



WIRELESS NETWORK COMMUNICATIONS

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WIRELESS NETWORK COMMUNICATIONS

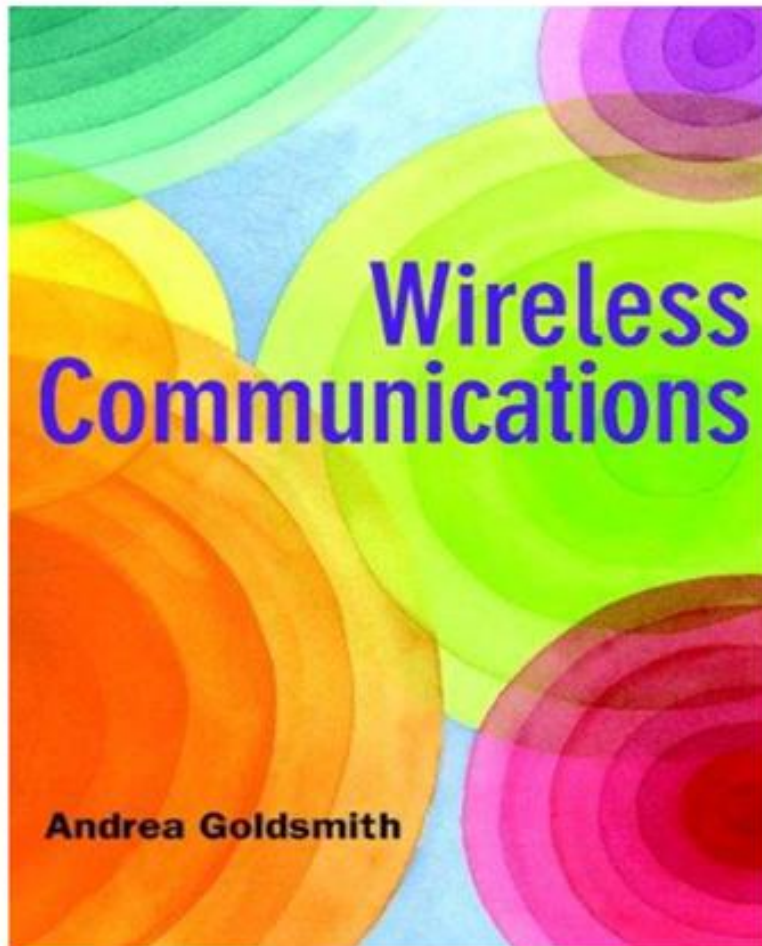
INTRODUCTION

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TEXT BOOK



Cited
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Andrea Goldsmith
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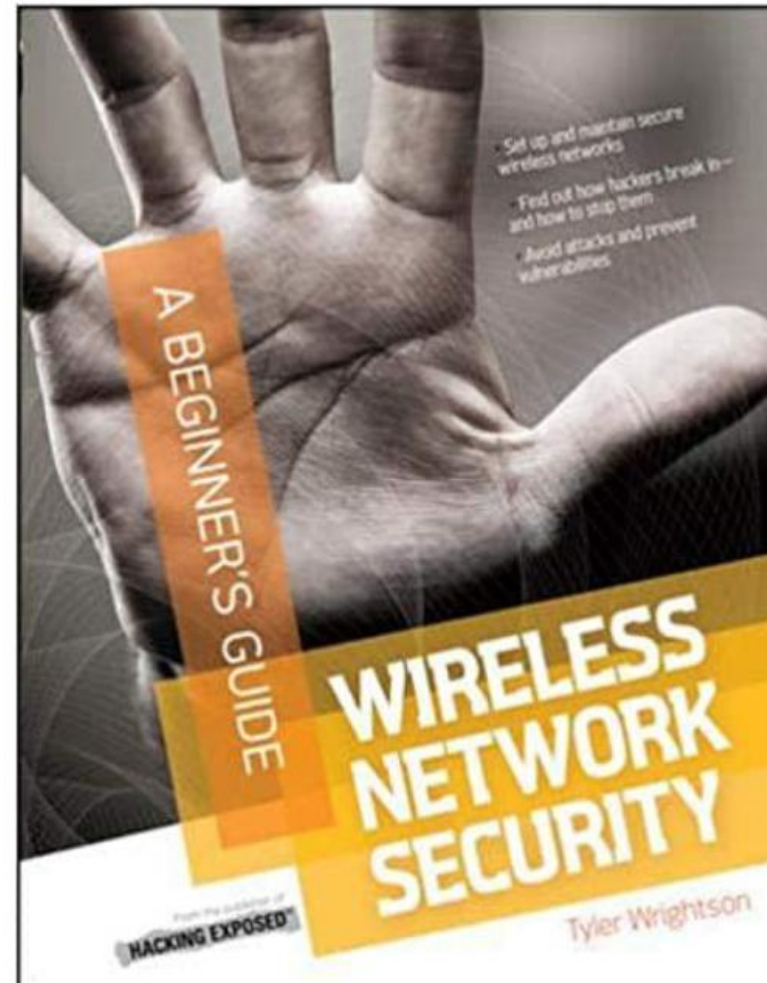
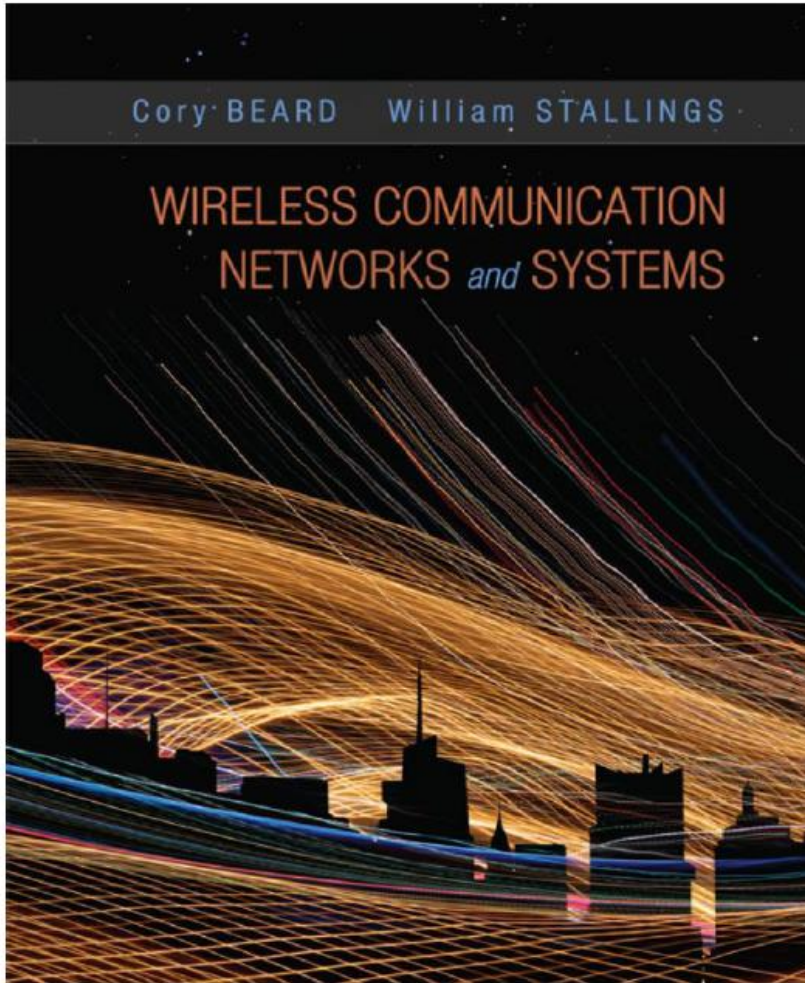
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REFERENCE BOOKS



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Course Objective

- ❖ Introduce the emerging trends of wireless network technologies
- ❖ Compare and contrast the wireless network technologies depending on the usage models
- ❖ Explain the characteristics of wireless channels and analyze its impact during communication
- ❖ Discuss various design parameters of communication
- ❖ Identify different attacks on wireless network and explore several mitigation approaches

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Course Outline



At the end of the course, the student will be able to:

- ❖ Identify and apply the appropriate wireless technology for real time applications.
- ❖ Simulate the channel characteristics such as path loss, shadowing, analyze the wireless networks and understand the Multipath channel models.
- ❖ Analyze emerging enhancements such as Adaptive Modulation and Multiple Input Multiple Output System.
- ❖ Capture the transmitted packets of wireless networks and analyze them for the wireless communication protocols
- ❖ Determine the threats on wireless network and Apply wireless security mechanisms

Prerequisite: UE18CS301 – Computer Networks

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Unit – I: Overview of Wireless Systems & Standards



- ❖ Introduction
- ❖ Wireless LAN Standards
- ❖ Wireless PAN Standards
- ❖ Wireless MAN Standards
- ❖ LPWAN Standards
- ❖ Long Range Communication – Satellite Networks

Tools/Language: Wireshark, Claynet/CISCO Packet Tracer

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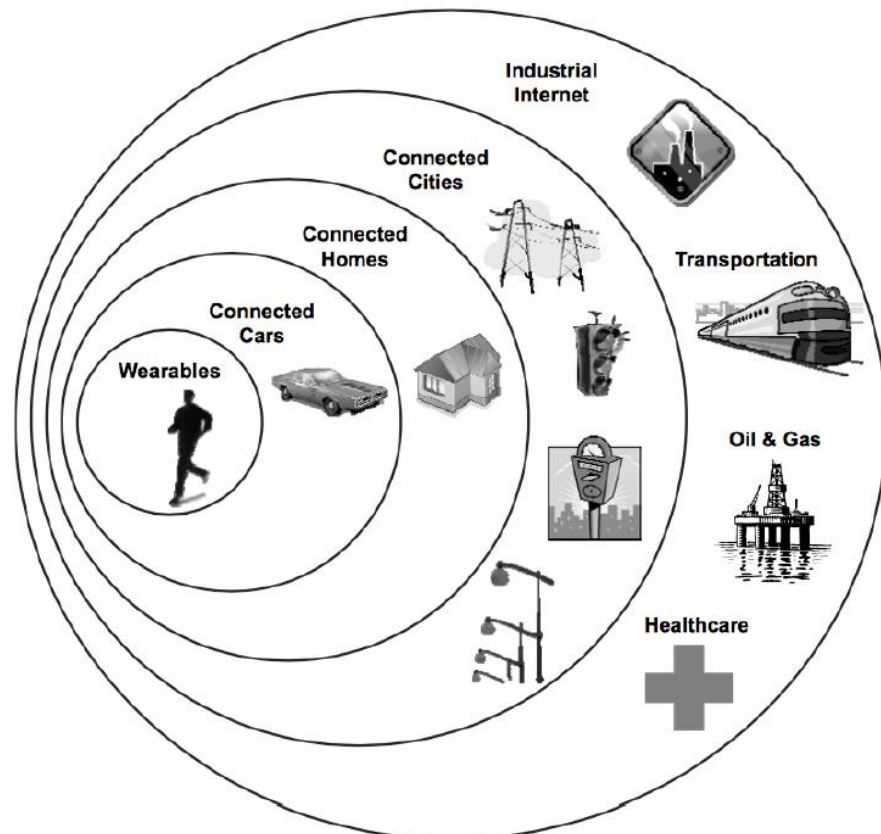
Wireless LAN – IOT



- ❖ Key application area for short – range communications
- ❖ Future Internet
 - Large numbers of wirelessly connected objects
 - Interactions between the physical world & computing, digital content, analysis, & services
 - Internet of Things
 - Useful for health & fitness, healthcare, home monitoring & automation, energy savings, farming, environmental monitoring, security, surveillance, education & many others.
- ❖ Machine-to-Machine Communications
 - Devices working together for data analysis & automated control

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Wireless LAN – IOT



Wireless standards for different types of networks

- ❖ Body Area Network (BAN)
- ❖ Body Sensor Network (BSN)
- ❖ Medical Body Area Network (MBAN)
- ❖ Personal Area Network (PAN)
- ❖ Home Area Network (HAN)
- ❖ Nearby Area Network (NAN)
- ❖ Local Area Network (LAN)
- ❖ Wide Area Network (WAN)
- ❖ Global Area Network (GAN)

