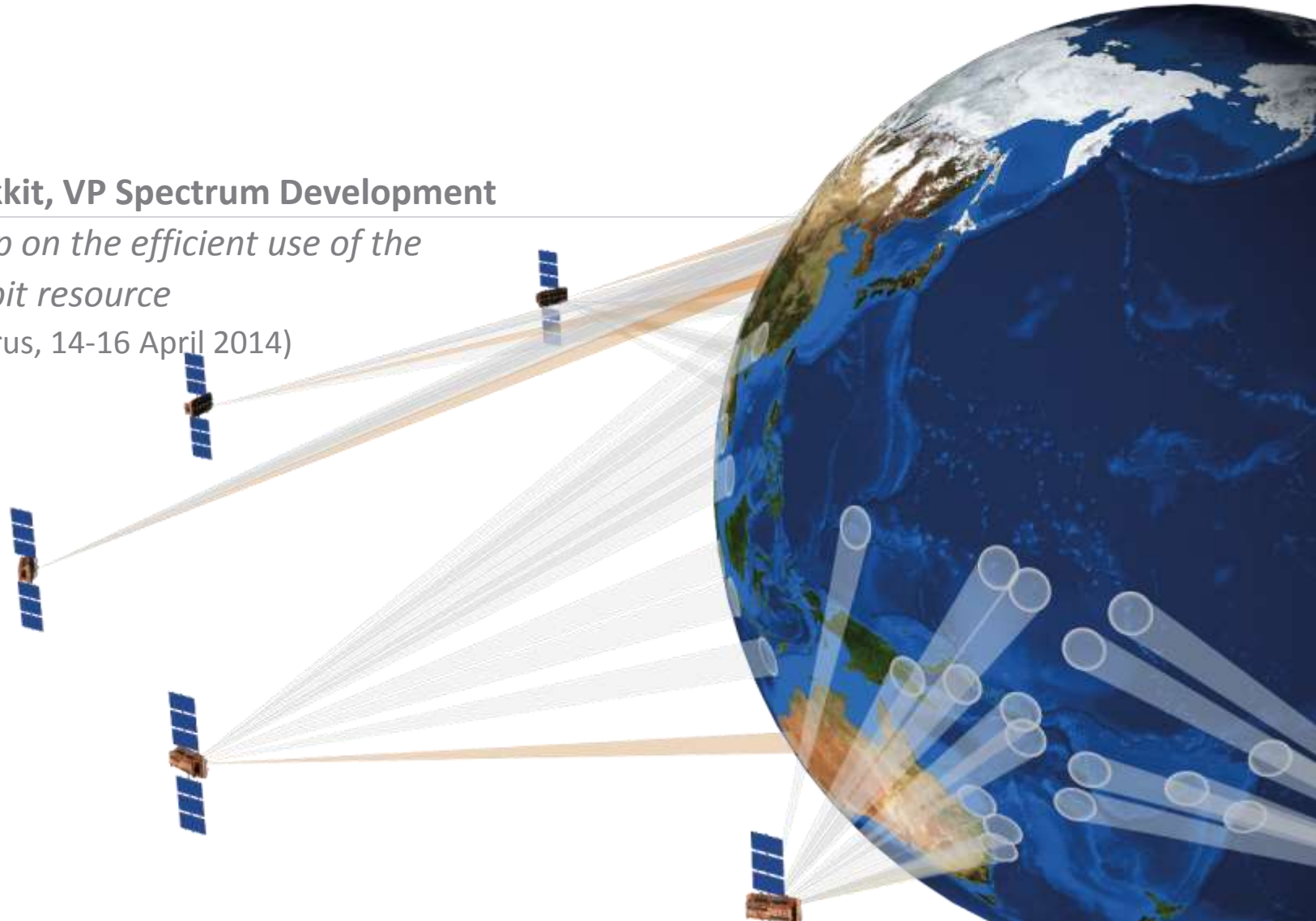
O3b..an innovative way to use Ka band

Hazem Moakkit, VP Spectrum Development

ITU Workshop on the efficient use of the spectrum/orbit resource

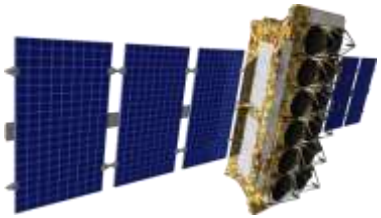
(Limassol, Cyprus, 14-16 April 2014)



April 14, 2014

What we do

O3b has deployed a next generation satellite constellation, delivering our customers superior, faster and more affordable connectivity



Continuous coverage: when one satellite leaves, another satellite takes over without transmission interruption

Initial constellation of MEO satellites circle the globe approximately four times a day

Each beam is connected to a high throughput teleport, with multiple layers of redundancy, ensuring operators have a reliable, high speed service

Ka-band beams of 700km diameter: steerable around the globe, each delivering up to 1.2Gbps

