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# SABER

## SAtellite Broadband for European Regions

### Satellites & satellite broadband internet

Eutelsat, SES Broadband Services, Skylogic

08/11/2012



# Agenda

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Why satellites?

Everything you always wanted to know about satellite but were afraid to ask

Satellite broadband

Currently available satellite broadband systems and services

Satellites' role for 100% EU coverage



# Digital Agenda for the EU - the left apart

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*[...] all Europeans, 100% of them, should have access to basic broadband by 2013. This is not the only target of the DA. But it is perhaps one of the most important: it will be a solid foundation on which we can build to deliver the remaining targets [...]*



*95% of Europeans now have access to broadband internet infrastructure. That's a great achievement. But it still leaves a lot of people - 10 million households, in fact - who we are still to reach.*



*[...] we cannot forget about social inclusion. [...] the benefits of the internet must be spread to include everyone.*

# Do solutions exist?

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*The 10 M unserved households are, by definition, those which it has proved the most difficult and expensive to cover, by and large rural and isolated*

- Complementarity of networks to the benefit of the final EU citizen
- Infrastructures providing the same services with different architectures



*Technologies like [...] satellite [...] can be the most cost-effective in such areas where more common, landline solutions are not an option*

*Although wireless technology does not have the same performance as advanced wired networks, it is good and getting better*

# The Real Last Mile

- Infrastructure heavy methods of rolling-out broadband will never reach the last few percent
  - the digital divide will not be bridged by such technologies
  - even 'wireless' networks require wires to the base stations
- There is complete synergy between the EC's objectives for underserved areas and broadband delivered by satellite

Digital Region will place South Yorkshire at the forefront of the UK's digital communications agenda, with coverage of the network reaching 1.3 million people, 540,000 homes and 40,000 businesses, **97%** of all premises.

**"state investments in broadband ... should be limited to investments in underserved areas."**

*EC Announcement, 17 Sept 2009*

**"Given that broadband services can be delivered on a host of network infrastructures based on wireline, wireless, satellite and mobile technologies, Member States should not favour any particular technology."**

*EC Guidelines for Rapid Deployment of Broadband, 30 Sept 2009*



# What satellites can do

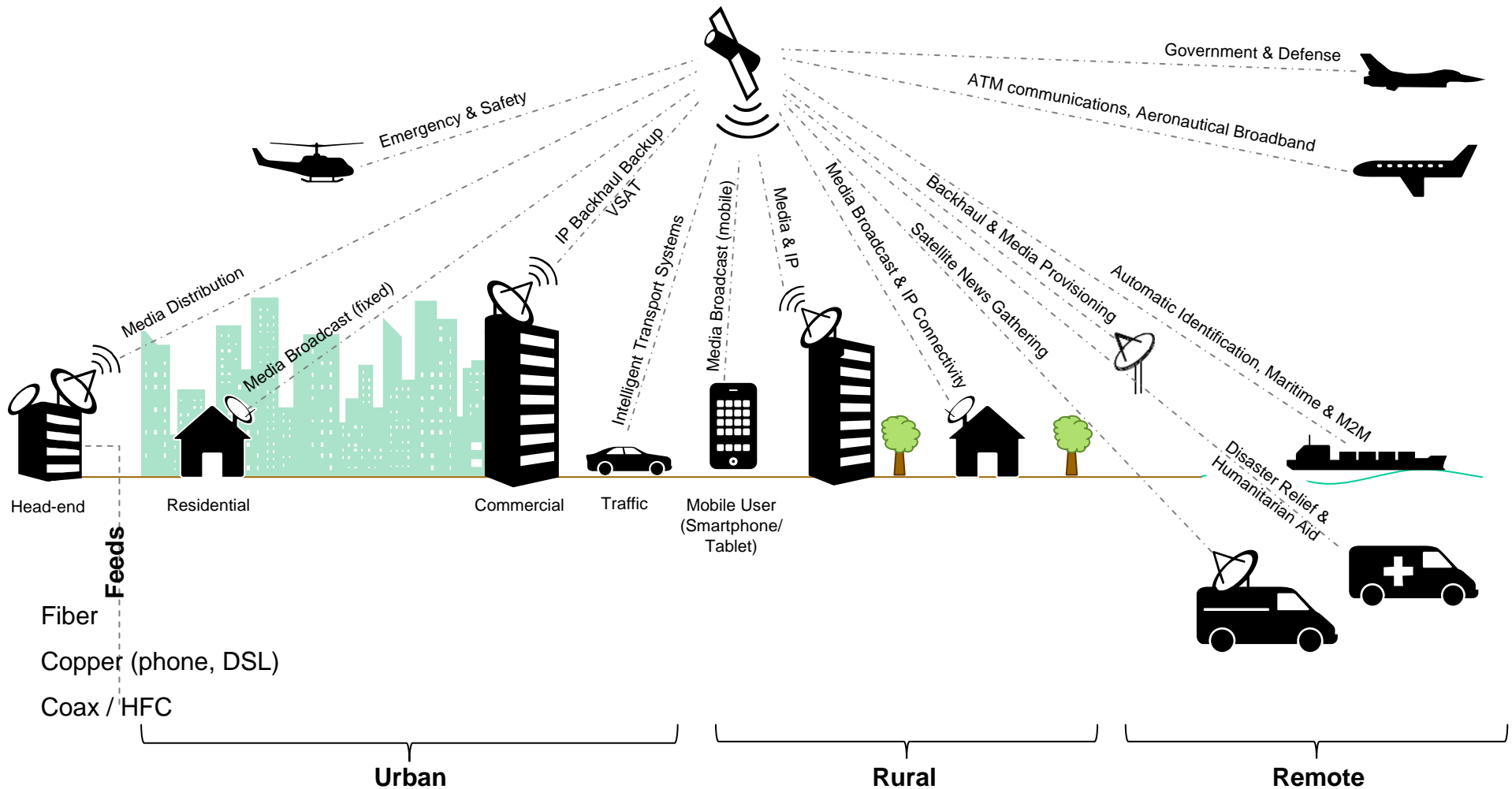
THERE ARE SOME THINGS  
THAT WE CAN'T DO ...

