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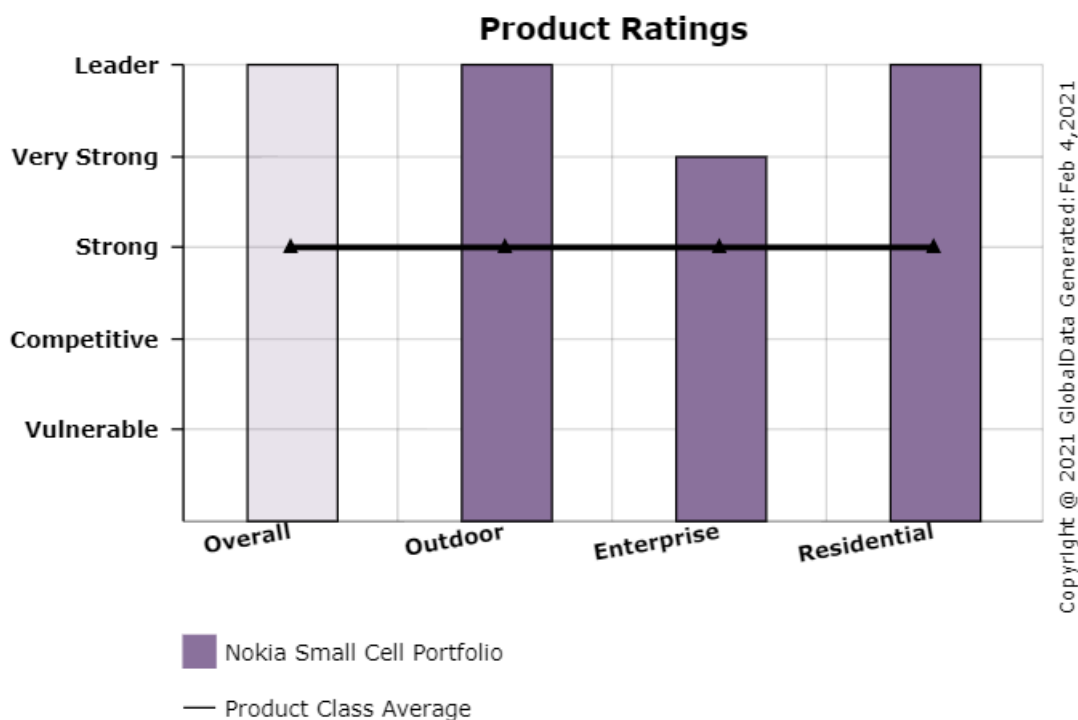
Nokia Small Cell Portfolio

January 28, 2021

PRODUCT ASSESSMENT REPORT - SMALL CELLS

REPORT SUMMARY

Nokia's small-cell portfolio adds new 5G support among its radio units. But the vendor still has a portfolio gap in one area: all-in-one 5G small cells with radio and baseband in a single unit.

SUMMARY

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Product Ratings

Legend:
- Nokia Small Cell Portfolio
- Product Class Average

Y-axis: Leader, Very Strong, Strong, Competitive, Vulnerable
X-axis: Overall, Outdoor, Enterprise, Residential

WHAT'S NEW

- **Q4 2020:** Two new products for Nokia's Airscale Indoor Radio solution become available: a 4G/5G hub and a hybrid fiber converter.
- **Q4 2020:** Three of Nokia's TD-LTE outdoor micro radio units gained 5G support commercially.
- **Q4 2020:** A new outdoor 5G micro radio unit supporting band n38 became available.

