

# Back to Basics: SatCom 101

# Agenda

- **Introduction**
- **When to use satellite phones**
- **Constellations**
- **Networks**
- **Solutions**
- **Conclusions**

# So Who is This Guy Anyway?

## Meet Lou Altman

- Founder, CEO
- Entrepreneur
- Innovative service leader
- Vocal advocate
- Speaker, strategist, optimist



# Contract Vehicles



**Schedule 70 GS-35F-0074W**



**Texas DIR-SDD-1859**



**VA-090413-GFI**



**4400008087**

**State of TN - 29648**

Main driver in Satcom

**DATA, DATA, DATA!!!**

M2M, Apps, Tracking, Connectivity

Voice forecast ~ 9% CAGR

Data forecast ~ **30%** CAGR

# Data Driven Future:

- More Competition
- Higher Data Rates
- Lower Cost
- Multi-band Solutions?

**Wait, why do we even  
need SatCom?**

# Many Reasons.....



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# Minor event

July 27, 2010 - Manhattan, NY - An equipment failure in Verizon Communications Inc.'s network knocked out its own landlines and AT&T Inc.'s wireless service in a limited part of Manhattan on Monday.

A “digital cross connect” was knocked out due to the severe thunderstorms over the past few days, according to Verizon. The company's technicians are working on repairing the equipment, but couldn't say when service would be back up.

# Impact of 'minor' event

- **No landline service for two days**
- **Limited cell service for two days**
- **No 911 service**
- **Businesses offline**
- **How much lost revenue?**
- **How much lost business?**

*What is at stake if your organization cannot make phone calls for.....  
One day? Two days? Four days?*

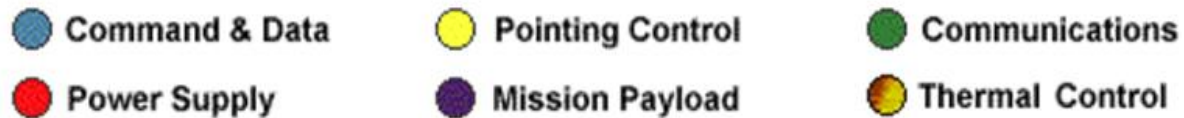
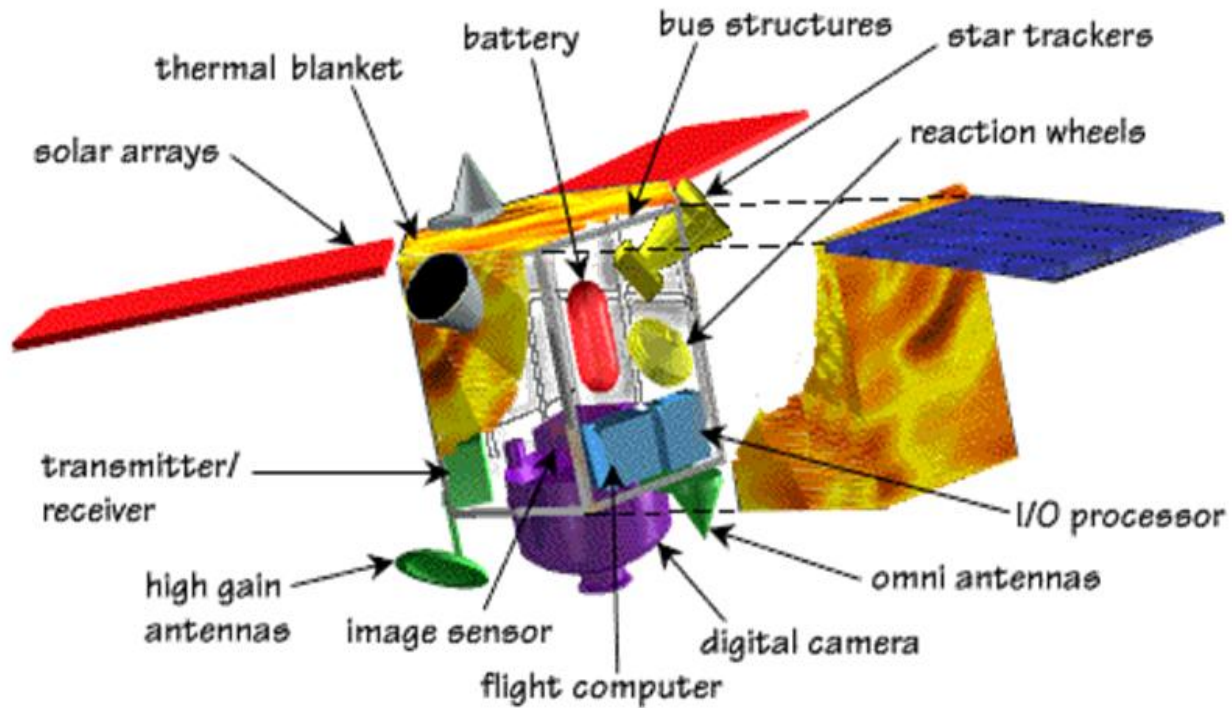
***2011 was the most  
expensive year in history  
for natural disasters***

**So really....**

***You are absolutely kidding  
yourself if you don't  
have some kind of satellite  
communications available,  
onsite, ready to go,  
tested, staff trained.***

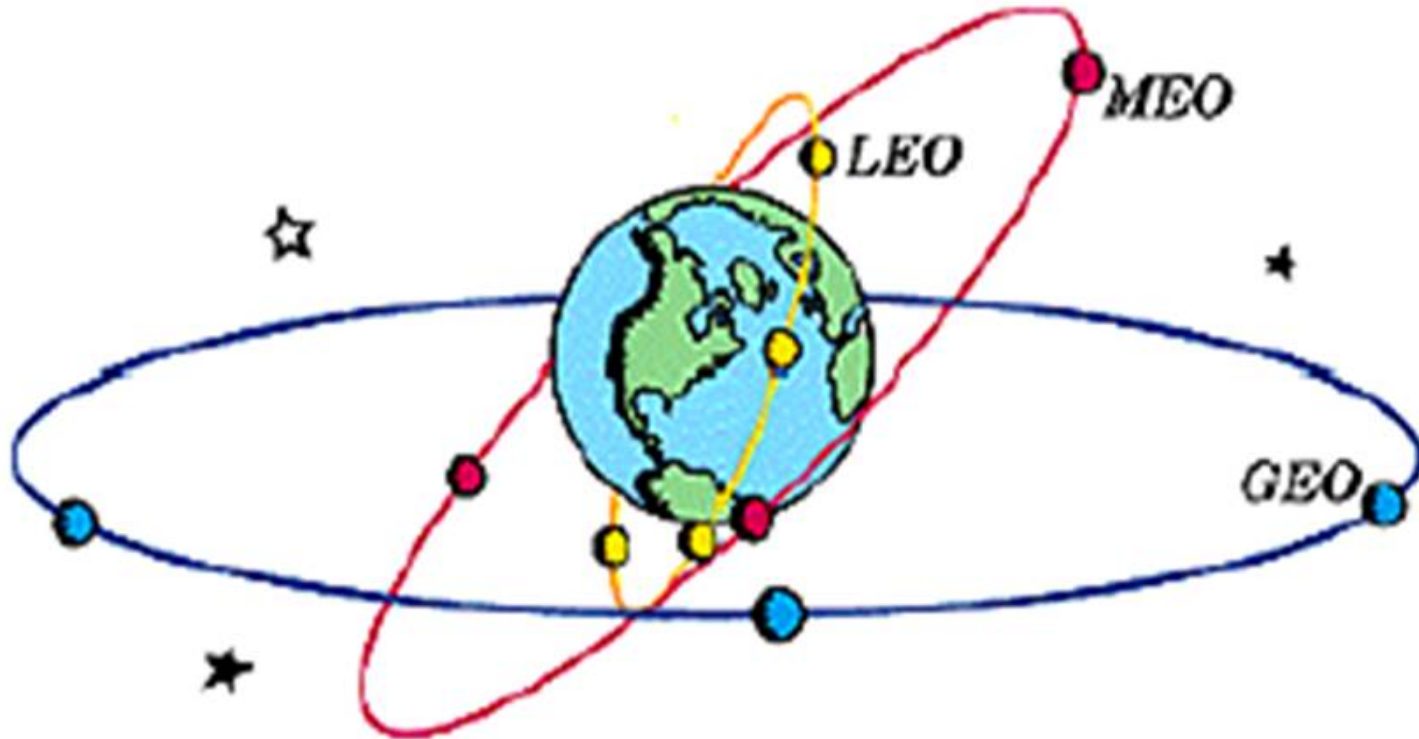
# What's in a Satellite?

# What's in a satellite?



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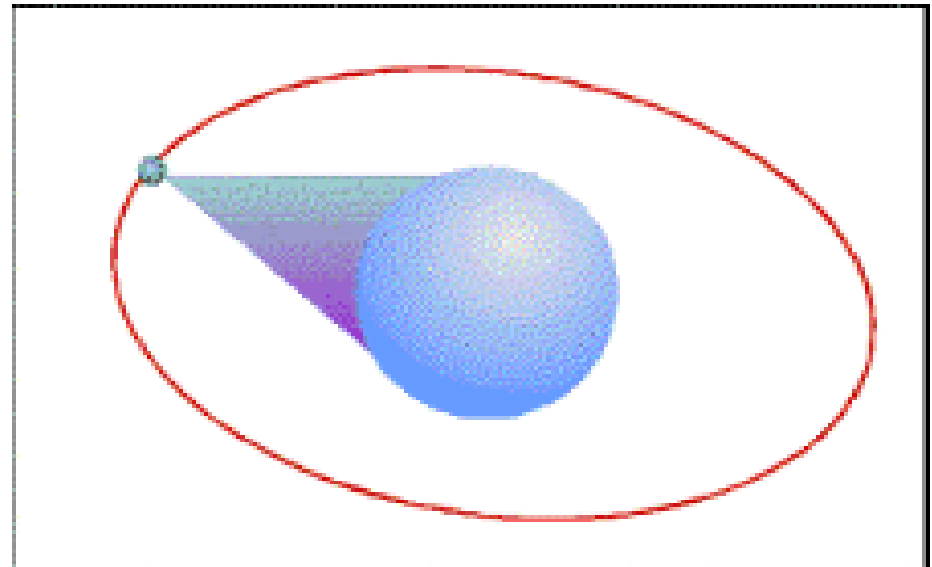
# Types of Satellite Orbits



**Communications satellite orbit the earth at a designated distance and trajectory**

# GEO Stationary

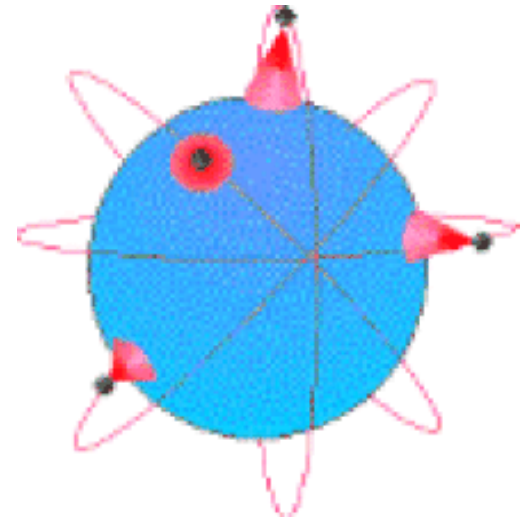
- Equatorial orbit
- No pole coverage
- Always same position
- 3-4 = global coverage
- ±23,000 miles
- 24 hours to orbit
- ± 1/4 second round trip
- Point, lock, use





# Low Earth Orbit

- **Orbit at 500 to 1000 miles**
- **Transmission delay only .05 seconds**
- **Lighter, lower cost equipment**
- **Orbiting periods – 90 to 120 min**
- **Fly at 16,000+ mph**
- **20 min horizon to horizon**
- **Footprint radius from 1875 miles to 2500 miles**
- **Cover 2.5% to 5% of the earth surface per satellite**
- **Need a lot of satellite for complete global coverage**



