Overview of Ka-band Satellite System Developments
&
Key Regulatory Issues

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Prospects For Use Of The Ka-Band
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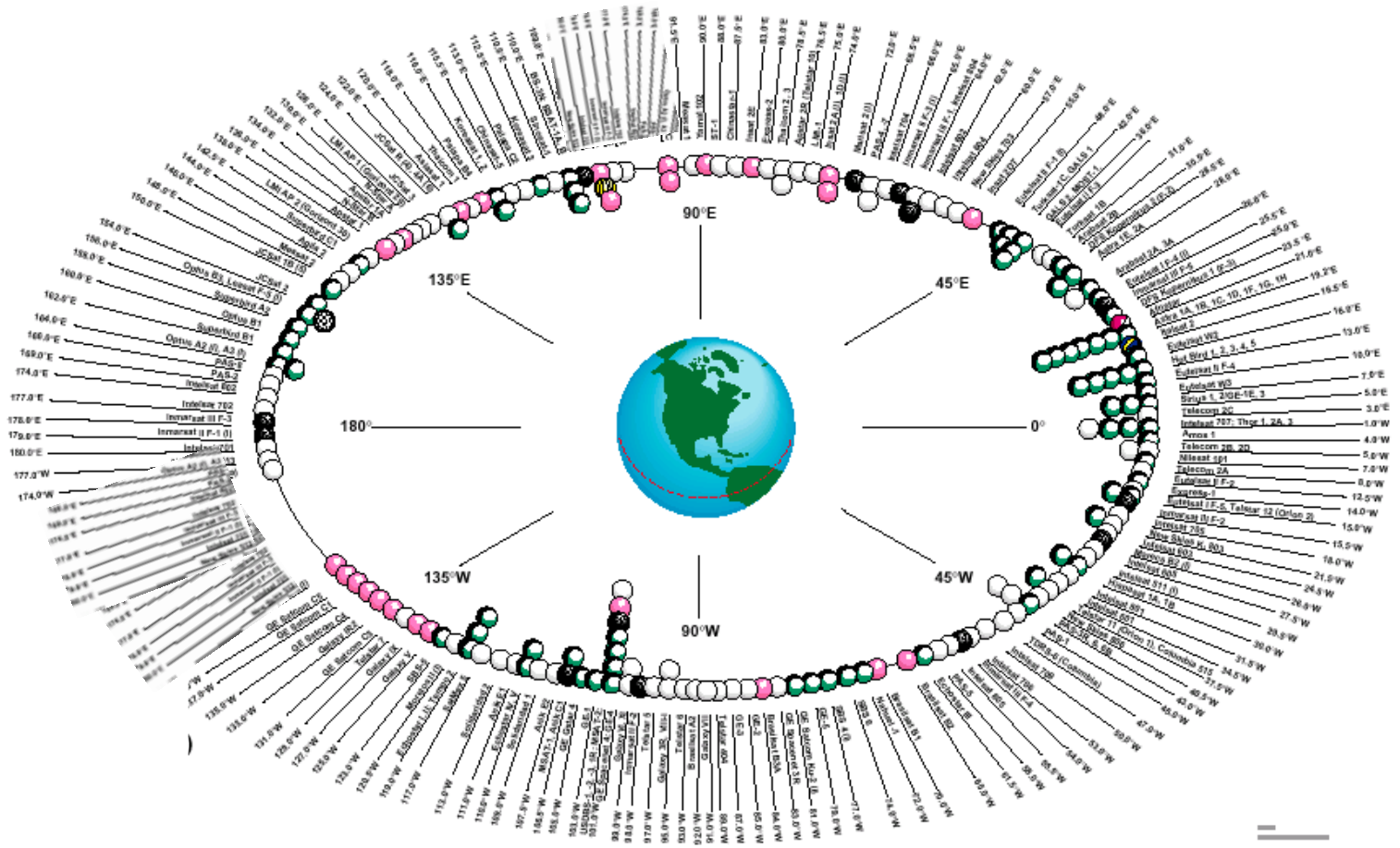
KA-BAND

