

5G is here. What now?

Mike Dano

Mike Dano

- I started at RCR Wireless News and then worked at FierceWireless
- I work at LightReading.com today
- I've been covering the wireless industry as a journalist for more than 20 years
- I wrote my first big story on 6G in 2019

The screenshot shows the LightReading website. At the top, there is a navigation bar with the LightReading logo, a "Newsletter Signup" button, and links for "Sign In" and "Register". Below the navigation bar is a horizontal menu with links: 5G | 6G | The Edge | Open RAN | The Cloud | Security | AI/Automation | Cable Tech | Optical/IP | Broadband | OSS/BSS/CX | Events | Resources | Market Leaders.

A large banner for the "Optical Networking Digital Symposium" is displayed, featuring the dates "Feb. 7th & 9th, 2023" and a "REGISTER NOW!" button. The banner also mentions "Gold Sponsor Infinera".

Below the banner is Mike Dano's profile. It includes a small profile picture and the following information:

- Member Since: January 7, 2019
- Blog Posts: 1990
- Posts: 105

There are also links for "Profile for Mike Dano", "Content by Mike Dano", "Saved by Mike Dano", and "Upskill U progress for Mike Dano".

The profile text states: "Reading's Editorial Director, 5G & Mobile Strategies. He has covered the wireless industry as a journalist for almost two decades, first at RCR Wireless News and then at FierceWireless and recalls once writing a story about the transition from black and white to color screens on cell phones. Mike is based in Denver and can be reached at mike.dano@lightreading.com. Follow @mikeddano on Twitter and find him on [LinkedIn](#)."

On the right side of the profile, there is a red button that says "Subscribe to Light Reading newsletters!" and a "SIGN UP HERE" button.

At the bottom right, there is a VIAMI Solutions advertisement with the text "Quality begins by knowing your network." and "NETWORK INTELLIGENCE ACROSS 5G, FIBER, AND CLOUD." with a "LEARN MORE" button.

Today's agenda

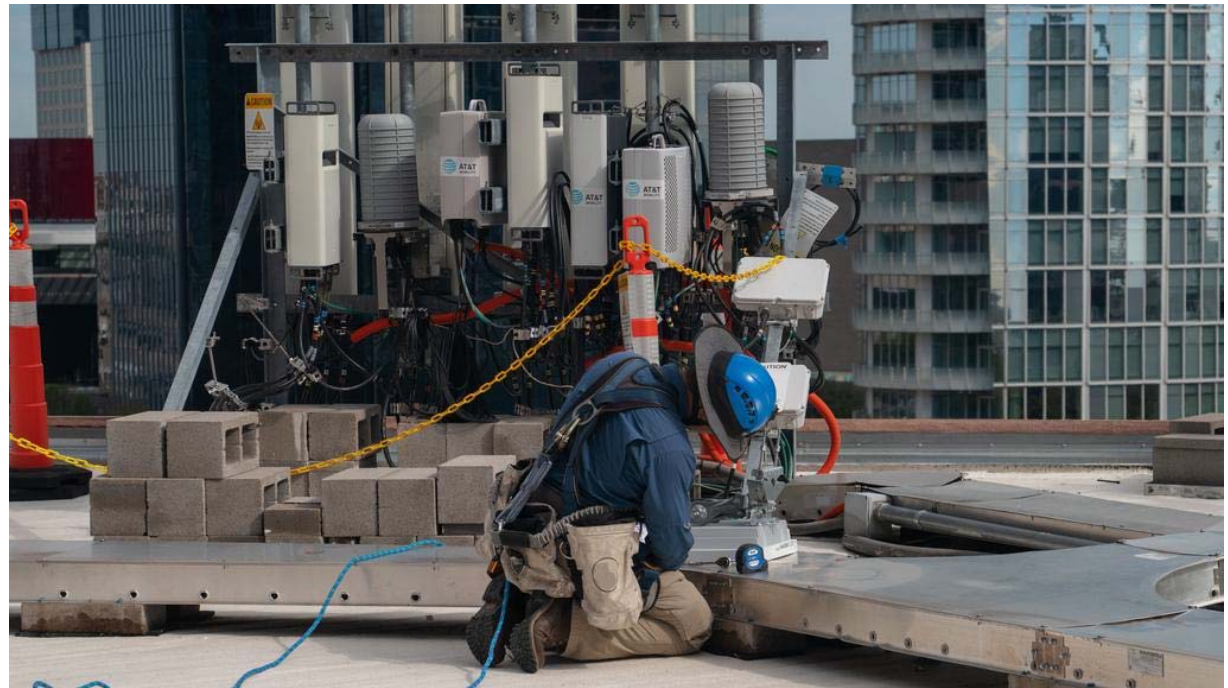
1. 5G: Where we are today
2. 5G traffic drivers
3. Small cells and DeWi
4. Knowns and unknowns
5. 6G (yes, really)
6. Q&A