# **We'll talk only about GEO and LEO constellations**

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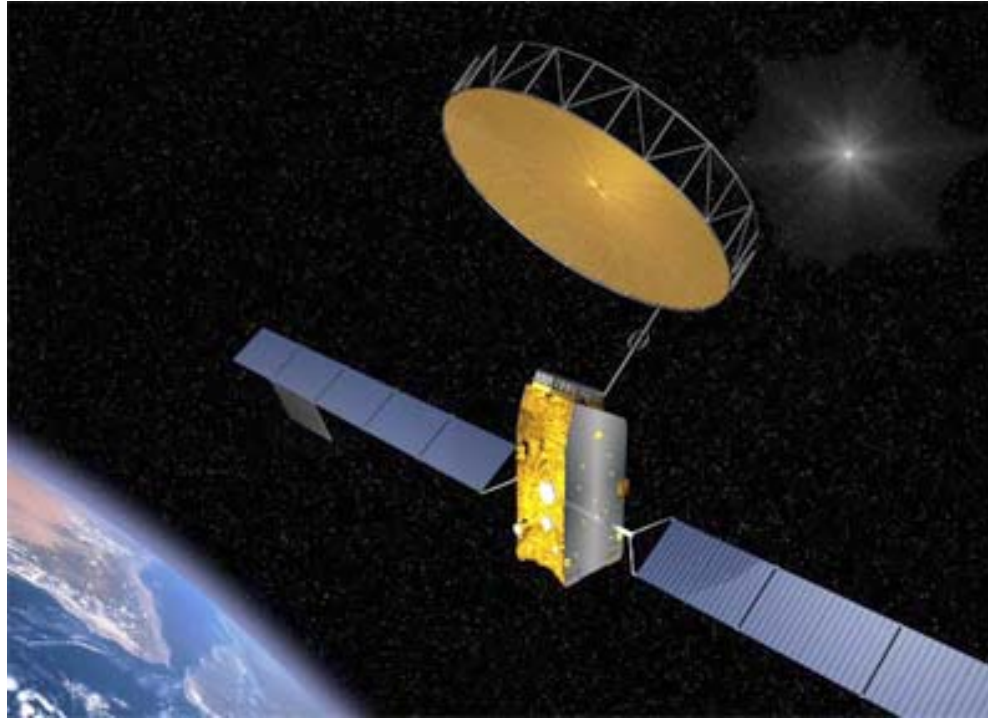


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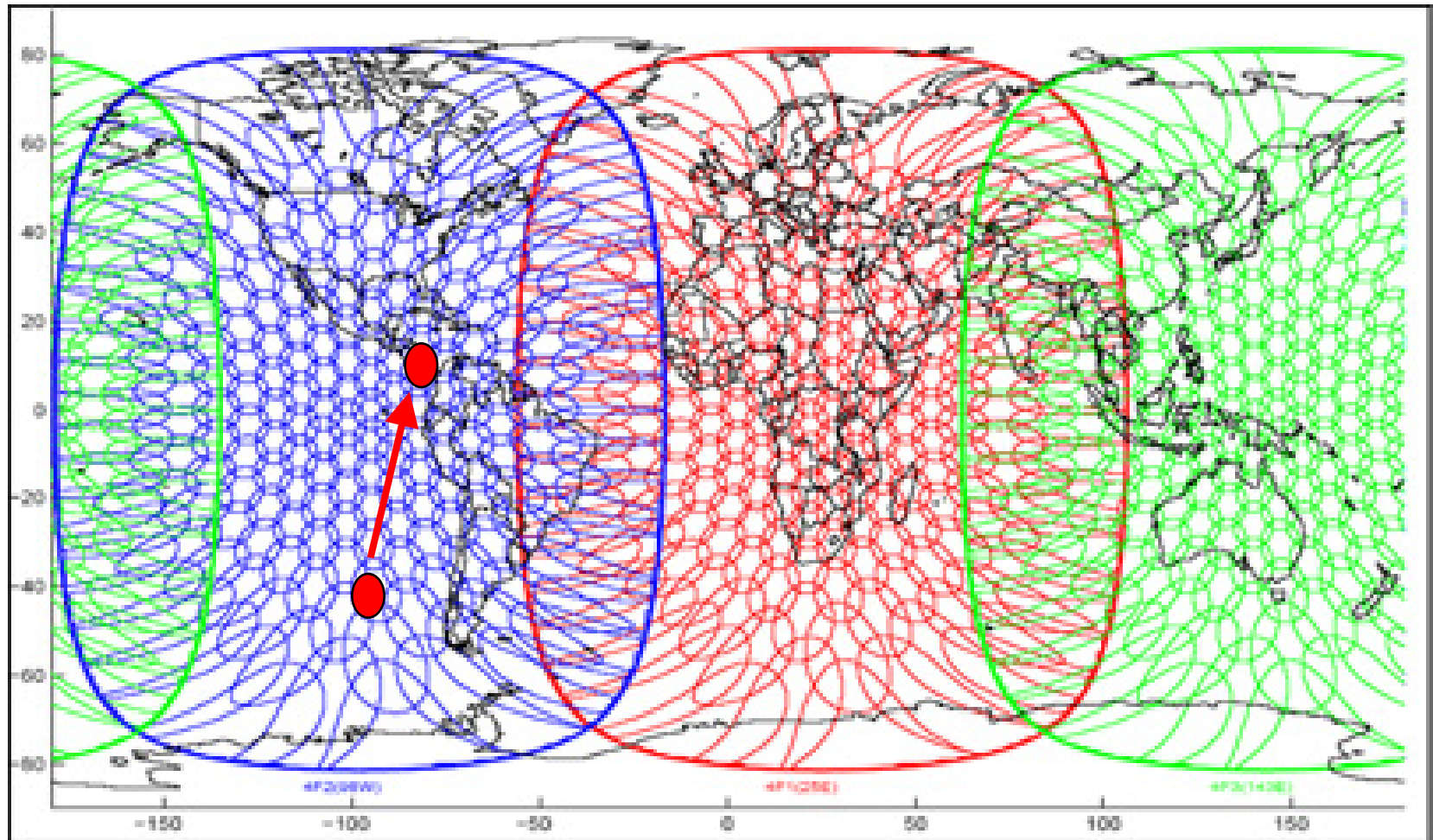
# INMARSAT

- Formed in 1979
- **IN**ternatonal **MAR**itime **SAT**ellite
- Many satellites; various services
- Our discussion will focus on:
  - BGAN
  - iSATPhone

# I-4 Satellite

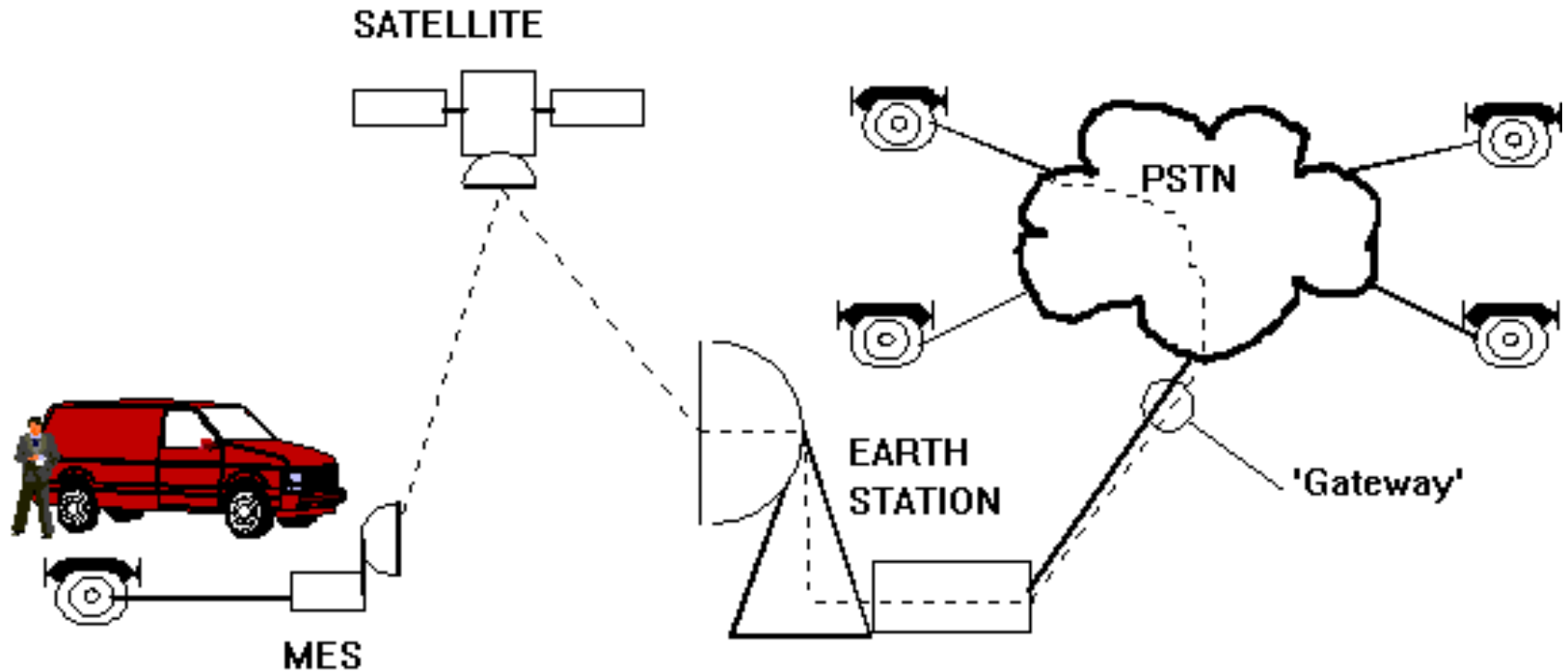


# Satellite footprints



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# Inmarsat path



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# Inmarsat highlights

- **BGAN – 30,000+ units**
- **iSAT handheld**
- **Fleet, Swift replacing RBGAN, M**
- **Ka Band, Global Xpress, 2014 - 50 Mbps**
- **Family of products:**
  - **iSAT, Land, Fleet Phone, BGAN, Xpress**



# Broadband Global Area Network **BGAN**

- **Highly portable, laptop-sized devices**
- **Data capability:**
  - **Up to 492K shared IP**
    - **pay by MB**
  - **32K, 64K, 128K, 256K, 384K streaming**
    - **pay by minute**
- **Capable of voice calls – ISDN, VoIP**
- **Weigh less than 3kg, lightest less than 1 kg**

# Terminals



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# iSAT Phone Pro

- **First Inmarsat handheld**
- **Near-global coverage**
- **Lightweight, robust**
- **Lower cost - >\$700**
- **Lower rates - \$35+/month, \$.80 - \$1.40/min, inclusive minutes**



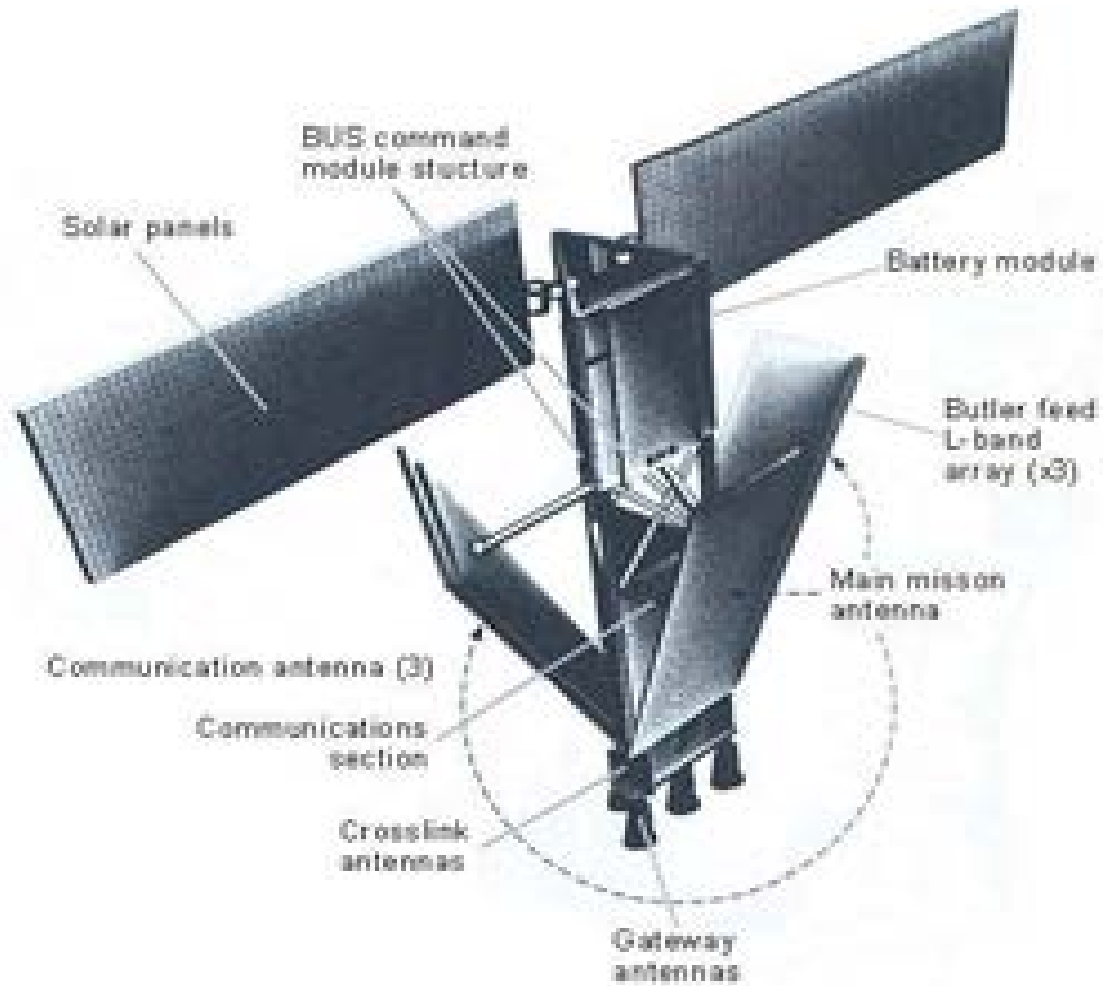
# Inmarsat Distribution Channel

- **Tier I - *Distribution Partners***
- **DPs sign up dealers, resellers and Service Providers**
- **Some DPs sell direct and compete with their channel**
- **Direct DP sales not always lower cost**
- **Very little flexibility in rate plans**



