SATCOMRUS 2021

50 YEARS | HUGHES
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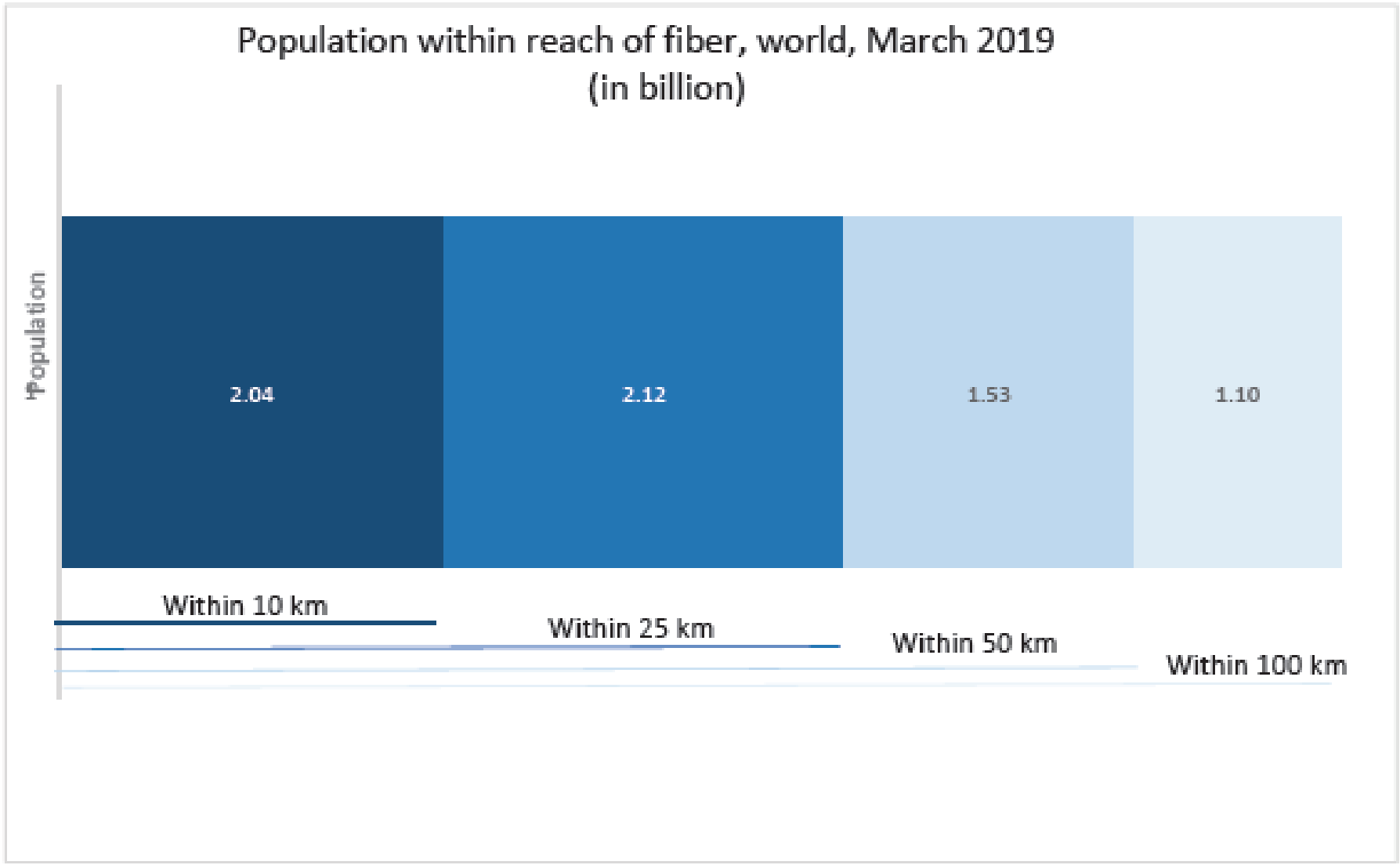
POWERING THE NETWORKS THAT CONNECT PEOPLE EVERYWHERE

50 ЛЕТ СОЕДИНЯЯ ЛЮДЕЙ !

