



EXCENTIS

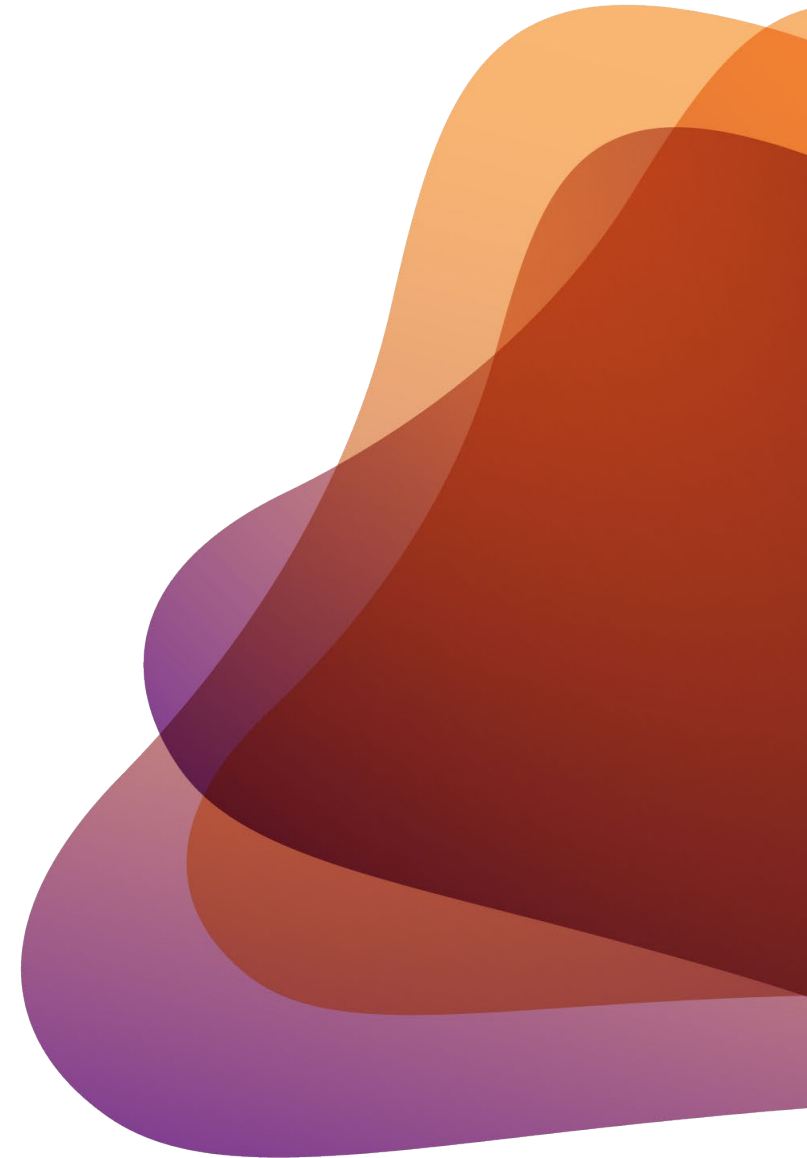
Training Portfolio 2023

www.excentis.com · training@excentis.com

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If you have any questions or would like custom training, don't hesitate to contact training@excentis.com.



The background features several overlapping circles in various shades of red and blue, creating a layered, abstract effect. The circles are semi-transparent, allowing the colors to blend and create darker tones in the overlapping areas.

Our Approach to Training

E∞CENTIS

This is our training strategy

We are experts and teach over 500 people every year

- We're not just trainers, we're also engineers tutoring from years of experience
- We combine theory with real-world examples and insights
- We're an independent partner
- We offer different growth paths based on job role and prior knowledge
- More fun and retention with interactive training sessions
- More specific? We craft tailor-made workshops using Excentis lab infrastructures
- Expert support after the courses

This is what you can expect

What previous attendees listed as pretty damn great

- *Learn a lot of difficult specification in a rather short amount of time, explained at the right level by an expert*
- *Knowledge that sticks: lots of interaction, quizzes, Q&A for much higher retention!*
- *Not just theory, but practical knowledge, tips, current states, trends, and much more*
- *Efficiency is increased: trainees will thoroughly understand what they configure, monitor, engineer, debug, handle support on, etc.*
- *Group discussions on practical situations from attendees*
- *Training paths and workshops for very high or low levels*
- *PDF syllabus and of course a training certificate by Excentis*

Learning paths

Learning depends on participant's job roles or perspectives

--> **Engineering**

You really want to understand *everything*, have real involvement into optimizations, understand discussions with vendors/operators and squash annoying issues to make room for new challenges, improving job satisfaction!

--> **Network Operations (service support & exploitation)**

You aim to understand what's happening on the operational side, you are eager to pinpoint any issue you observe, can understand and communicate this to just about anyone.

--> **Project Management**

You want to support your team, understand their technical challenges in projects while creating a high job satisfaction environment for everyone.

--> **Non-technical**

You'd like to know what the tech guys are doing, but explained in high-level terms.

Expertise levels

Are you a padawan, knight or a master?

Beginner

You have some technical background, but this is rather new material to you and you can't wait to sink your teeth in.

Intermediate

This is not your first rodeo, but you would like to hone your skills to become a master.

Expert

You are a master and wish to protect your title.



Training Courses Paths & Levels Overview

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Network Operations & Support

Beginner		Intermediate		Expert	
Cable Technologies	1d	Data Communications & HFC	0.5d	(Euro)DOCSIS Technology & Protocol: Level 1	2d
				(Euro)DOCSIS Refresher	1d
				DOCSIS 3.1 Operations	1d
		DOCSIS Wi-Fi Workshop		DOCSIS Wi-Fi Workshop	
		Wi-Fi	1d		
		Wi-Fi 6	0,5d		

For **technicians** we also have short **3-hour sessions available as workshops**, using the tools they use on everyday basis. Our aim is make them understand the situations they get confronted with, and the tools they are using, starting from a necessary portion of basic theory.

R&D and Engineering

Beginner		Intermediate		Expert	
Cable Technologies	1d	(Euro)DOCSIS Technology & Protocol: Level 2	2d	DOCSIS Workshop Expert Modules	
DataCommunications & HFC	0.5d	DOCSIS 3.1	2d		
(Euro)DOCSIS Technology & Protocol: Level 1	2d	DOCSIS 3.1 Refresher	0.5d		
(Euro)DOCSIS Refresher	1d	DOCSIS 4.0	1d		
DOCSIS 3.1 Essentials	0.5d	Distributed CCAP - R-PHY	0.5d		
Low Latency DOCSIS	0.5d	eRouter	0.5d		
		L2VPN	0.5d		
Intro EuroPacketCable	2d	EuroPacketCable 2.0	2d		
Wi-Fi	1d	Wi-Fi engineering	2d		
Wi-Fi 6	0.5d	Wi-Fi 7	0.5d		
DOCSIS Wi-Fi Workshop		DOCSIS Wi-Fi Workshop		DOCSIS Wi-Fi Workshop	

Project Management

Beginner		Intermediate		Expert	
Cable Technologies	1d	(Euro)DOCSIS Technology & Protocol: Level 1	2d	Distributed CCAP - R-PHY	0.5d
DataCommunications & HFC	0.5d	(Euro)DOCSIS Refresher	1d	eRouter	0.5d
		DOCSIS 3.1 Essentials	0.5d	L2VPN	0.5d
		Intro EuroPacketCable	2d	EuroPacketCable 2.0	2d
		Wi-Fi	1d		
DOCSIS Wi-Fi Workshop		DOCSIS Wi-Fi Workshop		DOCSIS Wi-Fi Workshop	

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Training Courses

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Cable Network Technologies

1d

[Info and registration](#)

OVERVIEW

HFC networks can provide multiple services over a single coaxial cable. This 1-day course provides a basic overview of the elements in an HFC (Hybrid Fiber Coax) network and the services a cable operator offers.

