

Current Trends in Wireless Networking

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Agenda

- Trends
- Existing Wireless Standards
 - WRAN
 - WMAN
 - WLAN
 - WPAN
- References

Some Advertisements



BSNL 3G
A generation ahead

Get ready for a faster life
BSNL presents 3G

Mobile Broadband Jump on any moment

Vodafone Mobile Broadband can open a world of opportunity in an instant. With a range of products that are just right for the way you work and play, you'll be ready to make the most of your time.

Reliance Netconnect Broadband+

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Pay Rs. 3500/- to get USB Modem & 2 months of unlimited internet usage worth Rs. 3500/- FREE

Offer valid for 1st 1Lakh Customers

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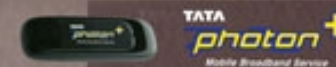
RELIANCE
Netconnect

Broadband+

I CARRY SPEED.

Presenting Photon Plus
Mobile Broadband Service

- Internet speeds up to 3.1mbps
- 20 times faster than current wireless technology

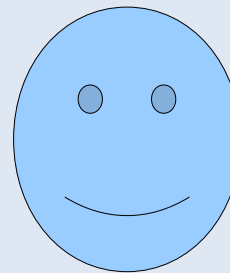


Call: 9220012345 for free demo

What does they offer?

- Faster Access
- Mobile TV
- Video Calls
- Video Conferencing
- Online Gaming

**Major Share of telecom
Industry is coming from
Wireless!**



Scope of Wireless Technologies

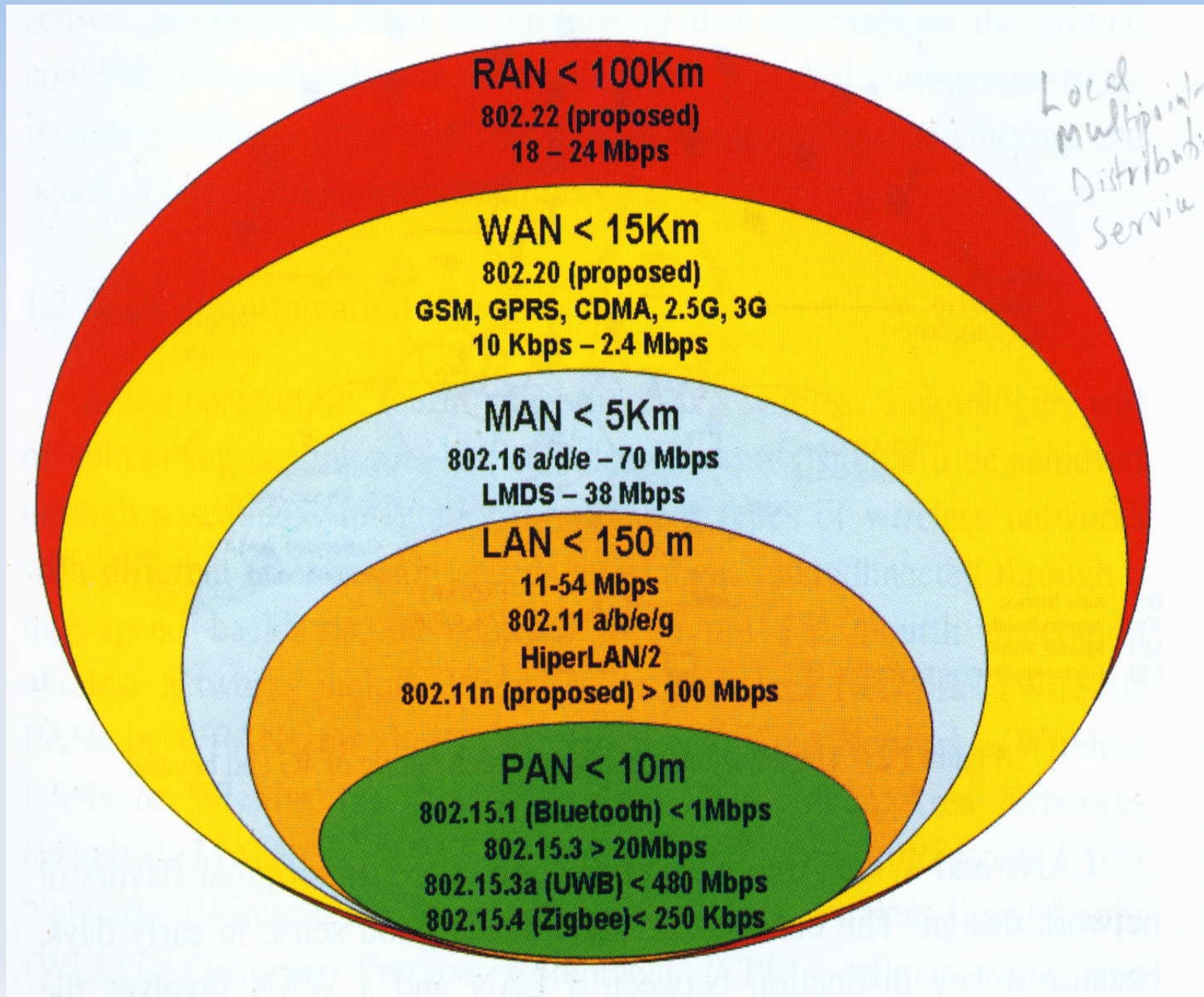
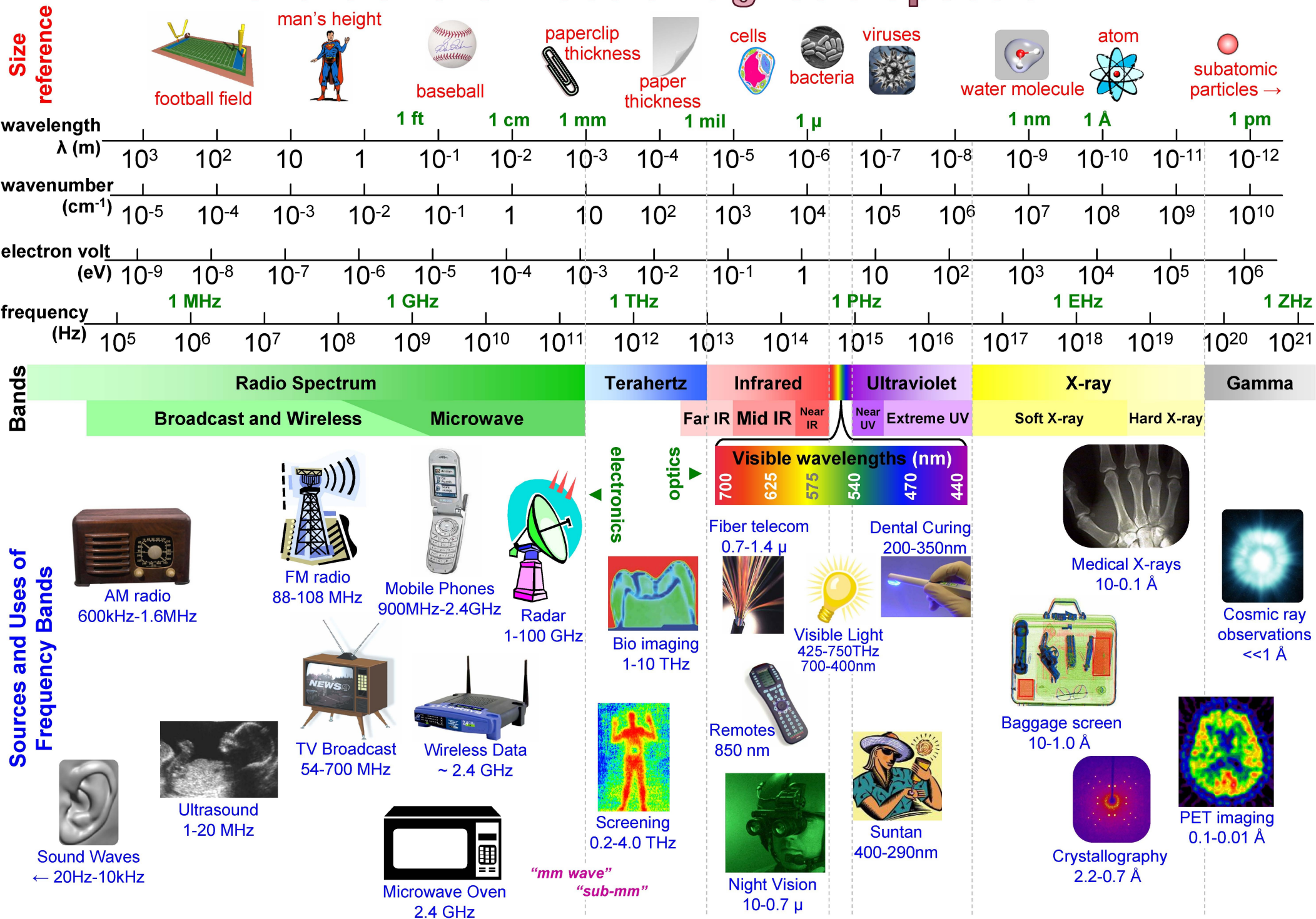