Courtesy: Goldman Sachs, IoT Primer, September 3, 2014; 'Internet of Things: Making sense of the next mega-trend'

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Types of Wireless Networks



Wireless Local Area Networks

- ❖ Used in University Campus or Library to Access Internet

Wireless Personal Area Networks

- ❖ Connectivity of personal devices within an area of about 30 feet

Wireless Metropolitan Area Networks

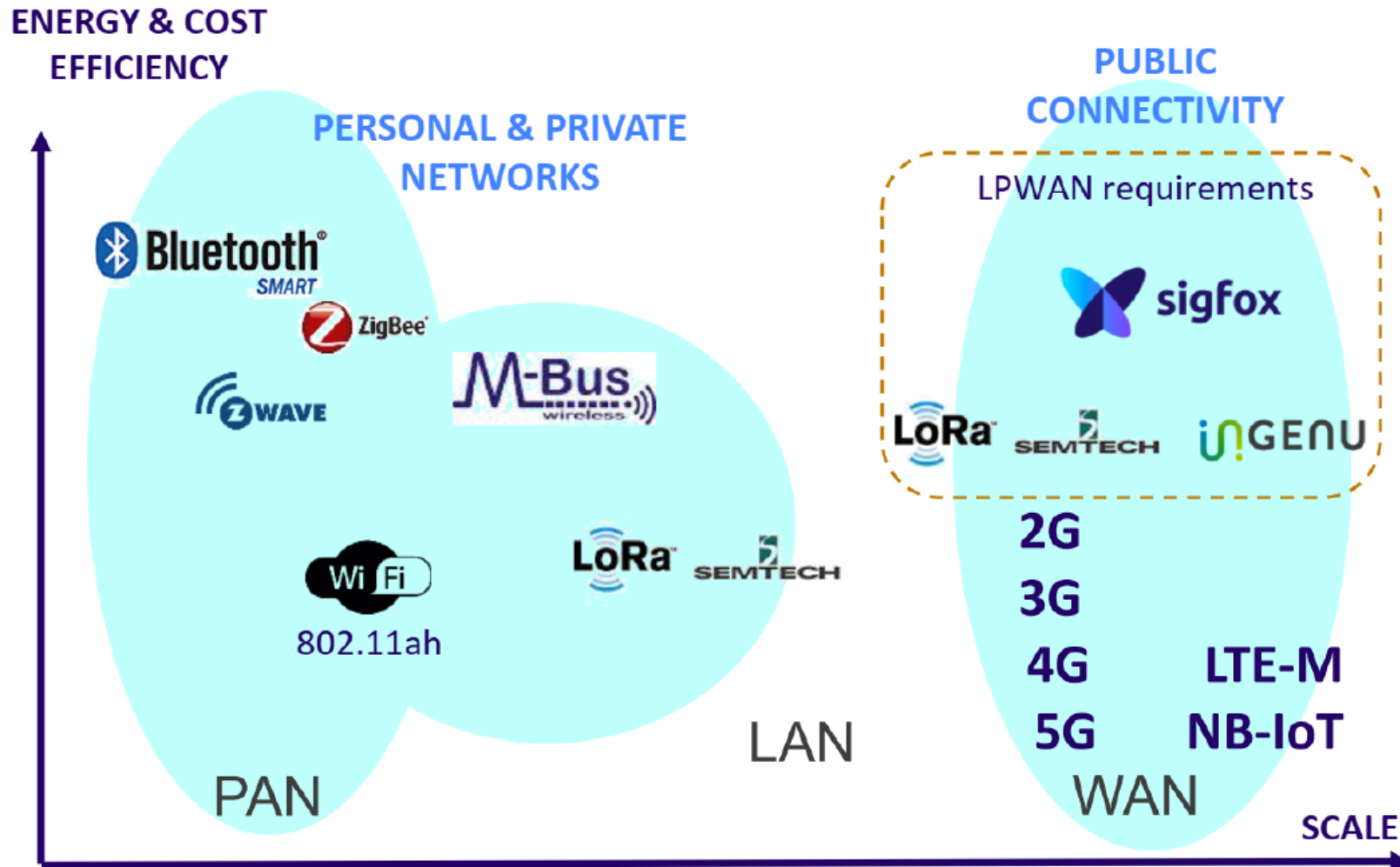
- ❖ Connection of multiple networks in different buildings in a city

