

# SIDICOM® WLS

DICOM Conformance Statement

English



V3.1

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for product version from 3.1 onwards

# Contents

<b>0</b>	<b>Introduction .....</b>	<b>4</b>
0.1	Purpose .....	4
0.2	Scope .....	4
0.2.1	System requirements .....	4
0.3	Definitions, Abbreviations .....	4
0.3.1	Definitions .....	4
0.3.2	Abbreviations .....	5
0.4	References .....	5
<b>1</b>	<b>Implementation Model.....</b>	<b>6</b>
1.1	Verification .....	6
1.1.1	Application Data Flow Diagram .....	6
1.1.2	Functional Definitions of AE's .....	6
1.1.3	Sequencing of Real-World Activities.....	6
1.2	Modality Worklist.....	6
1.2.1	Application Data Flow Diagram .....	6
1.2.2	Functional Definitions of AE's .....	7
1.2.3	Sequencing of Real-World Activities.....	7
1.3	Storage .....	7
1.3.1	Application Data Flow Diagram .....	7
1.3.2	Functional Definitions of AE's .....	8
1.3.3	Sequencing of Real-World Activities.....	8
1.4	Performed Procedure Step.....	9
1.4.1	Application Data Flow Diagram .....	9
1.4.2	Functional Definitions of AE's .....	9
1.4.3	Sequencing of Real-World Activities.....	9
<b>2</b>	<b>AE Specifications .....</b>	<b>10</b>
2.1	SIDICOM WLS Specification .....	10
2.1.1	Association Establishment Policies .....	10
2.1.2	Association Initiation by Real-World Activity.....	11
<b>3</b>	<b>Communication Profiles .....</b>	<b>14</b>
3.1	Supported Communication Stacks .....	14
3.2	TCP/IP Stack .....	14
3.2.1	Physical Media Support .....	14
<b>4</b>	<b>Extensions / Specializations / Privatizations .....</b>	<b>15</b>
4.1	Standard Extended / Specialized / Private SOPs .....	15
4.1.1	Extensions .....	15
4.1.2	Private Tags.....	15
4.2	Private Transfer Syntaxes .....	16
<b>5</b>	<b>Configuration.....</b>	<b>17</b>
5.1	AE Title/Presentation Address Mapping.....	17
5.2	Configurable Parameters.....	17
<b>6</b>	<b>Media Interchange.....</b>	<b>18</b>

7	Support of Extended Character Sets .....	19
8	Security .....	20

## History

Release	Date	Author	Review	Comment
1.0	03/01/1999	A. Scharff	U. Meng	
2.0	05/11/2001	U. Meng	A. Scharff	
2.2	06/01/2006	U. Meng	J. Zimmermann	
3.0	24/07/2007	U. Meng	J. Zimmermann	
3.1	16/06/2011	U. Meng	J. Zimmermann	Update version 3.1
3.1	15/12/2015	J. Zimmermann	U. Meng	Released

## 0 Introduction

### 0.1 Purpose

This document refers to the DICOM functionality of SIDICOM WLS, current version see release history above.

This document is written according to part PS 3.2 of [1].

The applications described in this Conformance Statement are the SIDEXIS software and the SIDEXIS DICOM interface (DICOM Gateway) for Worklist and Storage, in short SIDICOM WLS.

SIDEXIS controls all digital Sirona X-ray products.

SIDICOM WLS translates between DICOM applications and SIDEXIS. It acts as a Modality Worklist (MWL) SCU, a Performed Procedure Step (MPPS) SCU and as a SCU for the DICOM C-STORE functionality and provides images in the SC, DX, IO, VL, and CT format. It also can store additional SIDEXIS-specific data in DICOM Raw Data objects.

Furthermore SIDICOM WLS supports the C-Echo service as an SCU for administration.

### 0.2 Scope

This Conformance Statement refers to all digital Sirona X-ray products using SIDEXIS and SIDICOM WLS.