... FOR EVERYTHING ELSE,  
THERE ARE  
SATELLITES



# Satcom applications

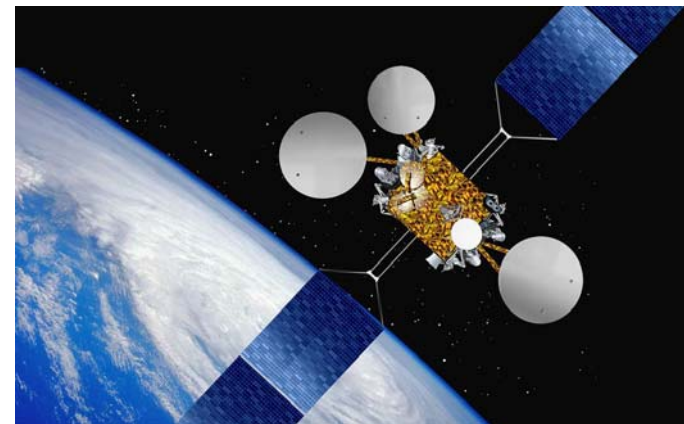
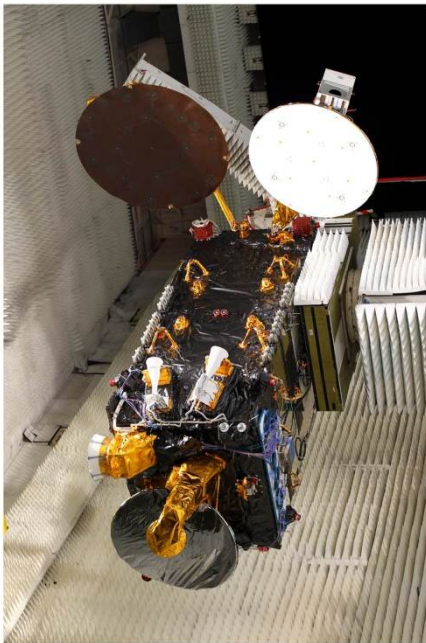
## Key role of satellite in data networks and broadband



# Satcom industry players

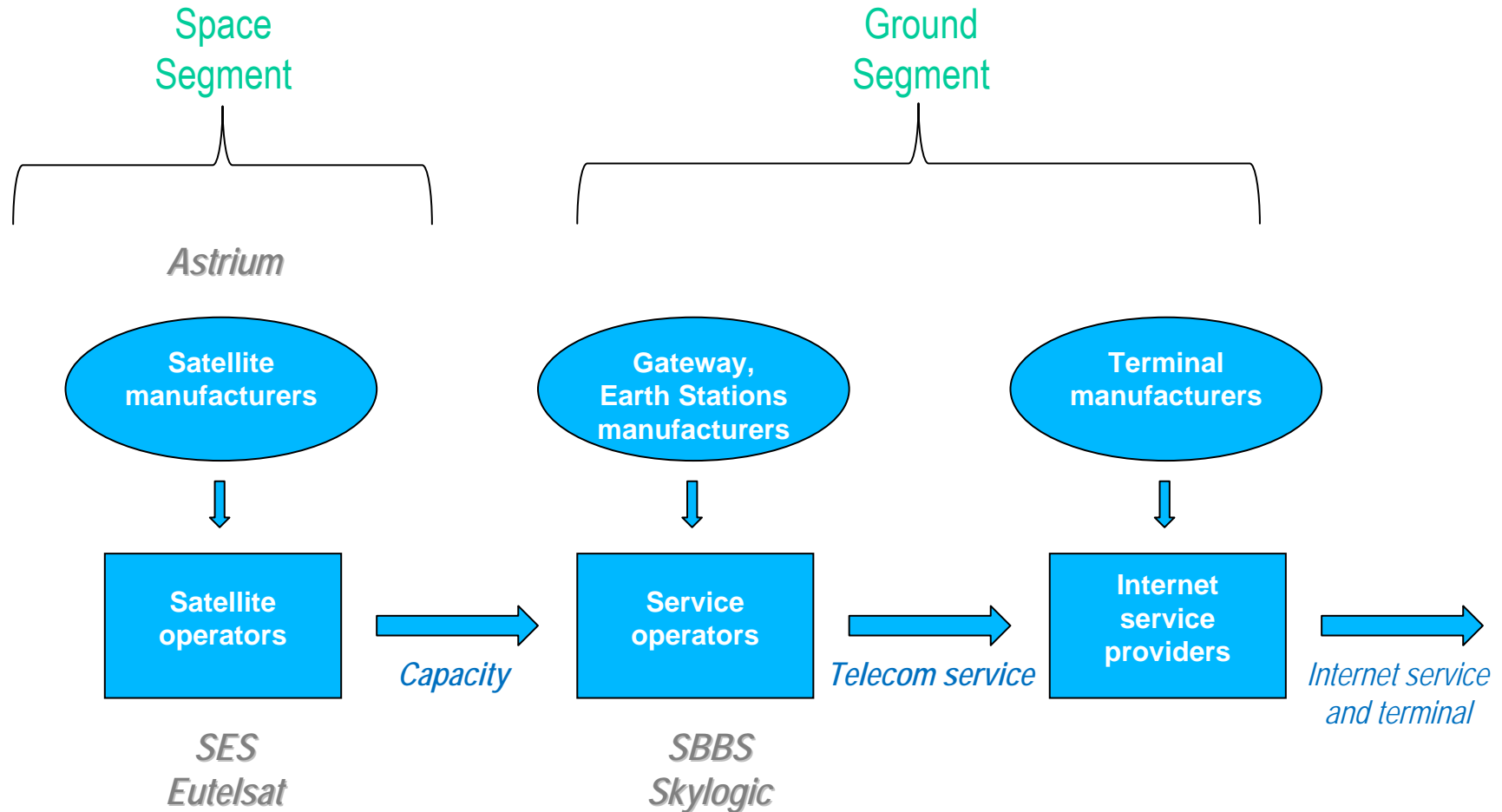
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- Satellite operators: a concentrated market (the 3 world leaders Intelsat, SES and Eutelsat, represent 60% of the sector)
- Satellite manufacturers: EADS-Astrium, Thales Alenia Space, NPO-PM, BSS, ISRO
- Satellite launchers: Ariane, Atlas, Delta, Proton, Sea Launch





