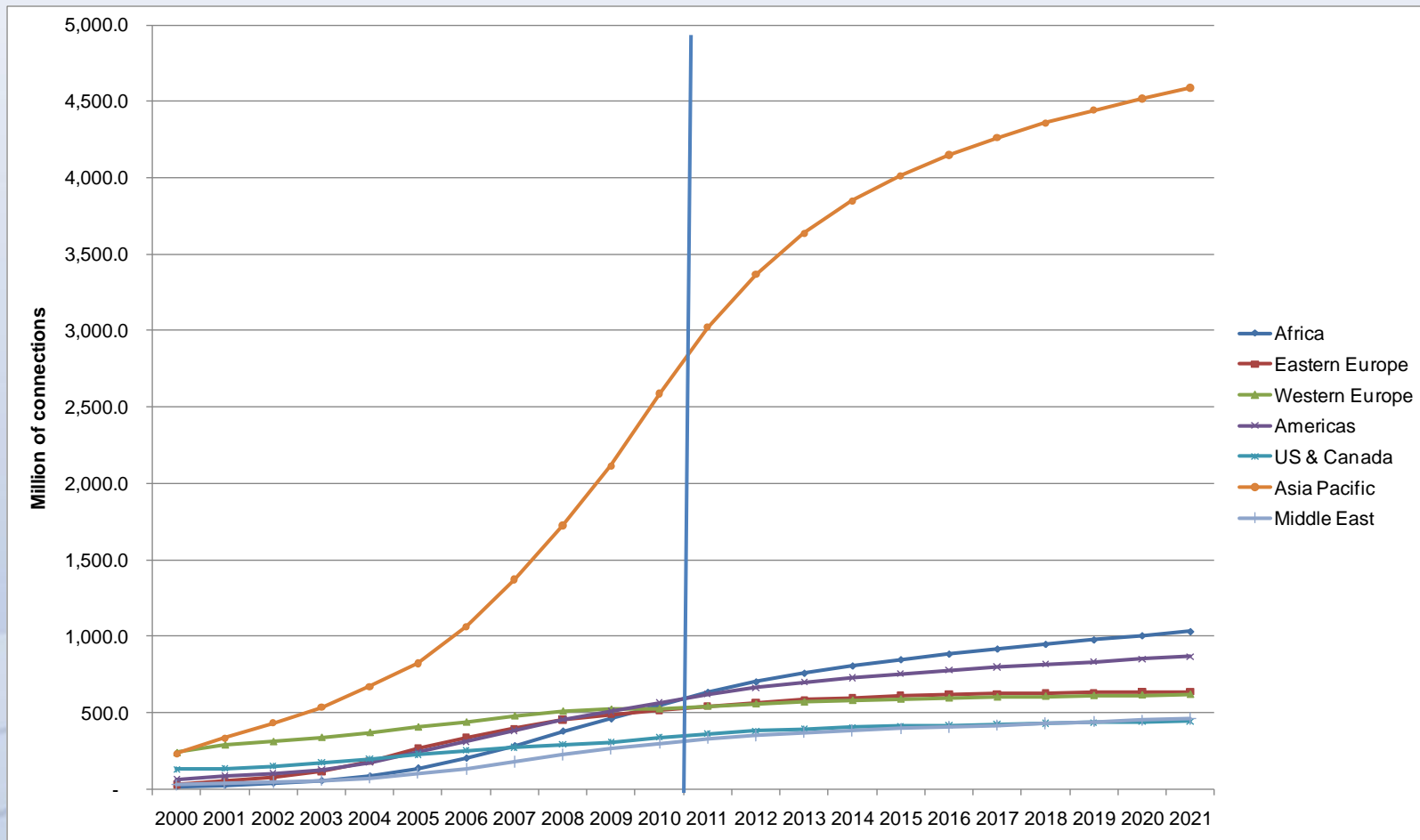


ESA Project Objectives

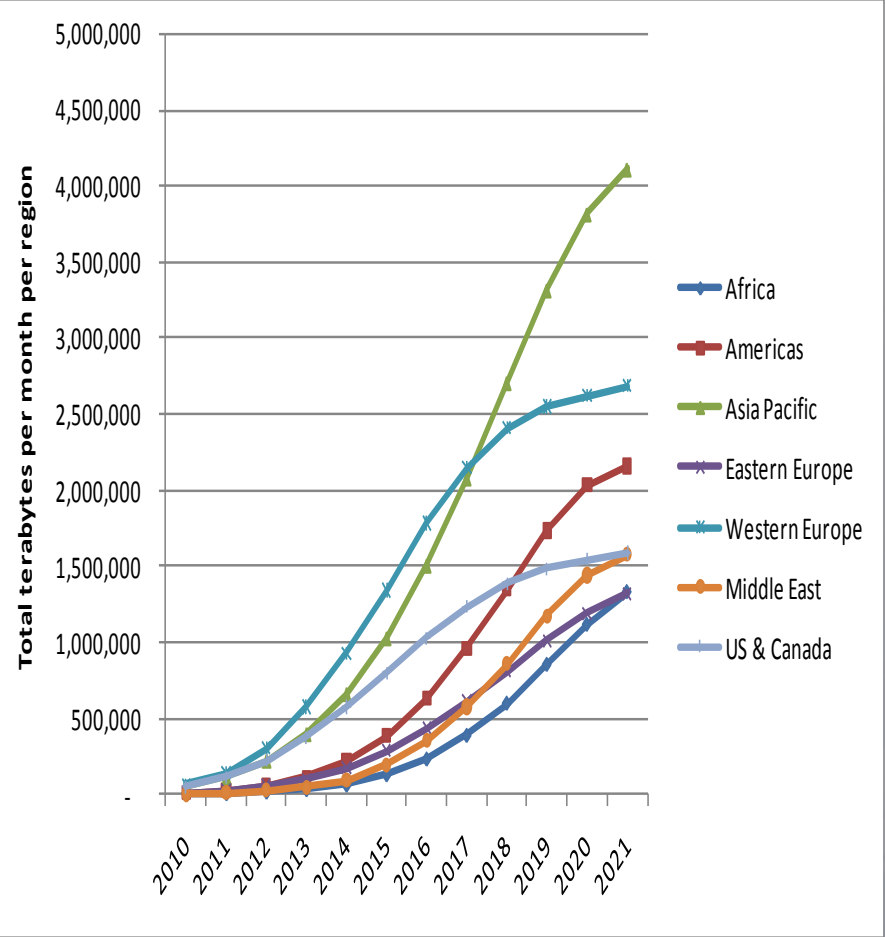
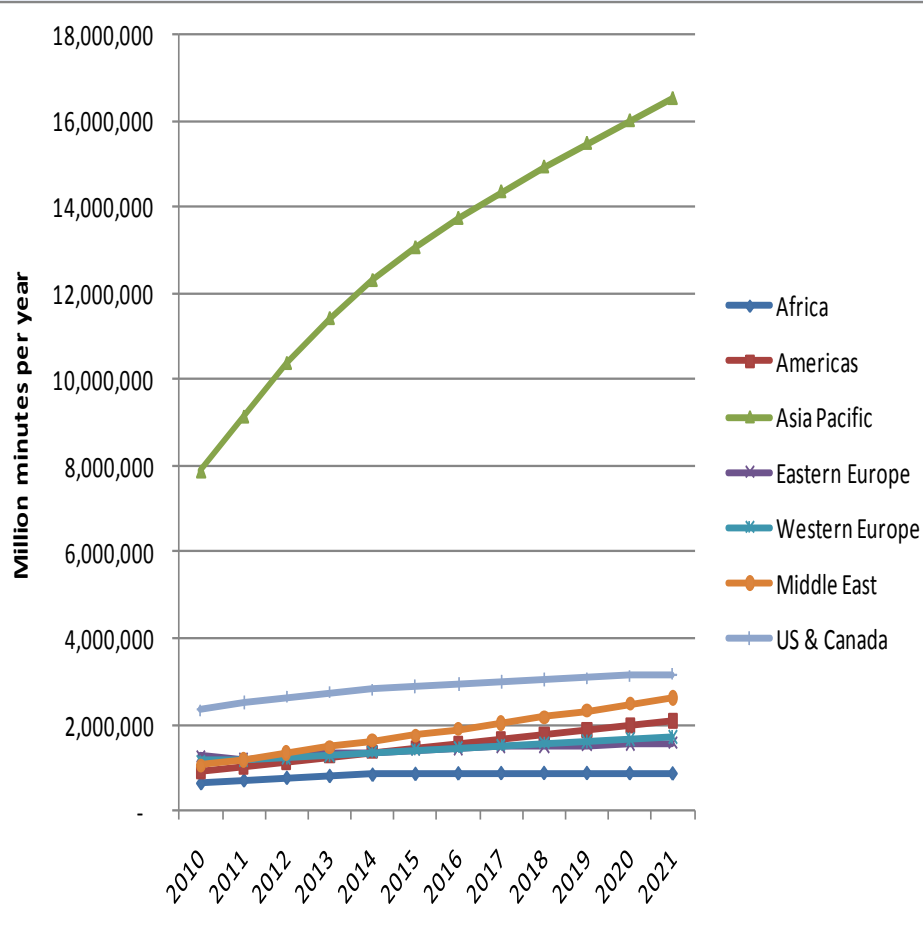
- To optimise the role of satellites in support of terrestrial mobile networks, and to maximise the likelihood of (satellite services) take-up:
 - Identify market opportunities & impact
 - Synergies & implementation options
 - Determine cost effectiveness
 - Determine required actions to make satellite integration a reality
 - Disseminate the findings
- Project current status
 - Market & Technology analysis complete
 - Suggests opportunities in broadcast/mobile video content crucial

