

What data does space-based technology offer?

PROF. HEIDI KUUSNIEMI



VAASA CLIMATE CHANGE CONFERENCE 26.9.2019

SESSION 2: "THE ROLE OF SPACE-BASED
DATA IN FIGHTING CLIMATE CHANGE"



Vaasan yliopisto
UNIVERSITY OF VAASA

Outline

- ▶ Space is part of the digital infrastructure of today
- ▶ Space-based technology and data
 - ▶ Satellite Navigation (SatNav)
 - ▶ Satellite Communication (SatCom)
 - ▶ Earth Observation (EO)
 - ▶ Also human space flight
- ▶ EU space programmes
- ▶ Global challenges to be addressed by space-based technology
- ▶ New Space



Source: Business Finland

DIGITAL INFRA-STRUCTURE IS OUR NEW CRITICAL INFRA-STRUCTURE!





In traffic and transport we utilise navigation services based on location information



Weather forecasts are based on the data generated by satellites



Communication satellites transmit real-time TV broadcasts to our homes



Climate change, deforestation, floods, storms and other changes and catastrophes in nature can be monitored, and we can be prepared for them with the data and images generated by satellites



Security and rescue authorities utilise location information in their operations



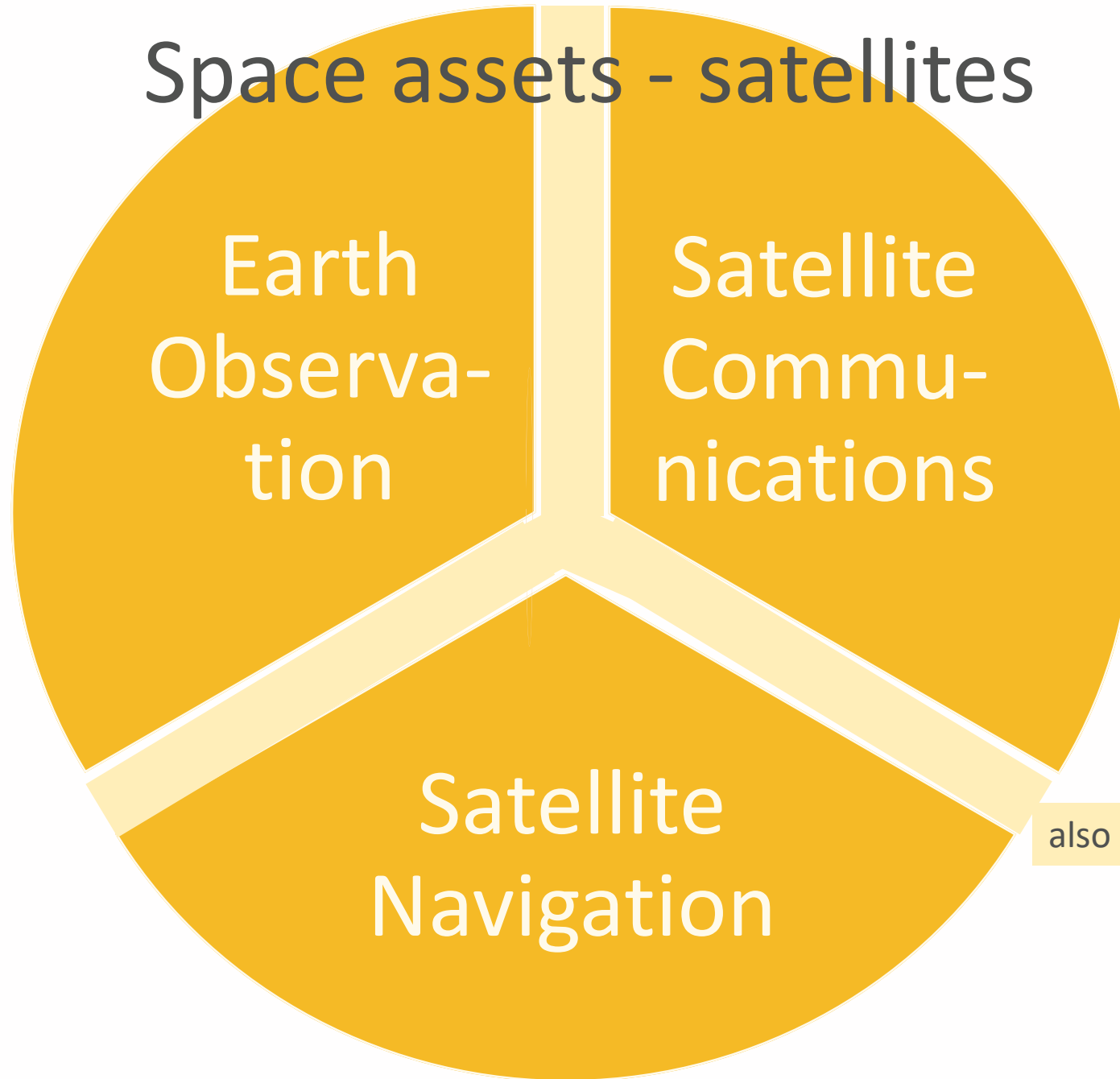
Data generated by satellites can be used for optimisation in agriculture and forestry



