

Colloquium

“Meeting the Communications Requirements of a Changing Arctic”

A central graphic for a conference banner. It features a blue globe with a grid pattern. A satellite is in orbit above the globe, and a commercial airplane is flying across it. Below the globe, a ship is visible. The background is a dark blue gradient with faint images of hands and light rays.

18th
Ka and Broadband
Communications
Navigation and Earth Observation
Conference

30th
AIAA International
Communications Satellite
Systems Conference (ICSSC)

A Conference jointly held with the Italian Space Agency (ASI) and the Communications Research Centre Canada (CRC)

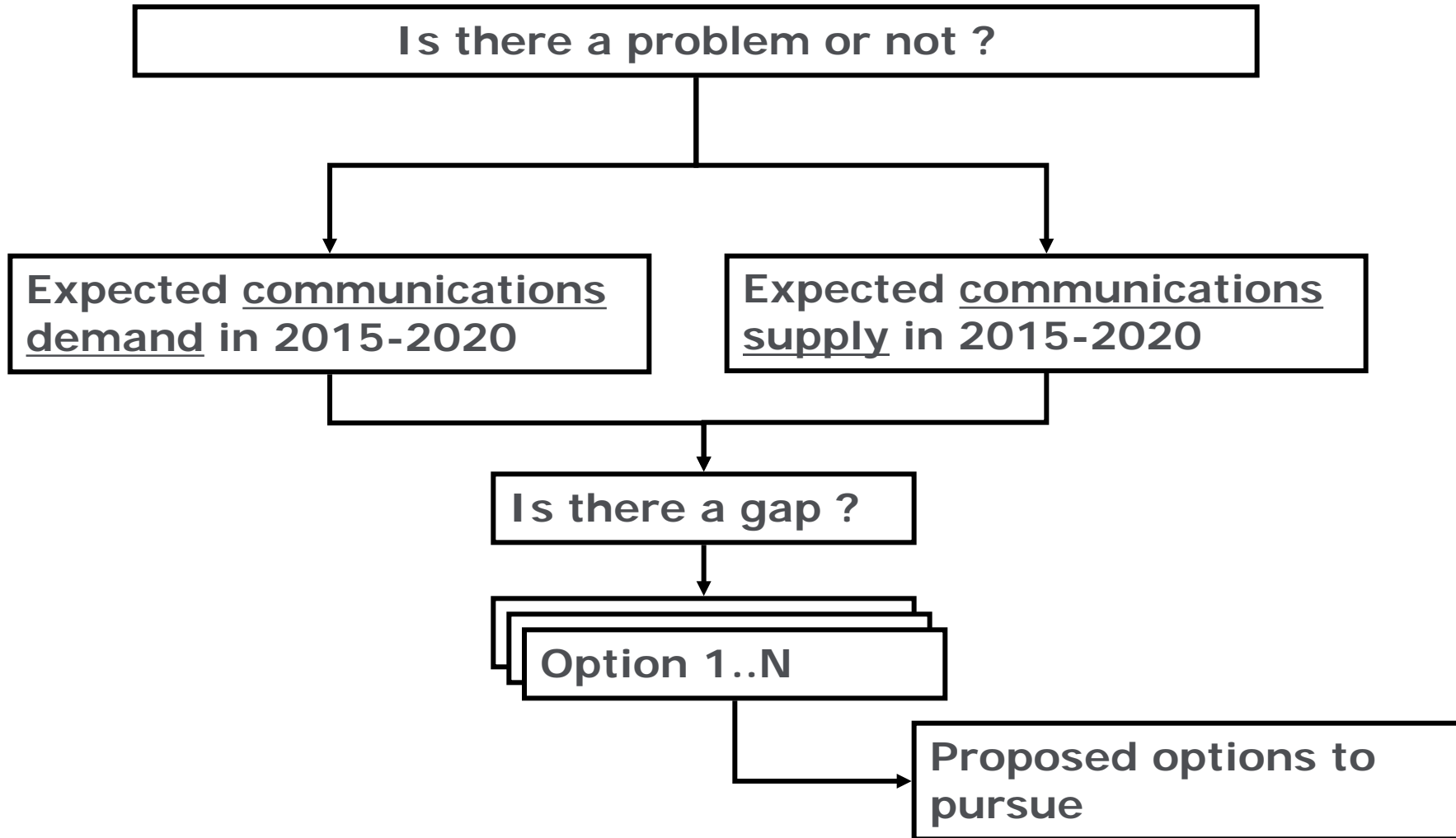
- We fund research & development of satellite telecommunication technology, systems and applications
- If a new service is qualified → new organisation



- Recently more public private partnerships:
 - ESA pays for non-recurrent costs and R&D
 - Private partner takes recurrent costs and operates a service

