CS698T
Wireless Networks: Principles and Practice

Topic 02
Challenges in Wireless Networks

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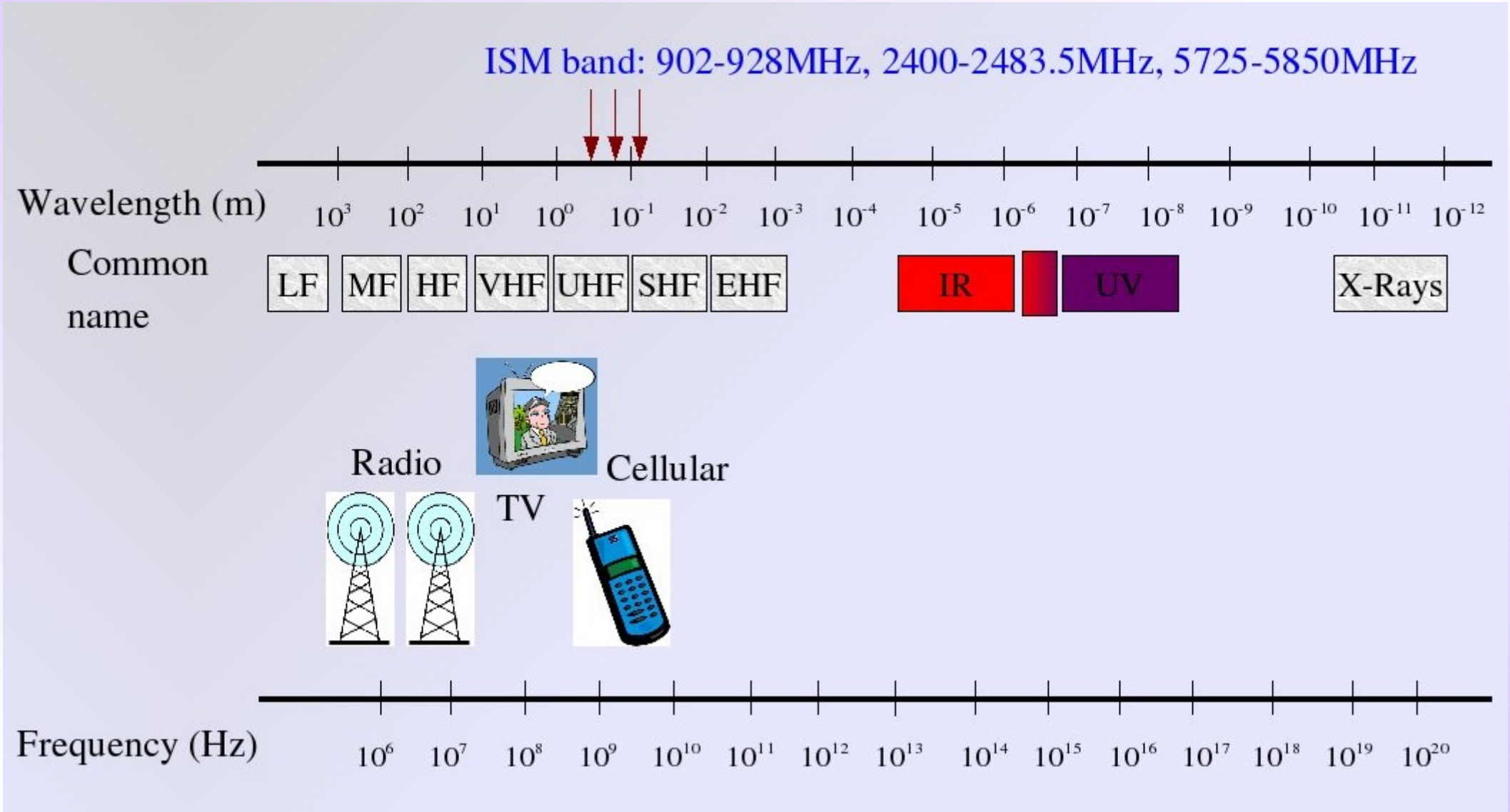
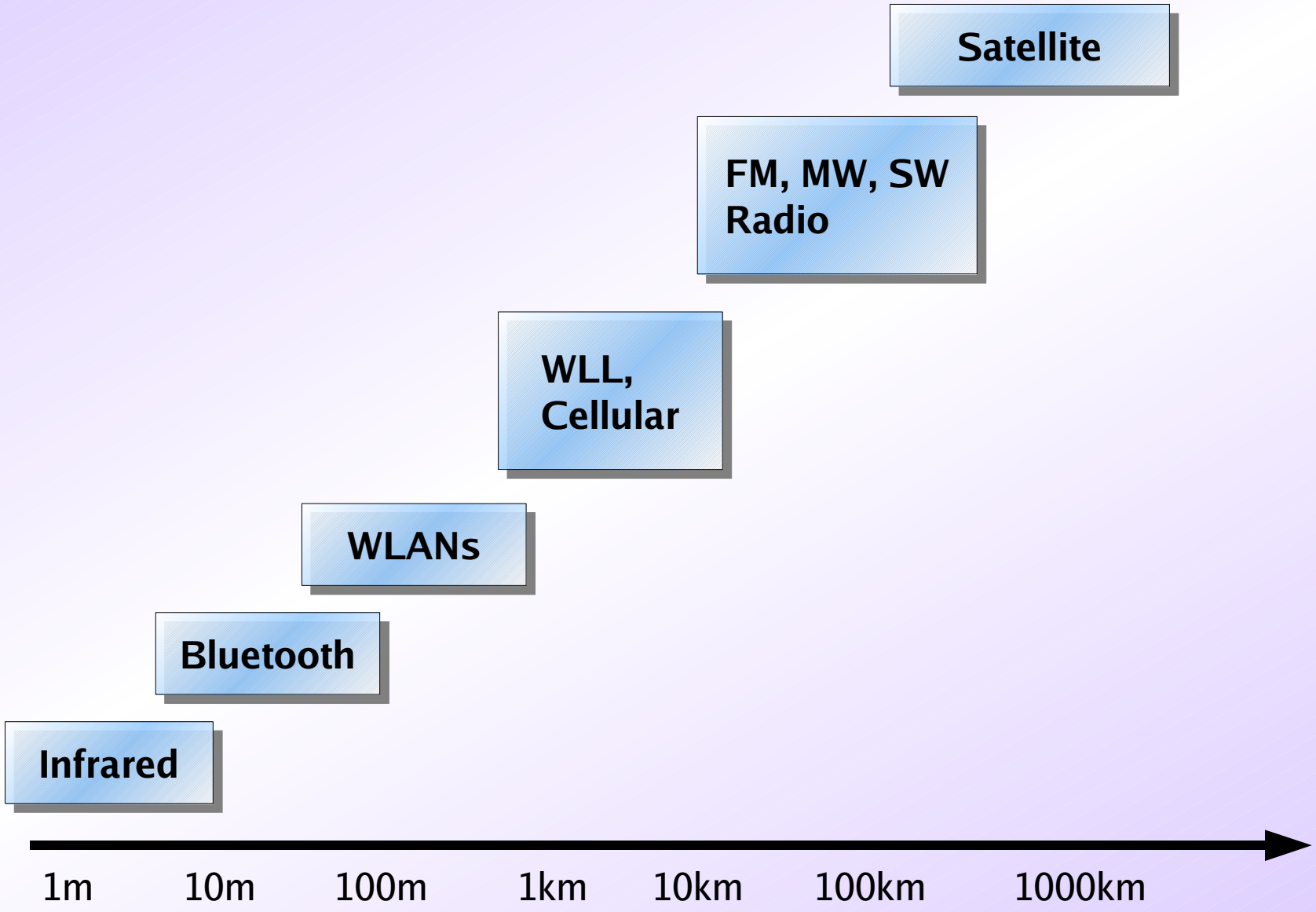
http://www.cse.iitk.ac.in/users/braman/courses/wless-spring2007/

