Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
Promoting the Development of Positioning, Navigation, and Timing Technologies and and Solutions	)	WT Docket No. 25-110

To: The Commission

COMMENTS OF
OPEN TECHNOLOGY INSTITUTE AT NEW AMERICA
AND PUBLIC KNOWLEDGE

The Open Technology Institute at New America and Public Knowledge ("OTI & PK") hereby submit these comments on the Notice of Inquiry in the above-referenced proceeding. There are many viable options for additional Position, Navigation and Timing (PNT) systems in the United States. We encourage the Commission to prioritize solutions that offer the most accurate, reliable service while imposing the least costs and disruption to consumers. To that end, we recommend that the Commission reject NextNav's proposal for a PNT service, as it would come at the expense of the incumbent unlicensed users of the lower 900 MHz band.

I. SUMMARY

OTI & PK agree wholeheartedly with the Commission's intention to uplift one or more additional PNT systems to complement or serve as an alternative to the current U.S. Global Positioning System (GPS).[1] GPS offers vital services that span industries and the globe, and we agree that our current reliance on GPS alone leaves us vulnerable to critical disruption, whether intentional or accidental. Diversifying our reliance on critical infrastructure is best practice. Fortunately, there are good options for both complementary and alternative PNT systems.

[1] *Promoting the Development of Positioning, Navigation, and Timing Technologies and Solutions*, Notice of Inquiry, WT Docket No. 25-110 (adopted March 27, 2025) ("NOI").

OTI & PK encourage the Commission to facilitate the use of multiple technologies or services that offer the necessary security and quality at the least cost and while doing the least harm to other, existing services. Importantly, OTI & PK advise the Commission to give a wide berth to NextNav's suggested PNT service. NextNav's proposal hinges on upending a band that currently houses unlicensed Part 15 devices that power every aspect of the economy. There are better options that do not.

II. THE IMPORTANCE OF PNT TO THE PUBLIC

GPS and other PNT technologies are critical resources for advancing precise technologies, calibrating sensitive instruments, and synchronizing processes across the world. GPS is free to use, and always has been since it was developed as military technology. It enables drivers to get to their destinations, PSAPs and 911 services to know where to send emergency services, and much more—all free of charge. In opening this Inquiry, the Commission must keep the general public's use of these services at the forefront, and balance the public and private sector benefits with the imperative to provide this technology free of use to all Americans.

Acknowledging that PNT (GPS) is a public good, the Commission should recognize that the history of GPS being *free to use* has produced enormous public and private benefits. Providing a service as a public good that becomes readily available to everyone promotes the public interest in many ways. Reports estimate that the economic benefits of GPS over the years approach $1.4 trillion.[2] GPS is used in all sectors of the economy, including agriculture, electricity, consumer devices, finance, mining, navigation, communications, and more. It is because of its free and available nature that GPS has become critical to so many industries,

[2] O'Connor, et al., *Economic Benefits of the Global Positioning System (GPS)*, RTI Report Number 0215471, Sponsored by the National Institute of Standards and Technology (June 2019), available at https://www.nist.gov/system/files/documents/2020/02/06/gps_finalreport618.pdf.

especially as technology requiring precision timing and location capabilities is developed to make processes more efficient and profitable.

PNT technology will become ever more important for public safety as the Commission seeks to modify and modernize the E-911 and NG911 technology systems in due time. GPS can be used in supporting the Department of Interior in managing over 800 independent handheld communications systems with over 45,000 users for public safety communications; by hospitals tracking the location of public safety vehicles for disaster response, and more.[3] As it advances new PNT technologies, the Commission should also ensure that existing uses of GPS for public safety are fostered—and enhanced—by technological advances.

Knowing these critical benefits to the public, the Commission must prioritize PNT technologies that strive to provide free access to critical services to the public. This is not to say that private, pay-to-play PNT networks should not exist, as they may have value-added uses for enterprise and the public sector. But it is the government's role to safeguard the public interest and foster the development of next-generation PNT technologies that are safe, secure, reliable, and free. Above all else, the Commission should not ***mandate*** the use of pay-to-play PNT systems. Nor should the Commission mandate the use of proprietary systems where the owner of the system may require onerous or expensive licensing conditions.

