



National PNTAB Meeting
November 16, 2022

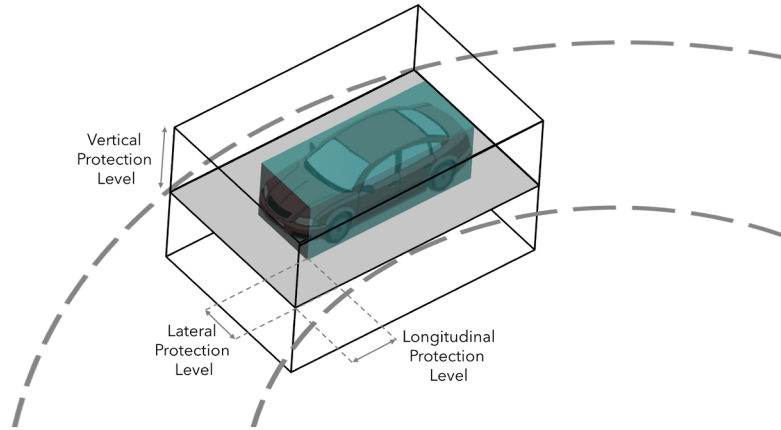
Bryan Chan
Co-founder, VP Business
Development & Strategy



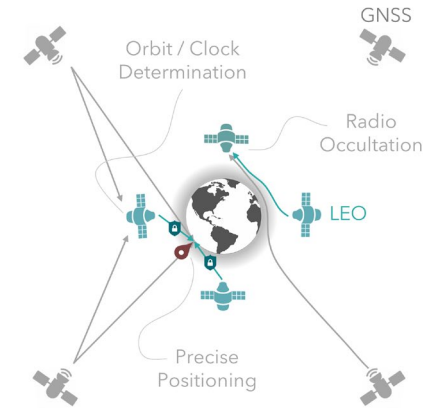
Prepared for the National PNTAB Meeting, November 2022.

