

Merits of Terrestrial Fibre vs LEO/MEO Satellite to Serve Remote Areas: Tech, Ops, Performance and Data Sovereignty

Support slides

SANOG 43, Bhutan 2025 08 22

Which Satellite offerings are relevant?

Starlink, certainly

O3b

OneWeb

Kuiper / Amazon

Provider	Orbit Type	Service Introduced / Launch Year
SES Broadband (ASTRA2Connect)	GEO	March 2007
Tooway (Eutelsat)	GEO	2007 (Hot Bird/Eurobird), KA-SAT May 2011
Viasat (Exede)	GEO	2012 (Exede service)
Kacific	GEO	2019 (post-Kacific1 launch)
StarBand	GEO	2000–2015 (ceased in 2015)
O3b	MEO	September 2014
HughesNet	GEO (satellite)	1996 (DirecPC) → 2006 (HughesNet)
OneWeb	LEO	First launch 2019 → service in 2021–2022
Starlink (SpaceX)	LEO	Test in 2018 → beta service in Nov 2019
Telesat Lightspeed	LEO	Agreement in 2021 → service from 2H 2023
Project Kuiper (Amazon)	LEO	Founded 2019 → launches 2023/25 → service late 2025

What are your practical experiences with regards to Technology/Operations/Performance?

Data rates Latencies

2. TechRadar Australia

Reports regional Starlink statistics in Australia: median download speed ~104.9 Mbps, upload ~11.3 Mbps, and latency ~59.8 ms. TechRadar

- **APNIC Blog Fact-Check:** Reported median download speeds of **178 Mbps**, peaks up to **386 Mbps**, and median upload around **17 Mbps**, with latency typically between **40–60 ms**, occasionally hitting **20 ms**.

Mohan, Nitinder, et al. "A multifaceted look at starlink performance." Proceedings of the ACM Web Conference 2024. 2024.

<https://arxiv.org/pdf/2310.09242>

Laniewski, Dominic, et al. "WetLinks: a large-scale longitudinal starlink dataset with contiguous weather data." arXiv preprint arXiv:2402.16448 (2024).

<https://arxiv.org/pdf/2402.16448>

APNIC

[Get IP](#) [Manage IP](#) [Training](#) [Events](#) [Insights](#) [Community](#) [Blog](#)

Fact checking Starlink's performance figures

By [Martino Trevisan](#) on 28 Nov 2022

Category: [Tech matters](#)

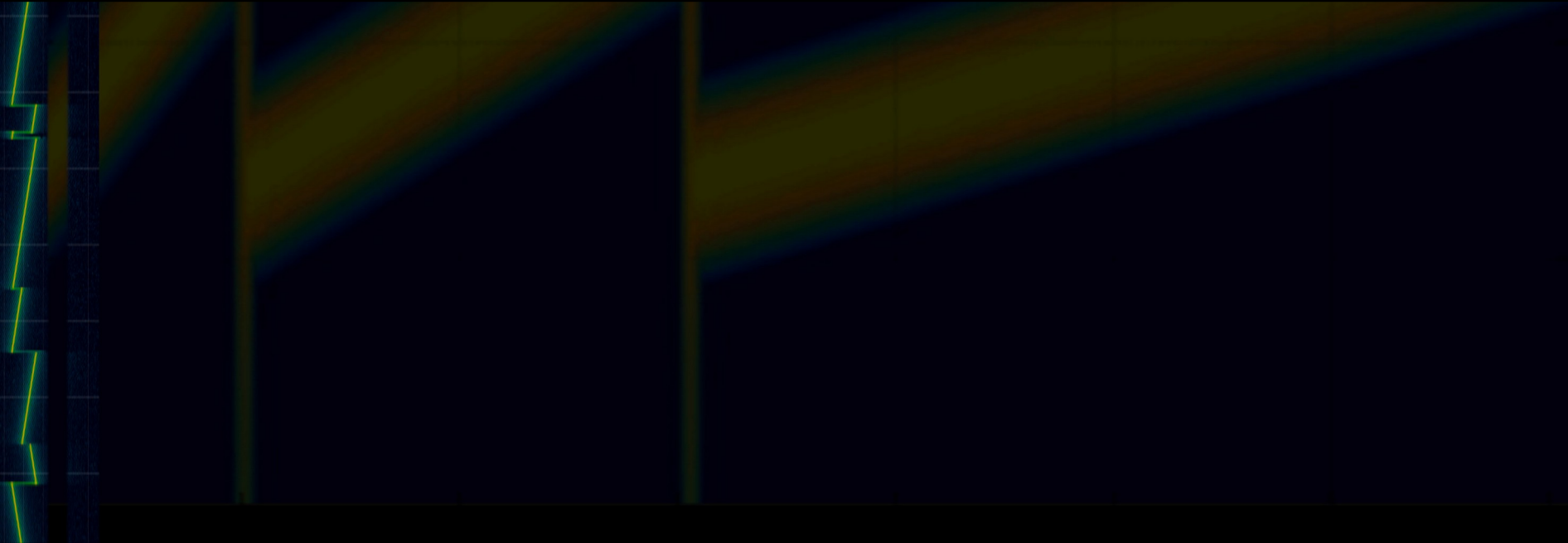


Satellite connectivity certainly offers advantages from a pragmatic point of view.

However there may be serious issues with regards to Data Sovereignty, Dependencies, Political context, Resilience and long term sustainability.

How do you balance these different aspects?

Which do take priority?

