



GEOSTATIONARY ATMOSPHERIC NETWORK

New telecommunication technology

GYRONAUTICA – Welcome to the Future

Sergey Kuzikov
CEO Gyronautica LLC

Where is the Internet?

2/3 of the Earth ‘out of reach’

1/2 of Humanity is offline

United Nations «Global Broadband Progress» Report for 2017

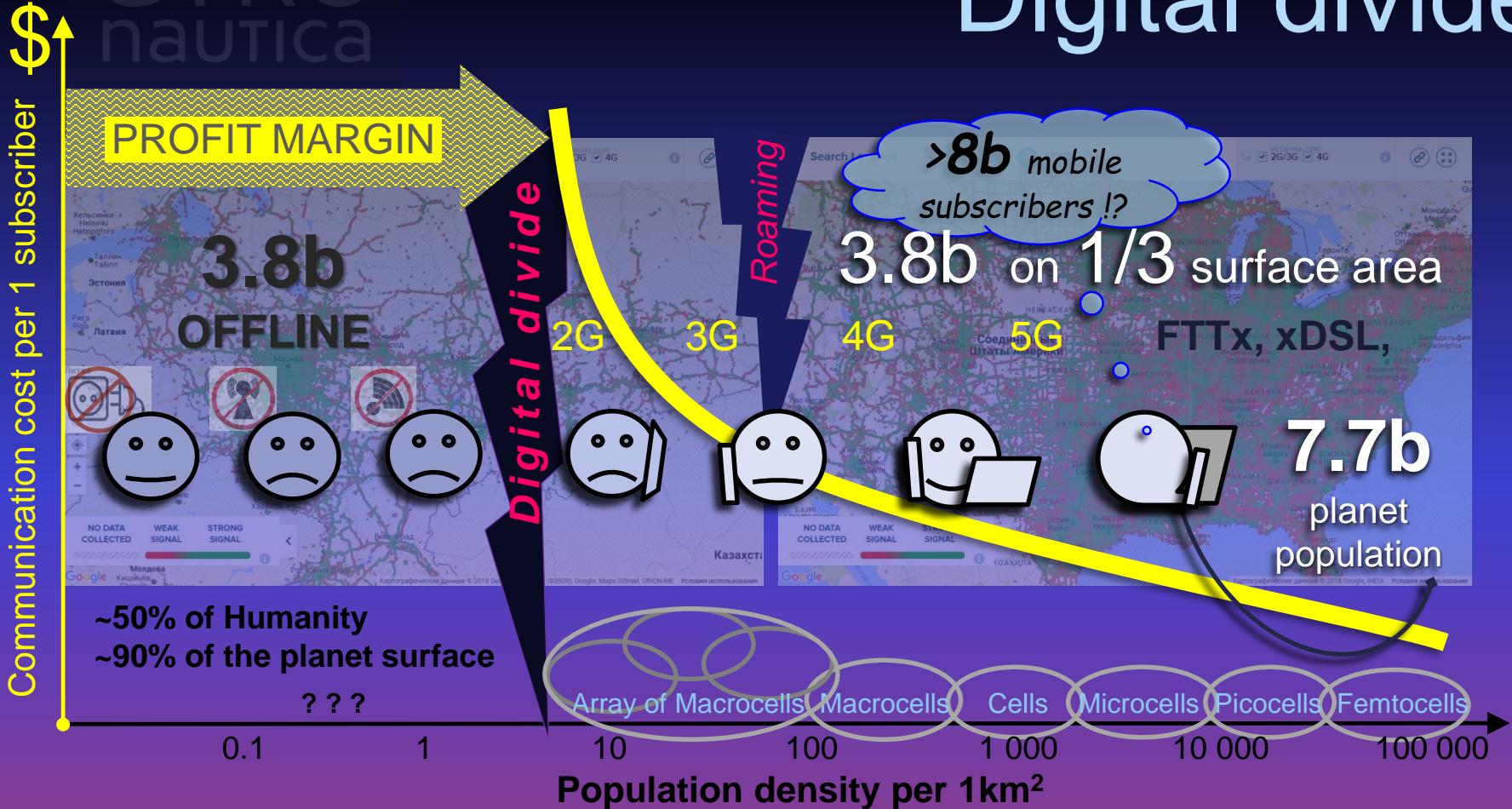
Why?



