5G will change how mobile networks are deployed, which has important implications for MNOs and towercos

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The number of 5G deployments is increasing worldwide and these deployments are making use of new spectrum and new technologies. Mobile network operators (MNOs) and towercos will need to respond differently to the network architecture and infrastructure requirements for 5G. More specifically, MNOs need to fully understand the costs associated with 5G in terms of both capex (for example, new equipment) and opex (for instance, site rental), whereas towercos must consider how they can maximise revenue from their towers amidst changes to site configurations, while also identifying opportunities to address the changing infrastructure requirements of MNOs. This article discusses how mobile network deployment is changing in response to 5G technology and examines how these changes will affect MNOs and towercos.

Trends in mobile deployment technology

Massive MIMO antennas for 5G

5G is expected to make extensive use of massive MIMO,[1] particularly in the 3.5GHz band for 5G coverage. Multiple vendors have stated that the beamforming benefits of massive MIMO will enable 3.5GHz to match the coverage of 1.8/2.1GHz, although this requires new antennas in addition to those currently being used for 2G, 3G and 4G.

Use of mmWave small cells for 5G

The mmWave spectrum bands (26/28GHz) are among the bands initially earmarked for 5G deployment. However, their propagation characteristics are significantly inferior to those of pre-5G bands and therefore have a smaller cell radius. Consequently, mmWave outdoor 5G deployments are expected to rely on the use of small cells that will be located closer to end users.

Centralisation of RAN

C-RAN technology pools baseband units in a single location to serve multiple sites, each via a very high bandwidth fibre connection. While C-RAN technology remains in its infancy, its potential adoption in future could reduce the ground space used at tower sites following the relocation of baseband units, which will make fibre connections to tower sites essential.

[1] Multiple-input and multiple-output.

Implications for 5G deployment

Macro sites

Deploying new massive MIMO antennas on existing towers in order to support 5G can increase tower loading. This is an important consideration because it affects the feasibility of rapid deployment and can also incur additional costs for the MNO (for example, increased site rental costs for leased sites).

Leading antenna vendors such as Huawei and Kathrein are offering '1+1' solutions with one passive multi-band panel for pre-5G deployments and one active massive MIMO panel for 5G. The impact on tower loading from moving to a '1+1' solution depends on the current configuration being used by the MNO.

- Loading from passive antennas for pre-5G deployment will be reduced if the MNO is currently using more than one passive panel (for example, one for high frequency and one for low frequency). Significantly, the use of single multi-band passive panels for pre-5G has increased, and for those sites where this infrastructure has been implemented, loading has been reduced.

- Massive MIMO antennas will be used in addition to passive panels; current panels used for 3.5GHz generally reach up to approximately 0.35 sqm in a cross-sectional area.

Small cells

Small cells need to be placed close to end users, and therefore, existing physical infrastructure such as street furniture (for instance, lamp posts) can be efficiently repurposed to deploy small cells. The use of street furniture for small-cell deployment has been used in leading markets including the USA, but deployment can be costly, and therefore deployment locations must be selected carefully.

Fibre

Increasing capacity requirements will drive the need for higher-capacity backhaul, with fibre the preferred technical solution to meet these needs. In addition, adoption of C-RAN architecture will also increase fibre demand for fronthaul to connect centralised baseband units to cell sites. As such, MNOs' demands for fibre are expected to increase, although the capex-intensive nature of fibre deployment may serve as a deterrent to the adoption of C-RAN in areas where fibre is not widely deployed.

Implications for MNOs and towercos

MNOs need to be fully informed about how 5G will affect their network and infrastructure requirements, as well as understand the scale of investment that is required to prepare for 5G. Use of massive MIMO on macro sites could increase tower loading and, as a result, site rental costs, while extensive small-cell and fibre deployment to support C-RAN is also likely to be costly. MNOs must carefully evaluate these costs against the benefits of 5G in order to identify the appropriate level of investment, while alternative solutions such as infrastructure-sharing should also be considered.

Towercos must anticipate the expected changes to tower loading presented by 5G by structuring their lease agreements in a way that enables them to maximise leasing revenue. In addition, towercos can take advantage of MNOs' new requirements for small cells and fibre by serving as neutral hosts, which is likely to be a more cost-effective solution for MNOs than self-deployment. Towercos such as Crown Castle have been actively investing

in such areas; other towercos must establish a business plan based on local market conditions in order to determine whether they should follow a similar model.

Analysys Mason advises MNOs and towercos worldwide on a range of commercial and technical issues, including 5G. We have recently helped a number of MNOs with 5G spectrum valuation, as well as conducted research on behalf of leading towercos into the expected evolution of site loading. For further information, please contact Lim Chuan Wei (Partner) at lim.chuan.wei@analysysmason.com or Jay Lee (Manager) at jay.lee@analysysmason.com.