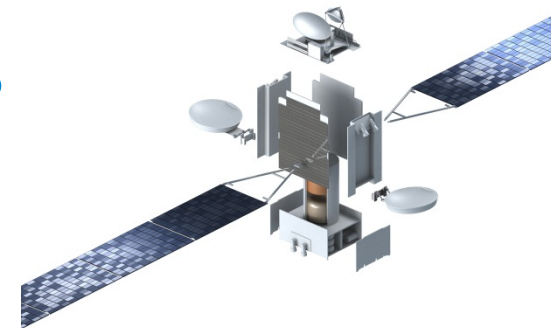
# Satellite broadband value chain



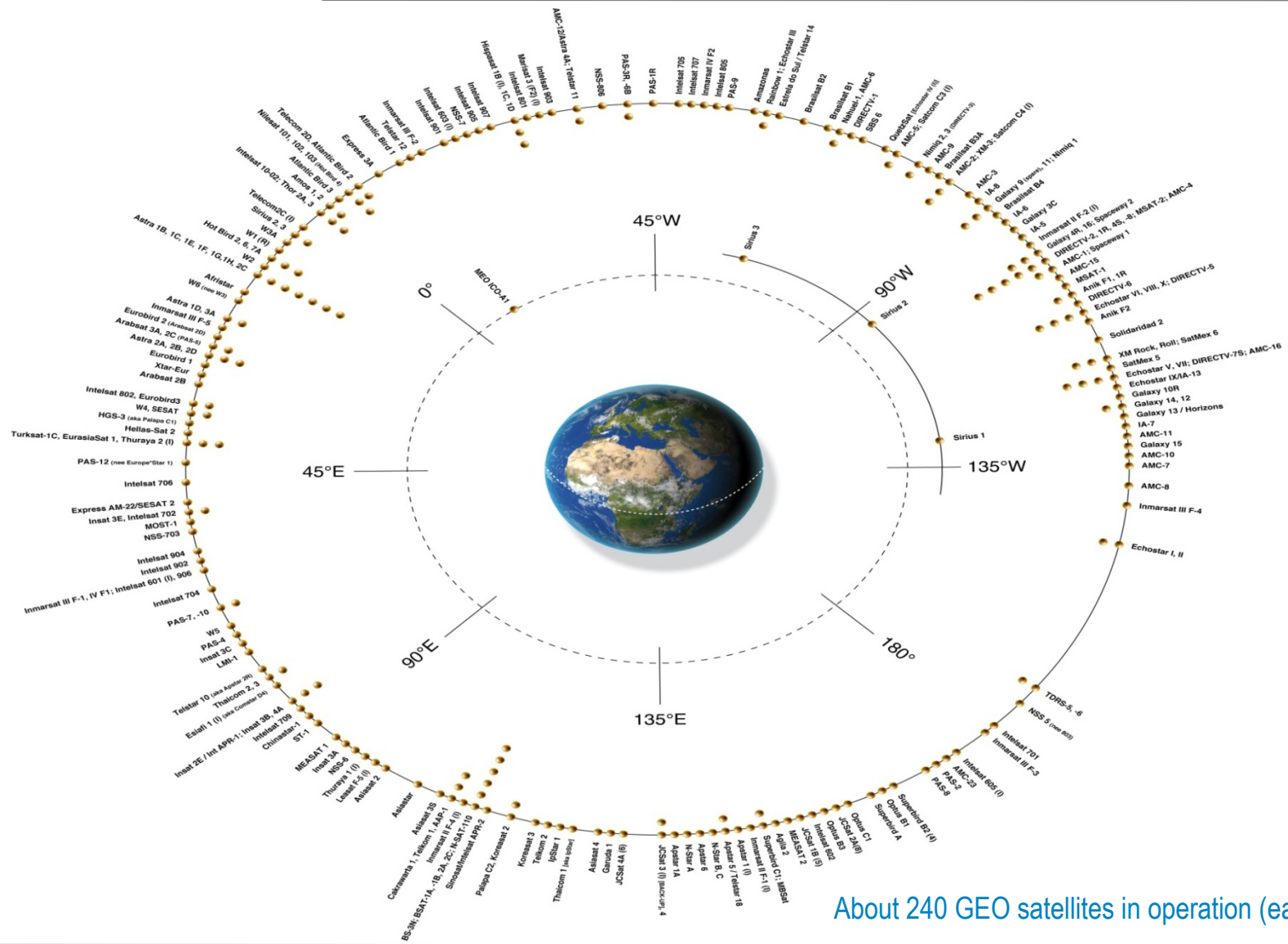
# Satellite costs and lifetime

## An investment entirely borne by the private sector

- About 150-250 M€ per (traditional) satellite
- About 100 M€ for a launcher, including some 20% of insurance costs
- So a final investment is about 250-350 M€ per satellite
- Procurement and launch cycle of 3 years
- Lifetime in orbit: 12 to 15 years


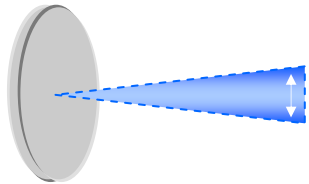
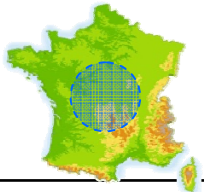
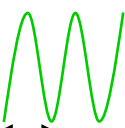
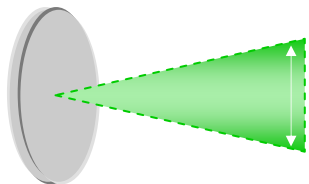
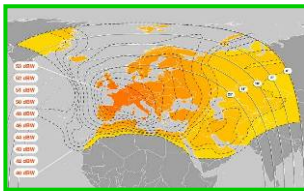

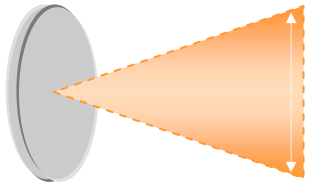



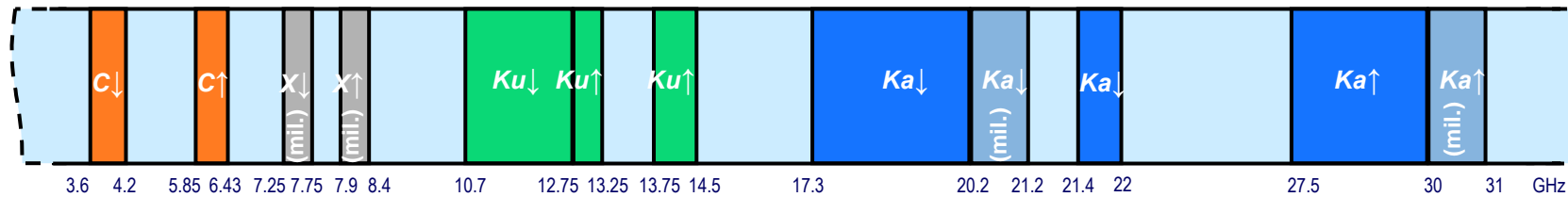
# GEO Orbital positions



About 240 GEO satellites in operation (early 2011)

# Satellites' frequency bands

<p><b>K<sub>a</sub> band</b></p>  <p>1 cm</p>	<p>Very high frequencies                  20 GHz ↓                  30 GHz ↑                  Largely available resource (6 GHz)</p>	<p>Concentrated beam</p> 	<p>Coverage concentrated over 500 km</p> 
<p><b>K<sub>u</sub> band</b></p>  <p>2 cm</p>	<p>High frequencies                  12 GHz ↓                  14 GHz ↑                  Still available resource (3.3 GHz)</p>	<p>Wide beam</p> 	<p>Continental coverage</p> 
<p><b>C band</b></p>  <p>8 cm</p>	<p>Medium frequencies                  4 GHz ↓                  6 GHz ↑                  Limited resource (1.2 GHz)</p>	<p>Very wide beam</p> 	<p>Multicontinental coverage</p> 



