

DOC-2026-074 v8 — XyDromatics Router: DICOM Conformance Statement

Document number: DOC-2026-074 **Title:** XyDromatics Router: DICOM Conformance Statement **Version:** v8

Category: DICOM Conformance Statement **Product:** XyDromatics Router **Release version:** 1.2.3.333

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:** v7 (prior version, DOC-2026-074); v8 (2026-08-07) — release-alignment to XyDromatics Router 1.2.3.333 (RI-2026-489), canonical DOC-2026-467 masthead, no substantive content change.

This statement is structured per DICOM PS3.2 (Conformance) 2024c.

1. Introduction

1.1 Revision History

Version	Date	Change
1	2026-04-18	Initial release (Router v1.1.x).
2	2026-05-26	DCR-2026-395 — add Storage Commitment Push Model SCP (1.2.840.10008.1.20.1) and reverse-association N-EVENT-REPORT SCU per IHE TF RAD-10 (PS3.4 Annex J). Paired with DCR-2026-393 / Router 1.2.0.88. Also documents the operator-facing /api/health queue-shape redesign (new canonical fields: processing, outbound, hold, failed, inbound_associations, inbound_queue; received aliased to storage_files).
3	2026-07-01	DCR-2026-925 / RI-2026-087 — destination failover: cold-standby fallback chains. When a destination's per-destination retry (DCR-2026-413) exhausts, the Storage SCU walks the destination's ordered fallback chain, delivering the (already rule-transformed) study to the next reachable destination until one succeeds or the chain is exhausted. Cycle-safe (config-load validation + per-file visited set); PHI-scope compatibility is an operator attestation; per-attempt audit + /api/health fallback_engaged / fallback_delivery counters. Router 1.2.0.221.

1.2 Audience

Engineers integrating XyDromatics Router with DICOM peers — modalities, PACS, VNAs, AI inference gateways, clinical workstations. Assumes DICOM familiarity at PS3.1–PS3.7 level.

1.3 Remarks

Router is a DICOM store-and-forward routing engine. Its role in the information model is a **conditional conformance SCP** — it accepts arbitrary Storage SOP classes from upstream senders and relays them to configured downstream destinations per routing rules. Router is NOT a long-term archive; for archival semantics see XyDromatics VNA (DOC-2026-075).

1.4 Terms and Definitions

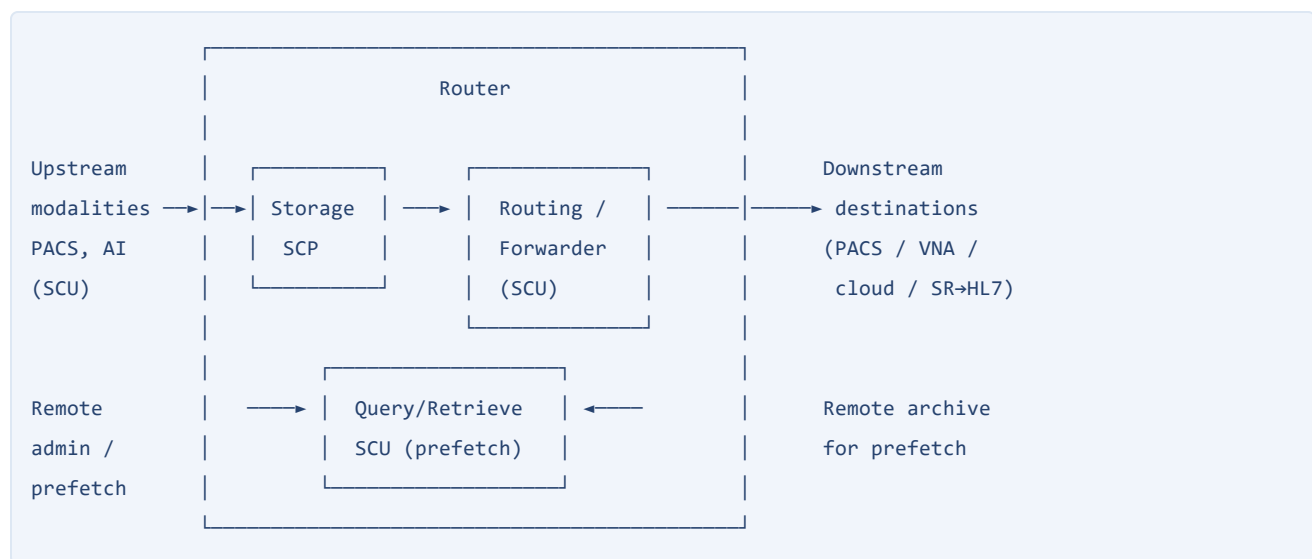
Per PS3.3. "Routing rule" is a Router-specific term meaning a match-and-forward policy (see Router user documentation).