III. THERE ARE MANY VIABLE PNT TECHNOLOGIES AND SOLUTIONS

In selecting a new technology to provide PNT, the Commission should ensure that it meets the necessary security, signal strength, and accuracy requirements. In doing so, it should also consider the ramifications of making any particular choice and prioritize a technology that can offer a service at the least cost to consumers and without harming other spectrum-dependent

[3] Cybersecurity and Infrastructure Security Agency, "Global Positioning System (GPS) for Public Safety Location Services: Use Cases and Best Practices" (2024), available at https://tinyurl.com/432edptw.

devices. Fortunately, several technologies already in existence offer the potential for secure, effective, and powerful complements or alternatives to the current GPS system.

A. Space-based Solutions

Alternative space-based solutions are a tried-and-true method of providing PNT to rival the existing system. Satellite PNT solutions are favorable for their ability to provide universal coverage across the United States and the world—indeed, the global reach of GPS has bolstered the reputation of the United States. PNT solutions that span international borders are increasingly advantageous in today's age of interconnected economies. However, space-based solutions are potentially vulnerable to atmospheric or human interference such as spoofing or jamming.

Though GPS operates using medium-Earth orbit (MEO) satellites, the Commission accurately points out that low-Earth orbit (LEO) satellites are a potential option as well.[4] LEO satellites send a stronger, more reliable signal due to their greater proximity to the Earth, and the larger number of satellites in a constellation leads to better locational accuracy and resilience.[5]

As the Commission mentions, some LEO systems already offer PNT services. For example, Iridium uses its constellation to offer Iridium Satellite Time and Location (STL), which is commercially available worldwide.[6] Iridium advertises STL as a complement to GPS that can function when GPS goes down or is unavailable; since STL operates in the L-band, it transmits a significantly stronger signal that is more resilient to jamming and able to penetrate indoors. It

[4] NOI at ¶ 22-23.

[5] Peter Gutierrez, "Using LEO Signals of Opportunity for PNT," *Inside GNSS* (June 10, 2024), https://insidegnss.com/using-leo-signals-of-opportunity-for-pnt/.

[6] Iridium, STL-vs-GPS-Overview (2024), https://tinyurl.com/4n9ct5sm.

offers a cryptographically secure connection that is resilient to spoofing.[7] Indeed, the technology has been vetted as a reliable timing source by both NIST[8] and the European Commission.[9]

In the United States, LEO satellites have rapidly become a connectivity solution for the digital divide. SpaceX's Starlink constellation already covers the continental U.S. and is working to increase capacity. Amazon's Kuiper is preparing to launch its first constellation.[10] Though they currently offer connectivity services rather than PNT, LEO constellations can provide the ubiquitous infrastructure that is necessary for a complete PNT solution.

As with other space-based solutions, LEO satellites are potentially vulnerable to interference from foreign actors, particularly when they play a role in international affairs, such as Starlink's service in Ukraine. LEO satellites are already being examined for the potentially larger role they may play in public deployment programs such as the Broadband Equity, Access and Deployment program, leading to increased regulatory attention.[11] The NTIA and the FCC may well (and should) grapple with the service's connection security even in its capacity as a connectivity solution, since there are known methods of providing a secure connection.

B. Terrestrial Solutions

Terrestrial PNT solutions face the same challenges as terrestrial connectivity solutions: Universal coverage remains daunting as long as some locations are prohibitively expensive, difficult to build out, or unprofitable. Moreover, terrestrial solutions are inherently regional and

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[7] "PNT Roundup: Iridium constellation provides low-Earth orbit satnav service," *GPS World* (Jan. 12, 2017), https://www.gpsworld.com/iridium-constellation-provides-low-earth-orbit-satnav-service/.

[8] Iridium, "NIST" (accessed Apr. 2025), https://satelles.com/nist/.

