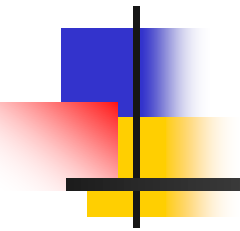
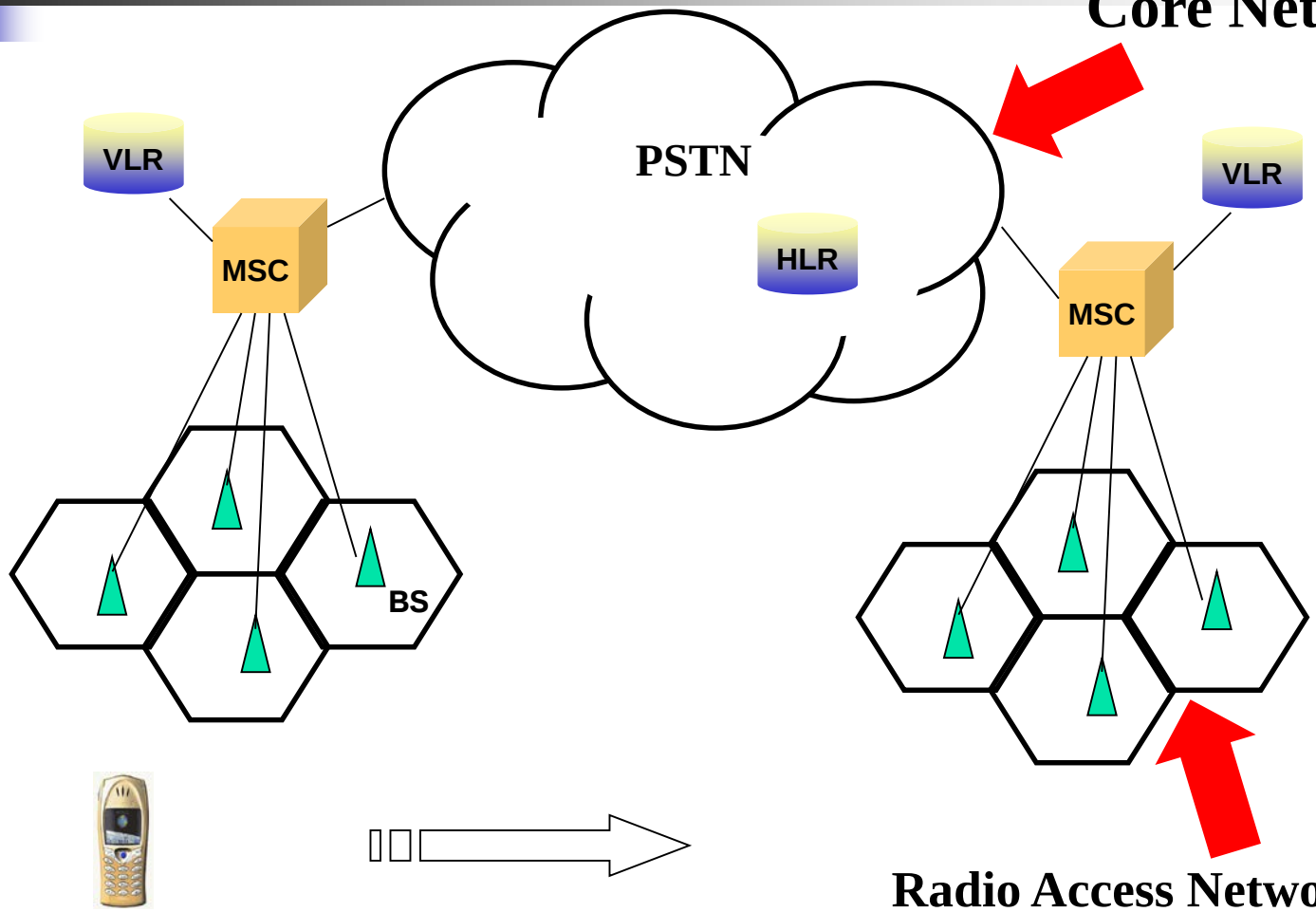
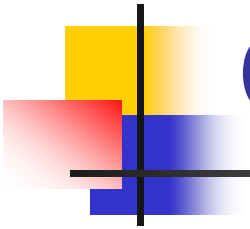


