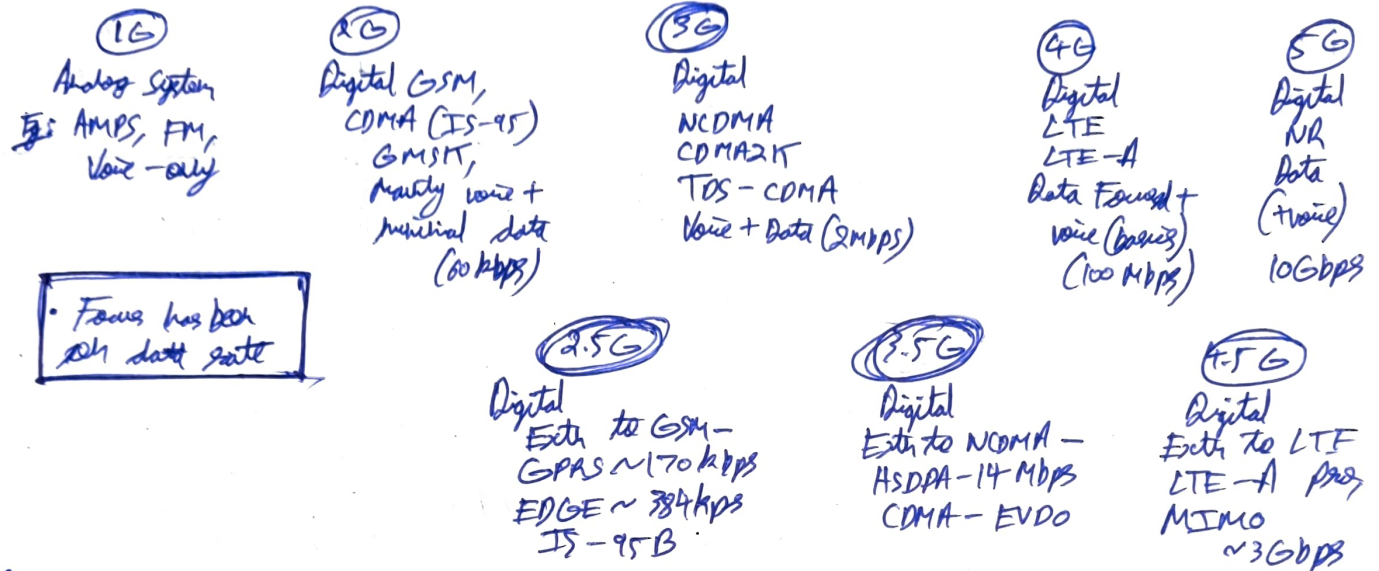


DTAI - 5G/WIFI - Which one is better?

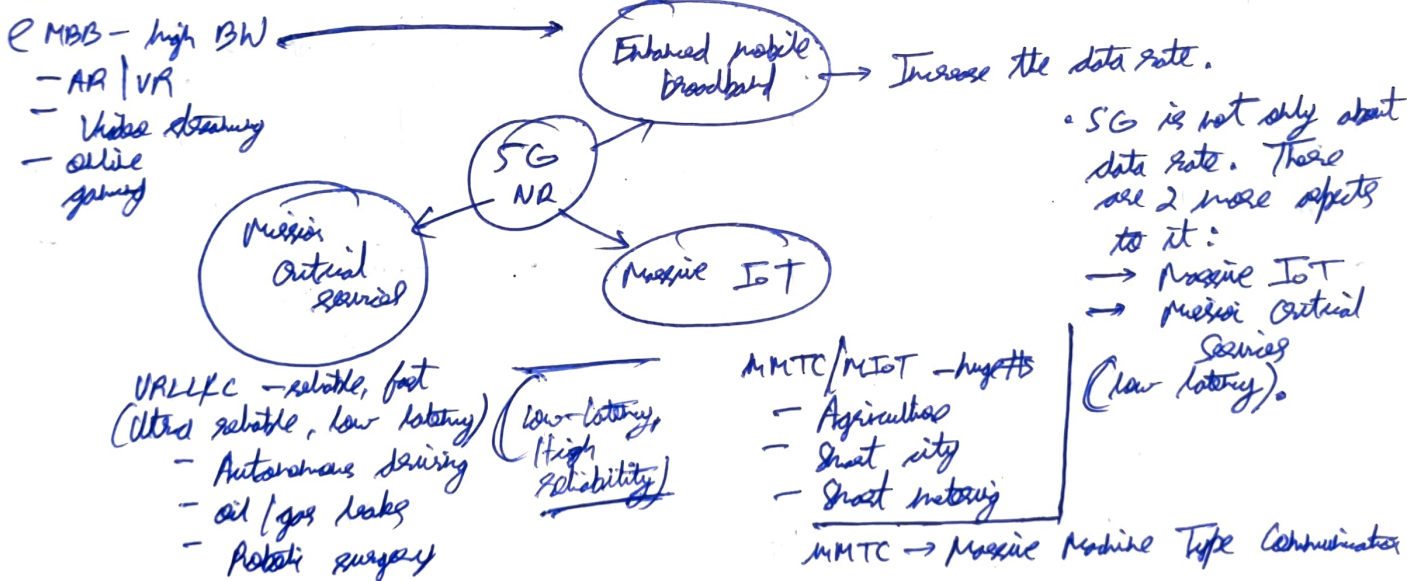
Why are we comparing 5G and Wi-Fi?