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# Iridium satellite



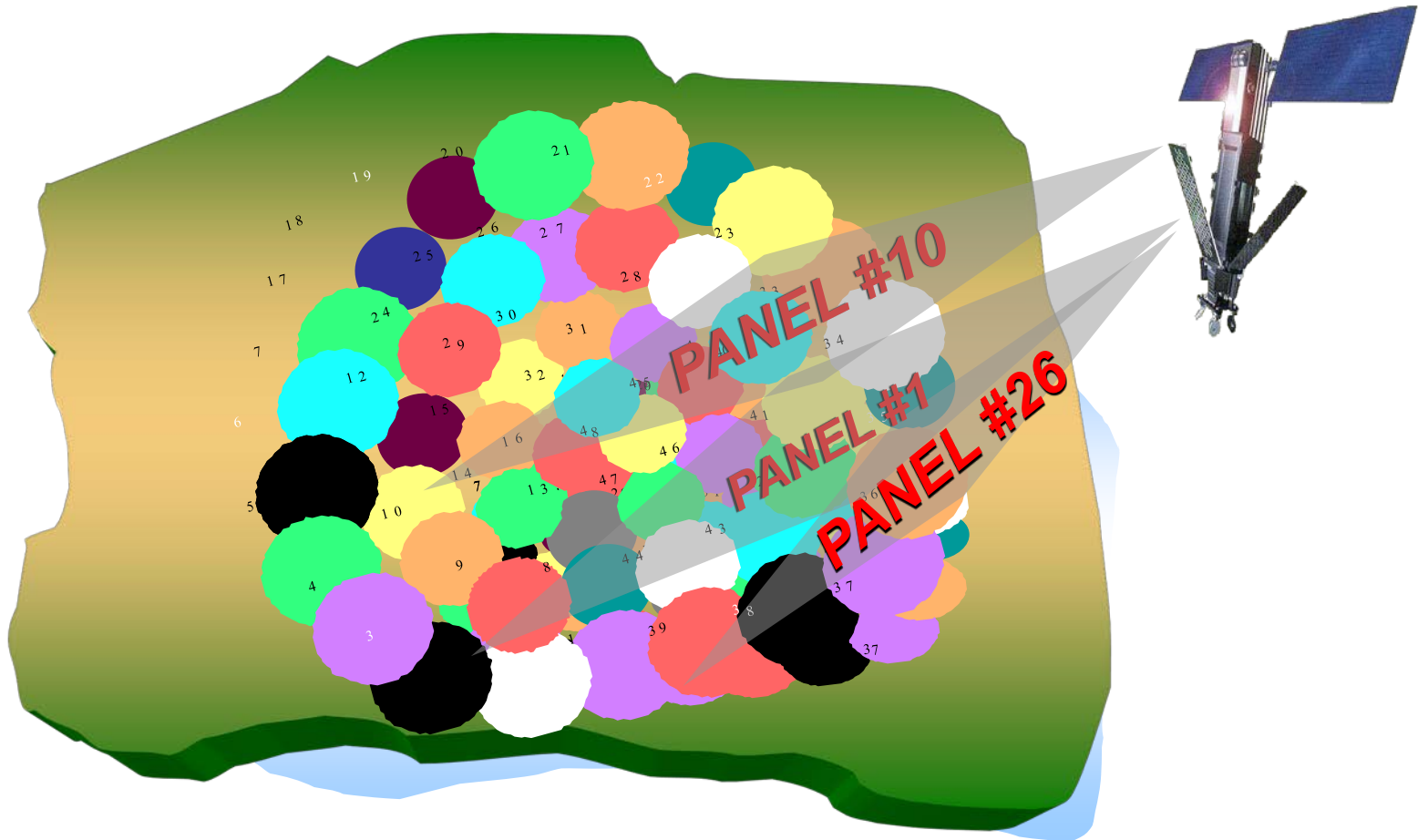
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# Constellation



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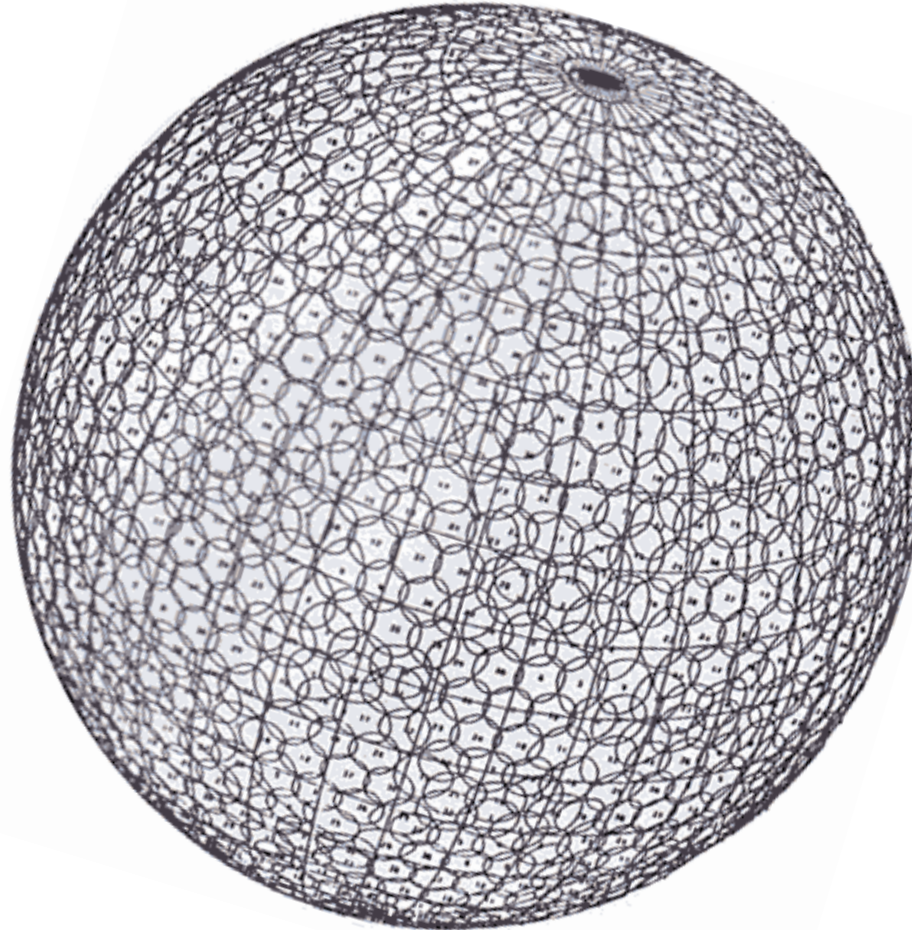
# Spot beams



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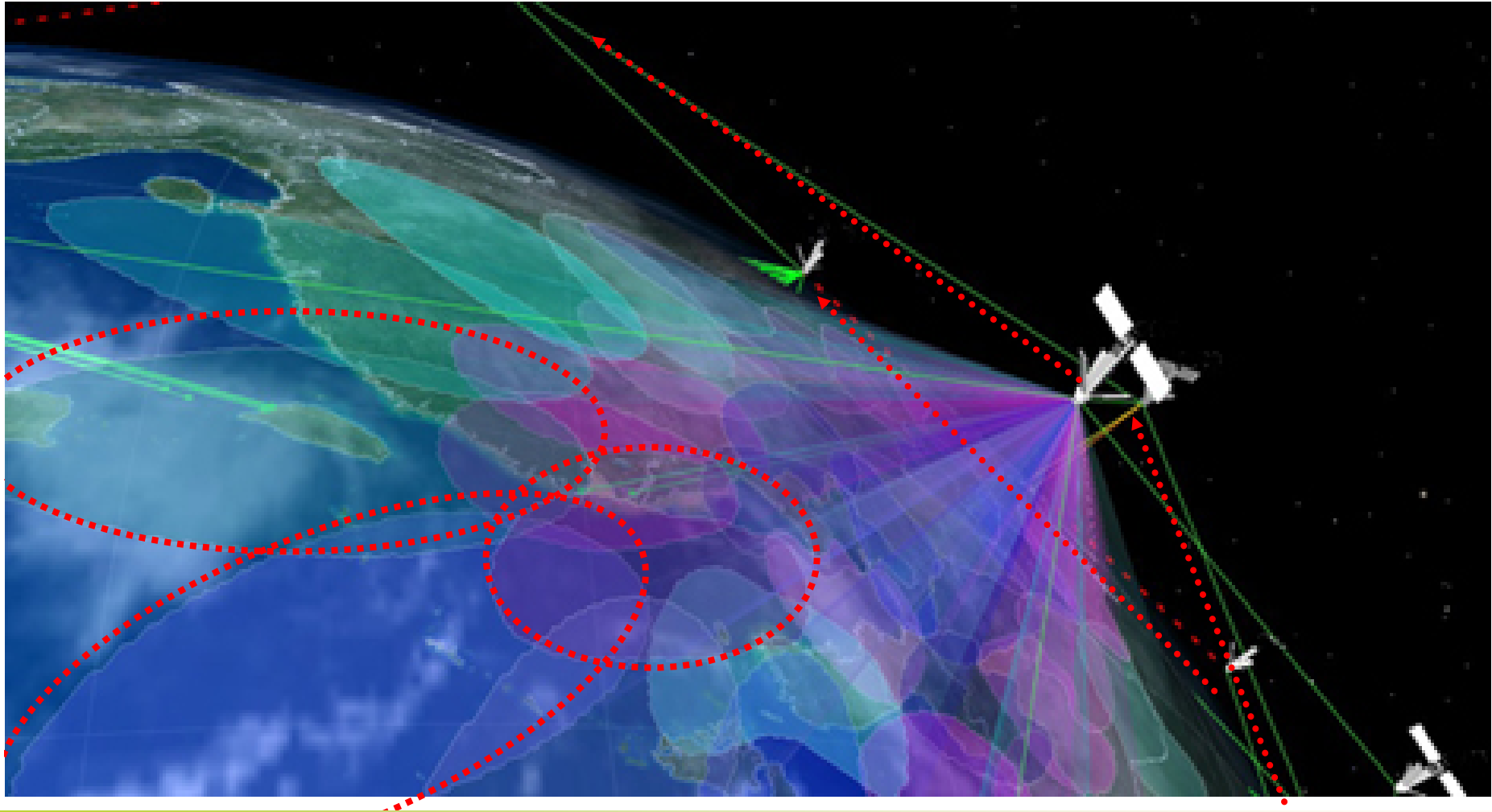