Chart of the Electromagnetic Spectrum



$$\lambda = 3 \times 10^8 / \text{freq} = 1 / (\text{wn} * 100) = 1.24 \times 10^{-6} / \text{eV}$$

Radio Services in India

Ref: <http://www.wpc.dot.gov.in>

<u>Sr. Radio Service</u>	<u>Frequency Band</u>
<u>1 Radio Navigation</u>	<u>9 – 14 kHz</u>
<u>2 Mobile (Distress & Calling)</u>	<u>495 – 505 kHz</u>
<u>3 Broadcasting</u>	<u>535 – 1605.5 kHz</u>
<u>4 Maritime Mobile</u>	<u>2065 – 2107 kHz</u> <u>2170 – 2178.5 kHz</u> <u>2190.5 – 2194 kHz</u>
<u>5 Fixed, Mobile, Broadcasting Radio Astronomy</u>	<u>610 – 806 MHz</u>
<u>6 Mobile, Fixed, Broadcasting</u>	<u>890 960 MHz</u>
<u>7 Mobile satellite</u>	<u>942 – 960 MHz</u>
<u>8 Radio Location</u>	<u>1350 – 1400 MHz</u>
<u>9 Mobile, Fixed, Space operation, space research</u>	<u>1710 – 1930 MHz</u>

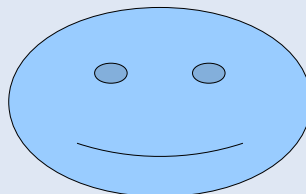
FCC (Federal Communications Commission) , ITU (International Telecommunication Union) are the international bodies for spectrum allocation

GSM

- Mobile telephone service providers in India use GSM and CDMA technologies
- 25 MHz spectrum in 900 MHz band (890 – 915 / 935 – 960 MHz) and
- 75 MHz in the 1800 MHz band (1710 – 1785 / 1805 – 1880 MHz) is earmarked for GSM services
- Spectrum for the **3G services** (voice, data and video) is 2.1 GHz (1920 – 1980 / 2110 – 2170 MHz) band

