Magic Quadrant for CSP 5G RAN Infrastructure Solutions

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This Magic Quadrant helps communications service providers identify and evaluate network equipment providers for their 5G RAN infrastructure. It will guide CSP chief technology officers (CTOs) toward the right 5G RAN vendor choices in a complex and rapidly evolving market.

Market Definition/Description

Gartner defines the market of communications service provider (CSP) 5G RAN infrastructure solutions as consisting of hardware and software components that support CSPs in providing connectivity services. Such services include mobile broadband, fixed wireless access and voice communication over a 5G network. Gartner considers 5G to be a foundational technology, implemented to evolve a CSP's services, including in the consumer and enterprise business sectors. This CSP 5G RAN infrastructure market encompasses CSPs' deployment of RAN solutions for public 5G.

5G RAN infrastructure solutions mainly support CSPs in upgrading their existing 4G RAN infrastructure, while providing an enhanced user experience and keeping costs under control. For instance, the introduction of 5G massive multiple input, multiple output (MIMO) and dynamic spectrum sharing between 4G and 5G can improve user throughput and rapidly expand 5G coverage. These solutions not only enhance network quality, but also serve as part of the 5G platforms addressing challenges faced by enterprises.

Standard Capabilities

The standard capabilities for this market include:

- RAN equipment, including radio units (RUs) and baseband units (BBUs) for 5G new radio. Examples include passive antennas, RUs, active antenna units (AAUs), virtualized BBUs (vBBUs), BBUs, distributed units (DUs), centralized units (CUs), virtualized DUs (vDUs), virtualized CUs (vCUs) and small cell.

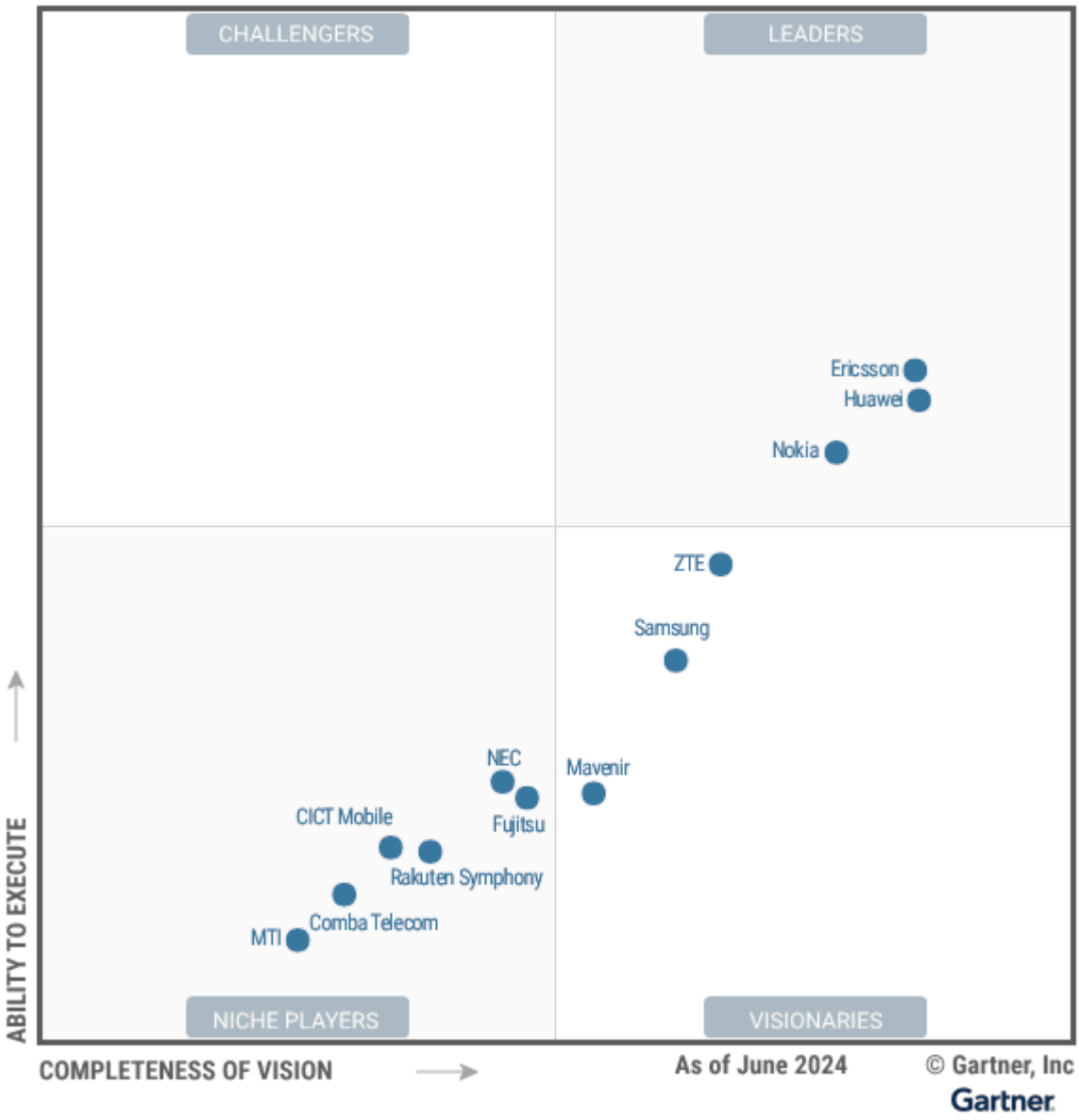
Optional Capabilities

The optional capabilities for this market include:

- Network infrastructure services — for design, build, run and support.
- 2G/3G/4G LTE RAN equipment including passive antennas, RU, vBBU, BBU, and small cell.
- Components provisioning of open RAN and vRAN including chipsets, servers, hypervisors and cloud-native platforms, and related open RAN/vRAN system integration.