1.5 Conformance References

- DICOM PS3.1–PS3.18, 2024c
- IHE ITI ATNA (audit) — Router emits ATNA audit messages per IHE ITI TF-2

2. Implementation Model

2.1 Application Data Flow



2.2 Functional Definitions

- **Storage SCP** — receives C-STORE associations, persists to spool, acknowledges with Success before policy evaluation.
- **Router/Forwarder (SCU)** — evaluates routing rules, issues C-STORE against one or more downstream destinations per instance.
- **Query/Retrieve SCU** — initiates C-FIND / C-MOVE / C-GET against remote archives for prefetch workflows.
- **Verification SCP/SCU** — C-ECHO both directions.
- **Storage Commitment SCP** (v2; DCR-2026-393) — accepts N-ACTION on SOP class 1.2.840.10008.1.20.1 (Storage Commitment Push Model, Action Type 1). Returns immediate N-ACTION-RSP Success; schedules async N-EVENT-REPORT delivery via reverse association per IHE TF RAD-10 / PS3.4 Annex J.
- **Storage Commitment N-EVENT-REPORT SCU** (v2; DCR-2026-393) — opens a reverse association back to the requesting AE after a brief delay (default ~2s) and sends N-EVENT-REPORT-RQ with success/failure SOP lists. Requestor must run an SCP that accepts Storage Commit Push Model on the reverse association; if not reachable, the report is logged and discarded (delivery is best-effort).

2.3 Sequencing of Real-World Activities

1. Upstream AE opens association on 11112/tcp (default; configurable).
2. Router evaluates Calling-AE whitelist (`restrict_unknown_sources`); rejects unknown AEs with `CallingAENotRecognized` .
3. Router negotiates presentation contexts per §3.1.2.5.
4. C-STORE requests are spooled to `%SYNTHOLOGY_ROUTER_DATA_DIR%\spool\` and acknowledged SUCCESS (0x0000) as soon as the file is committed to disk.
5. Forwarder subsystem (asynchronous to the SCP) evaluates routing rules and opens new associations to destinations as SCU.

3. AE Specifications

3.1 Storage SCP AE

3.1.1 SOP Classes Supported

Router accepts **all Storage SOP Classes** (PS3.4 Annex B). The SCP does not enforce an abstract-syntax whitelist — any Abstract Syntax offered by the association initiator will be evaluated against the transfer- syntax list in §3.1.2.5.2 and accepted if at least one common TS exists.

Additionally supported as SCP: | SOP Class | UID | |—| | Verification | 1.2.840.10008.1.1 | | Storage Commitment Push Model (v2; DCR-2026-393) | 1.2.840.10008.1.20.1 |

The Storage Commitment Push Model SOP Class is accepted on the SAME presentation contexts negotiated for C-STORE — integrating SCUs may add a Storage Commit PC to their A-ASSOCIATE-RQ and ride a single association for both C-STORE and the paired N-ACTION-RQ. See §3.5 for the full Storage Commitment SCP/SCU description.

3.1.2 Association Policies

3.1.2.1 General

Maximum PDU size: **16,384 bytes** default; configurable up to **131,072 bytes** per destination. Maximum number of simultaneous associations: **32** (soft limit; hardware-bound).

3.1.2.2 Number of Associations

- Inbound, simultaneous: 32 max (configurable, ceiling license-gated).
- Outbound, per destination: 4 max (configurable).

3.1.2.3 Asynchronous Nature

Asynchronous operations **NOT supported**. `MaxOpsInvoked = 1` , `MaxOpsPerformed = 1` .

3.1.2.4 Implementation Identifying Information

Field	Value
Implementation Class UID	1.2.826.0.1.3680043.10.1443.1
Implementation Version Name	IMAGESTREAM_RTR_1_1

3.1.2.5 Presentation Contexts — Acceptance

3.1.2.5.1 Accepted Abstract Syntaxes

All Storage SOP Classes per PS3.4 Annex B.4, plus Verification (1.2.840.10008.1.1) and **Storage Commitment Push Model** (1.2.840.10008.1.20.1; v2; DCR-2026-393).

