Y	Y
Waveform Storage - Trial (Retired)	1.2.840.10008.5.1.4.1.1.9.1	Y	Y
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Y	Y
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Y	Y
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Y	Y
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Y	Y
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Y	Y
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Y	Y
General Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.2	Y	Y
Arterial Pulse Waveform Storage	1.2.840.10008.5.1.4.1.1.9.5.1	Y	Y
Respiratory Waveform Storage	1.2.840.10008.5.1.4.1.1.9.6.1	Y	Y
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10	Y	Y
Standalone VOILUT Storage	1.2.840.10008.5.1.4.1.1.11	Y	Y

Table 4: Supported Storage SOP classes

SOP Class Name	SOP Class UID	SCP	SCU
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Y	Y
Color Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.2	Y	Y
Pseudo-Color Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.3	Y	Y
Blending Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.4	Y	Y
XA/XRF Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.5	Y	Y
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Y	Y
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Y	Y
X-Ray Fluoroscopy Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Y	Y
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Y	Y
X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	Y	Y
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	Y	Y
X-Ray 3D Craniofacial Image Storage	1.2.840.10008.5.1.4.1.1.13.1.2	Y	Y
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Y	Y
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Y	Y
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Y	Y
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Y	Y
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Y	Y
Deformable Spatial Registration SOP Class	1.2.840.10008.5.1.4.1.1.66.3	Y	Y
Segmentation SOP Class	1.2.840.10008.5.1.4.1.1.66.4	Y	Y
Surface Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.5	Y	Y
Real World Value Mapping Storage	1.2.840.10008.5.1.4.1.1.67	Y	Y
VL Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.1	Y	Y
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Y	Y
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Y	Y
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Y	Y
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Y	Y
VL Slide Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Y	Y
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Y	Y

Table 4: Supported Storage SOP classes

SOP Class Name	SOP Class UID	SCP	SCU
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Y	Y
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Y	Y
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Y	Y
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	Y	Y
Ophthalmic Tomography Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.4	Y	Y
VL Multi-frame Image Storage – Trial (Retired)	1.2.840.10008.5.1.4.1.1.77.2	Y	Y
Lensometry Measurements Storage	1.2.840.10008.5.1.4.1.1.78.1	Y	Y
Autorefraction Measurements Storage	1.2.840.10008.5.1.4.1.1.78.2	Y	Y
Keratometry Measurements Storage	1.2.840.10008.5.1.4.1.1.78.3	Y	Y
Subjective Refraction Measurements Storage	1.2.840.10008.5.1.4.1.1.78.4	Y	Y
Visual Acuity Measurements Storage	1.2.840.10008.5.1.4.1.1.78.5	Y	Y
Spectacle Prescription Report Storage	1.2.840.10008.5.1.4.1.1.78.6	Y	Y
Text SR Storage – Trial (Retired)	1.2.840.10008.5.1.4.1.1.88.1	Y	Y
Audio SR Storage – Trial (Retired)	1.2.840.10008.5.1.4.1.1.88.2	Y	Y
Detail SR Storage – Trial (Retired)	1.2.840.10008.5.1.4.1.1.88.3	Y	Y
Comprehensive SR Storage – Trial (Retired)	1.2.840.10008.5.1.4.1.1.88.4	Y	Y
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	Y	Y
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Y	Y
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Y	Y
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	Y	Y
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	Y	Y
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	Y	Y
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65	Y	Y
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Y	Y
Colon CAD SR	1.2.840.10008.5.1.4.1.1.88.69	Y	Y

Table 4: Supported Storage SOP classes

SOP Class Name	SOP Class UID	SCP	SCU
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Y	Y
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Y	Y
PET Curve Storage	1.2.840.10008.5.1.4.1.1.129	Y	Y
Enhanced PET Image Storage	1.2.840.10008.5.1.4.1.1.130	Y	Y
Basic Structured Display Storage	1.2.840.10008.5.1.4.1.1.131	Y	Y
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Y	Y
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Y	Y
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Y	Y
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Y	Y
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Y	Y
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	Y	Y
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Y	Y
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	Y	Y
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9	Y	Y