Magic Quadrant

Figure 1: Magic Quadrant for CSP 5G RAN Infrastructure Solutions



Vendor Strengths and Cautions

CICT Mobile

CICT Mobile is a Niche Player in this Magic Quadrant. CICT Mobile is a China-based company that specializes in providing mobile communication technologies, products and services for the communication industry. The company's products and services include network equipment, antenna feeder equipment, small cells, as well as services such as system integration, network management and operations. In the mobile infrastructure business, the company offers end-to-end solutions for Time Division-Long Term Evolution (TD-LTE) networks and 5G, including core,

radio access and optical transport. It also has a strong presence and cellular-vehicle-to-everything (C-V2X) solution in the Chinese transportation market.

Strengths

- As a state-owned optical company, CICT Mobile has close relationships with domestic communication service providers (CSPs), which can be leveraged to participate in scaled 5G rollouts in the Chinese market. The company currently has around 3% market share in China's 5G radio access network (RAN) market.
- China Information and Communication Technology Group, the parent company, is also a major supplier of optical equipment in China and Southeast Asia. The business network that was established for the optical product can be leveraged for its 5G RAN product and service in the region.
- CICT Mobile has a good portfolio, IP and industrial 4G/5G solution, especially in intelligent manufacturing, smart energy and C-V2X.

Cautions

- The company has a limited 5G-related product portfolio in terms of radio unit (RU) and baseband unit (BBU) variations. In addition, it does not have a clear strategy in emerging technologies like open radio access network (Open RAN) or cloud-native infrastructure. Both of these limit its capabilities in embracing the new technology ecosystem.
- CICT Mobile is a local Chinese 5G equipment vendor with a small market share. The company's lack of system integration, service capability and presence in the global market limit its ability to serve global clients outside China.
- Tension between the U.S. and China is increasing, along with political resistance and security concerns about Chinese vendors' products in certain nations and regions.

Comba Telecom

Comba Telecom is a Niche player in this Magic Quadrant. Headquartered in Hong Kong, Comba Telecom's major business derives from antenna and subsystems, including base station antennas, combiners and filters, and a distributed antenna system (DAS). However, the company has expanded its network product portfolio by providing Open RAN RUs since 2020. Its Open RAN solutions cover open radio RUs for macro urban/rural, open radio small cell for indoor enterprises, and open radio DAS for neutral host venues. In addition, Comba Telecom offers a wide array of services, including network design, optimization and maintenance services.

Strengths

- Comba Telecom has developed a notable presence in the 5G antenna market, particularly with its innovative Helifeed Green Antenna series, which has been widely deployed in China and Asia markets. Its antennas' credibility allows the company to rapidly cultivate relationships with CSPs and other ecosystem players, and penetrate markets.

- The company provides comprehensive antenna, DAS and indoor small cell solutions commercially deployed in multiple scenarios such as airports, subway stations, railways and tunnels, and landmark buildings. This approach diversifies its business and reduces dependency on any single scenario.

- The company's services include consultancy, network design, drive tests and maintenance. This range of services ensures CSP clients receive continuous support from planning through postdeployment, enhancing customer satisfaction and retention.

Cautions

- Recognized as an antenna specialist, Comba Telecom has limited capability to provide Tier 1 local support on RAN business for CSPs outside China and Asia. These challenges hinder its ability to secure CSPs' contracts as a 5G RAN vendor.

- Comba Telecom's business is focused on small cell and private mobile networks, and its products are not yet proven for large-scale 5G macro RAN rollouts. When considering Comba Telecom, CSPs need to position it in specific use cases and carefully evaluate product features and capabilities, service support, references and future roadmaps.

- Comba's 5G RAN product portfolio is not as comprehensive as those of Leaders in this Magic Quadrant, and its limited resources, such as system integration and support in markets outside of China and Asia, restrict its growth potential in these regions.

Ericsson

Ericsson is a Leader in this Magic Quadrant. It is a multinational networking and telecommunications company headquartered in Stockholm. Ericsson provides services, software and infrastructure for the communication industry. It has long had a strong focus on 3rd Generation Partnership Project (3GPP)-based mobile networks, and was one of the leaders in terms of volume of LTE deals. The company's 5G RAN offerings, including Ericsson Radio System, Antenna System, Radio Site System, Cloud RAN, Radio Dot System and Orchestrator, together with its professional services, help it maintain a strong position in the 5G RAN infrastructure market.

Strengths

- Ericsson's leading role in the evolution of 5G technology, which included such innovations as Ericsson Spectrum Sharing, Uplink Booster and in-house Ericsson Silicon, has given the company a first-mover advantage and enhanced its mind share as a technological thought leader.

- In February 2024, Ericsson reported that it had been working with CSPs to establish 134 commercial live 5G RAN networks. Based on Gartner counting, Ericsson has concluded more 5G deals with CSPs than any of its competitors. This success can be attributed to its diverse product portfolio, strong service and delivery teams, and broad market presence.

- Ericsson's R&D investments in 5G, 6G and adjacent technologies, including energy-efficiency features, contributions to various standardization bodies (e.g, 3GPP and O-RAN ALLIANCE) and its industry benchmark Ericsson Mobility Report have helped maintain its thought leadership.

Cautions

- Ericsson's RU product portfolio is more limited than some of its competitors. For example, Ericsson currently has limited massive multiple input/multiple output (MIMO) product variations, such as larger antenna array massive MIMO (e.g., 384 antennas), frequency division duplexing (FDD) massive MIMO, active-passive antenna, and multiband 8T8R RUs.

- In some cases, Ericsson has been said to lack flexibility and a customer-oriented culture. For example, some CSPs have noted that they have to align with Ericsson features, roadmap and delivery priorities, rather than the other way around.

