

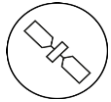
Role of Geostationary Satellites in Future Communication Systems

In a multi-orbit world

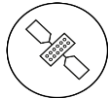
Joel Grotz, SES
ASMS 2025, Sitges, 28 February 2025

SES - Combining the strengths of GEO and MEO today and LEO with IRIS2 in the future

Today:

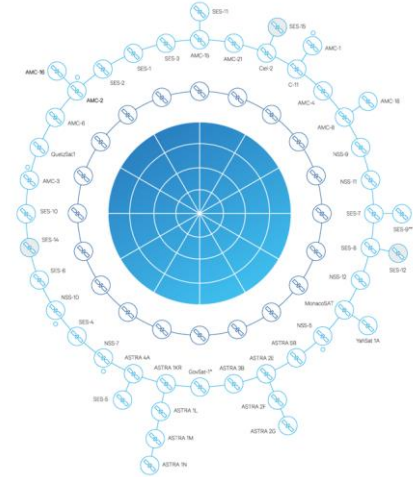
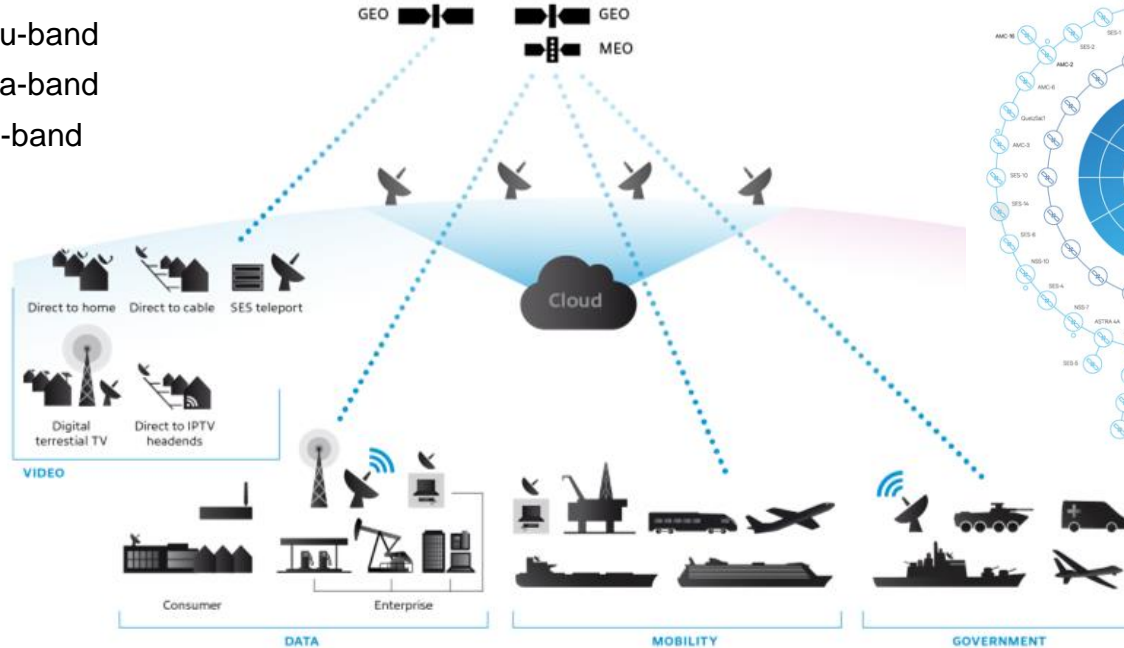


