



Extend Your Reach with 4G/5G Wireless

2022 CTA SUMMER MEETING AND VENDOR SHOWCASE

Dan McVaugh | 720-560-9001 | dan@castlerockmicrowave.com
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Why Wireless Extension?



TIME TO MARKET

INTERIM SOLUTION TO WIRED



FUNDING SOURCES

STAFFING

NaaS



GREAT PERFORMANCE

- Throughput
- Latency
- UL/DL

Customers Talk

- ▶ Latest NPS scores for various broadband services

Selected Subcomponent NPS Scores

	Web Browsing Experience	Streaming Audio Experience	Connecting and maintaining on WiFi	Adding new devices to the network	Existing device staying on the network	Streaming video experience	Tech support over the phone	Billing Support over the phone
Fixed Wireless	30.2	27.5	42	22.5	20.1	26.8	11.6	13.5
Fiber	22.3	20	14.4	13.1	13.9	11.5	-5.4	-4.8
Cable	6.1	2.6	-0.1	-0.5	-2.3	-13.4	-23.9	-24.4
DSL	-9.4	-14.3	-8.8	-13.5	-20.4	-20.4	-29	-27.3

Source: Recon Analytics Data from 4/29/22 through 6/24/22 n=11,999

Wireless Options

- ▶ Microwave

- ▶ Long-haul/mid-haul
- ▶ Back-haul
- ▶ Point-2-point
- ▶ Proprietary/IP










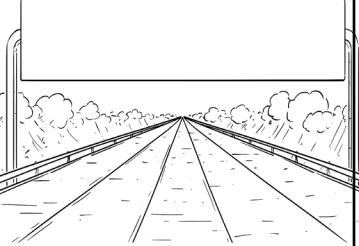










- ▶ Point-2-Multipoint

- ▶ Fixed end user
- ▶ i.e. WISP, telephony, telematics
- ▶ Proprietary or Wi-Fi

- ▶ Cellular (-like)

- ▶ Fixed/nomadic/mobile end users
- ▶ i.e. WISP, mobile cellular, IoT
- ▶ i.e. Non-proprietary Wi-Fi or 4G/5G

Generational Evolution of Cellular

	1G 1980s	2G 1990s	3G 2000s	4G 2010s	5G 2020s
Technology/ Speed					
Spectrum					
Data Capacity					
Applications					

4G vs 5G Considerations

	Today	2020-25
Users	10M people	+100M 'things'
Speed	100 Mbps	100x faster
Latency	>>10 <u>ms</u>	10x less
NW service level	Best effort for all	Committed SLAs
Logical networks	1	Many (slices)

