

# MikroTik MTCEWE Training Course



**Duration:** 3 days

**Outcomes:** By the end of this training session, the student will be able to understand major RouterOS Enterprise WiFi features, how WiFi works and implement CAPsMAN into real life WiFi setups.

**Target audience:** Network engineers and technicians wanting to deploy and support: Corporate WiFi networks based on MikroTik Controlled Access Point system Manager (CAPsMAN). Simple Layer 2 wireless bridges using MikroTik 60GHz. Wireless Wire Technology.

**Course prerequisites:** MTCNA certificate

## Module 1: Introduction to Wireless Networking

This module offers an introduction to the world of wireless networking, focusing on:

- The basics of wireless routers.

- RouterBOARD hardware that comes with integrated wireless capabilities.

- The variety of MikroTik wireless cards available.

- The module wraps up with a hands-on laboratory session, allowing participants to apply the concepts learned.

## Module 2: RF Wireless Fundamentals

Explore the characteristics of RF (Radio Frequency) wireless communication, including:

- An overview of the RF radio spectrum and electromagnetic energy.

- Understanding decibels in the context of wireless communication.

- Antenna theory, including isotropic, directional, and omnidirectional antennas, and the concept of antenna polarization.

- The initial setup for class practicals.

- How attenuation/absorption and reflection of building materials impact radio signals.

- Planning for 2.4/5GHz indoor/outdoor coverage, including cell sizes and transmitter power considerations.

- The dynamics of client roaming and RouterOS station roaming configurations.

- Addressing co-channel and adjacent-channel interference.

- Strategies for optimal access point placement.

- Insights into the physical network infrastructure and the significance of 'Airtime'.

- The module concludes with a practical laboratory session to reinforce learning.

## Module 3: Wireless Standards and Technologies

Dive into the technicalities of wireless standards and technologies, covering:

- An overview of 802.11a/b/g/n/ac wireless protocols and their features.

- Understanding bands, channels, and channel widths.

- The importance of scan lists.

- Modulation schemes and MCS (Modulation and Coding Scheme) data rates.

- The concepts of channel bonding and frame aggregation.

- An introduction to wireless chains (SISO, MIMO, and MU-MIMO).

- The basics of CSMA/CA and hardware protection mechanisms (RTS/CTS).

- Quality of Service priorities and WMM® (Wi-Fi Multimedia).

- A look into future standards like 802.11ax.

- This module includes a laboratory session for hands-on practice.



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## Module 4: Country/Regulatory Domain Settings in CAPsMAN

This module focuses on compliance with country-specific regulations within CAPsMAN (Controlled Access Point system Manager), including:

Managing antenna gain and controlling maximum EIRP (Effective Isotropic Radiated Power).

How to set antenna gain on CAP (Controlled Access Point).

Selecting the correct country code and understanding the purpose of the 'installation' setting.

Implementing Dynamic Frequency Selection (DFS) for radar detection.

The module is rounded off with a laboratory session to apply these settings in a practical environment.

## Module 5: Alternative Wireless Configurations Beyond CAPsMAN

This module explores wireless network expansion and bridging solutions outside of the CAPsMAN framework:

Techniques for extending network coverage using repeaters and extenders.

Utilising MikroTik's 60GHz Wireless Wire products for efficient network bridging.

The session concludes with a practical laboratory to apply these concepts.

## Module 6: Enhancing Wireless Security

Delve into the critical aspects of wireless security, including:

Different authentication methods such as Open and Shared.

Encryption technologies including WEP, WPA™ TKIP, and WPA2™ AES, and the vulnerabilities associated with older encryption methods like WEP and WPA™ TKIP.

An introduction to 802.11X, including RADIUS and EAP protocols.

The performance implications of using TKIP versus AES encryption.

Basic Access Control List (ACL) management for user access.

Strategies to mitigate the most common vulnerabilities in 802.11 networks.

This module features a laboratory session for hands-on security configuration and analysis.

## Module 7: Wireless Network Troubleshooting

This module is focused on identifying and resolving common wireless network issues:

Techniques for troubleshooting wireless clients.

Analyzing the registration table for connectivity issues.

Understanding and measuring TX/RX signal strength and signal-to-noise ratio.

Evaluating connection quality through CCQ, frames, HW frames, and hardware retries.

Diagnosing issues related to data rates.

Using system logs to troubleshoot wireless problems.

Employing scan and background scan for network optimization.

Analyzing frequency usage and employing tools like wireless snoopers and sniffers for in-depth network analysis.

A laboratory session is included to practice troubleshooting techniques.



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## Module 8: Conducting Wireless Surveys

This module covers the essentials of wireless network planning and validation:

Conducting pre-installation site surveys for optimal network design.

An overview of spectrum analysis for identifying interference sources.

Introduction to prediction software for network planning.

Performing post-installation validation surveys to ensure network performance meets expectations.

The module wraps up with a laboratory session, offering hands-on experience in conducting wireless surveys.

## Module 9: Advanced CAPsMAN v2 Configuration

Explore the advanced capabilities and configurations of MikroTik's CAPsMAN version 2:

Overview of CAPsMAN v2 features and enhancements.

Requirements for CAP devices in terms of hardware and software.

Understanding CAP communication methods: Layer 2 (broadcast/multicast) versus Layer 3 (via UDP).

Implementing DHCP option 138 for CAPs management.

Detailed process for configuring a CAP device.

Mechanisms for CAPsMAN discovery and CAP selection.

Enhancing security with SSL certificates for authentication and automatic locking.

Utilizing the auto-upgrade feature for CAP devices.

Techniques for securing CAP configurations effectively.

Configuring CAPsMAN with specific settings including channels, datapaths, security protocols, and data rates.

Provisioning interfaces on CAPs for both single and dual-band access points.

Managing datapaths and local forwarding options.

Differentiating between dynamic and static CAP interfaces in a CAPsMAN environment.

Setting up Virtual APs for additional SSIDs and configuring static interfaces on CAPs with VLAN support.

Utilizing access list features for enhanced network control.

The module concludes with a practical laboratory session, allowing for hands-on experience in configuring and managing a CAPsMAN v2 network environment.

**Still Have a MikroTik Training Question?**

**Call Our Team on 01449 888000**

