

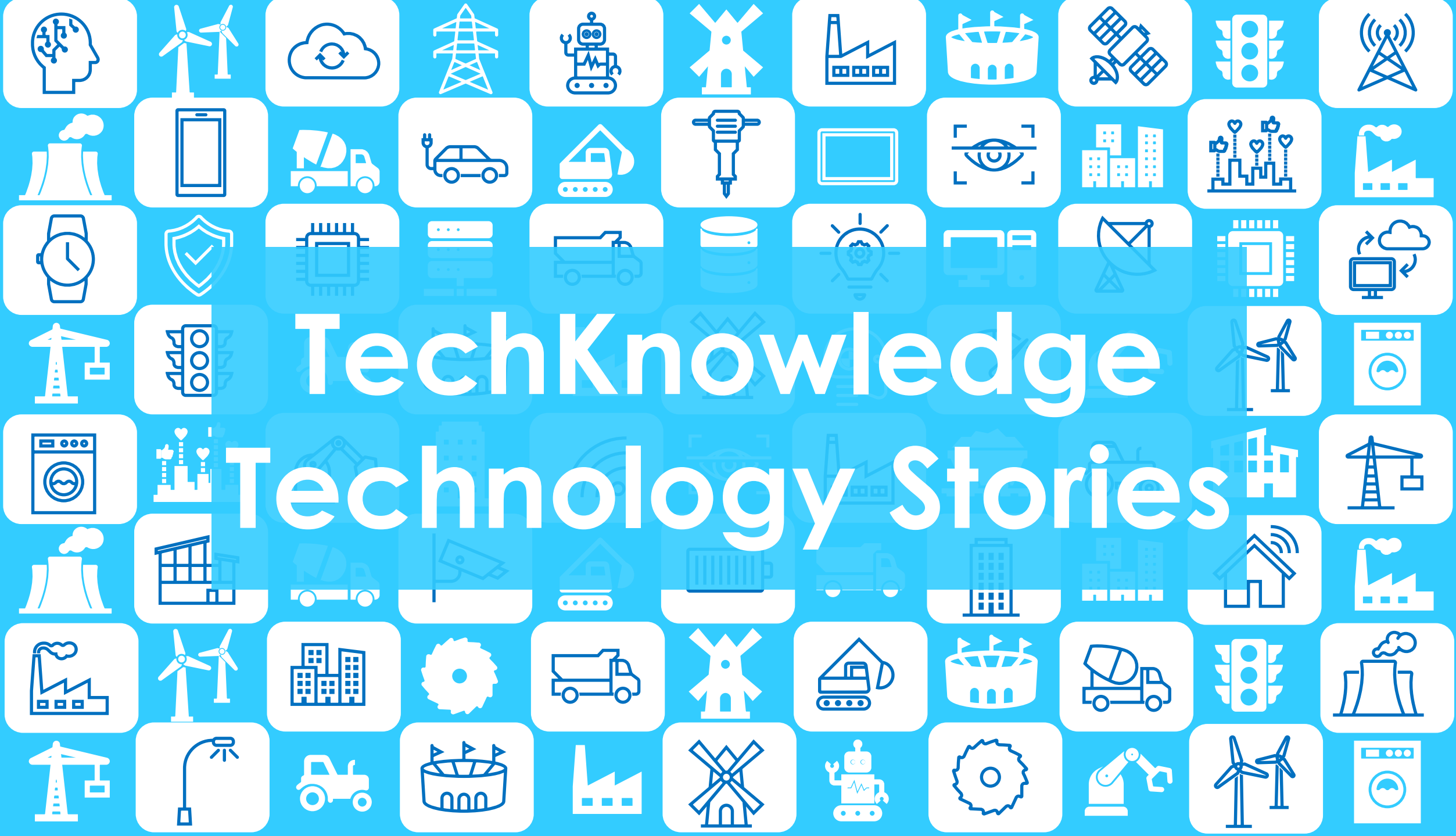
# TechKnowledge

## Technology Stories

Series 1

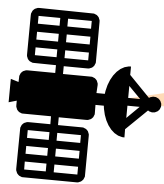
# Part 3: Satellites - Our Friends In the Sky...