- Although Ericsson announced its Open RAN support and related deal with AT&T in 2023, its priorities are single-vendor Open RAN supported by end-to-end Ericsson RAN solutions. Ericsson's approach to Open RAN Fronthaul multivendor integration is conservative, and is based on Ericsson's perception of the market and technology both being at a low level of readiness.

Fujitsu

Fujitsu is a Niche Player in this Magic Quadrant. It is an information and communications technology vendor headquartered in Kawasaki, Japan. Fujitsu focuses on five key technology areas, including network with 5G solutions. Because its mobile network infrastructure business up to 4G was heavily focused on the Japanese market, the company is now leveraging 5G to expand its international selling efforts. Fujitsu has been promoting open and virtualized base stations, and is initially focusing on selling 5G O-RAN RU (O-RU) to the global market.

Strengths

- Fujitsu is an active contributor to the O-RAN ALLIANCE and Telecom Infra Project (TIP). Fujitsu's dual-band and triband RUs are O-RAN-compliant and have been listed on TIP's Exchange marketplace. This can enable CSPs to quickly find interoperable solutions and reference designs for 4G and 5G networks.

- Fujitsu has proven itself a trusted partner for Japanese CSPs, such as NTT DOCOMO and KDDI. NTT DOCOMO has been commercially deploying Fujitsu 5G virtualized RAN (vRAN) since 2023. Fujitsu also commercially deployed 5G Open RAN massive MIMO RUs for KDDI in Japan. Thanks to its leadership and local presence in Japan, Fujitsu has developed the ability to rapidly improve the quality of its products.

- Fujitsu has been proactive in organizing multivendor O-RAN-compliant integration testing and plugfests with various BBU and RU vendors, resulting in early wins and engagements with DISH Network, Deutsche Telekom and AT&T. Fujitsu helps CSPs integrate and certify multivendor Open RAN networks via its interoperability labs in the U.S., Japan and India.

Cautions

- Fujitsu has a limited geographical reach (Japan and the U.S.) and is still establishing a presence in Europe and the rest of Asia.

- Fujitsu's go-to-market strategy, including its sales plan (direct sales versus channel sales) and target customers, are not clear outside Japan, and its localization capabilities are not assured.

- Fujitsu's 5G infrastructure product portfolio is not as comprehensive as those of the Leaders in this Magic Quadrant. Outside Japan in particular, Fujitsu lags behind Leaders in areas such as massive MIMO multiband RUs and 5G BBU solutions.

Huawei

Huawei is a Leader in this Magic Quadrant. It is a global information and communications technology (ICT) and smart devices provider headquartered in Shenzhen, China. Huawei's diverse business spans ICT infrastructure, enterprise, consumer electronics, cloud computing, energy and automotive sectors. Huawei's success in the 5G RAN market stems from its comprehensive and robust cellular network portfolio, which encompasses macrocells, small cells, single RAN BBUs and professional services. Huawei remains committed to investing in 5G and leading 5G-advanced research and development, with a particular emphasis on leveraging innovative hardware and software to enhance network performance, capacity, intelligence and energy efficiency.

Strengths

- Huawei has established itself as a technological leader in the 5G RAN market, spearheading the development of standards and innovative technologies. Huawei introduced its 5.5G products with Native Giga and Native Green initiatives, including ultrawideband and multiantenna technologies and 0 Bit 0 Watt solution, marking a key step in 5.5G commercial deployment.

- Huawei offers a high-quality and comprehensive 5G RAN portfolio (e.g., its MetaAAU, FDD ultrawideband, active-passive antenna, multiband RUs) to CSPs. Huawei has developed a number of leading innovative features, such as the massive MIMO adaptive high-resolution algorithm, Super Uplink, iHashBand2.0 and distributed massive MIMO software feature for its indoor base stations.

- Huawei has strong deployment and services capabilities. Huawei has a greater volume of 5G equipment deployed in China than any other vendor, and benefits from the large-scale stand-alone 5G implementation in China. Huawei's 5G business is also well-positioned in some countries in Asia/Pacific and Europe, as well as the Middle East. Huawei has established a global professional services organization to support its global operations, ensuring rapid response to customer needs.

Cautions

- Huawei's market presence and growth opportunities in regions such as North America, parts of Europe and Asia/Pacific are impacted by ongoing geopolitical challenges and security integrity concerns around its network portfolio.

- Due to restrictions imposed by the U.S. government, Huawei lacks access to some leading advanced silicon technology for 5G RAN chipsets. This may hinder its ability to keep pace with key competitors in chipset development.

- Huawei has been slow to respond to emerging trends like Open RAN and public cloud partnerships. This limitation constrains Huawei's capacity to participate in strategic Open RAN, vRAN and public cloud initiatives pursued by various CSPs.

Mavenir

Mavenir is a Visionary in this Magic Quadrant. It is a privately owned network software provider in the telecommunications industry headquartered in Richardson, Texas, U.S. Mavenir offers end-to-end cloud-native 5G network software. A significant early player in Open RAN, the company launched a fully virtualized 4G/5G Open RAN solution in 2019, and offers a 5G SA core together with multigenerational support and system integration capabilities. Mavenir has also added 2G capabilities, intelligent edge and RAN Intelligent Controller (RIC) to its portfolio. Mavenir positions itself to help CSPs break out of vendor lock-in and discontinue old legacy business models as quickly as possible.

Strengths

- Mavenir focuses on the total cost of ownership through the automation of deployment configuration and operations, and flexible deployment options for placement of virtualized central units (vCUs) and virtualized distributed units (vDUs). It also partners with major cloud and IT technology providers (e.g., Amazon Web Services [AWS], Microsoft, VMware) and supports multivendor Open RAN.

- Mavenir differs from other emerging vRAN vendors. It has been selling its in-house-developed OpenBeam hardware portfolio, including O-RU products. This includes massive MIMO RUs with a focus on high-capacity 5G 64 TRX massive MIMO.

