

SPACE FOR 5G

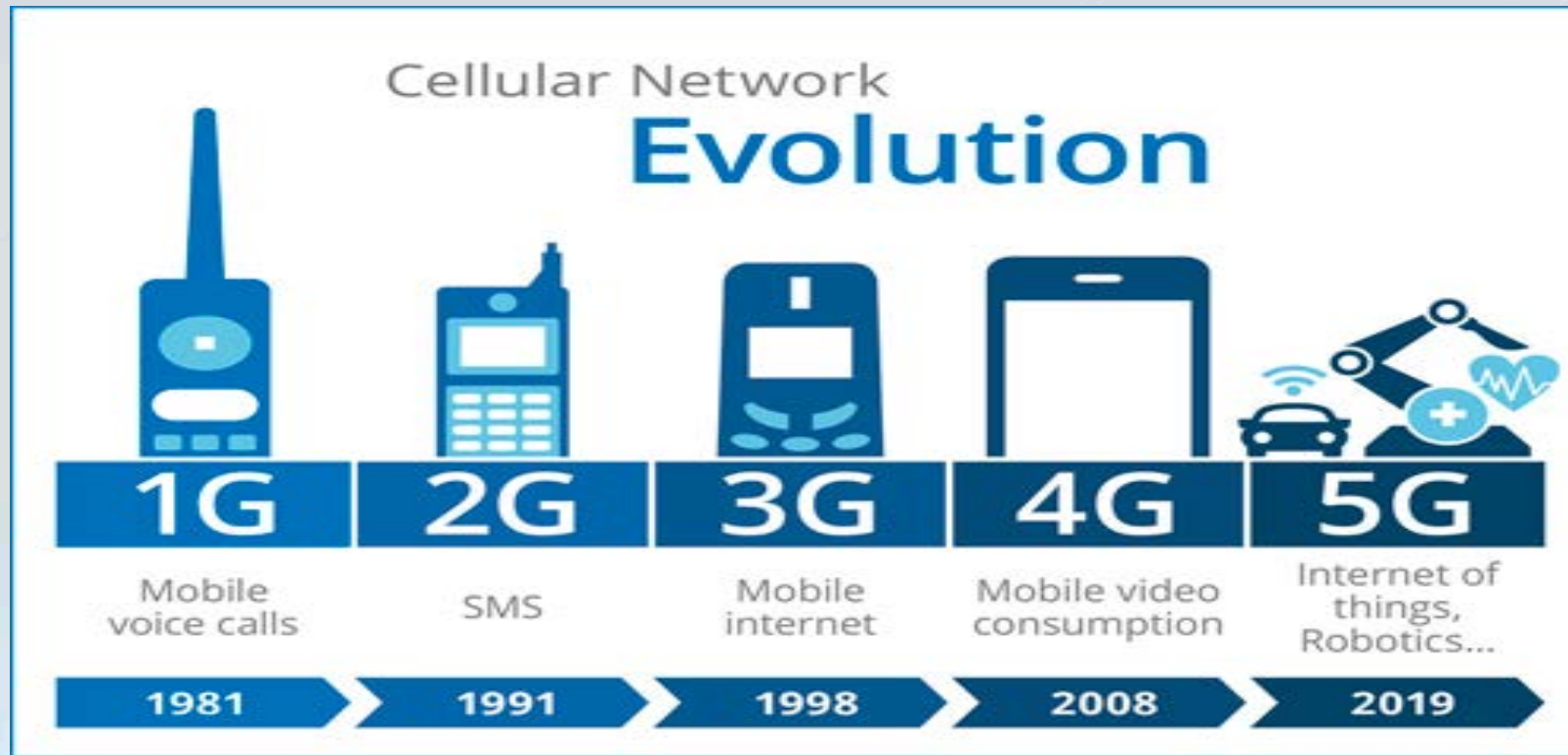


DOWNSTREAM GATEWAY
Space for Earth

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5G brings **NEW** communications capabilities such as: real-time responses, enhanced connectivity, [localisation services](#), connected cars, [smart cities](#), and [satellite communications](#).



