NOAA's GPS HARS proposal

Presentation for the
PNT Advisory Board

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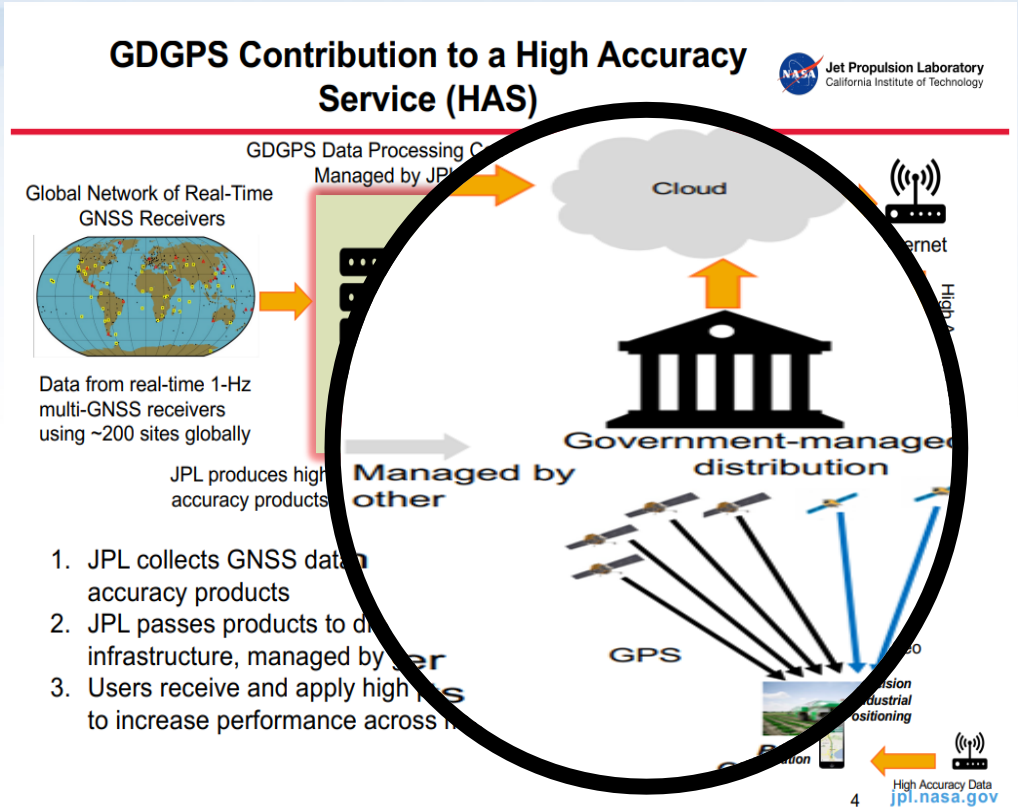
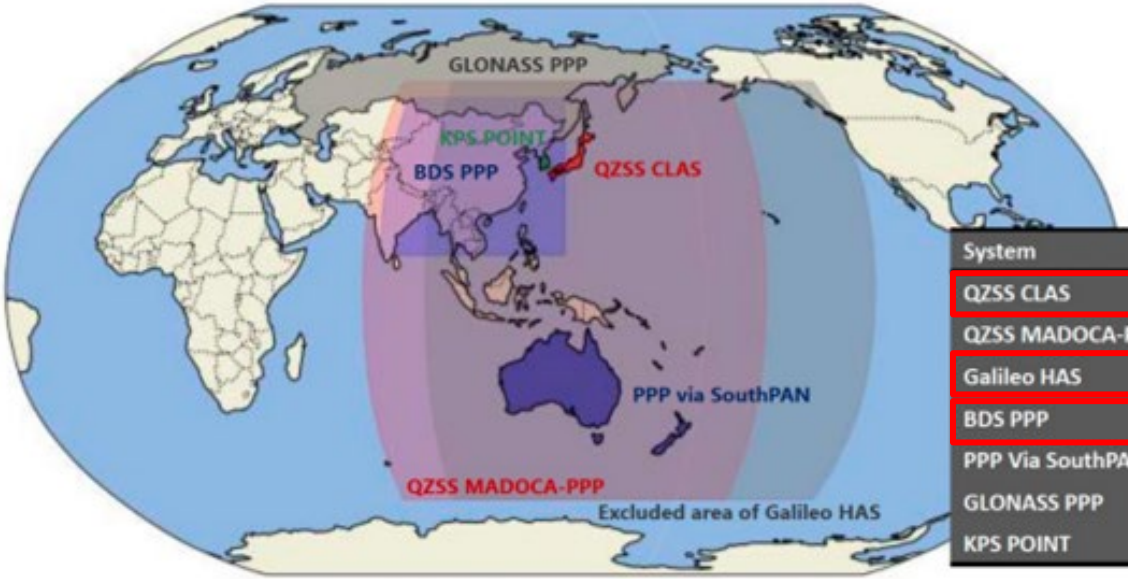
National Geodetic Survey (NGS)
National Ocean Service
NOAA

