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DESIGN STUDY

Private 5G and Zone 1 smartphones for a refinery's operator rounds, on CBRS

Complete design on current platforms

CAPABILITY	INDUSTRY	SETTING
Mobility	Energy	Gulf Coast refinery
DOCUMENT	**VERSION**	**DATE**
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WRITTEN BY

Mark Winston, Principal Network Architect

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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 regulator's own current page on Sep 24, 2026, or on Sep 27, 2026 where the text says so · [S*] figure from a page summary or trade press where the page could not be opened or was not read in full · [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 site IT and OT manager of a refinery whose operators still walk their rounds with paper and an intrinsically safe radio, whose process units are classified hazardous areas, and who is asked to put a managed smartphone in every operator's hand without putting an uncertified transmitter inside a classified zone.

Typical buyer [A]. A US Gulf Coast refinery on a 250-hectare site: eight process units, a tank farm, a jetty and a control building. 600 operators and maintenance technicians over four shifts; 220 of them carry a device on rounds. Process areas are classified Class I, Division 1 and Division 2; the control building and workshops are unclassified. Existing plant Wi-Fi covers buildings only.

What is in. Outdoor private 5G across process units, tank farm and jetty on CBRS; the hazardous-area placement of every radio; the Zone 1 / Division 1 smartphone; its enrollment, push-to-talk readiness and lost-device path. **What is out.** The DCS, safety systems and their networks; wireless process instruments (ISA100, WirelessHART); the refinery's fire and gas system; the push-to-talk service choice.

Assumptions. Celona is the private 5G vendor [A]. The site holds CBRS GAA access and may bid for PAL [A]. The refinery's hazardous-area drawings are current and signed by its own engineer [A]. Operators' rounds apps run on Android [A].

Related documents, read Sep 24, 2026.

- Celona 4G/5G access points: AP 21 and AP 25 "5G-NR, industrial indoor/outdoor", IP66, "C1D2 certified for hazardous environments", AP 25 on n48, both listed as supporting AerFlex (undated page; read in full Sep 27, 2026) — https://www.celona.io/access-points
- Celona AerFlex: "AP on site. Control in the cloud. Data stays local." (undated page; read in full Sep 27, 2026) — https://celona.io/aerflex
- Celona press release, AerFlex launch, August 6, 2025 (read in full Sep 27, 2026) — https://celona.io/news/celona-unveils-aerflex-the-industrys-first-cloud-controlled-ap-only-private-5g-platform-for-the-ai-powered-enterprise
- ecom Smart-Ex 03 DZ1: II 2G Ex ia IIC T4 Gb and Class I, Division 1, Groups A–D T4; 5G NR including n48; extended security patches until Q4 2032 (undated page; read Sep 27, 2026) — https://www.ecom-ex.com/products/communication/cell-phones/smart-ex-03-dz1/
- 47 CFR Part 96, Citizens Broadband Radio Service — https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-96

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- Ericsson Private 5G (comparison option) — https://www.ericsson.com/en/private-networks/ericsson-private-5g
- SRA-MOB-001, SDD-MOB-001, STP-MOB-001 (Symbeeo), v1.0 of Sep 27, 2026

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
A commercial outdoor private network on 3.5–3.7 GHz CBRS inside a refinery, with a placement model validated by measurement; strong RSRP inside the metal pipework, employees move freely on it	Celona engineers, IEEE VTC2024-Fall paper · October 7, 2024 · public deployment	the design's core premise — CBRS private cellular covering a refinery's pipe racks where Wi-Fi and public cellular fall short — is measured in a real refinery; the refinery is not named, and the paper does not settle R4 placement or R7	https://ieeexplore.ieee.org/document/10758023
AerFlex launched: AP-only private 5G, "secure local data breakout", network functions split between Celona access points and the cloud, no on-site servers; refineries named as a target environment	Celona press release · August 6, 2025 · vendor documentation, used to build our own design	R7 and §4.2: user traffic stays on site; control does not, which is why §6 carries an open limit	https://celona.io/news/celona-unveils-aerflex-the-industrys-first-cloud-controlled-ap-only-private-5g-platform-for-the-ai-powered-enterprise

Both rows were read on Sep 27, 2026: the press release in full; the IEEE paper through its abstract and bibliographic record on IEEE Xplore and the first page of the authors' copy on Celona's site (https://pages.celona.io/hubfs/IEEE%20Research%20Papers/A_Measurement_of_Commercial_Outdoor_Private_Network_Deployment_in_Refinery_Industry.pdf), so the paper's measurements are not used as figures here. The radio and phone facts (AP 21/AP 25 certification and bands, Smart-Ex 03 DZ1 marking, bands and patch date) come from Celona's and ecom's product pages, which carry no publication date; they were read that day and are listed under Related documents.