In red WGs where ESA is active

Main ongoing activities on 5G



SA - Services and System Aspects

overall architecture and service capabilities of systems based on 3GPP specifications responsibility for cross TSG co-ordination

New Use cases definition beyond Mobile
Broadband:
V2X, Railway, Automation (factory 4.0), PWS,

5G-NTN Architecture

RAN –Radio Access Network

functions, requirements and interfaces of the network: radio performance, physical layer, Layer 2/3 specifications, access network interfaces, RF conformance testing (UE and BS), and spectrum filing at ITU-R

5G-NR enhancements towards V2X

5G-NR Positioning Enhancements

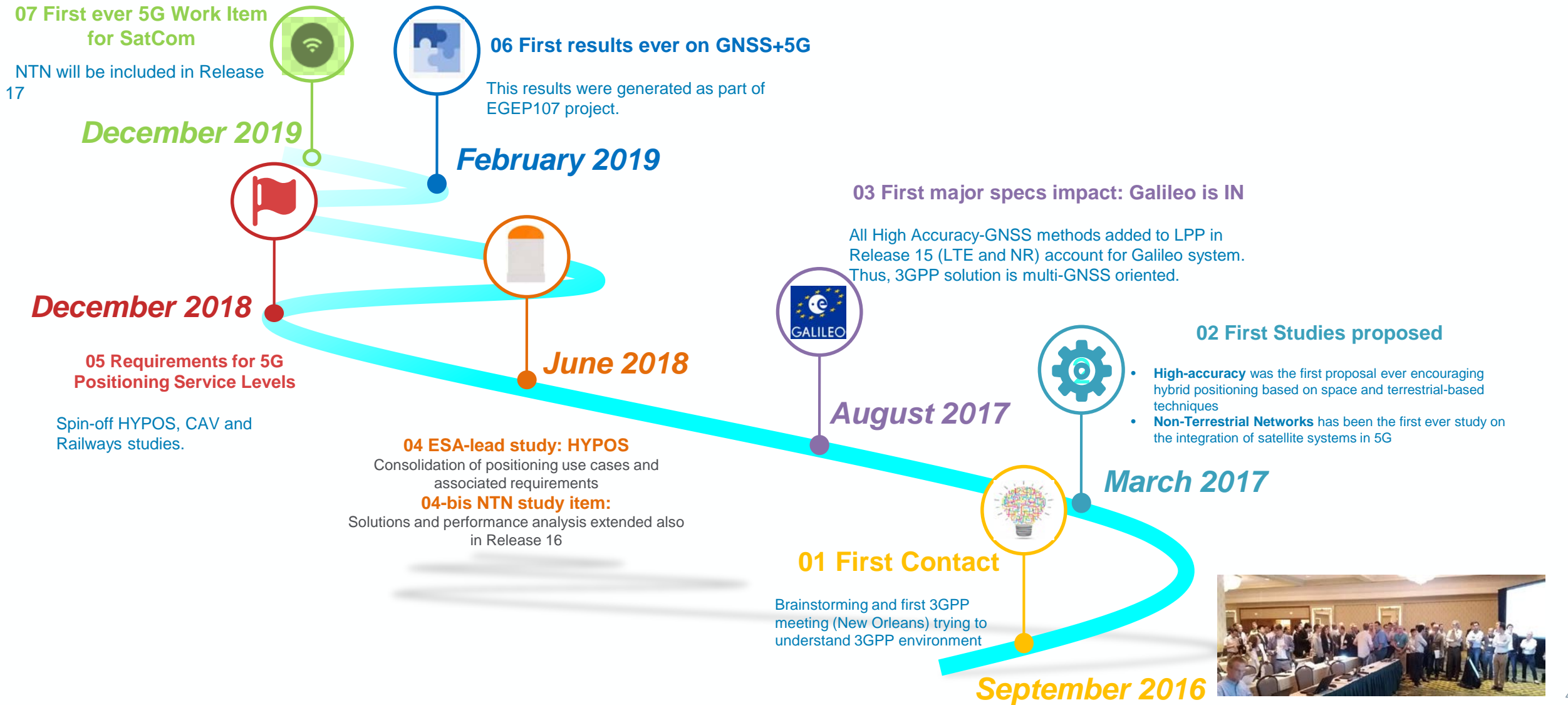
5G NTN Specifications

CT – Core Network and Terminal

terminal interfaces (logical and physical) and capabilities (such as execution environments) and the Core network part of 3GPP systems