3.1.2.5.2 Accepted 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
Explicit VR Big Endian (retired)	1.2.840.10008.1.2.2
Deflated Explicit VR Little Endian	1.2.840.10008.1.2.1.99
JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50
JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51
JPEG-LS Lossless	1.2.840.10008.1.2.4.80
JPEG-LS Near-Lossless	1.2.840.10008.1.2.4.81
JPEG 2000 Lossless	1.2.840.10008.1.2.4.90
JPEG 2000	1.2.840.10008.1.2.4.91
RLE Lossless	1.2.840.10008.1.2.5

Router does NOT perform on-the-fly transcoding in the SCP path — what arrives is what is forwarded unless a routing rule has an explicit transcode directive.

3.1.2.6 Extended Negotiation

Not supported.

3.1.2.7 SOP-Specific Conformance

- Verification: standard.
- All Storage SOP Classes: Router stores the DICOM object verbatim; tag-morphing is applied ONLY in the forwarder path per configured rules (Router is source-preserving at rest).
- **Storage Commitment Push Model (v2; DCR-2026-393)**: N-ACTION Action Type 1 accepted; Router returns N-ACTION-RSP Success synchronously, then queues an asynchronous N-EVENT-REPORT send on a reverse association back to the requesting AE per IHE TF RAD-10. See §3.5 for the full SCP/SCU description.

3.2 Storage SCU (Forwarder)

3.2.1 SOP Classes Supported

Router SCU forwards whatever SOP Class was received. Router never synthesizes objects it did not receive.

3.2.2 Association Policies

- Called-AE-Title: per destination configuration (no default).
- Transfer-syntax preference order: negotiation-time list matches the SCP side (§3.1.2.5.2), ordered by efficiency (Explicit LE first for uncompressed; compressed TS passed through unchanged).
- On association reject / C-STORE failure: retry per destination retry policy; mark exception in PACS Exception Service.
- On retry exhaustion (DCR-2026-925 / RI-2026-087): if the destination has a fallback chain configured, the SCU walks it in order and forwards the study to the next reachable destination (cold-standby failover) before recording a permanent failure.

3.3 Verification SCU

Router issues C-ECHO on a heartbeat schedule (default 5 min) to each destination. On repeated failure the destination is marked Offline and excluded from routing until recovery.

3.4 Query/Retrieve SCU

Router can issue: | SOP Class | UID | Role | |—|—|—| | Study Root Query/Retrieve — FIND | 1.2.840.10008.5.1.4.1.2.2.1 | SCU | | Study Root Query/Retrieve — MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | SCU | | Study Root Query/Retrieve — GET | 1.2.840.10008.5.1.4.1.2.2.3 | SCU | | Patient Root Query/Retrieve — FIND | 1.2.840.10008.5.1.4.1.2.1.1 | SCU |

Used for prefetch and scheduled-retrieve workflows only. Router is NOT a Q/R SCP (it does not hold studies for query).

3.5 Storage Commitment SCP + reverse-association N-EVENT-REPORT SCU (v2; DCR-2026-393)

Router implements IHE TF RAD-10 Storage Commitment Push Model per DICOM PS3.4 Annex J. The role is a paired SCP/SCU:

- **SCP side** — accepts inbound N-ACTION-RQ on SOP class [1.2.840.10008.1.20.1](#), Action Type 1 (Storage Commitment Request).
- **SCU side** — opens a reverse association back to the requesting AE and sends N-EVENT-REPORT-RQ with the commitment outcome.

3.5.1 N-ACTION-RQ handling

- Parses [\(0008,1199\) ReferencedSOPSequence](#) and accepts every referenced SOP Instance UID as committed-to-forward. Router's data flow is "receive + retain + selectively forward"; receipt itself implies commitment to the upstream chain. v2 does NOT separately verify durable persistence beyond what the C-STORE write-to-spool already guarantees.
- Returns N-ACTION-RSP with [\(0000,0900\) Status = 0x0000](#) (Success) immediately upon receiving and parsing the request. Per IHE RAD-10 the actual commitment result is delivered asynchronously via N-

EVENT-REPORT.

