



**Satellite Communications**  
TRANSFORMING LIVES

MIC/AFRM – GSC/AVIA/APSCC  
Ha Noi , 28<sup>th</sup> June 2019



Satellite Industry Coalition of Regional Associations covering Global, Regional & National Operators  
as well as Vendors

## Respond to Government requests for more detail on satellite industry:

### Concerns:

- ◆ Lack of information!
- ◆ Satellite services are “peripheral and expensive”!
- ◆ We don’t know what you do and what you need!

- ◆ **Knowledge transfer:** Impact of satellite industry innovations on cost, connectivity and spectrum
- ◆ **Understanding & awareness:** Technical, operational, regulatory aspects of satellite service provisioning
- ◆ **Support preparations for WRC:** Need for inputs post CPM to WRC-19 regional preparatory group meetings on key agenda items to ensure continued services enabled by satellite in various bands including C, L, S, KU, Ka and Q/V

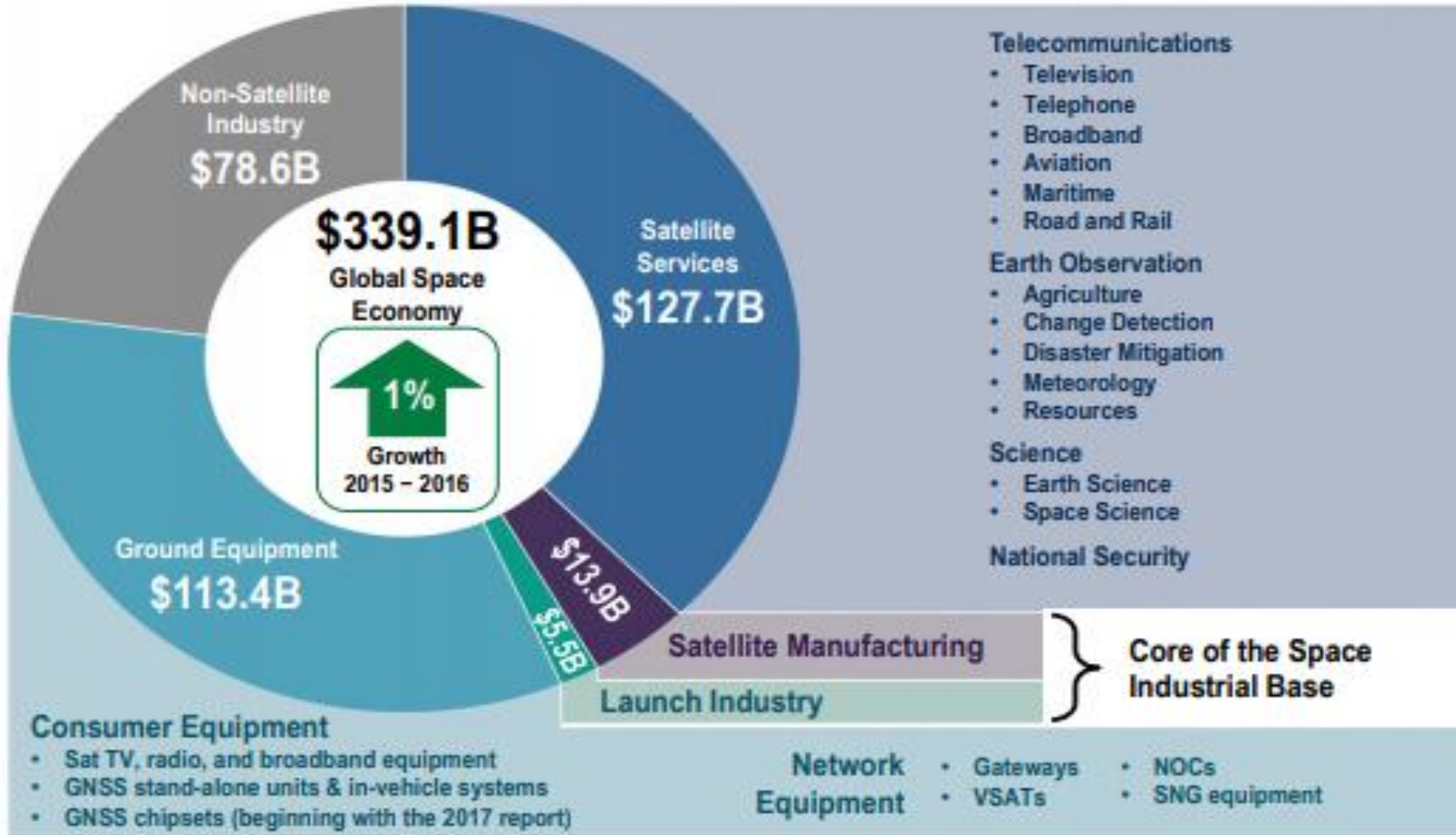
# Satellite Industry Workshop Agenda

Timing	Topic
08:30 – 09:00	Registration-Tea/Coffee
09:00 – 10:30	Opening Ceremony – Minister HE. Mr. Nguyen Manh Hung
	Satellite constellation systems and regulatory issues by Nguyen Huy Cuong, ARFM
	<b><u>Advances in Satellite Technologies – Next Generation of satellites &amp; constellations</u></b>
	<ol style="list-style-type: none"> <li>1. <b>Overview and introduction</b> by Bashir Patel GSC Senior Regional Advisor</li> <li>2. <b>GSO Constellations (MSS &amp; FSS) – Satellite Broadband</b> <ol style="list-style-type: none"> <li>a. <b>Inmarsat’s GX constellations</b> - by Bashir Patel GSC Senior Regional Advisor</li> <li>b. <b>Viasat 3<sup>rd</sup> Generation - VHTS</b> by Peter Girvan, VP Asia-Pacific</li> <li>c. <b>Intelsat EPIC – HTS</b> by Oki Baskaroo, Asia-Pacific</li> </ol> </li> <li>3. <b>NGSO Constellations</b> <ol style="list-style-type: none"> <li>a. <b>One Web</b> – by Dr Siok Tan, Director, Asia-Pacific,</li> <li>b. <b>O3B – SES &amp; SpaceX – Starlink</b> – by GSC representative</li> </ol> </li> <li>4. <b>Satellite Integration into 5G</b> by Peter Girvan, VP Asia-Pacific – Viasat</li> </ol>
