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Syngo Carbon Enterprise Access

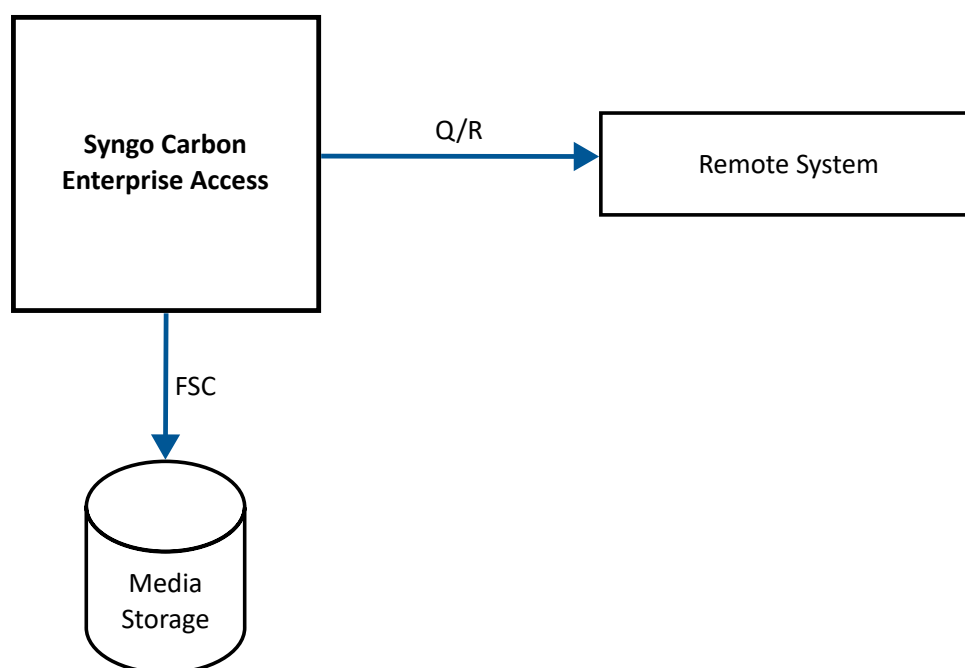
DICOM Conformance Statement

1 Overview

Syngo Carbon Enterprise Access is a versatile multi-modality viewing system for displaying DICOM instances. It supports access via native interfaces to DICOM instances and non-DICOM files stored in *syngo.share* core. It furthermore provides Query/Retrieve services to query remote systems for studies, series, and instances, enabling retrieval for viewing or export.

Export functionality includes the creation of ZIP archives and DICOM File Sets operating in the File Set Creator (FSC) role. A DICOMDIR file is generated for each File Set. In addition, Syngo Carbon Enterprise Access allows user-created captured images to be encoded as Secondary Capture instances and stored in *syngo.share* core via native interfaces.

Figure 1: Overview of Implemented Services



1.1 Content and Transfer

Table 1 lists all Storage SOP Classes and the usage scenarios for those instances. The “DIMSE”, “DICOM Web” and “Media Services” columns indicate the roles supported for each SOP Class.

The “Function” columns indicate how the instances are used by the system:

- Create: The system creates instances of the SOP Class. The type of the created SOP Class is indicated by one of the following abbreviations:
 - S: Standard SOP Class
 - SE: Standard Extended SOP Class
 - SP: Specialized SOP Class
 - P: Private SOP Class
- Display: The system displays the instances of the SOP Class to the user, either by displaying the SOP Instances natively or by applying instances of another suitable SOP Class to the image instances (e.g., a Presentation State or CAD SR).
- Process: The system processes the instances of the SOP Class to derive some further information that is made available to the user (e.g., a CAD processing algorithm, or a 3D Rendering).
- Archive: The system stores the instances of the SOP Class and makes them available again.

Please see the [note on supported Storage Transfer Syntaxes](#) regarding the column Transfer Syntax Set.

Table 1: Supported Storage SOP Classes

SOP Class	SOP Class UID	Transfer Syntax Set	DIMSE services		DICOM web services		Media services			Function			
			SCU	SCP	UA	OS	FSC	FSU	FSR	Create	Display	Process	Archive
Media Storage Directory Storage	1.2.840.10008.1.3.10	*	N	N	N	N	Y	N	N	S	N	N	N
Hardcopy Grayscale Image Storage (Retired)	1.2.840.10008.5.1.1.29	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Hardcopy Color Image Storage (Retired)	1.2.840.10008.5.1.1.30	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N

Table 1: Supported Storage SOP Classes ▼

▲ Table 1: Supported Storage SOP Classes ▼

SOP Class	SOP Class UID	Transfer Syntax Set	DIMSE services		DICOM web services		Media services			Function			
			SCU	SCP	UA	OS	FSC	FSU	FSR	Create	Display	Process	Archive
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Digital Intra-Oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Digital Intra-Oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	*	Y	Y	N	N	Y	N	N	N	Y	Y	N
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Legacy Converted Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.2	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	*	Y	Y	N	N	Y	N	N	N	Y	Y	N
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Enhanced MR Color Image Storage	1.2.840.10008.5.1.4.1.1.4.3	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Legacy Converted Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.4	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Enhanced US Volume Storage	1.2.840.10008.5.1.4.1.1.6.2	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	*	Y	Y	N	N	Y	N	N	S	Y	N	N
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	*	Y	Y	N	N	Y	N	N	S	Y	N	N
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	*	Y	Y	N	N	Y	N	N	S	Y	N	N
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N

▲ Table 1: Supported Storage SOP Classes ▼

▲ Table 1: Supported Storage SOP Classes ▼

SOP Class	SOP Class UID	Transfer Syntax Set	DIMSE services		DICOM web services		Media services			Function			
			SCU	SCP	UA	OS	FSC	FSU	FSR	Create	Display	Process	Archive
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	*	Y	Y	N	N	Y	N	N	N	Y	N	N
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
X-Ray 3D Craniofacial Image Storage	1.2.840.10008.5.1.4.1.1.13.1.2	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Breast Projection X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.13.1.4	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Breast Projection X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.13.1.5	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Intravascular Optical Coherence Tomography Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.14.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Intravascular Optical Coherence Tomography Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.14.2	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.120	*	Y	Y	N	N	Y	N	N	N	Y	N	N
VL Image Storage - Trial (Retired)	1.2.840.10008.5.1.4.1.1.177.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.177.1.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.177.1.1.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.177.1.2	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.177.1.2.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.177.1.3	*	Y	Y	N	N	Y	N	N	N	Y	N	N
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.177.1.4	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.177.1.4.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.177.1.5.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.177.1.5.2	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Ophthalmic Tomography Image Storage	1.2.840.10008.5.1.4.1.1.177.1.5.4	*	Y	Y	N	N	Y	N	N	N	Y	N	N

▲ Table 1: Supported Storage SOP Classes ▼

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SOP Class	SOP Class UID	Transfer Syntax Set	DIMSE services		DICOM web services		Media services			Function			
			SCU	SCP	UA	OS	FSC	FSU	FSR	Create	Display	Process	Archive
Wide Field Ophthalmic Photography Stereographic Projection Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.5	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Wide Field Ophthalmic Photography 3D Coordinates Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.6	*	Y	Y	N	N	Y	N	N	N	Y	N	N
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6	*	Y	Y	N	N	Y	N	N	N	Y	N	N
VL Multi-frame Image Storage - Trial (Retired)	1.2.840.10008.5.1.4.1.1.77.2	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Ophthalmic Thickness Map Storage	1.2.840.10008.5.1.4.1.1.81.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Corneal Topography Map Storage	1.2.840.10008.5.1.4.1.1.82.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	*	Y	Y	N	N	Y	N	N	N	Y	N	N
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Radiopharmaceutical Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.68	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	*	Y	Y	N	N	Y	N	N	N	Y	Y	N
Legacy Converted Enhanced PET Image Storage	1.2.840.10008.5.1.4.1.1.128.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
Enhanced PET Image Storage	1.2.840.10008.5.1.4.1.1.130	*	Y	Y	N	N	Y	N	N	N	Y	N	N
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	*	Y	Y	N	N	Y	N	N	N	Y	N	N
DICOS CT Image Storage	1.2.840.10008.5.1.4.1.1.501.1	*	Y	Y	N	N	Y	N	N	N	Y	N	N

* Syngo Carbon Enterprise Access does not validate any received data in terms of Transfer Syntaxes used and accepts properly sent DICOM requests.

Note on supported Storage Transfer Syntaxes (Table 2):

Syngo Carbon Enterprise Access does not validate any received data in terms of Transfer Syntaxes used. Transfer Syntaxes applied to SOP Classes of incoming requests are neither validated nor enforced. Syngo Carbon Enterprise Access accepts properly sent DICOM requests, under the assumption that the SCU applies a reasonable encoding for the transferred object.

