

QoS and QoE Aspects of Satellite-based Internet Services

ITU Workshop
Geneva June 8th 2026

James Carroll, VP Industry Affairs



 SPEEDTEST

Downdetector[®]

RootMetrics[®]



SPEEDTEST®

600M+
app
installs

11M+
daily tests

60B+
tests to date

15K+
global test
servers



Downdetector®

150M+
unique users

25M+
mo. problem
reports

34K+
services
monitored

70+
countries

Billions

of daily crowdsourced network
performance samples

Tens of Millions

of data points on NPS,
subscriber ratings, and
consumer sentiment

Millions

of miles of controlled drive and
walk network surveys

Defining the Future of Connectivity

Ookla data is used by governments, regulators, standards bodies, NGOs, academic institutions, trade groups, and analysts to solve the biggest connectivity challenges



ctia



THE WORLD BANK



OECD



GSMA™



The Global Media's Trusted Source

170K+

articles published annually
referencing Ookla brands

270B+

unique monthly impressions
on publications citing Ookla
data

73.2%

share of voice for Ookla and
Speedtest combined in
network intelligence

Global Reach and Impact

90%

of the Fortune 500 trust
Ekahau networking
insights

5K+

Enterprise clients for
Ookla in over 120
countries

2016

Consumer initiated satellite Speedtest test volumes

0.3%

% of fixed tests completed seen on satellite providers

30%

Satellite tests were 30% the speed of average fixed results

2026

Change has already come

4%

% of fixed tests
completed seen on
satellite providers

90%

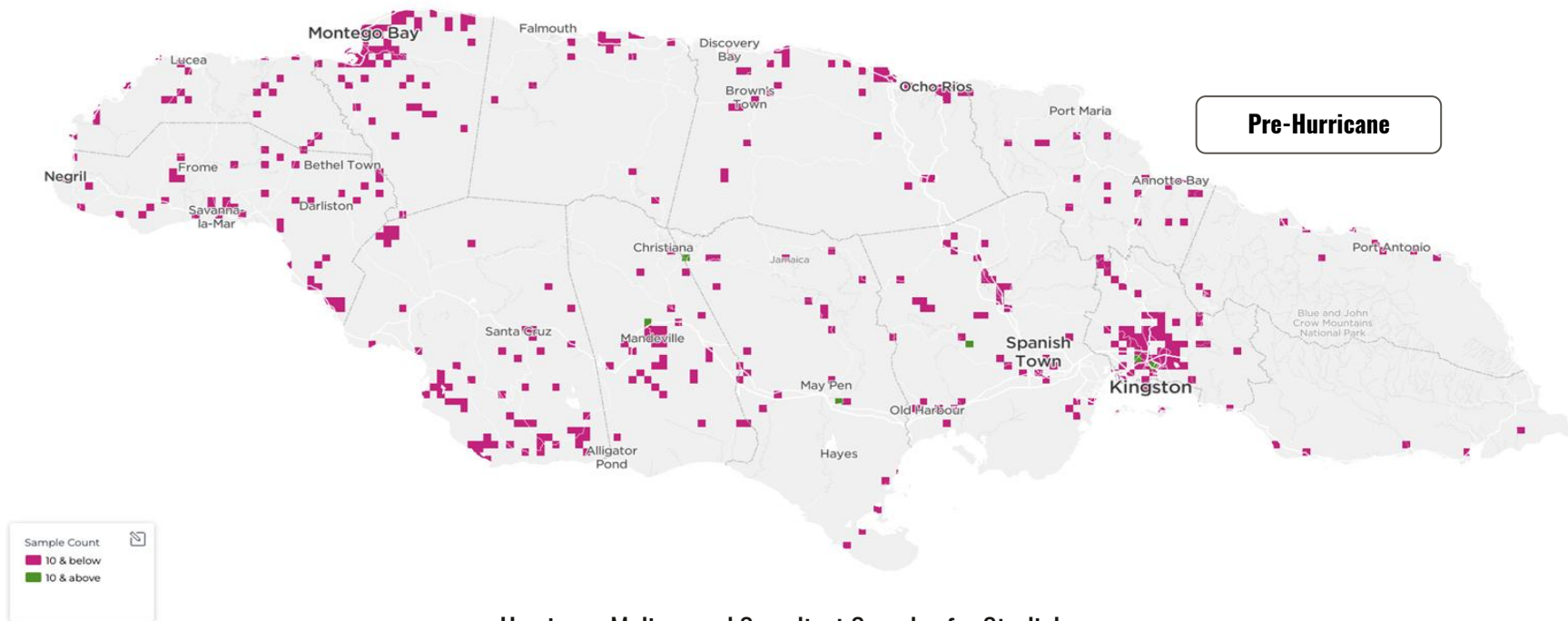
Satellite tests were 90% the
speed of average fixed
results

Measurement View 1

Resilience, backup, emergency preparedness

LEO becomes broadband lifeline in Jamaica post-Melissa

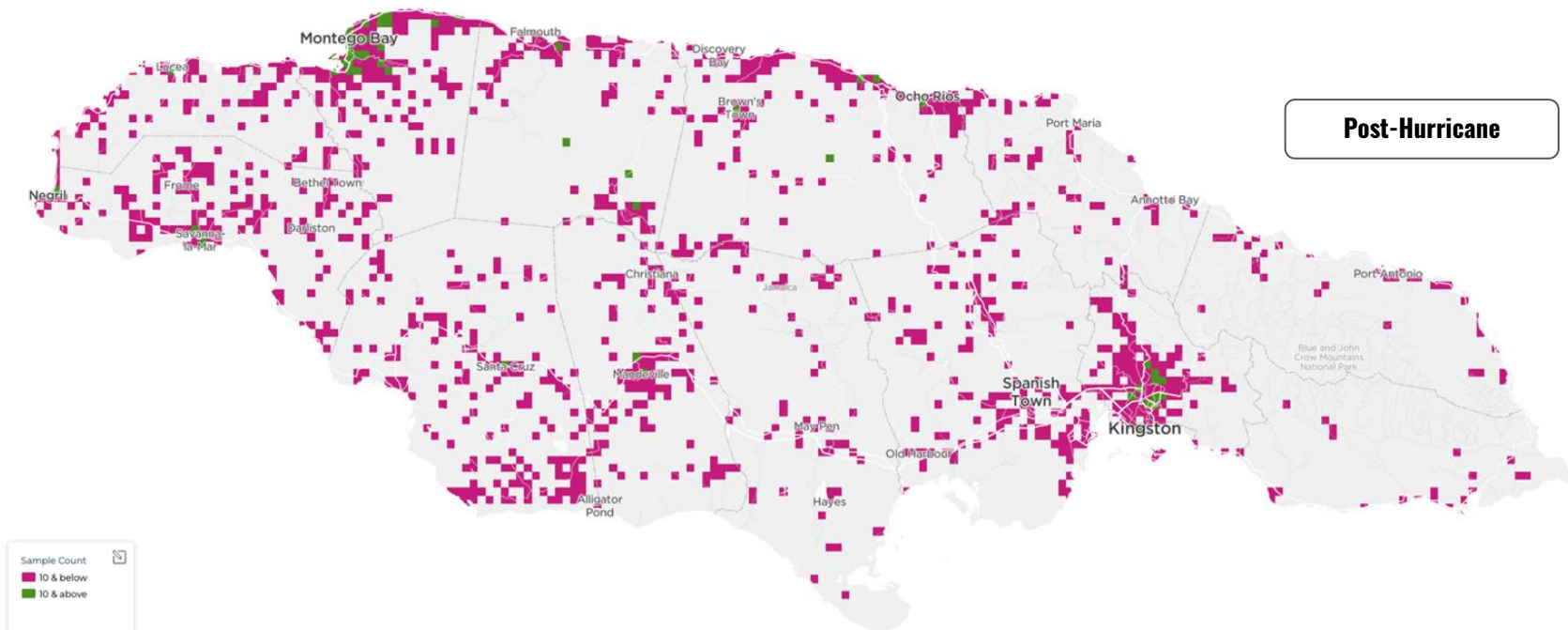
Observed Starlink usage increased fivefold from prior to Melissa to the last week of the free service period offered by SpaceX post-hurricane.