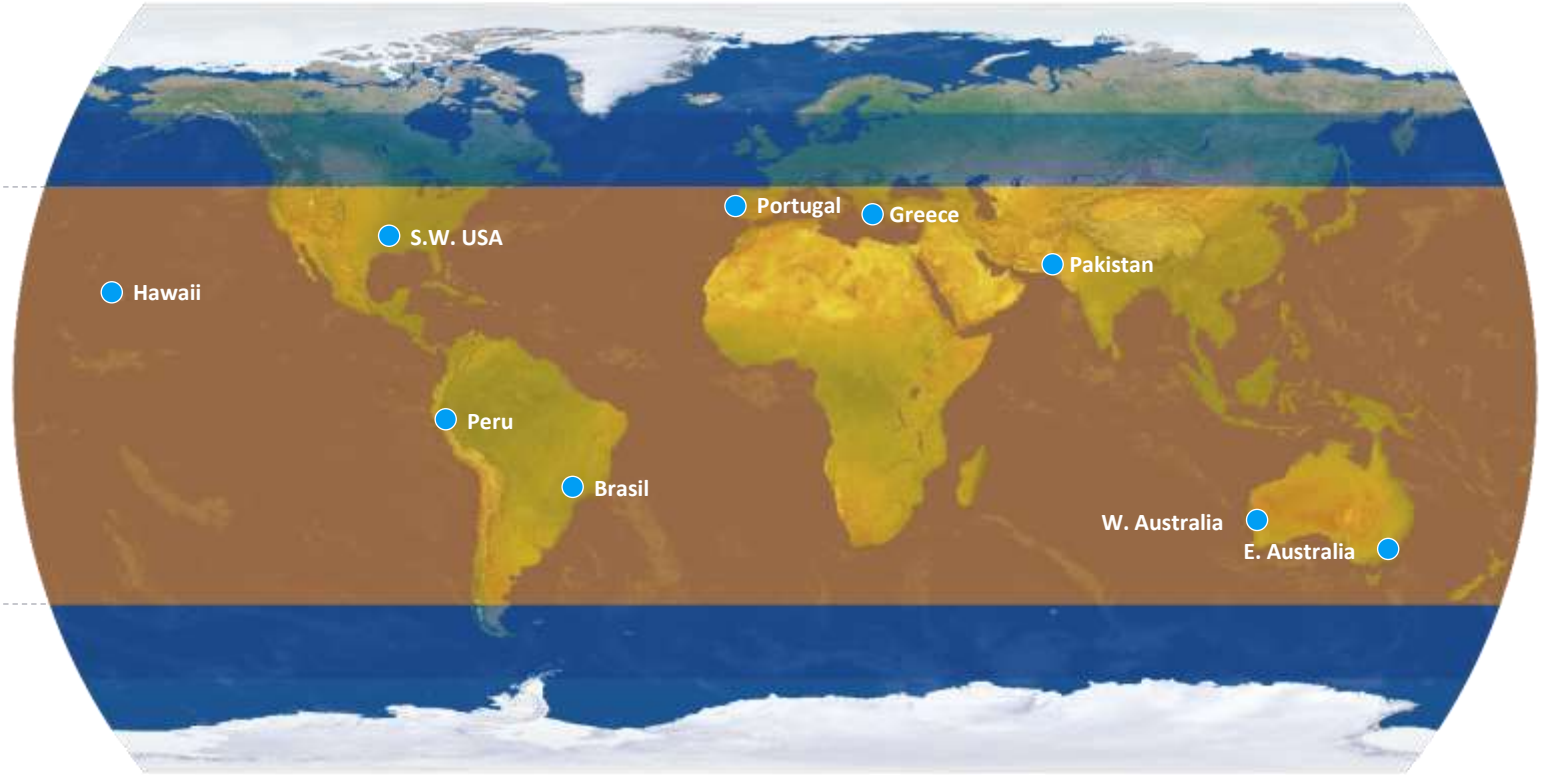
O3b is on schedule for full service launch in 2014

The O3b difference

MEO: 8,062km altitude

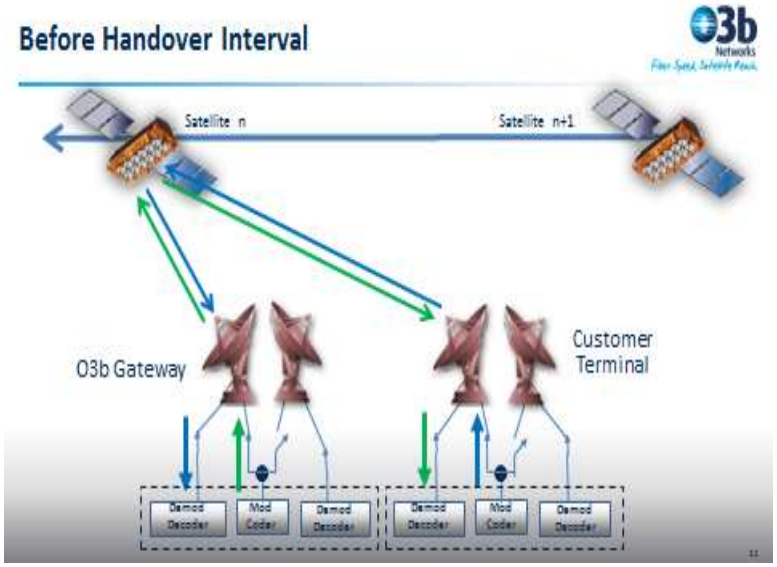
High Bandwidth	Scalable options from 100MB to 1.2GB
High Speed	4 x faster than Geostationary satellites
Low Latency	Roundtrip latency **of less then 150ms** enabling: • Faster interactivity • Crystal clear voice and video quality • Superior data services
Low Cost	Up to 30% more affordable
Flexibility	Steerable beams can be placed anywhere 45 degrees North/South of the Equator