Part 1: 5G: Where we are today

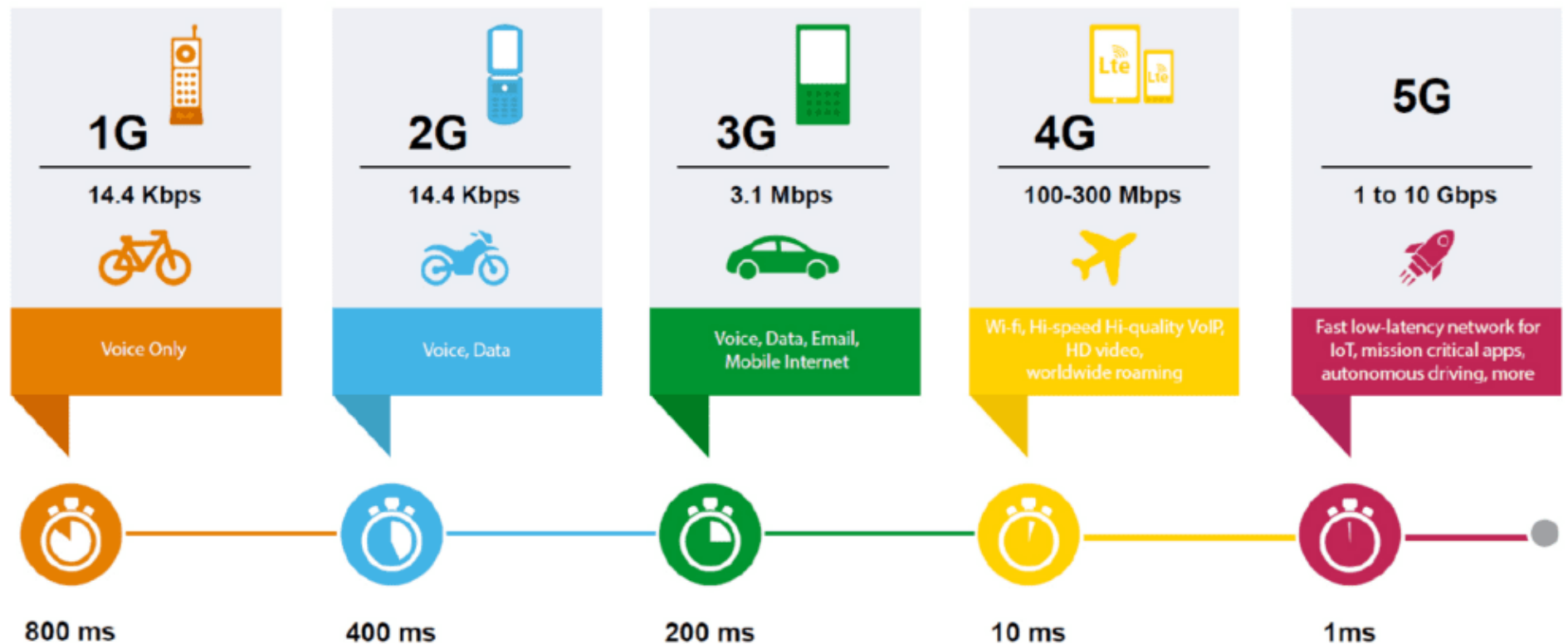


“Real” 5G requires a new radio on top of a cell tower, and a new phone

- Think of 3G, 4G and 5G as separate languages
- To get a connection, both sides have to “speak” the same “language”



5G: faster speed and lower latency



The big 5G factor: Network capacity

- 5G speeds and latency are better
- But the real key is that 5G networks have more capacity: More capacity for more customers, better performance and more devices
- It's not exactly clear how much more capacity 5G can create, but T-Mobile has a figure:



14x

However, not all 5G is the same

- There are different “flavors” of 5G
- Each “flavor” has some unique characteristics:
 1. **mmWave 5G:** Very fast, covers very small amounts of territory (think city blocks)
 2. **Midband 5G:** Pretty fast, covers significant amounts of territory (think smaller towns)
 3. **Lowband 5G:** Not very fast, but covers lots of territory (think big cities)
- The “best” 5G combines all of these into one network.





The worldwide race to 5G

- At least one “flavor” of 5G is now available in most countries in the world
- Midband 5G and lowband 5G are pretty common in most major countries
- mmWave 5G is mostly a USA phenomena
- 5G is just now rolling out in countries like India

Africa	162	19
Asia	140	61
Europe	165	113
Latin America	129	28
Middle East	51	23
Oceania	39	9
U.S. & Canada	17	14
Global Totals	703	267

Data provided by TeleGeography & 5G Americas as of 06/15/2023

Midband 5G coverage in the USA

T-Mobile = 260 million people covered

Verizon = 175 million people covered

AT&T = 130 million people covered

Dish = 0 million people covered

Dish Network: The 5G wild card in the USA

- Dish's 5G is on 18,000 towers today
- Dish will need another 12,000 towers or so by 2025
- Dish is pioneering a new cloud-based, open RAN capable network
- Dish has around 8 million customers today, and MVNO deals with AT&T and T-Mobile

BUT

- Dish is losing customers, with no end in sight
- Dish will need to raise more funding or go bankrupt within a year or so

