

Back at 3:30

- Student Presentation**
- Paper Discussion**
- Lecture**

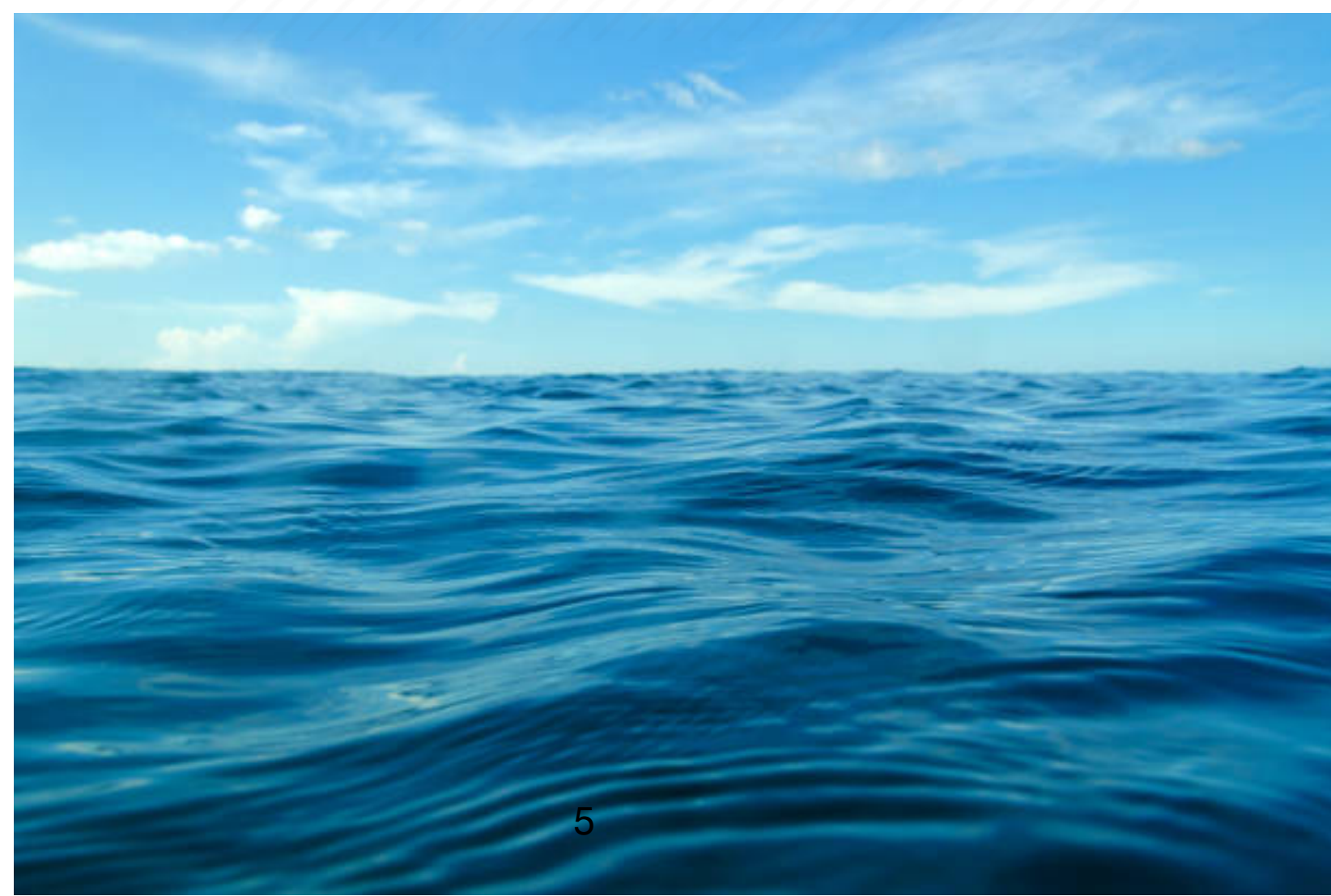
Intro to GEO Satellite Networking

ECE 239AS

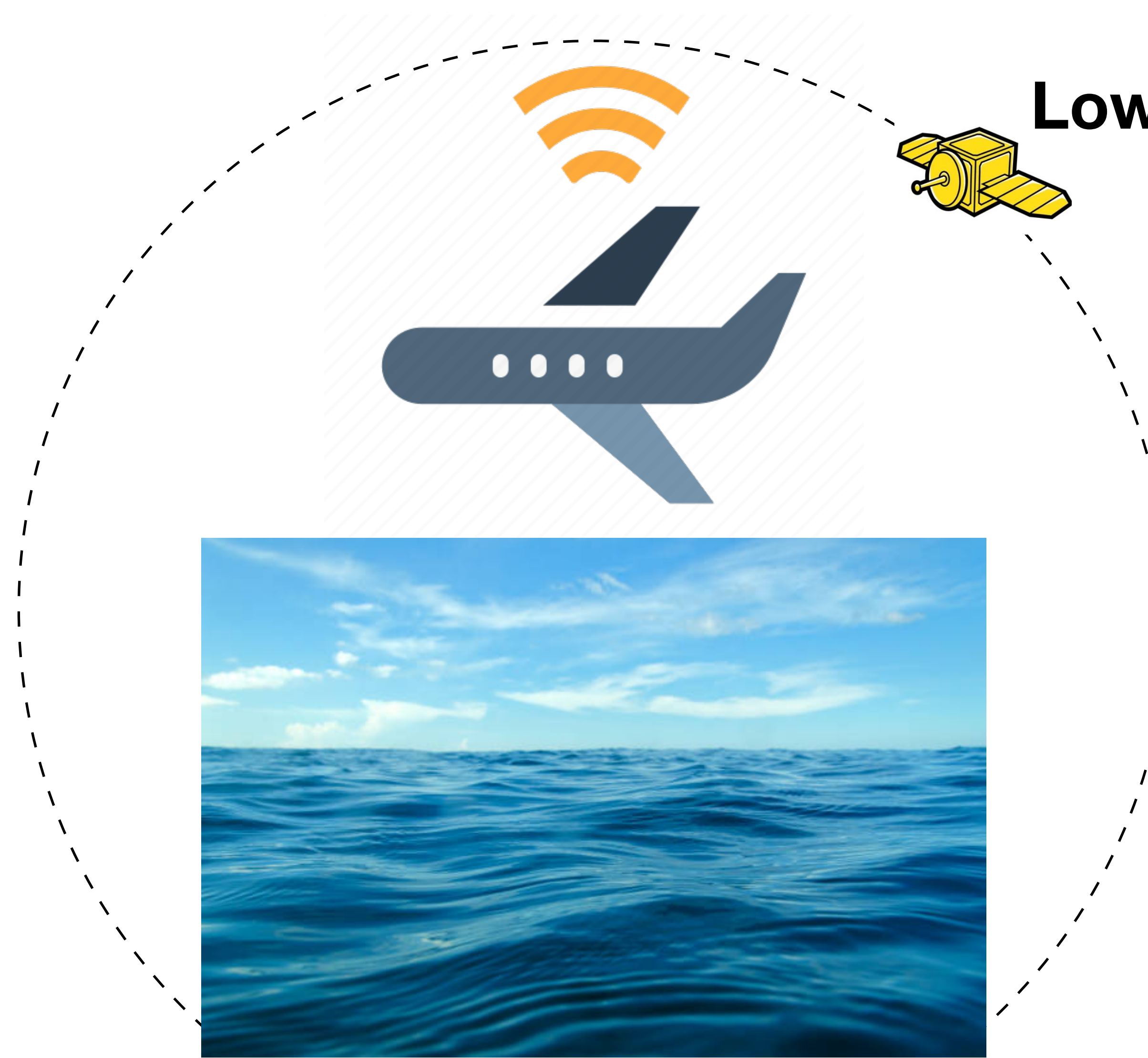
Liz Izhikevich







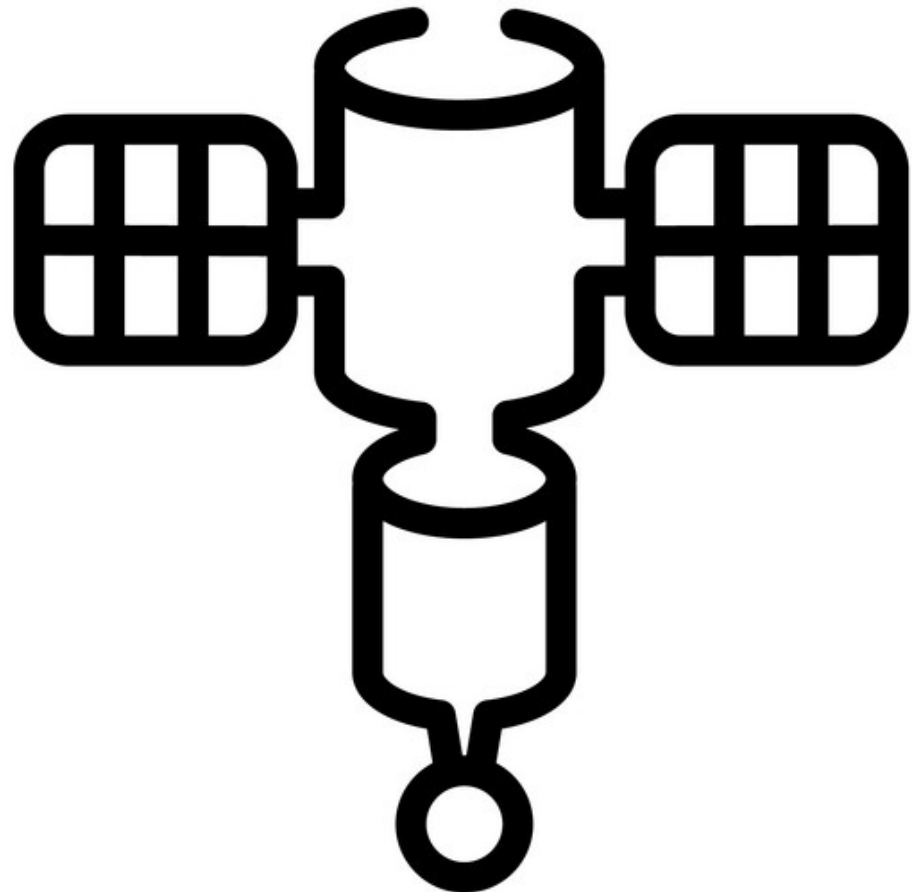




Low Earth Orbit (LEO)



Geostationary Earth Orbit (GEO)



Satellite networking provides widespread coverage for Internet connectivity

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INVESTING IN SPACE

About 150,000 people in Ukraine are using SpaceX’s Starlink internet service daily, government official says

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AUG 23, 2022 09:48AM EDT

Satellite networking is still a very young technology

The Washington Post
Democracy Dies in Darkness

Flying is terrible, but at least the WiFi is improving

Airlines are upgrading their service — and dropping the price

 By [Hannah Sampson](#)
July 11, 2022 at 1:16 p.m. EDT

Wild solar weather is causing satellites to plummet from orbit. It's only going to get worse.