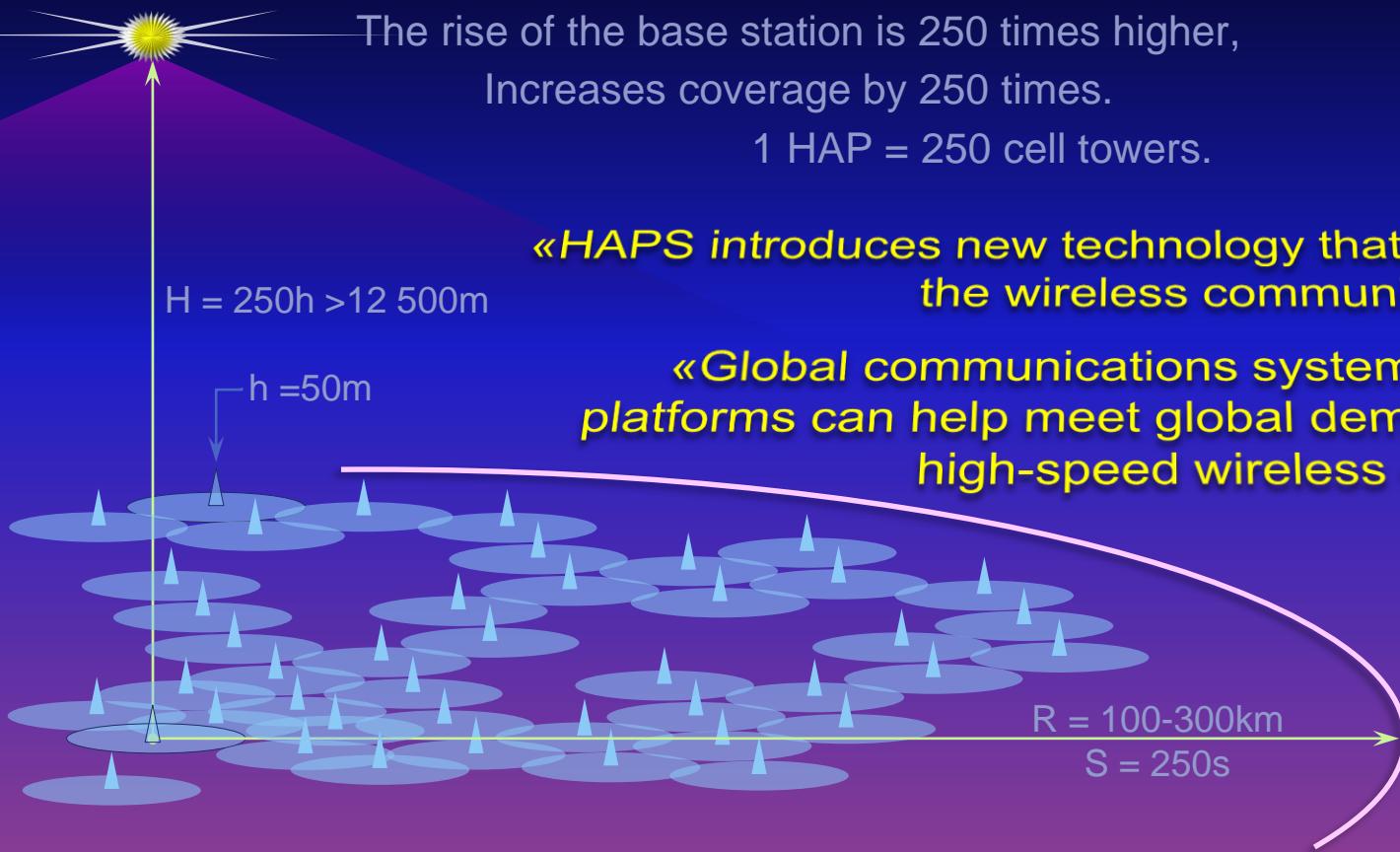
- Low density subscribers.
- Remoteness from the main channels.
- There are no sources of energy.



Digital divide

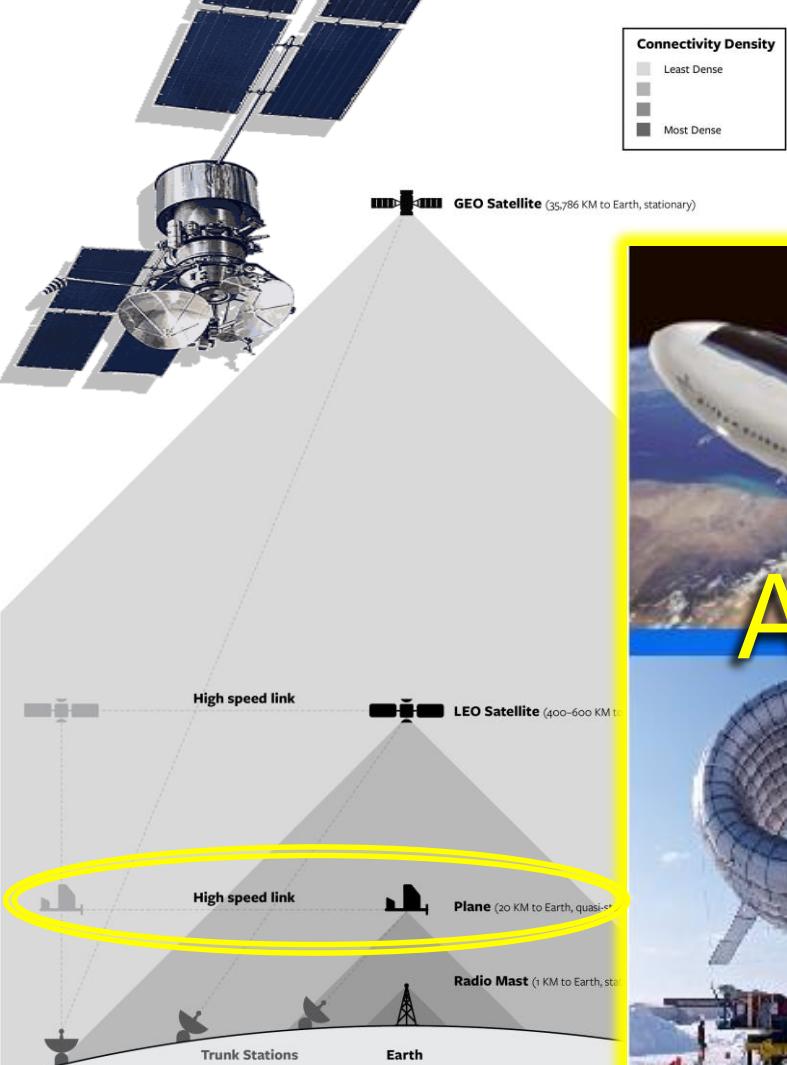


The only solution HAPs



High Altitude Platforms
Atmospheric satellites

International
Telecommunication
Union (ITU)



HAPs technology



Atmospheric satellites

Green energy for HAPs

SOLAR CELLS

< 1 kW/m² - low Power Density

< 20% - low efficiency of the cells

- 90% to fight with the WIND

- * Heavy batteries

- * Giant sizes

- * High cost

HIGH-ALTITUDE WIND

global, powerful, reliable

High Power Density 5-10 kW/m²

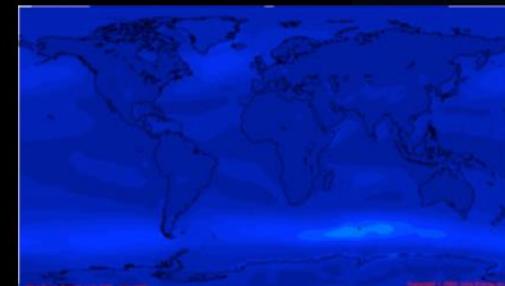
High efficiency up to 59%.

