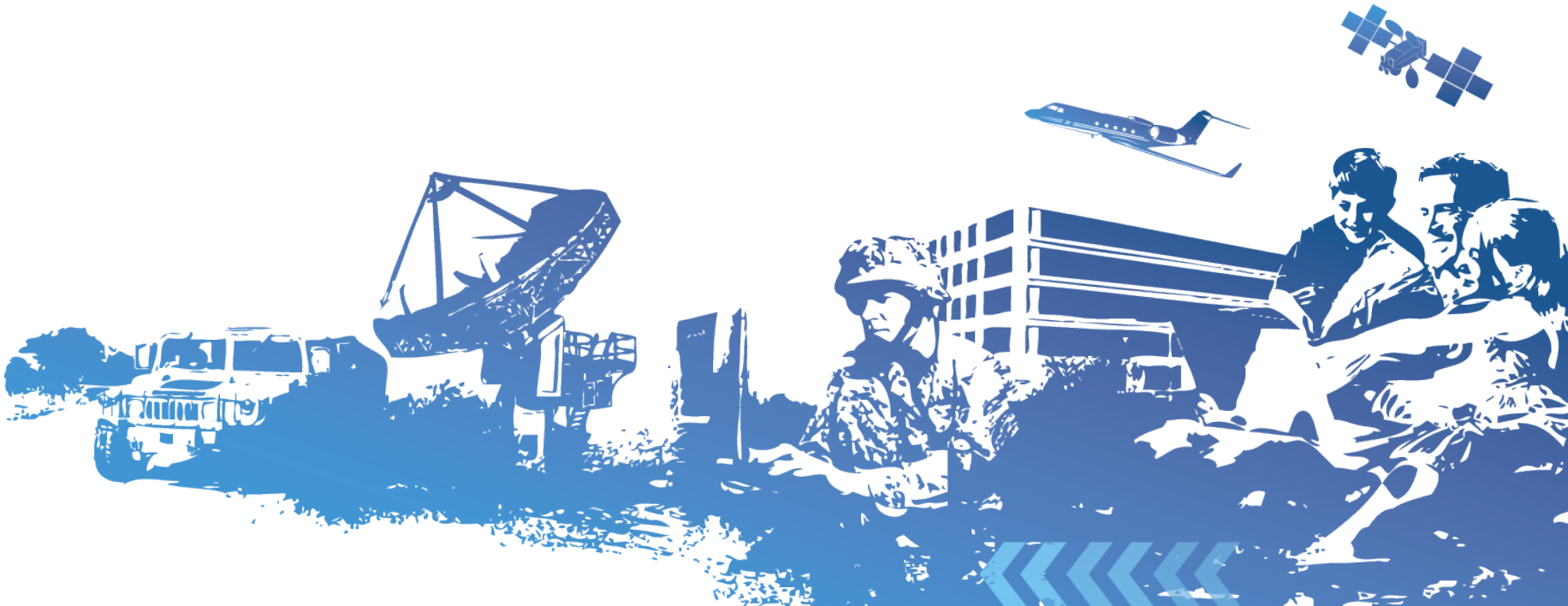
12 Mbps @ 36000 ft.

Coming attractions in in-flight broadband



12 Mbps at home or in the air

EXEDE HIGH SPEED SATELLITE INTERNET PLANS

SPEEDS	exede 12	15	25
	12 Mbps Downstream + 3 Mbps Upstream		
DAYTIME DATA ZONE Metered usage 5 a.m. – 12 midnight	10 GB month	15 GB month	25 GB month
LATE NIGHT FREE ZONE Unmetered usage 12 midnight – 5 a.m.	FREE Unmetered uploads AND downloads	FREE Unmetered uploads AND downloads	FREE Unmetered uploads AND downloads
DETAILS	MODERATE Perfect for occasional video downloads, photo sharing, music streaming, social networking and email.	MORE Great for those who spend more time on the Internet, use more data, and watch online videos more frequently.	MOST Gives you the most of all the things you love to do. This is the plan for those who depend on the Internet for work or entertainment.
PRICE	$49.99 month	$79.99 month	$129.99 month

PLUS All packages include: 10 Email Addresses with more than 10 GB of storage per address + FREE first 3 months of award-winning F-Secure Anti-Virus/ Anti-Spyware Software

FLEXIBLE BUY MORE Our BUY MORE feature gives you the flexibility to purchase more data in 1 GB increments.