October 7, 2021 - Kaliningrad, Russia

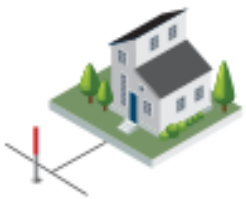
Fiber Is Great, When You Can Get It



Note: Not cumulative; figure depicts population within category not inclusive of lower thresholds

Source: ITU

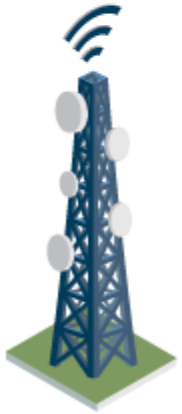
Cost Of Fiber

Buried Deployment Materials			
	Component	Description	Cost Range
	Fiber	Optical cable that transmits information that is broadcasted over the Internet. The larger the strand count, the greater the bandwidth that the fiber route can sustain. Costs will increase for greater fiber counts and will decrease with volume discounts.	$0.50 – $4.00 per foot
	Conduit	Tubing that encases fiber strands along a network route.	$0.55 – $2.00 per foot
	Fiber Optic Cable Splice Closure/ Handholes	Weatherproof encasement that envelopes the exposed area between spliced cables. These serve as access points to a fiber network and are used for repair or interconnection.	$100 – $400
	Vaults	Protective enclosure for network equipment that allows for maintenance and adjustments.	$1,000 – $2,000

Source: Broadband USA, US Dept Of Commerce “Network Costs Fact Sheet”

$2,600 to $21,120 per mile

Why Not Deploy 4G and 5G?



Wireless Deployment		
Component	**Description**	**Cost Range**
Microwave Relay	Station that receives signals and rebroadcasts them throughout an operator's network coverage area.	$250 – $1,000
Microwave Receiver	Device that receives a signal from an operator's network. Receivers can be mounted directly to a customer's premise to receive service.	$500 – $2,500
Microwave Transmitter	Device that broadcasts microwave data across an operator's network.	$1,000 – $10,000
Site Routers	Routers located at a wireless site to transmit traffic from the site to potential customers.	$2,500 – $7,500
Self-Organizing Network (SON) Device	Device that increases the reliability of the wireless network by automatically utilizing the most efficient network paths.	$45,000 – $55,000 (per tower)
Microwave Antenna	Device that receives and transmits wireless data.	$500 – $5,000
Outdoor Cabinet	Protective enclosure for network equipment that allows for maintenance and adjustments.	$7,000 – $11,000
Backup Power Generator	On-site generator at a communication site to provide backup power to the wireless tower.	$5,000 – $50,000
Backup Power Battery	On-site batteries to store backup power that would be used to support a wireless network if both the power grid and on-site generator were not operational.	$1,000 – $10,000
Tower (appx. 75-feet)[3]	Telecommunications tower used to support wireless antennas, transceivers and receivers.	$7,500 – $20,000
Tower (appx. 150-feet)[3]	Telecommunications tower used to support wireless antennas, transceivers and receivers.	$15,000 – $30,000
Tower (appx. 250-feet)[3]	Telecommunications tower used to support wireless antennas, transceivers and receivers.	$40,000 – $70,000

"Backhaul" (the link from the network core to the RAN) is the dominant cost

Each microwave hop: $11,000 to $97,000

Generally, more than 1 microwave hop breaks the business case for establishing service in a rural area

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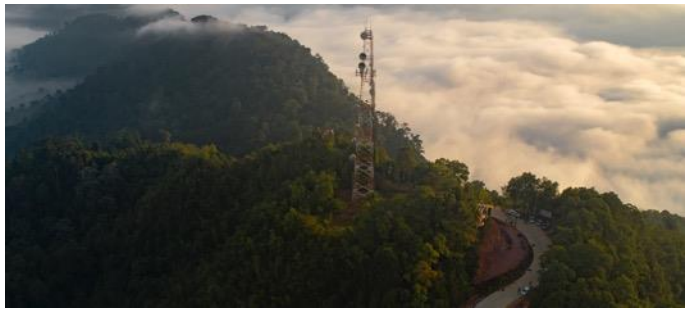
Challenges Of Deploying Terrestrial Connectivity To Remote and Hard To Serve Areas

