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DICOM Conformance Statement

Voxxil HIS

Version 2.9

PACS and RIS

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Product

Voxxil HIS 2.9: PACS (image archive, DICOM and DICOMweb services) and RIS (modality worklist, study reconciliation)

Manufacturer

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1 Conformance Statement Overview

Voxxil HIS is a hospital information system delivered as a single product with laboratory, radiology and electronic medical record modules. This document states the DICOM conformance of its imaging components: the **PACS**, which receives, archives, indexes and distributes DICOM objects, and the **RIS**, which schedules imaging procedures, publishes them to acquisition modalities through the Modality Worklist, and reconciles received studies with orders.

The PACS provides one DICOM network Application Entity, the **PACS DICOM AE**, and one DICOMweb service, the **PACS DICOMweb Origin Server**. The PACS DICOM AE acts as a Service Class Provider (SCP) for Verification, Storage, Query/Retrieve (FIND, MOVE and GET), Modality Worklist and Storage Commitment, and as a Service Class User (SCU) for Verification, Storage, Query/Retrieve (FIND and MOVE), Modality Worklist and Storage Commitment. The DICOMweb Origin Server provides the Search (QIDO-RS), Retrieve (WADO-RS), Store (STOW-RS) and Retrieve DICOM Instance (WADO-URI) transactions. The RIS does not open DICOM associations itself; it supplies the content of the Modality Worklist and consumes storage notifications from the PACS.

The PACS accepts 186 Storage SOP Classes (Annex 8.7) in 40 Transfer Syntaxes (Annex 8.8). Received objects are archived as DICOM Part 10 files in the Transfer Syntax in which they were received; no attribute value of a received object is changed on storage.

Table 1. Network Services

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Computed Radiography Image Storage	Yes	Yes
Digital X-Ray Image Storage – For Presentation / For Processing	Yes	Yes
Digital Mammography X-Ray Image Storage – For Presentation / For Processing	Yes	Yes
Breast Tomosynthesis Image Storage	Yes	Yes
CT Image Storage, Enhanced CT Image Storage	Yes	Yes
MR Image Storage, Enhanced MR Image Storage	Yes	Yes
Ultrasound Image Storage, Ultrasound Multi-frame Image Storage, Enhanced US Volume Storage	Yes	Yes
Nuclear Medicine Image Storage, Positron Emission Tomography Image Storage	Yes	Yes
X-Ray Angiographic Image Storage, X-Ray Radiofluoroscopic Image Storage	Yes	Yes
Secondary Capture Image Storage (single-frame and all multi-frame variants)	Yes	Yes
Basic Text SR, Enhanced SR, Comprehensive SR, Comprehensive 3D SR Storage	Yes	Yes
X-Ray Radiation Dose SR Storage, Radiopharmaceutical Radiation Dose SR Storage	Yes	Yes
Key Object Selection Document Storage	Yes	Yes
Grayscale / Color Softcopy Presentation State Storage	Yes	Yes
Encapsulated PDF Storage, Encapsulated CDA Storage	Yes	Yes
Segmentation Storage, RT Structure Set / RT Dose / RT Plan Storage	Yes	Yes
All other Storage SOP Classes listed in Annex 8.7	Yes	Yes
Query/Retrieve		
Patient Root Query/Retrieve Information Model – FIND	Yes	Yes
Patient Root Query/Retrieve Information Model – MOVE	Yes	Yes
Patient Root Query/Retrieve Information Model – GET	No	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Study Root Query/Retrieve Information Model – FIND	Yes	Yes
Study Root Query/Retrieve Information Model – MOVE	Yes	Yes
Study Root Query/Retrieve Information Model – GET	No	Yes
Workflow Management		
Modality Worklist Information Model – FIND	Yes	Yes
Storage Commitment Push Model	Yes	Yes
Modality Performed Procedure Step	No	No
Verification		
Verification	Yes	Yes

Table 2. Web Services (DICOMweb)

Service	Transaction	User Agent	Origin Server
Studies Service	Search (QIDO-RS)	Yes (Review Viewer)	Yes
Studies Service	Retrieve (WADO-RS), including metadata, frames, bulk data and rendered resources	Yes (Review Viewer)	Yes
Studies Service	Store (STOW-RS)	Optional (Review Viewer)	Yes
URI Service	Retrieve DICOM Instance (WADO-URI)	No	Yes
Studies Service	Retrieve Capabilities	No	No
Worklist Service	UPS-RS transactions	No	No

Table 3. Media Services

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
DICOM File-set with DICOMDIR, delivered as a ZIP package (Section 5). No physical-media Application Profile is claimed.	Yes (FSC)	No

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3 Introduction

3.1 Revision History

Table 4. Revision History

Document Version	Date	Product Version	Description
1.0	2026-03-15	Voxxil HIS 2.9	Initial release of the DICOM Conformance Statement for the PACS and RIS.

3.2 Audience

This document is intended for:

- hospital and radiology department IT staff responsible for connecting imaging equipment;
- system integrators and vendors of modalities, workstations, archives and information systems;
- evaluators of the product in procurement and acceptance testing.

The reader is assumed to be familiar with the DICOM Standard and with the terms defined in Section 3.5.

3.3 Remarks

DICOM by itself does not guarantee interoperability. This Conformance Statement facilitates a first-level validation of interoperability between Voxxil HIS and other applications that support the same DICOM functionality. It is not intended to replace validation with other DICOM equipment to ensure the proper exchange of the intended information.

The Conformance Statement should be read and understood in conjunction with the DICOM Standard. The user should be aware of the following:

- Test procedures should be defined and executed to validate the required level of connectivity with each device.
- The DICOM Standard evolves to meet users' future requirements. Voxxil reserves the right to change the product and will issue a revised Conformance Statement for any change that affects the conformance stated here.

3.4 Scope and Product Components

Table 5 lists the Voxxil HIS components that take part in DICOM communication and where each is specified.

Table 5. Components in scope

Component	DICOM role	Specified in
PACS DICOM AE	DICOM network AE (DIMSE): Verification, Storage, Query/Retrieve, Modality Worklist and Storage Commitment, as SCP and SCU	Sections 4.1 – 4.2.1, 4.4
PACS DICOMweb Origin Server	Origin Server for the Studies Service and the URI Service (HTTP/1.1 over TLS)	Section 4.2.2
RIS: worklist publisher and study reconciliation	Supplies the content of the Modality Worklist; matches received studies to orders. Not a DICOM AE.	Sections 4.1.2.3, 4.1.3, 8.1
Review Viewer (browser application)	DICOMweb User Agent used for clinical review, referring-physician and patient access	Section 4.2.3

Component	DICOM role	Specified in
PACS media export	File-set Creator for a DICOM File-set with DICOMDIR, packaged as ZIP	Section 5
Radiology reports	Produced as signed PDF documents by the RIS. Reports are not created as DICOM objects by this version.	n/a

3.5 Definitions and Terms

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Table 6. Definitions and terms

Term	Description
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, CT Image Storage SOP Class.
Application Context	The specification of the type of communication used between Application Entities. Example: DICOM network protocol.
Application Entity (AE)	An end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.
Application Entity Title	The externally known name of an Application Entity, used to identify a DICOM application to other DICOM applications on the network.
Association	A network communication channel set up between Application Entities.
Attribute	A unit of information in an 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).
File-set	A collection of DICOM files, and possibly non-DICOM files, that share a common naming space within which File IDs are unique.
File-set Creator (FSC)	An Application Entity that creates the DICOMDIR file and zero or more DICOM files.
Information Object Definition (IOD)	The specified set of Attributes that comprise a type of data object; it does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties.
Module	A set of Attributes within an Information Object Definition that are logically related to each other. Example: the Patient Module includes Patient Name, Patient ID, Patient Birth Date and Patient 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	The DICOMweb service that responds to requests from a User Agent (the server role of the DICOMweb transactions).
Presentation Context	The set of DICOM network services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.
Protocol Data Unit (PDU)	A packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size of packet they can receive for DICOM messages.
Query Key	An input value for a query process. Query Keys denote the set of DICOM tags that are sent from the SCU to the SCP and thus control the query result.
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).
Service Class User (SCU)	Role of an Application Entity that uses a DICOM network service; typically, a client.

Term	Description
Service/Object Pair (SOP) Class	The specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification.
Service/Object Pair (SOP) Instance	An information object; a specific occurrence of information exchanged in a SOP Class. Example: a specific X-ray image.
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.
Transfer Syntax	The encoding used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), Little Endian Explicit Value Representation.
Unique Identifier (UID)	A globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO 8824 Object Identifier.
User Agent	The DICOMweb client that issues requests to an Origin Server.
Value Representation (VR)	The format type of an individual DICOM data element, such as text, an integer, a person's name, or a code.

3.6 Abbreviations

Table 7. Abbreviations

Abbreviation	Meaning	Abbreviation	Meaning
AE	Application Entity	MWL	Modality Worklist
AET	Application Entity Title	PACS	Picture Archiving and Communication System
DICOM	Digital Imaging and Communications in Medicine	PDU	Protocol Data Unit
DIMSE	DICOM Message Service Element	QIDO-RS	Query based on ID for DICOM Objects by RESTful Services
FSC / FSR / FSU	File-set Creator / Reader / Updater	RIS	Radiology Information System
HTTP(S)	Hypertext Transfer Protocol (Secure)	SCP / SCU	Service Class Provider / User
IHE	Integrating the Healthcare Enterprise	SOP	Service-Object Pair
IOD	Information Object Definition	SPS	Scheduled Procedure Step
ISO	International Organization for Standardization	SR	Structured Report
JPEG	Joint Photographic Experts Group	STOW-RS	Store Over the Web by RESTful Services
JSON	JavaScript Object Notation	TCP/IP	Transmission Control Protocol / Internet Protocol
MPPS	Modality Performed Procedure Step	TLS	Transport Layer Security
MRN	Medical Record Number	UID	Unique Identifier
MSPS	Multiple Scheduled Procedure Steps	VR	Value Representation
WADO-RS / -URI	Web Access to DICOM Objects by RESTful Services / by URI	WL	Worklist

3.7 References

Table 8. References

Reference	Title
NEMA PS3 / ISO 12052	Digital Imaging and Communications in Medicine (DICOM) Standard, National Electrical Manufacturers Association, Rosslyn, VA, USA (available free at https://www.dicomstandard.org/). In particular PS3.2 Conformance, PS3.4 Service Class Specifications, PS3.7 Message Exchange, PS3.8 Network Communication Support, PS3.10 Media Storage and File Format, PS3.15 Security and System Management Profiles, PS3.18 Web Services.
IHE RAD TF	IHE Radiology Technical Framework, Volumes 1–3: Scheduled Workflow (SWF.b), Patient Information Reconciliation (PIR).
IETF RFC 5246 / RFC 8446	The Transport Layer Security (TLS) Protocol, Version 1.2 / Version 1.3.
IETF RFC 9110	HTTP Semantics.

