## **ECAS**

(Emerging Capabilities, Applications, and Sectors)

# subcommittee report. v1.1

Frank van Diggelen, Scott Burgett, Bryan Chan

#### Committee members

Bryan Chan (Vice Chair)

Dorota Brzezinska

Eileen Reilly

Frank Diggelen (Chair)

John Betz

Matthew Higgins

Renato Filjar

Russell Shields

Scott Burgett (Vice Chair)

Thomas Powell

Tim Murphy

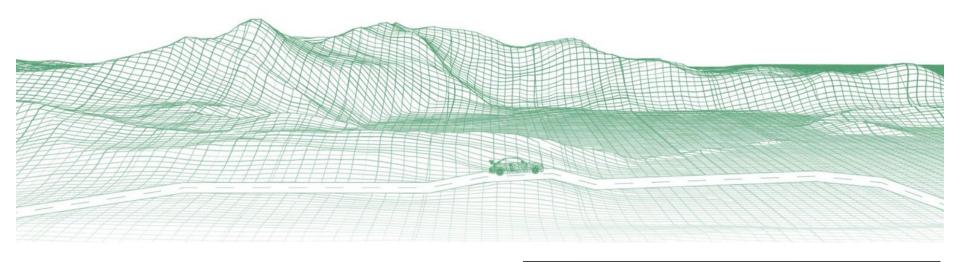
**Todd Walter** 

Vahid Madani

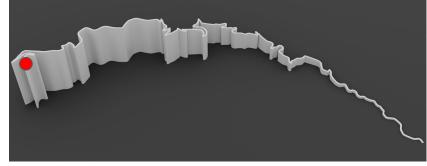
## Agenda for April

- Tern.ai presentation
- Update on HARS
- Plans for future meetings

Shaun Moore, CEO and Co-Founder sm@tern.ai

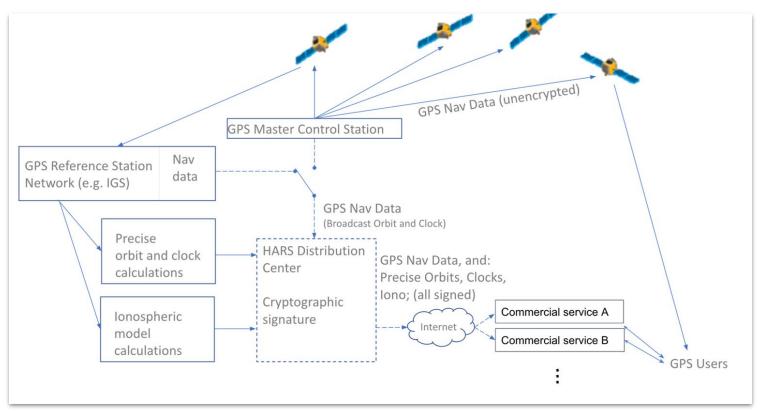


Location using digital 3D map + car sensors, and no GNSS



### HARS Update

#### High Accuracy and Resiliency Service



#### HARS status, developments

- Lots of industry interest
- Especially in "R": Robustness via Nav Data distribution
- Still need a government owner of this proposed program



April 23, 2024

The Honorable Thad Allen, Chairman
National Space-Based Positioning, Navigation, and Timing Advisory Board (PNT Board)
c/o Mr. James Joseph Miller, Designated Federal Officer
Space Operations Mission Directorate

NASA Headquarters Washington, DC 20546

Re: Accelerated GPS Modernization and High Accuracy and Robustness Service (HARS)

Dear Chairman Alle

By this letter, Apple Inc. offers its support for accelerated GPS modernization and for the establishment of a GPS High Accuracy and Robustness Service (HARS).

Apple sees great value in the modernization of GPS and in particular the accelerated availability of GPS 1.6. It is well understood that LIS, in conjunction with LI, enables better robustness and accuracy. Apple is an enery adopter of GPS 1.5 in products such as IPhone 18 Pro, IPhone 15 Pro and Apple Watch Ultra, and supports any accelerated deployment of L5 capable satellites to complete the consentation.

The US showed global leadership in satellite navigation with the deployment of OPS. With the inclusion of OPS capabilities in Phrone, Apple Which and other Apile products, citizens globally enjoy the termendous benefits of personal navigation and fitness asglications. These features can be challenged in difficult environments, where tall buildings or dones foliage can obstruct satellite without productions of the number of availations, with polyadis Consect exclusively navigation capabilities, would help ensure the continued importance of OPS and would significantly aid these use cases in Apple products.

Apple also supports the HARS proposal to include access to statellite navigation data via the internet. Today's internet connected devices support deviational speeds up to significant per second over secure SSLTIAS. Apple recommends that the GPS Control Segment make the navigation data, for each statellite, available via the internet instead of continued relations the stower, unsatellineduced statellite through second, the second improve the accuracy and robustness of consumer navigation systems like those used in inflorine, Pad, and Apple Watch. Specifically, publishing this data via the internet would allow devices to a couple more quickly and better track significant late a modernized participant, and the internet would allow devices to a couple more quickly and better track significant late a modernized participant, and produced the second participant in the second participant of the produced participant in the second participant in the

Sincerely,

/s Rob Mayor

Mailstop 35-3WTB Senior Director

Sensing & Connectivity at Apple

"Apple also supports the HARS proposal to include access to satellite navigation data via the internet."

### HARS developments and next steps

 We will update the white paper with a deep dive into the "R": Robustness achieved by distribution of Nav data. By Next PNTAB meeting.

Upcoming paper at ION GNSS+ conference, Sep 2024

"Nav data bits for increasing sensitivity and robustness in GNSS receivers" Frank van Diggelen, Tim Murphy, John Betz

#### Plans for future meetings

- Renato Filjar preparing a white paper on Al use for PNT
- Focus in LEO constellations and use for PNT

Led by Scott Burgett and Bryan Chan, vice chairs.