Infrastructure Challenges:

- Site Access
- Utility power
- Transportation
- Security

Capex Challenges:

- Investment in cell site
- Infrastructure
- Civil works



Opex Challenges:

- Power
- Backhaul

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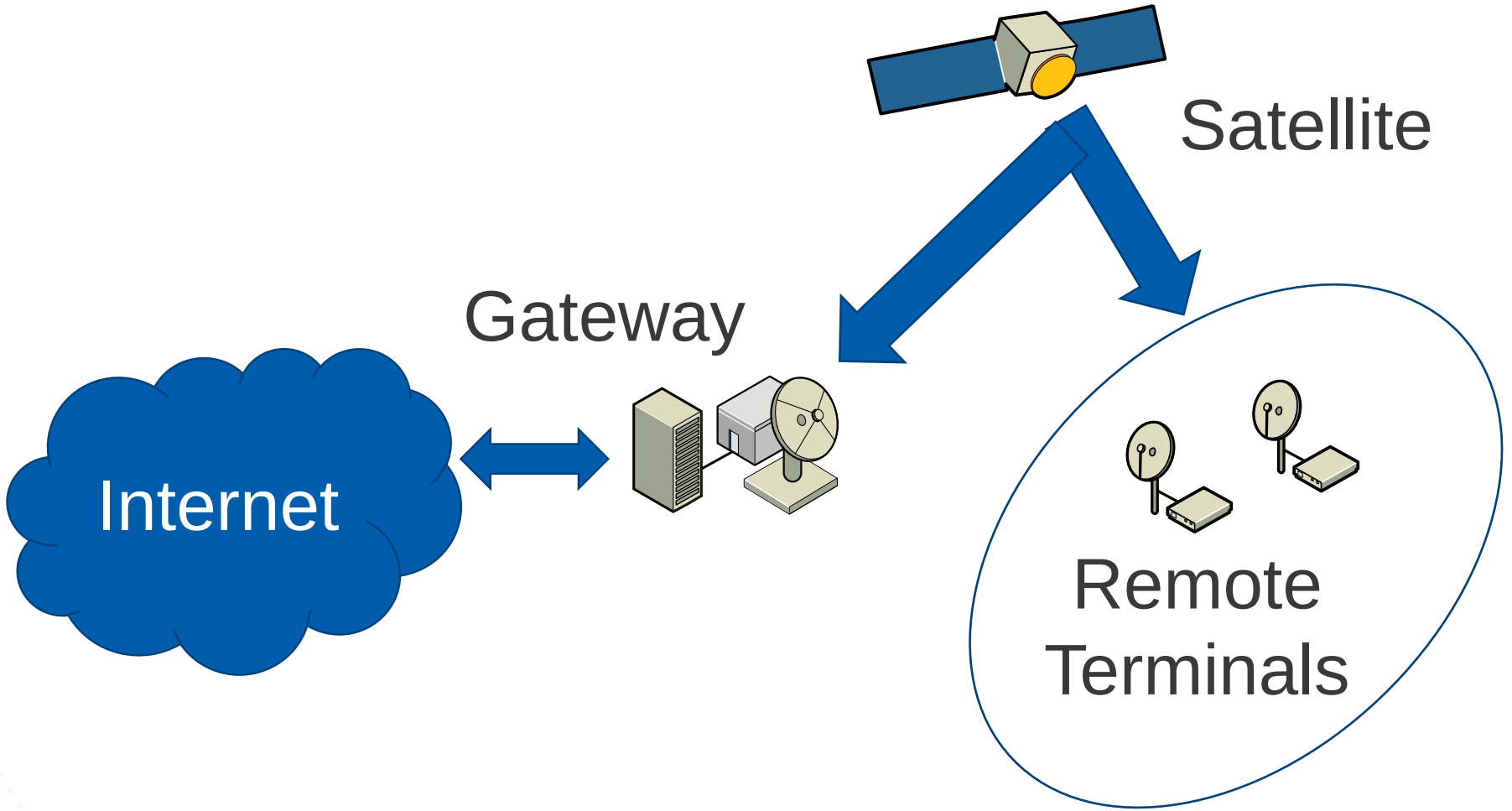
The Solutions