Hurricane Melissa and Speedtest Samples for Starlink
Speedtest Intelligence® | September 2025, Jamaica

LEO becomes broadband lifeline in Jamaica post-Melissa

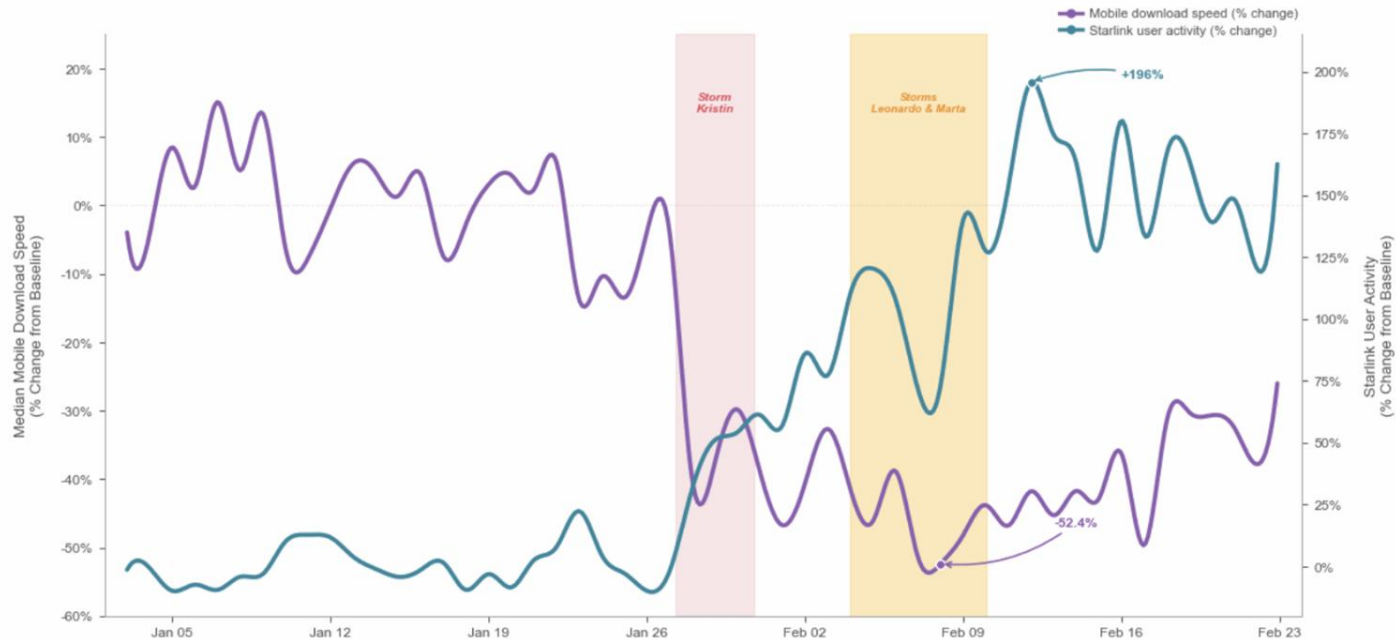
Observed Starlink usage increased fivefold from prior to Melissa to the last week of the free service period offered by SpaceX post-hurricane.



Hurricane Melissa and Speedtest Samples for Starlink
Speedtest Intelligence® | November 2025, Jamaica

Satellite becomes a fallback when terrestrial networks degrade

In Portugal's January–February 2026 storms, Starlink user activity rose as median mobile download speeds fell, highlighting satellite's role as a resilience complement



D2D is a real resilience layer but a constrained one

Over-claiming damages credibility; under-claiming misses the usefulness

- Deliver SMS to standard handsets in outdoor not-spots
- Deliver Wireless Emergency Alerts independent of subscriber MNO
- Provide structural fall-back coverage in rural / coastal / upland settings
- Use orbital paths that don't share fate with terrestrial fibre, microwave, or local power

What it can do

- Carry voice calls reliably on Starlink V1; AST Block 2 demonstrated >100 Mbps but pre-commercial
- Substitute for indoor coverage — Apple SOS, Starlink, AST all need open sky
- Support 999 SMS or government emergency alerts on UK O2 Satellite (yet)
- Replace terrestrial-grade reliability for everyday use (latency, throughput)

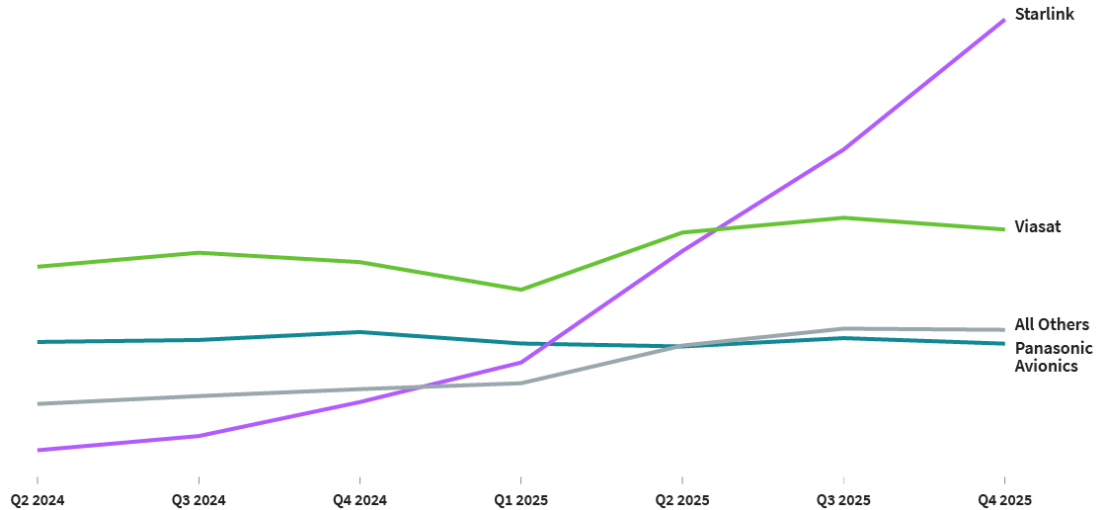
What it cannot yet (May 2026)