Table 5: Supported Private Storage SOP classes

SOP Class Name	SOP Class UID	SCP	SCU
GE private 3D Model Storage	1.2.840.113619.4.26	Y	Y
GE private PET Raw Data Storage	1.2.840.113619.4.30	Y	Y
Siemens CSA Non-Image Storage	1.3.12.2.1107.5.9.1	Y	Y
Philips 3D private Presentation State Storage	1.3.46.670589.2.5.1.1	Y	Y
Philips private MR Spectrum Storage	1.3.46.670589.11.0.0.12.1	Y	Y
Philips private MR Series Data Storage	1.3.46.670589.11.0.0.12.2	Y	Y
Philips private MR Examcard Data Storage	1.3.46.670589.11.0.0.12.4	Y	Y

Table 6: Supported Query/Retrieve SOP classes

SOP Class Name	SOP Class UID	SCP	SCU
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Y	-

Table 6: Supported Query/Retrieve SOP classes

SOP Class Name	SOP Class UID	SCP	SCU
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Y	-
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Y	-
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Y	-
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Y	-

Table 7: Supported Verification SOP classes

SOP Class Name	SOP Class UID	SCP	SCU
Verification	1.2.840.10008.1.1	Y	-

Table 8: Supported Storage Commitment SOP classes

SOP Class Name	SOP Class UID	SCP	SCU
Storage Commitment Push Model	1.2.840.10008.1.20.1	Y	-

Table 9: Supported Modality Performed Procedure Step SOP classes

SOP Class Name	SOP Class UID	SCP	SCU
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Y	-

For all non C-STORE SOP classes only “Implicit VR Little Endian: Default Transfer Syntax for DICOM” (1.2.840.10008.1.2) is supported.

The following C-STORE SCU/SCP transfer syntaxes are supported:

Table 10: List of supported C-STORE SCU/SCP Transfer Syntaxes

Transfer Syntax Name	UID
MPEG2 Main Profile @ Main Level	1.2.840.10008.1.2.4.100
JPEG 2000 Part 2 Multi-component Image Compression (Lossless Only)	1.2.840.10008.1.2.4.92
JPEG 2000 Part 2 Multi-component Image Compression	1.2.840.10008.1.2.4.93
JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90
JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91
JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80
JPEG-LS Lossy (Near-Lossless) Image Compression	1.2.840.10008.1.2.4.81
JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression	1.2.840.10008.1.2.4.70
JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
RLE Lossless	1.2.840.10008.1.2.5
Explicit VR Little Endian	1.2.840.10008.1.2.1
Explicit VR Big Endian	1.2.840.10008.1.2.2
Implicit VR Little Endian: Default Transfer Syntax for DICOM	1.2.840.10008.1.2

3.4.2 Association Establishment Policies

3.4.2.1 General

InboundServer AE supports plain TCP and TLS encrypted communication. For each kind of transport the server provides 3 distinct listen ports. All these ports are equivalent and provide the same services.

The maximum PDU size accepted is 16384.

3.4.2.2 Number of Associations

InboundServer AE starts a thread for each incoming association request. The number of simultaneous associations is thus only limited by the resources of the computer. InboundServer AE is configured for 30 simultaneous connections per default. This value can be changed without restarting the process.

3.4.2.3 Asynchronous Nature

InboundServer AE will only allow a single outstanding operation on an association. Therefore, it will not perform asynchronous negotiation.

3.4.2.4 Implementation Identifying Information

InboundServer AE will provide an

Implementation Class UID: 1.2.276.0.7230010.3.0.3.5.5

and an

Implementation Version Name: OFFIS_DCMTK_355

These two values are logged when InboundServer is started.

