

Overview of Cellular Generations

EECS3214

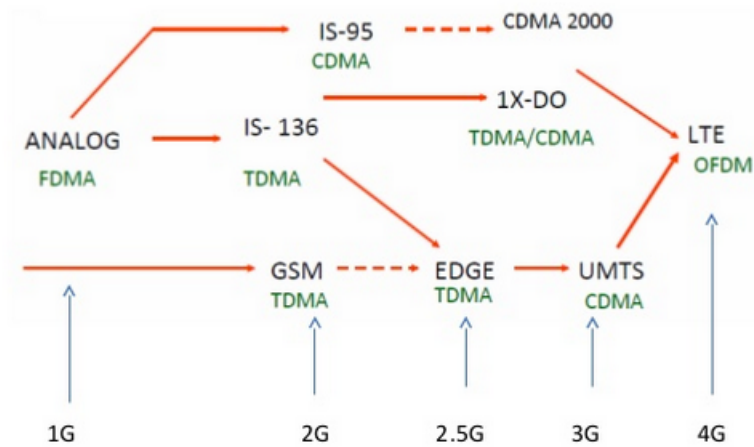
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Overview of Cellular Generations

- 1G
- 2G, 2.5G, 2.75G
- 3G, 3.5G (HSPA), 3.75G (HSPA+)
- 4G

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Evolution of Cellular Networks



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Cellular Generations Matrix

Cellular Generation	Technologies	Key Differentiators	Practical Timeframe	Official Sunset Date
1G	AMPS (USA) TACS (Europe) J-TACS (Japan)	Frequency reuse; analog systems	1983-1996	February, 2008
2G (Voice)	TDMA (IS-54; IS-136); GSM; CDMA (IS-95)	First all-digital systems; used sectorization	1992-present	Projected: 2016
2.5G	GPRS	GSM-based; 171 Kbps transmission speed	2000-2011	Beginning in 2012
2.75G (or 2.9G)	EDGE	GSM-based; 384 Kbps transmission speed	2003-present	TBD
3G	UMTS; CDMA2000 (1xEV-DO); WiMAX	Multimedia transmissions	2002-present	TBD
3.5G	HSPA	14.4 Mbps downlink speed	2006-present	TBD
3.75G	HSPA+	42 Mbps downlink speed	2010-present	TBD
4G	LTE	Download speed in tons of megabits	2010-present	TBD

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1G Networks

- Launched in early 1980s.
- Transmitting only voice.
- Used “frequency reuse” concept.
- Prominent 1G networks were:
 - AMPS (Advanced Mobile phone System)
 - Nordic NMT (Nordic Mobile Telephone)
 - European TACS (Total Access Communication System)
 - J-TACS

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2G Networks

- First all-digital cellular systems.
- Launched in early-to-mid 1990s.
- Mobile-assisted handoff capabilities.
- Prominent 2G networks:
 - GSM
 - cdmaOne (IS-95A/B)
 - D-AMPS (IS-136)

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2.5G and 2.75G Networks

- 2.5G:
 - Included GPRS and CDMA2000 1x technologies
 - Data rates up to about 144 Kbps
- 2.75G:
 - GSM-based EDGE wireless data technology
 - Sometimes also labeled as “2.9G”

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3G Networks

- Third generation networks.
- Having data rates of 384 Kbps and higher.
- Prominent 3G networks:
 - UMTS (Universal Mobile Telecommunication Service)
- In United States:
 - UMTS and CDMA2000 1xEV-DO have been deployed
- FDD means different frequencies are used.
- TDD means one frequency is used in both up and down links.

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3.5G and 3.75G Networks

- 3.5G (HSPA – High-speed packet access):
 - Evolved from UMTS
- 3.75G (HSPA+)

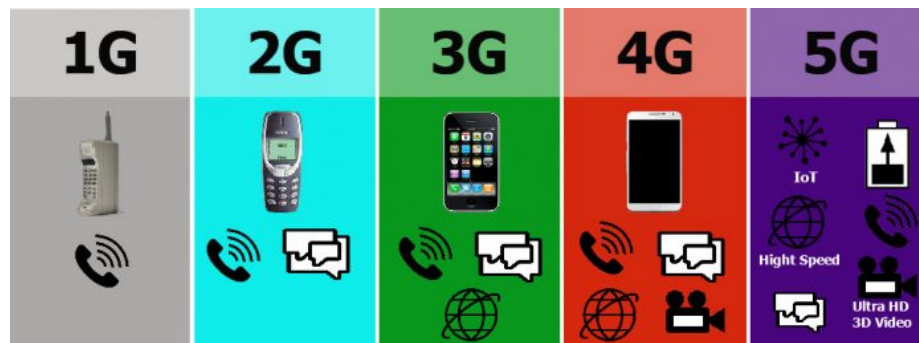
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4G Networks

- Consists of WiMAX and Long-term evolution (LTE).
- WiMAX never really “caught on” in the industry.
- True 4G technology is LTE Advanced (LTE-A).

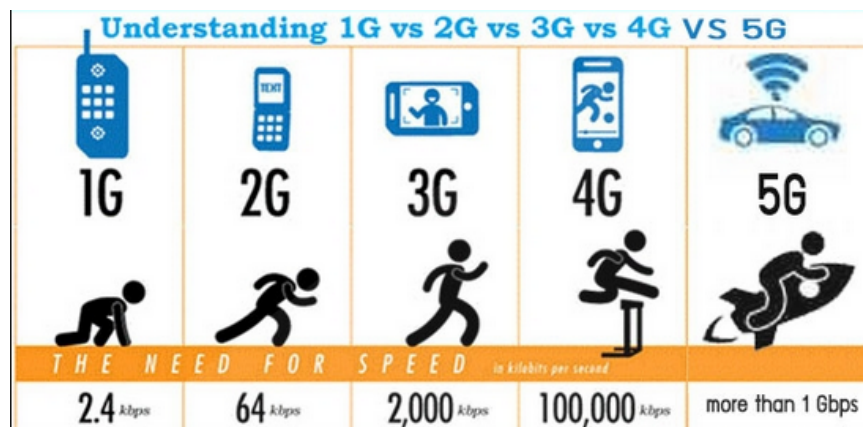
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5G Networks



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5G Networks (2)



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