

Advanced LPWA for IoT

Instructor Led | Duration: 2 Days | Course Number: 5G_201

Internet of Things (IoT) is expected to dominate telecom market in the coming years 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 advanced course on LPWA IoT takes a detailed look at 3GPP's efficient IoT solutions involving UE Category M1 and UE Category NB1. The network architecture enhancements required for IoT such as NIDD and SCEF are described. The roles played by IoT-specific protocols such as MQTT-SN, FOTA/SOTA, and DoNAS are summarized. A brief overview of the UE module industry is given. The architecture of a UE is discussed. Wireless optimizations customized for IoT are explained. Key technical features of EC-GSM are described. Characteristics and operations of UE categories M1 and NB1 and the network in support of IoT are illustrated.

Intended Audience

Technical personnel working for wireless operators, equipment and device manufacturers, who need a detailed look at 3GPP's IoT solutions.

Learning Objectives

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

- Mention roles of IoT-centric protocols such as MQTT-SN and DoNAS.
- Explain how of PSM and eDRX help increase UE battery life.
- Illustrate the functional architecture of a UE.
- Describe key features of UE Categories M1 and NB1.
- Summarize how basic communications between the UE and the network occur for IoT UEs.
- Compare capacity and battery life of UE categories M1 and NB1.
- Explain how EC-GSM enhances performance of IoT devices compared to GSM.

Suggested Prerequisites

- LTE Overview (eLearning)
- Technology Primer: LTE-M and NB-IoT (Instructor Led)

Course Outline

1. Architecture and IoT Protocols

- 1.1. MTC, eMTC, NB-IoT, & EC-GSM
- 1.2. LTE network enhancements (e.g., NIDD and SCEF)
- 1.3. APIs toward customer AS: OMA, OneM2M, and RESTful APIs
- 1.4. External device identifiers
- 1.5. Protocols: MQTT-SN, CoAP, & Non-IP
- 1.6. UE module industry overview
- 1.7. UE architecture

2. IoT-centric Features

- 2.1. Wireless optimizations for IoT
- 2.2. Power Save Mode (PSM)
- 2.3. eDRX in Connected and Idle modes
- 2.4. High latency communication
- 2.5. Extended Access Barring (EAB)
- 2.6. Optimized TAU signaling
- 2.7. Half Duplex (HD) FDD
- 2.8. eMBMS for IoT
- 2.9. Overview of UE location determination methods
- 2.10. Location services for IoT
- 2.11. Overview of VoLTE
- 2.12. Impact of supporting IoT voice services on RAN

3. eMTC: UE Category M1 and Network Features

- 3.1. Characteristics of UE category M1
- 3.2. Network enhancements
- 3.3. M1 UE-Network communications
- 3.4. CE Mode A and CE Mode B
- 3.5. Impact on UE battery life
- 3.6. Supportable capacity
- 3.7. Exploiting category M1 Features for enhanced UE design

4. NB-IoT: UE Category NB1 and Network Features

- 4.1. Overview of UE category NB1
- 4.2. Network enhancements
- 4.3. Deployment scenarios (in-band, guard band, and standalone)
- 4.4. Downlink and uplink channels
- 4.5. NB1 UE-Network communications
- 4.6. Category NB1 battery life
- 4.7. Category NB1 multicarrier support
- 4.8. Network capacity for NB1 devices
- 4.9. Exploiting category NB1 features for enhanced UE design
- 4.10. FOTA/SOTA for DoNAS

Additional Material

5. EC-GSM: A Closer Look

- 5.1. IoT enhancements in EC-GSM
- 5.2. EC-GSM vs. NB-IoT (e.g., coverage)