



# Global Xpress

## Global Mobile Broadband

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Almaty, September 2012



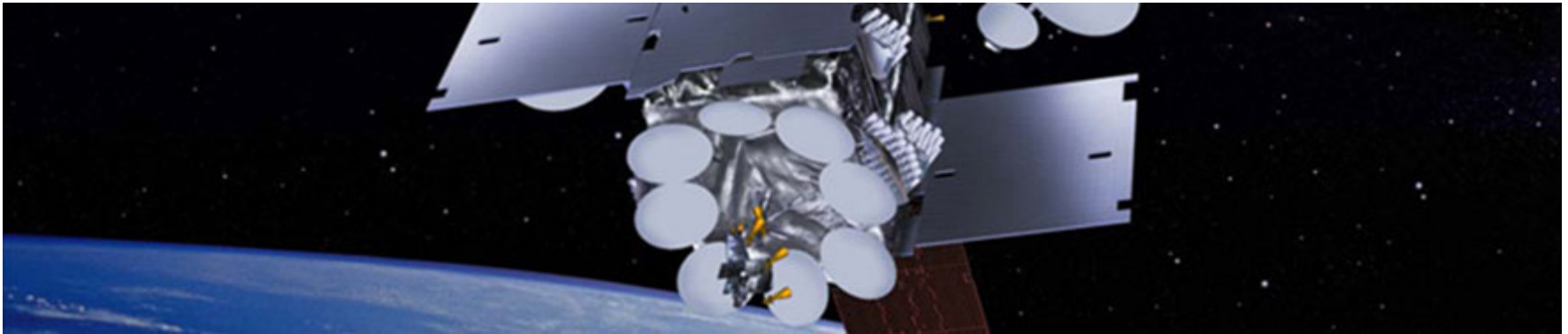
# Global Xpress (1/2)



- US\$1.2 billion global broadband network
- Boeing contracted to build three Inmarsat-5 satellites
- First launch 2013, with global coverage in 2014
- Lifetime of 15 years
- Complements our L-band services

# Global Xpress (2/2)

## THE NEW STANDARD IN MOBILE SATELLITE COMMUNICATIONS



### High Performance

- Smaller and more advanced
- Standard 60cm performance\*:
  - 50Mbps downlink
  - 5Mbps uplink
- Performance increases with 1m

*\* Performance on aero terminals will vary*

### Affordable

- Lower cost service
- Lower cost terminals
- Lower cost install/training

### Reliable

- Dual satellite constellations
- Global Ka-Band network
- Global L-Band Network for backup
- Inmarsat quality standards, end-to-end

# Elements of the Global Xpress Network

## END-TO-END QUALITY AND RELIABILITY

### User Oriented Terminals

- Choose from multiple manufacturers in most markets
- Designed around unique needs of user platforms
- One-touch installation – “Power up and get online”

### Robust Ground Infrastructure

- Fully redundant Satellite Access Stations
- Reliable Inmarsat global network
- Embedded security features



# The Satellite Network

## FLEXIBLE, GLOBAL SERVICE DELIVERY



### Global Coverage

- Three geo-stationary satellites
- 89 fixed beams per region
- 72 transponder pair capacity
- Designed for mobility

### High Capacity Overlay

- Six steerable beams per region
- Additional capacity for:
  - High traffic regions
  - Response to global events