# Equals global coverage



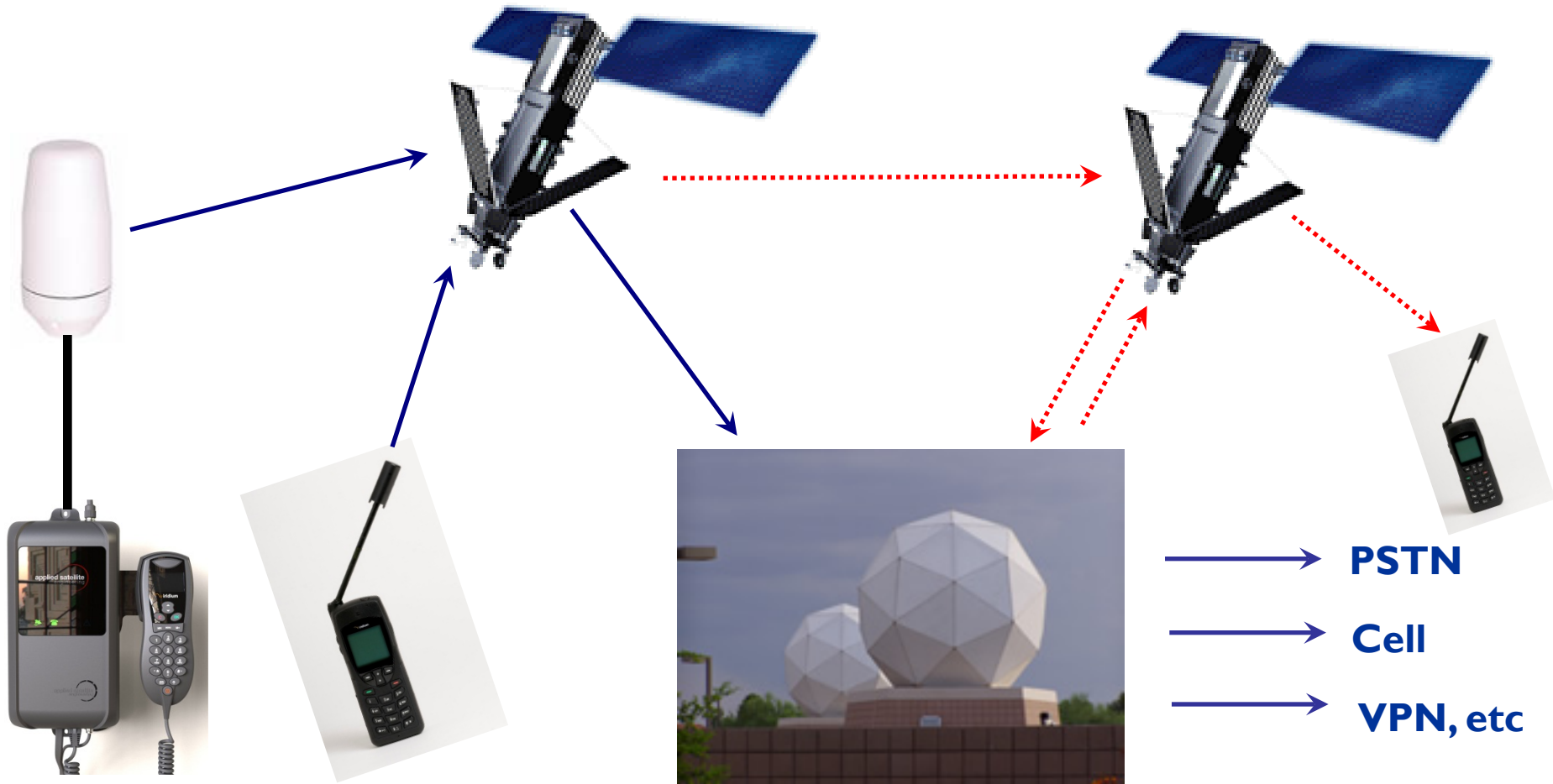
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# Cross linking



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# Iridium call path



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# Iridium Phones and Hardware



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# Iridium Update

- **Only fully global coverage**
- **9505A, 9555 handsets**
- **New! 9575 - Mil-Spec, tracking, SOS**
- ***Axcess Point: Connect to BB***
- **9603 data modem – smallest ever**
- **300+ SPs, VARs, VAMs**
- **NEXT - 2014-2105 - backwards compatible**
- **Higher data speeds, other functionality**



# NEXT-2015

## GOALS:

- Up to 1 Mbps on OpenPort 'class' antennas, 512kbps – 768kbps more practical speed
- The best value device and per-Mb pay/byte cost
- Higher speeds than FBB
- Partner with VSAT for coverage supplementation

# What's new?

## Extreme 9575

- Mil-Spec
- Rugged
- Tracking
- SOS alarm
- Wi-Fi to AxxessPoint



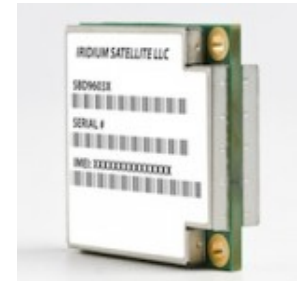
## Axxess Point

- Create Wi-Fi hotspot
- Connect to smartphones, tablets, laptops
- Web and mail



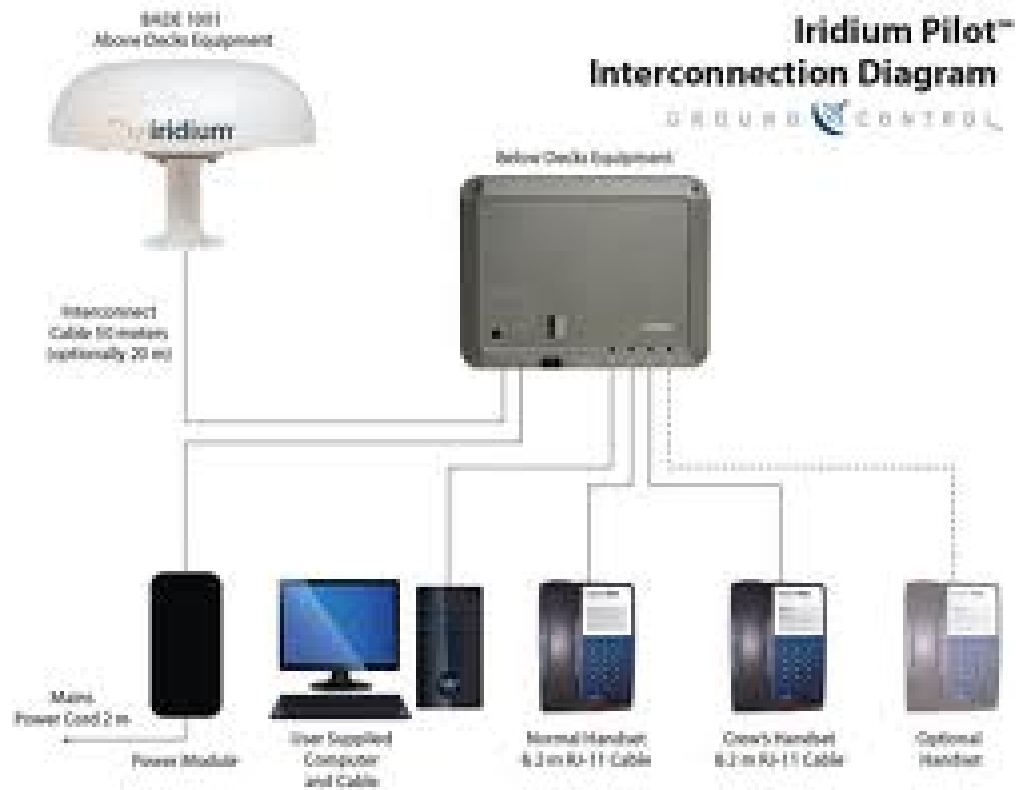
## 9603

- Smaller than a matchbook
- Powerful
- Developer kit
- SBD data
- Duplex
- Remote programming





# Iridium Pilot

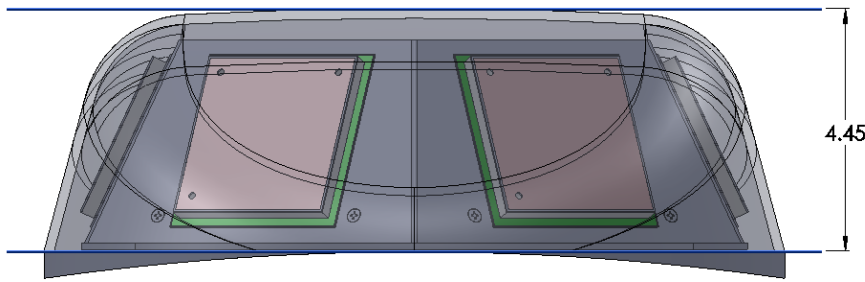
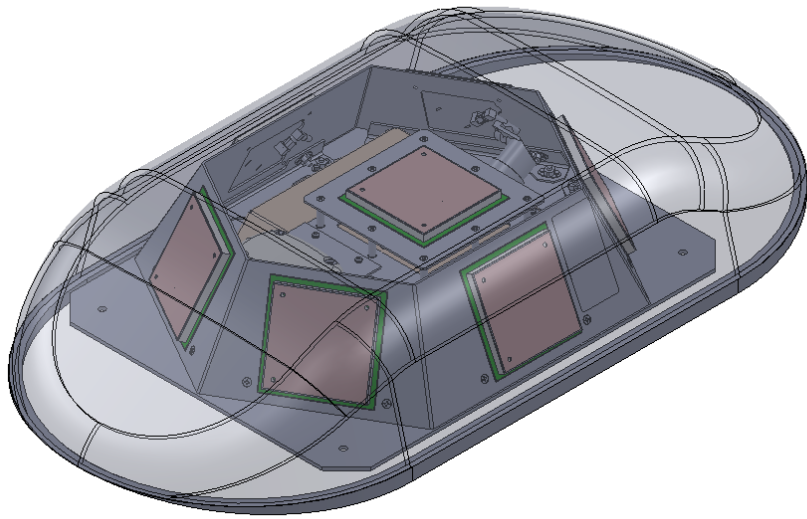
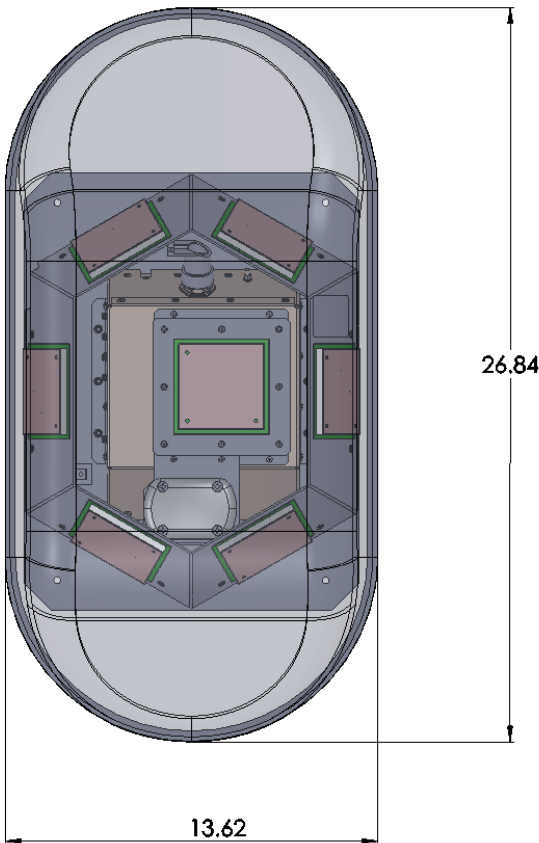




# **LiveTV launching OpenPort Aero:**

- **Lightweight antenna**
- **Voice, Data, TV**
- **IRDM+ViaSat = global coverage**