2 · Requirements register

Table 3. Requirements register

#	Requirement	Value	Source
R1	Devices on rounds	220 smartphones; ceiling 1.5×	[A]
R2	Coverage	RSRP ≥ −100 dBm, SINR ≥ 10 dB on 95 % of walkways, stairs and platforms of units, tank farm and jetty	[A]; SRA-MOB-001 R6
R3	Spectrum	CBRS under Part 96, GAA plus PAL where won; SAS grant before first emission	[S] 47 CFR Part 96; SRA-MOB-001 R8
R4	Radio placement	no radio inside Division 1; radios in Division 2 only if certified for it	[S] AP 21/AP 25 C1D2; [A] placement rule
R5	Handheld certification	Division 1 and ATEX/IECEx Zone 1	[S] Smart-Ex 03 DZ1

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#	Requirement	Value	Source
R6	Handheld network	5G NR on n48	[S] Smart-Ex 03 DZ1 band list
R7	Site WAN down	rounds app keeps working on site for ≥ 4 h	SRA-MOB-001 R7
R8	Outdoor radio sealing	IP66 or better	[S] AP 21, AP 25
R9	Enrollment	zero-touch, fully managed, no console step	SRA-MOB-001 R10
R10	Push-to-talk	a programmable PTT key on every handheld	[S] Smart-Ex "Push-To-Talk ready"
R11	Handheld security-update life	published end date ≥ 5 years from purchase	[S] patches until Q4 2032; SRA-MOB-001 R17
R12	Lost device	locked, wiped and SIM barred ≤ 15 min after report	SRA-MOB-001 R18
R13	Radio count	24 outdoor APs: 16 on poles, 8 on buildings and the jetty head	[T]

Thirteen rows; seven carry a vendor or regulator figure, two are design assumptions, one is a design target, and three restate an SRA-MOB-001 requirement for this design.

3 · Architecture overview

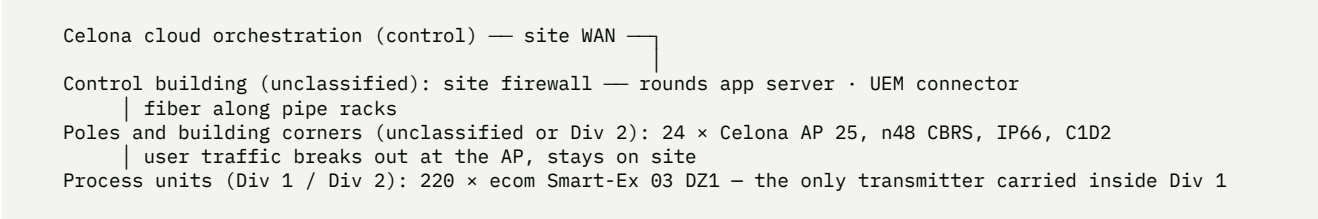


Figure 1. Refinery CBRS radios and Zone 1 phones

The rule that shapes the design is placement, not throughput. Radios stand in unclassified ground or, where the drawings allow, in Division 2 on a C1D2-certified unit [S]; the only radio that walks into Division 1 is the operator's phone, certified for it [S]. User traffic breaks out at the AP and never leaves the site [S].

Table 4. Architecture overview

Role	Product (exact model)	Qty	Capacity used	Why this unit
Outdoor 5G radio	Celona AP 25	24 [T]	220 devices at issue [A]	5G NR, n48, IP66, C1D2 certified [S]
Control and orchestration	Celona AerFlex	1 site	24 APs	AP-only; data breaks out locally [S]
Division 1 smartphone	ecom Smart-Ex 03 DZ1	240	220 + 20 spares [A]	Div 1 / Zone 1, 5G n48, IP68, AER verified [S]
Comparison option, core on site	Ericsson Private 5G	—	—	on-site dual-mode core [S]; SRA-MOB-001 D4

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4 · Design by subsystem

4.1 Radio placement.

24 AP 25 units: 16 on poles along the unit perimeter roads, six on the control building and workshop corners, two at the jetty head [A]. Each position is checked against the hazardous-area drawing: unclassified ground first; Division 2 only for a C1D2 unit with the installer's certificate [A]. External sector antennas point into the units along the pipe racks [A]. Rejected: mounting radios on unit structures inside Division 1 — no Celona AP is listed for it, and the rule in R4 forbids it.