Measurement View 2

In the air and on the High Seas

Speedtest Samples by Inflight Wi-Fi provider

Speedtest Intelligence® | Q2 2024 - Q4 2025



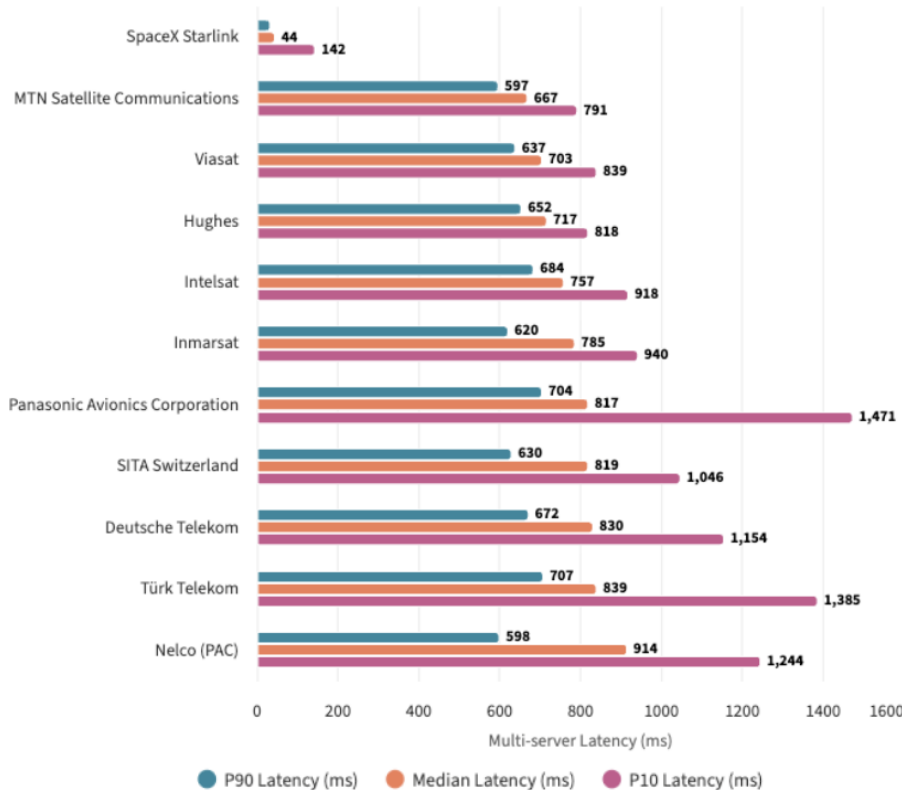
SPEEDTEST

Downdetector

RootMetrics

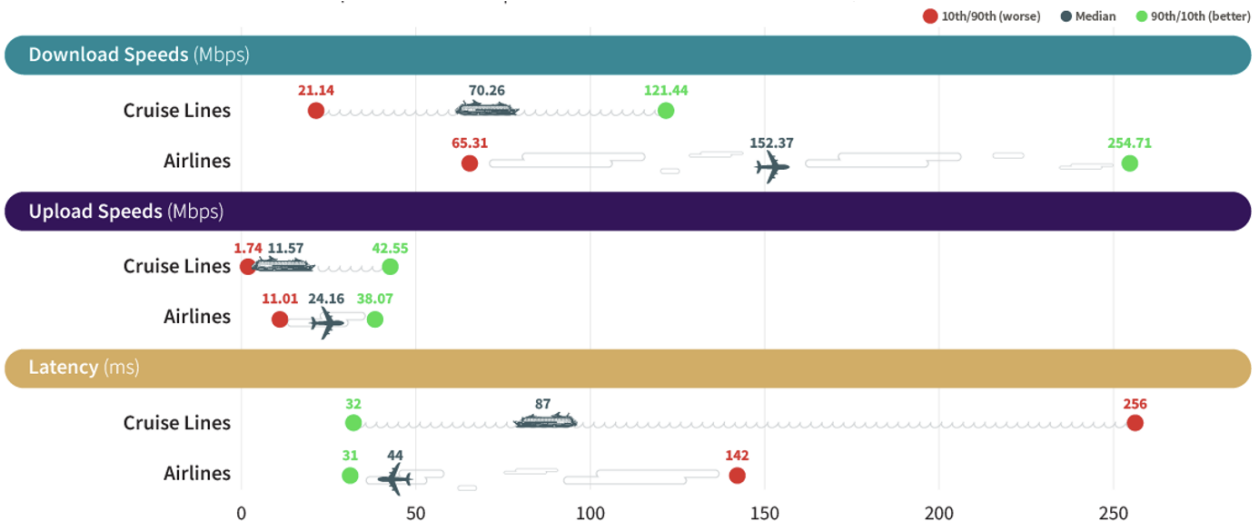
In-flight Wi-Fi Speed and Latency Performance

by Connectivity Service Provider Speedtest Intelligence® | Q1 2025



Starlink Performance Comparison

Speedtest® Data | Cruise Lines 1H 2025, Airlines Q1 2025



SPEEDTEST

Downdetector

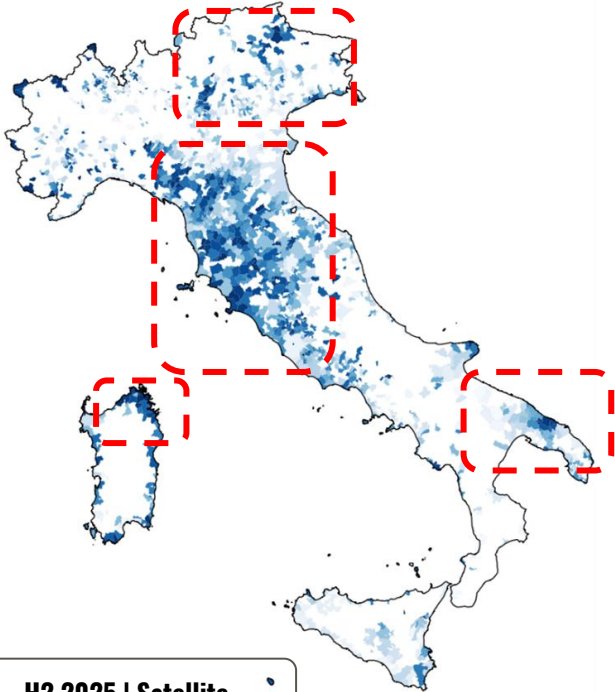
RootMetrics

Measurement View 3

Where and how are we using it as a fixed replacement?

