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DESIGN STUDY

A read-only AI assistant for a pharmaceutical manufacturer's validated data-center fabrics

Complete design on current platforms

CAPABILITY	INDUSTRY	SETTING
Automation	Life Sciences	Pharmaceutical manufacturer
DOCUMENT	**VERSION**	**DATE**
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Document control

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Sign-off	"An engagement under this design is signed by the practice lead before any build proceeds."		

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CONVENTIONS

Source tags. [S] figure read from the vendor's, project's, regulator's or standards body's own current page on Sep 24, 2026 · [S*] figure from the page's published summary where the page itself could not be opened · [A] design assumption, to be confirmed by the signing engineer · [T] design target: the record's outcome figure and anything derived from it. No figure comes from any engagement, file or asset. A row with more than one tag is counted once: as a published figure if any tag is [S] or [S*], otherwise as an assumption if any tag is [A], otherwise as a design target.

Table 1. Revision history

Date	Version	Change
Sep 27, 2026	`1.0`	First issue.
Oct 10, 2026	`1.1`	Approval line now reads: approved by the Founder, issued by Symbeeo. Mark Winston remains the author.

1 · Scope

Who it is for. The head of infrastructure at a pharmaceutical manufacturer whose on-call engineers spend the first half-hour of every incident working out what changed and what is affected, who wants an AI assistant to answer those questions — and whose quality function will not accept anything that can change a validated system without a named human and an audit trail.

Typical buyer [A]. A pharmaceutical manufacturer with two data centers hosting its manufacturing execution, laboratory information and quality systems, all in scope of its computerized-system validation. Each data center runs a 3-stage EVPN-VXLAN fabric managed by Juniper Apstra Data Center Director: 2 spines, 16 server leaves and 2 border leaves, 40 switches in total. Six network engineers share on-call. An ITSM tool holds changes; the site's log platform holds audit records.

What is in. The assistant's tool set and its read-only boundary; the path by which a proposed change reaches a human; the audit trail of every assistant call; the fabric's own validation and rollback, which the assistant reads. **What is out.** The fabric design; the choice of language model and its hosting; the validation of the GxP applications; firewall policy.

Assumptions. The client's quality function treats the assistant as a non-GxP tool as long as it cannot write to a validated system [A]. The client supplies an approved language-model endpoint inside its own tenancy [A]. Only network metadata — device names, interfaces, routes, alarms — is sent to the model; no GxP record content [A]. Fabric changes already go through Apstra with an ITSM approval [A].

Related documents, read Sep 24, 2026.

- SRA-AUT-001, Symbeeo reference architecture for infrastructure automation (§4.8, AI-assisted operations)
- Apstra Data Center Director product page — `https://www.juniper.net/us/en/products/network-automation/apstra-data-center-director.html`
- Apstra Data Center Director datasheet — `https://www.juniper.net/us/en/products/network-automation/apstra-data-center-director-datasheet.html`
- Apstra Data Center Director 6.2 User Guide — `https://www.juniper.net/documentation/us/en/software/apstra6.2/apstra-user-guide/index.html`
- JVD, 3-Stage EVPN/VXLAN Fabric with Juniper Apstra, solution architecture — `https://www.juniper.net/documentation/us/en/software/jvd/jvd-3-stage-datacenterdesign-with-juniper-apstra/solution_architecture.html`
- MCP specification release Jul 28, 2026 — `https://blog.modelcontextprotocol.io/posts/2026-07-28/`

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- NIST AI Risk Management Framework — https://www.nist.gov/itl/ai-risk-management-framework
- 21 CFR 11.10, controls for closed systems — https://www.ecfr.gov/current/title-21/chapter-I/subchapter-A/part-11/subpart-B/section-11.10
- Batfish releases — https://github.com/batfish/batfish/releases

1c · Public implementations this design follows

Each row is labeled. **Public deployment**: a named operator's real deployment, published and dated by the operator, its vendor or a partner, used where one exists. **Our own design**: the dated vendor or standards documentation this design was built from, where no public deployment of the design exists. Labels and dates checked Sep 27, 2026.