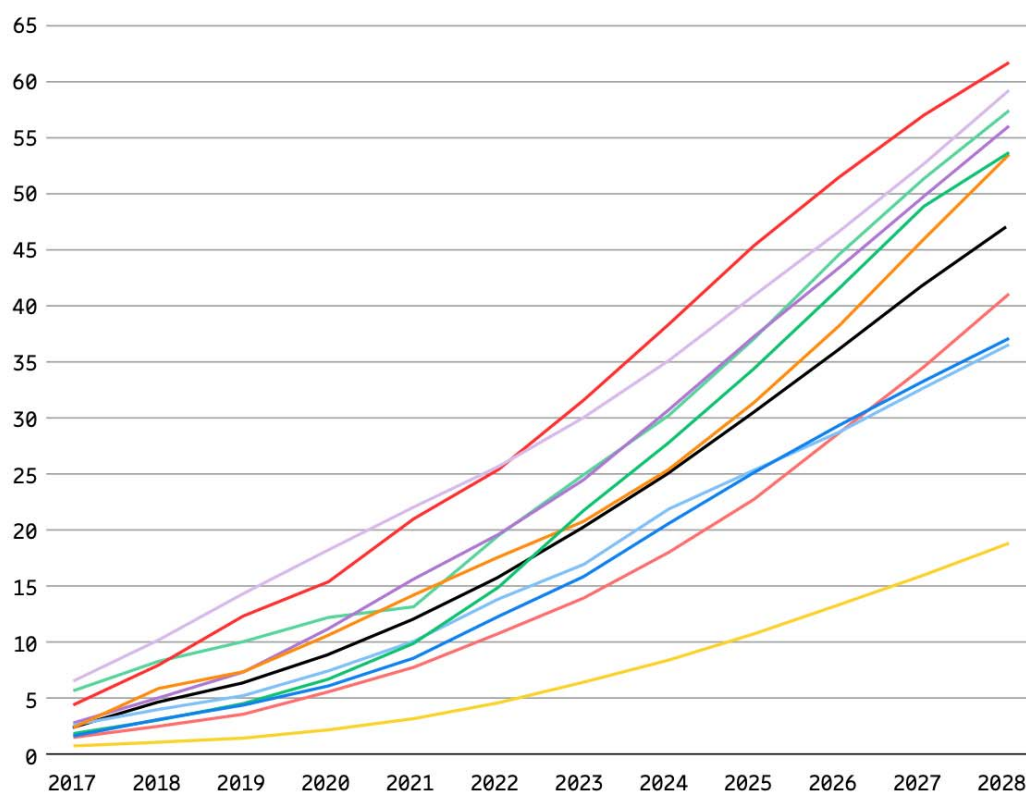


Part 2: 5G traffic drivers



Smartphone data traffic continues to rise...

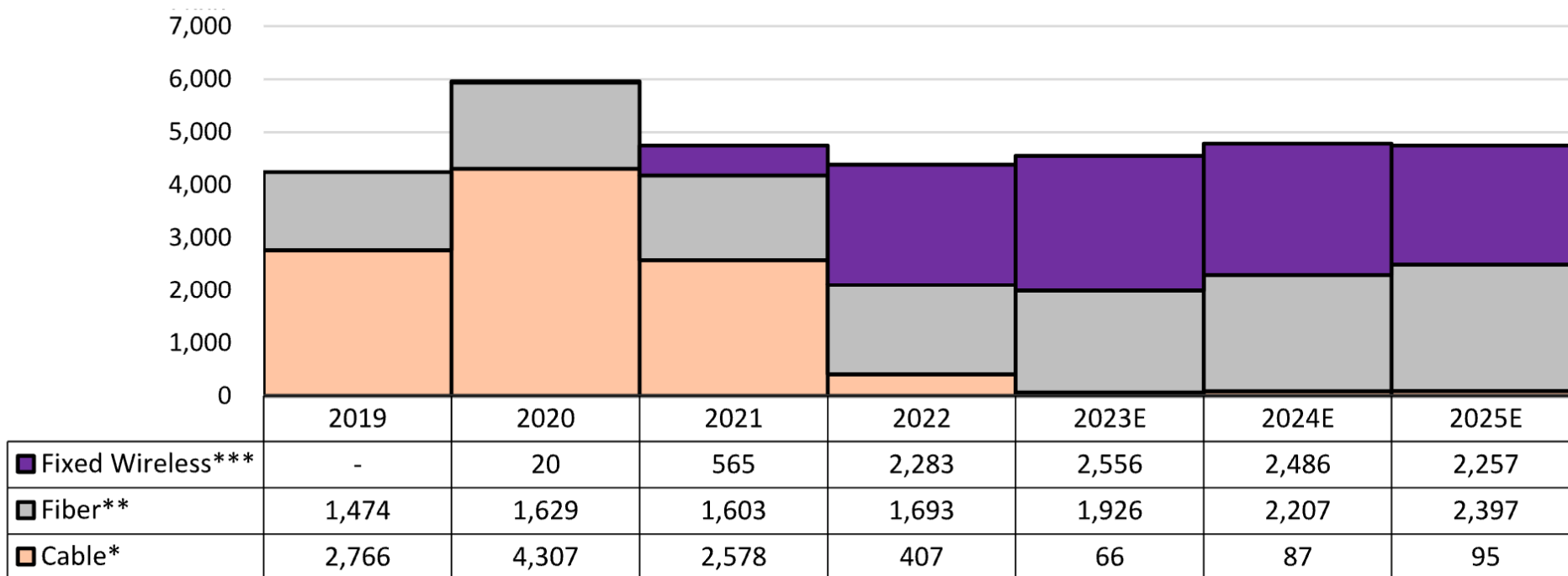
Figure 20: Mobile data traffic per smartphone (GB per month)



