Network Technologies and Protocols for IoT

Unit 1: Introduction to IoT

- Scope of IoT and components of an IoT-enabled thing.
- IoT reference models: ITU-T, IoT world forum, ETSI M2M.

Unit 2: Technologies for wireless connectivity and 5G core in IoT

Wireless connectivity:

- Description of the main solutions.
- Cellular technologies for IoT: LTE-M, NB-IoT, LTE-M1 (LTE eDRX and LTE PSM), Capillary Networks and Extended coverage GSM IoT (EC-GSM-IoT).
- Sigfox, LoRa

Communication among MTC applications and CIoT devices through 5G networks:

- Power Saving Enhancements
- High Latency Communications
- Monitoring Events & Network Exposure
- Device/Application Triggering
- MSISDN-less devices and Group Management
- Non-IP data delivery
- Control Plane and User Plane CIoT 5G optimizations

Unit 3: Security in IoT environments

- Security in the lifecycle of an IoT device: design, manufacturing, deployment, operation, and maintenance.
- Main vulnerabilities and threats in IoT. Attack surfaces, attack patterns.
- Recommendations and best practices. Mitigation and countermeasurements.
- Examples and real cases.

Unit 4: Protocols for IoT applications

- Requirements for communications between devices and applications using Internet protocols.
- Alternatives at the transport and network layers:
  - Tranport solutions (TCP vs UDP, IPv6 vs IPv4).
  - Low-Power Wireless Personal Area Networks (LoWPANs) and IPv6 in LoWPANs (6LoWPAN).
- Alternatives at the session and application layers:
  - HTTP and HTTP/2 vs Message Queuing Telemetry Transport (MQTT).
  - Constrained Application Protocol (CoAP)

- Examples of industry-adopted solutions (AllJoyn, Thread, Greengrass/AWS IoT, etc.).

Unit 5: Use cases of IoT deployments

Examples of use cases of IoT developed by Telefonica:

- Telemetry projects.
- Smart cities.