18th Annual TFI Technology Conference

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Austin, TX

Wireless Industry Panel
Implications for Tax & Valuation

Presenters:
Iain Gillott, iGR
Gary Hunter, AT&T
Steve Yergeau, T-Mobile

Agenda

- Goodbye 3G, hello 5G
- Why 5G is a better network
  - Improved efficiency
  - Lower cost per GB
  - Increased capacity
- Spectrum and 5G
- 2023 challenges
- Evolution of ORAN
- Benefits of ORAN
- Questions?

1: | The 3G Era is Finally Over

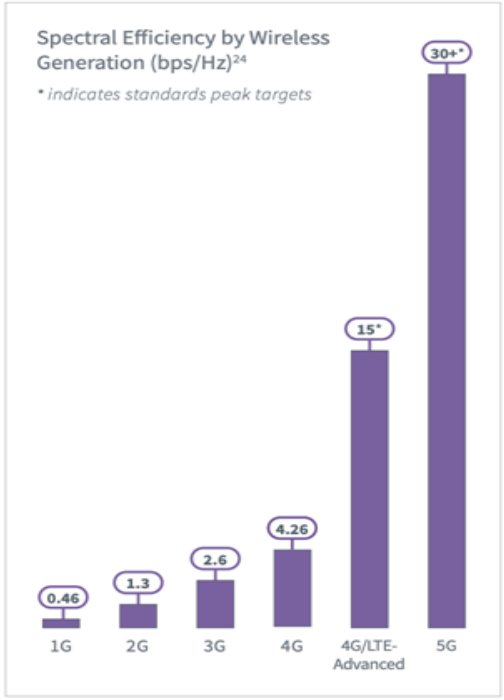
- AT&T was the first US carrier to shut down its 3G network on February 22, 2022
- T-Mobile dismantled Sprint's 3G CDMA network on March 31, 2022, and its 4G LTE network on June 30, 2022
  - The operator then shuttered its own 3G UMTS network on July 1, 2022
- VZ shut down its 3G CDMA network at the end of 2022

- Bandwidth demand is increasing
  - Data usage increases ~35% per year
  - More video, more media, more apps
- 5G now replacing 4G LTE
- More competition
  - Cable, satellite

Sources: "3G in the US rides into the sunset", Mike Dano, Light Reading, January 3, 2023.
"3G shutdowns in 2022: What we know so far", Light Reading, Mike Dano, February 7, 2022.
AT&T 2021 10K.

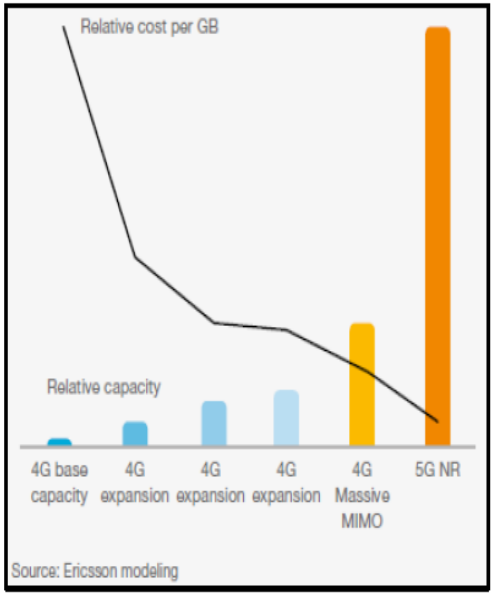
2: | Why 5G? It is Superior

Greater Spectral Efficiency



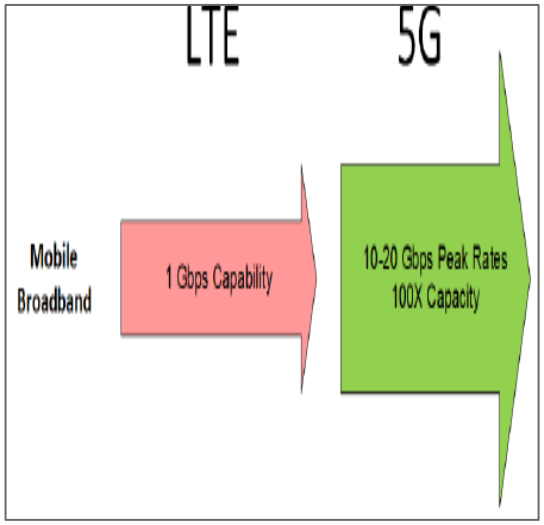
5G 2x 4G / LTE Advanced, >7X 4G .