57
more to come
GEO



26
more to come
MEO

Ku-band
Ka-band
C-band



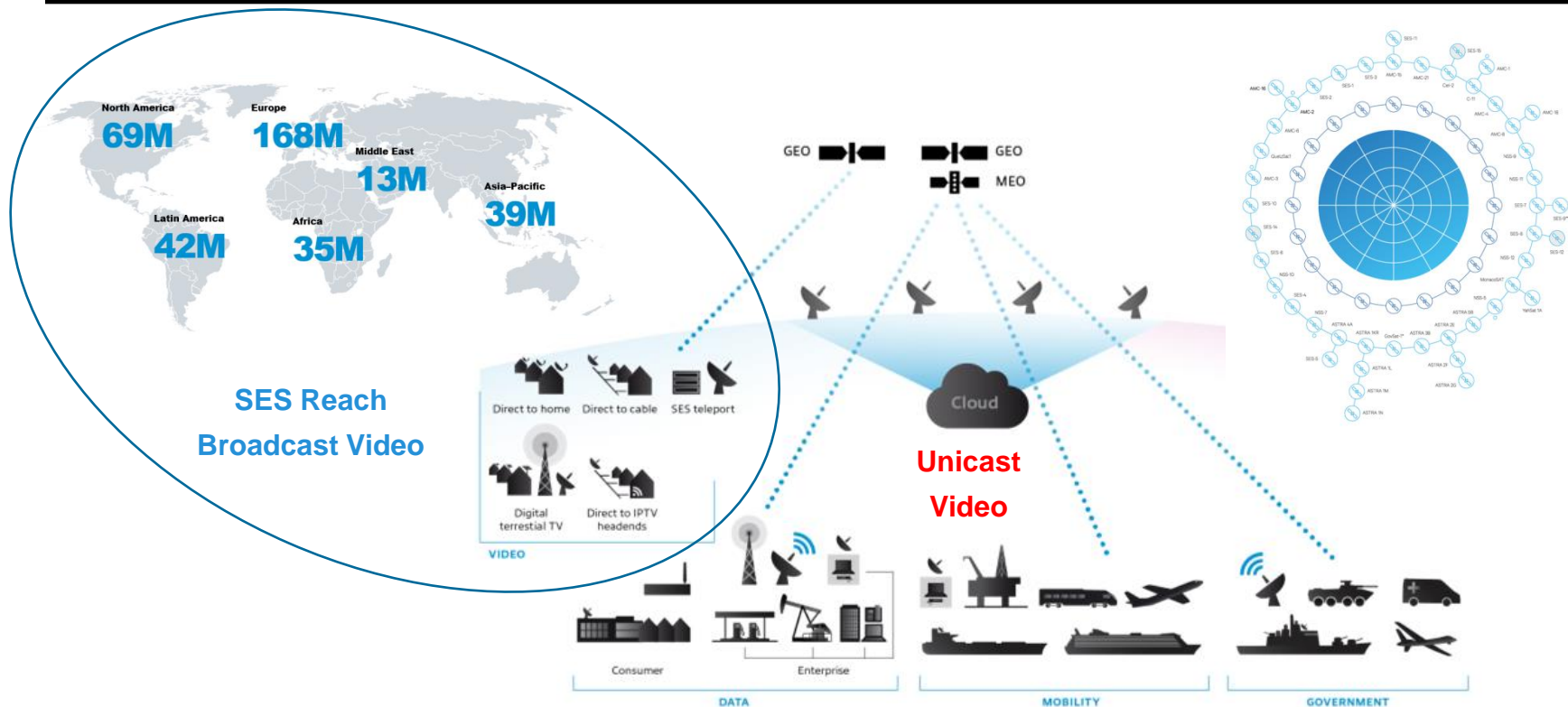
In future also:
+ LEO and MEO
Through IRIS2



