



ENG-515 - 5G and IoT



5G and IoT



Neotelis can also deliver a live session of this course specifically for your organisation.
Please contact us at training@neotelis.com for more information and a Proposal.

Description

This course is also available as a live distance learning course

Current Telco architecture is transforming from being composed of vertically integrated discrete network elements to being cognitive, cloud-optimized and seamless in operation. Such next-generation networks will not be server-centric, but instead will focus on data and content requirements. Data and the applications that use it will be decoupled. The new network architecture will support easy scalability, have built-in security and privacy, enable energy efficient operation, offer lower Operational Expenses

(OPEX), and flexibly support an extremely wide range of uses.

This 4-day course is designed to provide an overview of 5G and the Internet of Things (IoT), from a technical point of view.

Learning Outcomes

At the end of the course, participants will be able to:

- Identify 5G and IoT technology enablers and the features of both technologies
- Understand the detailed technical architecture and components of a 5G network
- Discuss the challenges of migration to 5G and some use cases of this new type of network
- Describe the applications and advancement of 5G, assess security considerations and the role of analytics and applications
- Understand what is IoT and describe the relationship between IoT and 5G
- Explain the architecture, layers and stack for IoT and assess its features and requirements

Topics

The training course covers the following topics:**DAY 1**

- **5G and IoT Technology Enablers**
 - Dynamic Spectrum Access (DSA)
 - Interference management
 - Small cells
 - Coordinated multipoint
 - Mass-scale MIMO, massive MIMO
 - Personal mobile internet
 - Software-Defined Radio (SDR)
 - Cognitive radio
 - Smart-radio
 - Multi-hop networks
 - Direct device-to-device (D2D) communications
 - Dynamic Adhoc Wireless Networks (DAWN)
 - IPv6 and 6LowPAN
 - Centralized RAN vs. cloud RAN
 - NFV, SDN, and cloud networking
 - Massive Machine Communication (MMC)
 - Massive Internet of Things (IoT)
 - Moving Networks (MN)
 - Ultra-Dense Networks (UDN)
 - Ultra-Reliable Communication (URC)
 - Mobile ad hoc network (MANET)
 - Wireless mesh network (WMN)

- Vandermonde-subspace frequency division multiplexing (VFDM)
- Millimeter-Wave
- 5G Cloud radio access network (C-RAN)
- Ultra small cells based heterogeneous network (HetNet)
- Heterogeneous cloud radio access network (H-CRAN)
- Ultra Reliable and Low Latency Communication (URLLC)
- Full dimension MIMO
- Adaptive Coding and Modulation (AMC)
- Filter-Bank Multi-Carrier (FBMC)
- Frequency and Quadrature Amplitude Modulation (FQAM)
- **5G Introduction**

- 8 Road map to 5G
- 5G technology detail
- Features of 5G
- 5G spectrum needs
- Evolution
- Introducing the key concepts of 5G framework
- Introducing the key components 5G architecture
- Overview of cloud computing & SDN
- Economic principles driving 5G & IoT

DAY 2

● **5G Architecture**

The service-driven 5G network architecture aims to flexibly and efficiently meet diversified mobile service requirements. With software-defined networking (SDN) and Network Functions Virtualization (NFV) supporting the underlying physical infrastructure, 5G comprehensively cloudifies access, transport, and core networks.

- 8 Objective of the architecture
- Architecture of 5G
- Differences from LTE
- Master core technology
- Flexible frame structure & design
- 5G design principles
- Flexibility
- Reliability
- Various components and functions
- Network softwarization and programmability
- Impact on mobile technologies
- Impact on service & infrastructure management and orchestration
- Key differences between 5G & previous cellular technologies
- Security- 5G planning using heuristic algorithm

- Dimensioning use of millimeter wave (mmw) carrier frequencies
- **5G Advancement**

8 5G radio

- 5G performance requirements
- 5G spectrum; multi spectrum scenario
- Air interface
 - Software defined air interface
 - New multiple accesses (“no cell” concept)
 - Physical layer procedures, and coding
 - New modulations schemes
 - Channel models for 2.3 GHz, 2.6 GHz, 5.25 GHz, 26.4 GHz, and 58.68 GHz.
 - Advanced MIMO technology with wider bandwidths
 - Propagation modeling of densely populated urban areas
 - Beam forming, network discovery, and relaying
 - Coding and modulation algorithms
 - Interference management
 - Non-orthogonal, asynchronous waveforms
 - Millimeter-wave beam forming
 - Cooperative diversity and flexible modulation
- Radio Network Virtualization (Cloud RAN)