Market Opportunities: Continued growth in mobile subscriptions



Global total of 8.6 billion connections in 2021

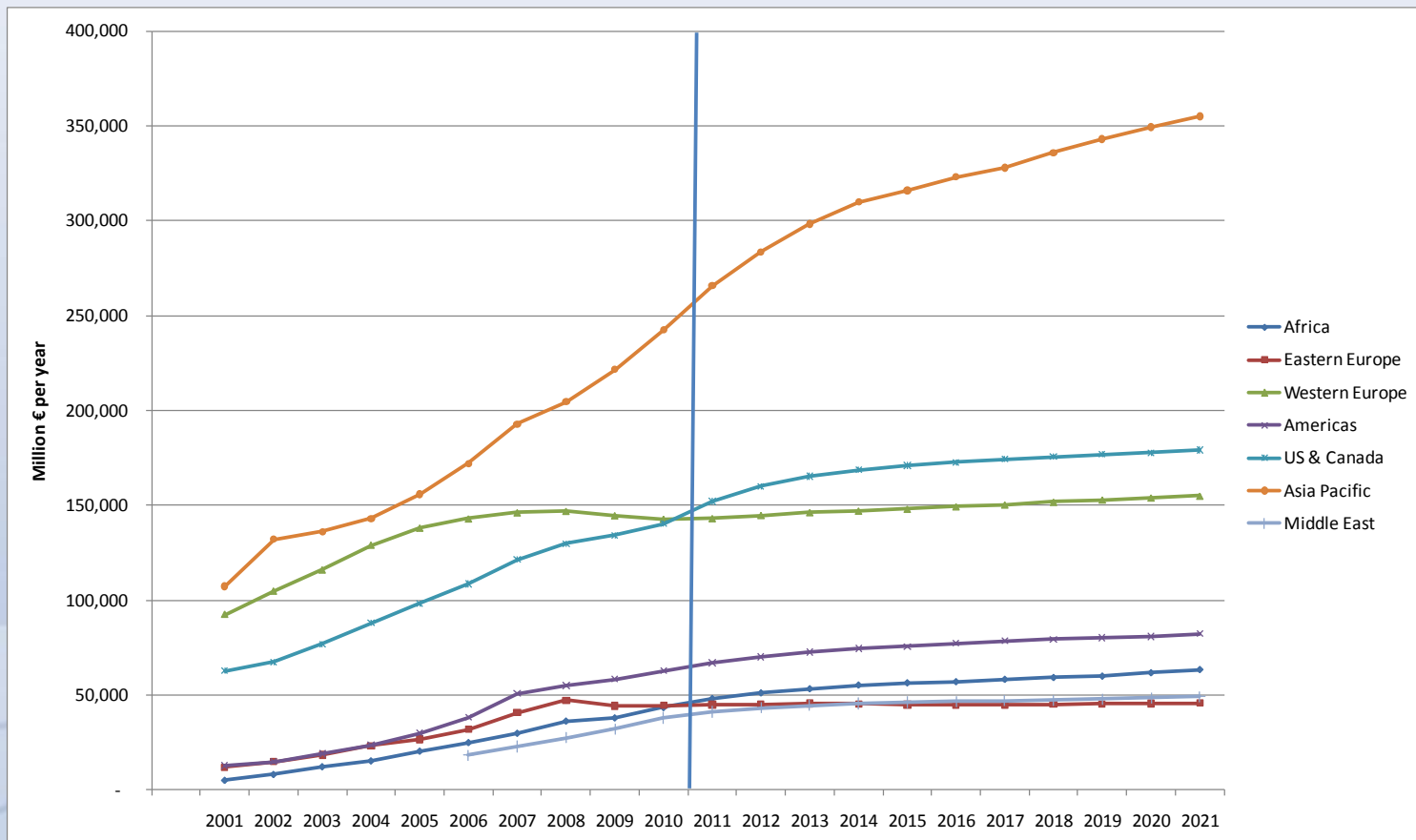
Market Opportunities: Usage growth large & dominated by data