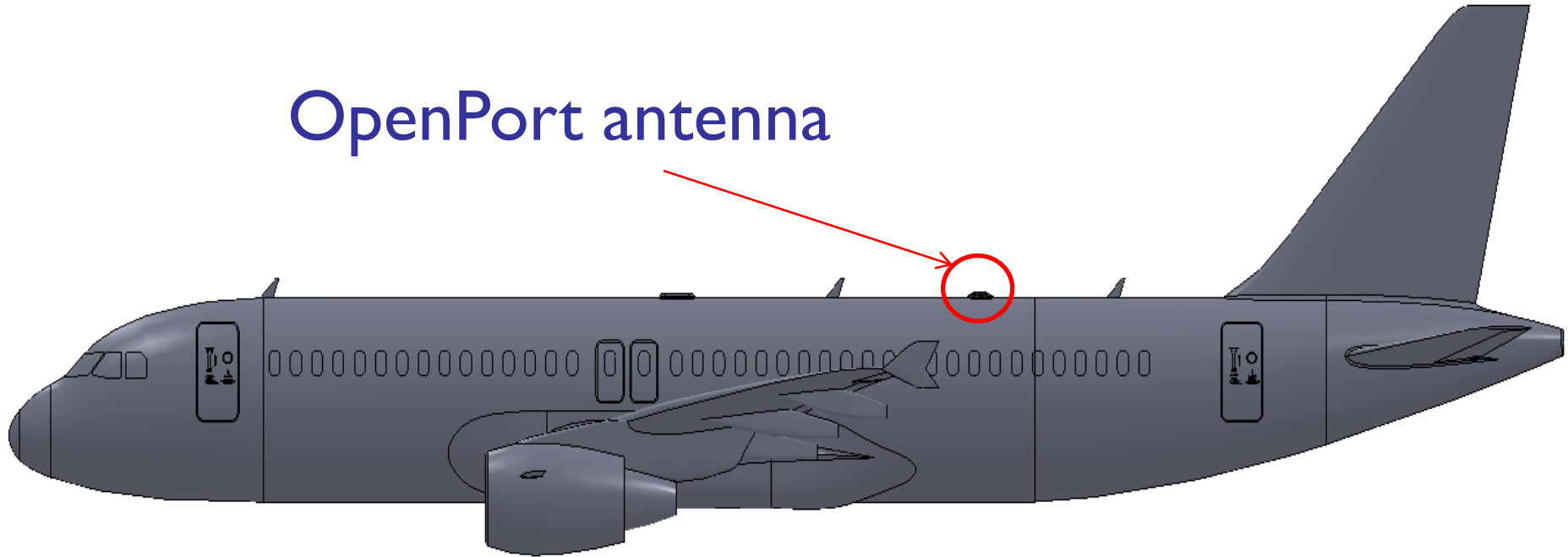
# OpenPort Aero Antenna



*Dimensions in inches*

# OpenPort Aero on Airbus A320

OpenPort antenna



Wi-Fi antennas inside the cabin

# Hosted Payload

## Aerion

- Iridium, FAA, NAV Canada, Harris, ITT Exelsis
- Tracking aircraft all over the world
- Hosted payload on NEXT satellites
- Transmitter on aircraft, via Iridium
- To ground stations, on to ATM

# Iridium Distribution Channel

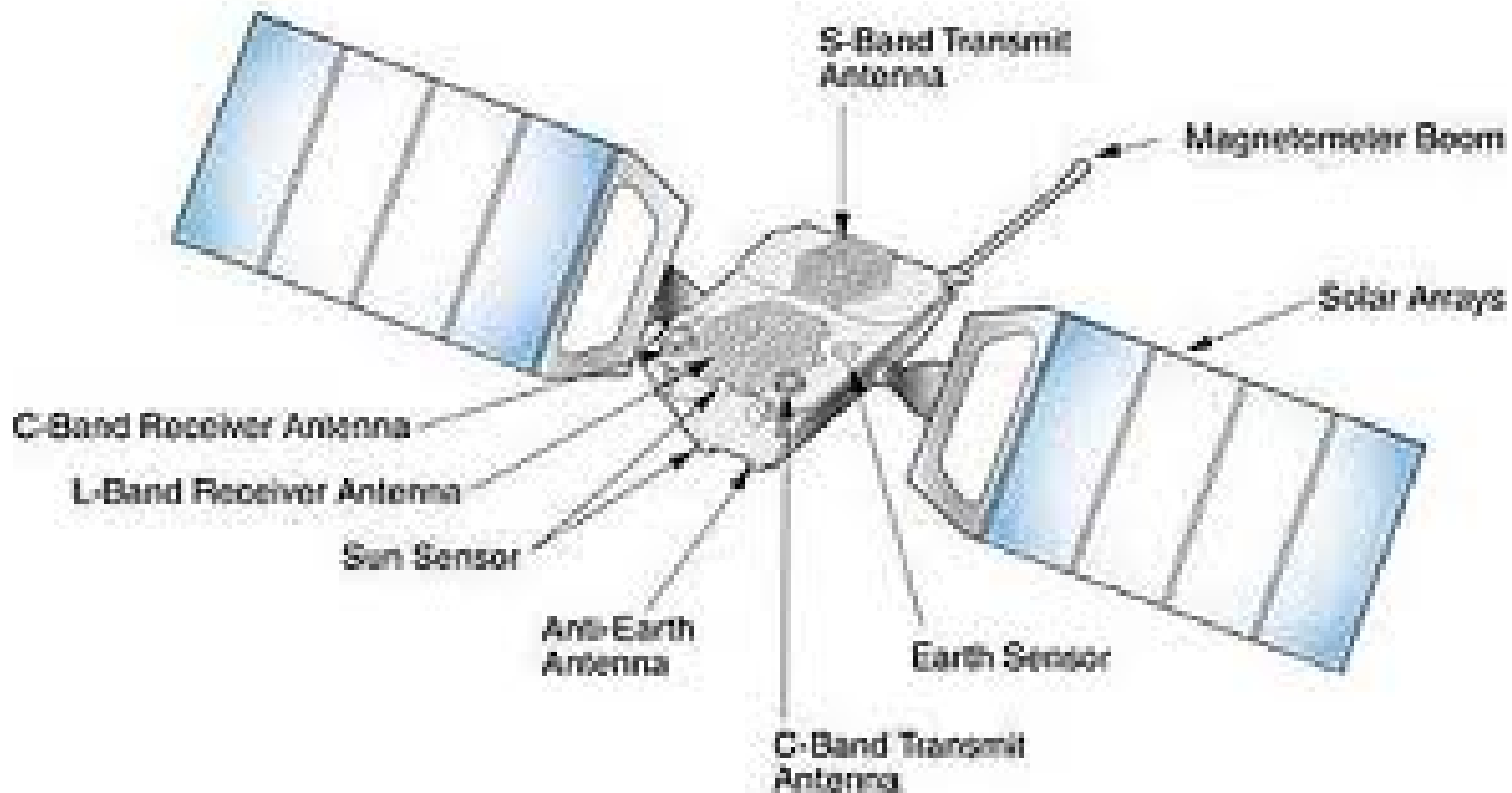
- **Tier I – ISP – Iridium Service Partners**
- **SPs sign up dealers, resellers and Service Providers**
- **Some SPs sell direct, compete w/channel**
- **Direct SP sales not always lower price**
- **A LOT of flexibility in rate plans:**

**Inclusive minutes, pooling, rollover**



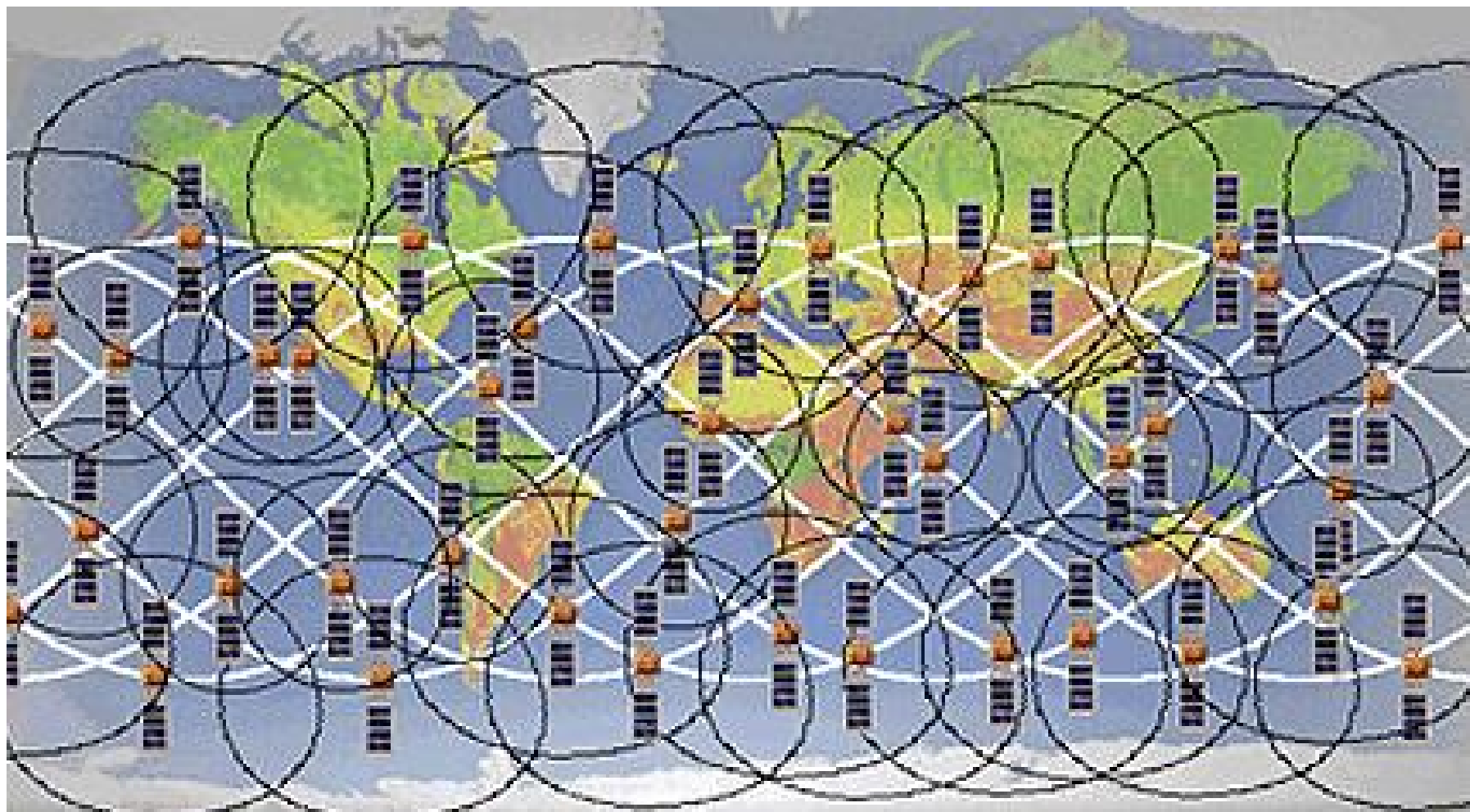
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# Globalstar satellite



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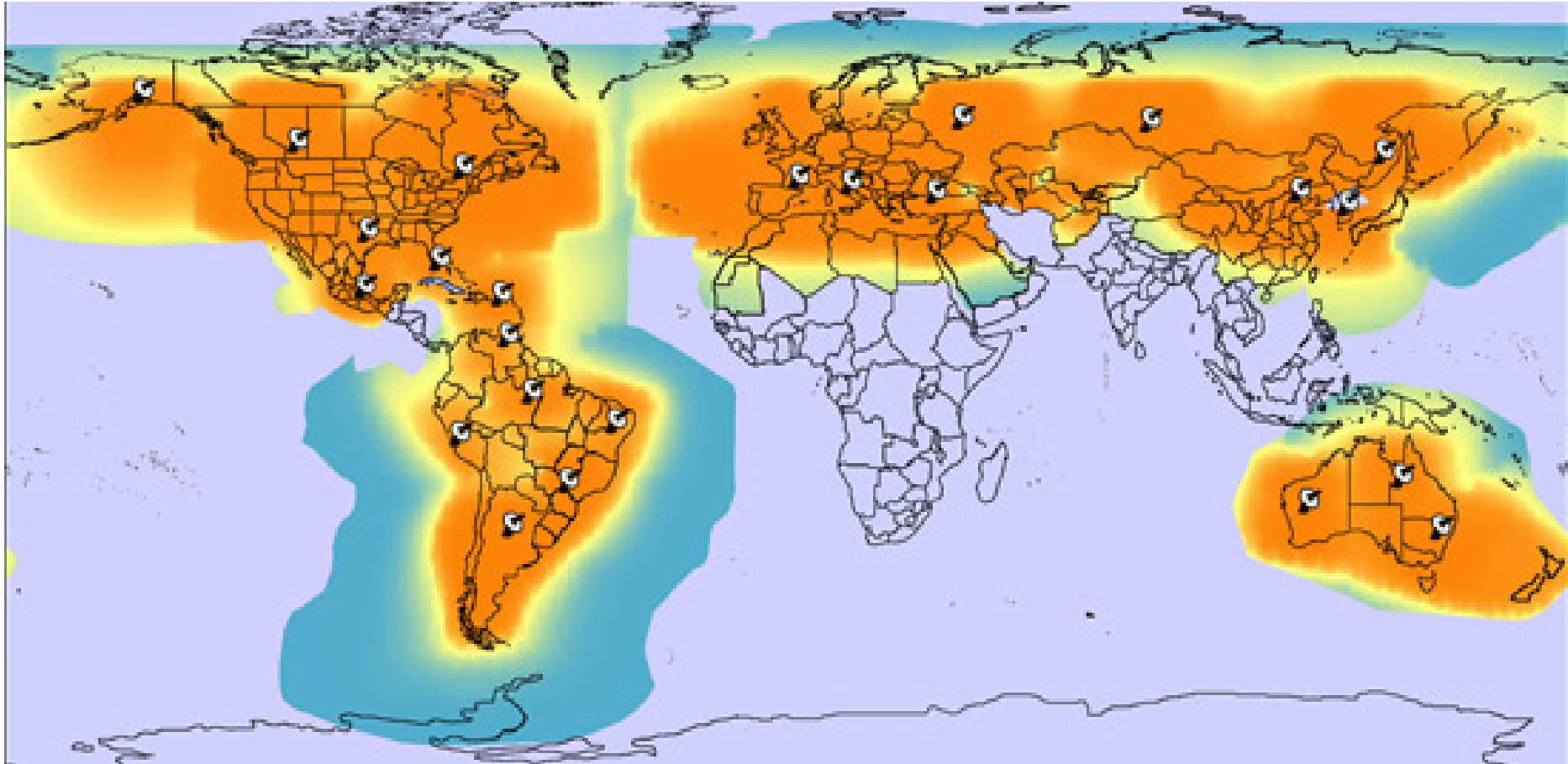
# Satellite footprints