Urban planning, land use and the construction sector all utilise data generated by satellites



Space assets - satellites



also human space flight



EU Space programmes

- ▶ **Copernicus** is a leading provider of Earth observation data - satellite remote sensing. It helps save lives at sea, improves our response to natural disasters, and allows farmers to better manage their crops.
- ▶ **Galileo** is Europe's global satellite navigation system, similar to GPS. It provides more accurate and reliable positioning and timing information for autonomous and connected cars, railways, aviation and other sectors. Galileo has been operational since December 2016 when it **started offering initial services** to public authorities, businesses and citizens.
- ▶ **EGNOS** (the European Geostationary Navigation Overlay Service) provides “safety of life” navigation services to aviation, maritime and land-based users over most of Europe



ESA Business Applications

European Space Agency -
<https://business.esa.int/>



European Space Agency



Global Challenges and Space (1)



- ▶ Global challenges
 - ▶ Climate change
 - ▶ Migration
 - ▶ Mobility
 - ▶ Communication
 - ▶ Energy
 - ▶ Shortage of resources
 - ▶ Demographic development
 - ▶ Conflicts and catastrophes
 - ▶ Health
- ▶ Space to provide
 - ▶ Information
 - ▶ Communication
 - ▶ Science & technology
 - ▶ Education
 - ▶ Inspiration



Global Challenges and Space (2)