Table 2: Supported Storage Transfer Syntaxes

Transfer Syntax name	Transfer Syntax UID	DICOM Web Service Bulk Data Media Type
Implicit VR Little Endian: Default Transfer Syntax for DICOM	1.2.840.10008.1.2	N/A
Explicit VR Little Endian	1.2.840.10008.1.2.1	N/A
Deflated Explicit VR Little Endian	1.2.840.10008.1.2.1.99	N/A
Explicit VR Big Endian (Retired)	1.2.840.10008.1.2.2	N/A
JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50	N/A
JPEG Extended (Process 2 & 4): Default Transfer Syntax for Lossy JPEG 12 Bit Image Compression (Process 4 only)	1.2.840.10008.1.2.4.51	N/A
JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	N/A
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	N/A
JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80	N/A
JPEG-LS Lossy (Near-Lossless) Image Compression	1.2.840.10008.1.2.4.81	N/A
JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90	N/A
JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91	N/A
MPEG2 Main Profile / Main Level	1.2.840.10008.1.2.4.100	N/A
MPEG2 Main Profile / High Level	1.2.840.10008.1.2.4.101	N/A
MPEG-4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102	N/A
MPEG-4 AVC/H.264 BD-compatible High Profile / Level 4.1	1.2.840.10008.1.2.4.103	N/A
MPEG-4 AVC/H.264 High Profile / Level 4.2 For 2D Video	1.2.840.10008.1.2.4.104	N/A
MPEG-4 AVC/H.264 High Profile / Level 4.2 For 3D Video	1.2.840.10008.1.2.4.105	N/A
MPEG-4 AVC/H.264 Stereo High Profile / Level 4.2	1.2.840.10008.1.2.4.106	N/A
HEVC/H.265 Main Profile / Level 5.1	1.2.840.10008.1.2.4.107	N/A
HEVC/H.265 Main 10 Profile / Level 5.1	1.2.840.10008.1.2.4.108	N/A
RLE Lossless	1.2.840.10008.1.2.5	N/A

1.1.1 Structured Reporting Root Template IDs

Syngo Carbon Enterprise Access supports display of Structured Report Storage SOP Classes as listed in Table 1. The application does not consider specific Root Template IDs and processes SR documents based on the standard DICOM SR content model.

1.2 DIMSE Services

1.2.1 Verification – N/A

This section does not apply to Syngo Carbon Enterprise Access.

1.2.2 Storage

For details on supported Storage SOP Classes see Section 1.1.

1.2.3 Workflow Management – N/A

This section does not apply to Syngo Carbon Enterprise Access.

1.2.4 Query/Retrieve

Table 3 lists all supported Query/Retrieve SOP Classes.

Table 3: Supported Query/Retrieve SOP Classes

SOP Class	SOP Class UID	Transfer Syntax	Transfer Syntax UID	SCU	SCP
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	Y	N
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Y	N
		Explicit VR Big Endian (Retired)	1.2.840.10008.1.2.2	Y	N
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	Y	N
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Y	N
		Explicit VR Big Endian (Retired)	1.2.840.10008.1.2.2	Y	N

1.2.5 Printing – N/A

This section does not apply to Syngo Carbon Enterprise Access.

1.3 DICOM Web Services – N/A

This section does not apply to Syngo Carbon Enterprise Access.

1.4 Media Services

Syngo Carbon Enterprise Access provides a File Set Creator (FSC) which is capable of creating a DICOM File Set consisting of a DICOMDIR and DICOM instance files. However, it does not support any specific Media Storage Application Profiles.

1.5 Real-Time Video Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

1.6 De-identification Profiles

Syngo Carbon Enterprise Access does not support any de-identification profiles. However, it supports minimization of patient identifying data during export. Minimization applies to all attributes of the Patient Module (Group Number 0010) in the DICOM header. Attributes of the Patient Module in nested structures within DICOM elements other than the Modified Attributes Sequence (0400,0550) of the Original Attributes Sequence (0400,0561) are not altered.

1.7 Specific Character Sets

Table 4: Supported Single-Byte Character Sets without Code Extensions

Defined Term	IANA	Description
none	US-ASCII	ASCII (7-bit)
ISO_IR 100	ISO-8859-1	Latin alphabet No. 1
ISO_IR 101	ISO-8859-2	Latin alphabet No. 2
ISO_IR 109	ISO-8859-3	Latin alphabet No. 3
ISO_IR 110	ISO-8859-4	Latin alphabet No. 4
ISO_IR 144	ISO-8859-5	Cyrillic
ISO_IR 127	ISO-8859-6	Arabic
ISO_IR 126	ISO-8859-7	Greek
ISO_IR 138	ISO-8859-8	Hebrew
ISO_IR 148	ISO-8859-9	Latin alphabet No. 5
ISO_IR 13	JIS_X0201	Japanese (Katakana)
ISO_IR 166	TIS-620	Thai

Table 5: Supported Single-Byte Character Sets with Code Extensions

Defined Term	IANA	Description
ISO 2022 IR 6	US-ASCII	ASCII
ISO 2022 IR 100	ISO-8859-1	Latin alphabet No. 1
ISO 2022 IR 101	ISO-8859-2	Latin alphabet No. 2
ISO 2022 IR 109	ISO-8859-3	Latin alphabet No. 3
ISO 2022 IR 110	ISO-8859-4	Latin alphabet No. 4
ISO 2022 IR 144	ISO-8859-5	Cyrillic
ISO 2022 IR 127	ISO-8859-6	Arabic
ISO 2022 IR 126	ISO-8859-7	Greek
ISO 2022 IR 138	ISO-8859-8	Hebrew
ISO 2022 IR 148	ISO-8859-9	Latin alphabet No. 5
ISO 2022 IR 13	JIS_X0201	Japanese (Katakana)
ISO 2022 IR 166	TIS-620	Thai

Table 6: Supported Multi-Byte Character Sets without Code Extensions

Defined Term	IANA	Description
ISO_IR 192	UTF-8	Unicode (UTF-8)
GB18030	GB18030	Chinese (GB18030)
GBK	GBK	Chinese (GBK)

Table 7: Supported Multi-Byte Character Sets with Code Extensions

Defined Term	IANA	Description
ISO 2022 IR 87	JIS_X0208-1990	Japanese (Kanji)
ISO 2022 IR 159	JIS_X0212-1990	Japanese (Supplementary Kanji)
ISO 2022 IR 149	KS_X_1001-1997	Korean (Hangul and Hanja)
ISO 2022 IR 58	GB2312	Simplified Chinese

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3 Introduction

3.1 Revision History

Table 8: Revision History

Revision	Date	Product Version	Change
13427	2026-07-03	VA50A	

3.2 Audience

This document is intended for the audience listed below. It is assumed that the reader has a working knowledge of the DICOM Standard.

The document structure was designed for easier access to relevant information for different user groups:

- Clinical Users, who want to get an overview of the implemented interoperability features of the system can see [Section 4 Implementation Model](#).
- Personnel involved in Sales can use the information in [Section 1](#) to assess the compatibility between different systems involved in a sales situation.
- System Integrators can use information in [Section 6](#) during system installation and also information from [Section 5 Service and Interoperability Description](#) for details regarding the implemented services.
- Field Service Engineers can use the details from [Section 5 Service and Interoperability Description](#) and from [Section 7 Network and Media Communication Details](#) for troubleshooting.
- Hospital IT staff focusing on security can use the details provided in [Section 8 Security](#) regarding implemented Security features.

3.3 Remarks

This document is a DICOM Conformance Statement that describes the DICOM capabilities of Syngo Carbon Enterprise Access.

The scope of this DICOM Conformance Statement is to facilitate integration between Syngo Carbon Enterprise Access and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [1]. DICOM by itself does not guarantee interoperability.

- This Conformance Statement is intended to aid in the validation of the integration of Syngo Carbon Enterprise Access within a DICOM environment.
- The Conformance Statement does facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.
- This Conformance Statement should not replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, it is the user's responsibility to perform the following validation activities:
 - The comparison of Conformance Statements from Syngo Carbon Enterprise Access and other DICOM conformant equipment is the first step towards assessing interconnectivity and interoperability between those systems.

- Test procedures should be defined and executed to validate the required level of interoperability with specific DICOM conformant equipment, as established by the healthcare facility.

3.4 Terms and Definitions

The following list includes DICOM Terms, that are used throughout this Conformance Statement:

Abstract Syntax	The information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.
Application Entity (AE)	A representation of the external behavior of an application process in terms of DICOM Network Services, Web Services and/or media exchange capabilities implemented in one or more roles. A single device may have multiple Application Entities.
Application Entity Title (AET)	The externally known name of an Application Entity, used to identify a DICOM application to other DICOM applications on the network.
Application Context	The specification of the type of communication used between Application Entities. Example: DICOM network protocol.
Association	A network communication channel set up between Application Entities.
Attribute	A unit of information in an Information Object Definition; a Data Element identified by a tag. The information may be a complex data structure (Sequence), itself composed of lower-level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).
Data Element	A unit of information as defined by a single entry in the data dictionary. An encoded Information Object Definition (IOD) Attribute that is composed of, at a minimum, three fields: a Data Element Tag, a Value Length, and a Value Field. For some specific Transfer Syntaxes, a Data Element also contains a VR Field where the Value Representation of that Data Element is specified explicitly
Information Object Definition (IOD)	The specified set of Attributes that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. Examples: MR Image IOD, CT Image IOD, Print Job IOD. The Attributes within an IOD may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C).
Media Storage Application Profile	The specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs).
Module	A set of Attributes within an Information Object Definition that are logically related to each other. Example: Patient Module includes Patient's Name, Patient ID, Patient's Birth Date, and Patient's Sex.
Negotiation	First phase of Association establishment that allows Application Entities to agree on the types of data to be exchanged and how that data will be encoded.