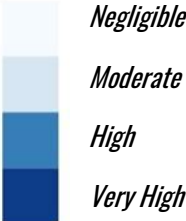
Satellite take-up concentrated along Apennine backbone

Map: Where is satellite broadband most commonly used in Italy?



Satellite Take-Up Per Capita by Comuni

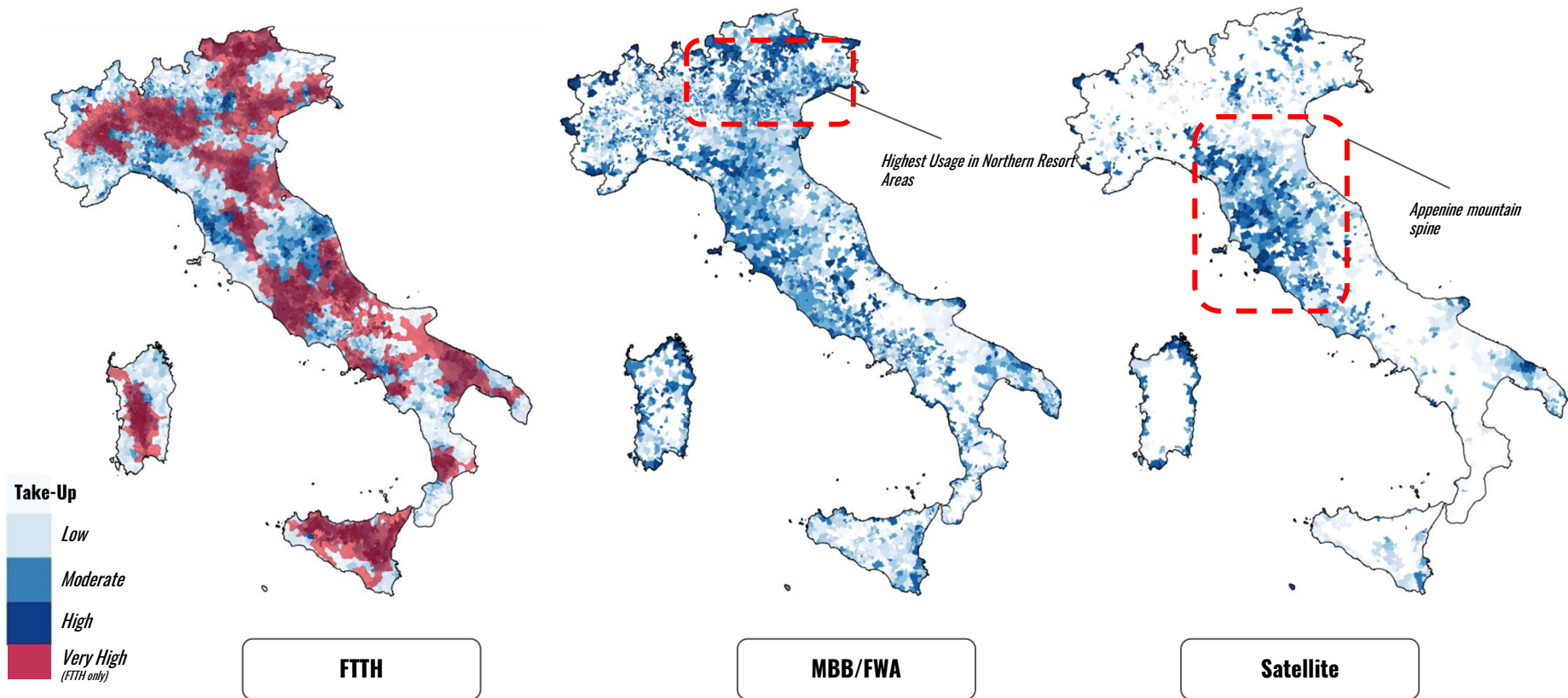
Mean estimated adoption adjusted for population based on Speedtest Intelligence® data