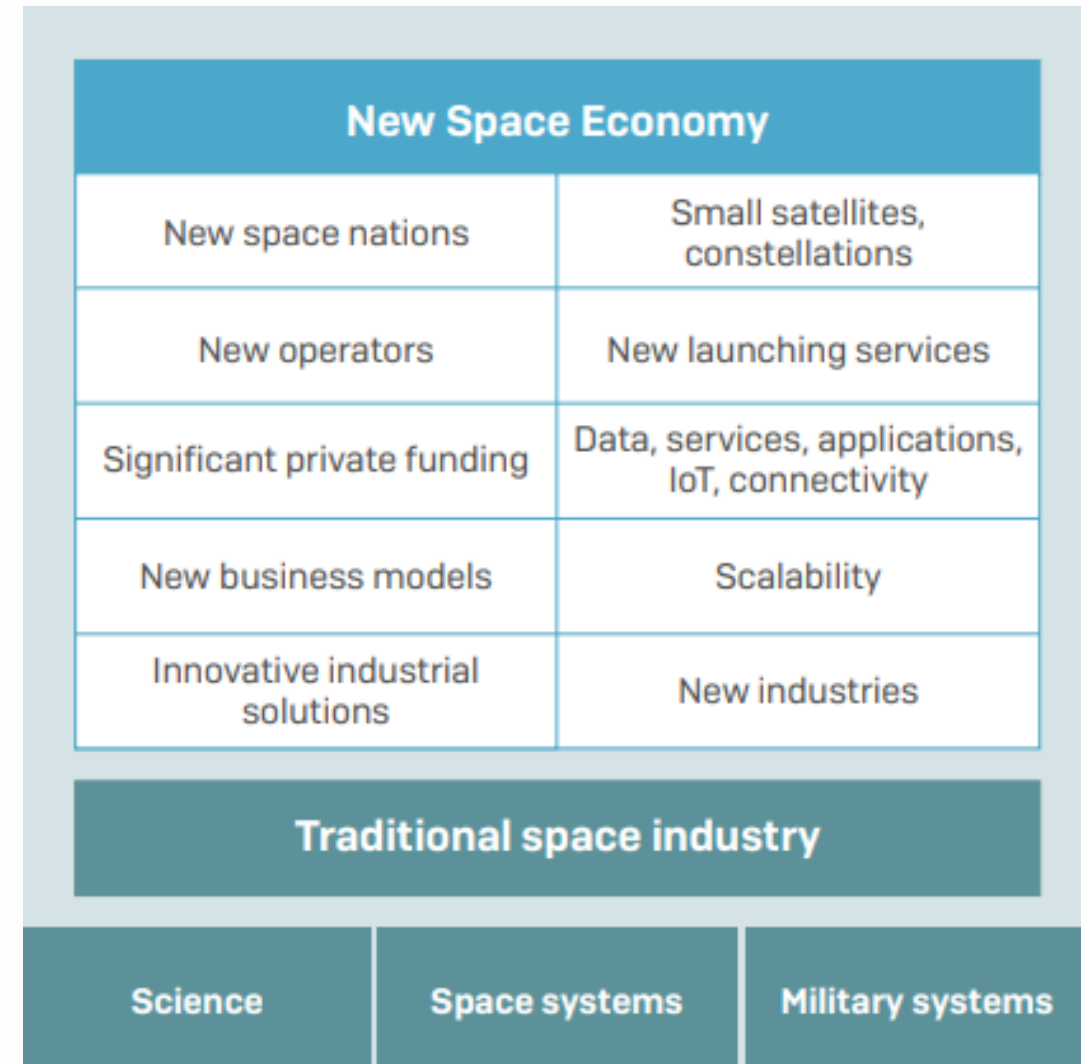


Source: UN Office for Outer Space Affairs

The New Space Economy – revolution of the space sector

Source: Ministry of Economic
Affairs and Employment

- ▶ New Space Economy has emerged next to the traditional space industry
 - ▶ refers to business using small satellites to deploy systems which offer commercial services and utilising space data and applications
 - ▶ enables easier and cheaper access to space than ever before
- ▶ The traditional space industry (formerly publicly funded at a national level) and the New Space Economy complement one another