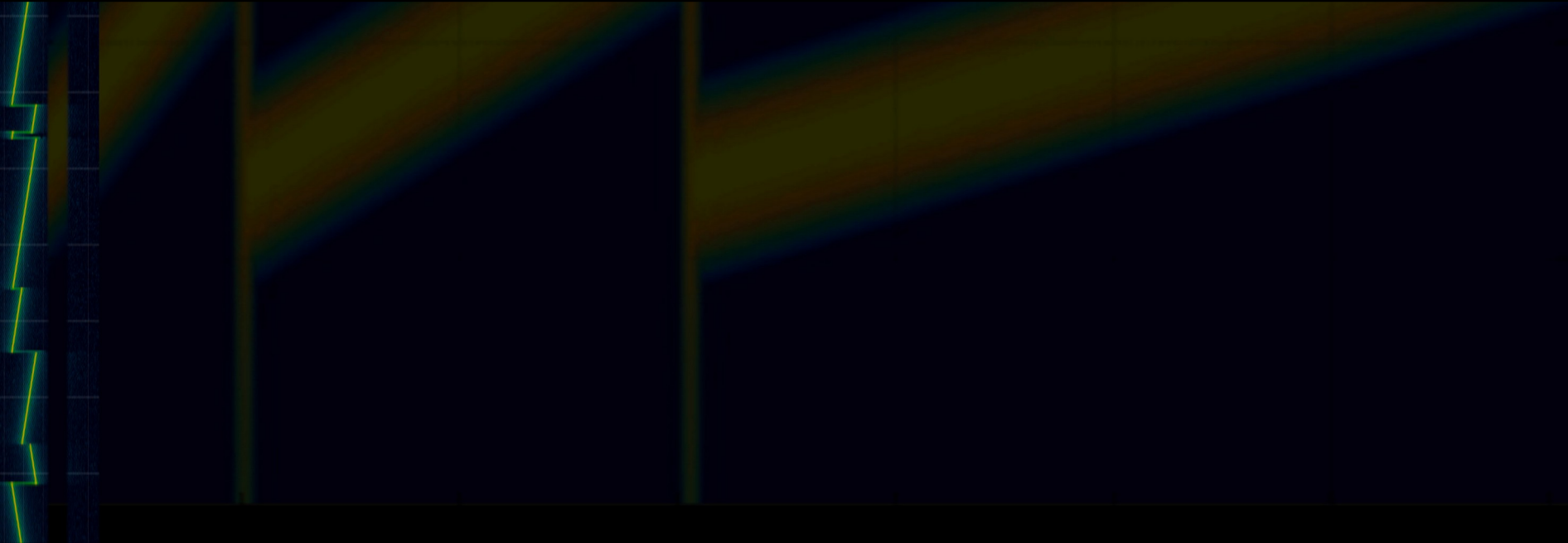


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