Reduced Cost per GB



A site fully evolved with 4G & 5G capacity will deliver mobile data 10x more cost efficiently than a basic 4G site does today.

Greater Capacity



5G has 10x-20x greater speed, 100x greater capacity.

Source: Global 5G: Implications of a Transformational Technology, 5G Americas Report Provided by Rysavy Research.

3: | 5G uses different types of Spectrum

Low, Mid and High-Band Spectrum [6]

Low-Band 0.3-3 GHz	Mid-Band 3-24 GHz	High-Band 24-50 GHz
	Lower Mid-Band 3-8.4 GHz / Upper Mid-Band 8.4-24 GHz	
Travels longer distances with minimal signal interruption. Today's 4G wireless networks are built primarily on low-band spectrum	Blends the characteristics of both low and high band spectrum, providing a mix of coverage and capacity	Travels much shorter distances (think feet, not miles) compared to low-band spectrum, but offers high capacity and ultra-fast speeds

Source: Spectrum Allocation in the United States, Accenture, 2022.

4: | Some thoughts about 2023

- New transport architecture
- New processes

- New Radios & Antennas
- Structural modifications/upgrades
- Jurisdictional approvals

- FAA restrictions
- Spectrum clearing

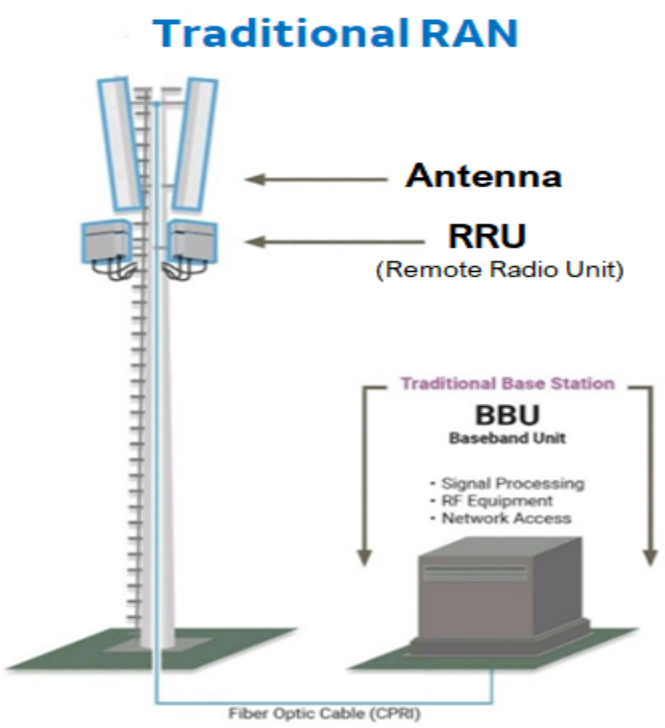