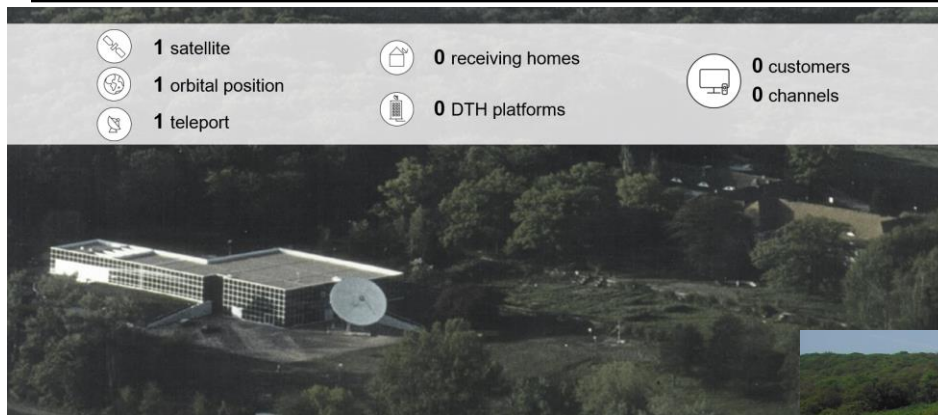
Space**RISE**

Video and Data services with global coverage to fix and mobile users

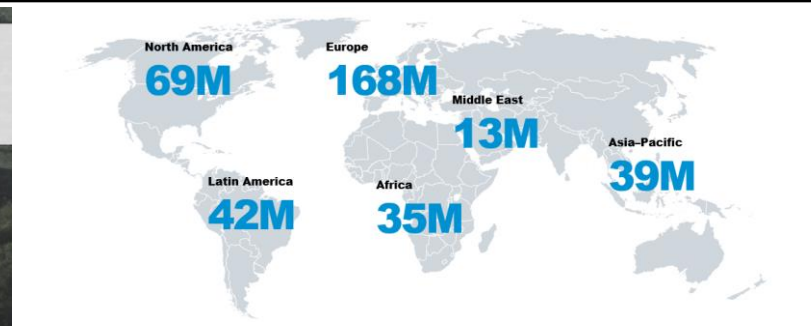
SES - Combining the strengths of GEO and MEO - Today



SES video evolution 1989 - 2019



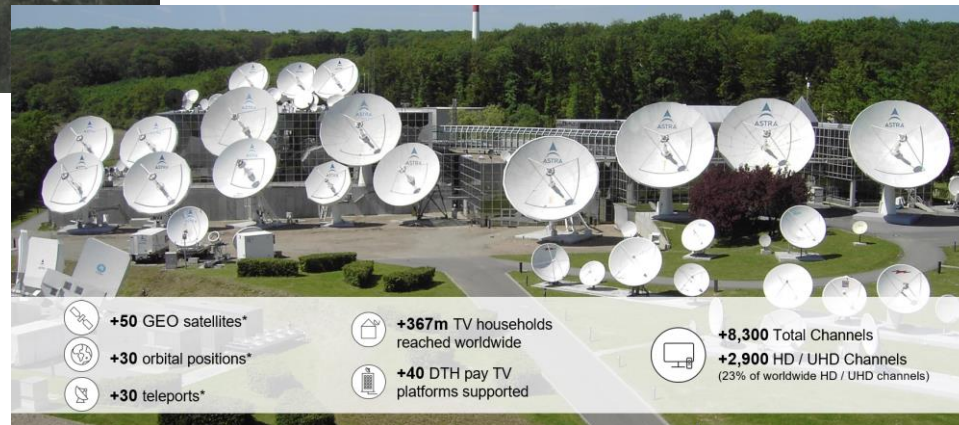
- 1 satellite
- 1 orbital position
- 1 teleport
- 0 receiving homes
- 0 DTH platforms
- 0 customers
- 0 channels



367m

Satellite, Cable & IPTV homes

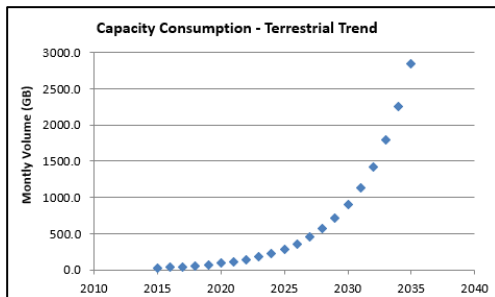
- 153m Satellite Homes
- 149m Cable Homes
- 44m IPTV Homes
- 21m DTT Homes



- +50 GEO satellites*
- +30 orbital positions*
- +30 teleports*
- +367m TV households reached worldwide
- +40 DTH pay TV platforms supported
- +8,300 Total Channels
- +2,900 HD / UHD Channels (23% of worldwide HD / UHD channels)

What do users want ?

Fiber experience everywhere ...Content everywhere.