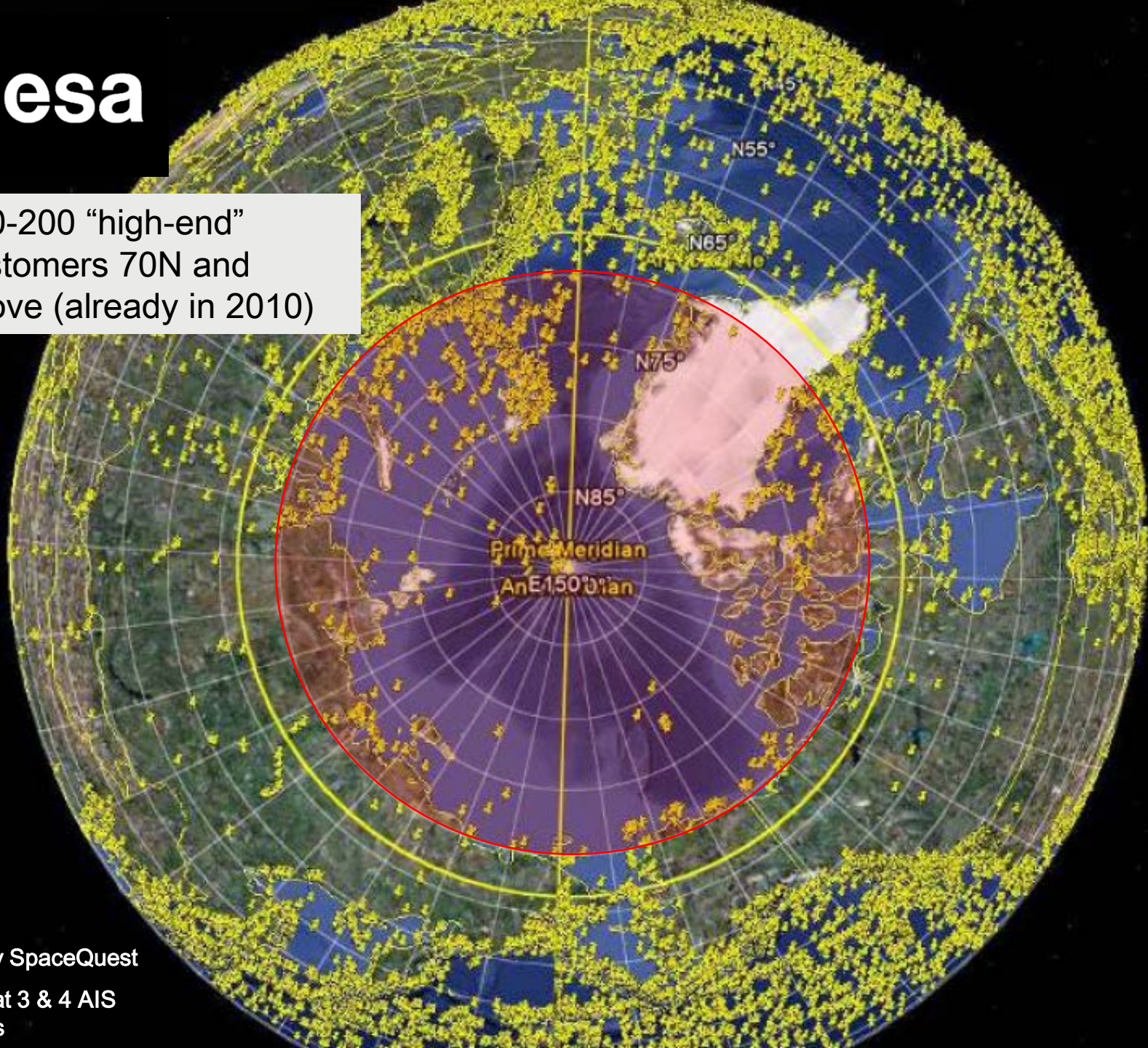
- Various AMSA, Arctic Council documents, high level meetings mention the need for reliable communications and navigation in the Arctic
- **ESA Telecom was requested to identify what is this perceived gap and what can be done to close it**
- **ESA Telecom consulted various stakeholders:**
 - Arctic Council, IMO, EC DG MARE, maritime VSAT providers, shipping operators, Oil&Gas,...
- We started a study “Future Arctic Communication Requirements” with reviewers from Norwegian and Canadian Space Agencies, maritime users and Russian experts







100-200 “high-end”
customers 70N and
above (already in 2010)



Vessel population in the Arctic – based on AIS

Courtesy SpaceQuest

AprizeSat 3 & 4 AIS
receivers

Arctic communications – expected broadband demand



- Oil&Gas

- **ESA Oil&Gas&Remote Sensing Workshops, 15 Sep 2010**

ESRIN

- Providing EO based products and services to the Arctic could increase significantly the demand for satellite telecommunication bandwidth. Initial feedback and trials show that using existing infrastructure could prove unreliable and costly.
- 10 to 20 k\$/month

- Scientific community

- IMO and WMO looking for solutions for maritime safety

information broadcasting

- Search and Rescue

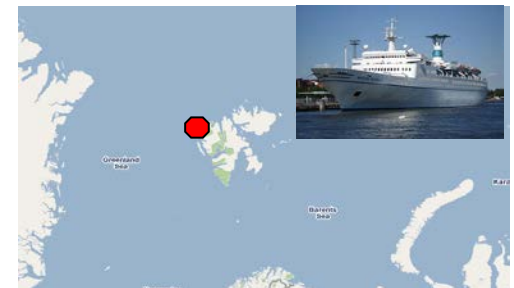
- Local population

- Regular vessels (revenue up to 10 k\$/month)

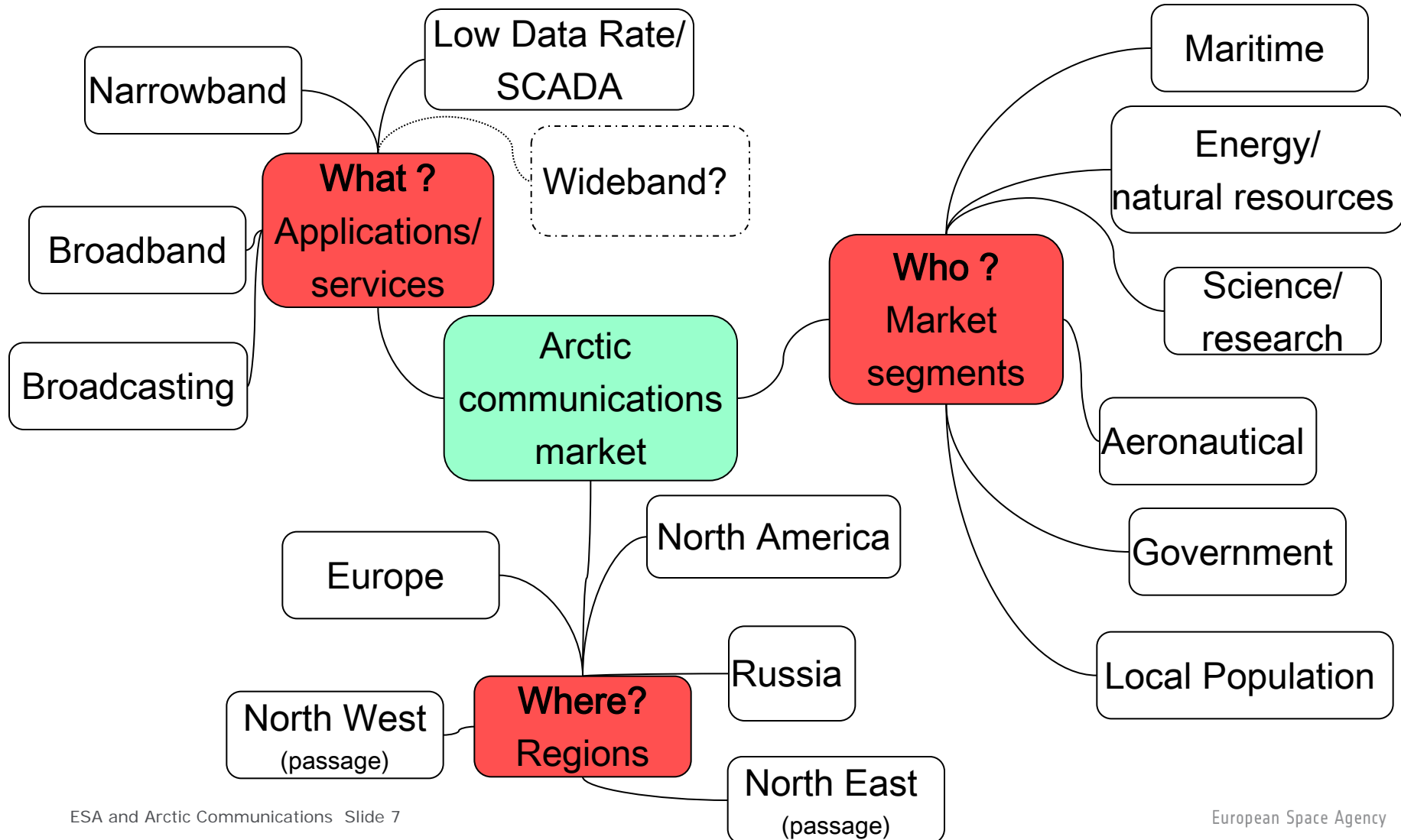
- Cruise vessels (revenue up to 50k\$/month)

