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DESIGN STUDY

Wi-Fi 7 refresh for a 12-building hospital campus, 6 GHz first

Complete design on current platforms

CAPABILITY	INDUSTRY	SETTING
Networking	Healthcare	Regional hospital group
DOCUMENT	**VERSION**	**DATE**
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WRITTEN BY

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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."		

Contents

1 · Scope 3
1c · Public implementations this design follows 4
2 · Requirements register 4
3 · Architecture overview 5
4 · Design by subsystem 6
5 · Failure behavior 7
6 · Limits 7
7 · Lessons learned 7
8 · The author 8

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CONVENTIONS

Source tags. [S] figure read from the vendor's own current page on Sep 18, 2026 · [S*] figure from the vendor's page 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 18, 2026	1.0	First issue.
Sep 20, 2026	1.1	Public implementations added; figures reconciled with published sources.
Sep 27, 2026	1.2	Figures and platform details rechecked against published sources.
Oct 10, 2026	1.3	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 of a hospital group whose wireless predates Wi-Fi 6E, whose clinical devices are moving to 6 GHz-capable radios, and who cannot take a ward off the air to cut over.

Typical buyer [A]. A regional hospital group, 12 buildings, 3,800 clinical staff. Buildings range from a 9-floor acute tower to two-floor outpatient blocks. Existing Wi-Fi 5/6 access points on 1G copper; existing controller pair at end of support.

What is in. Access points, the wiring-closet switches that power them, the controller pair, the ward-by-ward cutover method, and the 6 GHz clinical SSID design. **What is out.** Campus core and inter-building fiber (assumed adequate, [A]); NAC policy design; medical device certification; DAS and cellular.

Assumptions. Cisco is the wireless and access-switch vendor [A]. Every closet has two dark fiber pairs to the building core [A]. Each building has a UPS-backed closet [A]. Clinical devices arriving 2026–27 are Wi-Fi 7 or Wi-Fi 6E and 6 GHz-capable [A].

Related documents, read Sep 18, 2026.

- Cisco Wireless 9178 Series Access Points data sheet — https://www.cisco.com/c/en/us/products/collateral/wireless/wireless-9178-series-access-points-ds.html
- Cisco Catalyst CW9800H1 and CW9800H2 Wireless Controllers data sheet — https://www.cisco.com/c/en/us/products/collateral/networking/wireless/wireless-lan-controllers/cat-cw9800h1-cw9800h2-wireless-controllers-ds.html (replaces the Catalyst 9800-80, end of sale Dec 31, 2025: https://www.cisco.com/c/en/us/products/collateral/wireless/catalyst-9800-series-wireless-controllers/catalyst-c9800-wireless-lan-controller-eol.html)
- Cisco Catalyst CW9800M Wireless Controller data sheet — https://www.cisco.com/c/en/us/products/collateral/networking/wireless/wireless-lan-controllers/catalyst-cw9800m-wireless-controller-ds.html
- Cisco Catalyst 9300 Series Switches data sheet — https://www.cisco.com/c/en/us/products/collateral/switches/catalyst-9300-series-switches/nb-06-cat9300-ser-data-sheet-cte-en.html
- Migrate to 6 GHz and Wi-Fi 7 with Cisco Wireless (doc 223061), read Sep 20, 2026 — https://www.cisco.com/c/en/us/support/docs/wireless/catalyst-9800-series-wireless-controllers/223061-migrate-to-wi-fi-7-and-6ghz.html

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- Cisco Catalyst 9800 Series Configuration Best Practices, read Sep 20, 2026 — https://www.cisco.com/c/en/us/td/docs/wireless/controller/9800/technical-reference/c9800-best-practices.html
- Cisco Catalyst Center Validated Profile: Healthcare (Non-Fabric) Vertical, read Sep 20, 2026 — https://www.cisco.com/c/en/us/td/docs/cloud-systems-management/network-automation-and-management/catalyst-center/cisco-validated-solution-profiles/validated_profile_healthcare_nonfabric_vertical.html

1c · Public implementations this design follows

Deployment rows are real public deployments, each dated. Where no public deployment matches, the row is Vendor documentation: the vendor's document that this design, Symbeeo's own, is built on.

Table 2. Public implementations this design follows

Implementation	Who published it · date	What it settles for this design	URL
Vendor documentation. Migrate to 6 GHz and Wi-Fi 7 with Cisco Wireless, doc 223061	Cisco · updated Jul 22, 2026	Mixing AP generations in one coverage zone ("salt and pepper") is not recommended; a dedicated 6 GHz site survey precedes migration; 6 GHz allows only WPA3 or Enhanced Open; 6 GHz attenuates about 2 dB more than 5 GHz; Wi-Fi 7 needs IOS XE 17.15.3 or later, 802.11be profiles from 17.18.1	https://www.cisco.com/c/en/us/support/docs/wireless/catalyst-9800-series-wireless-controllers/223061-migrate-to-wi-fi-7-and-6ghz.html
Vendor documentation. Catalyst 9800 Series Configuration Best Practices	Cisco · updated Sep 4, 2026	Load a controller to about 80 % of its AP and client scale; site tags equal to the number of WNCD processes	https://www.cisco.com/c/en/us/td/docs/wireless/controller/9800/technical-reference/c9800-best-practices.html
Vendor documentation. Validated Profile: Healthcare (Non-Fabric) Vertical	Cisco · updated Apr 17, 2026	A healthcare wireless estate validated at 6,000 APs, 25,000 wireless endpoints, 2 controllers per site, 5 SSIDs, AP SSO and N+1 SSO — larger than this design on the same controller family	https://www.cisco.com/c/en/us/td/docs/cloud-systems-management/network-automation-and-management/catalyst-center/cisco-validated-solution-profiles/validated_profile_healthcare_nonfabric_vertical.html

