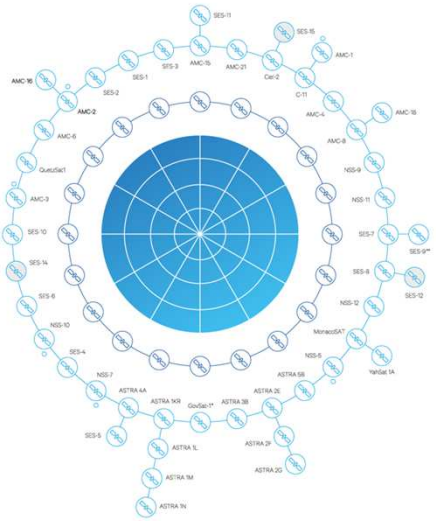

SES
NTN in 5G & Beyond
Multi Orbit Architectures
JP Choffray – 13-April-2023

SES – MEO-GEO Fleet

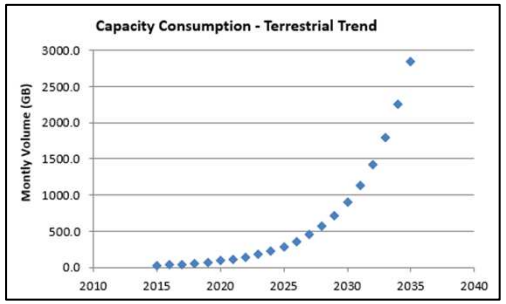
54 GEO widebeam

3 GEO HTS +3

20 MEO HTS +11



What do users want ? Fiber experience everywhere …



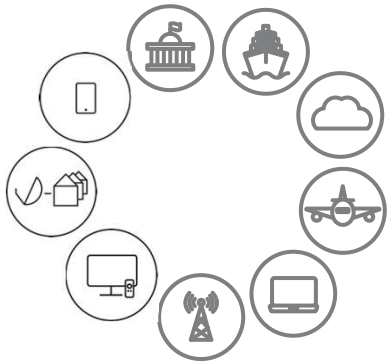
The capacity growth is essentially due “internet video” increasing in quantity and in resolution

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	6.1%(+1.1)	7.6%(+3.8)
5	FILE SHARING	4.2%(+1.4)	30.2%(+8.1)
6	MARKETPLACE	2.6%(-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

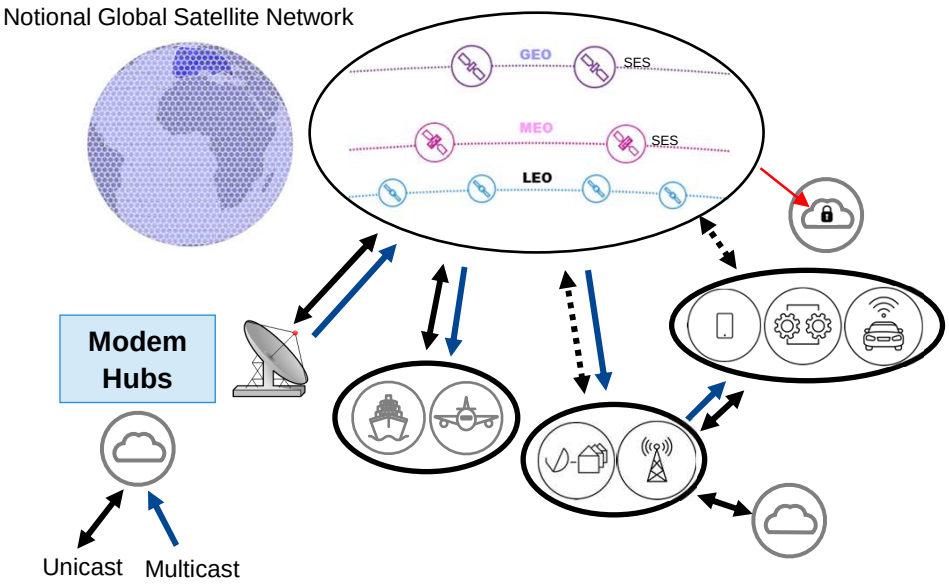
HD	MPEG-2	H.264	HEVC
Bitrate (Mbit/s)	18	8	4

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

Typical TV Bitrates (Mbit/s)