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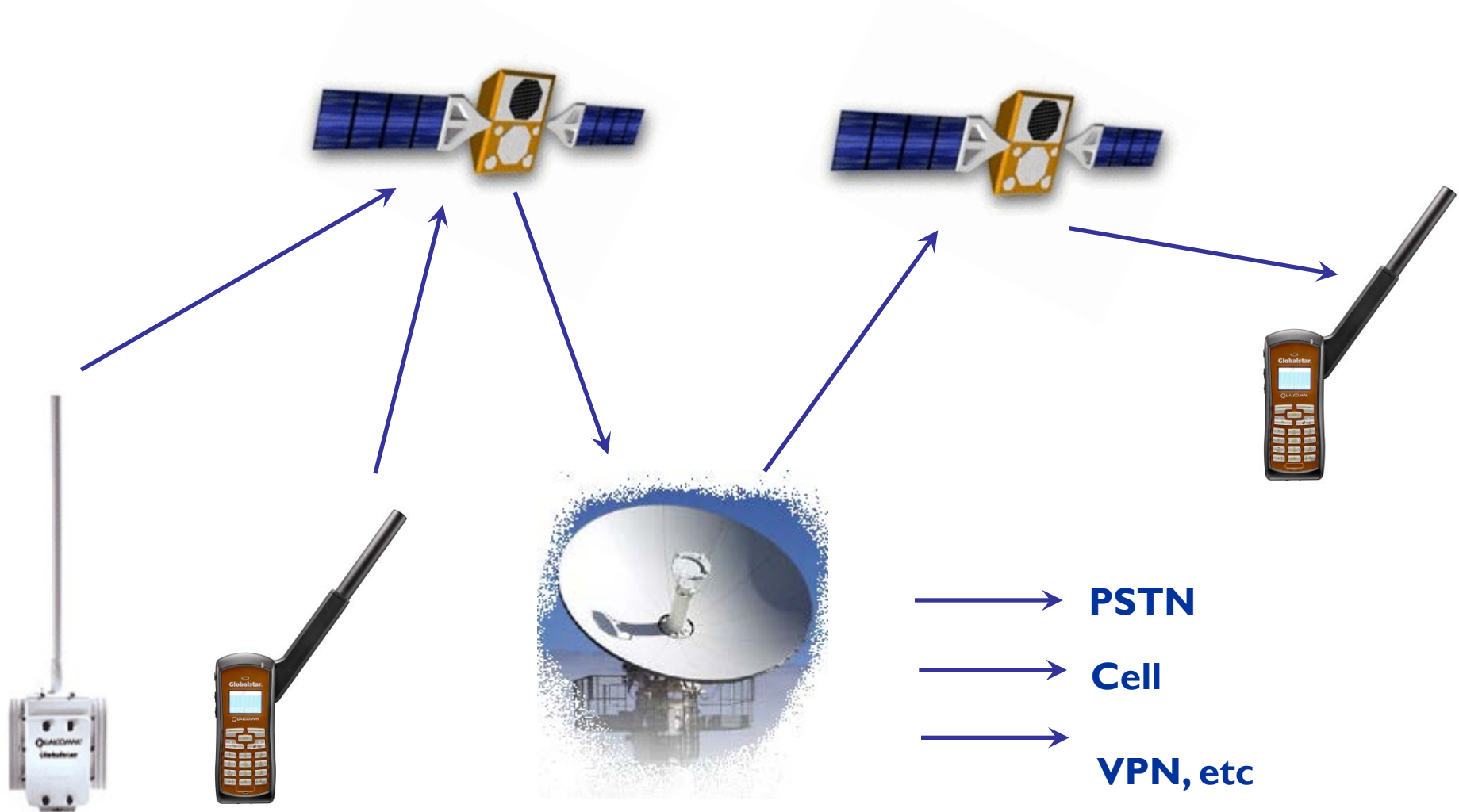


# Globalstar coverage



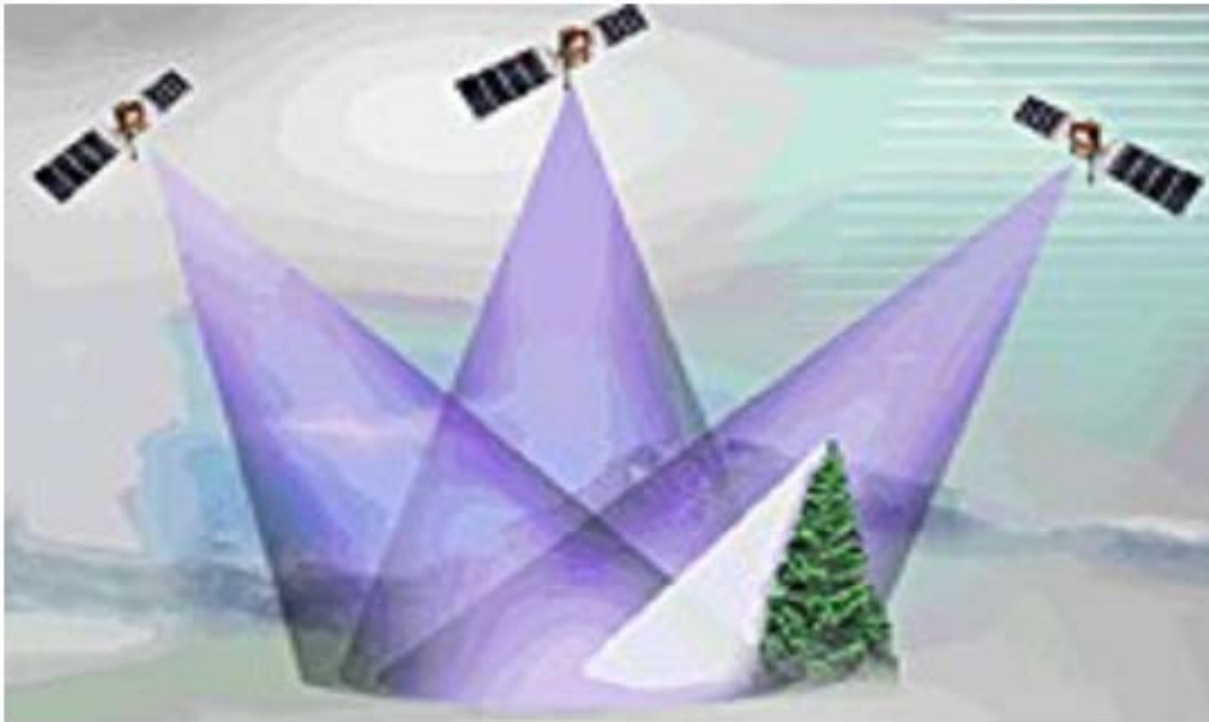
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# Satellite path



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# Path Diversity



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# Globalstar Service Update

- **Feb 2007 – report satellites radiated**
- **Limited connections; satellites to phones**
- **New constellation of 32 satellites**
- **October 2010, May 2011 online**
- **December 2011 launch**
- **Service at 50-60%**
- **Dispute with Thales Space Alenia resolved**
- **Next launch Q4 2012**
- **When operational – best service available**

# Globalstar phones and hardware



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# The Globalstar Advantage

- **Lower cost phones**
- **Monthly fee, unlimited airtime**
- **Lower cost rate plans, included minutes**
- **Locally-based numbers (ground station)**
- **I+ dialing (US based)**
- **Does not require int'l dialing**
- **Easy inbound calling**

# SPoT Personal Satellite Messenger

- **SPoT:**
  - November 2007
  - SPoT II 2010
  - SPoT connect 2011
  - 250,000+ units
  - 10,000 retail outlets
  - New product category



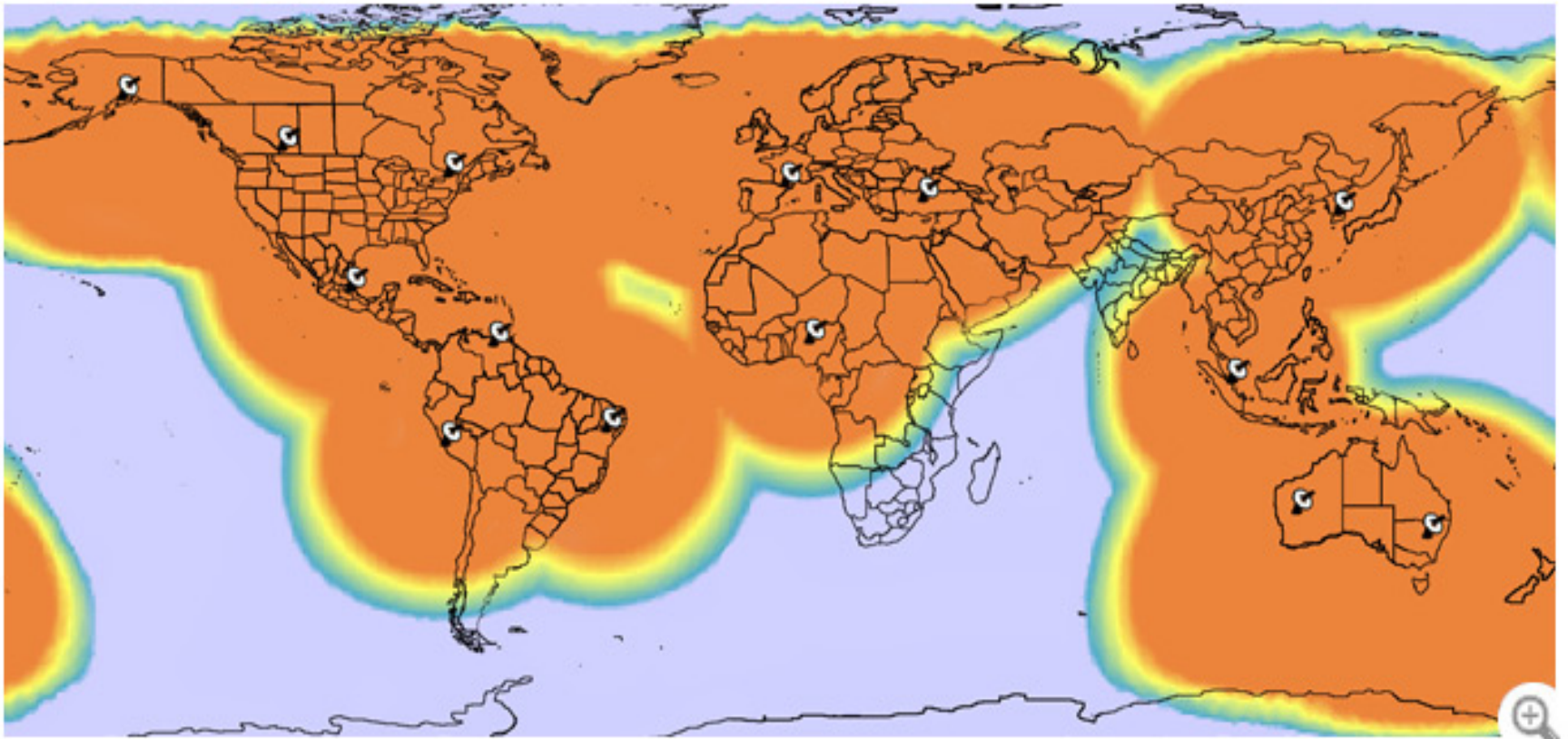
**SPoT**



**SPoT II**



**SPoT  
Connect**



Last Updated Dec, 2009

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# Globalstar Distribution Channel

- **Globalstar dealer network**
- **Dealers are direct with Globalstar**
- **All pricing is equal**
- **Choose dealer based on service**
- **Flexibility in rate plans:**

**Basic, inclusive minutes, pooling**

# VSAT

## Very Small Aperture Terminal

# What is VSAT

- **Parabolic Antenna**
- **Point, Check Signal and Clamp**
- **Choose your bandwidth**
- **Priced accordingly**
- **Single rate**
- **All you can use**
- **DISH, DirecTV**

# Terminals



Basic Low-cost System



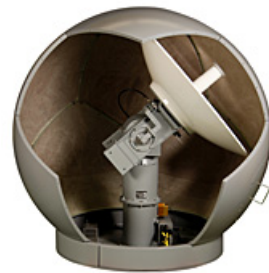
Auto-pointing Deployable



Non-penetrating Roof Mount



Marine Systems



UAV/UAS

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# Why VSAT?