### Dual Constellation Network

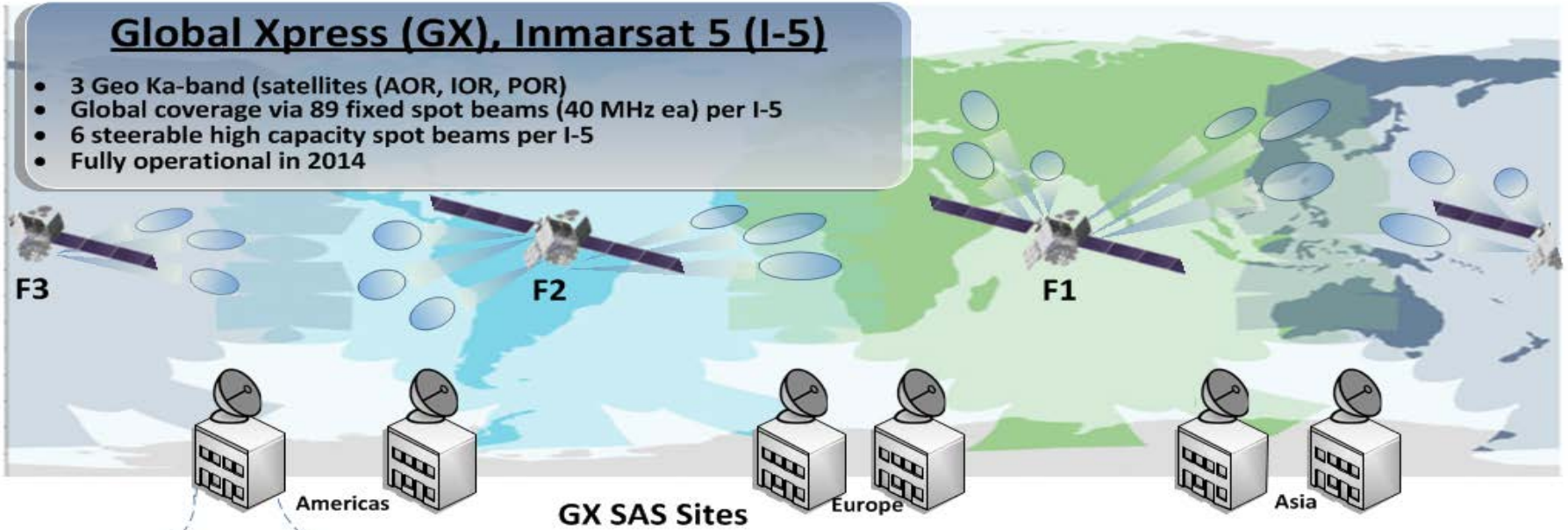
- Single, seamless offering
- Strategic overlap with Inmarsat-4
- Resilient, all-weather solution



# System Architecture

## Global Xpress (GX), Inmarsat 5 (I-5)

- 3 Geo Ka-band (satellites (AOR, IOR, POR))
- Global coverage via 89 fixed spot beams (40 MHz ea) per I-5
- 6 steerable high capacity spot beams per I-5
- Fully operational in 2014



### Satellite Access Stations (SAS)

- 6 SAS sites supporting global coverage and site diversity
- DVB-S2, multi-carrier MF-TDMA system
- QoS, multicast, IPv4/v6, dynamic routing, web acceleration, beam switching
- Security via AES-256, FIPS 140-2



### GX Markets



### GX User Terminals

- Terminal sizes from 30 cm to 1 m+
- Variants for GX markets
- Multiple vendors via 3<sup>rd</sup> party development kits

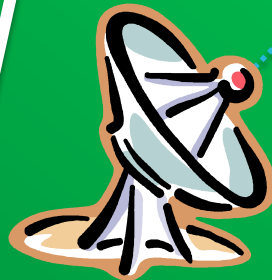
ISP  
PSTN

inmarsat

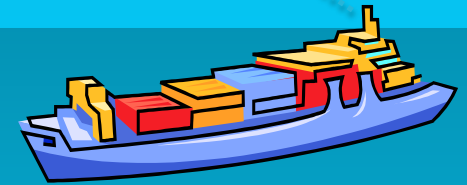
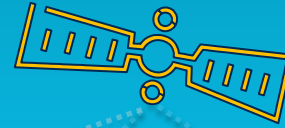
# Global Xpress dual SAS design