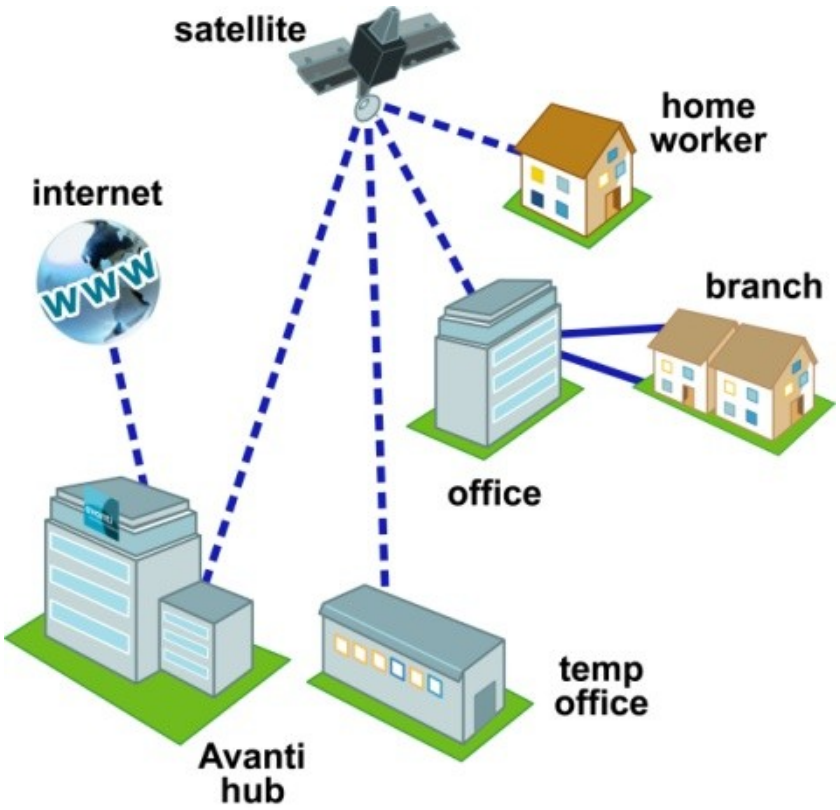
Ka-band Offers Significant Advantages

- Spectrum, a major constraint for satellite operators at C/Ku-band. Less congested at Ka-band.
- Ka-band satellites are highly efficient, which lowers bandwidth cost.
- Data traffic is increasingly bandwidth hungry. The higher Ka-band operating frequency enables high bandwidth data throughput (10Mbit/s…500 Mbit/s+)
- Customer premises are equipped with small Ka-band antenna – typically 74cm.

GEO Orbital Congestion



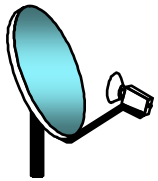
Ka-band Satellite Broadband Provides Access To Internet

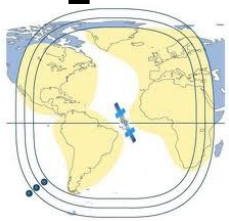


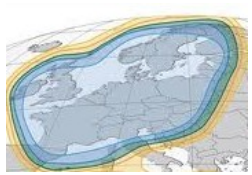
- Ka-band satellite broadband is a proven technology, delivering high-speed services to customers beyond the reach of terrestrial networks.
- Over 1 million premises are equipped with satellite broadband in the USA.
- Ka-band introduces higher download and upload speeds at lower cost.
- Typically up to 10Mbps/2.5Mbps broadband to 74cm Ka-band SITs (satellite interactive terminals) for consumers
- Higher data rates for government / enterprise customers

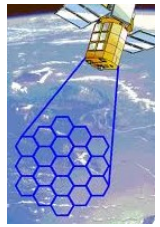
Spectrum & Technology Evolution

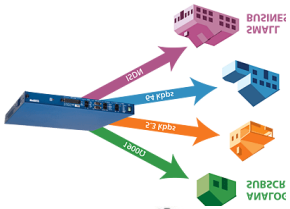
C		Ku		Ka

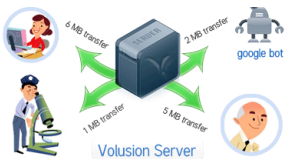


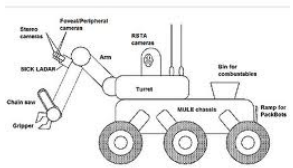


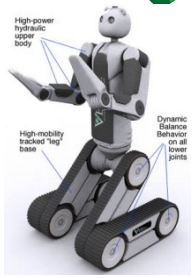












Current Use of Ka-band By Commercial Satellites

Indicative List of Launched Commercial Satellites With Ka-band	
Company	**Satellite System**
Arabsat	Arabsat-5B, Arabsat 5C
Avanti	HYLAS-1 / HYLAS-2
Eutelsat	Eutelsat-W3 series, Ka-Sat, Hotbird
Hispasat	Spainsat, Hispasat-1E
Hughes	Spaceway-3 / Jupiter-1
Intelsat	IAS-28 / Intelsat-20
Ipstar	Ipstar
Iridium	Iridium (LEO)
JAXA/NICT	Winds
Nilesat	Nilesat 201
SES	ASTRA 1H, ASTRA-1L, ASTRA-3B, ASTRA 4A, AMC-15, AMC-16, NSS-6
Spacecom	Amos 3
Telesat Canada	Nimiq 4
ViaSat	ViaSat-1, Wildblue -1, Anik-F2
Yahsat	Yahsat 1A (government) / Yahsat-1B