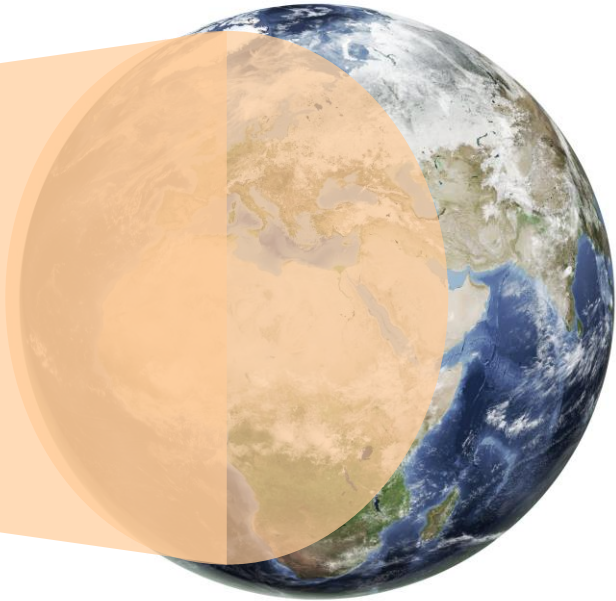
# TechKnowledge

## Technology Stories

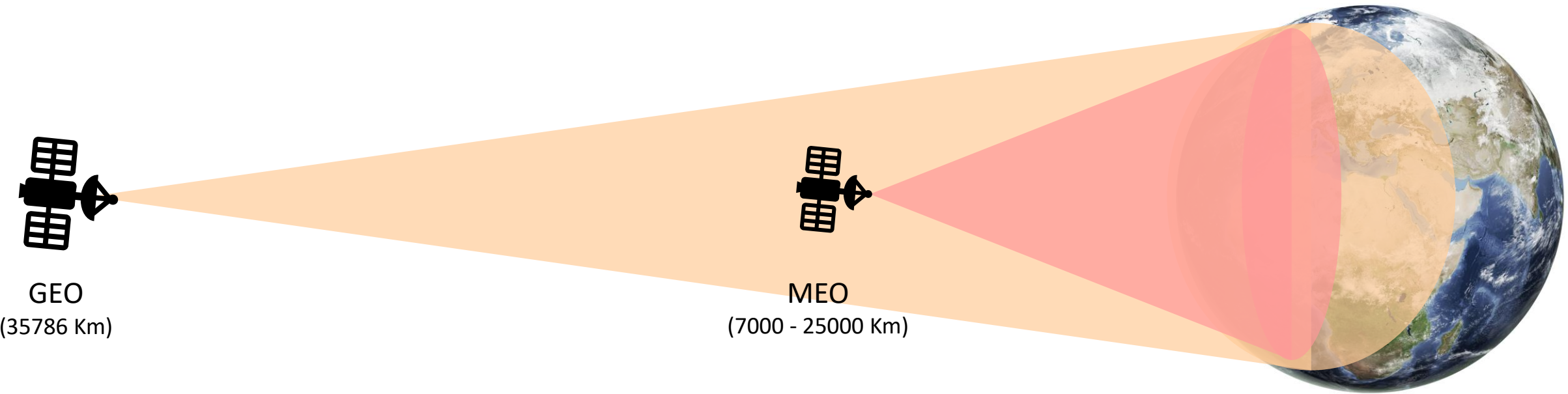


GEO  
(35786 Km)

GEO = Geostationary/Geosynchronous Earth Orbit



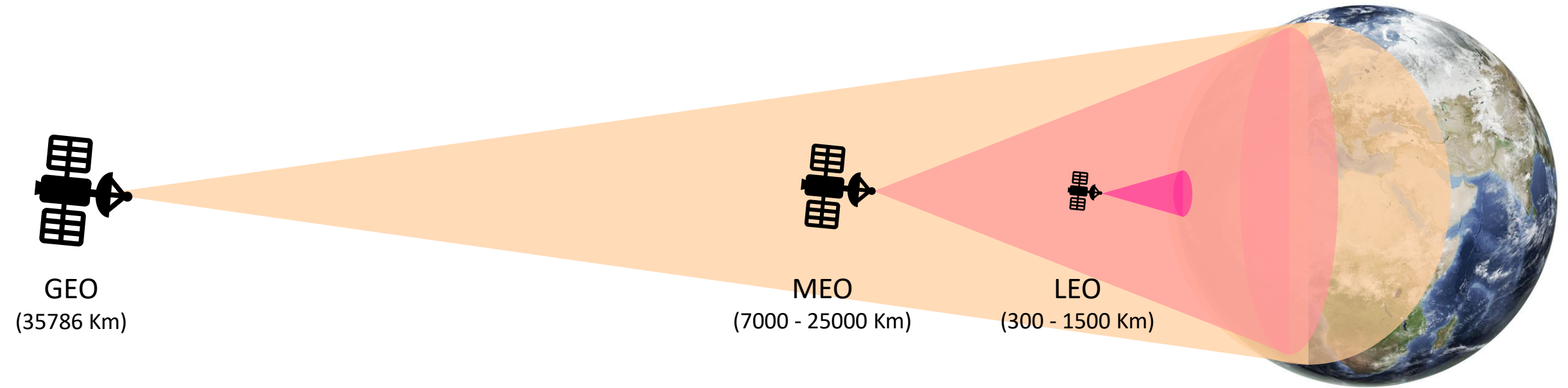




GEO  
(35786 Km)

MEO  
(7000 - 25000 Km)

GEO = Geostationary/Geosynchronous Earth Orbit  
MEO = Medium Earth Orbit



GEO = Geostationary/Geosynchronous Earth Orbit  
MEO = Medium Earth Orbit  
LEO = Low Earth Orbit