Regions	2022	2028	CAGR 2022–2028
India, Nepal, Bhutan	26	62	16%
GCC	26	59	15%
North America	20	58	20%
Western Europe	20	56	19%
North East Asia	18	54	20%
South East Asia and Oceania	15	54	24%
Global average	16	47	20%
Latin America	11	41	25%
Middle East and North Africa ¹	12	37	20%
Central and Eastern Europe	14	37	18%
Sub-Saharan Africa	4.7	19	26%

Fixed wireless: The first big new 5G service

Exhibit 6 - Annual Share of Broadband Net Adds (k)



Source: Company reports, Wells Fargo Securities, LLC estimates, Visible Alpha Consensus estimates

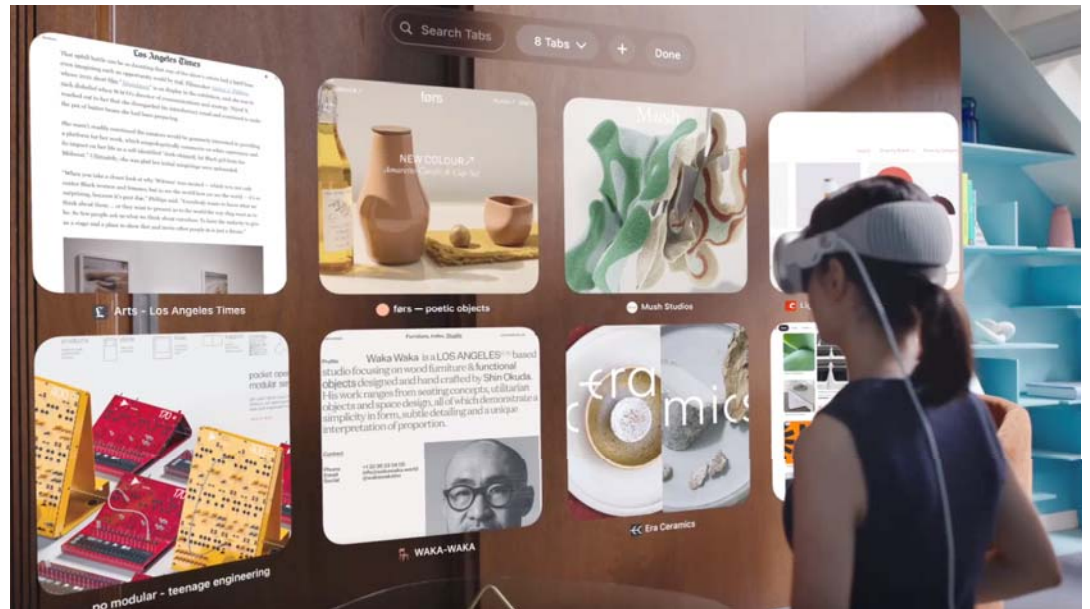
But FWA has its problems

- Carriers make 10-30x LESS money from 1GB of FWA data compared with 1GB of smartphone data
- Network capacity is not infinite. Today's networks can only support maybe 15 million FWA customers.
- Expanding FWA beyond 10-15% of the US market will require a big investment into more network equipment, more spectrum, or both



Looking to the future

- Many expect VR/AR wearables to drive the next big wave of 5G demand
- Think Apple Vision Pro
- But this might end up being a 6G story...



Part 3: Small cells and DeWi



Regular macro cell tower vs small cell



What is the future of small cells?

- AT&T missed its target of building 40,000 small cells in 2015
- T-Mobile canceled Sprint's purchase of 5,700 small cells
- Crown Castle cut its small cell buildout plans in half for 2021 and 2022.

Small cells cool off while midband 5G buildouts begin



News Analysis
MIKE DANO,
Editorial Director,
5G & Mobile
Strategies

5/11/2021

COMMENT (0)

AT&T, T-Mobile and Verizon are all working to put their new midband spectrum licenses to use in 5G. And much of that work appears to involve upgrades to their existing 5G radios on top of their existing macro cell towers, and not necessarily adding more small cells to their network footprints, at least at first.

However, those in the network construction industry still believe that wireless network operators will ultimately rely on hundreds of thousands of small cells around the country to densify their networks. They just might have to wait a couple more years.

"We believe the timing of an inflection point in third-party supplied outdoor small cell leasing is uncertain, and the industry reaching ~1 million outdoor nodes on air in the US is unlikely by 2024," wrote the financial analysts at Raymond James in a note to investors following the release of Crown Castle's first quarter results earlier this month.

...But wait!