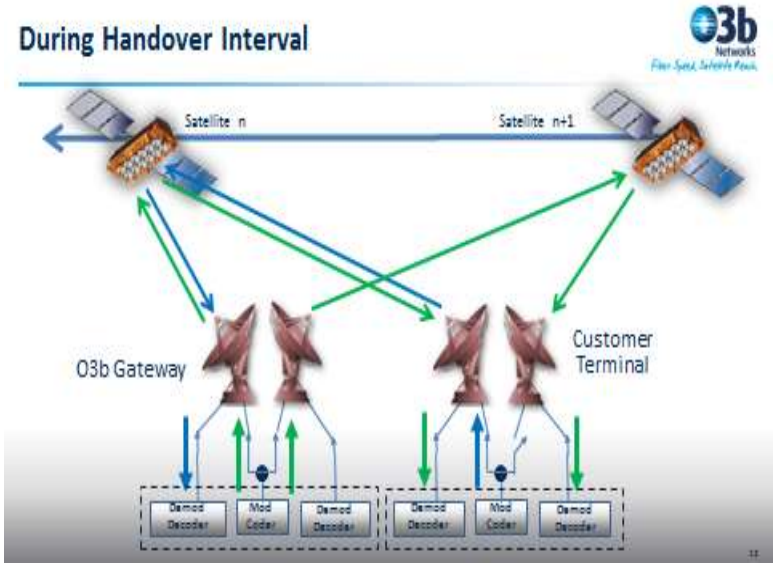
Coverage Map - General

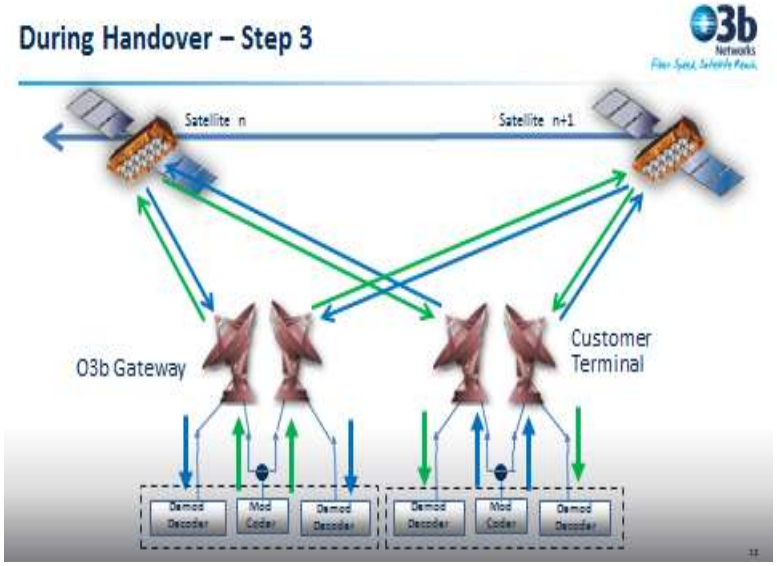


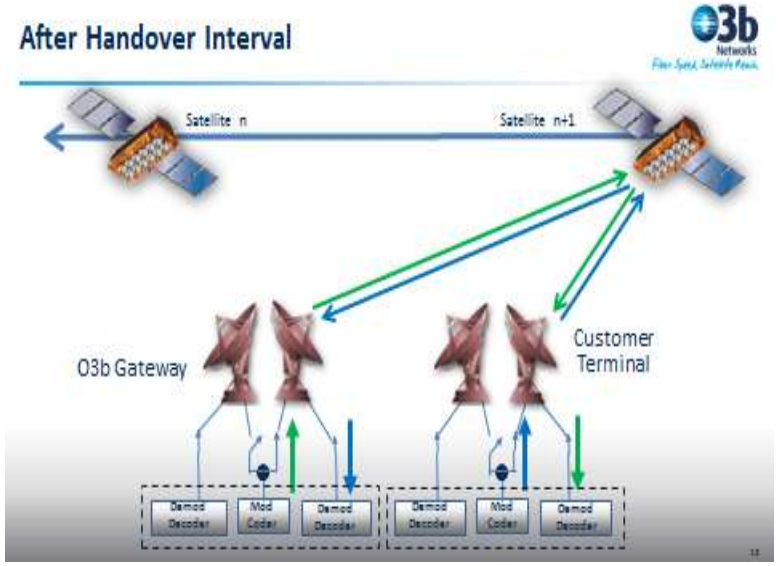
Customers can connect to fiber infrastructure through Regional Gateways