The target audience are professionals from the different departments like marketing, finance, operations, project management, ... who require a basic understanding of cable networks without too much technical details. Or people starting in telecom without any background. By attending this course, they will have an insight of the technologies used in an HFC network. It will also give them an idea of the different interactions between different services.

"Great training that everybody should follow who is new in telco business, or who wants to know a bit more about the technical background."

WHAT CAN YOU EXPECT?

- Understand basic operation of an HFC network
- Insights in the world of IP and its future
- A view on where and how fiber optics are used in an operator network
- Get an idea on how wireless communication works
- Understand how internet services are provided over an HFC network
- Understand how telephony services are provided over an HFC network
- See how multimedia services can be provided
- Understand how television (analogue/digital) is delivered over an HFC network
- Get a view on some more possible services

COURSE CONTENTS

- **PART 1: INTRODUCTION**
Operator's network · Access network · Backbone · Services
- **PART 2: INTERNET PROTOCOL (IP)**
IP network · IPv4 · IPv6 · IP QoS · Multicast · DNS · OTT · Net neutrality
- **PART 3: OPTICAL NETWORKING**
Optical network · WDM/CWDM/DWDM · Fibre in HFC network and backbone · Sonet/SDH · Ethernet
- **PART 4: WIRELESS COMMUNICATION**
Spectrum · Wireless link · Antennas · Duplexing modes · Interference · LTE
- **PART 5: EURODOCSIS**
Goal · Components · EuroDOCSIS 1.0/1.1/2.0/3.0/3.1/4.0 (FDX) · DOCSIS vs. EuroDOCSIS
- **PART 6: VOIP**
POTS · VOIP · Interface with PSTN · Security · Lawful intercept
- **PART 7: (EURO)PACKETCABLE MULTIMEDIA**
Goals · Architecture · Components · Examples
- **PART 8: DIGITAL CABLE TELEVISION**
TV signal · Compression · Digital transport · Conditional Access · Middleware · Services · Switched broadcasting · TV over IP
- **PART 9: SERVICES**
Wi-Fi community · Cloud · FMC · Power-line communication

COURSE INFORMATION

Prerequisites: None specified

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

Course duration: 1-day training / dates mutually agreed

Public & In-company courses: At Excentis or on-site in different
languages (English, German, French or Dutch)

Contact: training@excentis.com

[Info and registration](#)

Data Communications & HFC

0,5d

[Info and registration](#)

OVERVIEW

The Hybrid-Fibre-Coax (HFC) architecture has been adapted by many cable operators for internet, telephony and multimedia services. Understanding the performance of the individual components in an HFC network is important to estimate their impact on the communication signals in the return path (from customer to headend).

The course introduces the architecture and the basic components of the return path of an HFC network. Beside this, the attendee will get insight in modulations, multiple access techniques, analogue to digital, the different sources of interference, their influence on the communication signals, and some appropriate mitigation techniques. The audience is typical people starting in cable (engineering, network operations, management, ...)

WHAT CAN YOU EXPECT?

- Understand the architecture of an HFC network
- Knowledge of the performance of basic components in the return path of an HFC network
- Understanding of sources of interference and of techniques to reduce interference

COURSE CONTENTS

- **PART 1: INTRODUCTION**
What is an HFC network?
- **PART 2: SIGNALS**
Down- and upstream · Voltage, power and frequencies · Analogue and digital modulation techniques (focus on QAM), power and spectral efficiency
- **PART 3: HFC NETWORK ARCHITECTURE**
HFC and backbone · Optical nodes · Coaxial distribution plant · multiple access techniques
- **PART 4: COMPONENTS**
Passive: coaxial cable, splitter, tap, diplex filter, optical fibre
Active: amplifier, NTU, laser, photo detector, optical node
- **PART 5: NOISE**
Internal interference: intermodulation, thermal noise, group delay, amplitude flatness, micro-reflections, HUM modulation, fibre-optic noise
External interference: ingress, impulse noise and the entry points · Impact · BER and SNR
- **PART 6: RETURN PATH NOISE MITIGATION**
Hardware techniques: optimal network installation, filtering of upstream components, equalization of attenuation, improved home network
Software techniques: frequency hopping, robust modulation techniques, FEC, interleaving

COURSE INFORMATION

Prerequisites: Some experience with RF, basic electronics knowledge

Methodology: Instructor-led course, PDF slides, interactive quizzes, support afterwards

Course duration: half a day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different languages (English, German, French or Dutch)

Contact: training@excentis.com

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2d

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(Euro)DOCSIS Technology and Protocol: Level 1

OVERVIEW

The (Euro)DOCSIS technology is the leading technology for broadband IP access in cable networks. The (Euro)DOCSIS cable networks are also the basis for all next generation packet-based services like VoIP, video conferencing and other high-speed multimedia services.

The Level 1 training comprehensively covers all aspects of the (Euro)DOCSIS technology up to DOCSIS 3.1. Hereby the fundamentals of the architecture, the cable modem's provisioning process, security issues and their solutions, quality of service, management and much more are explained. This being an excellent starting point for all people new to the real technical subjects and protocol level within (Euro)DOCSIS.

WHAT CAN YOU EXPECT?

- Achieve a comprehensive understanding of the ideas behind the (Euro)DOCSIS specifications up to DOCSIS 3.1
- Understand most important key issues and advantages when using (Euro)DOCSIS in your cable network
- Benefit from hands-on experience of Excentis' EuroDOCSIS certification testing
- After attending this course, the attendee will be capable of understanding the (Euro)DOCSIS reference model and concepts

"The teachers are able to simplify and explain difficult concepts with great ease. Along with theoretical knowledge, they explain a lot of practical aspects of DOCSIS technology. I highly recommend this course and its instructors to anyone who is stepping into the DOCSIS world."

COURSE CONTENTS

- **PART 1: GOALS AND MILESTONES**
EuroDOCSIS Goals and Milestones (1.0. 1.1, 2.0, 3.0, 3.1, 4.0)
- **PART 2: REFERENCE MODEL AND EVOLUTION**
(M-)CMTS, CM and CPE · HFC Network · Packet Forwarding · Evolution (R-PHY, MHA,CCAP,...)
- **PART 3: RANGING, REGISTRATION AND PACKET SCHEDULING**
Big Picture · Initial Problem · Ranging · Registration
- **PART 4: IP LAYOUT, DOCSIS CM AND CPE PROVISIONING**
Routing or Bridging · Assigning IP addresses
- **PART 5: CONFIGURATION FILES**
Usage, format and types
- **PART 6: QOS MECHANISMS**
Service Flows and Classifiers · Relation to VoIP · Management
- **PART 7: CHANNEL BONDING AND LOAD BALANCING**
Channel Bonding · Load Balancing
- **PART 8: SECURITY OVERVIEW**
Security Threats · Beating the threats · BPI(+)
- **PART 9: MULTICAST FORWARDING CONCEPTS**
MDF · Multicast QoS · Multicast Authorization · Multicast Encryption
- **PART 10: CONFIGURATION MANAGEMENT AND MONITORING**
OSSI · CLI · IPDR/SP · SNMP · NETCONF · Notification and Event Handling · (Proactive) Network Monitoring
- **PART 11: CHANNEL DEFINITION AND MODULATION**
SC-QAM Channels · OFDM · OFDMA
- **PART 12: RF ASPECTS**
(Euro) DOCSIS RF Frequencies and D3.1 extensions · CM and CMTS Tx and Rx performance

COURSE INFORMATION

Prerequisites: Some experience with RF and IP, basic electronics knowledge

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

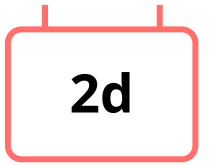
Course duration: 2-day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different languages (English, German, French or Dutch)

Contact: training@excentis.com

[Info and registration](#)

(Euro)DOCSIS Technology and Protocol: Level 2



[Info and registration](#)

OVERVIEW

This Level 2 training is the continuation of Level 1, providing in-depth content and is example driven. This training is specially intended for people wanting to know more than only a view on how the fundamental concepts work. Using examples; configuring and monitoring of modem and CMTS are highlighted. This being very useful for troubleshooting and to be able to elaborate with vendors and operators on more advanced topics.