Origin Server	Refers to the program that can originate authoritative responses to HTTP requests for a given Target Resource. The term “server” refers to any implementation that receives a web service request message from a user agent.
Presentation Context	The set of DICOM Network Services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.
Private SOP Class	A SOP Class that is not defined in the DICOM Standard but is published in an implementation’s Conformance Statement.
Protocol Data Unit (PDU)	A packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.
Security Profile	A set of mechanisms, such as encryption, user authentication, or digital signatures, used by an Application Entity to ensure confidentiality, integrity, and/or availability of exchanged DICOM data.
Service Class Provider (SCP)	Role of an Application Entity that provides a DICOM network service; typically, a server that performs operations requested by another Application Entity (Service Class User). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).
Service Class User (SCU)	Role of an Application Entity that uses a DICOM Network Service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU).
Service/Object Pair Class (SOP Class)	The specification of the network or media transfer (service) of a particular type of data (object) ; the fundamental unit of a DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.
Service/Object Pair Instance (SOP Instance)	An information object; a specific occurrence of information exchanged in a SOP Class. E.g., a specific X-ray image.
Specialized SOP Class	A SOP Class that is derived from the Standard that is specialized by additional Type 1, 1C, 2, 2C, or 3 Attributes, by enumeration of specific permitted Values for Attributes, or by enumeration of specific permitted Templates. The additional Attributes may either be drawn from the Data Dictionary in PS3.6 or may be Private Attributes.
Standard SOP Class	A SOP Class defined in the Standard, and that is implemented and used without any modifications.
Standard Extended SOP Class	A SOP Class that is defined in the standard, and that is extended by additional Type 3 Attributes. The additional Attributes may either be drawn from the DICOM Data Dictionary in PS3.6 or may be Private Attributes.
Tag	A 32-bit identifier for a Data Element, represented as a pair of four-digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element].

Transfer Syntax	The encoding used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), Little Endian Explicit Value Representation.
TLS-Secured Port	TCP port on which an implementation accepts TLS connections to exchange DICOM information.
Unique Identifier (UID)	A globally unique “dotted decimal” string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.
User Agent	A client in a network protocol used in communications within a client-server distributed computing system. In particular, the Hypertext Transfer Protocol (HTTP) identifies the client software originating the request, using a user-agent header, even when the client is not operated by a user.
Value Representation (VR)	The format type of an individual DICOM data element, such as text, an integer, a person’s name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR) ; with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

The following list includes product specific definitions used throughout this Conformance Statement:

Organizational unit	Representation of document-producing actors in a healthcare institution (e.g. departments, teams, devices). Organizational units function as archiving destinations for documents. Each document is archived in exactly one organizational unit.
----------------------------	--

3.5 Abbreviations

Abbreviations that are used in this DICOM Conformance Statement are listed here.

AE	Application Entity
AET	Application Entity Title
CAD	Computer Aided Detection
CDA	Clinical Document Architecture
CID	Context Identifier
DCS	DICOM Conformance Statement
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
ELE	Explicit VR Little Endian
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
IANA	Internet Assigned Numbers Authority
IHE	Integrating the Healthcare Enterprise
ILE	Implicit VR Little Endian
IOD	Information Object Definition
IPv4	Internet Protocol version 4

IPv6	Internet Protocol version 6
ISO	International Organization for Standardization
MPPS	Modality Performed Procedure Step
MWL	Modality Worklist
NEMA	National Electrical Manufacturers Association
NTP	Network Time Protocol
OID	Object Identifier
OS	Origin Server
PDU	Protocol Data Unit
PHI	Protected Health Information
PPS	Performed Procedure Step
QIDO-RS	Query based on ID for DICOM Objects by RESTful Services
RTV	Real-Time Video
SCP	Service Class Provider
SCU	Service Class User
SDP	Service Description Protocol
SOP	Service-Object Pair
SPS	Scheduled Procedure Step
SR	Structured Reporting
STOW-RS	STore Over the Web by RESTful Services
TCP/IP	Transmission Control Protocol/Internet Protocol
TID	Template Identifier
UA	User Agent
UI	User Interface
UID	Unique Identifier
UL	Upper Layer
UPS	Unified Procedure Step
UPS-RS	Unified Procedure Step by RESTful Services
VR	Value Representation
WADO-RS	Web Access to DICOM Objects by RESTful Services
WADO-URI	Web Access to DICOM Objects by URI

3.6 References

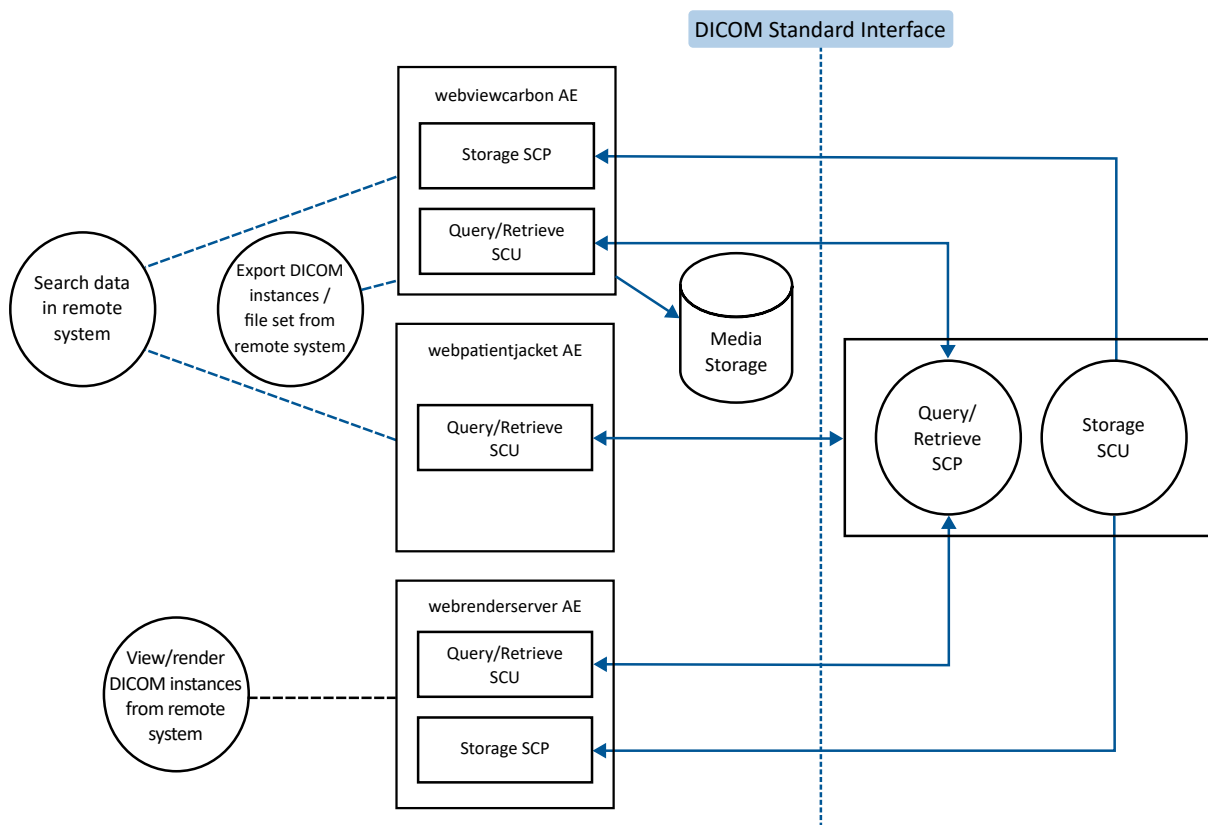
- [1] National Electrical Manufacturers Association (NEMA), Rosslyn, VA USA. *PS3 / ISO 12052 Digital Imaging and Communications in Medicine (DICOM) Standard*. <http://www.dicomstandard.org>.

4 Implementation Model

4.1 Application Entities and Data Flow

The network and media interchange application model for the Syngo Carbon Enterprise Access is shown in Figure 2 Syngo Carbon Enterprise Access Application Data Flow Diagram.

Figure 2: Syngo Carbon Enterprise Access Application Data Flow Diagram



This section describes the organization of the supported Services into Application Entities based on the default configuration of the system. This may change based on the actual setup at the customer site. See Section 6 for details about the configurability of Services into AEs.

4.1.1 Functional Definition of *webviewcarbon* AE

The *webviewcarbon* AE provides DICOM Query/Retrieve and Storage functionality to support search and export of DICOM studies from remote systems.

