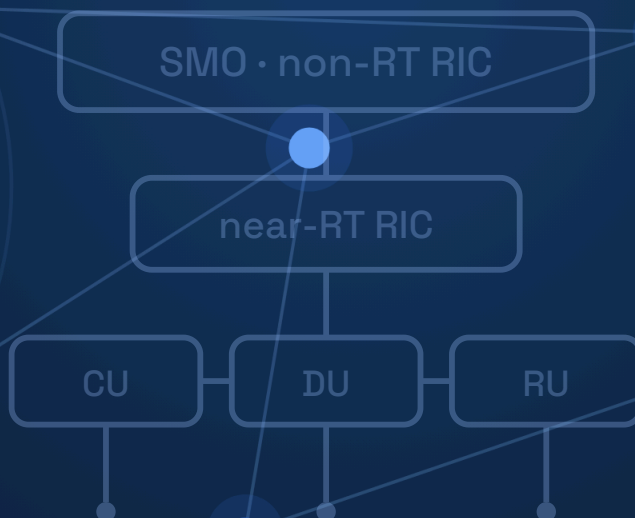




● TECHNICAL WHITEPAPER

Open RAN in Practice: What the 2026 Deployments Actually Tell Us

An evidence audit of the open RAN flagships — AT&T, Vodafone, 1&1, Rakuten, OREX and EchoStar — against the market data: what shipped, what stalled, and what it means for the next contract you sign.

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Abstract—Open RAN entered 2026 with cumulative revenues approaching \$10 billion, yet supplier concentration moved the wrong way: the top five RAN vendors took 96% of the market in the first three quarters of 2025, up from 95% a year earlier. This paper audits the flagship deployments against primary sources. AT&T passed 50% of traffic on open-capable hardware under a contract that remains, in practice, single-vendor. VodafoneThree handed 17,000 UK sites to Ericsson and Nokia while Vodafone kept Samsung as its European open RAN partner. Rakuten posted its first full-year EBITDA profit; EchoStar sold \$40 billion of spectrum and folded its greenfield into AT&T's network. The first commercially real open layer turned out to be the non-real-time RIC: third-party rApps reached production at AT&T and Rakuten, while no near-real-time xApp deployment with published results could be found. We close with the security record and a practical reading of every citable cost claim.

1. Introduction

Open RAN made three promises: mix radio and baseband vendors freely, cut the cost of the network, and break the grip of a shrinking supplier club. Those promises attracted the largest RAN contract ever signed, two greenfield operators built from scratch, and a standards effort that now ships through ETSI. Twenty-twenty-six is the first year there is enough deployment evidence to ask the uncomfortable question: did any of it work?

This paper is an audit, not a tutorial. The architecture — the RU/DU/CU split, the 7.2x fronthaul, the RIC and its interfaces — is covered in our earlier material and is taken as known. What follows is the market and practice layer: who deployed what, by when, with whom, and what the public record actually supports. Every figure is tied to a primary source where one exists; company self-claims are labeled as such; press-reported numbers that no operator has published are attributed to the outlet that reported them.

The short version, before the detail: open RAN won the standardization argument and lost — so far — the market-share war. Understanding why both halves of that sentence are true is, we think, the most useful thing a working engineer can take from the 2026 evidence.

2. The Scoreboard

Start with the honest numbers. Cumulative open RAN revenue was "approaching \$10 billion" by August 2025, according to Dell'Oro Group — but the path there was not a curve anyone forecast. After the initial scaling wave in Japan and the United States, open RAN revenues fell by roughly 40%

within two years, returning to year-on-year growth only in the second quarter of 2025 [2]. For the full year, growth landed "at the low end of the 5% to 10% target" [1]. Set that against the January 2022 forecast — open RAN at about 15% of the total RAN market by 2026, as reported at the time [4] — and the gap between expectation and delivery is roughly a factor of two.