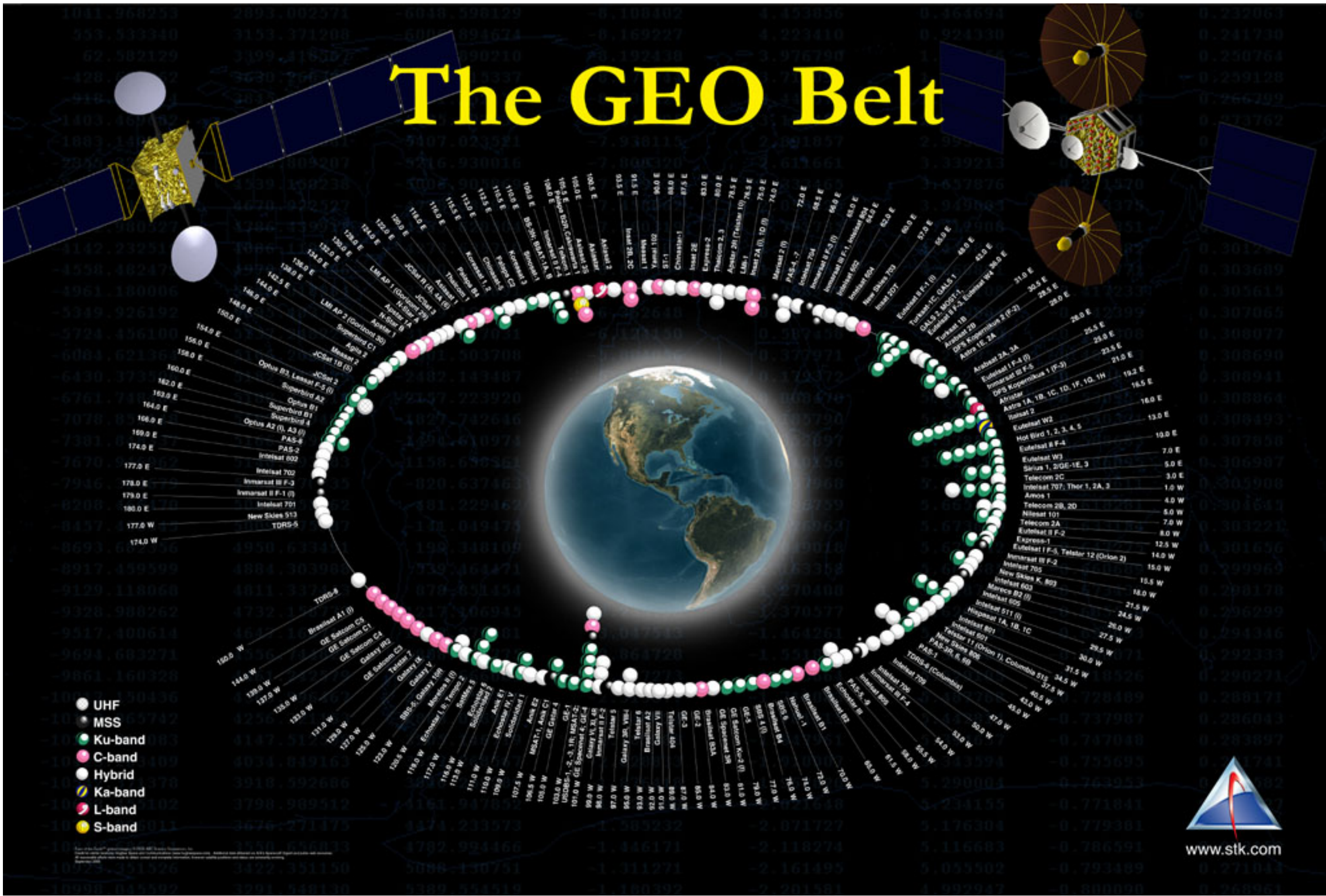
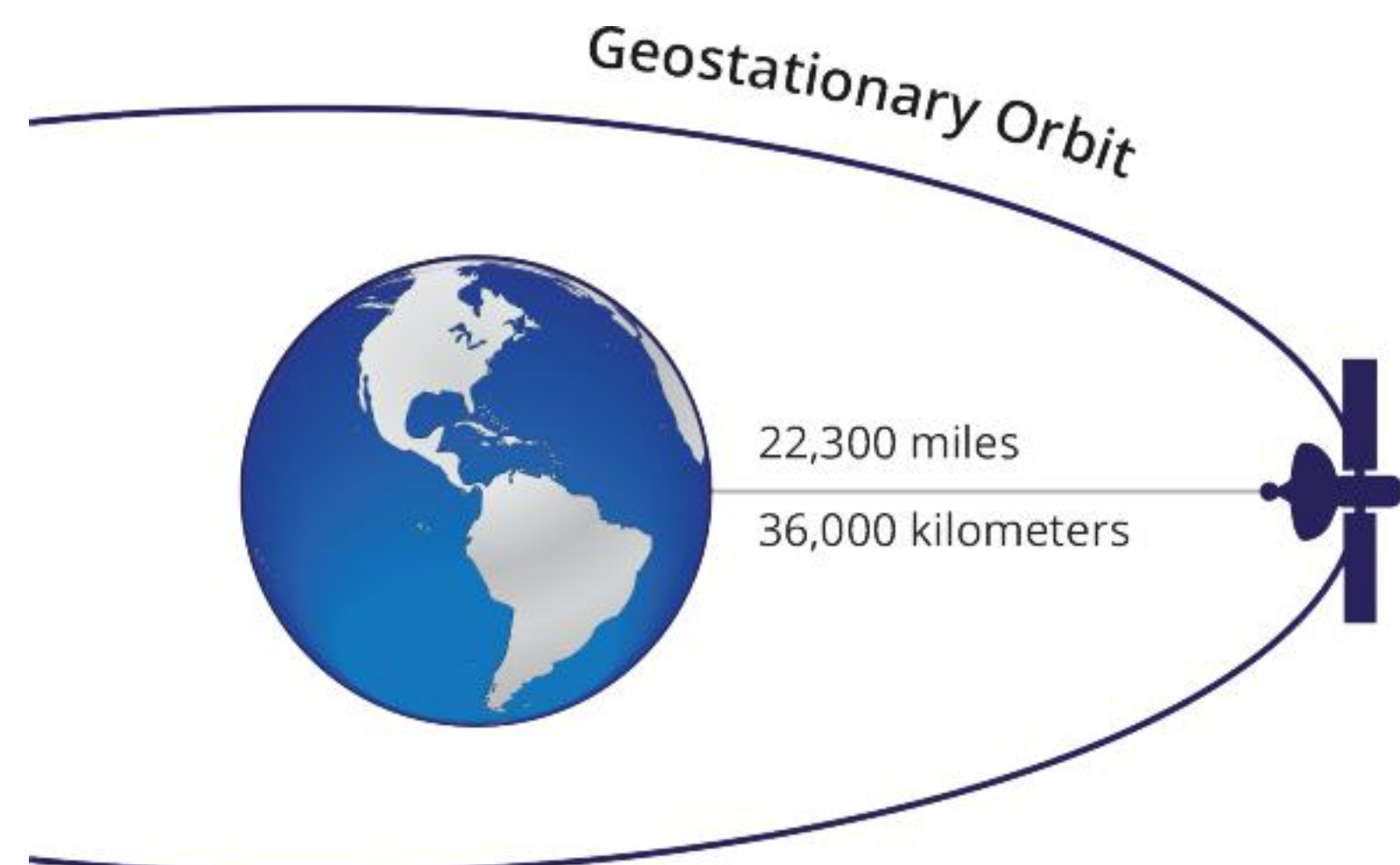
By [Tereza Pultarova](#) published June 23, 2022