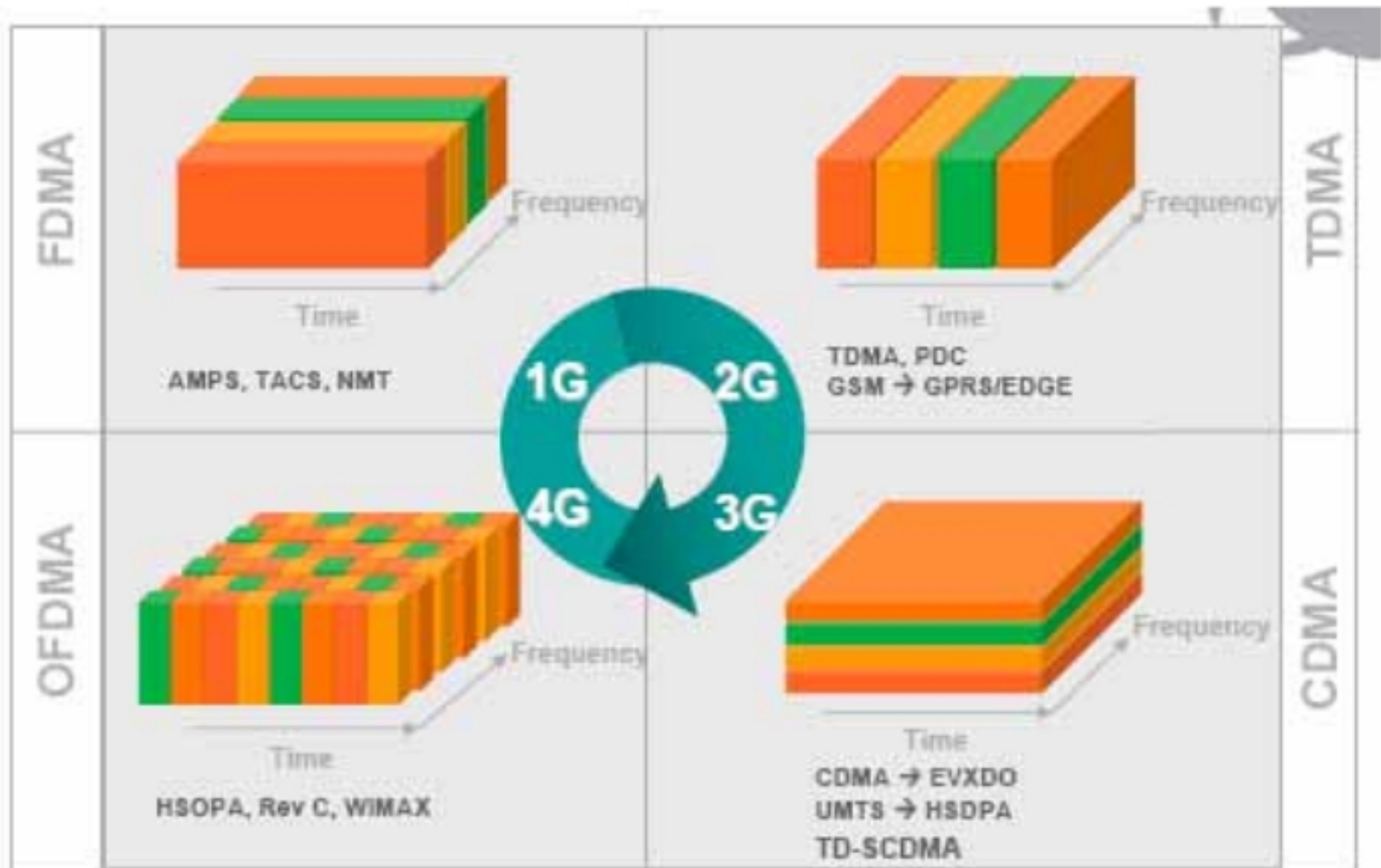
CDMA

- CDMA services, 20 MHz spectrum in the 800 MHz band (824 – 844 / 869 – 889 MHz) is available