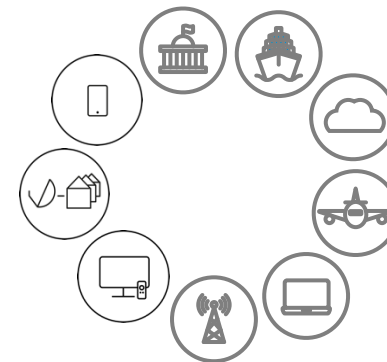
The capacity growth is essentially due “internet video” increasing in quantity and in resolution

GLOBAL APPLICATION CATEGORY TRAFFIC SHARE

1	VIDEO STREAMING	60.6%(+2.9) ↓	22.2%(-0.1) ↑
2	WEB	13.1%(-3.8) ↓	10.3%(-10.6) ↑
3	GAMING	8.0%(0.2) ↓	4.9%(+2.2) ↑
4	SOCIAL	8.1%(+1.1) ↓	7.6%(+3.8) ↑
5	FILE SHARING	4.2%(+1.4) ↓	30.2%(+8.1) ↑
6	MARKETPLACE	2.8%(-1.9) ↓	1.6%(-0.2) ↑
7	SECURITY AND VPN	1.6%(+0.2) ↓	5.3%(-2.1) ↑
8	MESSAGING	1.6%(-0.1) ↓	8.3%(-0.1) ↑
9	CLOUD	1.4%(+0.01) ↓	9.0%(-0.3) ↑
10	AUDIO STREAMING	0.4%(-0.5) ↓	0.3%(-0.1) ↑

GLOBAL VIDEO STREAMING TRAFFIC SHARE

1	HTTP MEDIA STREAM	23.8% ↓
2	NETFLIX	23.1% ↓
3	YOUTUBE	12.7% ↓
4	OPERATOR IPTV	10.0% ↓
5	FACEBOOK VIDEO	5.0% ↓
6	AMAZON PRIME	4.3% ↓
7	TWITCH	4.2% ↓
8	TIK TOK	3.4% ↓
9	OPENLOAD	2.4% ↓
10	DAILY MOTION	1.3% ↓



SD	MPEG-2	H.264	HEVC
Bitrate (Mbit/s)	3.5	2	1

HD	MPEG-2	H.264	HEVC
Bitrate (Mbit/s)	18	8	4

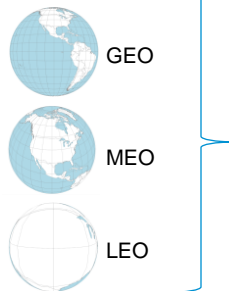
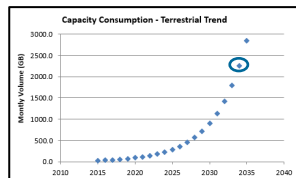
UHD	MPEG-2	H.264	HEVC
Bitrate (Mbit/s)	70-80	35-45	15-20 Mbit/s

Typical TV Bitrates (Mbit/s)

Source : The Global Internet Phenomena Report, Sandvine

Benefits of Multi-Orbit - Broadcast/Multicast/Unicast Combination

Growing data volume
demand



Constellation scenarios	GEO BB MEO Infra Unicast	LEO Only Unicast	LEO BB GEO BB Unicast	LEO MEO GEO Unicast	LEO GEO Uni/Multi	LEO MEO GEO Uni/Multi	LEO MEO GEO Uni/Multi	
EU Unicast Satellite	2	2	2	2	2	2	2	Millions HH
EU Unicast Terrestrial	200	200	200	200	200	200	200	Millions HH
Usage in the HH or in individual wireless mobility Unicast terrestrial customers can be satellite multicast customers (direct or indirect)								
Provisioning (M&U)	20	20	20	20	20	20	20	Mbps /HH
Monthly Volume	2196	2196	2196	2196	2196	2196	2196	GB
Peak BR : 200 Mbps	200	200	200	200	200	200	200	Mbps
Multicast share Satellite Unicast Customers	0%	0%	0%	0%	60%	60%	60%	
Multicast share for Terrestrial Unicast Customers	0%	0%	0%	0%	20%	20%	20%	
Content Share Factor	10000	10000	10000	10000	10000	10000	10000	
LEO Satellite Unicast Share (vs GEO)	0%	100%	50%	50%	100%	50%	20%	
Infrastructure Backhauling via satellite	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	
LEO Infra Backhauling Share (vs MEO)	0%	100%	100%	50%	100%	50%	50%	
Total Satellite Capacity required over EU	44	44	44	44	8.08	8.08	8.08	Tbps
Unicast capacity outside of EU	20	1078	588	549	196	102	55	Tbps
Number of LEOs	0	55000	30000	27500	10000	5000	2600	
Number of MEOs	240	0	0	120	0	48	48	
Number of GEOs	80	0	40	40	2	8	12	



