

LEO PNT

Position, Navigation, & Time from Low Earth Orbiting Satellites

Trends and technical considerations

Bryan Chan

December 6, 2023



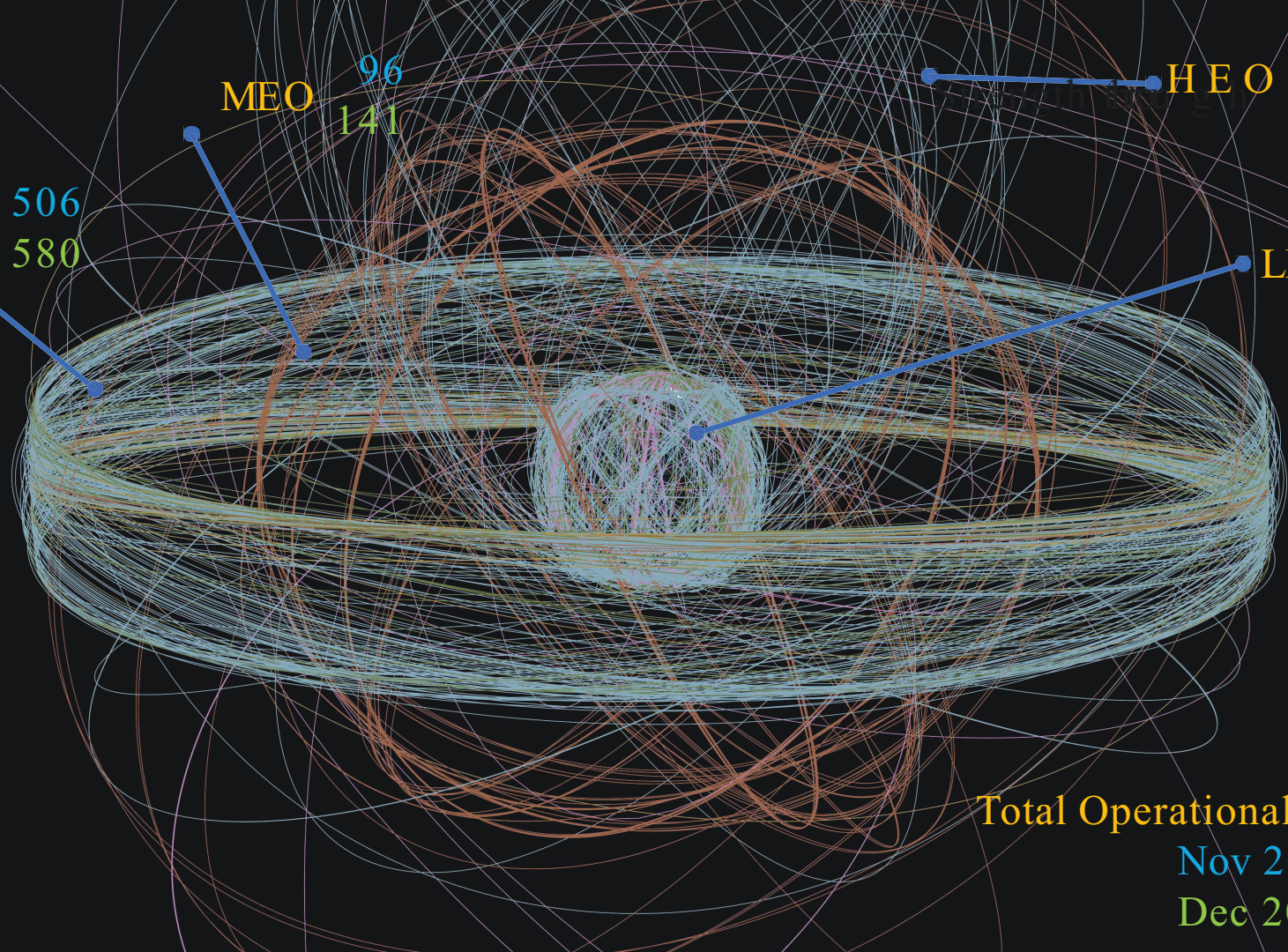
GEO
506
580

MEO
96
141

HEO
37
59

LEO
780
5938

Total Operational Satellites
Nov 2016: 1419
Dec 2022: 6718



LEO Mega-Constellations

Broadband Internet



#Sats = 5,500



#Sats = 634

Remote Sensing



#Sats = 175



#Sats = 95

Position, Navigation, & Time

Several organizations are developing proliferated LEO PNT satellites, based out of US, Europe, and China.

Sats = 16 (total)
200 to 370 sats per constellation (planned)