- Small Cell Forum forecasts 15% growth, with 36 million small cells globally by 2027
- Dell'Oro predicts small cell RAN revenues globally growing 20% by 2027
- "Verizon anticipates small cells activity will ramp in 2023 as activity shifts toward 16t16r deployments from early 8t8r deployments built in 2022," according to Wells Fargo last year

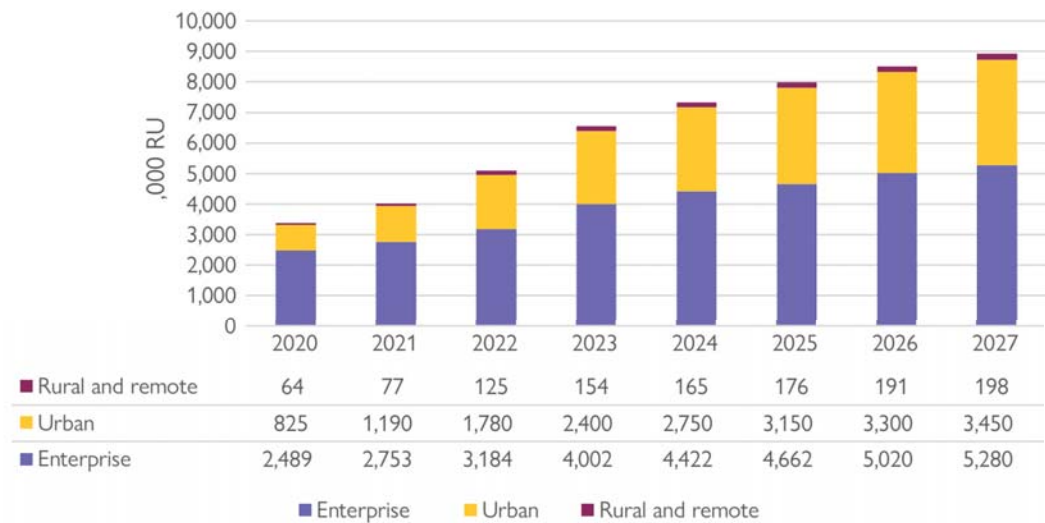


Figure 1-1. New deployments and upgrades of small cells and DAS by environment 2020-27 (by numbers of radio units deployed or upgraded)³

Do you believe in small cell growth?

☐

YES

☐

NO

One new thing: DeWi (Decentralized Wireless)