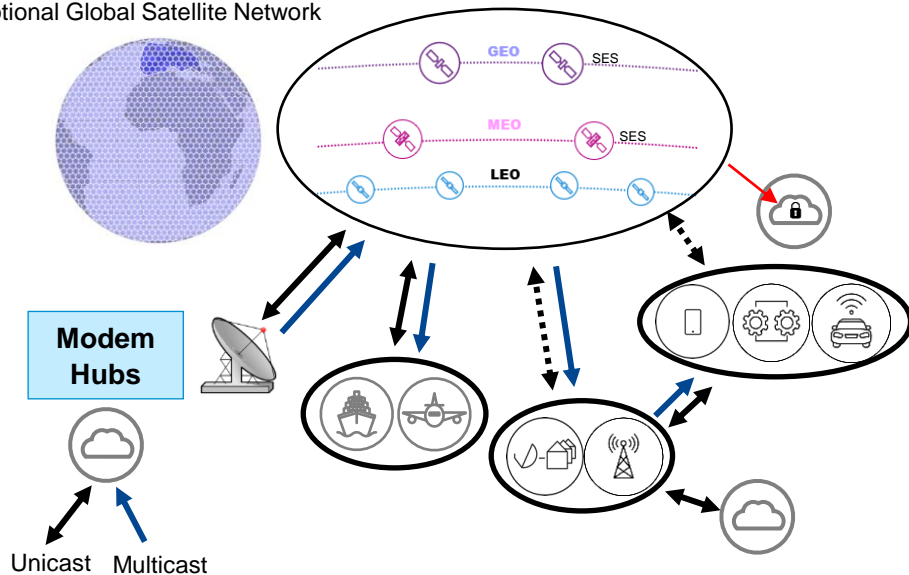
Investment scenarios in
LEO/MEO/GEO context
illustrate clearly benefits of
multi-orbit and GEO.

A mix of orbits and usage of
Multicast and Broadcast
Increases economic benefits
of resources
(spectrum and investment).

LEO-MEO-GEO integrated with terrestrial networks allows to deliver the best service everywhere in the most efficient way

Satellite Role - Multi Orbit Approach GEO-MEO-LEO

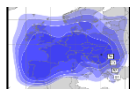
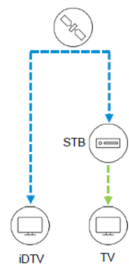
Notional Global Satellite Network



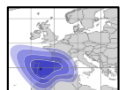
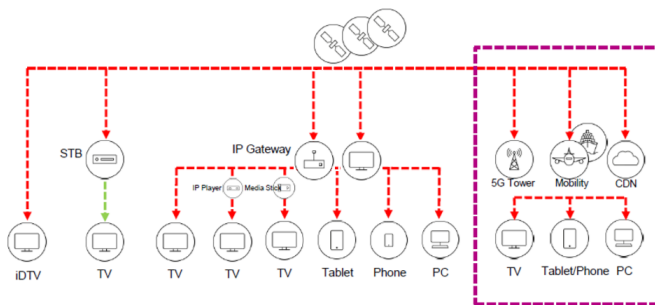
- Satellite systems are an integral part of the **overall global communication network of network**
- The **classical advantage of GEO satellites** for media distribution (signal shared by millions of receivers) is still applicable, **feeding the 5G/6G networks with media content at the edge**
- Due to their lower altitude and lower path loss, low orbits **open new perspectives for 5G/6G satellite services to handhelds and cars, in all bands**
- **Sub 6 GHz LEO constellations will target directly handhelds, IoT and cars using 3GPP NTN standards** and mainstream customer equipment
- The **satellite components shall be integrated** in a completely seamless way with the dominant 5G/6G terrestrial networks contributing to the **overall network of networks**