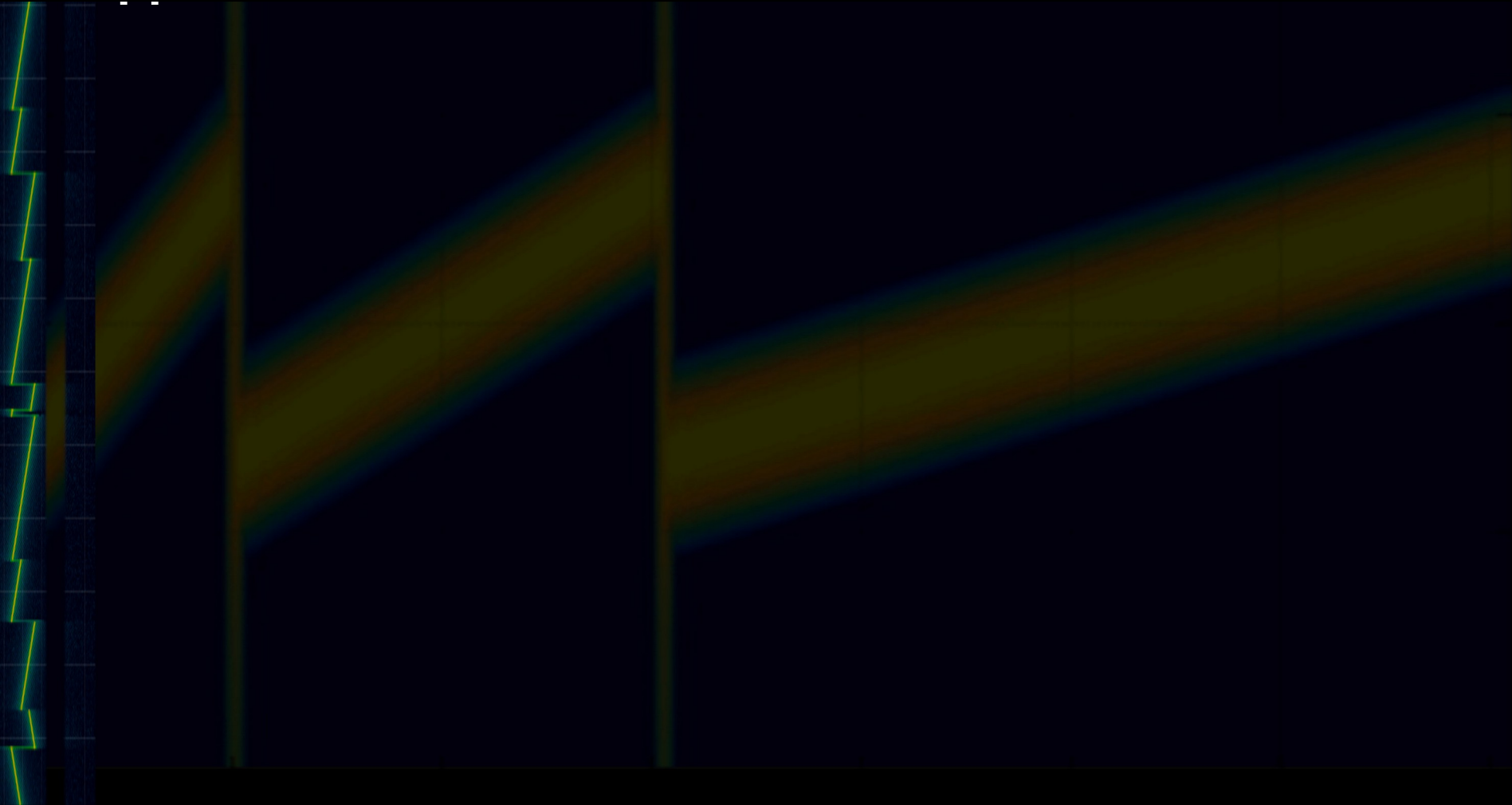
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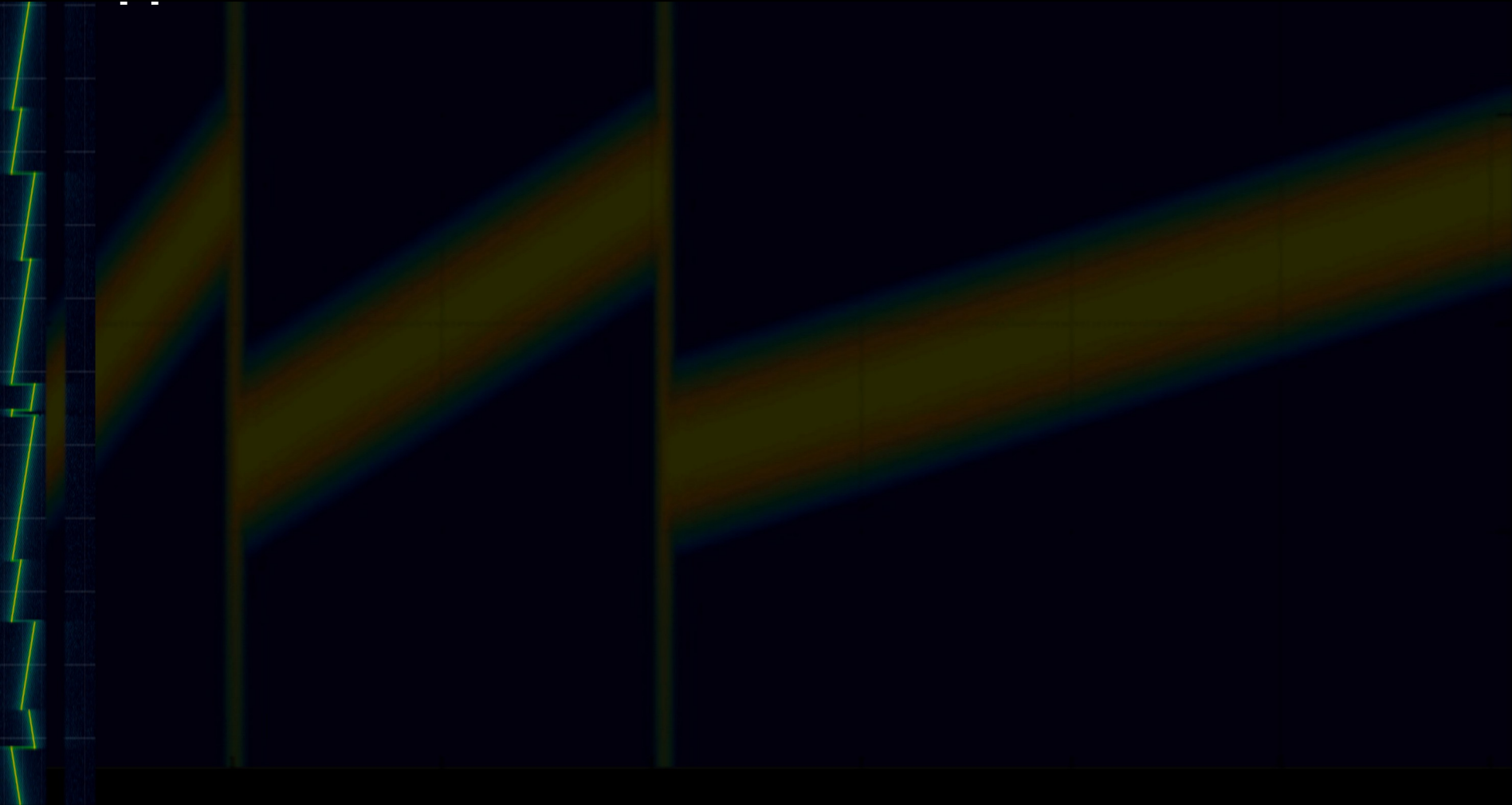


