

LTE Evolution and 5G – 2 days

CONTENTS

The course provides a comprehensive overview of the very latest functionality introduced/planned for LTE/LTE-A in 3GPP Release 13 and onwards (the Rel-13+ evolution of LTE is, by 3GPP, officially referred to as "LTE-Advanced Pro"). The course also describes emerging 5G technologies as defined by 3GPP. Both radio and core network related features are covered, but focus is on radio interface functionality.

This course is kept up to date in step with evolving standards for LTE and 5G, following the 3GPP quarterly meeting cycle. The contents listed in bullets below may therefore change slightly from one course event to the next. The chapters in the course relating directly to 5G will be expanded as the standard evolves (5G phase 1 will be completed in September-2018).

PREREQUISITES

Basic technical knowledge about the LTE radio interface and, to a lesser degree, evolved packet core. Apis IP-Solutions course 'LTE/EPC System Overview' provides necessary background information.

NOTE: This course is not delivered with the FoldOut methodology.

LTE-A Summary

- Timeline/status of the LTE-A standard
- Overview of LTE-Advanced features introduced in Releases 10, 11 and 12

Carrier Aggregation (CA) and Dual Connectivity (DC)

- CA concepts (PCell, SCell, scheduling etc)
- CA control channel usage (up to 32 carriers)
- DC concepts (MeNB, SeNB, MCG etc)
- DC control plane and user plane options

LAA and LWA

- Fair co-existence in unlicensed bands (CSAT, LBT)
- Licensed-Assisted Access (LAA)
- LTE/WLAN Aggregation (LWA)

Device to Device (D2D) and Vehicle-to-Anything (V2X)

- Direct Discovery and Direct Communication
- Basic V2X concepts (V2V, V2P, V2I etc)
- New nodes, interfaces and protocols for D2D/V2X
- Sidelink protocol and channel architecture
- Sidelink radio resource pool allocation

Machine-to-Machine (M2M) and Narrowband CIoT

- Bandwidth reduced M2M (cat M1 and M2 UEs)
- Narrowband CIoT (cat NB1 and NB2 UEs)
- Small data over NAS control plane
- Other CP/UP optimizations for eM2M/CIoT

5G - Overview

- 5G standardisation timeline (3GPP, ITU)
- Expectations, use cases and requirements

5G - Radio Access Network (NGRAN)

- NGRAN architecture (gNB, Xn and NG interfaces)
- CU/DU and CP/UP split options
- NGRAN protocols (XnAP, NGAP, F1AP, E1AP)

5G - New Radio (NR)

- NR spectrum ranges (planned and future)
- NR radio frames and OFDM numerology
- NR protocol stack and channel architecture
- Massive MIMO and beamforming
- Non Stand-Alone NR deployment with DC
- Stand-Alone NR deployment with/without DC
- What to expect in 3GPP Rel-16 (finished Dec-2019)