Minimum dimensions, weight
and platform cost.

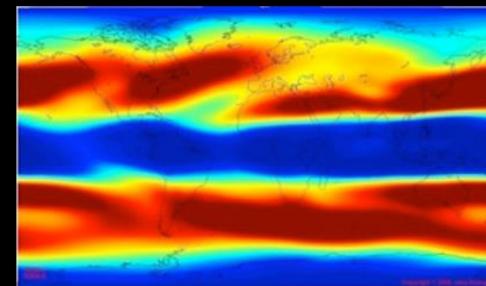
Comparison of Mean Power Density (kW/m²)



Surface Solar



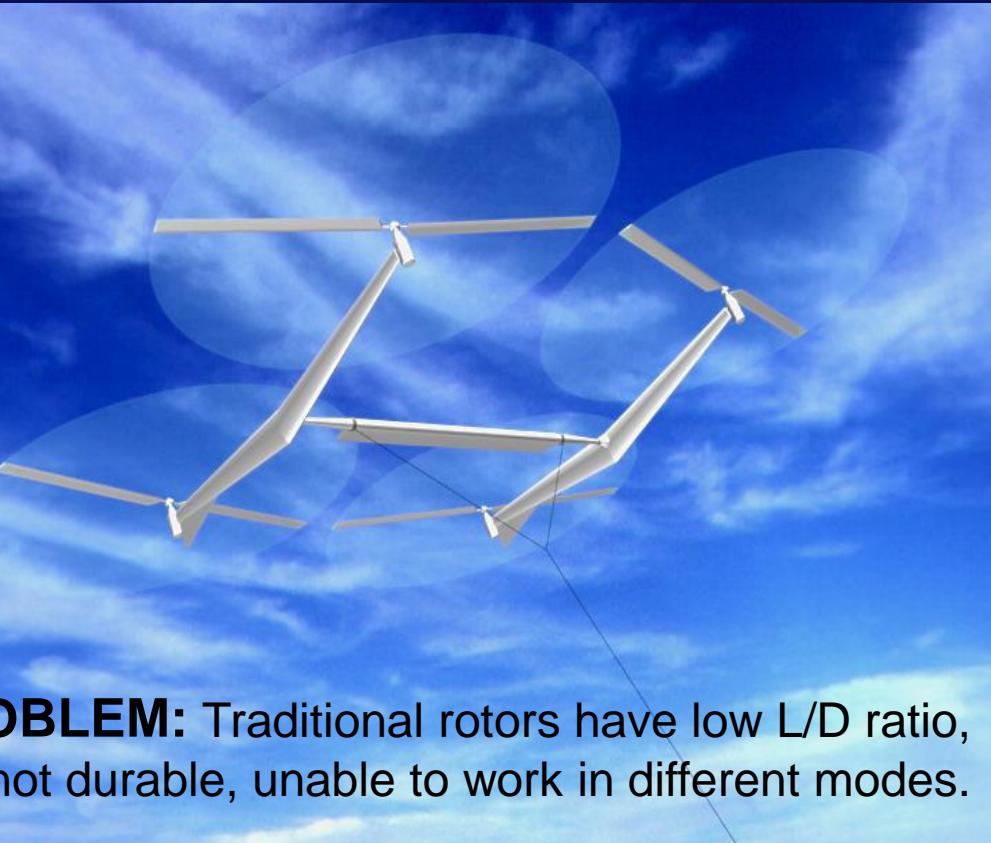
Surface Wind @ 50m



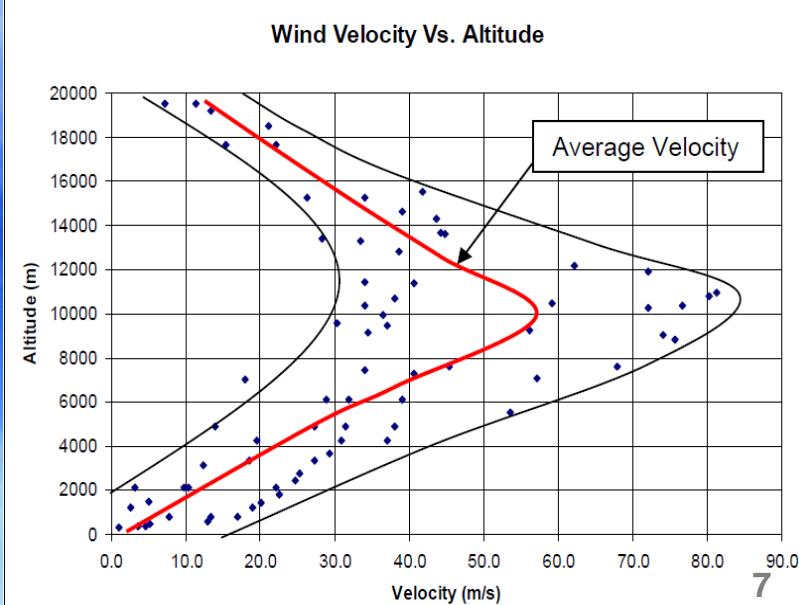
Wind @ 10,000m



High-altitude wind power



***High-altitude Wind –
powerful reliable source.
The only one in the Arctic!
How to get it?***



PROBLEM: Traditional rotors have low L/D ratio,
not durable, unable to work in different modes.