3.5.2 N-EVENT-REPORT-RQ delivery

- After returning N-ACTION-RSP, Router schedules an asynchronous task (default ~2 second delay; not currently operator-tunable) that opens a fresh A-ASSOCIATE-RQ back to the requesting AE.
- The reverse association proposes one presentation context: SOP class `1.2.840.10008.1.20.1` (Storage Commitment Push Model) with the same transfer syntax list as §3.1.2.5.2.
- N-EVENT-REPORT-RQ Event Type ID:
- `1` — all referenced SOP instances committed successfully.
- `2` — one or more referenced SOP instances failed; failure list carries `(0008,1198) FailedSOPSequence` with per-SOP `(0008,1197) FailureReason` codes (e.g. `0x0112` = no such object instance).

3.5.3 Reverse-AE address resolution

The requesting AE's network address is resolved in this order: 1. Lookup in Router's `Sources` table by AE-title match; on hit, use the configured `host:port`. This is the recommended deployment pattern — operator-configured Sources entries make reverse association delivery deterministic. 2. Fall back to the inbound association's RemoteHost + DICOM standard port 104.

If neither yields a reachable address, the N-EVENT-REPORT-RQ delivery fails silently; the failure is logged at WARN level. The requesting AE SHOULD eventually time out its commitment wait and treat the transaction as failed (see DCR-2026-394 / SynthIQ 1.0.0.45 for the paired SCU side reference implementation).

3.5.4 Persistence

v2 records each Storage Commitment transaction in the Router service log (ILogger) only. A persistent `storage_commitments` SQLite table for cross-restart durability is deferred to a follow-on DCR; today restart-during-N-EVENT-REPORT loses the in-flight send and the requesting AE must re-issue the N-ACTION-RQ (or time out and treat as failed).

3.5.5 Recommended SCU behavior (informational)

Integrating SCUs that consume Router's Storage Commitment service: - MAY queue the paired N-ACTION-RQ on the SAME fresh association as the C-STORE-RQ (single A-ASSOCIATE-RQ proposes both Storage + Commit PCs). Router accepts this and returns N-ACTION-RSP immediately after the C-STORE-RSP. - MUST run an SCP that accepts SOP class `1.2.840.10008.1.20.1` on inbound associations to receive the reverse N-EVENT-REPORT. The SCP should respond to N-EVENT-REPORT-RQ with N-EVENT-REPORT-RSP Success (`0x0000`) once it has processed the result locally. - SHOULD implement a timeout (recommended 5 minutes) after which an un-replied N-ACTION is treated as failed and the C-STORE retried.

4. Communication Profiles

4.1 Supported Communication Stacks

DICOM Upper Layer on TCP/IP (PS3.8). IPv4 and IPv6 both supported. DICOM on shared physical media (PS3.10) NOT supported.

4.2 TLS

DICOM-TLS (PS3.15 Secure Transport Connection) is **NOT** supported in v1.x. Planned for v1.2. Customers requiring encryption today should tunnel via IPsec or VPN at the network layer, or deploy a TLS-terminating proxy in front of Router.

4.3 Physical Media

Ethernet (any speed). No constraints beyond standard TCP/IP.

5. Extensions, Specializations, Privatizations

No DICOM extensions. Two Router-private mechanisms worth noting:

1. **Source AE whitelist with IP pinning** — rejections at association negotiation emit IHE ATNA `CallingAENotRecognized` / `IPRestrictionViolation` audit events.
2. **Tag mapping engine** — applied on the forwarder path per routing rule; transforms Patient ID, accession number, modality, etc. per configurable rules. The object forwarded may differ from the object received. Forwarded objects retain their original SOP Instance UID unless a rule explicitly issues a new one; modifications are logged.

6. Configuration

6.1 AE Title / Port

- Default Called-AE-Title: `IMAGESTREAM` (configurable at install time via MSI `AETITLE=` property or at runtime via web UI).
- Default SCP port: 11112/tcp (configurable).
- Inbound firewall rule: created automatically by MSI (see DOC-2026-049).

6.2 Destinations

Each destination is addressed by Called-AE-Title + host + port. Up to the license ceiling (tier-dependent) can be configured. Each may have its own retry policy, timeout, max PDU, transfer-syntax override.

A destination may also declare an ordered **fallback chain** (DCR-2026-925 / RI-2026-087): after its retry policy exhausts, Router moves the (already rule-transformed) study to the next destination in the chain until one delivers or the chain is exhausted — continuity of delivery during a downstream outage. The fallback INHERITS the primary's pseudonymization (routing rules are not re-evaluated). Chains are validated at config-load (cycle detection + valid-ID checks) and require an operator PHI-scope-compatibility attestation to activate; each attempt is audit-logged and surfaced via `/api/health fallback_engaged` / `fallback_delivery` counters.