Planned Use of Ka-band By Commercial Satellites

Indicative List of Planned Commercial Satellites With Ka-band	
Company	**Satellite System**
ABS	ABS-7, ABS-2
Arabsat	BADR 7
Avanti	HYLAS-3
Eutelsat	W3C, EUTELSAT-3B
Eutelsat / ictQATAR	ES'HAIL
Hispasat	Hispasat AG1, Amazonas-3
Inmarsat	Global Xpress F1/F2/F3
Inmarsat	Alphasat 1-XL
ISRO	G-Sat 14
Measat	Measat -5
NBN Co	NBN-1 / NBN-2
NewSat	Jabiru 1
O3B Networks Limited	O3b Networks (MEO)
RSCC	Express AM5 & AM6 & AM7
SES	Astra 2E, ASTRA 2F, ASTRA 2G, ASTRA 4B, ASTRA 5B
Russia RTCom	National Systems
Spacecom	Amos 4 & 6
Telenor	Thor-7
Turksat	Turksat 4A / Turksat 4B

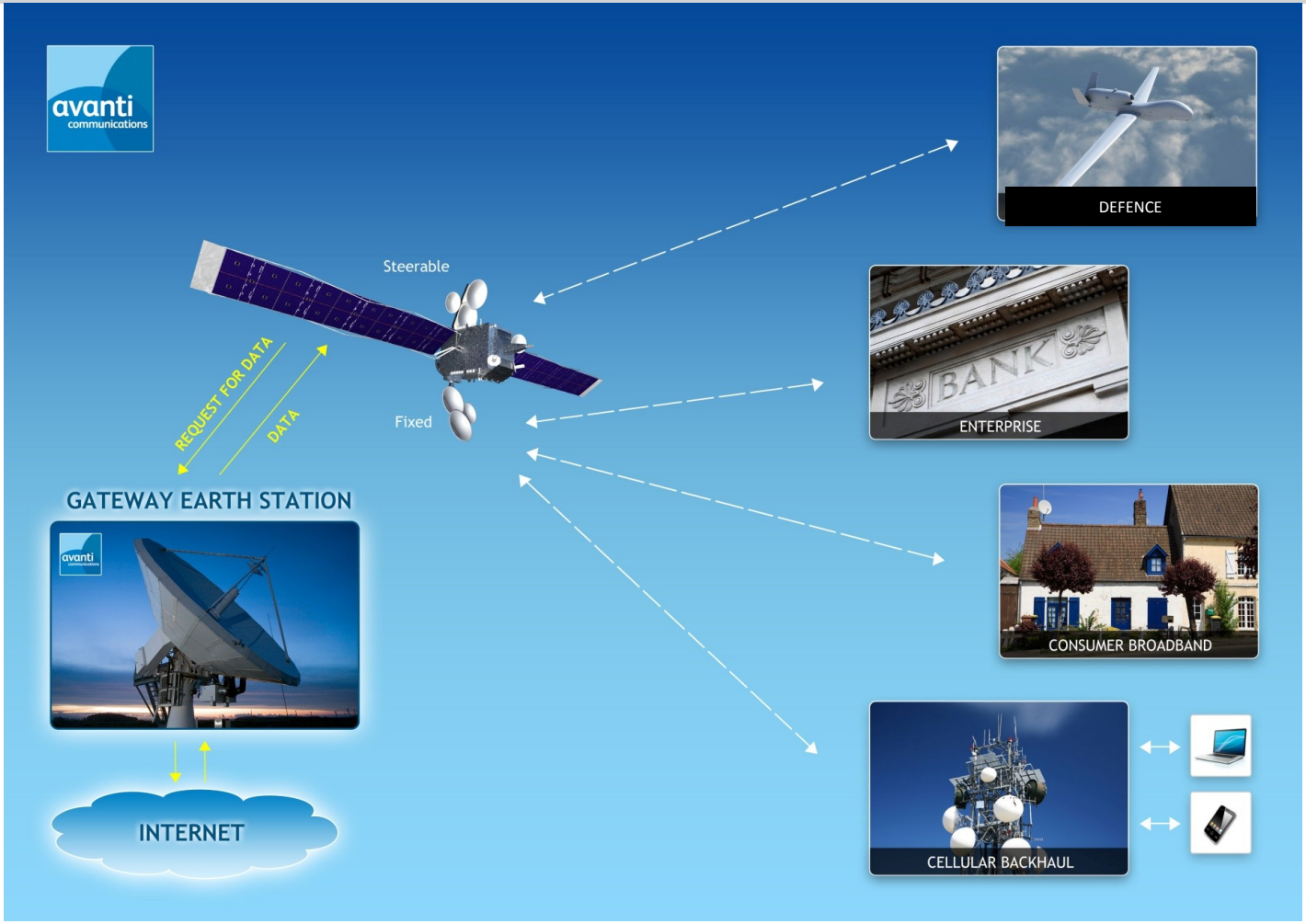
Source: Global VSAT Forum / November 2011

