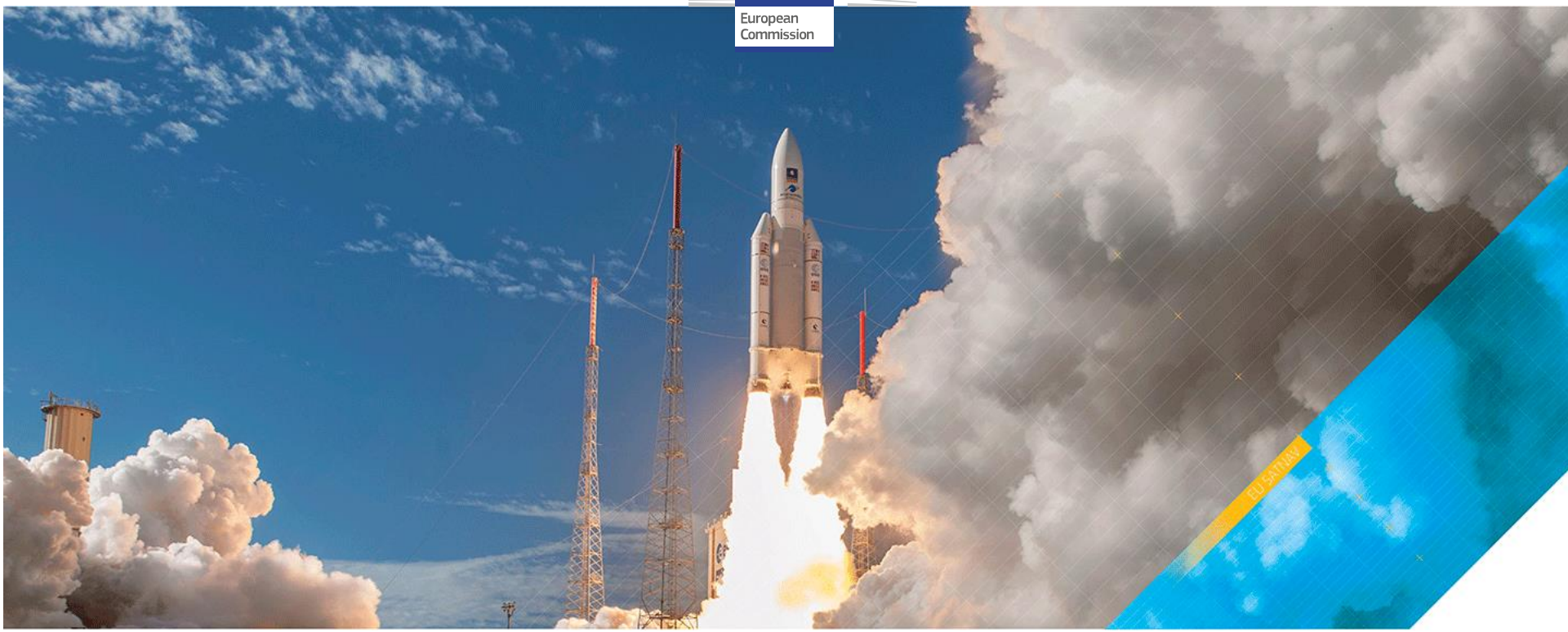
European Commission



GALILEO EGNOS

NAVIGATION MADE IN EUROPE

H2020 – EU SATELLITE NAVIGATION

Future of EGNSS – the evolution programme

EU Space Week 2019 • Helsinki, 4 December 2019

CONTEXT FOR G2G – VISION TO 2035

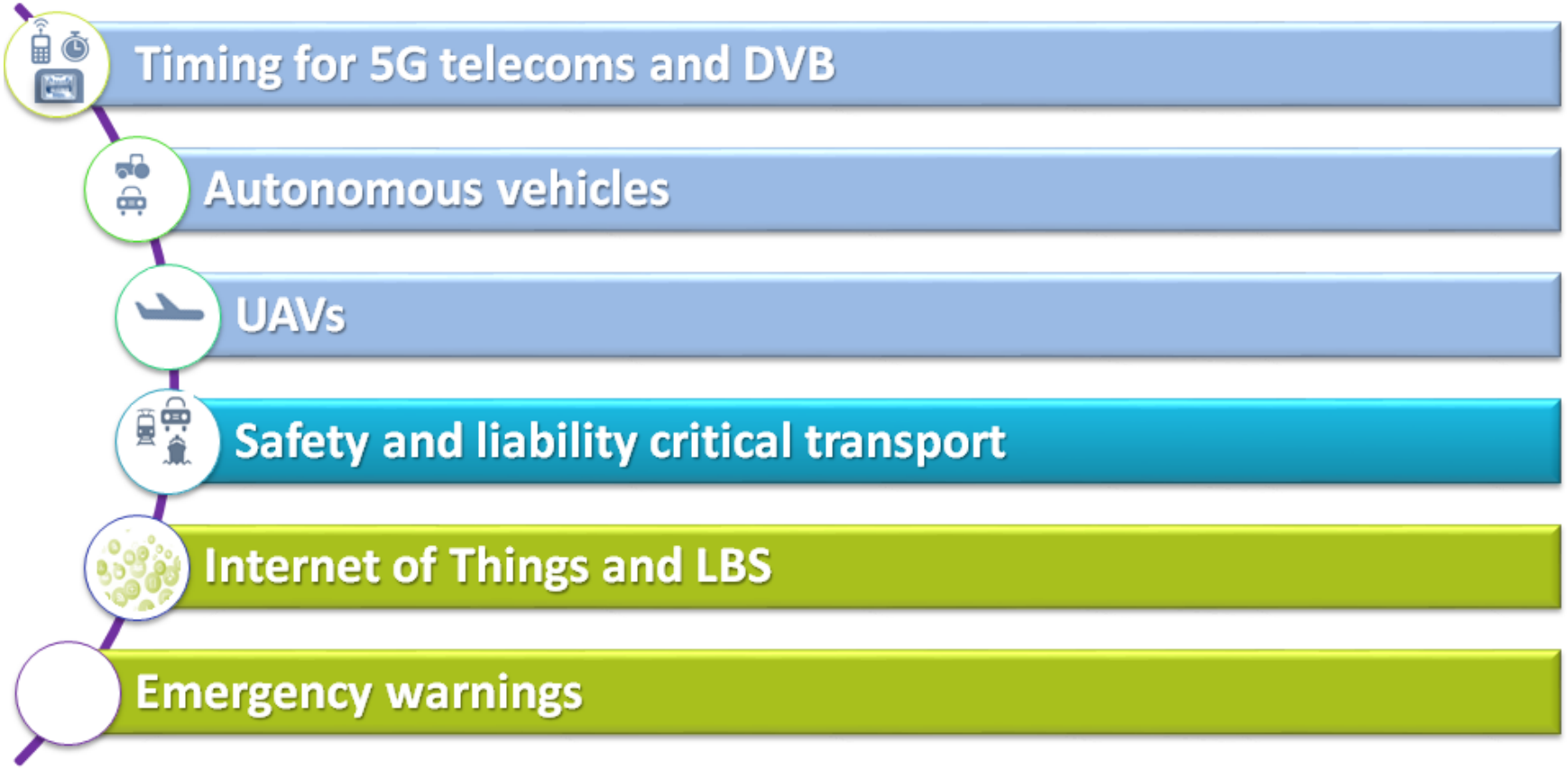
- **At least 4 global constellations in Medium Earth Orbit**
  - > 120 satellites broadcasting signals

- **Use of positioning and timing information (PNT) generalized**
  - The 5th facility (after water, electricity, gas, phone)
  - Massive usage does not tolerate service downtime: robustness !

- **Emerging new requirements from user communities**
  - e.g. authentication , for applications requiring trusted position and timing information (road charging, pay as you drive, access to mobile content, geo-fencing, etc)
  - New use cases: deep urban/indoor, high accuracy for all,

- **Changing environment of use: adjust to new realities**
  - Fast evolving technologies
  - Interference: repeaters, adjacent bands, multipath, jammers, cyber etc

MAIN DRIVERS FOR EVOLUTION



Usual KPIs still apply: Availability, accuracy, integrity !