GX SAS  
Site #1



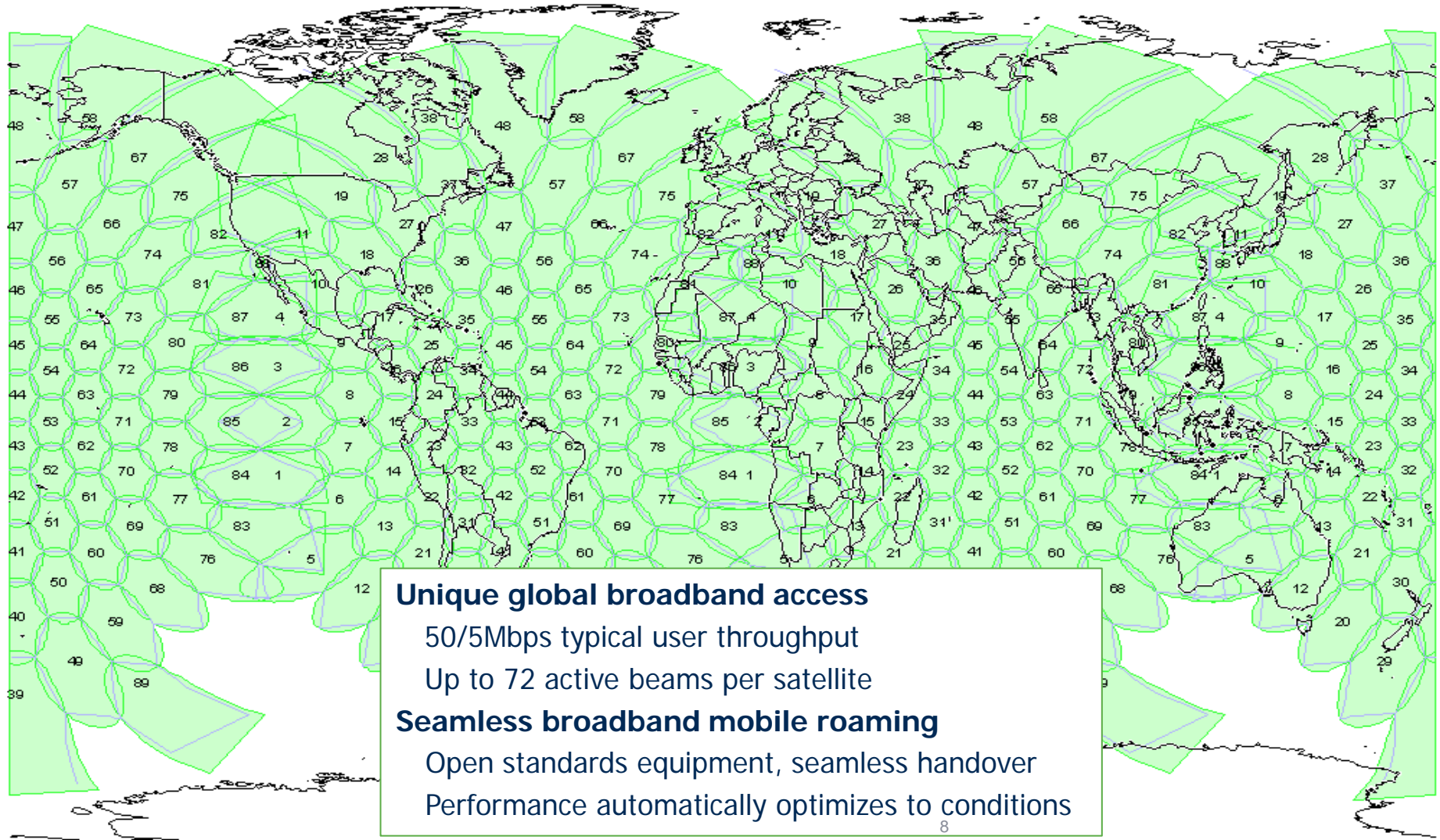
GX SAS  
Site #2



- Two GX SAS sites in each ocean region
- Physical separation of hundreds of miles
- Automatic switchover
- Virtually eliminates SAS outages

