Nokia Small Cells - innovative ways to expand coverage and capacity for the future
As demand for mobile broadband grows, the need for greater outdoor capacity and indoor coverage/capacity becomes more urgent. Complementing macro capacity, small cells offer a cost-effective way to meet this demand for large and complex indoor areas.

As the macro network becomes full, small cells will need to be implemented as a capacity underlay – using a pico cluster solution such as Nokia Flexi Zone.

Small Cells introduce various ways to exploit unlicensed spectrum to complement licensed spectrum assets.

Nokia has a full portfolio of small cells products and services to support this evolution from coverage to capacity.

As networks evolve to become ultra-dense, Nokia innovation helps operators prepare for 5G and the Internet of Things.

As mobile broadband demand continues to grow dramatically, operators will need to increase capacity significantly by adding small cells to complement their macro networks, forming heterogeneous networks, also known as HetNets. An underlay of small cells will deliver increases in outdoor capacity for busy urban areas and extend coverage indoors, even within very large buildings and at locations of very dense traffic.

As demand grows, these networks will become denser with more small cells being added to create Ultra Dense Networks (UDNs). Such UDNs will be key to providing the extreme capacity needed as 5G technologies are deployed to support new uses, as well as to provide indoor coverage for the Internet of Things (IoT).

Nokia offers an end-to-end portfolio of products and services across both macro and small cells that deliver the best mix of capabilities for the highest return on investment for operators as they evolve towards UDNs and 5G.
Nokia Flexi Zone: Innovation for capacity & wide coverage

Nokia Flexi Zone is an innovative small cell cluster solution for indoor and outdoor “hot zones”. Flexi Zone access points can operate as standalone micro/pico base stations for hot spots and then be evolved with the addition of the Flexi Zone Controller, enabling hotspots to grow into hot zones, expanding limited coverage deployments to meet growing demand. This novel “zone” architecture enables capacity upgrades to an existing network without costly reconfiguration.

The solution allows an operator to build almost unlimited capacity and coverage for very large indoor locations by deploying clusters of access points across a hot zone and enterprise/public indoor space. Flexi Zone uses single-band or multi-band LTE, WCDMA and Wi-Fi access points to complement the macro-cellular network, offering operators up to 50 percent lower overall costs than conventional small cell deployments. Further savings can be achieved by exploiting unlicensed spectrum in the form of License Assisted Access (LAA) and LTE-Wi-Fi Aggregation (LWA), complementing stand-alone service provider Wi-Fi. The Flexi Zone Base Station has full macro software parity for easier co-existence with HetNets and simplified IoT support. It also offers macro capacity that is four to ten times higher than with conventional small cells.

The Flexi Zone Controller can run a mix of indoor and outdoor cells within one cluster, making it the first small cell solution capable of addressing large and very large indoor environments like airports, university campuses and shopping malls.

With Flexi Zone Controller, the micro/pico-cell becomes a Flexi Zone Access Point able to serve indoor locations with extreme capacity. The base station can use a building's existing Ethernet cabling (even that carrying LAN data) to interconnect all Flexi Zone elements, eliminating the cost of new wiring for Distributed Antenna Systems (DAS) or Hybrid DAS. All Flexi Zone Base Stations incorporate HetNet interference management and load balancing to further boost the performance of the HetNet and the small cell layer.

Flexi Zone Controller also works with Nokia Mobile Edge Computing (MEC), supporting edge applications on a cluster of small cells.
Nokia Flexi Lite Base Station: Full-capacity micro / pico product in a compact package

Whether filling holes in rural coverage or providing hotspot capacity in densely crowded areas of an urban network, Nokia Flexi Lite Base Station delivers an effective solution. Offering the same capacity and running the same software as Nokia macro base stations, the Flexi Lite Base Station can be more easily integrated into a HetNet. With high power transmitter output (up to 10+10W), high receiver sensitivity (-121dBm single branch) and MIMO support, the Flexi Lite Base Station outperforms conventional microcellular base stations.

Flexi Lite Base Station can be deployed as a complete, compact one-box base station site for WCDMA/HSPA. Integration with an internal antenna and backhaul solutions minimizes installation costs and lowers the site’s visual impact.

Nokia Flexi Zone Mini-Macro LTE Base Station: Macro power, micro size

Equivalent in size to a small cell, Nokia Flexi Zone Mini-Macro LTE Base Station delivers macro-like base station RF power (2 x 20W). This allows operators to provide macro-sized coverage in locations unsuitable for macro base station deployment. As well as being an easy way to provide rural coverage, the base station opens up new use cases such as low cost indoor coverage for high rise buildings from an outdoor deployment on an adjacent building ('outside-in'), and for discreet deployments in sensitive residential areas.
Nokia Femtocell: Ultimate flexibility from a 3GPP-compliant solution

The Nokia Femtocell solution comprises a fully 3GPP-compliant Femtocell gateway, with Nokia 3G and 4G Femtocell Access Points (FAPs). The most recent addition to the range brings HSPA+ radio access to residential subscribers.