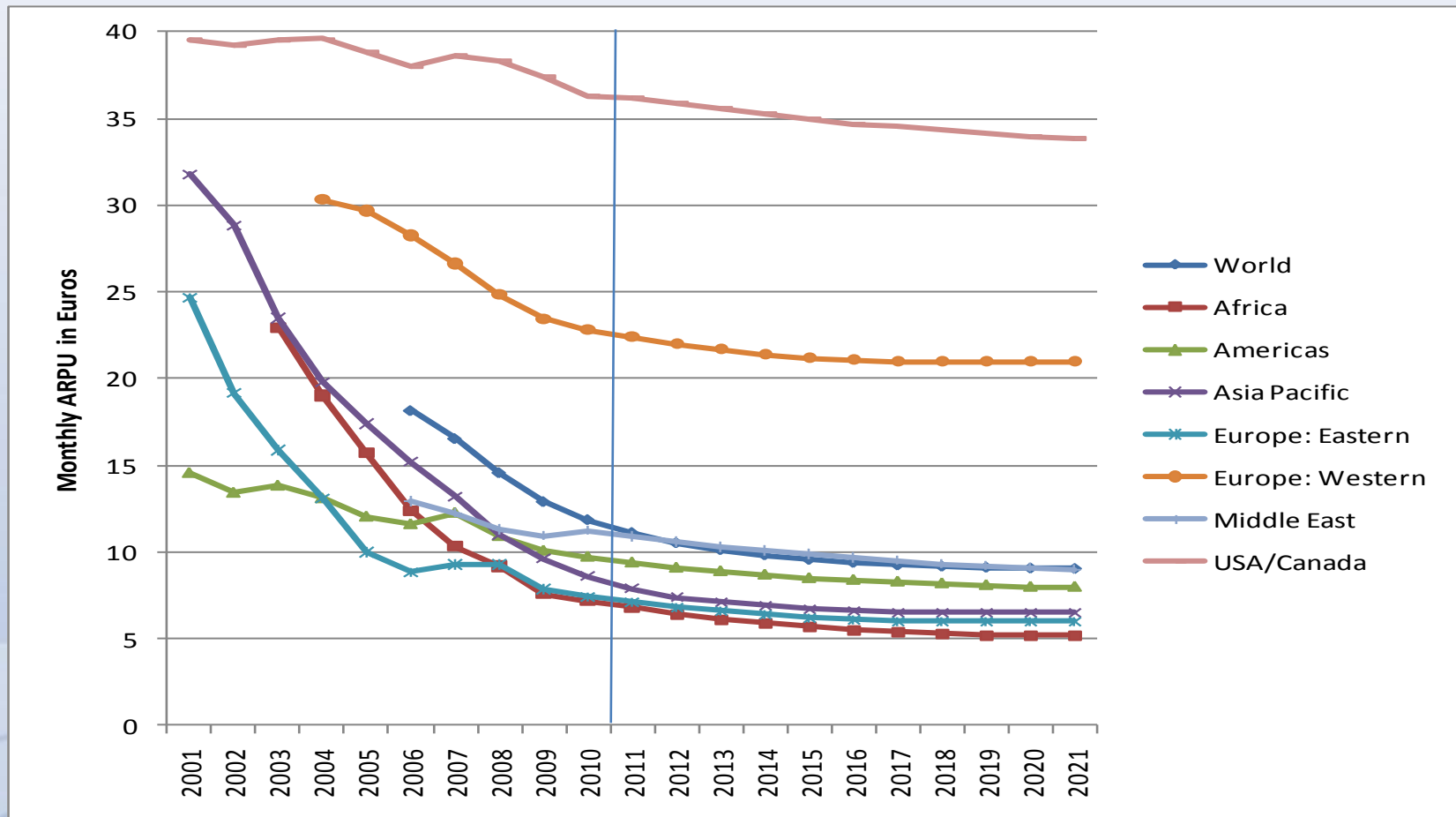
Source: Wireless Intelligence and Mott MacDonald forecasts

