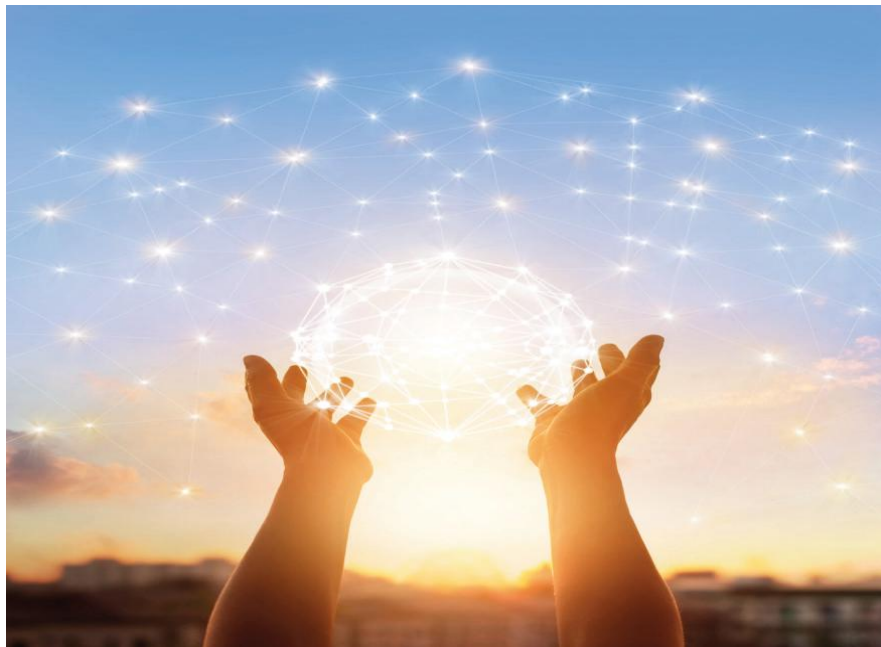
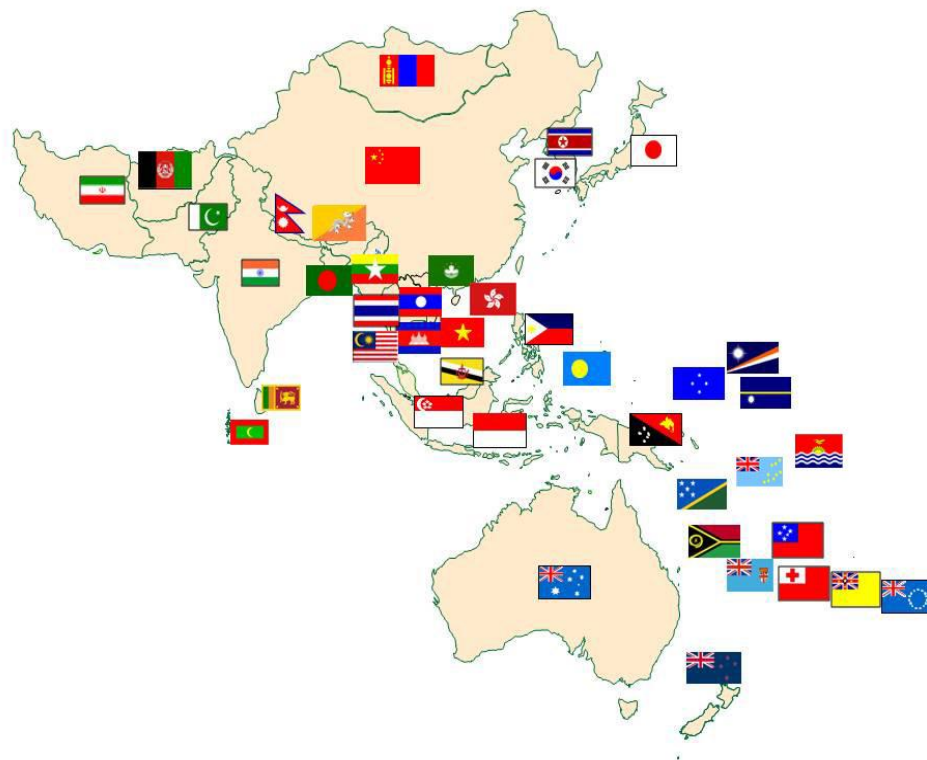




Satellite Communications TRANSFORMING LIVES

MCMC – GSC/AVIA/APSCC
New Delhi, 27th March 2019



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

Satellite Industry Workshop Agenda

<u>Agenda - 11th March</u>	<u>Timing</u>	<u>Lead</u>
Session	09.30-11.15	
0. Opening Ceremony & Lamp Lighting		
1. Welcome Address by Co-Chair of ITU-APT	09.30-09.40	Mr R.N. Agarwal
2. Introduction by President of ITU-APT	09.40-09.50	Mr Bharat Bhattia
3. Introduction to GSC & Advances in Satellite Technologies & its impact	09.50-10.20	Bashir Patel, GSC/Inmarsat
4. Future benefits of satellite Services 4a. Delivering future satellite services to rural areas	10.20-10.40	Sathya Narayanaswamy, VP, Viasat Gaurav Khoder, C Mgr, Intelsat
5. Keynote Address by Joint Wireless Advisor, DoT	10.40-10.50	Sh. R.B.Prasad, JWA, DoT, GOI
6. Key Note Address by Guest of Honour	10.50-11.00	Shri M.P.Singhal, Sr.DDG, TEC
7. Address by the Chief Guest, WA , DoT, GOI	11.00-11.10	Mr G.K.Agarwal
8. Vote of Thanks by Former WA, GOI, RRB, VP-ITU-APT	11.10-11.15	Mr P.K.Garg
Health Break /Tea Coffee	11.15-11.45	ALL
9. DoS Perspective on WRC-19 Issues	11.45-12.05	Dr P.K.Jain, ISRO
10. India Perspective for satellites & 5G Industries	12.05-12.25	Shri Ashutosh Pandey, DDG Sat, TEC
11. Satellite Integration in to 5G & future benefits of satellite services	12.25-12.45	Sathya Narayanaswamy, VP, Viasat
12. Satellite Service licensing trends and regulatory environment	12.45-13.05	Dr Tony Azzeralli, One Web
13. Future Spectrum Roadmap – Satellite Industry perspective	13.05-13.25	Gaurav Kharod, C.Mgr, Intelsat
Lunch Break	13.45–14.45	
14. Panel Discussions on Satellite Industry – WRC19 key satellite issues 14a. Key issues for satellite Industry at WRC-19 & discussions	15.00-17.00 15.00-15.30	ALL Bashir Patel, GSC/Inmarsat

Respond to government concerns expressed to 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