WWANS: Wireless Wide Area Networks

- ❖ Networks maintained over large areas, such as cities or countries, via multiple satellite systems or antenna sites
- ❖ Referred to as 2G (2nd Generation) systems

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Wireless LAN Standards



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Wireless LAN & Wireless PAN Standards



IEEE 802.11 WLAN

- ❖ Residential devices operate at a frequency of 2.4 GHz under 802.11b & 802.11g or 5GHz under 802.11a
- ❖ Some home networking devices operate in both radio-band signals & fall within the 802.11n or 802.11ac standards

IEEE 802.15 WPAN

Includes 7 task groups

- ❖ 802.15.1 (Bluetooth)
- ❖ 802.15.3 (High Rate WPAN)
- ❖ 802.15.4 (Low Rate WPAN)
- ❖ 802.15.6 (WBAN)
- ❖ 802.15.7 (Visible Light Communication)

The IEEE 802.15.4 technology is used for a variety of different higher layer standard

For example

- ❖ ZigBee
- ❖ 6LoWPAN
 - IPv6 over Low Power Wireless Personal Area Networks
 - Specified by Internet Engineering Task Force (IETF)
- ❖ Wireless Hart
- ❖ MiWi
- ❖ ISA100.11a

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Wireless Wide Area Networks



❖ Cellular Networks

- GPRS, EDGE
- UMTS (3G) HSPA+
- LTE (4G) Long Term Evolution

❖ Low Power Wide Area Network (LPWAN)

- Ultra Narrow Band (UNB) from Sigfox
- Weightless, from the Weightless SIG
- LoRaWAN, Long Range WAN, from the LoRa Alliance

❖ Cellular IoT

- LTE – M LTE for M2M (1.4 MHz)
- EC – GSM Extended Coverage GSM
- Narrowband IoT

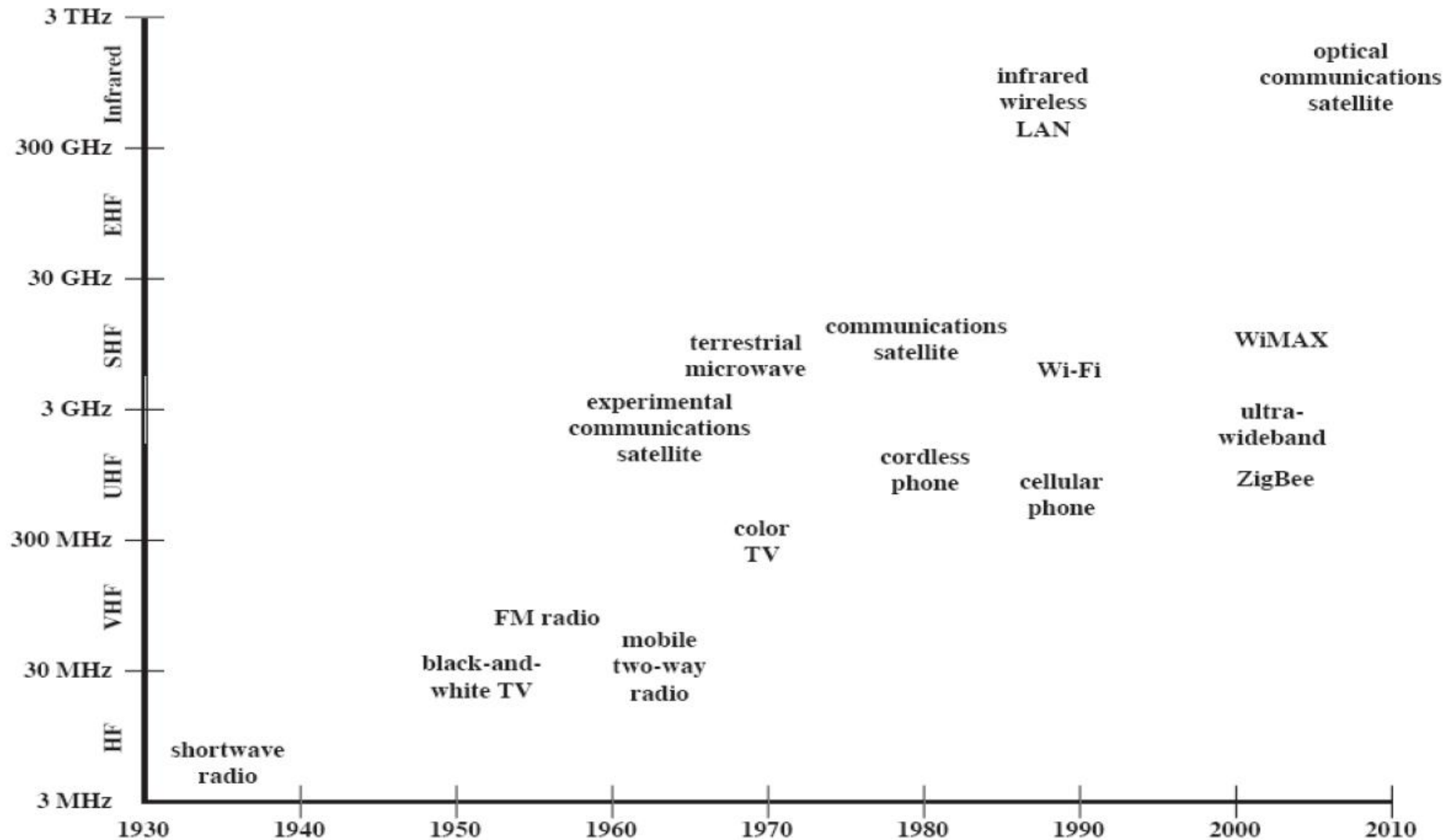
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HISTORY