Transition from TS Video to IP Media Delivery

Today - MPEG TS



Tomorrow - IP based

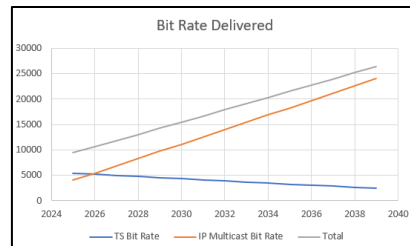
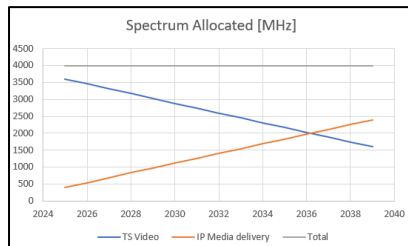


▲ The transition from TS video to IP Media delivery will be like the analog to digital transition on multiple aspects:

- IP Gateways are introduced to replace legacy receivers
- Progressive introduction of IP based Media Delivery
- Significant increase in quantity of content and non-linear Media Delivery

▲ Frequency reuse and dynamic footprints adjusted to content demand allow to increase the quantity of Media delivered (5x typically)

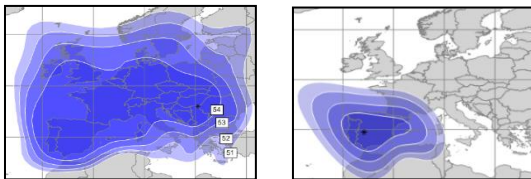
▲ The spectrum resource will gradually transition to the new system to enable gradual growth of content delivered



Notional Evolution of Capacity at 19.2E (with frequency reuse)

Example of a state-of-the-art GEO: SES-25 / Astra 1Q - Data & Video Convergence

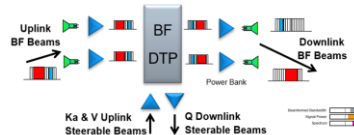
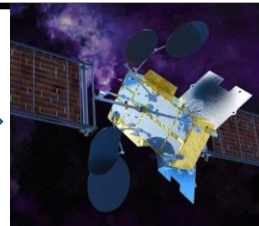
Broadcast/Multicast of Linear TV



