Wireless networks

Seminar of 3 days - 21h
Ref.: RSW - Price 2024: €2 750 (excl. taxes)

THE PROGRAMME

last updated: 01/2018

1) Principles of wireless networks
- Introduction to wireless networks.
- Fixed networks vs Wireless networks. Different generations.
- WPAN, WLAN, WMAN, WRAN networks.
- Caracteristics and theoretical performances.
- Handover and integration of the different solutions.
- Wireless networks for businesses.
- Troughputs needed. Available applications. Home, Office and Business networks.
- ISP Wi-Fi « Hot spots ».
- Wi-Fi. Advantages of wireless technologies.
- The Wi-Fi issues for ISPs.
- Handovers.
- Mobility issues. Different types of handovers.
- Integration within mobile networks.

2) Bluetooth, UWB, ZigBee and IEEE 802.15 networks.
- The IEEE 802.15 standard, the UWB, ZigBee and Bluetooth technologies.
- The 802.15.1 standard and bluetooth.
- IEEE 802.15.3. Very high trhoughput technology UWB.
- Wimedia consortium and WUSB.
- IEEE 802.15.4 and ZigBee products.
- Personal networks technologies.

3) Personal networks technologies
- WiFi (IEEE 802.11b/g).
- A massive success. Specifications.
- Wi-Fi devices : cards and access points.
- MAC layer : CSMA/CA. Frequency bands.
- Ethernet integration. Trhoughputs and performances.
- Medium Access technologies.
- Quality of Service and IEEE 802.11e.
- Voice encoding and audio « streams ».
- Wireless controlers and switches.
- Wi-Fi engineering and managment.
- Future of IEEE 802.11b with 802.11n and MIMO.
- Deployment of a Wi-Fi network.
- Constraints. Devices. Cost. Configuration.

4) Mesh-networks and ad-hoc networks
- Definition of a mesh-network and ad-hoc network.
- Mesh-networks routing.
- Different routing protocols : pro-actives (OLSR, DSDV) and reactives (AODV, DSR).

- Security and QoS in ad-hoc networks.

5) IEEE 802.16 standard and IEEE 802.16 standard
- Definition of the Wireless Local Lopp and WDSL access (Wireless DSL).
- WDSL vs fixed networks.
- Technologies and frequencies available.
- WiMAX. Theoretical performances.
- IEEE 802.16 standard. Mobile WiMAX.

6) The other solutions
- The new genration of regional wireless networks.
- Usage of the UHF/VHF bands and IEEE 802.22.
- Cognitive radio. Interactive radio.
- A unified network with wireless networks.
- IEEE 802.21 and the vertical handover.
- Continuity of service and a wireless Internet.

7) Protocols and applications of wireless networks
- The IP environment. The slow-start and buffer-bloat issues.
- MIMO technologies and the increase of the trhoughput.
- Home networks : UPnP and DLNA.
- Applications : voice, production, P2P...
- Pervasive Internet
- Developments. Internet city. Integration with the new IP generation.
- Sensors networks. Dust networks.

8) 3G vs WLAN
- 3GPP/3GPP2 vs Wi-xx.
- Comparison with UMTS.
- Fourth generation of mobile networks and UMA/IMS integration.

9) Wi-Fi security
- Weaknesses by design of wireless networks.
- Protection against Denial of Service possible ? How to control the radio coverage ?
- SSID and security issue.
- Attacks : Man-in-the-middle, ARP spoofing.
- Weaknesses of the authentication solutions.
- Elementary techniques based on SSID and MAC filtering.
- Interests and limits. Risks of the beacon frame usage and ssid probe request.
- Example of attacks : SSID brute forcing....
- Wired Equivalent Privacy – WEP
- Features. Key exchange. Authentication and encryption. Popular attacks. Demonstrations.
- WiFi Protected Access – WPA. Features. Advantages of WPA over WEP.
- Extensible Authentication Protocol – EAP. Temporal Key Integrity Protocol – TKIP.
- Message Integrity Check – MIC. WPA v2 and the 802.11i standard.

10) ILAN and WAN interconnexion
- Radio coverage control.
- Network separaton.
- Firewall and DMZ.
- End-user device protection.
- Mobile users, VPN and wireless networks.

DATES

REMOTE CLASS
2025 : 10 Jun, 18 Nov