The new technology, DOCSIS 3.1, is only slightly touched here. To get deeper knowledge of specific DOCSIS 3.1 mechanisms, the DOCSIS 3.1 Essentials, DOCSIS 3.1 Operations and DOCSIS 3.1 Engineering trainings are foreseen.

WHAT CAN YOU EXPECT?

- Achieve a comprehensive in-depth understanding of concepts in the (Euro)DOCSIS specifications
- Understand key issues of the technology and protocol with a focus on how to configure a CM and CMTS and get feedback
- Be able to troubleshoot and communicate issues to vendors and operators
- Benefit from hands-on experience of Excentis' EuroDOCSIS certification testing
- After attending this course, the attendee will be capable of understanding in-depth (Euro)DOCSIS concepts, configuration and monitoring

"After this training I understood so much more of what I've been struggling with for 10 years, wish I had this training much sooner."

COURSE CONTENTS

- **PART 1: OVERVIEW OF ALL SPECIFICATIONS AND TECHNOLOGY AREAS**
- **PART 2: DOCSIS A-TDMA AND MODULATION PROFILES**
UCD fields, IUC, FEC, interleaver, preamble, pre-equalizer, ...
- **PART 3: DOCSIS CHANNEL BONDING**
topology resolution, RCP, RCC, MDD, DSID, MRCM, TCC, SID-cluster, MTCM, attribute mask, DBC, partial service and CM-STATUS
- **PART 4: DOCSIS ENERGY MANAGEMENT**
- **PART 5: DOCSIS QOS CONFIGURATION, CONCEPTS AND FEEDBACK**
Scheduling types, classifiers, 3.x QoS enhancements
- **PART 6: DOCSIS SECURITY – BPI MECHANISM**
EAE, AK, TEK, KEK, certificates, AES, revocation, BPI+ enforce
- **PART 7: DOCSIS SECURITY – PACKET FILTERING (LLC, IP, UDC, SAV)**
- **PART 8: DOCSIS SECURITY - CM SOFTWARE UPGRADE**
CVS, CVC, CSA, signing and co-signing
- **PART 9: DOCSIS SECURITY – CONFIGURATION FILE SECURITY**
CM and (extended)CMTS-MIC, timestamping and CM IP address, D3.0 EAE, proxy TFTP
- **PART 10: DOCSIS SECURITY – MANAGEMENT ACCES CONTROL**
- **PART 11: DOCSIS VERSION COMPATIBILITY**
- **PART 12: DOCSIS MONITORING AND PNM**
MIBS, RXMER VS. CCR VS. BER VS. CNIR VS. CER VS. ..., PNM
- **PART 13: DOCSIS IP LAYOUT AND CPE PROVISIONING**
IPV6 layout + Prefix Delegation
- **PART 14: DOCSIS CONFIGURATION FILES - EXAMPLES**
- **PART 15: DOCSIS MULTICAST**
DSID forwarding, join authorization, QoS and encryption

COURSE INFORMATION

Prerequisites: Attended the Technology & Protocol Level 1 training

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

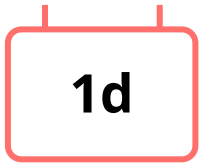
Course duration: 2-day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different
languages (English, German, French or Dutch)

Contact: training@excentis.com

[Info and registration](#)

(Euro)DOCSIS Technology & Protocol Refresher



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OVERVIEW

The (Euro)DOCSIS Technology & Protocol Refresher course refreshes in one day all fundamental aspects of the (Euro)DOCSIS technology up to DOCSIS 3.1.

This course is meant for people who can benefit from a quick refresher of the previous attended Level 1 course. Mainly prior to attending the Level 2, DOCSIS 3.1, DCA or L2VPN trainings it is worth considering this quick refresher of the (Euro)DOCSIS fundamentals.

WHAT CAN YOU EXPECT?

- A good refreshment/recap of the (Euro)DOCSIS Technology & Protocol course Level 1
- After attending this course, the attendee will have refreshed its understanding of the (Euro)DOCSIS reference model, concepts, key issues and advantages

"If you want stay up to date and learn about the latest new trends and technologies with highly professional trainers, then Excentis is the right place!"

COURSE CONTENTS

- **PART 1: DOCSIS REFERENCE MODEL AND ITS EVOLUTION**
- **PART 2: RF ASPECTS**
- **PART 3: MODEM INITIALIZATION**
Ranging, Topology Resolution, Provisioning, Registration, Best Effort packet forwarding and QoS, Security and Monitoring

COURSE INFORMATION

Prerequisites: Attended the (Euro)DOCSIS Technology & Protocol Level 1 training or have equal knowledge of the technology and protocol

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

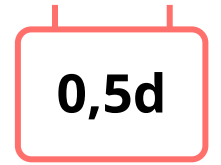
Course duration: full day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different languages (English, German, French or Dutch)

Contact: training@excentis.com

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eRouter



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OVERVIEW

Today, most operators deploy cable modems with embedded router and NAT functionality, a basic set of requirements for this type of devices is defined by eRouter. This course describes the different features that need to be supported by eRouter devices, this includes NAT, IPv6, DS-lite and others. Additionally, provisioning aspects of eRouter devices are also discussed.

WHAT CAN YOU EXPECT?

- Get insight into DOCSIS eRouter requirements
- Benefit from hands-on experience of Excentis' EuroDOCSIS certification testing

COURSE CONTENTS

- **PART 1: INTRODUCTION**
Specification overview (eRouter, RFC6204, RFC6204bis, HIPnet, CMrouter, eRouter, eDevice, eSAFE)
- **PART 2: THEORY OF OPERATION**
Protocol stack · Operational modes · Data forwarding in IPv4 (NAPT, ALG) and IPv6 · RA, SLAAC/DHCPv6/stateless DHCPv6 · DNS RDNSS · Prefix Delegation and division · DS-lite · Multicast · QoS · Security
- **PART 3: PROVISIONING AND MANAGEMENT**
Encapsulated configuration · TR-069 configuration · SNMP configuration · eRouter soft reset
- **APPENDIX**
MIBS and configurations objects

COURSE INFORMATION

Prerequisites: Basic understanding of DOCSIS

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

Course duration: half a day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different languages (English or Dutch)

Contact: training@excentis.com

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BSOD L2VPN

0,5d

[Info and registration](#)

OVERVIEW

L2VPN is an optional part of the DOCSIS set of specifications. It provides possibilities for operators to deliver new services to business customers. This course provides an insight into the operation and configuration of the L2VPN technology. It is perfectly suited for engineers and operational people who need to have a thorough understanding of the issues and possibilities offered by the L2VPN DOCSIS technology.

