

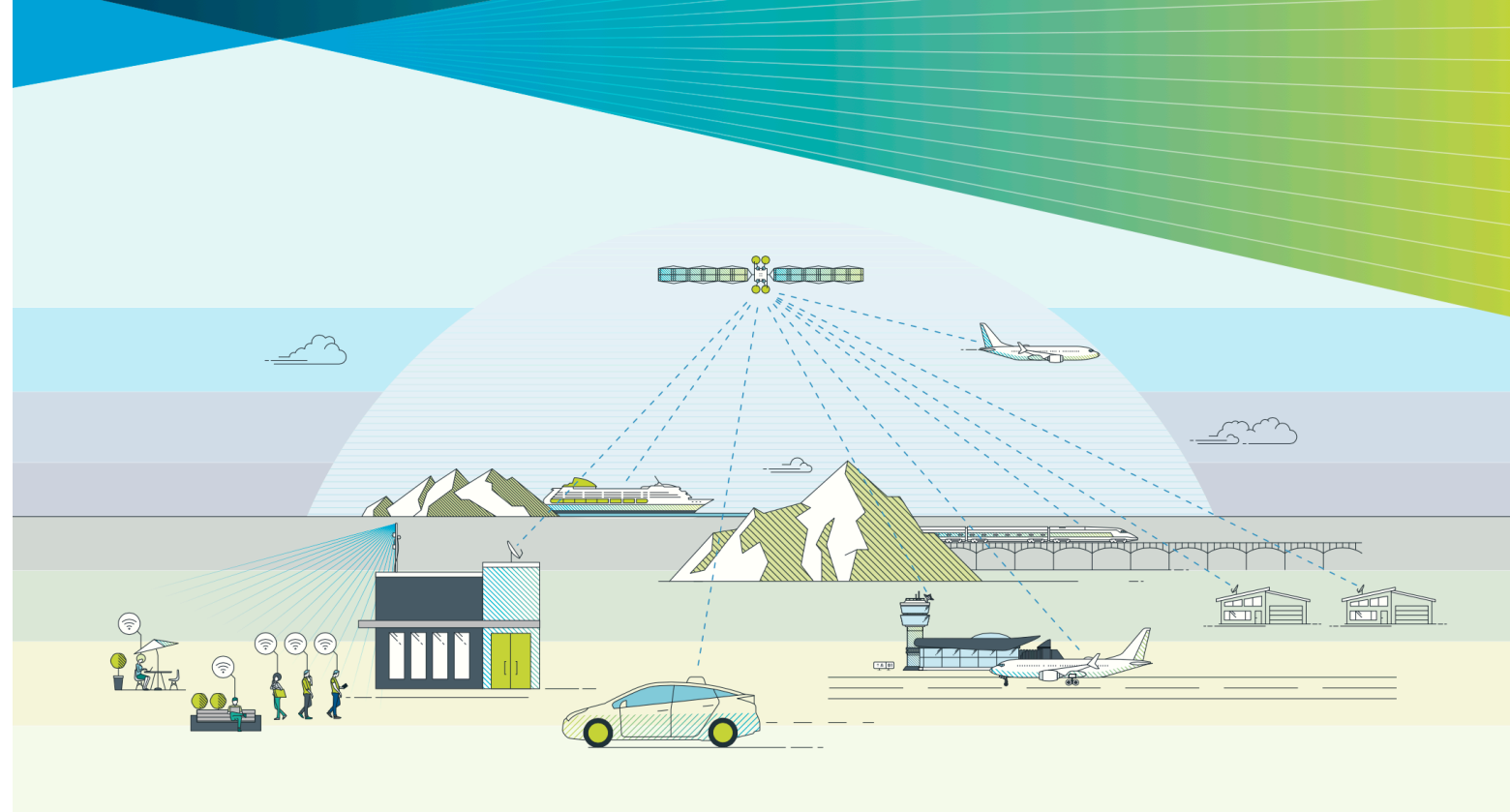
Key Outputs of WRC-19 and Road to WRC-23

June 2020

Viasat is the global satellite communications company that believes everyone and everything can be connected.