# Operations with few emissions

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**ONLY** satellites communicate for up to 15 years  
using solar energy & emitting zero carbon

- Solar panels generate all the electric power a satellite ever needs
- Satellites radiate PICOWATTS, terrestrial transmitters radiate MEGAWATTS



# International coordination

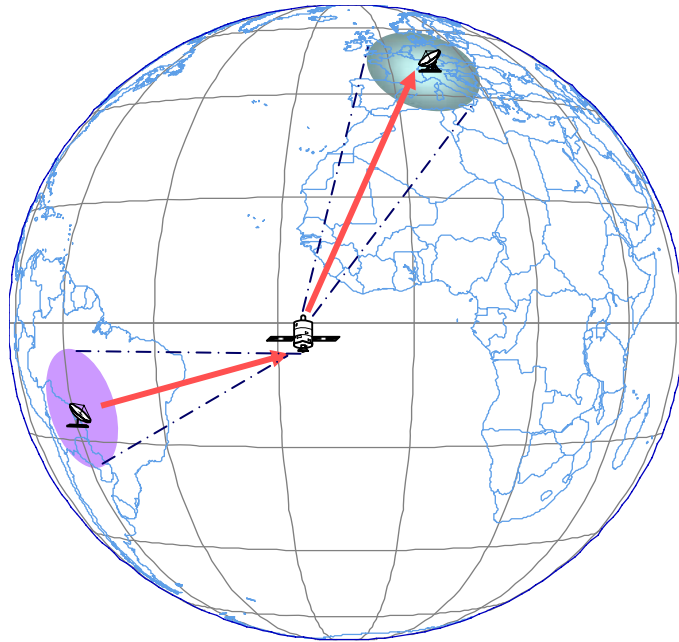
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## Orbital positions and frequencies allocation

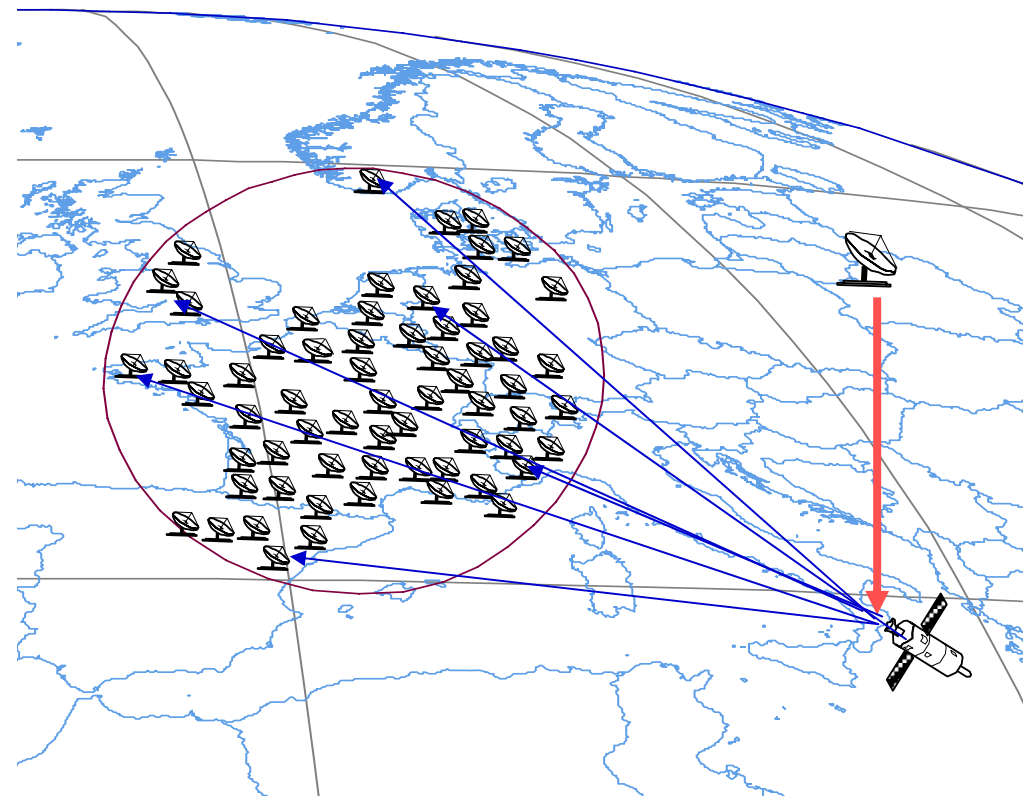
- Satellite coverage always has an international dimension
- The allocation of orbital positions and frequencies of transmission used by satellite operators is coordinated by the ITU (International Telecommunication Union), an organization of the United Nations.
- The main purpose is preventing any interference between different signals
- Satellites need to preserve access to adequate spectrum allocation protected against harmful interference (because of the weak signal)
- Satellite services are inherently spectrally efficient