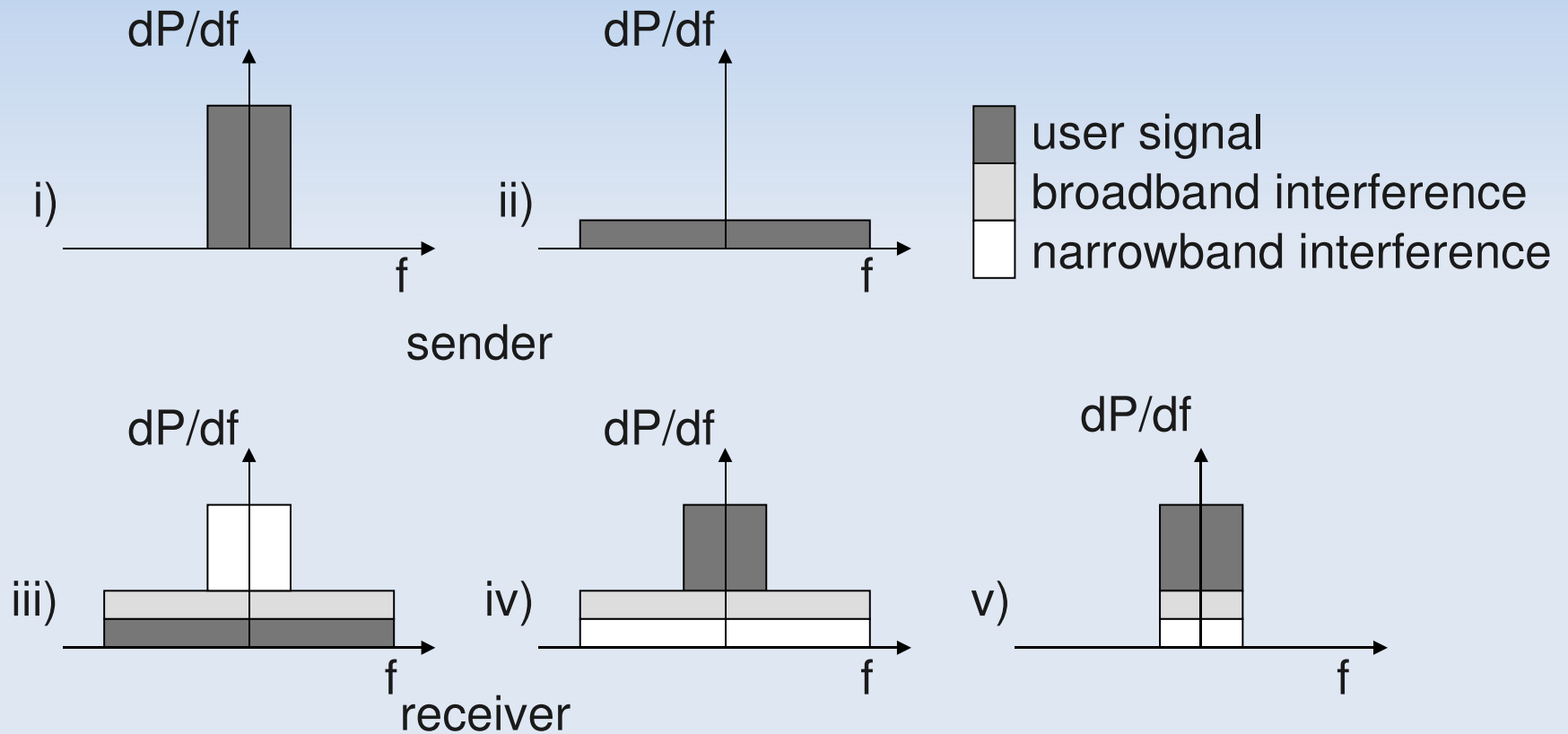


**Spectrum
allotment is
through
e-auction**

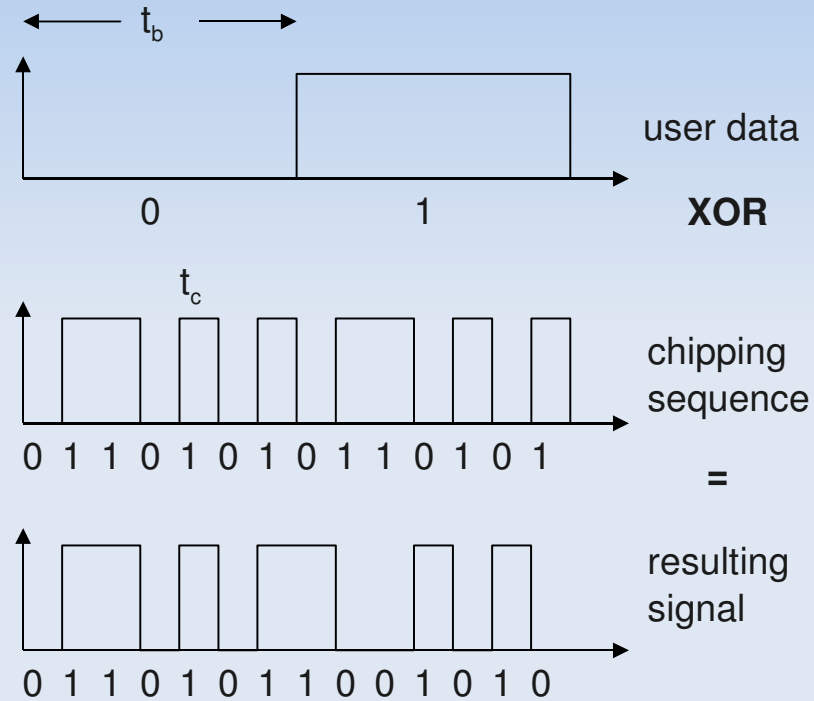
Multiple Access Methods



Spread Spectrum