3.4.2.5 Extended Negotiation

InboundServer AE supports extended negotiation for C-FIND according to DICOM 2009 PS 3.4, C.5.1.1 for Patient Root Query/Retrieve and Study Root Query/Retrieve. The flags "Relational-queries" (Byte 1) and "Date-time matching" (Byte 2) are supported. "Fuzzy semantic matching of person names" (Byte 3) is not supported and therefore always turned down by the SCP during association negotiation.

InboundServer AE supports extended negotiation for C-MOVE according to DICOM 2009 PS 3.4, C.5.2.1 for Patient Root Query/Retrieve and Study Root Query/Retrieve. "Relational-retrieval" (Byte 1) is supported.

3.4.3 Association Initiation Policy by Real-World Activity

A C-MOVE request is the only real-world activity which results in initiation of an association. In all other cases the InboundServer AE is not initiating communications with remote DICOM applications.

3.4.3.1 Real-World Activity: Move Request

Associated Real-World Activity

The InboundServer AE initiates an association when it receives a C-MOVE request. The association is initiated even when no datasets are to be transferred.

Proposed Presentation Contexts

The following table describes the Presentation Contexts that are presented remote DICOM applications for the C-MOVE request.

3.4.4 Association Acceptance Policies

The InboundServer AE accepts an association when it receives a valid association request with at least one matching presentation context.

3.4.4.1 Real-World Activity: Storage SCU

Associated Real-World Activity

The associated real world activity is a modality, workstation, PACS or other system attempting to store an image to the InboundServer AE. This results in storage of the received images in icoserve AIM.

Proposed Presentation Contexts

The following table describes the Presentation Contexts that the InboundServer AE accepts from remote DICOM Storage SCUs during a C-STORE request.

Presentation Context Acceptance Criterion

The InboundServer AE accepts any of the Presentation Contexts listed in the Presentation Context Table.

Transfer Syntax Selection Policies

When presented with multiple matching transfer syntaxes, the Local DICOM Storage SCP accepts Implicit VR Little Endian over Explicit VR Little Endian.

4 DICOM Media AE Specification

This chapter describes the DICOM Media functionalities of the icoview-, icoframe- and icoadmin-AEs.

4.1 Implementation Model

4.1.1 Application Data Flow Diagram

See sections 2.1 icoview Application Data Flow Diagram, 2.1 icoframe Application Data Flow Diagram and 2.1.3 icoadmin Application Data Flow Diagram.

4.1.2 Functional Definitions of AEs

The icoview- and icoframe-AEs implement standard DICOM conformant Service Classes for creating and reading DICOM file sets (according to DICOM PS3.10). At least General Purpose CD-R Interchange Profiles are supported.

The icoadmin AE implements a standard DICOM conformant Service class for retrieving DICOM images over Web Access for DICOM Persistent Objects (WADO).

4.1.3 Sequencing of Real World Activities

The DICOM Media functionalities of the icoview- and icoframe-AEs can be used at any time through their user interfaces.

Also the icoadmin-AE can be used at any time by the user or the application that performs the WADO request.

4.1.4 File Meta Information

The icoview-FSC AE will provide an

Implementation Class UID: 1.2.276.0.7230010.3.0.3.5.5

and an

Implementation Version Name: OFFIS_DCMTK_355

4.2 Application Entity Specification

4.2.1 icoview

Application Profiles Supported	Real World Activity	Role	SC Option
icoview-FSR	Read DICOM file set	FSR	Interchange
icoview-FSC	Export DICOM file set	FSC	Interchange

See 3.1 for supported SOP classes for import and export of media.

4.2.1.1 Real World Activities

Import Media

The user can chose whether a complete file set or just parts of it are read (FSR) for displaying purposes.

Reading DICOMDIR keys

All mandatory DICOMDIR keys are required in order to structure the images within the file sets appropriately.

Creating DICOMDIRs

icoview creates DICOMDIR with all mandatory keys as defined in DICOM 2009 PS 3.10.