Impact on scientific work -

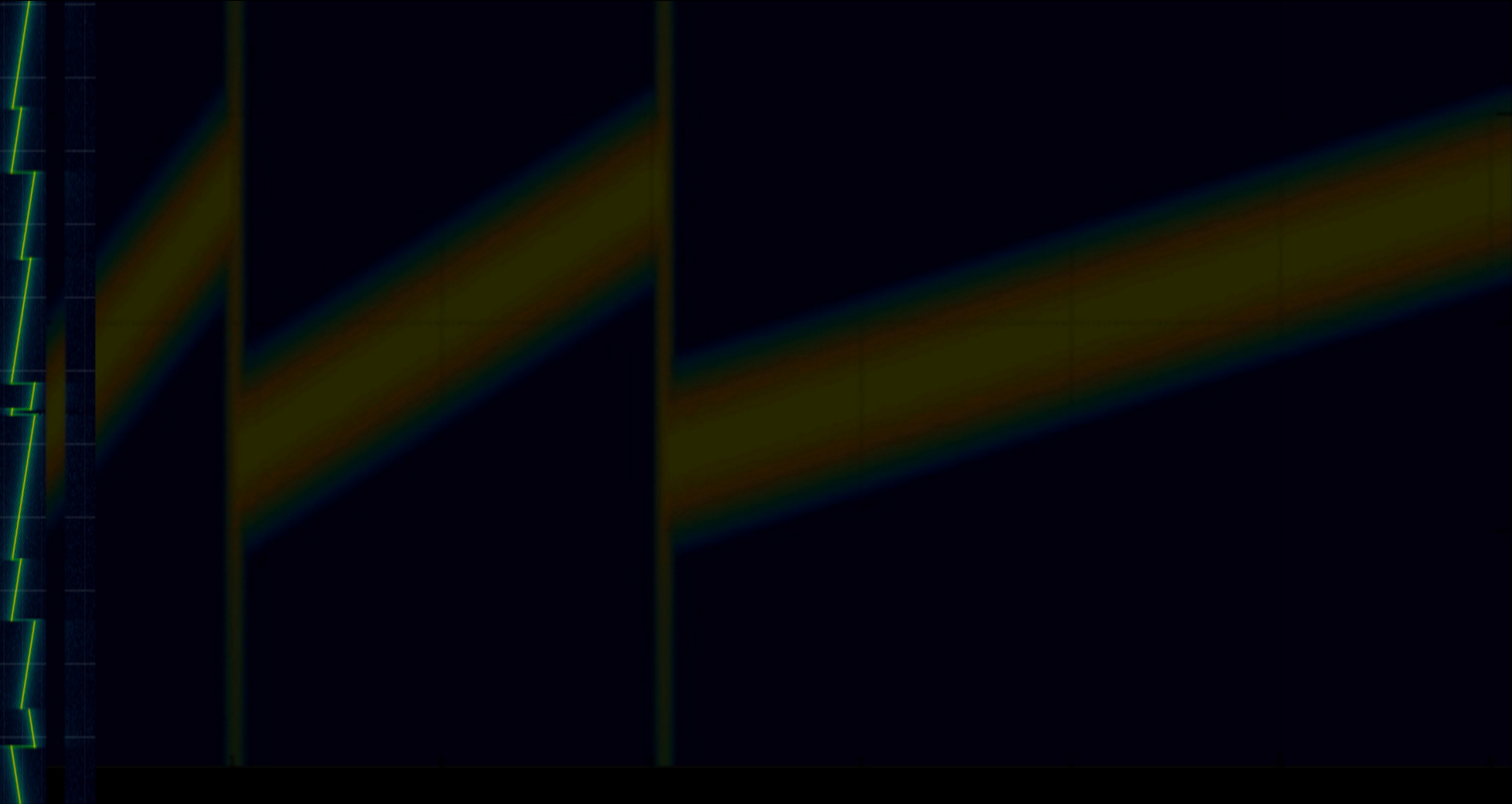
radio astronomy, space observation, ...



Environmental impact



Do you see Satellite connectivity as a relevant part of addressing remote connectivity challenges?

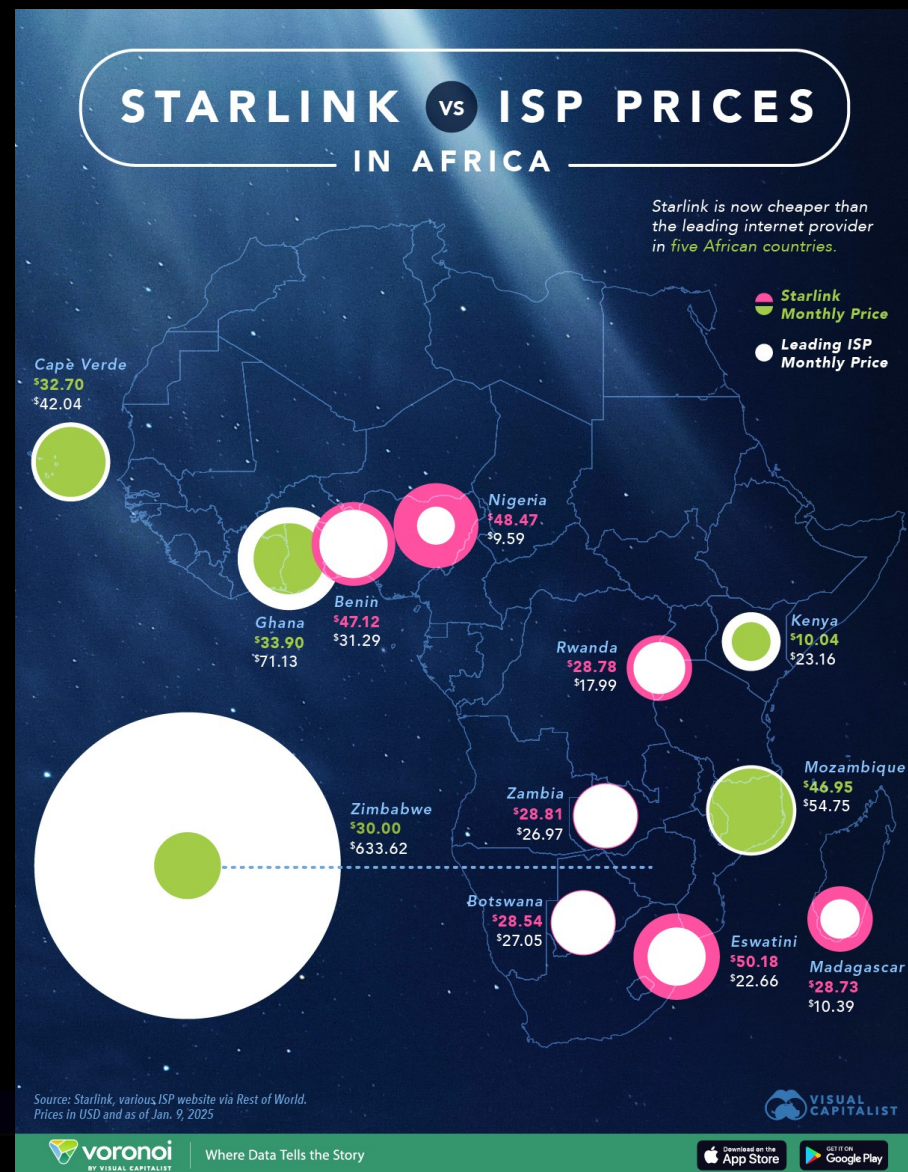


What is the impact on your country's

ISP, Telecoms and connectivity business landscape?