- **Broadcast Capabilities**
- **Independence from Terrestrial Infrastructure**
- **Mobile or Transportable Systems**
- **Emergency Situations**
- **Redundancy/Backup for Terrestrial System**
- **Full office functionality**

# VSAT costs

## 'You Get What You Pay For'

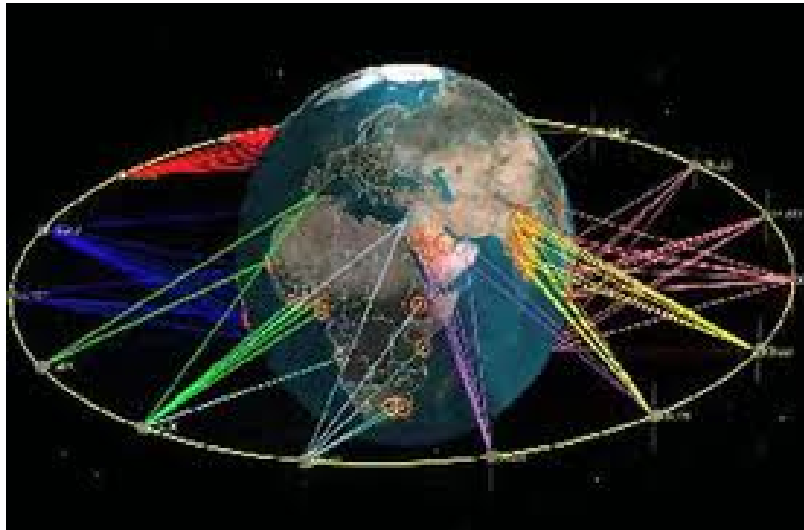
### Bandwidth determines antenna

- Larger antenna, lower speed ±\$15-30K
- Smaller antenna, higher speed ±\$30-50K
- Mobile, Aviation, Transportable up to \$100K

### Service: Determined by bandwidth, contention ratio

- 256/128 ±\$300- \$3,000/month
- 512/256 ±\$500- \$4,000/month

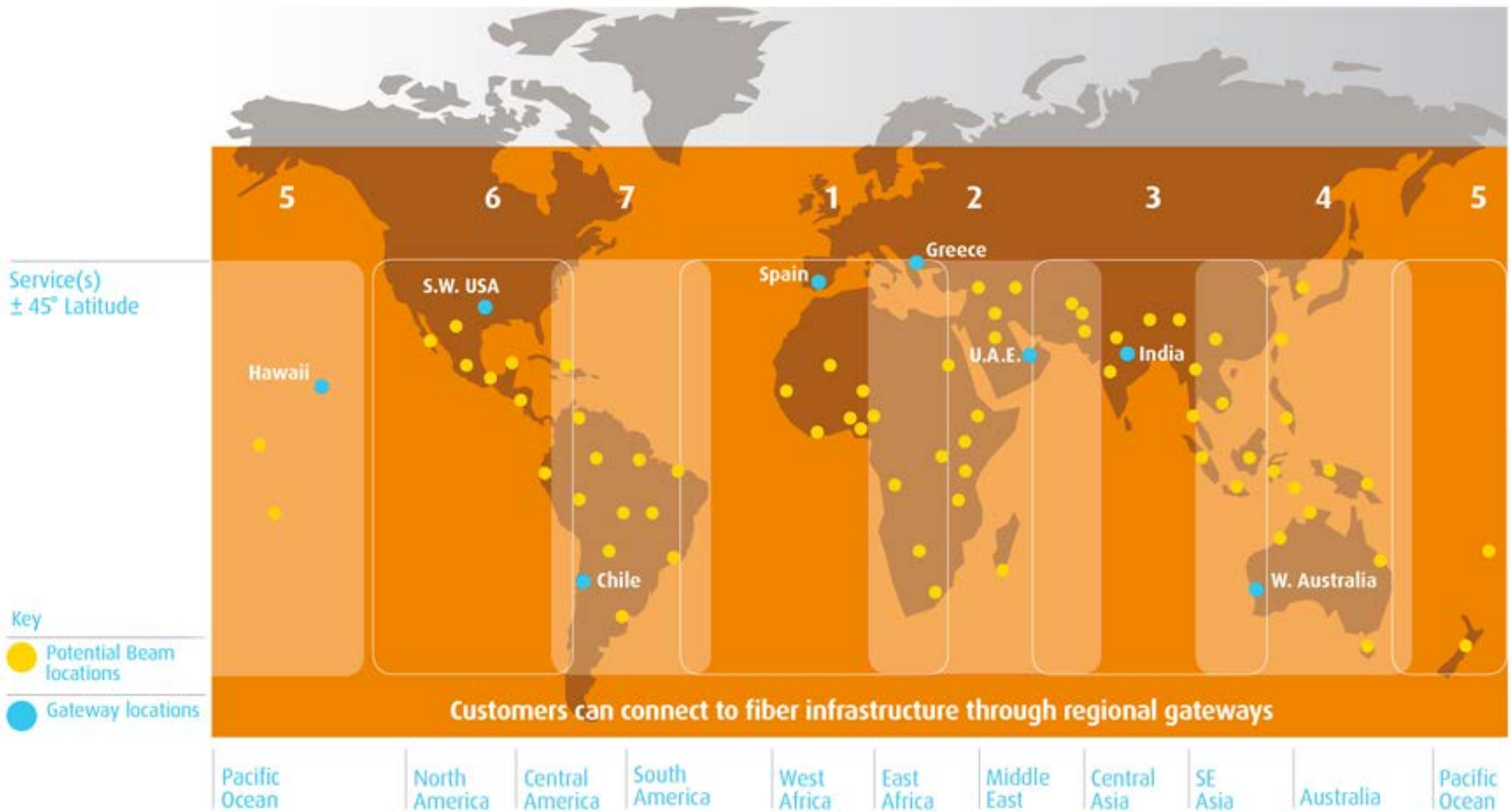




- 45° north/south
- 10 beams per region (7 regions) totaling 70 remote beams per 8 satellite constellation
- Up to 1.2 Gbps/beam (600 Mbps x 2)
- 84 Gbps per 8 satellite constellation
- Beam coverage: 700km diameter
- Transponders: 2 x 216 MHz per beam
- Launching 8 satellites in 2013
- Option for two more in 2014
- ViaSat infrastructure – Ka band
- Terminals/Antennas:
  - GD, Comtech, Gilat, Cobham
- Options, options....



# Coverage map



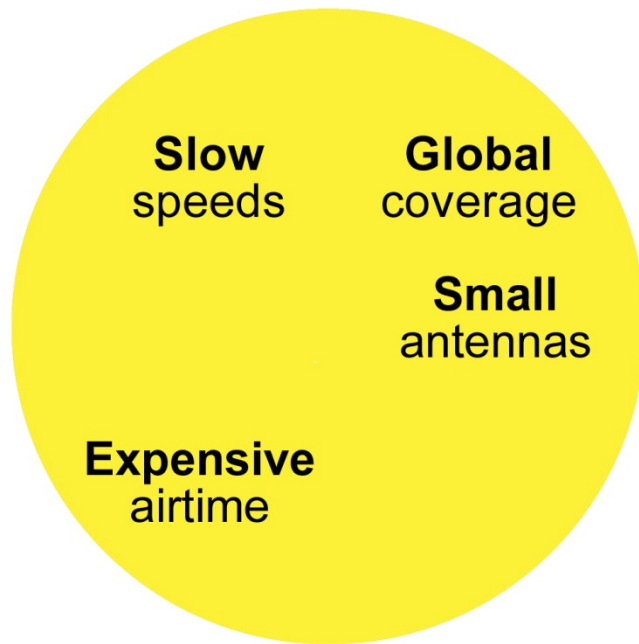
**KVH**

**KVH INDUSTRIES, INC.**

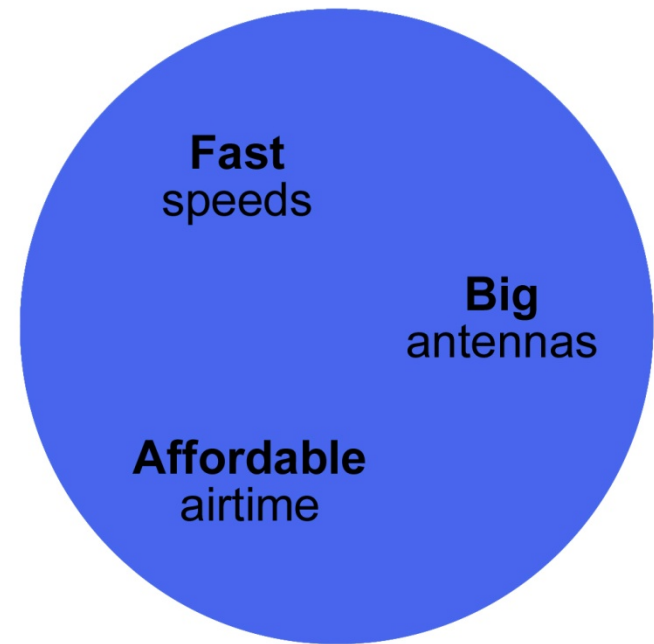
# Old SATCOM Compromise

Before KVH introduced mini-VSAT Broadband service, mobile connectivity was a compromise between expensive airtime or large antennas

## Inmarsat BGAN



## Traditional VSAT



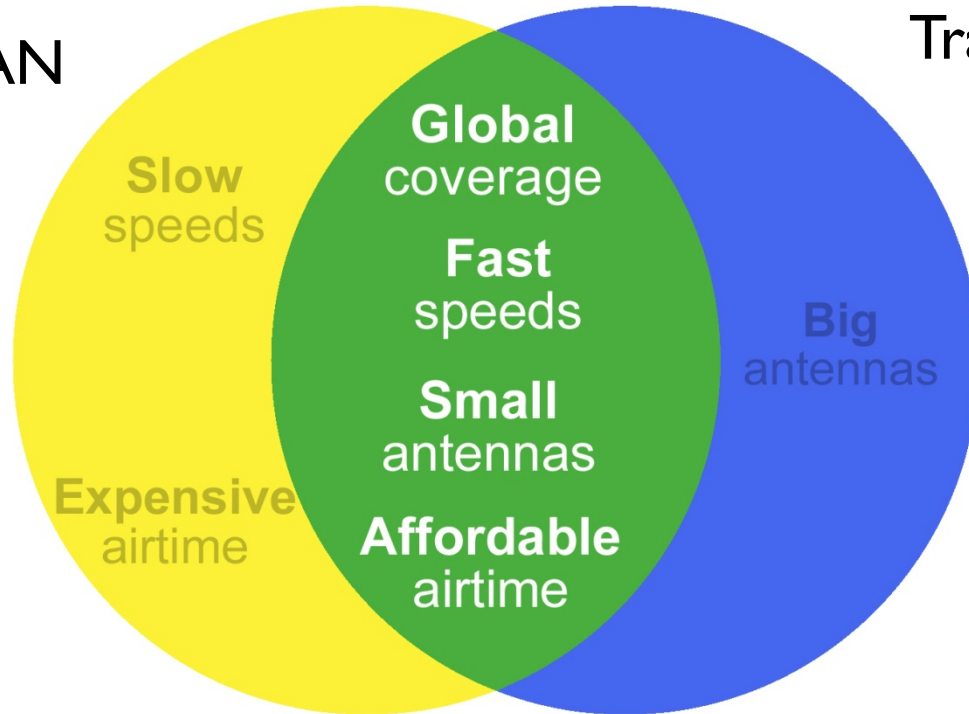
# No Compromises with mini-VSAT

KVH's mini-VSAT Broadband delivers fast, affordable service through ONE small antenna using ONE global network covering 95% of the Earth