OUTLINE

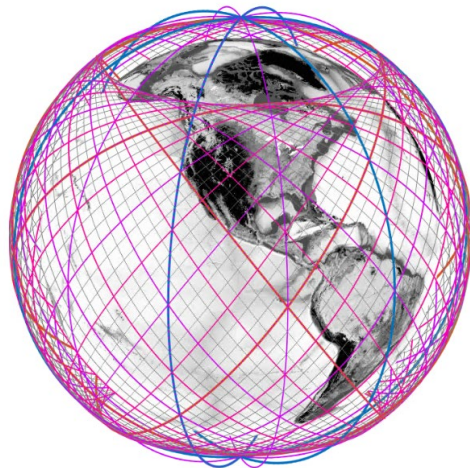
PNT Needs and Motivations



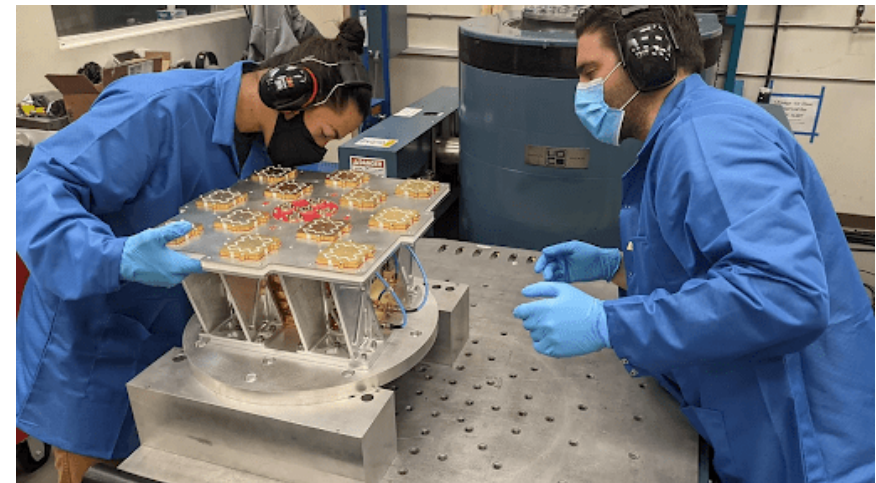
Commercial Sat Nav



Xona Pulsar

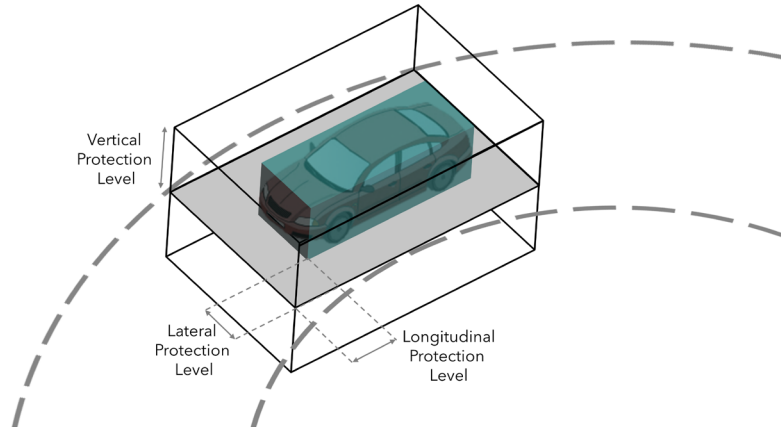


In Orbit Demonstration

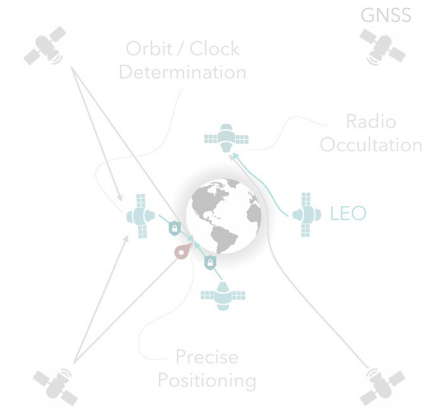


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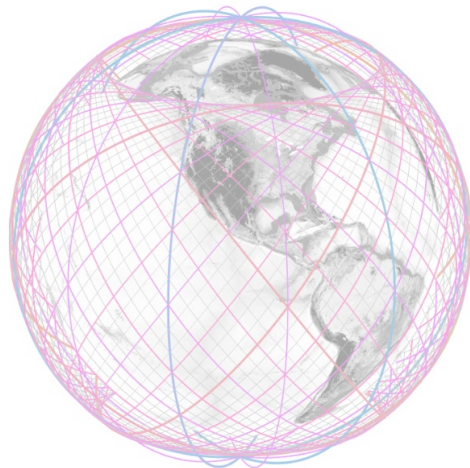
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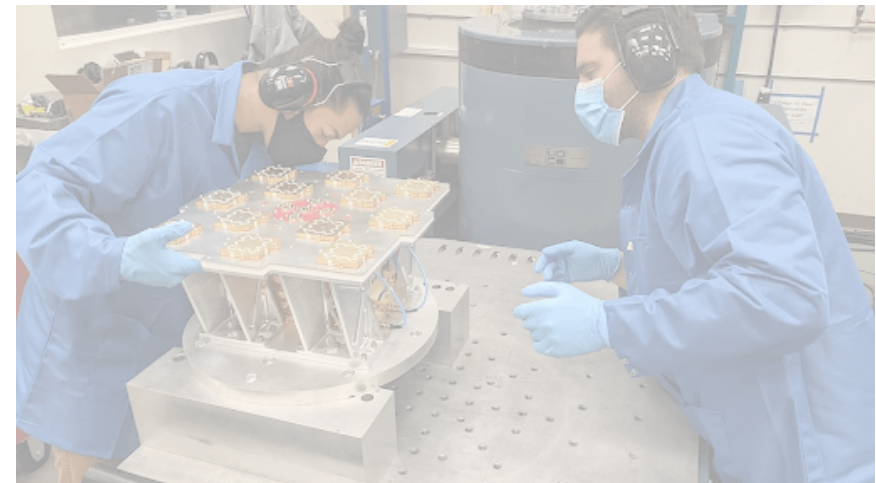
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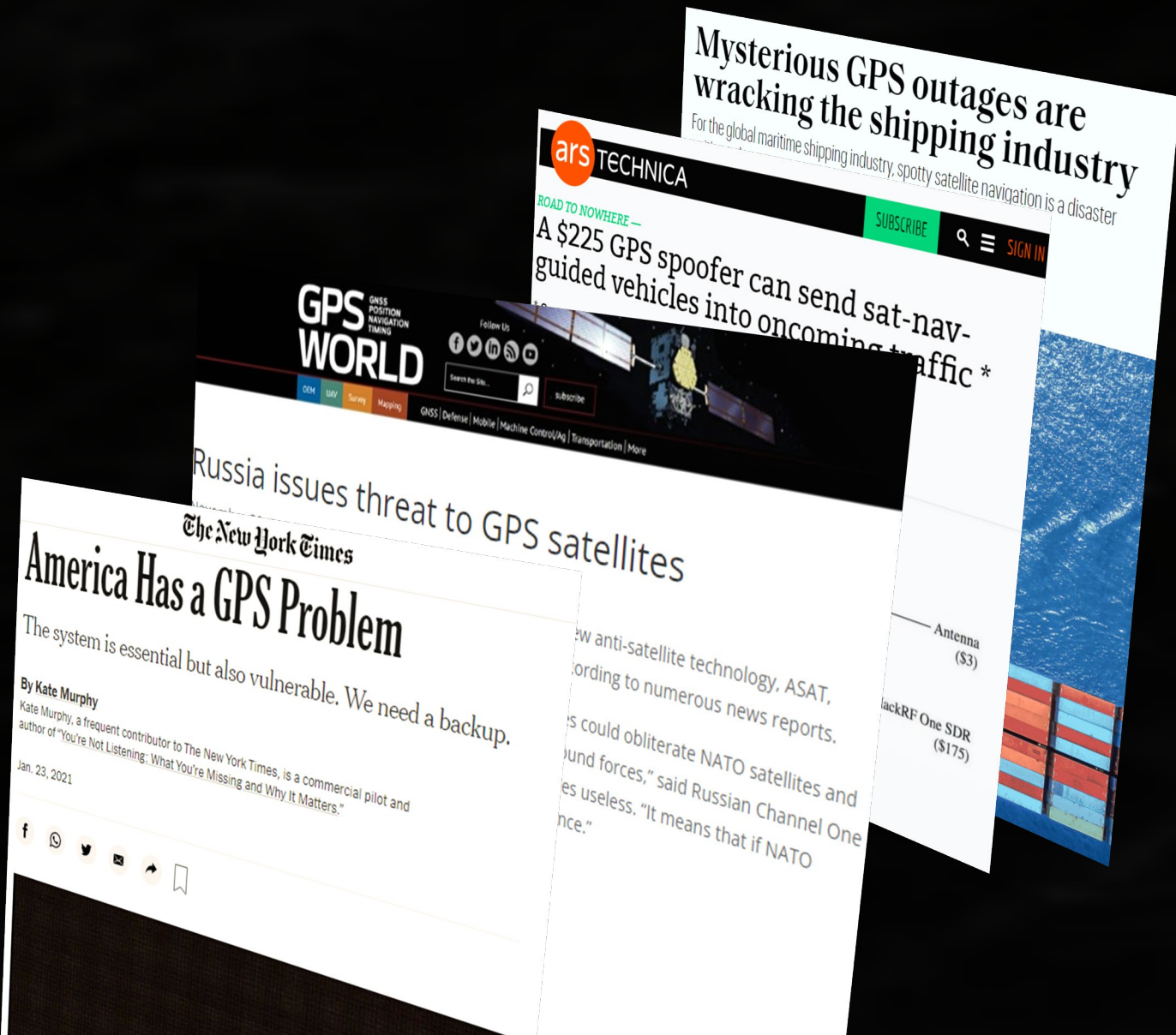
Xona Pulsar



In Orbit Demonstration



THE NEED FOR PNT RESILIENCE



- GPS' tremendous value to DOD and US economy has increased the need for alternatives
- PNT resilience has been heightened in recent years
- Government LEO PNT efforts are underway in several countries
- Resilience alone does not justify a commercial approach