Which effects do you predict?

<https://www.visualcapitalist.com/visualized-starlink-vs-leading-internet-provider-prices-in-africa>



Starlink Availability in Asia (2025)

Country	Operational Since	Monthly Price	Hardware Cost	USD Equivalent (Monthly / Hardware)
Bangladesh	May 2025	৳4,200	৳47,000	\$38 / \$430
Bhutan	Feb 2025	Nu.4,200	Nu.42,000	\$38 / \$380
Indonesia	May 2024	Rp 690,000	Rp 5,000,000	\$45 / \$325
Japan	Oct 2022	¥6,600	¥66,000	\$48 / \$480
Malaysia	Jul 2023	RM 260	RM 2,500	\$55 / \$525
Maldives	Nov 2023	MVR 590	MVR 5,500	\$38 / \$355
Mongolia	Mar 2024	₮150,000	₮1,200,000	\$44 / \$350
Philippines	Feb 2023	₱2,700–₱3,200	₱19,999–₱29,320	\$47–55 / \$355–520
Sri Lanka	Jul 2025	LKR 12,000–15,000	LKR 60,000–118,000	\$40–50 / \$160–390
Iran (Unofficial)	Sep 2022	NA	NA	>\$250 (black market)

source: <https://www.theasianaffairs.com/starlink-in-asia-2025/>

**What is the state of regulations and government strategy in this field,
and what might be needed in the future?**

Should regulators take action? If so, what action?

What is the state of regulations and government strategy in this field, and what might be needed in the future?

Kenya now turns to UN telecommunications agency to regulate Starlink



Starlink, the satellite division of Musk's SpaceX, has revolutionised internet access with a network of over 6,400 active satellites orbiting the earth, providing low-latency broadband across the globe. (Photo: Lightrocket / Getty Images)

By Eastleigh Voice Reporter • Tuesday, November 19, 2024



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Starlink Licence Fees to Increase 10 Times in New Proposal

by Joy Kwama — January 8, 2025 Reading Time: 3 mins read



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X owner, Elon Musk. PHOTO: Bloomberg

Regulation/Business aspects:

What are the stats of Starlink user count in Bhutan from February 2025, and where are the most users located in Bhutan and what type of service packages (business package (priority) or residential packages (unlimited)) are being used in Bhutan at the moment?

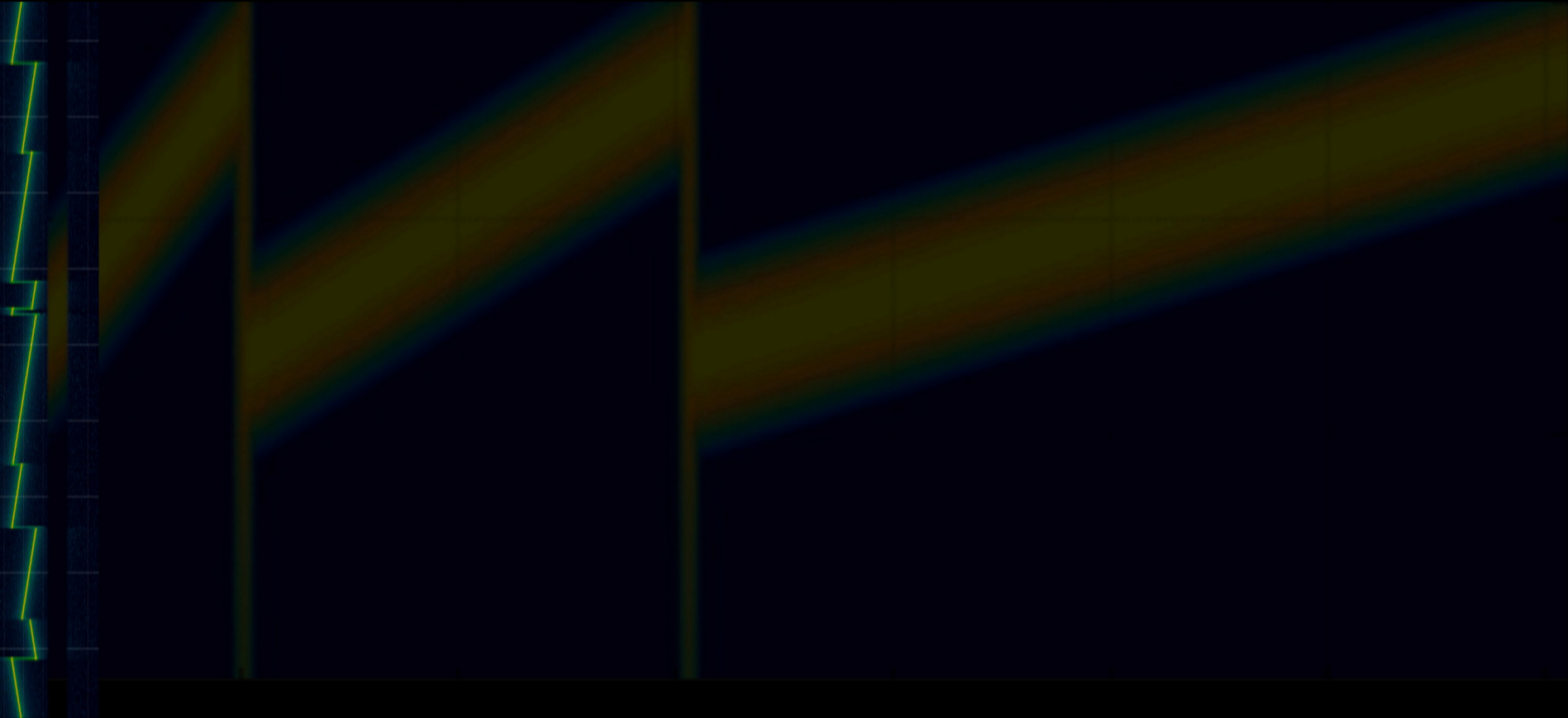
Why do you think a particular package has more subscriptions?