1G - 5G 核心網路的演進

Generic 2G Architecture





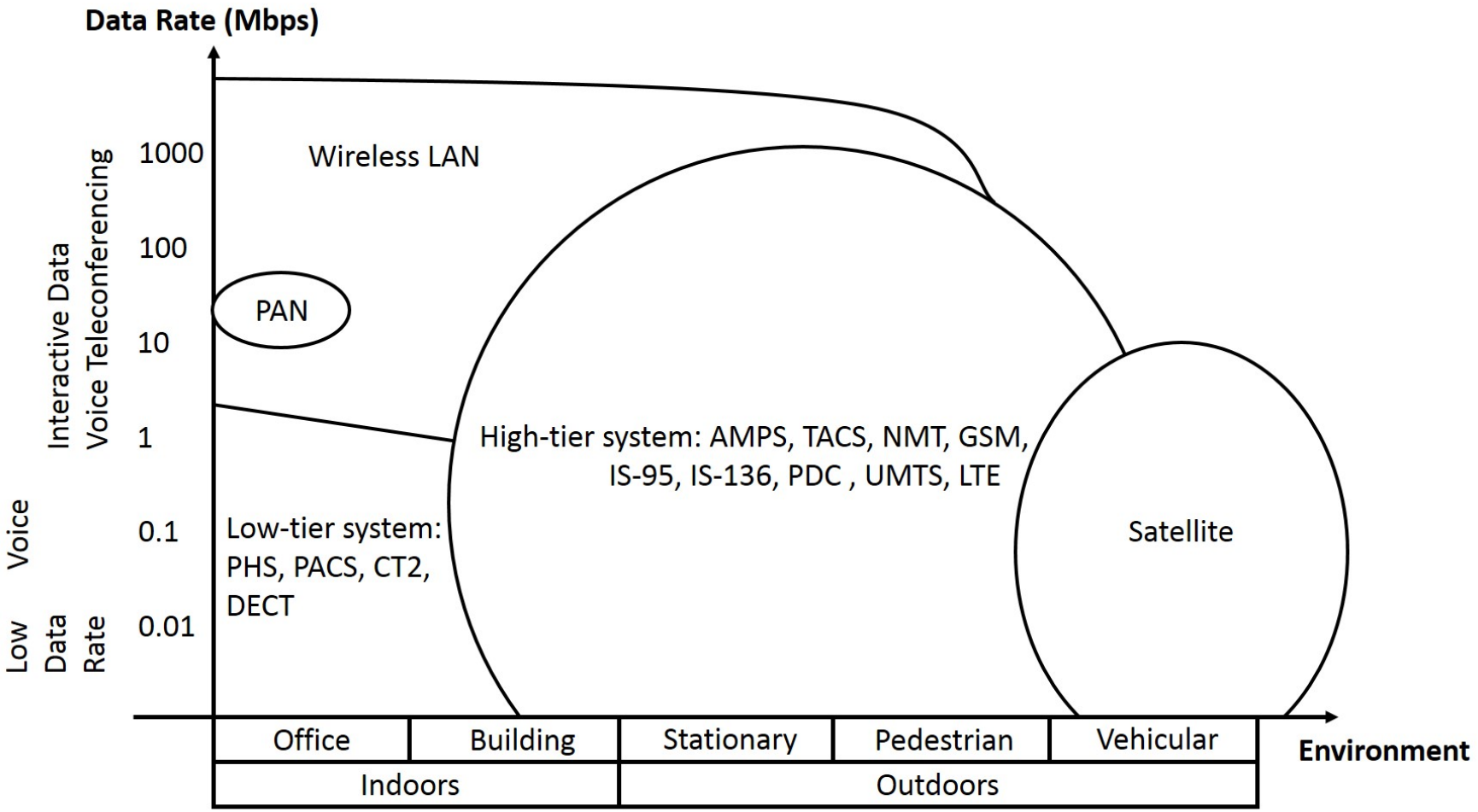
Outline

- Evolution of cellular networks from 1G to 4G
  - with focus on core networks
- What is 5G?
  - Softwarization and Virtualization
- Our open-source testbeds
  - Reconfigurable Core (RECO)
  - Service Level Virtualization (SLV)
  - free5GC