AVANTI & KA-BAND

Avanti Background

- Avanti Communications is a UK – Hqed satellite operator
- 14 years experience in the satellite industry
- Listed on the London Stock Exchange (AIM:AVN)
- > US$ 850 million capital deployed
  - Top shareholders include: M&G, Caledonia, GIC, Capital Group, Fidelity
  - Lenders EXIM (US), COFACE (France), Barclays Capital (UK)
- Use the latest Ka-band satellite technology
- Main activity is to provide broadband data communications
- Commercial satellite names: HYLAS-1 / HYLAS-2 / HYLAS-3 etc
- ITU-R Sector Member as a Recognised Operating Agency (ROA)
- ITU-D Sector Member

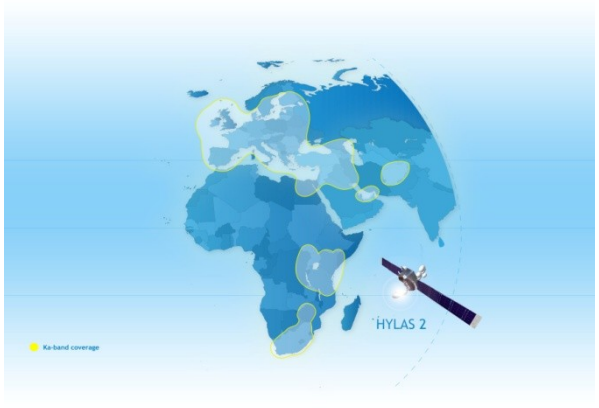
Avanti Operates In Four Markets Using Ka-band Satellite Technology



HYLAS-1 (Launched 26 November 2010)

- Private Public Partnership (PPP) with European Space Agency (ESA)
- Civil and government Ka-band system
- Multiple Ka-band Spot Beams
- Very high power (> 62dBW) Spot Beams
- Orbital location 33.5°W / Operational
- Constructed by EADS Astrium (EU) / ISRO (India)
- Other service / coverage areas feasible
- Ka-band Gateway Earth Stations in UK at Goonhilly and Lands End, Cornwall UK (diversity sites / connected by dark fibre)

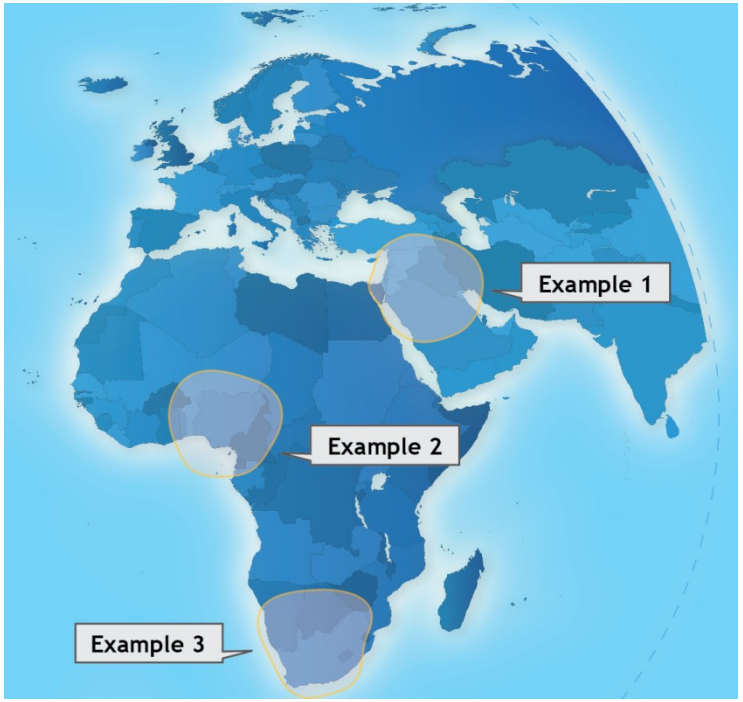
HYLAS-2 (Launched August 2, 2012)