4 Networking

4.1 Implementation Model

4.1.1 Application Data Flow

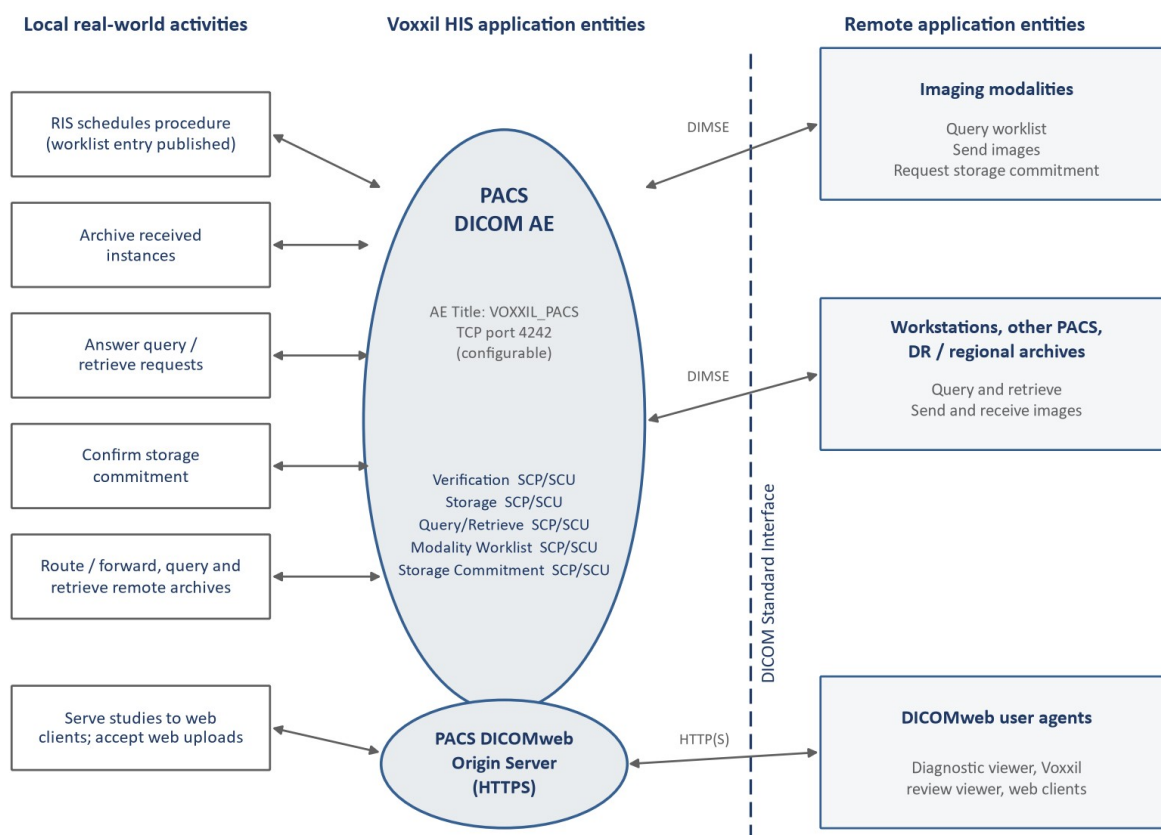


Figure 1. Voxxil HIS application data flow diagram

The PACS DICOM AE is a server application that is always running. Its behaviour is as follows:

- It accepts associations from registered and, where configured, unregistered remote AEs, and responds to Verification requests.
- It receives Composite SOP Instances from modalities, workstations and other archives (Storage SCP) and archives them without changing any attribute value.
- It answers query and retrieve requests from remote AEs (Query/Retrieve SCP). A C-MOVE causes the PACS DICOM AE to open a new association to the move destination and send the matching instances as a Storage SCU. A C-GET returns the matching instances on the same association.
- It answers Modality Worklist queries with the procedures scheduled in the RIS (Modality Worklist SCP).
- It confirms that received instances are safely archived when a modality requests Storage Commitment. The report (N-EVENT-REPORT) is always sent on a separate association that the PACS DICOM AE opens to the requesting AE.
- On operator request, by routing rule or through the application programming interface, it sends instances to remote AEs, queries and retrieves from remote archives, queries a remote worklist, requests Storage Commitment from a remote archive, and verifies remote AEs (SCU roles).

The PACS DICOMweb Origin Server gives web applications, including the Review Viewer, search, retrieve and store access to the same archive over HTTPS.

4.1.2 Functional Definition of AEs

4.1.2.1 Functional Definition of the PACS DICOM AE

The PACS DICOM AE waits for another application to connect at the presentation address configured for its AE Title (default VOXXIL_PACS, TCP port 4242). When another application connects, the PACS DICOM AE expects it to be a DICOM application. It accepts associations with Presentation Contexts for the SOP Classes of the Verification, Storage, Query/Retrieve, Modality Worklist and Storage Commitment Service Classes (Section 4.2.1.4).

Instances received in a Storage request are written to the archive storage area as DICOM Part 10 files, with the attribute values and Transfer Syntax in which they were received, and their attributes are indexed in the PACS database so that they can be found by C-FIND, QIDO-RS and the RIS. The storage area can be a local file system, network-attached storage or S3-compatible object storage; the choice does not affect the DICOM behaviour described here.

The same AE initiates associations as an SCU for the activities listed in Section 4.2.1.3. By default, the associations it initiates use its own AE Title as the Calling AE Title; a different local AE Title can be set for a remote AE (Section 4.4.1.2).

4.1.2.2 Functional Definition of the PACS DICOMweb Origin Server

The DICOMweb Origin Server responds to HTTP/1.1 requests, carried over TLS by the Voxxil HIS reverse proxy, for the Studies Service (Search, Retrieve and Store transactions) and the URI Service (Retrieve DICOM Instance transaction). It serves the same archive and index as the PACS DICOM AE: instances stored through STOW-RS are immediately available through DIMSE, and vice versa.

4.1.2.3 Functional Definition of the RIS Worklist Publisher and Study Reconciliation

The RIS is not a DICOM Application Entity and does not open DICOM associations. It interacts with the PACS as follows:

- **Worklist publication.** Every 60 seconds the RIS publishes, for every imaging procedure scheduled for the current day (institution local time), one worklist entry per scheduled examination. Entries are served to modalities by the PACS DICOM AE in its Modality Worklist SCP role (Section 4.2.1.4.5). A procedure is added to the worklist when it is scheduled and leaves it at the end of its scheduled day.

- **Storage notification.** When an instance is stored, and again when a study has received no new instance for the configured stable period (default 60 seconds), the PACS notifies the RIS over an authenticated HTTPS interface.
- **Study reconciliation.** When the PACS reports a study as stable, the RIS matches it to an order, in the order of precedence given in Section 4.1.3.1, and updates the order status. Studies that cannot be matched are placed on an unmatched-studies list for manual reconciliation (link to an existing order, reassign, create patient and order, or ignore). Reconciliation is recorded in the RIS; it does not modify the archived DICOM objects.

