Overview of Computers Workshop

Wireless and Networks

S2022 (Sem-1)

Mobile Networks Evolution

Mobile Wireless Networks - Evolution

1G

1980's

Basic analogue voice
No IP

0 kbit/s

One network for voice

NMT, AMPS, TACS

2G GSM

1990's

Digital voice
No IP

14kbps

One network for voice

GSM, IS-95
2.5G (GPRS, EDGE)

3G UMTS

2000's

Digital voice
WWW, multimedia

2Mbps

One network for voice
Other network for IP

UMTS, CDMA2000
3.5G (HSDPA, HSUPA, HSPA+, LTE)

4G LTE

2010's

Voice over IP
HD Video

300Mbps

One network for IP

LTE-Advanced
4.5G (LTE-Advanced Pro)

5G

2020's

Voice over IP
VR, V2X, IoT

1Gbps

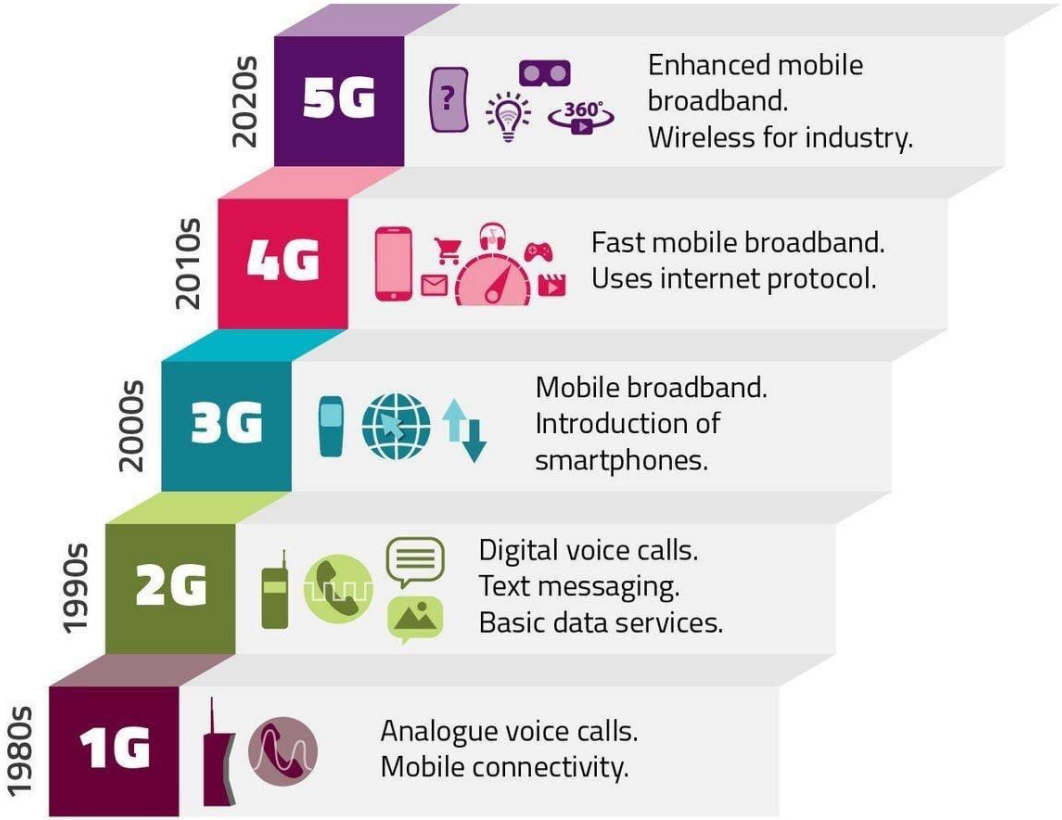
One network for IP

LTE-Advanced Pro
NR

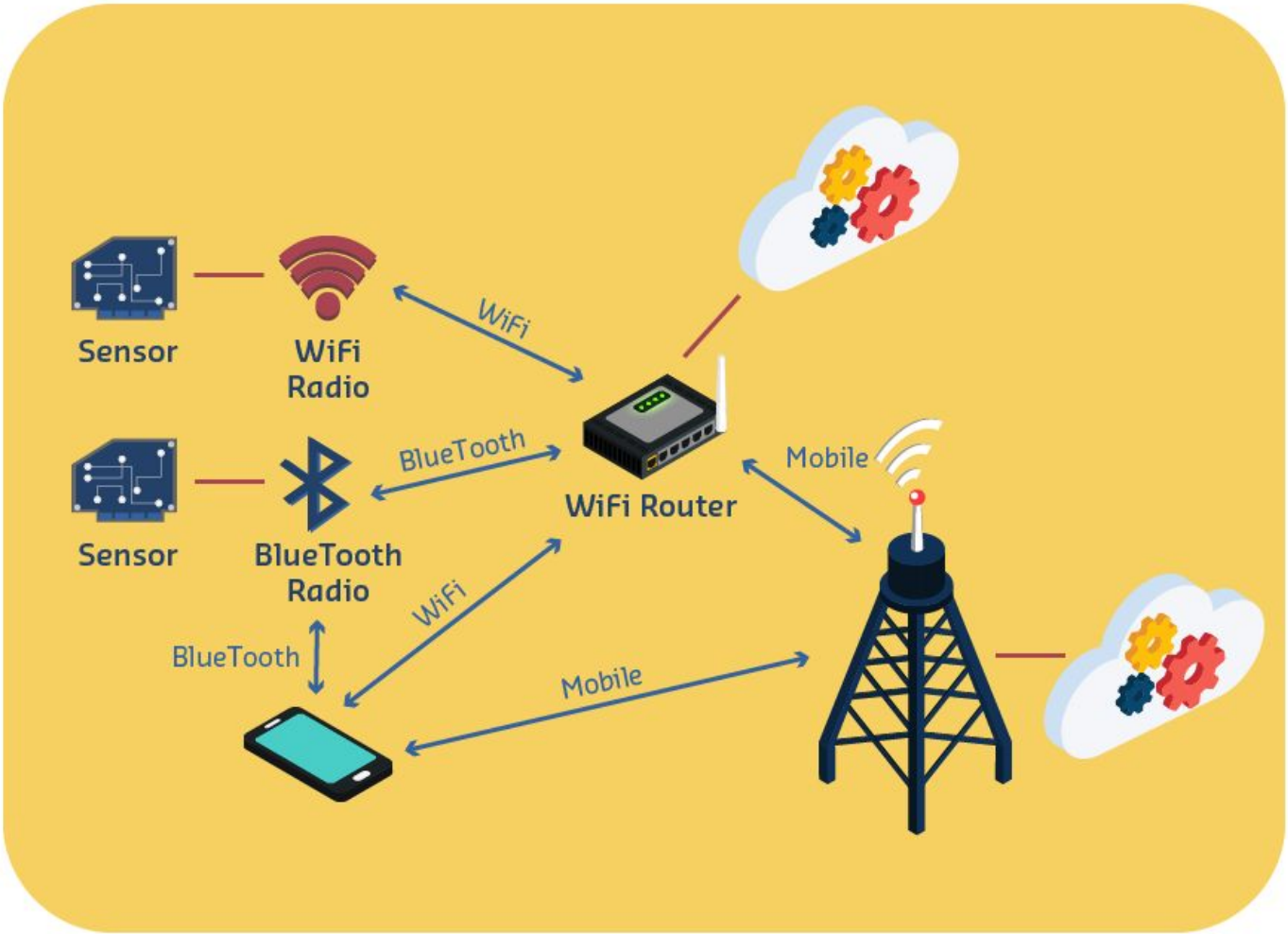
GRANDMETRIC WATCH!

Network Speed

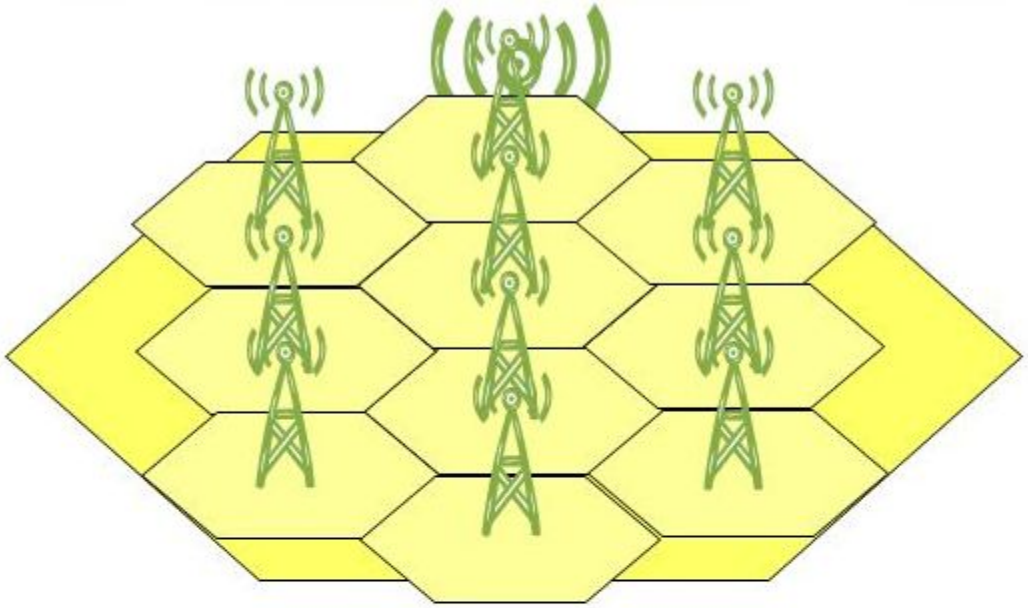
What in each step?