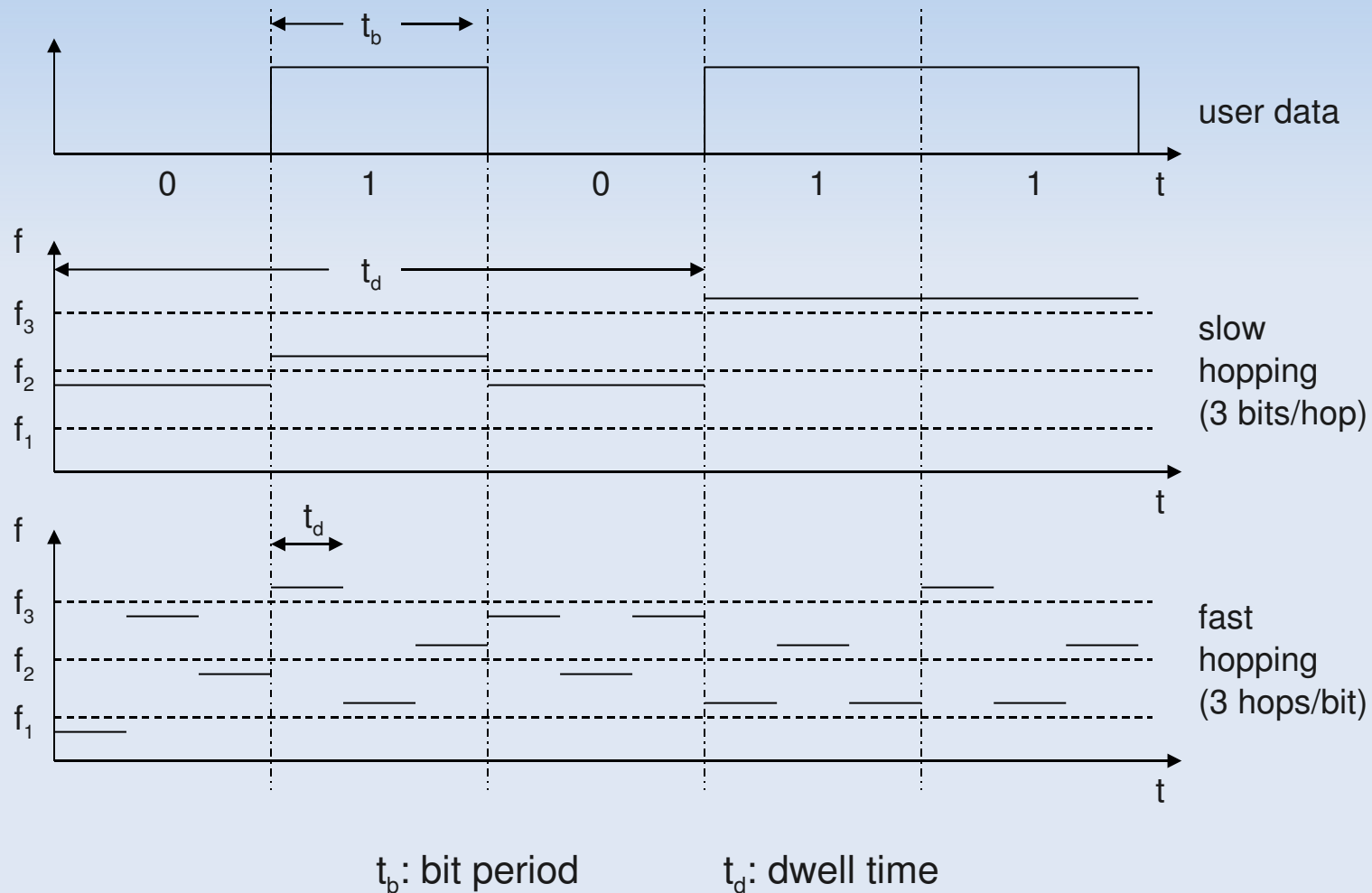


Direct Sequence Spread Spectrum



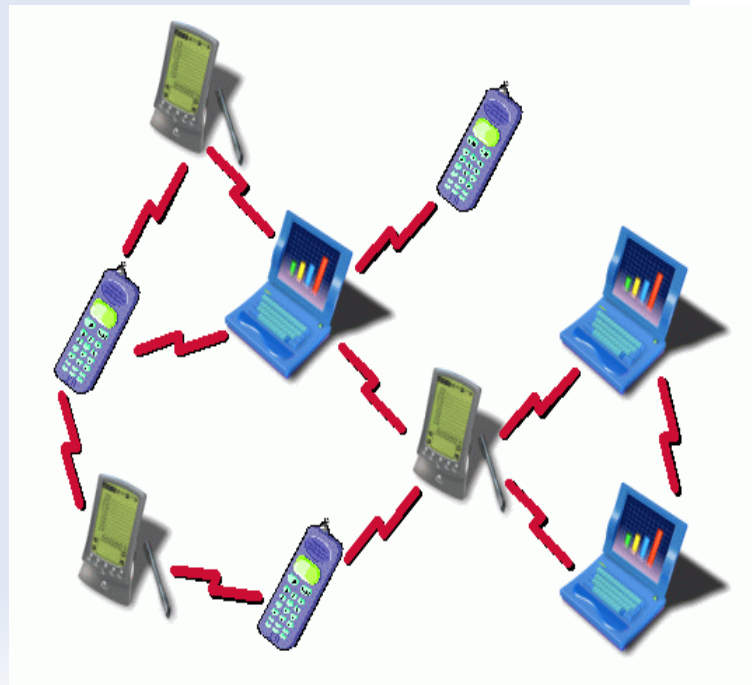
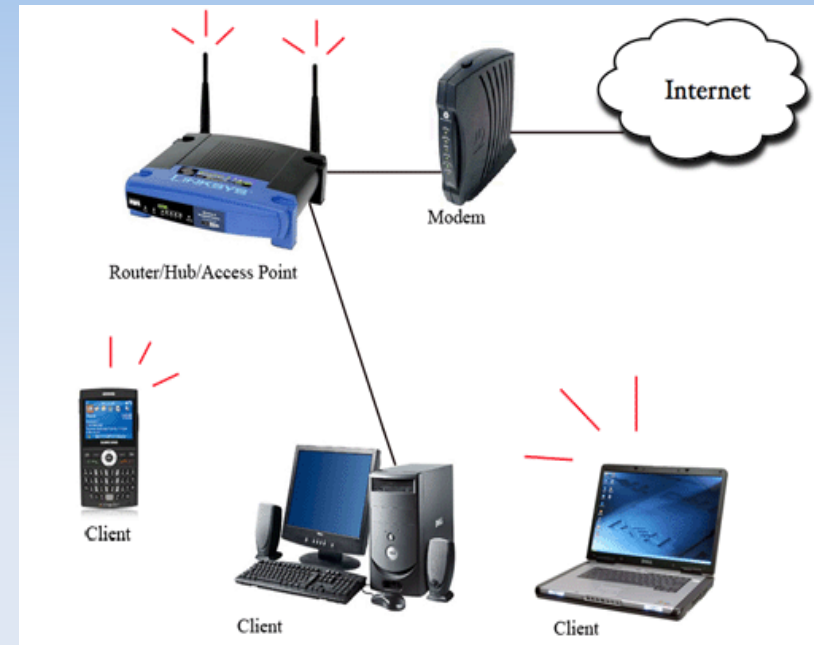
t_b : bit period
 t_c : chip period