10:30 – 10:45	Health Break/Tea Coffee
10:45- 11:45	Uniqueness & major benefits of satellite services both in fixed and mobile environments by <b>Tare Brisibe, VP Asia-Pacific, SES</b>
	Future Spectrum roadmap - Satellite industry perspective by <b>Oki Baskaroo, Asia-Pacific, Intelsat</b>
	Key issues for Satellite Industry at WRC-19 by <b>Bashir Patel GSC Senior Regional Advisor</b>
11:45 – 12:30	<p>Panel Discussions on satellite Industry</p> <p>Moderator: Mr. Le Van Tuan – Deputy Director General of ARFM</p> <p>Ministry officials</p> <p>Other members of National Preparatory Committee</p> <p><b>GSC members, Viasat, Inmarsat, OneWeb, Intelsat, ASIASAT, Thaicom</b></p>
12:30 - 14:00	Lunch
14:00 - 16:00	Discussions on Earth Observation Satellites, Satellite & Service costs and technology transfer by leading satellite manufacturer / operator



## **Session 1: Introduction to GSC & Advances in Satellite Technologies**

# Global Satellite Industry Perspective





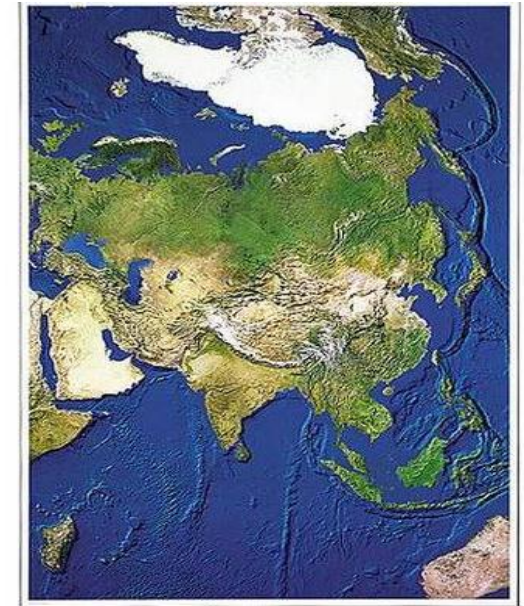
# Global Satellite Coalition Partners



Region 2



Region 1



Region 3

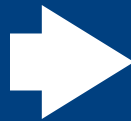


# Some of the well known members of Global Satellite Coalition (GSC)



# Unified Action, Common Vision

GSC –  
Satellite Industry  
Operators



• One Vision • One Voice •

A world where policy extends the benefits of innovation and technology development to society as a whole, so that digital, education, health & social divides across diverse geographies & economies, on land/sea/air are all bridged, leveraging satellite solutions in synergy with terrestrial communications to support economies of scale, reach & robustness.