# Satellite network architectures (1)



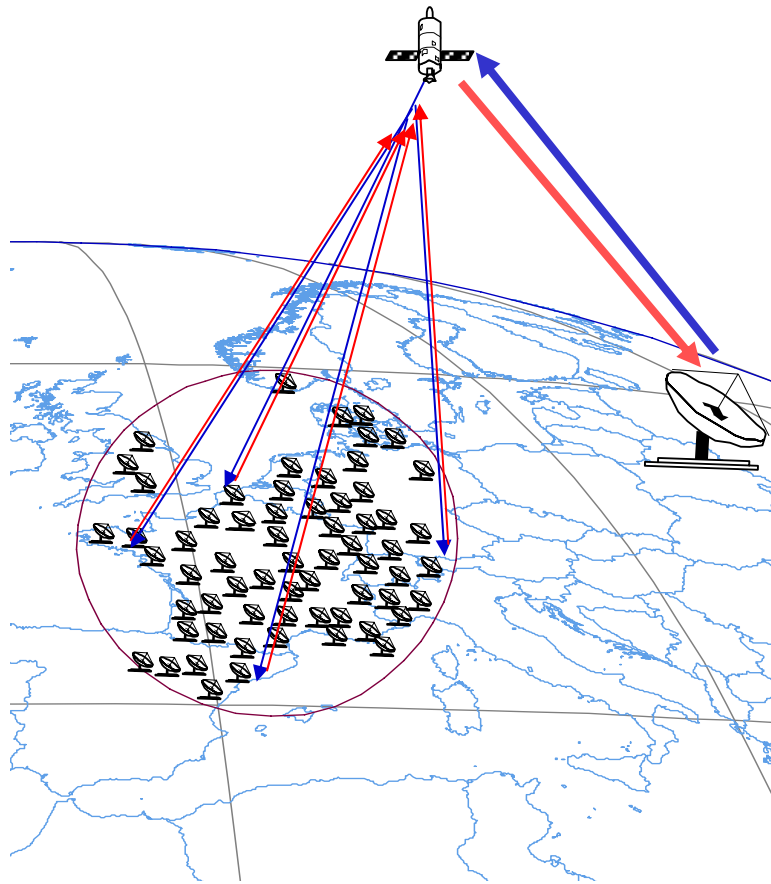
POINT TO POINT



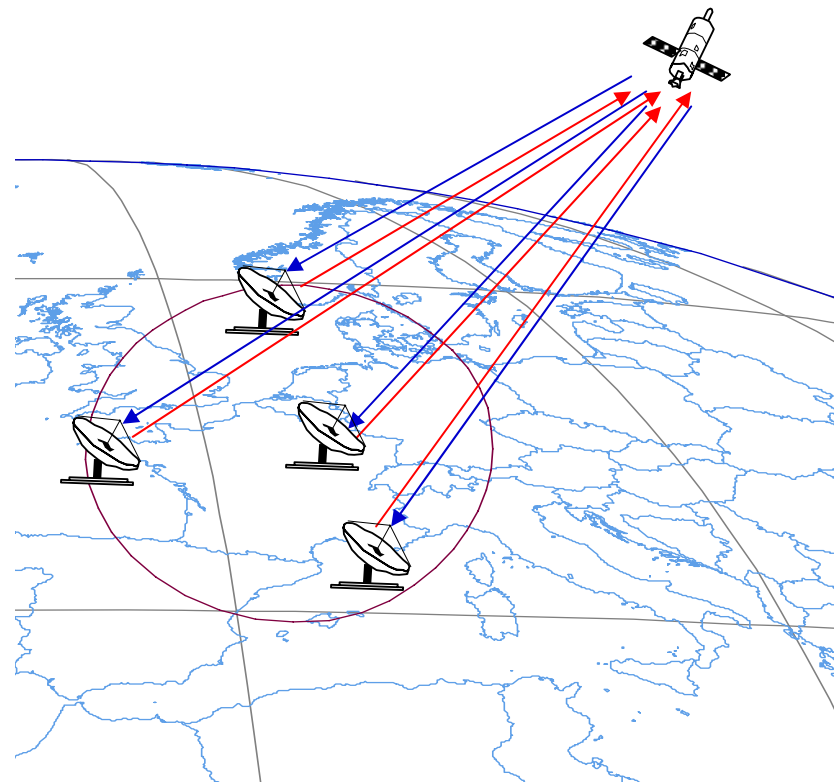
BROADCASTING (point-multipoint)

# Satellite network architectures (2)

Star networks



Meshed Networks



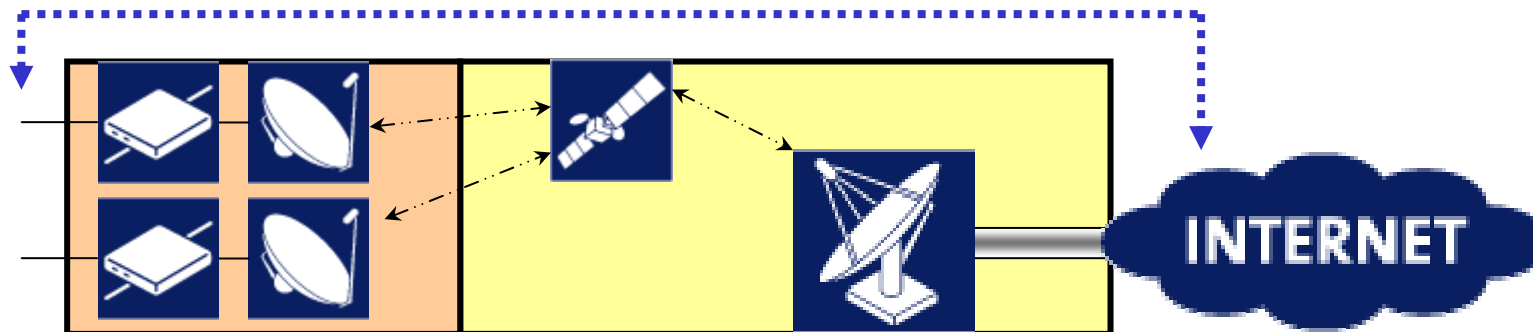


# Network architecture differs from terrestrial ones

- E.g. terrestrial networks show architectural separation into Backhaul and Last Mile



- In satellite networks, there is NO ARCHITECTURAL SEPARATION INTO BACKHAUL AND LAST MILE



# Satellites evolution toward consumer broadband

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The technology development now allows:

- performances of a hi-profile ADSL, in terms of speed and reliability
- subscription fee lower than in the past, thus enabling the provision of affordable services to residential user

## Typical consumer services

	<i>download speed (mbps peak)</i>		<i>Monthly fee</i>
	<i>low</i>	<i>high</i>	
<i>entry level</i>	<i>3</i>	<i>8 and higher</i>	<i>ADSL-like</i>

Various operators / countries



# General advantages of satcoms

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- *Ubiquitous service (no digital divide)*
- *Easy and immediate solution for «reaching» users and overcoming geographical barriers*
- Service everywhere, independent of distance
- Wide geographical coverage zones allow connectivity over vast service areas
- Rapid deployment, immediate provision of broadband access (core infrastructure already in place)