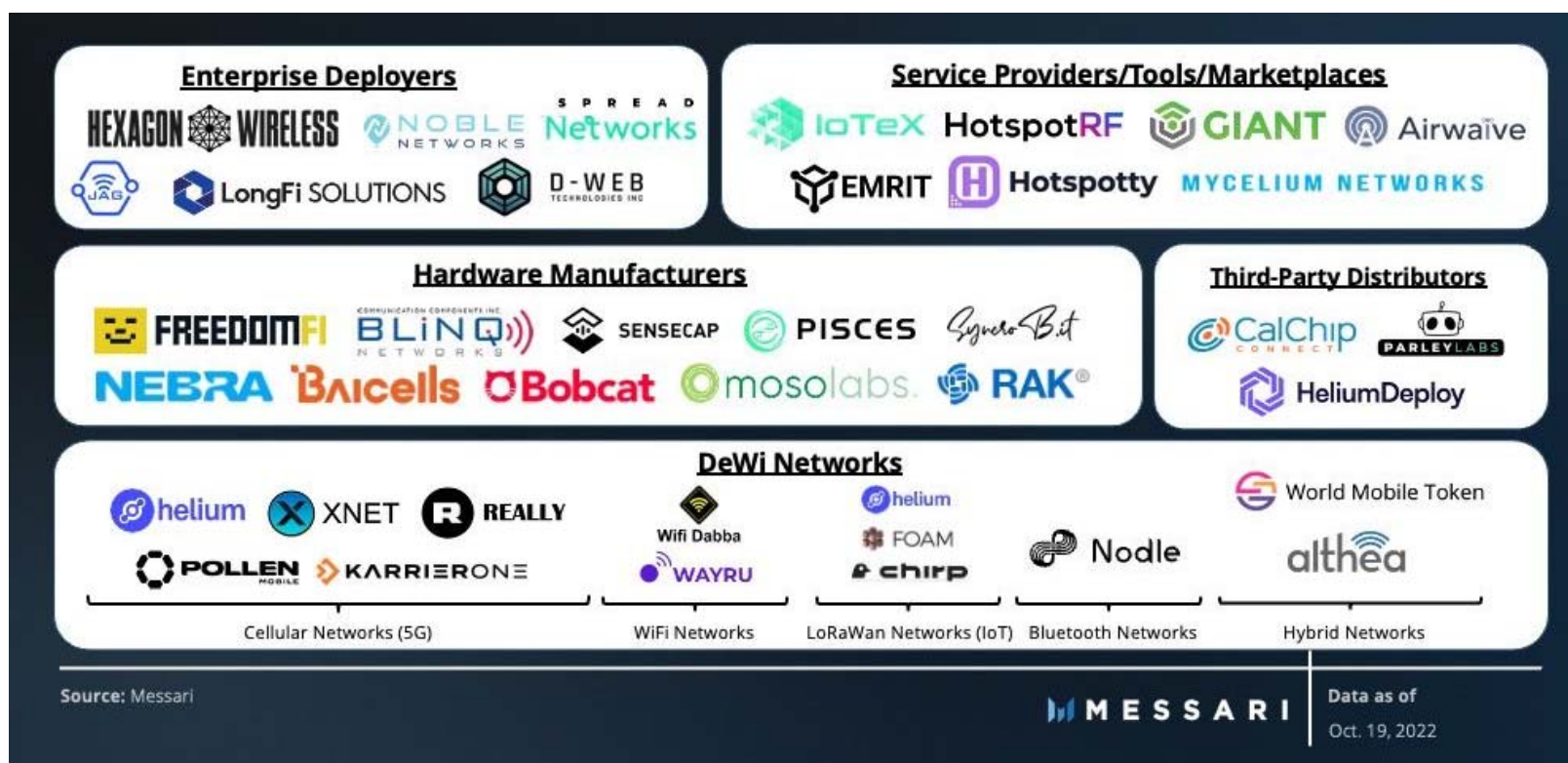
DeWi network operator

1. You buy a small cell radio for around \$5,000
2. You install and maintain that radio
3. You get paid in cryptocurrency based on the traffic over your radio

DeWi network user

1. You sign up for a DeWi phone and service
2. You verify DeWi coverage as you travel around
3. Your bill is *theoretically* cheaper because you're using DeWi sites

The DeWi ecosystem... large and growing

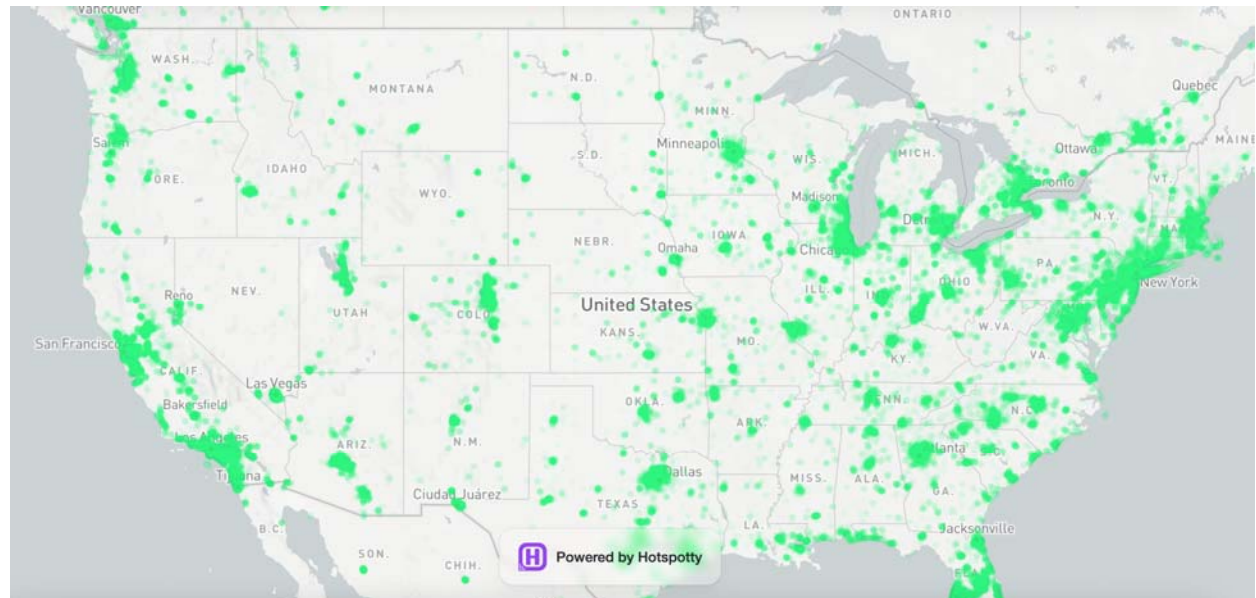


The first DeWi carrier: Helium Mobile

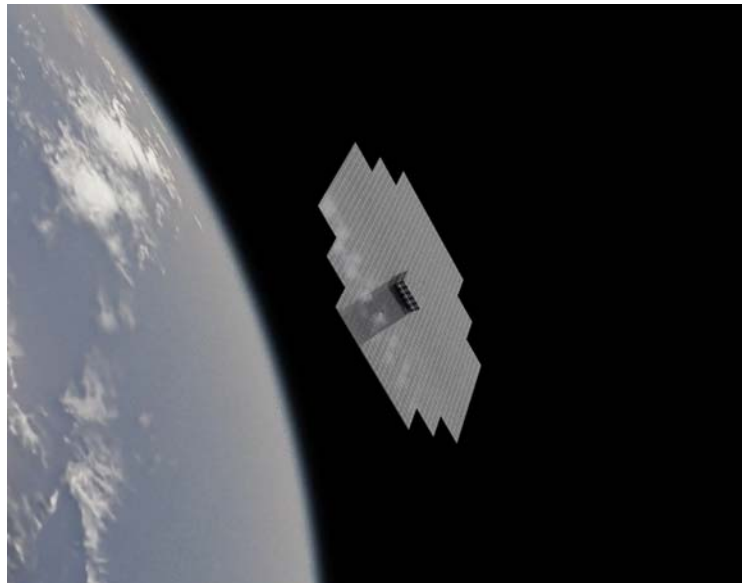
Helium has an MVNO with T-Mobile for national coverage

Its users have SELF-FUNDED the deployment of around 3,700 Helium cell sites (but that's down from around 8,000 before the crypto winter)

Helium raised \$200M at the beginning of 2022... so we'll see where this is heading.