Source: Cisco VNI and Mott MacDonald forecasts

Market Opportunities: Revenue growth rate does not match usage growth



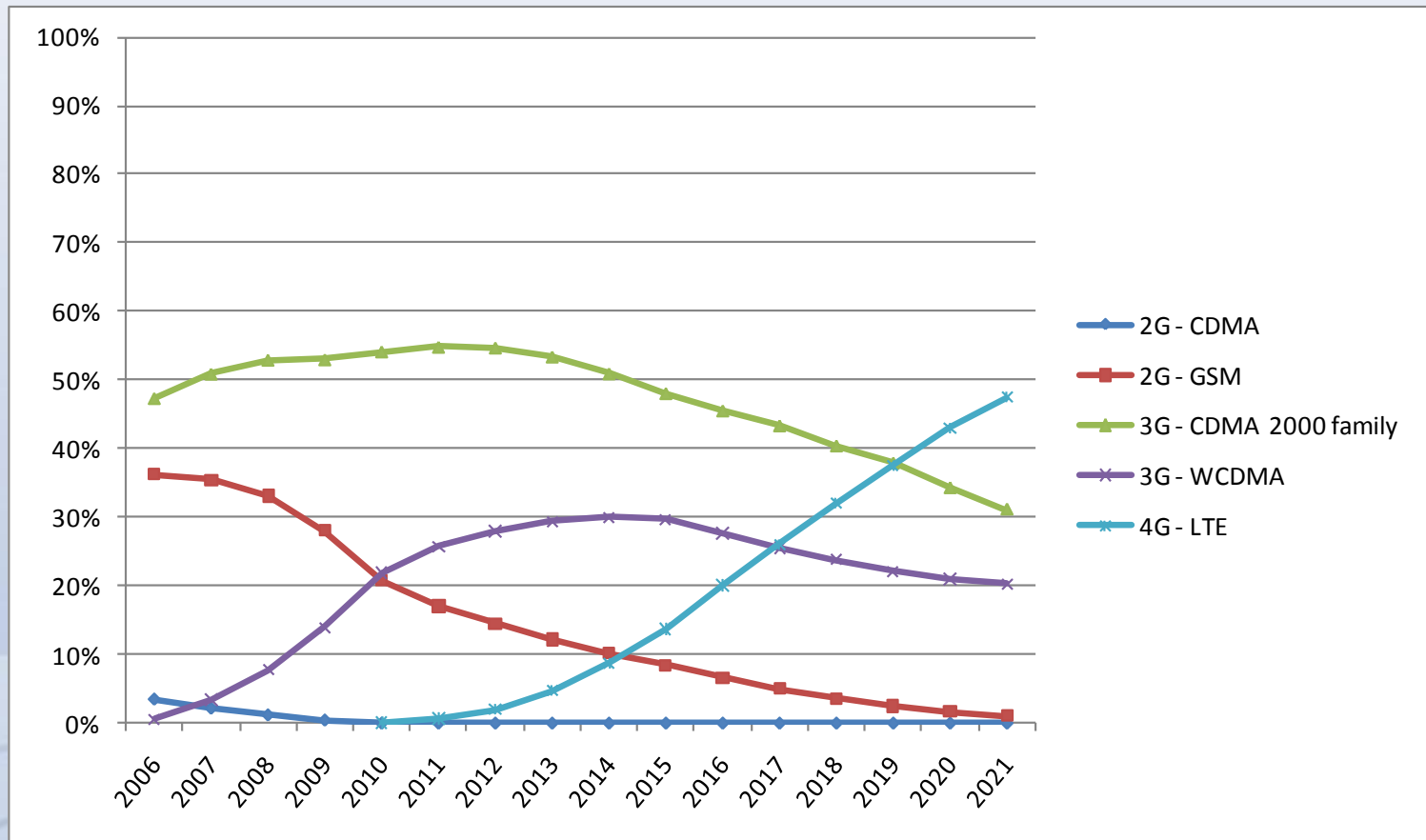
Market Opportunities: ARPU falling whilst usage increasing



MNOs need to radically re-engineer network cost base

Market Opportunities: Technology changes in mobile

US & Canada* – forecast shares by technology type



* US is leading in terms of LTE deployment, other markets follow

Summary: What Mobile Operators need:

- New source of revenues
 - From video content distribution
 - M2M opportunities such as smart grid/smart meters
- Decrease in churn
- More spectrum
 - to support ever higher bit rates & LTE deployment
- Cost reduction solutions
 - extended lifetime of 3G assets
 - Video traffic offload or cost reduction
 - Tower/Ran/backhaul sharing
- Coverage increase indoor & outdoor
 - Government & user pressure in developed markets⁷

Business Options for the future of satellite Industry

1/2

- ❑ **Option 1:** Leverage on satellite capability to put in place/restore communication facilities in a short time frame in places where price is less critical than mobile access to services.
- Unfortunately the revenues of this type of Niche market are decreasing as the coverage of cellular networks keeps increasing.