12/4/2024



Background:
Multiple high-accuracy services available internationally



System	Service	Status
QZSS CLAS	PPP-RTK	Operational
QZSS MADOCA-PPP	PPP	Trial
Galileo HAS	PPP	Initial Service
BDS PPP	PPP	Operational
PPP Via SouthPAN	PPP	Early Service
GLONASS PPP	PPP	Modernization
KPS POINT	PPP-RTK	Development

Hirokawa, et al., 2023 at ION GNSS+ in Denver, CO

6 regional HAS and 1 global HAS service are operational or in development at this time

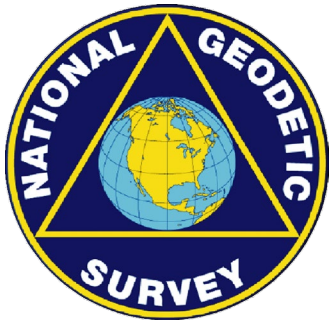
The ask from the PNT Advisory Board to NOAA:

Funding and operating a public service that can provide robust real-time GPS corrections

- ***H**igh-**A**ccuracy*: real-time corrections to GPS orbit parameters and clocks, to enable more accurate positioning solutions
- ***R**obustness*: Nav Data (ephemeris) can be cryptographically signed and delivered on the same channel.
- ***S**ervice*: delivered over the Internet, free to all users

Complementary US Government partners to deliver High-Accuracy Robustness Service (HARS)

Jet Propulsion Laboratory
California Institute of Technology



National Geodetic Survey

National Oceanic and Atmospheric Administration (NOAA)

(formally, knows as the Coast and Geodetic Survey - est. 1807)

More than 200 years in the geospatial business and counting

Shoreline mapping

Theodolite (1922)

Sextant Target (1916)