4.1.3 Sequencing of Real-World Activities

4.1.3.1 Scheduled Workflow

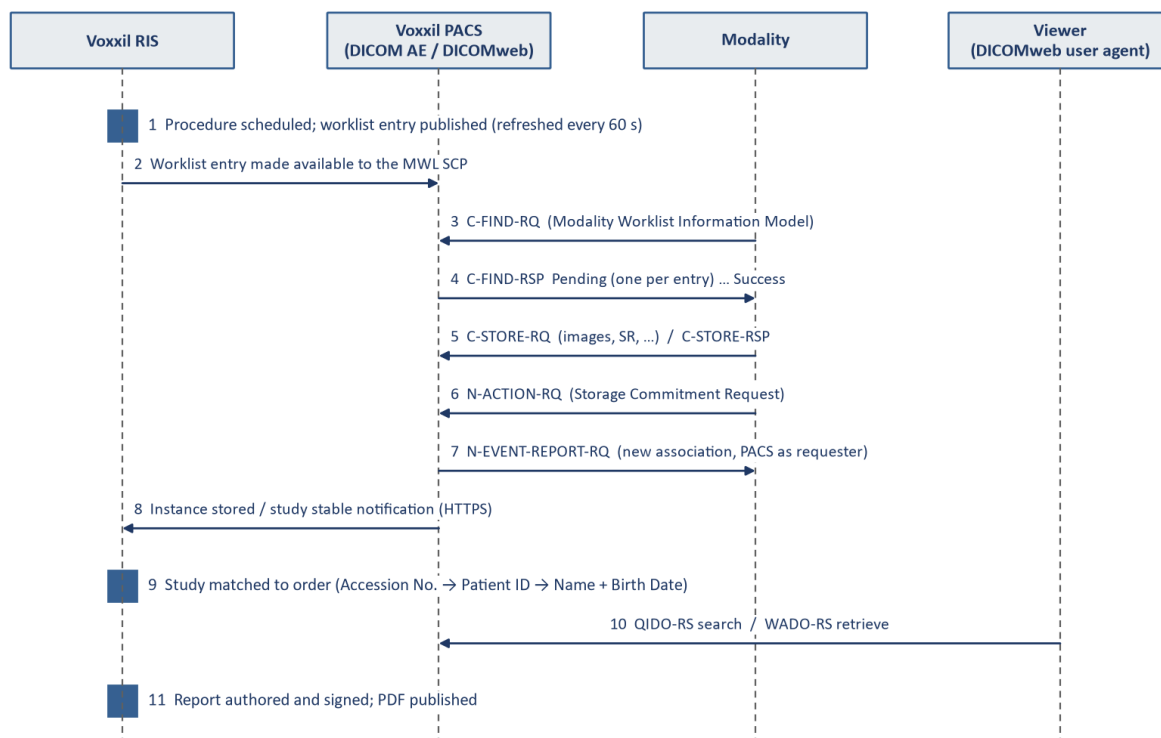


Figure 2. Scheduled workflow sequence

Table 9. Scheduled workflow steps

Step	Activity	Notes
1–2	Procedure scheduled in the RIS; worklist entry published	Entry contains the attributes in Table 32; refreshed every 60 s.
3–4	Modality queries the Modality Worklist	C-FIND on the Modality Worklist Information Model. Matching keys per Section 4.2.1.4.5.
5	Modality sends the acquired instances	C-STORE to the PACS DICOM AE. Instances are archived without attribute changes.
6–7	Storage Commitment (optional, modality-initiated)	N-ACTION request; the PACS returns the N-EVENT-REPORT on a new association that it opens to the requesting AE.
8	PACS notifies the RIS	Per stored instance, and once the study is stable.

Step	Activity	Notes
9	RIS reconciles the study with its order	Precedence: (1) Accession Number (0008,0050) against the order and radiology accession numbers; (2) Patient ID (0010,0020) against the MRN, choosing the newest scheduled or in-progress order; (3) Patient Name (0010,0010) and Patient's Birth Date (0010,0030), exact and case-insensitive, for modalities that do not use the worklist. Otherwise the study is placed on the unmatched-studies list.
10	Images are reviewed	QIDO-RS and WADO-RS from the Review Viewer.
11	Report authored and signed	The report is a PDF document managed by the RIS; it is not stored in the PACS as a DICOM object.

The PACS does not act as an MPPS SCP. The RIS treats the arrival of images for an order as completion of the acquisition step and updates the order and appointment status accordingly.

4.1.3.2 Query and Retrieve by a Remote AE

A remote workstation or archive queries the PACS DICOM AE with C-FIND at the Patient, Study, Series or Image level, then retrieves the selected entities either with C-MOVE (the PACS opens a new association to the move destination, which must be a registered remote AE, and sends the instances as a Storage SCU) or with C-GET (the PACS returns the instances on the same association; the requesting AE must negotiate the SCP role for the required Storage SOP Classes). C-MOVE sub-operations are performed synchronously before the final C-MOVE response is returned.

4.1.3.3 Forwarding, Routing and Retrieval from Remote Archives

Instances are sent to remote AEs (for example the disaster-recovery archive, a regional node or a third-party workstation) on operator request, by routing rule, or through the application programming interface. Each transfer runs as a queued job that is retried on failure and whose outcome is recorded. After a transfer the PACS can request Storage Commitment from the destination. Studies can likewise be queried (C-FIND SCU) and retrieved (C-MOVE SCU, with the PACS DICOM AE as move destination) from remote archives, for example for prefetch of prior studies or migration.

4.1.3.4 Unscheduled Acquisition

Modalities that do not use the Modality Worklist can store studies directly. Such studies are reconciled by Patient ID or by Patient Name and Patient's Birth Date (Section 4.1.3.1, step 9), or manually from the unmatched-studies list.

4.2 AE Specifications

4.2.1 PACS DICOM AE Specification

4.2.1.1 SOP Classes

The PACS DICOM AE provides Standard Conformance to the following SOP Classes:

Table 10. SOP Classes for the PACS DICOM AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	Yes
Storage SOP Classes (all listed in Annex 8.7, Table 48 and Table 49)	see Annex 8.7	Yes	Yes
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	Yes
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	Yes

SOP Class Name	SOP Class UID	SCU	SCP
Patient Root Query/Retrieve Information Model – GET	1.2.840.10008.5.1.4.1.2.1.3	No	Yes
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes
Study Root Query/Retrieve Information Model – GET	1.2.840.10008.5.1.4.1.2.2.3	No	Yes
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Yes	Yes
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	Yes

The Patient/Study Only Query/Retrieve Information Model, the Composite Instance Root and Composite Instance Retrieve Without Bulk Data models, Modality Performed Procedure Step, Instance Availability Notification, Unified Procedure Step and the Print Management Service Class are not supported; association requests proposing them are answered with the corresponding Presentation Context rejected. The retired Stored Print and Hardcopy Image Storage SOP Classes are Storage SOP Classes and are accepted (Table 49).

4.2.1.2 Association Policies

4.2.1.2.1 General

The DICOM Standard Application Context Name for DICOM 3.0 is always proposed and accepted:

Table 11. DICOM Application Context for the PACS DICOM AE

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

The maximum PDU size that the PACS DICOM AE offers to receive is 16384 bytes (configurable). It sends PDUs no larger than the maximum length offered by the peer.

4.2.1.2.2 Number of Associations

Table 12. Number of associations

Parameter	Value
Maximum number of DIMSE requests processed simultaneously as Association Acceptor	4 worker threads (configurable). The number of open associations is not limited; their requests are queued until a worker is free.
Maximum number of jobs run concurrently (outbound transfers, Storage Commitment processing and other archive jobs)	2 (configurable). Each job uses one association at a time.
Release of outbound associations	An association opened as SCU is released when the job or request that opened it ends; associations are not kept open for reuse.

4.2.1.2.3 Asynchronous Nature

The PACS DICOM AE does not support asynchronous operations (multiple outstanding transactions over a single association). The Asynchronous Operations Window is not negotiated; the default of one invoked and one performed operation applies.

4.2.1.2.4 Implementation Identifying Information

Table 13. DICOM Implementation Class and Version for the PACS DICOM AE

Implementation Class UID	Implementation Version Name
1.2.276.0.7230010.3.0.3.6.7	OFFIS_DCMTK_367

The PACS component of Voxxil HIS 2.9 embeds the Orthanc 1.12.2 DICOM engine and the OFFIS DCMTK 3.6.7 network toolkit. The Implementation Class UID and Implementation Version Name above are those of the toolkit and are sent in every A-ASSOCIATE request and response.

4.2.1.3 Association Initiation Policy

The PACS DICOM AE initiates associations for the activities below. For verification, query and retrieve it proposes the Verification, Patient Root and Study Root Query/Retrieve (FIND and MOVE) and Modality Worklist Presentation Contexts together on one association. To send instances it proposes, for each SOP Class to be sent, Presentation Contexts with the archived Transfer Syntax, the preferred Transfer Syntax and the uncompressed Transfer Syntaxes.

4.2.1.3.1 Activity – Send Instances

Description and sequencing. Instances are sent to a registered remote AE when (a) an operator or a routing rule forwards a patient, study, series or instance; (b) a remote AE requests a C-MOVE (sub-operations); or (c) a client of the application programming interface requests a transfer. The PACS DICOM AE opens an association, sends each instance with a C-STORE request, and releases the association when the transfer is complete. Each transfer is a queued job with a persistent status that can be monitored and resubmitted.

Table 14. Proposed Presentation Contexts for Send Instances

Abstract Syntax	Transfer Syntax	Role	Ext. Neg.
Any Storage SOP Class in Annex 8.7 (that of the instance being sent)	The Transfer Syntax in which the instance is archived. If the destination does not accept it: Explicit VR Little Endian (1.2.840.10008.1.2.1) or Implicit VR Little Endian (1.2.840.10008.1.2), after decompression by the PACS.	SCU	None

Transcoding can be allowed or disallowed for each remote AE. When it is allowed and the destination does not accept the archived Transfer Syntax, the instance is transcoded to the preferred Transfer Syntax configured for the PACS (default Explicit VR Little Endian). Lossy compression is applied only if a lossy preferred Transfer Syntax is configured.

Table 15. C-STORE response status handling (Send Instances)

Service Status	Status Code	Behaviour
Success	0000	The instance is recorded as sent. Proceed with the next instance.
Warning	B000, B006, B007	Treated as success; the warning is logged. Proceed with the next instance.
Error	A7xx, A9xx, Cxxx, any other	The instance is recorded as not sent, the error is logged and the job ends in a failed state. The job can be resubmitted by the operator or retried by the routing engine.

Table 16. Communication failure behaviour (Send Instances)

Exception	Behaviour
Association rejected or aborted by the remote AE or network	The job fails; the reason is logged and shown in the job status.
No response within the SCU timeout (default 10 s)	The association is aborted and the job fails.

4.2.1.3.2 Activity – Query Remote AE

Description and sequencing. An operator, routing rule or API client queries a registered remote AE. The PACS DICOM AE sends one C-FIND request at the requested level (Patient, Study, Series or Image) with the query keys supplied, receives the pending responses, and releases the association after the final response.

Table 17. Proposed Presentation Contexts for Query Remote AE

Abstract Syntax	Transfer Syntax	Role	Ext. Neg.
Patient Root Q/R Information Model – FIND 1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian 1.2.840.10008.1.2 Explicit VR Little Endian 1.2.840.10008.1.2.1 Explicit VR Big Endian 1.2.840.10008.1.2.2	SCU	None
Study Root Q/R Information Model – FIND 1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian 1.2.840.10008.1.2 Explicit VR Little Endian 1.2.840.10008.1.2.1 Explicit VR Big Endian 1.2.840.10008.1.2.2	SCU	None

Every identifier includes Specific Character Set (0008,0005) and Query/Retrieve Level (0008,0052). Matching and return keys are those supplied by the requester; wildcard and range values are passed through unchanged. Pending responses (FF00, FF01) are collected, Success (0000) completes the query, and any other status ends the query and is reported to the requester.