Applied in this design: the §3 and §4.5 cutover never runs old and new APs live in the same ward; new APs are installed with radios off and a ward switches generation in one window [S]. R9 at 80 % of the CW9800M limit is exactly Cisco's recommended ceiling.

2 · Requirements register

Table 3. Requirements register

#	Requirement	Value	Source
R1	Buildings and staff	12 buildings · 3,800 clinical staff	[A]
R2	Access point count	2,400 Wi-Fi 7 APs	[T]
R3	Radio plan	tri-band 2.4/5/6 GHz, 4x4 per radio; 6 GHz for clinical devices	[S] CW9178I tri-radio: one 4x4 6 GHz, one 4x4 5 GHz, one 4x4 2.4 GHz

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#	Requirement	Value	Source
R4	Aggregate rate per AP	up to 18 Gbps tri-radio, 24 Gbps quad-radio	[S] CW9178I
R5	AP uplink	2 × 10G multigigabit, power- and link-redundant	[S] CW9178I 2x 100M/1G/2.5G/5G/10G
R6	AP power	47 W max at 802.3bt	[S] CW9178I
R7	Access port	10G mGig, 90 W UPOE+ per port	[S] C9300X-48HX: 48x 10G mGig, 90 W UPOE+
R8	Closet PoE budget	up to 3,290–3,390 W per switch with dual 1,900 W supplies	[S] Catalyst 9300X
R9	Controller capacity	one HA pair, ≥ 2,400 APs with 25 % headroom = 3,000	[T]; [S] CW9800M 3,000 APs / 32,000 clients; CW9800H1 6,000 APs / 64,000 clients
R10	Client capacity	3,800 staff × 2 devices + 4,000 clinical devices ≈ 11,600	[A]
R11	Cutover	ward by ward, no ward off the air	[T]
R12	Controller failover	stateful switchover, 1:1 active standby	[S] CW9800M and CW9800H1 SSO
R13	6 GHz channels	20/40/80/160/320 MHz available; clinical SSID pinned to 6 GHz	[S] CW9178I; [A] SSID policy
R14	Availability target, clinical SSID	99.99 % per ward	[A]

Fourteen rows; nine carry a vendor figure, three are design assumptions, two are design targets.

3 · Architecture overview

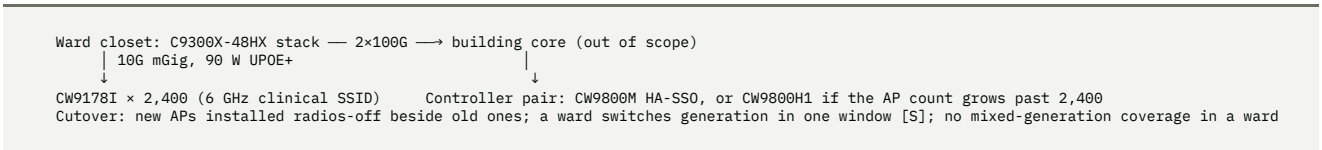


Figure 1. Ward access and controller layout

One access-point model across all 12 buildings, one switch model in every closet, one controller pair for the whole campus. The cutover method is the design, not an afterthought: each ward keeps its old APs on air until the moment its new ones take over, and no ward runs both generations live at once — Cisco's migration guide advises against mixing AP generations in one coverage zone [S] https://www.cisco.com/c/en/us/support/docs/wireless/catalyst-9800-series-wireless-controllers/223061-migrate-to-wi-fi-7-and-6ghz.html

Table 4. Architecture overview

Role	Product (exact model)	Qty	Capacity used	Why this unit
Access point	Cisco CW9178I	2,400	tri-radio, 18 Gbps aggregate [S]	4x4 on 6 GHz, dual 10G uplinks [S]

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Role	Product (exact model)	Qty	Capacity used	Why this unit
Access switch	Cisco C9300X-48HX	120 (stacks of 2–6 per closet) [A]	48 × 10G mGig, 90 W UPOE+ [S]	only fixed switch with 48 × 10G mGig + 90 W [S]
Uplink module	Cisco C9300X-NM-2C	120	2 × 100G/40G [S]	dual 100G to building core
Controller	Cisco CW9800M (HA pair)	2	2,400 of 3,000 APs = 80 % [S][T]	50 Gbps, 6 uplinks, SSO [S]
Controller, alternate	Cisco Catalyst CW9800H1 (HA pair)	2	2,400 of 6,000 APs = 40 % [S][T]	chosen if the AP count grows past 2,400, Cisco's 80 % ceiling on the CW9800M [A]; 64,000 clients, 100 Gbps, 1 RU [S]