Traditional Space

Institutional Space

Galileo, GNSS

Copernicus, Sentinels

Military Space Activities

Earth Observation Satellites

Ground Segment

Science missions, instruments

Space Exploration

Commercial Space

Components and Subsystems for COM Satellites

New Space Economy

New Business Models with Commercialisation Potential

Positioning, Navigation & Timing

Geoinformation, Data and Services, Platforms

Services: IoT, Media, Connectivity

Components and Subsystems For SmallSats

SmallSats Systems

Satellite Servicing

SmallSats Constellations, Radar / Hyperspectral

Manufacturing in Microgravity and Space

Space Resource Mining

Energy from Space

Space Situational Awareness, Space Weather

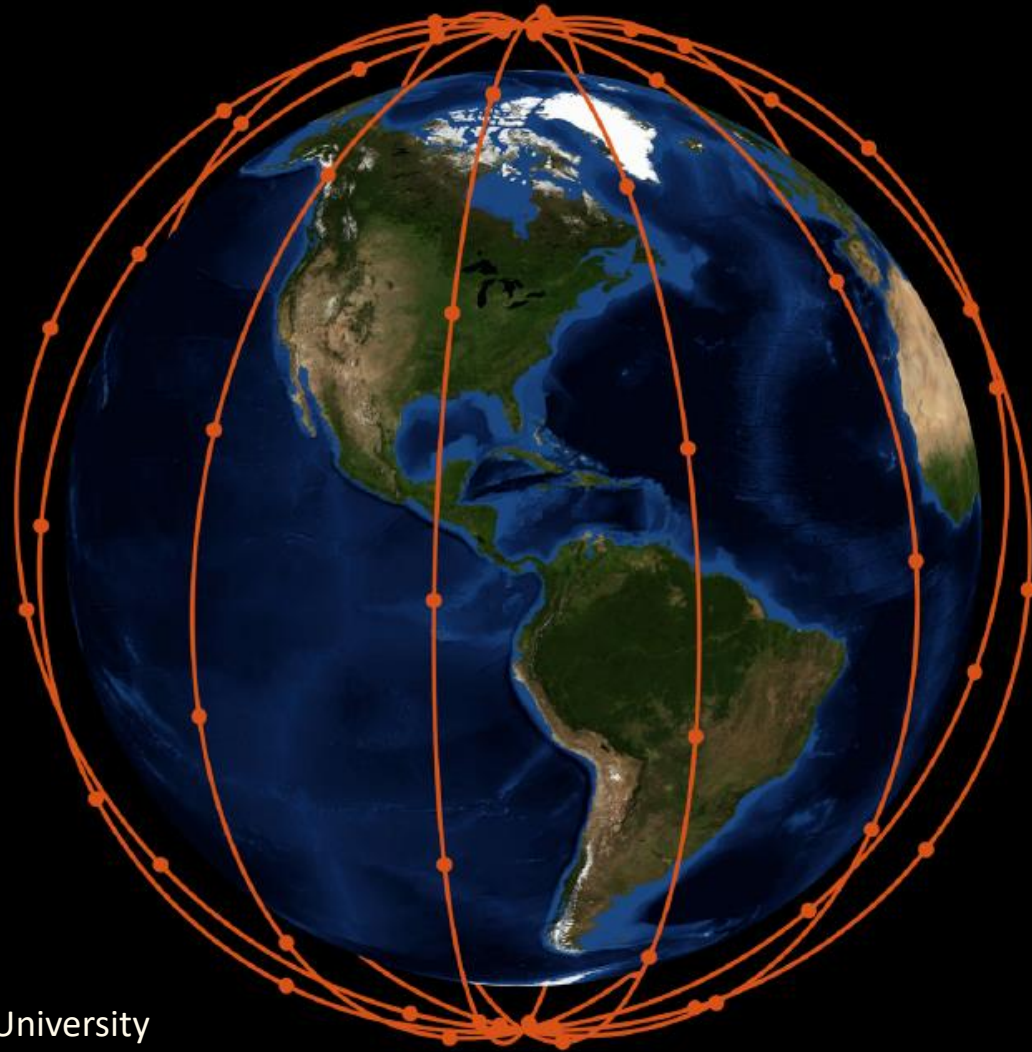
Space Tourism, Education

Space Habitats

Humans to Mars

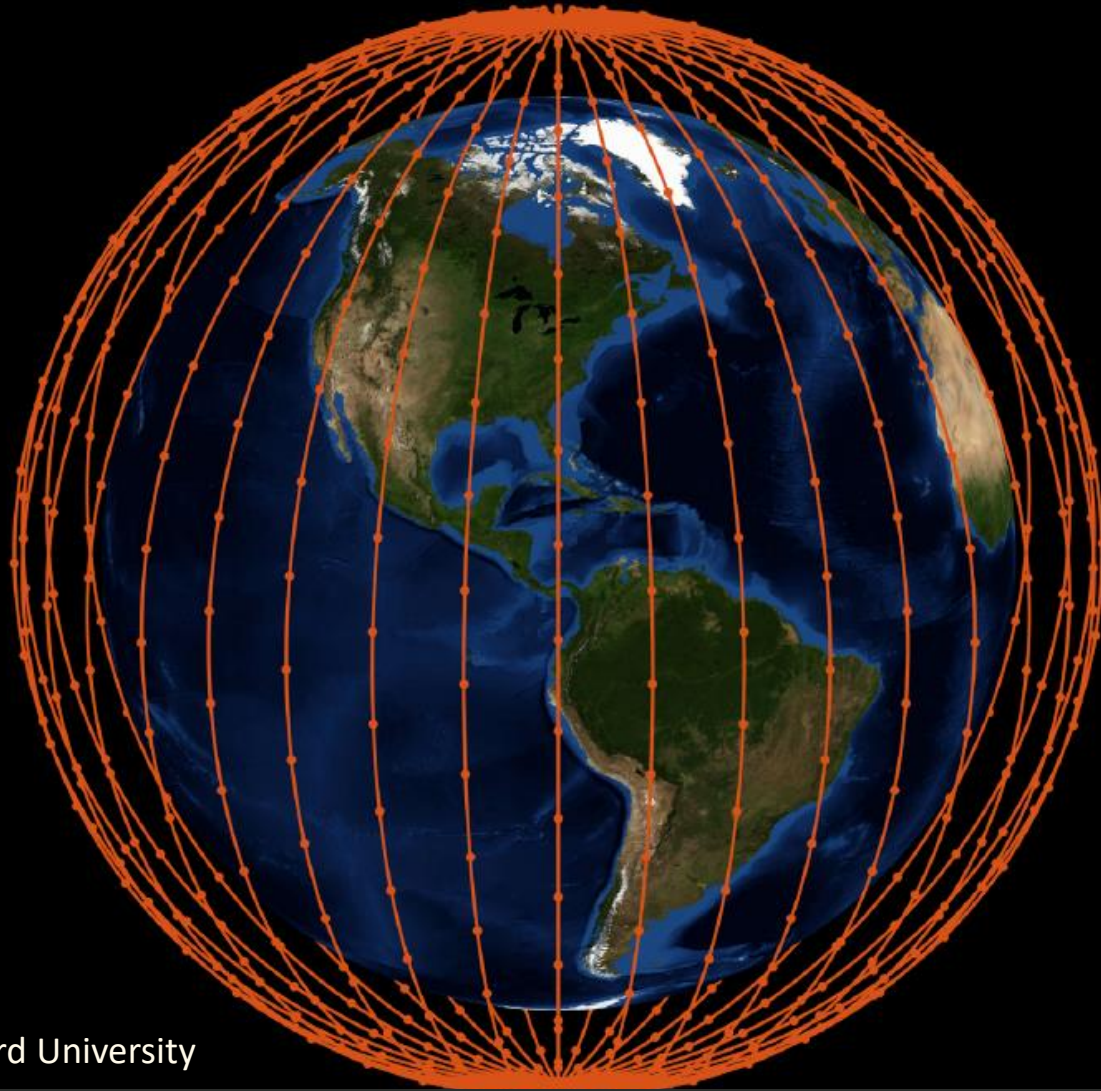
New Launch Systems

Iridium (66)



