Introduction to Wireless Networks

Syllabus

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課程內容大綱

Chapter 1: *Introduction to Wireless Local Area Networks*
Chapter 2: *Introduction to IEEE 802.11*
Chapter 3: *Introduction to Bluetooth*
Chapter 4: *Introduction to GSM*
Chapter 5: *Introduction to 2.5G (GPRS)*
Chapter 6: *Introduction to 3G (WCDMA)*
Chapter 7: *Introduction to 4G and ALL-IP Networks*
Chapter 8: *Introduction to Mobile Ad Hoc Networks*
Chapter 9: *Introduction to Wireless Sensor Networks*
Chapter 10: *Introduction to WiMax (IEEE 802.16)*
Chapter 11: *Introduction to IEEE 802.22*
Chapter 12: *Introduction to Mobility Issues*
Fourth-generation wireless technologies

Figure 1.2 – The envisioned communication puzzle of 4G and beyond
The Communication Puzzle

Fourth-generation wireless technologies include

- Wireless Personal Area Networks
  - Wireless PANs or WPANs
- Wireless Local Area Networks
  - Wireless LANs or WLANs
- Wireless Metropolitan Area Networks
  - Wireless MANs or WMANs
- Wireless Regional Area Networks
  - Wireless RANs or WRAN
- Cellular wide area network
- Satellite network
The scope of various wireless technologies

Figure 1.3 – The scope of various wireless technologies
Wireless systems: overview of the development

**cellular phones**
- 1981: NMT 450
- 1986: NMT 900
- 1992: GSM
- 1994: DCS 1800
- 1991: CDMA
- 1991: D-AMPS
- 1993: PDC
- 2000: GPRS
- 2001: IMT-2000

**satellites**
- 1982: Inmarsat-A
- 1988: Inmarsat-C
- 1992: Inmarsat-B
- 1992: Inmarsat-M
- 1998: Iridium

**cordless phones**
- 1980: CT0
- 1984: CT1
- 1987: CT1+
- 1989: CT 2
- 1991: DECT
- 199x: proprietary
- 1997: IEEE 802.11
- 1999: 802.11b, Bluetooth
- 2000: IEEE 802.11a
- 2007: Fourth Generation (Internet based)

**wireless LAN**
- 1980: CT0
- 1984: CT1
- 1987: CT1+
- 1989: CT 2
- 1991: DECT
- 1999: proprietary
- 1997: IEEE 802.11
- 1999: 802.11b, Bluetooth
- 2000: IEEE 802.11a

4G – fourth generation: when and how?
Chapter 1: Introduction to Wireless Local Area Networks

infrastructure network

AP: Access Point

wired network

AP: Access Point
Chapter 2: **Introduction to IEEE 802.11**

[Diagram showing the Distribution System with BSS1, BSS2, STA1, STA2, STA3, and Portal]
Chapter 3: Introduction to Bluetooth

Bluetooth Network

- Piconet
- Scatternet

How to jump efficiently between piconets?
Delay sensitive applications?
Development of mobile telecommunication systems

1G 2G 3G 2.5G

CT0/1 AMPS NMT
CT2
IS-136 TDMA D-AMPS
GSM PDC
IMT-FT DECT
IMT-DS UTRA FDD / W-CDMA
IMT-TC UTRA TDD / TD-CDMA
IMT-MC 1X EV-DO
IMT-SC IS-136HS UWC-136
CDMA
IS-95 cdmaOne cdma2000 1X
IMT-MC 1X EV-DO (3X)
1X EV-DV
0.10

NTFU, Department of Computer Science and Information Engineering
Chapter 4: Introduction to GSM

NSS with OSS

NSS with OSS

OMC, EIR, AUC

OMC, EIR, AUC

VLR

VLR

MSC

MSC

HLR

HLR

GMSC

GMSC

fixed network

RSS

RSS

BSC

BSC

BSC

BSC

BSC

BSC
Chapter 5: *Introduction to 2.5G (GPRS)*
Chapter 6: *Introduction to 3G (WCDMA)*

![Diagram of 3G WCDMA domains]
UTRAN comprises several RNSs.
Node B can support FDD or TDD or both.
RNC is responsible for handover decisions requiring signaling to the UE.
Cell offers FDD or TDD.

RNC: Radio Network Controller
RNS: Radio Network Subsystem
Chapter 7: Introduction to 4G and ALL-IP Networks
Chapter 8: Introduction to Mobile Ad Hoc Networks

ad-hoc network
Chapter 9: Introduction to Wireless Sensor Networks

Example of Wireless Bio-Sensor
Chapter 10: Introduction to WiMax (IEEE 802.16)

IEEE 802.16, WiMAX WMAN Resource Center - Microsoft Internet Explorer

Welcome to our new section on IEEE 802.16 - the IEEE Standard for Wireless Metropolitan Area Networks (MANs), also known as WiMAX and WirelessMAN.

IEEE 802.16 is working group number 16 of IEEE 802, specialising in point-to-multipoint broadband wireless access.

WiMAX is an acronym that stands for Worldwide Interoperability for Microwave Access.

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Chapter 11: Introduction to IEEE 802.22

IEEE 802 LAN/MAN Standards Committee
802.22 WG on WRANs (Wireless Regional Area Networks)

Introduction

The charter of IEEE 802.22, the Working Group on Wireless Regional Area Networks ("WRANs"), under the PAR approved by the IEEE-SA Standards Board is to develop a standard for a cognitive radio-based PHY/MAC/air_interface for use by license-exempt devices on a non-interfering basis in spectrum that is allocated to the TV Broadcast Service.

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Chapter 12: Introduction to Mobility Issues

integration of heterogeneous fixed and mobile networks with varying transmission characteristics
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