SIDICOM WLS is available only in English.

#### 0.2.1 System requirements

##### Supported SIDEXIS versions

- SIDEXIS 4 v4.1.1 or higher
- SIDEXIS XG version 2.61 or higher

##### Supported operating systems

- Windows XP SP3 32bit
- Windows 7 Professional SP1 32bit
- Windows 7 Ultimate SP1 32bit & 64bit
- Windows 7 Ultimate 64bit on BootCamp 3.0.4 (325) on iMAC, MAC OS 10.6.7
- Windows Server 2003 32bit
- Windows Server 2008 Standard 32bit & 64bit
- Windows 8 Professional 32bit & 64bit Patch Level Sep. 23, 2013
- Windows 8.1 Professional 32bit & 64bit
- Windows 10 Pro 32bit & 64bit

Each increased by the current service pack at the time of SIDICOM WLS release.

### 0.3 Definitions, Abbreviations

#### 0.3.1 Definitions

C-STORE                    DICOM service for storing of objects, e.g. images

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CT	Computer Tomography, specific DICOM Information Object
DX	Digital X-ray, specific DICOM Information Object
Gateway	Connection between different data channels
IO	Intra-Oral, specific DICOM Information Object
Modality Worklist	Service to inform the modality of new examinations
MPPS	Service to inform a DICOM partner of executed steps, e.g. taking an image
RAW Data	Raw Data, specific DICOM Information Object
SC	Secondary Capture, specific DICOM Information Object
VL	Visible Light (Photographic Image), specific DICOM Information Object

### 0.3.2 Abbreviations

ACR	American College of Radiology
AE	DICOM Application Entity
CT	Computer Tomography
DICOM	Digital Imaging and Communication in Medicine
DX	Digital X-ray
IO	Digital intraoral X-Ray
IOD	DICOM Information Object Definition
IS	Information System (HIS, RIS, PACS within hospital)
MPPS	Modality Performed Procedure Step,
NEMA	National Electrical Manufacturers Association
PPS	Performed Procedure Step
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SPS	Scheduled Procedure Step
SIDEXIS	Sirona Dental X-ray and Imaging System
SIDICOM WLS	SIDEXIS DICOM Interface Worklist / Storage
SOP	DICOM Service-Object Pair
UID	Unique Identifier, string unique in the whole network

### 0.4 References

- [1] Digital Imaging and Communication in Medicine (DICOM) 3.0, NEMA PS 3.1-18, 2011
- [2] SIDICOM WLS User Manual

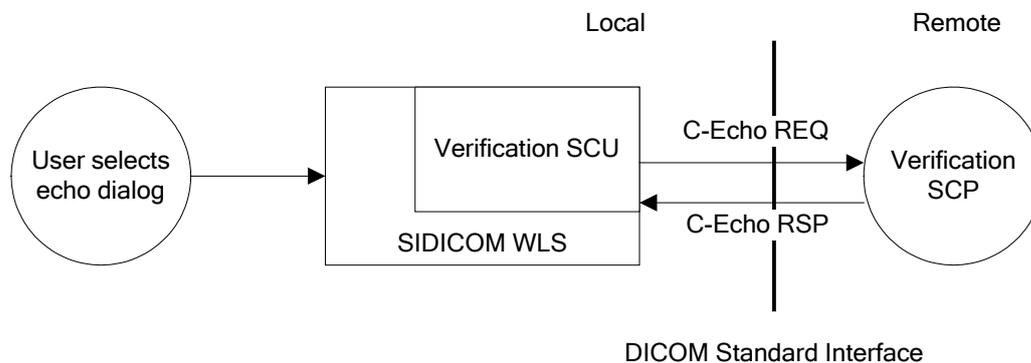
# 1 Implementation Model

## 1.1 Verification

### 1.1.1 Application Data Flow Diagram

The Verification service class defines an application-level class of service which allows the operator to verify the ability of an application on a remote node to respond to DICOM messages.