- Mavenir has closed a number of 4G/5G vRAN deals with both "greenfield" and Tier 1 operators, as well as smaller CSPs, for mobile and fixed wireless access (FWA) and nonterrestrial network (NTN) providers. These key operators include Airtel, Bell Canada, DISH Network, Deutsche Telekom, Ligado Networks, Paradise Mobile, Terrestar Solutions, Virgin Media O2 and Vodafone Idea.

Cautions

- Mavenir's ability to collaborate with other Open RAN/vRAN vendors could be strained as it increases its portfolio and competes more directly with other incumbent vendors. Mavenir used to offer partner products such as its 4G LTE RUs, but is actively developing in-house 4G/5G O-RUs. This could be a sign that Mavenir is planning to become an end-to-end player.

- The slow pace of investment by CSPs in vRAN and Open RAN solutions at scale has hampered Mavenir's growth.

- Mavenir's market approach has been to focus on vRAN and not develop traditional purpose-built solutions. As a result, it has limited experience at scale with commercial 5G RAN. It also lacks long-term established relationships as a trusted RAN provider, and is not positioned to bid for the non-vRAN portion of 5G RAN, which continues to be a major investment focus for many CSPs.

MTI

MTI is a Niche Player in this Magic Quadrant. Headquartered in Taiwan, it specializes in the design and manufacture of radio frequency (RF)/microwave and satellite communication products. Since the 3G era, MTI has established itself as a key original equipment manufacturer (OEM)/own design manufacturer (ODM) partner for other network equipment providers. With the advent of 5G, MTI has ventured into the Open RAN market by offering 5G RUs, expressing its ambition to become a 5G network equipment provider. MTI has been a member of the Foxconn group of companies since 2012, and Foxconn itself is aiming for new growth in the 5G network business, including developing and providing 5G small cells.

Strengths

- MTI's technology expertise in RF and microwave position it to become a bigger player in the Open RAN ecosystem. In addition, MTI is an active contributor to the O-RAN ALLIANCE and TIP projects.
- With over 40 years as an OEM/ODM, MTI has developed capabilities in technical innovation, efficient production, quality control and customer support. Its flexible business model provides O-RUs directly to CSPs or indirectly through partners, enabling it to effectively meet diverse customer needs in the O-RAN market.
- MTI's early engagements and achievements in the area of interoperability coordination with multiple BBU vendors are more advanced than those of other O-RU vendors.

Cautions

- As an OEM/ODM player and RF specialist with limited direct sales channels, MTI faces challenges in increasing its market visibility and establishing a robust local support network for CSPs, which hinder its ability to secure Tier 1 CSP contracts.
- MTI's 5G RAN solution is in the early stages and not yet proven for large-scale rollouts. CSPs should assess its Open RAN products' quality, performance and support, and consider initial deployments in specific scenarios (e.g., 4G rural outdoor).
- MTI has limited portfolios, offering only Open RAN RUs while lacking essential components like BBUs, massive MIMO and related services capabilities, which constrains its ability to service CSPs that need end-to-end offerings and primary system integration partners.

NEC

NEC is a Niche Player in this Magic Quadrant. It is an ICT vendor, with its headquarters based in Tokyo. NEC's vision is to be a solution and business co-creator for CSPs to help them become digital service providers. NEC, along with its fully owned subsidiary, Netcracker, provides 5G products and solutions to CSPs and industry players through the integration of IT, cloud and network technologies. The company is also a systems integrator in addition to a 5G product and

solution supplier in Open RAN. It delivers multivendor solutions under the brand NEC Open Networks.

Strengths

- NEC is a pioneer of Open RAN massive MIMO RUs, which have been commercially available since 2020. NEC is agile and flexible, based on situation and client demands. The company changed its global 5G strategy in 2023, announcing a shift of focus from Open RAN hardware to software, including vRAN, core and advanced operation management utilizing AI.

- NEC has large-scale commercial 5G RAN deployment experience and announced various 5G deals and commercial deployments with CSPs over the past 12 months. While NEC has been selected by NTT DOCOMO as a vRAN vendor for its nationwide 5G network services in Japan, Freshwave, which is a neutral host operator in the U.K., and NEC have been selected for Project NAVIGATE. The aim of Project NAVIGATE is to deploy and validate a blueprint for multioperator neutral host solutions with Open RAN. Germany's 1&1 launched its commercial service in December 2023, and Vodafone in the U.K. upgraded its 5G Open RAN network by adopting NEC's massive MIMO RUs.

- NEC and NTT DOCOMO announced their joint venture — OREX SAI — in 2024, to provide OREX packages, including OREX RAN, OREX Services and OREX SMO for Open RAN global deployments. This joint venture aims to combine each company's strengths, including NTT DOCOMO's Open RAN implementation expertise in Japan and R&D capabilities for Open RAN development and verification, and NEC's global footprint and capabilities for global system integration.

Cautions

- Due to NEC changing its global 5G strategy in 2023, its overseas businesses will be focused on smaller opportunities that already have pipelines. Related 5G investments will be reduced outside of Japan. This change could contribute to a degraded RU hardware portfolio and less support and engagement capabilities for CSPs and prospects.

- Incumbent European CSPs — NEC's new customers — are lagging in the large-scale introduction of Open RAN/vRAN. Emerging Open RAN vendors, including NEC, seem to be neglecting the best-of-breed vision, competing instead for small wins without cooperation. NEC and Samsung, which had established a 5G partnership, have not provided any public reporting on their business progress or updates on results of their 5G partnership.

- NEC's 5G infrastructure product portfolio, which includes multiband RUs, 5G BBU and millimeter wave (mmWave) support, is not as comprehensive as those of the Leaders in this Magic Quadrant, particularly outside Japan.