HIGH-PERFORMANCE NAVIGATION DRIVERS 5

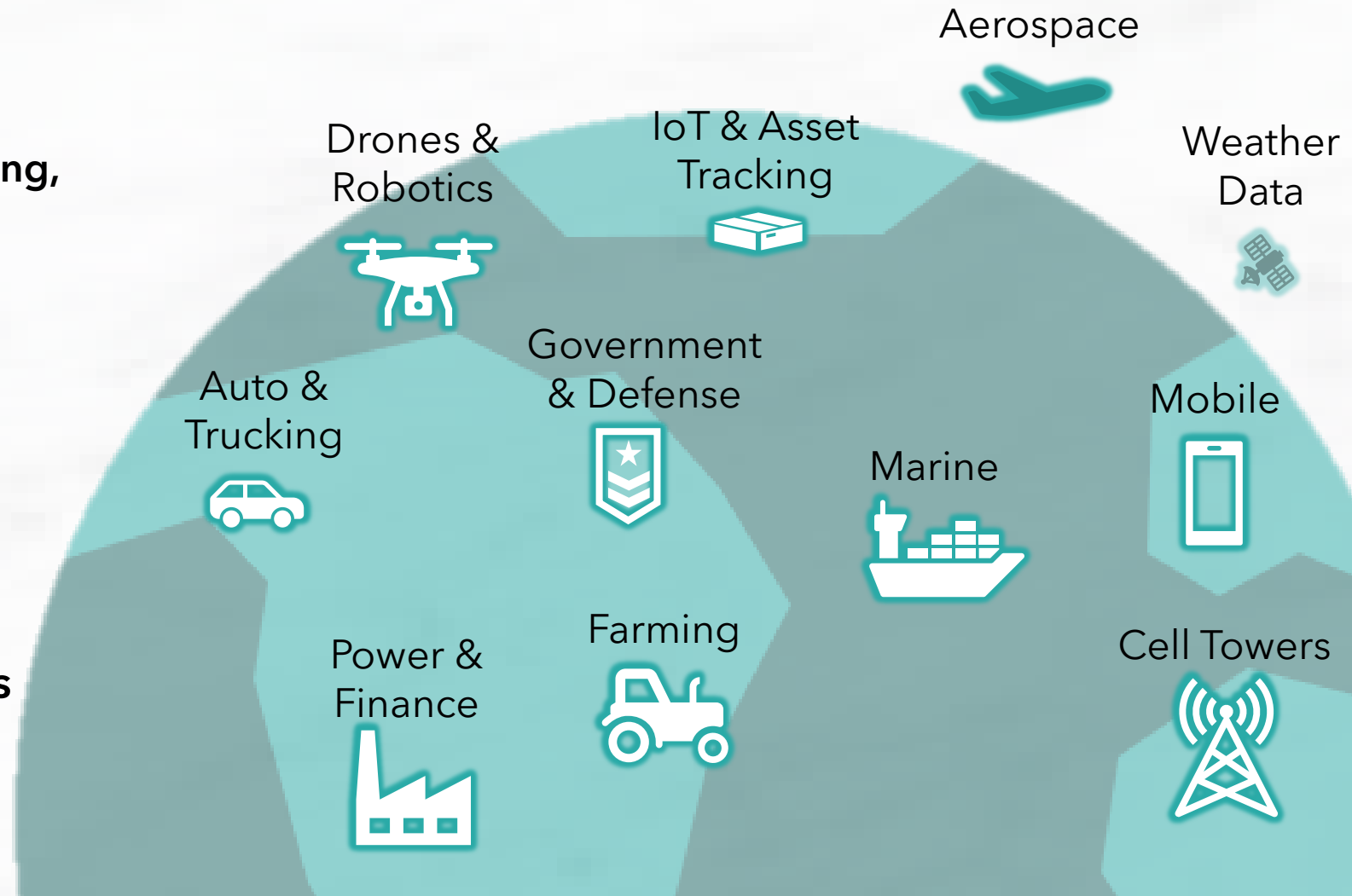
Agriculture / Construction: Higher accuracy, faster convergence

Critical Infrastructure: Precision timing, integrity, indoor penetration

IoT / mobile users: Better multipath resistance, scalable to mass market

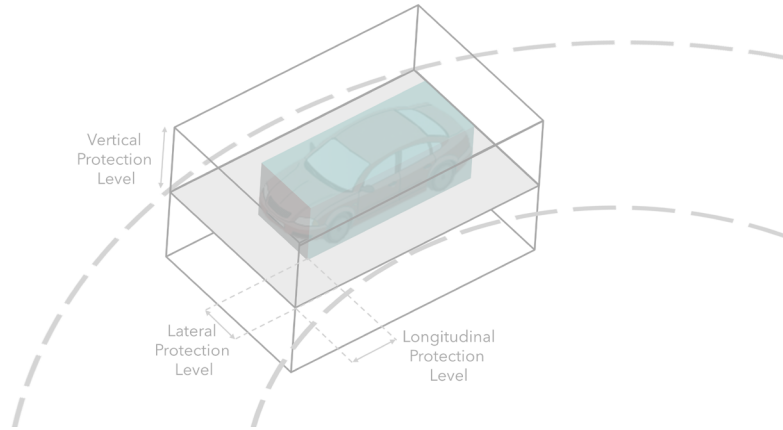
Automotive & Autonomy users:
All of the above

Needs for complementary, high-performance & resilient satnav fuels commercial PNT business models

