
Mobile Communications

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- ◆ *What is the history of mobile communications?*
 - ◆ *What types of wireless networks do exist?*
 - ◆ *Where to find information about current mobile networks?*

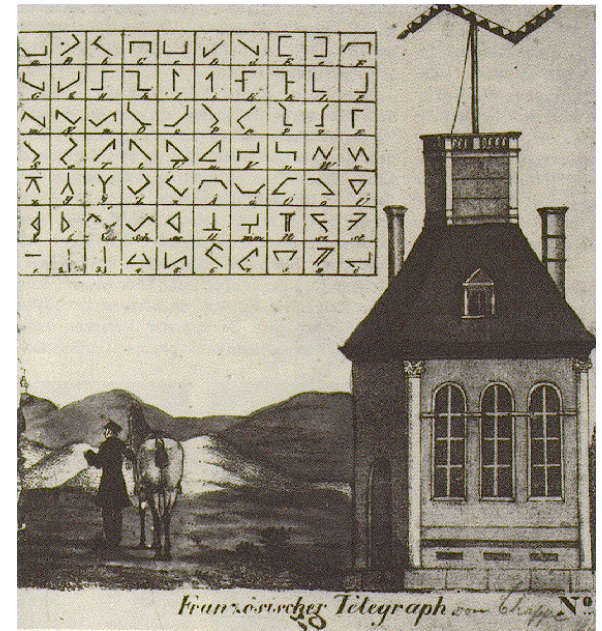
History – Past and Radio

◆ Past

- » Fire signal signals used to communicate the fall of Troy to Athens (600 km)
- » 2nd century B.C., sets of torches to transmit characters
- » 1793, 3 part semaphores on top hills and towers
- » 1837, electric telegraph

◆ Radio transmission

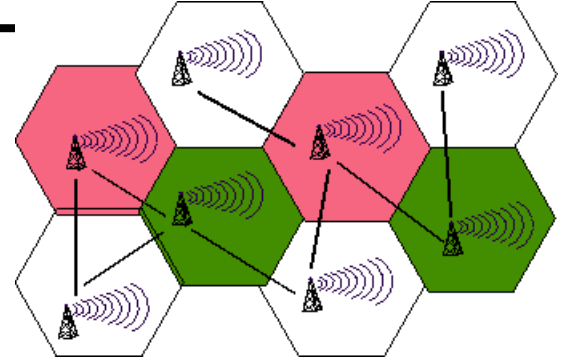
- » 1895, first radio transmission ~30 km away
- » 1906, amplitude-modulated (AM) radio
- » 1920, broadcast of radio news program
- » 1928, TV broadcast trials
- » 1933, frequency-modulated (FM) radio
- » 1946, Swedish police had the first radio phones installed in cars
- » 1950, mobile phone with direct dialling



History – Cell, 1st Generation

◆ Cellular topology

- » 1950's, cellular network concept
 - power of transmitted signal falls with square of distance
 - 2 users can operate on same frequency at separate locations
- » 1971, Finland, ARP, first public commercial cellular, mobile network



◆ 1st Generation ➔ Analogue, Frequency Division Multiplexing

- » 1982, NMT network covering Finland/Sweden/Norway/Denmark
- » 1983, AMPS in America
- » 1985, TACS, Total Access Communications Service, in Europe