Nokia

Nokia is a Leader in this Magic Quadrant. It is a global telecommunications and IT company headquartered in Espoo, Finland. Nokia's business focuses on mobile, fixed IP and optical networks, cloud and network services, supported by patents and standards from Nokia Bell Labs.

In 2023, Nokia launched a new brand identity, including an updated logo to help shift perceptions of Nokia from a mobile phone company to a B2B innovation and technology company. Nokia is one of the market leaders in terms of volume of 4G LTE deals, and it has secured market share with 5G contracts.

Strengths

- Nokia introduced anyRAN to the market in 2023, offering CSP clients and prospects the possibility of using a single RAN software solution across cloud and purpose-built network infrastructure. The anyRAN solution can run on various architectures, including a blueprint Cloud RAN solution on top of leading third-party server suppliers. It can also run within major public cloud data centers, which offers a great deal of flexibility and performance assurance to CSPs wanting to take a stepped approach toward Cloud RAN.

- Nokia has 110 live 5G commercial networks (across RAN and Core). Based on our count, Nokia is one of the market leaders in terms of the number of 5G deals, based in part on its strong sales team and customer-oriented culture focused on the needs of the CSP market.

- Nokia has invested heavily in cloudification, including support for CSPs that are transitioning to cloud-based network deployment and operation. Nokia has an advanced software and services organization that addresses areas such as 5G monetization, use of advanced analytics and AI for energy efficiency in 5G, and enhanced network upgrade planning, among other CSP needs.

Cautions

- While Nokia has improved its chipset performance with its ReefShark chipset, it still lags behind other advanced vendors in areas such as chipset design (e.g., smaller process node) and software optimization. CSPs should be mindful of Nokia's chipset development, delivery and product integration, and monitor for further improvements.

- While Nokia is active in terms of Open RAN/vRAN development and standardization, it has not yet gained significant commercial traction. AT&T chose Ericsson over Nokia in its $14 billion Open RAN network contract. Its Cloud RAN is not generally available and lags some other competitors.

- Nokia announced job cuts of 16% or 14,000 people in 4Q23; these layoffs could affect product development, sales/marketing engagements, and product quality — an area of continued concern.

Rakuten Symphony

Rakuten Symphony is a Niche Player in this Magic Quadrant. It is headquartered in Tokyo. Rakuten Symphony aims to accelerate the adoption of AI-powered, cloud-native, Open RAN-based mobile networks worldwide. It takes the operational, network and knowledge management software and hardware products and platforms already adopted for Rakuten Mobile's commercial 4G and 5G network in Japan and sells them under its AI, OSS, Cloud and Open RAN line of products and solutions to global CSPs. Rakuten Symphony enables CSPs with a cloud-native telecom platform that is highly scalable, demand-elastic and automated.

Strengths

- Rakuten Symphony's use of Open RAN supply chain alignment and its portfolio of Open RAN, OSS, Cloud and AI solutions have enabled Rakuten Mobile to extend the coverage of its 4G Open vRAN to cover 98.8% of the population of Japan. It has established 60,000 base station sites in the past four years and deployed more than 10,000 5G base stations in the past three years. Rakuten Symphony also aims to maintain a consistent operational headcount by automating operational, business and management processes. This early best practice contributed to Rakuten Symphony's first Open vRAN deal with a CSP, namely, 1&1 in Germany.

- Altiostar Networks, which was acquired by Rakuten Group in August 2021, was a leading vRAN vendor. This acquisition has expanded Rakuten Symphony's Open RAN/vRAN portfolio, primarily by adding 4G and 5G vRAN capabilities, which were missing from the company's own product portfolio.

- Rakuten Symphony's strength includes its agility and flexibility. The company launched its Real Open RAN Licensing Program in February 2024 to accelerate global Open RAN adoption.

Cautions

- Rakuten Symphony's limited telecom expertise led to the commercial network deployments for both Rakuten Mobile and 1&1 falling behind the original schedules committed to regulators. CSPs should be sensitive about the difference between the company's vision and its real products, solutions, execution of deployment plans, and delivery and operation capabilities.

- Rakuten Group's mobile business, which includes Rakuten Mobile and Rakuten Symphony, has announced its intention to be profitable in 2024. Further cost controls and reductions are expected, along with increased product and service prices, which may reduce Rakuten Symphony's competitiveness and lead to the postponement of new product and service launches.

- Product-oriented, preintegrated and preconfigured solutions derived from specific vendor combinations by the Rakuten Mobile commercial network in Japan are unlikely to attract many CSPs that are considering Open RAN to mitigate vendor lock-in or have different mixes of needs and scenarios.

Rakuten Symphony did not respond to requests to provide supplemental information for this document. Gartner's analysis is, therefore, based on other credible sources, including public information.

Samsung

Samsung is a Visionary in this Magic Quadrant. It is a multinational conglomerate that includes Samsung Electronics, Samsung Heavy Industries, Samsung E&A and Samsung C&T, and is headquartered in Seoul, South Korea. Samsung Electronics is responsible for the network business, and given its relatively late entry into the business of 3GPP-based cellular technology, it has focused on 5G for its market growth. While Samsung's local CSP clients adopt both its RAN

and core solutions, its global 5G network business comes mainly from RAN. Samsung is an early innovator of new cellular technologies such as small cell, mmWave, vRAN and Open RAN, and virtual evolved packet core (vEPC).

Strengths

- Samsung contributed to the world's earliest massive commercial adoption of 5G in South Korea, leading in market share among the top three local CSPs. Given its leading experience in South Korea, Samsung has driven advanced features and capabilities, such as massive MIMO RUs, in-house chipsets and virtualized solutions, which translate well to other markets.
- Samsung is one of the most influential Open RAN and vRAN innovators. It has won several major commercial deployment deals, including 5G stand-alone Open vRAN at KDDI, 5G Open RAN at NTT DOCOMO, vRAN at Verizon, Open vRAN at DISH Network, and Open vRAN at TELUS. It has also expanded its prior Open vRAN agreements with Vodafone in the U.K., and Romania and Germany.
- With its flexible approach to network solutions, supporting various architectural approaches (e.g., single RAN vendor, multivendor or vRAN), Samsung has the potential to become another vendor partner for CSPs. This is especially the case for CSPs that have struggled to find multiple vendor partners for their 5G networks.