Types of Wireless Network

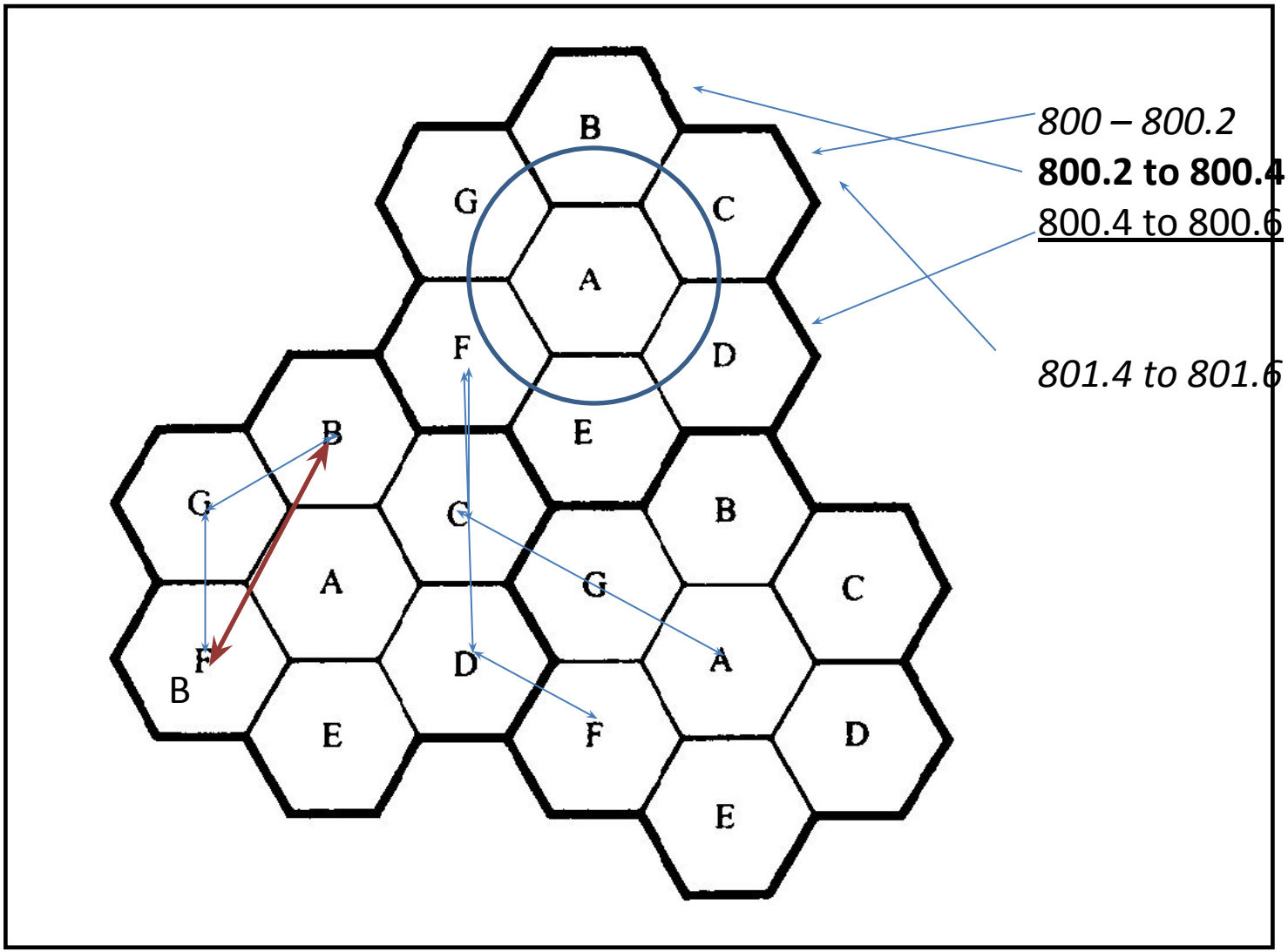


Cellular Concept



- Early Mobile Communications
  - Single, high powered transmitter with an antenna mounted on a tall tower
- The Cellular Concept
  - Replace a single high power transmitter (large cell) with many low power transmitters (small cells) each providing coverage to only a small portion of the service area

