Summary

Executive summary

Mobile operators are experiencing fast growth in mobile data and signalling traffic as customers increasingly use mobile computing devices. Adoption of smartphones is rising and more subscribers use multiple connected devices such as PCs and tablets. 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 60 percent from 2011 until 2016. 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 access 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 autonomous base stations including microcells, picocells and femtocells. Making use of Wi-Fi access points in unlicensed spectrum is also an increasingly attractive solution as new standardisation and interoperability efforts aim to make the network selection and user identification process seamless. HetNets will become increasingly important in the future as spectrum is a scarce resource and densification of the macro network gets more costly as site acquisition in metropolitan areas becomes more difficult. Several operators have already deployed microcells, picocells, femtocells and integrated carrier Wi-Fi network solutions. The first commercial integrated HetNets will be deployed starting in 2013.

A microcell is a small cellular base station that covers a limited area such as a shopping mall or a train station. Microcells are often deployed to add network coverage and capacity in areas with dense phone usage, or temporarily during various events when the need for capacity is known in advance. 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 limited geographical areas such as offices or public venues. These cells are often found inside buildings where coverage is poor or where there is a dense population of users. 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 20–100 mW output power, intended to extend coverage and offload the macro network in home and small office environments, supporting four to eight simultaneous users. Femtocells have been developed to work with a range of different cellular standards including CDMA, GSM, HSPA and LTE. Femtocells are self-installing plug-and-play devices deployed by users, similar to Wi-Fi access points. Femtocells use IP broadband connections for backhaul of voice and data. However, in contrast to Wi-Fi access points, femtocells are mobile infrastructure components that operate in licensed spectrum. Mobile operators usually install femtocell gateways that act as concentrators for integrating a large number of femtocells with the core network. About 40 mobile operators in 24 countries now offer femtocells to consumer and enterprise customers. However, the deployments have mainly been driven by large operator groups while smaller operators have struggled to justify the high costs of building and integrating a femtocell core network.

Berg Insight estimates that mobile operators globally had deployed 2.2 million small cell cellular base stations at the end of 2011, including more than 2 million femtocells. Mobile operators in North America, Japan and South Korea are now stepping up deployments of small cell cellular base stations 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 installed base of small cell cellular base stations will increase to 14 million units in 2016, driven by femtocells that will reach 10 million units in the same year.