6.3 Sources (v2; DCR-2026-393)

The `Sources` table maps incoming Calling-AE-Title to operator-known `(host, port, allowed-modalities, default-destinations)` metadata. Storage Commitment N-EVENT-REPORT reverse-association delivery (§3.5.3) uses this table for the requesting-AE address lookup. For reliable Storage Commit, every SCU that issues N-

ACTION-RQ to Router SHOULD have a corresponding Sources entry with its operator-known inbound DICOM listener `host:port`. Without an entry, Router falls back to the inbound association's RemoteHost + port 104; if the SCU listens on a non-standard port or behind NAT, that fallback fails.

6.4 /api/health JSON schema (v2; DCR-2026-393)

Router exposes a non-DICOM HTTP observability endpoint at `GET http://<host>:5000/api/health` (configurable port via MSI `HEALTHPORT=` property). The response is JSON; integrating monitoring systems can poll for capacity-planning + alerting. The schema is documented as “operator interface, not a DICOM wire protocol” — it may evolve across Router versions.

Relevant fields under `checks.queues` (v2 shape):

Field	Type	Meaning
<code>processing</code>	int	Items actively being routed RIGHT NOW (ProcessingDir file count). The LB-meaningful “is this Router busy” signal.
<code>outbound</code>	int	Items queued for outbound forward (OutboundDir file count).
<code>hold</code>	int	Items deferred / parked (HoldQueueDir; operator-hold or rule-gated). NOT actively being processed.
<code>failed</code>	int	Items in the failed-queue (FailedDir; failed dispatches, parked).
<code>inbound_associations</code>	int	Real-time count of inbound DICOM associations currently open. Drains as associations close.
<code>inbound_queue</code>	int	(v2 placeholder; currently always 0.) Items received but not yet claimed by the routing pipeline. Today Router routes in-process during the SCP handler with no intermediate staging queue; future architecture work may surface a meaningful value here.
<code>storage_files</code>	int	Persistent StorageDir file count (the archive Router retains across restarts; grows with traffic, does NOT drain).
<code>received</code>	int	DEPRECATED alias to <code>storage_files</code> retained for v1 parser back-compat. Integrating systems SHOULD migrate to <code>storage_files</code> .

7. Support of Character Sets

Router preserves `(0008,0005) Specific Character Set` as received; it does not recode PHI. ISO-IR 6 (default), ISO-IR 100 (Latin-1), ISO-IR 192 (UTF-8), and multi-byte sets (ISO 2022 series, GB18030) all pass through intact.

8. Security

8.1 Network

- Service runs as `LocalSystem` or a customer-provided domain account (§6 of Installation Guide).
- DICOM-TLS not supported in v1.x (see §4.2).

8.2 Audit (IHE ATNA)

Router emits ATNA-compatible audit records for: - Association establishment / release (Actor: `Application Activity`). - C-STORE received (Actor: `DICOM Instances Transferred`). - Source-node rejection (`Security Alert`). - Forwarded C-STORE (Actor: `DICOM Instances Transferred`, direction Destination).

Audit transport: file (`%SYNTHOLOGY_ROUTER_DATA_DIR%\logs\audit-*.jsonl`) in v1.x. Syslog transport planned for v1.2.

8.3 Access Control

- Calling-AE whitelist (§5 item 1).
- Optional IP pinning per AE.
- No DICOM-level authentication (PS3.15 Annex B User Identity) in v1.x.

9. Annexes

9.1 Abstract Syntaxes (abbreviated)

Because Router accepts all Storage SOP Classes, a full enumeration is omitted. Consult PS3.4 Annex B.4 for the authoritative list. Every Storage SOP Class listed there is accepted by Router SCP at negotiation time provided at least one TS from §3.1.2.5.2 is offered.

9.2 Non-Conformances

- No DICOM-TLS (v1.x).
- No DICOM Worklist (SCP or SCU).
- No Storage Commitment (SCP or SCU) — Router's in-memory acknowledgement is Best-Effort per PS3.4 Section B.5 after the spool write completes.
- No Hanging Protocol, no Structured Reporting Authoring.
- No Media Storage (PS3.10).
- Extended Negotiation not supported.

Review cycle: 1 year, or on any of: new SOP class support, DICOM-TLS addition, Q/R SCP addition, Storage Commitment addition, extended-negotiation support, tag-mapping semantics 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.