Session 3: Introduction to GSC & Advances in satellite technologies & its impact

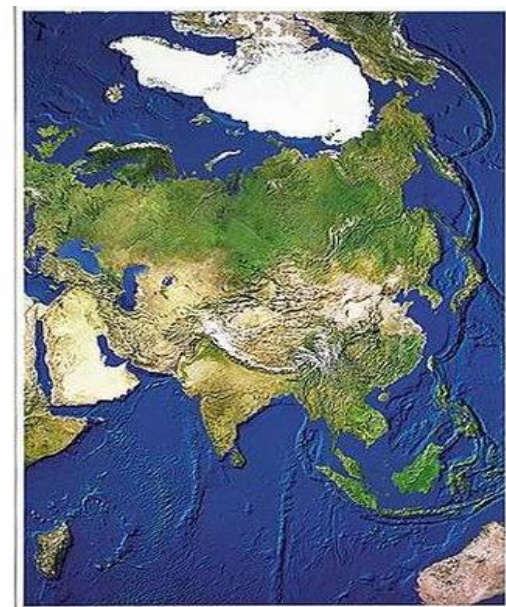
Global Satellite Coalition Partners



Region 2



Region 1



Region 3



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



Portfolio of Services provided across APAC

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**

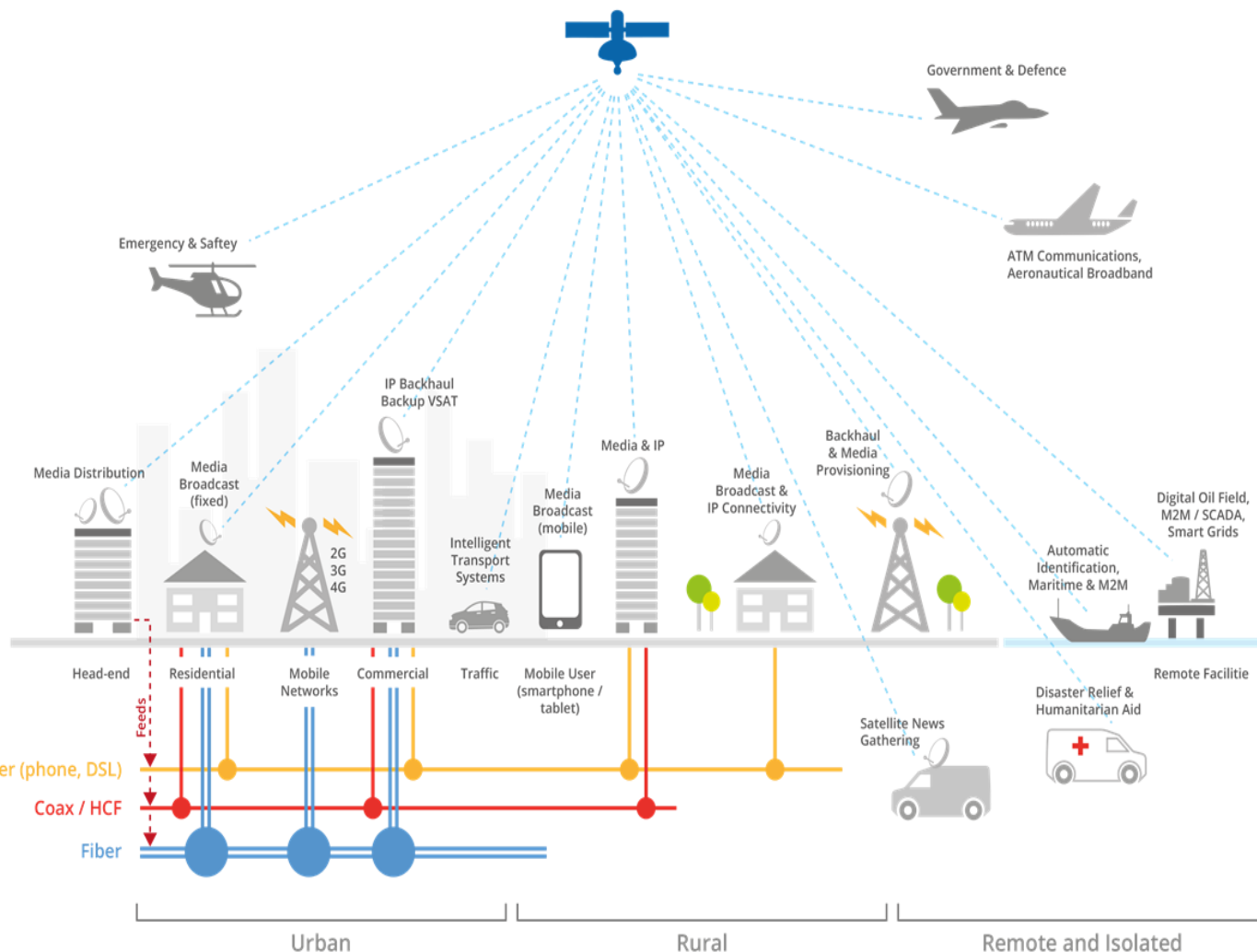


Connectivity for everyone - Opportunities for ALL



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



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

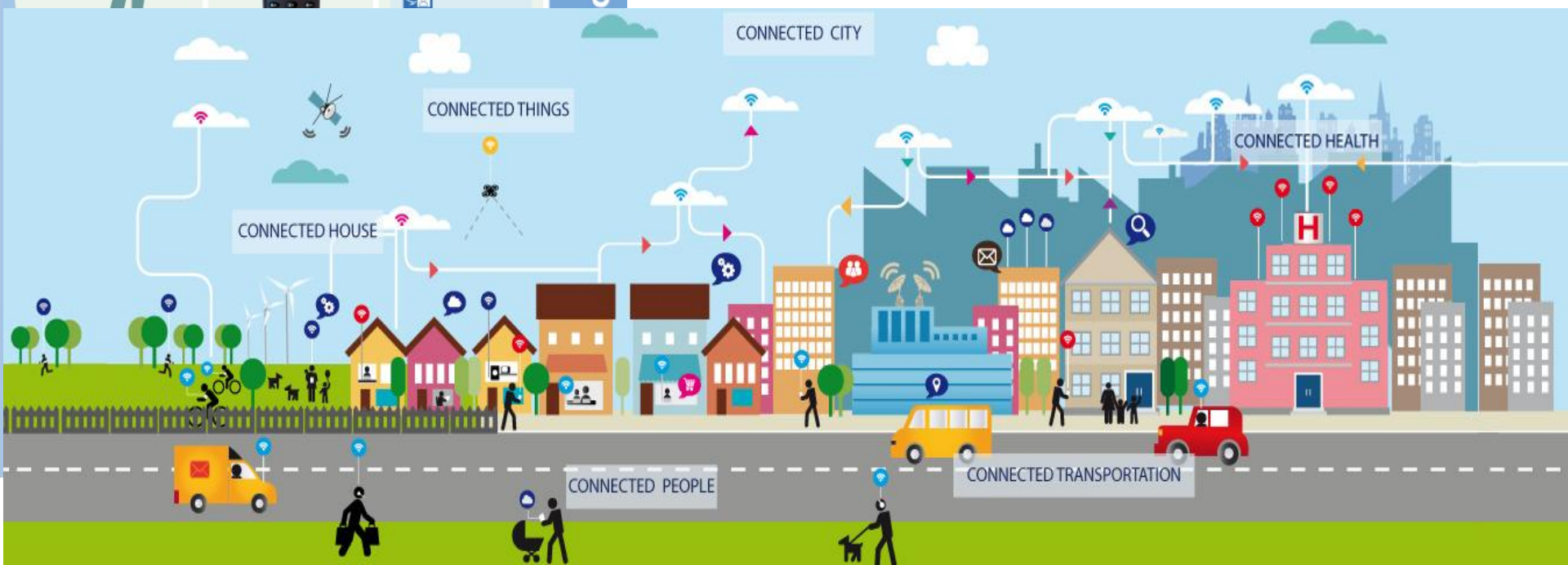
Drivers for Satellite Innovation (2)

Generation	Device	Specifications
1G 		1G Year early 80s Standards AMPS, TACS Technology Analog Bandwidth – Data rates –
2G 		2G Year 1991 Standards GSM, GPRS, EDGE Technology Digital Bandwidth Narrow Band Data rates < 80 - 100 Kbit/s 

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



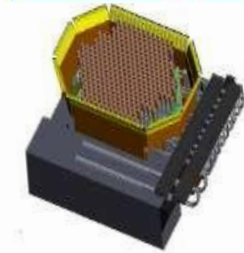
Increased Payload Flexibility:

- ◆ 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



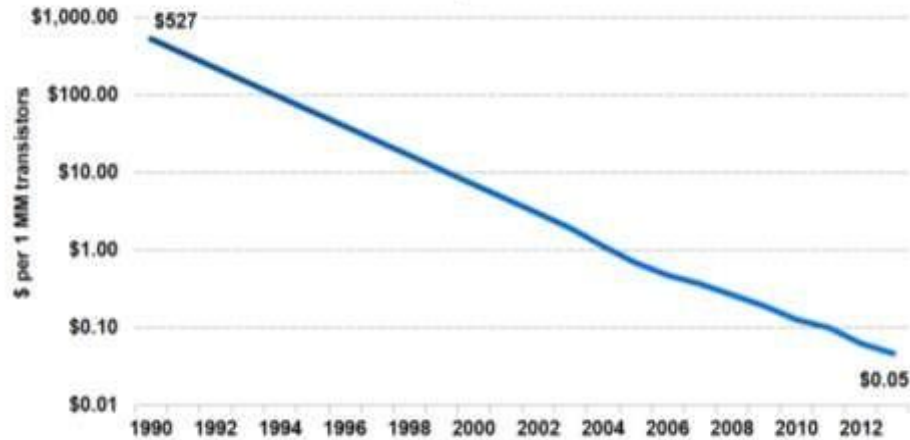
HTS- 50-200 Gbps to 1 TBps by 2020s

- ◆ 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

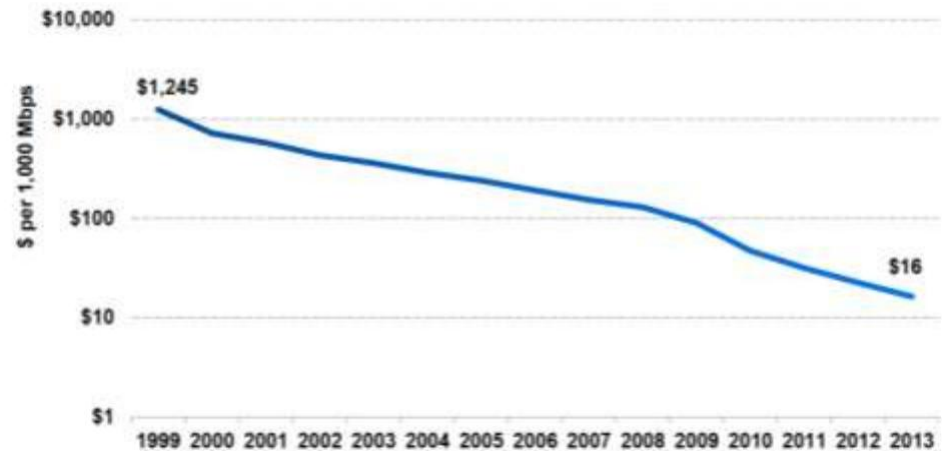
Innovative use of new technologies is drastically reducing cost per Mbps

Economics underpin this transformation

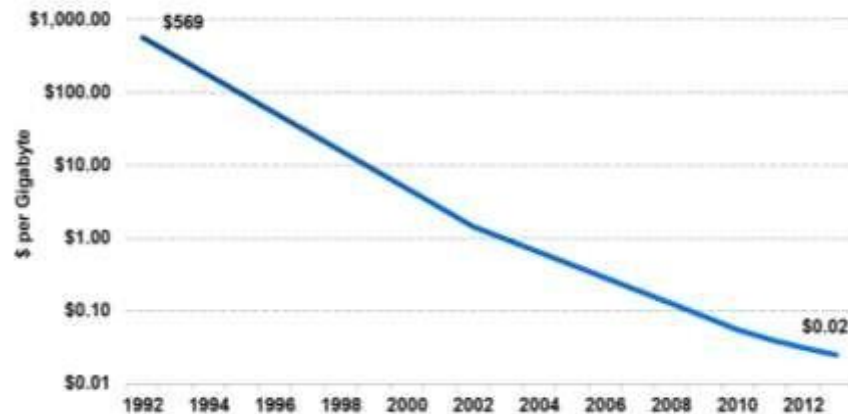
Computing costs declined 33% p.a. since 1990 ...



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



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

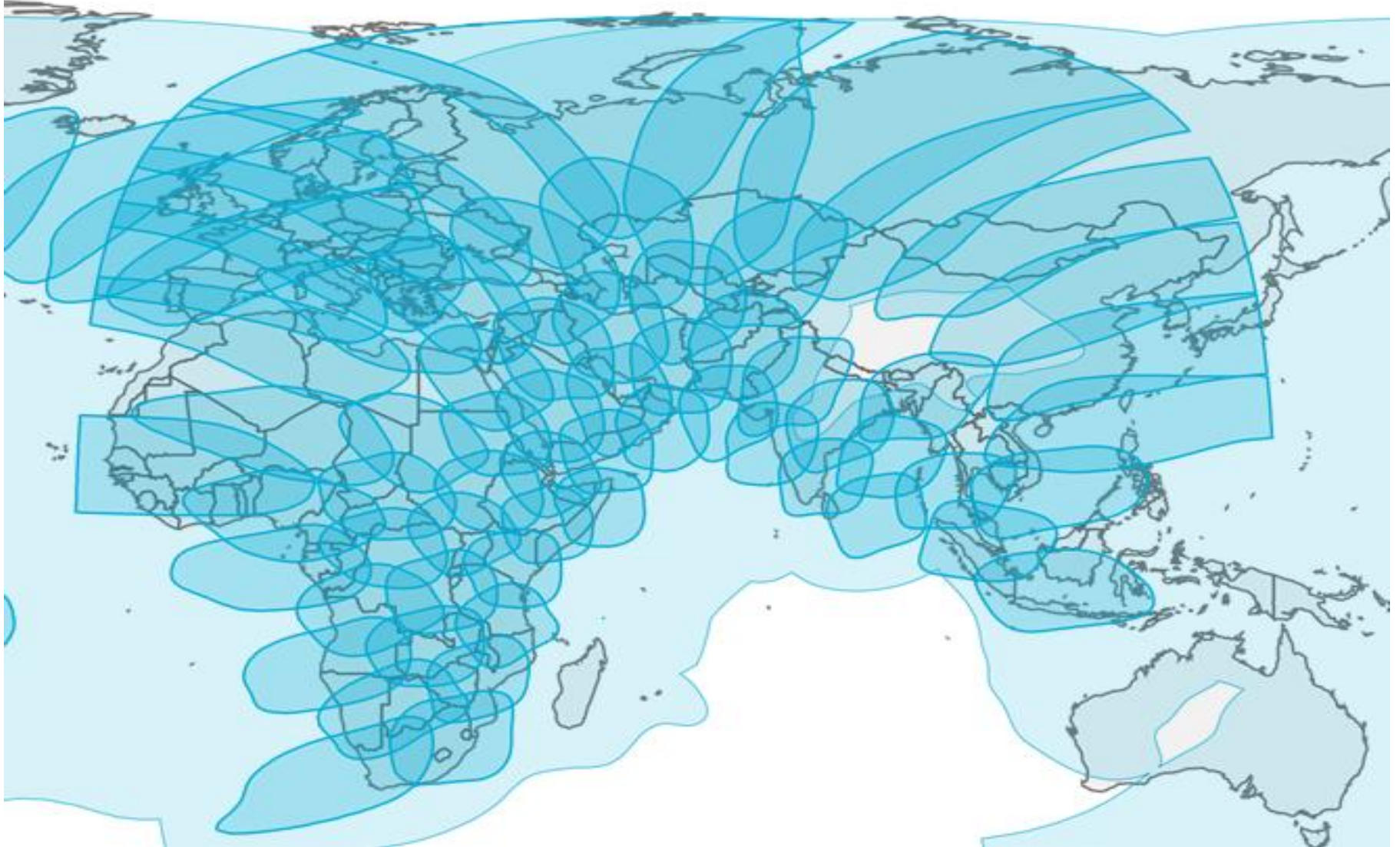


Advances in Satellite Technology

• Dramatic Price/MB Decrease •

Launch Providers	Satellites	User Terminals	Baseband
➤ New launchers on market ➤ Reusable rockets ➤ Cheaper Launchers ➤ Mission Extension Vehicles	➤ Electric Propulsion ➤ High Throughput + narrow-beam Satellites -> 1 TBps by 2020 ➤ GEO/MEO/LEO systems - more scalable capacity ➤ 60+ Ka-band systems: >100 Ku/Ka band systems by 2020	➤ Smaller, thinner, lighter antennae ➤ No moving parts (electronically steered antennae) ➤ Lower production cost ➤ User can install - small, easy to point antennae	➤ More efficient payloads ➤ Increased processing power ➤ Enhanced Link Efficiency ➤ Data traffic acceleration + compression e.g. DVB-S2, Adaptive Coding Mod, Carrier in Carrier, MPEG-4 Video Encoder, Multi-Demod Hub Cards