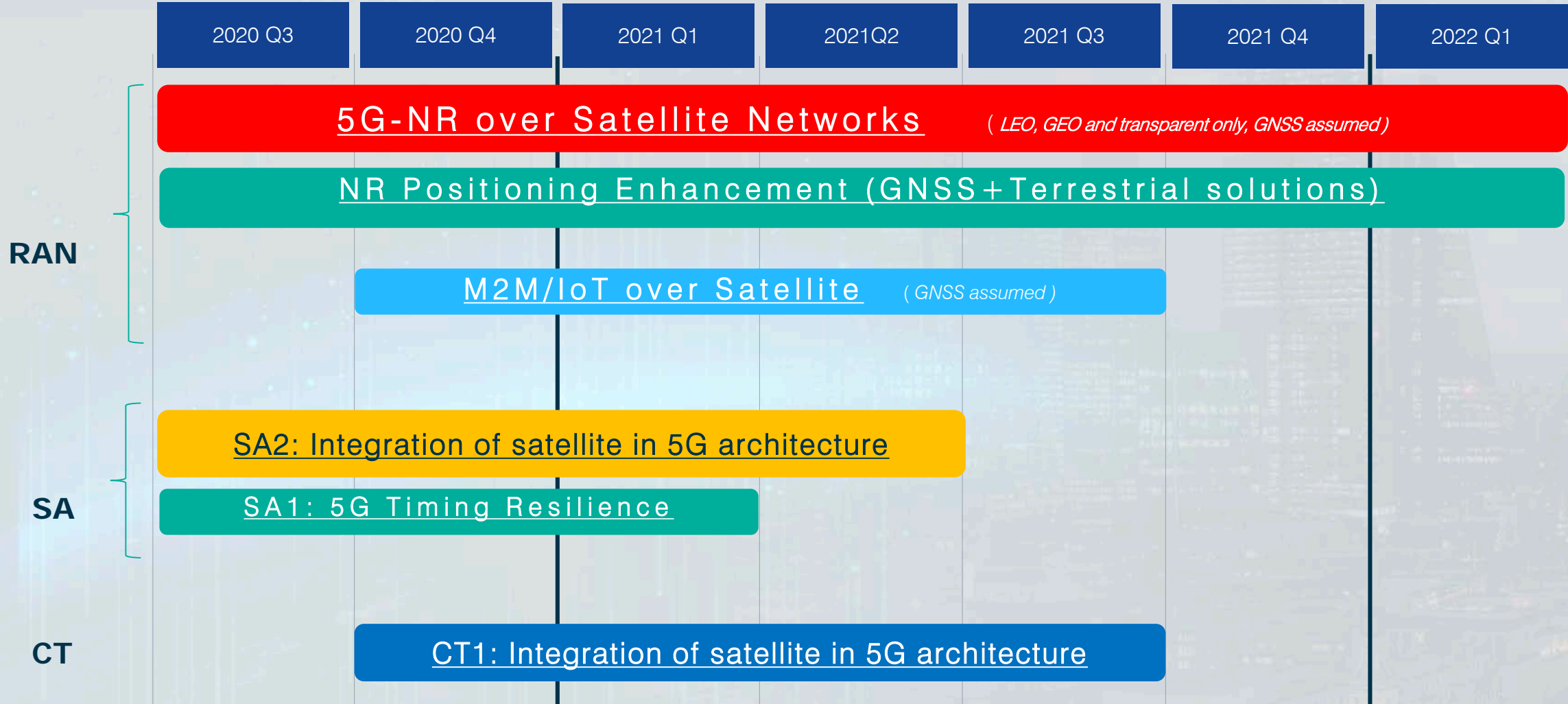
5G Core Network Interfaces

#SpaceFor5G: Key Milestones