WHAT CAN YOU EXPECT?

- Understand benefits and possibilities of DOCSIS L2VPN technology
- Understand operation and configuration of L2VPN DOCSIS operation

"Inspiring training!"

EXCENTIS

Excentis Training 2023

COURSE CONTENTS

- **PART 1: COURSE OVERVIEW AND INTRODUCTION**
Operator network overview · DOCSIS reference model
- **PART 2: L2VPN TECHNOLOGY OVERVIEW**
VLAN (802.1q) · Stacked VLANs · MPLS · VPLS · L2TPv3
- **PART 3: BUSINESS SERVICES OVER DOCSIS: L2VPN**
Reference model · Point-to-point · Point-to-multipoint · Isolation and privacy · Multicast · QoS embedded host exclusion · Config file overview
- **PART 4: CONFIGURATION FILE EXAMPLES**

COURSE INFORMATION

Prerequisites: Basic understanding of DOCSIS

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

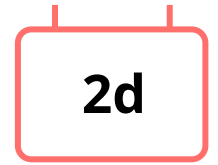
Course duration: half a day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different
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Contact: training@excentis.com

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Intro EuroPacketCable

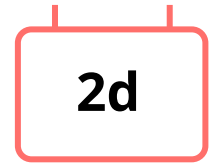


OVERVIEW

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More information on request, please [send us an email](#).

EuroPacketCable 2.0

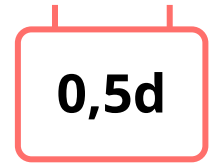


OVERVIEW

2d

More information on request, please [send us an email](#).

DOCSIS 3.1 Essentials



[Info and registration](#)

OVERVIEW

DOCSIS 3.1 is the latest version of the DOCSIS set of specifications, promising download speeds of up to 10 Gbps. It defines a totally new physical layer for achieving those speeds.

After attending this course, the attendee will be capable of understanding the essential DOCSIS 3.1 concepts.

WHAT CAN YOU EXPECT?

- A quick and dense overview of the technological evolution and its advantages along with basic concepts introduced in DOCSIS 3.1
- An overview of the different features and characteristics without providing the exact mechanisms
- Understanding of the speeds that can be offered by 3.1 based on network parameters

COURSE CONTENTS

- PART 1: INTRODUCTION
- PART 2: EVOLVED TELECOMMUNICATION SYSTEMS
- PART 3: UNDERSTANDING OFDM + DOCSIS 3.1 OFDM NUMEROLOGY
- PART 4: LDPC/BCH
- PART 5: PROFILES (+ PROFILE PROMOTION)
- PART 6: DOWNSTREAM TRANSMISSION
- PART 7: UPSTREAM TRANSMISSION
- PART 8: CM INITIALIZATION
- PART 9: FEATURES AND OTHER CHANGES
- PART 10: PREPARING FOR THE TRANSITION

COURSE INFORMATION

Prerequisites: Attended the (Euro)DOCSIS Technology & Protocol Level 1 training or have basic DOCSIS knowledge

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

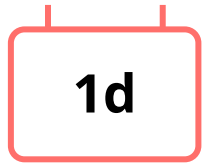
Course duration: half a day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different languages (English, German, French or Dutch)

Contact: training@excentis.com

[Info and registration](#)

DOCSIS 3.1 Operations



[Info and registration](#)

OVERVIEW

DOCSIS 3.1 is the latest version of the DOCSIS set of specifications, promising download speeds of up to 10 Gbps. It defines a totally new physical layer for achieving those speeds. However, to fully utilize its features, major HFC network upgrades are required, and the operational side shows quite some differences.

This DOCSIS 3.1 training is targeted for people who need a view on DOCSIS 3.1 from the operations point of view. The fundamentals of DOCSIS 3.1 are explained and enriched with 3.1 operational monitoring subjects. This training is especially suited for people having to look at the network performance and help to support technical challenges.

WHAT CAN YOU EXPECT?

- Achieve an understanding of technological evolution and its advantages along with basic new concepts introduced in DOCSIS 3.1
- A look at network performance expectations and how efficiency is increased
- Be able to understand operational monitoring of DOCSIS 3.1
- After attending this course, the attendee will be capable of understanding DOCSIS 3.1 concepts and perform operational monitoring of DOCSIS 3.1

*"This training was very informative and interesting!
It provides good knowledge base for work in this field, and further specialization."*

COURSE CONTENTS

- **PART 1: INTRODUCTION**
Historical perspective Capacity potential
- **PART 2: EVOLVED TELECOMMUNICATION SYSTEMS**
Understanding OFDM · DOCSIS 3.1 OFDM numerology · Benefits of LDPC error correction
- **PART 3: PROFILES**
Profile definition · Concepts and consequences
- **PART 4: CABLE MODEM INITIALIZATION**
Ranging and registration · New 3.1 Initialization Features
- **PART 5: DOWNSTREAM DATA TRANSMISSION**
PHY Link Channel (PLC) · OFDM Channel Descriptor (OCD) · Downstream Profile Descriptors (DPD)
- **PART 6: UPSTREAM DATA TRANSMISSION**
OFDMA scheduler · TaFDM
- **PART 7: FEATURES AND OTHER CHANGES**
DTP · Active Queue Management (AQM) · Hierarchical QoS (HQoS) · Energy Management · DOCSIS Light Sleep (DLS) · PKI certificate signing changes · Software upgrade
- **PART 8: NEW OPERATIONAL CONCEPTS**
Expected timelines and scenario's · 3.1 Network Architecture Evolution · OFDM Parameter Feedback · Profile Management · PNM Concepts

COURSE INFORMATION

Prerequisites: Attended (Euro)DOCSIS Technology & Protocol Level 1 training

Methodology: Instructor-led course, PDF slides, interactive quizzes, support afterwards

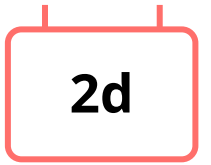
Course duration: 1-day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different languages (English, German, French or Dutch)

Contact: training@excentis.com

[Info and registration](#)

DOCSIS 3.1



[Info and registration](#)

OVERVIEW

DOCSIS 3.1 is the latest deployed version of the DOCSIS set of specifications, promising download speeds of up to 10 Gbps. It defines a totally new physical layer for achieving those speeds. However, to fully utilize its features, major HFC network upgrades are required.

The goal of this engineering course is to provide insight into how the new physical layer operates, the impact on the network and how the HFC network needs to be modified. The course also provides a good understanding of the speeds that can be offered by 3.1 based on network parameters.

It is recommended that the attendee already has a good knowledge of DOCSIS to fully benefit of attending this course.

WHAT CAN YOU EXPECT?

- Achieve an in-depth understanding of the technological evolution and its advantages along with the new concepts introduced in DOCSIS 3.1
- An overview of different features and characteristics
- Calculation of speeds that can be offered by 3.1 based on network parameters
- After attending this course, the attendee will be capable of understanding DOCSIS 3.1 concepts, numerology, configuration and monitoring

"The training was very detailed and extremely helpful! I found it beneficial that I attended DOCSIS Level 1 training few weeks before this course. That helped me to understand DOCSIS3.1 ranging and registration process better and make the story complete in my head."