Do you feel the introduction of Starlink in Bhutan has driven certain competition in the internet market in Bhutan?

Regulations & Spectrum Licensing

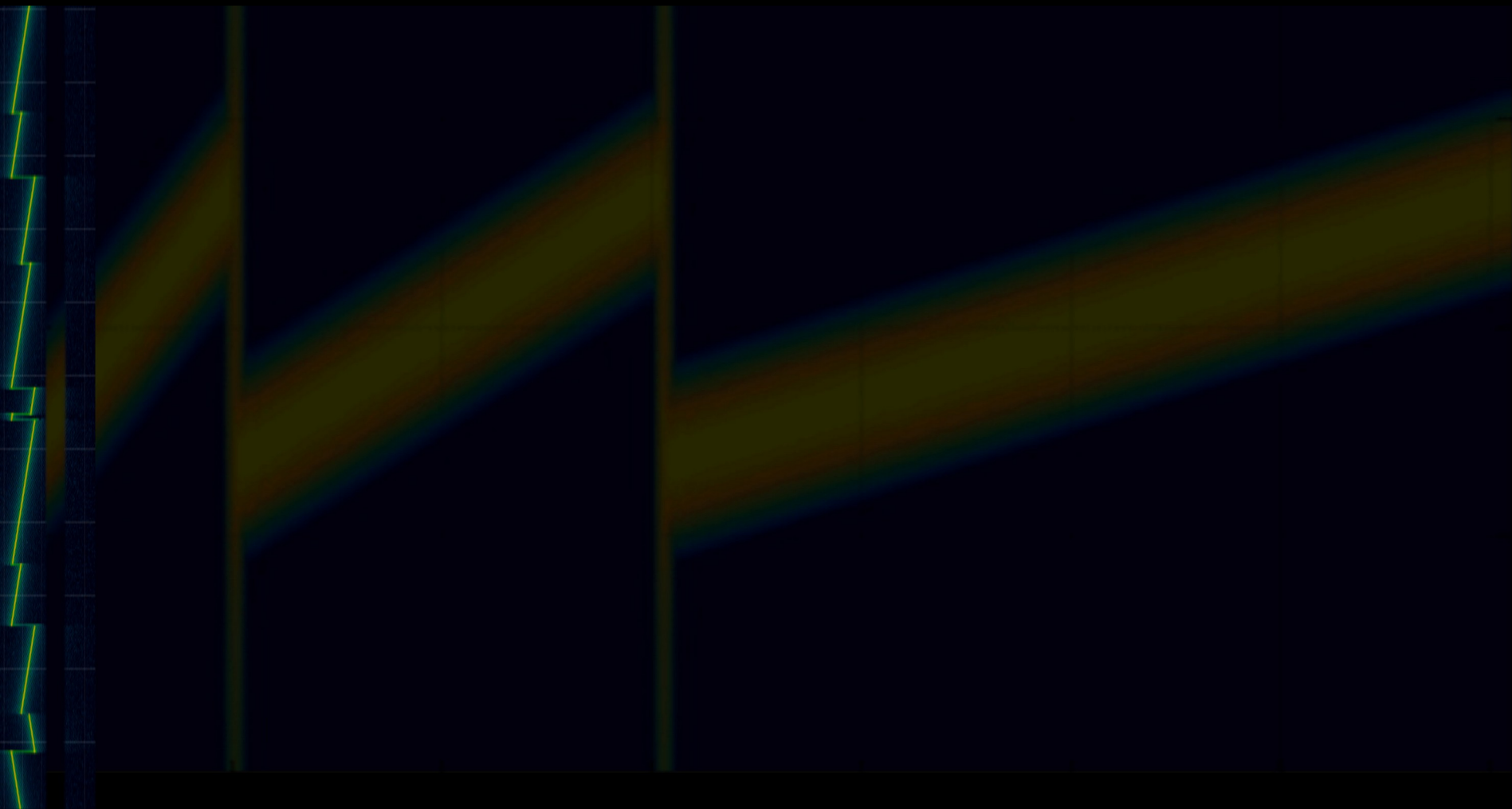
How are the licensing aspects of satellite based internet services in Bhutan? The spectrum allocations etc.

**From an end user perspective -
if Satellite connectivity is a compelling proposition,
what terrestrial alternatives would be able
to compete with it?**