4.2.1.3.3 Activity – Retrieve from Remote AE

Description and sequencing. To retrieve studies found by a query, or entities identified by UID, the PACS DICOM AE sends a C-MOVE request to the remote AE with a Move Destination that is normally its own AE Title. The instances arrive on a separate association and are handled by the Receive Instances activity (Section 4.2.1.4.2). The PACS DICOM AE does not act as a C-GET SCU.

Table 18. Proposed Presentation Contexts for Retrieve from Remote AE

Abstract Syntax	Transfer Syntax	Role	Ext. Neg.
Patient Root Q/R Information Model – MOVE 1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian	SCU	None
Study Root Q/R Information Model – MOVE 1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian	SCU	None

Pending responses are reported as progress. Success (0000) completes the retrieval; Warning (B000) is reported with the counts of failed sub-operations; any failure status ends the retrieval and is reported.

4.2.1.3.4 Activity – Query Remote Worklist

Description and sequencing. Where a third-party RIS provides the Modality Worklist, the PACS DICOM AE can query it through a C-FIND on the Modality Worklist Information Model with the matching and return keys supplied by the requester, for example to import scheduled procedures.

Table 19. Proposed Presentation Contexts for Query Remote Worklist

Abstract Syntax	Transfer Syntax	Role	Ext. Neg.
Modality Worklist Information Model – FIND 1.2.840.10008.5.1.4.3.1	Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian	SCU	None

4.2.1.3.5 Activity – Request Storage Commitment

Description and sequencing. After sending instances to a remote archive, the PACS DICOM AE can request Storage Commitment for them, either as part of the transfer or as a separate request. It sends an N-ACTION request (Action Type ID 1) with a new Transaction UID and the Referenced SOP Sequence of the instances. It releases the association after the N-ACTION response and accepts the resulting N-EVENT-REPORT on a new

association opened by the remote AE, which must be registered and permitted to send event reports; it records per instance whether storage was committed.

Table 20. Proposed Presentation Contexts for Request Storage Commitment

Abstract Syntax	Transfer Syntax	Role	Ext. Neg.
Storage Commitment Push Model 1.2.840.10008.1.20.1	Implicit VR Little Endian, Explicit VR Little Endian	SCU	None

4.2.1.3.6 Activity – Send Storage Commitment Report

Description and sequencing. When a remote AE has requested Storage Commitment from the PACS (Section 4.2.1.4.6), the PACS DICOM AE opens a new association to the requesting AE, as registered by AE Title, host and port, and sends the N-EVENT-REPORT. It proposes the Storage Commitment Push Model with SCU/SCP Role Selection so that it can act in the SCP role on this association. The report is never sent on the association that carried the N-ACTION.

Table 21. Proposed Presentation Contexts for Send Storage Commitment Report

Abstract Syntax	Transfer Syntax	Role	Ext. Neg.
Storage Commitment Push Model 1.2.840.10008.1.20.1	Implicit VR Little Endian, Explicit VR Little Endian	SCP	Role Selection

4.2.1.3.7 Activity – Verify Remote AE

Description and sequencing. An administrator can test a registered remote AE from the administration console. The PACS DICOM AE sends a C-ECHO request and reports the result.

Table 22. Proposed Presentation Contexts for Verify Remote AE

Abstract Syntax	Transfer Syntax	Role	Ext. Neg.
Verification 1.2.840.10008.1.1	Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian	SCU	None

4.2.1.4 Association Acceptance Policy

The PACS DICOM AE accepts an association when the Application Context is DICOM and at least one proposed Presentation Context is supported. Access control applies per remote AE and per service (Section 7.2): by default Verification, Storage and Modality Worklist requests are accepted from any AE, while Query/Retrieve (FIND, MOVE and GET) and Storage Commitment are accepted only from registered remote AEs. Requests for a service that a remote AE is not authorised to use are refused. The Called AE Title is not checked unless that option is enabled.

4.2.1.4.1 Activity – Verification

Table 23. Accepted Presentation Contexts for Verification

Abstract Syntax	Transfer Syntax	Role	Ext. Neg.
Verification 1.2.840.10008.1.1	Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian	SCP	None

The PACS DICOM AE returns Success (0000) to every C-ECHO request.

4.2.1.4.2 Activity – Receive Instances

Description and sequencing. A modality, workstation or archive sends instances with C-STORE. Each instance is written to the archive storage area and indexed before the C-STORE response is returned, so a Success response means that the instance is archived and can be queried and retrieved.

Table 24. Accepted Presentation Contexts for Receive Instances

Abstract Syntax	Transfer Syntax	Role	Ext. Neg.
Any Storage SOP Class in Annex 8.7	Any Transfer Syntax in Annex 8.8	SCP	None

Where several Transfer Syntaxes are proposed for one Abstract Syntax, the PACS DICOM AE selects the first one proposed by the requester that is in its accepted list. Storage SOP Classes not listed in Annex 8.7 are rejected at negotiation unless acceptance of unknown SOP Classes is enabled.

SOP specific conformance. The PACS DICOM AE conforms to the Storage Service Class at **Level 2 (Full)**: all Type 1, Type 2 and Type 3 attributes, including private attributes, are stored and returned with their values unchanged. Instances are not coerced, transcoded or compressed on receipt in the default configuration. The DICOM toolkit re-writes the encoding of the stored file (sequence and item lengths, group lengths and the File Meta Information), so the archived byte stream can differ from the one received. Digital Signatures present in received instances are retained as received attributes; the PACS does not verify or create Digital Signatures. Instances are retained until deleted by an authorised administrator or by a configured retention rule.

If an instance with the same SOP Instance UID is already archived, the new copy is discarded and Success is returned (the archived copy is kept). Replacement of the archived copy by the new one can be configured instead.

Table 25. C-STORE response status (Receive Instances)

Service Status	Status Code	Reason
Success	0000	The instance was archived and indexed, or an instance with the same SOP Instance UID was already archived.
Refused	A700	Out of resources: the instance could not be written or indexed (for example, storage full), or it was refused by a site-configured acceptance rule.
Error	A900	Data Set does not match SOP Class: the SOP Class UID or SOP Instance UID in the data set differs from the one in the request.
Error	C000	Cannot understand: the instance could not be processed for another reason.

4.2.1.4.3 Activity – Query

Description and sequencing. A remote AE queries the archive with C-FIND. The PACS returns one pending response per match and a final Success response.

Table 26. Accepted Presentation Contexts for Query

Abstract Syntax	Transfer Syntax	Role	Ext. Neg.
Patient Root Q/R Information Model – FIND 1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian 1.2.840.10008.1.2 Explicit VR Little Endian 1.2.840.10008.1.2.1 Explicit VR Big Endian 1.2.840.10008.1.2.2	SCP	None
Study Root Q/R Information Model – FIND 1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian 1.2.840.10008.1.2 Explicit VR Little Endian 1.2.840.10008.1.2.1 Explicit VR Big Endian 1.2.840.10008.1.2.2	SCP	None

SOP specific conformance. Hierarchical queries at the Patient, Study, Series and Image levels are supported. Relational queries and the other Extended Negotiation options (fuzzy semantic matching, timezone adjustment,

enhanced multi-frame image conversion) are not supported. Any attribute may be used as a matching or return key: attributes that are not held in the index are matched against the archived instances. The following matching types are supported:

- **S:** Single Value matching;
- **W:** Wild Card matching with * and ? for string VRs;
- **R:** Range matching for DA, TM and DT, including open ranges;
- **L:** List of UID matching;
- **U:** Universal matching (zero-length key).

Person Name matching is case-insensitive in the default configuration (case-sensitive matching can be configured). Each response contains Specific Character Set (0008,0005), Query/Retrieve Level (0008,0052) and Retrieve AE Title (0008,0054), whose value is the PACS DICOM AE Title. The keys most commonly used are listed below.

Table 27. C-FIND keys supported by the PACS DICOM AE

Attribute Name	Tag	Types of Matching
Patient Level		
Patient's Name	(0010,0010)	S, W, U
Patient ID	(0010,0020)	S, W, U
Patient's Birth Date	(0010,0030)	S, R, U
Patient's Sex	(0010,0040)	S, U
Number of Patient Related Studies / Series / Instances	(0020,1200) / (0020,1202) / (0020,1204)	Return only (computed)
Study Level		
Study Instance UID	(0020,000D)	S, L, U
Study Date / Study Time	(0008,0020) / (0008,0030)	S, R, U
Accession Number	(0008,0050)	S, W, U
Study ID	(0020,0010)	S, W, U
Referring Physician's Name	(0008,0090)	S, W, U
Study Description	(0008,1030)	S, W, U
Institution Name	(0008,0080)	S, W, U
Modalities in Study	(0008,0061)	S, U (computed)
SOP Classes in Study	(0008,0062)	Return only (computed)
Number of Study Related Series / Instances	(0020,1206) / (0020,1208)	Return only (computed)
Series Level		
Series Instance UID	(0020,000E)	S, L, U
Modality	(0008,0060)	S, U
Series Number	(0020,0011)	S, U
Series Description	(0008,103E)	S, W, U
Series Date / Series Time	(0008,0021) / (0008,0031)	S, R, U
Body Part Examined	(0018,0015)	S, W, U
Number of Series Related Instances	(0020,1209)	Return only (computed)
Image (Instance) Level		
SOP Instance UID	(0008,0018)	S, L, U
SOP Class UID	(0008,0016)	S, L, U

Attribute Name	Tag	Types of Matching
Instance Number	(0020,0013)	S, U

Table 28. C-FIND response status (Query)

Service Status	Status Code	Reason
Pending	FF00	A match is returned; more may follow.
Success	0000	Matching is complete.
Failure	C000	Unable to process: the identifier is invalid or the query could not be executed.