- UAV's

- Aeronautical (non-safety)

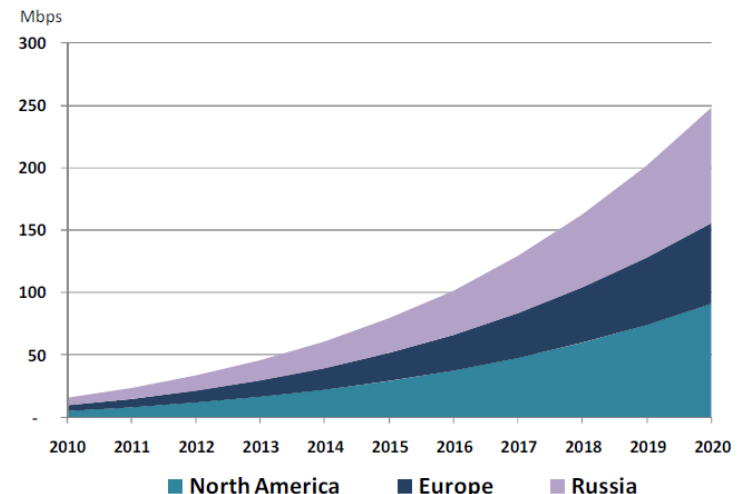
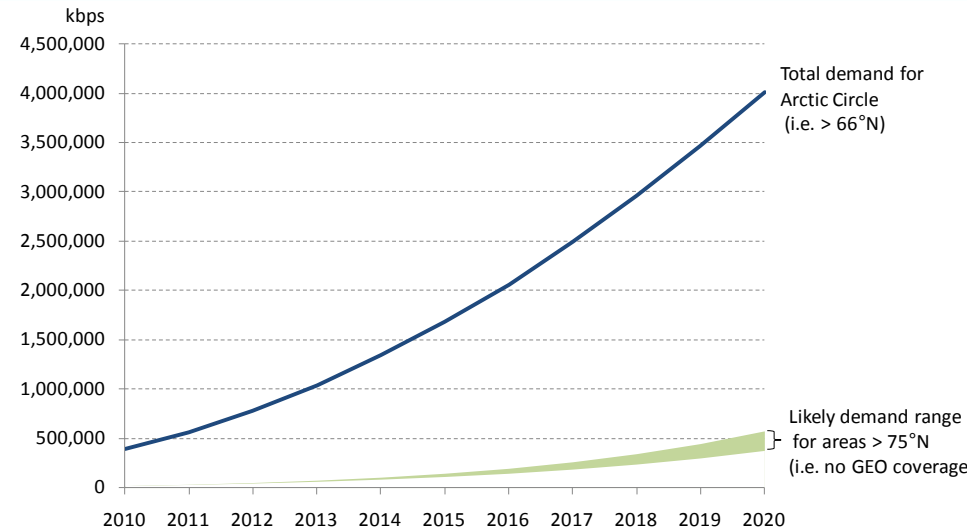


