Chapter 2
5G: Radio

Ravi Sekhar Yarrabothu
Vignan’s University, India

ABSTRACT

In evolution towards a successful mobile communications, the radio technology plays major role and the chosen radio technology should be spectrally efficient, robust and reliable. OFDM provided the much needed spectral efficiency, reliability, robustness and scalability for LTE, compared to the previous access methods such as TDMA, FDMA, and CDMA. For 5G, we should look for more spectrally efficient and massively scalable radio technology to cater to IoT and high bandwidth applications. The objective of this chapter is to introduce the 5G radio system, its challenges from both user and network perspective, and the key disruptive technologies for 5G – such as carrier aggregation, waveform engineering, full duplex, Multi-RAT, flexible networks, and Massive MIMO. Finally, the chapter discusses the current developments in 5G radio research.

INTRODUCTION

In the next few years, the demand for mobile broadband continues to increase, to cater the needs of delivering ultra-high definition video, tactile internet and IoT devices. 5G networks is going to be the platform enabling growth for many industries, ranging from the IT industry to the automotive, and manufacturing industries to entertainment.

As 5G is defined and requirements getting developed, it must include the entire 5G ecosystem (e.g., air interface, devices, transport, packet core). Future networks
5G will need to be deployed much more densely than today’s networks and, due to both economic constraints and the availability of sites. It needs to become significantly more heterogeneous and use multi Radio Access Technologies (RATs).

The operation of the network needs to be able to scale its operation even for short time periods depending on the widely varying traffic capacity needs and still remain energy efficient. Devices are no longer connected to just one single access node. The full picture consists of a combination of multiple physical interfaces based on the same or different radio technologies depending on the current situation and the actual used services. Fast selection and combining of all of the available interfaces supports an adaptive set of virtual interfaces and functions depending on applications.

5G networks enable newer applications such as autonomous driving, tactile applications and remote control of robots. At the same time, these applications bring a lot of challenges to the network. Few of these are related to ultra low latency in the order of few milliseconds and higher reliability comparable to fixed lines. But the biggest challenge for 5G networks will be that the services need to cater for a diverse set of services and their requirements. To achieve this, the goal for 5G networks will be to improve the flexibility in the architecture.

CHALLENGES FOR 5G RADIO SYSTEMS

5G networks need to present the opportunity for the operators to launch the new services, efficiently and cost-effectively, thus creating an ecosystem for technical and business innovation. In addition, the 5G infrastructures provides a customized network solutions to support vertical markets such as automotive, energy, food and agriculture, healthcare, etc. In addition, it is essential to accelerate the delivery of services to all the involved stakeholders. Compared to the evolution of earlier generations of mobile networks, 5G networks require not only improved networking solutions but involves sophisticated integration of massive computing and storage infrastructures.

There are three fundamental requirements for building 5G wireless radio networks:

- Capabilities for supporting massive capacity and massive connectivity.
- Support for an increasingly diverse set of services, application and users all with extremely diverging requirements for work and life.
- Flexible and efficient use of all available non-contiguous spectrum for wildly different network deployment scenarios.
Structural Changes and Regulatory Challenges in Japanese Telecommunications
www.igi-global.com/chapter/structural-changes-regulatory-challenges-japanese/49841?camid=4v1a

Reliable Communication in WCF
www.igi-global.com/chapter/reliable-communication-in-wcf/175129?camid=4v1a