NOAA/NGS engagement with Federal, State, and local communities

NASA

NGA

USACE

DoT

USAF

Navy

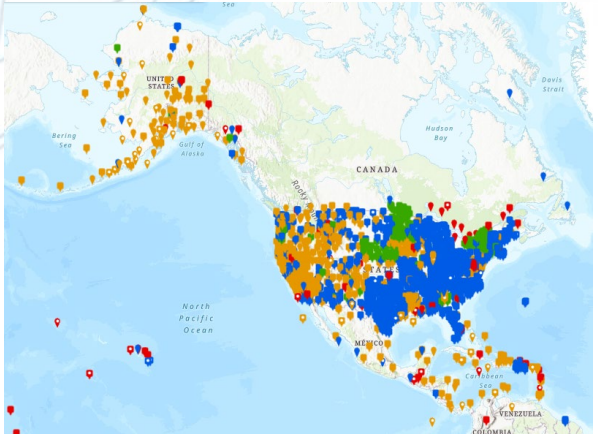
USCG/FEMA

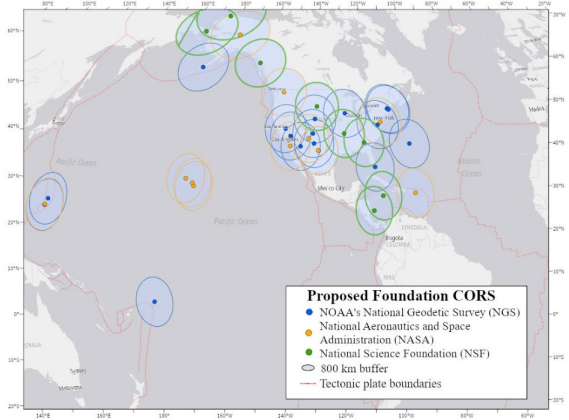
USGS

NOAA's National Geodetic Survey:
Expertise and Knowledge

IGS Analysis Center - satellite orbits and products

Foundation and Cooperative CORS Networks





IGS INTERNATIONAL GNSS SERVICE

NOAA: Government-managed delivery

NOAA has the authority to provide real-time operational services, and regularly collaborates with other federal agencies.

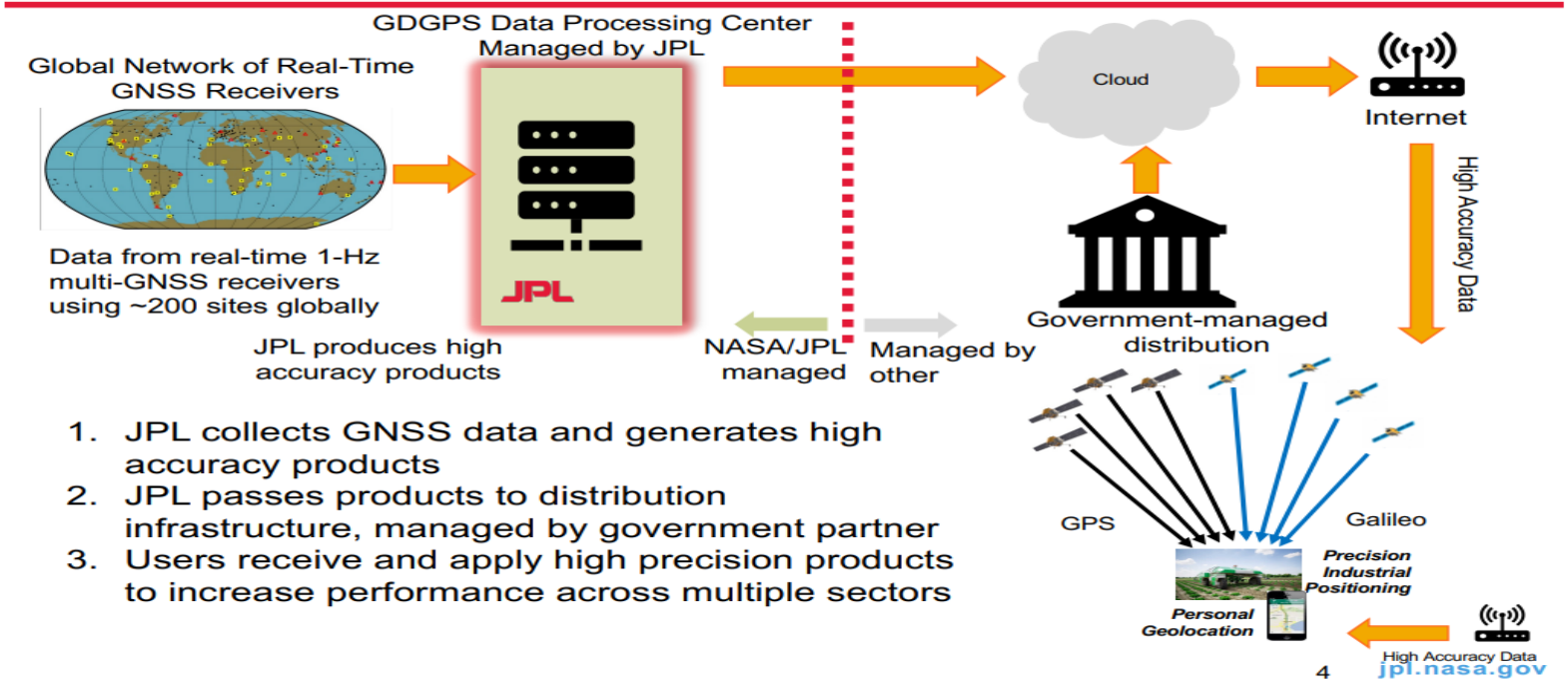
DEPARTMENT OF COMMERCE (DOC) • NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