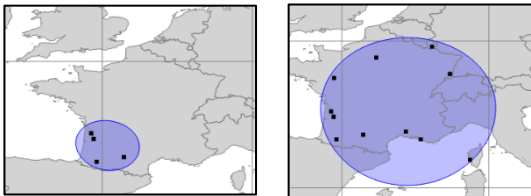
Customer API



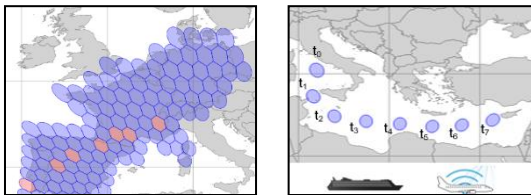
SDRM
ARC



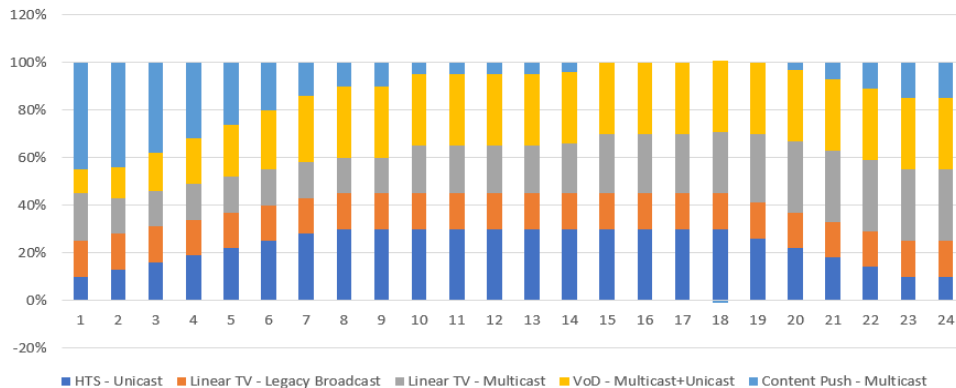
Multicast scheduled or on Demand



Multicast/Unicast on Demand

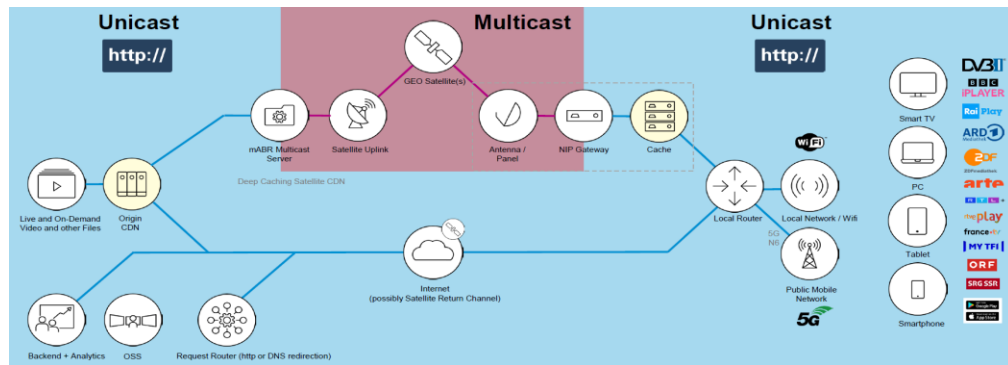


Notional satellite resource allocation over 24 hours



Software Defined Satellite - any beam @ any time @ any frequency

IP Based Multicast integrated with Unicast



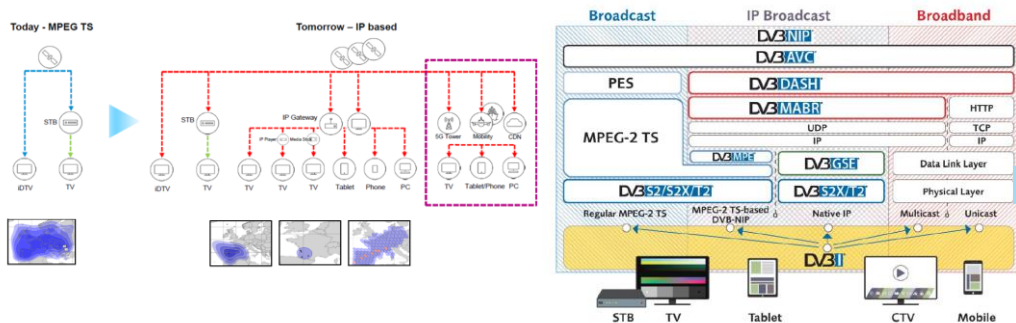
- ▲ Truly converged IP world with DVB-I and DVB-NIP



- ▲ These standards allow combination of any multicast and unicast connectivity in a seamless way