# Two Unique and Complementary Ka Payloads (1/2)

## Global Service Beams

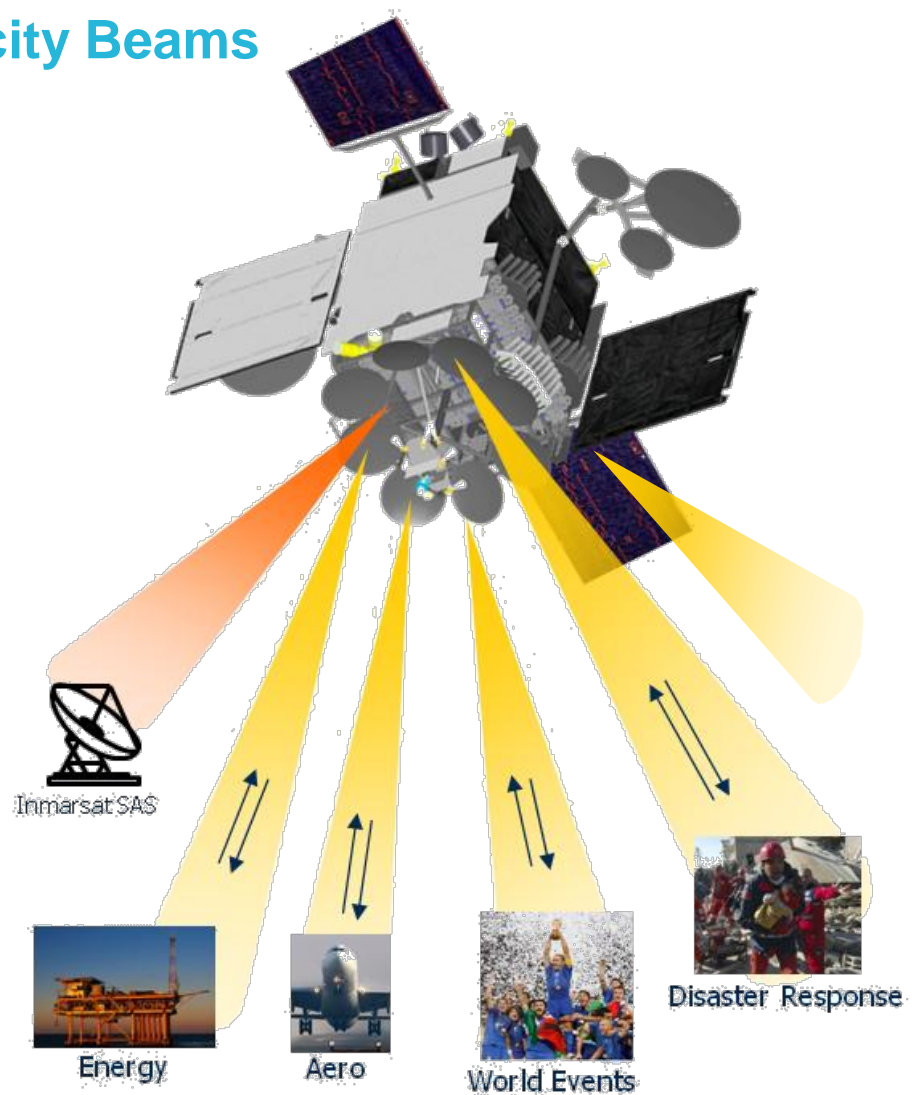
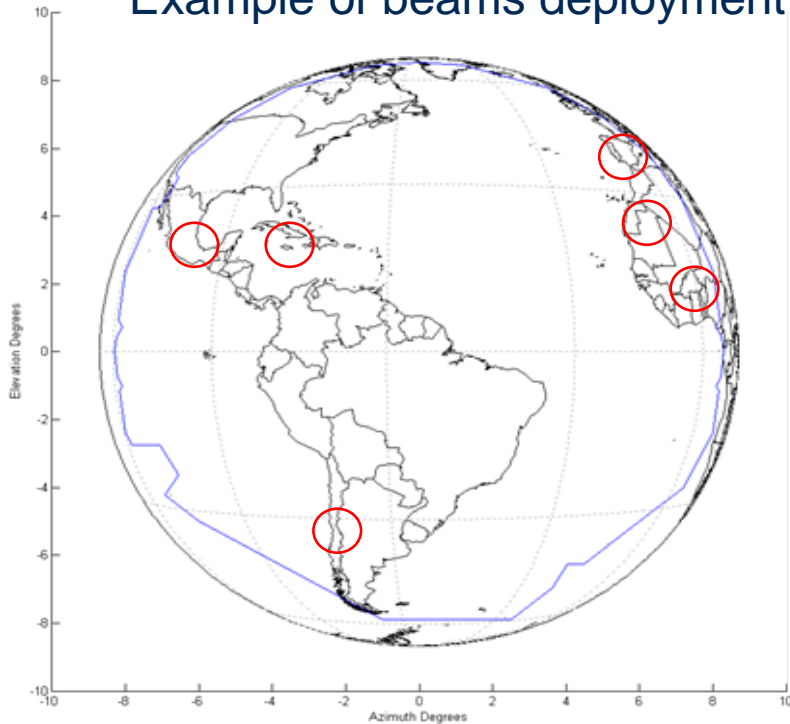