The *webviewcarbon* AE queries remote systems for studies, series, and instances using the C-FIND service (SCU role). It retrieves DICOM instances from remote systems using the C-MOVE service (SCU role) and, to receive the instances transferred as a result of C-MOVE requests, provides a C-STORE service (SCP role). Retrieved instances can be exported as a ZIP archive or as a DICOM File Set. In the latter case, the *webviewcarbon* AE acts as a File Set Creator (FSC).

4.1.2 Functional Definition of *webpatientjacket* AE

The *webpatientjacket* AE provides DICOM Query/Retrieve functionality to support patient-centric search of DICOM studies from remote systems.

The *webpatientjacket* AE queries remote systems for studies using the C-FIND service (SCU role), based on patient demographic search criteria.

4.1.3 Functional Definition of *webrenderserver* AE

The *webrenderserver* AE provides DICOM Query/Retrieve and Storage functionality to support retrieval of DICOM instances for rendering purposes.

The *webrenderserver* AE queries remote systems for series and instances of a given study using the C-FIND service (SCU role). It retrieves DICOM instances from remote systems using the C-MOVE service (SCU role) and, to receive the instances transferred as a result of C-MOVE requests, provides a C-STORE service (SCP role).

5 Service and Interoperability Description

5.1 Mapping of Services to Application Entities

Table 9 provides an overview of the Application Entities and the Services supported by each AE.

Table 9: Service to AE Mapping

Application Entity	Supported Services	Role								
		DIMSE services		DICOM web services		DICOM Media			Real-Time Video	
		SCU	SCP	Origin Server	User Agent	FSC	FSU	FSR	SCU	SCP
<i>webviewcarbon</i>	Storage	N	Y	N	N	Y	N	N	N	N
	Query/Retrieve	Y	N	N	N	N	N	N	N	N
<i>webpatientjacket</i>	Query/Retrieve	Y	N	N	N	N	N	N	N	N
<i>webrenderserver</i>	Storage	N	Y	N	N	N	N	N	N	N
	Query/Retrieve	Y	N	N	N	N	N	N	N	N

5.2 DIMSE Services

5.2.1 Basic Worklist Management Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.2.2 Modality Performed Procedure Step Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.2.3 Unified Worklist and Procedure Step Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.2.4 Instance Availability Notification Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.2.5 Storage Service

5.2.5.1 SCU of the Storage SOP Classes – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.2.5.2 SCP of the Storage SOP Classes

As a Service Class Provider of the Storage Service Class, Syngo Carbon Enterprise Access receives C-STORE-RQ messages from remote SCUs. However, the Storage SCP is not a general-purpose storage

endpoint - it is exclusively used to receive SOP Instances transferred by remote systems as a result of C-MOVE operations initiated by Syngo Carbon Enterprise Access. See [Section 1.1](#) for the list of supported SOP Classes.

Table 10 defines the conformance levels of Syngo Carbon Enterprise Access.

Table 10: Levels of Conformance	
Levels of Conformance	2
Level of Digital Signature Support	1

5.2.5.2.1 Attribute Coercion by Storage SCP

Syngo Carbon Enterprise Access does not coerce Attribute values of received SOP Instances. The received instances are used as-is for display and rendering purposes and are not persistently stored. Minimization of Patient Module Attributes as described in [Section 1.6](#) applies exclusively to export copies and is not performed upon reception.

5.2.5.2.2 Display and Processing Limitations for Storage SCP

This section describes limitations on displaying or processing instances, e.g., display or processing of the respective SOP Instances is prevented by an unsupported Value for an Attribute or the absence of that Attribute.

The lists are ordered by “Effect”, which describes what happens if the limitation is encountered. The following Values are used:

- ND: Display is not possible
- LD: Display is limited
- NP: Processing is not possible
- LP: Processing is limited
- OT: Other effects as described

DICOM instances

LD • Timezone Offset From UTC (0008,0201) is not applied on DA, TM, and DT attributes.

ND • Instances for which the value length of a tag exceeds 2 GiB (2^{31} - 9 bytes) are not supported.

DICOM images

- LD**
- Multiple window center and width presets are not supported.
 - VOI LUTs present in the Functional Group of multi-frame images are not considered.
 - VOI LUT functions are not supported.
 - Overlays stored in the unused bit planes of Pixel Data (7FE0,0010) are not supported, since this method was retired from the DICOM Standard in 2004.
 - Display Shutter and other graphical modules defined in image IODs are not applied.
 - ECG visualization is available only for color and monochrome images of modality XA. Only the first repeating group (5000 group) of the Curve Module is considered if Type of Data (5000,0020) is ECG. In addition, Curve Dimensions (5000,0005) must be 2, and Curve Data

Descriptor (5000,0110) must be present with values 0\1. Value representation is limited to unsigned short data: Data Value Representation (5000,0103) must be 0 and VR of Curve Data (5000,3000) must be OW.

- For modality US, the Sequence of Ultrasound Regions (0018,6011) can only be evaluated – and therefore annotations can only be calibrated – if there exists exactly one calibration region with Physical Units X Direction (0018,6024) and Physical Units Y Direction (0018,6026) indicating centimeters (3).

- ND**
- Images with 1 bit allocated for each pixel sample (binary images) are not supported.
 - Images with more than 16 bits per sample (Bits Stored (0028,0101)) are not supported.

DICOM whole slide microscopy images

Whole slide microscopy images (WSI images) consist of multiple instances forming an image pyramid. The image pyramid consists furthermore of zoom layers and Z-layers.

- LD**
- Display of whole slide images is not supported for data from remote systems. In this case, instances are interpreted as a common multi-frame image.
 - Thumbnail and overview layer are not available if the edge length of the topmost zoom layer of the image pyramid exceeds 5,000 pixels.
 - Overview layer is not available if the edge length of the topmost zoom layer of the image pyramid falls below 800 pixels.
 - Instances with an Image Flavor (third value of Image Type (0008,0008)) of LABEL or OVERVIEW consisting of multiple frames are not supported.
 - Image pyramids with a layer width or height exceeding $2^{31} - 1$ pixels are not supported.
- ND**
- Whole slide microscopy images consisting of monochrome image data are currently not supported.
 - Instances for which the Dimension Organization Type (0020,9311) is present with value must either follow TILED_FULL or TILED_SPARSE dimension organization.
 - All instances with an Image Flavor (third value of Image Type (0008,0008)) of VOLUME must use the same dimension organization.
 - Instances with multiple optical paths are not supported.
 - All instances must share the same Frame of Reference UID (0020,0052), Container Identifier (0040,0512), Issuer of the Container Identifier Sequence (0040,0513), Specimen UID (0040,0554), and Image Orientation (Slide) (0048,0102).
 - The number of Z-layers and the spacing between slices must be uniform across all zoom layers.
 - Image pyramids with a number of Z-layers exceeding $2^{31} - 1$ are not supported.
 - Image pyramids with layers exceeding $2^{31} - 9$ tiles (frames) are not supported.
 - Instances with Dimension Organization Type (0020,9311) of TILED_FULL and with an Image Flavor (third value of Image Type (0008,0008)) of VOLUME are not supported if they are part of a concatenation or if the number of frames per layer or in total exceeds $2^{31} - 1$.

DICOM ECGs

- LD**
 - Channel layouts are only possible if exactly 12 channels are present in the selected Waveform Multiplex Group.
 - Display properties (e.g. presentation groups, display colors, display scale) of the Waveform Module are not supported.
- ND**
 - ECG SOP Classes not listed in Table 1 are currently not supported.
 - Channel Sensitivity (003A,0210) is required to be present since samples shall represent defined (not arbitrary) units.
 - An ECG is not supported if Channel Time Skew (003A,0214), Channel Sample Skew (003A,0215), or Channel Offset (003A,0218) is present with a non-zero value.

DICOM videos

- ND**
 - Videos with an encapsulated video data stream segmented into more than one fragment are not supported.

DICOM Grayscale Softcopy Presentation States

- LD**
 - GSPS module limitations are listed in Table 12.
- ND**
 - GSPS are not applied on instances of the SOP Classes listed in Table 11 due to their limited support.
 - Presentation State Storage SOP Classes not listed above (see Table 1) are currently not supported.