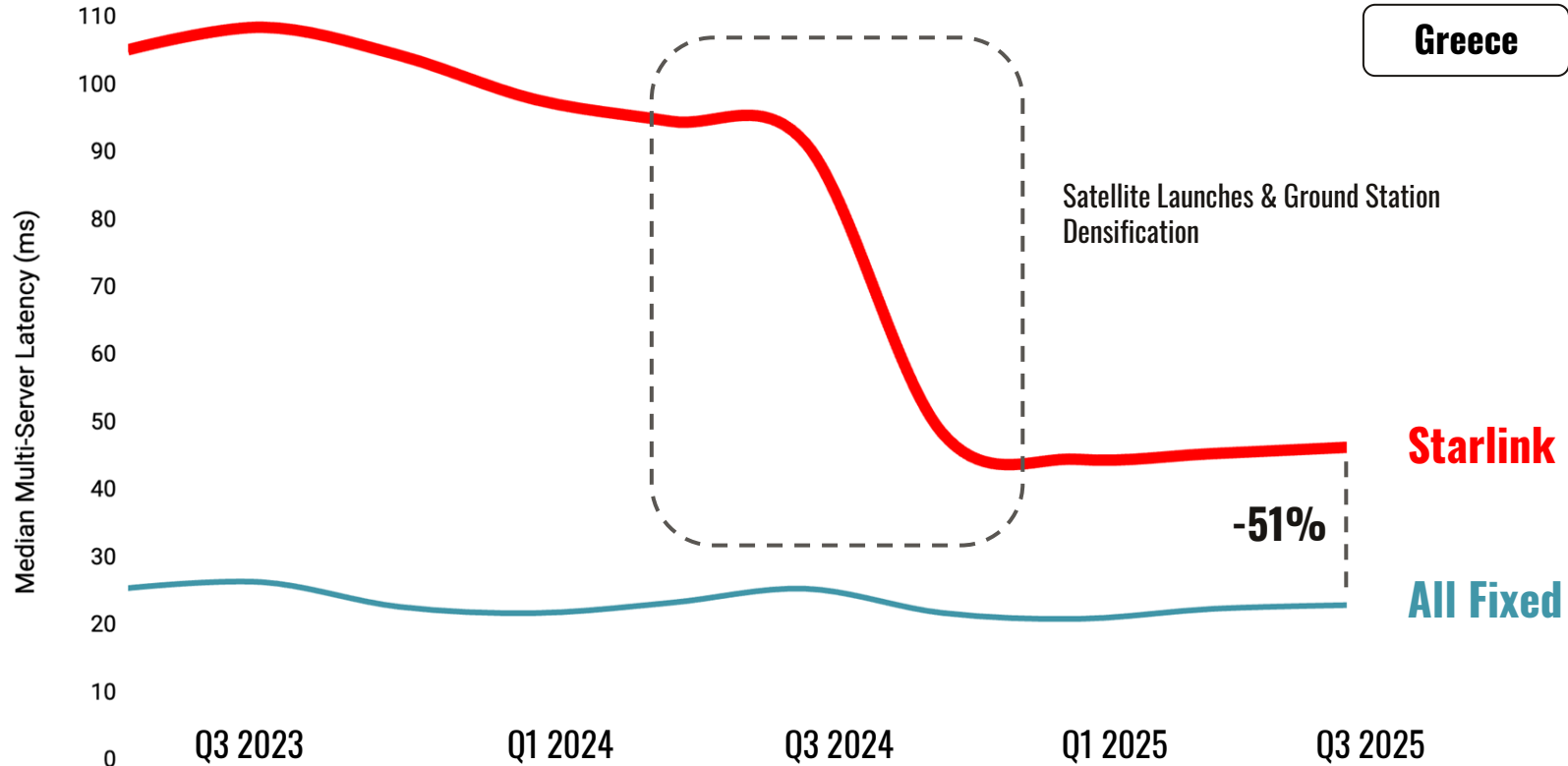
H2 2025 | Satellite

FWA & Starlink Carve Out Niches in Fibre-Rich Markets

Alternative platforms are actively following Italy's topography to capture seasonal resort demand and connect isolated mountain communities.