Cellular Concept



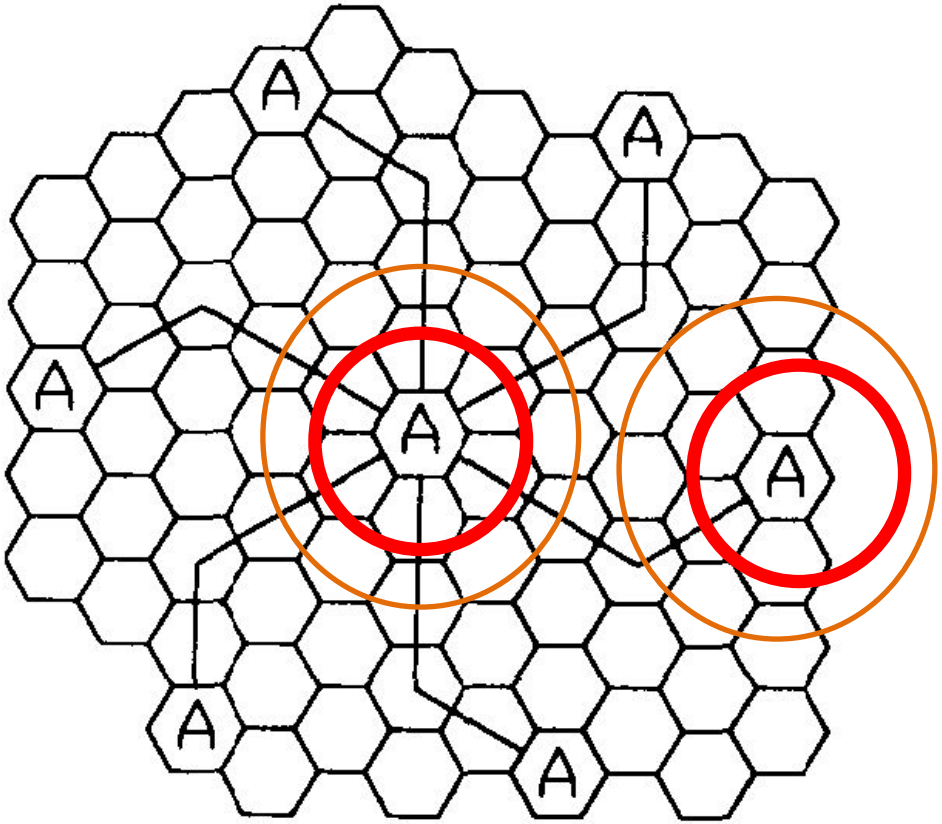
Frequency Reuse

$$S = kN$$

$$C = MkN = MS$$

$$N = i^2 + ij + j^2$$

$$\frac{S}{I} = \frac{S}{\sum_{i=1}^{i_0} I_i}$$



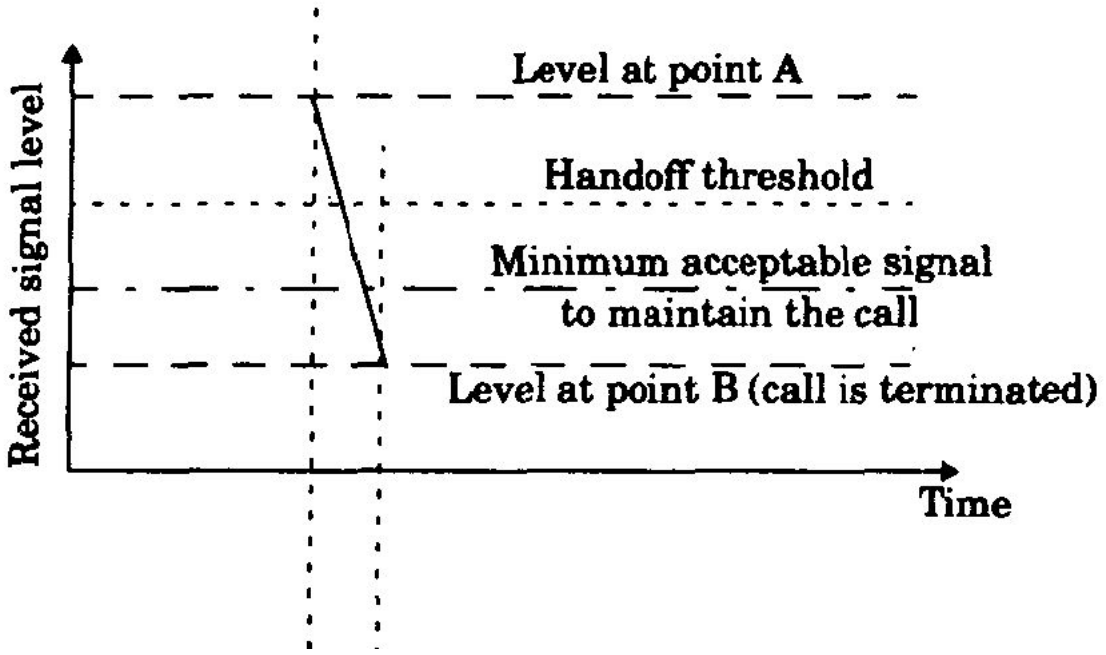
SINR = Signal to Interference and Noise Ratio ~SIR, C/I