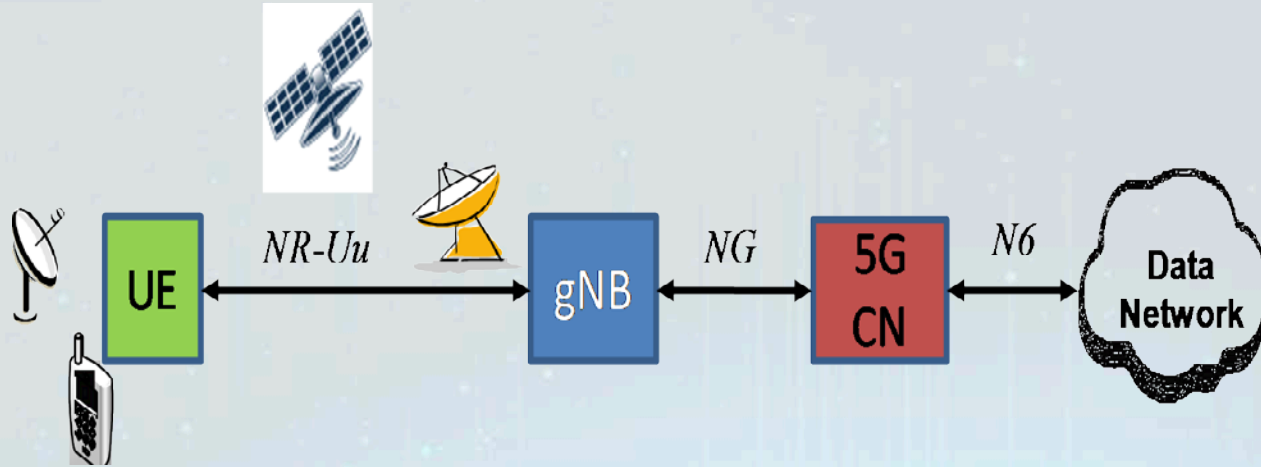


5G Release 17 Timeline

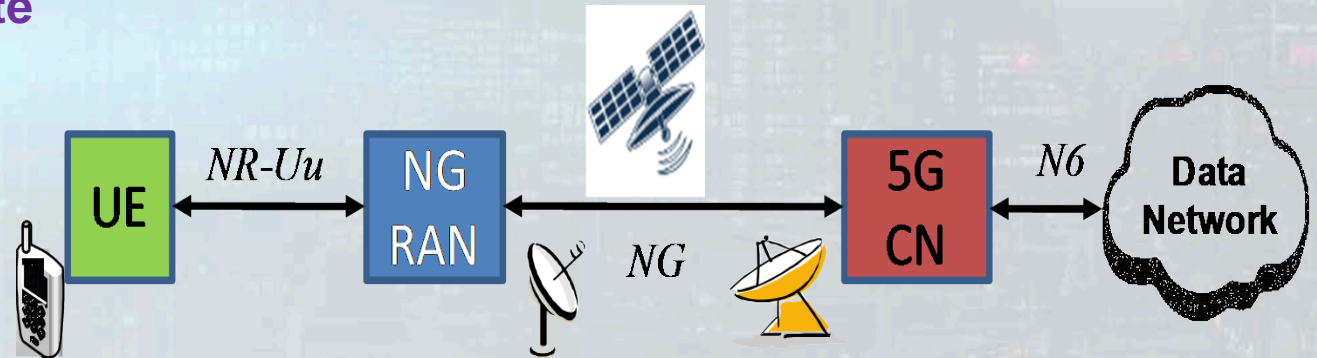
[www.3gpp.org]