## Network Services



**Cellular Backhaul**



**Maritime Communications**



**Oil & Gas**



**Aero Communications**



**Disaster Recovery**



**Enterprise**

## Media Services



**DTH TV Services**



**Cable Distribution**



**MCPC Platforms**



**Special Events**



**Satellite News Gathering**



**Mobile Video**

## Government Services



**ISR**



**Secure Communications**



**Hosted Payloads**



**End-to-end Communications**



**Embassy Networks**



**Space Situational Awareness**

# Diverse Services Relying on Satellite

E-learning - E-health -  
E-government - E-farming

Natural disasters -  
Emergency situations

Access to information &  
broadcasting services



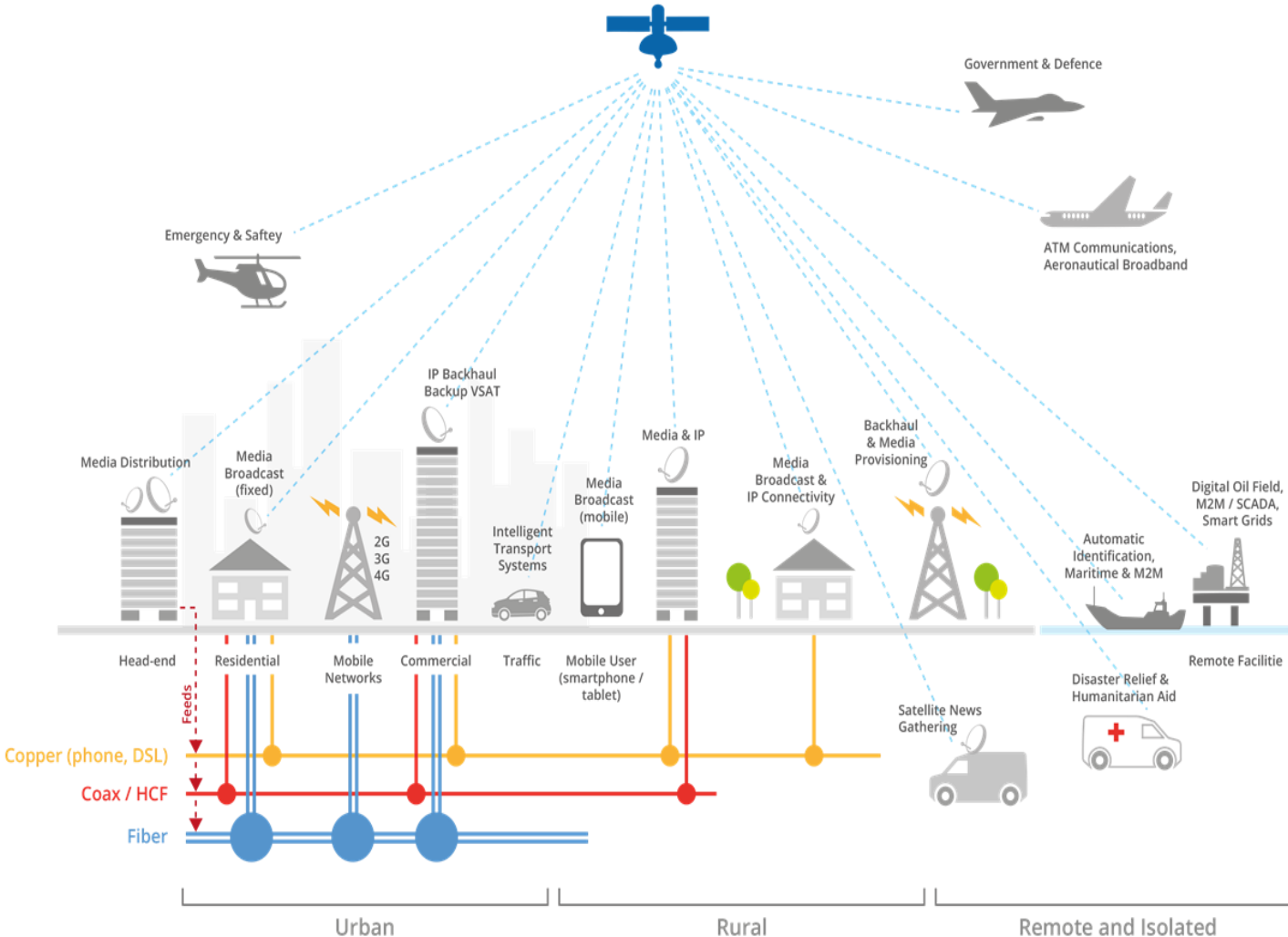
**Connectivity for everyone - Opportunities for ALL**



**Delivering on the SDGs • Driving Growth • Sustainable Solutions**



# The ICT Ecosystem



- ◆ Part of an eco-system that is relied on daily
- ◆ Interworking with other technologies
- ◆ Enabling numerous critical applications
- ◆ Civil, business & government users



# Advances in Satellite Technologies

## Its impact on Capacity, Costs & Spectrum



### **Session 3: Advances in Satellite Technologies & their impact on costs, capacity and spectrum:**

**“Digital divide” will be worse with 5G without satellite**

By 2020, LTE will cover  
**63%** of the worlds population but only  
**37%** of the landmass.

Source: OpenSignal

Generation	Device	Specifications
1G		<p><b>1G</b></p> <p>Year: early 90s</p> <p>Standards: AMPS, TACS</p> <p>Technology: Analog</p> <p>Bandwidth: -</p> <p>Data rates: -</p>
2G		<p><b>2G</b></p> <p>Year: 1991</p> <p>Standards: GSM, GPRS, EDGE</p> <p>Technology: Digital</p> <p>Bandwidth: Narrow Band</p> <p>Data rates: &lt; 80 - 100 Kbit/s</p>

Moving from a one-dimensional approach where people are connected



To an eco-system where global digital transformation is enabled through cross-sector collaboration



**Satellite strategies are adapting to growing end user expectations**

**4G**

**Proliferation of  
Mobile  
Devices**

**Bandwidth  
hungry apps &  
critical services**

**Cloud Computing**

**Interactive  
behaviour &  
OTT**

**High-speed access to anything, from any device, anywhere, anytime**



- **As terrestrial technologies both in fixed and Mobile environments have evolved.....**
  - Wired – from copper to fibre optics – high capacity urban rings
  - Terrestrial Wireless – Analogue – 2G – 3G – 4G/LTE - to future 5G / 6G
  
- **So has both Space and Ground segment technologies have evolved .....**
  - First Gen analogue Satcom to simple bend pipe technology to now on board digital signal processors
  - High capacity throughput – going up to several hundred Gbps
  - Advance resilient global network – end to end connectivity
  - Integrated solutions - inter-operable hardware / network solutions with move towards universal air interface (both terrestrial/satellite compatible)
  - Towards meeting future 5G needs

# Major Advances in Satellite Technologies

## Reduce infrastructure costs:

- ◆ More efficient payloads
- ◆ Advanced Electric Propulsion
- ◆ Lower dry mass - lattice like structures