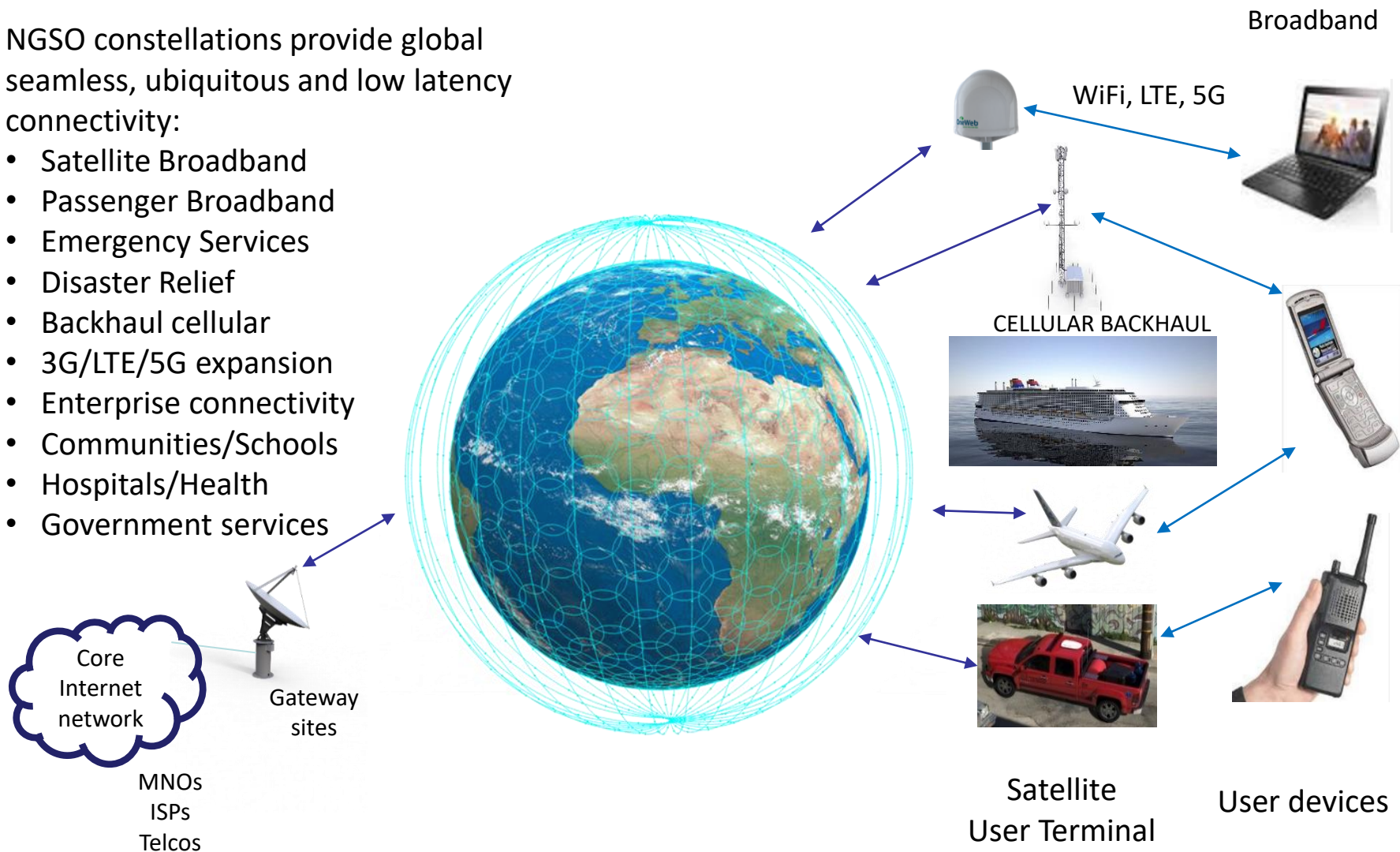
Next WAVE of GEO- HTS Satellite



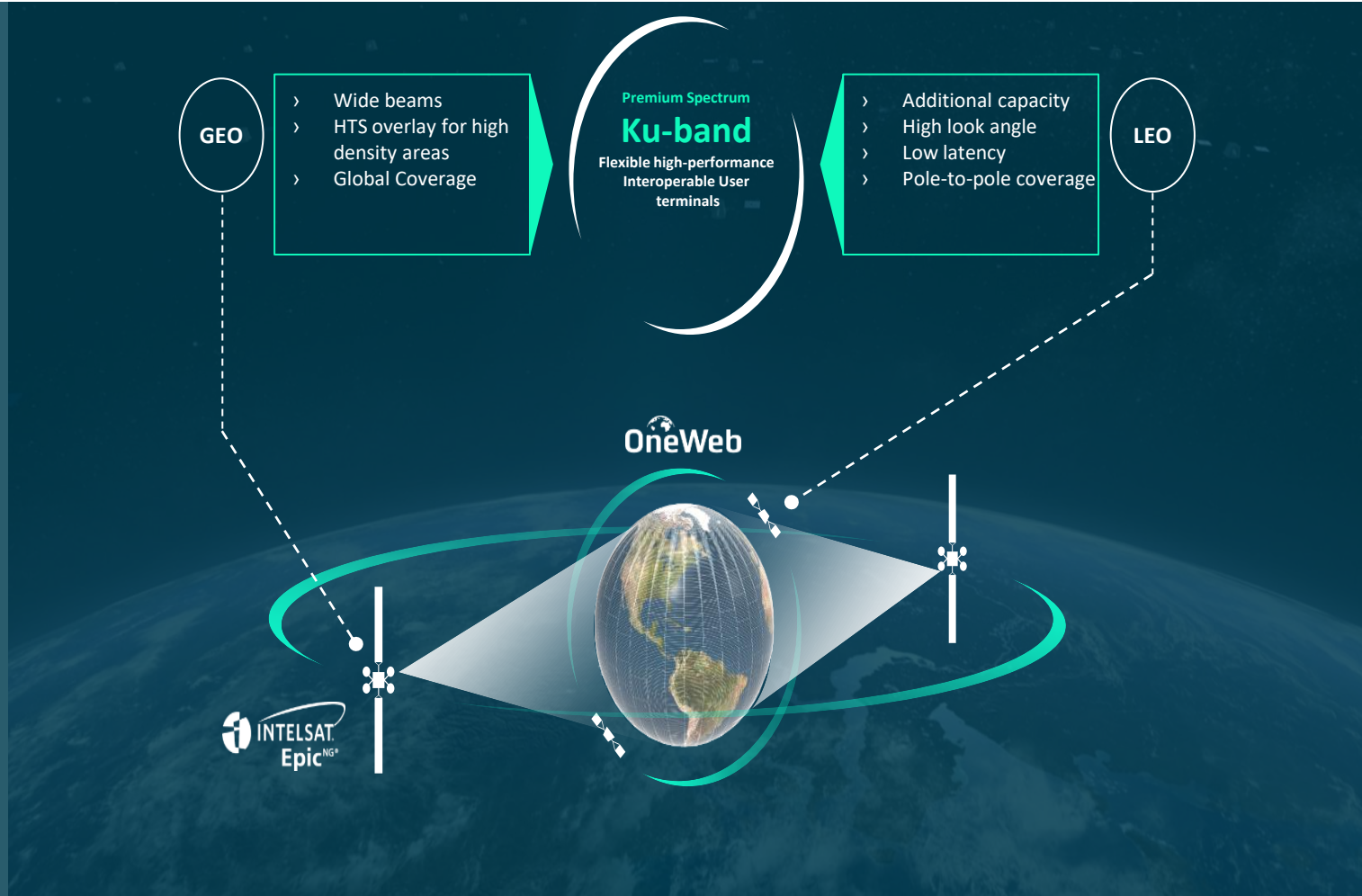
Non-GSO Constellations

NGSO constellations provide global seamless, ubiquitous and low latency connectivity:

- Satellite Broadband
- Passenger Broadband
- Emergency Services
- Disaster Relief
- Backhaul cellular
- 3G/LTE/5G expansion
- Enterprise connectivity
- Communities/Schools
- Hospitals/Health
- Government services

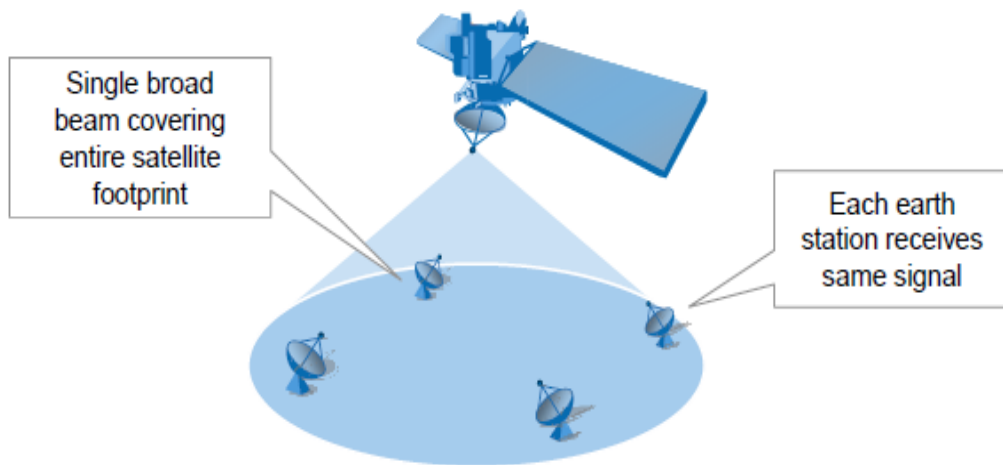


Using GEO HTS & LEO Satellites

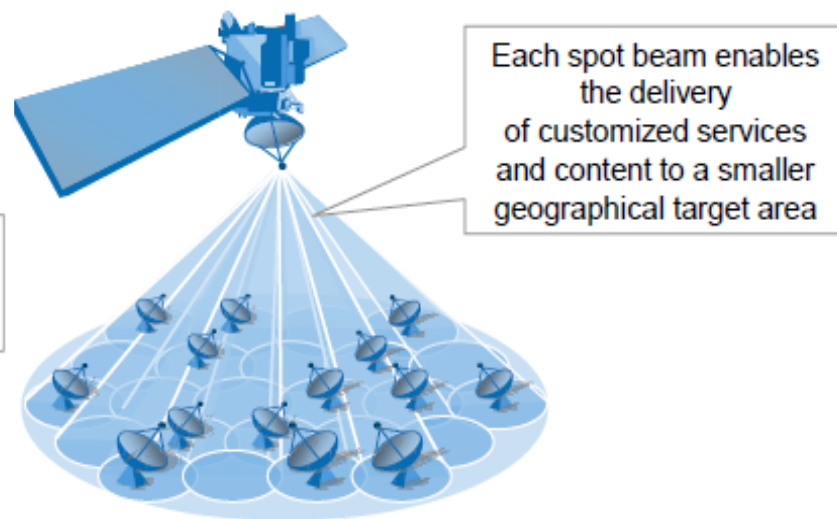


High Throughput Satellites

Broad Beam Technology



Multi-spot Beam Technology

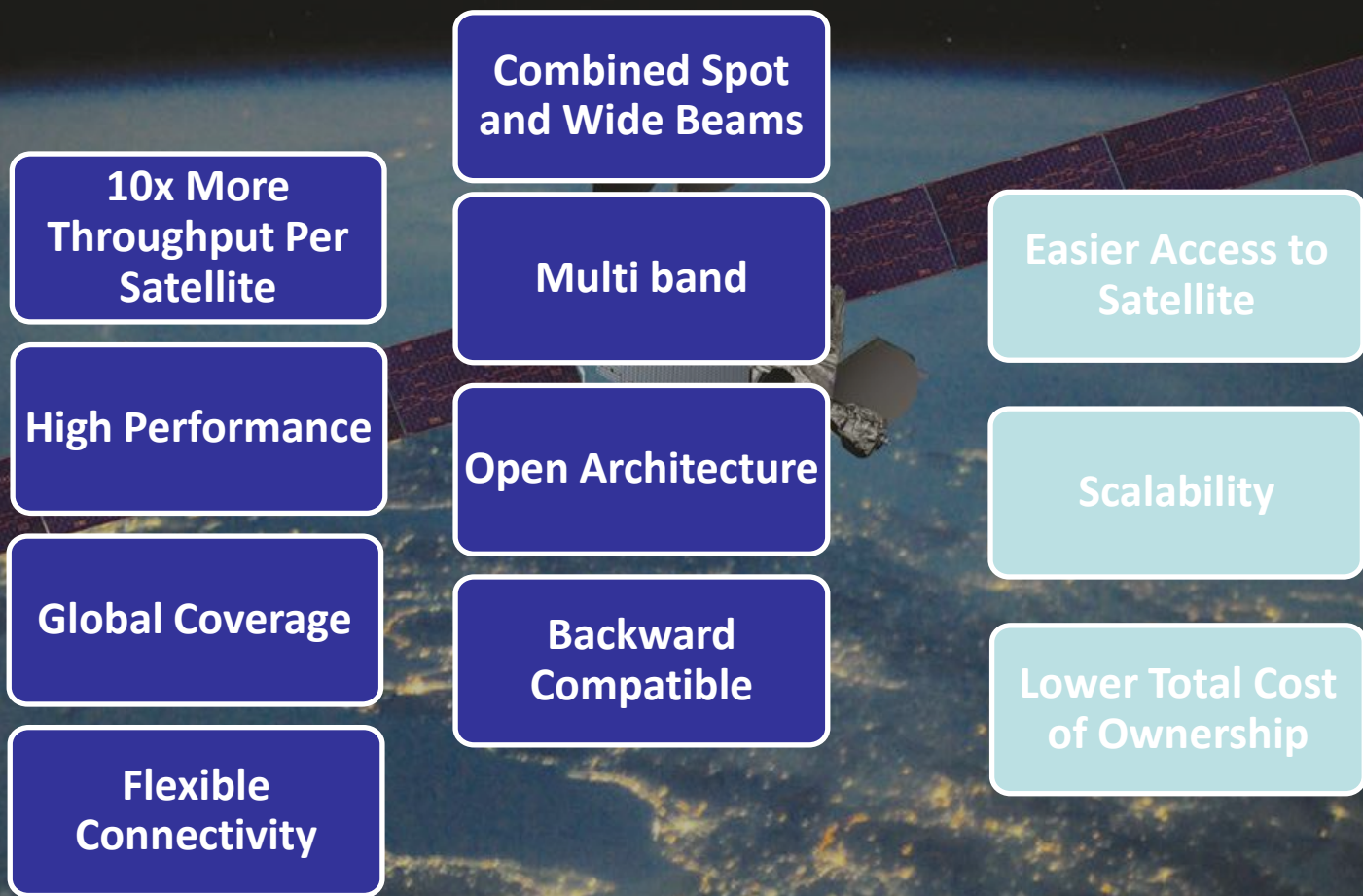


HTS is a **game-changing industry** wide innovation reaching consumers as well as enterprises