SARSAT SEARCH AND RESCUE SATELLITE-AIDED TRACKING

Global Differential GPS (GDGPS)

GDGPS Contribution to a High Accuracy Service (HAS)

Jet Propulsion Laboratory
California Institute of Technology

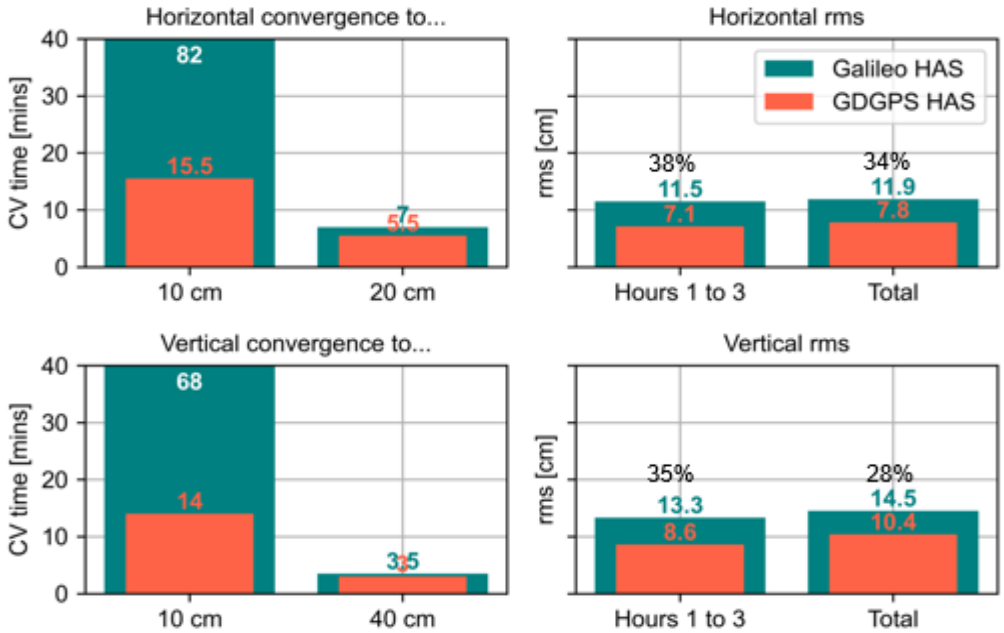


1. JPL collects GNSS data and generates high accuracy products
2. JPL passes products to distribution infrastructure, managed by government partner
3. Users receive and apply high precision products to increase performance across multiple sectors

GDGPS outperforms Galileo

GPS+Galileo Comparisons of Horizontal, Vertical RMS Errors and Convergence Times

Jet Propulsion Laboratory
California Institute of Technology



GDGPS HAS outperforms Galileo HAS by about 30% in horizontal and vertical components

HARS benefits to daily operations

Professional	Industry	Commerce
Fleet and Asset Management	Autonomous Vehicles	Aviation
Surveying	Smartphones	Rail
Precision Agriculture	Personal Navigation	Maritime
Environmental Monitoring	Drones	Trade control
Timing	Transportation infrastructure	Traffic Surveillance
		Emergency services
		Search and Rescue

To summarize

To operate a HARS, one would require the following:

- **Authorization**
- **Technology**
- IT and Physical **Infrastructure**
- Technically-Proficient **Personnel**
- Sustained **Resources**

By leveraging NASA's real-time GDGPS infrastructure and NOAA's service delivery platforms, NGS can build a high-accuracy, resilient service that ensures delivery of precise, reliable and secure GNSS corrections for a wide range of scientific and commercial applications

