

DOC-2026-077 v6 — XyDromatics SR Engine: DICOM Conformance Statement

Document number: DOC-2026-077 **Title:** XyDromatics SR Engine: DICOM Conformance Statement **Version:** v6
Category: DICOM Conformance Statement **Product:** XyDromatics SR Engine **Release version:** 1.0.2.211
Classification: Non-device software (FD&C Act §520(o)(1)(D)) **Owner:** Synthology Healthcare Solutions Group, LLC (SHSG) **Effective date:** (on approval) **Review cycle:** 1 year **Next review due:** 2027-04-18 **Supersedes:** v5 (2026-08-01) — GA re-cut for the 1.0.2.210 general-availability release; supersedes 1.0.1.172 (DCR-2026-2140 / RI-2026-428); v6 (2026-08-07) — release-alignment to XyDromatics SR Engine 1.0.2.211 (RI-2026-489), canonical DOC-2026-467 masthead, no substantive content change.

Structured per DICOM PS3.2 (Conformance) 2024c. HL7 v2.x message semantics per HL7 v2.5.1.

1. Introduction

1.1 Revision History

Version	Date	Change
1	2026-04-18	Initial release (SR Engine v1.0.x).
5	2026-08-01	GA re-cut for the 1.0.2.210 general-availability release; supersedes 1.0.1.172. (DCR-2026-2140 / RI-2026-428).

1.2 Audience

Integrators connecting reporting workstations / AI-vendor result producers / clinical-IT staff wiring SR Engine between upstream DICOM Structured Report producers and downstream VNA/PACS + EMR targets.

1.3 Remarks

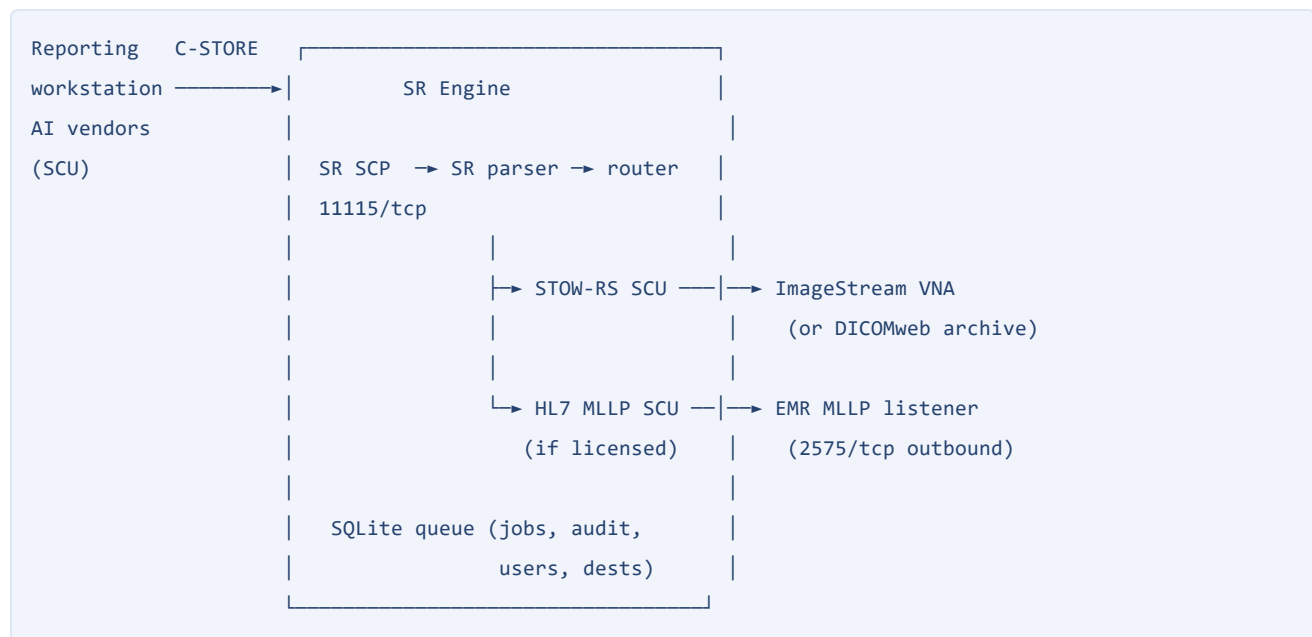
SR Engine is a **narrow-scope DICOM SR ingest + forwarder**. Its core function is: accept a DICOM Structured Report via C-STORE, optionally translate it to HL7 v2 ORU^R01 (license-gated), forward the DICOM SR to a downstream DICOMweb archive, and track the job lifecycle. It is not a full PACS; it is not a general routing engine (see Router, DOC-2026-074, for that role).