COURSE CONTENTS

- **PART 1: INTRODUCTION**
Historical perspective
- **PART 2: TECHNOLOGY OVERVIEW**
Expanded spectrum, New channel definition · Increased bandwidth · Overview of 3.1 technology and functionality
- **PART 3: NEW TOOLS IN THE BOX**
Modern data communication systems · Understanding OFDM, subcarriers, pilots, cyclic prefix, windowing roll-off and equalization · DOCSIS 3.1 OFDM numerology · LDPC
- **PART 4: DOWNSTREAM DATA TRANSMISSION**
3.1 downstream and its transmitter/receiver · PHY Link Channel (PLC) · OFDM Channel Descriptor (OCD) · Downstream Profile Descriptors (DPD) · Next Codeword Pointer (NCP) · Profiles
- **PART 5: UPSTREAM DATA TRANSMISSION**
3.1 upstream and its transmitter/receiver · Minislot definition · OFDMA Upstream Data Profiles · CCF · Minislot mapping · Unused and excluded subcarriers · TaFDM
- **PART 6: CABLE MODEM INITIALIZATION AND PROFILE PROMOTION**
Ranging and registration · Downstream profile management · OFDM Profile Test (OPT) · CM-STATUS · Upstream profile testing
- **PART 7: FEATURES**
DTP · Advanced Queue Management (AQM) · Hierarchical QoS (HQoS) · DOCSIS Light Sleep (DLS) · PKI signing changes & software upgrade · DOCSIS Low Latency
- **PART 8: PREPARING FOR THE 3.1 TRANSITION**
Expected scenario's · Capacity calculation · HFC network readiness · Power levels and physical layer implications · PNM

COURSE INFORMATION

Prerequisites: Attended (Euro)DOCSIS Technology & Protocol Level 1 training

Methodology: Instructor-led course, PDF slides, interactive quizzes, support afterwards

Course duration: 2-day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different languages (English, German, French or Dutch)

Contact: training@excentis.com

[Info and registration](#)

Low Latency DOCSIS

0,5d

[Info and registration](#)

OVERVIEW

Internet has grown tremendous the last 20 years. The more possibilities the internet provided; the more bandwidth was needed. However, certain services can't be improved by just adding additional bandwidth. These services need real-time behaviour. Think at applications such as web meetings, live video, online gaming or medical applications. For these, latency and jitter are at least equally important as throughput. With Low Latency DOCSIS, the cable access network is not going to be the weakest link in the latency chain. DOCSIS networks can have round trip time spikes of 1 second under heavy load. Latency sensitive application will perform badly in such situations while the bandwidth is not the issue. Low Latency DOCSIS is added to the DOCSIS 3.1 specification to handle this problem. It will keep the round trip time around 1 millisecond (for specific services), even under heavy load.

The goal of this course is to provide insight into how LLD operates, what the impact is on services and how this can be tested.

It is recommended that the attendee already has a good knowledge of DOCSIS to fully benefit of attending this course.

WHAT CAN YOU EXPECT?

- Achieve a good understanding of the benefits and challenges of LLD
- After attending this course, the attendee will be capable of understanding DOCSIS 3.1 LLD concepts, configuration and testing

COURSE CONTENTS

- **PART 1: LOWER LATENCY - WHY, GOALS AND HOW**
- **PART 2: MEDIA ACCESS IMPROVEMENTS**
MAP Interval, Pro-active Grant Scheduling
- **PART 3: Buffering tackled**
Coupled AQM, dual queue, queue protection, HQoS ASF
- **PART 4: PROVISIONING**
PGS, ASF, AQP expansion, classifiers
- **PART 5: DEPLOYMENT CONSIDERATIONS**
DOCSIS version support, packet marking, L4S
- **PART 6: PERFORMANCE AND REPORTING**
- **PART 7: LAB TESTS**
Discussion based on real test results

COURSE INFORMATION

Prerequisites: Attended (Euro)DOCSIS Technology & Protocol Level 1 training

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

Course duration: half a day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different languages (English, German, French or Dutch)

Contact: training@excentis.com

[Info and registration](#)

DOCSIS 3.1 Refresher

0,5d

[Info and registration](#)

OVERVIEW

The DOCSIS 3.1 Refresher course refreshes in a half a day the fundamental aspects of DOCSIS 3.1.

This course is meant for people who can benefit from a quick refresher of the previous attended DOCSIS 3.1 training. Mainly prior to attending the DOCSIS 4.0 training it is worth considering this quick refresher of the DOCSIS 3.1 fundamentals needed to understand how DOCSIS 4.0 is using them.

It is recommended that the attendee already has a good knowledge of DOCSIS to fully benefit of attending this course.

WHAT CAN YOU EXPECT?

- A good refreshment/recap of the DOCSIS 3.1 training
- After attending this course, the attendee will have refreshed its understanding of the DOCSIS 3.1 concepts, key issues and advantages and is well prepared to start the DOCSIS 4.0 training.

"Must have to refresh DOCSIS 3.1 knowledge just before diving into DOCSIS 4.0."

COURSE CONTENTS

- **PART 1: TECHNOLOGY OVERVIEW**
Increased speeds · Understanding OFDM, subcarriers, pilots, cyclic prefix , windowing roll-off, and numerology
- **PART 2: CABLE MODEM INITIALIZATION AND PROFILE MANAGEMENT**
Locking (PLC, OCD, DPD, NCP), Ranging and registration · Profile management (OPT, test SID, probing, CM-STATUS)
- **PART 3: FEATURES**
Advanced Queue Management (AQM) · Hierarchical QoS (HQoS) · PKI signing changes & software upgrade · DOCSIS Low Latency
- **PART 4: PREPARING FOR THE 3.1 & 4.0 TRANSITION**
Expected scenario's · Capacity calculation · HFC network readiness · Power levels and physical layer implications · PNM

COURSE INFORMATION

Prerequisites: Attended Technology & Protocol Level 1 training + DOCSIS 3.1

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

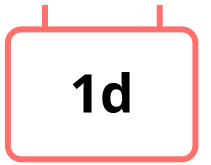
Course duration: half a day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different languages (English, German, French or Dutch)

Contact: training@excentis.com

[Info and registration](#)

DOCSIS 4.0



[Info and registration](#)

OVERVIEW

DOCSIS 4.0 is the latest version of the DOCSIS set of specifications, promising download speeds of 10 Gbps while also reaching 6 Gbps upstream speeds. This to allow for multi-gigabit symmetric services such as video conferencing, remote work/learning, health care applications, IoT and virtual reality over HFC networks.

The goal of this course is to provide insight into how this new DOCSIS version allows to get those high symmetrical speeds and based on use cases found out what the possibilities are for your HFC, CM and CMTS roadmap. Important changes in security also will be discussed.

It is highly recommended that the attendee already has a good knowledge of DOCSIS 3.1 to fully benefit of attending this course. This by attending the DOCSIS 3.1 training first or by having a 3.1 Refresher training.

WHAT CAN YOU EXPECT?

- Achieve an in-depth understanding of the technological evolution and its advantages along with the new concepts introduced in DOCSIS 4.0.
- An overview of the different options, characteristics and potential gains
- After attending this course, the attendee will be capable of understanding the main DOCSIS 4.0 concepts, terminology, field deployment options, and communication from CM and CMTS perspective

"This training helped me a lot in having an overview of all options we need to consider in our CM, CMTS, HFC roadmaps for the next decade."