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Evolution

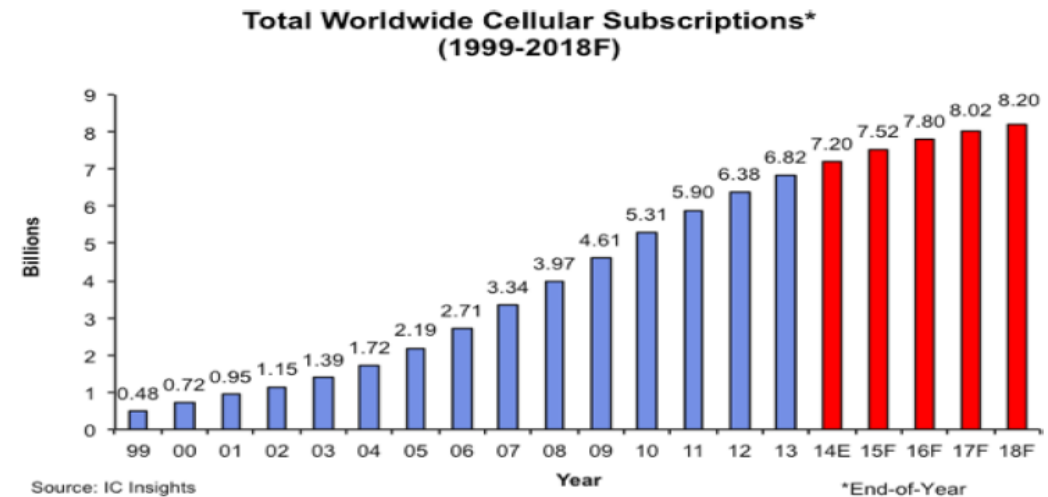


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Evolution



- ❖ Ancient Systems: Smoke Signals, Pigeons, ...
- ❖ Radio invented in 1880s by Marconi
- ❖ Many sophisticated military radio systems were developed during & after world war II
- ❖ Exponential growth in cellular use since 1988: approximately 8 billion worldwide users today
 - Ignited the wireless revolution
 - Voice, data, & multimedia ubiquitous
 - Use in 3rd world countries growing rapidly
- ❖ Wifi tremendous growth
- ❖ Bluetooth pervasive, Satellites also widespread





THANK YOU

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