4 · Design by subsystem

4.1 Access points.

CW9178I in tri-radio mode: one 4x4 6 GHz, one 4x4 5 GHz, one 4x4 2.4 GHz, up to 18 Gbps aggregate [S]. Quad-radio mode (second 4x4 5 GHz, 24 Gbps) reserved for the emergency department and outpatient waiting areas [A]. 6 GHz supports 20- to 320-MHz channels [S]; the design uses 80 MHz on 6 GHz for the clinical SSID and 40 MHz on 5 GHz for guest and legacy devices [A]. Density: one AP per 4 patient rooms, one per 60–80 m² of clinical floor [A]. Rejected: Wi-Fi 6E APs — clinical device fleet arriving 2026–27 is Wi-Fi 7 (R3, [A]).

4.2 Clinical SSID on 6 GHz.

One SSID for clinical devices, 6 GHz only, WPA3-Enterprise; one SSID for staff on 5 and 6 GHz; one for guests on 2.4 and 5 GHz [A]. Multi-link operation is a listed Wi-Fi 7 feature on the CW9178I [S]; the design enables it for staff devices and leaves clinical devices single-link until the device vendor confirms support [A].

4.3 Access switching and power.

C9300X-48HX per closet: 48 × 10G multigigabit, 90 W UPOE+ on every port, StackWise-1T at 1 Tbps, up to eight members per stack [S]. Each AP takes two ports on two different stack members [A], giving link and power redundancy (R5). Per-AP draw 47 W [S]: 2,400 APs draw 112.8 kW over 120 switches, 940 W per switch on average against a 3,290 W budget [S], 29 % used. Each switch carries 40 AP ports (2,400 × 2 ÷ 120), so after a member loss, or with every AP on a switch drawing from it, up to 40 × 47 W = 1,880 W, 57 %. Uplink C9300X-NM-2C, 2 × 100G [S]. Rejected: 1G access — cannot carry the AP's 10G uplink (R5).

4.4 Controllers.

CW9800M HA pair: 3,000 APs, 32,000 clients, 50 Gbps, 4 × 1/10G + 2 × 25G uplinks, SSO 1:1 active standby [S]. 2,400 APs is 80 % of the limit; 11,600 clients (R10) is 36 %. If the AP count grows past 2,400 during design validation, the Catalyst CW9800H1 (6,000 APs, 64,000 clients, 100 Gbps, 1 RU) replaces it [S]; the Catalyst 9800-80 is past end of sale (Dec 31, 2025) and is not used. Controllers in two different buildings on separate UPS [A]. Rejected: cloud-hosted controller — clinical SSID must survive WAN loss (R14, [A]).

4.5 Ward-by-ward cutover.

Sequence per ward: a dedicated 6 GHz survey of the ward [S]; install new APs on new switch ports beside existing APs with radios off; join the new controller pair; in one window under the biomedical engineering team's schedule, turn the old APs' radios off and the new APs' radios on, clinical SSID on 6 GHz; keep the old APs powered for 14 days as the

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rollback path; then retire them [A]. The two generations are never live together in one ward, per Cisco's migration guide [S]. No ward loses the old network before the new one is ready (R11). Twelve buildings at two wards per week is roughly 40 weeks [A].

4.6 Monitoring and lifecycle.

AP firmware moves with the controller release; a per-ward RF survey is recorded before and after cutover; capacity review when any AP's 6 GHz radio exceeds 60 % channel utilization for a week [A].

5 · Failure behavior

Table 5. Failure behavior

Failure	Behavior	Source
One AP uplink or one stack member down	AP stays up on its second 10G port and power source	[S] CW9178I power- and link-redundant uplinks; [A] ports on different members
One AP down	clients roam to neighbors; ward density is one AP per 4 rooms, so coverage holds at reduced rate	[A]
Active controller down	standby takes over statefully; clients keep their sessions	[S] SSO 1:1 active standby
Both controllers unreachable from a building	APs keep serving joined clients on the existing configuration until the controller returns; new joins wait	[A]
Closet power lost	ward's APs dark until UPS or power returns; adjacent wards' APs bleed coverage into corridors	[A]
6 GHz disabled by regulation in a country	CW9178I disables the 6 GHz radio; clinical SSID falls back to 5 GHz	[S] regional restriction note; [A] fallback

6 · Limits

- The 2,400-AP figure is a design target, not a survey result; the count is set by the RF survey per building.
- Controller sizing is at Cisco's 80 % ceiling on the CW9800M; any growth in AP count moves the design to the CW9800H1.
- 6 GHz range is shorter than 5 GHz; the one-AP-per-4-rooms density is a starting assumption to be tested in one ward first.
- Clinical device 6 GHz and multi-link behavior depends on the device vendor, not on this design.
- Cutover pace (two wards a week) assumes biomedical engineering can move devices at that rate.

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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SYMBEEO

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