PRODUCT OVERVIEW

Product Name	Nokia Small Cells
Description	Nokia's portfolio of small cells (compact, low-power base stations- the transmitting end nodes in a mobile network) falls into three categories of use cases: outdoor, indoor enterprise, and indoor residential. • Nokia positions its outdoor portfolio as comprised of three product types: standalone small cells (baseband and radio in the same box); remote radio heads (which rely on macrocell basebands); and millimeter-wave radios, some of which also have baseband processing functionality. • For indoor use cases, Nokia offers standalone small cells as well as the AirScale Indoor Radio solution, whose distributed architecture- a baseband unit connecting to a hub device, which in turn connects to multiple radio units - is designed for medium and large enterprise venues. Nokia also offers two residential small-cell products that are overseen by a separate organizational unit. • It is difficult to say how many products Nokia offers in its outdoor and enterprise small-cell portfolios because, unlike its peers, Nokia prefers to describe the characteristics and capabilities of its portfolio- in a list of more than 150 combinations of antenna configuration, physical volume, etc.- without listing discrete product names.
Components	• Flexi Zone Outdoor Micro/Pico • Flexi Zone Pico-Enhanced • Flexi Zone Mini Macro • Flexi Zone Multiband (G2) Micro/Pico • AirScale Micro RRH • AirScale Indoor Radio
Key Customers	• Bharti • China Mobile • T-Mobile US • Vodafone Group • Verizon

Key Rivals	Company Assessments	Product Assessments
	• Airspan	• CommScope
	• Ericsson	• Corning
	• Huawei	• Ericsson
	• ip.access	• Huawei
	• Samsung	• Samsung
	• Corning	• ZTE
	• ZTE	

ESSENTIAL ANALYSIS

Strengths	Limitations
• **Compact Outdoor, Residential Form Factors:** Nokia's smallest outdoor standalone small cell occupies 0.005 cubic meter of physical space, and its smallest outdoor radio unit is 0.003 cubic meter. Although more than one rival matches the first figure, none surpass it, and the second figure is best-in-class. In addition, the Femtocell Multi-band SOHO and Femtocell LTE Residential- at 0.0014 cubic meter and at 0.0006 cubic meter, respectively- are each smaller than any competing products in their categories. Compact, lightweight designs can be less aesthetically obtrusive and easier (i.e., less costly) to deploy.	• **Late Entry to Distributed Indoor Solutions Space:** While Ericsson, Huawei, and ZTE promote enhancements to distributed enterprise solutions that have been flagship offerings for a half-decade, Nokia introduced a new solution in late 2018 after emphasizing standalone small cells for years. As a result, its solution doesn't have as long a track record or as many deployments.
• **Multi-Band Capabilities:** Nokia's outdoor small-cell portfolio includes 14 dual-band and three triple-band options, a wider array of multi-band outdoor small cells than any of its competitors. Multi-band products can be helpful in boosting capacity and supporting both 4G/5G networks and operators with fragmented spectrum assets.	• **No All-In-One 5G:** Nokia doesn't currently offer all-in-one small cells supporting 5G in either its outdoor or indoor enterprise small cell portfolios. Although the vendor does offer multiple 5G radio unit products in each category, these products rely on macrocell baseband units. All-in-one small cells, with baseband and radio in the same unit, can provide siting flexibility in network densification efforts. Also, as Nokia has demonstrated over the years, all-in-one small cells can be effective in penetrating rivals' macrocell network footprints.

Strengths	Limitations
• **Enterprise Data Throughput:** Nokia claims its Flexi Zone Multiband (G2) Micro/Pico can support >1 Gbps of throughput in certain configurations. Though achieving this result relies on conditions that are not necessarily universally applicable (e.g., including 40 MHz FDD and 60 MHz LAA), this claim exceeds those of all rival standalone enterprise small cells and can be used to promote the capacity of Nokia's solutions. In addition, Nokia's AirScale Indoor Radio System promises 2 Gbps, a claim that is unsurpassed among rivals (though it relies partly on 5G). • **Multi-Band Capabilities:** Nokia's outdoor small-cell portfolio includes 14 dual-band and three triple-band options, a wider array of multi-band outdoor small cells than any of its competitors. Multi-band products can be helpful in boosting capacity and supporting both 4G/5G networks and operators with fragmented spectrum assets.	• **Heavier Hardware:** Nokia's lightest all-in-one outdoor LTE small cell is 5.2 kg, heavier than similar products from four out of the five competitors examined in these reports. Meanwhile, Nokia's lightest enterprise RU is 2 kg, heavier than similar products from all three rivals that offer them. Lighter products can be easier (and thus less costly) to install and can meet the weight limit requirements of more sites, giving operators more siting options.