In SIDICOM WLS the Verification service is totally integrated to act as SCU with all possible DICOM partners. There is an easy user interface to test the configured partners, Modality Worklist SCP, PPS SCP and C-Store SCP. The SCP will answer this response with C-Echo replies.



### 1.1.2 Functional Definitions of AE's

SIDICOM WLS opens an association to an application on the remote node and sends a Verification message (C-Echo Request) to verify that the remote application can respond (C-Echo Response) to DICOM messages.

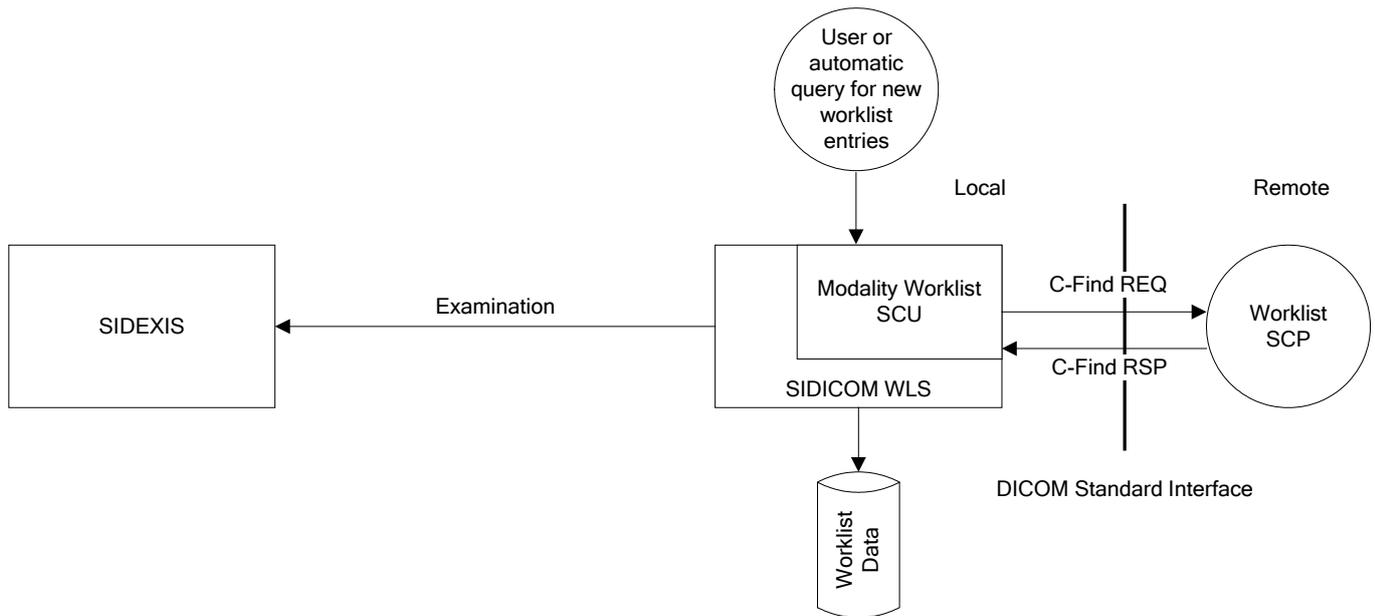
### 1.1.3 Sequencing of Real-World Activities

The user can select the "Echo Test" dialog from the "Query" menu of SIDICOM WLS. Inside this dialog, the user can select a pre-configured DICOM partner with a radio button or select "Other". If "Other" is selected, the partner's application entity title, address and port must be provided, too. Then the user can test the communication with the "Test" button. The communication results are shown in the status window.