Table 2. Public implementations this design follows

Implementation	Who published it · date	What it settles for this design	URL
Our own design, built from published documentation. 3-Stage EVPN/VXLAN Fabric with Juniper Apstra, Juniper Validated Design: ERB with eBGP underlay and overlay; baseline QFX5220-32CD spines, QFX5120-48Y server leaves, QFX5130-32CD border leaves; validated on Apstra 4.2.1-207 and Junos 23.4R2-S3	Juniper · JVD, page dated Jan 15, 2025	R1: the fabric the assistant reads is Juniper's own validated shape and part list	https://www.juniper.net/documentation/us/en/software/jvd/jvd-3-stage-datacenterdesign-with-juniper-apstra/solution_architecture.html
Our own design, built from published documentation. MCP Jul 28, 2026: a tool that needs input returns `input_required`, and the client retries with the answers — elicitation for approvals over stateless connections	Model Context Protocol · Jul 28, 2026	R5: the stop between a proposed action and a human is in the protocol the assistant speaks	https://blog.modelcontextprotocol.io/posts/2026-07-28/
Our own design, built from published documentation. NIST AI RMF 1.0, released Jan 26, 2023, and the Generative AI Profile NIST AI 600-1, released Jul 26, 2024	NIST · 2023 and 2024	R7: the governance frame the quality function can map its own procedures to	https://www.nist.gov/itl/ai-risk-management-framework

The switch models in §3 are the JVD baseline parts [S]. The JVD was validated on Apstra 4.2.1; this design runs 6.2, so the fabric is re-validated by the client on 6.2 before the assistant reads it [A]. No public, dated deployment of Apstra or an AI assistant on a pharmaceutical manufacturer's data-center fabric was found on Sep 27, 2026, so every row is documentation used to build our own design.

2 · Requirements register

Table 3. Requirements register

#	Requirement	Value	Source
R1	Estate	2 data centers · 40 switches · 2 spines, 16 server leaves, 2 border leaves per fabric	[A]

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#	Requirement	Value	Source
R2	Fabric state can be returned to a point in time	intent, configuration and validations together	[S] Apstra Time Voyager
R3	Fabric continuously validated	intent-based analytics probes running	[S] Apstra
R4	Assistant write access to any validated system	none; read scopes only	[T]
R5	A proposed change stops for a named human	100 %; protocol-level stop	[S] MCP `input_required`; [T]
R6	Every assistant call recorded	secure, computer-generated, time-stamped audit trail; 100 % of calls	[S] 21 CFR 11.10(e); [T]
R7	Governance frame	NIST AI RMF 1.0 with AI 600-1	[S] NIST
R8	Every answer cites the tool calls behind it	100 % of answers	[T]
R9	Impact question answered	≤ 2 min from question to cited answer	[T]
R10	Preview or beta components	none in the path to a validated system	[T]; [S] Batfish MCP server beta
R11	Data sent to the model	network metadata only; zero GxP record content	[A]
R12	Audit retention	per the site's records policy, assumed 10 years	[A]

Twelve rows; six carry a vendor, regulator or standards figure, three are design assumptions, three are design targets.

3 · Architecture overview

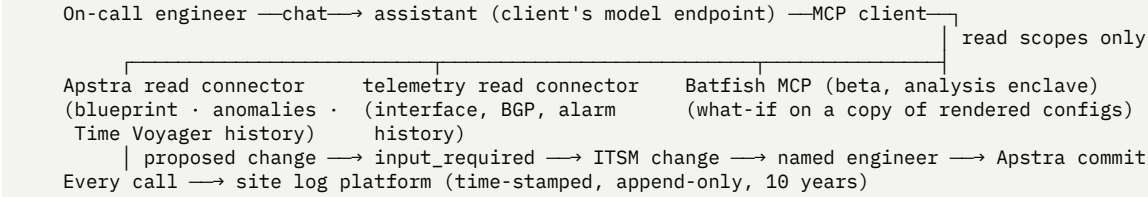


Figure 1. Read-only assistant and change path

The assistant reads three things and writes none. When it concludes that something should change, the result is a change request with its evidence attached, and the commit is made in Apstra by an engineer, exactly as before the assistant existed.