FIND THE BEST PLAN FOR YOU WITH OUR PLAN SELECTOR TOOL

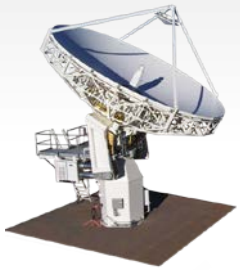
Exede in the Air
12 Mbps to each Passenger

~ Measured page loads 8x > current services

ViaSat Overview

- ViaSat is a technology company

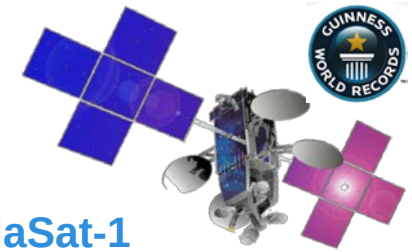





- ViaSat is a satellite operator


WildBlue-1


Anik-F2



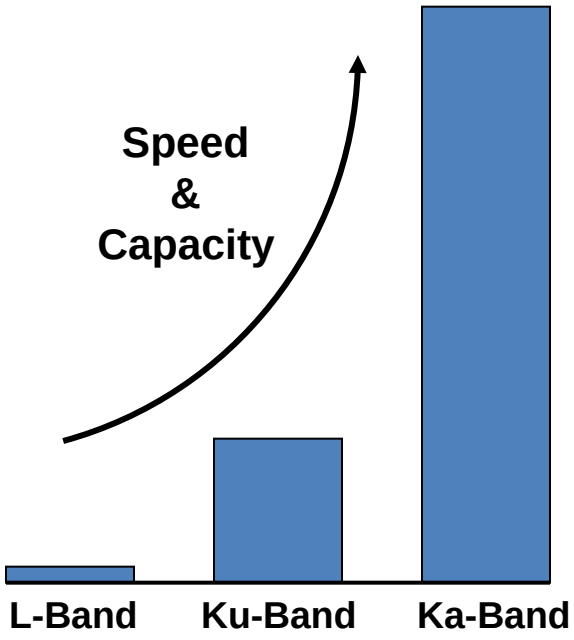
ViaSat-1

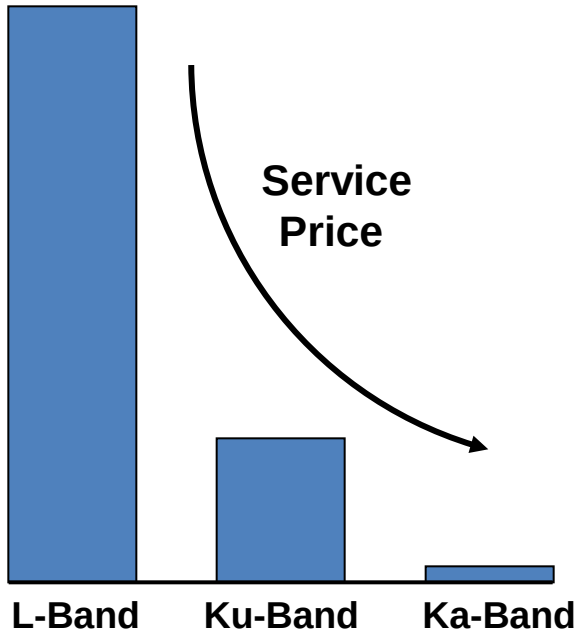
- ViaSat is a broadband service provider