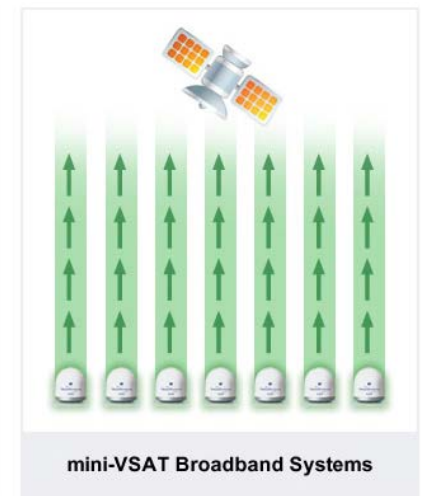
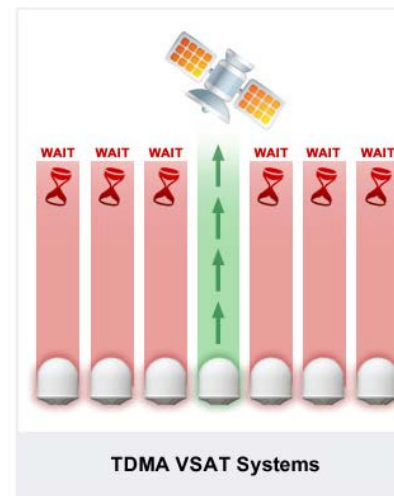
Inmarsat BGAN

Traditional VSAT

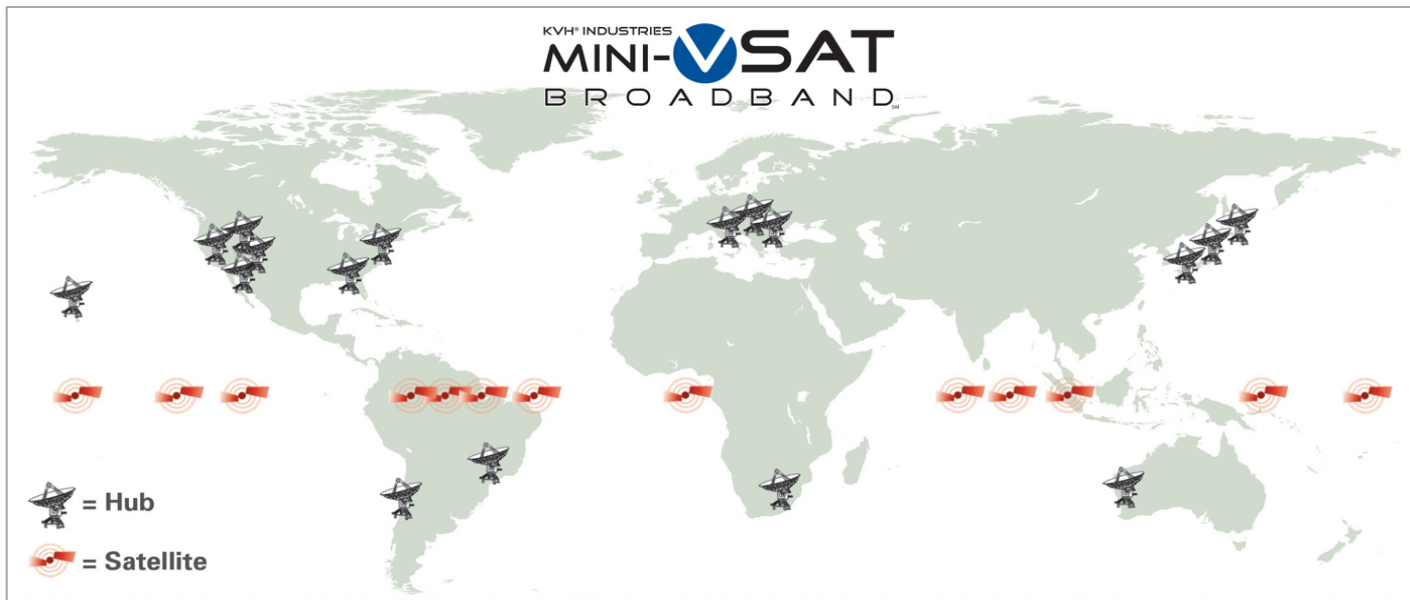


# Unique Spread Spectrum Technology

- **ViaSat next-generation ArcLight technology powers the network**
  - Designed for military to provide robust connectivity in mobile applications
  - Enables spectrum efficiency and data rates as fast as 4 Mbps with smaller antennas
  - CRMA (Code Reuse Multiple Access) frequency re-use and burst message transmission efficiency results in lower airtime costs
- **Critical benefits**
  - Simultaneous transmission of data at fastest data rates available
  - Lower contention than equally sized TDMA networks
  - Shorter ping times
  - 50% lower latency than competing services



# KVH built the mini-VSAT network with a robust, redundant infrastructure



## mini-VSAT Broadband Network: Land Earth Stations & Satellites

### U.S.A.; Kapolei, Hawaii

SAT – GE-23, 172°E;  
N. Pacific Ocean Region (NPOR)

### U.S.A.; Carlsbad, California

SAT – AMC-15, 105°W;  
Continental U.S.A.(CONUS-1)  
SAT – AMC-15, 105°W;  
Continental U.S.A.(CONUS-2)

### U.S.A.; Riverside, California

SAT – C-band;  
Atlantic Ocean Region (AOR)  
SAT – C-band;  
Pacific Ocean Region (POR)

### U.S.A.; Miami, Florida

SAT – AMC-21, 125°W;  
Caribbean (CARIB)

### Chile; Santiago

SAT – IS-14, 45°W;  
W. South America Region (WSAR)

### U.S.A.; Laurel, Maryland

SAT – T11N, 37°W;  
N. Atlantic Ocean Region (NAOR)

### Brazil; Rio de Janeiro

SAT – StarOne-C1, 65°W;  
Brazil (BRAZ)

### Italy; Turin

SAT – AB-2, 8°W;  
EMEA (EME1 & EME2)

### Germany; Fuchsstadt

SAT – C-band;  
Indian Ocean Region (IOR)

### Greece; Athens

SAT – NSS-6, 95°E;  
Middle East (M.E.)

### South Africa; Johannesburg

SAT – T11N, 37°W;  
W. Africa (AFRICA)

### Australia; Perth

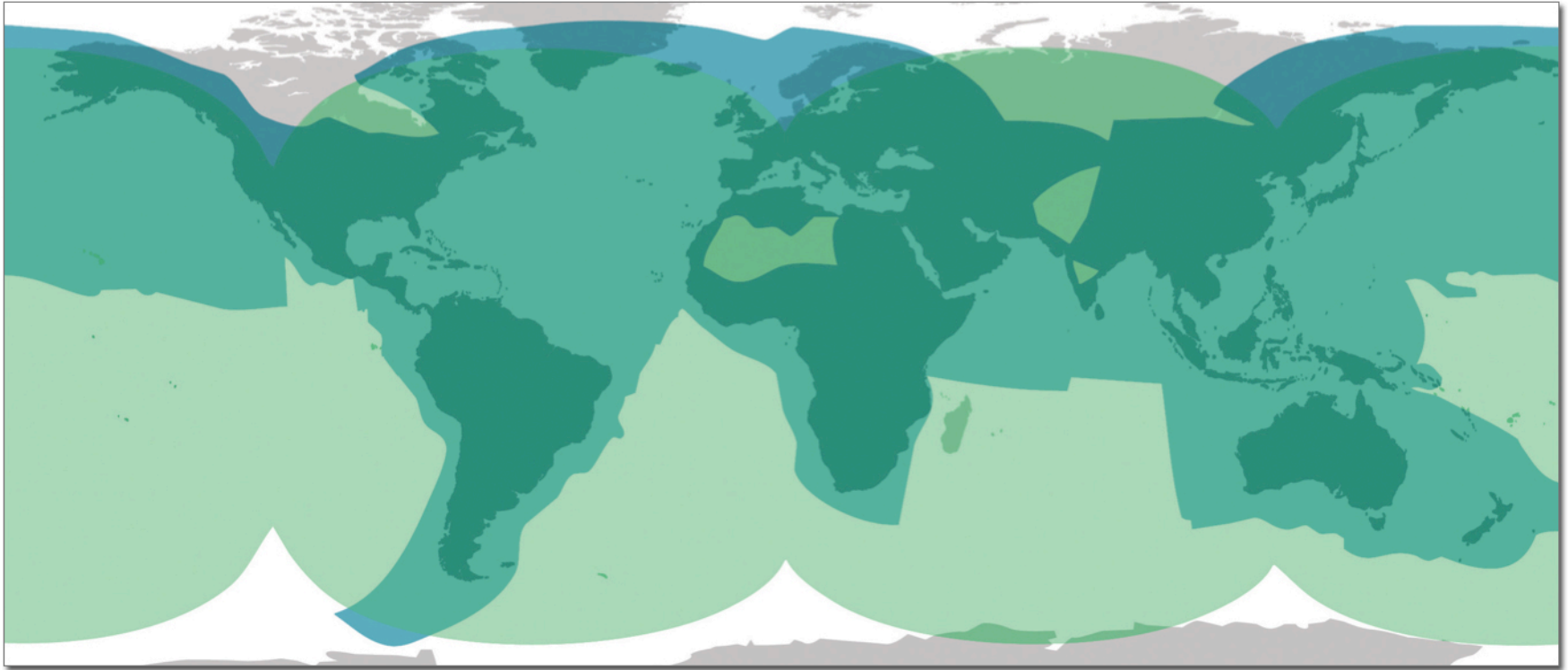
SAT – GE-23, 172°E;  
Australia/New Zealand (A/NZ)

### Japan; Yokohama

SAT – JSAT-1B, 150°E;  
Asia (ASIA)  
SAT – IS-15W, 85°E;  
W. Indian Ocean Region (WIOR)  
SAT – IS-15E, 85°E;  
E. Indian Ocean Region (EIOR)

# VSAT Coverage to 95% of Earth

- Providing fast, simple worldwide VSAT connectivity from ONE network



KVH® INDUSTRIES  
**MINI-VSAT**  
B R O A D B A N D™

■ Fielded Ku-band Coverage  
■ C-band Coverage (Q2 2012)

# TracPhone Systems for any application

- Three antenna options
  - Uniquely designed for different sized vehicles, vessels and applications
- One common integrated below deck unit providing same high quality unified network connections
- Tracphone V3
  - smallest, lowest cost Ku-band VSAT available with low priced, low commitment pay-as-you-go service
- Tracphone V7
  - compact, enterprise-class Ku-band VSAT with fixed or metered rate plans
- Tracphone V11
  - powerful global dual-mode C/Ku-band VSAT for anytime-anywhere connectivity



TracPhone V11  
Available June 2012



# Let's talk specific functionality

- **Portable VS. Fixed phones**
- **Docking Stations**
- **Multi-Line**
- **Secure/Non-Secure**

# Portable VS. Fixed

## Portable phones

- **Easy to carry**
- **'Grab and go'**
- **Best for field use**
- **Outdoor only**

## Fixed phones

- **EOC, Shelter**
- **Trailer, vehicle**
- **Plug into PBX**
- **Connect fax, PC**

# Docking stations

## Best of both worlds:

- Plug in portable phone
- Indoor use
- Connect to PBX, PC, fax
- Unplug phone, go to field



## **MXU:**

- **Four Iridium lines**
- **Four antennas**
- **All separate lines**
- **PBX, individually**

## **Open Port:**

- **3 Iridium voice lines, 1 data line**
- **One antenna**
- **Data up to 128k**
- **PBX, Ship's comms**

## **VSAT:**

- **Your choice**
- **Bandwidth**
- **= Functionality**
- **Custom build**

## **BGAN:**

- **VoIP solution**
- **Specific hardware**
- **Limited data**
- **More voice = less data**

# Secure vs. Non-Secure

## Secure:

- Iridium 9505A
- \$1600
- Sleeve = \$2500
- DISA SIM cards

## Non-Secure:

- IRDM, GSAT, iSAT
- Lower cost
- No sleeve
- Wide availability

**There are a wide array of satellite solutions offering diverse functionalities, flexible price points and rate plans.**

**No matter what your need or budget, there is a satellite solution to suit your requirements**



Louis Altman

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