# Two Unique and Complementary Ka Payloads (2/2)

## High Capacity Beams

Example of beams deployment



### Steerable overlay addresses hot-spots

- Responsive to surges caused by world events
- Serves growing high density markets (energy, aero)

### Interoperability with global beams

- Higher gain for most efficient bandwidth use
- Transparent handover of commercial services

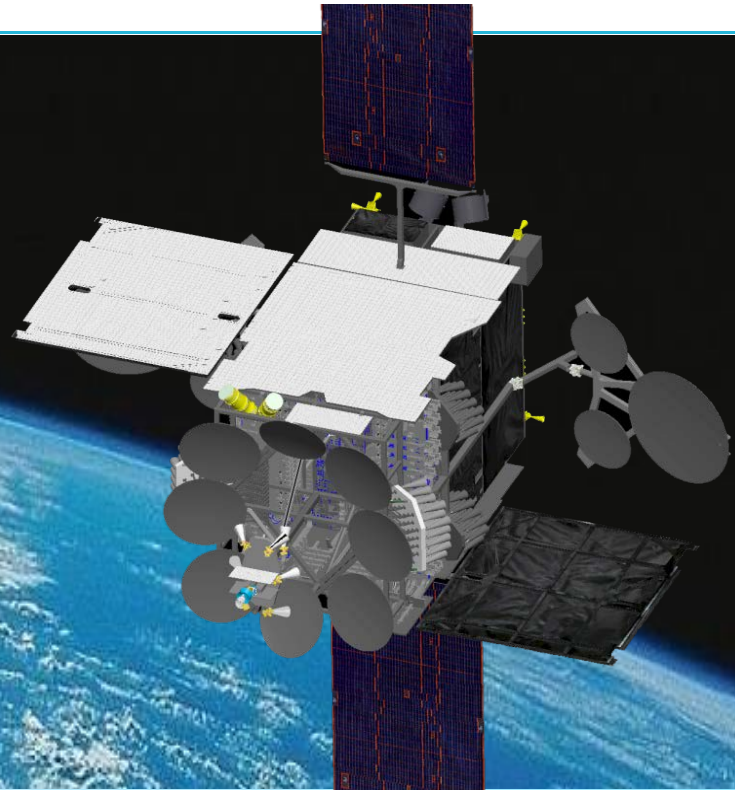
# Global Xpress Spectrum

## Global payload

User Uplink: 29.5 - 30.0 GHz  
User Downlink: 19.7 - 20.2 GHz  
Feeder Uplink: 28.0 - 29.5 GHz  
Feeder Downlink: 18.2 - 19.7 GHz

## High Capacity Payload

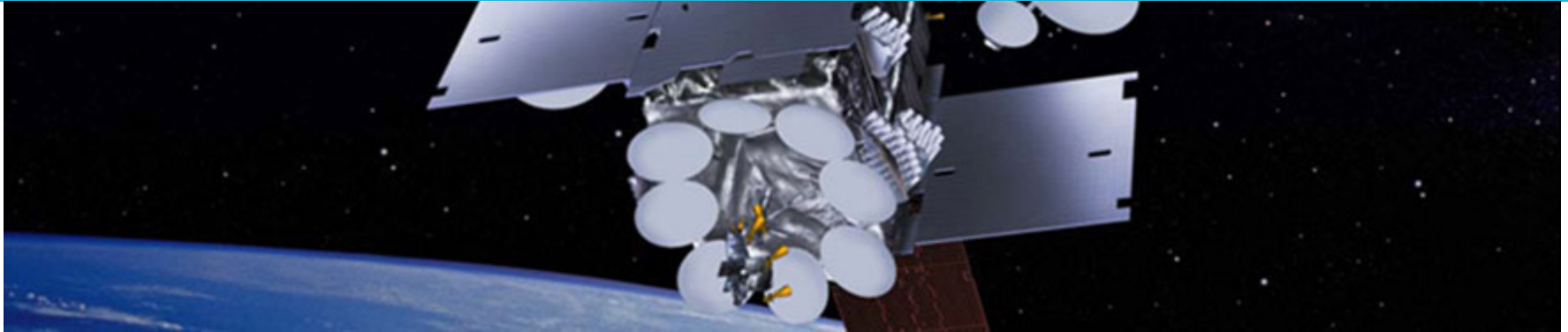
User Uplink: 29.0 - 29.5 GHz  
User Downlink: 19.2 - 19.7 GHz  
Feeder Uplink: 27.5 - 28.0 GHz  
Feeder Downlink: 17.7 - 18.2 GHz