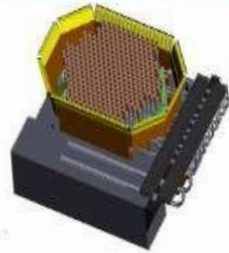
## Increased Payload Flexibility:

- ◆ Adv. Digital beam forming processors
- ◆ Advanced phased arrays
- ◆ Ka MPA - lower cost of capacity



## Resilient end-to-end ground network

- ◆ Higher performance, greater capacity, secure networks



## Lower cost launch vehicles

- ◆ Reduce launch mass
- ◆ Larger payloads



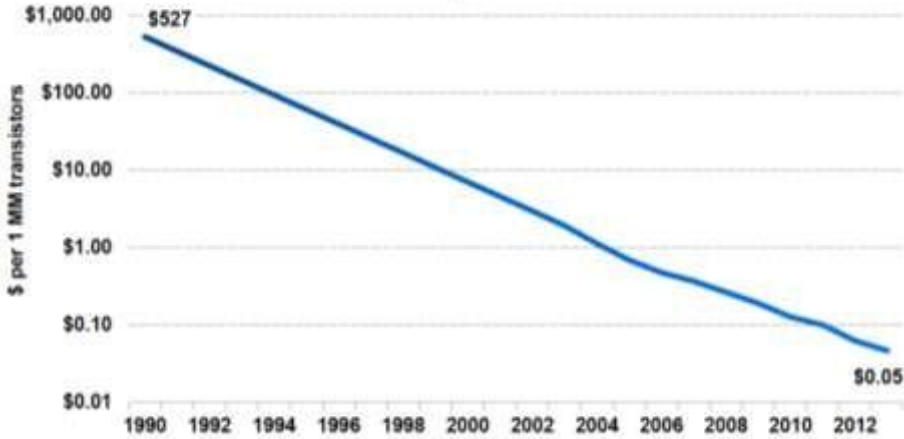
## HTS- 50-200 Gbps to 1 TBps by 2020s

- ◆ Innovation in ALL Satellite Bands
  - Hybrid C/Ku, L/S Bands
  - Ka-Band, Q/V Bands
- ◆ New Constellations - NGSO (1k+ satellites)
- ◆ Open Architecture (all IP & 5G)
- ◆ Higher Speeds 50/5 Mbps today
- ◆ Increased focus on M2M, IoT,
- ◆ Enhanced Utility for rural/remote
- ◆ Ubiquitous Connectivity Land/Sea/Air

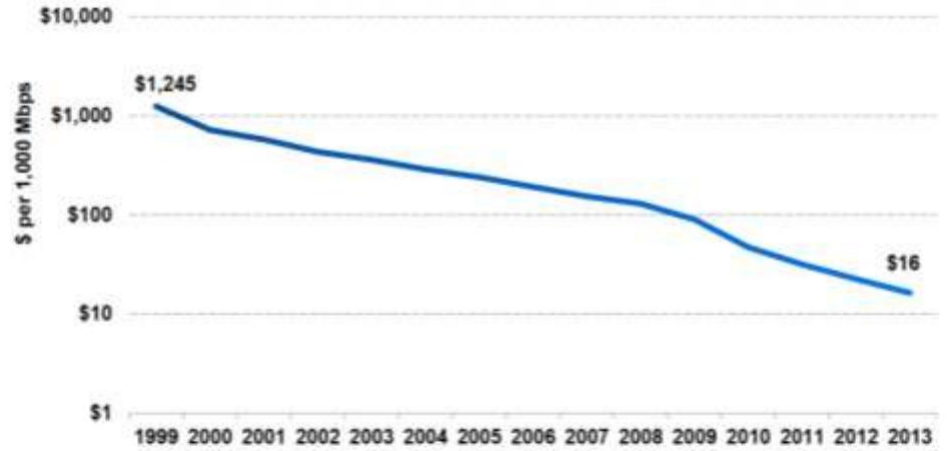
**Innovative use of new technologies is drastically reducing cost per Mbps**

# Economics underpin this transformation

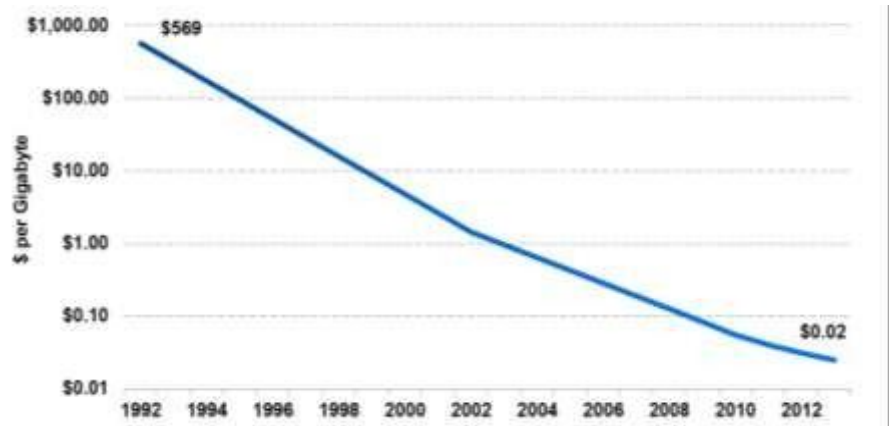
**Computing costs declined 33% p.a. since 1990 ...**