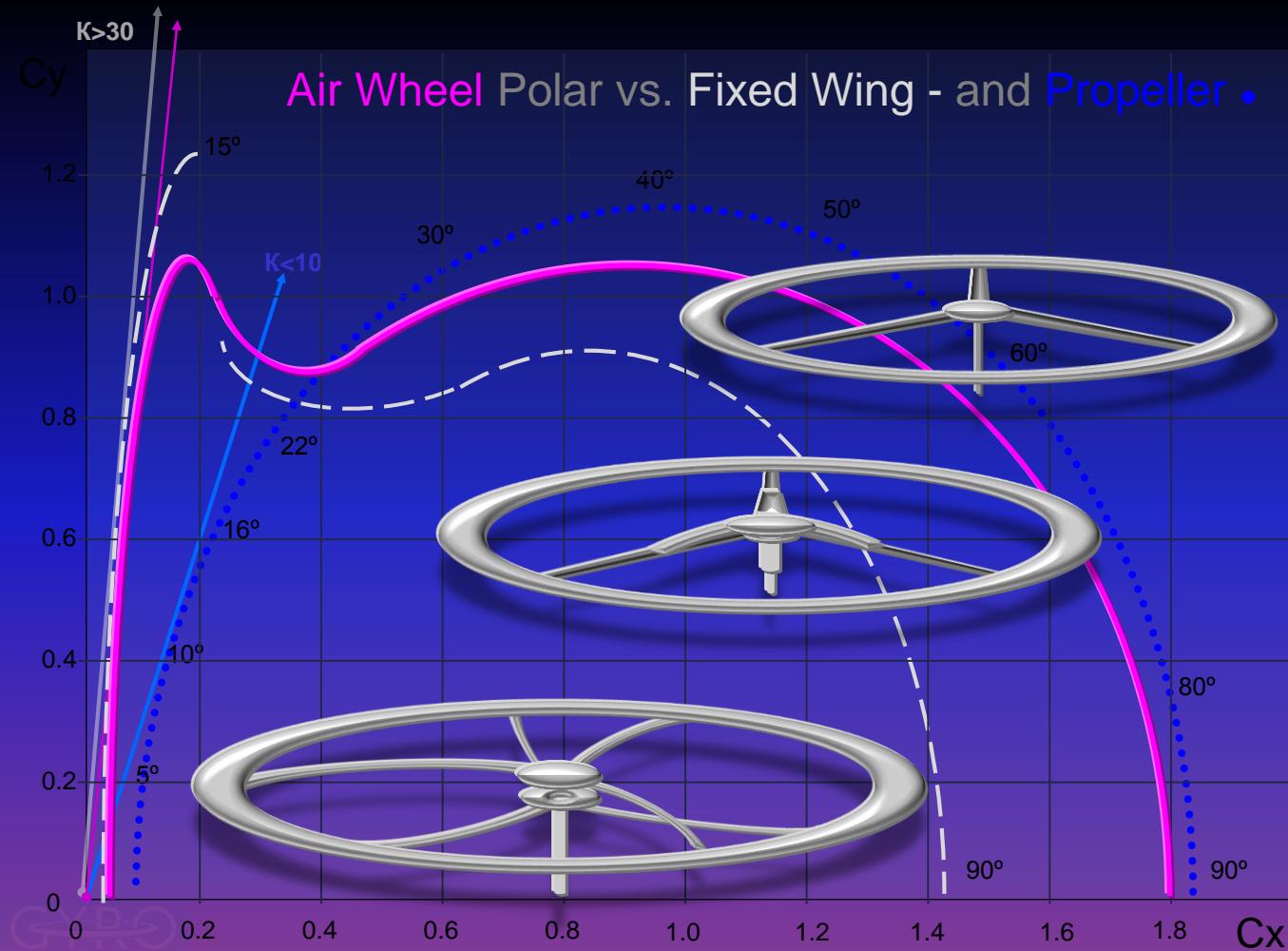
Solution

A key element
of the technology is
the Air Wheel rotor.

Work in 3 modes:

- ✓ helicopter,
- ✓ autorotations,
- ✓ wind turbines.

Maximum:
strength, resource,
efficiency, L/D ratio,
elevation angle, ...