LEO competitiveness is intensifying as Starlink latency collapses



Greece

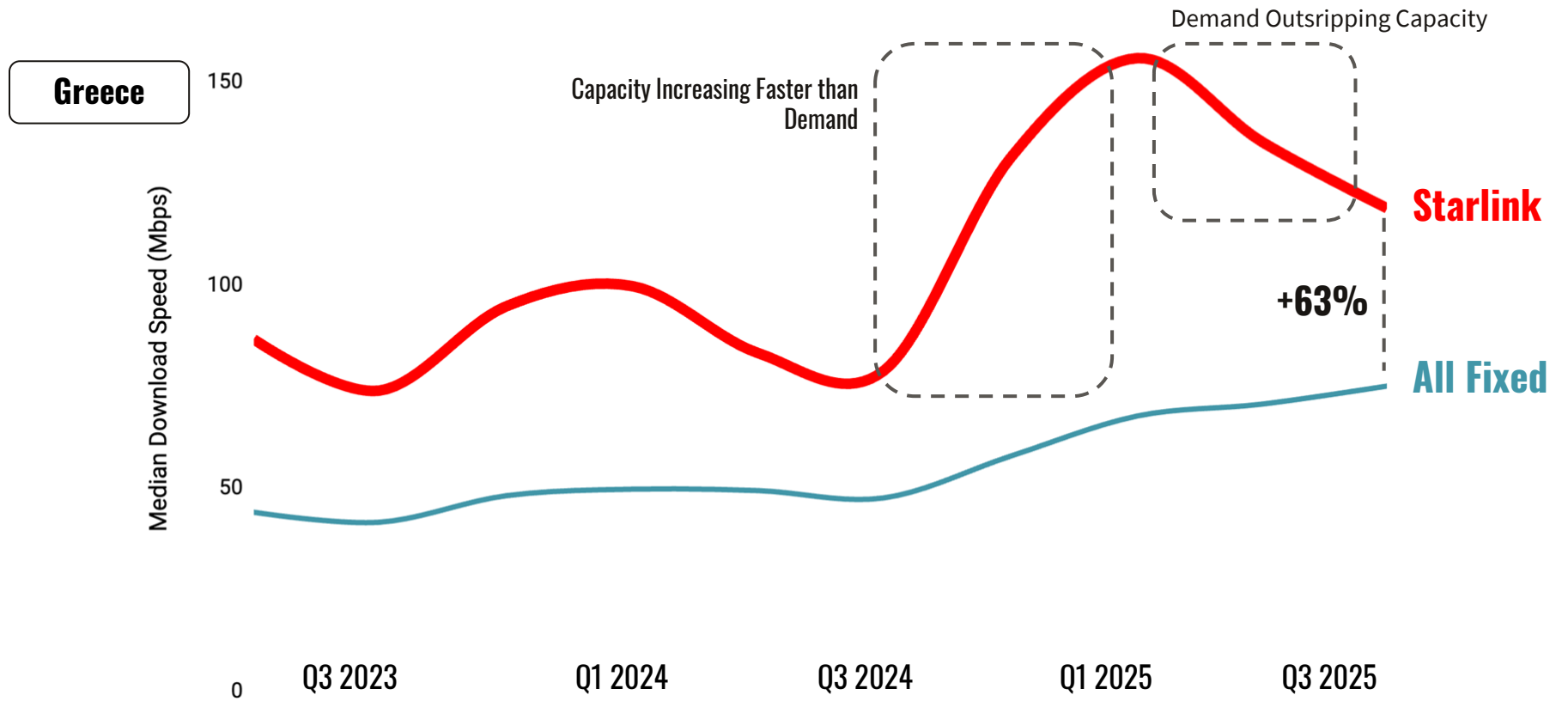
Starlink

All Fixed

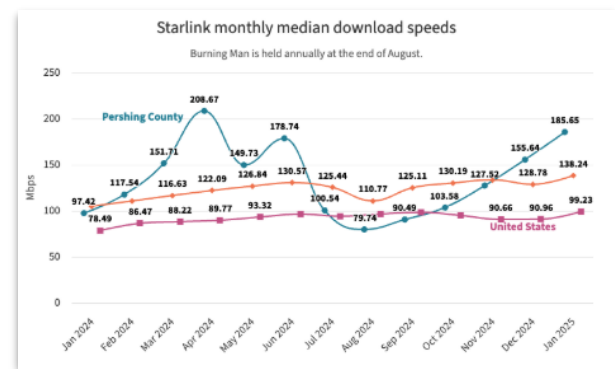
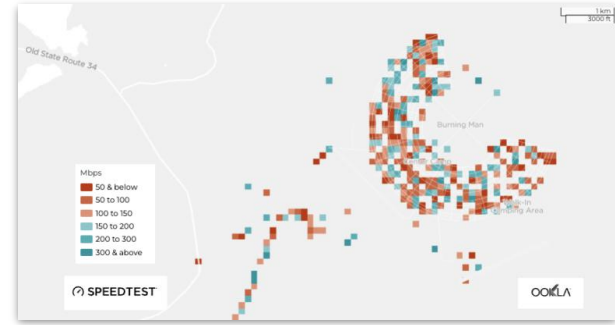
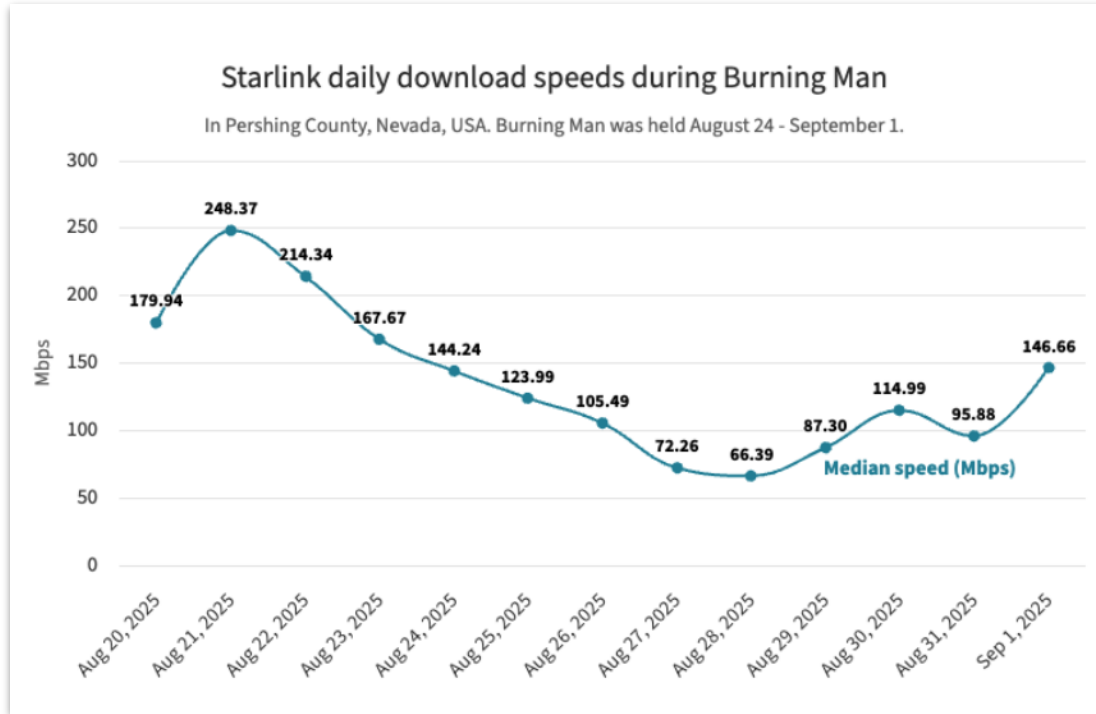
-51%

Satellite Launches & Ground Station Densification

Starlink maintains speed lead over average Greek fixed connection



Starlink usage at Burning Man - Nevada, USA



Measurement View 4

Direct to Device

What we know about D2D today

Direct-to-Device promises to eliminate outdoor cellular dead zones — three numbers anchor where the market is in early 2026

10+

Countries with commercial D2D services as of Mar 2026

Apple/Globalstar, Starlink Mobile, Skylo and Lynk Global all in market. 61 countries / territories are planning, evaluating or testing (GSA Feb 2026 count).

+24.5%

Growth in measured D2D connections, Jul 25 — Mar 26

Lifted by Starlink launches with KDDI (JP), Entel (CL · PE), Kyivstar (UA), VMO2 / O2 (UK) and others. Pricing tier changes in the US and CA partially offset.

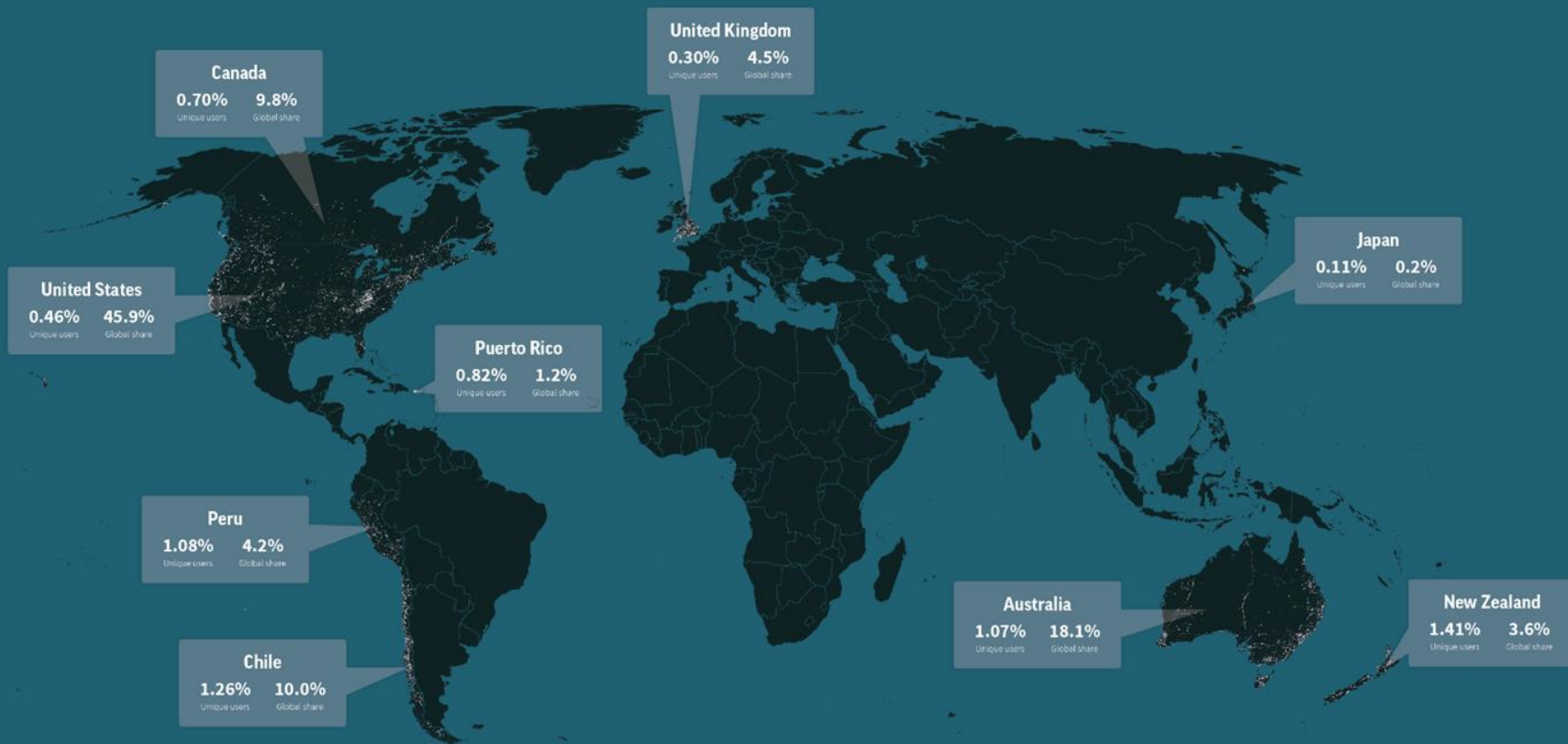
0.46%

Of U.S. mobile users recorded a D2D connection

And only 1.26% in Chile, the highest market. D2D is small as a share of mobile users today — this is an early-utility curve, not a saturation curve.