1.4 Conformance References

- DICOM PS3.1–PS3.18, 2024c (esp. PS3.4 Annex O — Structured Reporting).
- HL7 v2.5.1 Chapter 7 (Observation Reporting — ORU^R01 message).
- HL7 MLLP (Minimal Lower Layer Protocol).

2. Implementation Model

2.1 Application Data Flow



2.2 Functional Definitions

- **SR Storage SCP** — inbound C-STORE on 11115/tcp; accepts SR SOP Classes (§3.1.1) and Verification.
- **Peer-AE whitelist** — first-class design feature; non-whitelisted Calling-AEs are rejected at association.
- **SR Parser** — walks the Content Sequence (TID templates) to extract concept codes, values, units, datetimes.
- **STOW-RS SCU** — forwards the ingested SR (verbatim, no modification) to a configured destination.
- **HL7 Forwarder (license-gated)** — generates an ORU^R01 from parsed SR content and sends via outbound MLLP.

3. AE Specifications

3.1 Storage SCP AE (SR)

3.1.1 SOP Classes Supported

SOP Class	UID	Role
Verification	1.2.840.10008.1.1	SCP
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	SCP
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	SCP
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	SCP
Comprehensive 3D SR	1.2.840.10008.5.1.4.1.1.88.34	SCP
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	SCP
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	SCP
Colon CAD SR	1.2.840.10008.5.1.4.1.1.88.69	SCP
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	SCP
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	SCP
Radiopharmaceutical Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.68	SCP
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	SCP

Non-SR Storage SOP Classes are **rejected** at presentation-context negotiation with `abstract-syntax not supported`. SR Engine is deliberately not a general-purpose Storage SCP.

3.1.2 Association Policies

Parameter	Value
Default AE Title	<code>SRENGINE</code> (configurable)
Default Port	11115/tcp
Max PDU	16,384 bytes (configurable up to 131,072)
Max simultaneous associations	16
MaxOpsInvoked	1
MaxOpsPerformed	1
Implementation Class UID	1.2.826.0.1.3680043.10.1443.4
Implementation Version Name	IMAGESTREAM_SRE_1_0

3.1.2.5 Transfer Syntaxes

Transfer Syntax	UID
Explicit VR Little Endian	1.2.840.10008.1.2.1
Implicit VR Little Endian	1.2.840.10008.1.2
Deflated Explicit VR Little Endian	1.2.840.10008.1.2.1.99

SR objects are uncompressed by DICOM convention; no pixel-data TSEs are needed in an SR-only SCP.

3.2 Verification SCP / SCU

C-ECHO bidirectional. Whitelist enforcement applies to C-ECHO as well — non-whitelisted peers are rejected at association. This is intentional: allowing anonymous C-ECHO would leak service existence.

3.3 STOW-RS SCU (DICOMweb forwarder)

3.3.1 Destinations

Configured via *STOW-RS Destinations* in the web UI. Each destination: | Field | Notes | |—| | URL |
<https://host:port/dicom-web/studies> | | Credentials | Bearer / Basic / none | | IsDefault | Receives SR that does not match any routed destination | | Match rules | If `multi_destination` licensed |

3.3.2 Behavior

- Forwards SR as `multipart/related; type="application/dicom"`.
- Retry on 5xx with exponential backoff; 4xx fails fast to `failed → forwarding` ops queue.
- On 202 with per-instance warnings, per-job state reflects partial success.

3.4 HL7 MLLP Forwarder (license-gated — `hl7_forwarding`)

3.4.1 Message Type

- **ORU^R01** — Observation Result (unsolicited).
- HL7 v2.5.1 (wire-format); v2.3 / v2.4 compatibility mode at byte level (segment structures honored).

3.4.2 Segments Generated

Segment	Source
MSH	SR Engine static (sending-app/facility configured) + per-job control ID
PID	DICOM (0010,*) — PatientID, PatientName, BirthDate, Sex
PV1	DICOM (0008,0050) AccessionNumber → PV1-19
OBR	DICOM (0040,A043) ConceptNameCodeSequence → OBR-4
OBX	Walked from DICOM ContentSequence; value-type mapping below

3.4.3 OBX Value-Type Mapping

DICOM Content Value Type	HL7 OBX-2	OBX-5 construction
TEXT	TX	TextValue
NUM	NM	MeasuredValueSequence → NumericValue
CODE	CE	ConceptCodeSequence → code^text^system
DATE	DT	Date
TIME	TM	Time
DATETIME	TS	Datetime
UIDREF	ST	UID as string
PNAME	XPN	PersonName
CONTAINER	(recurses)	emits child OBX set

3.4.4 Framing

Standard MLLP: <VT> (0x0B) ... <FS><CR> (0x1C 0x0D). SR Engine waits for an ACK (MSA-2 = AA/CA/AE/AR) within 30 s; absent ACK retries per config.