The change coincided with the onset of the new solar cycle, and experts think it might be the beginning of some difficult years.

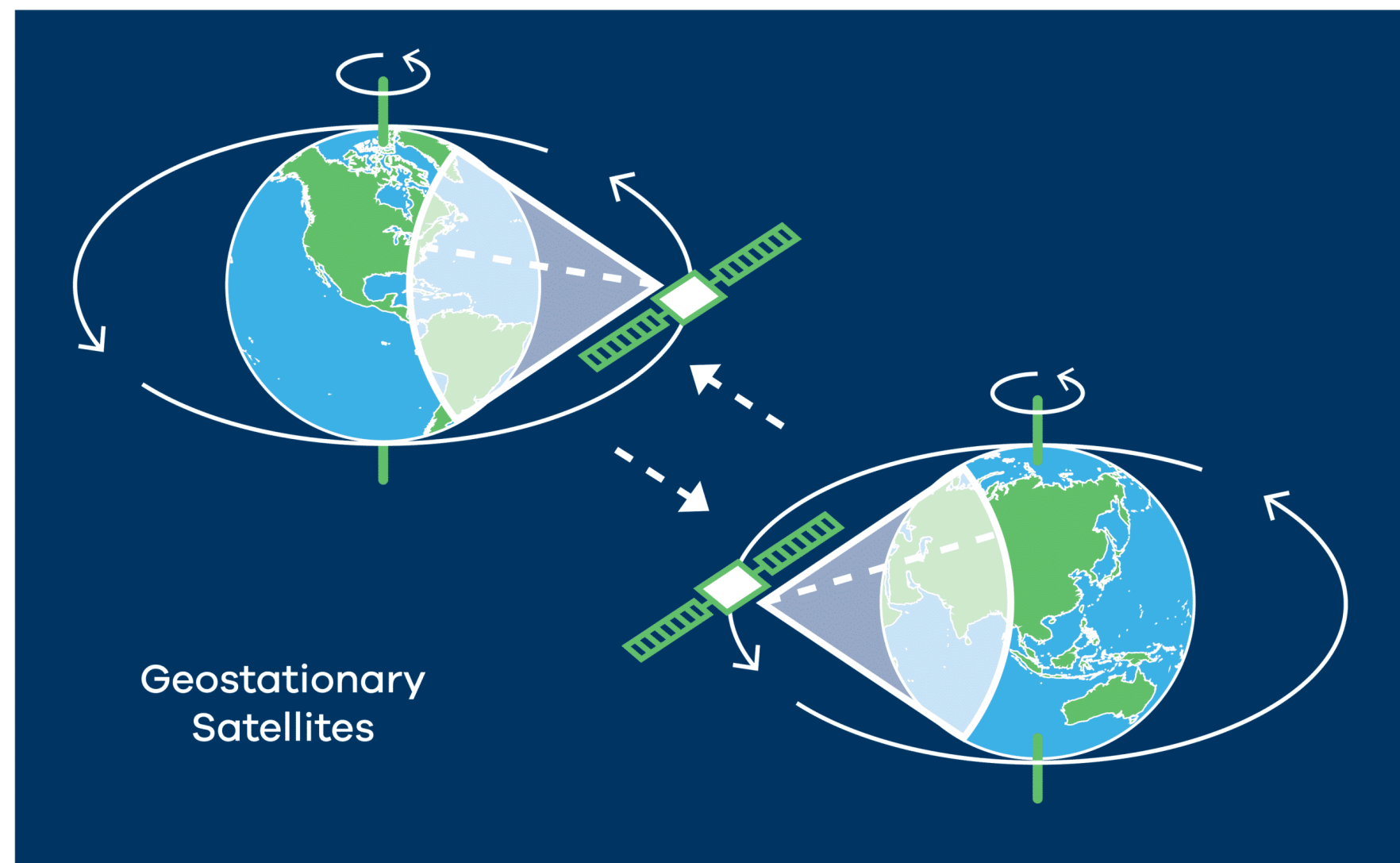
Fundamentals of GEO Satellite Networking