Solution

GAS

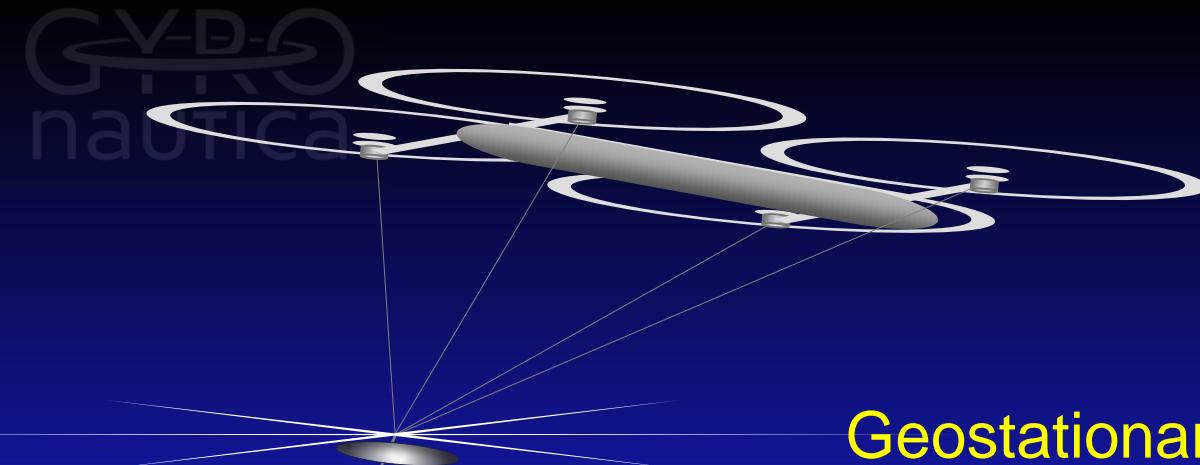
Geostationary Atmospheric Satellite

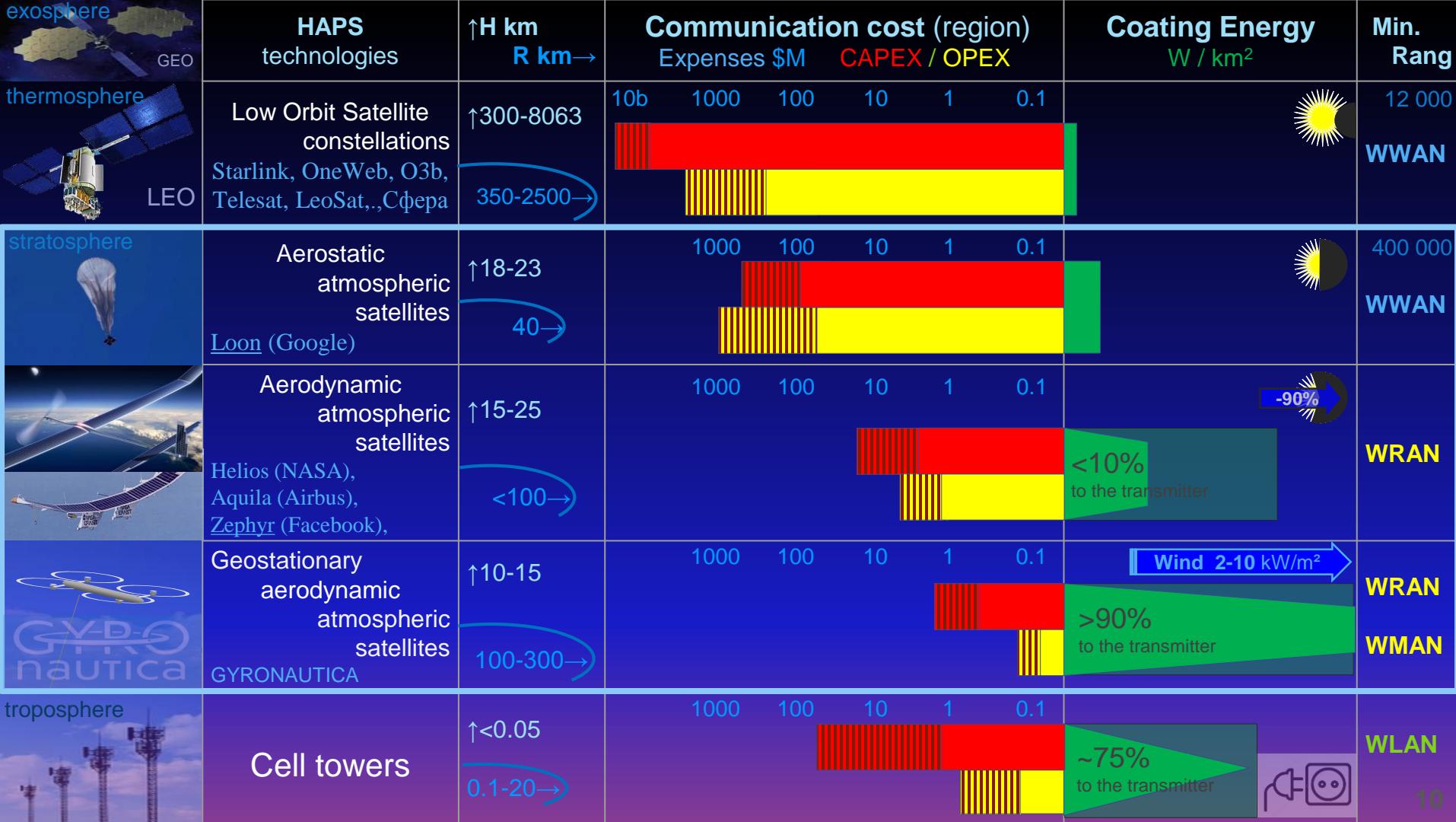
high-altitude aerodynamic tethered platform
on bearing Air wheel rotors.

Altitude up to 14 km ,
Horizon up to 400 km ,
Coverage area
from 30 000 km²,
up to 300 000 km².

Ultra High Molecular Polyethylene
UHMPE (Dyneema®, Spectra®)
specific strength = 378km!

- ✓ Absolute Green Energy Autonomy.