[9] "STL From Satelles Exceeds Expectations in JRC A-PNT Study," *Inside GNSS* (March 27, 2023), https://insidegnss.com/stl-from-satelles-exceeds-expectations-in-jrc-a-pnt-study/.

[10] Amazon, "Here's what to expect from Project Kuiper's first full-scale satellite launch" (Apr. 2, 2025), https://www.aboutamazon.com/news/innovation-at-amazon/project-kuiper-satellite-internet-first-launch.

[11] Patience Haggin, "Commerce to Overhaul 'Internet for All' Plan, Expanding Starlink Funding Prospects," *The Wall Street Journal* (updated March 4, 2025), https://tinyurl.com/bdf86tr5.

can be vulnerable to natural disasters or other on-the-ground events. However, they can provide an important complement or backup to existing GPS technology, especially in the absence of GPS or in locations that the signal cannot reach, such as indoors.

One viable terrestrial solution is already being promoted by broadcasters. The Broadcast Positioning System (BPS) leverages existing television transmission infrastructure to broadcast PNT data using the newest terrestrial broadcast standard, ATSC 3.0.[12] In February, the National Association of Broadcasters filed a petition requesting that the Commission require broadcasters covering about 70% of the population to start using the updated ATSC 3.0 standard by 2028, and that all other markets adopt the standard by 2030.[13]

As with every PNT solution, the more expansive the network the better, and while not as ubiquitous as satellite-based systems, one or more broadcast towers are found almost everywhere people reside across the country. BPS is highly resilient and accessible: Towers are equipped with backup generators in the case of emergency, and BPS receivers are passive devices that do not require an internet connection.[14] A study coauthored by NIST recently confirmed that the time accuracy from BPS was at least equivalent to that of GPS.[15] Broadcasters have highlighted BPS as a means of improving GPS's resiliency or, with the partnership of a timing source, a

[12] Matteo Luccio, "Television broadcasters propose new PNT service" *GPS World* (Apr. 11, 2025), https://www.gpsworld.com/television-broadcasters-propose-new-pnt-service/; Tariq Mondal, Robert D. Weller, P.E., and Sam Matheny, *Broadcast Positioning System (BPS) Using ATSC 3.0*, NAB Broadcast Engineering and Information Technology (BEIT) Conference (2021), https://tinyurl.com/5fcjamud.

[13] "TV-based PNT for 70% of Americans in three years – Petition to FCC," Resilient Navigation and Timing Foundation (Feb. 27, 2025), https://tinyurl.com/2kpm2mfx.

[14] Tariq I. Mondal, Dr. Jeffrey A. Sherman, and David A. Howe, Time Transfer Performance of the Broadcast Positioning System™ (BPS™), Proceedings of the 2025 International Technical Meeting, ION ITM 2025, at 89 (Jan. 27-30, 2025), https://www.nab.org/bps/ITM25-0009.pdf.

[15] *Id.* at 96.

standalone PNT solution. BPS may rely on eLoran signals for added security and a separate timing source, and thus function completely independently of GPS.[16]

Since the topline requirement for a terrestrial PNT solution is widespread coverage, any mobile carrier with the necessary coverage footprint and low-band spectrum could also be tapped or incentivized to provide a PNT solution, or to enter a partnership to provide one. Although the three biggest national mobile operators have substantial spectrum below 1 GHz, the Commission could identify a relatively narrow band of low-frequency spectrum to dedicate specifically to a PNT solution that leverages existing cellular infrastructure. This could also align with the fact that mobile carriers are already dependent on PNT to maintain synchronization that enables throughput across various networks. Of course, as with any terrestrial system, no mobile carrier has true universal coverage. The Commission may consider relegating terrestrial systems to a supplemental role for the important backup they provide.

IV. THE COMMISSION SHOULD RESOUNDINGLY REJECT NEXTNAV'S PROPOSAL TO DECIMATE THE 900 MHZ BAND FOR A PNT SOLUTION

With so many other good options on the table, the Commission should unilaterally reject NextNav's proposal,[17] which in our view would decimate the valuable 900 MHz band in service of a PNT solution that will enrich nobody more than the company itself.

