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Open RAN—Where Are We?

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Five years have passed since AT&T, China Mobile, Deutsche Telekom, NTT DoCoMo, and Orange founded the O-RAN Alliance back in 2018, with the mission to “reshape the Radio Access Network (RAN) industry towards more intelligent, open, virtualized, and fully interoperable mobile networks.” The O-RAN Alliance also envisioned that the O-RAN specifications would ultimately improve supplier diversity, user experience, RAN efficiencies, and operations by the carriers. As we just wrapped up the full-year results for the 2022 RAN market, the timing is right to review the progress—where are we in this journey to reshape the RAN?



First, let’s review some definitions. At a high level, we can conceptualize the RAN architectures aimed at reshaping the RAN with three high-level tracks, including Distributed RAN (D-RAN) -> Centralized RAN (C-RAN), Purpose-Built RAN -> Virtualized RAN (vRAN), and Proprietary RAN -> Open RAN. Cloud RAN is another term used to capture vRAN deployments adhering to cloud-native design principles. While these architectures and industry terms are at times used interchangeably, the reality is that the drivers, benefits, and competitive landscapes are different, especially now in this initial stage. In addition, the expectations and the risks vary significantly, meaning the probability that operators will mix and match the baseband and the radio with 6G is different than the likelihood that the operators will use vRAN with 6G. At the same time, the overlap ratio will evolve over time and most Open RAN will likely also be Open vRAN in the future, but there will also be some vRAN that is not Open RAN.

For now, we are treating Open RAN and vRAN differently. It is also worth pointing out that when we discuss Open RAN revenues, we measure O-RAN and OpenRAN manufacturer radio and baseband revenues. Similar to other technology transitions, revenue recognition is not always synchronized with operator deployments, especially in the early stages. From a revenue perspective, Open RAN is accelerating (see figure 1 below). Preliminary findings per Dell’Oro’s 4Q22 RAN report suggest Open RAN revenues (O-RAN and OpenRAN radios and baseband) comprised a mid-single-digit share of the overall RAN market in 2022, underpinned by robust greenfield adoption and improving brownfield traction in the US and Japan. The European operators are ahead of the rest of the world when it

comes to announcing Open RAN targets; however, they have been more cautious with deploying Open RAN. Instead they are focusing on building out 5G using traditional RAN. As a result, North America and the Asia Pacific regions accounted for more than 95 percent of the 2022 Open RAN