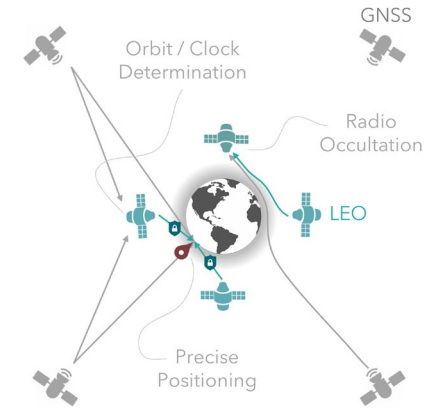


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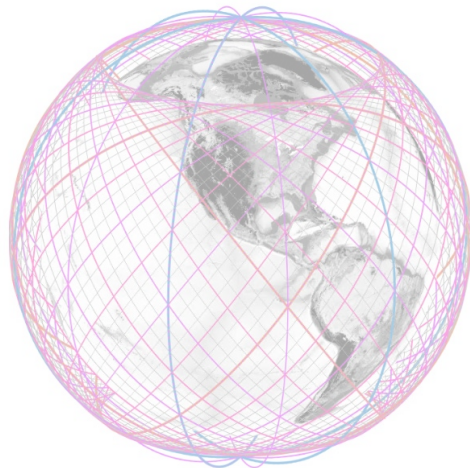
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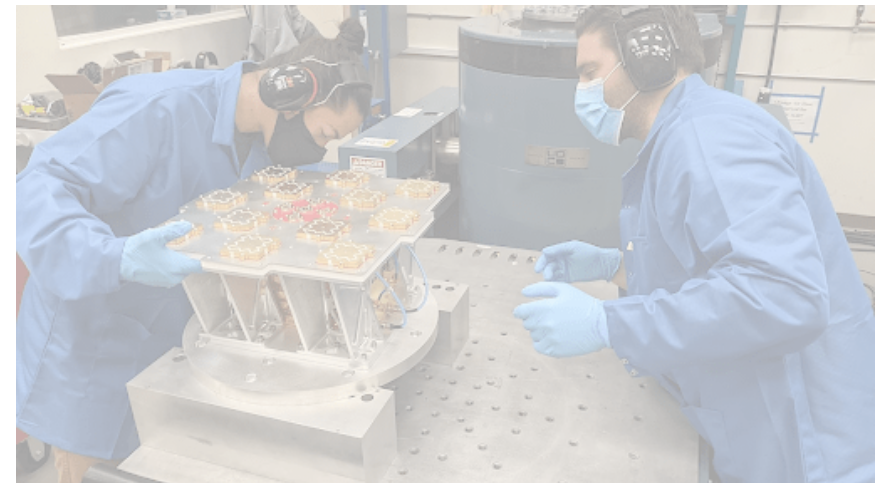
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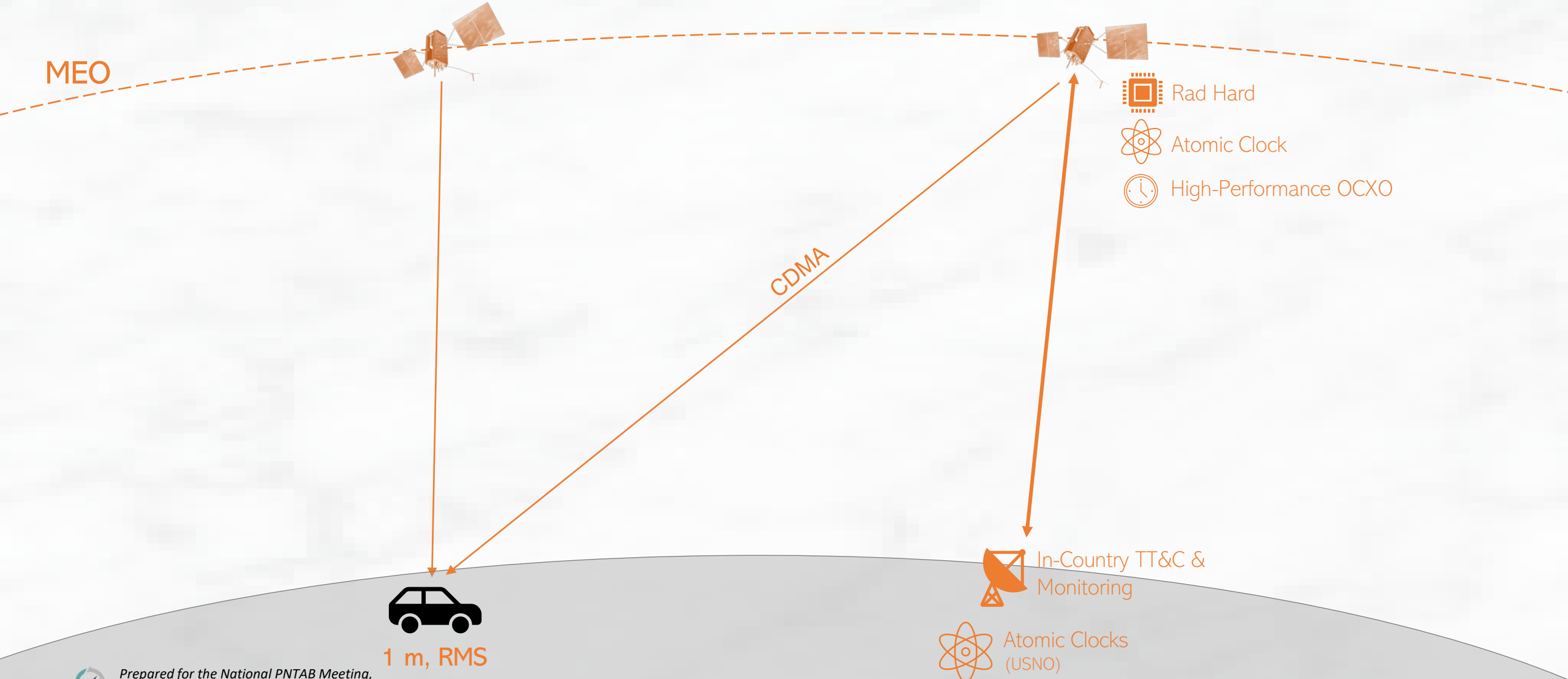
A COMPARISON OF PNT REQUIREMENTS

PNT Requirement	GPS	Sat Nav for Today
Focus User Group	Government, then Commercial	Commercial AND Government
Accuracy	"5 bombs in the same hole"	Keep cars in their lane
Availability	Global	Global, enhanced in population centers
Resistance to Interference	State-level actor	Cyber attacks, active RF environments
Space / Ground Segment Cost	Government defense budget	Commercially viable
User Equipment	Portable	Mass market
Independence	2 weeks without ground contact	No GPS dependency in entire system

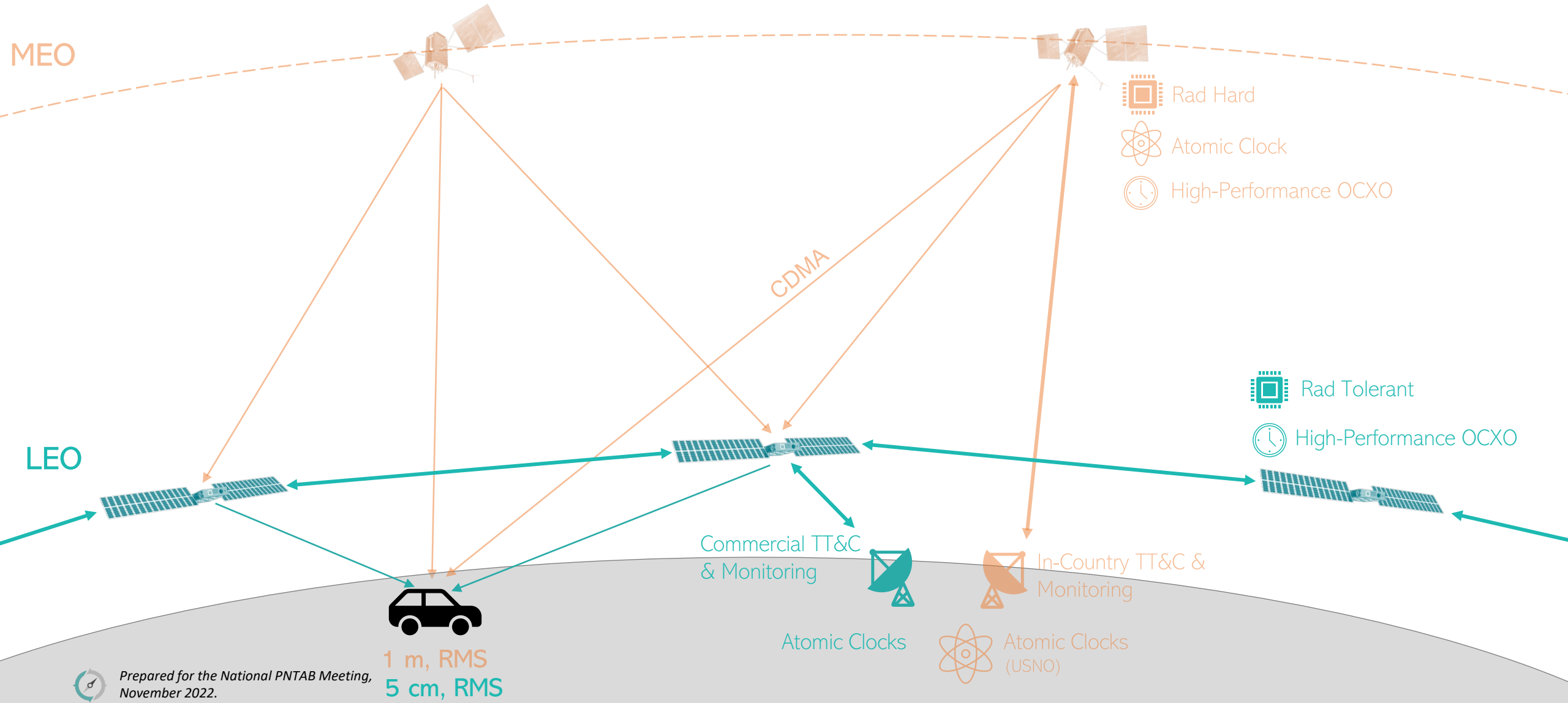
Different PNT requirements result in different PNT system architectures