Cautions

- Samsung has a smaller global scale than the Leaders in this Magic Quadrant and thus, may not be as suitable for all global markets.
- Incumbent European CSPs — Samsung's new customers — are lagging in large-scale introduction of Open RAN/vRAN. Emerging Open RAN vendors, including Samsung, seem to be neglecting the best-of-breed vision, instead competing for small wins without cooperation. Samsung and NEC, which had established a 5G partnership, have not provided any public reporting on business progress or updates on results of their 5G partnership.
- Samsung's 5G infrastructure product portfolio, which includes multiband RUs, active-passive antenna and 2G/3G support via its BBU, is not as comprehensive as that of the Leaders in this Magic Quadrant, especially outside South Korea.

ZTE

ZTE is a Visionary in this Magic Quadrant. The company is a global ICT technology solution provider headquartered in Shenzhen, China. ZTE operates in three core areas of business: telecommunications equipment, computility infrastructures and digital energies as well as smartphones and mobile terminals. It also provides system integration services. The company has a complete 5G telecommunications product line, covering wireless and wired infrastructure, core networks, software systems and services, and the Internet of Things. This broad portfolio, along with deployment and system integration expertise, enables ZTE to meet a diverse set of customer requirements.

Strengths

- ZTE offers a strong 5G RAN product portfolio, including massive MIMO RUs, multiband RUs, purpose-built BBUs, small cell series such as Qcell for indoor and Pad series for outdoor, as well as related services. This diverse range caters to a wide variety of customer use cases and deployment scenarios at competitive prices.

- Powered by strong R&D capabilities, ZTE is one of the major technological innovators in the 5G network infrastructure space. Its continued investment in enhanced 5G technologies and innovative features, such as Radio Composer, cloud platform, SuperDSS, and SuperMIMO and PowerPilot Pro, enables it to deliver intelligent, energy-efficient and high-performance solutions to its customers.

- ZTE is a reliable partner in China and various global markets such as Southeast Asia, Europe and Africa, due to its strong deployment expertise, ability to customize solutions, and quick response to customer requests. ZTE's participation in large-scale and complex stand-alone 5G rollouts in China has enabled it to quickly mature its products and service capability.

Cautions

- ZTE faces challenges in securing 5G contracts outside China due to ongoing geopolitical issues and security concerns about its network equipment. This limits its market exposure in regions such as North America, Europe and parts of Asia.

- ZTE's brand recognition and mind share among CSPs and its overall industry influence are lower than those of Leaders in this Magic Quadrant. The company relies mainly on the Chinese market, which has limited its go-to-market and contract-winning capabilities.

- ZTE has been slow to support emerging technology such as Open RAN and vRAN, which restricts its opportunities to engage in strategic Open RAN/vRAN projects pursued by various CSPs, potentially limiting its market reach in these emerging areas.

Vendors Added and Dropped

We review and adjust our inclusion criteria for Magic Quadrants as markets change. As a result of these adjustments, the mix of vendors in any Magic Quadrant may change over time. A vendor's appearance in a Magic Quadrant one year and not the next does not necessarily indicate that we have changed our opinion of that vendor. It may be a reflection of a change in the market and, therefore, changed evaluation criteria, or of a change of focus by that vendor.

Added

As this is a new Magic Quadrant, no vendors were added.

Dropped

As this is a new Magic Quadrant, no vendors were dropped.

Inclusion and Exclusion Criteria

To qualify for inclusion, a vendor needs to possess radio access network equipment (at least macro RU or BBU, or small cell) for 5G and these products should be generally available as of December 2023. General availability is defined as something a vendor's clients have in a production environment, rather than something they are testing or evaluating. Vendors are also required to possess at least one 5G RAN commercial contract/deployment with CSPs.

Evaluation Criteria

Ability to Execute

We determined each vendor's position by evaluating it against the following criteria.

Product or Service: This criterion includes products and services offered by the vendor that compete in the defined market (that is, radio network elements for 5G carrier infrastructure as well as network infrastructure service). It includes current product and service capabilities, quality, feature sets and skills, whether offered natively or through OEM agreements or partnerships, as defined in the Market Definition/Description section.

Overall Viability: This criterion includes an assessment of the overall organization's financial health, which underpins the financial and practical success of the relevant 5G RAN business unit. It also considers the likelihood of that business unit continuing to invest in the product, offer it and advance the state of the art within the organization's portfolio.

Market Responsiveness and Track Record: This is the vendor's ability to respond, change direction, be flexible and achieve competitive success as opportunities develop, competitors act, customers' needs evolve and market dynamics change. This criterion also considers the vendor's history of responsiveness, its market share and its market traction, demonstrated through 5G RAN contract wins. Disclaimer: For this subcriterion, Gartner has applied contract data information and considered only publicly verifiable 5G RAN contracts with named customers. Please note that vendors evaluated in this Magic Quadrant may have a larger number of 5G RAN contracts that they cannot reveal publicly due to nondisclosure agreement limitations.

Marketing Execution: This criterion includes the clarity, quality, creativity and efficacy of programs designed to deliver vendors' messages to influence the market, promote vendors' brands and businesses, increase product awareness, and establish positive identification with vendors' products, brands and organizations in CSPs' minds. This mind share can be driven by a combination of publicity, promotional activity, thought leadership, social media, referrals and sales activities. The criterion also includes the vendor's ability to market offered solutions under different regulatory contexts and adapt to different carrier 5G RAN business models.

