



Very impressed with the material and methods. Looking forward to more Mpirical training in the future.



Watch our course intro video.

# Introduction to Telecommunications Networks

## Course Description

Today's telecommunications networks are complex mixtures of legacy technologies, coupled with the latest generation of both fixed and mobile architectures. This course seeks to provide a grounding to those people who are new to the telecoms industry, providing them with a foundation of knowledge which will allow them to explore the telecommunications ecosystem in greater detail. As such, the course is all encompassing, providing technical detail on fundamental concepts, network architectures and finally, today's services environment.

Throughout the course, NetX will be utilized to explore not only the components of a 21st century telecommunications network but also call flows and key network procedures.

**3**

**days**  
(LiveOnsite,  
LiveOnline)

**18**

**hours learning**  
(OnlineAnytime)

**18**

**CPD Learning  
Credits**



**Level: 2  
(Intermediate)**

**The first phase of the course will cover the fundamental concepts of telecommunications networks and will contain the following sections:**

## **1. Telecommunications Ecosystem**

### **Topic areas covered include:**

- The Telecommunications Ecosystem:
  - Factors Affecting the Telecoms Landscape.
  - The Role of Standardization.
  - Components of a Telecommunication Infrastructure.
- Transport and Transmission:
  - Traffic Types.
  - Physical Transmission.
  - Handling the Data.
- Fixed Access Network Technologies:
  - Twisted Pair.
  - Optical Fibre.
  - Hybrid Fibre Coax.
- Mobile Access Network Technologies:
  - Mobile Technology Roadmap.
- Core Network Concepts.
- Virtualization.
- Services Environment:
  - IoT and Cellular IoT.
  - Converged Services (IMS).
  - OTT Service Providers.
- Operational and Business Support Systems:
  - Operational Support Systems.
  - Business Support Systems.
  - Policy Control.

## **2. Legacy TDM Networks**

### **Topic areas covered include:**

- Principles and Origins of Circuit Switching.
- TDM and Voice Digitization:
  - Pulse Code Modulation.
  - TDM and PDH.
  - Higher Order Multiplexing.
  - Problems with the PDH.
- Optical Transmission Systems:
  - Optical Fibre.
  - Synchronous Digital Hierarchy.
  - Next Generation SDH.
- Understanding SS7:
  - SS7 Architecture.
  - SS7 Terminology.
  - Signalling Point Codes.
  - Signalling Links.
  - Signalling Route.
  - SS7 Protocols.

## **3. Today's Packet Transport Networks**

### **Topic areas covered include:**

- Protocol Stacks.
- Market Drivers for Packet Transport Networks:
  - Improving OPEX and CAPEX.
- IP Addressing and Routing:
  - IPv4 and IPv6 Addressing.

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Credits

  
LiveOnsite, LiveOnline,  
OnlineAnytime

## Today's Packet Transport Networks (cont.)

- Routing Basics.
- Routing Tables and Protocols.
- Advancing IP Networks:
  - Multi Protocol Label Switching.
  - Carrier Ethernet.
- Complimentary Protocols to Packet Transport:
  - Dynamic Host Configuration Protocol.
  - Domain Name System.
  - Network Address Translation.



## 4. Securing Packet Transport Networks

### Topic areas covered include:

- The Threat Climate:
  - Protecting the Network.
  - Data Protection.
- Exploring the Threats to Security:
  - The Global Cybercrime Industry.
  - Malicious Software.
  - Botnets.
  - Denial of Service.
  - Physical Insecurity.
- Protecting Data:
  - IPSec Fundamentals.
  - IPSec Basic Operation.
  - Public Key Infrastructure (X.509 Certificates).

**The second phase of the course will cover the end to end architecture of mobile and fixed telecommunications networks and will contain the following sections:**

## **5. Architecture of Fixed Line Networks**

### **Topic areas covered include:**

- Fixed Network Architecture – Voice Services:
  - PSTN Switches.
  - Evolution of the PSTN Switch.
  - Positioning Soft Switches.
- Fixed Network Architecture - DSL Services:
  - DSL Basics.
  - DSL Network Elements.
  - Fixed Line Billing.
- Consolidating Fixed Access Networks.
- Optical Fibre and FTTX:
  - FTTX.
  - Passive Optical Networks.
- Hybrid Fibre-Coaxial Networks.
- 5G Fixed Wireless Access.