- ✓ Maximum reliability and power for transmitter.
- ✓ Minimum mass and dimensions.
- ✓ Minimum cost of the platform
and its flight year.
- ✓ Reliable fiber optic channel to Base Station.
- ✓ Work area from the tropics to high latitudes.





Competition



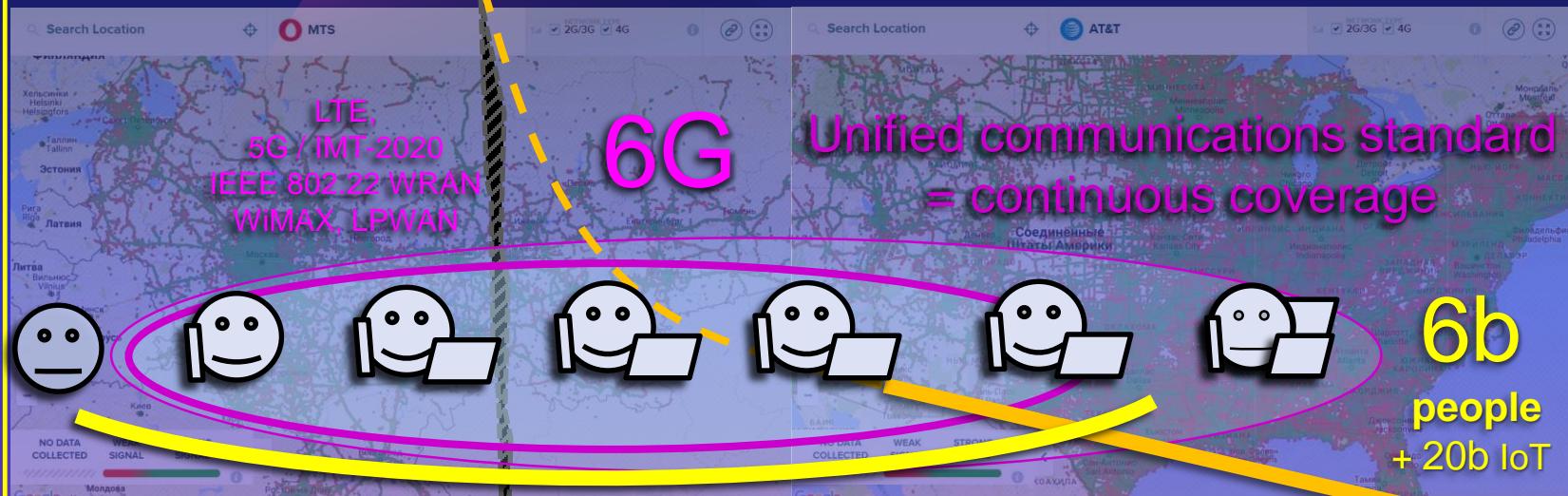
The technology of
Geostationary Atmospheric Satellites
is protected by patent and applications until 2033.