Smart home

Mobile gaming

Industry 4.0

Connected cars

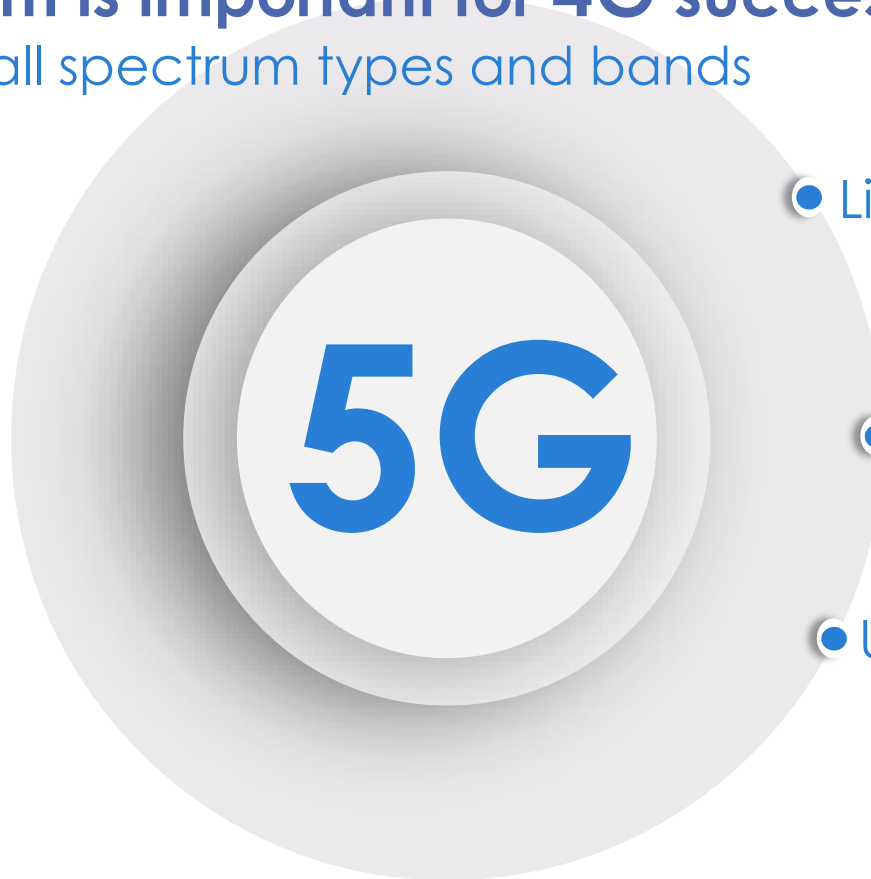
Drones

IoT wearables

NOKIA

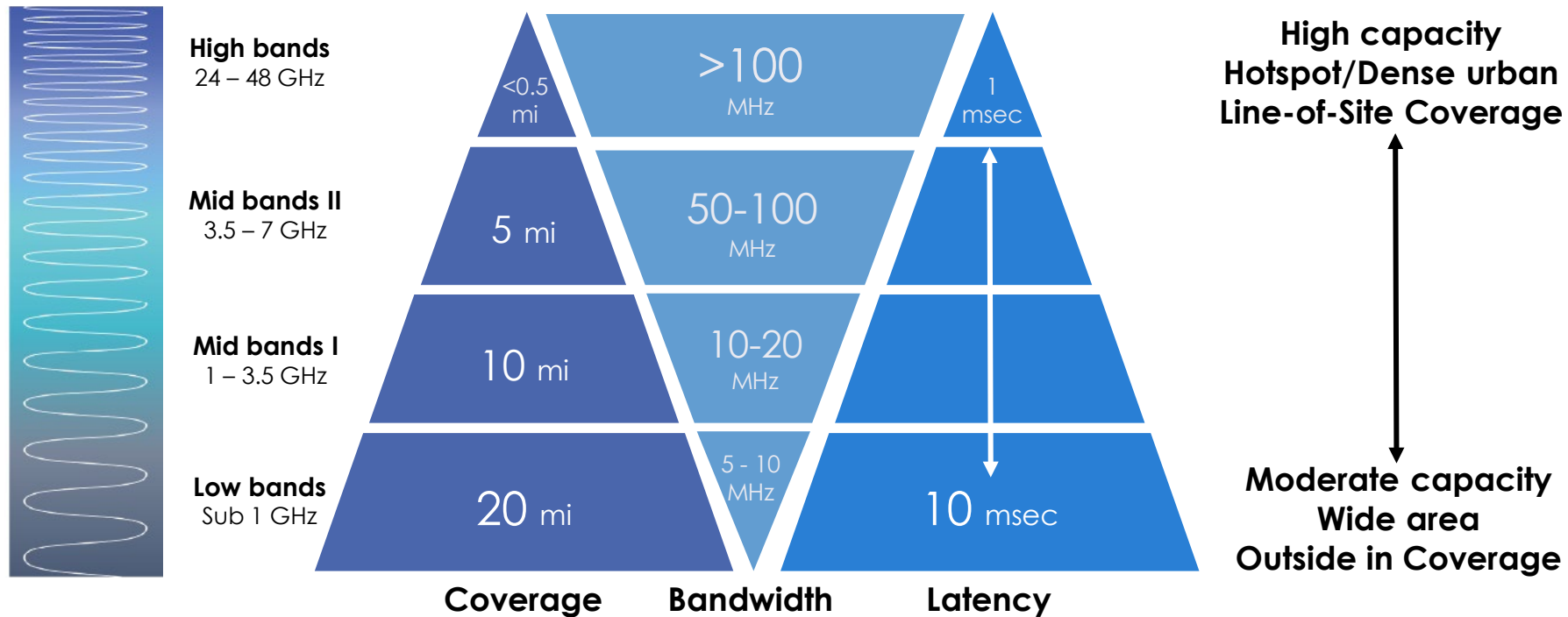
Spectrum Considerations

Spectrum is important for 4G success and *critical* for 5G success
Using all spectrum types and bands



- Licensed Spectrum
Exclusive use
\$\$\$\$
- Shared Spectrum
New shared spectrum paradigms
\$ - \$\$
- Unlicensed Spectrum
Shared Use
\$

Low, Mid, or High Band?