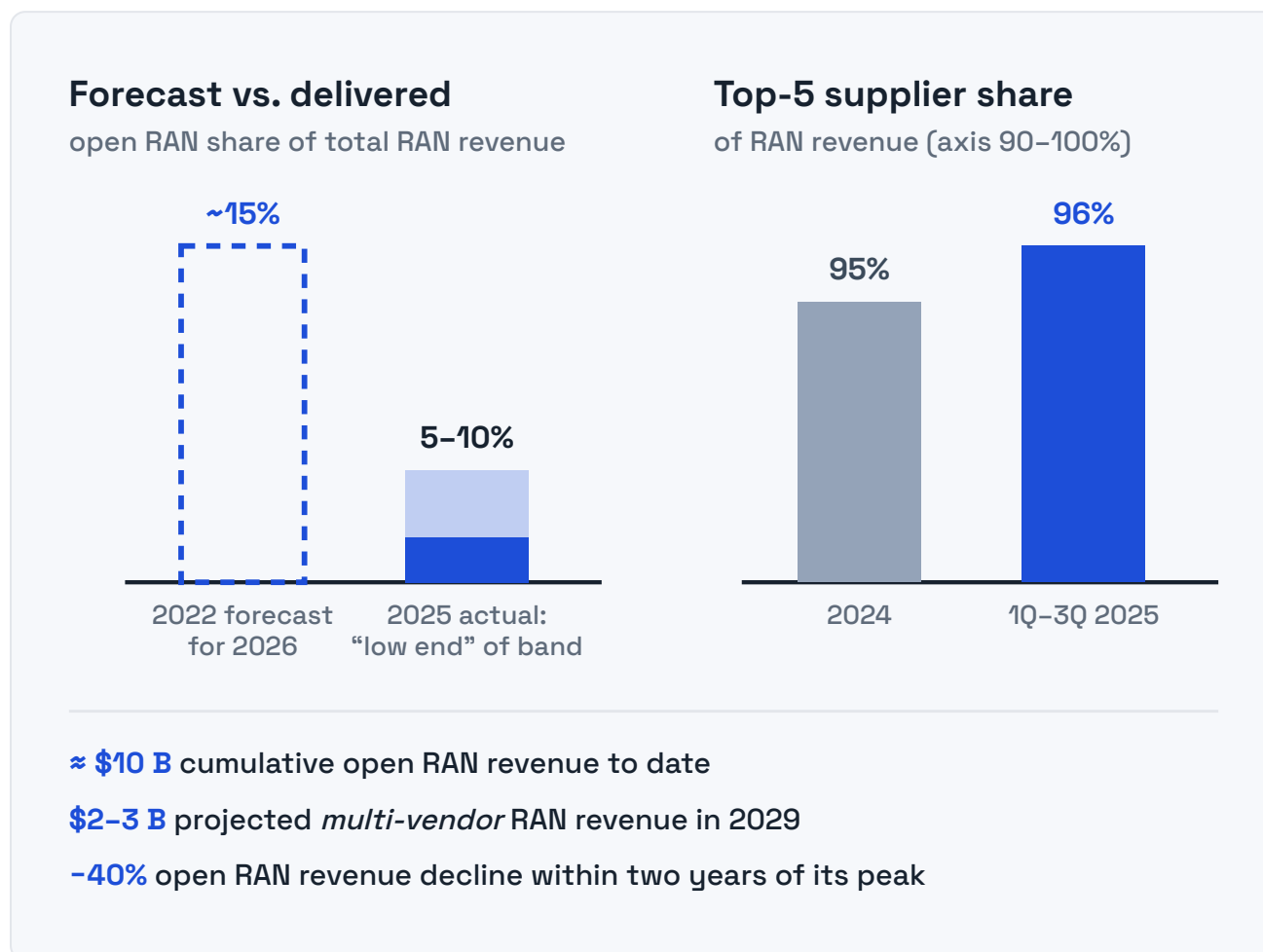


Fig. 1. The 2026 scoreboard. Left: the 2022 forecast for open RAN's share of RAN revenue versus the realized 2025 band. Right: top-five supplier concentration rose while openness was being deployed. Bottom: the headline market figures. Data: Dell'Oro Group [1], [2]; 2022 forecast as reported by RCR Wireless [4].

Concentration data tells the sharper story. The top five RAN suppliers held 96% of the market across the first three quarters of 2025 — up from 95% in 2024 [1]. Dell'Oro classifies five of its six tracked regions as "highly concentrated," with a Herfindahl-Hirschman index above 2,500, and projects multi-vendor RAN — the configuration open RAN was named for — at just \$2–3 billion by 2029 [2]. The backdrop is a flat market: worldwide RAN revenue has now spent five consecutive quarters inside a –4% to +4% year-on-year band [3].

Read plainly: open interfaces are being deployed at scale, and supplier diversity is not. Openness, in 2026, is mostly something operators buy as an option — and exercise at the negotiating table rather than in the radio mix.

3. The Flagships, Audited

Six deployments carry most of the evidence. Each gets one honest paragraph.