NTN Architectures Opportunities in Release 17



5G Direct Access via a Transparent Satellite

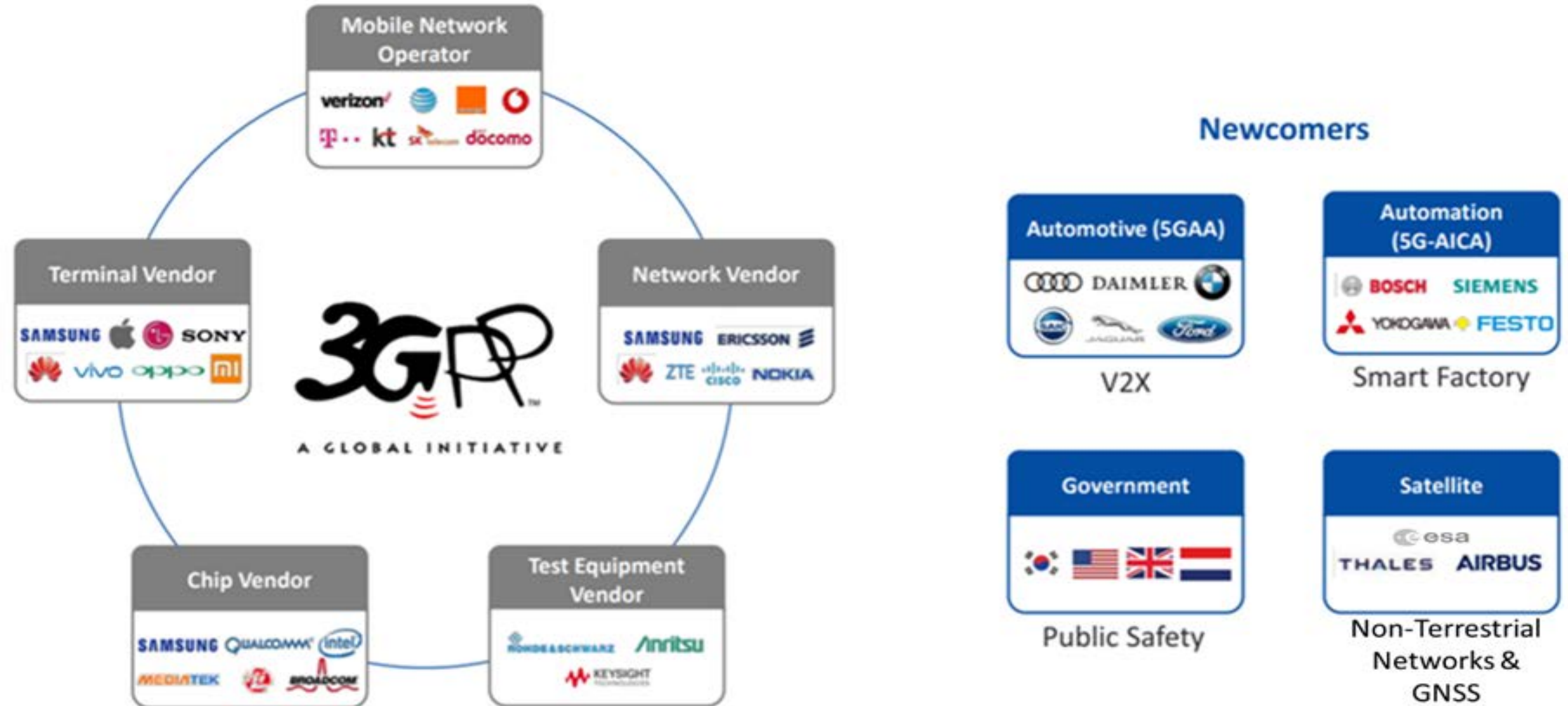


Satellite transport network (i.e., backhauling)

5G Performance via Satellite

Use-case	Experience data-rate (DL/UL)	Max UE speed	Environment	Example of UE Categories
Pedestrian	2 Mbps / 60kbps	3 km/h	Extreme coverage	Handheld
Vehicular	50 Mbps / 25 Mbps	250 km/h	Along roads in low population density	Vehicular mounted
Stationary	50 Mbps / 25 Mbps	0 km/h	Extreme coverage	Building mounted
Airplane	360 Mbps / 180 Mbps	1000 km/h	Open area	Airplane mounted
IoT	2 kbps / 10 kbps	0 km/h	Extreme coverage	IoT devices

5G landscape is evolving



Paradigm Shift in network-based localisation

Target for Positioning Accuracy [m]

E911: 50m

Possible solution: 5G

Possible solution: GNSS + 5G

IIoT: 0.5

<1m

4G (indoor & outdoor)

5G Release 17 (indoor)

5G Release 17 (outdoor)

PNT Cycle: Opportunities for ESA



Feedback to EGNSS evolution

Take into account emerging needs, technology transfer, etc..