Export Media

icoview is able to organize DICOM images, series and studies into a single-patient file set which will then be written on portable media (e.g. CDs or DVDs). The icoview, here acting as a FSC, uses the following Transfer Syntaxes:

Transfer Syntax Name	Transfer Syntax UID
Explicit VR Little Endian	1.2.840.10008.1.2.1

4.2.2 icoframe

Application Profiles Supported	Real World Activity	Role	SC Option
icoview-FSR	Read DICOM file set	FSR	Interchange
icoview-FSC	Export DICOM file set	FSC	Interchange

See 4.1 for supported SOP classes for import and export of media.

4.2.2.1 Real World Activities

Import Media

The user can chose whether a complete file set or just parts of it are read (FSR) for displaying purposes.

Reading DICOMDIR keys

All mandatory DICOMDIR keys are required in order to structure the images within the file sets appropriately.

4.2.3 icoadmin

Application Profiles Supported	Real World Activity	Role	SC Option
icoadmin-AE	WADO Request	FSR	Interchange

4.2.3.1 Real World Activities

WADO request

The user of the application that performs the WADO request can retrieve any DICOM image that exists in the icoserve AIM, by identifying it with its DICOM study, series and image id's. See DICOM 2009 PS 3.18 for more information.

4.3 Augmented and Private Application Profiles

Not used.

5 Communication Profiles

5.1 Supported Communication Stacks

InboundServer provides plain TCP (see DICOM 2009 PS 3.8, 9) and TLS encrypted communication (see DICOM 2009 PS 3.15, B.1).InboundServer uses OFFIS DICOM Tool Kit (DCMTK) for its communication which itself relies on the operating system it runs on.

6 Extensions/Specializations/Privatizations

Not applicable.

7 Configuration

icoview and icoframe provide user interfaces in order to facilitate configuration. InboundServer is configured according to the standard icoserve AIM server configuration mechanism which can be found in the icoserve AIM server documentation.

8 Support of Extended Character Sets

icoframe uses IR_100 character set for generated dicom images.

Appendices

A Key list for Query/Retrieve-Service classes

In the following, the DICOM keys which are used for matching on Patient, Study, Series and Image level in C-FIND requests are listed. All keys are supported for matching and response. Person Name fields are always matched case-insensitive.

A.1 Keys for C-FIND requests on Patient Level

Key	Tag	Remark
PatientID	(0010,0020)	
PatientName	(0010,0010)	
PatientBirthDate	(0010,0030)	Combined Date/ Time Matching supported
PatientBirthTime	(0010,0032)	Combined Date/ Time Matching supported
PatientSex	(0010,0040)	

A.2 Keys for C- FIND requests on Study Level

In case of Study Root Query/Retrieve, where no Patient level exists, all mentioned Patient level keys are supported on level Study.

Key	Tag	Remark
StudyInstanceUID	(0020,000D)	
StudyDate	(0008,0020)	Combined Date/ Time Matching supported
StudyTime	(0008,0030)	Combined Date/ Time Matching supported
StudyDescription	(0008,1030)	
AccessionNumber	(0008,0050)	
StudyID	(0020,0010)	
NumberOfStudyRelatedSeries	(0020,1206)	
NumberOfStudyRelatedInstances	(0020,1208)	
ReferringPhysicianName	(0008,0090)	
ModalitiesInStudy	(0008,0061)	

A.3 Keys for C- FIND requests on Series Level

Key	Tag	Remark
SeriesInstanceUID	(0020,000E)	
Modality	(0008,0060)	
SeriesNumber	(0020,0011)	
SeriesDescription	(0008,103E)	
NumberOfSeriesRelatedInstances	(0020,1209)	
InstitutionName	(0008,0080)	
PerformedProcedureStepStartDate	(0040,0244)	Combined Date/ Time Matching supported
PerformedProcedureStepStartTime	(0040,0245)	Combined Date/ Time Matching supported
PerformedProcedureStepEndDate	(0040,0250)	Combined Date/ Time Matching supported
PerformedProcedureStepEndTime	(0040,0251)	Combined Date/ Time Matching supported
RequestAttributesSequence/ RequestedProcedureID	(0040,0275)/ (0040,1001)	
RequestAttributesSequence/ ScheduledProcedureStepID	(0040,0275)/ (0040,0009)	