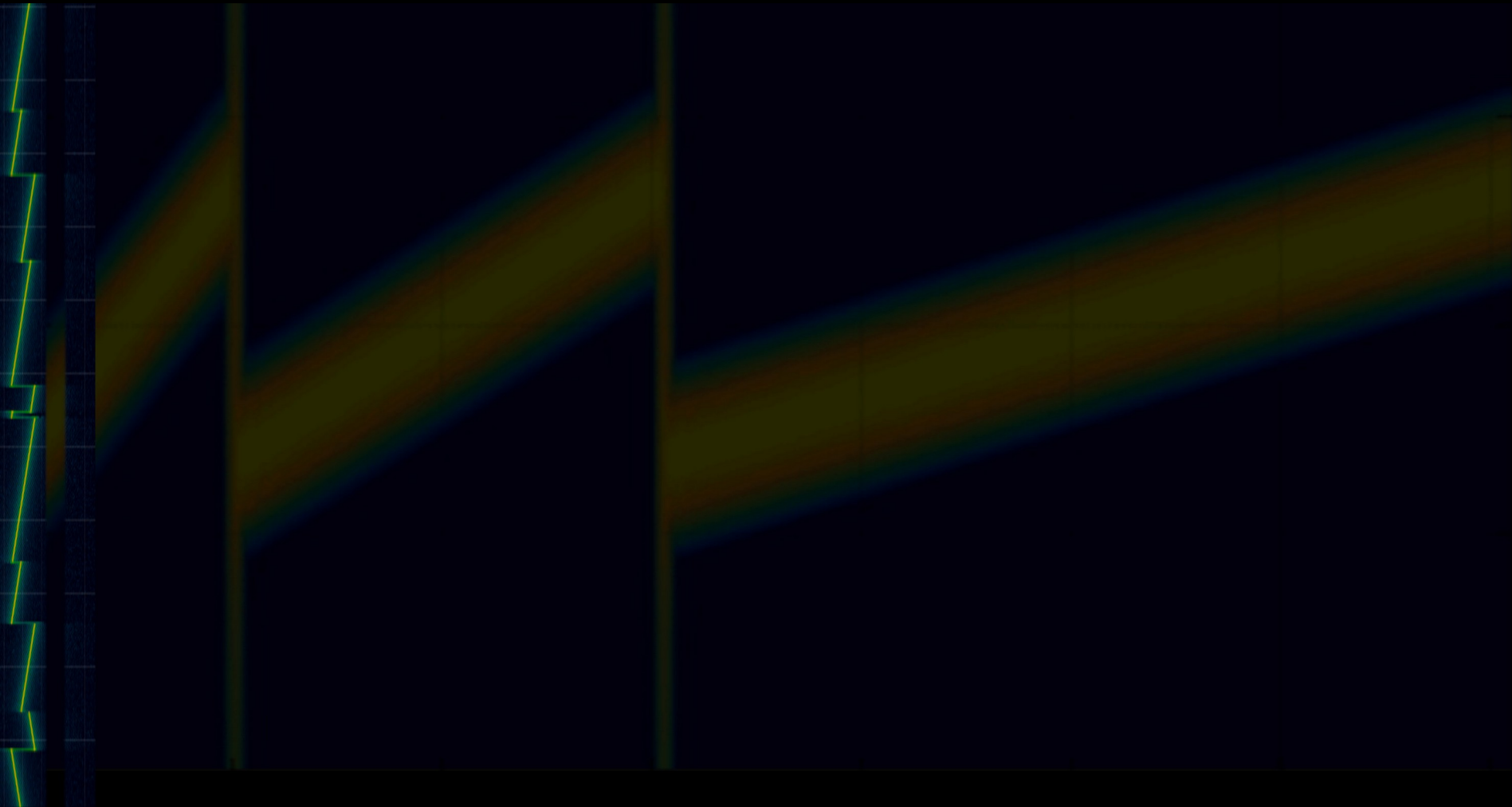


What did we not address?

What other aspects do we need to talk about?



Bonus slides



Data sovereignty



GEO-ECONOMICS AND POLITICS

What is digital sovereignty and how are countries approaching it?

Jan 10, 2025

Data sovereignty

The path to European data sovereignty

Opinion

By TechRadar Pro published 2 days ago

Who really controls data, and under whose law does it fall?



Comments (0)

A REUTERS SPECIAL REPORT

Musk ordered shutdown of Starlink satellite service as Ukraine retook territory from Russia

Soldiers panicked and drones surveilling Russian forces went dark.

By Joey Roulette, Cassell Bryan-Low and Tom Balmforth

July 25, 2025 5:00 PM GMT+6 · Updated July 28, 2025



What J.D. Vance Said

On the "Shawn Ryan Show", Vance asserted that if Europe, specifically the European Union, pursues regulations targeting platforms like X, the United States should reevaluate its support for NATO:

"So what America should be saying is, if NATO wants us to continue supporting them ... why don't you respect American values and respect free speech? ... It's insane that we would support a military alliance if that military alliance is going to be pro-free speech."

MediaKit

Business Insider

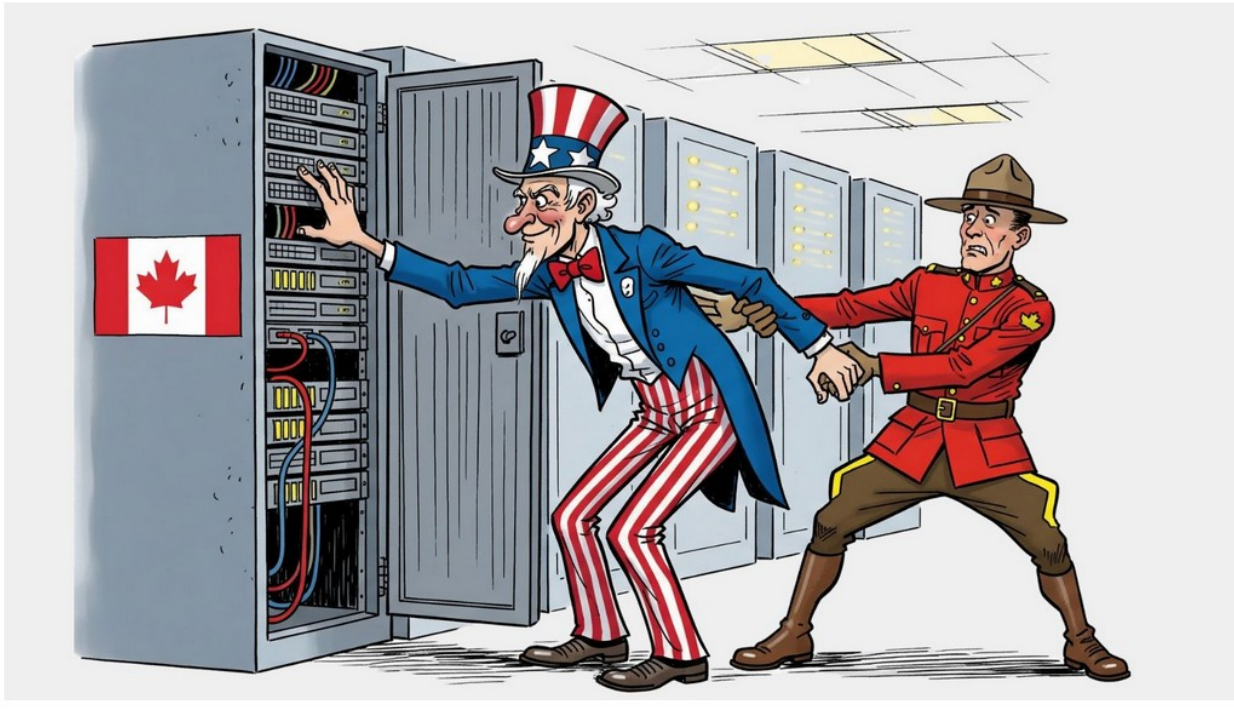
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Data sovereignty