CURRENT PERSPECTIVE

LEADER

Nokia's small-cell portfolio is a leader in the market. Across the full swath of small-cell segments (outdoor, enterprise, and residential), Nokia has long been more aggressive than rivals. It has repeatedly pointed to multi-vendor hetnet deployments (Nokia's small cells under a rival's macro footprint) to signal its intent to use small cells to drive market share growth. Its small cells offer high data throughput, compact form factors and macrocell feature parity. It also offers residential solutions that not all of its top competitors can match. At the same time, it doesn't currently claim as many options supporting 5G- in its outdoor or enterprise portfolios- as most of its rivals, an issue reminiscent of headwinds the company has faced in commercializing 5G in its macrocell base station portfolio.

Some peers have outshined Nokia in the area of distributed enterprise solutions. Ericsson's Radio Dot and Huawei's LampSite saw market traction for years before Nokia introduced its current distributed enterprise solution, the AirScale Indoor Radio System, in late 2018. The benefit of that timing is that it gives Nokia a chance to use the 5G era as a new insertion point (claiming that its younger solution has leapfrogged rival technology). At the same time, Nokia's solution in this product segment is not highly differentiated from more mature solutions. Still, Nokia's enviable momentum with enterprise customers in recent years- targeting specific verticals- could help the company build momentum in this space.

COMPETITIVE RECOMMENDATIONS

PROVIDER

- **Virtualize AirScale Indoor Radio:** Broaden Nokia's embrace of RAN virtualization by applying it to the AirScale Indoor Radio, efficiently integrating baseband functionality and edge computing in the same server unit to support low-latency applications.
- **Update ReefShark Progress In 5G Small Cells:** Be more vocal in communicating to the market how the pace of accelerating ReefShark systems-on-a-chip in Nokia's portfolio manifests in the small-cell portfolio in particular. Be transparent in updating the market on the timing and availability of 5G small cells enabled by SoCs.
- **Link Small Cells, Enterprise Momentum:** Devote more attention to directly tying Nokia's momentum in the enterprise space to its small-cell portfolio. This is especially important in countering the head start that rivals Ericsson, Huawei, and ZTE have had in the distributed enterprise segment.

COMPETITORS

- **Ericsson, Huawei, & ZTE:** Point to the relatively narrower set of 5G options in Nokia's small-cell portfolio as evidence that the vendor's well-documented missteps in commercializing 5G RAN gear afflict its small-cell portfolio as well and are not likely to be fully resolved very soon.
- **Samsung:** Contrast the virtualization aspects of Samsung's enterprise RAN portfolio with Nokia's more traditional architectures to argue that Samsung's solution has unique value.
- **Ericsson:** Add more multi-band capabilities to the Ericsson small-cell portfolio, particularly the outdoor portfolio, in order to keep pace with Nokia.

Buyers

- **Indoor mmWave RF Planning Services:** Engage with vendors including Nokia to explore professional services offerings that address the precise planning required in siting millimeter-wave radios in indoor enterprise settings.
- **Leverage Enterprise RAN Competition:** Press Nokia to clarify the unique value proposition of the AirScale Indoor Radio. Argue that it lacks both the maturity of some competing solutions. Use these points to gain greater leverage in negotiations.
- **Demand Transparency on Reorg Impact:** Press Nokia to be proactive and transparent about how its small-cell business, particularly relating to enterprise solutions, might change as a result of restructuring and strategic reorientation being conducted by its new CEO.