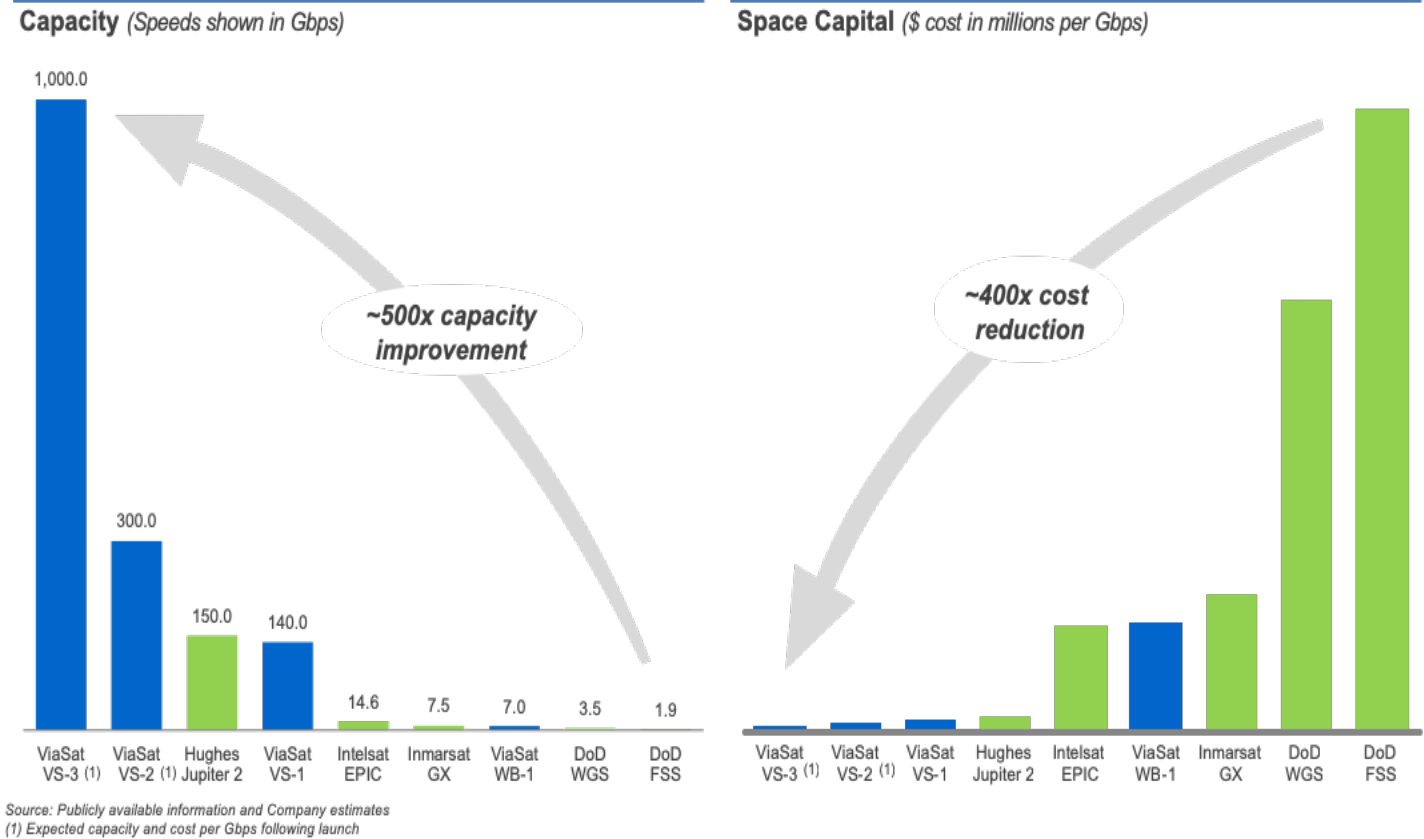
Spectrum is fundamental for connectivity

- > Only satellite can reach all the unconnected.
- > 28/18 GHz bands are reserved for satellite use, per ITU Radio Conference 2015 (WRC-15)
- > Advances in satellite technology are driving a new revolution in efficiency in the band
- > Keeping the band for fixed satellite services (FSS) incentivizes investment in connectivity







Changing the satellite services economy

- > Lowering the cost-per-bit allows other service models based on economies of scale
 - Democratizing connectivity
 - New services
 - Closing digital divides
- > Today: Cost and speed competitive with 4G services
- > Tomorrow: ViaSat-3 will connect tens of millions of new users, including in Africa



Redefining “Possible” in Internet Communications

Leaps in Technology Translated into Leaps in Service Speeds and Affordability for Users