# Terrestrial and Non-Terrestrial Networks

UAS = Unmanned Aircraft System  
HAPS = High-Altitude Platform Station

## Satellites

- GEO – 35,786 km
- MEO – 7,000 to 25,000 km
- LEO – 300 to 1,500 km

## UAS

- UAS Range – 8 to 50 km
  - Typically, 18 to 27 km
- HAPS – 20 km

## Aircraft

- Typically, 9 to 11.5 km

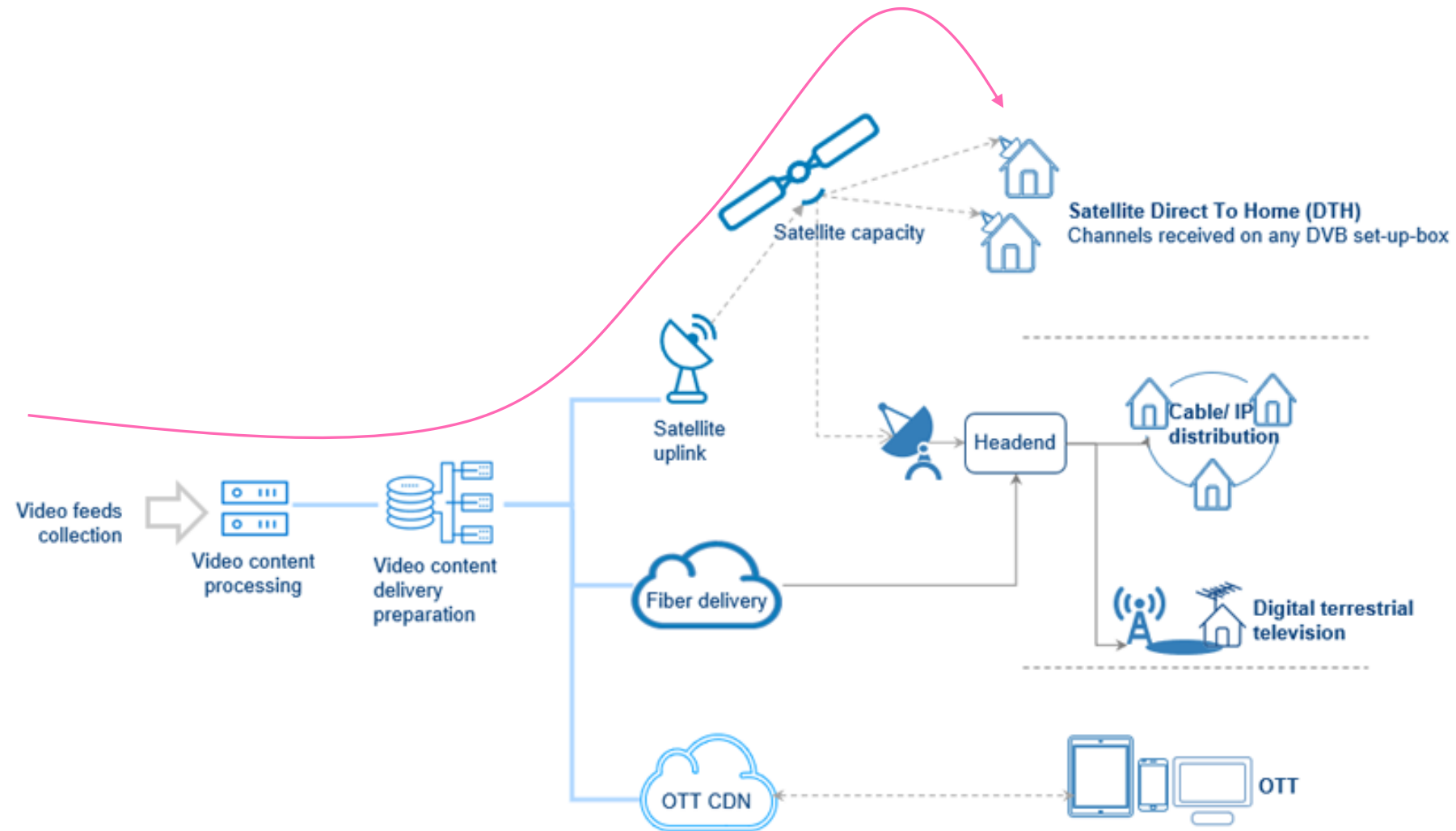
Terrestrial Networks

© 3G4G



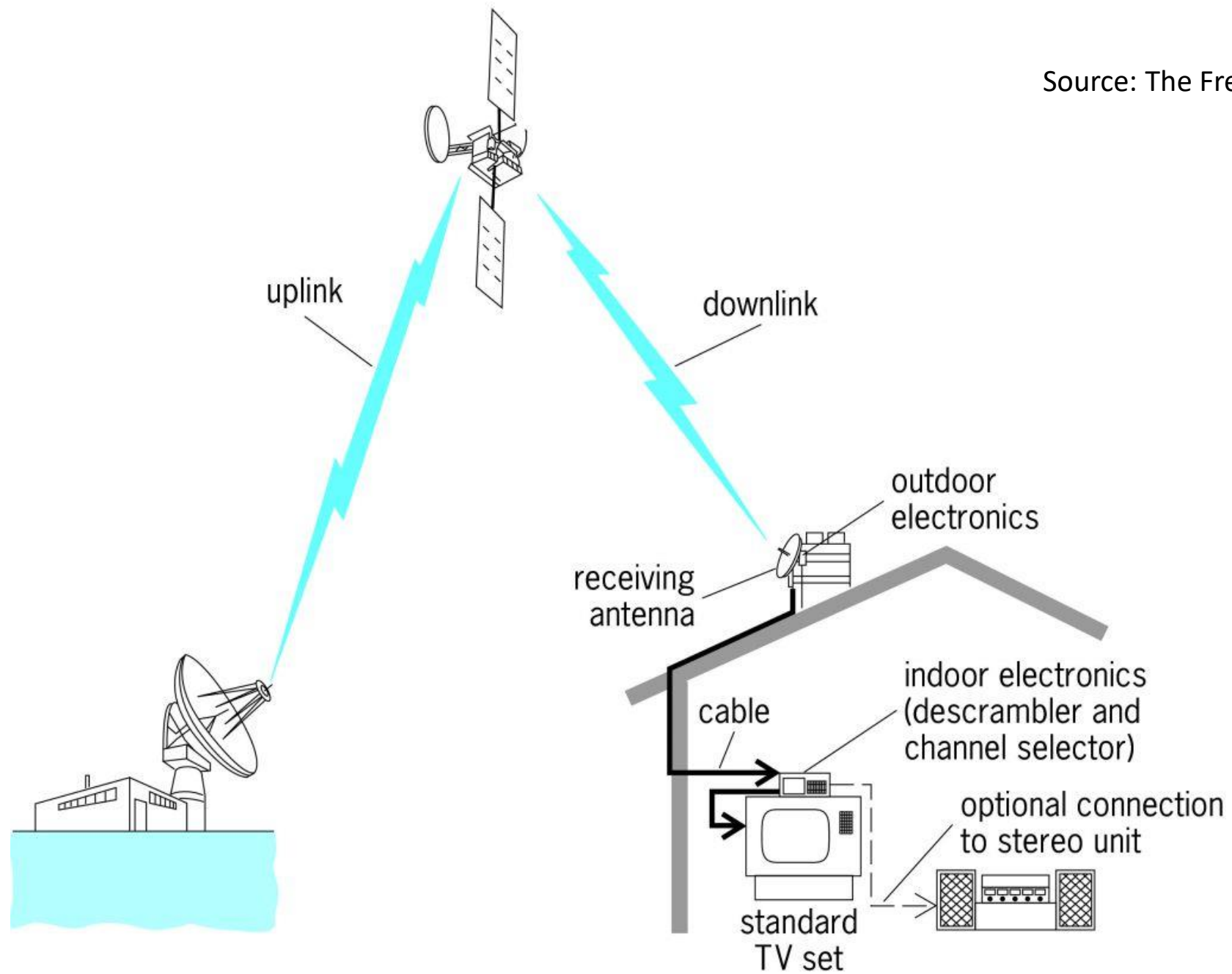
5G  
3G4G

# Direct Broadcast Satellite (DBS) or Direct-to-Home (DTH)



Source: Eutelsat

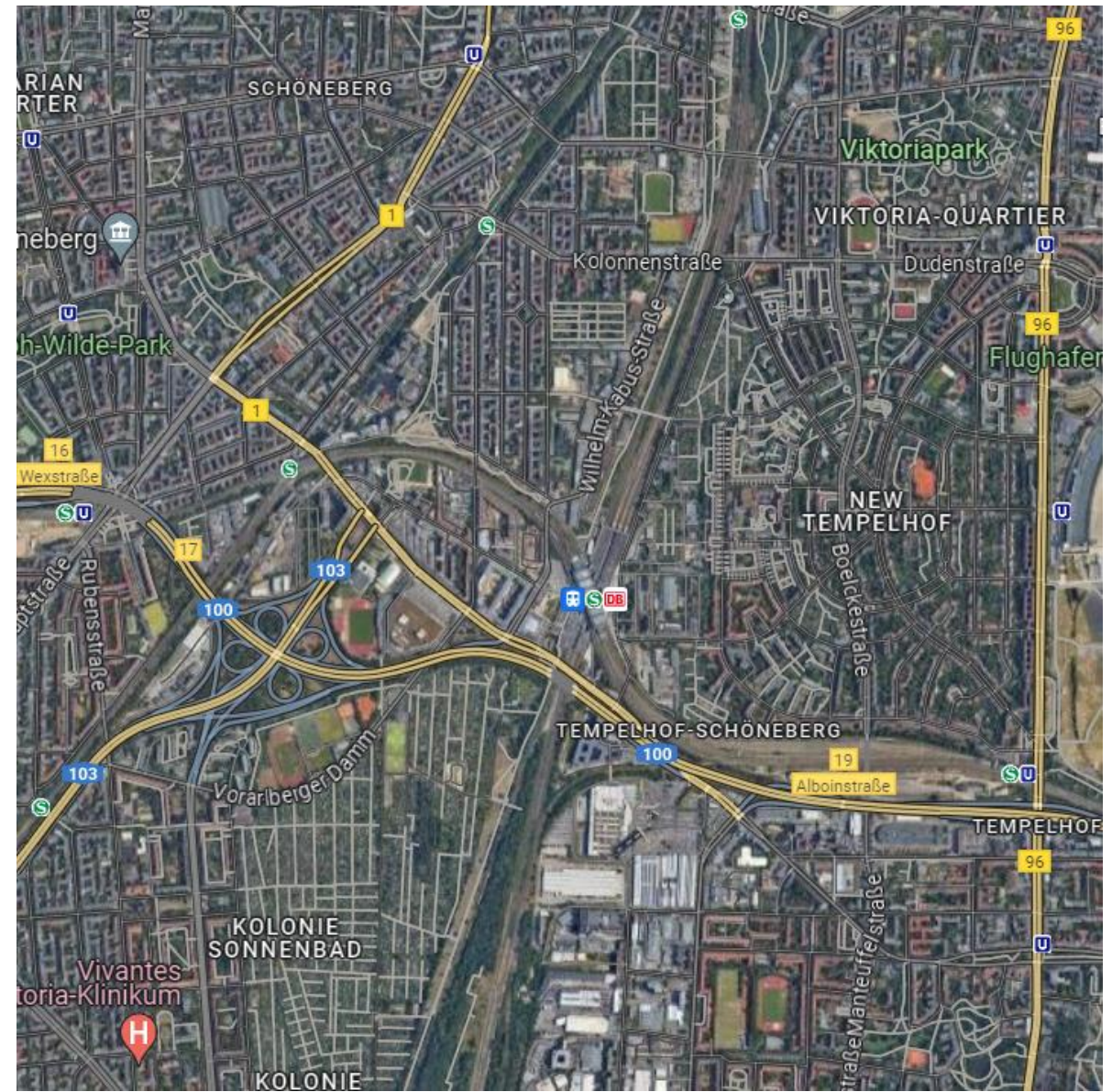
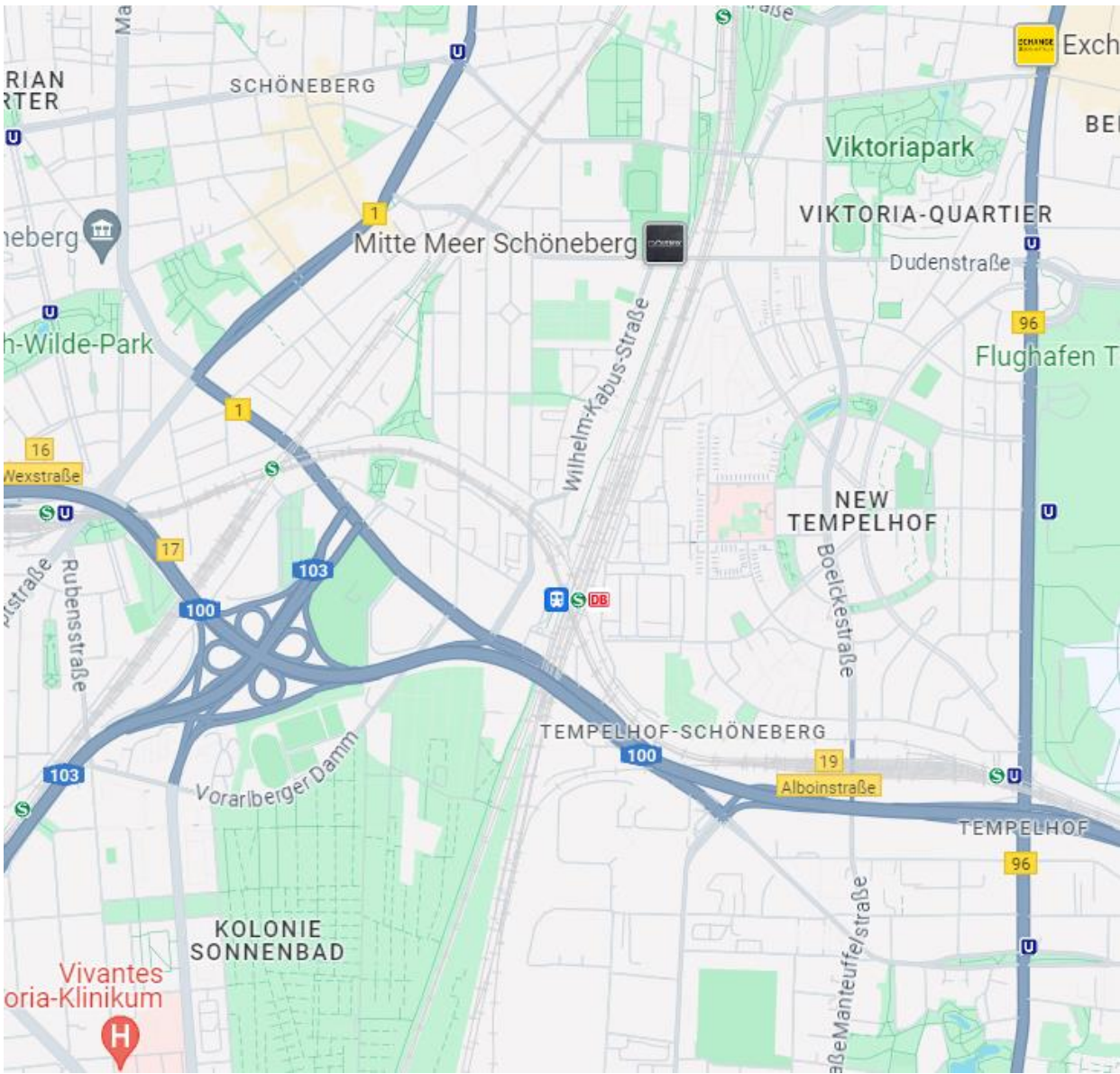