4.2.1.4.4 Activity – Retrieve**Table 29. Accepted Presentation Contexts for Retrieve**

Abstract Syntax	Transfer Syntax	Role	Ext. Neg.
Patient Root Q/R Information Model – MOVE 1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian	SCP	None
Patient Root Q/R Information Model – GET 1.2.840.10008.5.1.4.1.2.1.3	Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian	SCP	None
Study Root Q/R Information Model – MOVE 1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian	SCP	None
Study Root Q/R Information Model – GET 1.2.840.10008.5.1.4.1.2.2.3	Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian	SCP	None
Storage SOP Classes (C-GET sub-operations)	As negotiated by the requester, see Section 4.2.1.3.1	SCU	Role Selection

SOP specific conformance. Retrieval is supported at the Patient, Study, Series and Image levels using the unique keys of the Query/Retrieve model. For C-MOVE, the Move Destination must be a registered remote AE; the PACS opens a new association to its registered address and sends the instances as described in Section 4.2.1.3.1. For C-GET, the instances are sent on the same association using the Storage Presentation Contexts for which the requester negotiated the SCP role. Sub-operations are performed synchronously, and pending responses report the numbers of remaining, completed, failed and warning sub-operations.

Table 30. C-MOVE and C-GET response status (Retrieve)

Service Status	Status Code	Reason
Pending	FF00	Sub-operations are continuing.
Success	0000	All sub-operations completed successfully.
Warning	B000	Sub-operations completed with one or more failures or warnings.
Failure	C000	Unable to process, including a Move Destination that is not registered or cannot be reached.
Refused	A702	C-GET: out of resources, unable to perform sub-operations.
Cancel	FE00	C-GET: sub-operations were terminated by a C-CANCEL request.

4.2.1.4.5 Activity – Provide Modality Worklist

Description and sequencing. A modality queries the worklist with C-FIND on the Modality Worklist Information Model. The PACS DICOM AE matches the query against the worklist entries currently published by the RIS (Section 4.1.2.3) and returns one pending response per matching Scheduled Procedure Step.

Table 31. Accepted Presentation Contexts for Modality Worklist

Abstract Syntax	Transfer Syntax	Role	Ext. Neg.
Modality Worklist Information Model – FIND 1.2.840.10008.5.1.4.31	Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian	SCP	None

SOP specific conformance. Any attribute listed in Table 32 can be used as a matching key, with the matching types shown. Sequence matching on the Scheduled Procedure Step Sequence is supported. Matching is case-insensitive for Person Name. Entries are not filtered by the Calling AE Title; a modality that wants only its own procedures should supply Scheduled Station AE Title (0040,0001) or Modality (0008,0060) as a matching key.

Each worklist entry holds the attributes in Table 32. The response to a query contains the requested return keys that are present in the entry. A requested return key that the entry does not hold (for example Referring Physician's Name or Issuer of Patient ID) is omitted from the response instead of being returned with zero length.

Table 32. Modality Worklist attributes

Attribute Name	Tag	Matching	Value supplied by the RIS
SOP Common			
Specific Character Set	(0008,0005)	—	ISO_IR 100
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	Sequence	One item: the scheduled examination
> Scheduled Station AE Title	(0040,0001)	S, W, U	AE Title of the modality assigned to the procedure; zero-length (matches any station) when the modality has no AE Title configured
> Scheduled Procedure Step Start Date	(0040,0002)	S, R, U	Appointment date, institution local time
> Scheduled Procedure Step Start Time	(0040,0003)	S, R, U	Appointment time, institution local time
> Modality	(0008,0060)	S, U	Modality type of the assigned modality
> Scheduled Procedure Step Description	(0040,0007)	S, W, U	Examination name
> Scheduled Procedure Step ID	(0040,0009)	S, U	Generated by the RIS
> Scheduled Station Name	(0040,0010)	S, W, U	Station name of the assigned modality
> Scheduled Procedure Step Status	(0040,0020)	S, U	SCHEDULED
Requested Procedure			
Requested Procedure ID	(0040,1001)	S, U	Generated by the RIS
Requested Procedure Description	(0032,1060)	S, W, U	Examination name
Requested Procedure Priority	(0040,1003)	S, U	ROUTINE
Study Instance UID	(0020,000D)	S, U	Assigned by the RIS (see Section 8.1.4)
Imaging Service Request			
Accession Number	(0008,0050)	S, W, U	Accession number of the order: date (YYYYMMDD) followed by a four-digit daily sequence
Patient Identification and Demographics			
Patient's Name	(0010,0010)	S, W, U	Family name^Given name

Attribute Name	Tag	Matching	Value supplied by the RIS
Patient ID	(0010,0020)	S, W, U	Medical record number (MRN) of the patient; the internal patient identifier when no MRN is recorded
Patient's Birth Date	(0010,0030)	S, R, U	Date of birth
Patient's Sex	(0010,0040)	S, U	M, F or O

Table 33. C-FIND response status (Modality Worklist)

Service Status	Status Code	Reason
Pending	FF00	A matching worklist item is returned; more may follow.
Success	0000	Matching is complete (also when there are no matches).
Failure	C000	Unable to process the query.

4.2.1.4.6 Activity – Commit Storage

Table 34. Accepted Presentation Contexts for Storage Commitment

Abstract Syntax	Transfer Syntax	Role	Ext. Neg.
Storage Commitment Push Model 1.2.840.10008.1.20.1	Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian	SCP	None

SOP specific conformance. The PACS DICOM AE accepts N-ACTION requests with Action Type ID 1 (Request Storage Commitment) from registered remote AEs and returns an N-ACTION response with Success (0000). It then checks each referenced instance against the archive and sends the N-EVENT-REPORT on a new association to the requesting AE (Section 4.2.1.3.6):

- **Event Type ID 1** (Storage Commitment Request Successful) when every referenced instance is archived with the referenced SOP Class;
- **Event Type ID 2** (Storage Commitment Request Complete – Failures Exist) otherwise, with the committed instances in the Referenced SOP Sequence (0008,1199) and the others in the Failed SOP Sequence (0008,1198).

Table 35. Storage Commitment failure reasons

Failure Reason	Meaning
0112	No such object instance: the referenced SOP Instance is not in the archive.
0119	Class / Instance conflict: the SOP Instance is archived with a different SOP Class than the one referenced.

Committed instances are held in the archive storage area, which is protected by the redundancy and replication configured for the deployment, until they are deleted by an authorised administrator or a configured retention rule. The requesting AE must be registered with a host and port at which it accepts the N-EVENT-REPORT.

4.2.2 PACS DICOMweb Origin Server Specification

The DICOMweb Origin Server implements the following transactions of DICOM PS3.18. All resources are rooted at <https://<host>/dicom-web/> (Studies Service) and <https://<host>/wado> (URI Service). The Retrieve Capabilities transaction (OPTIONS) is not implemented.

4.2.2.1 Search Transaction (QIDO-RS)

Table 36. Search resources

Resource	URI template
All Studies	/studies
Study's Series	/studies/{study}/series
Study's Series' Instances	/studies/{study}/series/{series}/instances
All Series	/series
All Instances	/instances
Study's Instances	/studies/{study}/instances

Media type. Responses are application/dicom+json. The XML (multipart/related; type="application/dicom+xml") response is not supported for Search; a JSON response is returned instead.

Query parameters. {attributeID}={value} matching using the matching types of Section 4.2.1.4.3 (single value, wildcard, range, list of UID, universal); includefield={attributeID} or includefield=all; limit and offset for paging. The fuzzymatching parameter is accepted and ignored. Person Name matching is case-insensitive. The response contains the default return attributes of PS3.18 for each level, plus those requested with includefield.

4.2.2.2 Retrieve Transaction (WADO-RS)

Table 37. Retrieve resources and media types

Resource	URI template	Media types
Study / Series / Instance	/studies/{study}[/series/{series}[/instances/{instance}]]	multipart/related; type="application/dicom" [; transfer-syntax={uid} or *]
Metadata (Study / Series / Instance)	.../metadata	application/dicom+json; multipart/related; type="application/dicom+xml"
Frames	.../instances/{instance}/frames/{frames}	multipart/related; type="application/octet-stream" [; transfer-syntax={uid}]
Bulk data	.../instances/{instance}/bulk/{tag}	multipart/related; type="application/octet-stream"
Rendered (Instance, Frame, Series)	.../rendered	image/jpeg, image/png

When a transfer-syntax parameter names a Transfer Syntax other than the archived one, the Origin Server transcodes the instances or frames before sending them; transfer-syntax=* returns them as archived. The Thumbnail resources and the application/zip media type are not supported. Rendered resources are intended for review and preview, not for primary diagnosis.

4.2.2.3 Store Transaction (STOW-RS)

Instances are stored with POST /studies or POST /studies/{study} using a request body of media type multipart/related; type="application/dicom", one Part 10 instance per part. The response is application/dicom+json and contains the Retrieve URL (0008,1190), the Referenced SOP Sequence (0008,1199), with a Retrieve URL for each stored instance, and the Failed SOP Sequence (0008,1198). The HTTP status is 200 when every part was stored and 400 when one or more parts could not be stored; the parts that were stored are kept and listed. Stored instances are handled exactly as in Section 4.2.1.4.2.

4.2.2.4 Retrieve DICOM Instance Transaction (WADO-URI)

GET /wado?requestType=WADO&studyUID={study}&seriesUID={series}&objectUID={instance} [&contentType=...] is supported. contentType=application/dicom returns the Part 10 instance. Without contentType, or with image/png or image/jpeg, a rendered image is returned as image/png.

4.2.2.5 Header Fields and Access Control

Requests use the Accept, Content-Type and Authorization header fields. Every request is carried over HTTPS (TLS 1.2 or 1.3) and must be authenticated; unauthenticated requests are rejected with HTTP 401. Access through the Voxxil HIS web application is additionally subject to the user's role and to per-study access grants (Section 7.3).