- Civil and government Ka-band system
- Ca 50 spot beams across Middle East, Africa and Europe (> 24 active in normal operations)
- Plus steerable spot beam
- Very high power (> 62dBW) Spot Beams
- 'Wet' and 'dry' spot beams for differing regional climates
- Multiple gateway earth stations (UK, Cyprus, Germany, etc)
- Constructed by the Orbital Sciences Corporation (USA)

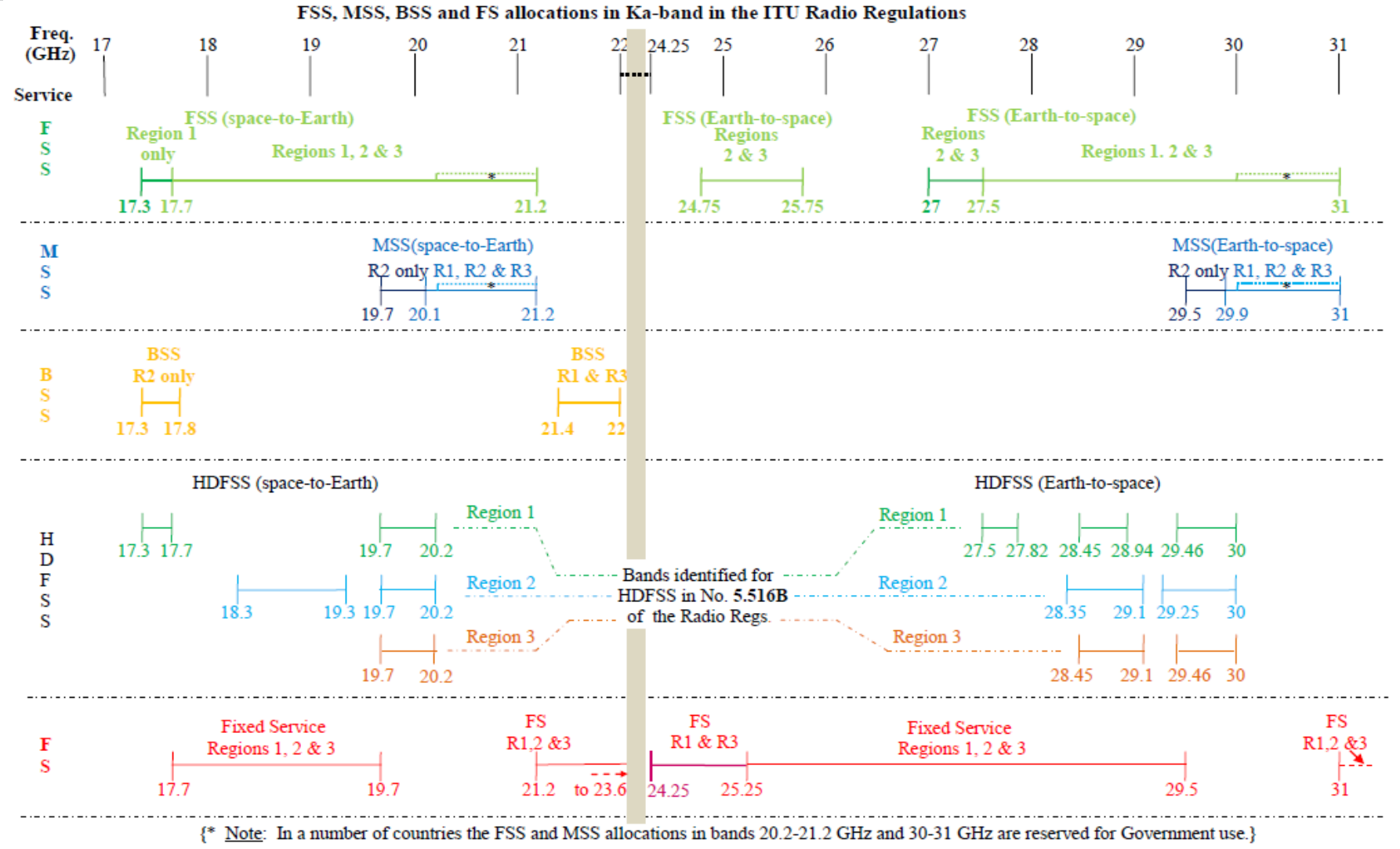
HYLAS 3 Ka-band (Planned Launch 2015)

- Private Public Partnership (PPP) with European Space Agency (ESA)
- HYLAS-3 will be a “hosted payload” on a GEO EDRS-C satellite mission flown by ESA. The HYLAS 3 payload would be integrated onto the ESA EDRS-C GEO satellite.
- The HYLAS-3 Ka-band capacity will operate in a cluster of Ka-band user spot beams large enough to cover an area the size of Southern Africa. It could go anywhere in Africa or the Middle East or CIS.
- The HYLAS-3 Ka-band user-beam antenna is fully steerable throughout the life which confers great flexibility advantages to certain customers.
- Avanti completed financing round of £ 75 million for HYLAS-3 in February 2012
- HYLAS-3 Ka-band payload : MDA (Canada) is prime-contractor.