Frequency Hopping Spread Spectrum



Classification of Wireless technologies

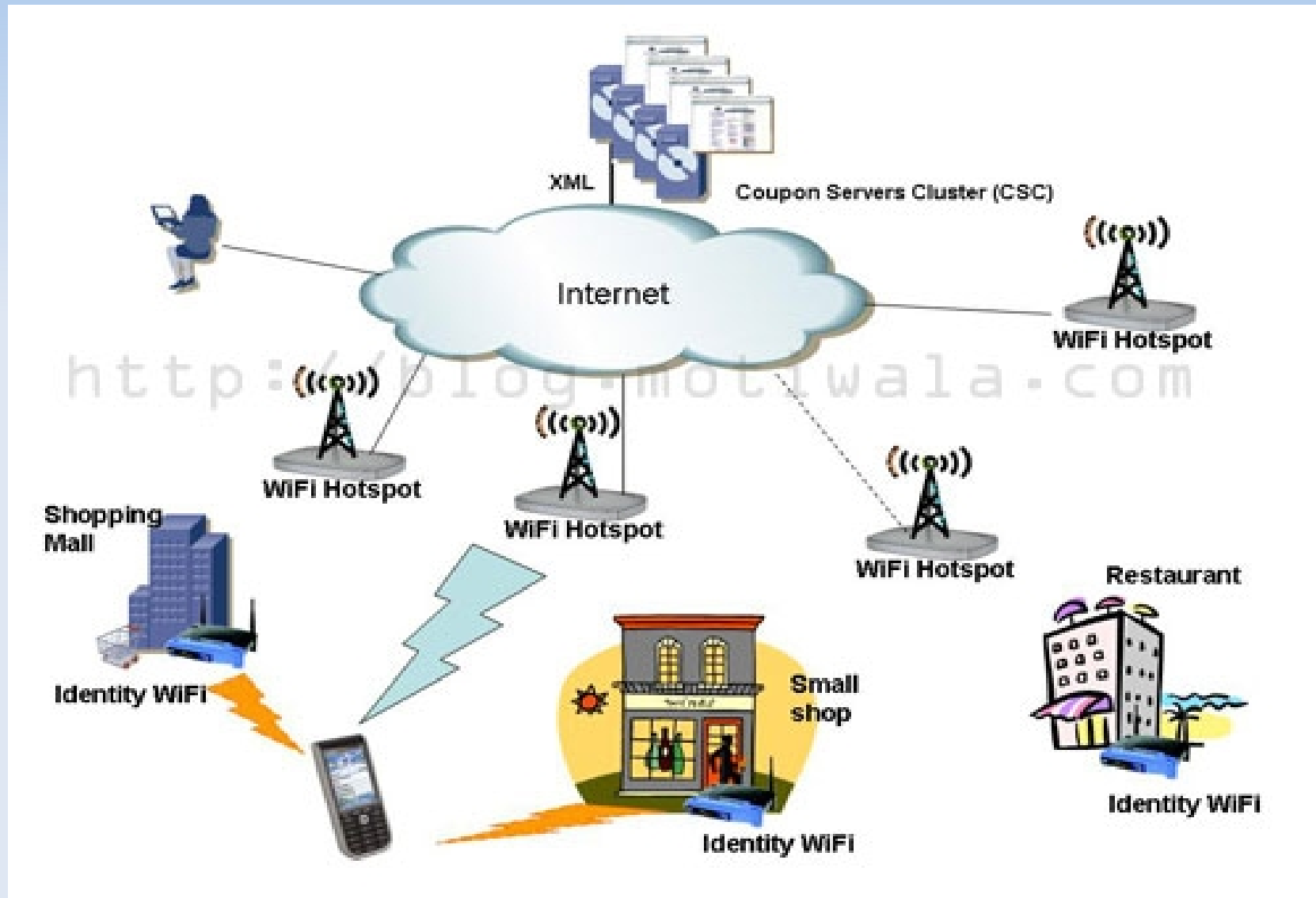
- Infrastructure based
 - WLAN, WiMax, WWAN
- Adhoc
 - Bluetooth
 - MANET
 - VANET
 - WSN



Wi-Fi

- WLAN (IEEE 802.11 standard)
- Uses ISM band (2.4 GHz, 5 GHz)
- IEEE 802.11b, 2.4 Ghz, 1 Mbps
- IEEE 802.11a, 5 Ghz, upto 54 Mbps
- IEEE 802. 11g, 2.4 Ghz, upto 54 Mbps
- IEEE 802.11n, (both 2.4, 5 Ghz), >100 Mbps.
May replace 802.11 a/b/g
- Effective range of access point is around
100 feet