	Residential	ESIM (airplanes, ships, cars, buses and trains)	Small, Medium, and Large Enterprise	Community Wi-Fi	Other Applications
					<ul style="list-style-type: none"> • Government • Maritime • Agriculture • Health Care • Education • Disaster Recovery • Tourism
Service Speeds	100+ Mbps	25 Mbps to each passenger	100 Mbps-1 Gbps	25-100 Mbps per user	25 Mbps-1 Gbps
Service Pricing	\$25-100	\$0-5	\$50-100+	< \$1	By use
Target Users	<ul style="list-style-type: none"> • No internet • Less than 25 Mbps- DSL, slow cable, slow wireless 	<ul style="list-style-type: none"> • All passengers, as well as crew 	<ul style="list-style-type: none"> • No internet • Less than 25 Mbps - DSL, slow cable, slow wireless 	<ul style="list-style-type: none"> • Underserved communities • Areas with high priced wireless • Areas with slow speed - 2G/3G wireless 	<ul style="list-style-type: none"> • No internet • Too expensive internet • Too slow internet
Size of Market	200+ million households	Billions of passenger connections annually	50+ million businesses	1-2 Billion people	1 Billion+ uses annually

Case Studies:

> Mexico:

- > 2,500+ Community Wi-Fi sites,
- > Covering ~2 million people.
- > Slower rollout, limits to community size/revenue

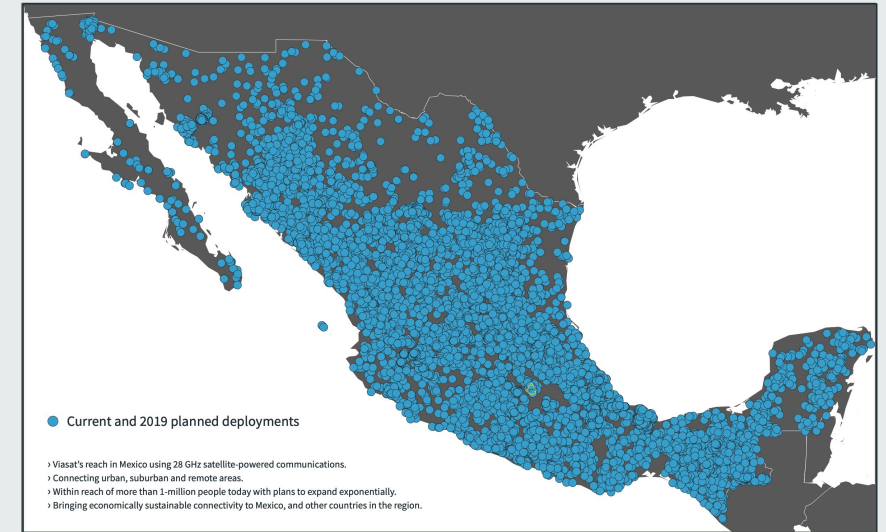
> Brazil:

- > 15,000 government sites,
- > Covering 3 million people.
- > Can go wherever government wants service

> Developing a value-added platform for users means involving other stakeholders:

- > Education
- > Financial Inclusion
- > Healthcare and Telemedicine
- > More

Viasat Mexico Deployments



Installed GESAC Terminals in Brazil



WRC-19 – AI 1.5 ESIMs in the FSS Ka-band

*WRC-19 AI 1.5 : to consider the use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service and take appropriate action, in accordance with Resolution **158 (WRC-15)***

Objective: Make full band available for ESIMs in 17.7-19.7/27.5-29.5 GHz

Background:

- **WRC-15** ITU Member States adopted a framework for ESIM within the Fixed Satellite Service (FSS) that facilitates gate-to-gate operations on aircraft, pier-to-pier access on ships, and on land (e.g. trains, buses and cars) for the upper Ka band (19.7-20.2 GHz and 29.5-30 GHz).
- **WRC-15** At the same time, WRC-15 rejected proposals for studies of 5G/IMT in those bands and instead expanded studies to include ESIM satellite broadband services in the lower Ka band (17.7-19.7 and 27.5-29.5 GHz).

WRC-19 AI: 1.5 ESIMs in the FSS Ka-band

Outcome: Success!

WRC-19 made full Ka band available for GSO-ESIMs as part of the FSS, as per ITU footnote 5.517A

- ESIMs may operate in the full 2 GHz as of July 1, 2020.
 - The BR will provide additional information on aeronautical ESIM characteristics to the Director's Report for WRC-23.
- Approved use of GSO-ESIMs for gate to gate, pier to pier, and ubiquitous terrestrial operations throughout 17.7-19.7 and 27.5-19.5 GHz.
 - For the rare cases in which ESIM operations could affect cross-border terrestrial operations (e.g., co-frequency, line of sight cases), WRC-19 adopted certain technical provisions.
- This outcome provides a good platform for administrations to authorize GSO-ESIMs across the full Ka-band and within the FSS allocation.

Looking Ahead: WRC-23

- Continue to protect key FSS Spectrum
- Enable satellite communications efficiencies through ensuring smooth conclusion of AI 1.17 (Space-Space Links)
- Studies to extend ESIMs to NGSO - AI 1.16