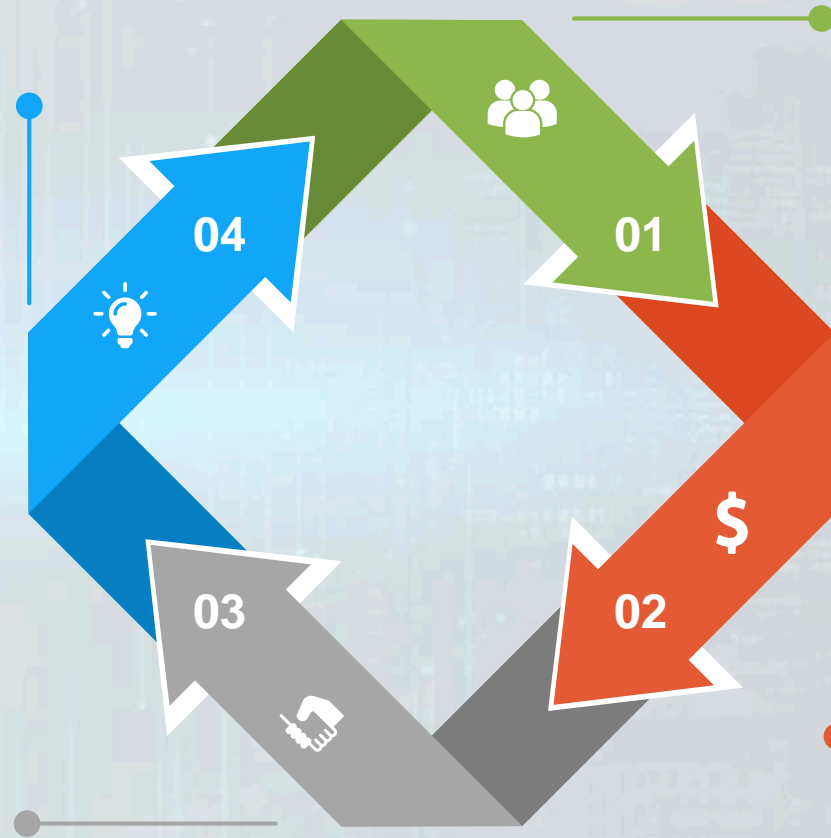
3GPP Standardisation

Emerging use cases, promote EGNSS

Invest in downstream R&D

Undertake R&D with space and **non-space** European industry: GINTO5G, POMELO, etc.

