

Satellite broadband for the masses: Are we there yet?

Mike Puchol CTO - Poa Internet

Connecting the Unconnected

HNP Kibera, Kenya. Source: Author

Google		connecting the unconnected				×	Ļ	• ٩
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PERCENTAGE OF INDIVIDUALS NOT USING THE INTERNET



Uncomected:

$\sim 4,000,000,0000$

Let's make it sound

less worse than it is ...

Unconnected:

~3,999,999,999





THE VICIOUS CIRCLE

LONG-HAUL IP LOCAL LOOP **MIDDLE MILE** LAST MILE/INCH **REGULATION**

ALL OTHER STUFF









LOCAL LOOP

MIDDLE MILE

LAST MILE/INCH

REGULATION

ALL OTHER STUFF

THE VICIOUS CIRCLE

Unconnected:









MIDDLE MILE

LAST MILE/INCH

REGULATION

ALL OTHER STUFF

THE VICIOUS CIRCLE

Unconnected:

~3,827,361,834











THE VICIOUS CIRCLE

DIAMOND SHIPPING Hapag-Lloyd

ALL OTHER STUFF

FUSO

175 J

0

Unconnected:

~3,999,999,999

"Hey, what if we use satellites?"



LOCAL LOOP(ish)





REGULATION

ALL OTHER STUFF

THE VICIOUS CIRCLE

Viasat 3 - 1 Tbps per satellite

3x Viasat 3 = 3,000,000,000,000 bps Unconnected = 4,000,000,000 people **Provisioned Capacity Per Unconnected:** 750 bits per second

Source: Viasat

What if we provision

1.5 Mbps per

Unconnected?

Source: Viasat

Unconnected:

~3,997,999,999

Revenue at \$12.50/sub:

\$25 million / month Cost of Viasat 3:

\$2,300 billion

Source: Viasat

Payback period: 8 years

Source: Viasat

Viasat CFO



Heard of LEO?

Comparison of distance between Low Earth Orbit and Geostationary Satellite Systems

Starlink at 550 km ~9,000 km (MEO) Starlink at 550 km ~9,000 km (MEO) Store of the set of the set



Source: https://newspace.im/

Can you plug Starlink please?



INSERT BIG FAT BOLD DISCLAIMER HERE

Aggregate capacity 88 Tbps

- 20 Gbps per satellite

STARLINK

Gen1 constellation:

- 4,400 satellites

- 5 orbital shells

- Optical ISL



If we could use the 88 Tbps to Connect the Unconnected...

Unconnected:

~3,823,999,999

Caveats:

- Capacity is evenly spread, hard to concentrate capacity on specific regions. - Average satellite lifespan ~5 years. - Cost: \$10 billion!



Caveats:

 Needs gateways to offload traffic to terrestrial networks. - Satellites always moving. - More complex user terminal.



LINK SATS: 4 📄 🍄 🌦 💋 🕥 🎢 🛞 🖉 🗓 🕄

You can also play: https://starlink.sx

MOVING MARKERS DO NOT REPRESENT ACTUAL SIZE OF STARLINK SATELLITES

T Q TOTAL: 3524 OP: 2695 ISL: 1710 (85%) STBY: 489

🕐 1.5 S

COVERED CELLS: 1101 (100%) USED SATS: 22 USED BEAMS: 749

TOTAL CAP: 442.8 GBPS (76%) MAX CELL CAP: 2.6 GBPS AVG CELL CAP: 402.1 MBPS

BY MIKE PUCHOL 🔰 | THIS SITE IS NOT AFFILIATED WITH STARLINK OR SPACEX | © OPENSTREETMAP CONTRIBUTORS | V2.0.5

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LINK SATS: 4 🛛 🖶 🧖 🌦 💋 🕥 🎢 🛞 🖉 🗓 🕄 😨 T Q TOTAL: 3524 OP: 2756 ISL: 1684 (83%) STBY: 428 OFF: 340 @ 1.1 S TOTAL CELLS: 1101 COVERED CELLS: 1101 (100%) USED SATS: 15 USED BEAMS: 387 TOTAL CAP: 235.5 GBPS (58%) MAX CELL CAP: 1.2 GBPS AVG CELL CAP: 213.9 MBPS 32 Mbps 175 Mbps 25 Mb 19 Mbps 28 : 22 : 22 ≪ < 00 ▷ > » | "Ŋ ×1 MOVING MARKERS DO NOT REPRESENT ACTUAL SIZE OF STARLINK SATELLITES BY MIKE PUCHOL 🔰 | THIS SITE IS NOT AFFILIATED WITH STARLINK OR SPACEX | © OPENSTREETMAP CONTRIBUTORS | V2.0.5

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MOVING MARKERS DO NOT REPRESENT ACTUAL SIZE OF STARLINK SATELLITES



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Traditional VSAT antennas

Electronically Steered Antenna (ESA)

Source: SpaceX

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221,378 User Terminals Cost per terminal: ~\$1,000 Total CAPEX: \$221,4 million **Cost for user: \$500**

MOVING MARKERS DO NOT REPRESENT ACTUAL SIZE OF STARLINK SATELLITE

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SATS: 4

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MA : NM : PP

"Hey, what if we share

infrastructure?"

Y Q TOTAL: 3524 OP: 2695 ISL: 1710 (85%) STBY: 489 OFF: 340 @ 1.5 S

TOTAL CELLS: 1101 COVERED CELLS: 1101 (100%) USED SATS: 22 USED BEAMS: 749 TOTAL CAP: 442.8 GBPS (76%) MAX CELL CAP: 2.6 GBPS AVG CELL CAP: 402.1 MBPS TERMINALS: 221,378 @2 MBPS LINK 🛛 SATS: 4 👘 🗁 🗭 🍠 🜑 🎢 🛞 🐼 🗓 🕄 🥲

221,378 Customers **100 Customers per UT Total CAPEX: \$2,2 million Cost for user: \$5**

MOVING MARKERS DO NOT REPRESENT ACTUAL SIZE OF STARLINK SATELLITES

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Let people use their skills!

Remember this?

CARRIER-GRADE SWITCH

IP68 OUTDOOR RACK CABINET

PoE INJECTOR

AC POWER DISTRIBUTION BOARD



Who are we to judge?

But does this scale?

Source: Wikipedia

Maybe not at macro level...

Source: Wikipedia

But quite possibly at micro

evel.

UMURIRO

AIRTIME

FATABUGUZI

But we're not there yet...



Lack of power infrastructure in rural areas

Devices.

IT skills.
What is the internet for?

Remember

this?







Are we there yet?



Thank you!

Mike Puchol CTO - Poa Internet