Customer Experience: This criterion includes relationships, products, services and programs that enable CSPs to succeed with the products evaluated. Specifically, it includes the ways in which CSPs receive technical support or account support. It may also include ancillary tools, customer support programs (and the quality thereof), the availability of user groups, SLAs, ecosystem of vendors and prepackaged solutions for services leveraging the 5G RAN network.

Table 1: Ability to Execute Evaluation Criteria

Evaluation Criteria ↓	*Weighting* ↓
Product or Service	High
Overall Viability	Medium
Sales Execution/Pricing	NotRated
Market Responsiveness/Record	High
Marketing Execution	Medium
Customer Experience	Medium
Operations	NotRated

Source: Gartner (July 2024)

Completeness of Vision

We determined each vendor's position by evaluating it against the following criteria.

Market Understanding: This criterion includes an ability to understand customer needs and translate them into products and services. Vendors must show a clear vision of their market — listen, understand customer demands, and shape or enhance market changes with their added vision. The ability to see 5G RAN in the wider context of CSPs' overall network transformation strategies is particularly important, provided this insight is reflected directly in the product roadmap of the vendor.

Marketing Strategy: This criterion includes clear, differentiated messaging consistently communicated internally, and externalized through social media, advertising, customer programs and positioning statements. Vendors must demonstrate alignment of the vendor's 5G RAN marketing strategy with its current market position and its overall 5G RAN portfolio strategy, including a market segment focus.

Offering (Product) Strategy: This criterion includes an approach to product development and delivery that emphasizes market differentiation, functionality, methodology and features as they map to current and future requirements. This approach includes differentiated approaches to the different 5G RAN segments, including Tier 1, 2 and 3 CSPs.

Vertical/Industry Strategy: This criterion includes the strategy to direct resources (sales, product and development), skills and products to meet the specific needs of individual market segments, including verticals.

Innovation: This criterion includes direct, related, complementary and synergistic layouts of resources, expertise or capital for investment, consolidation, defensive or preemptive purposes, including sustained evidence of technological expertise and leadership. Vendors must have an appropriate budget for R&D planning, actively participate and demonstrate leadership of 5G RAN standardization and following technologies, and support ecosystem partners via interfaces and interoperability. Vendors also need to possess co-innovation facilities and participate with partners, customers, academic institutions, others.

Geographic Strategy: This criterion includes the vendor's strategy to direct resources, skills and offerings that meet the specific needs of geographies outside the "home" or native geography, either directly or through partners, channels and subsidiaries, as appropriate for that geography and market.

Table 2: Completeness of Vision Evaluation Criteria

Evaluation Criteria ↓	*Weighting* ↓
Market Understanding	Medium
Marketing Strategy	Medium
Sales Strategy	NotRated
Offering (Product) Strategy	High
Business Model	NotRated
Vertical/Industry Strategy	Medium

Evaluation Criteria ↓	Weighting ↓
Innovation	High
Geographic Strategy	Medium

Source: Gartner (July 2024)

Quadrant Descriptions

Leaders

Leaders typically have a significant number of commercial references for the 5G network equipment market. They also have momentum in this area, as exemplified by new contract wins. They have a broad portfolio and, even where they need partners, they are CSPs' preferred primary vendors. They appear in nearly all CSP procurements and trials of 5G RAN infrastructure as de facto suppliers, and their presence in the Leaders quadrant tends to be fairly stable. These are high-viability technology providers. They are well-positioned with their current product portfolios and are likely to continue delivering leading products. Leaders do not necessarily offer the best solution for every customer requirement, and their products may not be "best of breed" in every area. Overall, Leaders provide solutions that offer relatively low risk and can achieve and sustain high-quality deployments.

Challengers

Challengers have strong market execution capabilities and good solutions, but overall, their products lack the breadth and depth of Leaders' offerings. Their solutions do not indicate a clear vision for how the market is evolving, and they are not as innovative or advanced as those of Leaders.

Visionaries

Visionaries demonstrate a clear understanding of the market and provide key innovative elements that exemplify the market's future. However, they may lack the ability to influence a large part of the market, have not fully expanded their sales and support capabilities to achieve global reach, or do not have the funding and scale to execute the capabilities of Leaders.

Niche Players

Niche Players tend to offer products that focus on a particular segment of the market (for example, a given country, such as Japan) or a subset of functionality (such as vRAN). Their technology and products also tend to be more specialized. This specialization can be an advantage, because CSPs aligned with the focus of Niche Players can find these vendors'

offerings very suitable. In some cases, Niche Players have made specific decisions about where and where not to compete, so being a Niche Player does not preclude having a well-defined strategy. They could also be attractive partners for some of the larger vendors in this market, thanks to their market specializations or technological strengths.

Context

Use this Magic Quadrant as a reference, but explore the market further beyond these providers. The Magic Quadrant is not Gartner's sole tool for creating a vendor shortlist. You should also consider other Gartner reports (see the Recommended by the Author section) and Gartner analyst discussions.

Gartner advises CSPs to base their choice of external vendor on the following:

- An evaluation of multiple (at least two) 5G RAN infrastructure vendors to ensure service continuity and a smooth negotiation process
- The vendor's willingness to work together with other stakeholders (sometimes including their competitors) to achieve the CSP's overall network modernization aims
- A business value assessment against the CSP's most important goals

Market Overview

As of January 2024, more than 300 3GPP-compliant 5G networks have been commercially launched in 113 countries and territories, according to the Global Mobile Suppliers Association (GSA). Most of these 5G networks rely on an anchor in the 4G radio access and core network. This is called non-stand-alone (NSA) architecture, and incumbent mobile CSPs naturally adopt it as an interim solution. According to GSA, about 46 CSPs were known to have deployed or launched public 5G SA networks as of January 2024. However, just launching 5G SA is not enough to achieve end-to-end network modernization. To provide real value through 5G, CSP networks need to be more agile, flexible and reliable by implementing technical innovations, including edge computing, software-defined network/network function virtualization (SDN/NFV) and cloudification, orchestration/automation, and network slicing.

