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Digital Connectivity and Low Earth Orbit Constellations

Online Forum: Assessing the Promise of Low Earth Orbit (LEO) Satellites
in Accelerating Rural Connectivity and Closing the Digital Divide

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WHY SATELLITE?

Population density: satellite is the least costly & least complex method of delivering broadband in sparsely populated areas (less than 60 inhabitants per km²).

No alternative: in locations that are very remote, are inaccessible or for moving assets.

Rapid deployment is possible, provided that sat's are operational, ground stations in reach and stable power supply available on location.

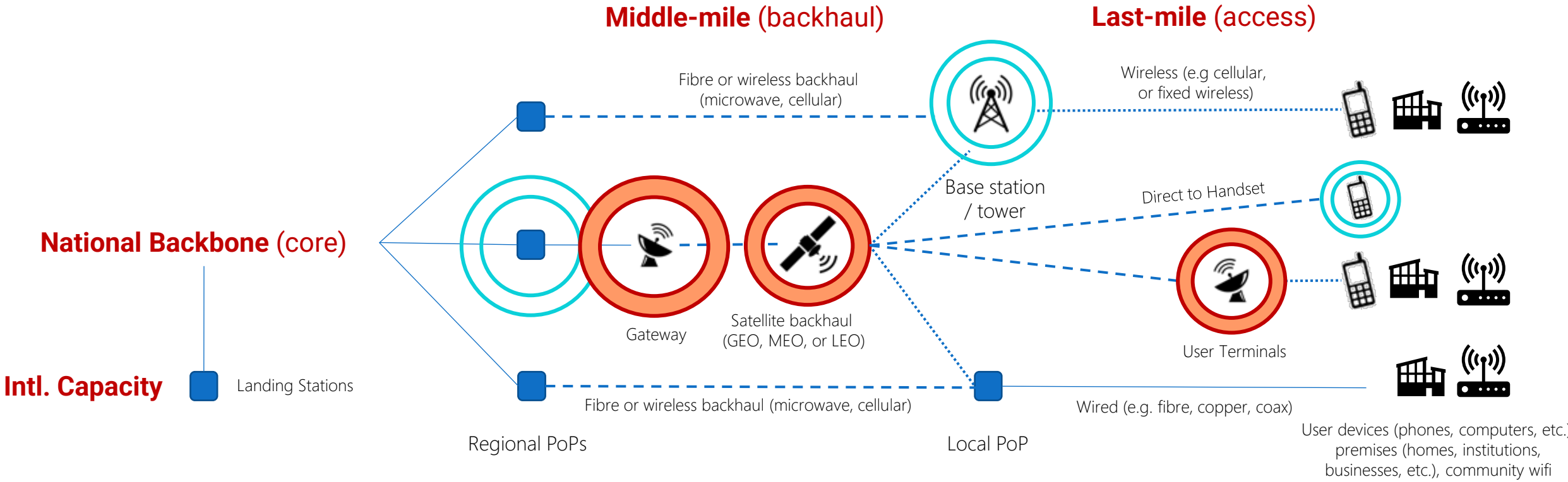
Resilience of satellites as space-based assets.

Technological advances: global capacity is increasing, latency rivals fixed broadband. Connectivity will be achievable with feature and smart phones.

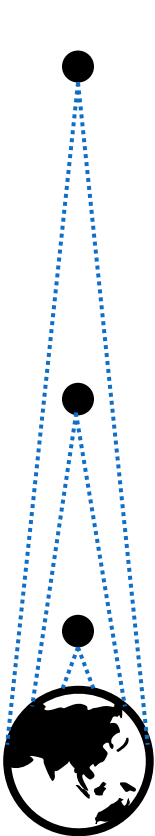
Costs for sat' production, terminals and launches are reducing.