COURSE CONTENTS

- **PART 1: INTRODUCTION**
The road towards DOCSIS 4.0 ·
D4.0 overview and terminology: FDX, FDD, spectrum extensions, ...
- **PART 2: FREQUENCY DIVISION DUPLEX OPERATION (FDD)**
Principles of FDD · Band plans · FDD-specific CM initialization ·
PHY changes
- **PART 3: FULL DUPLEX OPERATION (FDX)**
Principles of FDX · Terminology (sub-bands, RBA, IG, TG, ...) · Band plans ·
Interference mitigation challenges (ALI, ACI, CCI) · FDX-specific CM
initialization · Interference group discovery (sounding CWT-REQ/RSP or
OUDP, Downstream Protection DPR) · CM echo cancellation (ECT-REQ/RSP)
· Dynamic Frequency Division Duplex Operation (DFDD) · PHY changes
- **PART 4: MAC LAYER**
Minimum grant bandwidth · new MMM · Bonding requirements
- **PART 5: FDX USE CASES**
FDX-L CM · Static FDX upstream
- **PART 6: HFC CONSIDERATIONS**
Challenges · FDX amplifiers
- **PART 7: SECURITY UPDATES**
Improved authentication framework BPI+ v2: Perfect Forward Secrecy
(PFS), Mutual Message Authentication (MMA) · TOFU · CM SSH
- **PART 8: D4.0 DEPLOYMENT OPTIONS**
D4.0 modem types (FDD, FDX, FDX-L) · Network migration strategy options

COURSE INFORMATION

Prerequisites: Attended DOCSIS 3.1 or DOCSIS 3.1 Refresher
training

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

Course duration: 1-day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different
languages (English, German, French or Dutch)

Contact: training@excentis.com

[Info and registration](#)

DISTRIBUTED CCAP ARCHITECTURES – R-PHY

0,5d

[Info and registration](#)

OVERVIEW

As bandwidth capacity needs grow rapidly, there is increasing pressure on headend and HFC infrastructure. New modular distributed headend architectures are hot topics to address the need for smaller scale and more flexible options. The basic idea around Distributed Access Architectures (DAA) is to distribute some or all the functionality of CMTS/CCAP from headend down to a remote location.

If you want to know why distributed architectures are a hot topic, what Remote PHY is all about, what the difference with a Remote CCAP architecture is... then this course is for you. We will look at the specs, not the marketing.

WHAT CAN YOU EXPECT?

- Gain key insights in current and future remote cable architectures
- R-PHY & R-MAC-PHY advantages and challenges
- Get to know the protocols (GCP, R-DEPI/R-UEPI, R-DTI) R-PHY is using to make this (more complex) distributed system work
- Synchronize time using PTP
- How to provision and monitor all the RPDs, and upgrade them,...
- How to add analog services over the new digital optics using Out Of Band (OOB)
- How to compare R-PHY with R-MAC-PHY solutions

"I like that we were a smaller group which made it possible to be more interactive with the instructor. Being able to relate what we are learning to what we are doing in our own network is extremely valuable."

COURSE CONTENTS

- **PART 1: HEADEND EVOLUTION**
Driving forces · Challenges · Evolution of CMTS and HFC architectures
- **PART 2: DISTRIBUTED CCAP ARCHITECTURES: AN OVERVIEW**
Remote PHY · Remote MAC + PHY · C-DOCSIS I, II, III · SPLIT-MAC, ...
- **PART 3: MHA V2 – REMOTE PHY**
MHA review and MHA v2 architecture · GCP Control plane · R-DEPI and R-UEPI data plane · R-DTI and PTP timing and synchronization · Provisioning and configuration of R-PHY device · RPD software upgrade
- **PART 4: REMOTE MACPHY**
R-MAC-PHY system examples

COURSE INFORMATION

Prerequisites: Understand the architecture of an HFC network and basic understanding of (Euro)DOCSIS technology

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

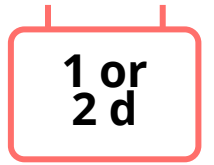
Course duration: half a day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different languages (English, German, French or Dutch)

Contact: training@excentis.com

[Info and registration](#)

Wi-Fi



[Info and registration](#)

OVERVIEW

Wi-Fi has become almost as essential as food, water and shelter. Wi-Fi issues have become the demon for both customers and ISPs and among the biggest problems are common misunderstandings about Wi-Fi.

This course provides a thorough understanding of Wi-Fi networks and the issues that surround them. It explains current standards, including Wi-Fi 6, and technology aspects, as well as new market developments.

The course also provides the basics on how to plan, deploy and troubleshoot Wi-Fi networks.

WHAT CAN YOU EXPECT?

- Understand current Wi-Fi standards, their options, their performance and limiting factors
- Wi-Fi 6 promises interesting improvements in latency, throughput, range, power consumption, but how do they work and achieve what is promised?
- Learn how to successfully plan and deploy a residential Wi-Fi network
- Learn the basics of Wi-Fi troubleshooting

"This was one of the best trainings I've had so far. I was especially impressed by the level of knowledge of the trainer, no question was left unanswered. Looking forward to my next training from Excentis!"

COURSE CONTENTS

- **PART 1: THE Wi-Fi PHYSICAL LAYER**
Technology overview · Wi-Fi 6 (802.11ax) · Modulation techniques · OFDMA · Channels · DFS · Wi-Fi 6E · Antennas · EIRP · (MU-)MIMO · Link adaptation algorithm
- **PART 2: THE Wi-Fi MAC LAYER**
Packet transmission · BSS color · QoS (WMM) · Beacon · Making a connection · Security · WPA3 · Roaming · Power efficiency (TWT)
- **PART 3: Wi-Fi NETWORK PLANNING**
Coverage definition · Attenuation · Interference · Network components · Mesh · Transmit power · Troubleshooting and tools
- **PART 4: CASE STUDIES**

A 2-days engineering version is also possible but only on request as a private session. Please [contact us](#).

COURSE INFORMATION

Prerequisites: Understanding of Ethernet

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

Course duration:

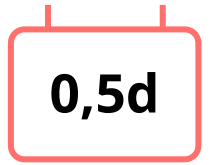
- 1-day training Wi-Fi basics / Dates Mutually agreed
- 2-day training Wi-Fi engineering / Dates Mutually agreed (on request)

Public + In-company courses: At Excentis or on-site in different languages (English or Dutch)

Contact: training@excentis.com

[Info and registration](#)

Wi-Fi 6



[Info and registration](#)

OVERVIEW

Wi-Fi has become almost as essential as food, water and shelter. As many other technologies, also Wi-Fi gets improved all the time.

This course covers all concepts of the latest Wi-Fi technology, called Wi-Fi 6 or 802.11ax. It is ideally suited for everyone who previously followed a Wi-Fi training when Wi-Fi 6 wasn't out yet. Want to know what Wi-Fi 6 promises and how it will achieve that: register for this Wi-Fi 6 training.

WHAT CAN YOU EXPECT?

- We debunk all the myths that surround the buzzwords such as OFDMA, MU-MIMO, BSS coloring, TWT and much more.
- These new technology features promise interesting improvements in latency, throughput, range, power consumption, but how do they work and achieve what is promised?
- What about Wi-Fi 6E? How will this play a role in the future of Wi-Fi: Europe vs US?