## 1.2 Modality Worklist

### 1.2.1 Application Data Flow Diagram

The basic worklist service class defines an application-level class of service which facilitates the transfer of worklist items from the information system to the imaging modality. The worklist is queried by the AE and supplies the SCU with the scheduled tasks which have to be performed on the modality. SIDICOM WLS supports the worklist service in the role of a SCU. SIDICOM WLS transfers the worklist data to SIDEXIS examinations. The DICOM worklist of these examinations data are stored for further processing, e.g. C-Store or MPPS.



### 1.2.2 Functional Definitions of AE's

The modality worklist SCU requests the worklist SCP to perform a match to the keys specified in the C-FIND DIMSE service. The worklist SCP responds to the C-FIND query and sends scheduled imaging service requests and patient demographic information from the information system to the modality.

### 1.2.3 Sequencing of Real-World Activities

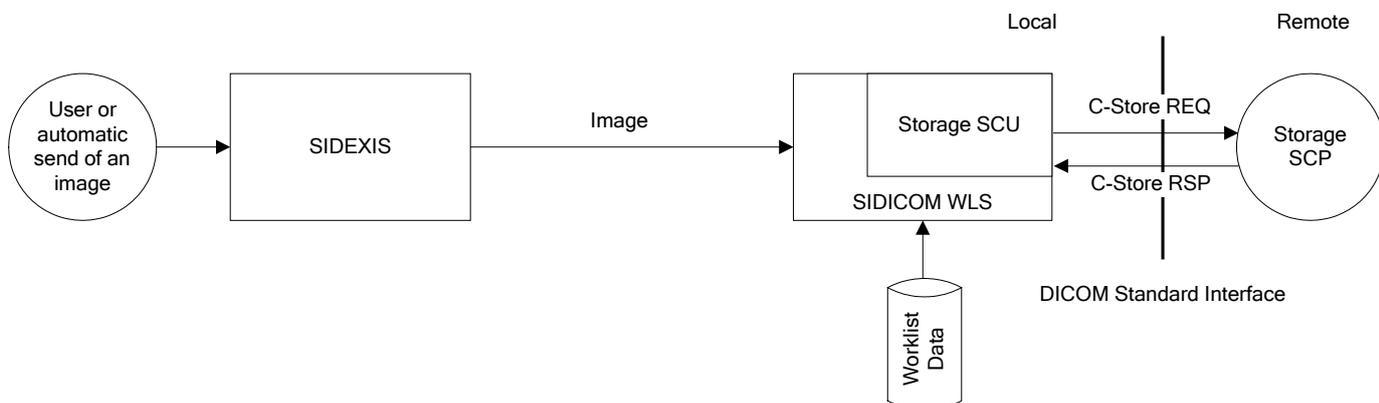
The DICOM Worklist user interface can be started with the SIDEXIS command "Get DICOM Worklist".

To perform a worklist query the user has to initiate it with the user interface "Query" / "Repeat last" or to make a "New" query. In this case it is possible to fill in new key-matching entries in a dialog. Furthermore it is possible to configure SIDICOM WLS to re-query automatically after a configurable time period.

## 1.3 Storage

### 1.3.1 Application Data Flow Diagram

SIDICOM WLS receives images and related patient data from the SIDEXIS application. These images will then be converted into DICOM SC, DX, IO, VL, or a series of CT images depending on the modality type and the configuration of SIDICOM WLS. If the new image belongs to a Scheduled Procedure Step from a worklist, the worklist data can be merged into the image data. SIDICOM WLS supports storage in 8 and 16bit pixel depth.



### 1.3.2 Functional Definitions of AE's

SIDICOM WLS entity acts as a Service Class User (SCU) for Storage Service Class.

### 1.3.3 Sequencing of Real-World Activities

For sending images and related patient data from SIDEXIS to a DICOM V3.0 C-STORE SCP the user needs to activate a DICOM Send command from within SIDEXIS or to check option "Automatically receives a copy of new exposures" in the configuration of SIDICOM WLS.