Geostationary Earth Orbit (GEO)

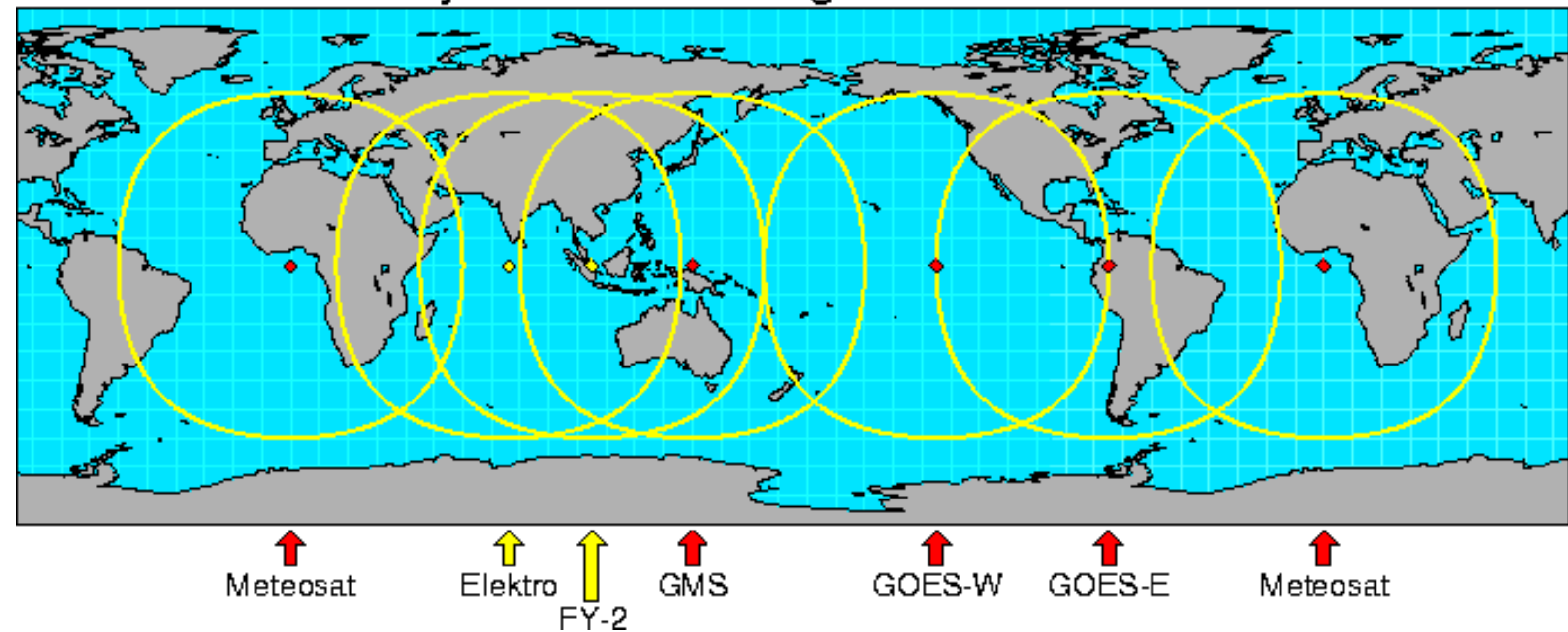
3 km/s = 1 period of 24 hours = geostationary