4.2.3 Review Viewer (DICOMweb User Agent)

The Review Viewer is the browser-based viewer of Voxxil HIS used for clinical review, teleradiology triage and referring-physician and patient access. It is opened from the RIS for a given Study Instance UID and acts as a DICOMweb User Agent of the PACS DICOMweb Origin Server:

Table 38. DICOMweb transactions used by the Review Viewer

Transaction	Resources used
Search (QIDO-RS)	Study and series level searches for the study being opened
Retrieve (WADO-RS)	Series metadata (application/dicom+json); frames and bulk data (application/octet-stream)
Store (STOW-RS)	Optional, enabled per deployment: stores measurement reports created in the viewer as DICOM Structured Reports

The Review Viewer does not open DIMSE associations. Its display functions are not intended for primary diagnostic interpretation.

4.3 Network Interfaces

4.3.1 Physical Network Interface

Voxxil HIS is indifferent to the physical medium over which TCP/IP runs; it uses the TCP/IP stack of the host operating system (Ubuntu LTS, x86-64). Servers are normally connected by 1 Gb/s or 10 Gb/s Ethernet.

4.3.2 Additional Protocols

Table 39. Additional protocols

Protocol	Use
DNS	Optional: remote AEs may be registered by host name instead of IP address.
NTP	Time synchronisation of the host operating system; used for time stamps in the index, logs and audit trail.
HTTP/1.1 over TLS	DICOMweb (Section 4.2.2) and the Voxxil HIS web application and API.

DHCP and LDAP are not used to configure DICOM network parameters.

4.3.3 IPv4 and IPv6 Support

IPv4 is supported and tested. IPv6 is not claimed.

4.4 Configuration

4.4.1 AE Title / Presentation Address Mapping

4.4.1.1 Local AE Titles

Table 40. Local AE Titles

Application Entity	Default AE Title	Default TCP/IP Port
PACS DICOM AE	VOXXIL_PACS	4242 (104 or any other port can be configured)
PACS DICOMweb Origin Server	n/a	443 (HTTPS)

The AE Title and port are set for each deployment. At a multi-site installation each site gateway has its own AE Title.

4.4.1.2 Remote AE Titles

Each remote AE is registered with its AE Title, IP address or host name, TCP port and the services it may use (Verification, Storage, Query, Modality Worklist, Retrieve by C-MOVE, Retrieve by C-GET, Storage Commitment). Registration is required for C-MOVE destinations, for Storage Commitment reports and for all associations that the PACS initiates, and in the default configuration for Query/Retrieve. The remote AE's host can optionally be checked against its registration. Per-AE overrides are available for the SCU timeout, local AE Title and transcoding.

4.4.2 Parameters

Table 41. Configuration parameters

Parameter	Configurable	Default Value
General		
PACS DICOM AE Title	Yes	VOXXIL_PACS
Listening TCP port	Yes	4242
Check the Called AE Title	Yes	No
Check the remote host against the registered AE	Yes	No
Accept Verification / Storage / Modality Worklist from unregistered AEs	Yes	Yes / Yes / Yes
Accept Query, Retrieve (MOVE, GET) and Storage Commitment from unregistered AEs	Yes	No
Maximum PDU size the AE can receive	Yes	16384 bytes
Maximum PDU size the AE can send	No	Maximum offered by the peer
DIMSE worker threads (inbound requests processed simultaneously)	Yes	4
Concurrent jobs (outbound transfers and other archive jobs)	Yes	2
Timeouts		
DIMSE inactivity timeout for inbound associations (the ARTIM timeout is fixed at 30 s)	Yes	30 s
Timeout for outbound associations (connect, A-ASSOCIATE-AC, DIMSE responses)	Yes	10 s (per remote AE override possible)
Storage		
Accepted Transfer Syntaxes	Yes	All in Annex 8.8
Accept Storage SOP Classes not listed in Annex 8.7	Yes	No
Replace an archived instance on receipt of the same SOP Instance UID	Yes	No (keep archived copy)
Transcoding on receipt	Yes	None (archive as received)

Parameter	Configurable	Default Value
Compression of the storage area	Yes	No
Delay after the last instance before a study is considered stable	Yes	60 s
Query/Retrieve		
Case-sensitive Person Name matching	Yes	No
Maximum number of C-FIND responses	Yes	Unlimited
C-MOVE sub-operations performed before the final response	Yes	Yes
Preferred Transfer Syntax when the PACS must transcode for a destination	Yes	Explicit VR Little Endian
Quality of lossy transcoding (when a lossy preferred Transfer Syntax is configured)	Yes	90
Storage Commitment		
Number of Storage Commitment reports received from remote AEs that are kept for enquiry	Yes	100
Modality Worklist (RIS)		
Worklist publication interval	No	60 s
Institution time-zone offset used for worklist dates and times	Yes	UTC-04:00 (Guyana)
Specific Character Set of worklist entries	No	ISO_IR 100
Character Sets and Security		
Character set assumed when Specific Character Set (0008,0005) is absent	Yes	ISO_IR 100 (Latin-1)
BCP 195 TLS Secure Transport Connection Profile (DIMSE)	Yes	Disabled; enabled per deployment
Require a trusted client certificate when TLS is enabled	Yes	Yes
De-identification of patient data in log files	Yes	Yes

5 Media Interchange

5.1 Implementation Model

An authorised user, or a client of the application programming interface, can export one or more patients, studies or series as a DICOM File-set. The PACS acts as a **File-set Creator (FSC)**: it creates a DICOMDIR and a copy of each selected instance and delivers them as a single ZIP package. Voxxil HIS does not write physical media itself; the package can be written to CD, DVD or Blu-ray by a disc-publishing system or by any disc-authoring software.

5.2 File-set Content

Table 42. Content of an exported File-set

Item	Content
DICOMDIR	Basic Directory IOD (Media Storage SOP Class 1.2.840.10008.1.3.10), Explicit VR Little Endian, in the root of the package.
Instances	DICOM Part 10 files under the directory IMAGES, with File IDs IM0, IM1, ...; each file keeps the Transfer Syntax in which it is archived. Transcoding of the exported files can be requested.
Directory records	PATIENT, STUDY, SERIES and IMAGE, with the keys in Table 43.

Table 43. DICOMDIR directory record keys

Directory Record	Keys included
PATIENT	Patient's Name (0010,0010), Patient ID (0010,0020)
STUDY	Study Date (0008,0020), Study Time (0008,0030), Accession Number (0008,0050), Study Description (0008,1030), Study Instance UID (0020,000D), Study ID (0020,0010)
SERIES	Modality (0008,0060), Series Instance UID (0020,000E), Series Number (0020,0011)
IMAGE	Referenced File ID (0004,1500), Referenced SOP Class UID in File (0004,1510), Referenced SOP Instance UID in File (0004,1511), Referenced Transfer Syntax UID in File (0004,1512), Instance Number (0020,0013)

Because the exported files keep their archived Transfer Syntax, conformance to a specific Media Storage Application Profile (for example STD-GEN-CD, which requires Explicit VR Little Endian) is not claimed. The PACS does not act as a File-set Reader; DICOM files from media are imported through Storage (Section 4.2.1.4.2) or STOW-RS (Section 4.2.2.3).

6 Support of Extended Character Sets

The PACS stores every instance with its original encoding. For indexing, matching and the DICOMweb JSON responses it decodes text attributes according to Specific Character Set (0008,0005). Table 44 lists the character sets decoded correctly. When Specific Character Set is absent, ISO_IR 100 (Latin-1) is assumed (configurable). C-FIND responses carry Specific Character Set (0008,0005). DICOMweb responses are encoded in UTF-8.

Table 44. Supported character sets

Character Set	Defined Term	Supported
Default repertoire (ASCII)	ISO_IR 6 (or absent value)	Yes
Latin alphabet No. 1	ISO_IR 100	Yes
Latin alphabet No. 2	ISO_IR 101	Yes
Latin alphabet No. 3	ISO_IR 109	Yes
Latin alphabet No. 4	ISO_IR 110	Yes
Latin alphabet No. 5	ISO_IR 148	Yes
Cyrillic	ISO_IR 144	Yes
Arabic	ISO_IR 127	Yes
Greek	ISO_IR 126	Yes
Hebrew	ISO_IR 138	Yes
Thai	ISO_IR 166	Yes
Japanese (JIS X 0201 Katakana)	ISO_IR 13	Yes
Unicode in UTF-8	ISO_IR 192	Yes
Chinese	GB18030, GBK	Yes
Single-byte sets with code extensions	ISO 2022 IR 6, ISO 2022 IR 100, ...	Yes
Multi-byte sets with code extensions (Japanese Kanji, Korean, Simplified Chinese)	ISO 2022 IR 87, ISO 2022 IR 159, ISO 2022 IR 149, ISO 2022 IR 58	Stored and returned unchanged; not decoded for matching or JSON

Modality Worklist entries published by the RIS use ISO_IR 100.

7 Security

7.1 Security Profiles

The PACS DICOM AE supports the **BCP 195 TLS Secure Transport Connection Profile** (PS3.15 Annex B), for associations it accepts and those it initiates. The profile is configured per deployment. When it is enabled:

- TLS 1.2 and TLS 1.3 are accepted; earlier TLS and SSL versions are refused;
- the PACS presents its X.509 certificate and, by default, requires a client certificate issued by a trusted certificate authority (mutual authentication);
- associations without TLS are refused on the TLS port;
- for outbound associations, TLS is used towards remote AEs that are registered as using TLS.

The DICOMweb Origin Server and the Voxxil HIS web application are served over HTTPS with TLS 1.2 or 1.3, using certificates issued by the customer's own certificate authority or obtained automatically through ACME.