Improve
capacity
availability

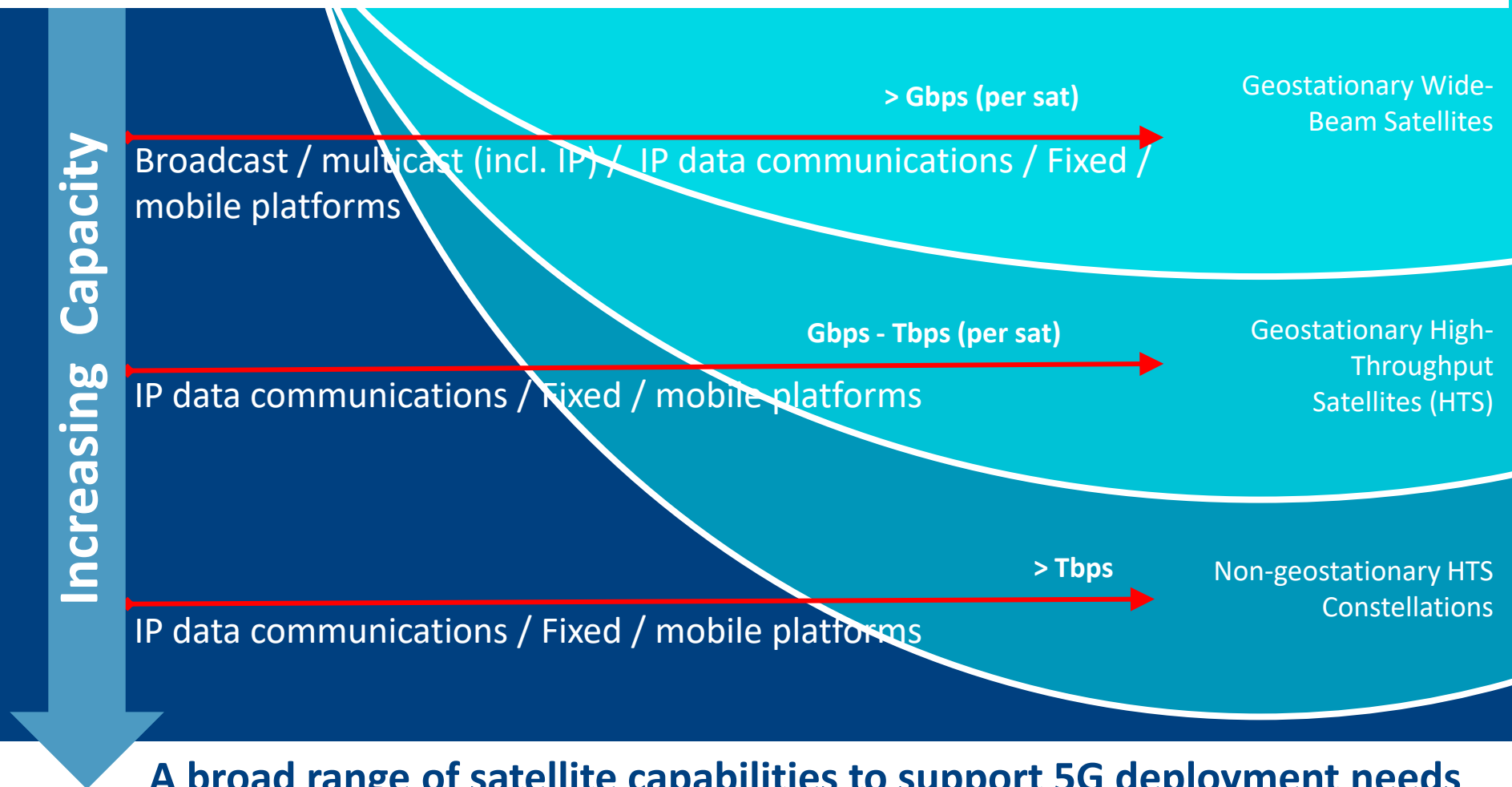
Higher
throughput rates

Lower space
segment cost
per MB

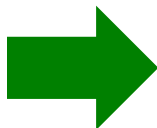




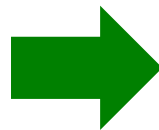
Massive increase in available bandwidth



Yesterday Today



Future



Portable and Mobile Services Satellite Communications Antennae

Portable antennae



Vehicular antennae



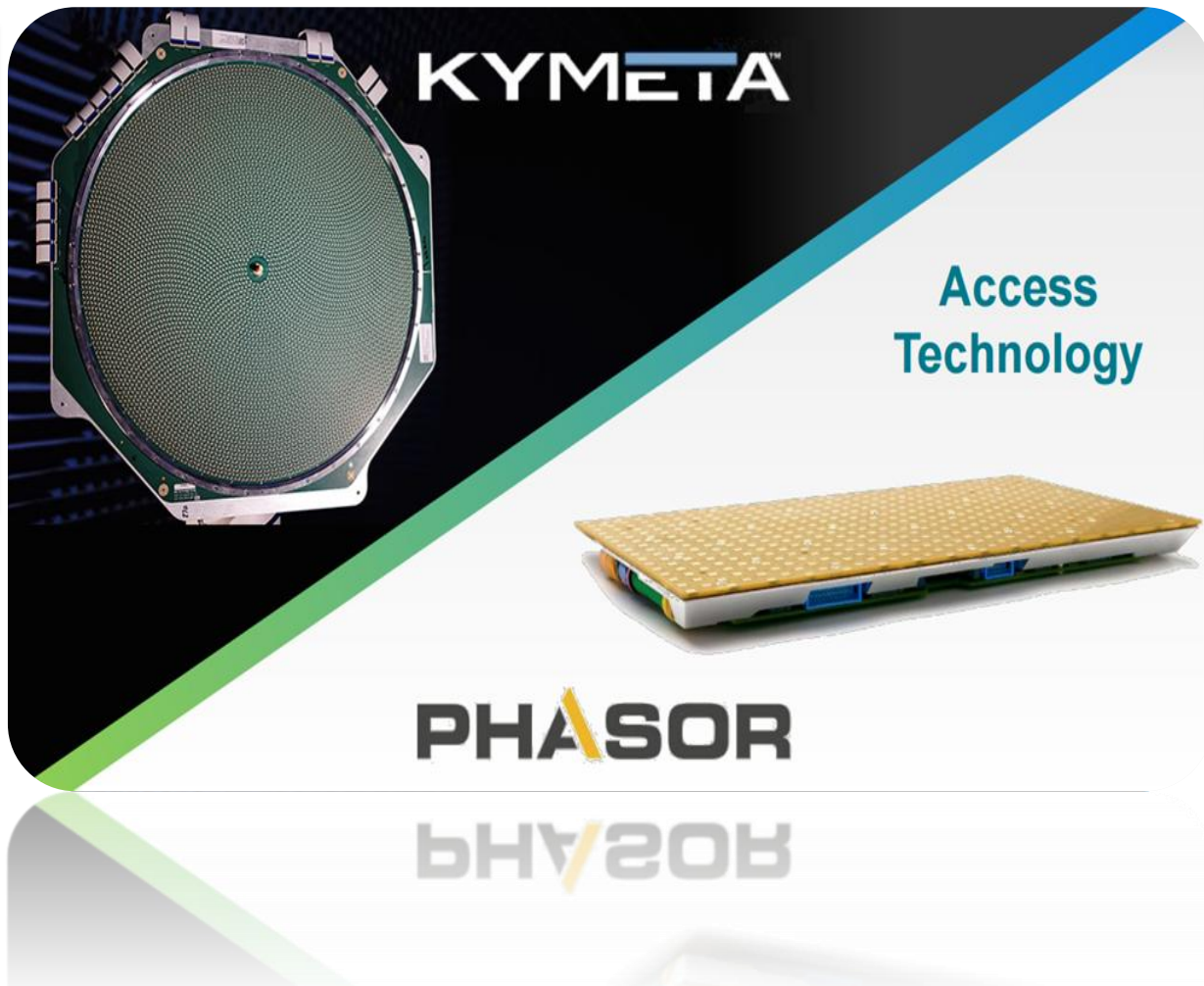
Maritime antennae



- 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



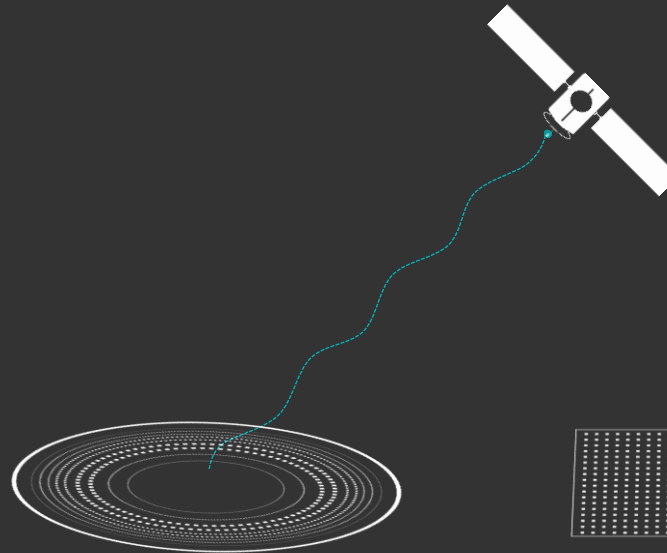
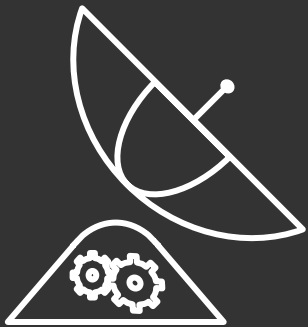
- Business jets
- Cars
- Hand-held devices
- IoT applications
- Sensors



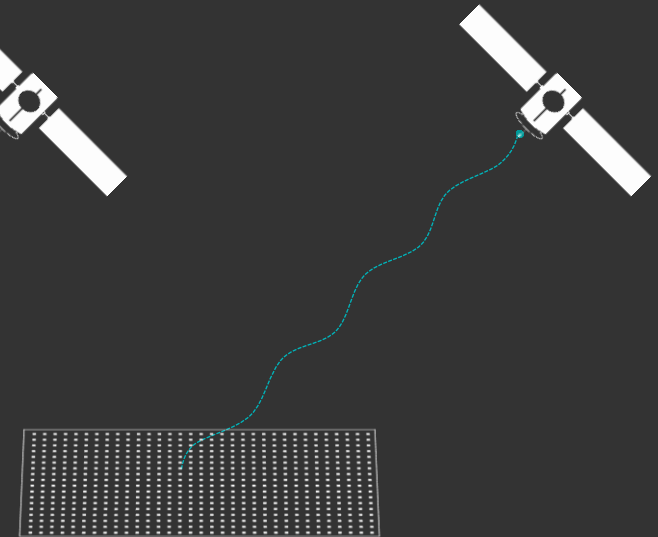
Advancements in ground segment technology are enabling access to new and previously un-served segments