Just as GPS use is pivotal to every industry in every location in the world, beneficiaries of the lower 900 MHz band are ubiquitous. The Internet of Things (IoT) rests on the shoulders of the unlicensed Part 15 devices that have proliferated across the band. The hundreds of millions of devices utilizing the band include audio and visual devices, panic buttons, drones, home security

[16] "eLoran Timing System Reduces Reliance On Gps," *Edge Computing News* (Apr. 9, 2025), https://www.edgecomputing-news.com/news/eloran-timing-system-reduces-reliance-on-gps/.

[17] NextNav Petition for Rulemaking, Enabling Next-Generation Terrestrial Positioning, Navigation, and Timing and 5G: A Plan for the Lower 900 MHz Band (902-928 MHz) (filed Apr. 16, 2024) ("Petition").

systems, medical devices, and devices that support agriculture, utilities, logistics, and retail operations.[18] Critical network protocols and operating systems rely on the lower 900 MHz band, including radio frequency identification technology (which wirelessly connects devices to the internet), Z-Wave (which ensures interoperability among certified smart devices), LoRaWAN (a Low Power, Wide Area networking protocol that supports smart cities, logistics, agriculture, and more), HaLow, and automatic vehicle identification systems.[19] The band is designated for industrial, scientific and medical applications at the ITU level, allowing scalability and global reach for the IoT devices that rely on it.[20] The Commission correctly identifies the risk of reliance on a single GPS system that could go down and render critical services unusable, including consumers' ability to communicate with IoT devices.[21] But that very network of IoT devices hinges on the existence of unlicensed Part 15 devices in the 900 MHz band that NextNav proposes to plunder. The Commission must not pillage one valuable use case to preserve another.

NextNav purports to offer a band plan that would allow the extant Part 15 devices to continue operating unencumbered.[22] The record shows broad disagreement on this matter. Indeed, NextNav itself has tacitly acknowledged its inability to coexist with the current band users by encouraging the Commission to eliminate the safe harbor for Part 15 unlicensed devices and to remove the requirement for licensees to produce field tests that their systems do not cause

[18] Comments in Opposition of Open Technology Institute at New America, Public Knowledge et al., WT Docket No. 24-240, at 12-15 (filed Sept. 5, 2024) ("Comments in Opposition").

[19] *Id*. at 16-19.

[20] Letter from Chamber of Commerce et al. to Ms. Marlene H. Dortch, Secretary, FCC, Re: NextNav Inc. Petition for Rulemaking, WT Docket No. 24-240, at 4 (March 10, 2025) ("Chamber of Commerce Letter").

[21] NOI at ¶ 7.

[22] NextNav, *5G NR and Unlicensed Part 15 Technologies in the Lower 900 MHz Band*, WT Docket No. 24-240, (submitted Feb. 27, 2025).

harmful interference to Part 15 devices.[23] Moreover, several commenters have come forward with criticisms of NextNav's study alleging the possibility of coexistence without harm. The Z-Wave Alliance argues that NextNav makes a number of erroneous assumptions, including understating the importance of one of its channels (and proposing to operate its 5G downlink directly on top of one of Z-Wave's primary channels), inaccurately depicting its device's transmission power levels and receiver sensitivity, and failing to include real-world data.[24] The LoRa Alliance contends that NextNav inaccurately assesses real-world conditions and cites a number of technical concerns.[25] A broad U.S. Chamber of Commerce coalition further submits to the record that NextNav's report assessing the public benefits of its proposals[26] fails to accurately account for the potential harms done to incumbent users.[27] At the very least, this widespread disagreement demands further scrutiny of NextNav's suggested band plan.