## Why Ka-band?

- 2.5 GHz of available spectrum
- Includes 2x500 MHz of spectrum exclusive to satellite
- Fewer operational satellites – simplify coordination
- L-band can be used to improve availability

# International Regulatory Regime – Progress

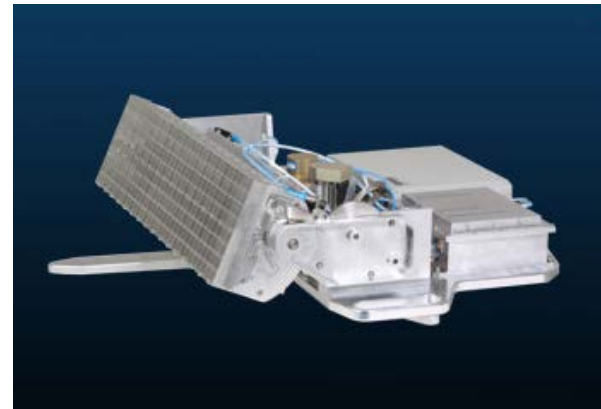


- **“Earth Stations on Mobile Platforms” (ESOMPs):** Refers to earth stations operating in FSS networks, with characteristics similar to FSS earth stations but on a mobile platform
- **ITU-R Report ITU-R S.2223**
- **ETSI harmonised standard (EN 303 978) for Ka-band ESOMPS**
- **CEPT is developing new ECC Report and ECC Decision**
- **Administrations are developing national authorisations for ESOMPs**

# Global Xpress User Terminals

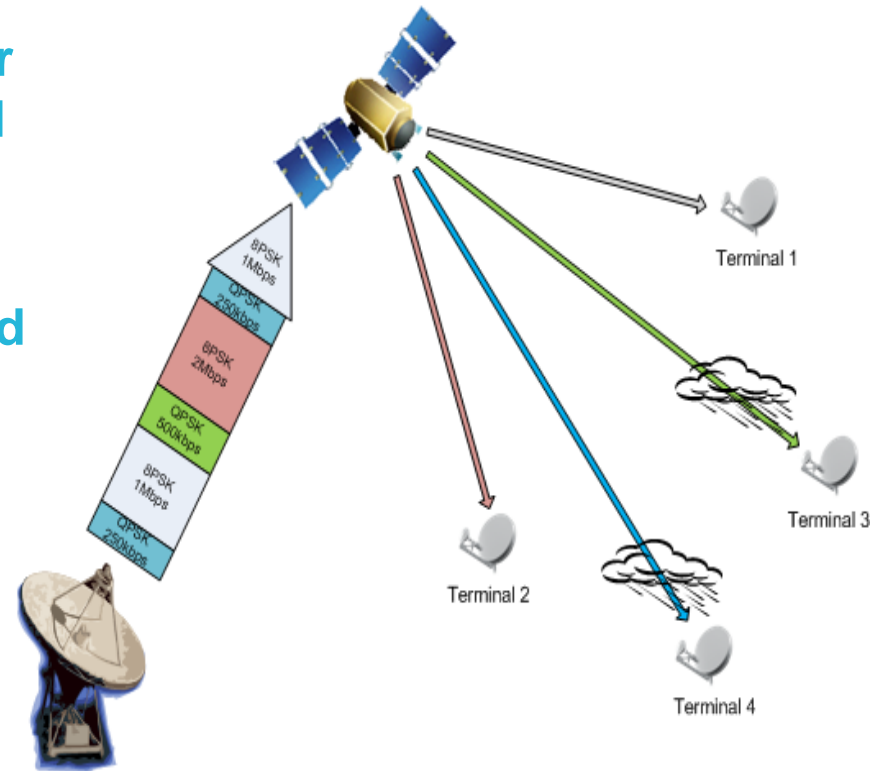
- > Uses adaptive coding and modulation to maintain link in rain-fade
- > Maximum data rates: 5 Mbit/s uplink, 50 Mbit/s downlink for 60 cm (other terminals higher or lower)