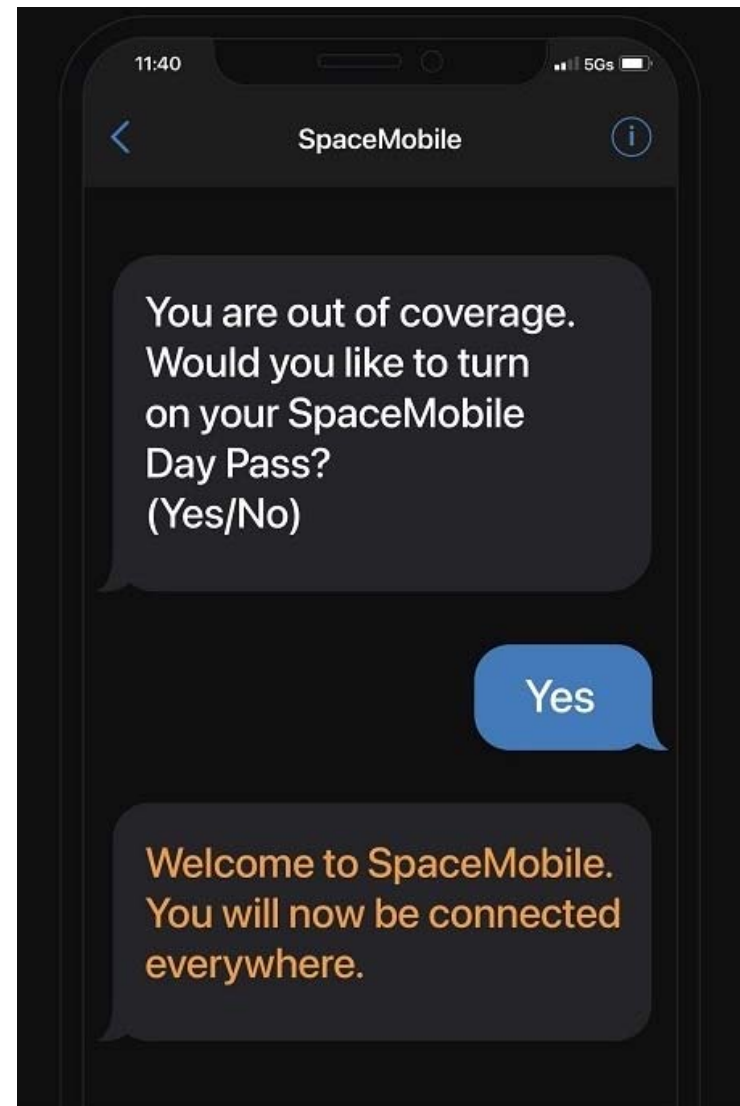


Part 4: Knowns and unknowns



5G ... from space!

- Apple and Globalstar pioneered this concept with the iPhone 14
- That's just the start. Dozens of other companies are working on similar efforts
- The first services will be for emergencies only
- But there is a possibility for faster speeds. One recent test clocked 10 Mbps from LEO satellites
- Ultimately this could be available across ALL phones, old and new.
- What does this mean for future rural networks?



Neutral host networks

- Indoor networks are important: 80% of all wireless traffic is conducted indoors
- Traditionally, big venues like stadiums and airports work with wireless network operators to deploy DAS networks indoors.
- These are very expensive
- But new technologies – and new business models – are pushing the concept of cheap, indoor networks
- This could allow smaller venues, like the Sound Hotel, to build their own wireless networks – at their expense



Private wireless networks

- A big new trend in 5G is private wireless networks
- A company like Dow can buy its own private 5G network from Nokia to cover a big manufacturing plant like the one in Freeport, Texas, that covers 20 square miles
- Applications on such networks can include everything from employee communication to autonomous robots
- These private networks can also potentially be integrated into public, commercial networks



5G from the cable guys

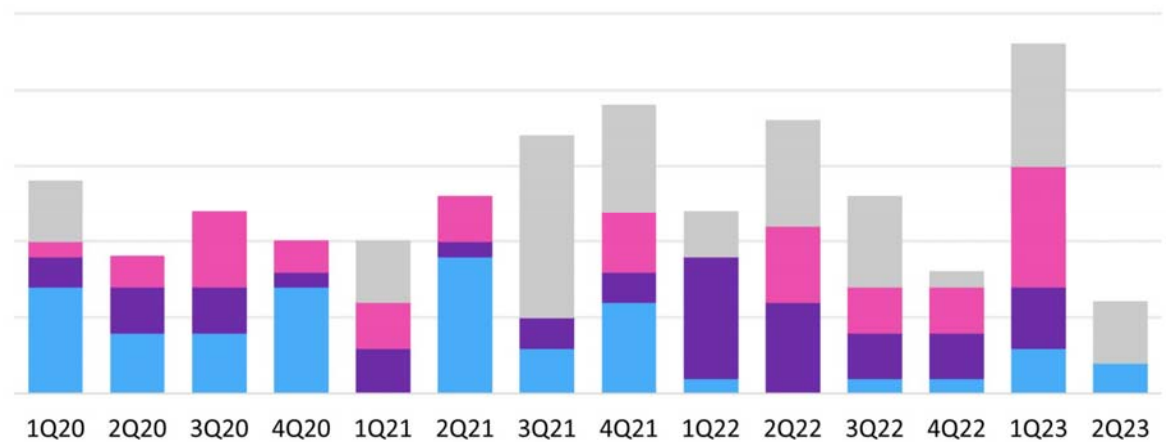
- Comcast, Charter, Cox and Altice are all now offering mobile services through MVNO deals
- Their next step: To build their own small-scale 5G networks
- Comcast already has a deal with Samsung for strand-mounted 5G radios.
- The question, though, is when these networks will actually be built



