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DESIGN STUDY

Research compute deployment into an existing lab-campus room: six racks to be surveyed, verified at receipt, cabled and tested

Complete design on current platforms

CAPABILITY	INDUSTRY	SETTING
Implementation Services	Life Sciences	Life-sciences company
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 or publisher's own current page on Sep 24, 2026 · [S*] figure from the publisher's summary or a secondary report, where the publisher's full text could not be read on that date · [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. Steve Phillips remains the author.

1 · Scope

Who it is for. The head of research IT at a life-sciences company putting a new genomics compute cluster into a room that was built for something smaller, whose security team wants proof that each server arrived as it left the factory, and whose scientists want it running on a named date.

Typical buyer [A]. A life-sciences company on one lab campus. The cluster: four compute racks of 16 Dell PowerEdge R7725 each (64 servers), one storage rack, one network rack. The room: a raised-floor room of an earlier generation, in use, with other tenants' racks in it. A build room on the same campus, 80 m from the data room, is available for staging. Go-live date fixed by the research program.

What is in. Site survey of the room and the delivery route; receipt with platform-certificate verification; staging in the campus build room; rack-and-stack; MPO trunk and patch cabling with endface inspection and link test; out-of-band and firmware baseline; A/B power failover per rack; the as-built record; handover. **What is out.** The cluster design itself (SDD-DC-001 and SDD-AI-001 paths); the storage platform's configuration; the scheduler and research software; room power or cooling works, which the survey may find are needed but does not deliver.

Assumptions. Dell is the server vendor and the servers are ordered with Secured Component Verification [A]. Staging in the client's build room (SRA-IMP-001 D1, third option) [A]. The fabric between racks runs on MPO trunks [A]. The client's certificate authority issues the BMC certificates (SDD-IMP-001 P5) [A].

Related documents, read Sep 24, 2026.

- SRA-IMP-001, SDD-IMP-001, STP-IMP-001 — this capability's reference architecture, design and test plan
- Dell PowerEdge R7725 product page — `https://www.dell.com/en-us/shop/dell-poweredge-servers/new-poweredge-r7725-rack-server/spd/poweredge-r7725/pe_r7725_tm_vi_vp_sb`
- Dell, How to validate Secured Component Verification (on device) certificates, KB 000293241, modified May 22, 2026 — `https://www.dell.com/support/kbdoc/en-us/000293241/how-to-validate-secured-component-verification-on-device-certificates`
- NIST SP 1800-34, Validating the Integrity of Computing Devices — `https://www.nccoe.nist.gov/publication/1800-34/`
- NSA Cybersecurity, HIRS repository — `https://github.com/nsacyber/HIRS`
- NetBox v4.6 release notes — `https://netboxlabs.com/docs/netbox/release-notes/version-4.6`

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- Standards as cited in SRA-IMP-001 §9: ANSI/TIA-942-C, ANSI/BICSI 002-2024, ANSI/TIA-568.3-E, IEC 61300-3-35 ed. 3.0, ISO/IEC 14763-3:2024, ANSI/TIA-606-D
- Vertiv, VR Installer/User Guide, SL-11425 Rev 3, dated 10-18 on the document, read Sep 27, 2026 — https://www.vertiv.com/globalassets/products/facilities-enclosures-and-racks/racks-and-containment/vertiv-vr-rack/vertiv-vr-rack-installer-user-guide-rev3.pdf
- Schneider Electric, Installation and Customization, NetShelter SX Cabinet, 990-2183J-001, publication date January 2020, read Sep 27, 2026 — https://download.schneider-electric.com/files?p_enDocType=User+guide&p_File_Name=990-2183J_EN.pdf&p_Doc_Ref=990-2183_EN