*"A dense but highly interesting introductory course.
Very systematic approach, providing useful insights all the way!"*

COURSE CONTENTS

- PART 1: Wi-Fi 6 · 802.11AX
- PART 2: TECHNOLOGY EVOLUTION
- PART 3: Wi-Fi 6E
- PART 4: OFDMA
- PART 5: INCREASED GUARD INTERVAL
- PART 6: UPLINK MU-MIMO
- PART 7: BSS COLORING
- PART 8: TARGET WAKE TIME
- PART 9: WPA3

COURSE INFORMATION

Prerequisites: Understanding of previous Wi-Fi technologies

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

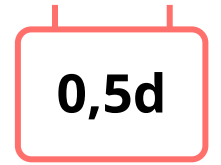
Course duration: half a day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different
languages (English or Dutch)

Contact: training@excentis.com

[Info and registration](#)

Wi-Fi 7



[Info and registration](#)

OVERVIEW

Wi-Fi has become almost as essential as food, water and shelter. As many other technologies, also Wi-Fi gets improved all the time.

This course covers all concepts of the latest Wi-Fi technology, called Wi-Fi 7 or 802.11be. It is ideally suited for everyone who previously followed a Wi-Fi training including Wi-Fi 6. Want to know what Wi-Fi 7 promises and how it will achieve that: register for this Wi-Fi 7 training.

WHAT CAN YOU EXPECT?

- What are the promised speeds
- How will those speeds be obtained (bands, channel sizes, modulations)
- How to make Wi-Fi more efficient (Multi-RUs, preamble puncturing, STA to STA data exchange)
- How to make Wi-Fi more reliable (MLO, redundancy)
- How to lower latency (MLO, inherently load balancing)
- MLO / MLD
- QoS (Traffic separation/differentiation, Restricted Service Periods, QoS signaling)
- The extras Wi-Fi 7 is promising

"The reference to the mathematics made me feel young again :-)"

COURSE CONTENTS

- **PART 1: New header**
- **PART 2: Higher throughput**
- **PART 3: More efficient**
- **PART 4: More reliable**
- **PART 5: Lower latency**
- **PART 6: Multi-Link Operation / Devices (MLO/MLD)**
- **PART 7: QoS**
- **PART 8: Extras**

COURSE INFORMATION

Prerequisites: Understanding of all previous Wi-Fi technologies

Methodology: Instructor-led course,
PDF slides, interactive quizzes, support afterwards

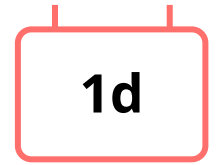
Course duration: half a day training / Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different
languages (English or Dutch)

Contact: training@excentis.com

[Info and registration](#)

Wi-Fi HANDS-ON



[Contact us](#)

OVERVIEW

Wi-Fi has become almost as essential as food, water and shelter. As many other technologies, also Wi-Fi gets improved all the time.

This hands-on workshop allows to have exclusive insights in Wi-Fi testing (stability, performance benchmarking, features) at Excentis Wi-Fi testing facilities.

This is a highly valued approach of learning everything that was discussed in theory in practice. It is ideally suited for everyone who previously followed a Wi-Fi training.

WHAT CAN YOU EXPECT?

- Take captures and analyze the Wi-Fi communication between AP's and clients
- Execute expert-led exercises such as validating airtime fairness, throughput, roaming, security, and other feature support.

COURSE CONTENTS

- **PART 1: ANALYSIS OF Wi-Fi CONNECTIONS**
- **PART 2: Wi-Fi TECHNOLOGY TESTING**
Airtime fairness · Throughput · Roaming · Security · Other feature support

COURSE INFORMATION

Prerequisites: Understanding of Wi-Fi

Methodology: Instructor-led course, support afterwards

Course duration: 1-day training/ Dates Mutually agreed

Public + In-company courses: At Excentis or on-site in different languages (English or Dutch)

Contact: training@excentis.com

[Contact us](#)

WORKSHOPS

[Contact us](#)

• OVERVIEW

- The workshops are based on a mutual predefined scope and time. The purpose is to have a custom workshop session with a group of people of the same company led by a subject expert. That way specific content can be discussed, or a more practical approach is possible. The workshops are still trainings but can be guided by the trainees, the workshops are however not intended as consultancy to solve individual problems.
- Example workshops that we currently offer are the ByteBlower, (Euro)DOCSIS, Wi-Fi and XRA-31 workshop. Workshops are always tailored on a specific demand and the content need to be agreed on prior to getting an individual offer.
- [Contact us for more information.](#)

• WHAT CAN YOU EXPECT?

- A subject expert leading an interactive training session
- Be able to ask all your questions within a predefined scope
- Ability to have hands-on using Excentis lab or your own lab setups

COURSE CONTENTS

EXAMPLE TOPICS (EURO)DOCSIS:

- PART 1: CMTS CLI CONFIGURATION AND FEEDBACK
- PART 2: MONITORING USING SNMP MIBs
- PART 3: CREATING A (EURO)DOCSIS HFC OR LAB NETWORK
- PART 4: ANALYSIS OF SPECTRUM AND MODULATION
- PART 5: SIMULATING CUSTOMER TRAFFIC USING THE BYTEBLOWER TRAFFIC GENERATOR/ANALYSER
- PART 6: CREATING A MODEM CONFIG FILE AND TESTING THE APPLIED SETTINGS
- PART 7: SETTING UP VOICE CALLS
- PART 8: TAKING RF CAPTURES AND ANALYSIS

EXAMPLE - DOCSIS 3.1 workshop for technicians

- Introduction to D3.1
- Understanding OFDM + DOCSIS 3.1 OFDM Numerology
- Profiles
- CM Initialization
- Operator specific config and measurement + monitoring tools

COURSE INFORMATION

Prerequisites: Depends on the topics of the workshop

Methodology: Instructor-led interactive training session

Course duration: Depends on the topics to cover / dates mutually agreed

Private training: At Excentis or on-site

For availability in different languages (English, German, French or Dutch) please contact training@excentis.com

Contact: training@excentis.com

[Contact us](#)

BYTEBLOWER WORKSHOP

[Contact Us](#)

• OVERVIEW

- ByteBlower is a TCP/IP traffic generator/analyzer tool to perform exhaustive tests on IP networks and networking equipment, either in a lab environment or in real-life networks.
- This 1-day workshop provides a detailed overview of ByteBlower. It covers the ByteBlower components, the flexibility of the GUI and the power of the API. The ByteBlower server, including the installation and update process, is also covered in detail.
- Target audience for this workshop are all users of the Excentis ByteBlower traffic generator.
- This workshop is only available when a company contracts to host it for a group of participants.

• WHAT CAN YOU EXPECT?

- Achieve a comprehensive understanding of ByteBlower, its components and software
- Get a grasp of the possibilities of ByteBlower
- An interactive workshop with examples, questions and answers

COURSE CONTENTS

- **PART 1: INTRODUCTION TO BYTEBLOWER**
Main concepts of ByteBlower and traffic testing
- **PART 2: THE BYTEBLOWER SERVER**
ByteBlower server, installation and update process
- **PART 3: THE BASICS OF THE BYTEBLOWER GUI**
First steps with the GUI: wizards, views, ...
- **PART 4: IPv4 TESTING USING THE BYTEBLOWER GUI**
Full possibilities of ByteBlower GUI for testing IPv4 networks (unicast, multicast, ...)
- **PART 5: IPv6 TESTING USING THE BYTEBLOWER GUI**
Full possibilities of ByteBlower GUI for testing IPv6 networks (unicast, multicast, ...)
- **PART 6: THE BYTEBLOWER COMMAND LINE INTERFACE**
Running tests without a graphical environment
- **PART 7: INTRODUCTION TO THE BYTEBLOWER TCL INTERFACE**
An initiation to automation and scripting using ByteBlower API

COURSE INFORMATION

Prerequisites: Ethernet, TCP/IP

Methodology: Instructor-led interactive training session

Course duration: 1 day / dates mutually agreed

Private training: At Excentis or on-site

For availability in different languages (English, German, French or Dutch) please contact training@excentis.com

Contact: training@excentis.com

[Info and registration](#)

COMPANY TAILORED TRAINING

[Contact Us](#)

• OVERVIEW

- Excentis also has experience in offering a company specific tailored training on topics related to cable network technologies and services, (Euro)DOCSIS, Wi-Fi.
- With such a customized training the content can be adapted to the specific network conditions, services, operations, monitoring, ... of the cable operator.