Shannon's Theorem
More spectrum = Capacity

$$C = B \log_2(1 + S/N)$$

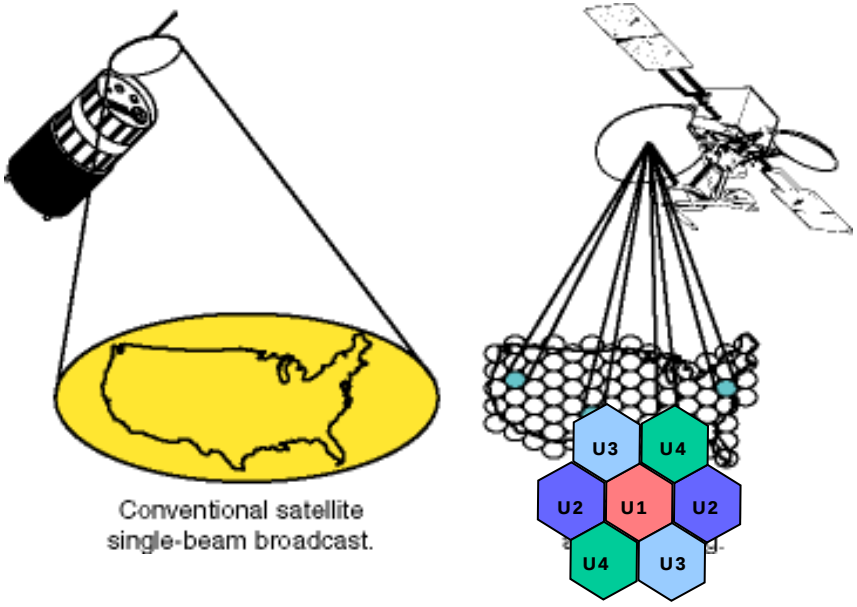
- Air-to-ground terrestrial systems operating around 800 MHz have significantly smaller spectrum (few MHz)
- Much more spectrum available at Ka-band (100's MHz)





Frequency reuse drives up capacity

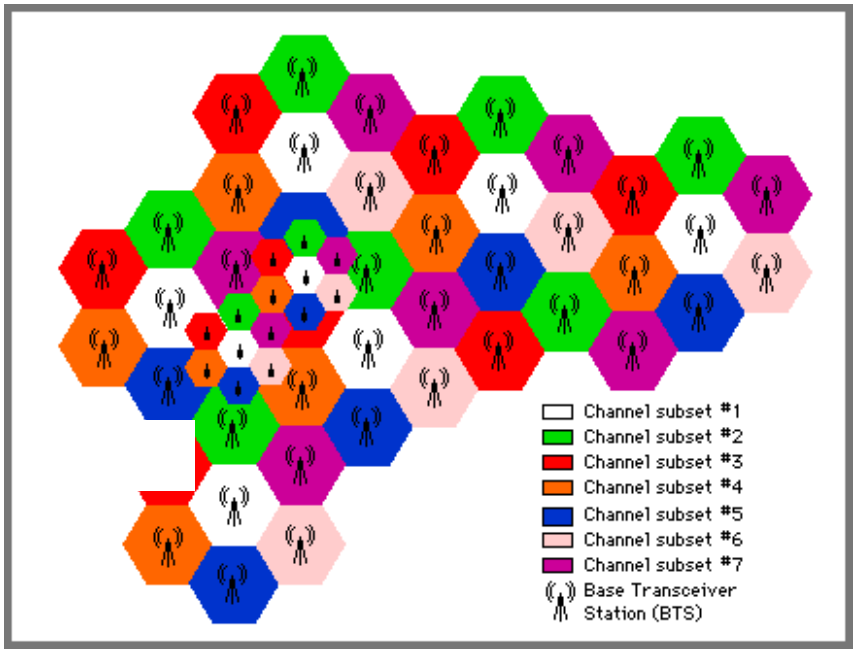
Ku and Ka Satellites



Conventional satellite single-beam broadcast.

1 Color per User Beam

Terrestrial Cellular



ViaSat-1 Beams 500 MHz or 1000 MHz wide
Beam 'colors' created using high / low frequency band plus both polarizations

Satellite Payload Challenge

Greater Coverage(Sq Km)

GX

FSS Asia

WildBlue 1
SpaceWay

ipSTAR

ViaSat-2

ViaSat-1

Greater Capacity (Gbps)

ViaSat's JetBlue/United Program

- Program for large U.S. fleets
  - A320, 737 & 757
  - EMB-190
  - Total ~ 400 aircraft
- ViaSat providing all airtime services

A320

EMB-190

737NG

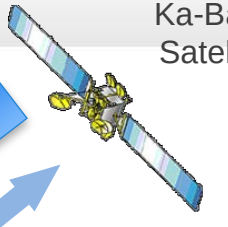
Service Introduction in Fall of 2013!!