Types of Wireless Networks

- Personal Area Networks (PANs)
- Wireless Local Area Networks (WLANs)
- Low-tier wireless systems
- Public wide-area (high-tier) cellular radio systems
- Mobile satellite systems

Wireless systems: bit rates vs. coverage areas



Low-Tier Wireless Systems

- Initially, designed mainly to serve users with pedestrian moving speeds
- Coverage ranges typically are less than 500 meters outdoors and less than 30 meters indoors
- Used as wireless extensions of residential or office telephones
  - Cordless Telephone, Second Generation (CT2)
  - Digital European Cordless Telecommunications (DECT)
- Provide public services
  - Personal Access Communications Systems (PACS)
  - Personal Handyphone System (PHS)

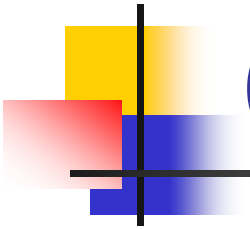
Cordless Telephone, Second Generation (CT2)

- Designed in the United Kingdom in 1989
- Designed for use in homes, offices, or public telephone booths
- Supports only circuit-switched voice services

Digital European Cordless Telecommunications (DECT)

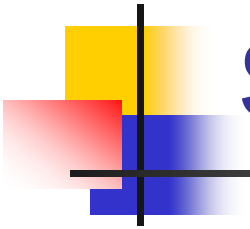
- Defined by the European Telecommunications Standards Institute (ETSI) in 1992
- Designed primarily for use in an office environment
- Supports circuit-switched voice and data services

Personal Handyphone System (PHS)



- Designed by the Telecommunications Technical Committee of Japan
- Support both voice and data services
- Support a channel rate of 384 Kbps

Personal Access Communications Systems (PACS)



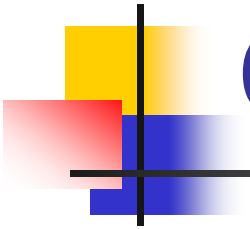
- Designed by Telcordia (then, Bellcore) in the United States in 1992
- Provide wireless access to local exchange carriers (LECs)
- Radio coverage within a 500-meter range
- Support voice, data, and video
- Use in both indoor and outdoor microcells

Public Wide-Area (High-Tier) Wireless Networks

- Provide public mobile services over large geographical areas to users moving on both pedestrian and vehicular speeds
- Consists of
  - Radio Access Networks (RAN): provide radio resources for mobile users to access a core network
    - a cell may exceed 10 kilometers in diameter
  - Core Network: a wireline network used to interconnect RANs and to connect the RANs to other networks
- Classified into *generations* based on the technologies they use and networking capabilities they provide

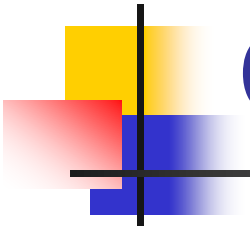
1G Wireless Networks

- Became commercially available in the early 1980s
- Analog radio technologies and circuit-switched transmission and networking technologies
- Main service: circuit-switched voice
- Lack the ability to support roaming between different network operators
- Three main 1G radio system standards
  - Advanced Mobile Phone Systems (AMPS) in North America
  - Total Access Communications Services (TACS) in the United Kingdom
  - Nordic Mobile Telephone (NMT) in Nordic countries



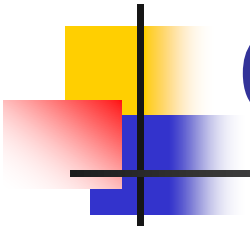
Circuit Switching

- Dedicated communication path between two stations
- A channel is dedicated to the connection on each physical link
- Most common example is the telephone network



Operation

- Circuit establishment
  - Channel capacity must be reserved between each pair of node
- Information transfer
- Circuit disconnect
- Example
  - Public telephone
  - PBX (Private Branch Exchange)



Characteristics

- Connection path must be established before data transmission begins
- Low channel utilization
- Delay prior to data transfer for session establishment
- Once the circuit is established, data are transmitted at a fixed data rate with no delay other than the propagation delay