Kymeta – Phased Array Antennas

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



- › Metamaterial
- › Passive array

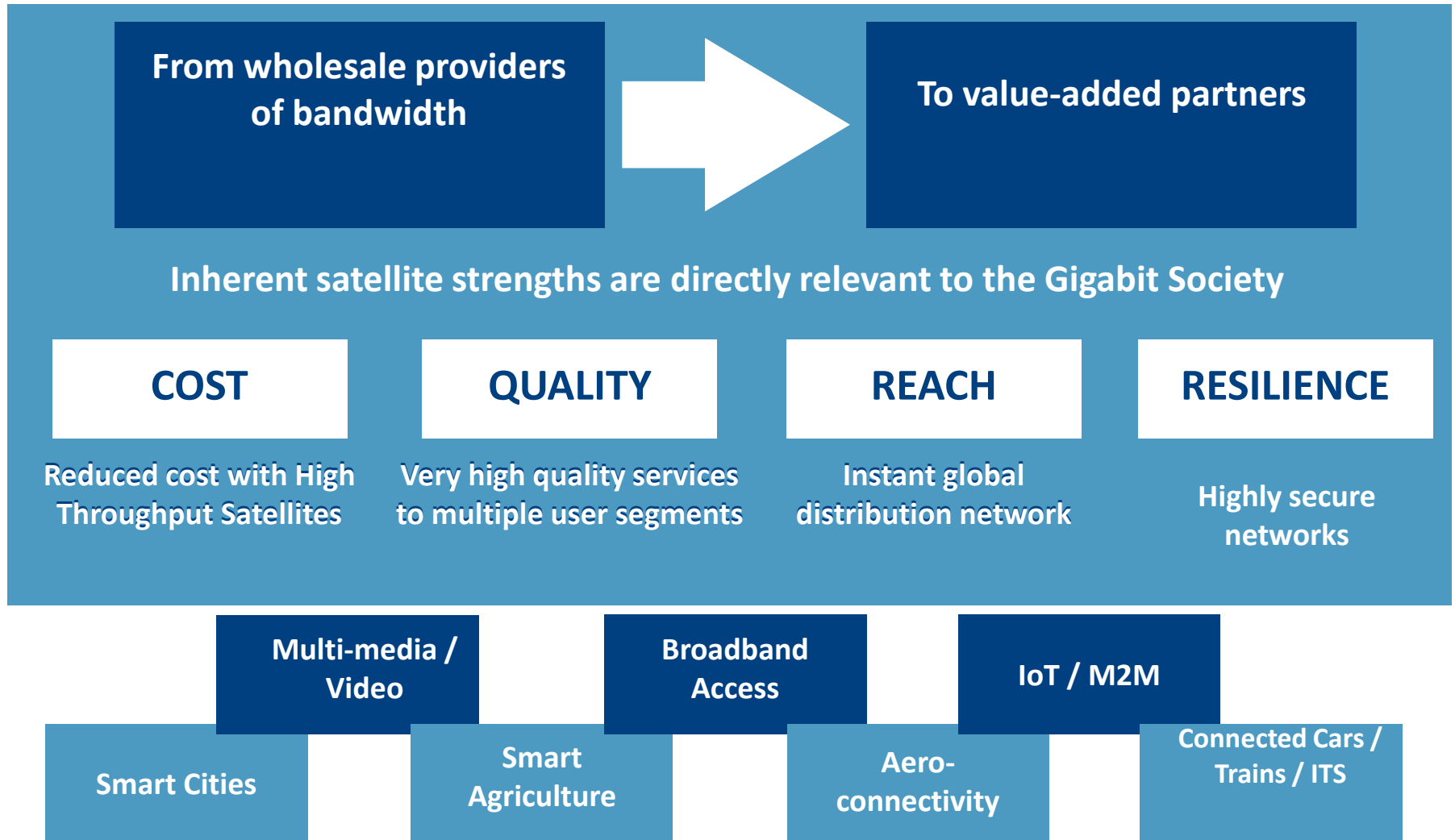


- › Active phased array
- › Panels may be laid CONFORMABLY

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

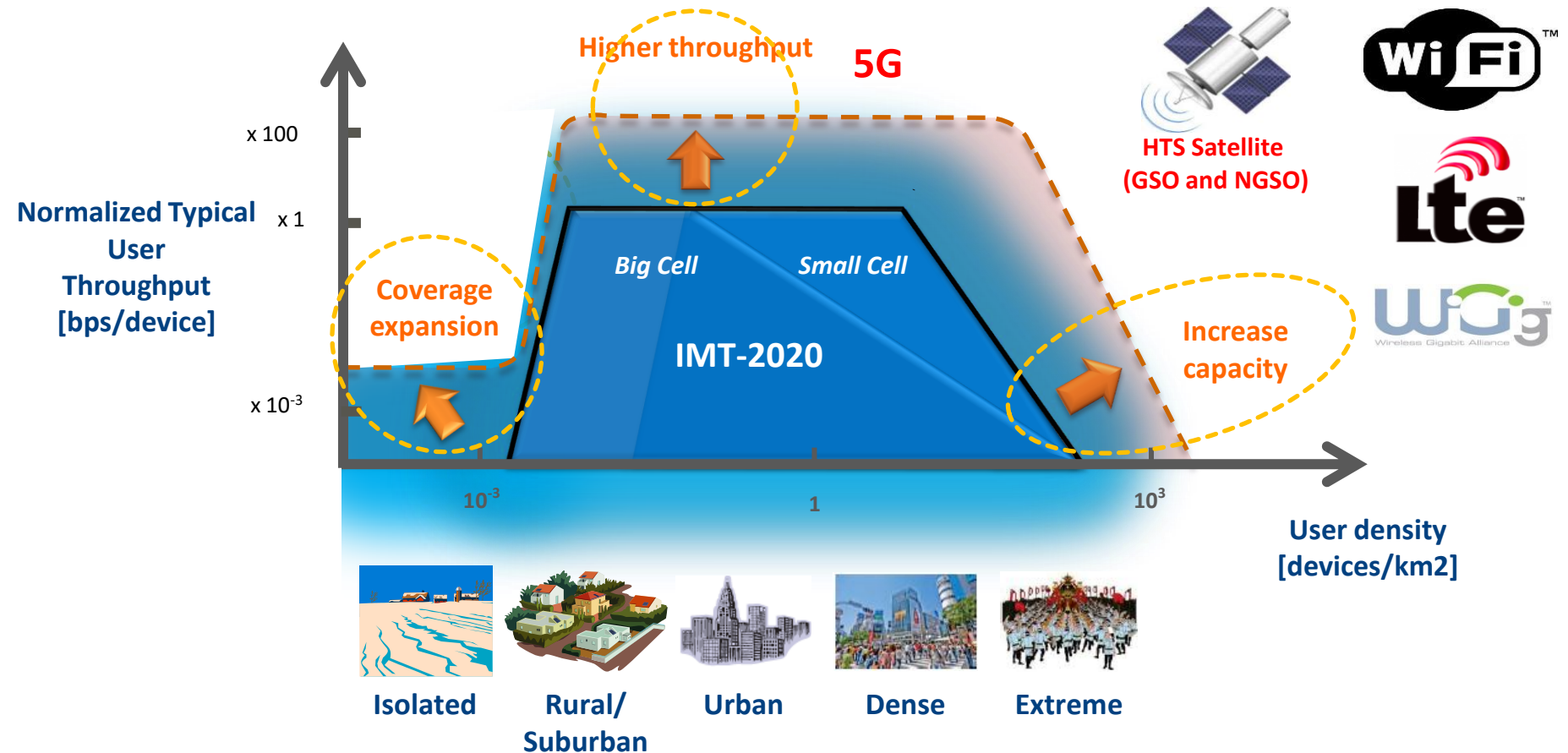
- ◆ Satellites now match level of terrestrial telco charges
- ◆ User terminals cost only few hundred \$ (same order of magnitude as an iPhone)
- ◆ Monthly fees start at few tens of \$ per month (just like mobile data plans)