There are different send commands within SIDEXIS. These commands can be reached via the menu or you can place them as buttons in the SIDEXIS toolbars (see SIDEXIS manual):

SIDEXIS Command	Description
Exam > Export > Create New DICOM Study	<p>Creates a <b>new</b> DICOM study, based on the active SIDEXIS examination and send it to the DICOM archive.</p> <p>This study is a collection of all images in the SIDEXIS exam.</p> <p>This <b>does not include</b> DICOM <b>worklist</b> data (The study instance UID is generated by SIDICOM WLS).</p> <p>Depending on the hospital workflow, this may be a good choice for sending GALAXIS/GALILEOS Implant views.</p>
Image > Export > Send to DICOM (Same command can be triggered automatically with option "Automatically receives a copy of new exposures" in the configuration of SIDICOM WLS)	<p>Sends the active image to the DICOM archive.</p> <p>This includes worklist data if the image examination belongs to a worklist order.</p> <p>This includes a CT Series if the active 2D image refers to a 3D examination.</p>
Image > Export > Send image to DICOM	<p>Sends the active image to the DICOM archive.</p> <p>This includes worklist data if the image examination belongs to a worklist order.</p> <p>This <b>excludes</b> sending underlying 3D data.</p>
Image > Export > Send volume for 3 <sup>rd</sup> party to DICOM	<p>If the active image refers to a 3D examination this command creates a new 3D CT Series optimized for a special 3<sup>rd</sup> party manufacturer (e.g. for Implant planning) and send it to the archive.</p> <p>This includes worklist data if the image examination belongs to a worklist order.</p> <p>This series cannot be reimported into SIDEXIS.</p>
Image > Export > Send volume to DICOM	<p>If the active image depends on a 3D examination this command sends the 3D CT Series of the active image to the archive.</p> <p>This includes worklist data if the image examination belongs to a worklist order.</p> <p>This series cannot be reimported into SIDEXIS.</p>

SIDICOM WLS will obtain the data from SIDEXIS and convert them into DICOM V3.0 images, series, and so on. When the SIDEXIS data is related to a DICOM Worklist item, depending on the command, SIDICOM WLS fills in the worklist data. If the Storage SCP supports IO or DX images, these types can be used. Otherwise the images are transferred in the SC image format. Video images are converted into the VL format. 3D volumes are converted into CT series. SIDEXIS-specific additional data is stored in DICOM Raw Data objects.

#### **There is no overlay information of the images or examinations exported.**

All images that should be transmitted to the archive are first scheduled into a local output queue (SIDEXIS is blocked during this operation) and then transmitted to the archive asynchronously in a background process.

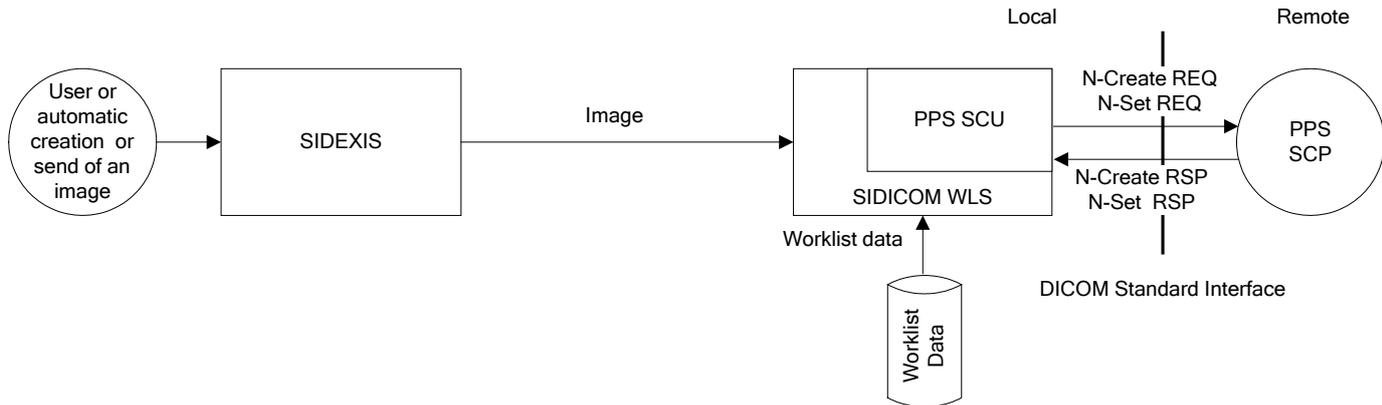
Then SIDICOM WLS associates a connection and sends the image to a DICOM V3.0 C-STORE SCP. It automatically feeds back a successful send process or errors.