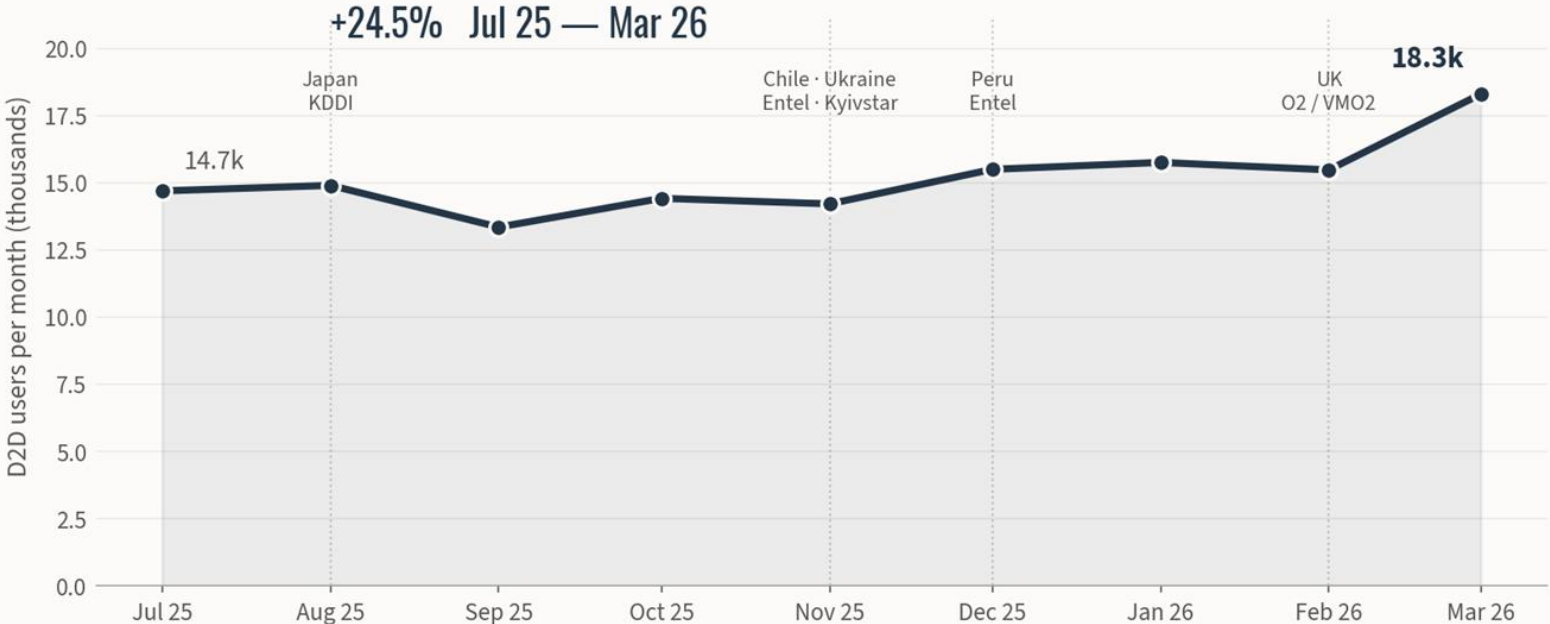
The Global D2D Market: By Unique Users and Country

Ookla® Data | March 2026



D2D users grew 24.5% globally between July 2025 and March 2026

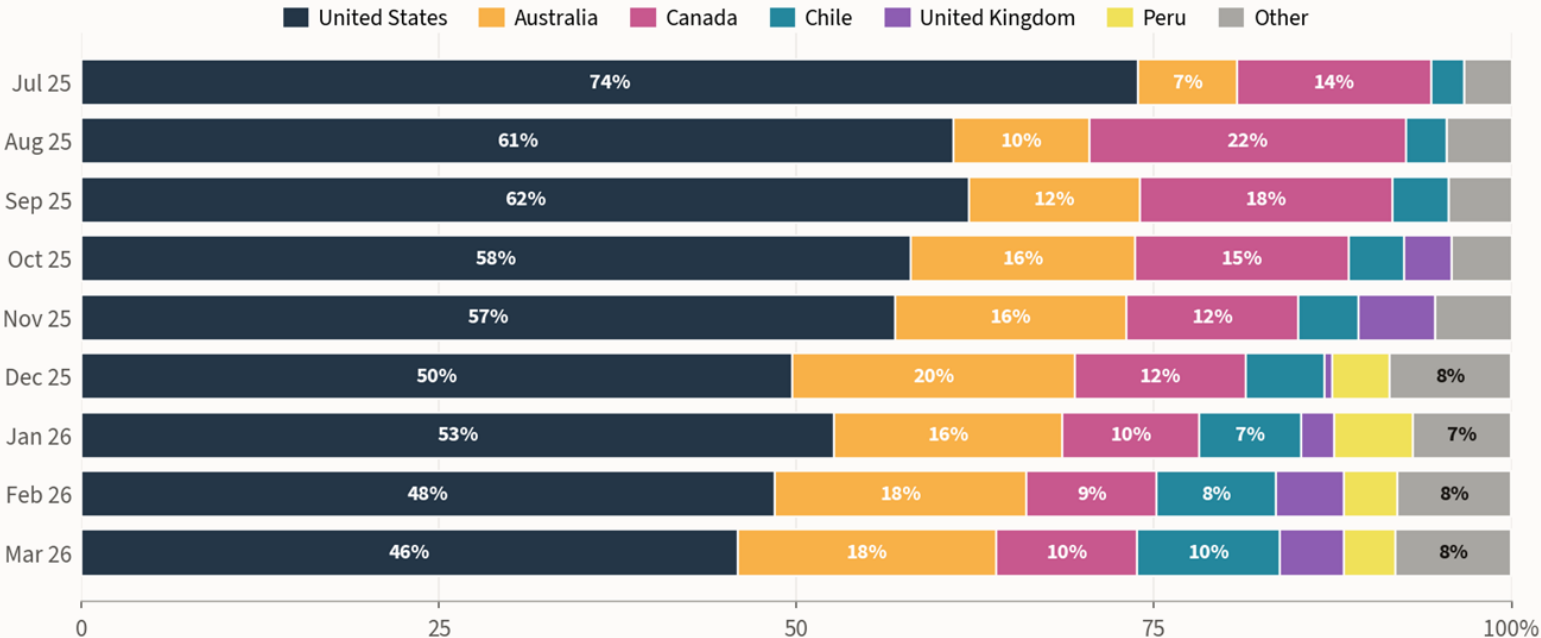
Each new commercial launch produces a visible step up — even with US and Canadian penetration softening after free-trial pricing ended



Source: Ookla® Speedtest Intelligence® · D2D users = Android Speedtest users with ≥1 D2D MNC registration in month · Mar 2026 estimated from published article totals