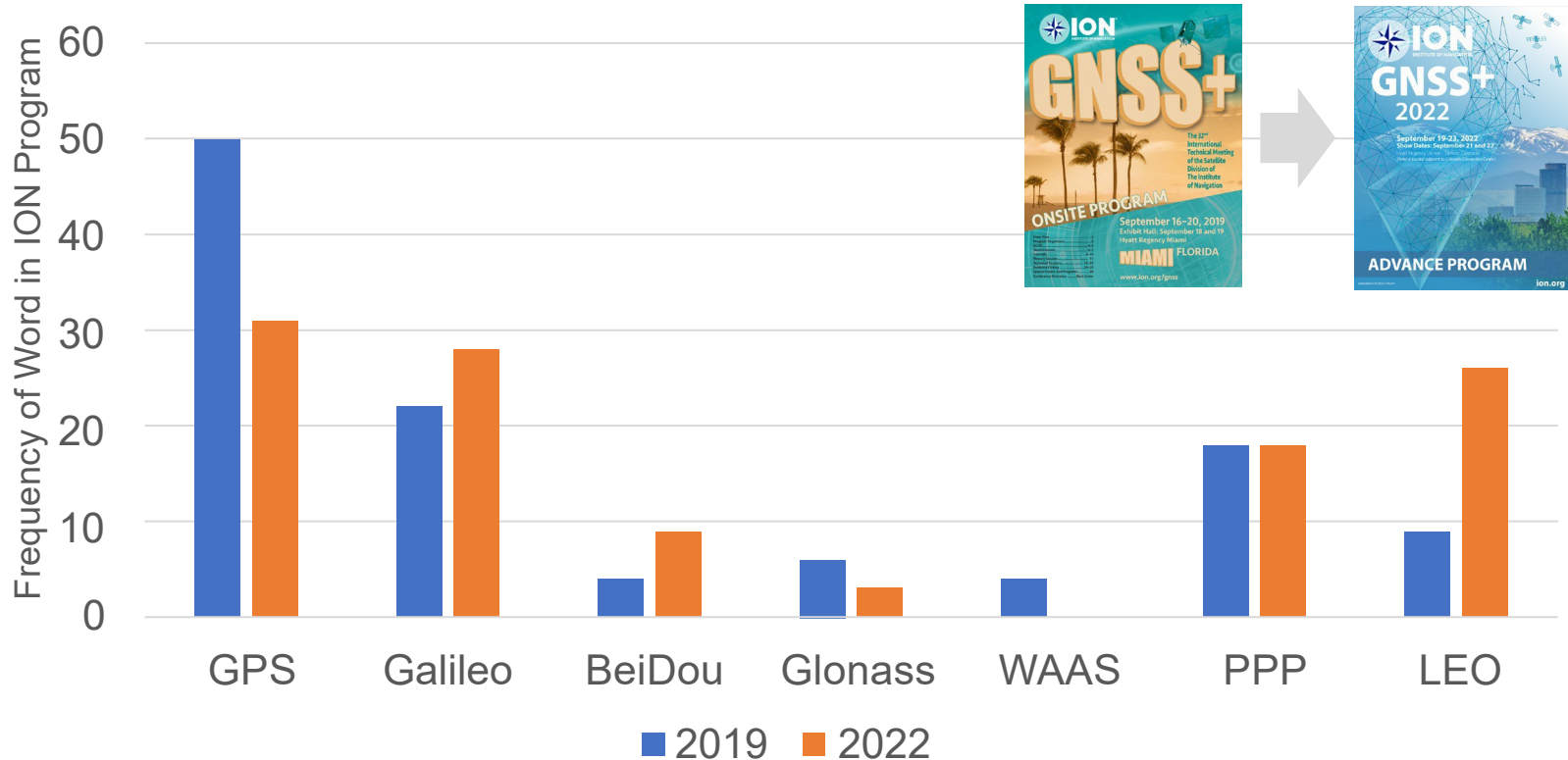
Why LEO PNT?

PNT applications are seeking improved accuracy, resiliency, and/or security

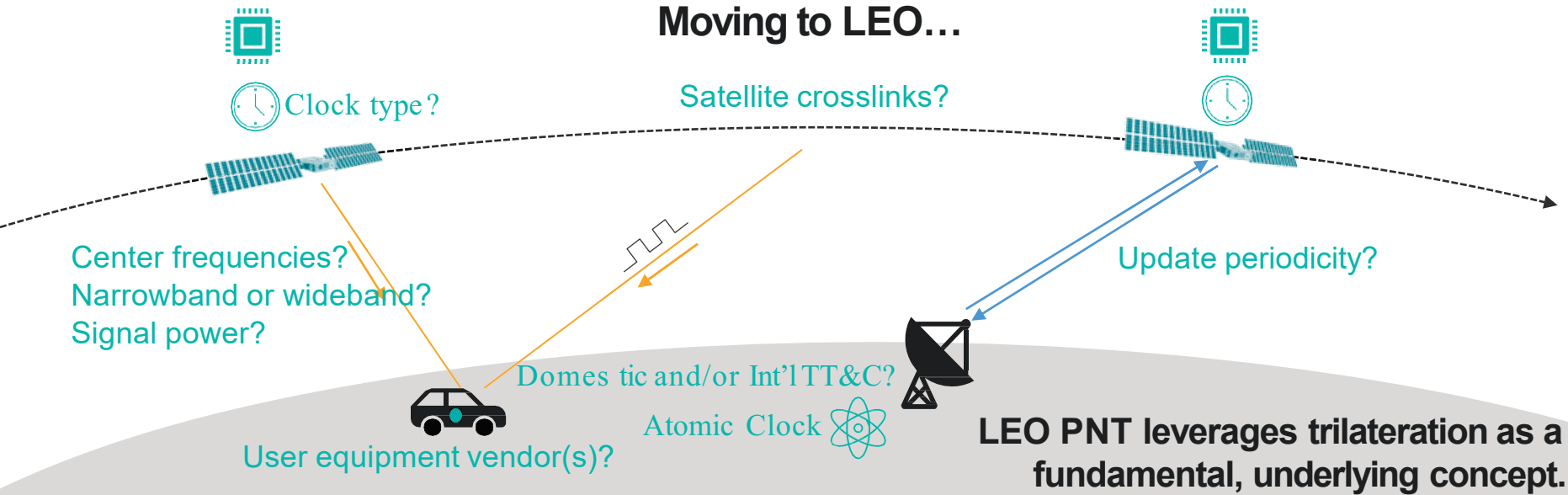
Technology advancements and the New space ecosystem enable high performance from LEO with low red costs



Interest in LEO from ION Community



Sat Nav Considerations Today



Concluding Remarks

- LEO PNT is here to stay
- There are many different approaches to LEO PNT, which ultimately depend on organization's mission and targeted end users
- Call for the government to consider LEO PNT's impact on National PNT policy directives, Protect/Toughen/Augment framework