Arctic communications – demand segmentation

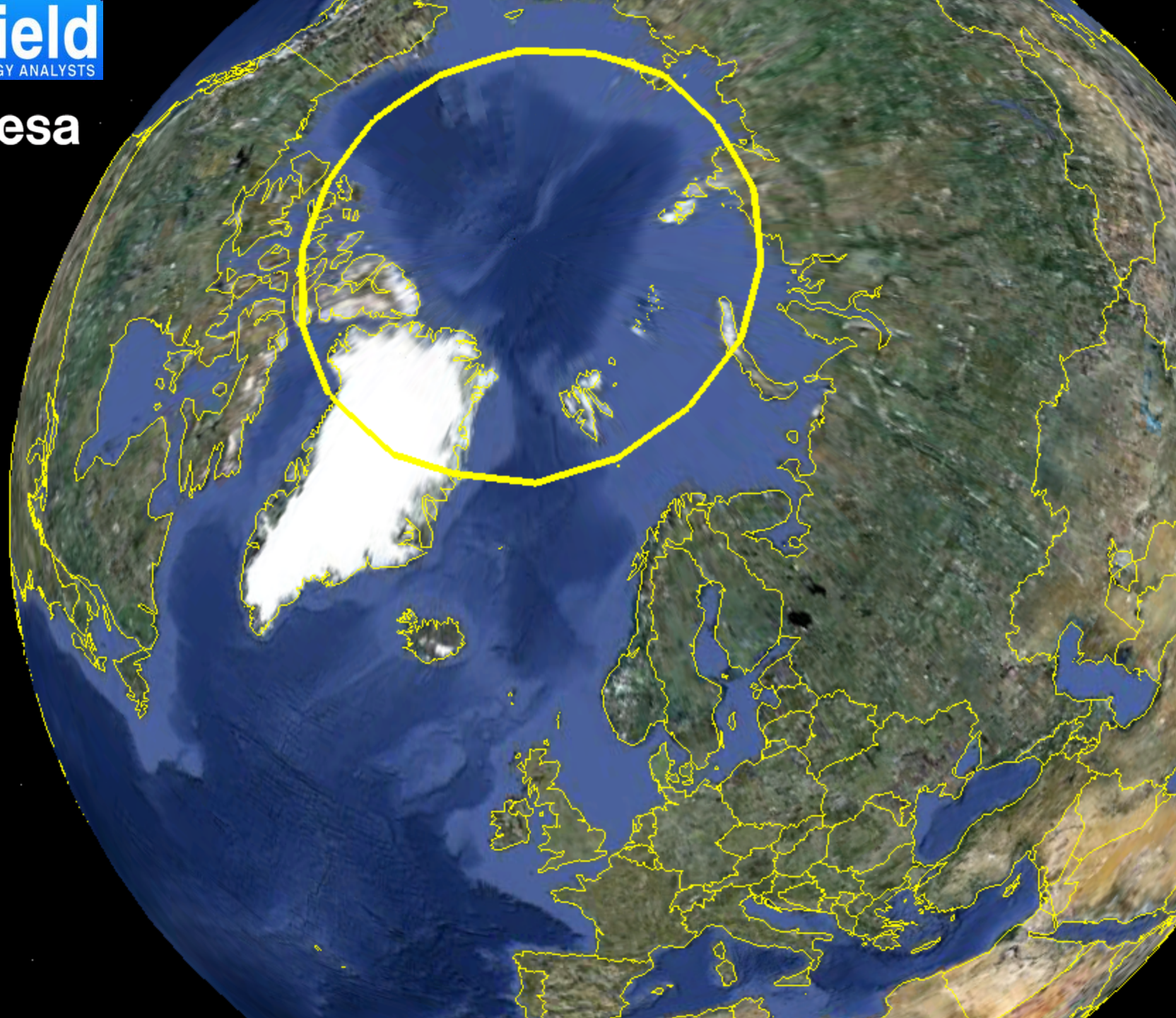


Arctic communications – expected broadband demand

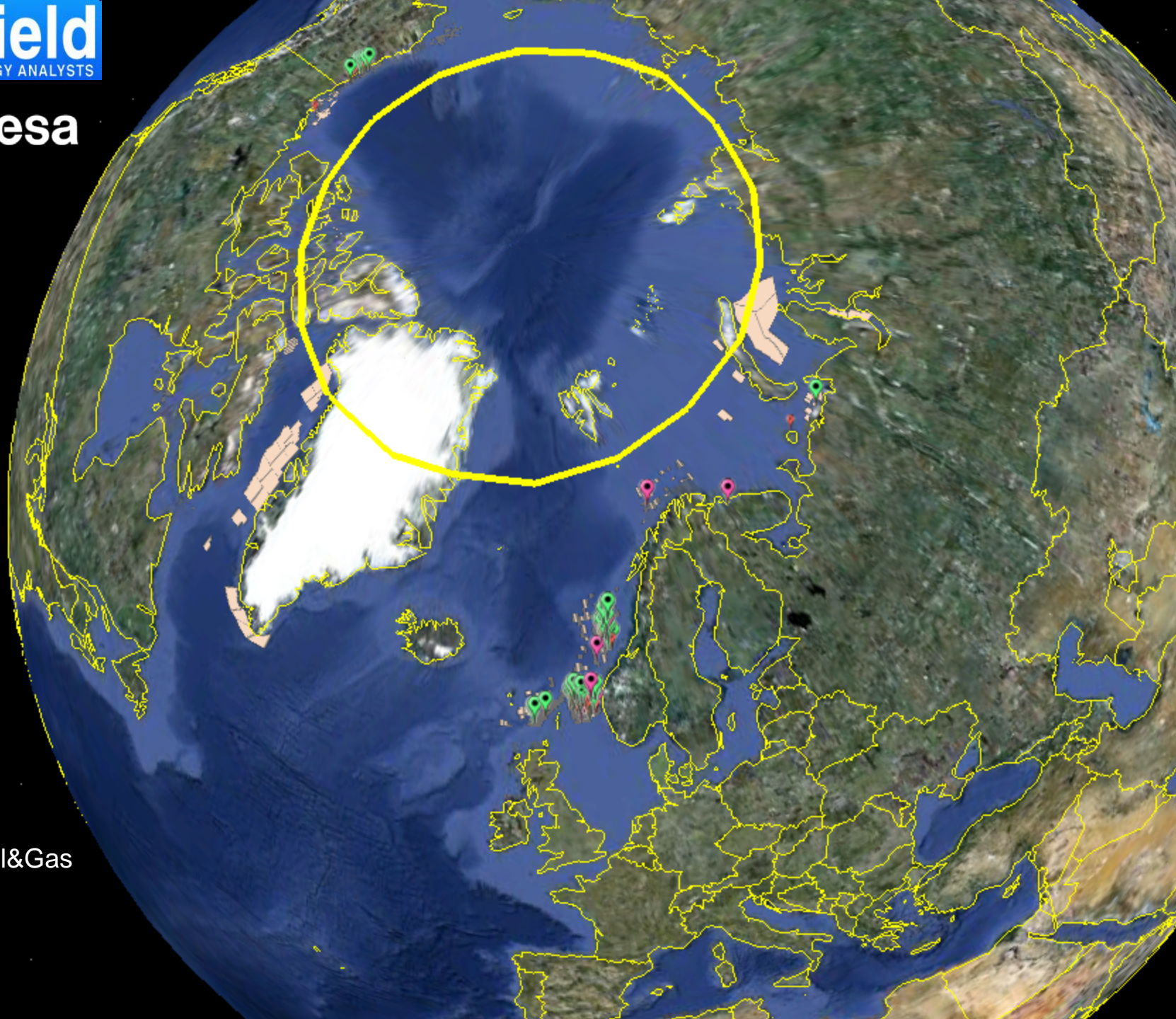
- Majority of capacity demand in the Arctic located within the range of 66°N-75°N, still largely served by GEO satellites (VSAT) - depending on issues such as potential blockage, maritime usage.
- Demand in Arctic areas north of 75°N estimated as 250-400 Mbps (or 9%-14% of the total Arctic satcom demand by 2020)
- Segments that could contribute to increased demand over 75°N are mainly maritime, government, and aeronautical communications as well as local population. Energy possibly after 2020.