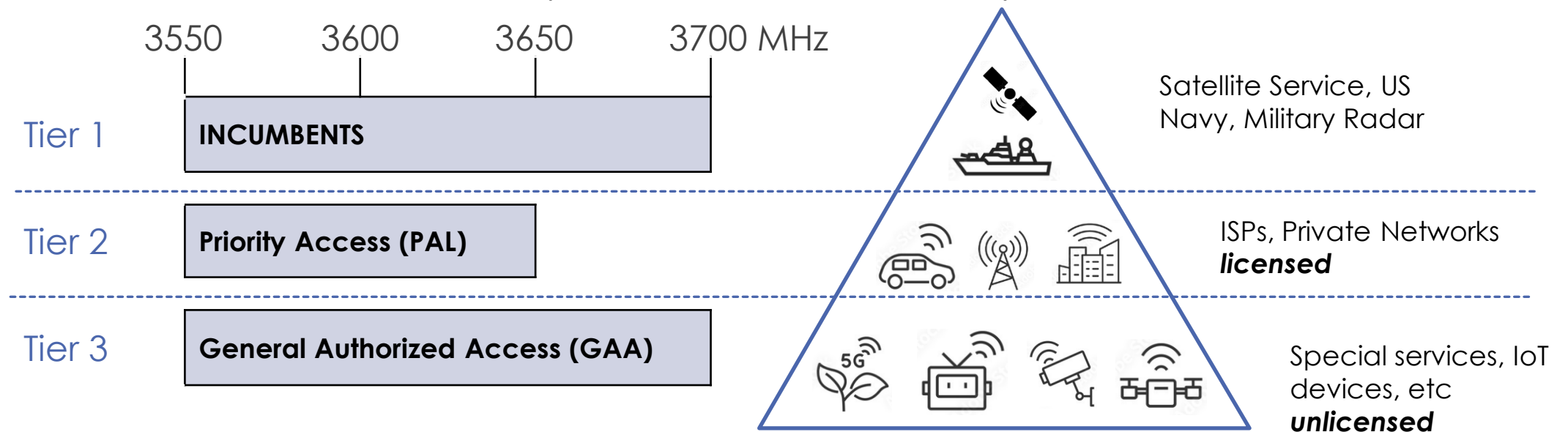


CBRS Is New Spectrum Option

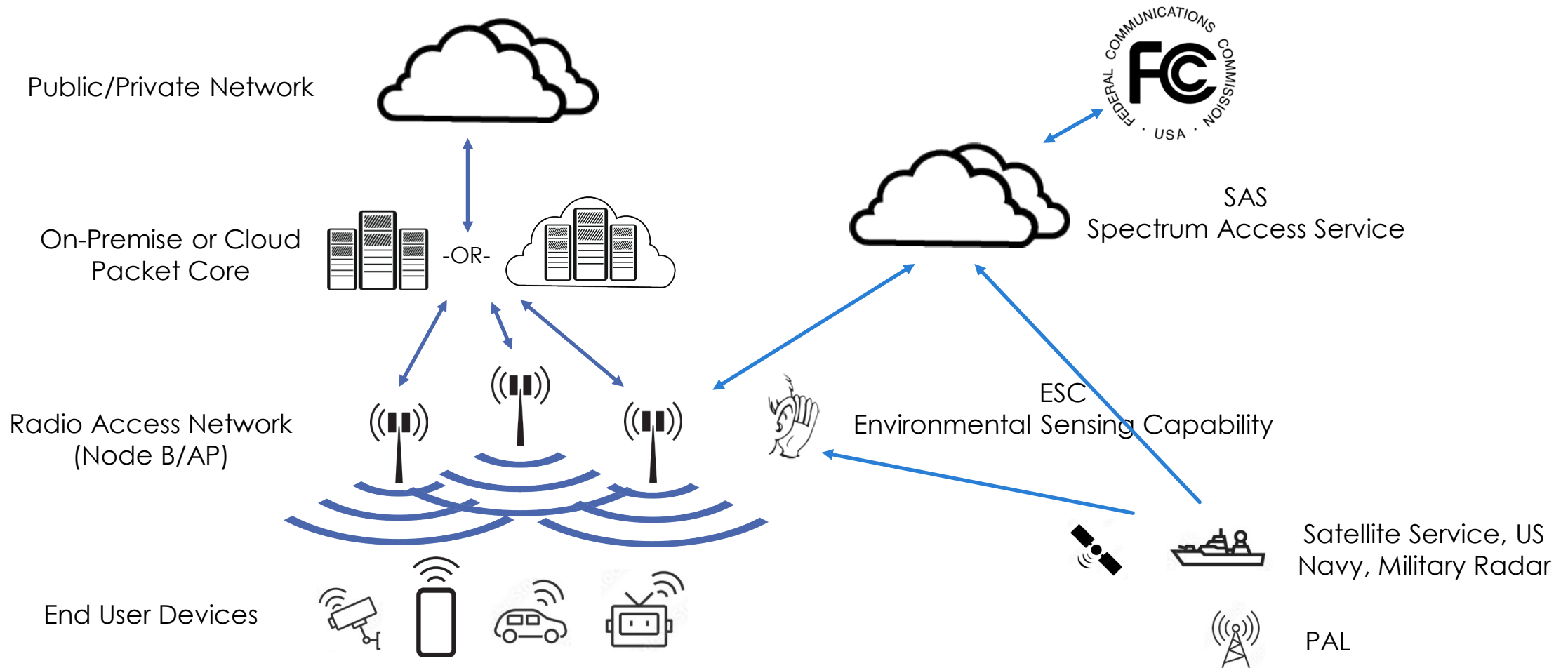
