

# Course : Telecommunications networks, implementation

*Practical course - 4d - 28h00 - Ref. RKF*

*Price : 2790 CHF E.T.*

This course, in which practical work plays a central role, will enable you to understand and implement the principles of telecommunications. It describes the standards used, architecture principles, equipment, services and applications available.

## Teaching objectives

**At the end of the training, the participant will be able to:**

- ✓ Understand the vocabulary and principles of telecommunications networks
- ✓ Understanding the standards used
- ✓ Identify new telecommunications architectures and equipment
- ✓ Understand the main services and protocols

## Intended audience

Technicians, IT specialists, engineers and network managers.

## Prerequisites

Connaissances de base en informatique.

## Practical details

### Hands-on work

Alternating conceptual and practical presentations.

### Teaching methods

Practical work accounts for between 50 and 70% of the session's time.

## Course schedule

### 1 Connection alternatives

- Twisted pair, coaxial and fiber optics.
- Wiring principle and rules.
- Wireless and Power Line Communication (PLC).
- Modems.
- DSLAM. NRA.

### PARTICIPANTS

Technicians, IT specialists, engineers and network managers.

### PREREQUISITES

Connaissances de base en informatique.

### TRAINER QUALIFICATIONS

The experts leading the training are specialists in the covered subjects. They have been approved by our instructional teams for both their professional knowledge and their teaching ability, for each course they teach. They have at least five to ten years of experience in their field and hold (or have held) decision-making positions in companies.

### ASSESSMENT TERMS

The trainer evaluates each participant's academic progress throughout the training using multiple choice, scenarios, hands-on work and more.

Participants also complete a placement test before and after the course to measure the skills they've developed.

## 2 Fiber optic networks

- How is the FTTH market faring?
- Technologies used, current technologies: complement and/or replacement?
- Relevant applications of today and tomorrow.
- Technical specifics of each architecture.
- Manufacturers' fiber optic measurements.
- On-site measurement stages.
- Principle of photometry and reflectometry.
- Attenuation: fiber slopes, connectors and splices.

## 3 Mobile networks

- Frequency allocation, cellular concepts and radio engineering.
- Performance and service quality evaluation methods.
- Sizing of 4G networks (LTE/LTE-A).
- Sizing of access and collection networks.
- 5G-CN architecture: SDN, NFV, cloud, MEC, 5G entities (AMF, UPF, SMF, AUSF, UDM, PCF) and interfaces (Ni).
- Roaming vs. non-roaming, 5G-CN and 5G RAN interactions, interaction with 4G, slicing.
- 5G-CN procedures: exposed services, mobility management, traffic management, security management.
- 5G and IoT.

## 4 Internet of Things

- M2M/IoT: EC-GSM, LTE-M, NB-IoT?
- M2M/IoT network architecture: interfaces, equipment, protocols, procedures.
- Standards: WPAN, WLAN and LP-WAN solutions.
- V2V, V2X extension: concepts and principles, from Wi-Fi to LTE-V2X.
- Security: from authentication to encryption, solutions.
- A 5G close to M2M/IoT.
- Les protocoles : Zigbee, 6LowPAN, Thread, Wi-Fi, WiMax, Bluetooth Low-Energy (BLE), NFC, Neul, Sigfox, LoRaWAN.

## 5 Telephony over IP (ToIP), Voice over IP (VoIP)

- Voice coding, the command for ToIP.
- RTC signaling reminder, ss7.
- User identification, traffic management "Voice" in an IP network.
- QoS: meet bandwidth requirements and enable interactivity.
- Dimensioning to limit the "blocking" of calls; use of Erlang's law.
- The SIP protocol. The protocol. Voice signaling and flow mechanisms.
- Interfaces with protocols (DHCP, HTTP, DNS). SIP/H323 comparison.
- The different SIP components and their roles within the architecture.

### TEACHING AIDS AND TECHNICAL RESOURCES

- The main teaching aids and instructional methods used in the training are audiovisual aids, documentation and course material, hands-on application exercises and corrected exercises for practical training courses, case studies and coverage of real cases for training seminars.
- At the end of each course or seminar, ORSYS provides participants with a course evaluation questionnaire that is analysed by our instructional teams.
- A check-in sheet for each half-day of attendance is provided at the end of the training, along with a course completion certificate if the trainee attended the entire session.

### TERMS AND DEADLINES

Registration must be completed 24 hours before the start of the training.

### ACCESSIBILITY FOR PEOPLE WITH DISABILITIES

Do you need special accessibility accommodations? Contact Mrs. Fosse, Disability Manager, at [psh-accueil@orsys.fr](mailto:psh-accueil@orsys.fr) to review your request and its feasibility.

## 6 Service quality

- MPLS support for Diffserv.
- RSVP-TE and OSPF-TE protocols.
- The joint implementation of QoS and TE, Diffserv-Aware TE.
- The Subnetwork Bandwidth Manager (SBM) protocol.
- How do I reserve resources with SBM?
- Spanning Tree and QoS.
- Reconfigure network with STP and RSTP protocols.

## 7 Operator telephone interconnections

- ToIP connectivity, crossing IP domains (STUN, TURN, ICE).
- SBCs (Session Border Controllers).
- Regulatory obligations.
- Use of E.164 numbers (ENUM).
- Security and ToIP.
- Interconnection architecture. Connecting PSTN operators. Connecting ToIP operators.
- The IP Packet Exchange concept.

## 8 The IPTV system and its components

- VoD services: RTSP/RTP, HTTP adaptive streaming, VoD and content delivery network.
- Head-end (IRD, video router, encoders).
- Access networks (DSL, FTTH).
- Content security (CAS, DRM).
- Definitions of DVB standards.
- Packeting (UDP/IP vs. RTP/UDP/IP).
- Live services: from head-end to STB, IP multicast transport (IGMP/PIM-SSM, IGMP snooping).
- Introduction to multicast on MPLS networks P2MP, content delivery network, zapping.