Why Satellite

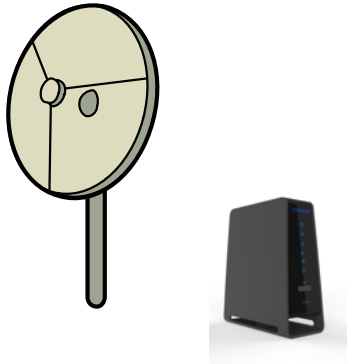
Community Wi-Fi

Cellular Backhaul

Satellite: Simple Architecture To Delivery Ubiquitous Coverage



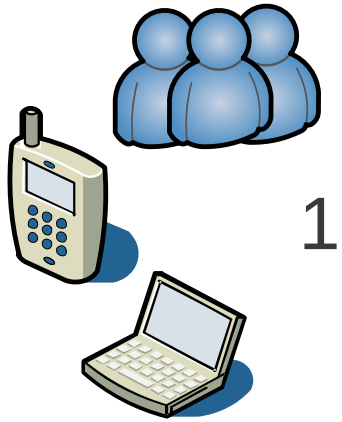
High Performance



HT2200

300 Mbps UDP or 200 Mbps TCP to the LAN

Up to 50 Mbps return throughput



16,000 simultaneous TCP sessions

Using Satellite Connected Wi-Fi to Deliver Services

Satellite Enabled
Community Wi-Fi

Community Wi-Fi
Public Use

Prepaid
Sold by a Retailer to
Public Users
Example: PSN Indonesia

Subsidized
Social Inclusion
Examples: Telecomm,
Telefonica

Home/SMB Community Wi-Fi
Private use

Offered by a WISP
Subscription based
Examples: Altegro and
KB Iskra

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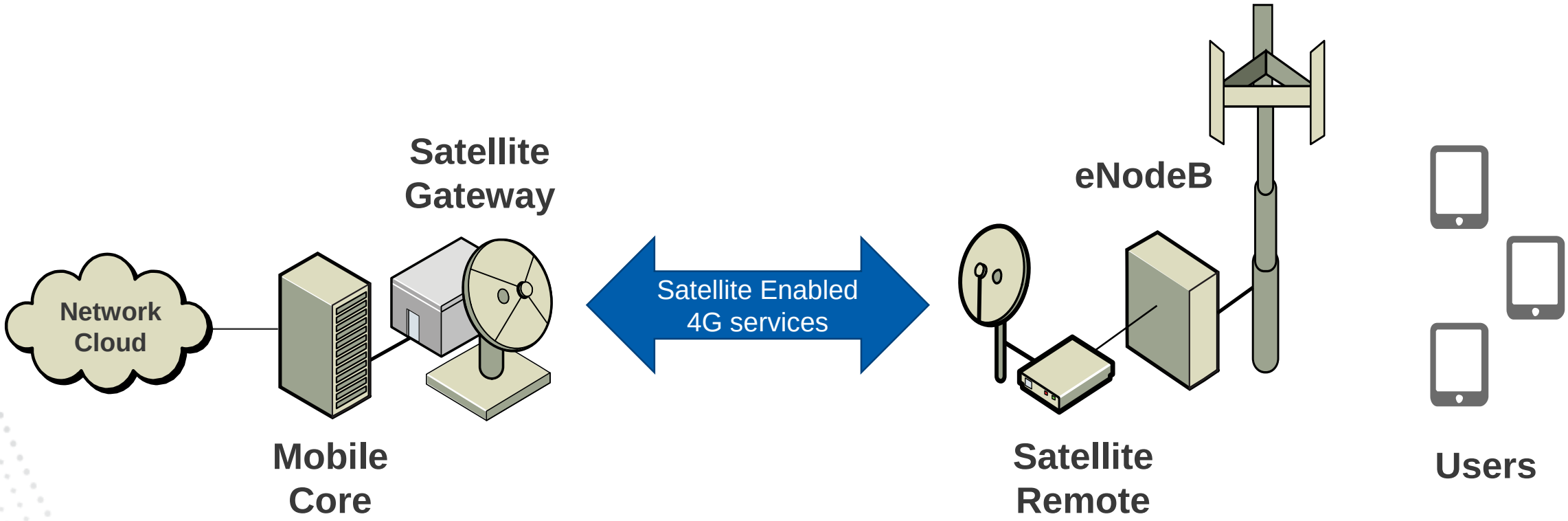
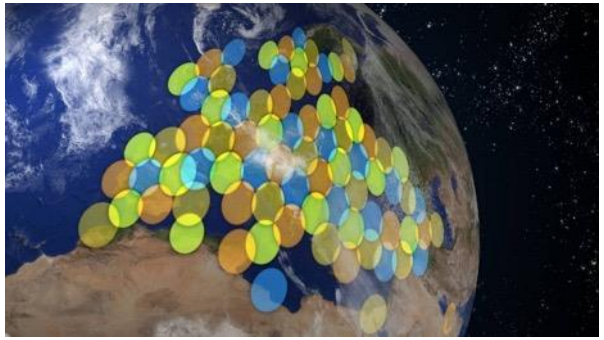
Using Satellite Connected 4G RAN to Deliver Services