Citizen's Broadband Radio Service

New shared spectrum paradigm

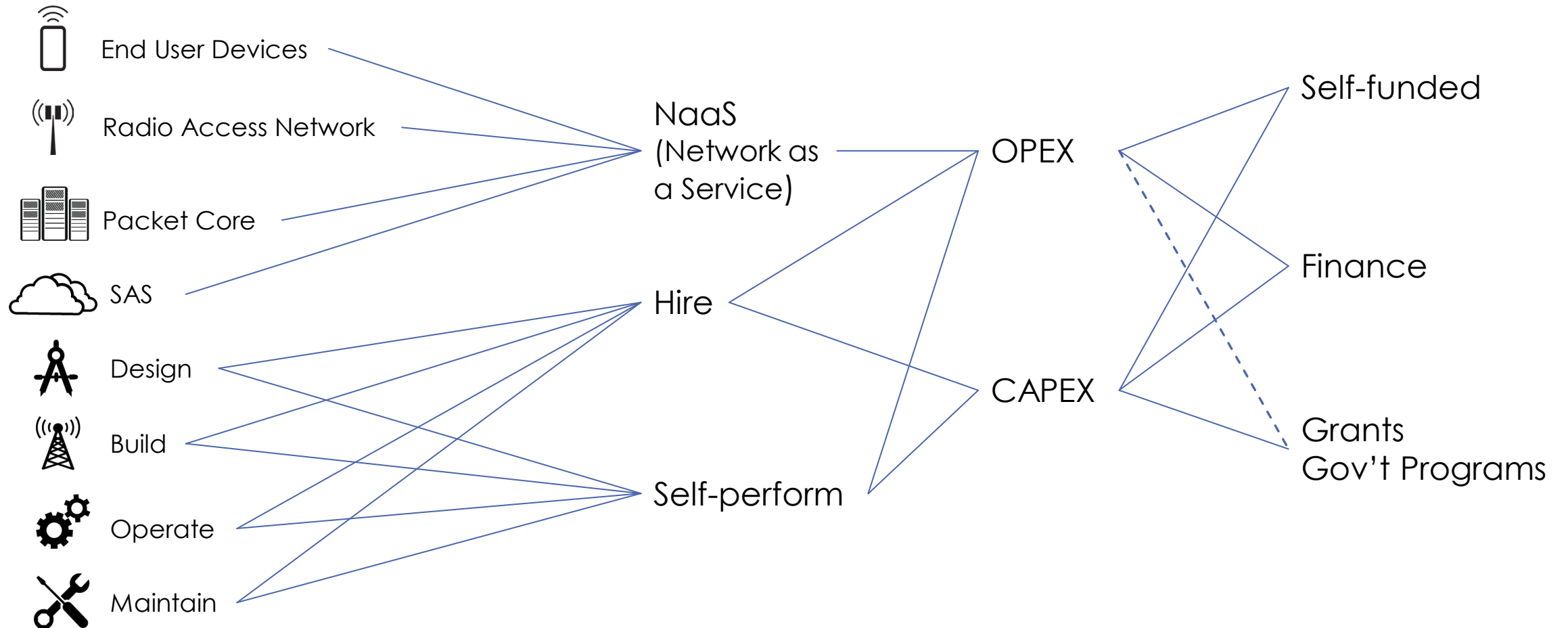
(Both licensed and unlicensed)