$$Q = \frac{D}{R} = \sqrt{3N}$$

	Cluster Size (N)	Co-channel Reuse Ratio(Q)
$i = 1, j = 1$	3	3
$i = 1, j = 2$	7	4.58
$i = 2, j = 2$	12	6
$i = 1, j = 3$	13	6.24

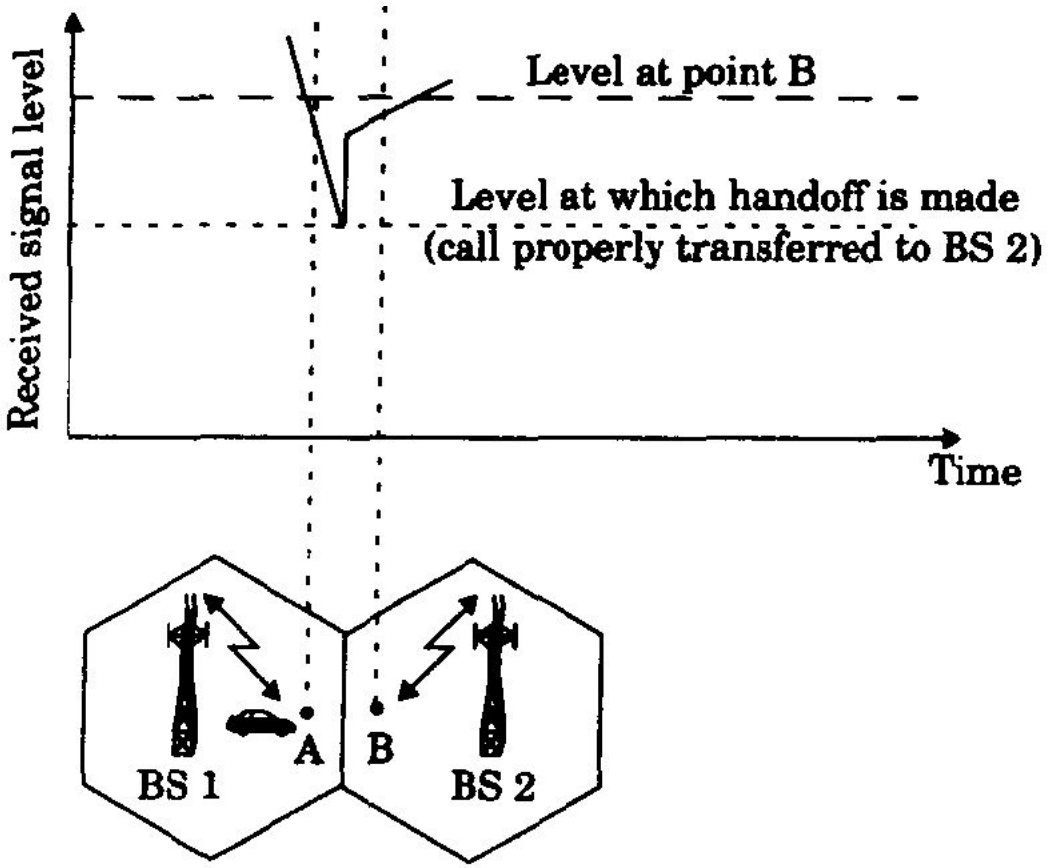
Handover - 1

(a) Improper handoff situation



Handover - 2

(b) Proper handoff situation



Umbrella cell Approach