The Economics Of Satellite

Capex investment: less than $2,000 per site including installation
Opex: as low as $30-$40/month



High Throughput Satellites Purpose Designed For Data

Driving lower bandwidth pricing

VHTS Hughes / Echostar Jupiter-3 Satellite scheduled for launch in 2022 allow Hughes to offer true unlimited Broadband Connectivity up to 100 Mbps service plan per household from East Coast to West Coast in North America

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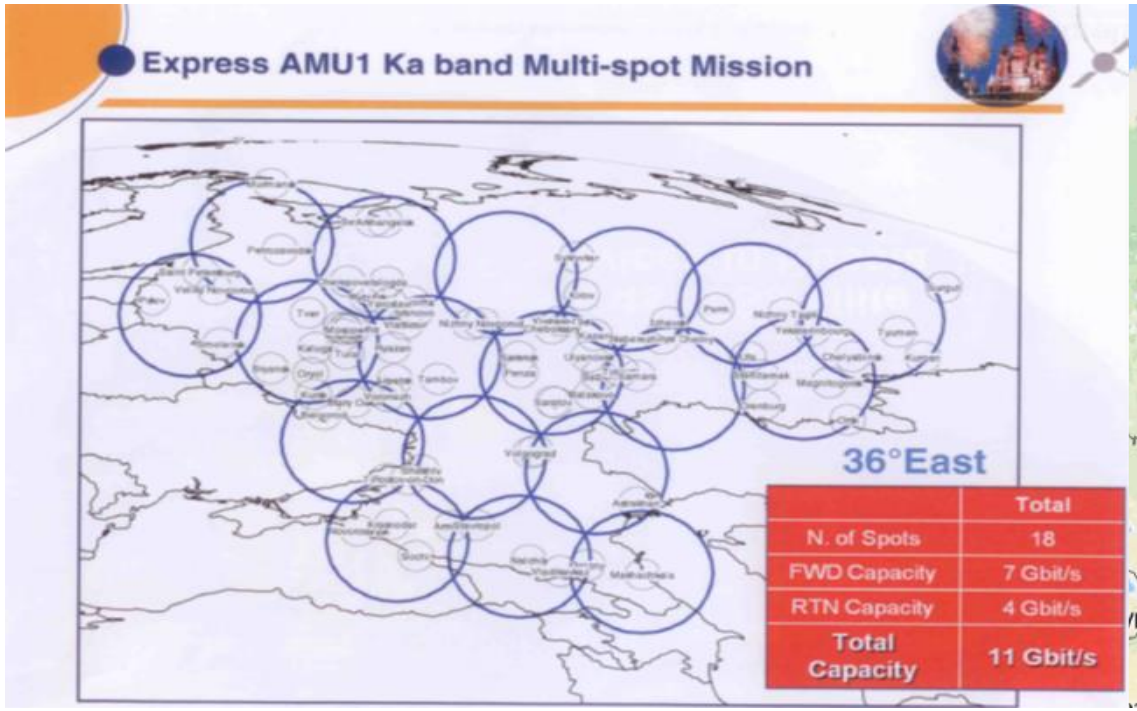
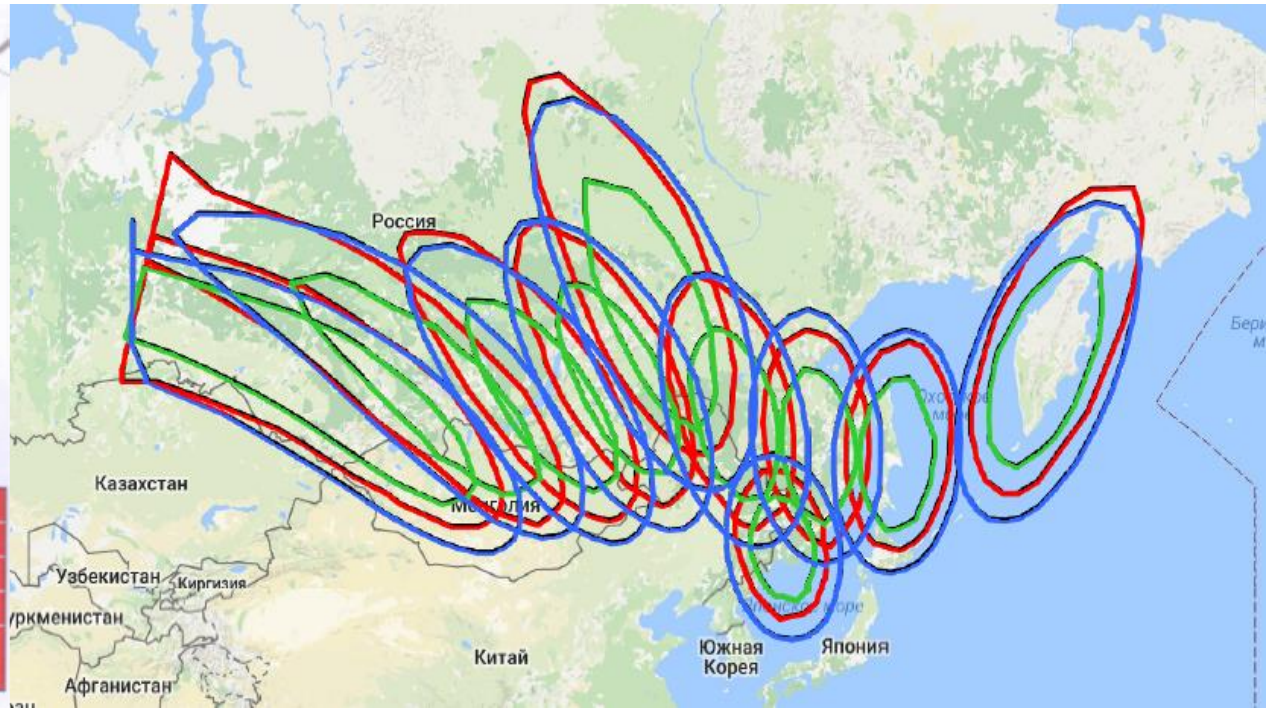
RSCC Ka-band on Express AMU1 / AM5





Over 21 000 VSAT as January 2021

JUPITER™ SYSTEM

Case Study #1
KB Iskra

- **5 Satellites: Express AMU-1 / AM5 / 103 & Yamal 401/402**
- **7 Teleports in Krasnoyarsk, Khabarovsk and Moscow**
  - JUPITER System Ka-band VSAT
  - Hughes HN – Ku band VSAT
  - Over 21 000 VSATs total
- **Service plans starts from 1470 RUB**

- **Outcomes**:
  - More than 37 000 subs
  - Site usage averages 30 GB/month
  - Most traffic is Social Media, YouTube, Instagram

VSAT + Wi-Fi Mast

User Router

Case Study #2
Ka-Internet & Raduga Internet

- **10 Satellites: 4 in Ka band & 6 in Ku band**
- **Ka-Internet – Business to Operators**
- **Raduga Internet – Business to Consumer**
  - JUPITER System Ka-band VSAT
  - Hughes HN – Ku band VSAT
- **Service plans:**
  - **“Simple” starts from 100 RUB / month;**
  - **“Equal” starts from 500 RUB / month;**
  - **“No limits” starts from 4000 RUB / month**
- **Customers**:
  - Wholesales to VSAT operators;
  - Government Social Programs
  - Remote Consumer – true digital divide customers