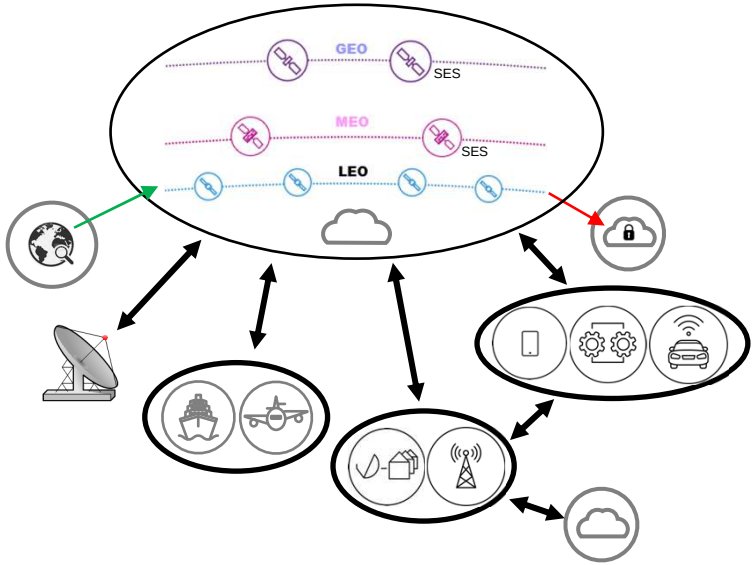
Source : The Global Internet Phenomena Report, Sandvine, September 2019

Satellite Role - Multi Orbit Approach



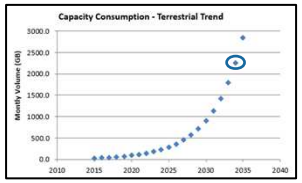
- Satellite systems are an integral part of the **overall global communication network of network**
- The **classical advantage of GEO satellites** for media distribution (signal shared by millions of receivers) is still applicable, **feeding the 5G/6G networks with media content at the edge**
- Due 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**

MEO – GEO – LEO Fleet – Distribution of roles



- Terrestrial : mainstream fixed and mobile communication (with gaps)
- LEO : low latency comm, direct to HH & cars, IoT, earth observation, QKD …
- MEO : Infrastructure backhauling, EO LEO backhauling, ISR backhauling …
- GEO : Media distribution (direct & indirect), latency insensitive comm
- Dynamic networks selection for user experience optimization and needs fulfillment
- Upcoming constellations should move to interoperable 3GPP based regeneration

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




GEO


MEO


LEO

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 Backauling 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**	

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

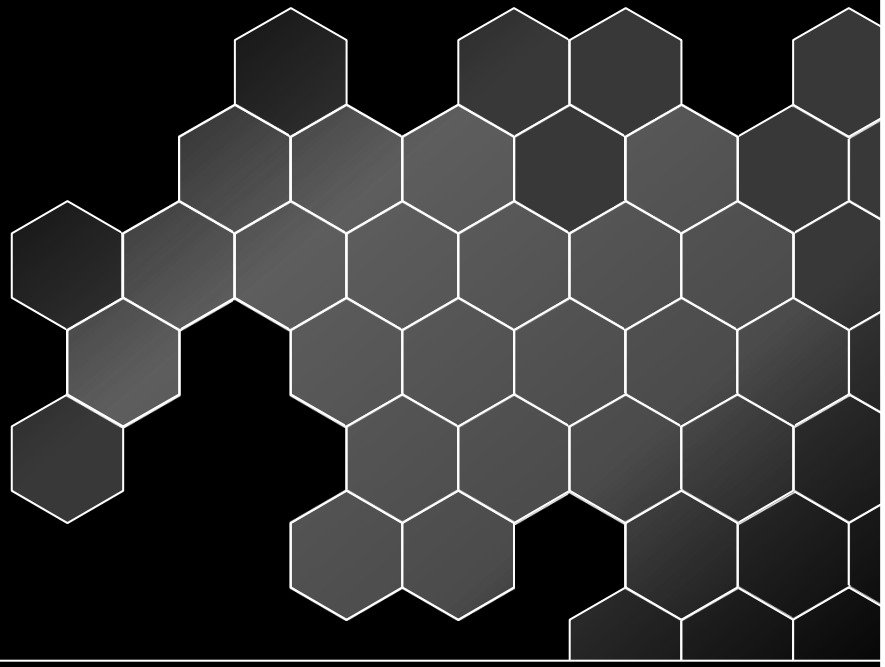
Conclusion

- Innovation for satellite communications is accelerating, potentially leading to a largely increased role for the satellite

- Adoption of cutting-edge technologies for space enables standard “software defined satellites” and should soon allow “flying base stations” based on 5G/6G technologies

- Standardization activities in 3GPP are preparing the ground for new generation of satellites systems as an integral part of 5G / 6G networks

THANK YOU



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