U.S. share of global D2D fell from 74% to 46% in nine months

As commercial launches landed elsewhere, the D2D market diversified — Australia and Chile are now the second and third largest shares



Source: Ookla® published article 'Measuring the Direct-to-Device (D2D) Marketplace: 2026' (Apr 2026) · % of monthly D2D connection samples

D2D connections work below terrestrial's 'usable' floor

RSRP measurements on the U.S. Starlink-T-Mobile D2D network sit between -108 and -126 dBm — 5 to 10 dB weaker than typical weak terrestrial cellular



Source: Ookla® network measurements · Starlink-T-Mobile D2D in U.S. vs T-Mobile LTE in Los Angeles · 2026

Drive-tested D2D in rural New York — 60% of texts went through

RootMetrics®

On a moving car in T-Mobile not-spots, Starlink D2D took an average of 1 minute 17 seconds to send and receive a text

238

TEXT SENDS
ATTEMPTED

Northern New York drive
in T-Mobile not-spots

60%

SUCCESS
RATE

Send + receive completed
on Starlink D2D

1m 17s

AVERAGE TIME
TO COMPLETE

Across 143 tests;
best 1 s · worst 5 min

Moving
car

TEST
CONDITION

Service is intended for
outdoor, stationary use
with a clear sky view

Source: Ookla RootMetrics® drive test, rural New York state · H2 2025 · 238 D2D text-send attempts on Starlink-T-Mobile network

Crystal Ball Gazing

The present, the immediate future and the endless possibilities

Starlink dominates global Speedtest sample share

Speedtest Intelligence® | Q3 2025



 SPEEDTEST

Downdetector[®]

RootMetrics[®]

2036 ?

While still in its technical infancy, leo satellite has

- **Changed travel connectivity**
- **Changed resilience and disaster recovery connectivity**
- **Changed how governments view fixed intervention areas**

And it's just getting started...

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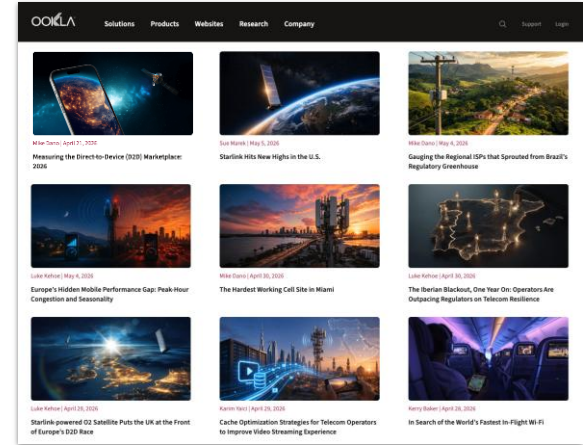
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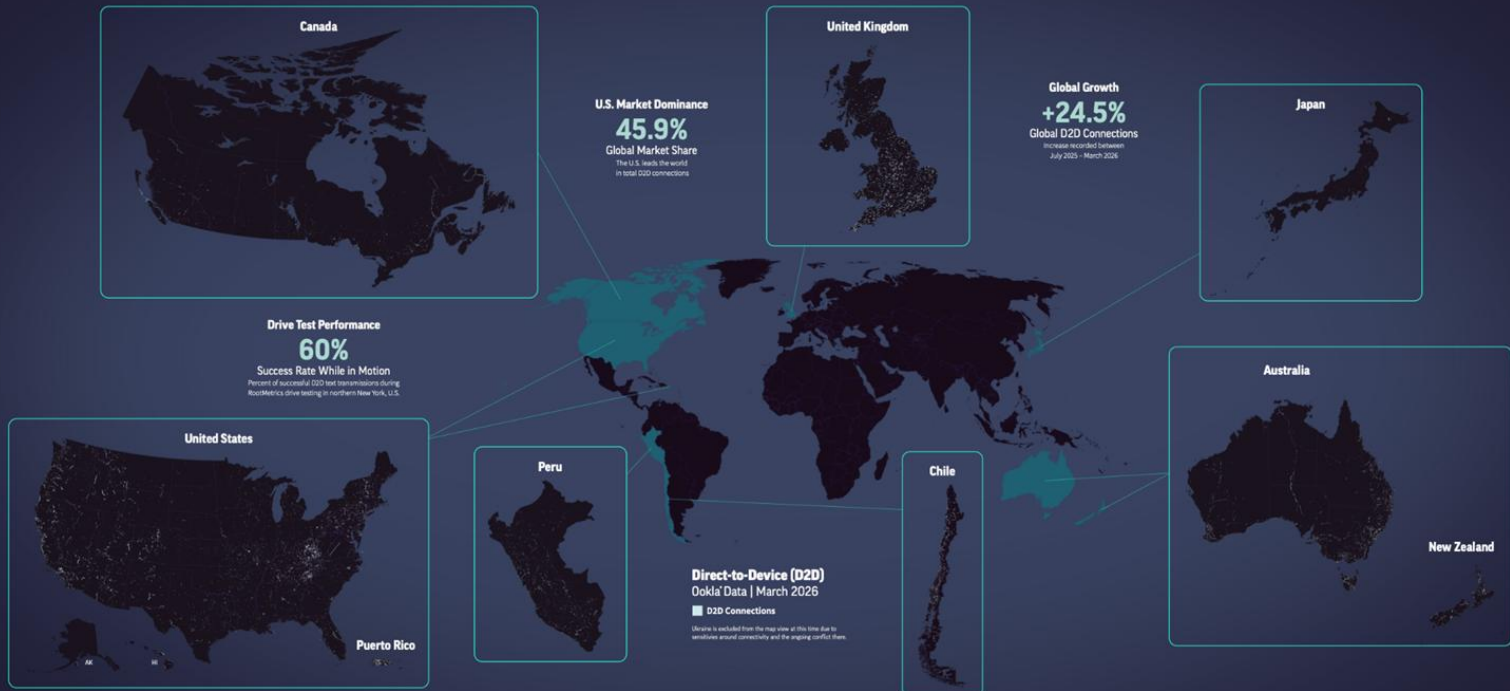
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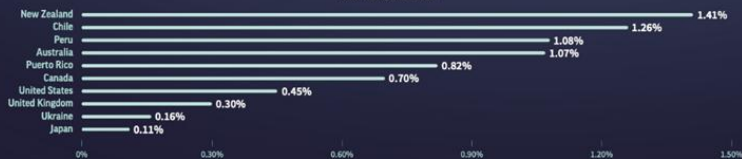


The Global D2D Market

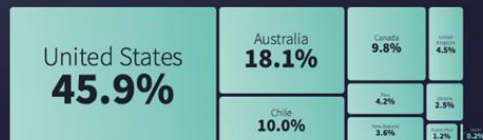
March 2026 Edition



Unique Monthly D2D Users, as a Percent of Total Speedtest Users
Okla' Data | March 2026



Global Share of Total D2D Connections
Okla' Data | March 2026



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Better outcomes.

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