

# LTE-M and NB-IoT

TPR1026x | Expert-Led Live | 5G Access | ⚙️⚙️⚙️

Course Duration: 4 hours

Internet of Things (IoT) is expected to dominate the telecom market where machines exchange data for intelligent applications. Devices and networks supporting IoT pose unique challenges such as low power, low cost, low mobility, and long battery life. This course addresses several low power wide area (LPWA) network technologies defined by 3GPP to meet these requirements. 3GPP-defined LPWA technology options include LTE-M (or enhanced machine type communication) and Narrowband IoT (NB-IoT). This course provides a foundation for MTC and NB-LTE and their extensions. Fundamental concepts of IoT-centric optimizations for a wireless network are explained. IoT-specific characteristics of the wireless network and relevant UE categories (e.g., M1, M2 and NB1 and NB2) are described.

## Intended Audience

Technical and product marketing personnel working for wireless operators, equipment and device manufacturers, as well as IoT architects and designers.

## Objectives

After completing this course, the student will be able to:

- Define IoT and give examples of LPWA technologies
- Explain how the requirements for cellular IoT are achieved in LTE-M and NB-IoT
- Describe the key features of the LTE-M and NB-IoT air interface
- Specify key characteristics of NB-IoT and LTE-M device categories
- Sketch the end-to-end 3GPP network architecture and data delivery methods for cellular IoT

## Course Prerequisites

[LTE Overview](#)

## Outline

1. IoT: What and Why
  - 1.1 What is the Internet of Things?
  - 1.2 Cellular IoT Growth and Applications
  - 1.3 The LPWA Landscape and Standardization of Cellular IoT
2. Wireless Optimizations for IoT
  - 2.1 Wireless Requirements of IoT
  - 2.2 Optimization of IoT Operations
3. Capacity Management and Enhancements
  - 3.1 Capacity Optimization
  - 3.2 Overload Control and Congestion
  - 3.3 Extended Access Barring
  - 3.4 Single Cell Point-to-Multipoint
4. Coverage Enhancements
  - 4.1 Repetitions for Improved Coverage
  - 4.2 Power Density and Coverage
  - 4.3 TX/RX Diversity and Frequency Hopping
5. Battery Life Enhancements
  - 5.1 Power Save Mode
  - 5.2 Extended DRX for Idle Mode
  - 5.3 Extended DRX for Connected Mode
6. Device Positioning
  - 6.1 E-Cell ID Method
  - 6.2 OTDOA for IoT
7. Network and Device Enhancements for IoT
  - 7.1 Attach and Data Delivery Options
  - 7.2 Network and Enhancements for IoT
  - 7.3 Data Delivery Options
  - 7.4 Security for IoT
8. UE Categories for LTE-M and NB-IoT
  - 8.1 Overview of Release 13 and 14 UEs
  - 8.2 UE Category M1
  - 8.3 UE Category NB1
  - 8.4 UE Category M2
  - 8.5 UE Category NB2
9. LTE-M and NB-IoT Operations
  - 9.1 Deployment Scenarios
  - 9.2 Radio Resources and Channels
  - 9.3 Downlink Traffic Processing
  - 9.4 Uplink Traffic Processing
10. Additional Information
  - 10.1 EC-GSM Key Features
  - 10.2 Unlicensed IoT Solutions