

Duration: 4 Days ( 30 Hours)  
Course Code: DEC80211

**Overview:**

Linux® Wireless (DEC80211) teaches experienced C programmers already familiar with the Linux kernel architecture and Module programming skills and strategies they need to understand Linux Wireless Networking subsystem and Wifi Driver development.

**Target Audience:**

Experienced C programmers with a good understanding of the Linux kernel who want to learn how to develop wifi device drivers for linux system and maintain protocol stack or Who wants understand whole data flow in networking and wireless subsystem.

**Objectives:**

- Introduction and Review of Kernel Programming
- Module programming
- Network Basics
- WLAN Basics
- WIFI Standards
- Protocol Layers
- PCI , USB Based Devices
- User to Kernel Interaction
- User space wifi applications
- CFG80211, MAC80211
- WIFI Hardware (Chipsets basics)

**Prerequisites:**

- Experience in C programming
- Knowledge of Linux Kernel Internals or Equivalent

## WiFi – 802.11

<p><b>Introduction to Linux Kernel</b></p> <ul style="list-style-type: none"> <li>What is a Linux Kernel?</li> <li>Kernel Programming</li> <li>Module Programming</li> </ul> <p><b>Network and WiFi Basics</b></p> <ul style="list-style-type: none"> <li>What is network</li> <li>Linux Network Subsystem</li> <li>802 standard</li> <li>WLAN network topology</li> <li>Infrastructure Mode</li> <li>Repeater Mode</li> <li>Bridge Mode</li> <li>Ad-hoc Mode</li> <li>Channel scanning and synchronization</li> <li>Passive Scan</li> <li>Active Scan</li> <li>Authentication and association</li> <li>Open Authentication</li> <li>Shared Key Authentication</li> <li>Data transfer mechanism</li> </ul> <p><b>802.3 Standard</b></p> <ul style="list-style-type: none"> <li>802.3 standards</li> <li>Some details</li> </ul> <p><b>Wireless Standards</b></p> <ul style="list-style-type: none"> <li>802.11 standards</li> <li>802.15 standards</li> <li>802.16 standards</li> <li>etc</li> </ul> <p><b>WLAN and WiFi</b></p> <ul style="list-style-type: none"> <li>Difference between WLAN and WiFi</li> <li>Examples</li> </ul> <p><b>Networking Device</b></p> <ul style="list-style-type: none"> <li>NIC Card, WiFi cards, Routes, Bridges, Repeaters, Switches etc</li> </ul> <p><b>Network Topology</b></p> <ul style="list-style-type: none"> <li>Mesh, star etc</li> </ul> <p><b>WiFi Device</b></p> <ul style="list-style-type: none"> <li>Chipset</li> <li>Details</li> </ul> <p><b>WiFi Standards</b></p> <ul style="list-style-type: none"> <li>802.11</li> <li>Terms used BSS, iBSS, SSID, ESSID, BSSID Stations, Clusters, Access Point, ESS etc</li> </ul> <p><b>Wifi User space application</b></p> <ul style="list-style-type: none"> <li>wpa_supplicant</li> <li>wicd</li> <li>connman</li> <li>hostapd</li> <li>NetworkMangers</li> <li>nm_cli</li> <li>wpa_cli</li> <li>ip</li> <li>ifconfig</li> <li>iwconfig</li> <li>ifup/ifdown</li> <li>route</li> <li>arp</li> <li>iptunnel</li> <li>ipmaddr</li> </ul>	<p><b>Protocol Architecture</b></p> <ul style="list-style-type: none"> <li>OSI Model</li> <li>The Physical Medium Dependent Layer</li> <li>The Data Link Layer</li> <li>The Network Layer</li> <li>The Transport Layer</li> </ul> <p><b>802.11 PHY</b></p> <ul style="list-style-type: none"> <li>802.11</li> <li>802.11 a/b/g/n/ac etc</li> <li>Comparisons</li> <li>Radio channels and frequencies</li> <li>Frequency Channel Allocation for 802.11a/b/g</li> <li>Modulation technologies</li> <li>Direct Sequence Spread Spectrum</li> <li>Orthogonal Frequency Division Multiplexing (OFDM)</li> <li>MSDU</li> <li>MPDU</li> <li>PSDU</li> <li>PPDU</li> <li>LLC</li> <li>MAC</li> <li>PLCP</li> <li>PMD</li> <li>MLME</li> </ul> <p><b>802.11 MAC</b></p> <ul style="list-style-type: none"> <li>Access</li> <li>Management Frame</li> <li>Beacon</li> <li>Probe request</li> <li>Probe response</li> <li>Authentication</li> <li>De-Authentication</li> <li>Association Request</li> <li>Association Response</li> <li>Disassociation</li> <li>Re-Association Request</li> <li>Re-Association Response</li> <li>Control Frames</li> <li>Control Wrapper</li> <li>Acknowledge (ACK)</li> <li>Request to Send (RTS)</li> <li>Clear to Send (CTS)</li> <li>Data Frames</li> <li>Data frame formats</li> <li>Details</li> </ul> <p><b>802.11 Details</b></p> <ul style="list-style-type: none"> <li>802.11</li> <li>802.11 b</li> <li>802.11 a</li> <li>802.11 g</li> <li>802.11 n</li> <li>802.11 ac</li> </ul>	<p><b>Security Protocols in WLANs</b></p> <ul style="list-style-type: none"> <li>Common WLAN Attacks</li> <li>Passive Attacks: eavesdropping</li> <li>PHY Layer attacks: RF Jamming</li> <li>Active Attacks: hacking</li> <li>WLAN Security Solutions</li> <li>WEP-SharedKey</li> <li>WPA-PSK</li> <li>WPA-Open</li> <li>Server Based Authentication</li> <li>Server-based security: 802.1x / 802.11i</li> </ul> <p><b>User to Kernel interface</b></p> <ul style="list-style-type: none"> <li>system calls</li> <li>netlink</li> <li>etc</li> </ul> <p><b>Linux Kernel Side</b></p> <ul style="list-style-type: none"> <li>nl80211</li> <li>cfg80211 subsystem</li> <li>mac80211 subsystem</li> </ul> <p><b>Wifi Drivers</b></p> <ul style="list-style-type: none"> <li>Coding</li> <li>Details</li> </ul> <p><b>Wifi Hardware</b></p> <ul style="list-style-type: none"> <li>Chipsets</li> </ul> <p><b>WIFI flow</b></p> <ul style="list-style-type: none"> <li>Data Path</li> <li>Control Path</li> </ul> <p><b>Source Code Analysis</b></p> <ul style="list-style-type: none"> <li>Driver source</li> <li>PCIe, USB based</li> </ul> <p><b>Administration**</b></p> <ul style="list-style-type: none"> <li>Commands</li> <li>Configurations</li> <li>Setups AP, stations</li> </ul> <p><b>Testing **</b></p> <ul style="list-style-type: none"> <li>How to</li> <li>Tools in market</li> <li>wireshark</li> </ul> <p><b>Case Study**</b></p> <ul style="list-style-type: none"> <li>Coding</li> <li>Details</li> </ul> <p><b>More on WIFI**</b></p> <ul style="list-style-type: none"> <li>Coding</li> <li>Load Balancing and Rate Adaptation – Load Balancing – Rate Adaptation (dynamic rate shifting)</li> <li>Power Management</li> <li>Roaming</li> <li>Quality of Service</li> <li>The next-generation WLAN</li> </ul>
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