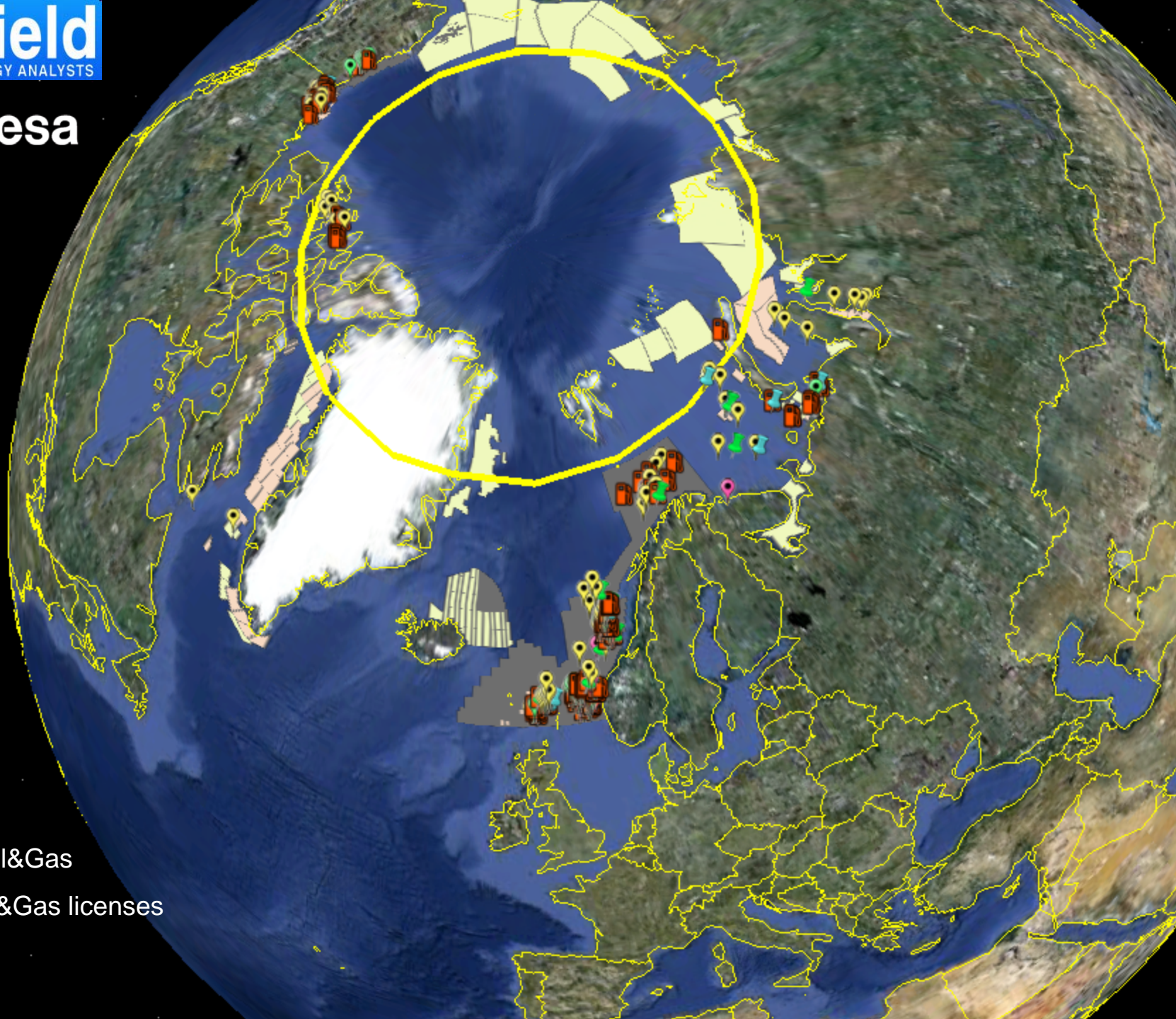


70 deg N



70 deg N

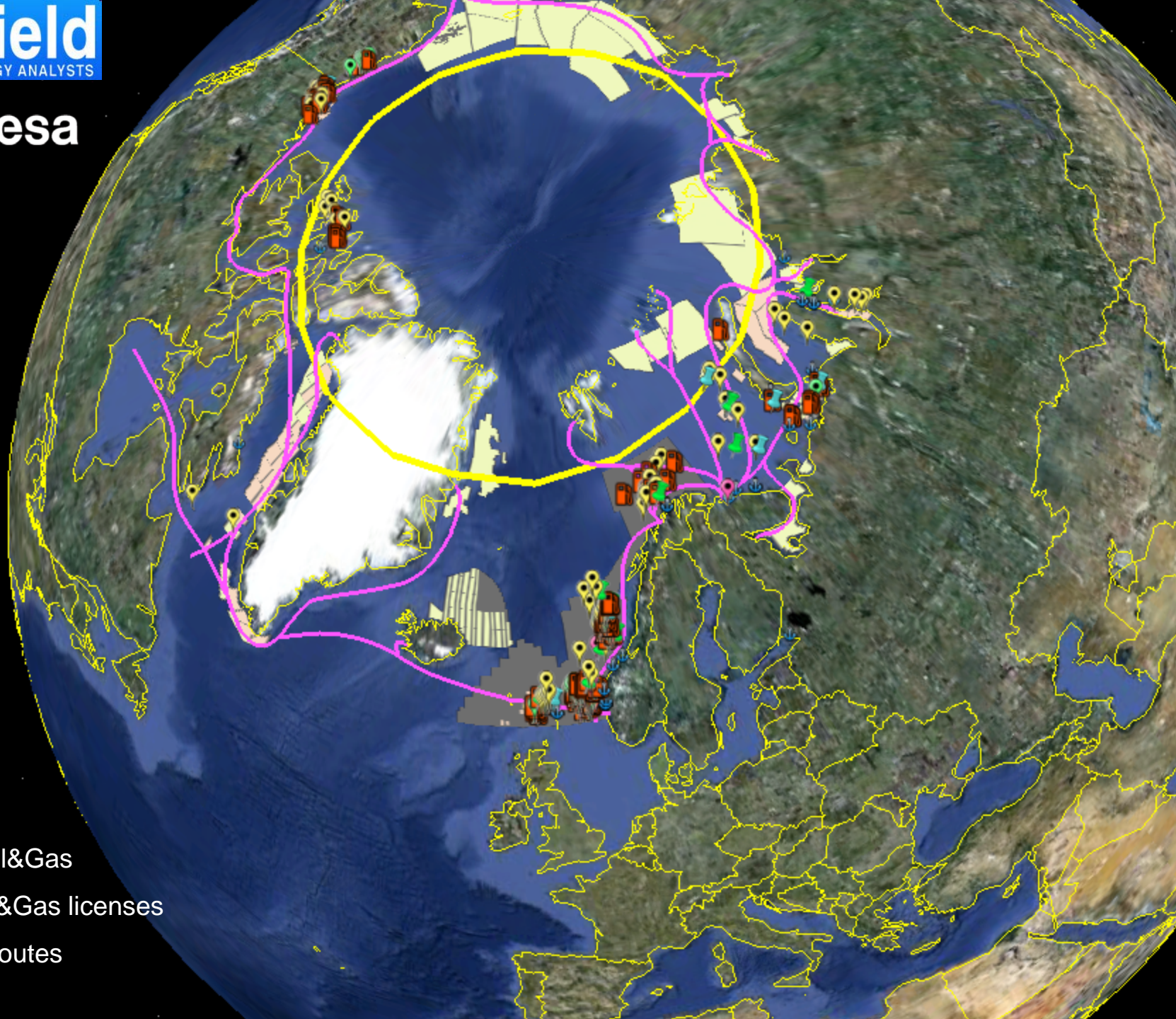
Current Oil&Gas



70 deg N

Current Oil&Gas

Future Oil&Gas licenses

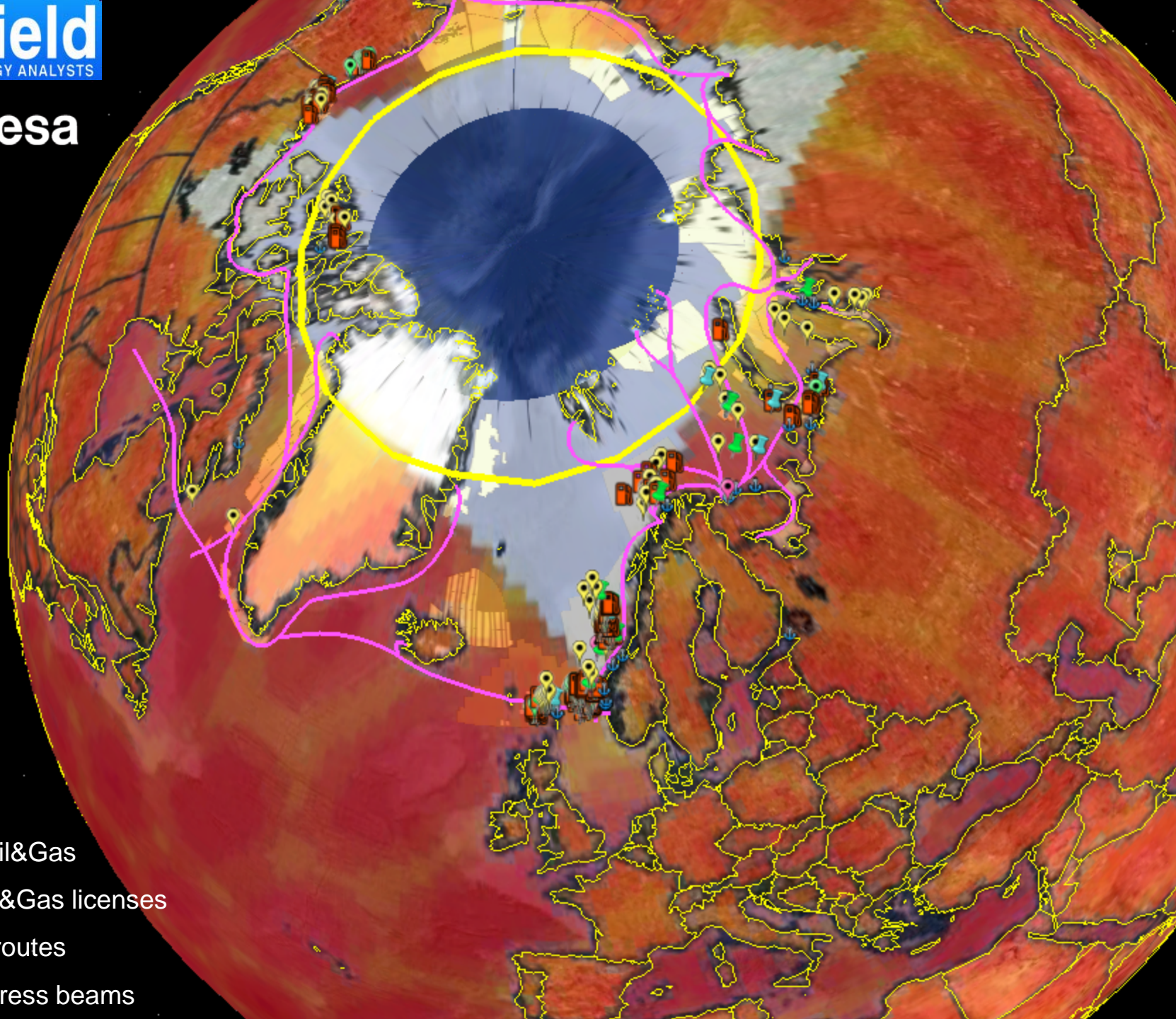


70 deg N

Current Oil&Gas

Future Oil&Gas licenses

Shipping routes



70 deg N

Current Oil&Gas

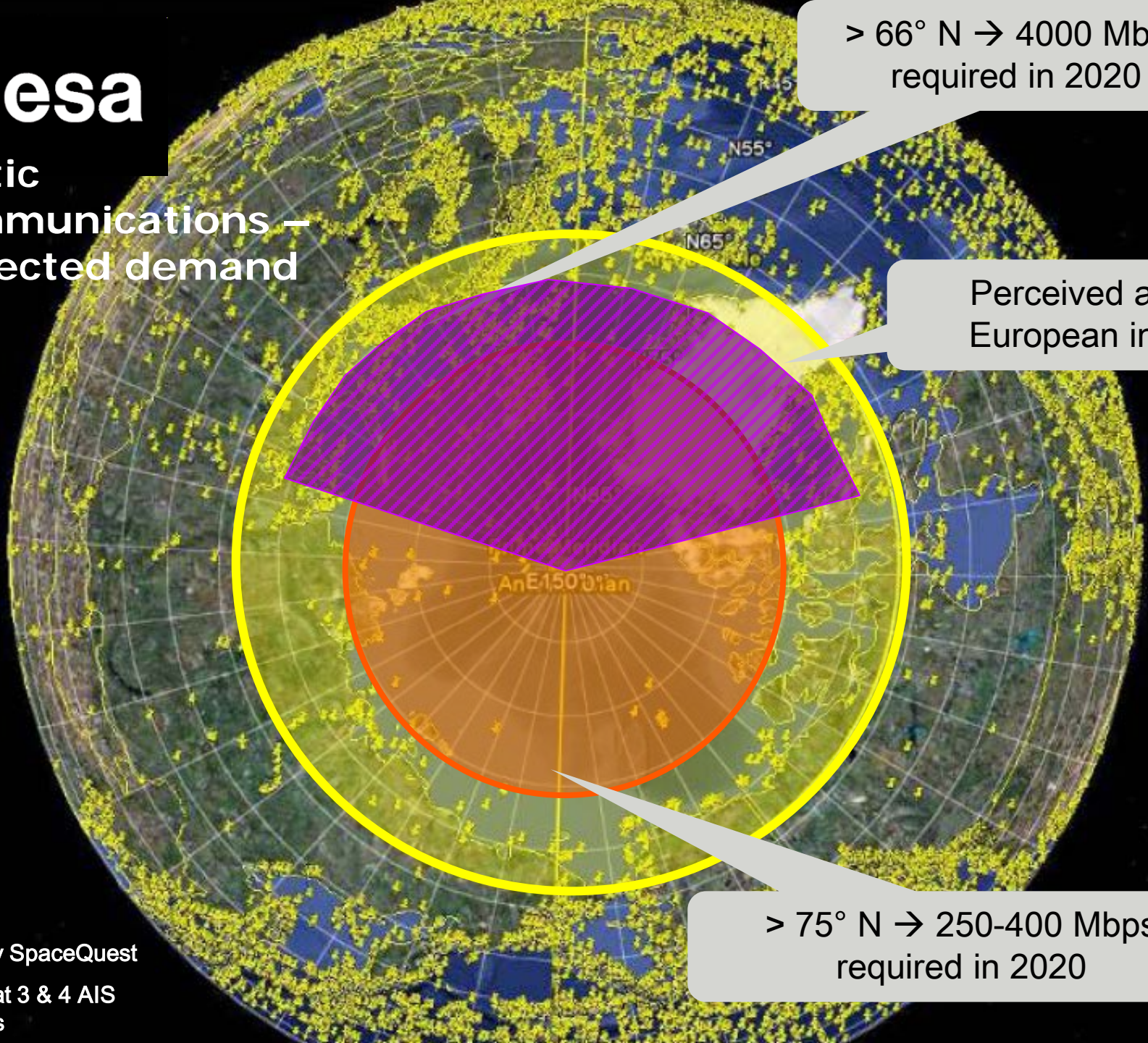
Future Oil&Gas licenses

Shipping routes

Global Xpress beams



Arctic communications – expected demand

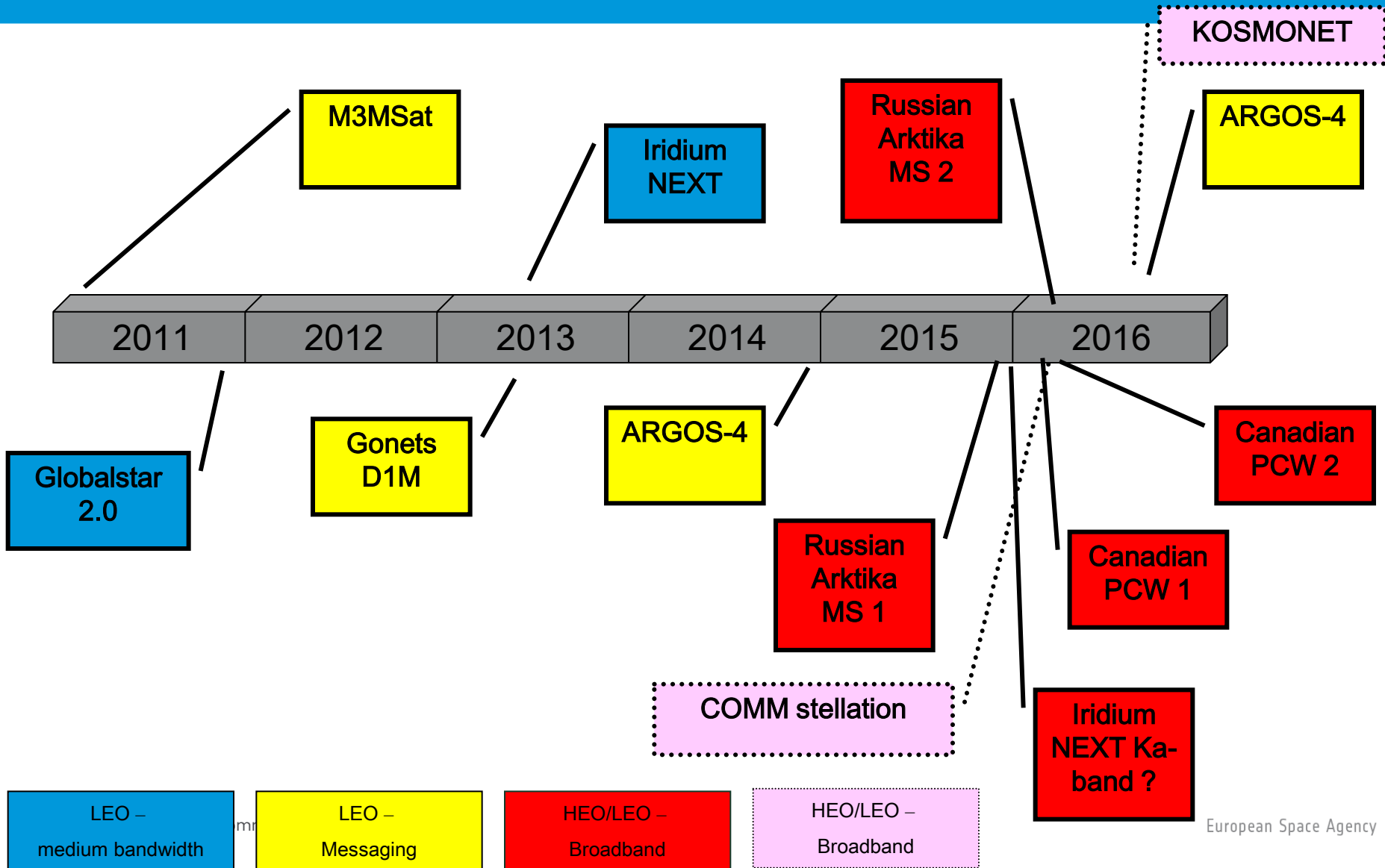