Table 11: SOP Classes and corresponding UIDs for which Grayscale Softcopy Presentation States are not applied

SOP Class name	SOP Class UID
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4
Surface Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.5
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6

Table 12: Grayscale Softcopy Presentation State module coverage and limitations

Module	Implemented	Limitations
Presentation State Identification	Partially	No further attributes beside Presentation Creation Date (0070,0082), Presentation Creation Time (0070,0083), and Content Label (0070,0080) with Content Creator's Name (0070,0084) from the Content Identification Macro are processed.
Presentation State Relationship	Partially	The Referenced Segment Number (0062,000B) from the Image SOP Instance Reference Macro is not considered.
Presentation State Shutter	No	-
Presentation State Mask	No	-
Mask	No	-
Display Shutter	No	-
Bitmap Display Shutter	No	-
Overlay Plane	No	-

Table 12: Grayscale Softcopy Presentation State module coverage and limitations ▼

▲ Table 12: Grayscale Softcopy Presentation State module coverage and limitations

Module	Implemented	Limitations
Overlay Activation	No	-
Displayed Area	Partially	The Referenced Segment Number (0062,000B) from the Image SOP Instance Reference Macro is not considered. The enumerated value VO LUME of Pixel Origin Interpretation (0048,0301) is not supported. The enumerated value TRUE SIZE of Presentation Size Mode (0048,0301) is interpreted as a magnification factor of 1: 1, as the client currently does not provide the physical pixel size of the display.
Graphic Annotation	Partially	The Referenced Segment Number (0062,000B) from the Image SOP Instance Reference Macro is not considered. The enumerated value MA TRIX for all annotation units of this module is not supported. The Text Style Sequence Macro, Compound Graphic Instance ID (0070,0226), and Graphic Group ID (0070,0295) from the Text Object Sequence (0070,0008) are not supported. The Line Style Sequence Macro, Fill Style Sequence Macro, Compound Graphic Instance ID (0070,0226), and Graphic Group ID (0070,0295) from the Graphic Object Sequence are not supported. The Compound Graphic Sequence is not considered.
Spatial Transformation	Yes	-
Graphic Layer	Partially	The Graphic Layer Description (0070,0068) is not considered.
Graphic Group	No	-
Modality LUT	No	-
Softcopy VOI LUT	No	-
Softcopy Presentation LUT	No	-
SOP Common	Partially	No further information is read from this module for GSPS instances apart from common information required for every supported DICOM instance (e.g. Specific Character Set (0008,0005)).

DICOM Structured Reports

- LD**
- Referenced images need to be in the same study in order to be resolved automatically.
 - Referenced images do not consider a referenced Presentation State or Segment Number.
 - Referenced multi-frame images not referencing all frames only consider the first referenced frame.
- ND**
- Support is currently limited to the rendering of Basic Text Structured Reports, X-Ray Radiation Dose Structured Reports, Radiopharmaceutical Radiation Dose Structured Reports, and Key Object Selection Documents.

5.2.6 Storage Commitment Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.2.7 Query/Retrieve Service Class

5.2.7.1 SCU of the Study Root Q/R Information Model - FIND SOP Class

As a Service Class User of the Study Root Q/R - Information Model - FIND SOP Class, the Syngo Carbon Enterprise Access uses the C-FIND-RQ message and supports the Query Keys listed in Table 13, Table 14 and Table 15 for hierarchical queries.

In the “Matching Type” column the following Values can be used:

- SINGLE_VALUE: SCU can request Single Value matching on this Attribute.
- UID: SCU can request List of UID matching on this Attribute.
- WILDCARD: SCU can request Wildcard matching on this Attribute.
- RANGE: SCU can request Range matching on this Attribute.
- SEQUENCE: SCU can request Sequence matching on this Attribute.
- UNIVERSAL: SCU can request that the Attribute be a return Value (universal matching).

In the “Query Value Source” column the following Values can be used:

- FIXED: The query Value cannot be modified by the user or by configuration.
- GENERATED: The query Value is generated by the system (e.g., current date as the study date).
- CONFIGURATION: The query Value is dependent on system configuration.
- USER: The query Value is entered by the user.
- SCANNED: The query Value is read from a barcode scanner or similar device.
- EMPTY: The query Value is sent with a zero-length value to indicate it is a return key only.

In the “Display on UI” column the following Values can be used:

- D: the return Value is displayed on the main UI by default.
- C: the return Value is displayed on the main UI if configured.
- N: the return Value is never displayed.

Table 13: Supported C-FIND Attribute Matching for Study Root Q/R Model - SCU on Study Level

Attribute Name	Tag	Matching Type	Comments
StudyDate	(0008,0020)	SINGLE_VALUE, RANGE, UNIVERSAL	
StudyTime	(0008,0030)	RANGE, UNIVERSAL	
AccessionNumber	(0008,0050)	SINGLE_VALUE, WILDCARD, UNIVERSAL	
ModalitiesInStudy	(0008,0061)	SINGLE_VALUE, UNIVERSAL	
ReferringPhysicianName	(0008,0090)	WILDCARD, UNIVERSAL	
StudyDescription	(0008,1030)	WILDCARD, UNIVERSAL	
PatientName	(0010,0010)	WILDCARD, UNIVERSAL	
PatientID	(0010,0020)	SINGLE_VALUE, WILDCARD, UNIVERSAL	
PatientBirthDate	(0010,0030)	SINGLE_VALUE, RANGE, UNIVERSAL	
PatientBirthTime	(0010,0032)	RANGE, UNIVERSAL	
PatientSex	(0010,0040)	SINGLE_VALUE, UNIVERSAL	
PatientBirthName	(0010,1005)	WILDCARD, UNIVERSAL	
PatientMotherBirthName	(0010,1060)	WILDCARD, UNIVERSAL	
StudyInstanceUID	(0020,000D)	UID, UNIVERSAL	
StudyID	(0020,0010)	SINGLE_VALUE, WILDCARD, UNIVERSAL	
NumberOfStudyRelatedSeries	(0020,1206)	UNIVERSAL	
NumberOfStudyRelatedInstances	(0020,1208)	UNIVERSAL	
AdmissionID	(0038,0010)	UNIVERSAL	
AdmittingDate	(0038,0020)	UNIVERSAL	
AdmittingTime	(0038,0021)	UNIVERSAL	

Table 13: Supported C-FIND Attribute Matching for Study Root Q/R Model - SCU on Study Level ▼

▲ Table 13: Supported C-FIND Attribute Matching for Study Root Q/R Model - SCU on Study Level

Attribute Name	Tag	Matching Type	Comments
DischargeDate	(0038,0030)	UNIVERSAL	
DischargeTime	(0038,0032)	UNIVERSAL	

Table 14: Supported C-FIND Attribute Matching for Study Root Q/R Model - SCU on Series Level

Attribute Name	Tag	Matching Type	Comments
SeriesDate	(0008,0021)	UNIVERSAL	
SeriesTime	(0008,0031)	UNIVERSAL	
Modality	(0008,0060)	UNIVERSAL	
Manufacturer	(0008,0070)	UNIVERSAL	
InstitutionName	(0008,0080)	WILDCARD, UNIVERSAL	
StationName	(0008,1010)	WILDCARD, UNIVERSAL	
SeriesDescription	(0008,103E)	WILDCARD, UNIVERSAL	
InstitutionalDepartmentName	(0008,1040)	WILDCARD, UNIVERSAL	
PerformingPhysicianName	(0008,1050)	UNIVERSAL	
OperatorsName	(0008,1070)	UNIVERSAL	
ManufacturerModelName	(0008,1090)	UNIVERSAL	
BodyPartExamined	(0018,0015)	WILDCARD, UNIVERSAL	
SeriesInstanceUID	(0020,000E)	UID, UNIVERSAL	
SeriesNumber	(0020,0011)	SINGLE_VALUE, WILDCARD, UNIVERSAL	
Laterality	(0020,0060)	SINGLE_VALUE, UNIVERSAL	
NumberOfSeriesRelatedInstances	(0020,1209)	UNIVERSAL	
PerformedProcedureStepStartDate	(0040,0244)	RANGE, UNIVERSAL	
PerformedProcedureStepStartTime	(0040,0245)	RANGE, UNIVERSAL	
RequestAttributesSequence	(0040,0275)	SEQUENCE	
- ScheduledProcedureStepID	(0040,0009)	SINGLE_VALUE, WILDCARD, UNIVERSAL	
- RequestedProcedureID	(0040,1001)	SINGLE_VALUE, WILDCARD, UNIVERSAL	

Table 15: Supported C-FIND Attribute Matching for Study Root Q/R Model - SCU on Instance Level

Attribute Name	Tag	Matching Type	Comments
ImageType	(0008,0008)	UNIVERSAL	
SOPClassUID	(0008,0016)	UNIVERSAL	
SliceThickness	(0018,0050)	UNIVERSAL	
AcquisitionNumber	(0020,0012)	UNIVERSAL	
InstanceNumber	(0020,0013)	UNIVERSAL	
ImagePositionPatient	(0020,0032)	UNIVERSAL	
ImageOrientationPatient	(0020,0037)	UNIVERSAL	
SliceLocation	(0020,1041)	UNIVERSAL	
SamplesPerPixel	(0028,0002)	UNIVERSAL	
PhotometricInterpretation	(0028,0004)	UNIVERSAL	
NumberOfFrames	(0028,0008)	UNIVERSAL	

Table 15: Supported C-FIND Attribute Matching for Study Root Q/R Model - SCU on Instance Level ▼

▲ Table 15: Supported C-FIND Attribute Matching for Study Root Q/R Model - SCU on Instance Level