A. AT&T: the brownfield flagship

In December 2023, AT&T signed Ericsson to lead its open RAN build under a five-year agreement. Ericsson said "could approach roughly \$14 billion," with a stated ambition of carrying 70% of wireless traffic over open-capable platforms by late 2026 [5]. By March 2026 the operator reported the radio swap more than half done, over 50% of network traffic on open-capable hardware, and Cloud RAN live in two cities [6]. The first commercial call with third-party radios — 1Finity (Fujitsu) units on Ericsson baseband — came in August 2025, twenty months into the program [7]. A month earlier, AT&T became the first operator anywhere to put a third-party rApp into live production, delivered over the O-RAN R1 interface through Ericsson's automation platform, whose ecosystem Ericsson puts at more than sixty rApps [8]. The press release named neither the rApp vendor nor any performance figure — a detail worth noticing in a program this public.

B. Vodafone and VodafoneThree: the golden cluster meets procurement

Vodafone UK's "golden cluster" — fourteen live urban open RAN sites in southwest England, announced in May 2023 as Europe's first commercial urban deployment — came with a group pledge to put open RAN on 30% of European sites by 2030 [9]. Two years later, the merged VodafoneThree awarded roughly 17,000 UK sites to Ericsson (lead supplier, around 10,000 sites) and Nokia (around 7,000); Samsung, the incumbent open RAN partner, was excluded. Light Reading, which reported the site split, put Samsung's live count at about 70 of a planned 2,500 and cited deployment speed and coverage obligations as the rationale [10]. The same group then turned around in October 2025 and confirmed Samsung as its "primary partner for large-scale open RAN and vRAN deployments within Europe," with Wismar, Germany slated to become Vodafone's first fully open-RAN city in early 2026 [11]. Both facts are true at once: open RAN lost the UK battle and kept the European war.

C. 1&1: the regulatory greenfield

Germany's fourth operator built on the Rakuten platform and spent 2025 racing a regulatory clock. By the end-2025 deadline it had reportedly migrated its customer base — more than twelve million SIMs — onto its own open RAN core and network, with roughly 1,500 of its own antenna sites live and 4,500 more in development [12]. Its national-roaming safety net moved from Telefónica to Vodafone in August 2024 [13]. The migration figures come from trade press and analyst write-ups rather than operator publications, and we present them as such.

D. Rakuten: the survivor turns a profit

The original greenfield finally crossed the line. Rakuten Mobile reported its first full-year EBITDA profit for fiscal 2025 — ¥12.9 billion, a ¥66.7 billion improvement year-on-year — on 10.01 million subscriptions, and Rakuten Symphony, the unit selling the platform to others, posted its first full-year non-GAAP operating profit [14]. The numbers that made Rakuten famous — around 40% lower capex and 30% lower opex than a conventional build — remain company self-claims that have never been independently audited [27], and after six loss-making years the more defensible lesson is about persistence and balance sheet as much as architecture.

E. NTT Docomo and OREX: open RAN as an export product

Docomo packaged its operator experience into OREX, claiming total-cost reductions of "up to 30%" and base-station power savings of "up to 50%" — figures whose baseline, per Docomo's own footnotes, is Docomo's standard network compared with the same network running OREX

components [16]. The export strategy is finding buyers: OREX SAI, the Docomo–NEC joint venture, signed Indonesia's SURGE for up to 4,800 base stations in an initial 2026 phase, billed as the first commercial open RAN fixed-wireless-access system at 1.4 GHz (band n50) [17].

F. EchoStar: the cautionary tale

The United States' only at-scale multi-vendor greenfield ended its independent life in 2025–26. EchoStar agreed in August 2025 to sell its 3.45 GHz and 600 MHz licenses to AT&T for about \$23 billion, converting itself into a "hybrid MNO" whose Boost customers ride AT&T's network while parts of the Boost RAN are decommissioned [18]; a month later, AWS-4 and H-block spectrum went to SpaceX for roughly \$17 billion [19]. The FCC approved the ~\$40 billion package on May 13, 2026 [20]. Calling this the "strategic abandonment" of the standalone network is an analyst's framing [21], but the engineering point stands without editorializing: the network was built, it worked, and the business around it did not survive contact with the capital markets. Architecture was never EchoStar's problem.