Source: Stuart Pearson on Twitter

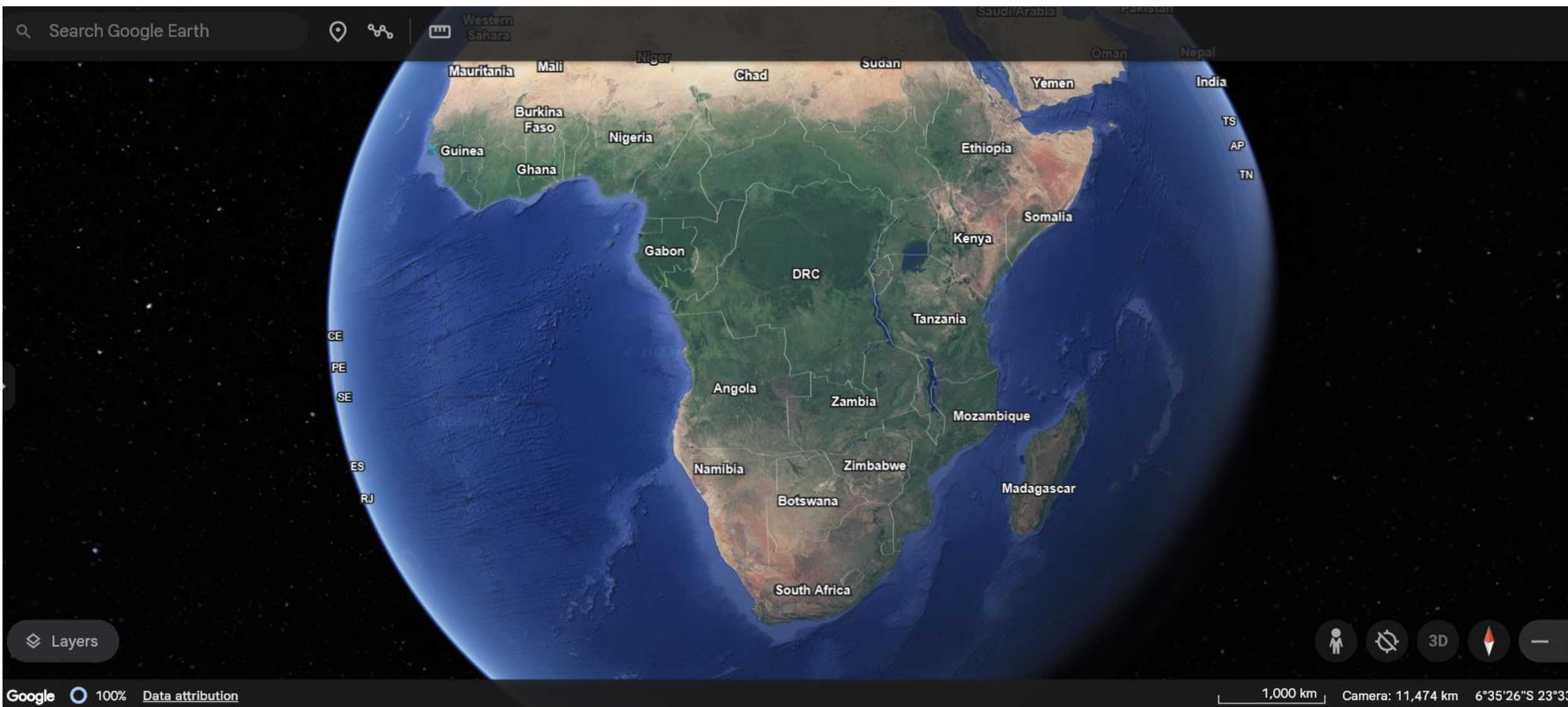




Google Map & Google Satellite

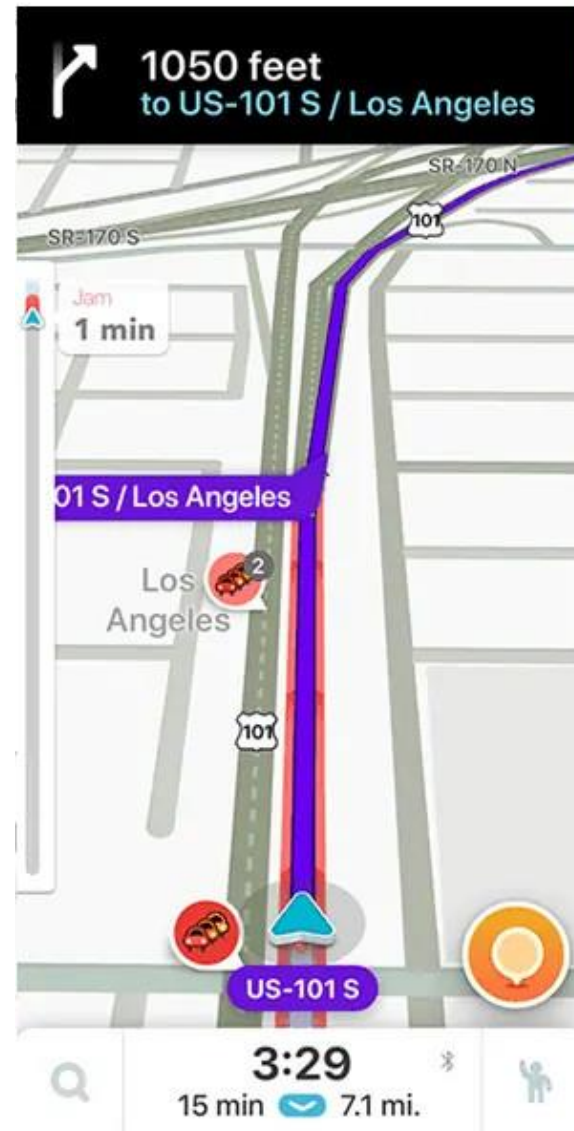




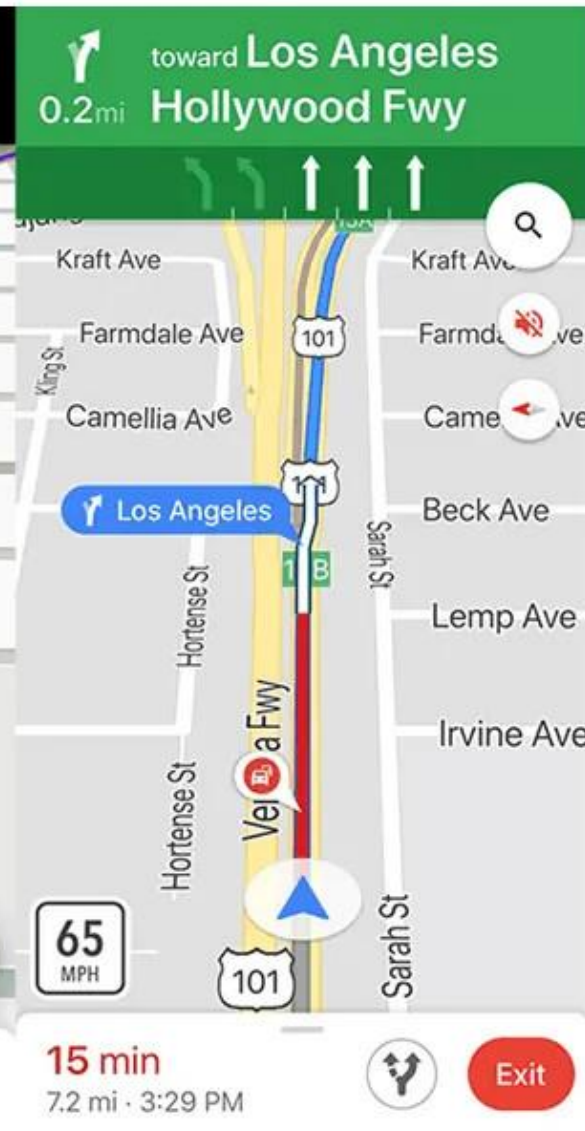




## Waze



## Google Maps



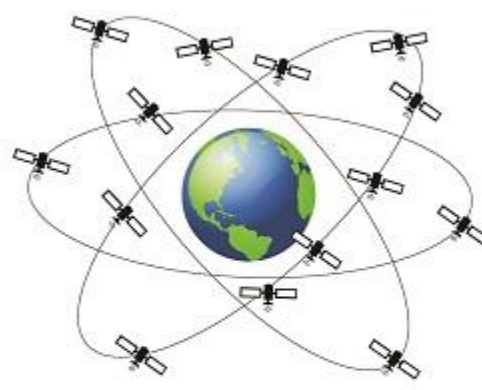
# Global Navigation Satellite Systems (GNSS)

## 4 GNSS CONSTELLATIONS



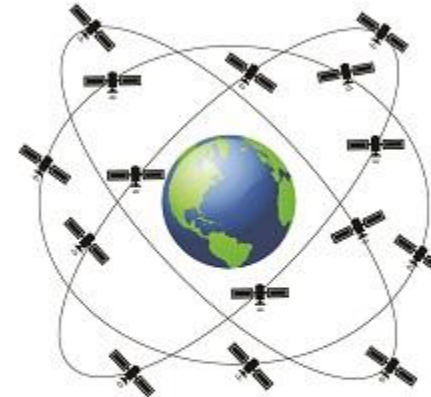
### GPS

6 Orbital planes  
24 Satellite + Spare  
55° Inclination Angle  
Altitude 20,200 km



### Galileo

3 Orbital planes  
27 Satellite + 3 Spares  
56° Inclination Angle  
Altitude 23,616 km



### GLONASS

3 Orbital planes  
21 Satellite + 3 Spares  
64.8° Inclination Angle  
Altitude 19,100 km



### BeiDou

6 Orbital planes  
35 Satellite + 3 GEO + 27 MEO + 3 IGSO  
55° Inclination Angle  
Altitude 38,300 km, 21,500 km

Source: SpaceNews



5G  
3G4G

# GNSS Applications and Services

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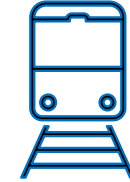
Location Based  
Services