Table 4. Architecture overview

Role	Product (exact version)	Qty	Capacity used	Why this unit
Fabric manager	Juniper Apstra Data Center Director 6.2 [S]	1 cluster per data center [A]	20 switches each [A]	intent graph, Time Voyager, analytics probes [S]

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Role	Product (exact version)	Qty	Capacity used	Why this unit
Spine	Juniper QFX5220-32CD [S]	4	2 per fabric	JVD baseline spine [S]
Server leaf	Juniper QFX5120-48Y [S]	32	16 per fabric	JVD baseline server leaf [S]
Border leaf	Juniper QFX5130-32CD [S]	4	2 per fabric	JVD baseline border leaf [S]
What-if analysis	Batfish v2026.08.27, MCP server beta [S]	1, analysis enclave [A]	40 rendered configurations [A]	adds an MCP server for AI agents [S]
Assistant connectors	MCP servers, read scopes only [A]	3	—	protocol with `input_required` stop [S]

4 · Design by subsystem

4.1 The fabric the assistant reads.

Apstra holds the fabric's intent in a graph database used as its single source of truth [S], runs intent-based analytics probes for continuous validation [S], and can move the whole network state — intent, configuration and validations — back or forward to a point in time with Time Voyager [S]. The assistant reads these; it never becomes a second source of truth. Rejected: an assistant with its own configuration store — two sources of truth in a validated environment.

4.2 Tool set and read boundary.

Three connectors, each an MCP server holding a read-only service account: Apstra (blueprints, anomalies, probe results, Time Voyager revision history), telemetry (interface, BGP and alarm history), and Batfish [A]. No connector holds a credential with write permission, so a model error cannot become a write; the boundary is enforced by the credential, not by the prompt (R4) [T]. Rejected: one broad connector with write scopes "disabled in configuration" — one setting from a validated-system change.

4.3 From proposal to change.

When the assistant proposes an action, the connector returns `input_required`, the MCP Jul 28, 2026 mechanism for approvals [S]; the client turns that into an ITSM change with the assistant's evidence attached, assigned to a named engineer (R5) [A]. The engineer makes the change in Apstra; Time Voyager is the rollback [S]. The assistant cannot approve its own proposal (SRA-AUT-001 R11).

4.4 What-if analysis.

Batfish v2026.08.27 adds a beta MCP server for AI agents [S]. It runs in an analysis enclave on a copy of the rendered configurations, answering "what would this change reach" before an engineer opens a change [A]. Because it is beta, nothing it answers is used as validation evidence; the fabric's own Apstra probes remain the validated check (R10) [T].

4.5 Audit trail.

Every assistant question, every tool call with its parameters and result, and every proposal is written to the site's log platform as it happens (R6) [T] — the shape 21 CFR 11.10(e) asks of secure, computer-generated, time-stamped audit trails [S]. The assistant's own service accounts cannot delete or alter these records [A]. Every answer shown to the engineer lists the tool calls behind it (R8) [T].

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4.6 Governance.

The quality function maps its procedures to NIST AI RMF 1.0 and the Generative AI Profile, AI 600-1 [S] (R7): a named owner for the assistant, a monthly review of a sample of answers against their cited tool calls, and a register of every proposal and its outcome [A]. Only network metadata leaves for the model endpoint (R11) [A].

5 · Failure behavior

Table 5. Failure behavior

Failure	Behavior	Source
Assistant gives a wrong answer	answer carries its tool calls; engineer checks them; monthly review samples answers	[T] R8; [A] review
Assistant proposes a harmful change	stops at `input_required`; becomes a change request an engineer can reject	[S] MCP; [T] R5
Model endpoint down	engineers work as before, directly in Apstra; no fabric impact	[A]
Connector credential leaked	read-only scope; no write possible; credential revoked and rotated	[T] R4
Batfish MCP (beta) returns a wrong what-if	advisory only; Apstra probes remain the validated check	[T] R10
Log platform unreachable	assistant stops answering until the audit trail is available again	[A] fail closed

6 · Limits

- The switch counts and the six-engineer on-call are assumptions; the client's Apstra blueprints set the real inventory.
- The JVD part list was validated on Apstra 4.2.1 and Junos 23.4R2-S3; its applicability to 6.2 is for the client to confirm.
- Whether the quality function accepts the assistant as a non-GxP tool is the client's decision, not this design's.
- The ten-year retention is an assumption; the site's records policy sets it.
- The Apstra connector is built on Apstra's own interface; no vendor-published MCP server for Apstra was read for this design.

7 · Lessons learned

None yet — this is a design study; populated after the first build against it.

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8 · The author

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Signed off by Edwin Ozer, Founder.

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SYMBEEO

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Figures are as published by their sources on the dates given in this document; figures marked [A] are assumptions.

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