DAY 3

• Migration to 5G

- 8 Challenges for migration
- Options
- Advanced features details
- How operators can move smoothly to 5G
- 5G use cases
 - Mobile broadband
 - Automotive
 - Smart society
 - Smart grids
 - Health
 - Industrial
 - Logistic/ freight tracking

• Applications of 5G

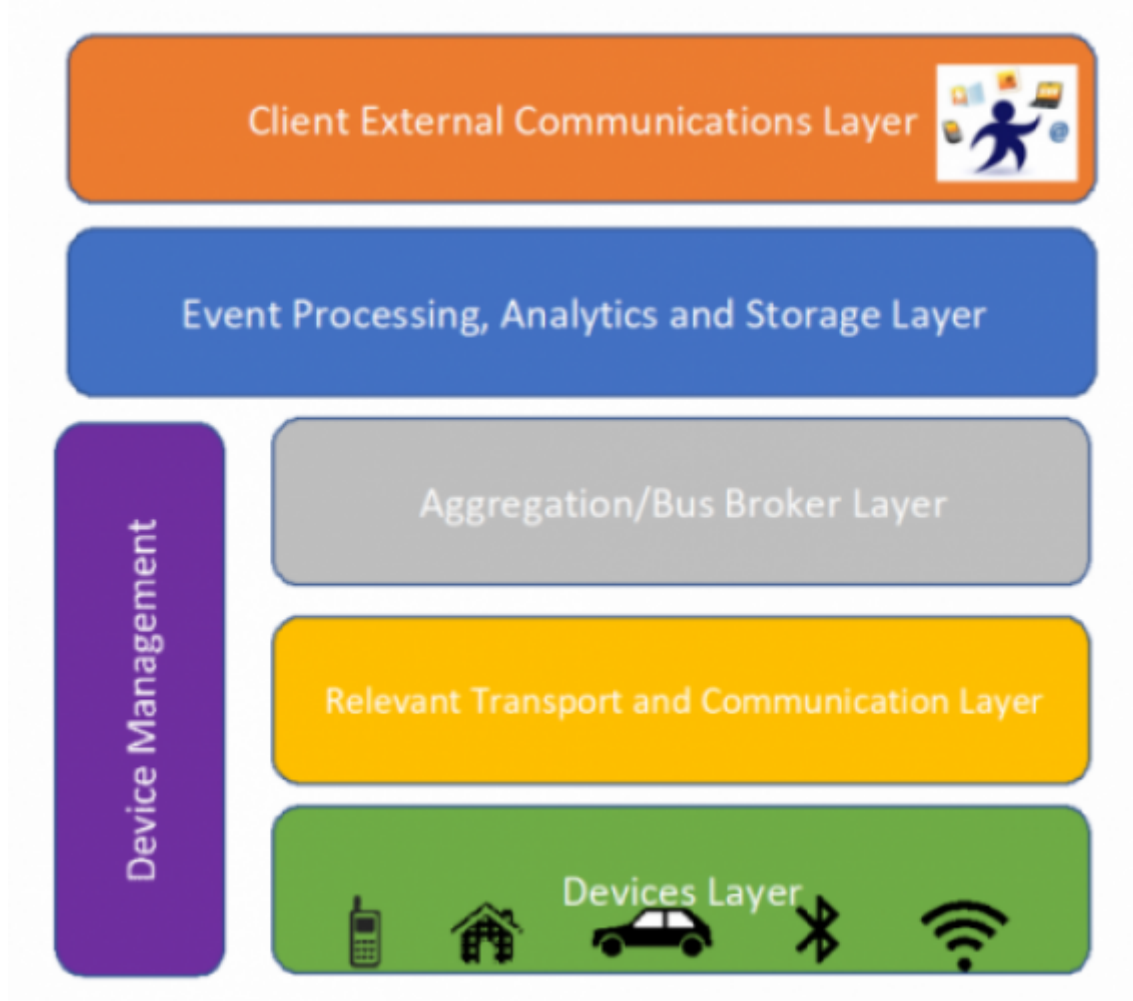
- 8 Security considerations in 5G
 - Cloud security
 - Application security
- Role of analytics & applications in 5G
 - 5G use cases; smart cities, critical assets, smart homes, manufacturing etc.
 - Introduction to analytics (basic & advanced)

- Role of analytics in 5G
- IOT & 5G
 - 5G fundamental role in IoT
 - Relationship between 5G and IoT
 - Understanding the IoT & 5G frameworks
 - 5G & IoT framework compatibility

DAY 4

IoT Architecture and Layers

The reference architecture consists of different layers. Layers can be realized by means of specific technologies. There are also some cross-cutting/vertical layers such as access/identity management.