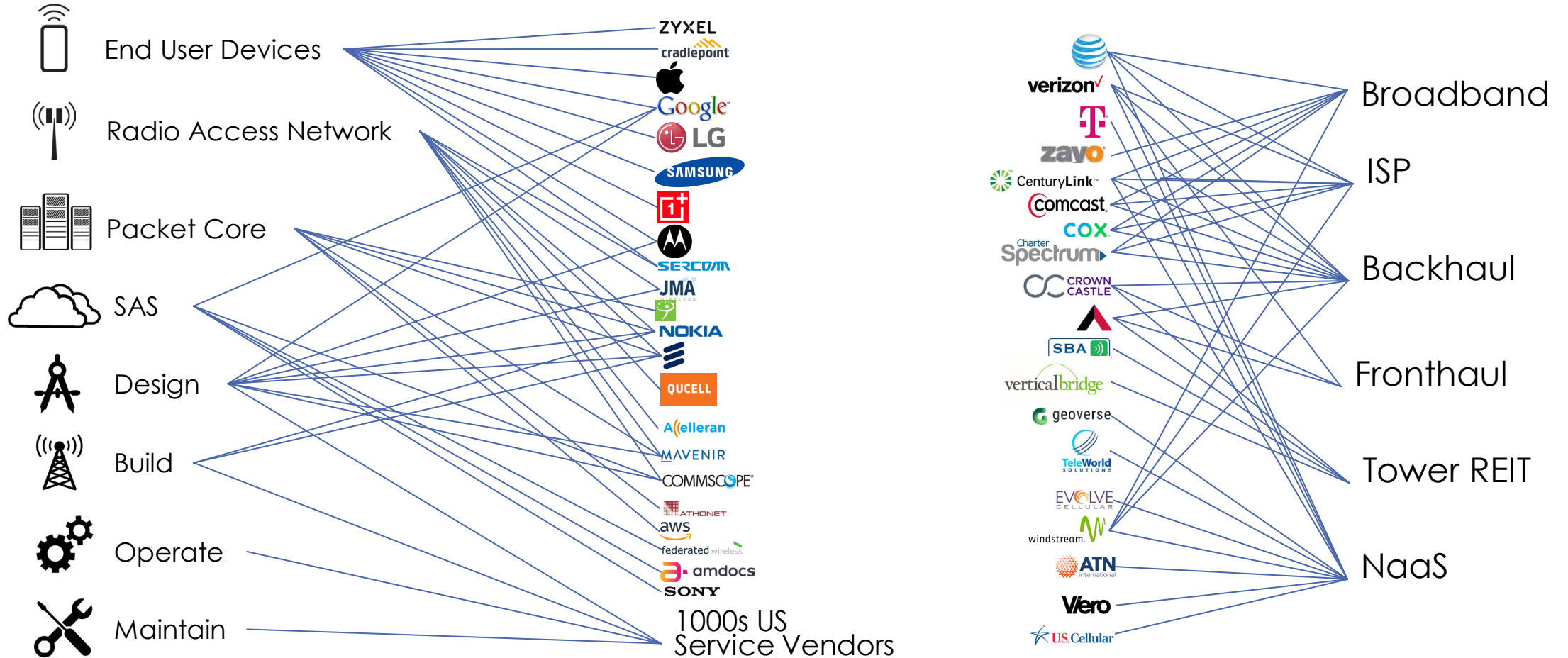
4G/5G CBRS Architecture



Network Ecosystem Options



Vendor Ecosystem



Technology Considerations



TIME TO MARKET

FUNDING SOURCES

- Capital vs Expense
- Matching Grants
- Low Interest Loans
- Is Wireless Allowed?



PERFORMANCE

- Probability of Service
- Throughput
- Latency
- UL/DL
- Applications

3DS Proven Process



DISCOVERY

The discovery step determines the real-world viability of your network.

- Feasibility studies
- Budget estimates
- Desktop designs
- Coverage maps



DESIGN

The design step generates your comprehensive wireless network design.

- Site surveys
- Fiber backhaul defined
- RF planning
- Equipment selection
- Network design
- Final RF design
- Drawings and SOW



DEPLOYMENT

The deployment step consists of the physical build-out and provisioning of your network.

- Hardware purchase
- Project management
- Training
- FCC coordination
- Equipment installation
- Tower construction/ services
- Configuration/ optimization
- Documentation



SUPPORT

The support step offers customizable maintenance and support packages.

- Lifecycle services (PDF)
- Management software
- Customer service
- ISP set-up services
- Network operations
- Training
- Staff augmentation
- Preventative maintenance
- Break/fix
- Updates

Thank You

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dan@castlerockmicrowave.com

720-560-9001