Across agencies collaboration

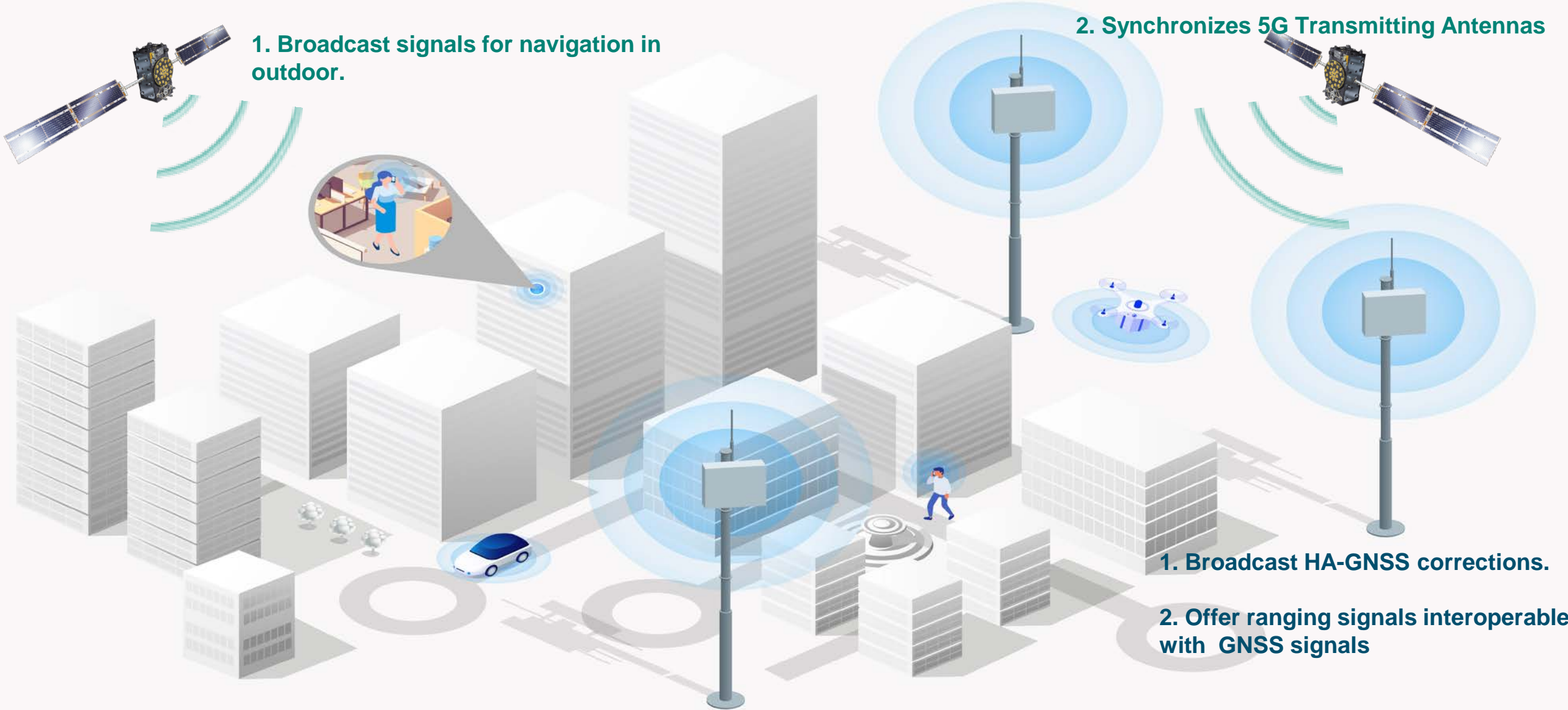


GNSS and 5G: A mutually-beneficial technological partnership



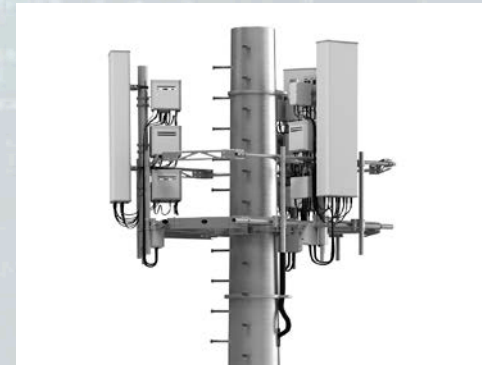
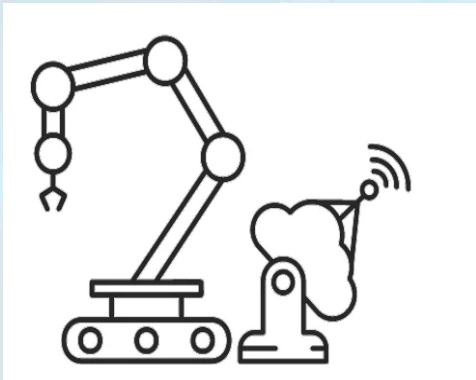
1. Broadcast signals for navigation in outdoor.

2. Synchronizes 5G Transmitting Antennas



NAVISP EI2 PNT for 5G Call for ideas

- Co-funded R&D
- Submission deadline: 31/01/2021
- Support the European GNSS to put forward and develop globally competitive solutions at high TRL in the fields of 5G, GNSS, and hybrid positioning based on the two.



You can find the recorded webinar hosted at the European Space Agency YouTube account (<https://youtu.be/l6JC9pLbeWc>).

Cross-directorate cooperation
to unlock the full potential of #SpaceFor5G, and,
why not, 6G soon



- **Multi-GNSS is expected to continue being a cornerstone PNT technology also in the context of 5G**
- **The role of space (GNSS and SatCom) in current and future global communications standard is expected to grow**
- **Prepare early for 6G and 2030 horizon: LEO for SatCom & PNT**