> 66° N → 4000 Mbps required in 2020

Perceived area of European interest

> 75° N → 250-400 Mbps required in 2020

Arctic communications – expected communications supply in 2015-2020



Arctic communications – expected broadband supply in 2015-2020

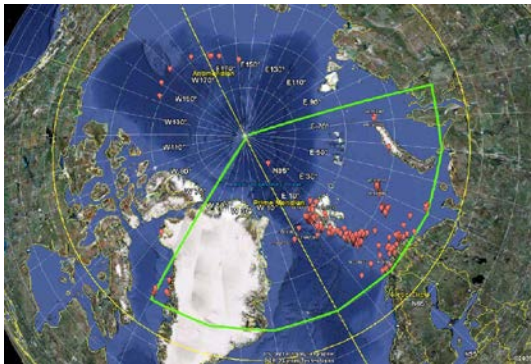


Broadband systems > 1 Mbps

Iridium NEXT 	Ka-band mission ?	Funding OK, use of Ka-band unclear
PCW concept 	No European Arctic coverage	Since recent budget cuts government, less momentum
CASCADE/CASSIOPE 	LEO Ka-band Store&Forward	Launch 2012 (Falcon), cooperation with O3B
MSCI COMMstellation 	Global Ka-band	Funding unclear
KOSMONET 	the "Russian Iridium"	Funding not available yet, Early studies performed
ARKTIKA 	No European Arctic coverage	Status unclear. Relation with Polarstar (Gascom) unclear

Arctic communications – Gap Analysis

- Low data rate services – no problem – various solutions
- Medium data rate services – no problem – one solution: Iridium NEXT



