

Bluetooth – Operation, Procedures & Testing

Course Duration:

2 Days

Course Description:

- ▶ This unique course first explains the origins of Bluetooth and the business perspective of Bluetooth. The student obtains a detailed knowledge about the various sources and administratives for a successful Bluetooth implementation.
- ▶ The next part of the course is dedicated to the core specification of Bluetooth and a detailed consideration of the various parts of the Bluetooth protocol stack, including functions like pairing, security or power control.
- ▶ The course concludes with a consideration of the different Bluetooth profiles.

As in all INACON courses we integrated several interactive exercises for a perfect learning experience.

Pre-Requisites:

- ▶ Thorough knowledge about communications technology and basic knowledge about communications protocols is required.

Course Target:

- ▶ The student is enabled to implement the Bluetooth technology.
- ▶ The student will understand the implications and issues when integrating the Bluetooth Hard- and Software into other devices.

Some of your questions that will be answered:

- How does Bluetooth operate?
- What are the functions of the various layers of the Bluetooth Protocol Stack and which layers do I need to implement my feature set?
- How can I test my Bluetooth implementation and what will be tested?
- What performance can I expect at which layer?
- What is the Function of the various Bluetooth Profiles and which ones do I need to implement?

Who should attend this class ?

- Design Engineers who need to implement or test the Bluetooth technology.
- Engineers who shall develop and test Bluetooth applications.

Table of Contents:

Around the Bluetooth Specification

- **Administratives** / Introduction to Bluetooth, The ISM-Frequency Band and International Availability of Frequencies, The Special Interest Group (SIG)
- **Business Aspects of Bluetooth** / Targeted Applications, History & Future, Bluetooth 2.0, Market Analysis
- **The Bluetooth Qualification Program** / Functions of BQA, BQRB, BQB and BQTF, Interoperability Testing among Vendors, Important Links
- **Bluetooth vs. Alternative Technologies** / Bluetooth vs. 802.11, Bluetooth vs. IrDA, Bluetooth vs. Home RF

Comprehensive Introduction to Bluetooth Technology and Operation

- **Bluetooth Networking** / Ad Hoc Networking, Master <-> Slave Concept, Piconets and Scatternets
- **Introducing the Bluetooth Protocol Stack** / From the Physical Layer to the Application, Tasks and Functions of the Different Layers, The Protocol Stack with and without the Host Controller Interface, The Concept of Profiles in the Bluetooth Specifications
- **Overview of Bluetooth Operation** / Finding other Devices, Device Pairing, Service Discovery, Bluetooth Addressing, Asymmetric and Symmetric Performance

Baseband Processing in Bluetooth

- **Physical Characteristics of Bluetooth** / Modulation, Description of the Physical Channel, TDD- and TDM-Scheme, Slow Frequency Hopping in Bluetooth, Power Levels, Timing and Clocking (e.g. CLK_N and CLK_E)
- **Physical Links** / SCO (Synchronous Connection Oriented) and ACL (Asynchronous Connection-Less), The Bluetooth Packet Structure (Access Code, Header, Payload), Packet Types
- **Logical Channels** / LC-Channel (Link Control), LM-Channel (Link Manager), UA-Channel (User Asynchronous), UI-Channel (User Isochronous), US-Channel (User Synchronous)
- **The Data Processing Chain** / Voice Encoding, Encryption, Whitening and Channel Coding
- **The Generation of Hopping Sequences** / Paging & Inquiries, Page Response & Inquiry Response, Page Scan & Inquiry Scan, during a Connection

Higher Layers of the Bluetooth Protocol Stack

- **LC and LM (Link Controller and Link Manager)** / Control Functions of the LC, Network Establishment, Link Configuration, Control of Low-Power Modes (Hold, Sniff, Park), Audio Codecs for Bluetooth, Authentication Functions, Encryption in Bluetooth (SAFER+), The Bluetooth Test Mode and Tests
- **HCI (Host Controller Interface)** / Tasks and Functions of the HCI, HCI-Commands and Packets, HCI over USB, HCI over UART, HCI over RS 232, Flow Control
- **L2CAP (Logical Link Control And Adaptation Protocol)** / Multiplexing Support in L2CAP, Segmentation and De-Segmentation, QoS-Support, L2CAP-Signaling Format and Message Exchange
- **SDP (Service Discovery Protocol)** / Tasks and Functions, Data Representation, PDU-Format, Service Records and Service Attributes

Interfacing to the Application Layer

- **RFCOMM (RS-232 Cable Emulation)** / Specifics of Serial Ports and Serial Port Emulation, Frame Types and Structure in RFCOMM, Connection Establishment and Release, RFCOMM-Link Control through Multiplexor Frames
- **OBEX (Object Exchange)** / Similarity with IrDA, Object Model, OBEX-Packet Structure, OBEX-Operations, OBEX Session Management.
- **TCS (Telephone Control part Specification)** / Tasks and Functions, Signaling Format (Q.931), Call Establishment Signaling

The Bluetooth Profiles

- **Overview of the Bluetooth Profiles** / Tasks and Functions of the different Profiles
- **Detailed Consideration of GAP (Generic Access Profile)** / Feature and Parameter Definitions
- **Detailed Consideration of the Serial Port Profile** / Feature and Parameter Definitions
- **Detailed Consideration of the Headset Profile** / Feature and Parameter Definitions