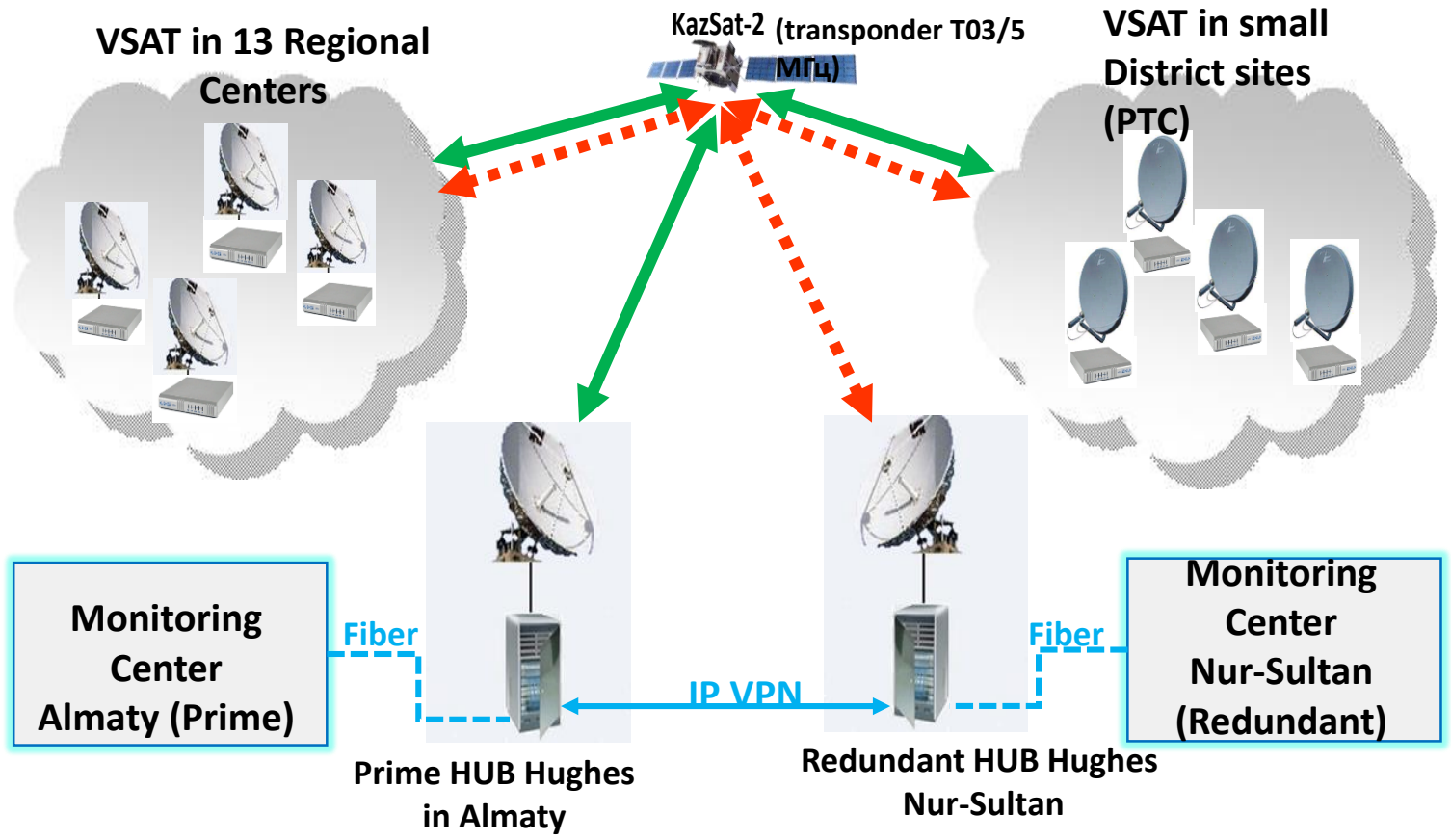
Case Study #3 - AO “Kazteleradio”