Attribute Name	Tag	Matching Type	Comments
Rows	(0028,0010)	UNIVERSAL	
Columns	(0028,0011)	UNIVERSAL	
BitsAllocated	(0028,0100)	UNIVERSAL	
BitsStored	(0028,0101)	UNIVERSAL	
ConceptNameCodeSequence	(0040,A043)	SEQUENCE	
- CodeValue	(0008,0100)	SINGLE_VALUE, UNIVERSAL	
- CodingSchemeDesignator	(0008,0102)	SINGLE_VALUE, UNIVERSAL	
- CodingSchemeVersion	(0008,0103)	UNIVERSAL	
- CodeMeaning	(0008,0104)	UNIVERSAL	
ReferencedRequestSequence	(0040,A370)	SEQUENCE	
- AccessionNumber	(0008,0050)	UNIVERSAL	
- StudyInstanceUID	(0020,000D)	UNIVERSAL	
- RequestedProcedureID	(0040,1001)	UNIVERSAL	
ContentLabel	(0070,0080)	UNIVERSAL	
ContentDescription	(0070,0081)	UNIVERSAL	
PresentationCreationDate	(0070,0082)	UNIVERSAL	
PresentationCreationTime	(0070,0083)	UNIVERSAL	
ContentCreatorName	(0070,0084)	UNIVERSAL	

5.2.7.2 SCU of the Patient Root Q/R Information Model - FIND SOP Class – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.2.7.3 SCU of the Study Root Q/R Information Model - MOVE SOP Class

Syngo Carbon Enterprise Access uses List of UID matching to retrieve multiple entities in a single C-MOVE request. List of UID matching is applied at the Study level (multiple Study Instance UIDs), the Series level (multiple Series Instance UIDs within a single study), and the Image level (multiple SOP Instance UIDs within a single series).

A C-MOVE-CANCEL request may be sent in the following conditions:

- On error: If an error occurs during an ongoing C-MOVE operation (e.g., I/O error), a C-MOVE-CANCEL is sent as part of error recovery.
- When requested data is no longer needed (*webrenderserver* AE only): If a C-MOVE operation is still in progress and instances have not yet been fully received, a C-MOVE-CANCEL is sent to stop the ongoing retrieval.

5.2.7.4 SCU of the Patient Root Q/R Information Model - MOVE SOP Class – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.2.7.5 SCP of the Study Root Q/R Information Model - FIND SOP Class – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.2.7.6 SCP of the Patient Root Q/R Information Model - FIND SOP Class – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.2.7.7 SCP of the Study Root Q/R Information Model - MOVE SOP Class – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.2.7.8 SCP of the Patient Root Q/R - Information Model - MOVE SOP Class – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.2.8 Print Management Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.3 DICOM Web Services – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.4 Media Services

5.4.1 File Set Creator (FSC)

Syngo Carbon Enterprise Access supports creating the Basic Directory IOD as a File Set Creator (see Section A.3). It is capable of creating a DICOM File Set consisting of a DICOMDIR and DICOM files.

The produced file set has the following characteristics:

- All DICOM files are stored using the Explicit VR Little Endian Transfer Syntax. Instances in compressed Transfer Syntaxes are decompressed prior to writing; instances that cannot be converted to Explicit VR Little Endian Transfer Syntax are either excluded or included in their original form, depending on user configuration.
- The file set is packaged as an ISO 9660 Level 1 image. ISO 9660 Level 3 is used automatically if any individual file exceeds 4 GB in size.
- The DICOMDIR is placed in the root directory of the file set.

5.4.2 File Set Reader (FSR) – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.4.3 File Set Updater (FSU) – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.5 Real-Time Video Services – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.6 Cross Service Considerations – N/A

This section does not apply to Syngo Carbon Enterprise Access.

5.7 Specific Character Sets

See [Section 1.7](#) for supported Values for Specific Character Set (0008,0005).

Generic configuration for Specific Character Sets is covered in [Section 6.1](#).

6 Configuration

Throughout all subsections the following Values can be used in the “Configurable” column:

- USER: The parameter is configurable by the user.
- SERVICE: The parameter is configurable by service personnel.
- FIXED: The parameter is not configurable (it has a fixed Value). The Value is required for the configuration of the remote system.
- N/A: The parameter is not applicable for the local or the remote system.

6.1 General Configuration Parameters

Table 16 and Table 17 list general configuration parameters applicable across all supported DICOM Services.

Table 16: General Configuration Parameters - General Parameters

Parameter	Configurable	Default Value	Comments
Timeout for establishing a new connection	FIXED	1 minute	
Timeout for waiting on acceptance of the association (A-ASSOCIATE-AC)	FIXED	1 minute	
Timeout for waiting on a response (e.g. after sending a C-FIND request)	FIXED	1 minute	
Timeout for waiting on a response regarding a retrieval request (e.g. after sending a C-MOVE request)	FIXED	1 minute	
Timeout for waiting on release of the association (A-RELEASE-RP)	FIXED	1 minute	
Timeout for waiting on establishment of a new association (A-ASSOCIATE-RQ)	FIXED	1 minute	
Timeout for idle associations	FIXED	1 minute	
Timeout for association release after issuing a C-CANCEL-RQ	FIXED	1 minute	If, after issuing a C-CANCEL-RQ, the SCP continues to send responses or fails to cease DIMSE activity within the configured timeout period, the association is aborted, as the operation cannot be terminated in an orderly manner.

Table 17: General Configuration Parameters - DICOM Services Parameters

Parameter	Configurable	Default Value	Comments
Specific Character Set	FIXED	ISO_IR 192	Used in all C-FIND and C-MOVE requests.

6.2 Configuration of DIMSE Services

Syngo Carbon Enterprise Access is configured in the product configuration in `syngo.share` Configuration and static server configuration files.

The tables in the following subsections show the configuration parameters required for DIMSE Services.

In order to identify whether Syngo Carbon Enterprise Access is an SCP and/or an SCU, the following applies:

- SCP: The (Secured) Local Called AET and Remote Calling AET parameters are present.
- SCU: The (Secured) Local Calling AET and Remote Called AET parameters are present.

6.2.1 Basic Worklist Management Service Configuration – N/A

This section does not apply to Syngo Carbon Enterprise Access.

6.2.2 Modality Performed Procedure Step Service Configuration – N/A

This section does not apply to Syngo Carbon Enterprise Access.

6.2.3 Unified Worklist and Procedure Step Service Configuration – N/A

This section does not apply to Syngo Carbon Enterprise Access.

6.2.4 Instance Availability Notification Service Configuration – N/A

This section does not apply to Syngo Carbon Enterprise Access.

6.2.5 Storage Service Configuration

webviewcarbon AE and *webrenderserver* AE provide a Storage SCP as part of their Query/Retrieve functionality. Thus, the Storage SCP only processes data from remote systems as answers to a previously issued C-MOVE request.

Table 18 lists Storage Service configuration parameters:

Table 18: Storage Service Parameters: Local Configuration Parameters - Storage Service

Parameter	Configurable	Default Value	Comments
Called AE Title (SCP)	SERVICE	WEBVIEW (for <i>webviewcarbon</i> AE) WEBRS (for <i>webrenderserver</i> AE)	AE Title under which the Storage SCP listens for incoming C-STORE associations. To be configured in: server configuration
Port	SERVICE	12300 (for <i>webview</i> AE) 12201 (for <i>webrenderserver</i> AE)	TCP port the Storage SCP listens on. To be configured in: server configuration
Maximum number of simultaneously open associations	SERVICE	10 (for <i>webview</i> AE) 20 (for <i>webrenderserver</i> AE)	The maximum number of simultaneously open associations of the Storage SCP. To be configured in: server configuration
Supported Transfer Syntax as SCP	FIXED		Accepts all Transfer Syntaxes
Supported Storage SOP Classes as SCP	FIXED		Accepts all Storage SOP Classes

6.2.6 Storage Commitment Service Configuration – N/A

This section does not apply to Syngo Carbon Enterprise Access.

6.2.7 Query/Retrieve Service Configuration

webviewcarbon AE, *webpatientjacket* AE and *webrenderserver* AE provide a Query/Retrieve SCU supporting C-FIND; *webviewcarbon* AE and *webrenderserver* AE additionally support C-MOVE.

Table 19 and Table 20 list Query/Retrieve Service configuration parameters:

Table 19: Query/Retrieve Service Parameters: Local Configuration Parameters - Query/Retrieve Service

Parameter	Configurable	Default Value	Comments
Called AE Title (SCU)	SERVICE	WEBVIEW (for <i>webviewcarbon</i> AE) WEBRS (for <i>webrenderserver</i> AE)	AE Title used to initiate associations for C-FIND and C-MOVE to remote systems. An alternate calling AET can be configured for each remote system in the product configuration. To be configured in: server configuration (default value) / product configuration (alternate Calling AE Title)
Move Destination AE title	FIXED		Automatically set to the Called AE Title of the Storage Service of the same AE.

Table 20: Query/Retrieve Service Parameters: Remote Configuration Parameters - Query/Retrieve Service

Parameter	Configurable	Default Value	Comments
Called AE Title (SCP)	SERVICE		AE Title of the remote system. To be configured in: product configuration
Port	SERVICE		Port of the remote system. To be configured in: product configuration
Host	SERVICE		Host of the remote system. To be configured in: product configuration

6.2.8 Print Management Service Configuration – N/A

This section does not apply to Syngo Carbon Enterprise Access.