Operators deploying the Nokia Femtocell solution have seen immediate benefits with increased customer loyalty and lower costs. The business case for Enterprise Femtocell deployments is even stronger, with the opportunity to create new business models through innovative architectures and location awareness. In addition, Nokia Enterprise Femtocells can extend into public spaces to provide coverage and high capacity in areas of dense user population and high broadband use.

The Nokia Femtocell solution is flexible, proven and mature, giving operators the tools to differentiate their networks to residential and enterprise customers.
Towards Ultra Dense Networks

Networks need to be prepared to support an aggressive traffic growth of up to 75 percent a year. To meet these traffic demands, HetNets need to be evolved into Ultra Dense Networks (UDN).

Nokia has launched several solutions to help operators overcome the main small cell deployment barriers they face in evolving and deploying their networks.

One of these challenges, a particular problem as networks grow ever denser, is interference between base stations. Downlink Coordinated Scheduling and Uplink Coordinated Multi-Point (CoMP) is an innovative interference mitigation technique based on the Flexi Zone Controller. It raises network performance for users at the cell edge by up to 200 percent and cuts the need for detailed indoor radio network planning.

Nokia AirScale offers cloud-based Wi-Fi

Integrating Wi-Fi more fully with their licensed band networks can bring extensive benefits to operators. Furthermore, it supports the further evolution to 5G, which will combine all earlier radio access generations together with specific 5G technologies.

This is now possible with Nokia AirScale Wi-Fi, a cloud-based, carrier-grade Wi-Fi solution that combines gigabit wireless performance with deployment simplicity. Operators can now seamlessly integrate Wi-Fi with their existing networks to improve the customer experience and generate new revenue streams.

The solution also allows service providers without licensed spectrum, such as governments, Internet players and large enterprises, to run a Wi-Fi service that takes advantage of Mobile Edge Computing and analytics to deliver advanced context-based services.

Nokia AirScale Wi-Fi expands on the existing components of our widely deployed Smart Wi-Fi solution. This includes the industry leading carrier-grade WLAN Gateway, AAA and Motive platform for Device Management, as well as Customer Experience Management and Service Management to deliver an end-to-end Wi-Fi solution.

The Nokia AirScale Wi-Fi access solution is part of Nokia’s Smart Wi-Fi end-to-end solution and comprises compact indoor and outdoor Wi-Fi access points, Wi-Fi integrated into the Nokia Flexi Zone G2 Base Station and a Cloud Controller that runs on the Nokia AirFrame server platform. The Cloud Controller enables easy and quick deployment with automated configuration, monitoring and management of Wi-Fi access points. The controller also provides automated scaling to support more than 10,000 access points. Furthermore, being Cloud-based, the solution enables Nokia to deliver Wi-Fi as a hosted service.
Support to find the right sites

Nokia uses award-winning 3-D Geolocation to find the best locations for small cells. Using a methodology called SCORE (Site Certified for Overall Relative Estimation) also makes it easier to find the right locations for small cell deployment. SCORE rates sites on their deployment cost, network performance and maintenance cost, then assigns a relative value from one to 100. This provides a convenient way for an operator to compare sites and optimize their deployment budget. By eliminating the need for thousands of individual site visits this embedded service cuts small cell TCO by around 20 percent and accelerates deployment by up to 30 percent.

Nokia was first to market with a global Site Certification Partner Program (2014 Small Cells Forum award winner) which includes more than 50 trained and certified site and installation partners. The program speeds up the deployment of indoor and outdoor small cells by up to 40 percent by providing specialized expertise and a global database of more than one million pre-qualified sites with access to power and backhaul.

A Multilayer Optimization Service can optimize multivendor equipment across 2G/3G/LTE and Wi-Fi networks. Based on proprietary Nokia tools and methodology and patented algorithms for interference detection and load simulation, it has demonstrated its value for a US operator by helping it jump from number four to number one for network performance (Root Metrics).

With innovative solutions and services that make deployment easier than ever before, Nokia is helping pave the way to a world of denser networks, where small cells will help transform our world to one that brings all the benefits of 5G.
About Nokia
By focusing on the human possibilities of technology, Nokia embraces the connected world to help people thrive. Our three businesses are leaders in their fields: Nokia Networks provides broadband infrastructure, software and services; HERE provides mapping, navigation and location intelligence; and Nokia Technologies provides advanced technology development and licensing. www.nokia.com

Nokia Networks, which provides broadband infrastructure, software and services, operates at the forefront of our industry. From the first ever call on GSM to the first call on LTE, we have set the pace of innovation, a record that continues with future technologies such as 5G. Together with our operator customers, who serve close to 5 billion subscribers, we are embracing the opportunity of the connected world and helping to solve its challenges. http://networks.nokia.com/

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