- Inflationary pressure
- Labor market

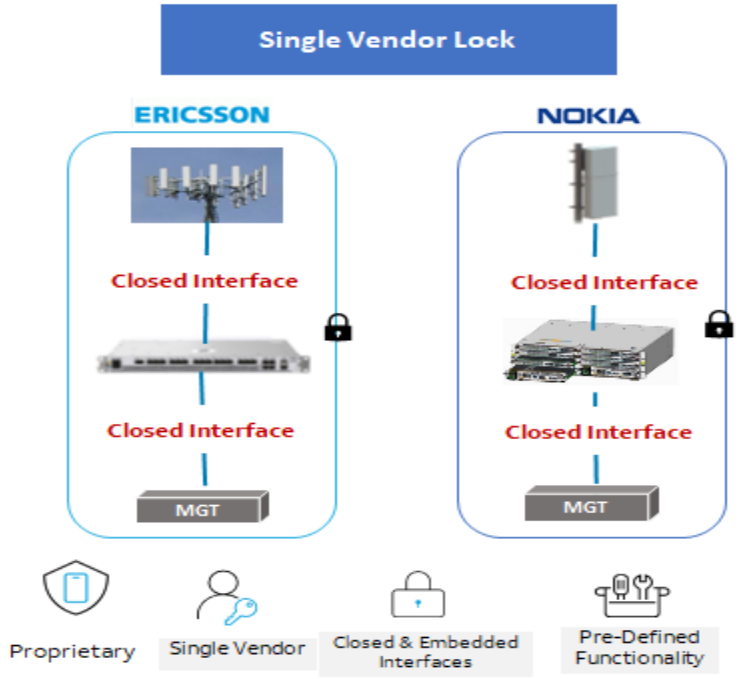
- Supply chain pressure
- Logistics

Plus, the more spectrum the better!

5: | The Evolution to ORAN

Earlier this month, Alan Davidson, head of the National Telecommunications and Information Administration, talked about the agency's plan to advance open Radio Access Networks (open RAN).





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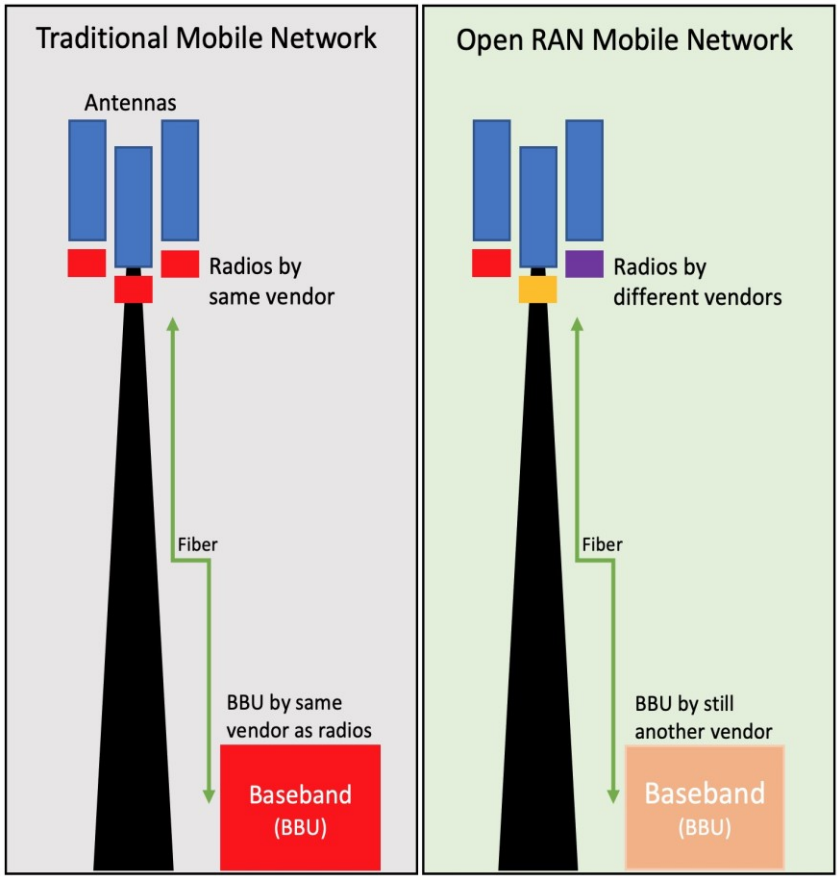
Source: "NTIA to develop national spectrum strategy in 2023" Linda Hardesty, Fierce Wireless, Jan. 9, 2023.

6: | Benefits of ORAN



Benefits of an ORAN Network:

1. Increase vendor supply for hardware/software components
   - More players (beyond just Ericsson and Nokia) - increase competition, innovation, and reduce cost
   - Reduces risk
2. Separation of HW & SW
   - CAPEX cost savings with vendor agonistic hardware (~40% less)
   - Standardized of HW platform across RAN/core/edge
3. Making network maintenance open to a wider range of service providers
4. Reducing the amount of physical infrastructure required at cell sites
   - Reduces power consumption
   - Reduces space needed at cell site

Questions?