4.2 Core and control.

AerFlex splits the core between the AP and Celona's cloud; user traffic breaks out locally at the AP [S]. The rounds app server sits in the control building, so a round's data never crosses the site WAN [A]. Celona's page does not say what a device does when the cloud control path is lost [S]; R7 therefore stays open until Celona states WAN-loss behavior in writing. If it cannot meet R7, Ericsson Private 5G with its on-site core [S] replaces AerFlex in the same positions (SRA-MOB-001 D4) [A].

4.3 Smartphone.

Smart-Ex 03 DZ1: ATEX II 2G Ex ia IIC T4 Gb and II 2D Ex ia IIIC T135 °C Db; Class I Division 1 Groups A–D T4 [S]. 5G NR bands include n48, n77 and n78; Wi-Fi 6E ready; Android 15 with Android 16 planned; extended security patches until Q4 2032; IP68 per IEC 60529; MIL-STD-810H; Android Enterprise Recommended; push-to-talk ready [S]. Wi-Fi is used in the control building; 5G everywhere else [A]. Rejected: a standard rugged phone in an Ex case — the certification is the device's, not the case's [A].

4.4 Enrollment and apps.

Fully managed through zero-touch into the site UEM (SRA-MOB-001 D5) [A]. Kiosk-style launcher with the rounds app, the PTT client, camera for defect photos and the gas-detector companion app [A]. eSIM profiles for the CBRS network pushed through the UEM, with a public-carrier profile as fallback for the site roads [A].

4.5 Spectrum.

Each AP registers with a SAS under Part 96; GAA is the floor, PAL where the refinery holds it [S]. A lost grant stops the radio at grant lapse (SRA-MOB-001 F6); the phone falls back to its public-carrier profile where coverage exists [A].

4.6 Rollout.

One process unit first, two shifts of operators for four weeks, paper rounds kept in parallel [A]. Then one unit a week; tank farm and jetty last. About 12 weeks [A].

5 · Failure behavior

Table 5. Failure behavior

Failure	Behavior	Source
One AP down	phones reselect a neighboring AP; walkway coverage at reduced margin	[A]
Site WAN down	user traffic already breaks out on site; control-path behavior not published	[S] local breakout; §6 open limit

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Failure	Behavior	Source
SAS unreachable	radios stop at grant lapse; phones fall back to public carrier where it reaches	SRA-MOB-001 F6; [A]
Phone fails in the field	operator collects a spare in the control building; enrolls by power-on	[A] 20 spares
Phone lost on site	locked and wiped from the UEM; SIM barred	SRA-MOB-001 F10
UEM unreachable	phones keep last policy; spares wait to enroll	SRA-MOB-001 F7

6 · Limits

- AerFlex behavior with the cloud control path lost is not stated on Celona's page; R7 is unproven until Celona states it in writing, and the Ericsson on-site core is the fallback.
- The 24-AP count is a design target; a predictive RF design on the plant's steel model and a walk test on platforms set it.
- Placement rests on the refinery's hazardous-area drawings; this design does not classify areas.
- Celona's pages list C1D2 (North American Division 2) certification; any ATEX Zone 2 installation outside the US needs a separately read certificate.
- Celona's access-point page, read Sep 27, 2026, lists the AP 25 as supporting AerFlex; the firmware release that carries it is confirmed before order.
- CBRS is US-only; the same design elsewhere needs the national local license.

7 · Lessons learned

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

8 · The author

WRITTEN BY

Mark Winston

Principal Network Architect

CCIE, CISSP, CCSP, CCISO, CISM, Adopting Zero Trust (Forrester)

Signed off by Edwin Ozer, Founder.

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SYMBEEO

Each vendor's tool shows you their option. We show you all of them against one requirement.

Compared. Then Delivered.

hello@symbeeo.com · symbeeo.com

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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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