A.4 Keys for C- FIND requests on Image Level

Key	Tag	Remark
SOPInstanceUID	(0008,0018)	
InstanceNumber	(0020,0013)	
SOPClassUID	(0008,0016)	
Rows	(0028,0010)	
Columns	(0028,0011)	
BitsAllocated	(0028,0100)	
BitsStored	(0028,0101)	
SamplesPerPixel	(0028,0002)	
NumberOfFrames	(0028,0008)	
ImageComments	(0020,4000)	
ContentTemplateSequence/ TemplateIdentifier	(0040,A504)/ (0040,DB00)	*
ContentTemplateSequence/ MappingResource	(0040,A504)/ (0008,0105)	*
ContentDate	(0008,0023)	*
ContentTime	(0008,0033)	*
ObservationDateTime	(0040,A032)	*

Key	Tag	Remark
ReferencedRequestSequence/ StudyInstanceUID	(0040,A370)/ (0020,000D)	*
ReferencedRequestSequence/ AccessionNumber	(0040,A370)/ (0008,0050)	*
ReferencedRequestSequence/ RequestedProcedureID	(0040,A370)/ (0040,1001)	*
ReferencedRequestSequence/ RequestedProcedureCodeSequence/ CodeValue	(0040,A370)/ (0032,1064)/ (0008,0100)	*
ReferencedRequestSequence/ RequestedProcedureCodeSequence/ CodingSchemeDesignator	(0040,A370)/ (0032,1064)/ (0008,0102)	*
ReferencedRequestSequence/ RequestedProcedureCodeSequence/ CodingSchemeVersion	(0040,A370)/ (0032,1064)/ (0008,0103)	*
ReferencedRequestSequence/ RequestedProcedureCodeSequence/ CodeMeaning	(0040,A370)/ (0032,1064)/ (0008,0104)	*
ConceptNameCodeSequence/ CodeValue	(0040,A043)/ (0008,0100)	*
ConceptNameCodeSequence/ CodingSchemeDesignator	(0040,A043)/ (0008,0102)	*
ConceptNameCodeSequence/ CodingSchemeVersion	(0040,A043)/ (0008,0103)	*
ConceptNameCodeSequence/ CodeMeaning	(0040,A043)/ (0008,0104)	*
CompletionFlag	(0040,A491)	*
VerificationFlag	(0040,A493)	*
VerifyingObserverSequence/ VerifyingOrganization	(0040,A073)/ (0040,A027)	*
VerifyingObserverSequence/ VerificationDateTime	(0040,A073)/ (0040,A030)	*
VerifyingObserverSequence/ VerifyingObserverName	(0040,A073)/ (0040,A075)	*
VerifyingObserverSequence/ VerifyingObserverIdentificationCodeSequence/ CodeValue	(0040,A073)/ (0040,A088)/ (0008,0100)	*
VerifyingObserverSequence/ VerifyingObserverIdentificationCodeSequence/ CodingSchemeDesignator	(0040,A073)/ (0040,A088)/ (0008,0102)	*
VerifyingObserverSequence/ VerifyingObserverIdentificationCodeSequence/ CodingSchemeVersion	(0040,A073)/ (0040,A088)/ (0008,0103)	*

Key	Tag	Remark
VerifyingObserverSequence/ VerifyingObserverIdentificationCodeSequence/ CodeMeaning	(0040,A073)/ (0040,A088)/ (0008,0104)	*
ContentLabel	(0070,0080)	*
ContentDescription	(0070,0081)	*
PresentationCreationDate	(0070,0082)	*
PresentationCreationTime	(0070,0083)	*
ContentCreatorName	(0070,0084)	*
ReferencedSeriesSequence/ SeriesInstanceUID	(0008,1115)/ (0020,000E)	*
ReferencedSeriesSequence/ ReferencedImageSequence/ ReferencedSOPClassUID	(0008,1115)/ (0008,1140)/ (0008,1150)	*
ReferencedSeriesSequence/ ReferencedImageSequence/ ReferencedSOPInstanceUID	(0008,1115)/ (0008,1140)/ (0008,1155)	*