METRICS

Outdoor Small Cell Base Stations

Rating:	**Leader** Flexi Zone Outdoor Micro/Pico; Flexi Zone Pico-Enhanced; Flexi Zone Mini Macro; Flexi Zone Multiband (G2) Micro/Pico; AirScale Micro RRH; Flexi Zone MulteFire Multi-band Pico; AirScale mmWave Radio
Architecture Type:	• Standalone small cell that can be used with Cloud FlexiZone Controller; Standalone small cell that can be used with Cloud FlexiZone Controller; Standalone small cell that can be used with FlexiZone Controller; Standalone small cell that can be used with Cloud Flexi Zone Controller; Remote Radio Head; Standalone small cell that can be used with Cloud Flexi Zone Controller; Cloud (F1 terminating) and Classical (eCPRI Termination)
Max. Power Output:	• Up to 2x5 W (adjustable 250 mW to 5 W); 2x1 W; 2x 20 W; Up to 4x5 W; 50-500 mW per Tx path (1 W total output power); Max EIRP 55 dBm
Max. Data Throughput:	• 200 Mbps (FDD-LTE 20 MHz 2x2 MIMO) or 310 Mbps (TD-LTE 2x20 MHz 2x2 MIMO); 200 Mbps (FDD-LTE 20 MHz 2x2 MIMO) or 310 Mbps (TD-LTE 2x20 MHz 2x2 MIMO) + Wi-Fi 802.11ac maximum throughput; 400 Mbps (FDD-LTE 2x20 MHz 2x2 MIMO) or 310 Mbps (TD-LTE 2x20 MHz 2x2 MIMO); Over 1 Gbps depending on configuration (Up to 40 MHz FDD or 80 MHz TDD of licensed LTE in up to 3 possible bands + 60 MHz LAA or 80 MHz LWA + Wi-Fi 802.11ac); Maximum of 80 MHz; 300 Mbps; 13.8 Gbps DL / 1 Gbps UL
Maximum number of simultaneously RRC-connected users supported:	• 4,000; Data not provided; 4,000; 4,000; Based on system module; 2,000; Data not provided
Volume:	• 0.005 m3; 0.008 m3; 0.01 m3; < 0.01 m3; 0.003-0.004 m3; 0.0031 m3; 0.01 m3
Mass:	• 5 kg; 8 kg; 10 kg; 10 kg; < 5.8 kg; < 2.9 kg; 11 kg
Radio Access Technology Support:	• FD-LTE, TD-LTE or WCDMA/HSPA; FD-LTE, TD-LTE (2 carriers of 20 MHz) + 802.11ac; FD-LTE, TD-LTE; FD-LTE, TD-LTE + LAA 60 MHz or LWA 80 MHz + WiFi 802.11ac; FD-LTE, TD-LTE; TD-LTE; 5G
Unlicensed Spectrum Technology Support:	• No; 802.11ac wave 1 WiFi; No; LTE-U (commercial, certified and shipping now) / LAA (commercial, certified and shipping now) / 802.11ac wave 1 2x2 WiFi + supports LWA (demonstrated at MWC16 / ready now but waiting for standard and chipset availability); LAA is supported via a specific product variant; 2x20 MHz MLF carriers; None

General Market Availability:	• 2x2 MIMO; 2x2 MIMO; 2x2 MIMO; Total of 6 pipes, MIMO support depending on configuration; Up to 4T4R MIMO; External, 2T2R
Wireless Backhaul Options:	• Q1 2014; Q4 2014; Q2 2016; Q4 2016; Q2 2017; Q2 2018; Q4 2019
Deployments:	• All (some used indoor): 206 wins (including China Mobile, Verizon, Telefonica Chile, Vodafone Group, TMO-US, Tele2-NL, Zain-Saudi, Bharti, Avantel, TT-Netværket, Airtel-Vodafone, Algar Telekom-BR, Salt, Ooredoo Qatar, PT-Smartfen, TIM-Brazil, Kyivstar Ukraine, Tata India, CUC China, Ooredoo Qatar, AIS Thailand, Alfa, Vimpelcom, Megafon, M1, Antel, Telefonica Movistar, Sprint, etc.)