6.3 Configuration of DICOM Web Services – N/A

This section does not apply to Syngo Carbon Enterprise Access.

6.4 Configuration of Media Storage Service

Table 21 lists configuration parameters for the Media Storage service.

Table 21: Media Storage Service Parameters

Parameter	Configurable	Default Value	Comments
Minimize Patient Data	USER	No	Options: Yes; No Option to minimize patient data. For further details please see Section 1.6 .
Add Nonconvertible DICOM Instances	USER	Yes	Options: Yes; No Option to add DICOM instances which cannot be converted to Explicit VR Little Endian.
ISO 9660 Level	USER	Auto	Options: Auto, Level 1 Auto automatically upgrades to Level 3 if any file in the file set is ≥ 4 GB. If Level 1 is selected and a file ≥ 4 GB is present, the export fails with an error.

6.5 Configuration of Real-Time Video Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

6.6 Configuration of Audit Trail - Syslog – N/A

This section does not apply to Syngo Carbon Enterprise Access.

7 Network and Media Communication Details

7.1 General

7.1.1 General Association Parameters

Table 22 lists Association parameters applicable to all AEs on the system.

Table 22: General Association Parameters

Name	Value
Implementation Class UID	1.2.40.0.13.1.3
Implementation Version Name	dcm4che-5.34.2
Maximum PDU Length	16378

7.2 Specifications

7.2.1 *webviewcarbon* Application Entity

7.2.1.1 Sequencing of Real-World Activities for *webviewcarbon* AE

The *webviewcarbon* AE supports two real-world activities: searching for DICOM data in a remote system (C-FIND) and exporting DICOM instances from a remote system (C-MOVE / C-STORE). The typical sequence is: the user initiates a search (C-FIND) to locate studies, series, or instances. Based on the search results, the user may optionally trigger an export. The export activity involves two DIMSE operations: the *webviewcarbon* AE issues a C-MOVE request to the remote system, which in turn transfers the requested instances back to the *webviewcarbon* AE via C-STORE. A C-MOVE operation always follows a preceding C-FIND, while C-FIND may be performed independently.

7.2.1.2 Association Parameters of *webviewcarbon* AE

Table 22 lists Association parameters applicable to all activities of *webviewcarbon* AE.

7.2.1.3 Association Initiation

This section details the Association policies of the Application Entity when it is initiating an Association.

7.2.1.3.1 Real-World Activity: Search data in remote system (C-FIND)

webviewcarbon AE serves as an SCU for all the supported Q/R Information Model - FIND SOP Classes. The *webviewcarbon* AE initiates a C-FIND request and displays the responses to the user. The proposed Transfer Syntaxes for association establishment for C-FIND are defined in Table 3.

If the C-FIND operation is no longer relevant, the *webviewcarbon* AE issues a C-CANCEL request to cancel it. This may be triggered by the user or by the system.

The Association is closed when the C-FIND operation is finished or cancelled.

7.2.1.3.2 Real-World Activity: Export DICOM instances/file set from remote system (C-MOVE)

webviewcarbon AE acts as an SCU for all the supported Q/R Information Model MOVE SOP Classes. It initiates a C-MOVE request to a remote system to retrieve DICOM instances for export. The proposed Transfer Syntaxes for association establishment for C-MOVE are defined in Table 3.

If an error occurs during export, the *webviewcarbon* AE issues a C-CANCEL request to terminate the C-MOVE operation.

The Association is closed after the SCP sends the final C-MOVE response or after cancellation.

7.2.1.4 Association Acceptance

This section details the Association policies of the Application Entity when it is the acceptor of an Association.

7.2.1.4.1 Real-World Activity: Export DICOM instances/DICOM File Set from remote system (C-STORE)

The *webviewcarbon* AE serves as an SCP for the C-STORE service. It accepts associations from remote systems that transfer DICOM instances as a result of a previously issued C-MOVE request. The *webviewcarbon* AE does not act as a general-purpose storage endpoint - it only accepts C-STORE requests in the context of an ongoing C-MOVE operation initiated by itself. The received instances are temporarily buffered to be packaged for export (e.g., as a DICOM File Set with DICOMDIR) and are not permanently stored in the system.

Transfer Syntax Selection Policies

The *webviewcarbon* AE accepts any Transfer Syntax proposed by the remote SCU. When multiple Transfer Syntaxes are proposed within a Presentation Context, the first proposed Transfer Syntax is accepted.

7.2.2 *webpatientjacket* Application Entity

7.2.2.1 Sequencing of Real-World Activities for *webpatientjacket*

The *webpatientjacket* AE supports one real-world activity: searching for DICOM studies in a remote system based on patient demographic criteria (C-FIND). The activity is initiated by the user through the user interface and is independent of any other activity.

7.2.2.2 Association Parameters of *webpatientjacket* AE

Table 22 lists Association parameters applicable to all activities of *webpatientjacket* AE.

7.2.2.3 Association Initiation

This section details the Association policies of the Application Entity when it is initiating an Association.

7.2.2.3.1 Real-World Activity: Search data in remote system (C-FIND)

webpatientjacket AE serves as an SCU for all the supported Q/R Information Model - FIND SOP Classes. The *webpatientjacket* AE initiates a C-FIND request and displays the responses to the user. The proposed Transfer Syntaxes for association establishment for C-FIND are defined in Table 3.

The Association is closed when the C-FIND operation is finished.

7.2.2.4 Association Acceptance – N/A

This section does not apply to Syngo Carbon Enterprise Access.

7.2.3 *webrenderserver* Application Entity

7.2.3.1 Sequencing of Real-World Activities for *webrenderserver*

The *webrenderserver* AE supports one real-world activity: viewing and rendering DICOM instances from a remote system (C-FIND / C-MOVE / C-STORE). This activity involves three DIMSE operations executed in a fixed sequence:

1. C-FIND is performed to query the structure of the requested study, retrieving metadata about its series and instances.
2. Once the study structure is known, C-MOVE is initiated to request retrieval of the relevant instances from the remote system.
3. C-STORE is the result of the C-MOVE operation: the remote SCP transfers the instances to the *webrenderserver* AE, which acts as Storage SCP to receive them.

C-FIND is always the first step; C-MOVE and C-STORE always follow in sequence and do not occur independently.

7.2.3.2 Association Parameters of *webrenderserver* AE

Table 22 lists Association parameters applicable to all activities of *webrenderserver* AE.

7.2.3.3 Association Initiation

This section details the Association policies of the Application Entity when it is initiating an Association.

7.2.3.3.1 Real-World Activity: View/render DICOM instances/file set from remote system (C-FIND/C-MOVE)

The *webrenderserver* AE serves as an SCU for all supported Q/R Information Model - FIND SOP Classes. It initiates C-FIND requests to query the structure of a requested study, retrieving metadata about its series and instances. The retrieved metadata is used to build the study structure and to identify the instances to be retrieved in the subsequent C-MOVE steps. The proposed Transfer Syntaxes for association establishment are defined in Table 3.

If an error or interruption occurs during the C-FIND operation, the *webrenderserver* AE issues a C-CANCEL request to cancel it.

The Association is closed when the C-FIND operation is finished or cancelled.

The *webrenderserver* AE acts as an SCU for all supported Q/R Information Model - MOVE SOP Classes. Based on the instance metadata retrieved in the preceding C-FIND step, it initiates a C-MOVE request to a remote system to retrieve individual DICOM instances on demand as requested for rendering. The remote SCP will transfer the instances to the *webrenderserver* AE via C-STORE. The proposed Transfer Syntaxes for association establishment are defined in Table 3.

If an error occurs during the C-MOVE operation, or if the requested instances are no longer needed, the *webrenderserver* AE issues a C-CANCEL request to cancel the C-MOVE operation.

The Association is closed after the SCP sends the final C-MOVE response or after cancellation.

7.2.3.4 Association Acceptance

This section details the Association policies of the Application Entity when it is the acceptor of an Association.

7.2.3.4.1 Real-World Activity: View/render DICOM instances from remote system (C-STORE)

The *webrenderserver* AE serves as an SCP for the C-STORE service. It accepts associations from remote systems that transfer DICOM instances as a result of a previously issued C-MOVE request. The *webrenderserver* AE does not act as a general-purpose storage endpoint - it only accepts C-STORE requests in the context of an ongoing C-MOVE operation initiated by itself. The received instances are processed for rendering and are not permanently stored.

Transfer Syntax Selection Policies

The *webrenderserver* AE accepts any Transfer Syntax proposed by the remote SCU. When multiple Transfer Syntaxes are proposed within a Presentation Context, the first proposed Transfer Syntax is accepted.

7.3 Status Codes

The following sections describe the Status Codes supported by the system for each implemented service as well as the reason for issuing specific Status Codes or the associated behavior when receiving it.

7.3.1 General AE Communication and Failure Behavior and Handling

7.3.1.1 Communication Failure Behavior as Association Initiator

Table 23 describes behavior of the AE if a communication failure occurs when it initiated an Association.