Electro-Magnetic Spectrum



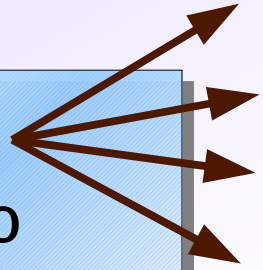
Range of Wireless Systems



Wireless Systems: Classification

Analog

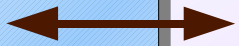
Broadcast:
AM, FM radio
Television
Satellite broadcast



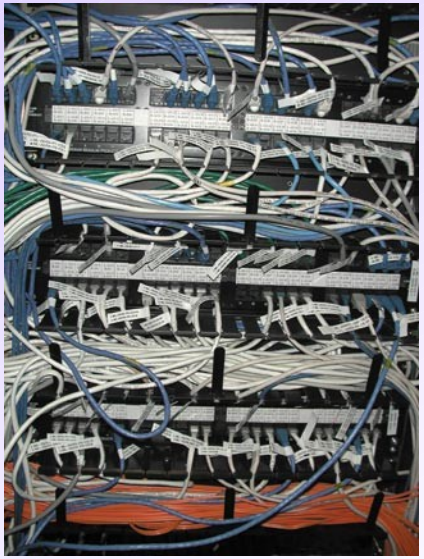
Two-way:
Cordless phone
Analog cellular

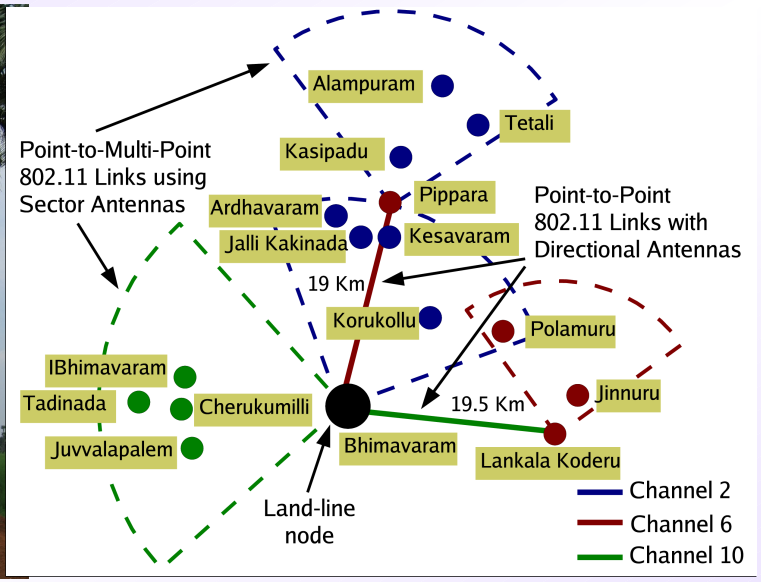
Digital

Two-way:
Digital cellular
Wireless local loop
Wireless LANs
Infrared
Bluetooth



Wired versus Wireless





- Attenuation is low
- Interference is nil: each wire is a separate medium
- Clumsy, costly, no mobility

- Attenuation is high
- Interference is high: single medium
- No knots, no digging to lay cables, tether-free

Wireless Networking Challenges

- Reference: The Challenges of Mobile Computing, George H. Forman and John Zahorjan, IEEE Computer, April 1994
  - Tech report: http://citeseer.ist.psu.edu/38782.html
- Read the paper!
  - From next class: read paper beforehand

Challenge-1: Disconnection

- User moves out of range, or obstacle comes in-between
- Techniques to cope with this:
  - Operate asynchronously: lazy-write-back, pre-fetching
  - Expose disconnection to the user

Challenge-2: Low Bandwidth

- Result of shared channel, high attenuation
- Techniques to cope with this:
  - More spectrum (but this is a limited resource)
  - Smaller cells
  - Compression
  - Pre-fetching, lazy write-back
  - Intelligent scheduling

Challenge-3: Variable Bandwidth

- Sources of variability:
  - Moving from wired to wireless
  - Moving from one wireless network to another
  - When changing location
- Techniques to cope with this:
  - Application has to adapt to changing bandwidth availability

Challenge-4: Security Risks

- Problem: broadcast medium!
  - No well defined boundary
- Techniques to cope with this:
  - Design system with security in mind
- Problem: device can be stolen!
- Techniques to cope with this:
  - Protect data in the device (e.g. using PIN)

Challenge-5: Mobility

- Network address has to change!
- Techniques to cope with this:
  - Decouple identity from location
- Need to keep track of user location
  - Paging mechanism

Challenge-6: Power Consumption

- Portable devices cannot have large batteries
- Techniques to cope with this:
  - Design system with power in mind
  - All protocols and applications must be power-aware

Challenge-7: User Interface

- Wireless applications cannot expect a sophisticated interface:
  - Form factor & capability of device may be limited
- Techniques to cope with this:
  - Application specific
  - Clever UI design (e.g. voice recognition)