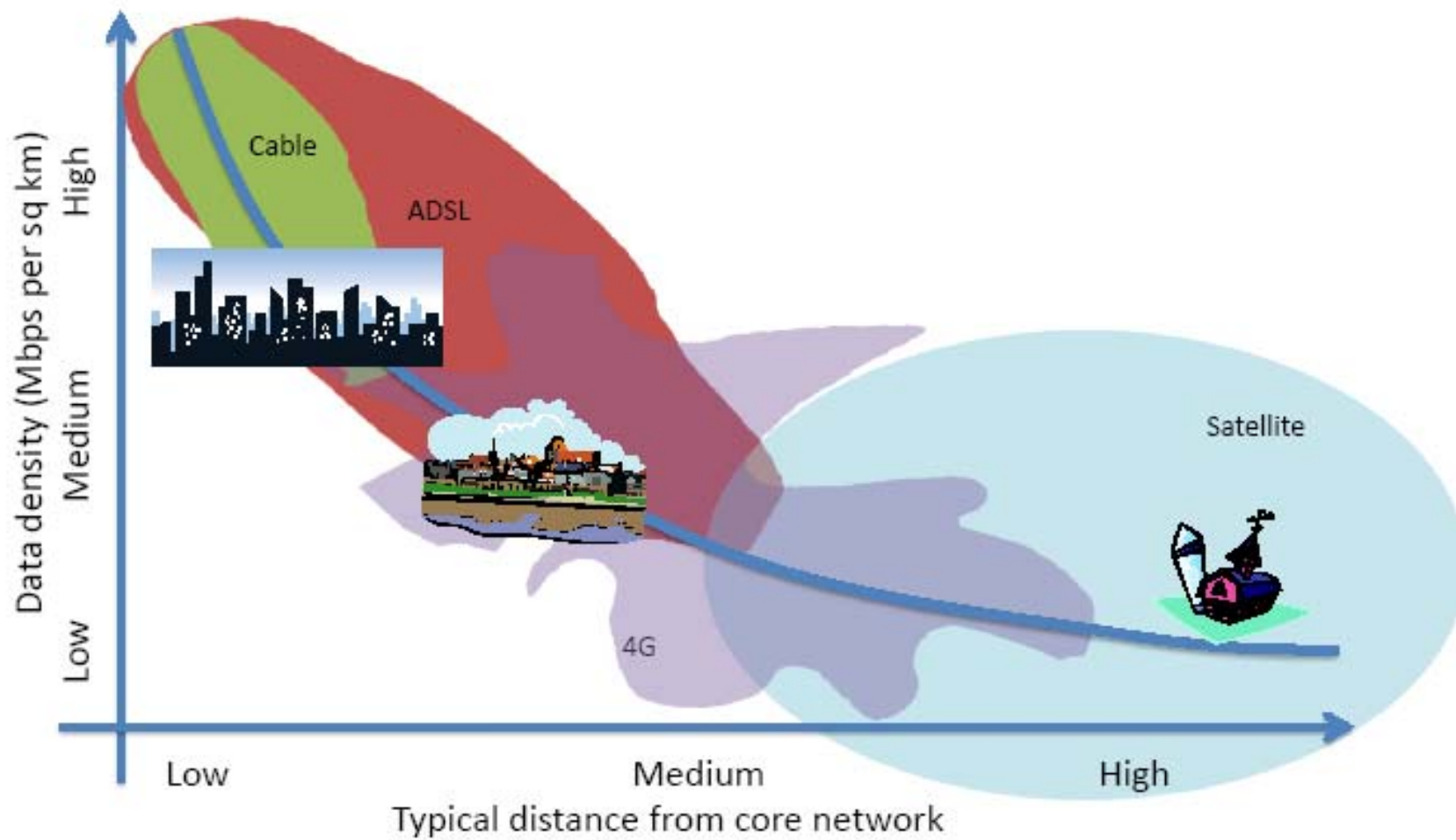
# End-user key benefits of satellite broadband

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- always-on connectivity for broadband and VoIP
- flat-rate monthly fee
- low-cost subscriber equipment
- simple to install and use
- no infrastructure investment required
- sustains large end-user populations
- capable of large network deployments
- “Triple play” capabilities – Internet, TV and VoIP in one offering



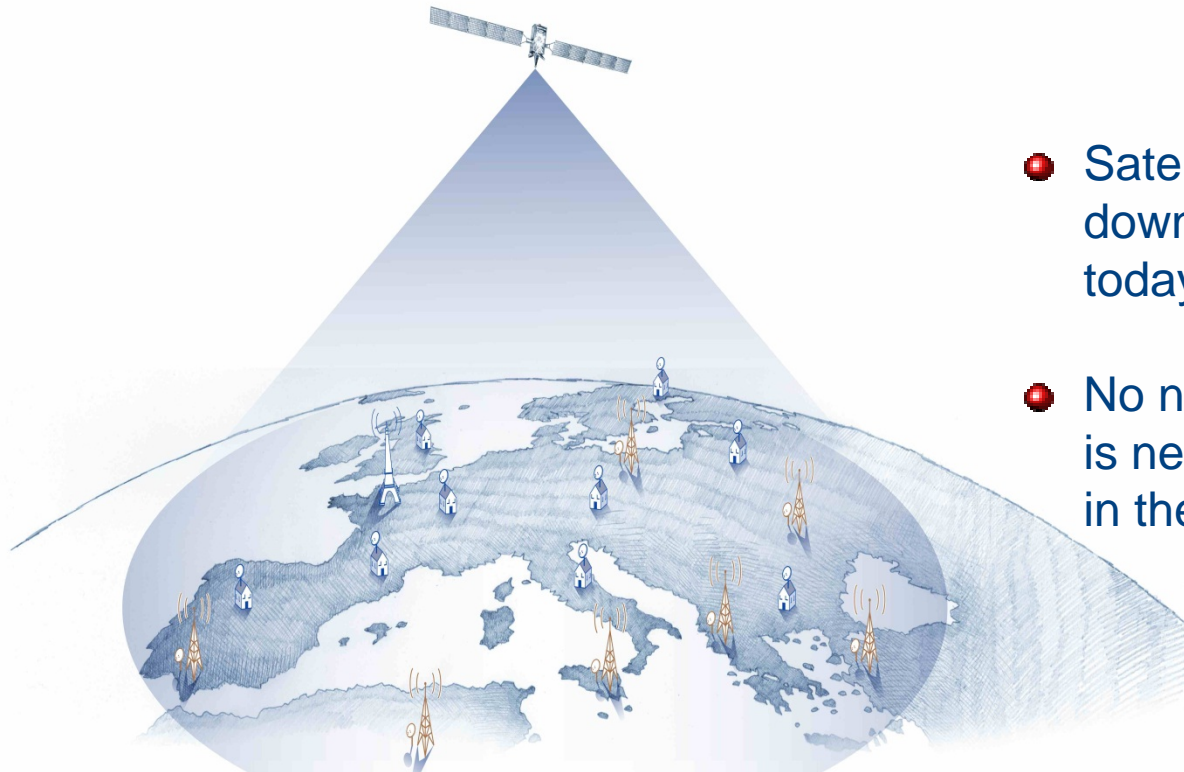
# Total cost per home connected



# Setting the target for 100% coverage

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## Satellites - The invisible infrastructure already in place



- Satellite signals already shine down onto the entire EU territory today
- No new substantial infrastructure is needed to enable connectivity in the EU

*A million extra businesses or households in rural areas can connect to broadband via satellite by the end of 2013*

# The user equipment

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Installed terminal (IDU+ODU): €300 - €500 per household