Network Elements

Antenna

To Cabin LAN

Broadband Ka-band Satellite Transceiver



Ka-Band Satellite

Forward Link

Return Link

Hub Antenna

SMTS

Forward Channel Modulator

Ethernet

Router

Internet

Network Operations Center

Two way communications from the middle of the sky, the middle of the ocean, or the middle of the desert

Satellite Comm Equipment

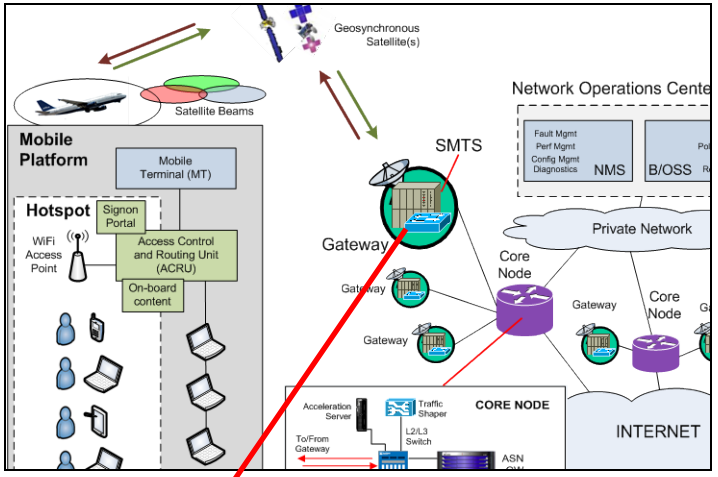
- The Aircraft Unit is based on ViaSat's SurfBeam® 2 technology and infrastructure deployed on several high capacity satellites currently in service (ViaSat's own Wild Blue-1, Anik-F2 and ViaSat-1 in North America and Eutelsat's Ka-Sat in Europe).

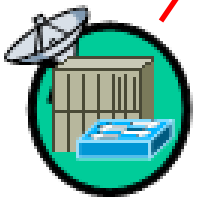
- It consists of three Line Replaceable Unit (LRU)'s :
  - Aircraft Modem Unit (AMU)
  - Power Supply Unit (PSU)
  - Airborne Antenna Unit (AAU)

- Radome
  - The radome provides environmental protection as well as minimizing aerodynamic loads and providing bird strike and lightning protection.
  - The radome must be designed to allow RF signals to pass through at Ka-band with minimal impact on the RF performance of the antenna system. The AAU resides in the Radome

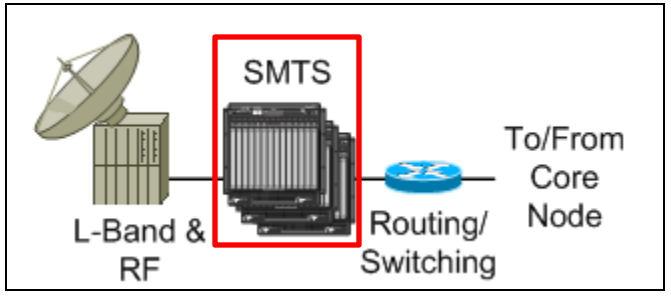
Satellite Modem Termination System (SMTS) aka Base Station

- Component at Satellite Gateways responsible for managing the Air Interface with MTs
  - Physical Layer
    - Modulation / Demodulation of satellite Forward and Return channels, FEC encoding/decoding
    - PHY layer algorithms (timing control, power control, fade mitigation)
  - Media Access Control (MAC) Layer
    - MT network entry / registration / exit, bandwidth request and grant protocols
- Performs Radio Resource Management (RRM) for satellite network
  - Schedules and allocates satellite bandwidth to MT Service Flows to ensure Quality of Service (QoS) objectives are met
  - Congestion control and Load Balancing with Satellite Beam
- Manages air interface portion of MT Handover protocols



