

Beyond the Tower

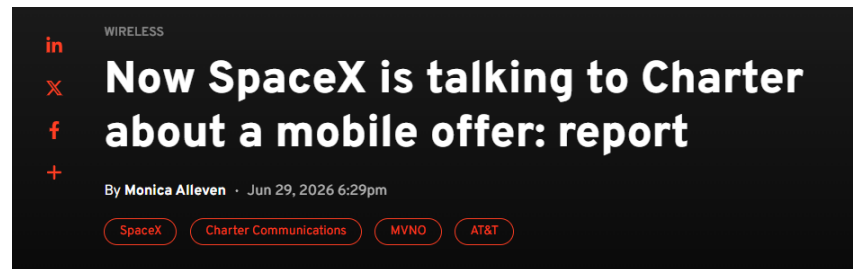
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The question we set out to answer

Can D2D satellite in any way replace terrestrial cellular?



BENZINGA

Could Elon Musk's SpaceX Buy T-Mobile? Analyst Sees Wireless Giant As 'Clear Choice'



CONNECTIVITY

Major US Carriers Band Together in Joint Venture to Encourage D2D Competition

By  Rachel Jewett

THURSDAY, MAY 14, 2026

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Satellite Players and Analyst Respond

SpaceX execs seemed to take the news as a challenge, with President and COO Gwynne Shotwell posting "I guess Starlink Mobile is doing something right! It's David and Goliath (X3) all over again — I'm bettin' on David."

Coverage challenges exist globally

Metric	United Kingdom	United States	Canada	Australia
Population Coverage (4G/LTE)	>99%	>99%	99.4%	99.7%
Landmass Coverage (Best Carrier)	~96% (at least one MNO)	~60% (Verizon LTE)	<30%	~35% (Telstra)
Major Road Coverage	High (>95%)	High	~88%	Variable (High on coasts, low in interior)
Primary Policy Vehicle	Shared Rural Network (SRN)	5G Fund for Rural America	CRTC Broadband Fund	Mobile Black Spot Program (MBSP)
Key Topographic Challenge	National Parks	Vast Tribal Lands, National Parks & Mountain West	Arctic & Northern Forests	Remote Interior Desert

Business case (optimistic)

	SpaceX Starlink (D2D)	Amazon Leo	AST SpaceMobile
Capex \$bn			
Initial	15	22	3.5
Annual recurring	3	3.3	0.35
Capex 2025-2035	45	48	7
Revenues 2025-2035 \$bn			
Broadband	81.0	16.2	0.0
Mobile	16.5	9.3	9.9
Total (2025-2035)	97.5	25.5	9.9
Revenues less Capex \$bn	52.5	-22.9	2.9



Spectrum: MSS or MS?

- Either
 1. SNOs will offer service directly to consumers, bypassing the MNOs (eg Apple), or
 2. SNOs will pair with MNOs. The MNOs retain the customer link and present a complete service package to the consumer (eg T-Mobile/Starlink in US)
- Recent evidence of MSS spectrum acquisition by SpaceX and AST suggests the SNOs would prefer to offer direct service
- But few have acquired enough spectrum globally to deliver a valuable service making an MNO route a necessary evil
 - Apple's service is limited to allowing iPhones to connect to emergency services, message friends and family, and request roadside assistance
- Expect a messy picture, with different options in different countries, at least for a few years



Unlicensed spectrum?



OFFICE OF CHAIRMAN BRENDAN CARR

Chairman Carr Proposes to Expand Direct-to-Device Satellite Broadband Connectivity to Unlicensed Wireless Devices

Proceeding Also Proposes Allowing Unlicensed Wireless Devices to Operate on Spacecrafts

WASHINGTON, July 15, 2026—FCC Chairman Brendan Carr today proposed a new proceeding to explore new avenues to allow innovative unlicensed wireless devices to communicate directly with satellites. With the transformative wave of investment and innovation in recent years around direct-to-device (“D2D”) services, this proceeding will look at the more than 225 megahertz of unlicensed spectrum to potentially support the capacity requirements and complement other bands for D2D services. The proposal would also clarify that using equipment authorized under the FCC’s part 15 rules for unlicensed wireless devices is permitted within FCC-authorized spacecraft.

- Proposing to allow use of 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz where terrestrial devices are generally permitted to operate with power levels up to 4 watts (36 dBm) EIRP
- But satellite will see thousands or millions of devices and not be able to differentiate the wanted device (unless it is extremely rural / remote)
- No certainty of use means cannot rely on bands so can only be supplementary to other MS/MSS bands
- No standards yet for satellite operation in these bands (eg no NTN equivalent in Wi-Fi)

A simple capacity analysis

- In dense urban areas the capacity differential is approximately 1/10,000!

	Spectrum (MHz)	Efficiency (bits/s/Hz)	Cell size (km ²)	Capacity (Mbits/km ²)
Starlink	65	0.8	700	0.073565
Typical MNO	350	2	1	700

- There is little that can be done to address this
 - Smaller satellite cells are not viable because of antenna size and uplink imbalance
 - More spectrum can be found but only 2-5x
 - Spectrum efficiency limited by antennas, power and real world usage
- T-Mobile President said that based on May 2026 data, the use of T-Satellite is about 0.0002% of its total network usage

Predictions

What will happen

- Satellite D2D service will continue to be offered for the foreseeable future.
- Provision will become more competitive from SpaceX, Amazon Leo, AST and China (Guowang and Qianfan).
- Capabilities will improve to 2G/3G cellular level service

What won't happen

- D2D will not replace terrestrial networks.
- D2D will not be available indoors nor inside a vehicle, in tunnels, in trains...
- SNOs will not become the primary owner of the consumer relationship.
- D2D will not be a full backup for widespread terrestrial network failure

Uncertainties

- Whether there will be a positive business case for one or more of the SNOs.
- Whether the world will fragment into multiple national networks
- Whether national regulators will insist that MNOs deliver D2D capabilities in areas without terrestrial coverage
- Whether additional MSS spectrum will be made available

Can D2D in any way replace terrestrial cellular?

- **Definitely:** for deeply rural coverage delivering “2G” service levels
- **Possibly:** owning the customer if MVNO arrangements can be reached
- **Not at all:** replacing mobile networks. Perhaps purchasing them or increasing Wi-Fi off-load.