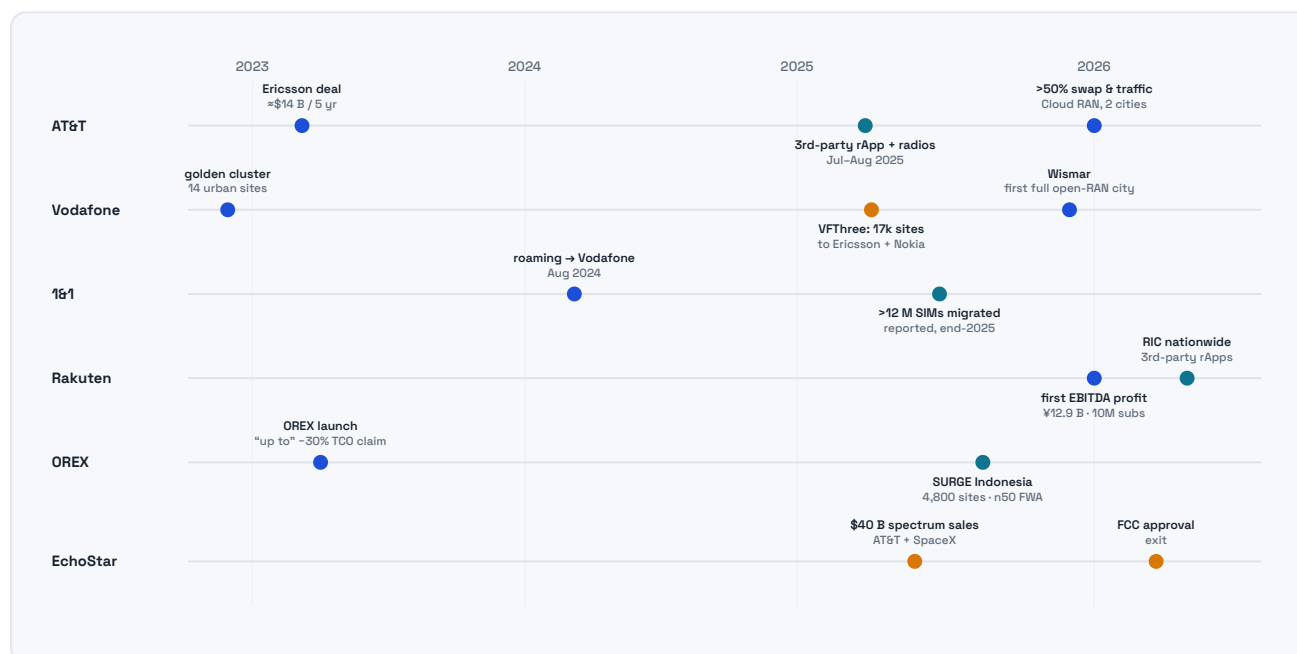


Fig. 2. Deal to reality, 2023–2026: contract dates, first-call and migration milestones, and where each flagship stood by mid-2026. Blue markers are operator-published events; teal are production/technology firsts; amber are restructuring events. Sources: [5]–[21].

4. The Brownfield Paradox

Here is the pattern the flagships share: the largest "open RAN" deployments in the world are, in vendor terms, almost single-vendor. AT&T's program is led end-to-end by Ericsson, with third-party radios arriving twenty months in. VodafoneThree picked two incumbents for seventeen thousand sites explicitly for speed. The configuration open RAN was named after — different vendors' radios and baseband mixed in one network — is the part Dell'Oro sizes at \$2–3 billion by 2029 [2], a rounding error against a \$35-billion-a-year market.

Why? No public study prices the integration burden of multi-vendor RAN, and we will not invent a number. But operator behavior prices it for us: when coverage obligations bite, operators pay for one throat to choke. The supplier side tells the same story from below — Mavenir, open RAN's most

committed independent challenger, completed a recapitalization in July 2025 that wiped out more than \$1.3 billion of debt, and exited radio-unit hardware to concentrate on software [22].

What operators actually bought with openness is leverage. Vodafone now holds five-year agreements with Ericsson, Nokia and Samsung simultaneously [11]; AT&T can credibly threaten to mix radios because it has done it once in production [7]. Option value is real value — it just looks different from the multi-vendor future on the 2020 conference slides.

5. The RIC Ledger: rApps Are Real, xApps Are Not Yet

If you want to know where openness first became a product rather than a procurement posture, look at the layer almost nobody discussed in 2022: the non-real-time RIC and its R1 interface. Within eight months, two operators put third-party automation apps into commercial production — AT&T in July 2025 [8], and Rakuten in February 2026, which deployed its RIC nationwide with named rApps from AirHop Communications and Future Connections for predictive maintenance, mobility and traffic optimization [15]. Neither announcement published quantified gains, which is itself a data point: this layer is young enough that vendors aren't yet competing on measured results.

