

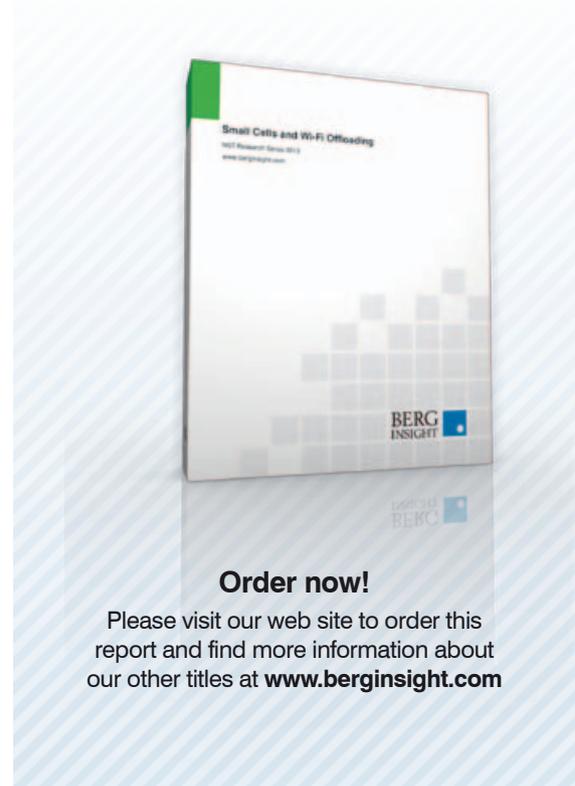
# Small Cells and Wi-Fi Offloading

**Small Cells and Wi-Fi Offloading** is the third consecutive report from Berg Insight analysing the emerging global market for small cell base stations and Wi-Fi offloading solutions.

This strategic research report in the NGT Research Series from Berg Insight provides you with 160 pages of unique business intelligence, including 5-year industry forecasts and expert commentary on which to base your business decisions.

## ***This report will allow you to:***

- **Benefit** from numerous executive interviews with market leading companies.
- **Comprehend** how small cell technologies affect mobile networks.
- **Identify** key players on the global small cell market.
- **Predict** future business models for femtocell services.
- **Anticipate** the timing of mass-deployments of small cell devices and services.
- **Realize** the importance of integrated Wi-Fi offloading solutions.
- **Evaluate** the existing Wi-Fi offloading solutions from key vendors.
- **Gain** access to the latest data and forecasts about small cell shipments.



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## How can heterogeneous networks solve future mobile network capacity needs?

Mobile operators are experiencing fast growth in mobile data and signalling traffic as more customers adopt smartphones, tablets and PCs with mobile broadband connections. Berg Insight forecasts that the number of active smartphone users worldwide will grow from 1.2 billion at the end of 2012 to 4.0 billion at the end of 2018. Total mobile data traffic in cellular networks have more than doubled every year since 2007 and is forecasted to grow at a compound annual growth rate (CAGR) of more than 50 percent from 2012 until 2018. Subscribers are also becoming more reliant on mobile phones as their primary or only device for voice communication and therefore expect ubiquitous network coverage.

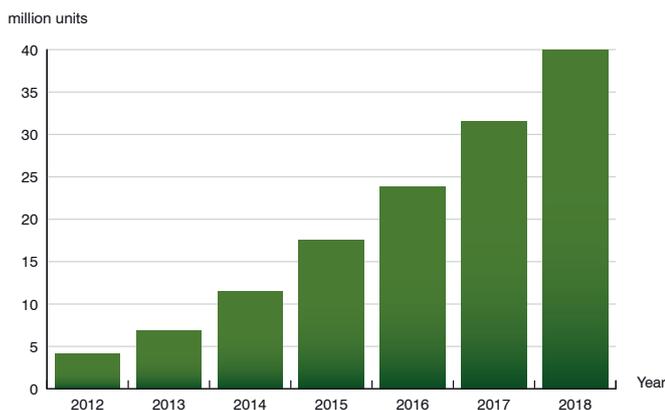
In order to meet the rising demand, operators need to use a combination of approaches. These include improving the mobile macro layer by using more spectrum and increasingly advanced radio air interfaces with higher spectral efficiency, making the macro layer denser by installing more base stations in traffic hotspots, as well as introducing heterogeneous networks (HetNets). HetNets are composed of multiple radio technologies, architectures, backhaul solutions and base stations of varying transmission power. Examples of low power nodes include Remote Radio Units (RRU) and Distributed Antenna Systems (DAS), as well as small base stations including microcells, picocells and femtocells. Spectrum is a scarce resource and densification of the macro network gets more costly when site acquisition in metropolitan areas becomes more difficult. Spectrum reuse and deployment of multiple small cell base stations thus becomes more attractive. However, large-scale small cell deployments in public areas remain challenging since finding suitable backhaul and power can be difficult.