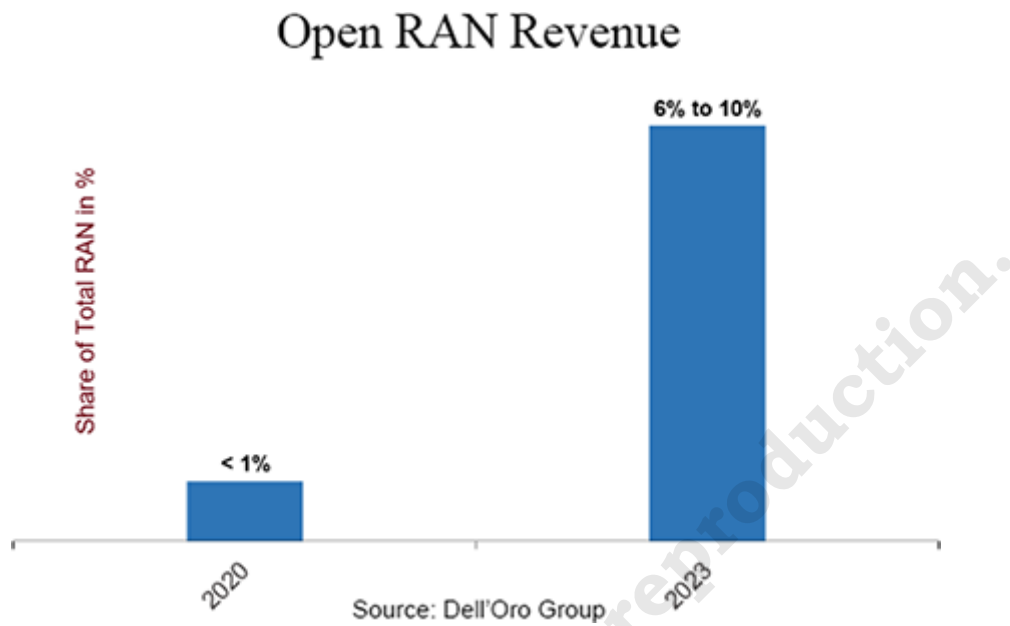


Figure 1: Open RAN Revenue

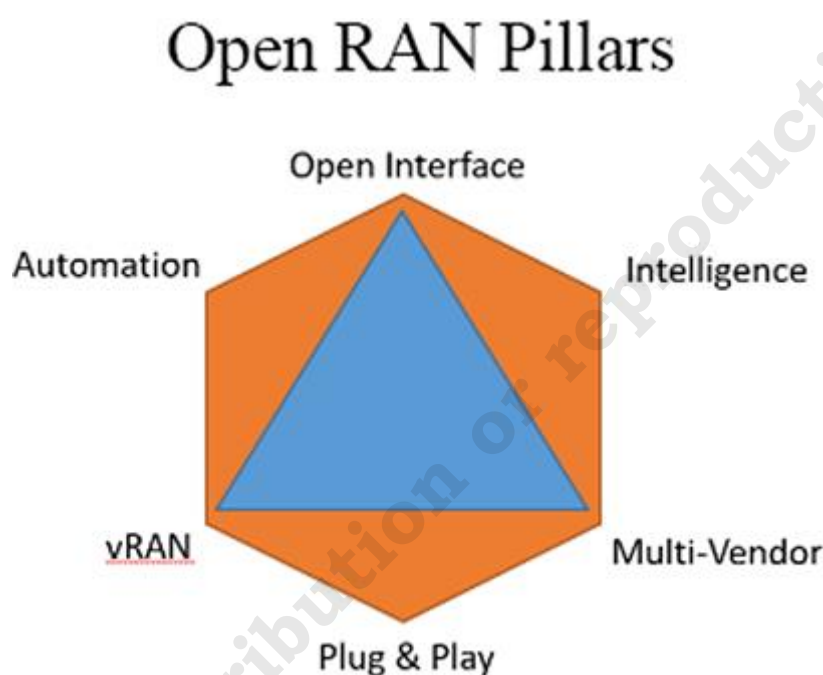
market. Technology adoption has been mixed, with Open RAN still mostly being a macro story. It is worth noting that O-RAN appears to be gaining some ground in private settings with non-traditional RAN suppliers; however, the volumes remain small relative to macro. LTE was dominating the mix initially, but Open RAN is now primarily driven by 5G NR. And perhaps more importantly, O-RAN Massive multiple-input multiple-output (MIMO) is now a reality, with higher order MIMO configurations accounting for a sizeable portion of the 2022 Open RAN market.

Not all Open RAN is the same. Implementations vary widely in this initial phase, with some operators focusing first on the interface before tackling vRAN and multi-vendor deployments while others prioritize virtualization before addressing multi-vendor RAN. As a result, single-vendor Open RAN is now driving a material portion of the overall Open RAN market.

In other words, even if the market is accelerating at a faster pace than initially expected, the rise of Open RAN has so far had a limited impact on the broader RAN (proprietary and Open RAN) supplier dynamics. Per Dell'Oro's 4Q22 RAN report, the collective RAN share of the top five RAN vendors (Huawei, Ericsson, Nokia, ZTE, and Samsung) declined by less than one percentage point between 2021 and 2022, partly because the leading Open RAN supplier (Samsung) is also an established RAN supplier.

At the same time, market concentration as measured by the Herfindahl-Hirschman Index (HHI) is improving, with the global RAN HHI down around six percent in 2022 relative to 2020 levels. Although a confluence of market-related and geopolitical factors can help to explain the downward HHI trend, it is challenging to compute the exact contribution from the various events in isolation. Still, our assessment is that Open RAN is contributing to some of the HHI RAN decline, even if the overall impact has been more muted than initially expected. It is early days to estimate marginal efficiency improvements with Open RAN. Preliminary findings suggest next-generation architectural savings will likely be mostly driven by everything around the O-RAN equipment, partly because the radio and baseband equipment together account for 10 to 20 percent of the combined CAPEX and site OPEX. In

addition, there are few data points at this juncture suggesting that the 7.2x radio BOM will be smaller than the proprietary BOM with similar functional splits. Savings with the O-RAN equipment are of course possible (Rakuten estimates cheaper O-RAN HW and integrated antenna and radios can cut the radio unit (RU) capex by about 4x), but this will likely be more driven by margin reductions than BOM savings.



Source: Dell'Oro Group

Figure 2: Open RAN Pillars

Same with the baseband, the direct cost synergies with vRAN remain negligible. And if anything, our assessment is that the combined hardware plus software baseband costs are still more favorable with purpose-built RAN.