**... bandwidth 27% p.a. since 1999 ...**



**... and storage 38% p.a. since 1992**



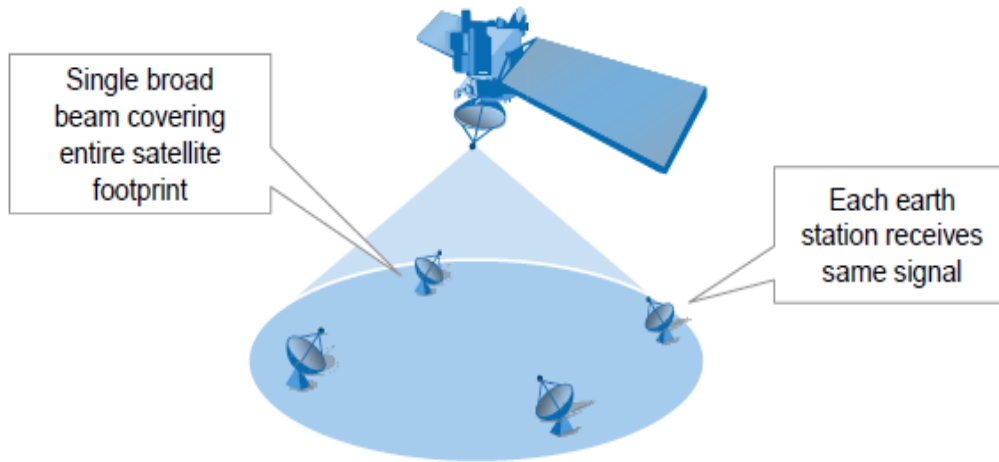
Source: International Data Corporation, Deloitte, 5/14

• **Dramatic Price/MB Decrease** •

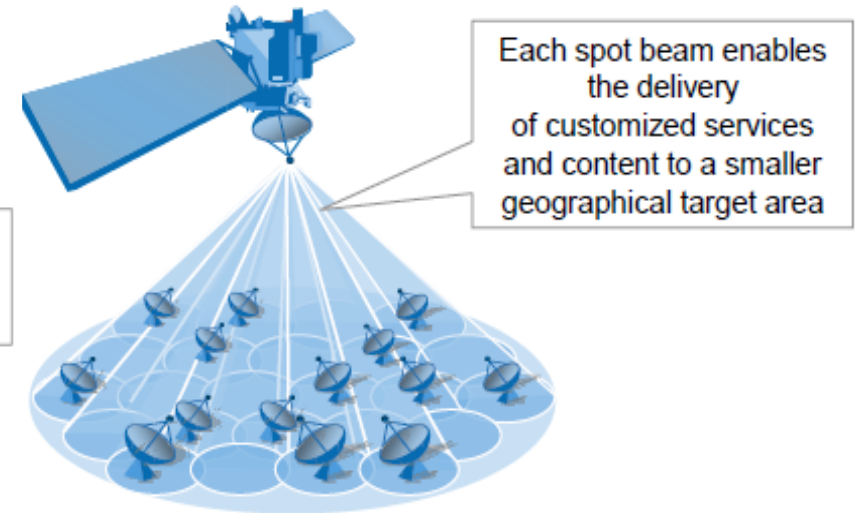
Launch Providers	Satellites	User Terminals	Baseband
<ul style="list-style-type: none"> <li>➤ New launchers on market</li> <li>➤ Reusable rockets</li> <li>➤ Cheaper Launchers</li> <li>➤ Mission Extension Vehicles</li> </ul>	<ul style="list-style-type: none"> <li>➤ Electric Propulsion</li> <li>➤ High Throughput + narrow-beam Satellites -&gt; 1 TBps by 2020</li> <li>➤ GEO/MEO/LEO systems - more scalable capacity</li> <li>➤ 60+ Ka-band systems: &gt;100 Ku/Ka band systems by 2020</li> </ul>	<ul style="list-style-type: none"> <li>➤ Smaller, thinner, lighter antennae</li> <li>➤ No moving parts (electronically steered antennae)</li> <li>➤ Lower production cost</li> <li>➤ User can install - small, easy to point antennae</li> </ul>	<ul style="list-style-type: none"> <li>➤ More efficient payloads</li> <li>➤ Increased processing power</li> <li>➤ Enhanced Link Efficiency</li> <li>➤ Data traffic acceleration + compression</li> </ul> <p>e.g. DVB-S2, Adaptive Coding Mod, Carrier in Carrier, MPEG-4 Video Encoder, Multi-Demod Hub Cards</p>



## Broad Beam Technology



## Multi-spot Beam Technology



HTS is a **game-changing industry** wide innovation reaching consumers as well as enterprises