- ◆ Moving towards open architecture (all-IP & 5G) enabling fully integrated 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 Operators are also evolving...Technically & Commercially

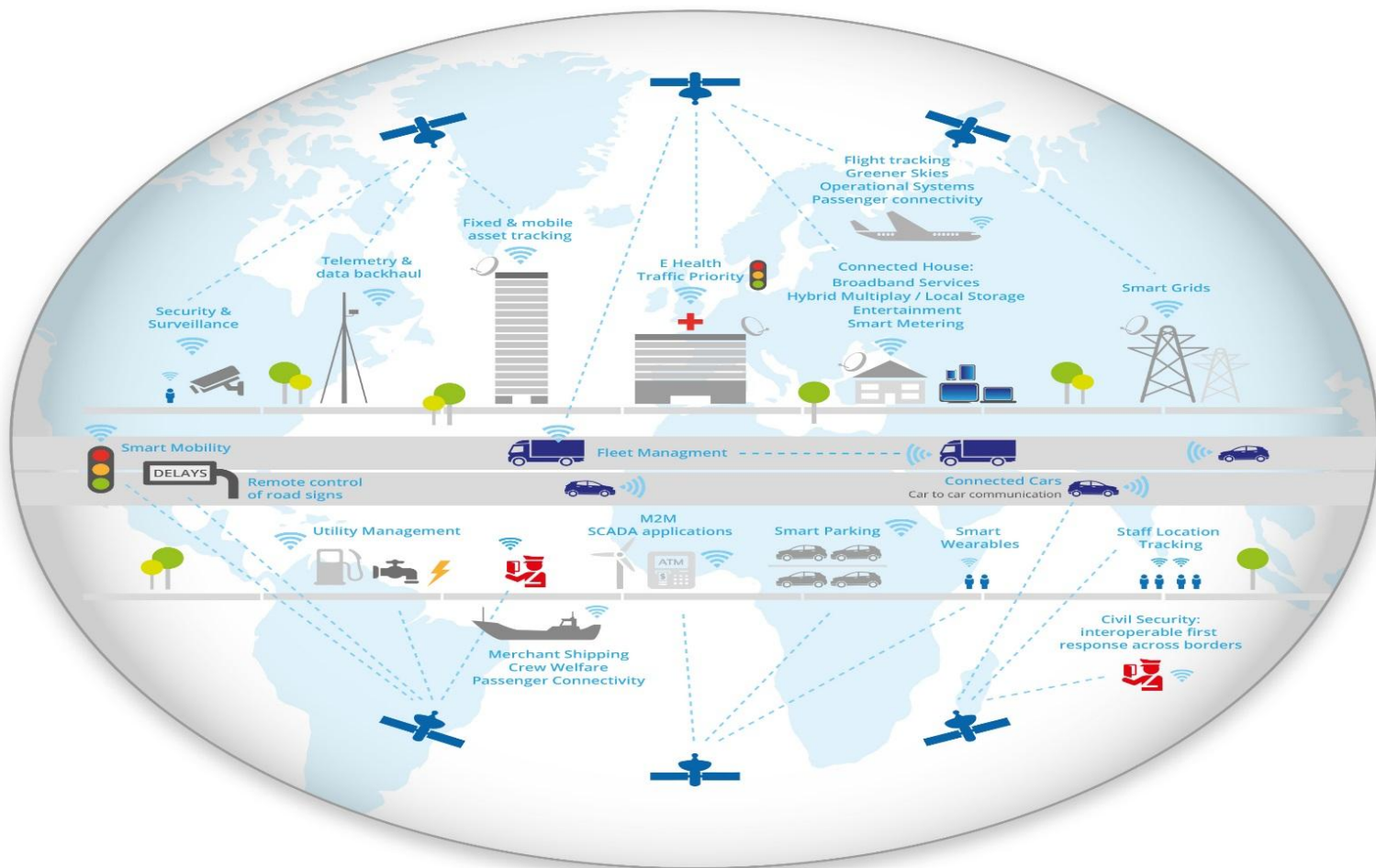


What does the Future Hold ?

Satellite Integration in '5G' Ecosystem



Integrated terrestrial & satellite solutions to enable a ubiquitous & robust 5G eco-system



The two Industries working together to maximise benefits to consumers

Satellite

Beyond the reach of other technologies

Next Session 4:

Future Benefit of Satellite Services

Delivering future Satellite Services to Rural areas