Complementary efforts

Jet Propulsion Laboratory
California Institute of Technology

National Geodetic Survey

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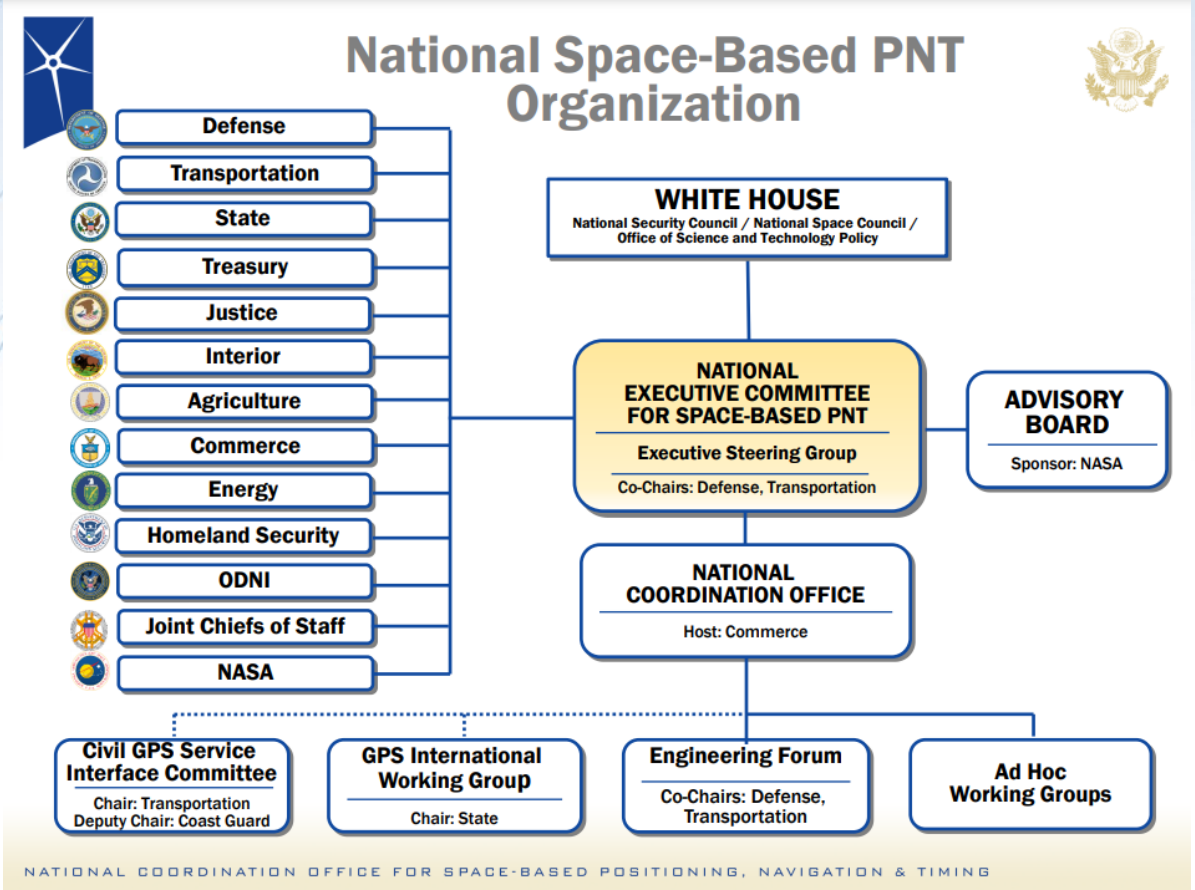
How can the PNTAB facilitate GPS HARS?



Proposed path forward

December, 2024 - Provide a three things memo (and presentation) to the PNT Advisory Board

2025-2026 - Finalizing the cost of operations and a MOU with NASA

- Continuing NOAA/NASA monthly collaboration meetings

FY 2027 - Fingers crossed for approved budget 🙂

Thank you for your time!

It takes a village to raise a child

Special thanks to:

NOAA - Brad Kearse, Dan Gillins, Rick Bennett, Josh Jones, Ittai Baum, Jordan Krcmaric, and Andrew DiSanto

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