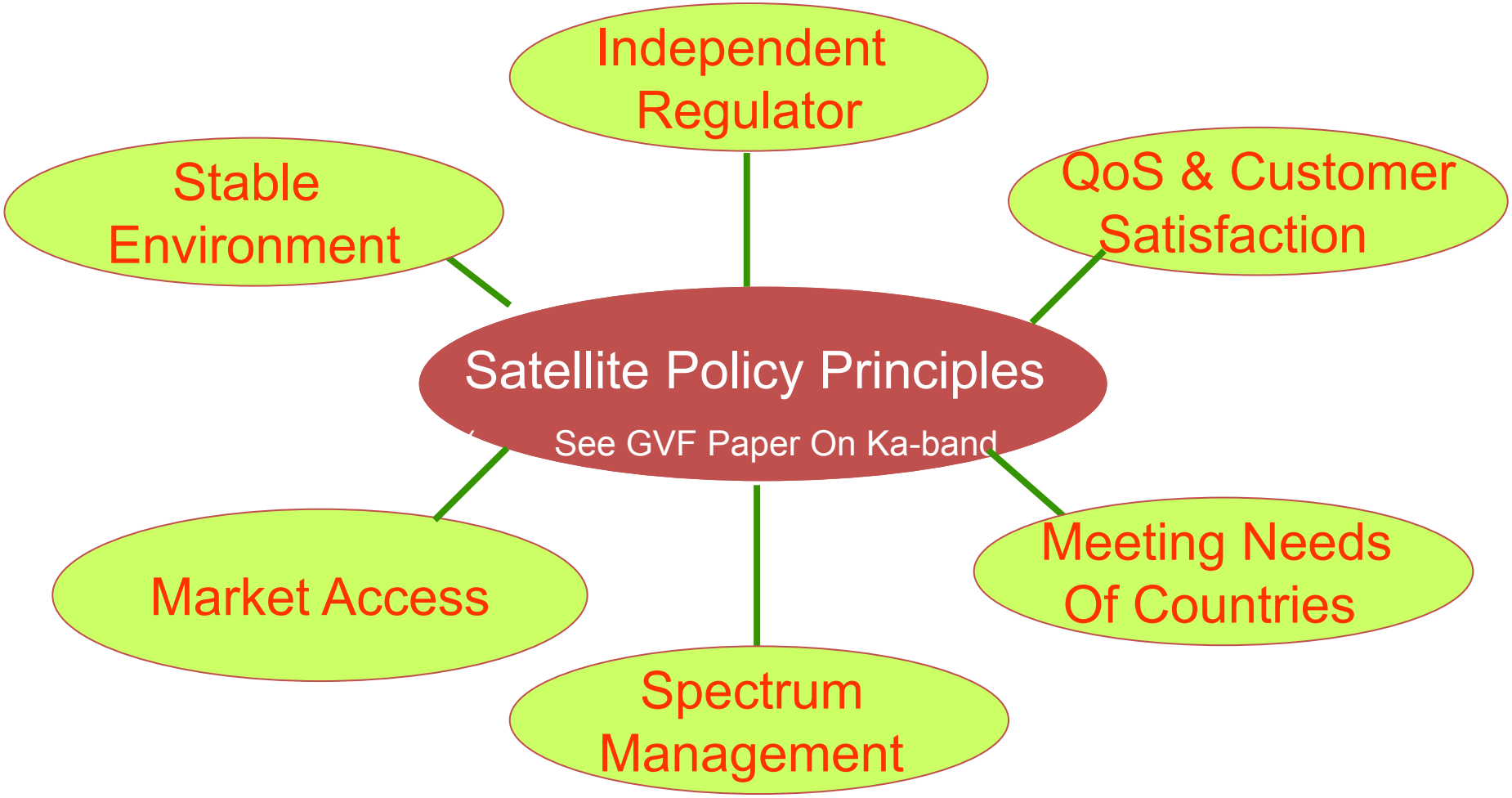
KEY KA-BAND REGULATORY ISSUES FOR GEO KA-BAND FSS