Improve capacity availability

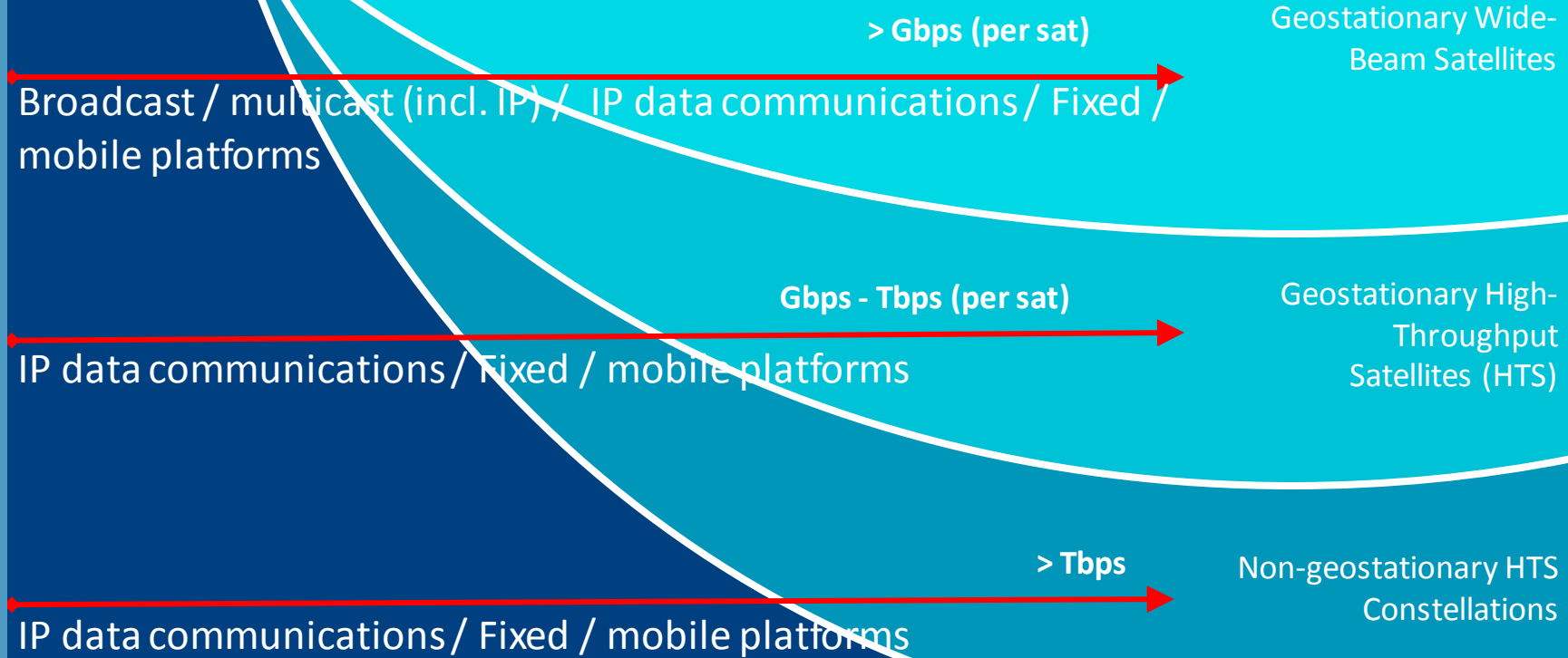
Higher throughput rates

Lower space segment cost per MB



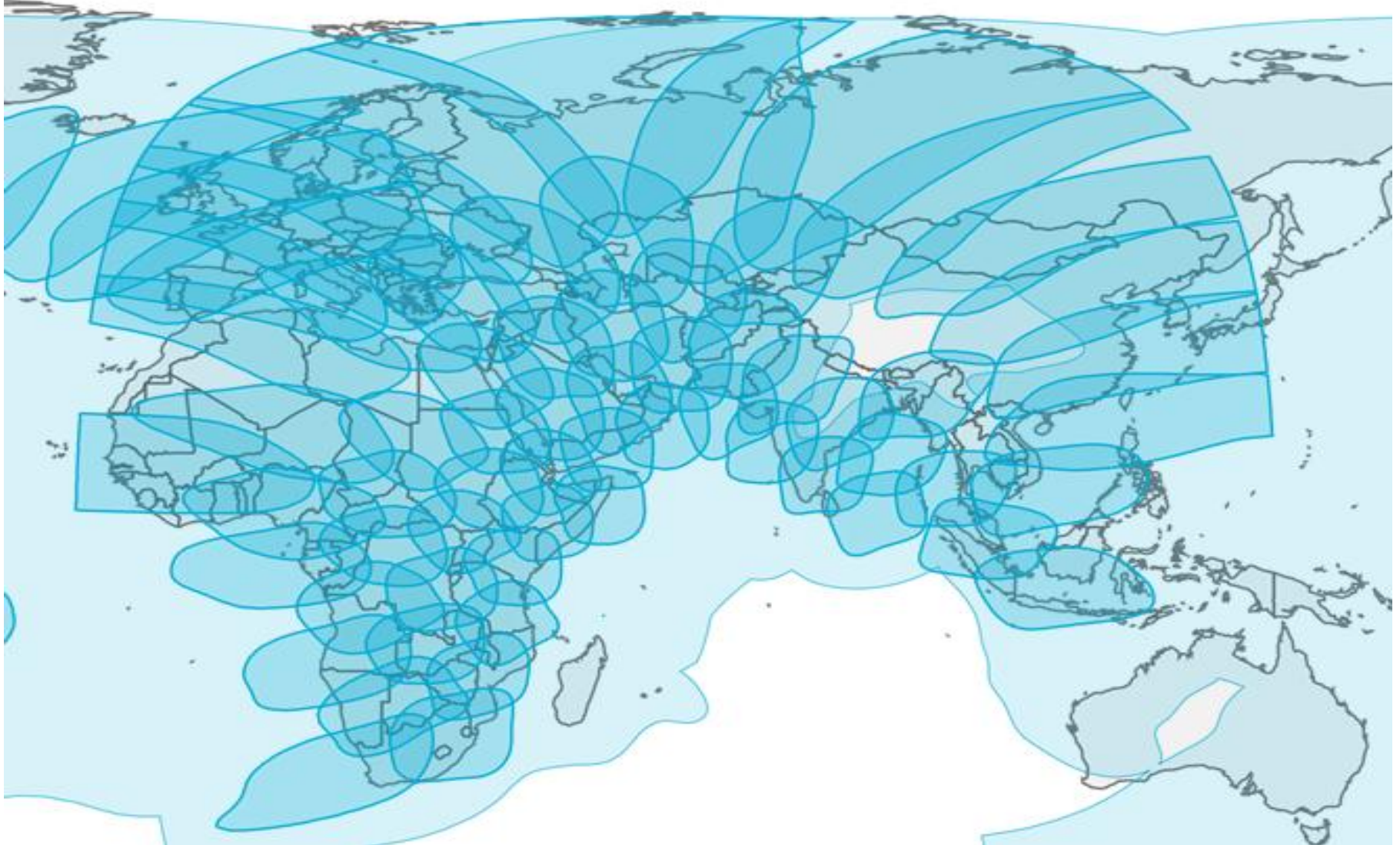
## Massive increase in available bandwidth