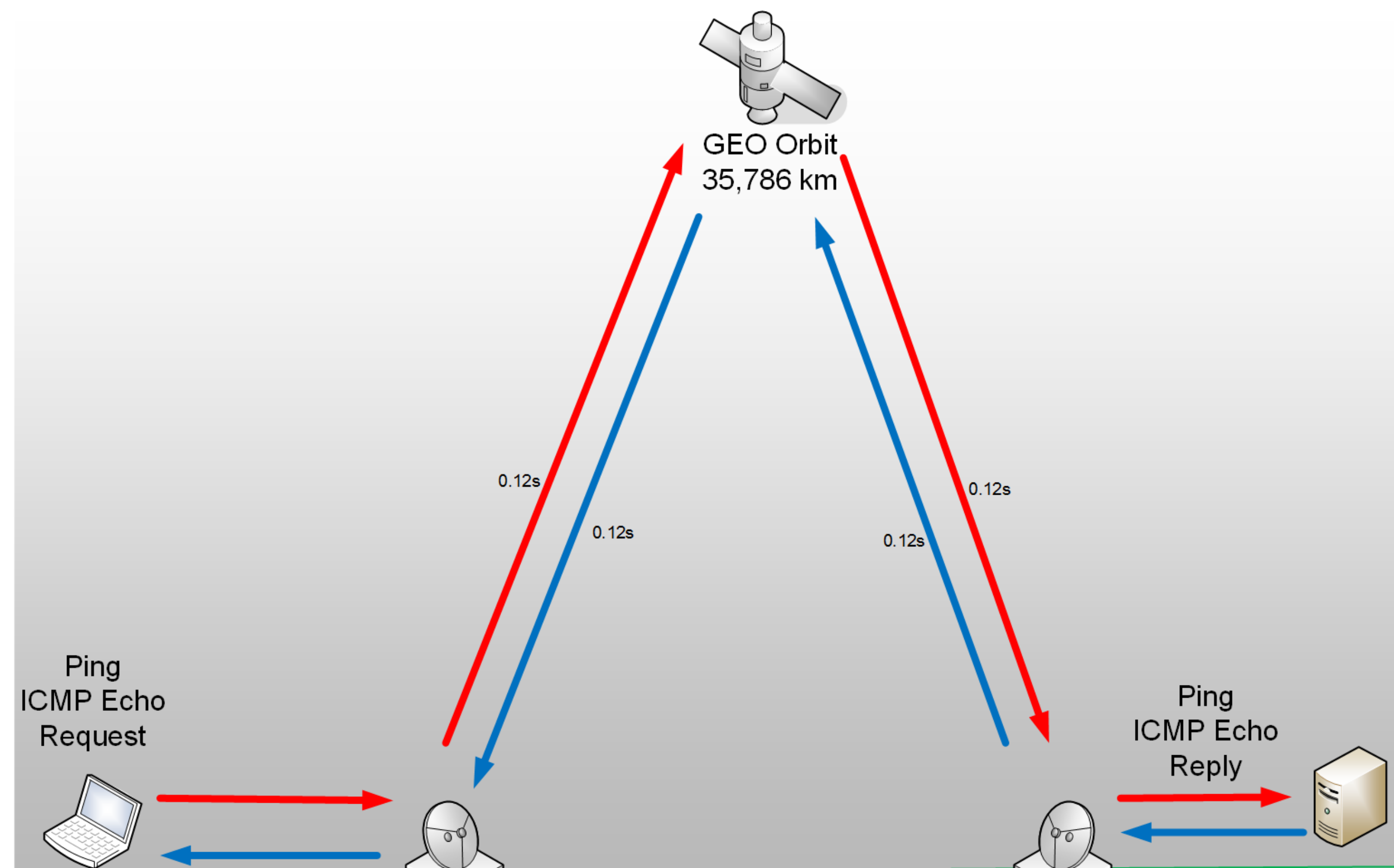
GEO Satellites provide wide coverage



Global Geostationary Satellite Coverage

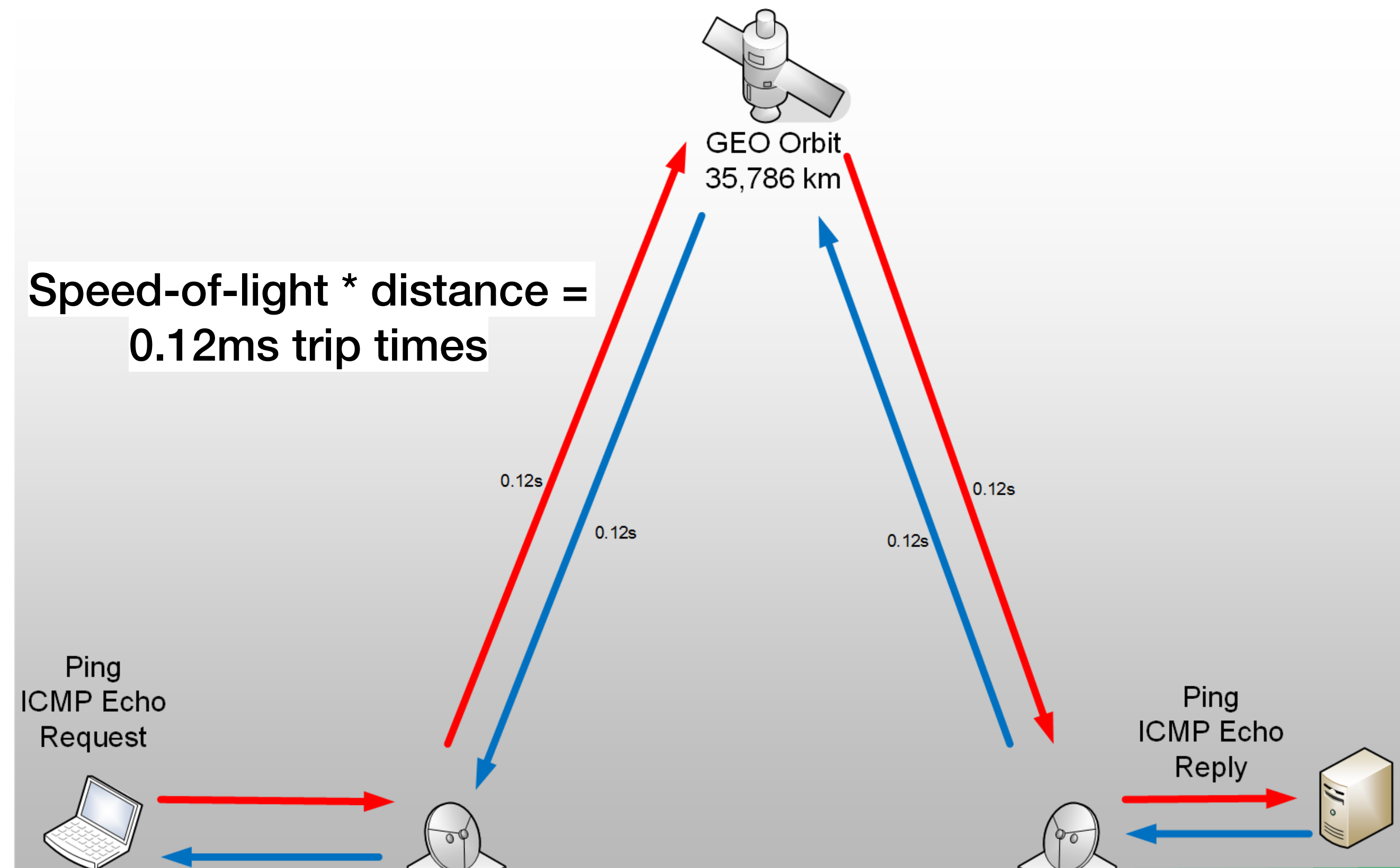


GEO Satellites work like a “bent-pipe”