SYSTEM ARCHITECTURE - GPS

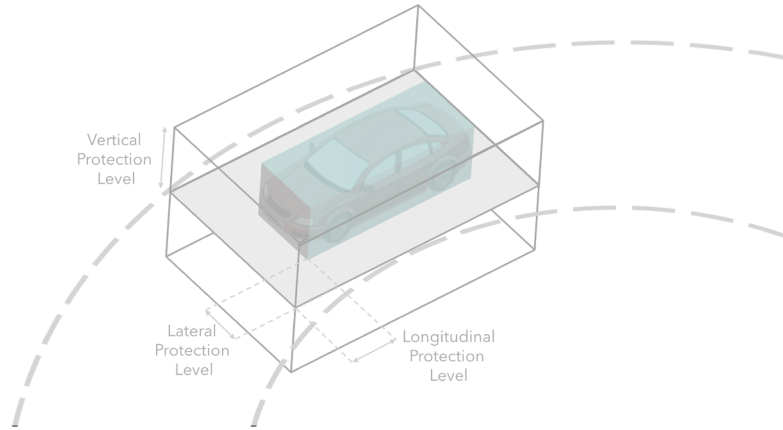


SYSTEM ARCHITECTURE - XONA PULSAR

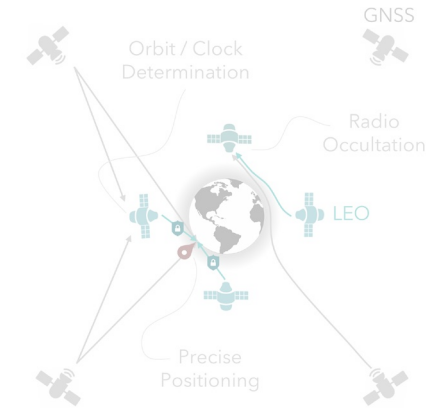


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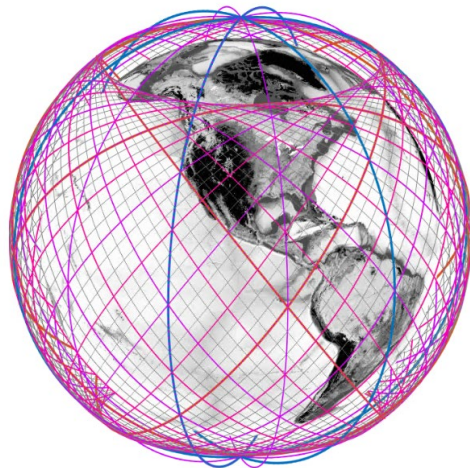
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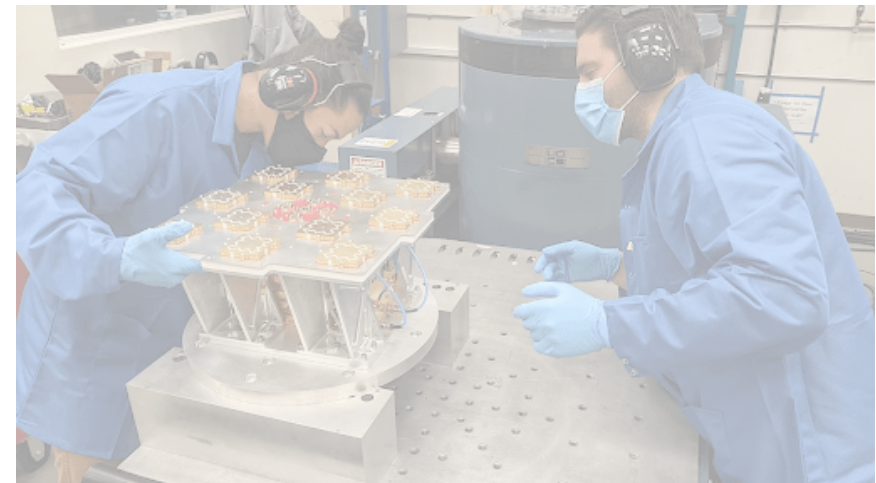
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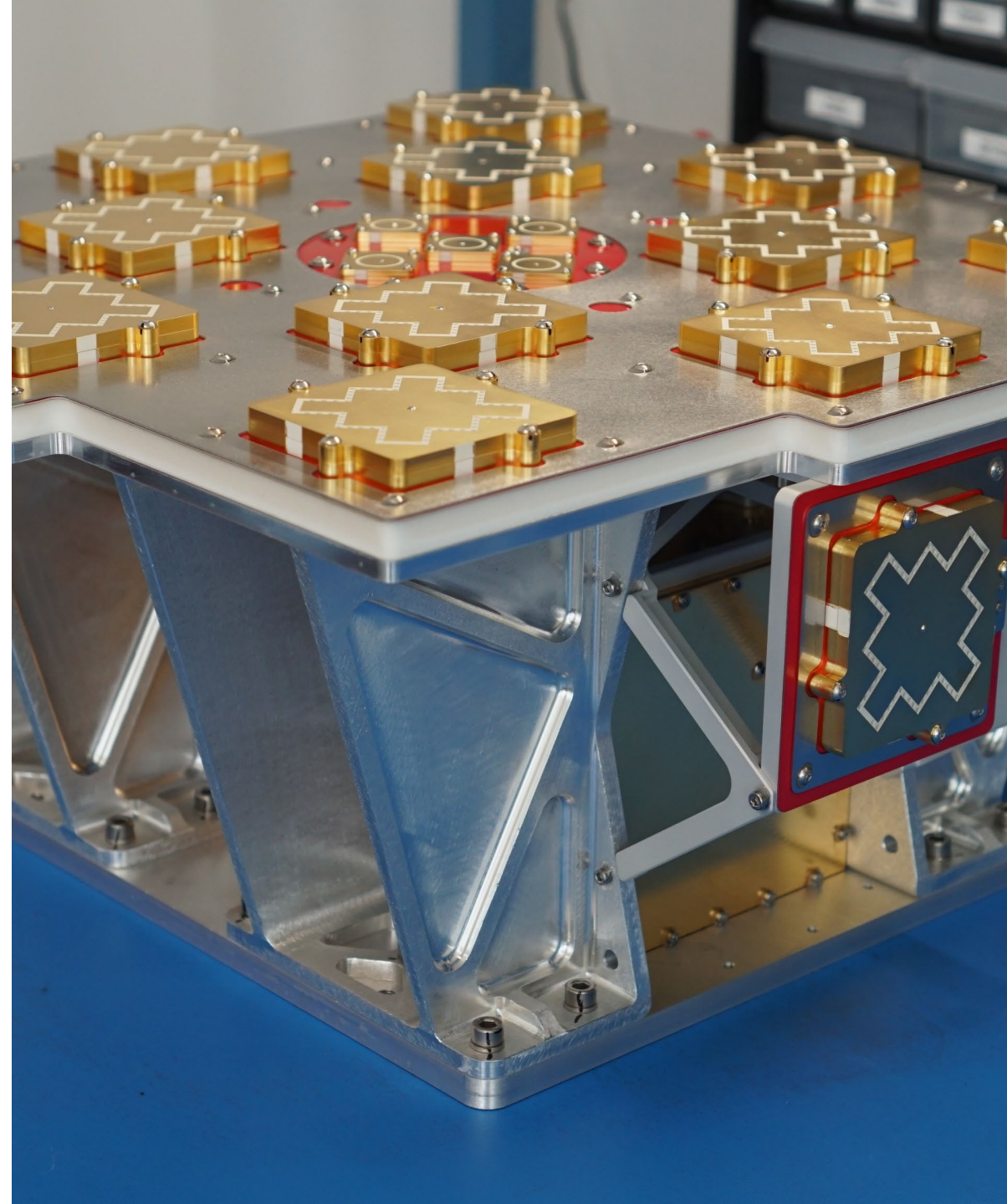