- **KazSat-2 Satellite**
  Ku-band – 5 MHz

- **2 Teleports with Geographical Redundancy in Almaty and Nur-Sultan**
  - 13 Regional VSAT
  - 800+ VSATS at Re-Broadcast sites

- **Outcomes**:
  - To ensure quality of Digital TV availability and delivery on the territory of Kazakhstan Republic

Kazakhstan TV Broadcast Monitoring Network based on Hughes HX Technology



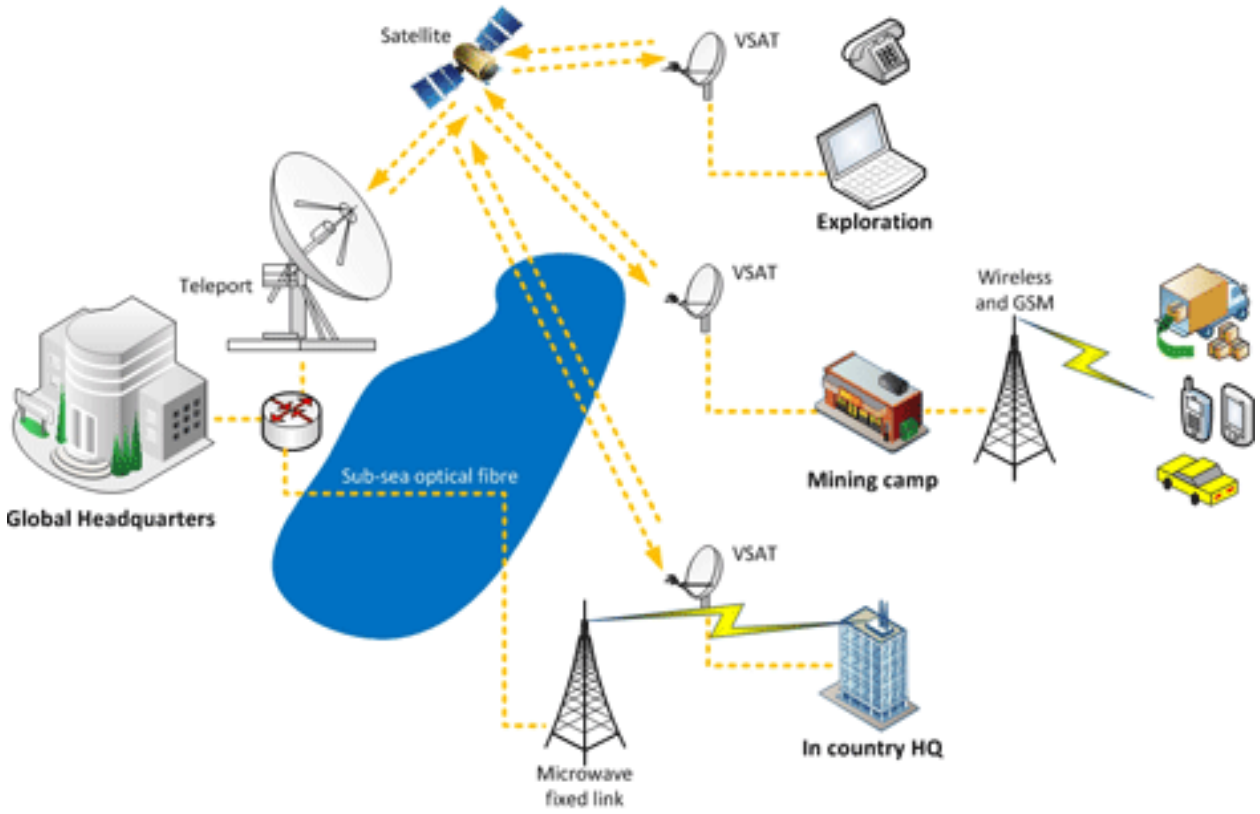
Case Study #4
Delta Telecom, Azerbaijan

Satellite VSAT Services

- Latest Jupiter Platform
- Layer 2
- COTM Services
- 3G/4G GSM Backhaul
- Government Networks
- Oil Exploration & Mining

- Up to 30 Mbps download

Azerspace-1 Satellite Ku band




Powering a
Connected Future
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