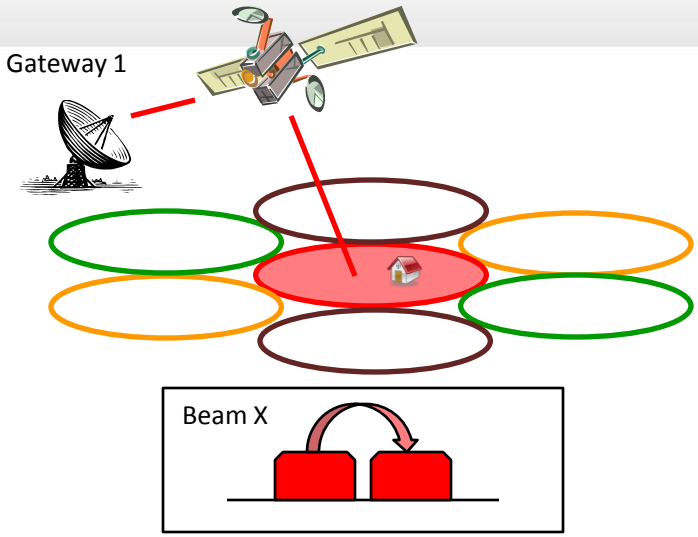


Gateway

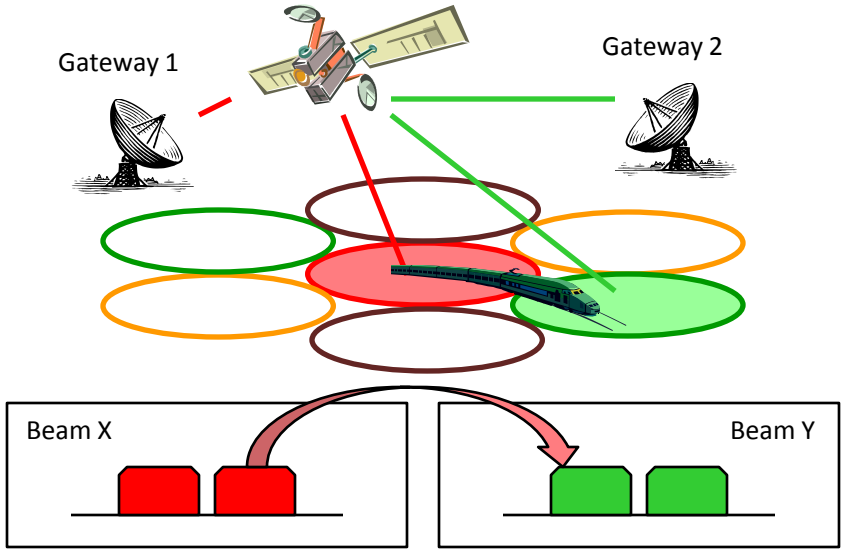


SurfBeam 2 Mobility Overview

- SurfBeam 2 initial deployment uses mobility protocols to handoff users from one carrier to another within a Beam – similar to hand-offs across sectors.