• WHAT CAN YOU EXPECT?

- Customized training content made together with the client
- Professional slide material

COURSE CONTENTS

Defined together with the client

EXAMPLE TOPIC:

Cable Technologies and services overview

- For a specific operator
- For administrative people
- For technicians
- For engineers
- For managers

COURSE INFORMATION

Prerequisites: Depends on the topics of the workshop

Methodology: Instructor-led interactive training session

Course duration: Depends on the topics to cover / dates mutually agreed

Private training: At Excentis or on-site

For availability in different languages (English, German, French or Dutch) please contact training@excentis.com

Contact: training@excentis.com

[Contact us](#)

The background features several overlapping circles in various shades of red and blue, creating a layered, abstract effect. The circles are semi-transparent, allowing the colors of the ones behind them to show through. The overall composition is centered and balanced.

Practicalities

E&CENTIS

Live Trainings

Location

On-site at your facilities

External facilities

Excentis offices

Public classes time schedule

Full day:	09h30 - 17h00	(09:30 a.m. until 5 p.m.)
Half day morning:	09h30 - 13h00	(09:30 a.m. until 1 p.m.)
Half day afternoon:	13h30 - 17h00	(1:30 p.m. until 5 p.m.)

On-demand sessions are bespoke.

Live Online Trainings

Timing

Trainings covering 1 or more days are split into two or four afternoon sessions with breaks

Public classes time schedule

Half day morning:	9h00– 12h30	(9:00 a.m. until 0:30 p.m.)
Half day afternoon:	13h15– 17h00	(1:15 p.m. until 5 p.m.)

On-demand sessions are bespoke.

Registrations

Individuals

Please register using the online registration forms on the [Excentis website](#).

Groups

A group quote can be requested or we can offer you a training campaign.

Contact training@excentis.com.

Languages

For availability in languages different from English, German, French or Dutch, please contact training@excentis.com.

⚠ Excentis needs **a minimum of four participants** for a session to take place.



**Questions or personal training
for you or your company?**

**We'd love to help,
(from) virtually anywhere on or off the planet.**

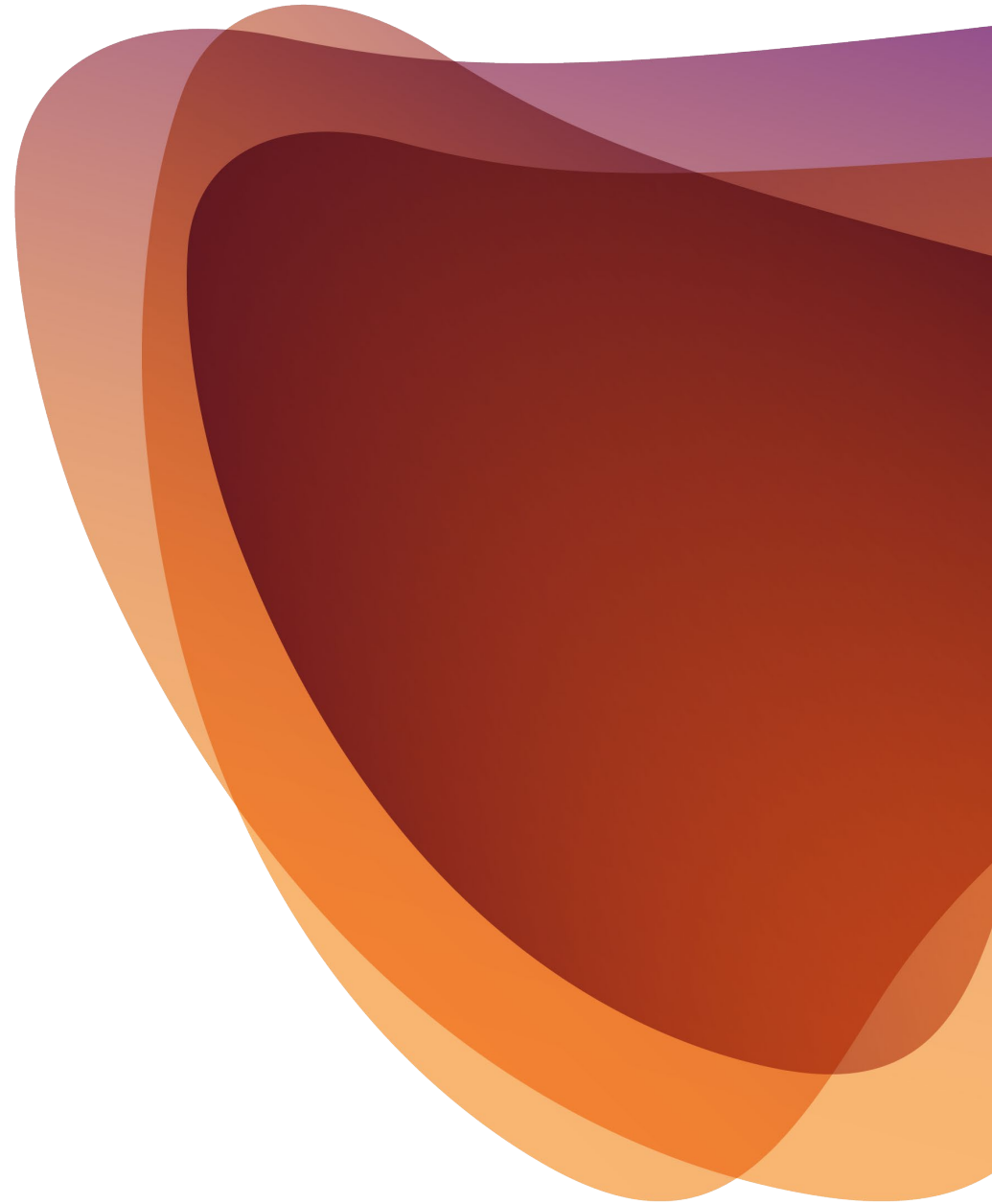
Contact us on:

training@excentis.com

+32 9 269 22 91

www.excentis.com · training@excentis.com

Version: January 2022 · training@excentis.com



A few kind quotes from participants

- *It was a great training course, as always! The trainers are skilled and know what they are talking about, thumbs up.*
- *Very knowledgeable trainer with strong communication skills who managed to keep the participants engaged throughout the training. Content and explanations well adopted to the knowledge of the participants. "*
- *First course I have what uses quizzes for feedback (both towards instructor as trainee), really liked it.*
- *The training course has given me the confidence I need to work further on this topic myself.*
- *This was one of the best training courses I've had so far. I was especially impressed by the level of knowledge of the trainer, no question was left unanswered. Looking forward to my next session from Excentis!*
- *Very good tempo, not boring, very interactive and inspiring with plenty of possibilities to ask for clarifications if needed.*
- *Come as a novice, leave as an expert!*
- *Good meaningful content, highly knowledgeable trainers & very well presented.*
- *You guys really know how to teach those complex techniques in an interesting manner in detail while the topics are still clearly described!*
- *And one of our favies:
The trainer was a true expert in the technology and has excellent communication skills.
All course attendees were highly impressed.*