



Setting new standards for
Wireless Services

What is 5G?

White Paper

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What is 5G?

As envisaged, 5G comprises heterogeneous networks, primarily those of both wide and local areas.

The existing wide-area wireless networks (macro/micro cell LTE-A) continue to evolve towards 5G. New techniques and mechanisms are needed to enhance the operation, performance, control and management of these evolving networks to satisfy the additional requirements for 5G such as full coverage, high peak data rate and delay consistency throughout wide-area coverage. In addition, a revolutionary approach is needed for the design and deployment of dense small cells to support emerging new services and applications, particularly those that require peak data rates in order of several 10s of Gb/s.

There are three main challenges to the deployment of dense small cells: low CAPEX and OPEX for the deployed network elements; overcoming the complex network management issues that arise from the huge number of small, heterogeneous base stations and the approach to network backhauling. Because of the very high peak data rates per base station, connections between access nodes and between access nodes and gateways in a 5G dense small cell network will require huge capacity. An obvious solution is to use optical fibre in the backhaul; however, this solution is both costly and inflexible, as it has no self-organising feature. An alternative solution is to use wireless backhauling at millimetre-wave frequencies above 18 GHz where very wide frequency bands are available.

To reduce both CAPEX and OPEX of the 5G network, the following approaches could be considered at the start of the 5G network design.

- Software Defined Network (SDN) (separation of control and data planes)
- End-to-end network virtualization
- Cloud RAN (radio access virtualization)
- Full automation (measurements and reporting)
- Self-X (self-configuration, self-optimization and self-healing)

These techniques offer other advantages such as easy and fast roll out, easy capacity and coverage expansion, easy network upgrading, support for multi-vendors' equipment, lower energy consumption, network sharing and more . . .

5G Requirements

- Ubiquitous (100% coverage - everywhere and anytime)
- Consistency (minimum application data rate of 10 Mb/s per user and maximum delay of 5 ms - everywhere and anytime)
- High quality voice (comparable to circuit switched voice - everywhere and any time)
- Scalability (in terms of number of device accesses per AP)
- Minimum end-to-end delay (1 ms)
- Minimum access delay (less than 100 ms)

- Maximum peak data rate 100 Gb/s per user
- Use of both licensed and unlicensed bands (radio spectrum)
- Efficient use of shared radio resources (100% utilisation)
- Adaptive QoS-aware scheduling
- Lower energy consumption (compared with 4G)
- Seamless roaming/handover
- Self organising features
- Robust and fast monitoring, control and network management
- Smart offloading
- Dynamic traffic classification and management based on user's required QoS
- Minimum signalling load (less than 10% of payload)
- Much lower CAPEX and OPEX (compared with 4G)

AWTG is working closely on all research and development aspects of 5G network design in collaboration with the 5G Research Team at the Centre for Telecommunications Research, King's College, London.