Only a growing economy could compensate by allowing more and more people to pay for the high fees associated to such services.

Business Options for the future of satellite Industry

2/2

- ❑ **Option 2:** Target a complementary satellite and cellular LTE/UMTS services offer with roaming agreements signed with other cellular operators,

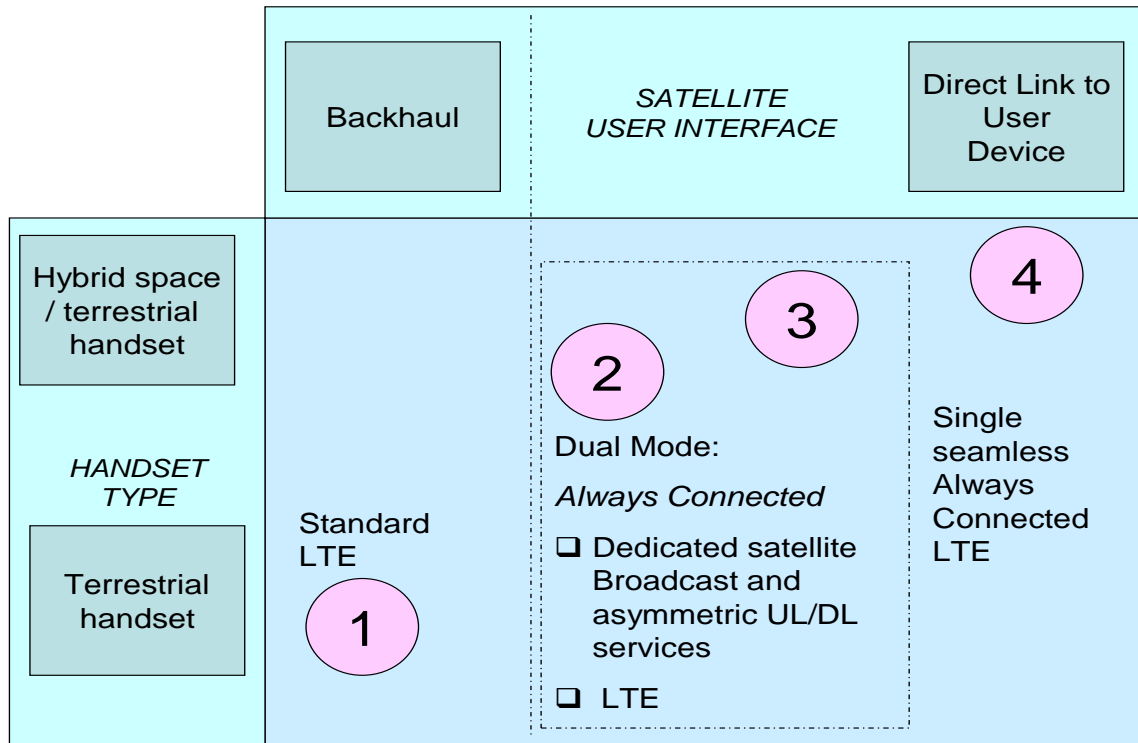
- ❑ **Option 3:** Deliver Multi-media broadcast for car infotain'ment systems. The major advantages is that there is no direct competition with cellular operators

- Wifi gateways shall be proposed to connect devices smart-phones, tablets, net-books) rather than trying to create a market for dual mode sat./cellular devices with 2 chips