But user communities call for improvements…

Credits: GSA, 2016

R&D IN SUPPORT OF EGNSS PROGRAMMES

- The study of the evolution of EGNSS at mission and system levels has been supported by a strong R&D programme covering all segments of the EGNSS programme:

  - R&D on downstream sector, supporting the development of new applications and receiver technology;
  - R&D on new mission concepts and new services, to assess their viability;
  - R&D on technology and architecture, to bring to maturity the necessary components and assess the system concepts.

MAIN EVOLUTIONS (1)

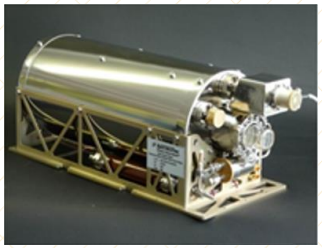
Service evolutions include:

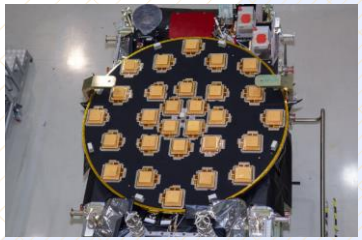
- Robust **Timing** Services
- **Space** Service Volume
- **ARAIM** – coming back to serving SoL communities
- **Emergency** Warning Services
- **Search And Rescue** – Innovative service based on the return link
- **Ionosphere** Prediction Capability
- **Signals** Evolution – increased performance at user level (TTFF, accuracy, authentication, etc)
- **EDAS** service evolution
- **EGNOS** Aviation service evolution
- **SBAS** authentication