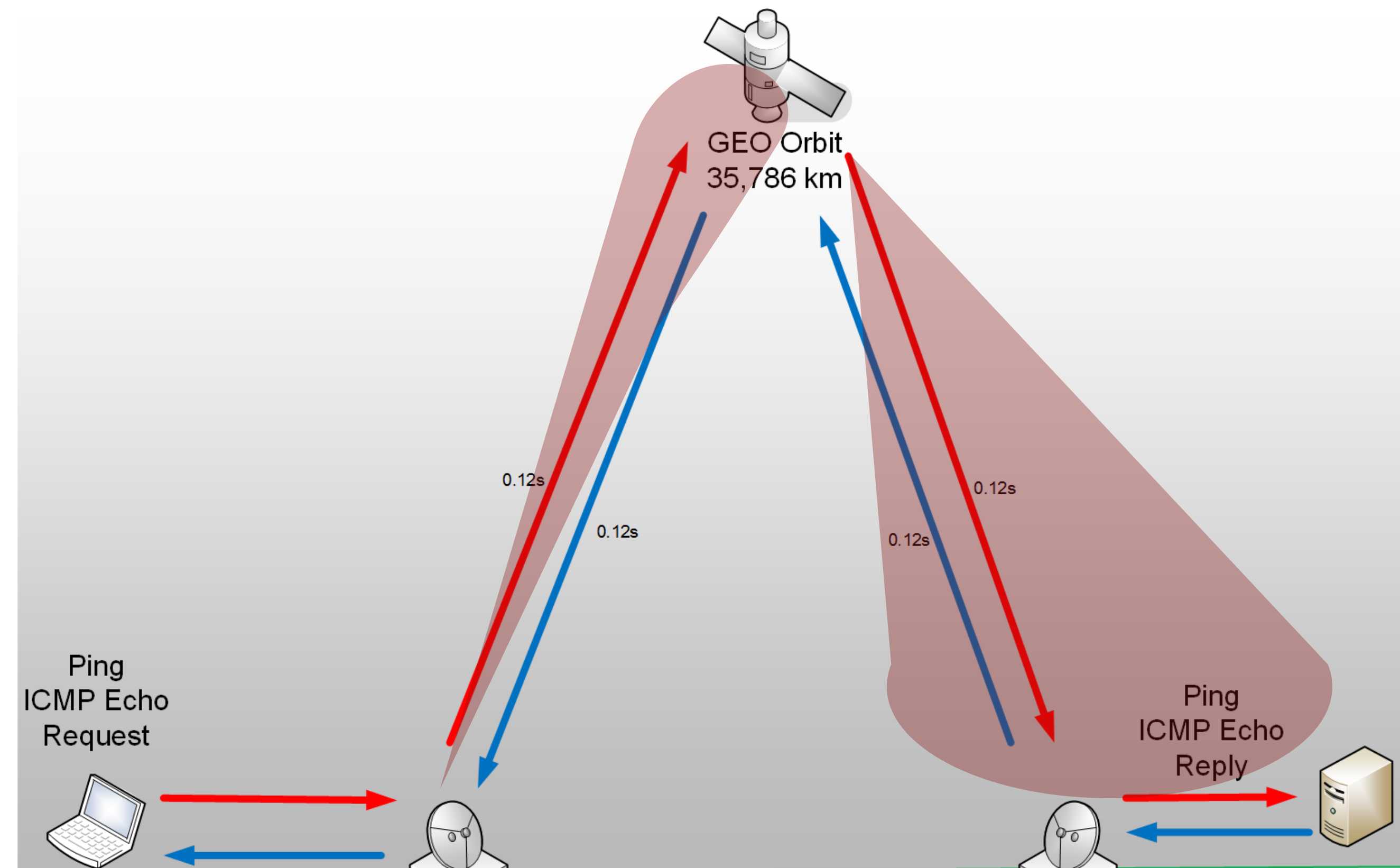
GEO Satellites incur high latency

- GEO satellite RTT time ~500ms
- Terrestrial RTT time <100ms

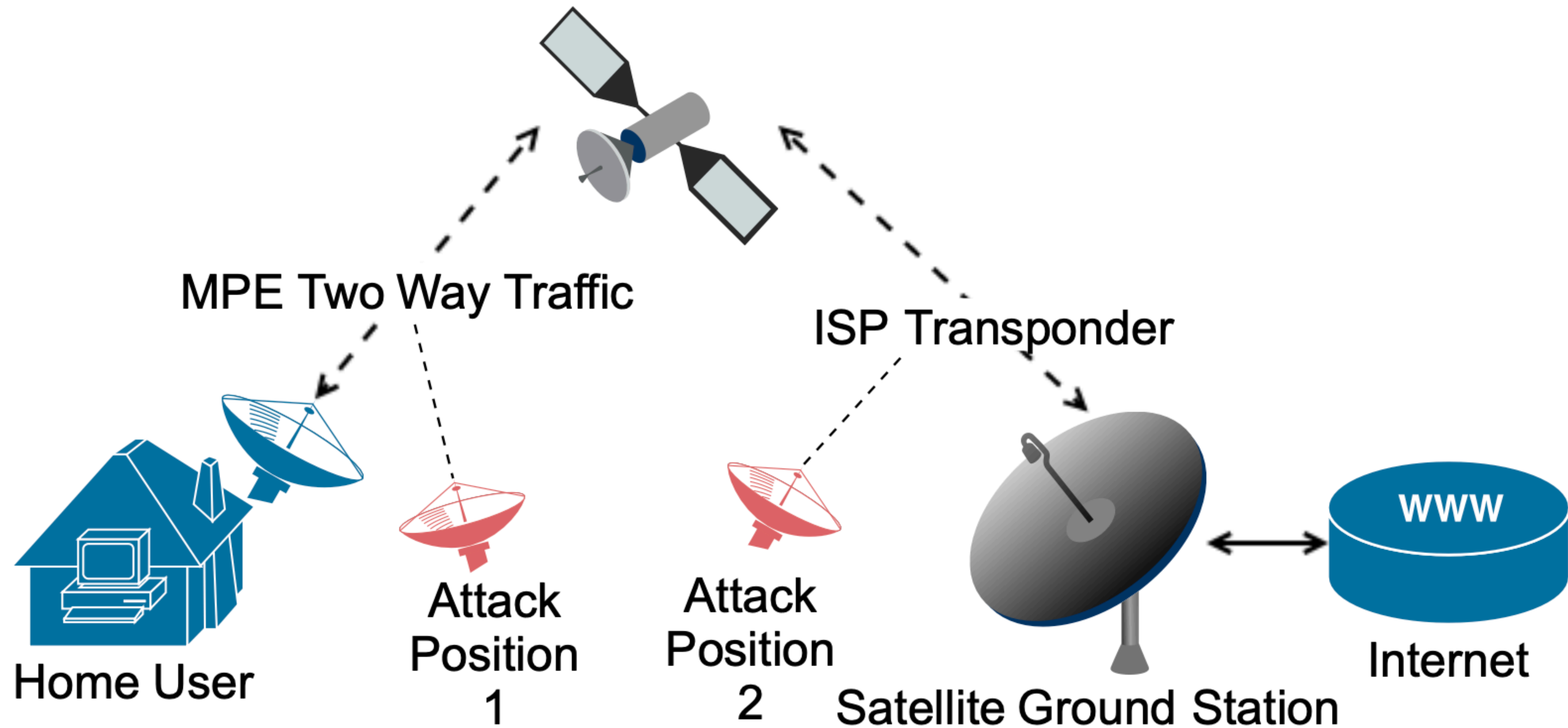


GEO Satellites broadcast data over wide territories

- GEO satellites use radio frequencies to transmit data (e.g., Digital Video Broadcasting for Satellite, DVB-S)



Passive Attack



Passive Attack

Equipment	Cost
Selfsat H30D Satellite Dish	€85
TBS 6983 Satellite PCI-E Card	€197
3-Meter Coaxial Cable	€3
Total	€285



European Communication laws

Directive 2002/58/EC of the **European Parliament** and of the Council of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector (**Directive on privacy and electronic communications**)

Article 5

Confidentiality of the communications

1. Member States shall ensure the confidentiality of communications and the related traffic data by means of a public communications network and publicly available electronic communications services, through national legislation. In particular, they shall **prohibit listening, tapping, storage or other kinds of interception or surveillance of communications and the related traffic data by persons other than users, without the consent of the users concerned, except when legally authorised to do so in accordance with Article 15(1)**. This paragraph shall not prevent technical storage which is necessary for the conveyance of a communication without prejudice to the principle of confidentiality.

Article 15(1).

Member States may adopt legislative measures to restrict the scope of the rights and obligations provided for in Article 5, Article 6, Article 8(1), (2), (3) and (4), and Article 9 of this Directive when such restriction constitutes a **necessary, appropriate and proportionate measure within a democratic society to safeguard national security (i.e. State security), defence, public security, and the prevention, investigation, detection and prosecution of criminal offences or of unauthorised use of the electronic communication system**, as referred to in Article 13(1) of Directive 95/46/EC. To this end, Member States may, inter alia, adopt legislative measures providing for the retention of data for a limited period justified on the grounds laid down in this paragraph. All the measures referred to in this paragraph shall be in accordance with the general principles of Community law, including those referred to in Article 6(1) and (2) of the Treaty on European Union.