Microsoft says U.S. law takes precedence over Canadian data sovereignty

By Alexander Rudolph Published August 16, 2025



Impact on scientific work -

see e.g. <https://www.space.com/spacex-starlink-satellites.html>

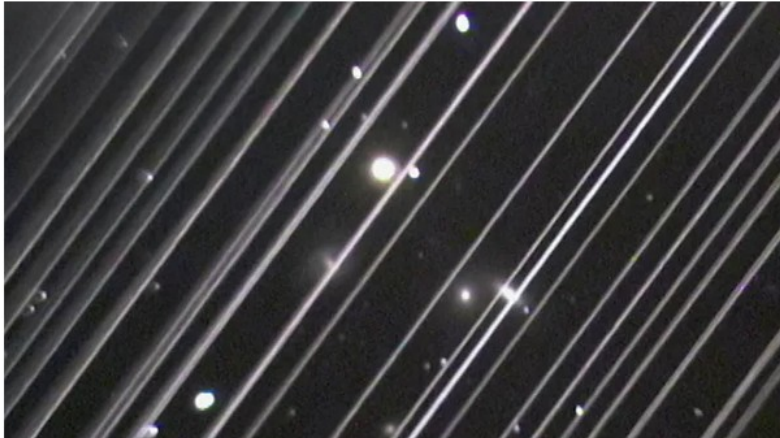
Scientists analyze 76 million radio telescope images, find Starlink satellite interference 'where no signals are supposed to be present'

News By Stefanie Waldek published July 28, 2025

A new survey analyzed the effect of Starlink satellite emissions on 76 million radio telescope images.

      Comments (0)

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An astronomical image marred by trails caused by satellites of SpaceX's Starlink megaconstellation. (Image credit: Victoria Girgis/Lowell Observatory)

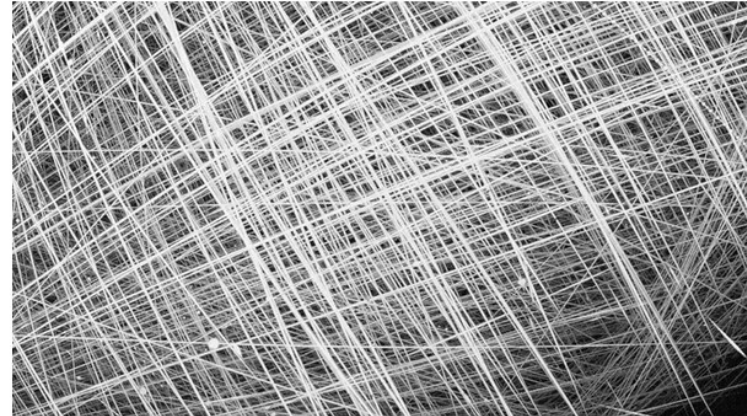
Satellite streaks block out the Arctic sky | Space photo of the day for June 20, 2025

News By Kenna Hughes-Castleberry published June 20, 2025

Researchers created a satellite tracking system to track satellite streaks across the Arctic for the first time ever.

      Comments (8)

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A compilation of images taken from 14 different cameras showing the different satellite activity on the night of Feb. 22, 2025. Each streak is one satellite moving across the sky. (Image credit: U. Western and Defence R&D Canada)

From intelligence gathering to internet usage to navigation, satellites are used daily across the globe. However, their activity is causing serious issues.

Environmental impact

PLANETARY SCIENCE

Space Junk Is Polluting Earth's Stratosphere with Vaporized Metal

Defunct satellites and other pieces of orbital debris are pumping metals into Earth's fragile upper atmosphere, with effects unknown

By Leonard David, Lee Billings on October 26, 2023



Advances in Space Research
Volume 67, Issue 3, 1 February 2021, Pages 1002-1025



On the anthropogenic and natural injection of matter into Earth's atmosphere

Leonard Schulz^a , Karl-Heinz Glassmeier^{a, b}

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<https://doi.org/10.1016/j.asr.2020.10.036>

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Satellite mega-constellations create risks in Low Earth Orbit, the atmosphere and on Earth

[Aaron C. Boley](#) & [Michael Byers](#)

[Scientific Reports](#) **11**, Article number: 10642 (2021) | [Cite this article](#)

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Do you see Satellite connectivity as a relevant part of addressing remote connectivity challenges?

https://thexlab.org/wp-content/uploads/2025/07/Starlink_Analysis_Working_Paper_v0.2.pdf

Starlink Capacity Analysis v0.2

Sascha Meinrath¹ Karl Grinda² Glenn Fishbine³ Nancy DeGidio³

July 18, 2025

Abstract

Assuming no topographical considerations or pre-existing user base, in areas where there are more than 6.66 households per square mile within a Starlink beam's coverage area, Starlink may fail to deliver the minimum service level (100/20Mbps) to qualify as a broadband service, thus failing to meet the NTIA eligibility requirements to receive federal support for broadband through programs such as the Broadband Equity, Access, and Deployment (BEAD) program.