Increasing Capacity



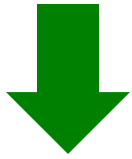
A broad range of satellite capabilities to support 5G deployment needs

## Next WAVE of GEO- HTS Satellite

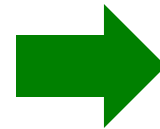




Yesterday Today →

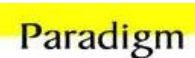


Future





- Broad range of terminals for air, sea and land
  - Launch manufacturers selected, contracts awarded
  - Ranging from 45-240 cm, most available at service launch
- Ka-band facilitates dual-use
- Hybrid L-Ka options



# Portable and Mobile Services Satellite Communications Antennae

## Portable antennae



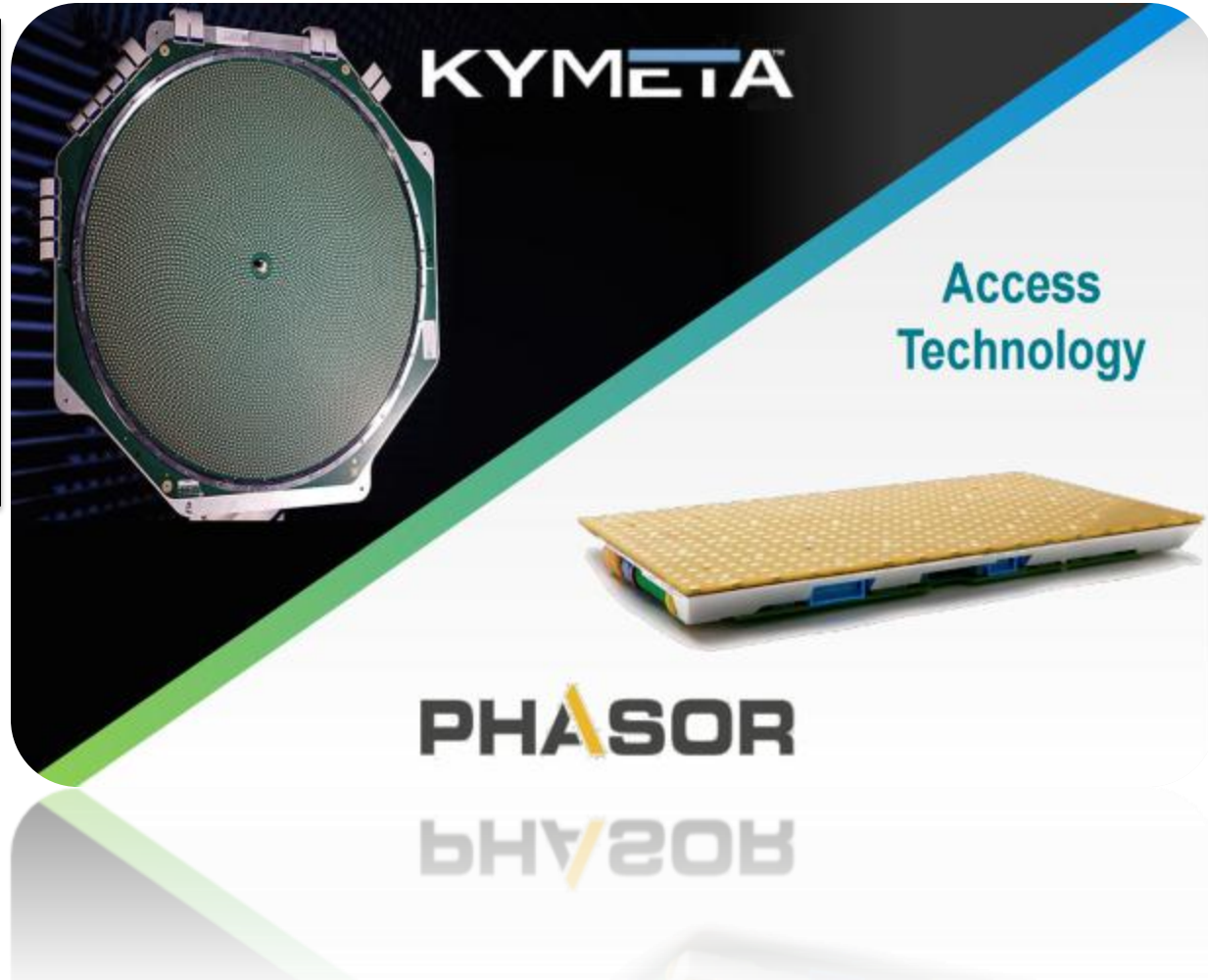
## Vehicular antennae



## Maritime antennae



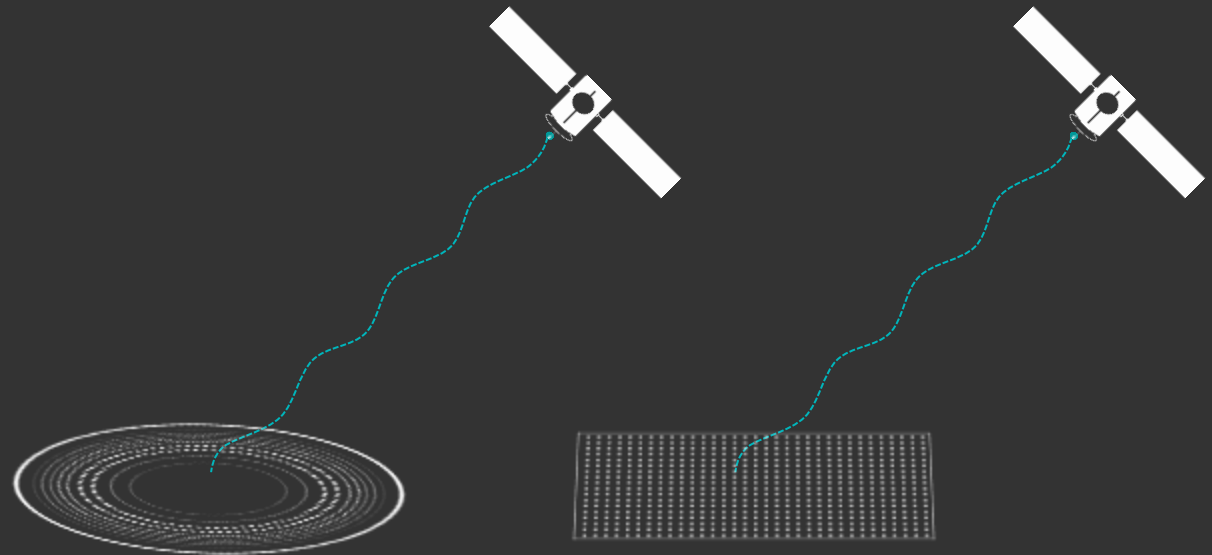
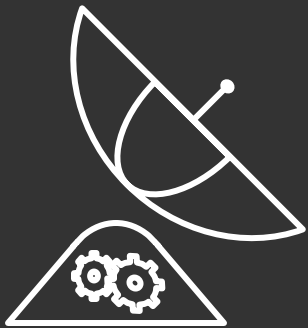
- Business jets
- Cars
- Hand-held devices
- IoT applications
- Sensors



*Advancements in ground segment technology are enabling access to new and previously un-served segments*

# Kymeta – Phased Array Antennas

- › Electronically Steered Antennas (ESA)
- › No moving parts
- › Ultrathin and light



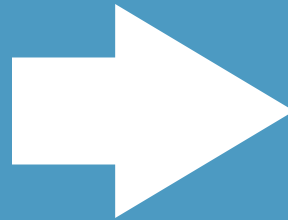
- › Metamaterial
- › Passive array

- › Active phased array
- › Panels may be laid CONFORMABLY



# Satellite Operators are also evolving... .....Technically & Commercially

**From wholesale providers  
of bandwidth**