INDOOR ENTERPRISE SMALL CELL BASE STATIONS

Rating:	**Very Strong**
	Flexi Zone Indoor Pico (LTE/Wi-Fi or 3G/Wi-Fi); Flexi Zone Indoor Multiband (G2) Pico; Femtocell Multi-band SOHO; Distributed Antenna System Radio Frequency Module (DAS RFM); Flexi Zone MulteFire Multi-band Pico; AirScale Indoor Radio System
Architecture Type:	• Standalone small cell that can be used with Cloud Flexi Zone Controller; Standalone small cell that can be used with Cloud Flexi Zone Controller; Femtocell; Remote radio head; Standalone small cell that can be used with Cloud Flexi Zone Controller; Distributed
Max. Power Output:	• 2x250 mW (LTE or 3G) or 1x500 mW (3G); 3 independent radios, each with 2x250 mW; 2x125 mW (LTE) and 1x125 mW (WCDMA); 2x40 mW; 50-500 mW per Tx path (1 W total output power); 4x250 mW (4T4R 5G ANT)
Max. Data Throughput:	• 200 Mbps (FDD-LTE 20 MHz 2x2 MIMO) or 310 Mbps (TD-LTE 2x20 MHz 2x2 MIMO) + WiFi 802.11ac maximum throughput OR maximum DC-HSPA+ for 4x5 MHz 2x2 MIMO + WiFi 802.11ac maximum throughput; Over 1 Gbps depending on configuration (Up to FDD 40 MHz or TDD 80 MHz of licensed LTE in up to 3 possible bands + LAA 60 MHz or LWA 80 MHz + WiFi 802.11ac); 300 Mbps downlink and 150 Mbps uplink at 20 MHz; Max LTE throughput for 2x20 MHz 2x2 MIMO; 300 Mbps; 2 Gbps (5G Peak rate per ANT)
Max. number of simultaneously RRC-connected users supported:	• 2,000 (LTE), 72 CE (3G); 2,000 (LTE); Support up to 64 RRC connected LTE users per AP + 32 connected UMTS users; Based on system module; 2,000; Based on system module
Volume:	• 2.8 L; 3.1 L; < 1.4 L; 12.7 L; 3.1 L; 2 L
Mass:	• < 2.2 kg; < 2.9 kg; 0.88 kg; 10 kg; < 2.9 kg; 2 kg

Radio Access Technology Support:	• FD-LTE, TD-LTE or DC-HSPA+; Up to FDD 40 MHz or TD 80 MHz of licensed LTE in up to 3 possible bands + LAA 60 MHz or LWA 80 MHz + Wi-Fi 802.11ac; WCDMA + LTE; FD-LTE; LTE; 5G initially, 4G to follow, 2G/3G via RF injection
Unlicensed Spectrum Technology Support:	• FD-LTE, TD-LTE or DC-HSPA+; Up to FDD 40 MHz or TD 80 MHz of licensed LTE in up to 3 possible bands + LAA 60 MHz or LWA 80 MHz + Wi-Fi 802.11ac; WCDMA + LTE; FD-LTE; LTE; None
General Market Availability:	• Q1 2015; Q1 2016; Q2 2017; Q4 2015; Q2 2018; Q2 2019
Deployments:	• All: 180 wins, including China Mobile, Telefonica Chile, Vodafone Group, TMO-US, Tele2-NL, Zain-Saudi, Bharti, Avantel, TT-Netværket, Airtel-Vodafone, Algar Telekom-BR, Salt, Ooredoo Qatar, PT-Smartfen, TIM-Brazil, Du, Etisalat, AT&T, Elisa, EE, Mosaic, China Unicom, 3Mob, Sure International, Telecom Italia, Telefonica, Vimpelcom, TIM Brazil, Antel Uruguay and Bouygues Telecom France, Megafon, Telekomunikacije RS A, M1, G-Mobile, and Telefonica Movistar

INDOOR RESIDENTIAL SMALL CELL BASE STATIONS

Rating:	Leader Femtocell Multi-band Residential; Femtocell LTE Residential
Max. Power Output:	• 2x50 mW (LTE) and 1x50 mW (WCDMA); 2x50 mW
Max. Data Throughput:	• UMTS 21 Mbps (L1 HSDPA), 5.7 Mbps (L1 HSUPA), 150 Mbps (20 MHz LTE DL), 75 Mbps (20 MHz LTE UL); 150 Mbps LTE DL, 70 Mbps LTE UL
Maximum number of users simultaneously supported:	• 16 (8+8 or 16 LTE); 16
Volume:	• 0.0014 m3; 0.0006 m3
Mass:	• 0.88 kg; 0.3 kg
Radio Access Technology Support:	• WCDMA/HSPA/LTE; LTE

Unlicensed Spectrum Technology Support:	• All: No
General Market Availability:	• Q3 2017; Q2 2019
Deployments:	• 54 Home Femto contracts including Vodafone UK/Italy/NZ/Czech Republic, UK, Antel Uruguay, Bouygues Telecom France, Du UAE, Etisalat UAE, TDC Denmark, O2 Germany & Spain, TIM Brazil, M1 Singapore, Cellcom, TMO-US, Megafon and Vimpelcom; 51