SATELLITE CONNECTIVITY



FEATURES OF ORBITAL ALTITUDES



GEO
Geosynchronous/
Geostationary



MEO
Medium Earth Orbit

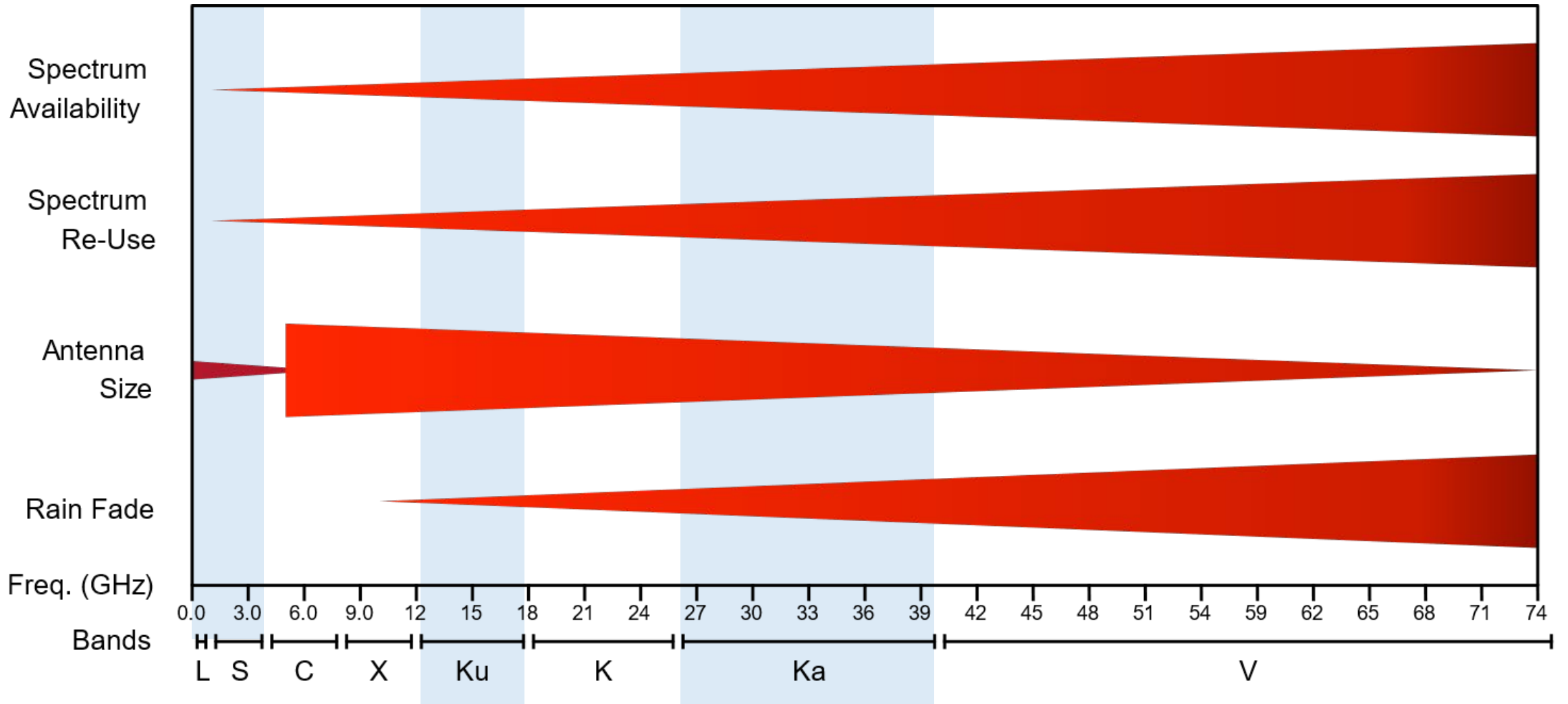


LEO
Low Earth Orbit

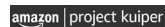
Altitude	Latency (roundtrip)	Orbital Period	Number of satellites to span globe	Cost per satellite	Effective lifetime of satellite
35,786 km	~477ms	24 hours	3 (if necessary)	~US\$100M to ~US\$400M	15 to 20 years
2,000 to 35,786 km	~27ms to ~477ms	127 minutes to 24 hours	5 to 30 (depending on altitude)	~US\$80M to ~US\$100M	10 to 15 years
160 to 2,000 km	~2ms to ~27ms	88 minutes to 127 minutes	Hundreds or Thousands (depending on altitude)	~US\$500,000 to US\$45M	5 to 10 years

Source: ITU Last Mile Internet Connectivity Solutions Guide, <https://www.itu.int/en/ITU-D/Technology/Pages/LMC/LMC-Home.aspx>

FEATURES OF SATELLITE SPECTRUM



Mobile Spectrum



SATELLITE BROADBAND ADOPTION CHALLENGES

Affordability

Even when affordability targets are reached, lower income populations still find prices unaffordable.