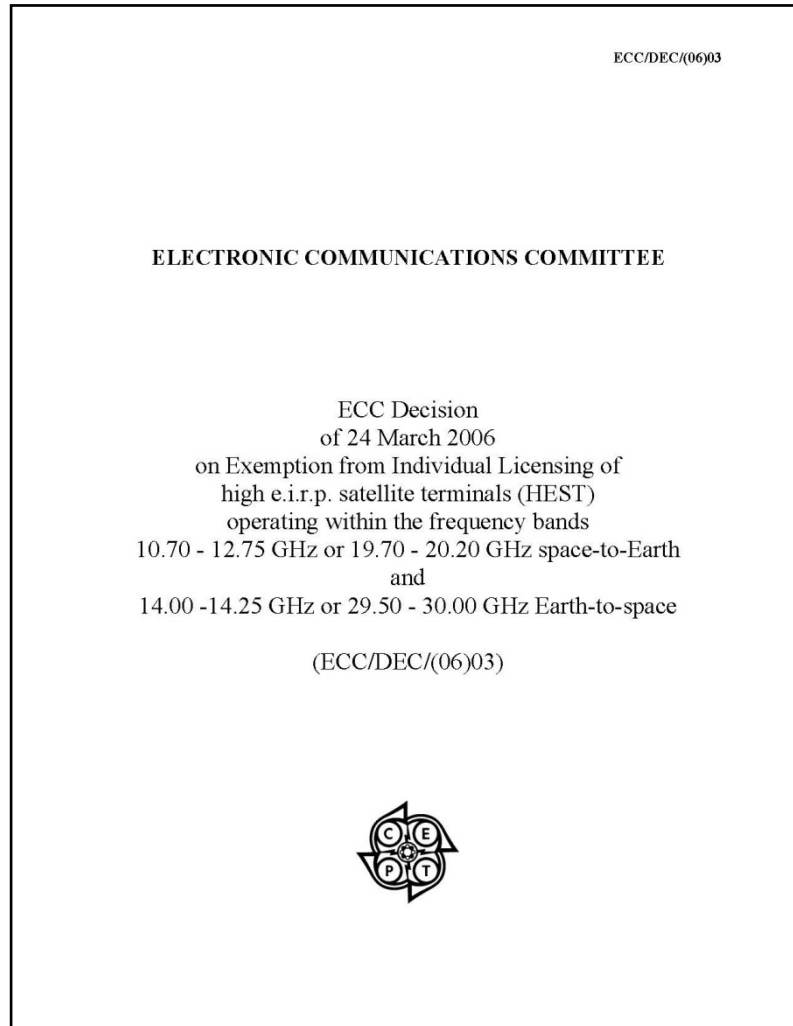
Simple  
installation

Compact  
Ø 70-80 cm

Affordable  
costs



# Blanket licensing

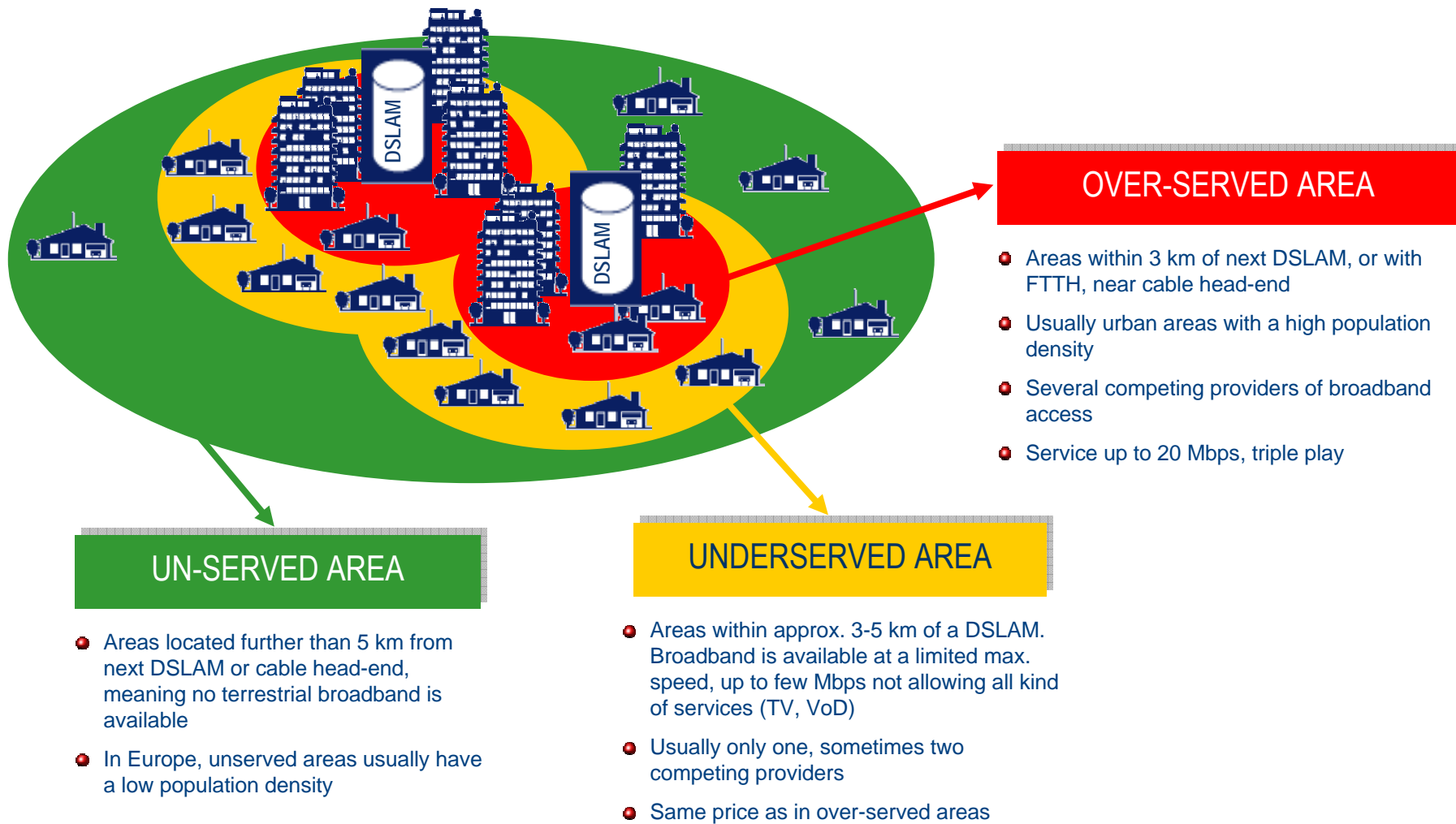


- Ruled by ECC Decision 06/03
- Exemption From Individual Licensing of High EIRP Satellite Terminals (HEST) operating in the 19.7-20.2 GHz Space to Earth and 29.5-30.0 GHz Earth to Space Frequency Band
- The ECC Decision exempts from individual licensing Terminals having an EIRP < 60 dBW (in some countries the limit is lowered to 50 dBW)
- **CEPT countries:** *Albania, Andorra, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Malta, Moldova, Monaco, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, and Vatican City*