XONA'S MISSION

Enable modern technologies to operate safely in any environment, anywhere on Earth.

Xona has combined world leading experts in precision GPS, autonomous systems, and civil aviation safety with new-space professionals to build the first satellite navigation system designed to meet the accuracy and protection levels needed for safe operation of modern technology.

BACKED BY



COMMERCIAL LEO PNT BENEFITS

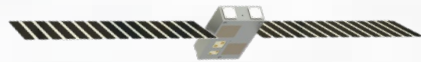
Xona PULSAR is a commercial PNT service built around a dedicated LEO constellation of 300 small satellites. Features include:

- **Complementary GPS Aids** – In-band data provides GPS acquisition aids, corrections, and integrity monitoring.
- **Resilience and Accuracy** – Signals are over 100x more powerful than GPS (L1 C/A) and provide sub-10 cm accuracy.
- **Security** – Encryption and authentication provides access control and protection against spoofing.
- **GPS Backup** – Service delivers meter-level position and timing, fully independent of existing systems if needed.

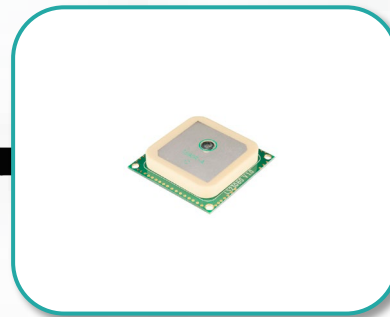


NAVIGATION & TIMING AS A SERVICE

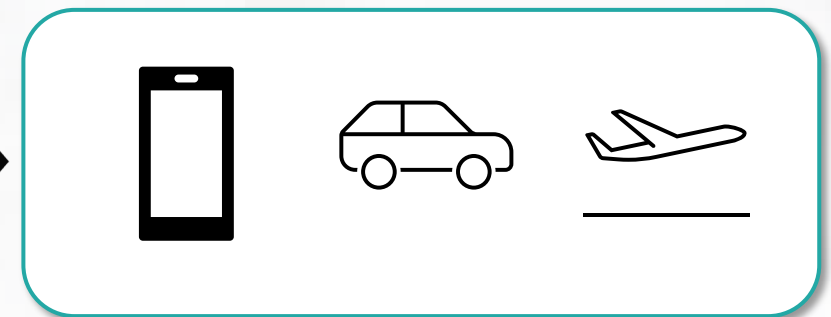
Xona is developing the infrastructure...



...partnering with Tier 1's and receiver manufacturers to integrate Xona functionality...



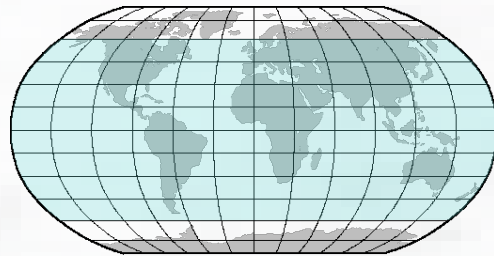
...to provide service to end users.