History – Packet Radio

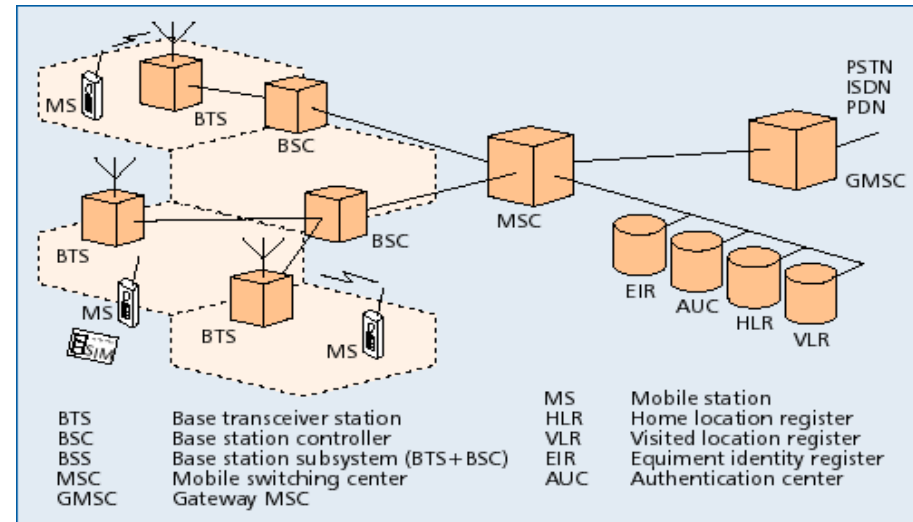
- ♦ 1971, ALOHANET packet radio
 - » computers communicate with central HUB
- ♦ 1980's ad-hoc, self-configurable packet networks
- ♦ 1985, Wireless LANs authorized to use ISM (free) bands
- ♦ 1997, first WLAN (WIFI) standard

History – 2nd and 3rd Generation

◆ 2nd Generation

digital transmission and signalling; ISDN based

- » 1982, specification of GSM starts
- » Early 1990's
 - Europe: GSM
GSM - Global System for Mobile Communication
 - USA: D-AMPS, cdmaOne
 - Japan: Personal Digital Cellular (PDC)