**To value-added partners**

**Inherent satellite strengths are directly relevant to the Gigabit Society**

**COST**

Reduced cost with High  
Throughput Satellites

**QUALITY**

Very high quality services  
to multiple user segments

**REACH**

Instant global  
distribution network

**RESILIENCE**

Highly secure  
networks

**Multi-media /  
Video**

Smart Cities

**Broadband  
Access**

Smart  
Agriculture

**IoT / M2M**

Aero-  
connectivity

Connected Cars /  
Trains / ITS

• **Enhanced Performance** • **Efficient Spectrum usage** • **Cost Effective** • **Affordable** •

- ◆ **Satellites now match level of terrestrial telco charges**
- ◆ **User terminals cost only few hundred \$ (same order of magnitude as an iPhone)**
- ◆ **Monthly fees start at few tens of \$ per month (just like mobile data plans)**
- ◆ **Moving towards open architecture (all-IP & 5G) enabling fully integrated heterogeneous networks**
- ◆ **Deployment of terrestrial devices at edge of satellite networks for scale/cost benefits**
- ◆ **Growing focus on mobility / M2M services - more capable L/S-band systems**
- ◆ **Resilient end-to-end ground network: higher performance, greater capacity, secure network**

# Satellite

## Beyond the reach of other technologies

### **Next Session 2: GSO Constellations**

**2a: Inmarsat's GX Constellation**

**2b: Intelsat EPIC**

**2c: Viasat's 3<sup>rd</sup> Generation**