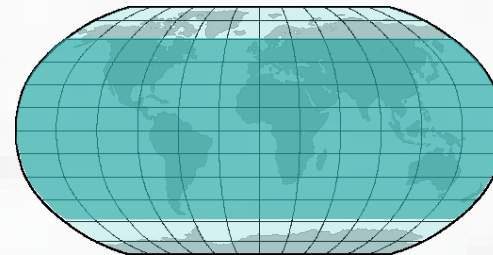
PULSAR PHASED ROLLOUT

Initial operational capability in mid-latitude regions beginning in 2025

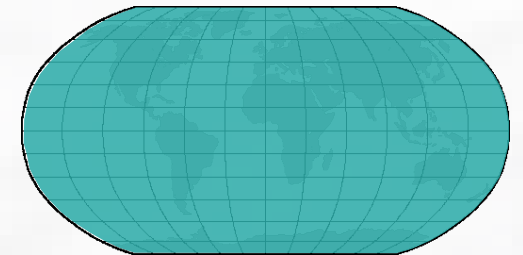
Phase 1
40 Satellites



Phase 2
70 Satellites



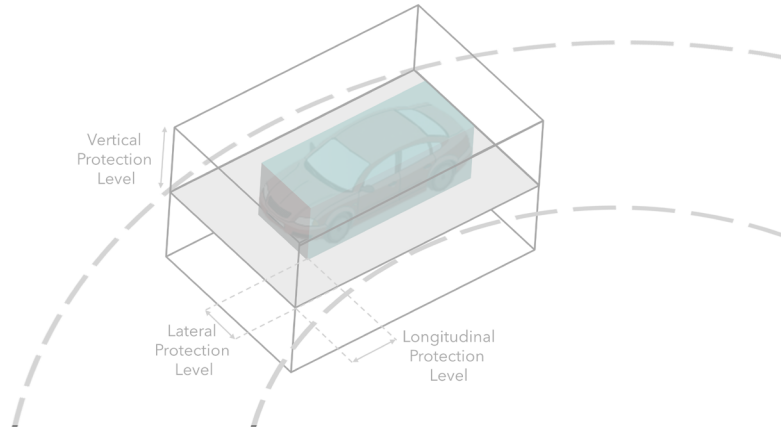
Phase 3
300 Satellites



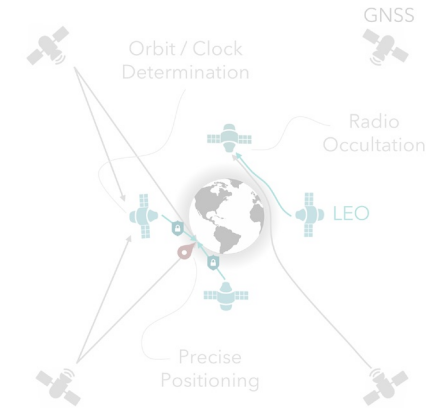
<ul style="list-style-type: none"> • Precision Timing for Stationary Users • GNSS Enhancements for Mobile Users 	<p>>99% Availability Mid-Latitudes</p>	<p>>99% Global 100% Mid Lat</p>	<p>100% Global Coverage</p>
<ul style="list-style-type: none"> • Precision LEO PNT for All Users 	<p>-</p>	<p>>50% Global Coverage</p>	<p>100% Global Coverage</p>

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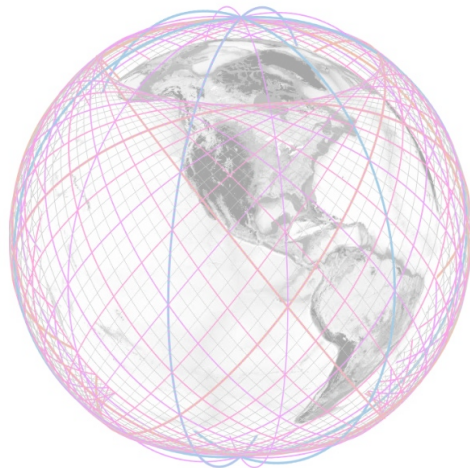
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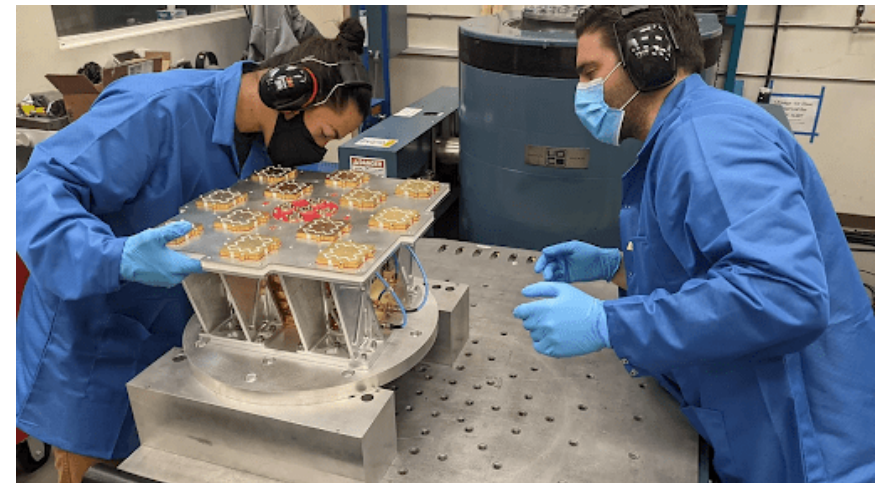
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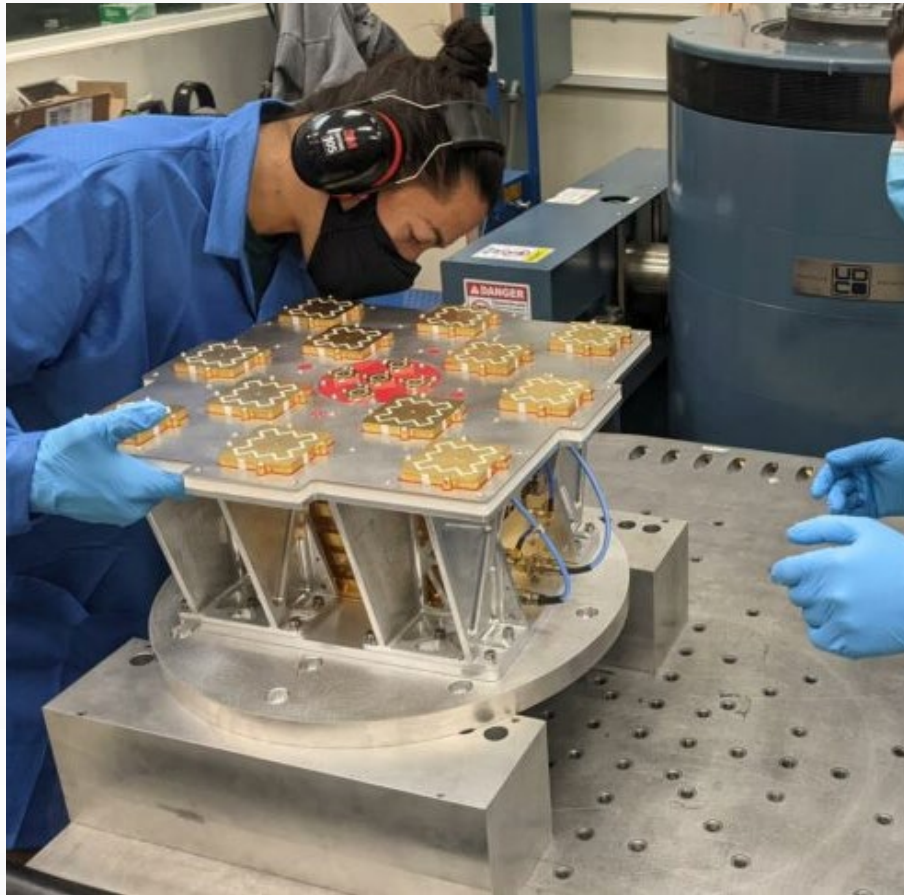
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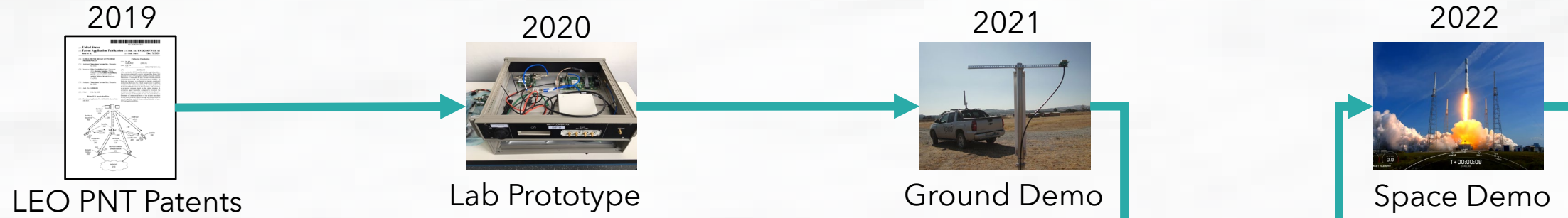
DEMO MISSION - HUGINN