Handover Methodology

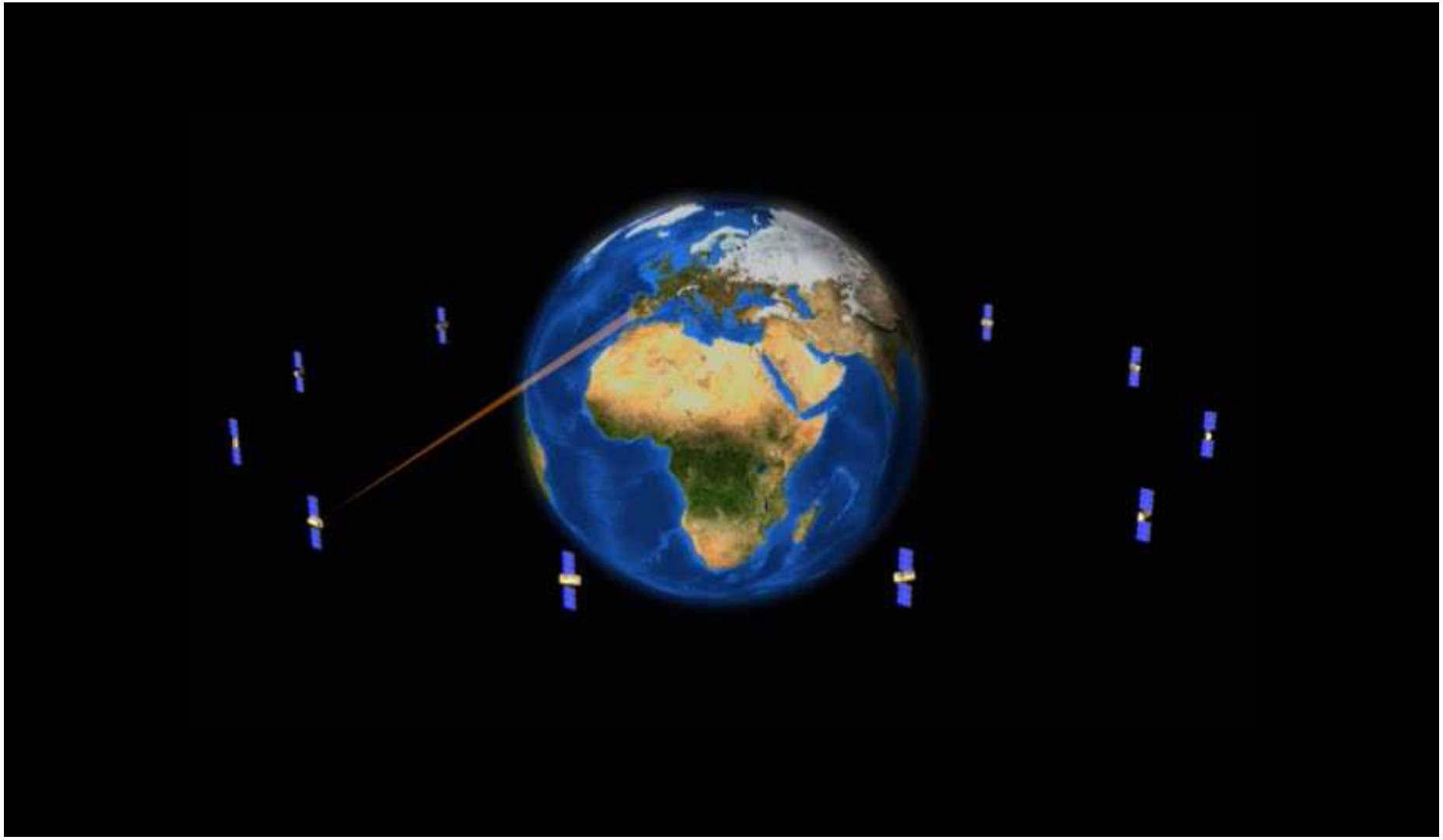








How it really works



O3b goes live

Performance exceeds design objectives

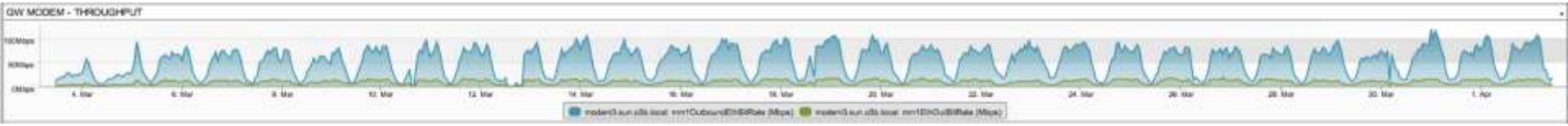
South Pacific Goes Live

Telecom Cook Islands

- Telecom Cook Islands became O3b's first commercial customer on March 12, 2014
  - Rarotonga now has fiber-like internet speeds for PC's and mobile devices
  - Five more islands in Cook Groups coming online

- Testing over TCI link showed data rates up to 1.6Gbps, with:
  - Latency below 150msec
  - No packet loss due to jitter
  - Flawless execution of make-before-break handover

- O3b bringing up additional customers rapidly
  - Already passing traffic in Samoa, Papua New Guinea and Dem. Republic of Congo