7.2 Association Level Security

- Remote AEs are registered with AE Title, address and port, and are authorised per service (Section 4.4.1.2).
- Query, Retrieve and Storage Commitment are refused to unregistered AEs in the default configuration.
- Checks of the Called AE Title and of the remote host against its registration can be enabled.
- Retrieved instances are only sent to registered move destinations.

7.3 Application Level Security

- DICOMweb and API access require authentication. Users of Voxxil HIS sign in to the web application, and access to studies is controlled by role-based permissions and per-study access grants (for example for external referring physicians and patients).
- Access to patient data and changes to it are recorded in the Voxxil HIS audit trail, with user, action, resource, time, IP address and outcome.
- Patient identifiers are removed from PACS log files.

7.4 De-identification

Authorised users can create de-identified copies of patients, studies, series or instances, for teaching, research or external second opinion. De-identification applies the **Basic Application Level Confidentiality Profile** of PS3.15 Annex E (Table E.1-1, DICOM 2023b), optionally with specified attributes retained or replaced. The copies receive new Study, Series and SOP Instance UIDs, Patient Identity Removed (0012,0062) is set to YES, and De-identification Method (0012,0063) records the profile applied. The original instances are not altered.

8 Annexes

8.1 IOD Contents

8.1.1 Created SOP Instances

In normal operation Voxxil HIS does not create Composite SOP Instances; it archives and distributes the instances it receives. New instances are created only in the following cases:

Table 45. Created SOP Instances

Case	SOP Class	Content
De-identified copy (Section 7.4)	Same as the source instance	Source attributes processed per the Basic Application Level Confidentiality Profile; new UIDs; (0012,0062) and (0012,0063) added.
Modified copy by an authorised administrator (for example correction of patient demographics during reconciliation)	Same as the source instance	Source attributes with the requested corrections. New SOP Instance UIDs are generated unless the administrator chooses to keep them.
Measurement report saved from the Review Viewer (optional, Section 4.2.3)	DICOM Structured Report	Measurement report referencing the measured images; stored in the PACS through STOW-RS.

8.1.2 Usage of Attributes from Received IODs

The PACS indexes the following attributes of every received instance; they are used for C-FIND, QIDO-RS and the RIS. All other attributes remain available from the archived instance.

Table 46. Attributes indexed by the PACS

Level	Attributes indexed
Patient	Patient's Name, Patient ID, Patient's Birth Date, Patient's Sex, Other Patient IDs
Study	Study Date, Study Time, Accession Number, Institution Name, Referring Physician's Name, Study Description, Study Instance UID, Study ID, Requesting Physician, Requested Procedure Description
Series	Series Date, Series Time, Modality, Manufacturer, Station Name, Series Description, Operators' Name, Contrast/Bolus Agent, Body Part Examined, Sequence Name, Protocol Name, Cardiac Number of Images, Acquisition Device Processing Description, Series Instance UID, Series Number, Image Orientation (Patient), Number of Temporal Positions, Images in Acquisition, Performed Procedure Step Description, Number of Slices, Number of Time Slices, Series Type
Instance	Instance Creation Date and Time, SOP Instance UID, Acquisition Number, Instance Number, Image Position (Patient), Image Orientation (Patient), Temporal Position Identifier, Image Comments, Number of Frames, Image Index

The RIS uses Accession Number (0008,0050), Patient ID (0010,0020), Patient's Name (0010,0010), Patient's Birth Date (0010,0030), Patient's Sex (0010,0040), Study Instance UID (0020,000D), Study Date and Time, Study Description (0008,1030), Referring Physician's Name (0008,0090) and Modalities in Study (0008,0061) to reconcile and list studies, and SOP Class UID (0008,0016) to recognise Structured Reports, Key Object Selection documents, encapsulated documents and Secondary Capture objects.

8.1.3 Attribute Mapping

Table 47 shows how worklist attributes are expected to appear in the acquired images (as specified by IHE Scheduled Workflow) and how the RIS uses them.

Table 47. Worklist to image attribute mapping

Modality Worklist	Image IOD	Use by the RIS
Accession Number (0008,0050)	Accession Number (0008,0050)	First reconciliation key
Patient ID (0010,0020)	Patient ID (0010,0020)	Second reconciliation key
Patient's Name (0010,0010), Patient's Birth Date (0010,0030)	Same attributes	Third reconciliation key
Patient's Sex (0010,0040)	Patient's Sex (0010,0040)	Display
Study Instance UID (0020,000D)	Study Instance UID (0020,000D)	Stored with the order when images arrive

Modality Worklist	Image IOD	Use by the RIS
Requested Procedure ID (0040,1001)	Request Attributes Sequence (0040,0275) > Requested Procedure ID	—
Scheduled Procedure Step ID (0040,0009)	Request Attributes Sequence > Scheduled Procedure Step ID	—
Scheduled Procedure Step Description (0040,0007)	Request Attributes Sequence > Scheduled Procedure Step Description	—
Requested Procedure Description (0032,1060)	Study Description (0008,1030) or Requested Procedure Description	Display

8.1.4 Coerced / Modified Fields

- **Storage.** No attribute of a received instance is coerced or modified.
- **Query responses.** Specific Character Set (0008,0005), Query/Retrieve Level (0008,0052) and Retrieve AE Title (0008,0054) are added to each C-FIND response. Computed attributes (Section 4.2.1.4.3) are derived from the archive.
- **Modality Worklist.** The RIS assigns the Study Instance UID supplied in a worklist entry. Until images are received for the procedure, the value may be reassigned when the worklist is republished. Because studies are reconciled on Accession Number first, a study is reconciled in the same way whether the modality uses the supplied Study Instance UID or generates its own.

8.1.5 UIDs Generated by the RIS

Study Instance UIDs in worklist entries are generated under the organisation UID root configured for the deployment, with the default root 1.2.826.0.1.3680043.9.7125. Each UID has the form <root>.<time in milliseconds>.<random number>.

8.2 Data Dictionary of Private Attributes

Voxxil HIS does not define or create private attributes. Private attributes in received instances are archived and returned unchanged.

8.3 Coded Terminology and Templates

The PACS does not use coded terminology or templates. Structured Reports that it receives are archived, indexed and distributed without interpretation of their templates.

8.4 Grayscale Image Consistency

The PACS does not display images for diagnosis and does not support the Grayscale Standard Display Function. Display calibration is the responsibility of the diagnostic display system and viewer.

8.5 Standard Extended, Specialized and Private SOP Classes

None.

8.6 Private Transfer Syntaxes

None.

8.7 Storage SOP Classes

The PACS DICOM AE accepts the 166 Storage SOP Classes in Table 48 and the 20 retired Storage SOP Classes in Table 49, as SCP, and sends instances of all of them as SCU.

Table 48. Storage SOP Classes

SOP Class Name	SOP Class UID
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1
Acquisition Context SR Storage	1.2.840.10008.5.1.4.1.1.88.71
Advanced Blending Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.8
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3
Arterial Pulse Waveform Storage	1.2.840.10008.5.1.4.1.1.9.5.1
Autorefracton Measurements Storage	1.2.840.10008.5.1.4.1.1.78.2
Basic Structured Display Storage	1.2.840.10008.5.1.4.1.1.131
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4
Body Position Waveform Storage	1.2.840.10008.5.1.4.1.1.9.8.1
Breast Projection X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.13.1.4
Breast Projection X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.13.1.5
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3
C-Arm Photon-Electron Radiation Record Storage	1.2.840.10008.5.1.4.1.1.481.19
C-Arm Photon-Electron Radiation Storage	1.2.840.10008.5.1.4.1.1.481.13
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65
Colon CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.69
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2
Compositing Planar MPR Volumetric Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.7
Comprehensive 3D SR Storage	1.2.840.10008.5.1.4.1.1.88.34
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
Content Assessment Results Storage	1.2.840.10008.5.1.4.1.1.90.1
Corneal Topography Map Storage	1.2.840.10008.5.1.4.1.1.82.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
CT Performed Procedure Protocol Storage	1.2.840.10008.5.1.4.1.1.200.2
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.3
Dermoscopic Photography Image Storage	1.2.840.10008.5.1.4.1.1.77.1.7
DICOS 2D AIT Storage	1.2.840.10008.5.1.4.1.1.501.4
DICOS 3D AIT Storage	1.2.840.10008.5.1.4.1.1.501.5
DICOS CT Image Storage	1.2.840.10008.5.1.4.1.1.501.1
DICOS Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.501.2.1
DICOS Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.501.2.2
DICOS Quadrupole Resonance (QR) Storage	1.2.840.10008.5.1.4.1.1.501.6
DICOS Threat Detection Report Storage	1.2.840.10008.5.1.4.1.1.501.3
Digital Intra-Oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3
Digital Intra-Oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1

SOP Class Name	SOP Class UID
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Eddy Current Image Storage	1.2.840.10008.5.1.4.1.1.601.1
Eddy Current Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.601.2
Electromyogram Waveform Storage	1.2.840.10008.5.1.4.1.1.9.7.2
Electrooculogram Waveform Storage	1.2.840.10008.5.1.4.1.1.9.7.3
Encapsulated CDA Storage	1.2.840.10008.5.1.4.1.1.104.2
Encapsulated MTL Storage	1.2.840.10008.5.1.4.1.1.104.5
Encapsulated OBJ Storage	1.2.840.10008.5.1.4.1.1.104.4
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1
Encapsulated STL Storage	1.2.840.10008.5.1.4.1.1.104.3
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1
Enhanced MR Color Image Storage	1.2.840.10008.5.1.4.1.1.4.3
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1
Enhanced PET Image Storage	1.2.840.10008.5.1.4.1.1.130
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22
Enhanced US Volume Storage	1.2.840.10008.5.1.4.1.1.6.2
Enhanced X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.76
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1
Extensible SR Storage	1.2.840.10008.5.1.4.1.1.88.35
General Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.2
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2
Grayscale Planar MPR Volumetric Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.6
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1
Implantation Plan SR Storage	1.2.840.10008.5.1.4.1.1.88.70
Intraocular Lens Calculations Storage	1.2.840.10008.5.1.4.1.1.78.8
Intravascular Optical Coherence Tomography Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.14.1
Intravascular Optical Coherence Tomography Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.14.2
Keratometry Measurements Storage	1.2.840.10008.5.1.4.1.1.78.3
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59
Legacy Converted Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.2
Legacy Converted Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.4
Legacy Converted Enhanced PET Image Storage	1.2.840.10008.5.1.4.1.1.128.1
Lensometry Measurements Storage	1.2.840.10008.5.1.4.1.1.78.1
Macular Grid Thickness and Volume Report Storage	1.2.840.10008.5.1.4.1.1.79.1
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50
Microscopy Bulk Simple Annotations Storage	1.2.840.10008.5.1.4.1.1.91.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2
Multi-channel Respiratory Waveform Storage	1.2.840.10008.5.1.4.1.1.9.6.2