* These keys are only supported when used in conjunction with one of the following SOP classes

SOP Class Name	SOP Class UID
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1
Color Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.2
Pseudo-Color Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.3
Blending Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.4
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67
Text SR Storage – Trial (Retired)	1.2.840.10008.5.1.4.1.1.88.1
Audio SR Storage – Trial (Retired)	1.2.840.10008.5.1.4.1.1.88.2
Detail SR Storage – Trial (Retired)	1.2.840.10008.5.1.4.1.1.88.3
Comprehensive SR Storage – Trial (Retired)	1.2.840.10008.5.1.4.1.1.88.4
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59

A.5 Keys for C-FIND requests issued by icoview on Study Level

Key	Tag	Remark
PatientID	(0010,0020)	
PatientName	(0010,0010)	
PatientBirthDate	(0010,0030)	
PatientSex	(0010,0040)	
StudyDate	(0008,0020)	
StudyDescription	(0008,1030)	
AccessionNumber	(0008,0050)	
ModalitiesInStudy	(0008,0061)	
StudyInstanceUID	(0020,000d)	
NumberOfStudyRelatedSeries	(0020,1206)	
NumberOfStudyRelatedInstances	(0020,1208)	

B Key list for Modality Worklist C-FIND requests

Modality Worklist queries support all C-FIND keys from Level Patient.

Key	Tag	Remark
AdmissionID	(0038,0010)	
ScheduledProcedureStepSequence/ ScheduledStationAETitle	(0040,0100)/ (0040,0001)	
ScheduledProcedureStepSequence/ ScheduledProcedureStepStartDate	(0040,0100)/ (0040,0002)	Combined Date/Time Matching supported
ScheduledProcedureStepSequence/ ScheduledProcedureStepStartTime	(0040,0100)/ (0040,0003)	Combined Date/Time Matching supported
ScheduledProcedureStepSequence/ Modality	(0040,0100)/ (0008,0060)	
ScheduledProcedureStepSequence/ ScheduledPerformingPhysicianName	(0040,0100)/ (0040,0006)	
ScheduledProcedureStepSequence/ ScheduledProcedureStepDescription	(0040,0100)/ (0040,0007)	no matching, response only
ScheduledProcedureStepSequence/ ScheduledProcedureStepID	(0040,0100)/ (0040,0009)	
ScheduledProcedureStepSequence/ ScheduledProtocolCodeSequence/ CodeValue	(0040,0100)/ (0040,0008)/ (0008,0100)	no matching, response only
ScheduledProcedureStepSequence/ ScheduledProtocolCodeSequence/ CodeMeaning	(0040,0100)/ (0040,0008)/ (0008,0104)	no matching, response only

Key	Tag	Remark
RequestedProcedureID	(0040,1001)	
RequestedProcedureDescription	(0032,1060)	no matching, response only
StudyInstanceUID	(0020,000D)	
AccessionNumber	(0008,0050)	
CurrentPatientLocation	(0038,0300)	no matching, response only

C Declaration of Conformity for 93/42/EEC

C.1 General

CE 0297

icoserve AIM (Advanced Image Management) is a medical device, risk class IIb according to 93/42/EEC, appendix IX, rule 10 for clinicalwide acquisition, storage, distribution and diagnosis of medical multimedia data.

C.2 Producer Information

ITH icoserve technology for healthcare GmbH
Innrain 98
A-6020 Innsbruck
Austria

C.3 Production Year

2010

C.4 Reminder

Please note the documentation of each module. Using this medical device requires special training.