3.4.5 Acknowledgement Handling

MSA-2	Job outcome
AA (Accept Accept)	HL7 forwarded successfully
CA (Commit Accept)	Success (v2.5+ enhanced ACK)
AE (Accept Error)	Job → hl7_failed with the ERR details
AR (Accept Reject)	Job → hl7_failed
(timeout)	Retry per config; eventually → hl7_failed

HL7 forwarding failure does NOT fail the DICOM forward (STOW-RS); these two legs are independent.

4. Communication Profiles

- TCP/IP IPv4 & IPv6.
- DICOM on 11115/tcp inbound.
- STOW-RS outbound HTTPS (443/tcp or custom).
- HL7 MLLP outbound 2575/tcp (or custom EMR port). **No inbound MLLP** — SR Engine never acts as HL7 receiver.
- No TLS for DICOM (PS3.15) in v1.x.

5. Extensions, Specializations, Privatizations

5.1 PHI Masking in UI

The web UI displays PatientID as `X***Y` (first + last char) by default; operators can toggle unmask (role-gated, audited). This affects the UI only; forwarded DICOM SR and ORU^R01 messages contain the full PHI.

5.2 Whitelist-Only C-ECHO

Unlike most SCPs, SR Engine rejects C-ECHO from non-whitelisted peers (see §3.2).

5.3 SR-Only Abstract-Syntax Policy

Non-SR Storage SOP Classes are rejected. This is a design choice (SR Engine is narrow by intent, not broad-plus-filter).

6. Configuration

Setting	Default	Where
AE Title	<code>SRENGINE</code>	MSI <code>AETITLE=</code> or web UI
DICOM port	11115/tcp	MSI <code>SCPPORT=</code> or web UI
Web UI port	5101/tcp	MSI <code>WEBPORT=</code> or config
HL7 enabled	off	License feature <code>hl7_forwarding</code>
Multi-destination enabled	off	License feature <code>multi_destination</code>

7. Support of Character Sets

Accepts all ISO-IR character sets referenced in PS3.3 C.12.1.1.2. Outbound HL7 is encoded per configured HL7 character set (default `~^\\&` delimiters, encoding `8859/1`). UTF-8 HL7 output is supported via MSH-18 `UNICODE UTF-8`.

8. Security

8.1 Network

- DICOM-TLS not supported in v1.x.
- STOW-RS outbound HTTPS (TLS 1.2/1.3).
- HL7 MLLP is plaintext in v1.x (MLLP/TLS on roadmap).

8.2 Audit

- Association accepted / rejected (with Calling-AE, remote IP).
- C-STORE received (SOP Instance UID, size, Calling-AE).

- STOW-RS forward outcome.
- HL7 MLLP forward outcome (incl. ACK code or timeout).
- User authentication events (web UI).
- PHI unmask events (user, timestamp, studies viewed).

Transport: SQLite audit table + rolling log files in v1.x. Syslog on roadmap.

8.3 Access Control

- Calling-AE whitelist is mandatory (cannot be disabled).
- Web UI: Admin / Operator / Viewer roles with JWT-Bearer.

9. Annexes

9.1 Non-Conformances

- Does NOT accept non-SR Storage SOP Classes.
- Does NOT act as Q/R SCP, MPPS SCP, Storage Commitment SCP, or Worklist SCP.
- Does NOT accept inbound HL7 (no MLLP listener).
- Does NOT generate DICOM SR (only ingests and forwards).
- Does NOT support DICOM-TLS in v1.x.
- Does NOT support MLLP over TLS in v1.x.

9.2 Known Quirks

- If the downstream VNA returns HTTP 409 on STOW-RS (duplicate SOP Instance UID), SR Engine treats this as success for idempotency — the SR was already stored. The job is marked `processed` with a `duplicate` flag for audit.
- CONTAINER content items nested deeper than 16 levels are flattened into OBX rows; deeper nesting is rare in real-world SR and this behavior is documented for AI-vendor SR producers that emit deep comprehensive SR.

Review cycle: 1 year, or on any of: new SR SOP Class support, HL7 message-type expansion (ORM, DFT, etc.), MLLP-TLS support, DICOM-TLS support, or whitelist-policy change. **Next review due:** 2027-04-18.

Regulatory classification. Non-device software under the FD&C Act §520(o)(1)(D) software exclusion. This statement is published by Synthology Healthcare Solutions Group, LLC as a controlled document; the authoritative version is the approved record in the Synthology quality-management system.