Key considerations

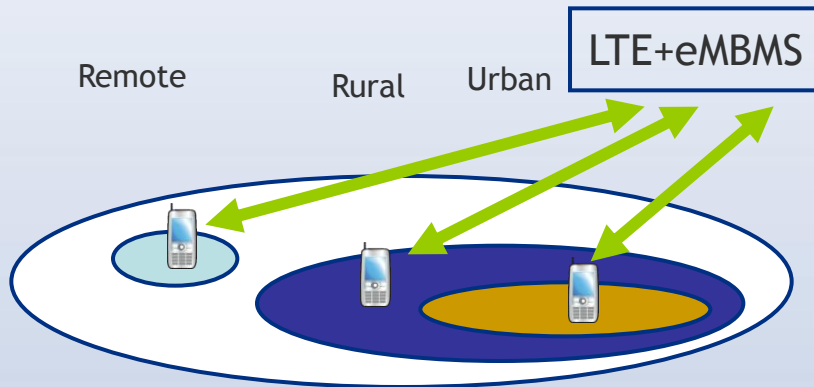
- MSS band (mainly S and L band) based systems is key to the future of the satellite industry
 - Offer direct access to nomadic and mobile end-users
- Generalisation of in-band use of Complementary Ground Component (CGC) terrestrial technologies
 - Regulatory pressure on license holders to maintain an active role of satellite access and to offer integrated satellite-terrestrial services
- Video (streaming, live/broadcast, multicast) and content delivery on the move
 - Drives traffic and market growth to the satellite and cellular industries
- Next Generation Mobile Networks (NGMN) terrestrial systems
 - - IP orientation an enabler for satellite based backhauling

From Options to Proposed Scenarios

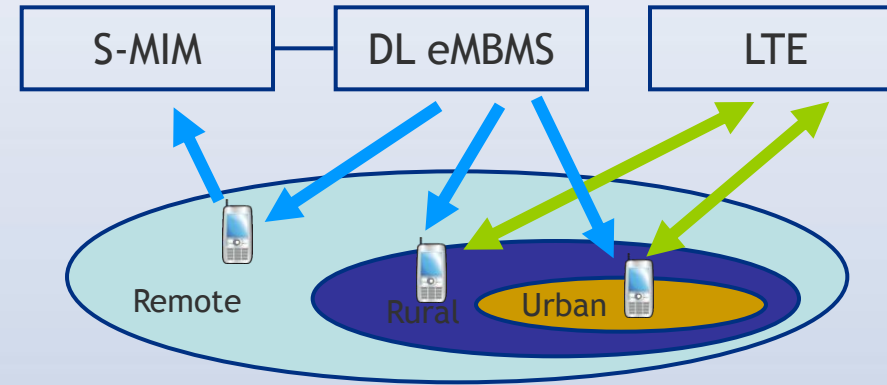


Overview of proposed delivery scenarios

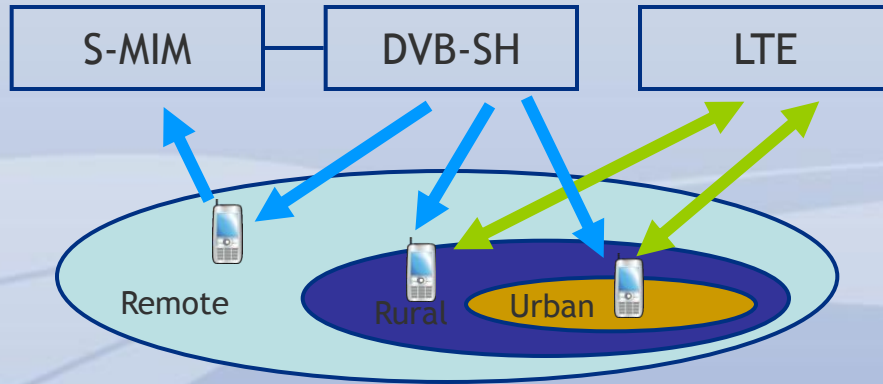
Scenario 1:



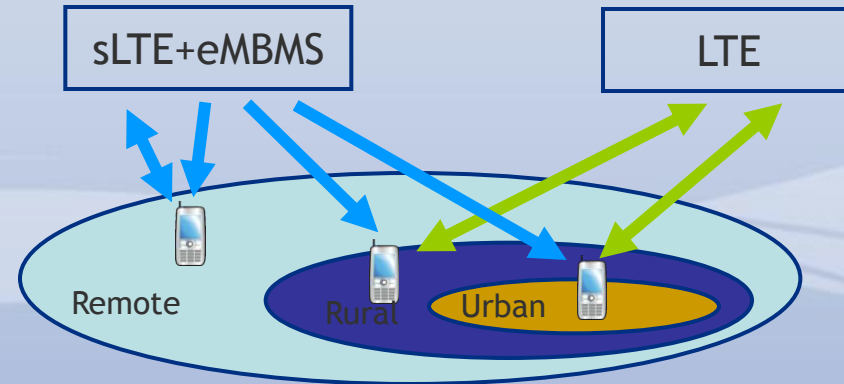
Scenario 3:



Scenario 2:



Scenario 4:



Criteria to assess the Delivery Scenarios from a Performance perspective

$$\text{Capacity} = \text{Spectrum} \times \text{Spectrum Efficiency} \times \text{Nbr of Tx equipment} \times \text{TX mode}$$