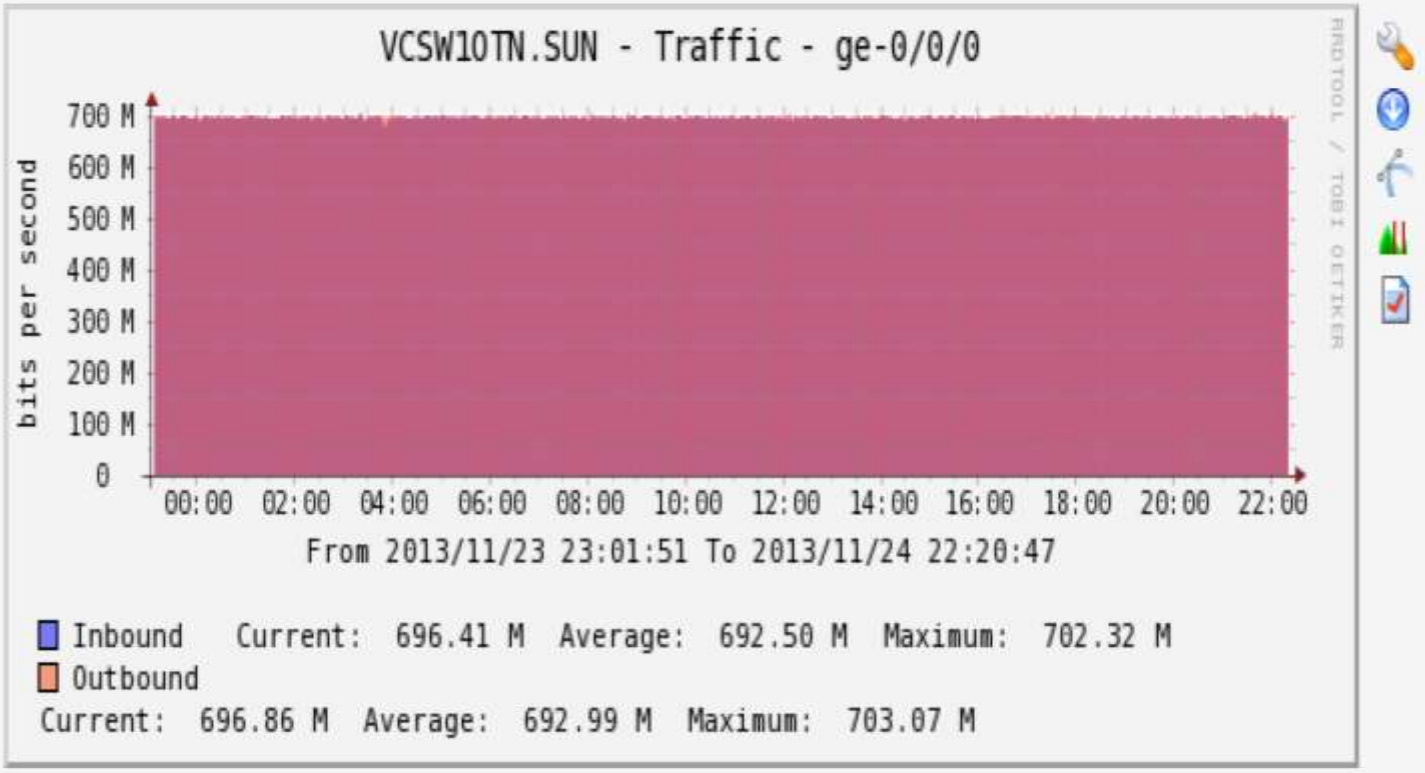
Ready for Operations

Pacific Gateways

Customer Terminals

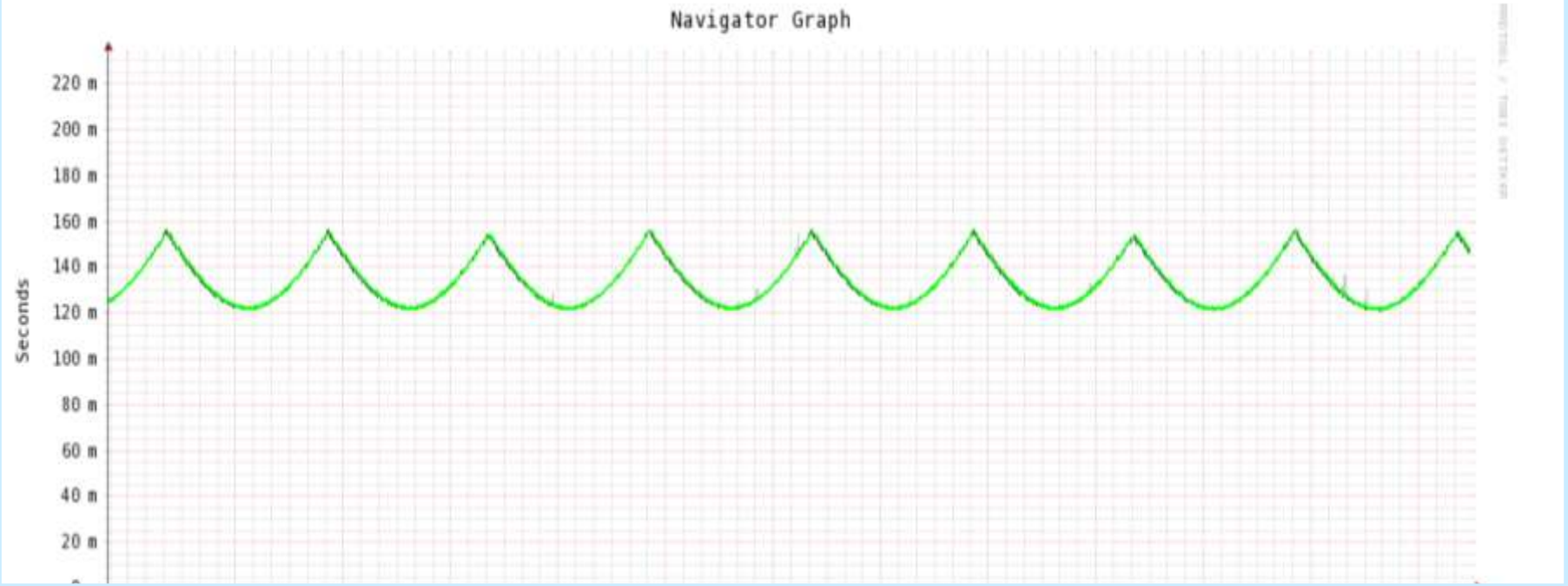
Long Term stability

Telecom Cook Island - Hawaii



Hitless Handovers

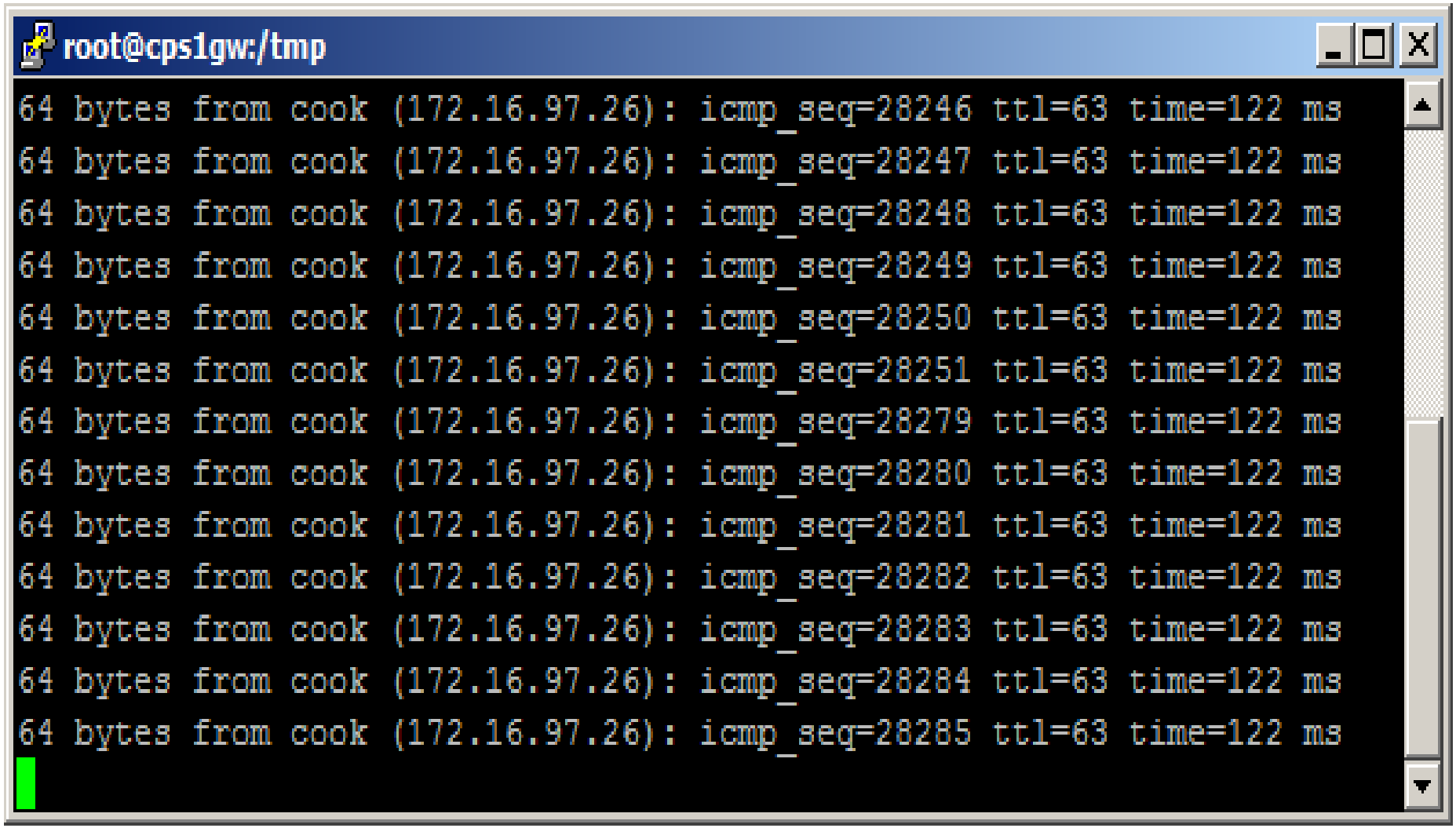
O3b Link round trip latency result



median rtt: 134.0 ms avg 155.7 ms max 121.4 ms min 145.5 ms now 10.2 ms sd 13.1 am/s
packet loss: 0.00 % avg 0.00 % max 0.00 % min 0.00 % now
loss color: 0 1 2 3 4 5
probe: 10 Remote ICMP Echo Pings (1000 Bytes) every 60s end: Mon Dec 2 17:29:08 2013