- ▲ SES develops DVB-NIP and DVB-I products for fix and mobile users

- ▲ Integrates seamlessly with 5G-NTN also



Any app developed for terrestrial works with satellite as well without change

Future Media Terminals



Flat Panel for Legacy DTH



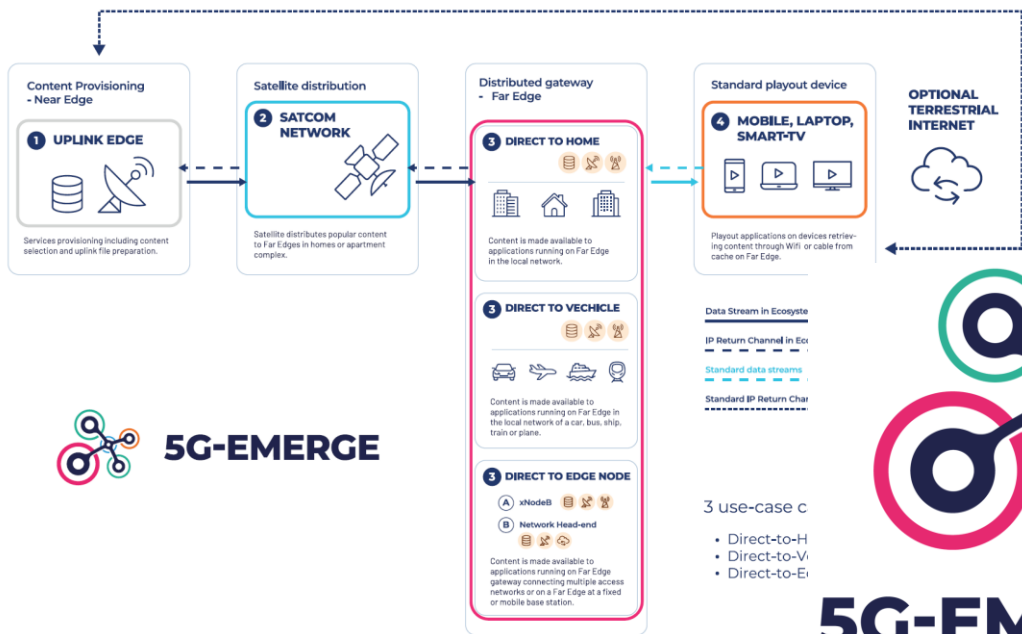
Low-cost Terminal
and HDMI stick



Integrated Terminal
Nomadic and mobile applications

- ▲ All upcoming media terminals will have the capability of acting as DVB-NIP media gateways, serving media to any device via the LAN Gateway
- ▲ The low-cost terminal and the HDMI stick, needed for short term business needs will connect TV-sets but will also be capable with adequate SW of acting as a DVB-NIP Media Gateway
- ▲ The integrated DVB-NIP terminal (with electronic steering) will not contain any decoder, its DVB-NIP Media Gateway will serve any device on the connected LAN with content
- ▲ This terminal is targeting large quantities (millions) and consumer friendly priced

Light Zoom on 5G Emerge Project



▲ The 5G-EMERGE project aims to develop a state-of-the-art hybrid delivery ecosystem that leverages both satellite and terrestrial networks to enhance media distribution



- 1 ESA ARTES**
Industry Initiated Partnership Programme, with 21 consortium partners representing stakeholders in the full delivery value chain, led by EBU and co-sponsored by ESA ARTES
- 2 5G FOR CONVERGENCE**
Network-slices seamlessly integrate Near Edges with distributed Far Edges through a virtualised satellite connection to 5G-Networks
- 3 NATIVE IP**
Hybrid infrastructure based on open standards to deploy edges in both 5G and non 5G-network head-ends, home networks and networks in vehicles
- 4 BASELINE EDGE SERVICES**
Edge architecture that can host applications and expose popular content transparently to end-users, with caching and satellite backhaul as core service

To conclude

SPECTRUM SHORTAGE EVERYWHERE...

- ▲ Increased demand of throughput requires enormous amounts of spectrum and resources in the future
- ▲ Connecting everything and everyone in unicast is not scalable

THERE IS PLENTY OF ROOM FOR GROWTH WITHIN MULTICAST AND BROADCAST...

- ▲ Efficient broadcasting and multicasting is and remains essential in the future, especially for satellite NTN networks

GEO SATELLITES TODAY ARE FLEXIBLE AND COST COMPETITIVE...

- ▲ GEO satellites remain cost competitive and are ideal for broadcasting and multicasting
- ▲ The GEO orbit benefits from a cost-effective implementation and is ideal to offload multicast and broadcast traffic
 - GEO broadcasting can seamlessly integrate with other networks based on DVB-NIP
- ▲ DVB-NIP and 5G based Broadcasting help solve this gap

FOR DATA LINKS...MULTI-ORBIT CONSTELLATIONS

- ▲ MEO constellations allow to serve high datarate users and concentrate capacity geographically
- ▲ LEO constellations are the basis for Direct-to-Device communications, low-cost consumer terminals, 5G convergence
 - However: Cannot concentrate and scale capacity for user clusters in geographic area and inherent low average fill rate

Thank you for your attention.

SES[▲]