Iridium NEXT		Ka-band mission ?	Funding OK
PCW concept 1/2		No European Arctic coverage	Funding decision in March 2011, Phase A completed
CASCADE		LEO Ka-band Store&Forward	Launch 2011
MSCI COMMstellation		Global?	Funding unclear
KOSMONET		the "Russian Iridium"	Funding not available yet, Phase 0 performed
ARCTIKA		No European Arctic coverage	Funding unclear, Phase A performed

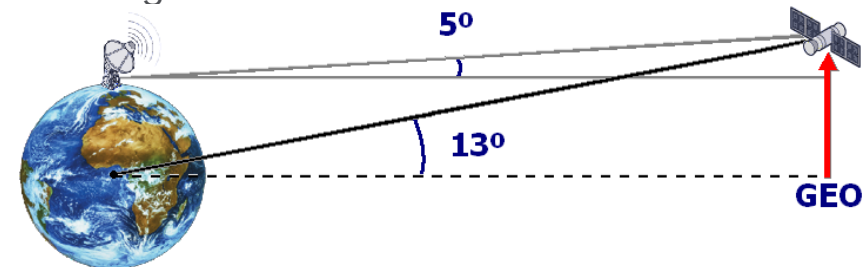
- Broadband solutions and a European requirement over 75 N:
 - Iridium – so far unclear whether any broadband Ka-mission accessible to European users and which capabilities
 - CASCADE – only store and forward – interviews suggested of limited use for professional users
 - For Russian systems the funding is unclear; also unclear whether European access possible at all
 - PCW has currently only Canadian Ka-band coverage and an unclear

1. Use existing infrastructure (i.e. inclined end-of-life GEO's)

- Not of interest to commercial operators, orbital slots too valuable, needs custom arrangements for continuous coverage

2. Join forces with planned systems

- Canada PCW
 - Expand coverage to European interests, add small (2-3 transponder) payload (and add an EGNOS transponder)
- Russian systems ARKTIKA
 - Expand coverage to European interests



3. Self-standing European initiative

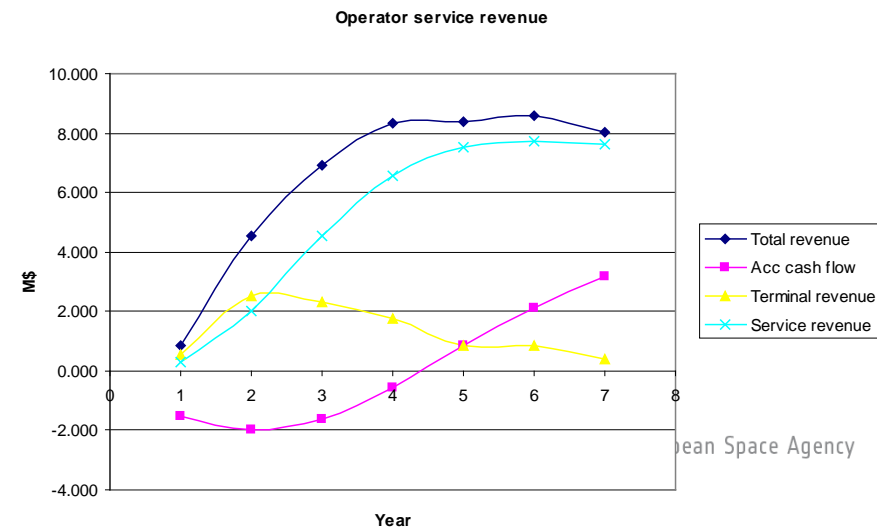
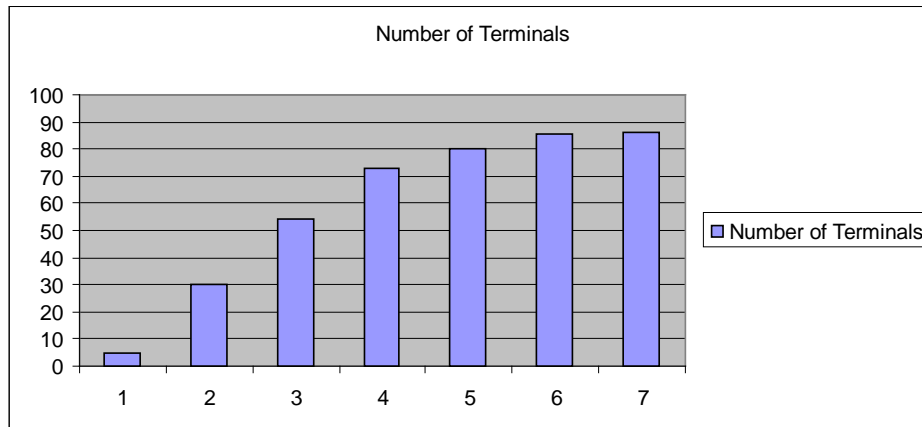
Is there any commercial sense in this ?

(Based on business case models developed in ARTES VSAT studies)



Assume, from a service provider's point of view:

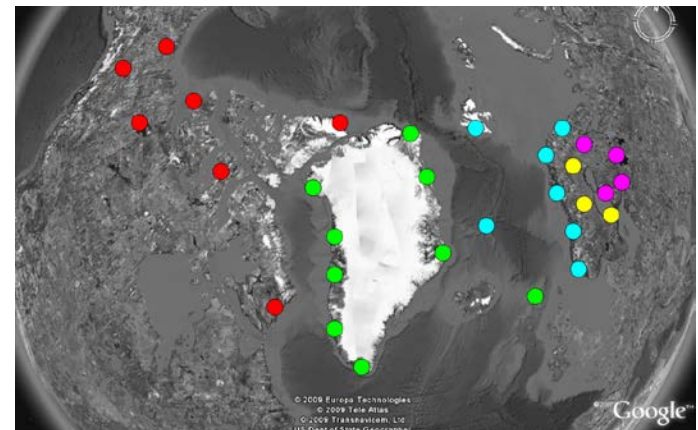
1. Transponder price of **\$10.000.000/y** per 56 MHz equivalent (assuming two satellites required) or **\$15.000/MHz/month**
2. Terminal price **\$100.000**
3. Hub of **\$1.000.000**
4. High-end customers
 - At service introduction **\$10.000/month** for 2 Mbps/512 kbps, contention 1:6
 - After a number of years **\$7.400/month**
5. Ramp up of customers



Future studies or initiatives ?

Ongoing:

1. Payload accommodations study “how to fit a secondary payload that covers the European navigation and communications needs” on the Canadian PCW system -> presented in this conference
2. Arctic EGNOS testbed for navigation
3. ...



ESA is prepared to assist any operator or service provider that wants to explore any initiatives in this area