MAIN EVOLUTIONS (2)

Technological evolutions include:

- **Navigation Payload (Signal Generation Unit)**
  - New signals
  - Flexibility to accommodate rapidly evolving needs
  - Self-compensating capability (thermal variations, config changes)
- **Amplifiers**
  - More efficiency
- **Clocks**
  - More reliable
  - Technology diversity (PHM, Rubidium, Caesium + Clock Ensemble for robustness)
  - Less bulky
- **Antennas**

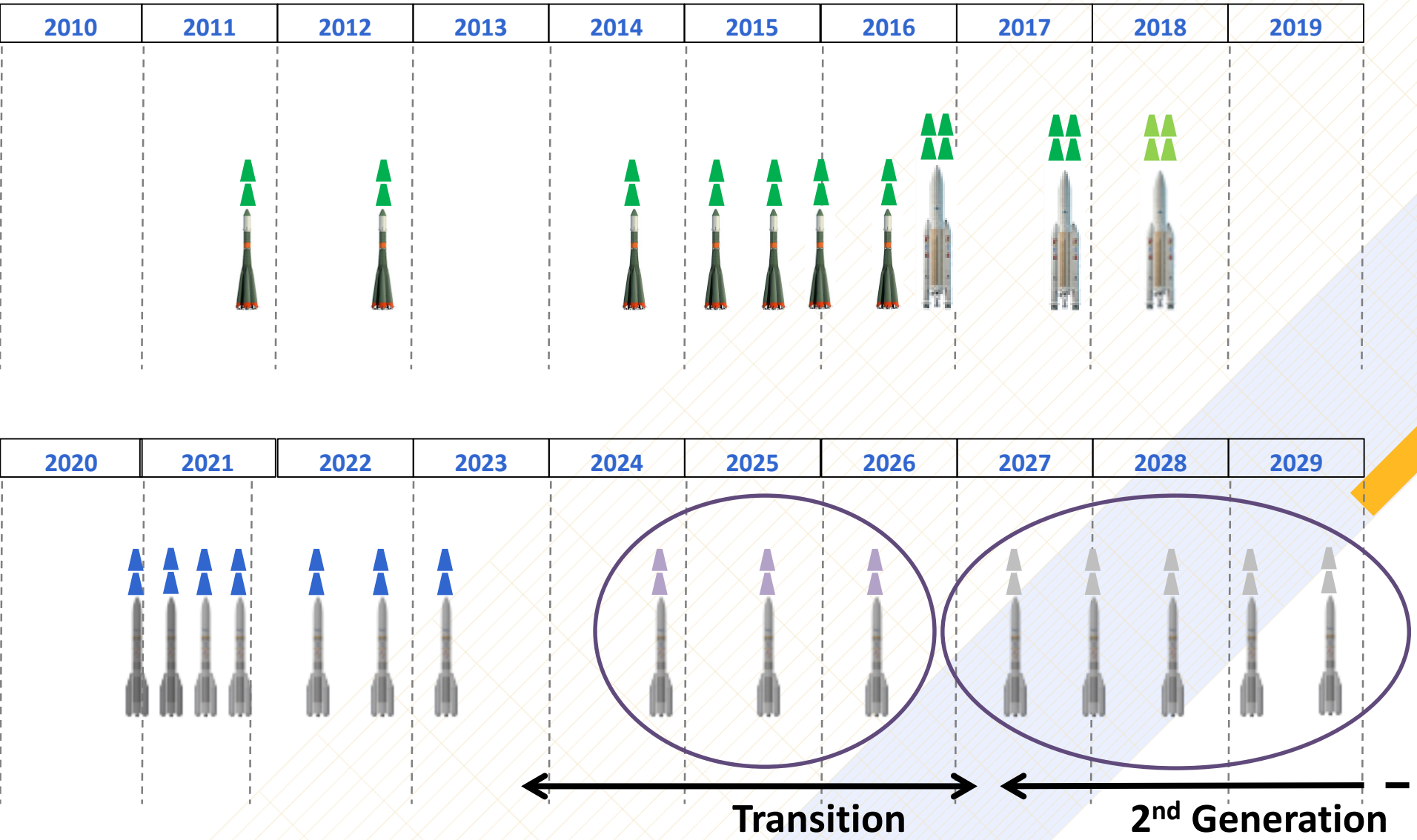




- As well as **ground stations equipment, ODTS, RFCS, EGNOS technology, EGNOS evolutions system engineering**, etc

Credits: ESA, 2018

SCHEDULE FOR EVOLUTION



CONCLUSION : EVOLUTION OR REVOLUTION ?

How can we forecast the breakthroughs of millions of bright engineers and business developpers in the next 2 decades?

GNSS, the Robust Backbone of Human Navigation

GNSS Flexibility for adaptation to future Added Value services

THANK YOU

http://ec.europa.eu/galileo