Moreover, NextNav itself has acknowledged that its PNT proposal would require use of only a fraction of the 15 megahertz it requests, suggesting the entire proposal is little more than a transparent bid for a windfall. Indeed, OTI & PK have previously noted that far from proposing an equitable spectrum swap, NextNav is requesting to trade 14 megahertz of shared, low-power, limited-use spectrum in return for 15 megahertz of valuable full power, flexible-use spectrum.[28] By the company's own admission, its proposed PNT services would minimally occupy the

[23] Letter from Robert Lantz, General Counsel, NextNav Inc., to Marlene H. Dortch, Secretary, FCC, at A-6 (June 7, 2024).

[24] Z-Wave Alliance NextNav Study Rebuttal, WT Docket No. 24-240, at 1-2, 4 (submitted Apr. 9, 2025).

[25] LoRa Alliance Comments on NextNav Technical Report, WT Docket No. 24-240, at 1, 3 (submitted March 26, 2025).

[26] NextNav Notice of Ex Parte, submitting to the record Brattle Supplemental Report, WT Docket No. 24-240, (submitted March 28, 2025).

[27] Chamber of Commerce Letter at 3-4.

[28] Comments in Opposition at 21.

band—around 5% of the network's total capacity—and NextNav would then lease or sell the remaining spectrum to a mobile carrier.[29]

If NextNav's proposal is to rely on a 5G operator with existing infrastructure to provide its PNT solution, better for the Commission to go directly to a mobile operator with nationwide network infrastructure, or to encourage the necessary partnerships, that do not come at the expense of the entire ecosystem of incumbents relying on the lower 900 MHz band.

V. THE COMMISSION SHOULD PRIORITIZE AN OPTION THAT OFFERS THE GREATEST BENEFITS AT THE LEAST COST

In selecting a system (or systems) to provide a PNT complement or alternative, the Commission should include among its considerations the quality, security, and public availability of the new service as well as the cost of promoting it. Fortunately, there is a plethora of options from which the Commission may choose. LEO satellites offer universal coverage and a PNT solution that has been vetted by regulators across the world. Possible ready-made terrestrial PNT solutions include broadcast-based services and mobile carriers with nationwide footprints.

The Commission should also consider that other leading countries are adopting a combination of terrestrial and space-based PNT solutions. China relies on a system of satellite coverage, fiber-based, and eLoran PNT that ensures both regional and global coverage with space-based and terrestrial signals.[30] The United Kingdom is examining deployable eLoran to provide a PNT service as a standalone alternative to its Global Navigation Satellite System.[31]

In the spirit of decreasing reliance on a single point of failure, the Commission should consider the benefits of adopting multiple solutions or those that rely on multiple bands of

[29] Petition, executive summary and 27.

[30] Dana Goward, "China finishing 'High-precision Ground-based Timing System' – a worry for the United States," *GPS World* (Sept. 5, 2023), https://tinyurl.com/5b2wrum9.

[31] Dana Goward, "UK MOD investigating deployable eLoran," *GPS World* (Sept. 30, 2024), https://www.gpsworld.com/uk-mod-investigating-in-deployable-eloran/.

spectrum, decreasing the likelihood of a targeted attack. Any system is vulnerable to security risks or failure, though some have more built-in protections than others. BPS, for example, transmits an extremely strong signal and operates on the entire TV Band,[32] rendering it less vulnerable to attack. Harnessing the power of multiple mobile or LEO operators could provide those same benefits. Selecting a combination of solutions to both enhance GPS and replace it in a long-term outage would provide even greater security. This would also help ensure that some form of PNT service remains available to all who those need it.

VI. CONCLUSION

Alongside these many coherent proposals for PNT solutions, NextNav's proposal should be looked at with great skepticism. Its proposed solution relies on a single band that will be an easy target for disruption and is limited to devices able to communicate over 5G. If mobile service is the solution, the Commission should go straight to the source and tap mobile carriers with low-band spectrum and ubiquitous coverage—or allocate new spectrum for that purpose—rather than devastate the vibrant economy of the 900 MHz band. The Commission should choose carefully among its many good options and should reject the one that does little but provide an unjustified windfall to a single company at the expense of everybody else.

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[32] Mondal, Sherman and Howe, *Time Transfer Performance* at 89.