Top Level View Of ITU Frequency Allocations At Ka-band

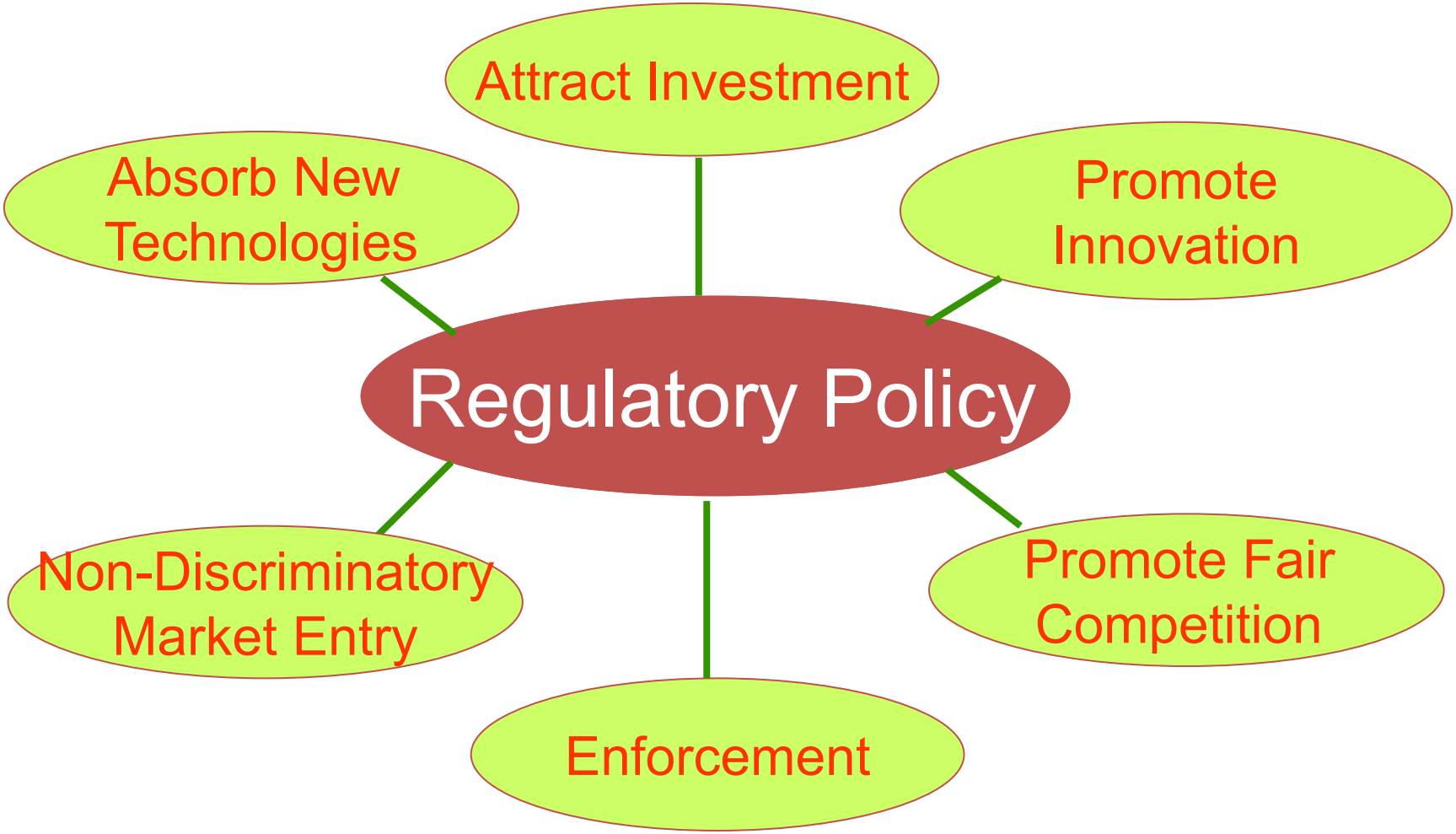


Source: Global VSAT Forum / November 2011

Key Regulatory Policy Principles



Positive Regulatory Practice



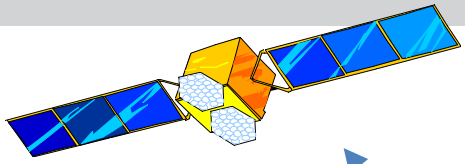
Estimate Of Ka-band GEO FSS Satellite Network Filings To ITU By CIS Countries

CIS Country		Ka-band ITU Satellite Filings At "API" Stage	Ka-band ITU Satellite Filings At "NOT" Stage
	Armenia	0	0
	Azerbaijan	23	0
	Belarus	1	0
	Kazakhstan	16	10
	Moldova	0	0
	Russia	61	28
	Tajikistan	0	0
	Uzbekistan	0	0
	Kyrgyzstan	0	0
	Turkmenistan	0	0
	Ukraine	4	0