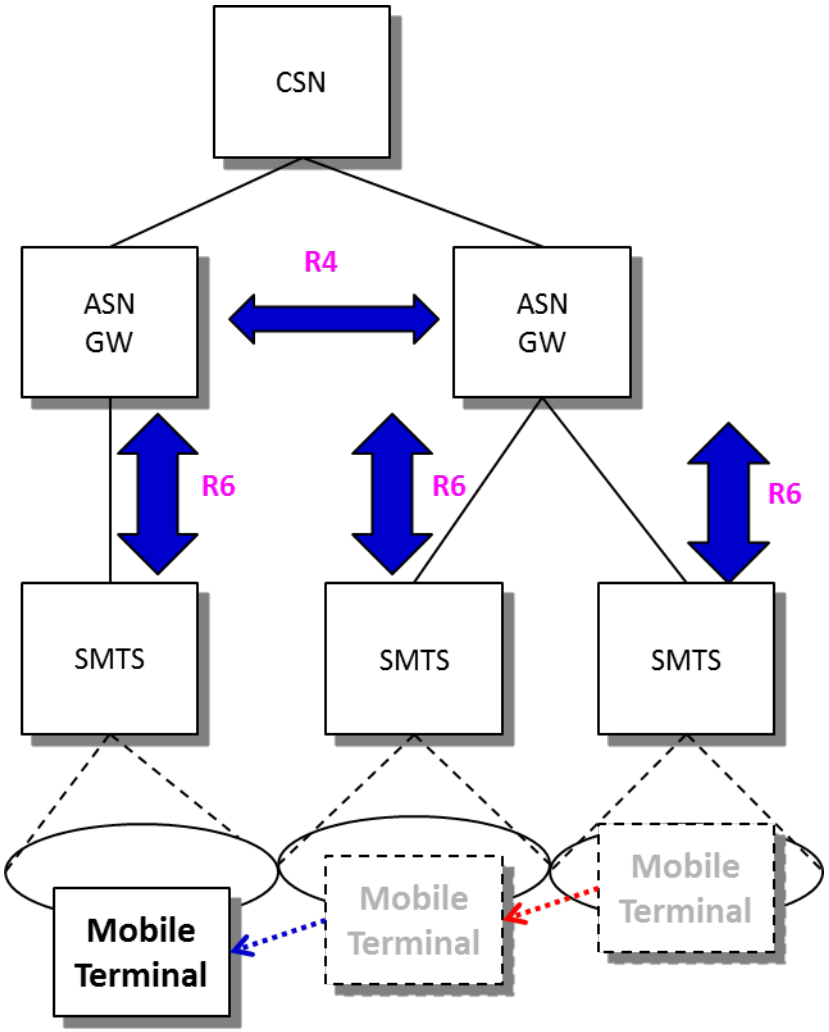


- Mobility enhancement extends this capability to enable seamless Beam-to-Beam and Satellite-to-Satellite handoffs



SurfBeam 2 Mobility Architecture

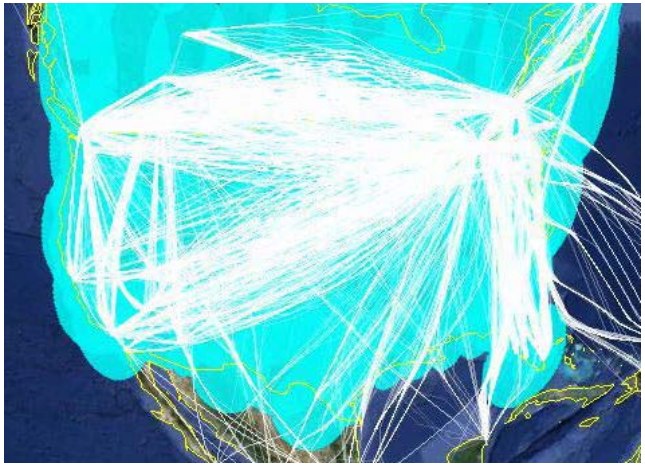
- Beam-to-Beam Handover (HO) based upon established WIMAX mobility protocols
  - Utilize HO protocols defined over R4, R6, R8-over-R6 interfaces
- Mobility protocols convey MT Context information between Serving and Target Beam controllers prior to Handover
  - Ensures Handover is rapid and largely 'seamless'
- ASN supporting the beam in which the flight originates serves as anchor for that mobile throughout course of flight
  - All traffic to/from this mobile always traverses this gateway



ViaSat Ka-band Handoffs

- Key points
  - All user services persist through hand-off process
    - Web pages continue to load
    - Video streams continue
    - Email & VPN services continue
- Why it works
    - All beams tied together via ground network to form a single integrated network
    - There is a ~ 3 sec modem retuning process that occurs during hand-off
    - Results in brief, infrequent incremental packet delay that is not distinguishable from typical variations in the internet