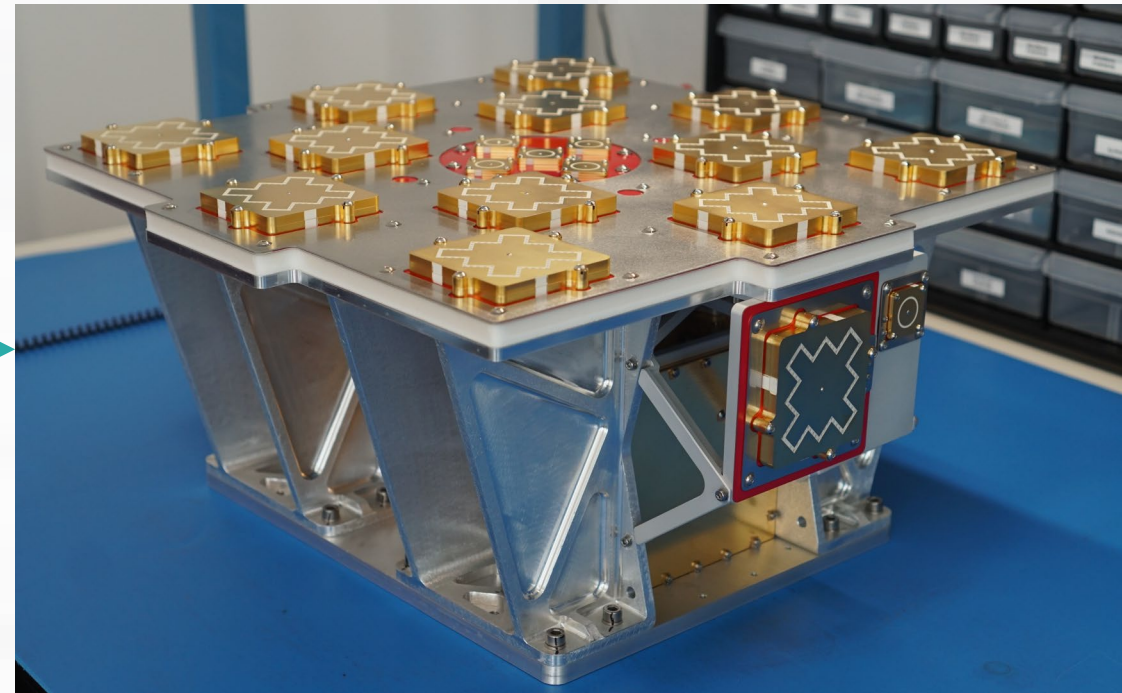
May 22, 2022: Xona became the first privately funded company to launch a dedicated satellite navigation mission

PULSAR IS MOVING TO PRODUCTION

17



- Core tech is proven -- went from ground demo to orbit in less than 12 months
- 10+ user equipment vendors are integrating Xona's LEO PNT signals into their products, demand for GPS+Xona devices are in the millions
- Gathered key feedback from demo mission and stakeholders; incorporated into production spectrum plan
- Evaluating suppliers for ground and space segment production systems



Xona's "Huginn" demo payload.



THE PULSAR ECOSYSTEM

Suppliers

Ground and Space Segment Partners



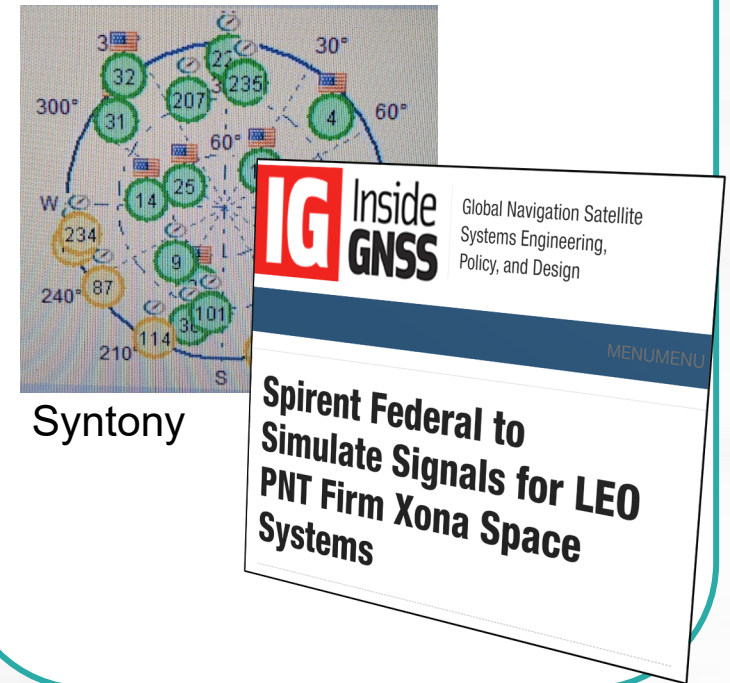
User Equipment

Consortium of Partners



Simulators

Consortium of Partners



THE XONA TEAM

FOUNDING TEAM



Brian Manning
CEO



Tyler Reid
CTO



Bryan Chan
Business



Jerami Martin
Satellites



Adrien Perkins
Engineering



Andrew Neish
Signals



Kaz Gunning
Algorithms



Paul Tarantino
Testing

Founded by 5 PhD's & 3 MS from Stanford's Aerospace Engineering and GPS Laboratory.

Grown to 45 full time employees, combining leaders in modern satellite navigation with traditional and new space expertise.



New headquarters in Burlingame, CA.



XONa

space systems



Bryan Chan, Co-founder, Business Development | bryan@xonaspace.com



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