WiFi Application Scenario

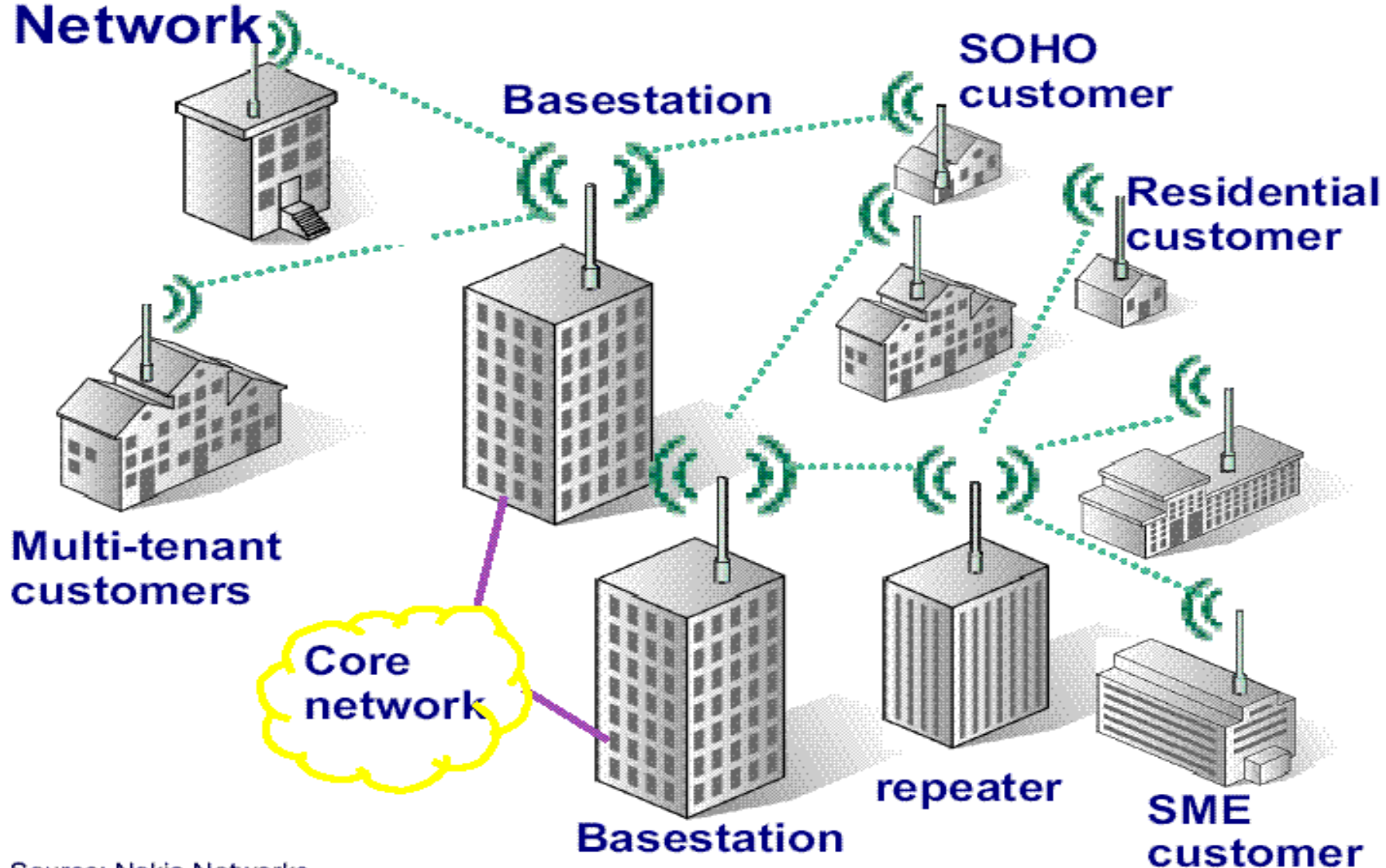


WiMax

- **WiMAX** (Worldwide Interoperability for Microwave Access):
 - Protocol of communication network without wire, based on the standard IEEE 802.16
 - Allows communications over long distances than WiFi, and a greater bandwidth. Cover approximately 40km.
 - 802.16d (802.16-2004) – only fixed wireless
 - 802.16e (802.16-2005) – fixed and mobile wireless
 - Most deployment of mobile WiMAX networks has been done in the licensed (2.5GHz and 3.5GHz) and unlicensed (5.8GHz) bands.
 - Data rate depends on implementation (~ 70Mbps)

WiMax Application Scenario

WirelessMAN: Wireless Metropolitan Area Network

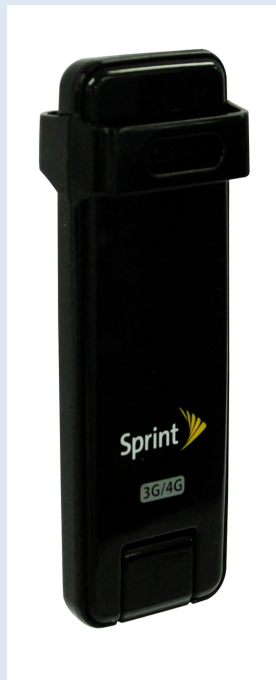


WiMax devices

WIMAX receiver : PCMCIA card



A WIMAX tower



USB Type CDMA & Wimax Modem



Intel® Centrino®
Advanced-N +
WiMAX 6250

WRAN

- Wireless Regional Area Network
- IEEE 802. 22
- A standard for a **cognitive radio**-based PHY/MAC/air_interface
- Uses the spectrum that is allocated to the TV Broadcast Service (non-interfering basis)
- white spaces within the television bands between 54 and 862 Mhz
- Range around 100 Km (capacity 18 Mbps)
- By 2010 the standard may be released

WPAN

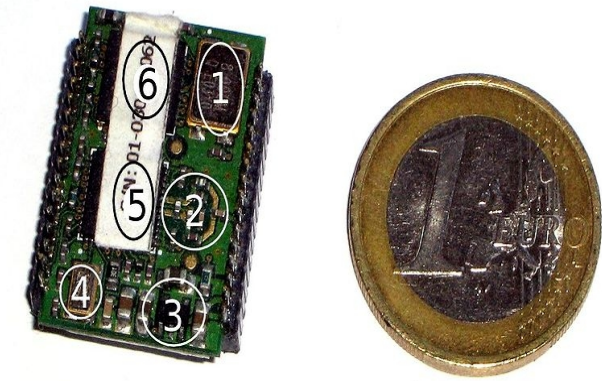
- Wireless Personal Area Networks
 - IrDA (850 nm)
 - Bluetooth
 - Zigbee
 - UWB (Ultra Wideband IEEE 802.15.3a)
 - Wireless Sensor Network
 - 6LoWPAN
 - BAN (IEEE 802.15.6)

Bluetooth

- IEEE 802.15.1 (2.4 GHz)
- Class 1 100 mW (20 dBm) ~100 meters
- Class 2 2.5 mW (4 dBm) ~10 meters
- Class 3 1 mW (0 dBm) ~1
- Version 1.2 1 Mbit/s
- Version 2.0 + EDR 3 Mbit/s