G → Generation. Progression of technology from generation to generation.

Evolution of Cellular Technologies



Pillars of 5G



WIFI

- WI-FI: Wireless Fidelity
- WLAN: Wireless Local Area Network
- WWAN: Wireless Wide Area Network

WIFI Generations

- Today we are in Wi-Fi 6 era.

Features Grouping

- Technology
- Users

Generations and Network Concept (Technical Comparisons)

SIM → Subscriber Identity Module

Cellular Access Network

→ UE's

→ CNB

→ Backhaul network.

In India, the major part of 3GPP is TSDSI (Telecommunication Standards Development Society, India).

→ Who gives these values.

mmWave → millimeter wave

- Spectrum and Bandwidth
- A small portion of the bandwidth is allotted for specific applications / communication.

→ Not much flexibility

Practical data rate is less than 50% of the theoretical values.

OFDMA allows us to fit multiple users with lesser latency.

MIMO → Multiple Input Multiple output

MU → Multi user

OFDMA → Orthogonal Frequency Division Multiple Access

MCS → Modulation Coding Scheme

Feature	5G	WI-FI
Generations	Fifth generation of cellular network	6th generation of local area communication
Network Architecture	Wide Area Network	Local Area Network
Specifications Making	3GPP (3rd Generation Partnership Program)	IEEE (Institute of Electrical and Electronics Engineers)
Specifications Body	3rd Generation Partnership Program (3GPP)	IEEE (Institute of Electrical and Electronics Engineers)
Spectrum	<ul style="list-style-type: none"> • FR1 / sub-7: 410 MHz - 7125 MHz • FR2 / mmwave: 24250 MHz - 52600 MHz • Licensed spectrum • THz not a freq. band 	<ul style="list-style-type: none"> • 2.4 GHz • 5 GHz • 6 GHz → (Not in India) • 60 GHz • Unlicensed Spectrum
Bandwidth (MHz)	<ul style="list-style-type: none"> • 5-30 (X5) • 30-100 (X10) • 50, 100, 200, 400 	<ul style="list-style-type: none"> • 20, 40 • 20, 40, 80, 160 • 20, 40, 80, 160
Data Rate (Peak - load speed)	~10 Gbps → 20 Gbps	~9.6 Gbps
Data Rate Drivers	OFDMA MCS MIMO	OFDMA MCS MIMO
Users (capacity) - with MU-MIMO	1 million	8
Security Reach	Global	Local
Security - Example	<ul style="list-style-type: none"> • SIM card • Network Algorithms (Huge Protocol Stack) 	<ul style="list-style-type: none"> • Network protocol protected (weak) • WPA3

- Theoretically, 50 devices can be connected to 5G WI-FI, but unlicensed spectrum gives problems.
- Not much difference in 4G, 5G coverage now. Practically 5G coverage is worse today. Optimization still has to happen.

Set-up Complexity and Cost

LOS Communication Line of Sight

Small cells →
Low stakes

Feature	5G	NI-Fi
Set-up complexity	• Simple for home users • Complex for enterprises	• Simple for home users. • Relatively simple for enterprises
Cost	Home users: Pre-paid, Post paid device. Enterprises: Small cells, dock boards, security set-up, expertise - very high	Home users: Router device, ISP (Airtel, Jio) Enterprises: Routers and gateway, Dock boards, Security set-up, Expertise - low.
Latency	~1ms	~2ms
Reliable connection	Highly variable (based on channel conditions).	Mostly stable (users may not be mobile)
Coverage	~5-10 km	<200 m
Tech Adoption	Mobile Enterprises (IoT)	Home / Office devices Enterprises (IoT)

→ If you want internet connection

→ Enterprises look at from an IoT perspective

Generators, Network Architecture, Spec Naming, Spec Body, Spectrum, BW, Data rate, delay, Security, Set-up complexity, Cost, Latency, Reliable connection, Coverage, Adoption.

So, which one is better?

→ Depends on our application. Make a table and compare for yourself.

NOTES

- Firewall is not a 5G security feature.
- T14 is not a 5G frequency band.
- GSM/GPRS is not a 5G network deployment scenario.
- Beamforming is the process of combining multiple signals into one.
- Ethernet is not a Ni-Fi network topology.
- Previous device compatibility is not a benefit of 5G.
- Massive device connectivity is the most important feature of mMTC in 5G.