Allocated spectrum

Inter-system interference

Site Sharing SFN

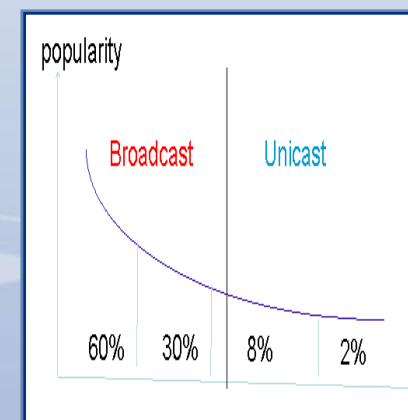
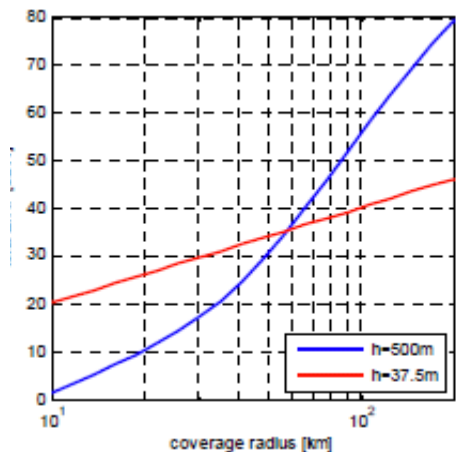
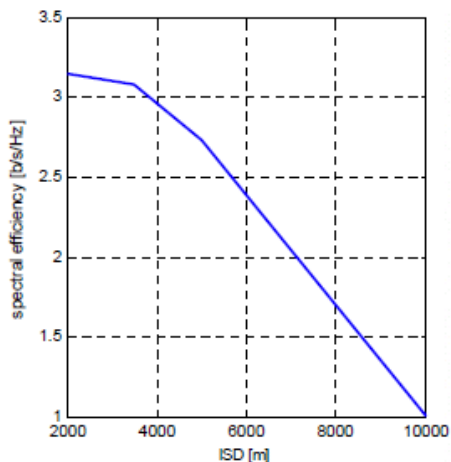
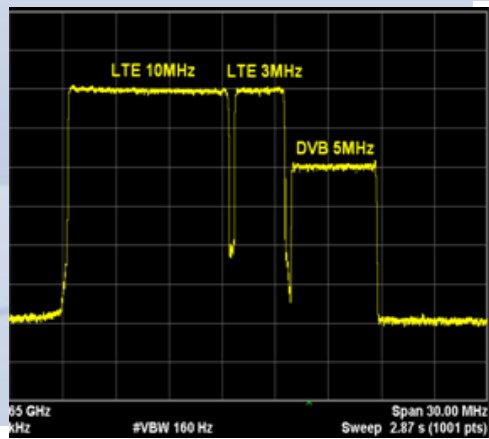
Unicast Broadcast

Spectrum Usage

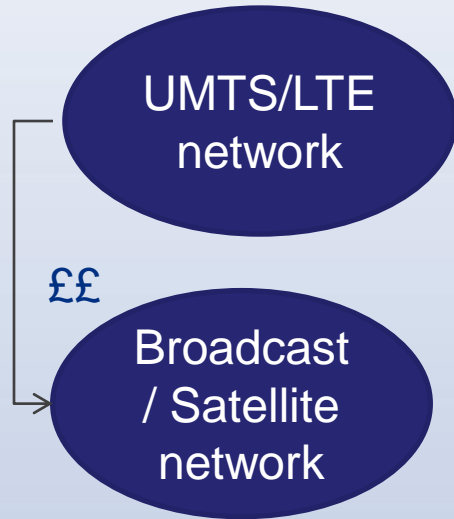
Spectral efficiency

Energy efficiency

Content distribution



Cost Model: assessing the Delivery Scenarios for different use cases



Sat can be :

S-MIM + DVB-SH

S-MIM + S-eMBMS

S-LTE + S-eMBMS

Use Case 1:

a Mobile operator extends its network by using satellite for broadcast and direct access

Use case 2:

a broadcaster becomes a 'satellite & CGC broadcaster' in S-band and offers its services to a cellular operator.

Use case 3:

a Satellite MSS Broadcaster starts with no footprint, introduces CGC and cellular services

Thank You

Contact us:

Philomena.Skeffington@mottmac.com

jean-marc.hanriot@alcatel-lucent.com