IoT stack

- Device hardware (sensors, hardware/firmware)
- Device software

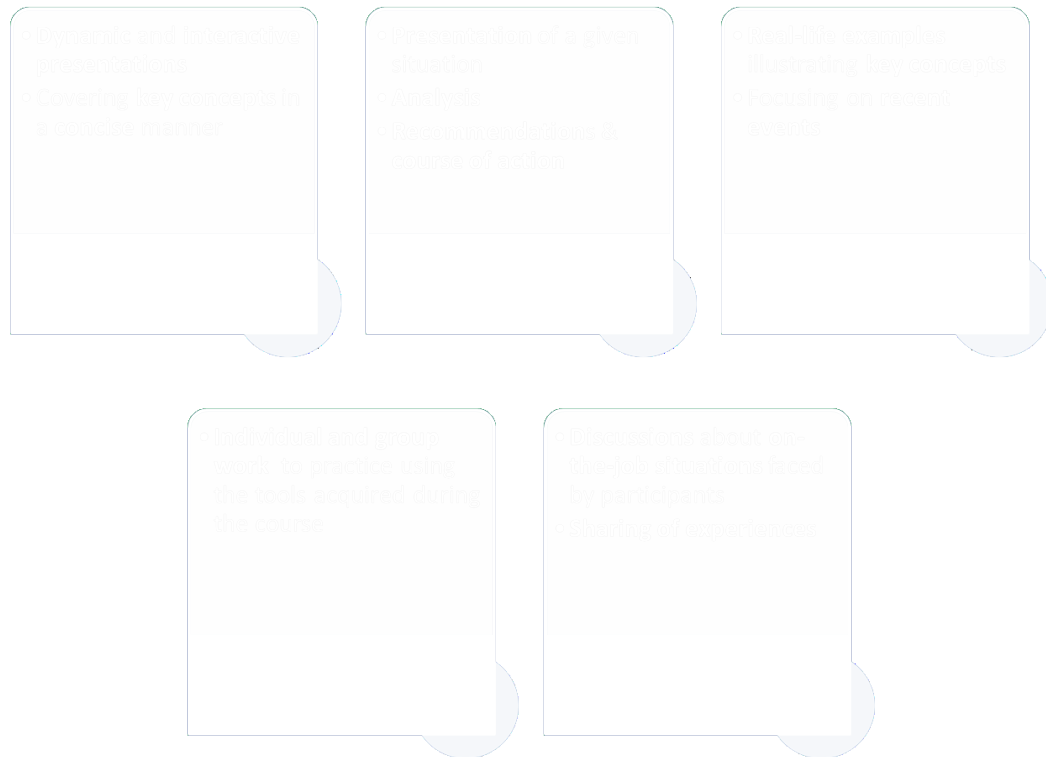
- Communication (device hub/gateway, device management...)
 - Cloud platform (data management & intelligence, API design/build, API runtime management, application PaaS (aPaaS), iPaaS middleware...)
 - Cloud applications (website, mobile apps, mobile aPaaS...)
- **Overview of IoT connectivity Methods and technologies**
- ZigBee PRO, ZigBee 3.0 and ZigBee IP
 - 6LowPAN
 - RFID
 - Bluetooth LE or bluetooth smart technology
 - Z-Wave
 - IEEE 802.15.4, IEEE 802.15.4e, 802.11ah
 - 802.11ah, Wi-Fi HaLow
 - GSM, CDMA, GPRS, 3G, LTE, small cells, SATCOM
 - Sensors and sensor networks
 - MIPI, M-PHY, UniPro, SPMI, BIF, SuperSpeed USB Inter-Chip (SSIC), Mobile PCIe (M-PCIe) and SPI
 - Wired connectivity
 - IPv4/IPv6

Target Audience

- Strategic or technical managers, consultants, communications professionals, network professionals and others who plan on using, evaluating or working with 5G wireless networks, applications and services, including IoT

Methodology

A combination of engaging activities and dynamic presentations to stimulate and maximize participants' learning.



Location

A selection of Neotelis' training courses is held in various cities around the world. Please contact us at training@neotelis.com for the complete Yearly Training Calendar.



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