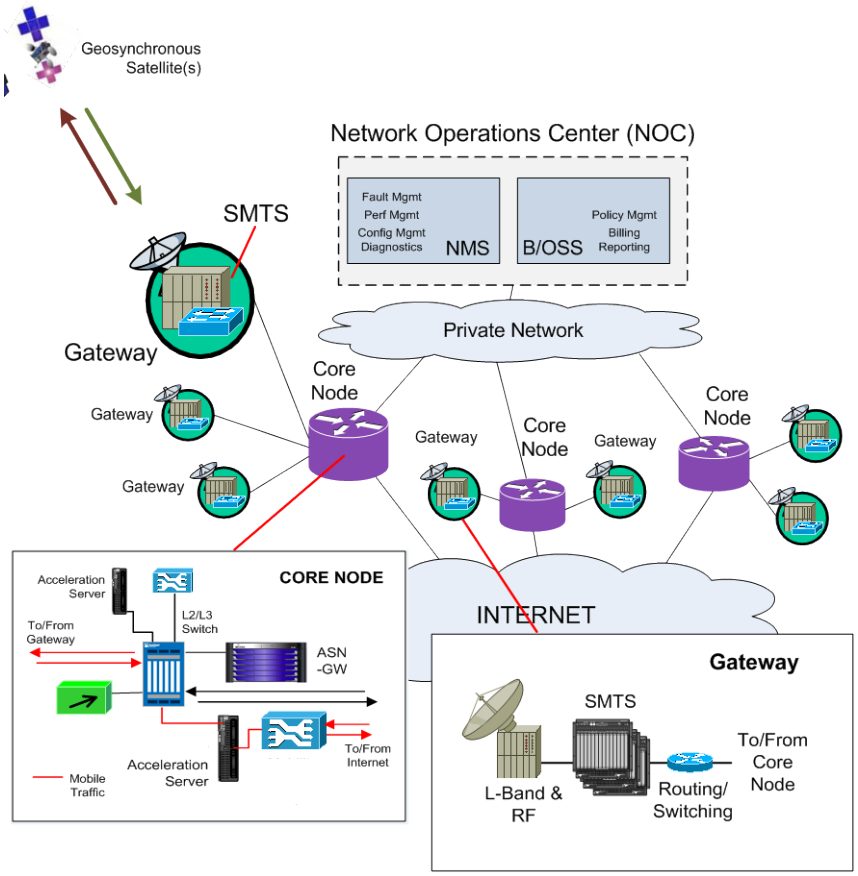
ViaSat Ka Network over North America



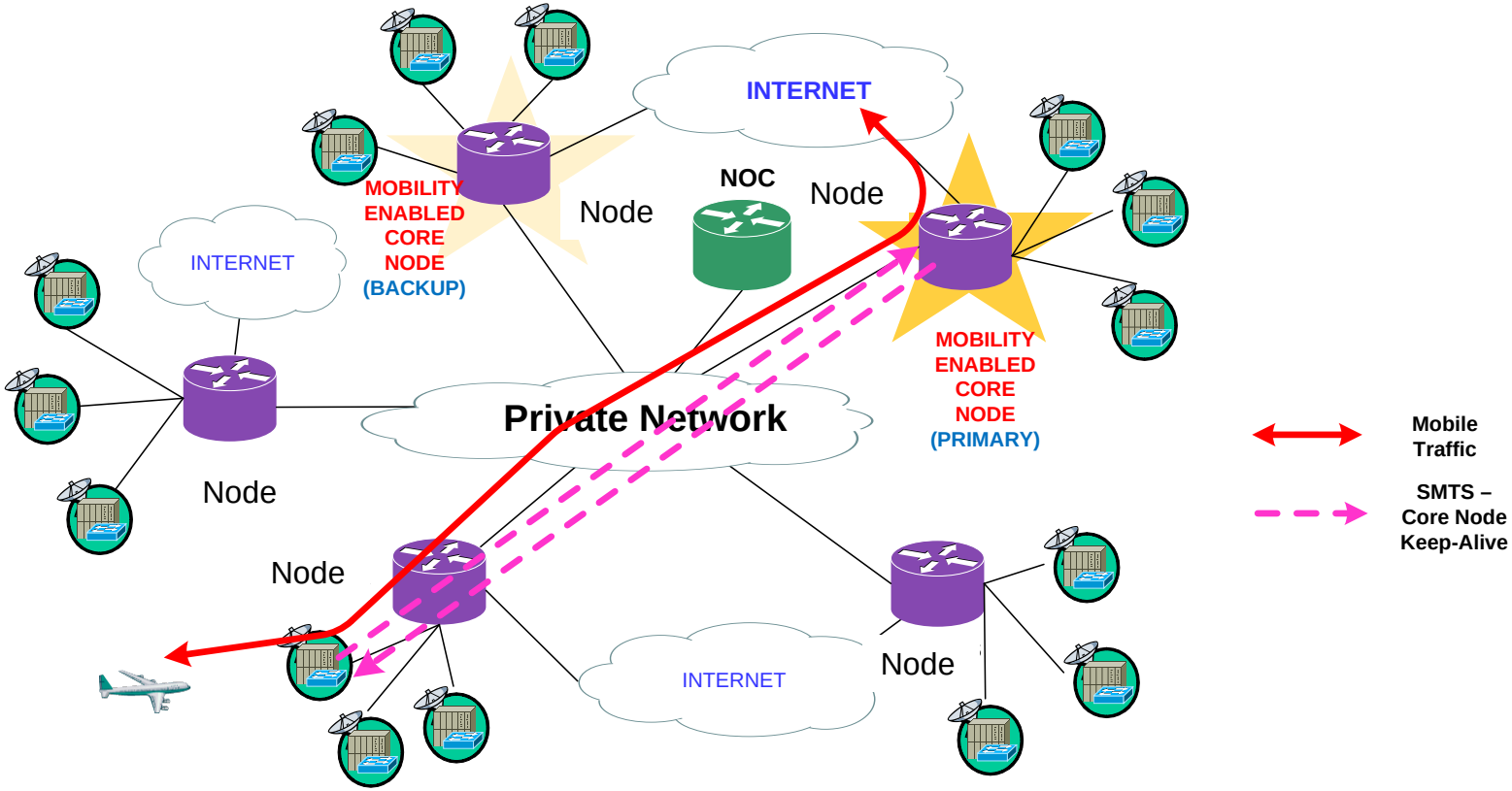
Multi-beam architecture is key to enabling huge capacity increase and large economic benefit