But there are significant cost savings to be had beyond the O-RAN radio and baseband equipment. Rakuten for example, estimates its Open Cloud RAN implementation will eventually reduce the overall total cost of ownership (TCO) by 30 to 40 percent relative to traditional architectures. Mavenir's TCO calculations are in line with that of Rakuten. Dish also believes its cloud-native architecture and build-out strategy will produce cost advantages relative to the incumbents utilizing traditional architectures. Granted, not having to support legacy technologies is a major factor, but operators that incorporate automation throughout their networks can also benefit from lower rollout, site access, network management, and field maintenance costs. As Rakuten points out, its engineer-to-subscriber ratio is 1:20 K instead of one per thousand typical in legacy networks.

RAN Market Concentration (HHI)*

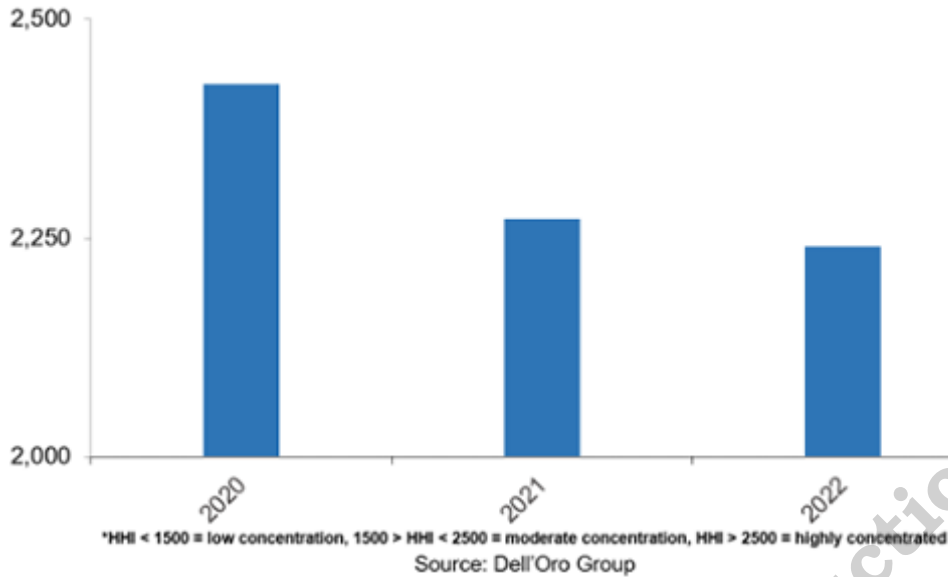


Figure 3: Market concentration

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Since it is difficult to find chief financial officers (CFOs) that want to pass up 40 percent CAPEX and OPEX savings, it is worth pointing out that we don't have as much data about the TCO comparisons between Open RAN and proprietary RAN in brownfield settings. And even though incumbent RAN suppliers believe there can be synergies with vRAN and Cloud RAN, they remain somewhat skeptical that Open RAN can deliver any material equipment cost savings.

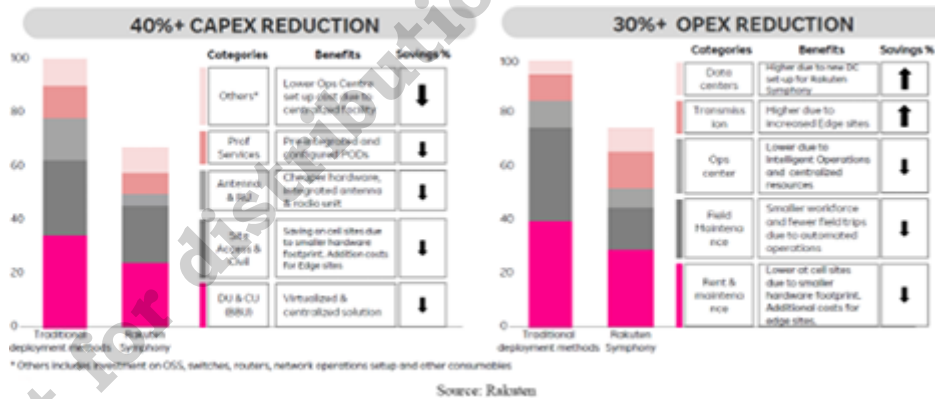


Figure 4: Savings Reductions

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In summary, the “reshaping” of the RAN has come a long way in just a few years, underpinned by early adopters embracing the Open RAN and vRAN movements. Meanwhile, there is more uncertainty when it comes to the early majority brownfield operator and the implications for the broader RAN market concentration depending on the type of Open RAN operators deploy. In other words, the movement and HHI index is trending in the right direction, but it is still early days in this journey.