Chapter 15
NB–IoT for 5G:
How 5G Aligns With NB–IoT

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ABSTRACT

It is expected that internet of things (IoT) will deal with the major activities in the connected living environment as well as the industrial processes. All these aspects are going to be real in the frameworks of the fifth-generation (5G) mobile networks. 5G-based narrowband IoT (NB-IoT) networks have the capability to serve various innovative IoT applications at a great extent. NB-IoT is third generation partnership project (3GPP) standardized low power wide area (LPWA) technology which is designed for IoT devices requiring long battery life, low cost, worldwide coverage, and high system capacity. To improve the performance, 3GPP has agreed that the NB-IoT will continue evolving as part of the 5G specifications. NB-IoT along with 5G will work in several connected living applications. This combination will also be very useful in the industrial environments which need high data rates and low latency. All these features will be supported by 5G in the future. Similarly, applications with low data rates in the IoT world will be supported by NB-IoT. So 5G and NB-IoT are going to be a popular combination for several new applications.
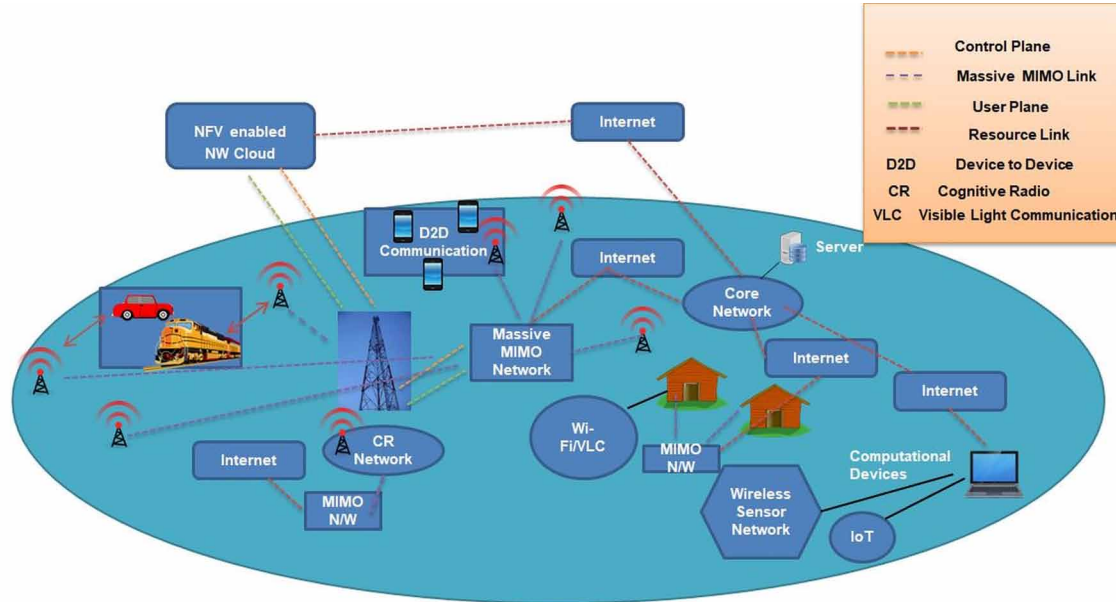
INTRODUCTION

Before going through the technologies presented in this chapter, it is essential to understand the basic principles of narrowband Internet of things (NB-IoT) and the fifth generation (5G) mobile networks. It is expected that you have already got some ideas about these technologies in the previous chapters. 5G mobile networks are advanced high speed cellular networks based on IMT 2020 mobile telecommunication standards. The most important thing about the 5G is that the expected services from mobile communication can be obtained easily with fewer expenses compared to the previous legacy versions. 5G has the ability to provide services such as high speed live video streaming, online games which will attract many Internet consumers in the market (Sharma et al., 2019). 5G devices are connected to the telephone network and the Internet by radio waves via multiple local antennas in the cell. In addition to

the conventional microwave frequencies, millimeter waves (wavelength in the range: 10 mm to 1 mm) technologies are also the candidates for high speed communications.

In 4G cellular communications, there is no facility for devices to communicate with each other. All communications pass through the gateways and base station. This is inefficient especially when the devices are close by. In the scheme like machine to machine (M2M) communications, number of devices which form network is very large, so it is required that devices communicate directly with each other.5G facilitates many of the devices to connect and to exchange information directly. 5G technology can be used as a flexible platform for numerous applications. To get the benefits it is required that the core network should reach to the unique levels of intelligence and flexibility. However, there are many challenges that wireless operators are facing to enhance capacity and performance even in 5G environment. 5G would be seen in the future everywhere to connect people among themselves or with the devices. IoT applications are widely proposed as a major use case in the imminent 5G mobile network. It is also anticipated that IoT will be a part of 5G technologies as it helps to connect various devices to the user. At present, various types of IoT networks are available. NB-IoT is a new type of radio access technology which requires very less resources for its deployment. Massive number of devices will be connected together in the 5G NB-IoT, which will need high rate to support successful delivery of messages in a certain time period.

Figure 1. Basic 5G Architecture

Even though Long Term Evolution (LTE) technology has the ability to provide better network connectivity in IoTs but cellular network takes up most of the available bandwidth and causes extra costs. NB-IoT can be used for number of low-power devices, which increase network coverage and also provide better spectrum utilization. Since battery life is more than 10 years it can be used for a wide range of use cases. 5G network deployment permits the shift of IoT to a purely cellular based context so that devices

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