SurfBeam 2 Network Infrastructure

- Network consists of satellite RANs and a Packet Core
  - Internet Point of Presence (PoP) at Core Node
  - “Core” Nodes part of a Packet Core
  - Connection of Core Node to associated Gateways
- Routing Infrastructure
  - OSPF for IGP
- CG-NAT for passengers
- Content filtering rules applied by service provider



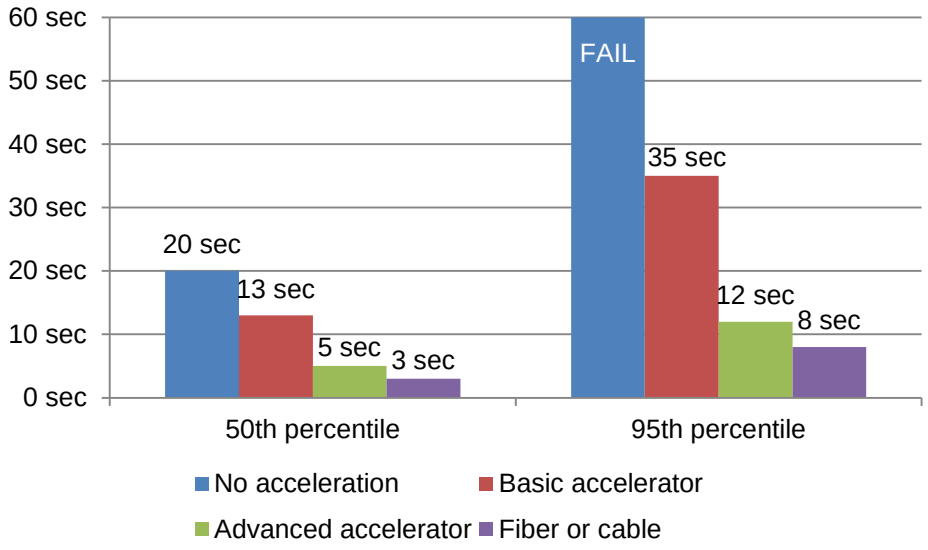
Packet Core Node redundancy



Failover done through managing routes with different cost metrics

Getting over TCP performance on a Long Fat Network

- TCP slow start and congestion avoidance does not work well high bandwidth-delay product networks
- Split-connection TCP proxy
  - Eliminates TCP connection setup round trips for HTTP & HTTPS
  - Eliminates TCP slow start
  - Fills bandwidth “pipe” by overcoming TCP receive window limitations



Summary

- High capacity satellite enables residential experience in the air
- Spectrum reuse allows for higher capacity
- Airline mobile network is similar to the terrestrial mobile
- Higher delay compensated with protocol proxies

Any Questions?