MOBILE TELECOMMUNICATION SYSTEM

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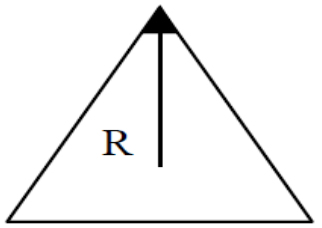
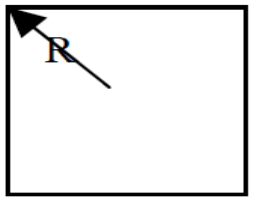
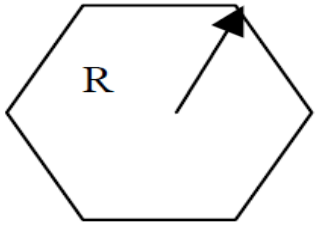
AP/CSE

Cell Structure

- The actual radio coverage of a cell is known as the cell footprint.
  - It has the most sides that can fit together without gaps.
  - The frequency reuse become possible using this shape.
  - The radiation pattern of the antennas used is 60 degree which means 6 are required for the full 360 degrees coverage which is the same no. of sides the hexagon consists.
- http://cdn.intechweb.org/pdfs/14752.pdf

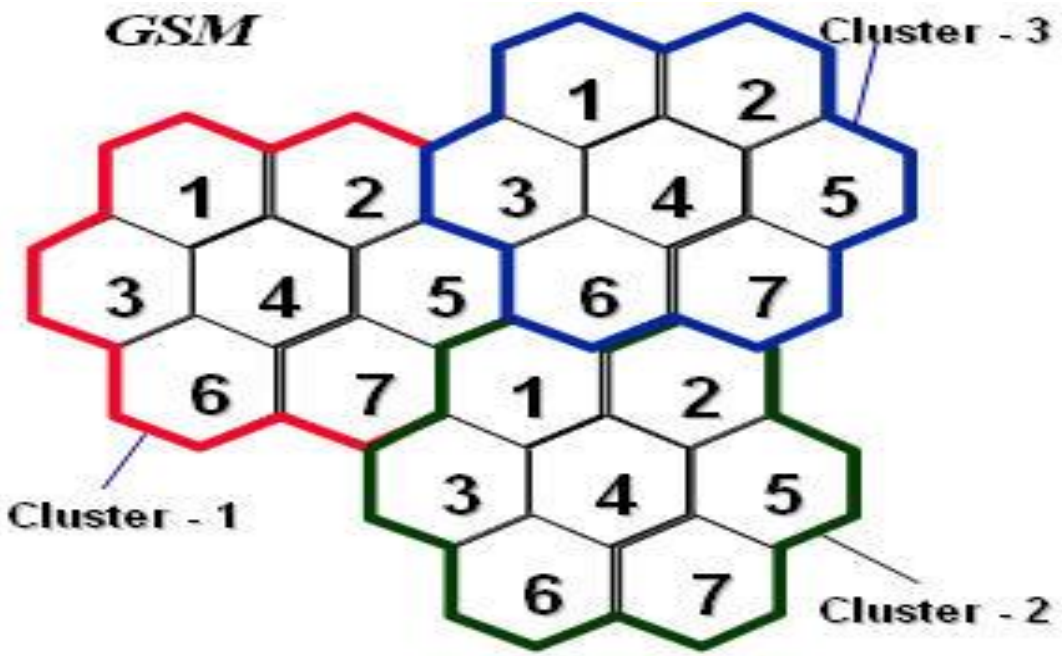


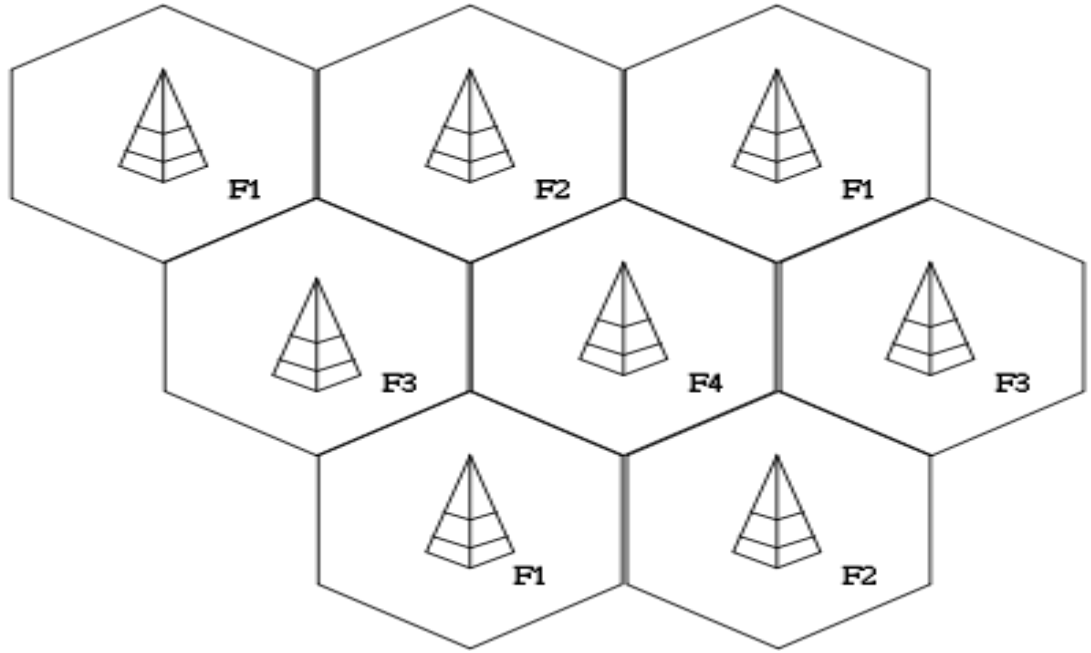




$$A_{tri} = 1.3R^2 \qquad A_{sq} = 2.0R^2 \qquad A_{hex} = 2.6R^2$$

Frequency Reuse

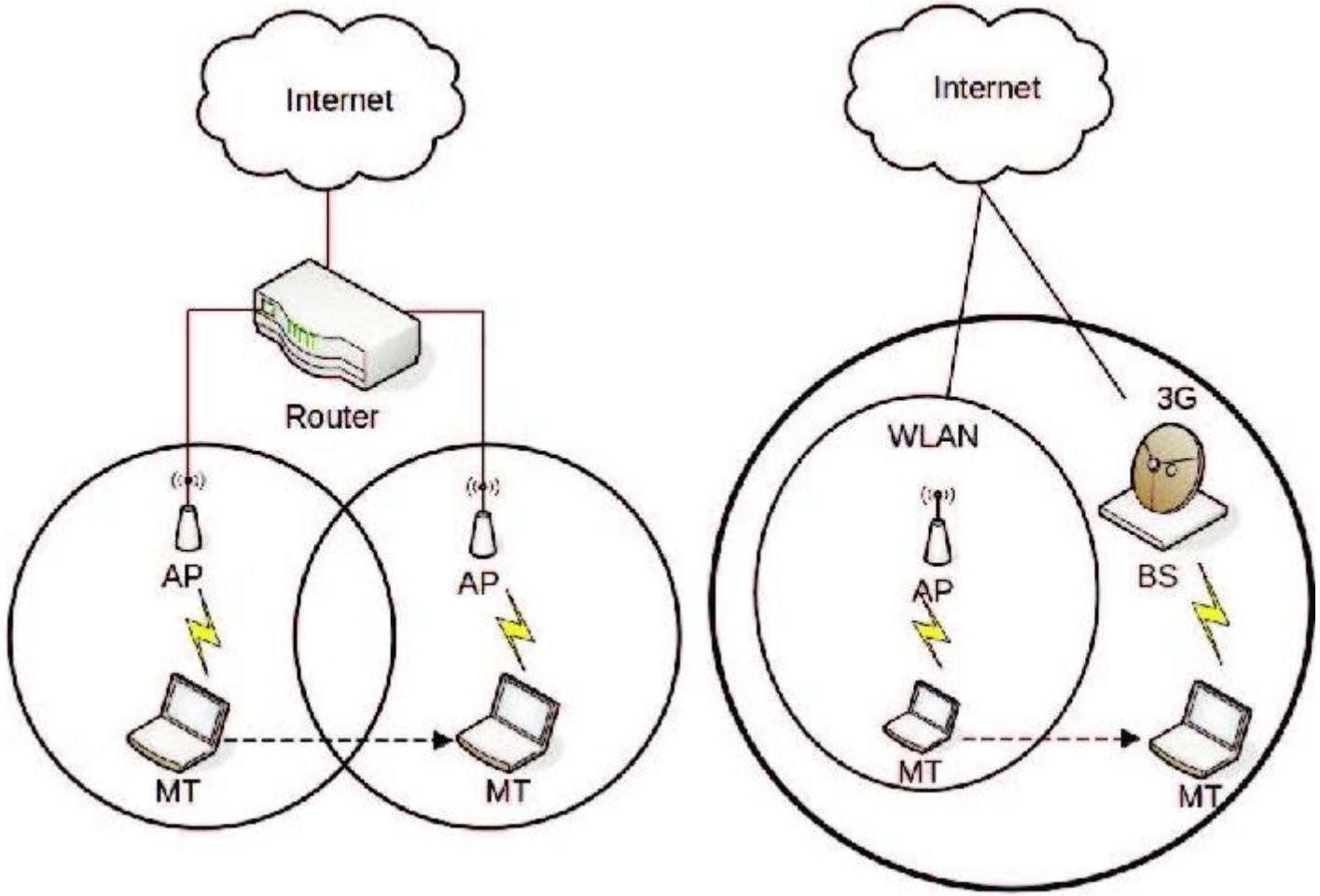




Comparison

Generation	Evolution	Deployment	Speed	Standard	Technology	Handoff	Features
1G	Analog cellular technology	1979	2.4 kbps	AMPS, NMT, TACS	FDMA	Horizontal	Voice calls
2G	Digital cellular technology	1992	64 kbps	GSM, GPRS	TDMA/CDMA	Horizontal	Voice calls, SMS