1c · Public implementations this design follows

Table 2. Public implementations this design follows

Implementation	Who published it · date	What it settles for this design	URL
Acceptance testing at receipt: a provisioner scans the device, builds a hardware manifest and compares it with the platform certificate held by the HIRS attestation certificate authority	NIST NCCoE, SP 1800-34 · final Dec 2022 · published guidance, used to build our own design	The receipt check in §4.2 and R4	https://www.nccoe.nist.gov/publication/1800-34/
Validating a Dell system's integrity and authenticity from its platform certificates with the HIRS tool and an attestation CA portal, locally or remotely	Dell KB 000293241 · modified May 22, 2026 · vendor documentation, used to build our own design	The tool the receipt check uses for the 64 servers	https://www.dell.com/support/kbdoc/en-us/000293241/how-to-validate-secured-component-verification-on-device-certificates
NetBox 4.6 adds cable bundles: cables grouped to represent a physical run managed as a unit	NetBox Labs · May 5, 2026 · vendor documentation, used to build our own design	R13: each MPO trunk is one bundle in the as-built, with its test result attached	https://netboxlabs.com/docs/netbox/release-notes/version-4.6
A US university's campus research cluster of 338 Dell compute nodes, each with two 96-core AMD EPYC processors, built with Dell, AMD and NVIDIA in late 2024 and run through an early user program with 29 research groups before full production	The university's research computing center · Mar 5, 2025 · public deployment	§4.6 and R14: a research cluster of this family reaches production through acceptance on real research work, not on the last cable test	https://www.rcac.purdue.edu/news/7072

The SP 1800-34 row is [S*]: the method is from the publisher's summary; its December 2022 publication date was confirmed on NIST's CSRC page on Sep 27, 2026 (https://csrc.nist.gov/pubs/sp/1800/34/final). The university cluster row was read on Sep 27, 2026; it is the university's own published story, not a Symbeeo engagement, and it is cited for the method, not for a figure in this plan.

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2 · Requirements register

Table 3. Requirements register

#	Requirement	Value	Source
R1	Site survey	room and route surveyed and signed: floor load at six positions, measured power per feed, inlet temperature at the positions, route from dock to build room and from build room to row	[S*] BICSI 002-2024, TIA-942-C; SRA-IMP-001 R1
R2	Survey age	≤ 60 days at delivery	[A]; SRA-IMP-001 R2
R3	Network rack width	≥ 800 mm	[S*] TIA-942-C; SRA-IMP-001 R3
R4	Receipt integrity	64 of 64 servers match the order by serial; each server's platform certificate validated against its discovered components	[S] Dell KB; [S*] SP 1800-34
R5	Server management	iDRAC10 on every server; firmware, BIOS and BMC read over Redfish against the baseline	[S] R7725 product page lists iDRAC10; [A] Redfish read
R6	Burn-in	manufacturer diagnostics plus 72 h load in the build room; zero uncorrected errors	[A]; SRA-IMP-001 R5
R7	Management plane first	BMC reachable over out-of-band, factory credentials replaced, client-CA certificate installed before any in-band step	[T]; SRA-IMP-001 R7
R8	MPO polarity	one polarity method across every trunk and cassette, from the TIA-568.3-E methods	[S] TIA-568.3-E adds universal methods U1 and U2
R9	Endface	every connector inspected to IEC 61300-3-35 ed. 3 before first mating	[S]
R10	Link test	every link tested for loss, length and polarity to ISO/IEC 14763-3:2024, which covers MPO cabling	[S]
R11	A/B power	per rack under load: A feed off, restore, B feed off; zero unplanned restarts	[T]; STP-IMP-001 T17
R12	Labels	every cabinet, panel, port and cable in the TIA-606-D scheme; 10 % audit finds zero mismatches	[S*] TIA-606-D; SRA-IMP-001 R9
R13	As-built	NetBox 4.6 export: elevations, serials, cables and trunk bundles with test results	[S] NetBox 4.6
R14	Go-live	every STP-IMP-001 case passed or waived before the program's date	[T]

Fourteen rows; six carry a vendor or standards figure, three a summary figure, two are design assumptions, three are design targets.

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3 · Architecture overview



Figure 1. Survey-to-handover build sequence

The room is the risk in this design, not the servers, so the survey gates the order and the delivery day gates the rack-and-stack. The build room keeps unpacking, burn-in and firmware out of a live room shared with other tenants. The racks go into the data room empty; the servers cross the 80 m in their Dell packaging (§4.4).

Table 4. Architecture overview

Role	Product (exact model)	Qty	Capacity used	Why this unit
Compute server	Dell PowerEdge R7725	64	16 per compute rack [A]	2U, AMD EPYC 9005, iDRAC10, Secured Component Verification offered [S]
Receipt check	HIRS provisioner and attestation CA	1	64 servers [A]	the SP 1800-34 method [S*]; the tool Dell's KB uses [S]
Source of truth	NetBox 4.6	1	6 racks, 64 servers, every cable and trunk [A]	cable bundles for MPO runs [S]
Fiber test set and endface microscope	per STP-IMP-001 §3, with serial and calibration date	1 each	every link and connector [T]	ISO/IEC 14763-3:2024 and IEC 61300-3-35 ed. 3 [S]

4 · Design by subsystem

4.1 Survey.

Measured, not read from drawings: floor load at the six rack positions against the racks' loaded weight; power per feed with the room carrying its current tenants; inlet temperature at the positions; the route from dock to build room and from build room to row, door, lift, threshold and corridor, against the empty rack on its pallet and the boxed servers on carts [A]. Signed by the campus facilities owner (R1, R2). If the survey finds a shortfall, the order is held and the shortfall goes to the client as a works item, not absorbed into the schedule [T].