# Households broadband coverage



# The technology mix

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*« In order to reach the ambitious DAE high speed broadband targets it is necessary to secure investments from all player- incumbent, new entrant, mobile, fixed and satellite. The different models pose different obstacles and challenges. »*

Commissioner Kroes at Every European Digital, European Parliament, Brussels, May 31st 2011

*« We rather need an intelligent mix of complementary technologies deployed incrementally and according to local circumstances. »*

Commissioner Kroes at the Mobile World Congress 2012, Barcelona, February 27th 2012

# The “integrated” solution to digital divide

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# The Digital Agenda for Europe

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2013 ▶ Basic Broadband for All

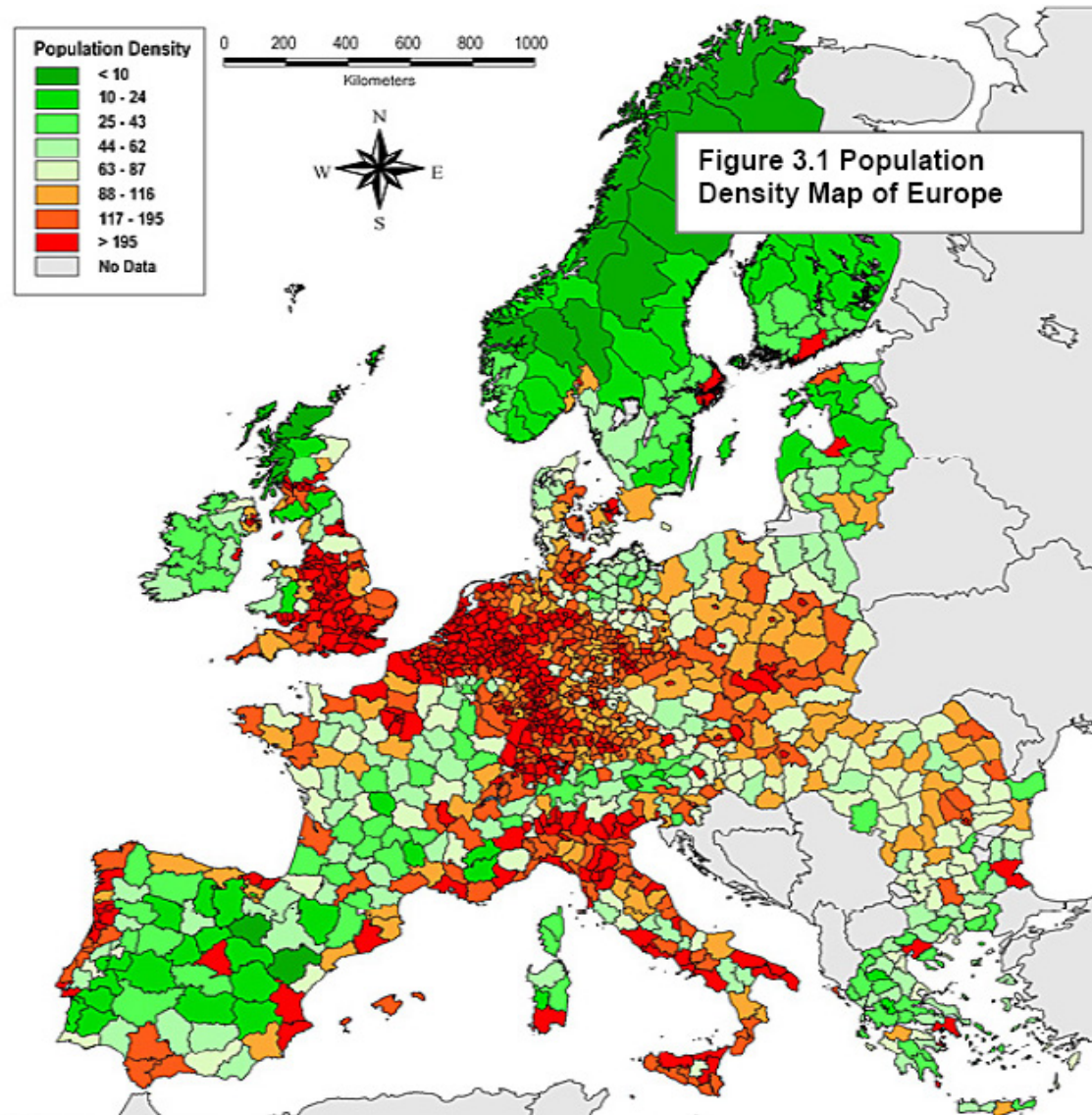
2020 ▶ 30 Mbps for All (100 Mbps for 50%)



Financial support must truly target market failures or support the delivery of broadband in rural and remote areas



# 56% lives in rural and remote areas



# Cost-benefit analysis

Location	Funding (EUR million)	Number of households	Cost per household (EUR) <sup>[1]</sup>	Total cost (EUR million)	Potential saving with satellite (EUR million)
South Yorkshire Digital Region	105	546 000	183	100.4 M	
East Peak (UK)	0.50	1502	346		
Krško (Slovenia)	6.03	2811	2144	12.0 M	<b>9.6 M</b>
Mozirje (Slovenia)	6.03	2000	3015		
Nuenen (the Netherlands)	6.2	7500	1300	9.7 M	<b>6.0 M</b>
Asturias (Spain)	47	51 000	921	47.0 M	<b>21.5 M</b>

- In satellite broadband, the costs do not increase as population densities drop [2]
- The one-off cost per 'connected' household is 400-500 EUR, representing the price of a purchase and installation a user terminal

[1] Analysys-Mason "The socio-economic impact of bandwidth" EC DG INFSO workshop, 21/02/2012

[2] In opposition to what stated for broadband in general in the Draft EU Guidelines for the application of state aid rules in relation to the rapid deployment of broadband networks, 2012

# Satellite broadband and EU competition principles

MARKET FAILURE	<ul style="list-style-type: none"><li>&gt; Address citizens in “white areas” with public financing for user ground equipment</li><li>&gt; Sound management of public funding in a period of crisis and lack of resources</li></ul>
TECHNOLOGY NEUTRALITY	<ul style="list-style-type: none"><li>&gt; 100% coverage of basic broadband to all</li><li>&gt; There is no “one size fits all”</li><li>&gt; The answer: a combination of technologies</li><li>&gt; Affordable satellite monthly fees</li></ul>
IN-PLACE INFRASTRUCTURE	<ul style="list-style-type: none"><li>&gt; Encourage and facilitate private investments</li><li>&gt; Satellites, a private investment in place</li><li>&gt; available resources for each region</li><li>&gt; Fast roll out</li></ul>
COST EFFECTIVENESS	<ul style="list-style-type: none"><li>&gt; Economical effort proportional to needs</li><li>&gt; Most economically advantageous solution - total cost per user connected, i.e. adopter</li></ul>