The near-real-time story is starker. As of this writing — June 2026 — we could not find a single named commercial xApp deployment with published results, a gap consistent with the trade press's standing skepticism [25]. The reasons are structural as much as commercial: the sub-second control loop sits on the scheduler's turf, where RAN vendors guard both performance and accountability. Analyst sizing reflects the asymmetry — SNS Telecom & IT put global RIC and app spending at roughly \$600 million by end-2025, rising to about \$700 million by 2027 [26], against that \$35-billion-plus RAN backdrop.

For planners, the practical reading is simple. The rApp path is production-proven and contractually safe to pilot today. The xApp path remains a lab story; treat any near-real-time ROI projection as unproven until someone publishes numbers with their name attached.

6. Security: From Liability to the Most-Standardized Layer

The 2021-era critique that "open means insecure" has aged badly. The O-RAN Alliance's security working group (WG11) published its Security Requirements and Controls and Security Protocols specifications at version 14.0 in February 2026, alongside Security Tests v12.0 and a Threat Modeling technical report at v8.0 — all published through ETSI and ATIS and adopted by TTA [23]. Mandatory support for TLS and mTLS 1.3 on applicable interfaces was completed as 2025 specification work; the 2026 agenda adds Security Capability Assurance Specifications (SCAS) for the O-RU, O-DU and SMO, and completion of the Open Fronthaul security test suite [23]. The program tracks the CISA Zero Trust Maturity Model — with measured progress toward its "Initial" level — and pairs its assurance work with GSMA's NESAS scheme [23]. The specifications land as ETSI publicly available specifications; ETSI TS 104 104 V9.1.0 is a representative example [24].

Governance had its stress test early: Nokia's 2021 pause over US entity-listed Chinese members ended within weeks after the Alliance changed its participation procedures — a reminder that the consortium's geopolitics, like its security, matured under pressure rather than ahead of it.

7. What Should You Budget?

Every cost figure in circulation deserves its baseline printed next to it. Table I is the complete citable ledger as of mid-2026.

TABLE 1 · The TCO ledger: every citable claim and its baseline

Claim	Claimant	Baseline / nature	Counter-evidence
"Up to" -30% TCO, -50% site power	NTT Docomo (OREX) [16]	Docomo's own standard network vs. the same network with OREX RAN+SMO — a self-baseline, per Docomo's footnotes	Open RAN revenue fell ~40% in two years [2]; Mavenir restructured and exited radio hardware [22]; VodafoneThree chose incumbents for "speed" [10]; EchoStar sold its spectrum and left [18]–[21]
-40% capex, -30% opex	Rakuten [27]	Company self-claim; never independently audited	
"Up to" +20% throughput from AI link adaptation	AT&T / Ericsson [28]	Operator blog; self-test vs. rule-based baseline, no independent measurement	
RIC + apps market ~\$600 M by end-2025	SNS Telecom & IT [26]	Analyst forecast — for scale, total RAN runs ~\$35 B+/yr	

Three budgeting rules fall out of it. First, treat every percentage as a ceiling, not an estimate — each one is prefixed "up to" in its own source, and each is measured against a baseline its claimant chose. Second, demand the baseline in writing before accepting a savings figure into a business case; Docomo, to its credit, footnotes its own. Third, budget systems integration as a first-class line item rather than a contingency: no public number prices it, but the consistent pattern — single-vendor awards, a recapitalized challenger, an exited greenfield — is what that cost looks like when it is paid in behavior instead of invoices.

8. Conclusion

The 2026 scorecard, plainly stated. Standardization: won — the specs ship through ETSI, security is NESAS-grade, and every flagship RFP demands the interfaces. Vendor diversity: not delivered — concentration rose to 96% while "multi-vendor" headed for \$2–3 billion by 2029. Economics: unproven — every savings number in the public record is a self-claim against a private baseline. Automation: quietly real — the first commercial third-party apps arrived wearing the letter r, not x. And viability: decided by balance sheets, not architecture — Rakuten earned its first profit the same quarter EchoStar's exit was approved.

Watch five things over the next twelve months: whether AT&T hits its 70%-of-traffic target by late 2026 [5], [6]; whether Wismar actually becomes a fully open-RAN city [11]; the first SCAS publications for the O-RU, O-DU and SMO [23]; the first xApp deployment anywhere with published numbers; and whether open RAN growth escapes the low end of Dell'Oro's 5–10% band [1]. Open RAN in 2026 is not a revolution that failed. It is a procurement reform that succeeded — and an automation platform whose first real products arrived earlier than its critics noticed, and smaller than its champions promised.

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