3G	Mobile broadband technology	2001	2 Mbps	UMTS, CDMA2000	WCDMA/CDMA 2000	Horizontal	Mobile internet, video calls
4G	Ultra-mobile broadband technology	2009	100 Mbps	LTE, WiMAX	OFDMA/MIMO	Horizontal and Vertical	Mobile broadband, HD video streaming, VoIP
5G	Next-generation mobile broadband technology	2019	10 Gbps	5G NR	OFDMA/MIMO/ Massive MIMO	Horizontal and Vertical	Mobile broadband, HD video streaming, VoIP, AR/VR, IoT
6G	Future-generation mobile broadband technology	2030	1 Tbps				Mobile broadband, HD video streaming, VoIP, AR/VR, IoT, AI, Integrate 5G with satellite network for global coverage Ultra fast Internet access Smart home/cities
7G	Terahertz mobile broadband technology	2040	10 Tbps				Mobile broadband, HD video streaming, VoIP, AR/VR, IoT, AI, autonomous driving, Space roaming World completely wireless

Horizontal and vertical



Future 6G, 7G

- 6G
  - Integrate 5G with satellite network for global coverage
  - Ultra fast Internet access
  - Smart home/cities

- 7G
  - Space roaming
  - World completely wireless

Key Points

- PSTN - public switched telephone network
- MTS -Mobile Telephone Systems
- AMTS -Advance Mobile Telephone Systems
- IMTS- Improved Mobile Telephone Systems
- Horizontal handoff
  - between two same wireless mobile network technologies.
- Vertical handoff
  - between two different wireless mobile network technologies.

Key Points

- SMS-Short Message Service
- MMS-Multimedia Messaging Service
- GSM -Global System for Mobile communication
- GPRS -General Packet Radio Service
- EDGE -Enhanced Data for Global Evolution
- UMTS -Universal Mobile Telecommunications Service
- HSDPA -High-Speed Downlink Packet Access
- HSUPA -High-Speed Uplink Packet Access
- LTE- Long Term Evolution

Summary

- Cellular networks
- Comparison of 1G – 5G

Test Your Knowledge?

- Why the cell structure is preferred to be hexagonal shape?
- ------- uses the cellular network to enable high speed internet connections ti devuces wutg built-in compatible technology such as smart phones

a) Cellular radio b) bluetooth c)wi-fi

References

Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi, 2007.

Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt. Ltd, New Delhi – 2012.