- The maximum signal power in the direct line of sight of the Base Station.
- Compatibility and addition of cellular technologies.
- Organic combination with cable optic lines.
- The cost of coverage is lower than competitors by orders of magnitude.
- Internet backbone stratospheric Free Space Optic.
- A comprehensive solution to communication, navigation, remote sensing, digital broadcasting DTV,

...

Technology 6G

Communication cost per 1 subscriber \$



GAScels

0.1

1

10

Macrocells

100

Cells

1 000

Microcells

10 000

Picocells

100 000

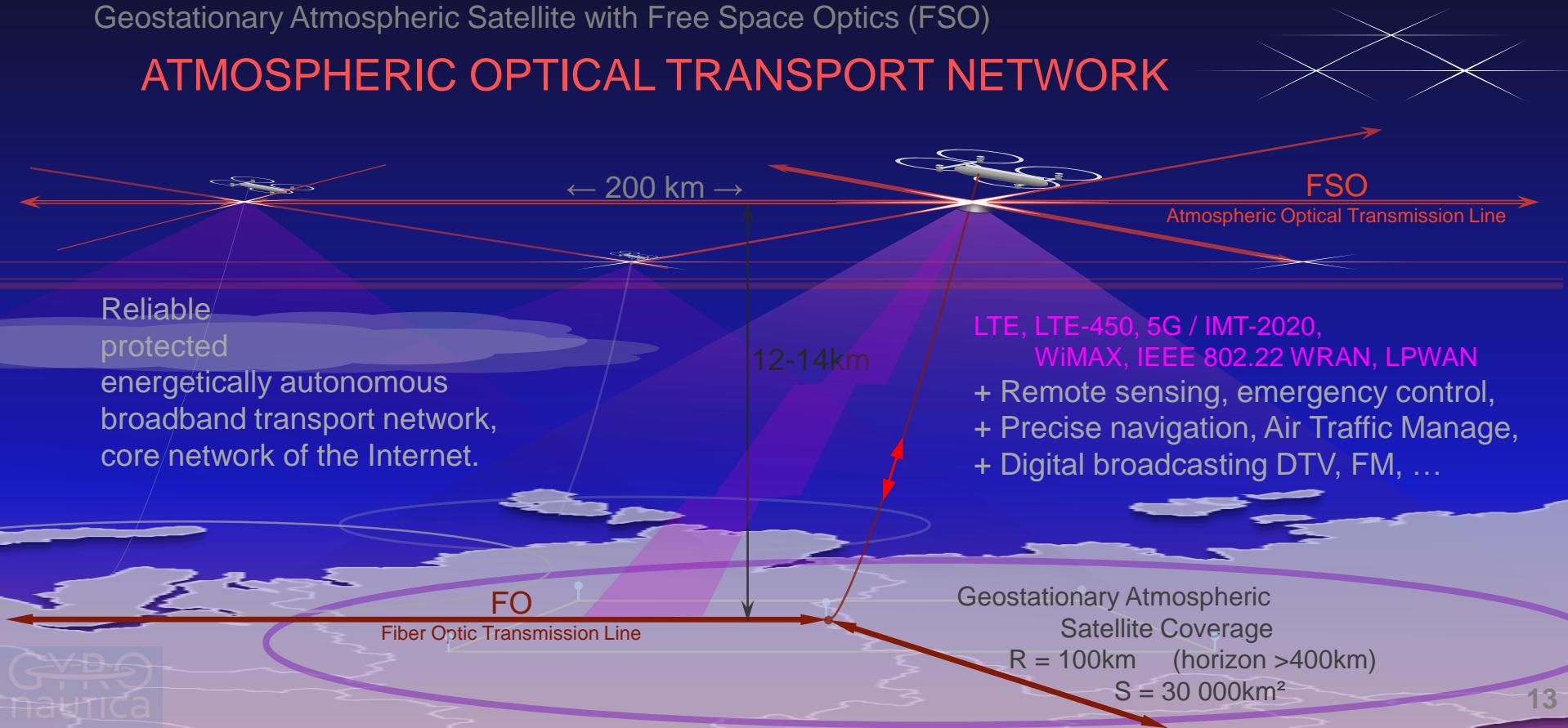
Femtocells

100 000

Population density per 1km²

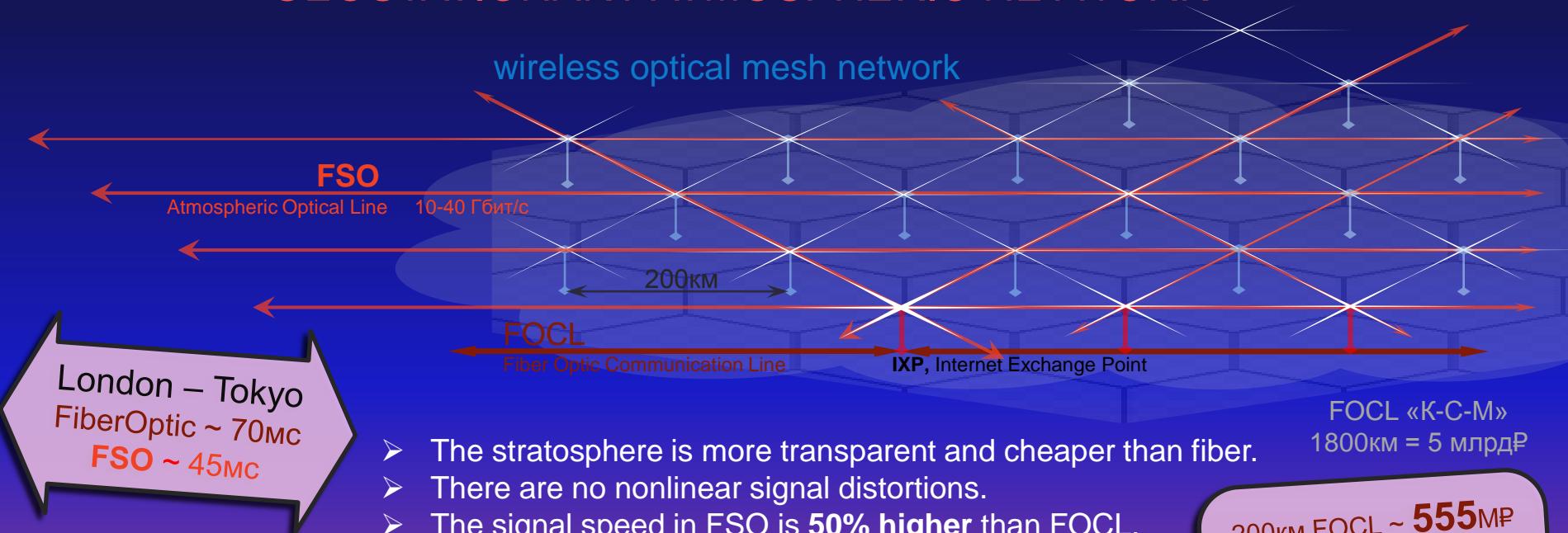
Geostationary Atmospheric Satellite with Free Space Optics (FSO)

ATMOSPHERIC OPTICAL TRANSPORT NETWORK



GAN on Free Space Optics (FSO)

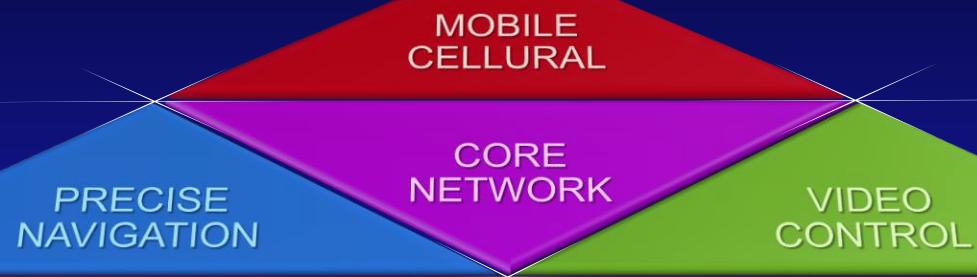
GEOSTATIONARY ATMOSPHERIC NETWORK



- The stratosphere is more transparent and cheaper than fiber.
- There are no nonlinear signal distortions.
- The signal speed in FSO is **50% higher** than FOCL.
- Each GAS adds ~ 3 FSO channel at ~ 200km.

GAN on Free Space Optics (FSO)

SERVICES OF THE GEOSTATIONARY ATMOSPHERIC NETWORK



- Service Combinations*
- Car navigation
 - Social networks
 - Objects security
 - Surveillance
 - Building
 - Telecontrol



Russian market

National Project DIGITAL ECONOMY Σ budget 1 635 mlrd ₽ (\$25 b)
- Federal Program Information Infrastructure 7724 mlrd ₽ (\$12 b)
- FP Elimination of the digital divide in Russia 168 mlrd ₽ (\$2.6b)