4.2 Receipt.

Every server checked against the order by serial. Each server's platform certificate is validated with the HIRS tool through an attestation CA [S]: the provisioner builds the hardware manifest and compares it with the certificate [S*]. A server that does not match is quarantined and not installed (SRA-IMP-001 F1) [A].

4.3 Build room.

Per server, in the build room's staging positions: Dell diagnostics, then 72 h load; iDRAC10 reached over out-of-band, factory credentials replaced, client-CA certificate installed; firmware, BIOS and BMC set to the baseline and read back

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over Redfish (R5–R7) [A]. The build room's network has no route to the campus production network (SDD-IMP-001 §4.5) [A].

4.4 Rack-and-stack.

The six racks go into the data room empty, set and leveled in their positions before any server leaves the build room [A]. After burn-in the servers go back into their Dell packaging, cross the 80 m on carts and are racked in place [A]; each is powered and read back over Redfish before the first patch, so a fault from the move is found before cabling [A]. Rolling loaded racks across the campus was rejected: Vertiv's VR rack guide recommends casters only for moving empty racks and warns that obstructed routes and uneven floors can topple a rack [S]; Schneider rates the NetShelter SX cabinet for 1,021 kg of equipment on its casters but states no distance or route condition [S], and a route with doors, a lift and thresholds is not a room floor. If the client wants the racks integrated in the build room, the alternative is a rack sold for shipping loaded on a shock pallet, by change order [A]. Heaviest units lowest, A/B cords to opposite PDUs, blanking panels fitted, labels on before the first patch [A]. Power per rack is read under load and compared with the survey figure [T].

4.5 Cabling and test.

MPO trunks between racks, cassettes in each rack; one polarity method for the whole room, chosen from TIA-568.3-E, which added universal methods U1 and U2 [S]. Every connector inspected to IEC 61300-3-35 ed. 3 before first mating [S]; every link tested to ISO/IEC 14763-3:2024 [S]. Each trunk is a cable bundle in NetBox with its tester export attached (R13) [A].

4.6 Failover and handover.

Per rack under load, A feed off, restore, B feed off (R11). The as-built is the NetBox export plus the STP-IMP-001 results (R13, R14). The research IT team walks one runbook, replacing a failed node, before signing receipt [A].

5 · Failure behavior

Table 5. Failure behavior

Failure	Behavior	Source
Survey finds floor or power short	order held; works item to the client; go-live date reviewed	[T]
Server fails platform-certificate validation	quarantined; Dell replaces; installed count reduced until it arrives	[A]; SRA-IMP-001 F1
Server fails burn-in	held in the build room; part or unit replaced; 72 h rerun	[A]; SRA-IMP-001 F2
Server faults at the post-move read-back	not patched; reseated and diagnostics rerun; part or unit replaced	[A]
Endface fails inspection	cleaned and re-inspected; re-terminated if it fails twice	[A]; SRA-IMP-001 F4
Trunk fails polarity or loss	trunk out of service; cassette or trunk replaced; retested	[A]
Unit restarts on a feed test	PSU and cord checked; rack retested before acceptance	[A]

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6 · Limits

- Platform-certificate validation covers what the manufacturer certifies; storage and network racks from other vendors are checked by serial only unless they issue certificates.
- The SP 1800-34 method is carried from the publisher's summary; the signing engineer reads the volume before the receipt procedure is written.
- 72 h burn-in in a build room assumes the room can carry the 64 servers at load at once; if not, they burn in in batches of 16 and the schedule lengthens.
- Every server is handled twice, once into a staging position and once into its rack; that is the price of not rolling loaded racks 80 m (§4.4).
- The survey can find that the room needs works; this plan does not deliver them.
- R7725 core counts and memory ceilings are not restated here; they belong to the cluster design.

7 · Lessons learned

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

8 · The author

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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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