If a block of images shall be sent (e.g. an exam containing a CT series and/or DX views) the send process is by default only labelled as being successful if all of these images are transmitted successfully.

## 1.4 Performed Procedure Step

### 1.4.1 Application Data Flow Diagram

SIDICOM WLS supports the Modality Performed Procedure Step. With this service the application can inform a PPS SCP within an Information System about the steps that are performed by the modality. It can create/update a new PPS when an image is scheduled to be sent to the main archive, and complete the step at the time of transferring the image to a C-Store SCP. The Scheduled Procedure Step data from the worklist can be filled into the PPS.



### 1.4.2 Functional Definitions of AE's

SIDICOM WLS entity acts as a Service Class User (SCU) for Modality Performed Procedure Steps.

### 1.4.3 Sequencing of Real-World Activities

The PPS functionality can be switched on or off in the configuration file of SIDICOM WLS. If switched on the PPS is created and updated automatically during the image scheduling and transfer process.

## 2 AE Specifications

### 2.1 SIDICOM WLS Specification

The SIDICOM WLS Application Entity provides Standard Conformance to the following DICOM V3.0 SOP Classes as an SCU:

SOP Class Name	SOP Class UID
Verification Service Class	1.2.840.10008.1.1
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Digital X-ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital Intra-oral X-ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3

#### 2.1.1 Association Establishment Policies

##### 2.1.1.1 General

The configuration of SIDICOM WLS defines the Application Entity Titles, the port numbers, the host name or IP address. For the different services C-Storage, Modality Worklist and Performed Procedure Step there can be different configuration blocks (AE title, port, IP address).

##### 2.1.1.2 Number of Associations

SIDICOM WLS can only attempt 1 association for each service establishment at a time. It is not possible to start multiple instances of SIDICOM WLS.

##### 2.1.1.3 Asynchronous Nature

SIDICOM WLS does not support asynchronous communication (multiple outstanding transactions during a single association).

##### 2.1.1.4 Implementation Identifying Information

The SIDICOM WLS Implementation Class UID is

1.2.276.0.7230010.3.0.3.5.3

The default AE Title is:

SIDICOM

The implementation version name is

OFFIS\_DCMTK\_353

Sirona Company Root UID (Default only used for 2D IODs)

1.3.6.1.4.1.25790

**2.1.2 Association Initiation by Real-World Activity**

SIDICOM WLS initiates associations for the DICOM V3.0 services

- Verification
- Modality Worklist
- Performed Procedure Step
- C-STORE SCP

In no case SIDICOM WLS acts as a Server (SCP)

**2.1.2.1 Real-World Activity – for Verification**

SIDICOM WLS initiates an association for DICOM V3.0 Verification service.

**2.1.2.1.1 Associated Real-World Activity - for Verification**

After calling the SIDICOM WLS verification dialog, the user can perform a verification to the configured Store, Worklist or PPS partner. It is also possible to verify partners not yet configured.

**2.1.2.1.2 Proposed Presentation Contexts - for Verification**

The presentation contexts that are proposed by SIDICOM WLS for the verification operation are specified in the following:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification Service Class	1.2.840.10008.1.1	Explicit VR Little Endian Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None

**2.1.2.2 Real-World Activity – for Modality Worklist**

SIDICOM WLS initiates an association for DICOM V3.0 Modality Worklist service.