Low Latency

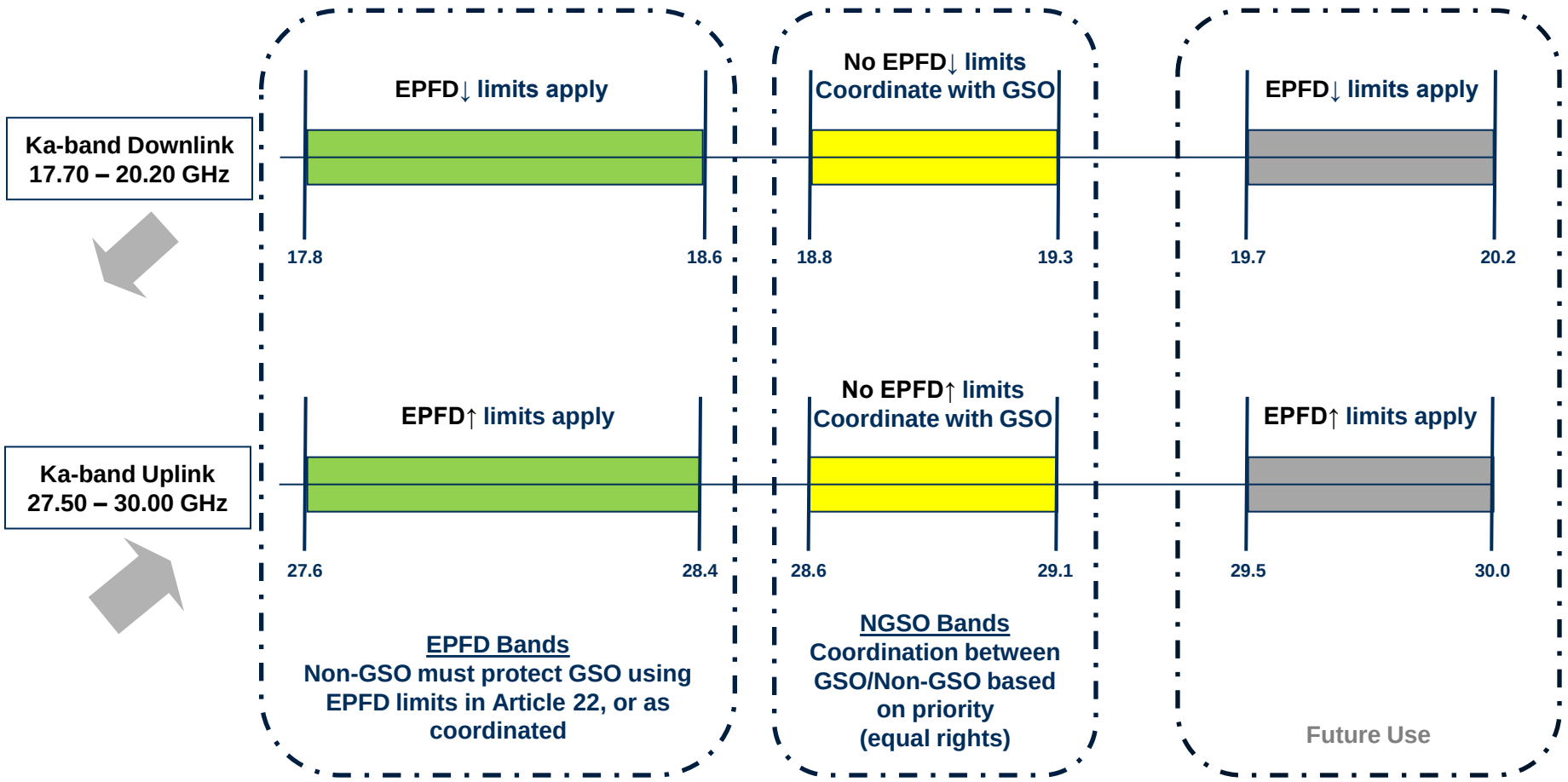
Telecom Cook Island - Huwaii



O3b and the ITU Radio Regulations

O3b operates in full accordance with the ITU RR

O3b Frequency Plan



Applicable ITU Rules & Regulations

O3b SPECTRUM

Bands subj. to epfd limits
(17.8-18.6 / 27.6-28.4 GHz)

- Article 22 of the ITU RR applies
- epfd limits imposed on NGSO satellites to protect GSOs
- Article 22 ensures protection of GSO satellites

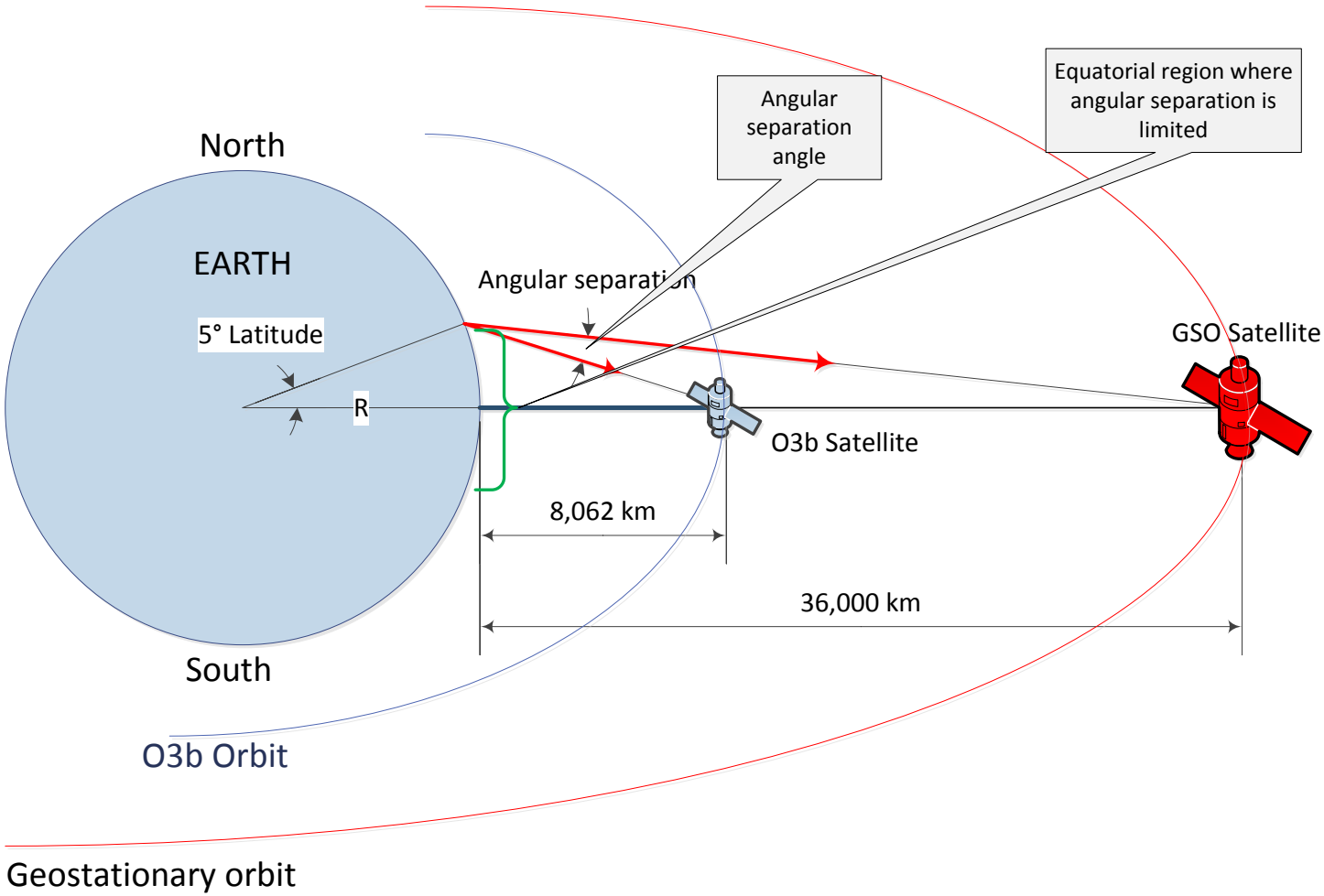
epfd COMPLIANCE

Bands subject to coordination
(18.8-19.3 / 28.6-29.1 GHz)

- NGSO and GSO satellites are treated on equal footing
- First-come, first served
- Coordination is effected under RR 9.11A