Navigation



Precision  
Farming



Real-time  
Tracking



Aviation  
Applications



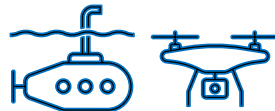
Fleet  
Management



Maritime  
Applications



Autonomous  
Driving



Military  
Applications



Timing &  
Synchronization



Search &  
Rescue



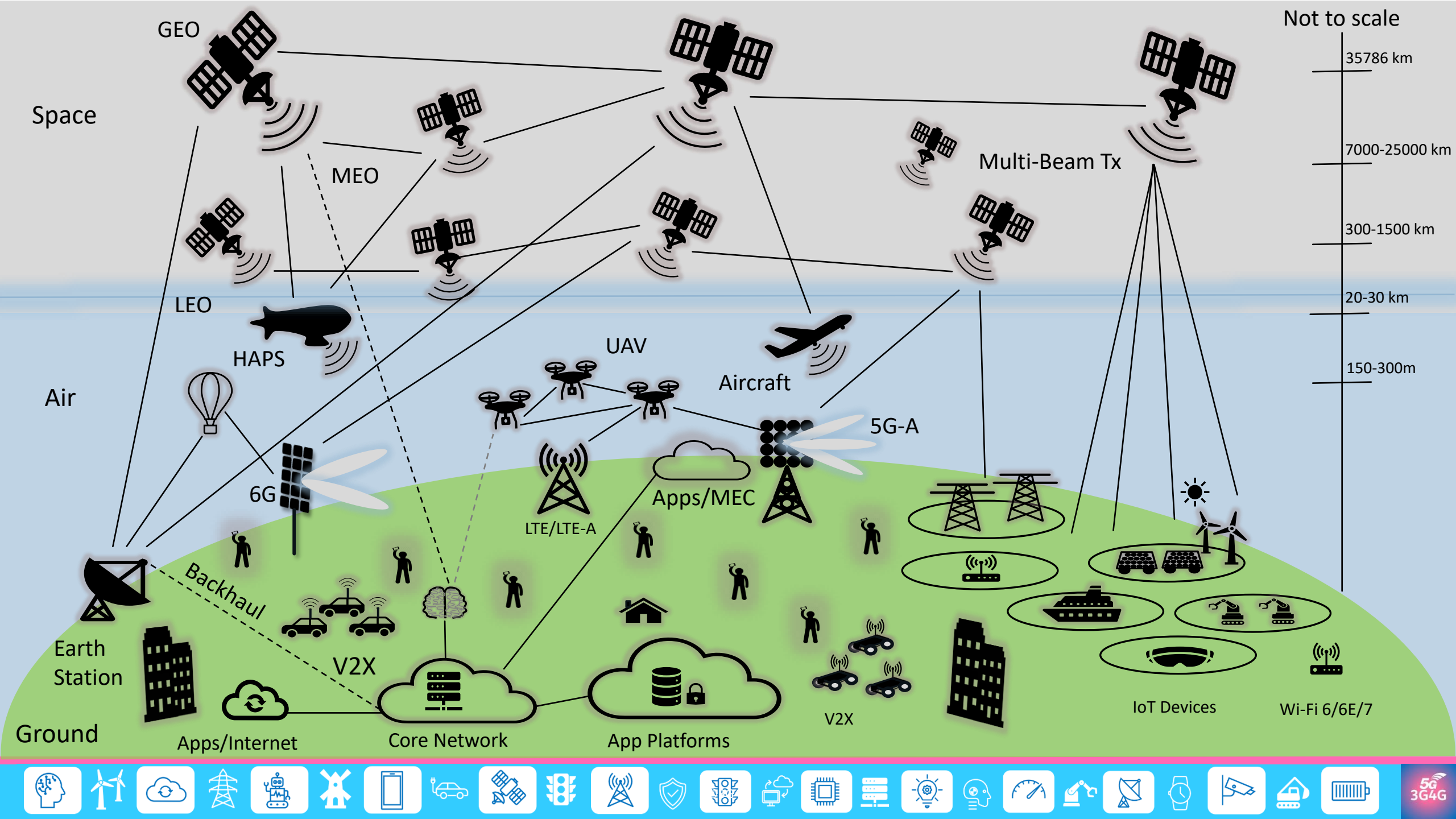


Source: Gilat

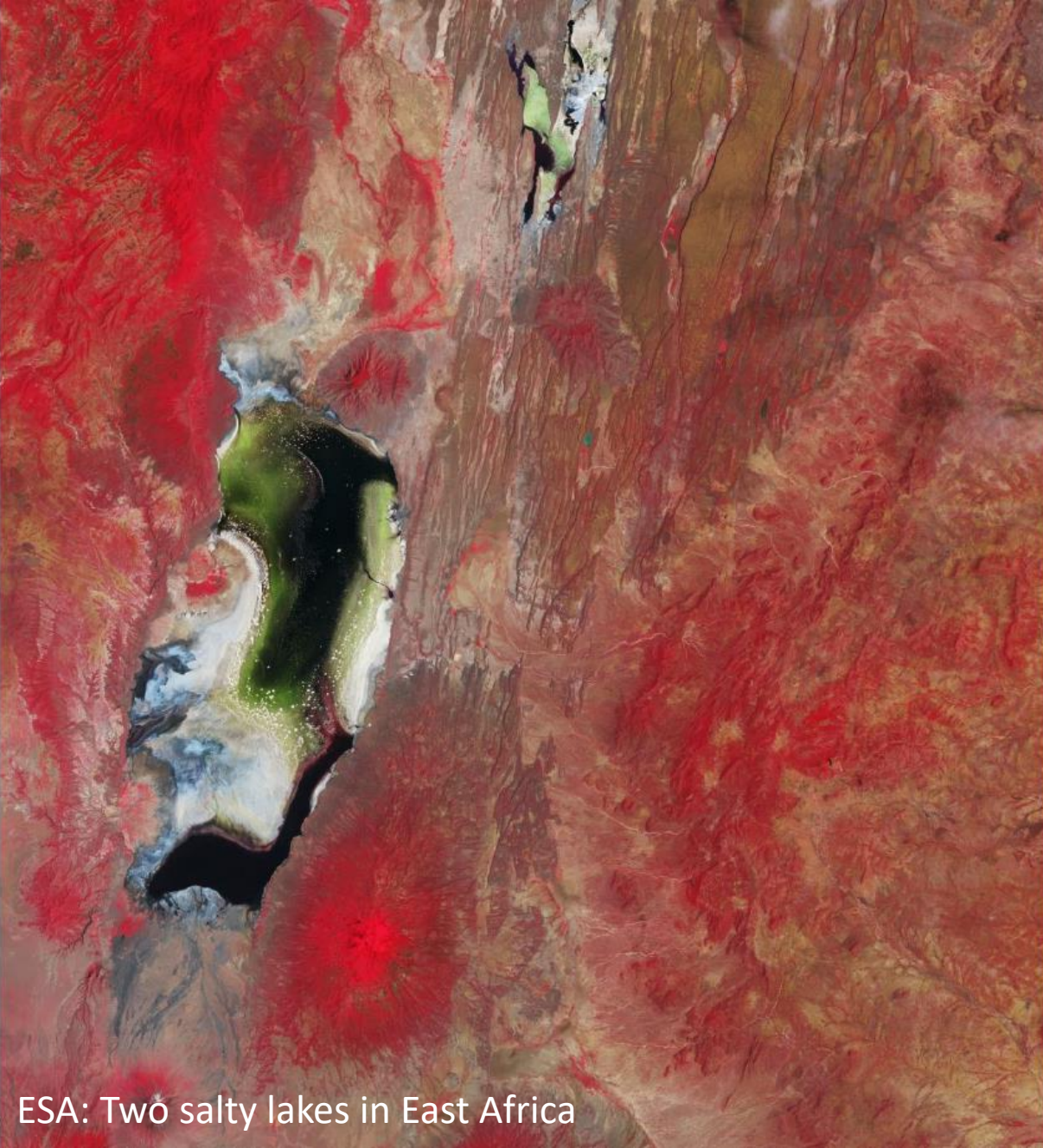


5G  
3G4G

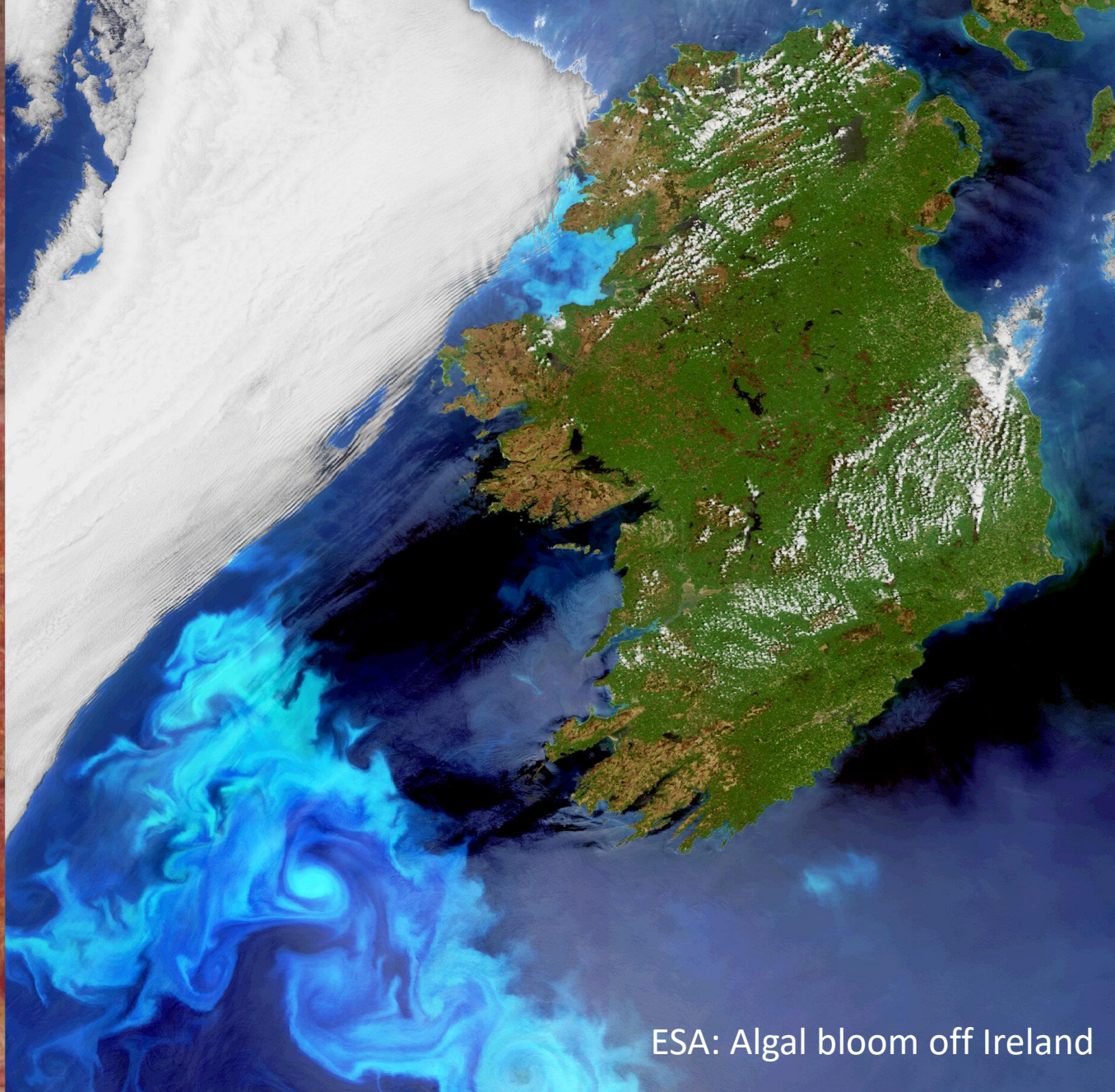








ESA: Two salty lakes in East Africa



ESA: Algal bloom off Ireland



5G  
3G4G





Source: ESA - The power of Earth observation



# References and Further Reading

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- Via Satellite: GEO, MEO, and LEO ([link](#))
- Space.com: What is a geosynchronous orbit? ([link](#))
- Eutelsat: What are TV Distribution models? ([link](#))
- The Free Dictionary by Farlex: Direct broadcasting satellite systems ([link](#))
- LinkedIn - GNSS constellations: differences, what have in common and vulnerabilities ? ([link](#))
- SpaceNews: Modern civilization would be lost without GPS ([link](#))
- Feedough - Google Maps vs. Waze: A Detailed Comparison ([link](#))
- Tualcom: GNSS Application Areas ([link](#))
- Geographic Book: GNSS Applications ([link](#))
- Satellite Applications Catapult on YouTube: Satellite Applications and Intelligent Transport ([link](#))
- ESA: Top 10 Earth observation stories of 2023 ([link](#))
- The 3G4G Blog: 3GPP 5G Non-Terrestrial Networks (NTN) Standardization Update ([link](#))
- ESA: CEOS Earth Observation Handbook 2023 ([link](#))
- ESA: The power of Earth observation Video ([link](#))



# Thank You

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