SOP Class Name	SOP Class UID
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4
Multiple Volume Rendering Volumetric Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.11
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
Ophthalmic Axial Measurements Storage	1.2.840.10008.5.1.4.1.1.78.7
Ophthalmic Optical Coherence Tomography B-scan Volume Analysis Storage	1.2.840.10008.5.1.4.1.1.77.1.5.8
Ophthalmic Optical Coherence Tomography En Face Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.7
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1
Ophthalmic Thickness Map Storage	1.2.840.10008.5.1.4.1.1.81.1
Ophthalmic Tomography Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.4
Ophthalmic Visual Field Static Perimetry Measurements Storage	1.2.840.10008.5.1.4.1.1.80.1
Parametric Map Storage	1.2.840.10008.5.1.4.1.1.30
Patient Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.73
Performed Imaging Agent Administration SR Storage	1.2.840.10008.5.1.4.1.1.88.75
Planned Imaging Agent Administration SR Storage	1.2.840.10008.5.1.4.1.1.88.74
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3
Radiopharmaceutical Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.68
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66
Real World Value Mapping Storage	1.2.840.10008.5.1.4.1.1.67
Respiratory Waveform Storage	1.2.840.10008.5.1.4.1.1.9.6.1
Robotic Radiation Record Storage	1.2.840.10008.5.1.4.1.1.481.20
Robotic-Arm Radiation Storage	1.2.840.10008.5.1.4.1.1.481.15
Routine Scalp Electroencephalogram Waveform Storage	1.2.840.10008.5.1.4.1.1.9.7.1
RT Beams Delivery Instruction Storage	1.2.840.10008.5.1.4.34.7
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4
RT Brachy Application Setup Delivery Instruction Storage	1.2.840.10008.5.1.4.34.10
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8
RT Physician Intent Storage	1.2.840.10008.5.1.4.1.1.481.10
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5
RT Radiation Record Set Storage	1.2.840.10008.5.1.4.1.1.481.16
RT Radiation Salvage Record Storage	1.2.840.10008.5.1.4.1.1.481.17
RT Radiation Set Delivery Instruction Storage	1.2.840.10008.5.1.4.1.1.481.21
RT Radiation Set Storage	1.2.840.10008.5.1.4.1.1.481.12
RT Segment Annotation Storage	1.2.840.10008.5.1.4.1.1.481.11
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3

SOP Class Name	SOP Class UID
RT Treatment Preparation Storage	1.2.840.10008.5.1.4.1.1.481.22
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4
Segmented Volume Rendering Volumetric Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.10
Simplified Adult Echo SR Storage	1.2.840.10008.5.1.4.1.1.88.72
Sleep Electroencephalogram Waveform Storage	1.2.840.10008.5.1.4.1.1.9.7.4
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1
Spectacle Prescription Report Storage	1.2.840.10008.5.1.4.1.1.78.6
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3
Subjective Refraction Measurements Storage	1.2.840.10008.5.1.4.1.1.78.4
Surface Scan Mesh Storage	1.2.840.10008.5.1.4.1.1.68.1
Surface Scan Point Cloud Storage	1.2.840.10008.5.1.4.1.1.68.2
Surface Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.5
Tomotherapeutic Radiation Record Storage	1.2.840.10008.5.1.4.1.1.481.18
Tomotherapeutic Radiation Storage	1.2.840.10008.5.1.4.1.1.481.14
Tractography Results Storage	1.2.840.10008.5.1.4.1.1.66.6
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1
Visual Acuity Measurements Storage	1.2.840.10008.5.1.4.1.1.78.5
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6
Volume Rendering Volumetric Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.9
Wide Field Ophthalmic Photography 3D Coordinates Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.6
Wide Field Ophthalmic Photography Stereographic Projection Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.5
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1
X-Ray 3D Craniofacial Image Storage	1.2.840.10008.5.1.4.1.1.13.1.2
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
XA Performed Procedure Protocol Storage	1.2.840.10008.5.1.4.1.1.200.8
XA/XRF Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.5

Table 49. Retired Storage SOP Classes

SOP Class Name (retired)	SOP Class UID
Audio SR Storage - Trial	1.2.840.10008.5.1.4.1.1.88.2

SOP Class Name (retired)	SOP Class UID
Comprehensive SR Storage - Trial	1.2.840.10008.5.1.4.1.1.88.4
Detail SR Storage - Trial	1.2.840.10008.5.1.4.1.1.88.3
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5
RT Beams Delivery Instruction Storage - Trial	1.2.840.10008.5.1.4.34.1
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8
Standalone PET Curve Storage	1.2.840.10008.5.1.4.1.1.129
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11
Stored Print Storage	1.2.840.10008.5.1.1.27
Text SR Storage - Trial	1.2.840.10008.5.1.4.1.1.88.1
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3
VL Image Storage - Trial	1.2.840.10008.5.1.4.1.1.77.1
VL Multi-frame Image Storage - Trial	1.2.840.10008.5.1.4.1.1.77.2
Waveform Storage - Trial	1.2.840.10008.5.1.4.1.1.9.1
X-Ray Angiographic Bi-Plane Image Storage	1.2.840.10008.5.1.4.1.1.12.3

8.8 Transfer Syntaxes

The PACS DICOM AE accepts the following Transfer Syntaxes for all Storage SOP Classes. Transfer Syntaxes marked as retired are accepted for compatibility with older equipment.

Table 50. Accepted Transfer Syntaxes

Transfer Syntax Name	Transfer Syntax UID	Notes
Implicit VR Little Endian	1.2.840.10008.1.2	
Explicit VR Little Endian	1.2.840.10008.1.2.1	
Deflated Explicit VR Little Endian	1.2.840.10008.1.2.1.99	
Explicit VR Big Endian	1.2.840.10008.1.2.2	Retired
JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	
JPEG Extended (Process 2 and 4)	1.2.840.10008.1.2.4.51	
JPEG Extended (Process 3 and 5)	1.2.840.10008.1.2.4.52	Retired
JPEG Spectral Selection, Non-Hierarchical (Process 6 and 8)	1.2.840.10008.1.2.4.53	Retired
JPEG Spectral Selection, Non-Hierarchical (Process 7 and 9)	1.2.840.10008.1.2.4.54	Retired
JPEG Full Progression, Non-Hierarchical (Process 10 and 12)	1.2.840.10008.1.2.4.55	Retired
JPEG Full Progression, Non-Hierarchical (Process 11 and 13)	1.2.840.10008.1.2.4.56	Retired
JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	
JPEG Lossless, Non-Hierarchical (Process 15)	1.2.840.10008.1.2.4.58	Retired
JPEG Extended, Hierarchical (Process 16 and 18)	1.2.840.10008.1.2.4.59	Retired
JPEG Extended, Hierarchical (Process 17 and 19)	1.2.840.10008.1.2.4.60	Retired
JPEG Spectral Selection, Hierarchical (Process 20 and 22)	1.2.840.10008.1.2.4.61	Retired

Transfer Syntax Name	Transfer Syntax UID	Notes
JPEG Spectral Selection, Hierarchical (Process 21 and 23)	1.2.840.10008.1.2.4.62	Retired
JPEG Full Progression, Hierarchical (Process 24 and 26)	1.2.840.10008.1.2.4.63	Retired
JPEG Full Progression, Hierarchical (Process 25 and 27)	1.2.840.10008.1.2.4.64	Retired
JPEG Lossless, Hierarchical (Process 28)	1.2.840.10008.1.2.4.65	Retired
JPEG Lossless, Hierarchical (Process 29)	1.2.840.10008.1.2.4.66	Retired
JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1])	1.2.840.10008.1.2.4.70	
JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80	
JPEG-LS Lossy (Near-Lossless) Image Compression	1.2.840.10008.1.2.4.81	
JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90	
JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91	
JPEG 2000 Part 2 Multi-component Image Compression (Lossless Only)	1.2.840.10008.1.2.4.92	
JPEG 2000 Part 2 Multi-component Image Compression	1.2.840.10008.1.2.4.93	
JPIP Referenced	1.2.840.10008.1.2.4.94	
JPIP Referenced Deflate	1.2.840.10008.1.2.4.95	
MPEG2 Main Profile / Main Level	1.2.840.10008.1.2.4.100	
MPEG2 Main Profile / High Level	1.2.840.10008.1.2.4.101	
MPEG-4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102	
MPEG-4 AVC/H.264 BD-compatible High Profile / Level 4.1	1.2.840.10008.1.2.4.103	
MPEG-4 AVC/H.264 High Profile / Level 4.2 For 2D Video	1.2.840.10008.1.2.4.104	
MPEG-4 AVC/H.264 High Profile / Level 4.2 For 3D Video	1.2.840.10008.1.2.4.105	
MPEG-4 AVC/H.264 Stereo High Profile / Level 4.2	1.2.840.10008.1.2.4.106	
HEVC/H.265 Main Profile / Level 5.1	1.2.840.10008.1.2.4.107	
HEVC/H.265 Main 10 Profile / Level 5.1	1.2.840.10008.1.2.4.108	
RLE Lossless	1.2.840.10008.1.2.5	