**2.1.2.2.1 Associated Real-World Activity - Modality Worklist**

A Modality Worklist query can be performed by the user or automatically after a configurable time period. When SIDICOM WLS tries to query for new worklist entries it opens an association to the Modality Worklist SCP. After the association has been established a C-Find request with possible matching values is sent to the SCP. Then the partner will send the matching worklist entries the with C-Find responses to the Worklist SCU (SIDICOM WLS).

**2.1.2.2.2 Proposed Presentation Contexts - Modality worklist**

The presentation contexts that are proposed by SIDICOM WLS for the Modality Worklist C-Find operation are specified in the following:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Explicit VR Little Endian Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None

**2.1.2.3 Real-World Activity – for Send image operations**

SIDICOM WLS initiates an association for DICOM V3.0 C-STORE service.

The types of images that can be transferred are specified in the configuration files.

**2.1.2.3.1 Associated Real-World Activity - for Send image operations**

Once the Store Image association has been established, an Information Object (SC, DX or IO image) is sent via the DICOM V3.0 C-STORE service to a DICOM V3.0 C-STORE SCP (e.g. an archive) by SIDICOM WLS.

**2.1.2.3.2 Proposed Presentation Contexts - for Send image operations**

The presentation contexts that are proposed by SIDICOM WLS for the send image operation are specified in the following:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Digital X-ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Little Endian Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Digital Intra-oral X-ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Explicit VR Little Endian Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Explicit VR Little Endian Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Explicit VR Little Endian Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None

**2.1.2.4 Real-World Activity – for Performed Procedure Step**

SIDICOM WLS initiates an association for DICOM V3.0 Performed Procedure Step service at the time of creation a new PPS (N-Create), and updating the PPS (N-Set). The association is not open during the whole life of the PPS but opened and closed for every create or set event.

**2.1.2.4.1 Associated Real-World Activity - for Performed Procedure Step**

The Performed Procedure Step is created automatically when a Scheduled Procedure Step is performed. (Creation of an new image). It is updated when the image is transferred from SIXELIS to SIDICOM WLS (at this time the image is queued in for sending). And it is updated when the Scheduled Procedure Step is finished (e.g. it can be finished after the image was sent successfully or after the user cancelled the SPS).

**2.1.2.4.2 Proposed Presentation Contexts - for Performed Procedure Step**

The presentation contexts that are proposed by SIDICOM WLS for the Performed Procedure Step N-Create and N-Set operations are specified in the following:

Presentation Context Table
----------------------------

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Explicit VR Little Endian Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None

## **3 Communication Profiles**

### **3.1 Supported Communication Stacks**

SIDICOM WLS provides DICOM V3.0 TCP/IP network communication support as defined in PS 3.8 of [1].

### **3.2 TCP/IP Stack**

SIDICOM WLS communicates over the TCP/IP protocol stack on any physical interconnection media supporting the TCP/IP stack.

#### **3.2.1 Physical Media Support**

SIDICOM WLS is indifferent to the physical medium over which TCP/IP executes; it inherits this from the operating system on which it exists.

## 4 Extensions / Specializations / Privatizations

In accordance with DIN 6862-2 the following CT tags are missing because they are either technically not available or not applicable:

Attribute Name	Tag
Single Collimation Width	(0018,9306)
Total Collimation Width	(0018,9307)
Table Feed per Rotation	(0018,9310)
Spiral Pitch Factor	(0018,9311)
Exposure Modulation Type	(0018,9323)
CTDIvol	(0018,9345)
CTDI Phantom Type Code Sequence	(0018,9346)

### 4.1 Standard Extended / Specialized / Private SOPs

#### 4.1.1 Extensions

In addition to the standard SC IOD SIDICOM WLS can supply the following tag as defined in PS3.3, C.7.6.2 of [1]:

Attribute Name	Tag
Pixel Spacing	(0028,0030)

This tag is transmitted by default (factory setting). To deactivate transmission please refer to the SIDICOM WLS user manual [2].