## **6. Architecture of the Internet**

### **Topic areas covered include:**

- Internet Architecture:
  - Keeping the Internet Updated.
  - Peering and Internet Exchange Points.
  - Internet Standardization and Regulation.
- IP Addressing on the Internet:
  - IP Address Management.
  - Classless Interdomain Routing.
  - IPv6 Addressing.
  - 1.2.4 Port Allocations.
- The World Wide Web:
  - HTTP.
  - The Dark Web.
  - Tor Operation.

## **7. Architecture of Mobile Networks**

### **Topic areas covered include:**

- High Level Architecture.
- Mobile Radio Access Networks:
  - Mobile Devices.
  - SIMs, USIMs and eSIMs.
  - Sharing Radio Resources.
  - RAN Composition.
  - Dual Connectivity.
  - Virtualization in the RAN.
- Mobile Core Networks:
  - Mobility Management.
  - Session Management.
  - Subscriber Management.
- Network Connectivity:
  - 2G and 3G CS Architecture.
  - 2G and 3G PS Architecture.
  - 4G Architecture.
  - 5G Architecture.
  - Interworking.
- Complimentary Technologies:
  - IP Multimedia Subsystem.
  - Cellular IoT.
  - Wi-Fi Integration.



The third and final phase of the course will cover services deployed across telecommunications networks and will contain the following sections:

## 8. Evolution of Voice Services

### Topic areas covered include:

- Fixed Line Call Establishment:
  - Fixed Line (TDM) High Level Call Establishment.
  - Fixed Line (Packet) High Level Call Establishment.
- 2G/3G CS Mobile Call Establishment:
  - Initial Procedures.
  - 2G/3G CS Mobile Originated Call.
  - 2G/3G CS Terminated Call.
  - SMS Transfer.
  - 2G/3G Roaming Considerations (CS Services).
- 4G and 5G Voice Services:
  - Architectural Requirements.
  - VoLTE Initial Procedures.
  - IMS Registration.
  - 4G/5G Call Procedures.
  - SIP Signalling Exchange.
  - Tearing Down the Call.
- Interworking:
  - Interworking with Legacy Voice Networks.
  - Handing Over from 4G to 2G/3G (SR-VCC).
  - EPS Fallback.
  - Wi-Fi Calling (VoWi-Fi).

## 9. Connecting to Mobile Data Services

### Topic areas covered include:

- GPRS Based Data Services (2G and 3G):
  - The PDP Context.
- LTE Based Data Services:
  - PDN Connections and EPS Bearers.
- 5G Based Data Services:
  - PDU Sessions and QoS Flows.

## Connecting to Mobile Data Services (cont.)

- Mobility Concepts:
  - Location Areas, Routing Areas and Tracking Areas.
  - Handovers.
  - Roaming.

## 10. Mobility Concepts

### Topic areas covered include:

- Tracking a Subscriber's Location.
- 2G/3G Mobility Considerations:
  - 2G/3G CS and PS Cell Re-selection.
  - 2G/3G CS Handovers.
  - 3G Handover Types.
- 4G Mobility Considerations:
  - Tracking Area Updates.
  - 4G Handovers.
- 5G Mobility Considerations.

## 11. Over the Top (OTT) Services

### Topic areas covered include:

- Over the Top Services.
- Internet (OTT) Based Voice:
  - Skype.
  - Viber.
  - WebRTC.
- IPTV:
  - Service Provider TV Content Delivery.
  - OTT Content Delivery.
  - Netflix Case Study.
  - Video Streaming Techniques.



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# NetX

The Mpirical Network Visualisation Solution: **NetX Bringing Telecoms to Life!**  
Imagine the benefits of having an entire mobile network available from your desktop.

- Where you can view a complete network map.
- Watch call flows across the network.
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NetX does this... and even more with our NetX customization options!  
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+44(0)1524 844669



[enquiries@mpirical.com](mailto:enquiries@mpirical.com)

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