While 5G has gained substantial global traction since its introduction, 5G technology and related businesses and services will continue to evolve over the next five or more years. Currently, 5G coverage is still limited in many countries, and 5G subscription plans and capable devices are still expensive. These challenges facing CSPs' consumer businesses will be solved gradually over the next several years and are similar to those CSPs encountered when 2G, 3G and 4G were introduced.

However, the monetization of the 5G enterprise business will remain a key challenge for the telecom industry throughout the 2020s. A "radio-access-only" or "technology-oriented" approach will not be enough to help CSPs succeed with 5G. Instead, 5G vendors need to collaborate with CSPs to identify client demands and provide issue-driven solutions. New vendors have emerged or positioned themselves to use the transition to 5G as an entry point into the RAN and broader

network infrastructure market. Their momentum is driven by virtualization, cloudification, open source and network automation.

This Magic Quadrant examines vendors of 5G RAN infrastructure. Gartner monitors various vendors that do not yet meet the minimum criteria for inclusion because some of them do not possess 5G RAN commercial agreement with CSPs or do not possess generally available 5G RAN solutions. For example, JMA Wireless, Parallel Wireless and Radisys (now a member of the Reliance Industries family) provide vRAN solutions; Baicells, Benetel and Viettel High Tech provide Open RAN solutions; and CommScope, KMW and Mitsubishi Electric offer radio antenna products. In addition, EdgeQ, Intel, Marvell and Qualcomm provide external hardware accelerators for vRAN; and AWS, Dell, Red Hat and VMware provide NFVI and cloud-native platforms.

According to Gartner's "Market Share: Communications Service Provider Operational Technology, Worldwide, 2023," the market share of the top four vendors (Ericsson, Huawei, Nokia and ZTE) on the mobile carrier network infrastructure was about 93% in 2023. While "greenfield CSPs" such as DISH Network and Rakuten Mobile are deploying 5G supported by new vendors of Open RAN and vRAN, incumbent CSPs such as Airtel, Etisalat, Telefónica and Vodafone are accelerating similar initiatives using TIP. Open ecosystems could eliminate the existing vendor lock-in situation and require multivendor interoperability between different network nodes. Incumbent network equipment providers, such as Ericsson, Fujitsu, NEC, Nokia and Samsung have also committed to Open RAN and vRAN. CSPs now have more options when selecting vendors for open RAN or vRAN deployments. This competition will contribute to CSPs' future success with 5G.

The race to win business in the 5G infrastructure market is still less than halfway through the full life cycle of 5G, and vendors are achieving different degrees of traction in terms of securing commercial contracts with CSPs. To gauge how well vendors meet requirements as the 5G market and technologies evolve, Gartner evaluates them using its own criteria developed to capture their ability to address CSPs' evolving wants and needs for 5G RAN infrastructure, as described above. These criteria are summed up in our framework as vendors' Ability to Execute and Completeness of Vision.

Evaluation Criteria Definitions

Ability to Execute

Product/Service: Core goods and services offered by the vendor for the defined market. This includes current product/service capabilities, quality, feature sets, skills and so on, whether offered natively or through OEM agreements/partnerships as defined in the market definition and detailed in the subcriteria.

Overall Viability: Viability includes an assessment of the overall organization's financial health, the financial and practical success of the business unit, and the likelihood that the individual business unit will continue investing in the product, will continue offering the product and will advance the state of the art within the organization's portfolio of products.

Sales Execution/Pricing: The vendor's capabilities in all presales activities and the structure that supports them. This includes deal management, pricing and negotiation, presales support, and the

overall effectiveness of the sales channel.

Market Responsiveness/Record: Ability to respond, change direction, be flexible and achieve competitive success as opportunities develop, competitors act, customer needs evolve and market dynamics change. This criterion also considers the vendor's history of responsiveness.

Marketing Execution: The clarity, quality, creativity and efficacy of programs designed to deliver the organization's message to influence the market, promote the brand and business, increase awareness of the products, and establish a positive identification with the product/brand and organization in the minds of buyers. This "mind share" can be driven by a combination of publicity, promotional initiatives, thought leadership, word of mouth and sales activities.

Customer Experience: Relationships, products and services/programs that enable clients to be successful with the products evaluated. Specifically, this includes the ways customers receive technical support or account support. This can also include ancillary tools, customer support programs (and the quality thereof), availability of user groups, service-level agreements and so on.

Operations: The ability of the organization to meet its goals and commitments. Factors include the quality of the organizational structure, including skills, experiences, programs, systems and other vehicles that enable the organization to operate effectively and efficiently on an ongoing basis.

Completeness of Vision

Market Understanding: Ability of the vendor to understand buyers' wants and needs and to translate those into products and services. Vendors that show the highest degree of vision listen to and understand buyers' wants and needs, and can shape or enhance those with their added vision.

Marketing Strategy: A clear, differentiated set of messages consistently communicated throughout the organization and externalized through the website, advertising, customer programs and positioning statements.

Sales Strategy: The strategy for selling products that uses the appropriate network of direct and indirect sales, marketing, service, and communication affiliates that extend the scope and depth of market reach, skills, expertise, technologies, services and the customer base.

Offering (Product) Strategy: The vendor's approach to product development and delivery that emphasizes differentiation, functionality, methodology and feature sets as they map to current and future requirements.

Business Model: The soundness and logic of the vendor's underlying business proposition.

Vertical/Industry Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of individual market segments, including vertical markets.

Innovation: Direct, related, complementary and synergistic layouts of resources, expertise or capital for investment, consolidation, defensive or pre-emptive purposes.

Geographic Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of geographies outside the "home" or native geography, either directly or through partners, channels and subsidiaries as appropriate for that geography and market.