Several operators have already started to deploy microcells, picocells, femtocells and integrated carrier Wi-Fi network solutions. Since the introduction of 2G networks, operators have for instance deployed microcells to fill coverage holes in outdoor locations where macro cell deployments were unfeasible and DAS to enhance coverage in public indoor areas. Early femtocell deployments have also mainly focused on enhancing coverage for residential customers. Some operators have also started to use femtocells in various indoor public areas to enhance coverage and capacity. With the introduction of ▶

▶ HetNets, small cell solutions increasingly become integrated nodes that also provide capacity enhancement to the network. Furthermore, small cells are increasingly becoming multi-mode solutions, incorporating cellular access technologies including 3G/LTE, in addition to Wi-Fi. HetNets also need to incorporate advanced interference management and Self-Organising Network (SON) technologies to reduce cost and complexity of installation and reduce network OPEX. Making use of Wi-Fi access points in unlicensed spectrum is an increasingly attractive solution as new standardisation and interoperability efforts such as Hotspot 2.0 aim to make the network selection and user identification process seamless.

A microcell is a small cellular base station that covers a limited area such as a shopping centre or a train station, serving up to about 100 simultaneous users. Output power is usually a few watts and the radius of the coverage area ranges between 100 metres and 300 metres. Similar to microcells, picocells add coverage and capacity to small areas such as offices or public venues. There is no clear distinction between microcells and picocells, though picocells are usually smaller, have lower output power and may support fewer simultaneous users. Picocells and microcells are deployed by the operator and are part of the RAN. Femtocells are low power cellular access points with about 10–100 mW output power, intended to extend coverage in home and office environments, supporting 4–32 simultaneous users. Femtocells are self-installing plug-and-play devices deployed by customers, using IP broadband connections for backhaul. In contrast to Wi-Fi access points, femtocells are mobile infrastructure components that operate in licensed spectrum.

Berg Insight estimates that mobile operators globally had deployed 4.1 million small cell cellular base stations at the end of 2012, including more than 3.5 million femtocells. Femtocells have mainly been deployed in homes and small offices, but enterprise femtocells can be expected to account for a growing share in the future. Mobile operators in North America, Japan and South Korea are now also stepping up deployments of open access femtocells, picocell and microcells in public areas to increase mobile network data capacity. Operators in other countries will gradually follow as data demand increases in hotspot areas. Berg Insight forecasts that the total installed base of cellular small cells will increase to 40 million units in 2018, including 33 million femtocells.



Installed base of small cell base stations, million units (World 2012–2018)

### This report answers the following questions:

- What is the current status of the femtocell market?
- How will femtocell services evolve in the future?
- What are the femtocell strategies of the leading mobile operators?
- Which companies are active in the small cell market?
- Which operators have introduced Wi-Fi offloading solutions?
- How will cellular and Wi-Fi small cell technologies evolve in the future?
- How will North America, Europe and Asia-Pacific compare in terms of small cell deployments?

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## About the Author

**André Malm** is a Senior Analyst with a Masters degree from Chalmers University of Technology. He joined Berg Insight in 2006 and his areas of expertise include mobile network technologies, handset technologies and location-based services.

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