Source: ITU SNL Database (Date: August 20, 2012)

Ka-band GEO FSS Satellite Systems & Typical GEO FSS Frequency Bands Used

Shared Bands (FSS / FS)
17.7 – 19.7 GHz ↓
27.5 – 29.5 GHz ↑



Exclusive Satellite Band
19.7 – 20.2 / 21.2 GHz↓
29.5 – 30.0 / 31.0 GHz↑

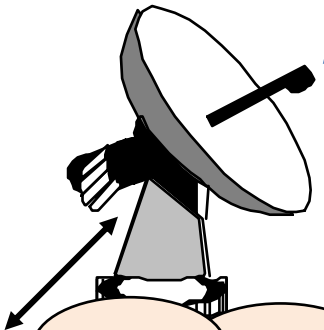
- Allocation of adequate spectrum on an exclusive basis by ITU for Ka-band FSS
- National Frequency Allocations for Ka-band FSS
- Is it feasible to establish GW inside every country ?

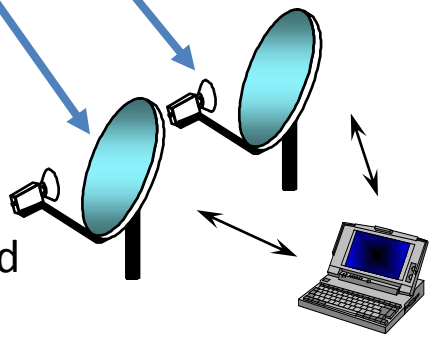
Frequency coordination (with terrestrial FS)

Spectrum Fee for GWs

Incorrect alignment of VSATs

Spectrum Fees for VSAT Networks





Public networks

Gateway Earth Stations (GW)

Customer Ka-band FSS VSATs

Ka-band GEO FSS Licensing

Typical Ka-band Regulations in Other Countries - For Blanket Licensing of GEO FSS Earth Stations:

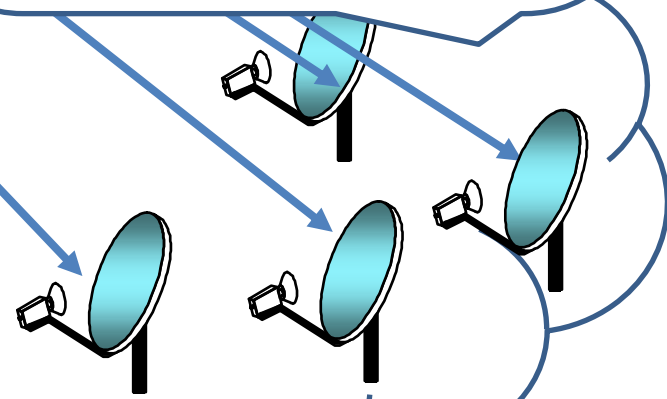
- Meet off-axis EIRP density limits (viz ITU-R Recommendation 524-9)
- Meet antenna side-lobe limits (viz ITU-R Recommendation 580-6)
- EIRP ≤ 55 dBW

≥ Outside airport perimeter

- Service Provider Licensing / Network Authorisation
- Blanket licensing of GEO Ka-band VSATs which comply with international standards (e.g. ETSI, ITU-R)
- Compliance and QoS
- [Registration of VSATs]
- Licensing fees

Typical Ka-band Regulations in Other Countries:

- No charge for individual VSAT
- Network / Spectrum Authorisation Fee
  - Throughput (bandwidth)
  - Power
- Flat rate based on cost recovery



Regulatory Steps To Enable Ka-band GEO FSS Satellite Services

1. Ensure Ka-band FSS satellite frequency allocations of the ITU are implemented in national frequency allocations tables.
2. Ensure equitable market access for Ka-band GEO Systems and application of WTO “National Treatment” principle.
3. Ensure licensing policies established to enable Ka-band GEO FSS satellite. service provision and Ka-band GEO FSS VSAT network operations in country.
4. Transparent, efficient and fair licensing regime to meet needs of operations, service providers and consumers / customers for GEO Ka-band FSS satellite services.
5. Implement a Ka-band VSAT Blanket License approach for GEO Ka-band VSATs (so end users do not need to apply for individual licences).
6. Implement a transparent and fair spectrum / licence fee for GEO Ka-band VSAT network operations / service providers.
7. Effect appropriate enforcement.
8. See GVF White Paper (2011) On Ka-band Licensing Principles.

Spasibo

Спасибо

THANK YOU

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