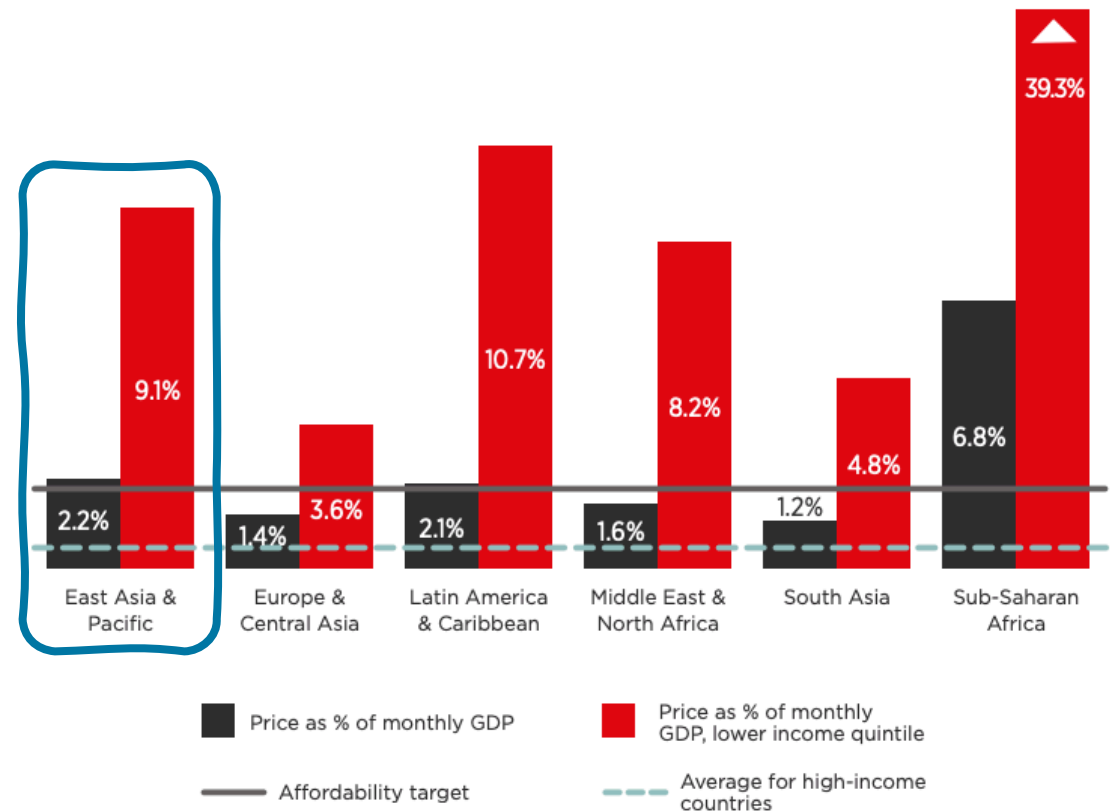
93% of Asia-Pacific's population lives within reach of 3G / 4G networks. However only 42% are using mobile internet services.

Device Requirements

Broadband satellite requires terminals and roof-mounted antennas. Direct-to-handset satellite connectivity may require new devices (S-Band).

Availability of Power

Fixed satellite terminals require 50-150 Watts of electricity – a challenge for most off-grid users in developing Asia and the Pacific.



SATELLITE BROADBAND

ADOPTION CHALLENGES

NETWORK

Licenses & Permits



Ground Infrastructure
Satellite Network Portals
(Ground Stations)

Towers & Power Supply



Asia-Pacific roll-out
often 2nd priority
(evolving)

PRICING



Business models
focus on high value
market segment

- Subscription



- Hardware
(exception: Direct-
to Handset)



If no Ground Stations / SNPs,
no fixed infra needed... will
savings be passed on to
consumers?



Competitiveness with GEO HTS
(e.g. community / free wifi)

MARKET FIT



Low latency not significant for
many solutions that address key
development challenges:
(e.g. agricultural IoT sensors,
field reporting in health and
social sector, citizen services,
basic financial products, etc.).

Interactive voice and video
communication do require low
latency (e.g. online education
and telehealth).

Super low latency demand:
VoLTE (<150ms), Gaming
(<100ms), military, security,
market trading.

Digital Connectivity and Low Earth Orbit Satellite Constellations

Opportunities for Asia and the Pacific

ADB Working Paper

<http://bit.ly/LEO-ADB>