	Maritime		Aero		Land-based			
	1m	60cm	Class A	Class B	Fixed	Transportable	COTM	Manpack
Antenna Size (cm)	100	60	17x70	30	>100	TBD	TBD	<70
Antenna Structure	reflector	reflector	asymmetric	symmetric	reflector	reflector	asymmetric	Flat panel/reflector



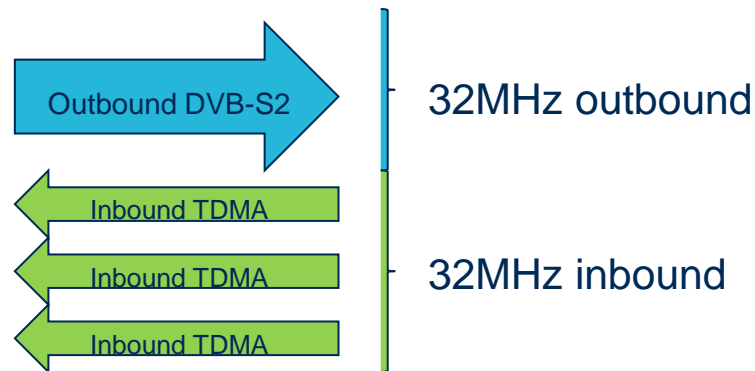
# Satellite Air Interface Overview (1/2)

- > The forward link is based on DVB-S2 ACM
- > The return link uses MF/TDMA
- > MODCODs are changed in real time, per terminal depending on current reported signal to noise
- > Adapts to current link conditions, trading excess link margin for increased throughput

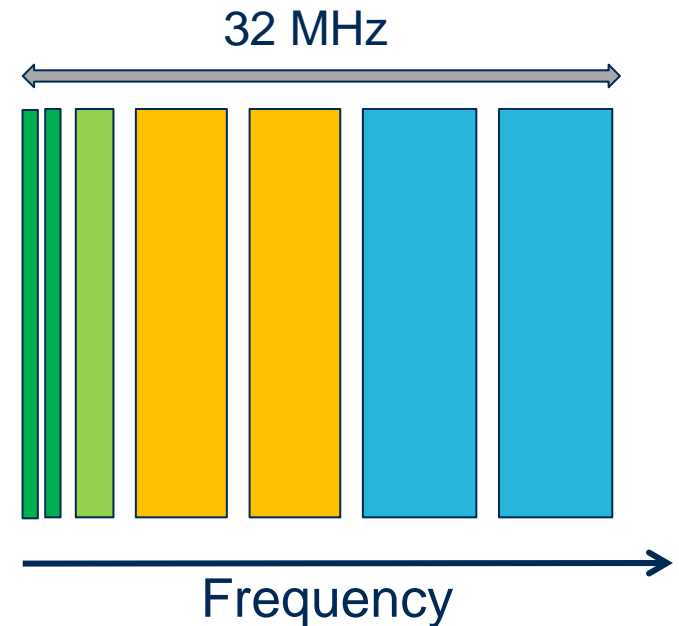




# Satellite Air Interface Overview (2/2)



- Return channel is broken into multiple carriers.
- Satellite Terminals will be assigned slots (TDMA) into the carriers depending on:
  - QoS/Queue size
  - Terminal (EIRP) characteristics
  - Channel (fade) characteristics



# GX Summary and Major Business Milestones

**SETTING THE NEW STANDARD IN MOBILE COMMUNICATIONS:  
SPEED, AFFORDABILITY AND RELIABILITY**

Major Milestone/ Deliverable	Plan
Satellite access station sites under contract for 1 <sup>st</sup> satellite	Completed
Four terminal vendors under contract	Completed
Satellite critical design review	Completed
Terminal and ground station critical design review	Completed
Ground station site construction starts	Completed
Terminal and ground station final design review	Q3 2012
First user terminal acceptance testing completed	Q1 2013
Secure sufficient authorisations in footprint of first satellite	Q2 2013
1st I5-satellite launched	Q2 2013
3rd -I5-satellite launched	Q2 2014
Global service ready	Q4 2014

# Questions

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## Thank you!

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