◆ 3G systems

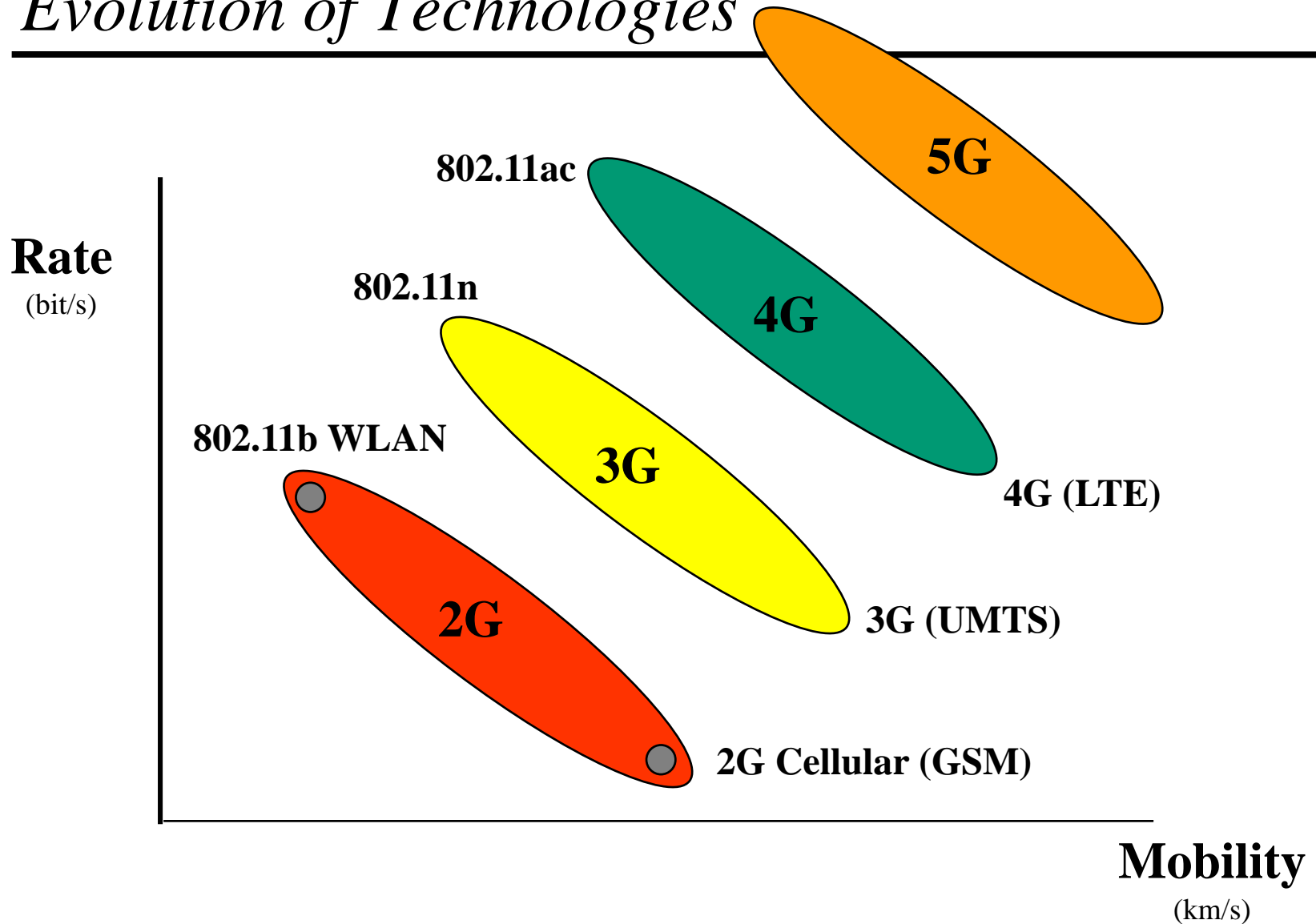
aimed at multimedia communication

- » 2001, Japan, first implementation of 3G systems

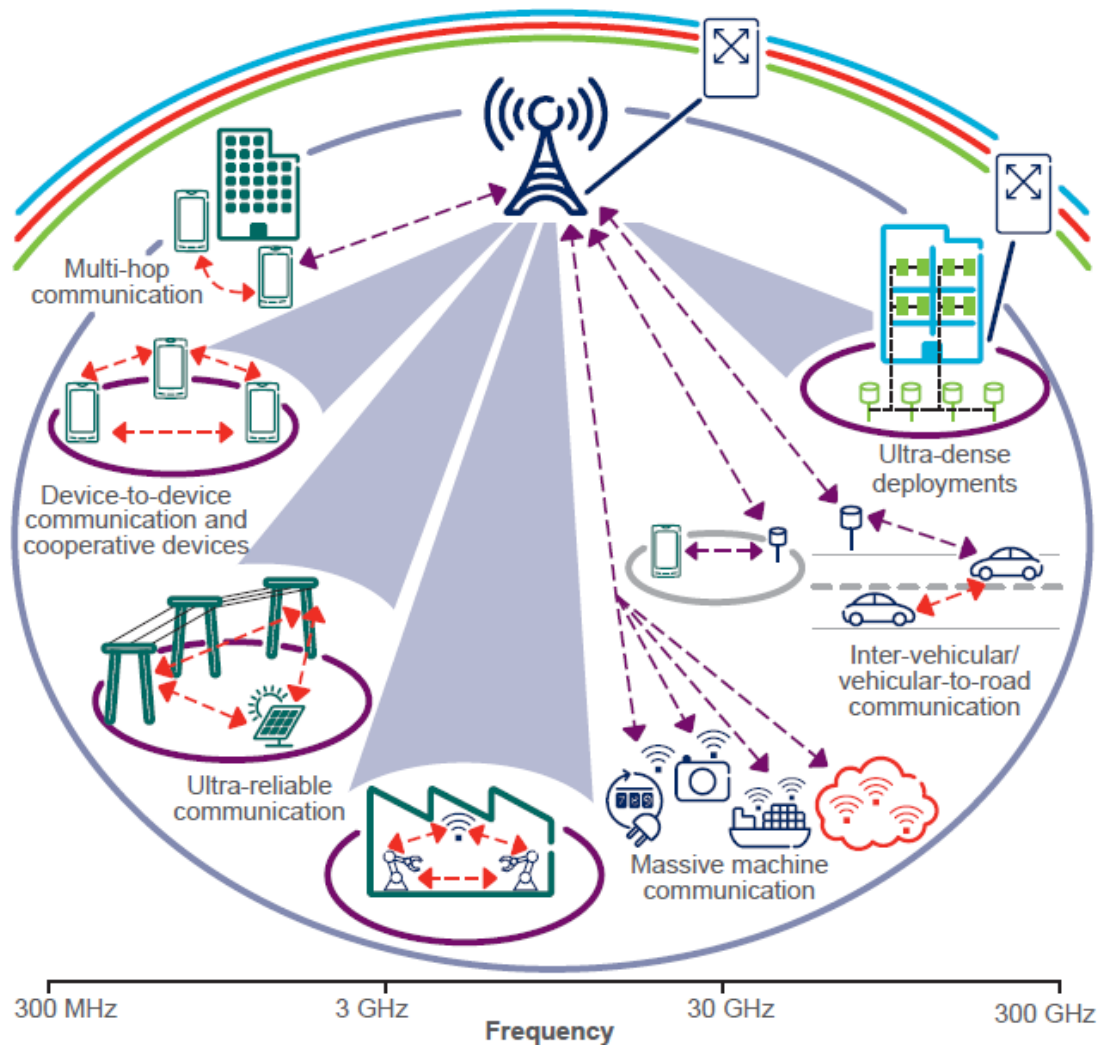
Type of Networks

- ♦ WPAN - Wireless Personal Area Networks
 - » short distances between a private group of devices
- ♦ WLAN - Wireless Local Area Networks
 - » for areas such as home, office, group of buildings
- ♦ WMAN - Wireless Metropolitan Area Networks
 - » from several blocks of buildings to entire cities
- ♦ PLMN - Public Land Mobile Networks
 - » regions and countries