ZigBee

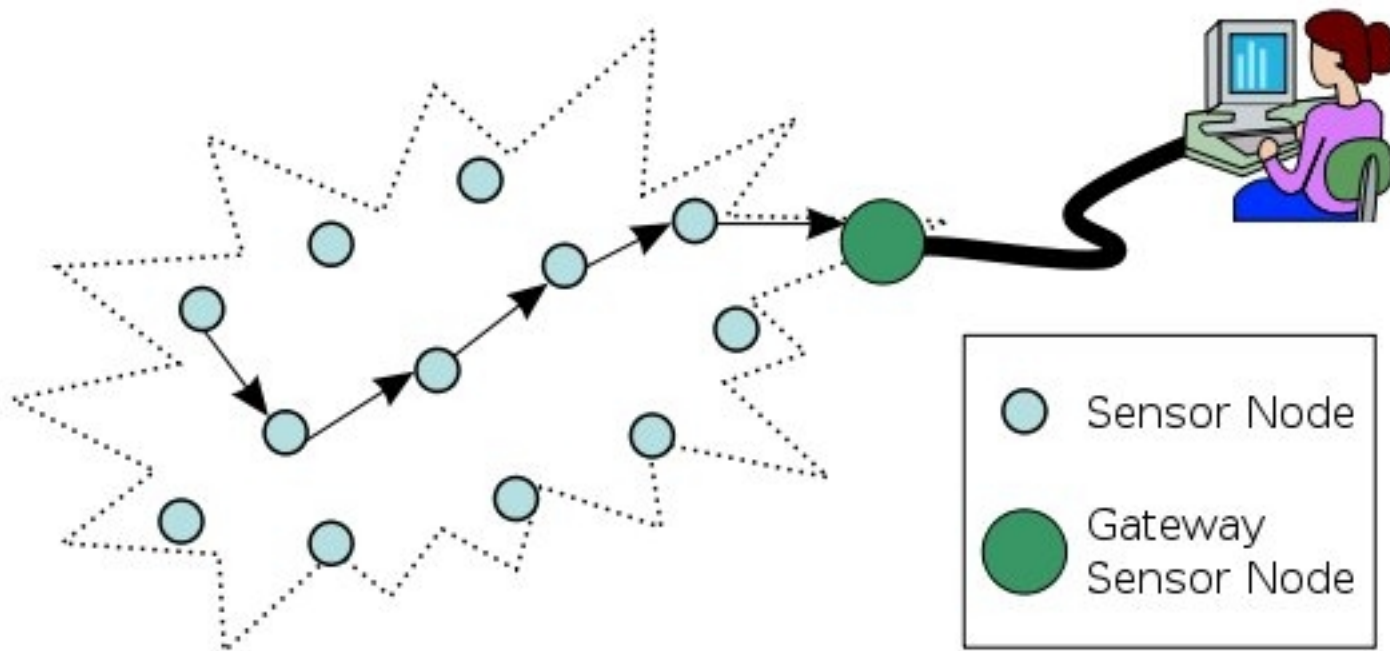


- Mesh technology for WPANs
- Low data rate and power consumption (1mW)
- Used for Home automation
- Conforms to IEEE 802.15.4-2003
- Uses 2.4 Ghz, 915 Mhz and 868 Mhz ISM Band
- Range is 10 – 75 m
- Application "Wireless headphones connecting with cell phones via short-range radio"

6LoWPAN

- IPV6 for IEEE 802.15.x networks

Wireless Sensor Network



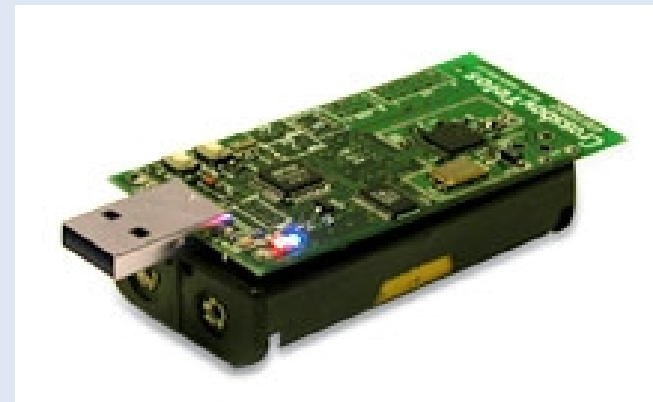
Sensor Nodes



SUN Spot



Mica Mote



TelosB

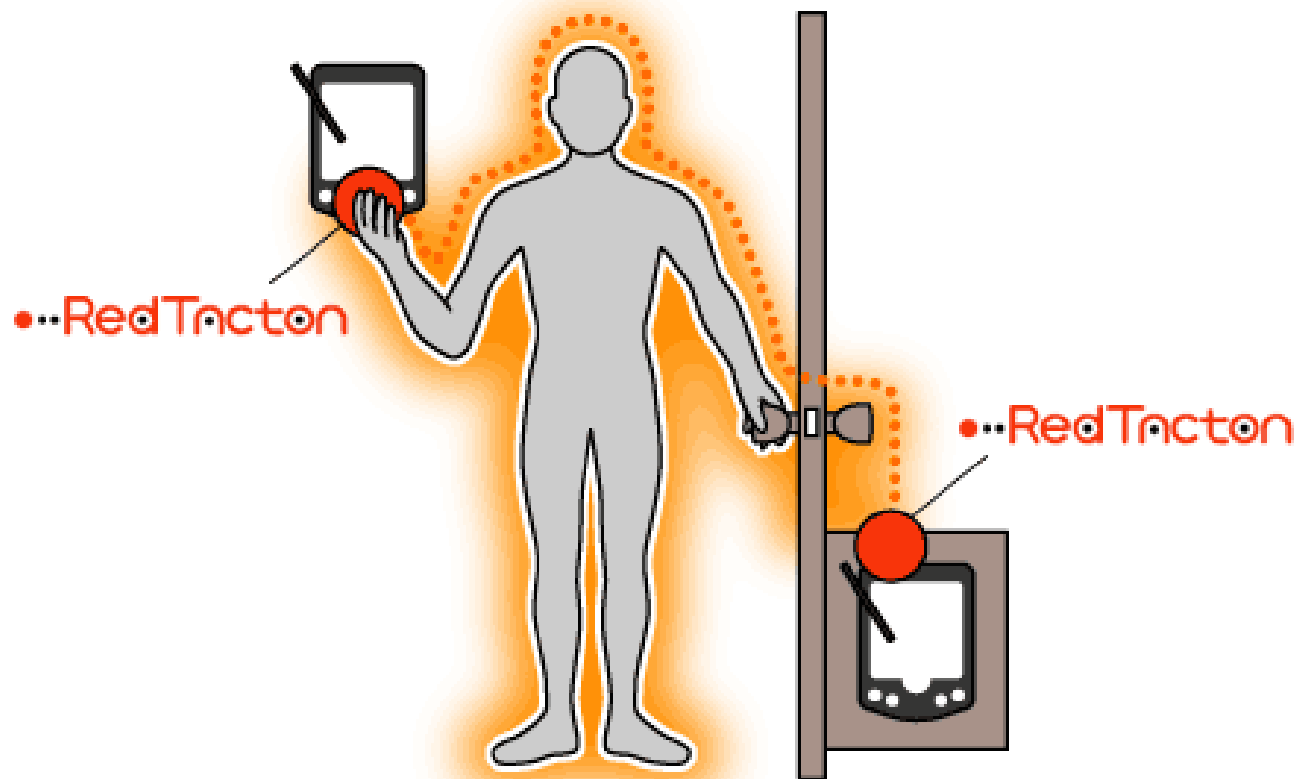
Sensor Programming

- Operating Systems
 - Tiny OS
 - Contiki OS
 - SOS
 - MantisOS
- Programming Languages
 - C/Java/NesC

BAN

- Body Area Network
- set of mobile and compact intercommunicating sensors, either wearable or implanted into the human body, which monitor vital body parameters and movements

RedTacton



Conclusion

- We have seen Emerging trends in Wireless Networks

References

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