Depending on the configuration (not on the factory setting) there are additional possibilities to send extended tags, please refer to the user manual [2].

If the values are available from the device, SIDICOM WLS set the tag (0x0018,0x115e) Image (and Fluoroscopy) Area Dose Product for new DX as well as CT image objects. In every case the value corresponds to the whole exposure scan.

#### 4.1.2 Private Tags

SIDICOM WLS includes special private data in the image IODs.

All private tag groups are marked as "Sirona - <Group description>" in the private tag Creator ID.

The generated DICOM objects can include one or more of the following private data groups.

Private data group	Description
8001,10xx	Private exam data
8003,10xx	Private image data
8005,10xx	Private composites data
8101,10xx	Private object model data
8101,11xx	Private object model data
8201,10xx	Private raw image data
8201,12xx	Private raw image data
8301,10xx	Private overlay image data
8301,12xx	Private overlay image data
8401,10xx	Private patient data
8301,13xx	Private patient data

While sending new studies SIDICOM WLS may add entries for special raw series consisting of private RAW Data storage objects (1.2.840.10008.5.1.4.1.1.66) that are created during the DICOM export process. All these objects are marked as "Raw Data Records".

It is recommended neither to display these records nor the corresponding series in viewers, nor to try to interpret the linked "Raw data objects".

SIDICOM WLS can set links to the Raw Data series in normal image IODs in extended sequence "Referenced Raw Data Sequence (0008,9121)".

Image-related referenced series can be set in sequence "Referenced Series Sequence (0007,1115)".

## 4.2 Private Transfer Syntaxes

None supported.

## 5 Configuration

### 5.1 AE Title/Presentation Address Mapping

SIDICOM WLS maps Application Entity Titles to host name and port via an internal configuration method.

In order to decrease the communication time on some systems, it can be useful to use domain names instead of IP addresses. In this case the Domain Name Service (DNS) or system's "hosts" file must be configured correctly.

### 5.2 Configurable Parameters

See user and configuration manual.

## 6 Media Interchange

None supported (Media interchange is supported by SIDEXIS/SIDICOM RM).

## 7 Support of Extended Character Sets

SIDICOM WLS supports extended character sets under the condition that the underlying Windows operation system supports the code page used by the chosen char set.

By default, use of extended char set is switched off.

It can be switched on for exports by setting entry

```
[IDDTODICOM]
CharSet=<Valid character set>
```

in SIDICOM.ini.

It can be switched on for Query & Retrieve imports by setting entry

```
[DICOMTOIDD]
DecodeCharSet=1
```

in SiDICOMQR.ini (Belonging to the Query & Retrieve (SIDICOM QR) installation).

Take care: If you import DICOM objects with SIDICOM QR with DecodeCharSet=1, the DICOM objects that include extended characters sets must be coded the right way! If DecodeCharSet is switched on, for newly exported objects CharSet=... should be set to your local char set, too.

DICOM ISO Label	Language
ISO_IR 100	Western
ISO_IR 144	Cyrillic
ISO_IR 138	Hebrew
ISO_IR 126	Greek
ISO_IR 127	Arabic
ISO 2022 IR 87	Japanese / Kanji
ISO_IR 192	Universal Unicode UTF8

## 8 Security

SIDICOM WLS does not support any specific security measures. It is assumed that SIDICOM WLS is used within a secure environment. It is assumed that a secure environment includes at a minimum:

- Firewall or router protection to ensure that only approved external hosts have network access to SIDICOM WLS
- Firewall or router protection to ensure that SIDICOM WLS only has network access to approved external hosts and services
- Any communication with external hosts and services outside the locally secure environment use appropriate secure network channels (such as f.ex. a Virtual Private Network (VPN))

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

All users of the application need to have write access to the installation directory of the application and its sub-directories.



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We reserve the right to make any alterations which may be due to technical improvements.

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