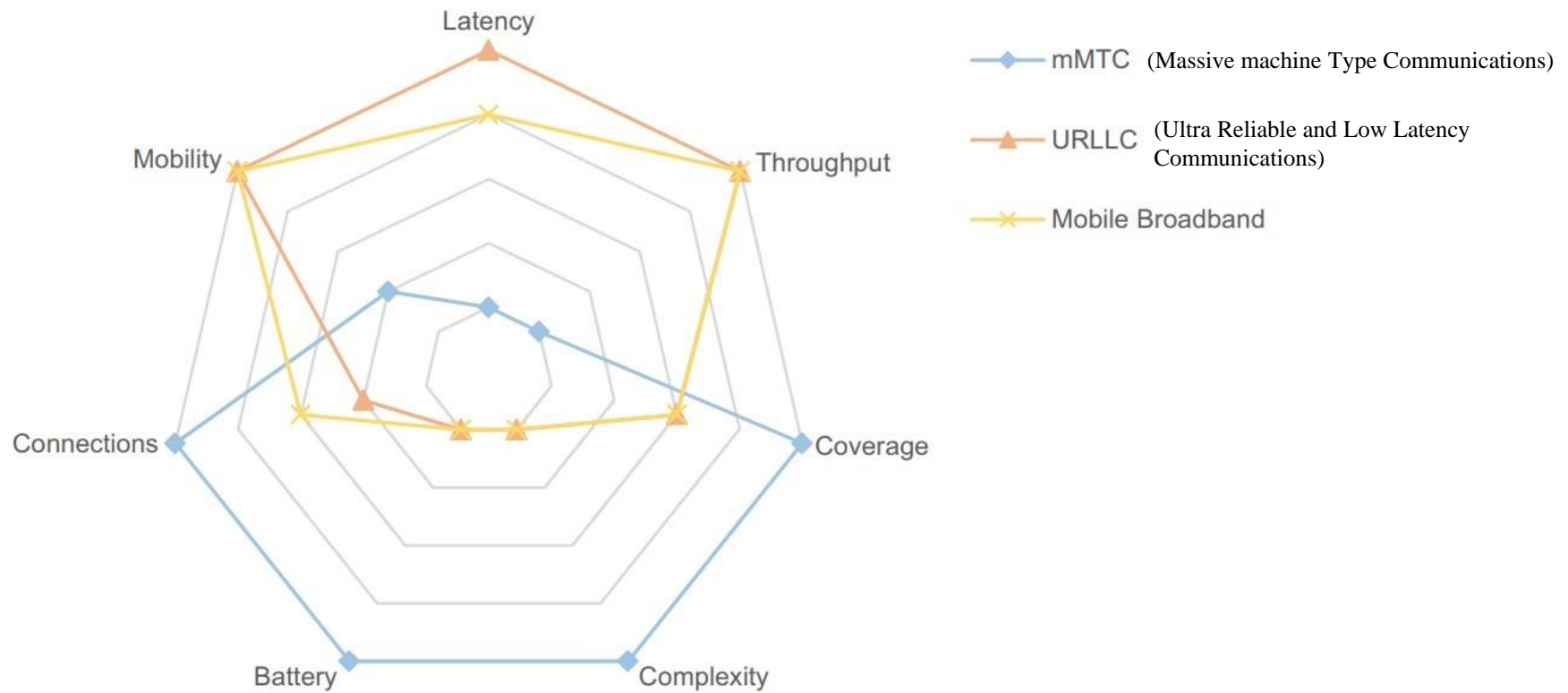
Evolution of Technologies



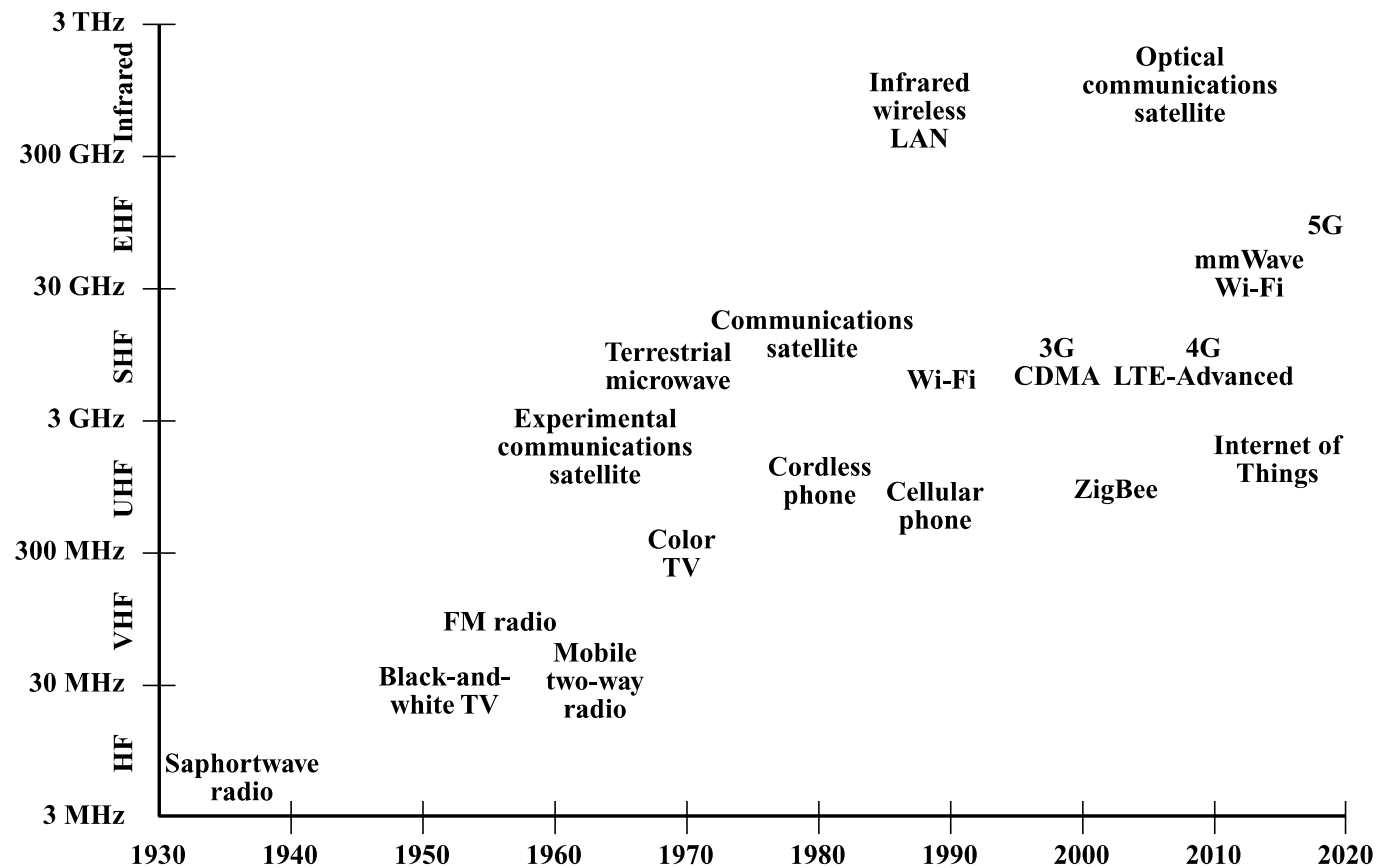
5th Generation



5G, 6G - Communications Requirements



Frequencies vs Time



High carrier frequency → high bandwidth → high bitrate (bit/s)

Standards - IEEE

- ♦ IEEE - Institute of Electrical and Electronics Engineers
- ♦ 802 Standards for Local /Metropolitan Area Network, wired and wireless
 - » Wireless LANs (802.11)
 - » Wireless Personal Area Networks (802.15)

<http://standards.ieee.org/about/get/>

- ♦ Layers 1 and 2 of the OSI communications model
- ♦ Below the IP communications layer



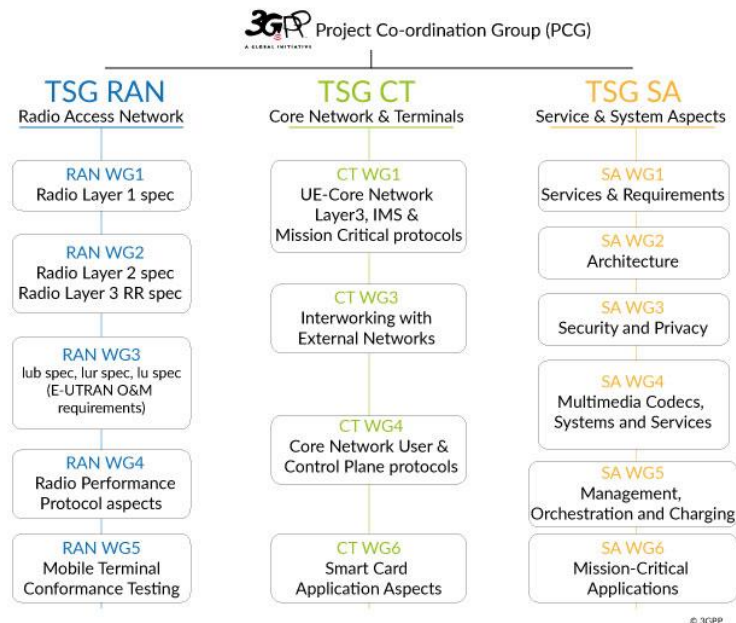
Standards – 3GPP



♦ Scope of 3GPP

- » Mobile telecommunications
 - cellular technologies, including radio access, core network and service capabilities
- » Specifications for GSM, GPRS, UMTS, LTE, LTE-Advanced, 5G
- » Specifications developed by Technical Specification Groups (TSG)

<http://www.3gpp.org>



Standards - IETF

<http://www.ietf.org>

- ◆ Defines standards for the Internet, including
 - » TCP/IP
 - » key services
 - » routing protocols
 - » deployment of IP over technologies



Standards - Other

- ♦ ITU - Worldwide
- ♦ ETSI - Europe

Homework

1. Review slides
2. Read from Schiller
 - » Chap. 1
3. Read from Goldsmith
 - » Chap. 1
4. Answer questions at moodle