600 GAS (100+500) will cover Russia (17M km² + 61 t.km border):

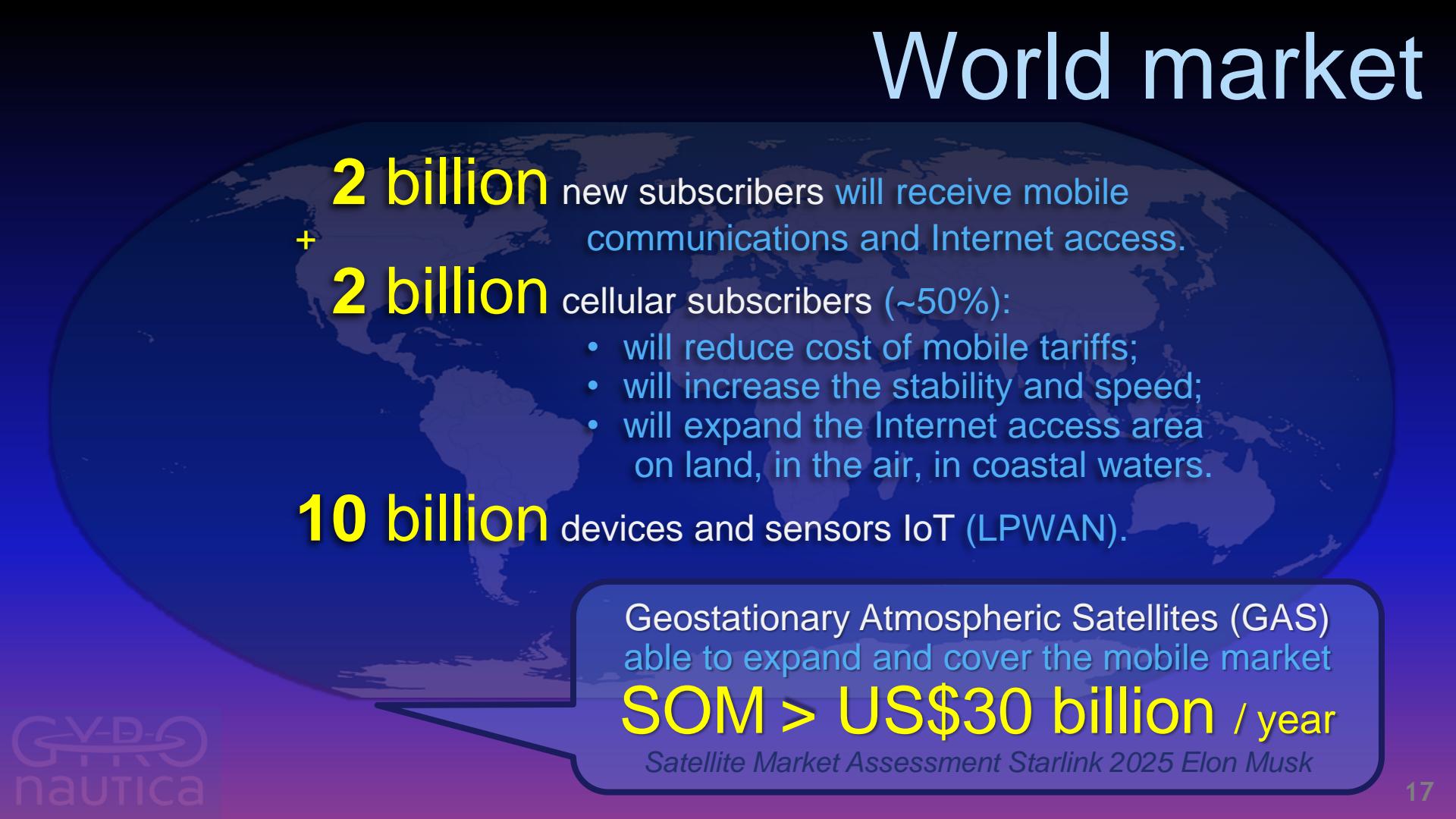
- ✓ Mobile broadband (LTE, 5G/IMT-2020, IEEE802.22 WRAN, LPWAN)
- ✓ Atmospheric Optical Network - 360 000 km trunk optical lines.
- ✓ Control of territories, ways, forests, ..., state borders, emergency zone
- ✓ National Navigation System (centimeter accuracy).
- ✓ Digital Broadcasting FM, DTV, HDTV, UHDTV.
- ✓ Air navigation (ADS-B), airtraffic management, meteorology, ...

GAN solution

State co-investment ~5% of the budget NP

R&D & CAPEX of the project for 4 years - 80 mlrd ₽ (M\$1250)
SOM (50 million subscribers x tariff 134 ₽/mon) = 80 mlrd ₽ / year

World market

- 
- 2 billion** new subscribers will receive mobile communications and Internet access.
 - +
2 billion cellular subscribers (~50%):
 - will reduce cost of mobile tariffs;
 - will increase the stability and speed;
 - will expand the Internet access area on land, in the air, in coastal waters.
 - 10 billion** devices and sensors IoT (LPWAN).

Geostationary Atmospheric Satellites (GAS)
able to expand and cover the mobile market

SOM > US\$30 billion / year

Satellite Market Assessment Starlink 2025 Elon Musk



CEO, CTO

Sergey Kuzikov

co-founder of the company,
IP author, patents owner,
aerodynamic calculation,
aircraft design,

The project team employs qualified young engineers.
Stable team from the foundation of the company in 2015.



CFO, Business Development

Daniel Kuzikov

co-founder of the company,
design and product
experience management in
international startups,



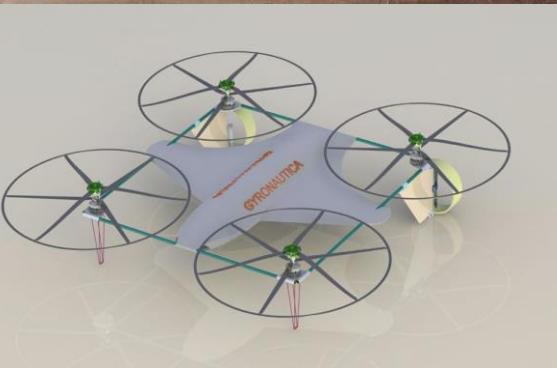
Advisor, co-investor

Vladimir Vishnevskiy

Doctor of Technical Sciences,
Professor, Academician of the
International Academy of
Communications and the New York
Academy of Sciences, Full Member
IEEE Communications Society, ...

Project Current Status

- ✓ The current patent for the group of inventions RU2538737 opens up the possibility of selling the technology licenses.
- ✓ The final stages of patenting in **USA, Europe, China, Canada**.
- ✓ The R&D cycle of the Air Wheel rotors is completed.
- ✓ Aerodynamically stable schemes tested on the prototypes.
- ✓ Development of production technologies and components.
- ✓ LOMO started designing FSO modules for the GAN project.



To continue the GAN project, we need to make a responsible choice:

- Whose base stations will rise above the surface and cover the planet with 6G?
- Whose global atmospheric optical network will be the backbone of the Internet?



PROJECT

GEOSTATIONARY ATMOSPHERIC NETWORK

Welcome to the Future

www.gyronautica.ru

gyronautica@mail.ru

gyronautica@gmail.com

Contacts

GYRONAUTICA LLC

CEO Kuzikov Sergey

+7 911 227 1215