COORDINATION IS REQUIRED

Inherent Angular Separation of O3b Orbit from GSO



Interference potential exists with GSO only in narrow range of equatorial latitudes (e.g., within approx. 5˚ of the equator)

Compatibility with other Services

Sharing with FSS NGSO

- O3b shares well with certain other types of NGSO satellite systems where angular separation between the orbits can be maintained
- Russian Molniya is a perfect example:

  O3b orbit appears in a different part of the sky from the active arc of the Molniya orbit
- Similar compatibility exists with other HEO (Highly Elliptical Orbit) systems, as studied by the Working Parties of the ITU

Sharing with FS

- O3b is fully compliant with the ITU Radio Regulations
- Article 21 sets pfd limits on FSS to ensure protection of the fixed service
- O3b earth stations are *individually coordinated* with other co-frequency services (Appendix 7)
- O3b is not a high-proliferation system (i.e., O3b terminals are not ubiquitously deployed)

O3b changes the game for humanitarian response

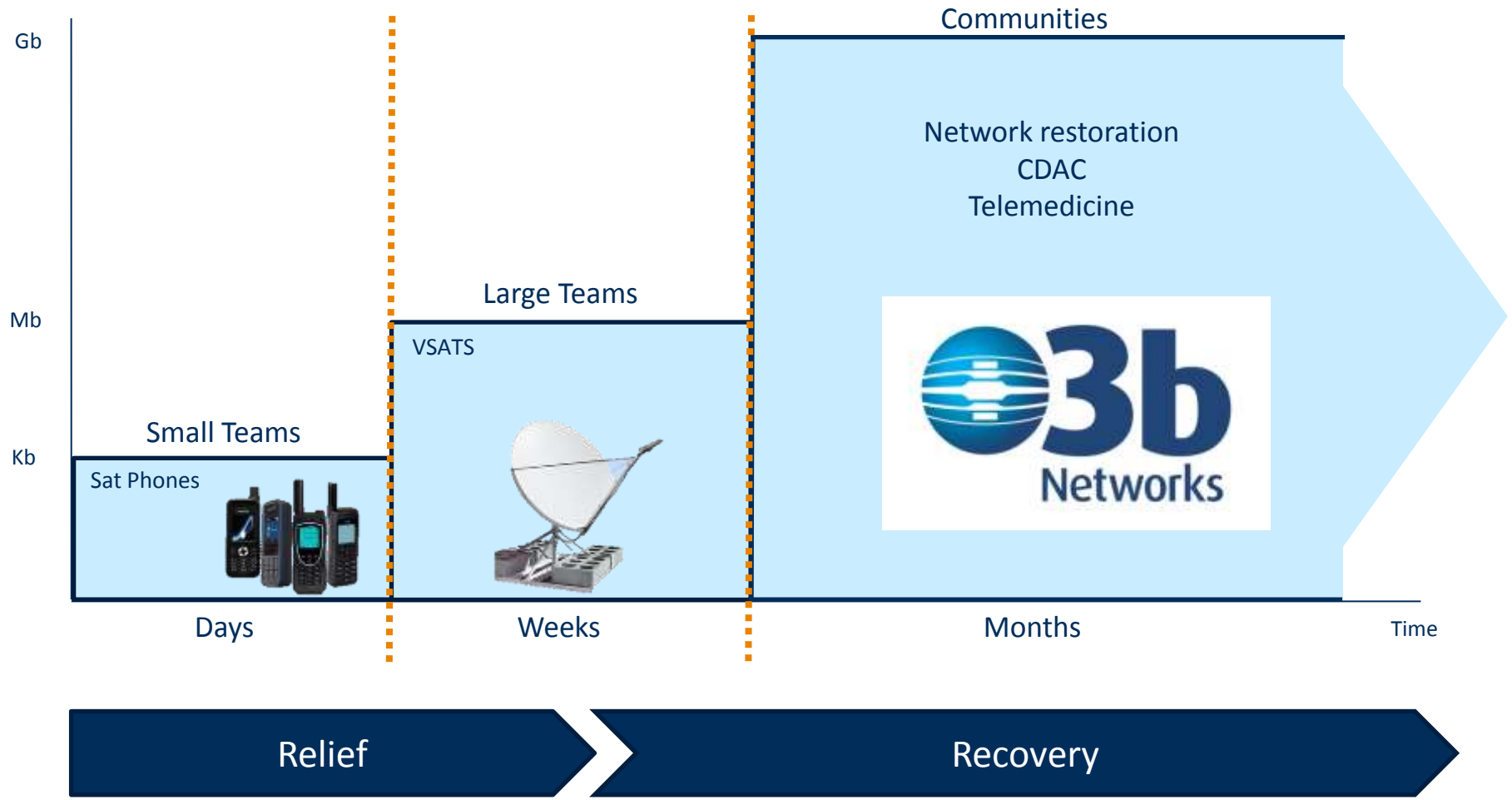
- Traditional satellites bring basic voice, data, and video to responders but strain to meet new bandwidth and latency requirements of cloud computing, interactive browsing, advanced sensors/HD video, etc.

- These challenges grow as:
  - Relief activities scale up and transition to recovery operations
  - The communications needs of affected communities are addressed

- **O3b** provides a new and unique service to meet the high quality bandwidth needs of large scale, long term humanitarian response

O3b changes the game for humanitarian response

- **O3b** provides a new and unique service for the high quality bandwidth needs of large scale humanitarian response



Conclusions

O3b performance has exceeded its design specification

O3b is compatible with other services

O3b is an enabler to terrestrial based communications

O3b sets a great example of how the Radio Regulations can advance communications around the world


O3b
Networks
Fiber Speed. Satellite Reach.