Satellite
communications
via Iridium

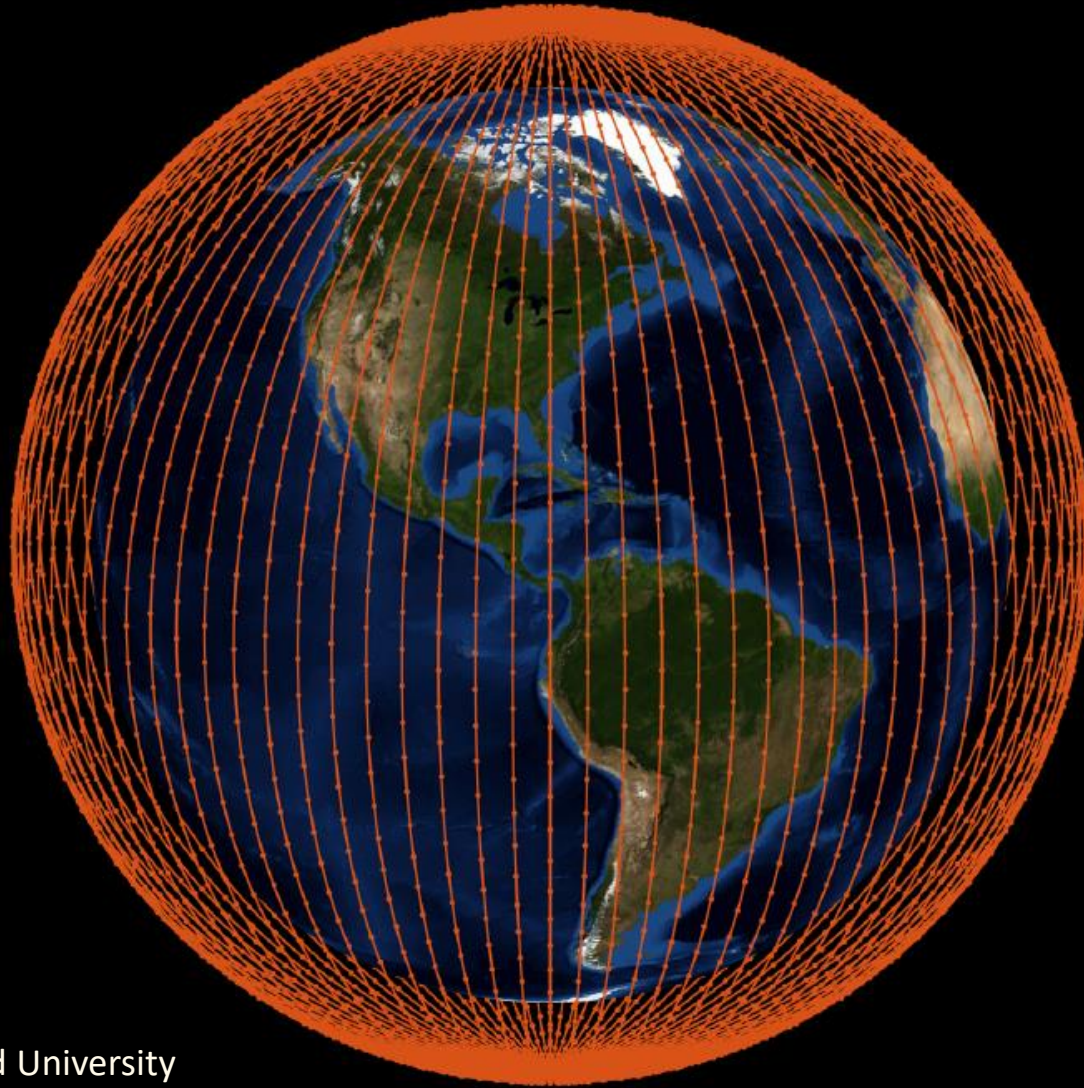
OneWeb (648)



Planned satellite
broadband connectivity
via OneWeb

Source: Tyler Reid, Stanford University

SpaceX / Samsung (4000+)



Planned satellite
broadband
connectivity
via SpaceX &
Samsung etc



Vaasan yliopisto
UNIVERSITY OF VAASA

THANK YOU! ANY QUESTIONS?

HEIDI.KUUSNIEMI@UNIVAASA.FI