Putting 5G networks into the cloud

- Old telecom networks used proprietary software inside proprietary hardware
- New telecom networks use open source software inside commodity hardware
- That's allowing carriers like AT&T and Dish to put their core network functions inside a public cloud like Microsoft Azure or AWS
- This MIGHT help lower costs, particularly with AI and automation
- But this will be a 10-year journey for any operator

Public cloud - telco engagement by quarter, 1Q20–2Q23

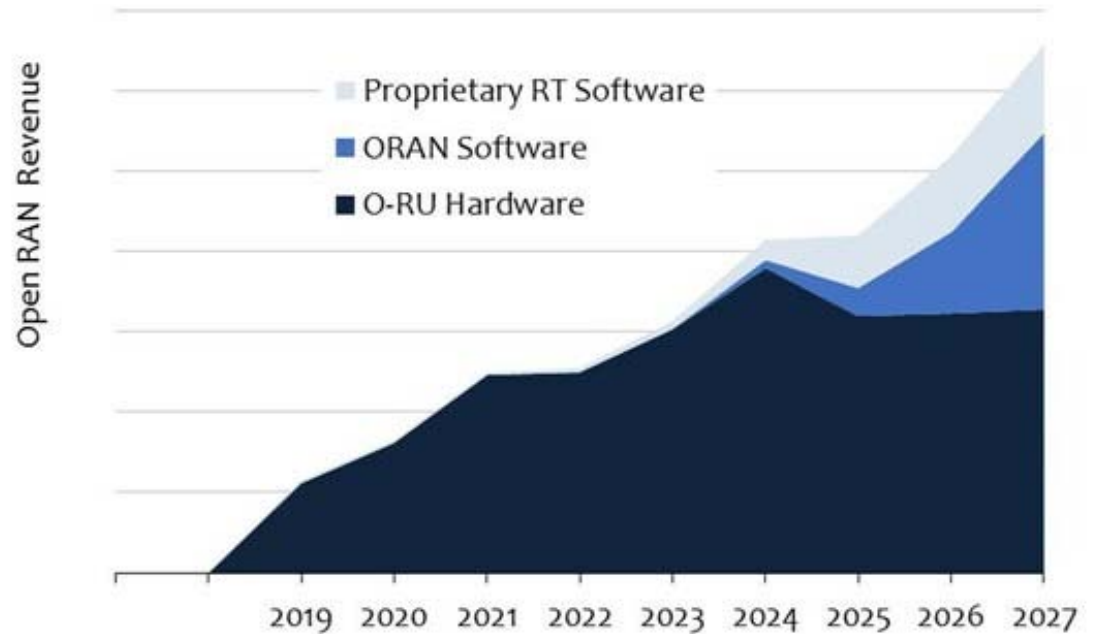


Source: Omdia

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The 'open RAN' question

- Open RAN promises to create open “connections” between various parts of the 5G radio network
- This would allow operators to mix and match products from various vendors, plugging them together like Lego bricks
- Already Verizon is requiring some open RAN standards in its 5G equipment today
- But it's not yet clear whether this will result in cheaper equipment or new equipment suppliers.



Note: Including both private and public telecom networks

Edge computing

- The concept of edge computing builds on everything we've been talking about: cloud, software, open RAN and private networks
- Edge computing promises to distribute computing all over the country instead of having it in giant, centralized data centers
- This will speed up latency and create "instant" services like real-time AR
- This concept stalled during Covid, but is now getting a second life
- 5G operators are investing into their own mini edge computing data centers



The Endgame?

The inevitable collision of cable and wireless

- FWA cannot keep up with cable and fiber network capacity
- Comcast and Charter will never have owner's economics in wireless networks.

...So...

- Will T-Mobile buy Charter?
- Will Verizon buy Charter?
- Will Comcast buy AT&T?
- ...And who will buy Dish?



Part 5: 6G (yes, really)



Kostas Chalkiotis

Vice President 6G & NTN

No, seriously, 6G is really really coming



What to expect from 6G networks

- They should mainly focus on spectrum bands between 7-20GHz
- They will probably use lots of AI and automation
- Expect some networks to target spectrum above 100GHz... even up to 300GHz (these will mostly be indoors)
- All of this will require new radios and new phones – and probably lots and lots more transmission sites
- ...But only if network traffic (and revenues) increase



Part 6: Q&A!



Thanks!

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