Table 23: DICOM Communication Failure Behavior as Association Initiator

Failure	Failure Behavior
Timeout	The operation fails. If an association exists, an orderly release (A-RELEASE) is attempted; if release itself fails, the association is aborted (A-ABORT). Error is logged and propagated.
Association aborted	The ongoing operation fails. No release attempted (association already terminated). Error is logged and propagated.
Network Disconnect	Same behavior as association aborted. Additionally, any remaining open socket is forcibly closed.

7.3.1.2 Communication Failure Handling as Association Acceptor

Table 24 describes how the AE responds when it receives an Association request that leads to a failure in communication.

Table 24: DICOM Communication Failure Handling as Association Acceptor

Exception	Failure Response
Failure during processing of an Association request	Presentation Context rejection due to unsupported SOP Class or Transfer Syntax is not applied. In case of a protocol-level failure during association negotiation, the connection is closed by the underlying DICOM stack.
Unrecognized Called AE	The association is rejected with an A-ASSOCIATE-RJ: • Result: 1 - rejected-permanent • Source: 1 - DICOM UL service-user • Reason: 7 - called-AE-title-not-recognized
Exceed limit for number of connections supported	The association is rejected with an A-ASSOCIATE-RJ: • Result: 2 - rejected-transient • Source: 3 - DICOM UL service-provider (Presentation related function) • Reason: 2 - local-limit-exceeded The maximum number of simultaneously open associations is configurable.

7.3.2 DIMSE Services

DICOM Standard status codes are supported. For all supported DIMSE services, errors will terminate the corresponding operation and a suitable message is logged.

7.3.2.1 Basic Worklist Management Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

7.3.2.2 Modality Performed Procedure Step Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

7.3.2.3 Unified Worklist and Procedure Step Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

7.3.2.4 Instance Availability Notification Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

7.3.2.5 Storage Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

7.3.2.6 Storage Commitment Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

7.3.2.7 Query/Retrieve Service –N/A

This section does not apply to Syngo Carbon Enterprise Access.

7.3.2.8 Print Management Service – N/A

This section does not apply to Syngo Carbon Enterprise Access.

7.3.3 DICOM Web Services – N/A

This section does not apply to Syngo Carbon Enterprise Access.

8 Security

8.1 Introduction

The security section describes security features implemented by this product. It includes information on securing patient data during export and where to find additional details on non-DICOM network protocols as well as on port configuration.

8.2 External Network Requirements

Various non-DICOM network protocols are described in the Syngo Carbon Enterprise Access Security Whitepaper.

8.3 TCP Port Configuration

See [Section 6 Configuration](#) for information on the usage of ports for DICOM. For more information on default and available ports see the Syngo Carbon Enterprise Access Security Whitepaper.

8.4 DICOM Security Profiles Support

Syngo Carbon Enterprise Access does not support any specific DICOM Security Profiles. For information on Audit Trail Messages see [Section C.2.2](#).

During export, Syngo Carbon Enterprise Access supports various options to secure patient data: Retrieved instances can be exported as a password-protected ZIP archive. Furthermore, Syngo Carbon Enterprise Access supports the minimization of patient identifying data during export (see [Section 1.6](#)).

8.5 User Identity Negotiation Support – N/A

This section does not apply to Syngo Carbon Enterprise Access.

8.6 Web Services Security Features – N/A

This section does not apply to Syngo Carbon Enterprise Access.

8.7 Other Security Features – N/A

This section does not apply to Syngo Carbon Enterprise Access.

Annexes

A Information Object Definitions (IODs)

This section describes all the SOP Instances natively created by Syngo Carbon Enterprise Access, namely Secondary Captures (i.e., SOP Classes marked with “S” in the “Create” column in Table 1).

A.1 Information Shared Across Multiple IODs – N/A

This section does not apply to Syngo Carbon Enterprise Access.

A.2 Secondary Capture IODs

Syngo Carbon Enterprise Access creates Secondary Capture instances when a user uploads a captured image. Depending on the pixel characteristics of the image, one of three Multi-Frame Secondary Capture SOP Classes is selected:

Table 25: Storage SOP Classes for Secondary Capture IODs

SOP Class	SOP Class UID	Samples/ Pixel	Bits Allocated	Bits Stored
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	1	8	8
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	1	16	9-16
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	3	8	8

Table 26, Table 27, Table 28, Table 29, Table 30, Table 31, and Table 32 list the key DICOM attributes set by Syngo Carbon Enterprise Access when creating Secondary Capture instances. Attributes derived from existing patient, study, and visit records (such as Patient ID, Patient Name, Study Instance UID, or Accession Number) are not listed, as they are populated from the source data without modification.

Table 26: DICOM Attributes for Secondary Capture instances - Image Pixel Module

Tag	Attribute	Value
(0028,0002)	Samples per Pixel	1 (monochrome) / 3 (color)
(0028,0004)	Photometric Interpretation	MONOCHROME2 / RGB
(0028,0006)	Planar Configuration	0 (for RGB only)
(0028,0010)	Rows	Derived from image
(0028,0011)	Columns	Derived from image
(0028,0100)	Bits Allocated	Derived from image
(0028,0101)	Bits Stored	Derived from image
(0028,0102)	High Bit	Derived from image
(0028,0103)	Pixel Representation	0 (unsigned)

Table 27: DICOM Attributes for Secondary Capture instances - Multi-frame Module

Tag	Attribute	Value
(0028,0008)	Number of Frames	1

Table 28: DICOM Attributes for Secondary Capture instances - SC Multi-frame Image Module

Tag	Attribute	Value
(0028,1052)	Rescale Intercept	0
(0028,1053)	Rescale Slope	1
(0028,1054)	Rescale Type	US
(2050,0020)	Presentation LUT Shape	IDENTITY

Table 29: DICOM Attributes for Secondary Capture instances - General Image Module

Tag	Attribute	Value
(0020,0013)	Instance Number	0
(0008,0023)	Content Date	Set to instance creation date
(0008,0033)	Content Time	Set to instance creation time

Table 30: DICOM Attributes for Secondary Capture instances - General Series Module

Tag	Attribute	Value
(0020,0011)	Series Number	≥ 200

Table 31: DICOM Attributes for Secondary Capture instances - SC Equipment Module

Tag	Attribute	Value
(0008,0060)	Modality	OT
(0008,0064)	Conversion Type	WSD

Table 32: DICOM Attributes for Secondary Capture instances - General Equipment Module

Tag	Attribute	Value
(0008,0070)	Manufacturer	Siemens Healthineers
(0008,1090)	Manufacturer's Model Name	<i>webviewcarbon</i>
(0018,1020)	Software Versions	x.x.x.x

A.3 Basic Directory Storage IOD

Syngo Carbon Enterprise Access creates a Media Storage Directory Storage (1.2.840.10008.1.3.10) (DICOMDIR) instance as part of DICOM File Set exports. The File-set ID (0004,1130) is set to SYNGOSHARE. The directory record hierarchy follows the standard PATIENT / STUDY / SERIES / IMAGE structure.

B Structured Report Content Encoding – N/A

This section does not apply to Syngo Carbon Enterprise Access.

C Security Details

This section provides additional details about security features that are formally described in Section 8.

C.1 External Network Requirement Details

Various external network protocols are described in the Syngo Carbon Enterprise Access Security Whitepaper.

C.2 DICOM Security Profile Details

C.2.1 Online Electronic Storage Secure Use – N/A

This section does not apply to Syngo Carbon Enterprise Access.

C.2.2 Audit Trail Messages

Syngo Carbon Enterprise Access has no own Audit Trail stack but provides auditing in conjunction with *syngo.share core*.

- User login or logout generates a User Authentication audit message with event ID 110114.
- *syngo.share core* audits query for and access to DICOM data whenever data is accessed via DICOM or the native interfaces. When running Syngo Carbon Enterprise Access on top of remote systems, routing DICOM Q/R via *syngo.share core* is the recommended standard (although not required). This ensures auditing of all relevant events.

In the context of DICOM Q/R, *syngo.share core* audits namely the following events:

- Begin Transferring DICOM Instances (ID: 110102)
- DICOM Instances Accessed (ID: 110103)
- DICOM Instances Transferred (ID: 110104)
- Query (ID: 110112)

For details, please refer to the latest DICOM Conformance Statement of *syngo.share core*.

C.2.3 Audit Trail Message Transmission Profile - SYSLOG - TLS – N/A

This section does not apply to Syngo Carbon Enterprise Access.

C.2.4 Audit Trail Message Transmission Profile - SYSLOG - UDP – N/A

This section does not apply to Syngo Carbon Enterprise Access.

C.2.5 Secure Transport Connection Details – N/A

This section does not apply to Syngo Carbon Enterprise Access.

C.2.6 Attribute Confidentiality Details – N/A

This section does not apply to Syngo Carbon Enterprise Access.

C.2.7 Digital Signature Details – N/A

This section does not apply to Syngo Carbon Enterprise Access.

C.2.8 Additional DICOM Security Profile Details – N/A

This section does not apply to Syngo Carbon Enterprise Access.

D Mapping of Attributes – N/A

This section does not apply to Syngo Carbon Enterprise Access.

E Code Set Usage – N/A

This section does not apply to Syngo Carbon Enterprise Access.

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