OPEN PNT INDUSTRY ALLIANCE

COALITION WHITE PAPER

The Open PNT Industry Alliance strengthens economic and national security by supporting government efforts to accelerate the implementation of backup positioning, navigation, and timing (PNT) capabilities for critical infrastructure.

The coalition’s mission is to promote open market concepts that preserve industry’s long-term ability to harness its collective ingenuity to protect GPS/GNSS with multiple solutions that are technologically advanced, commercially viable, and based on a sustainable long-term funding framework.

The Problem

For nations around the world, the Global Positioning System (GPS) and other Global Navigation Satellite Systems (GNSS) are susceptible to inadvertent disruptions and deliberate attacks. Such incidents have the potential to impair or incapacitate critical infrastructure, and these threats need to be addressed by implementing multiple forms of alternative PNT.

The Solution

With the scope, complexity, and severity of disruptions and attacks evolving continuously, the combination of wide-ranging PNT solutions and emerging technologies offers superior protection to current threats by providing a backup to GPS/GNSS and improving our national resilience. A safe and secure future — one in which national critical infrastructure is protected by assured PNT — depends on having multiple technologies to complement GPS/GNSS, each with the requisite properties of performance quality and operational resilience.

While national governments will play a critical role in providing a framework for regulation and funding, they should not mandate a single technology or its implementation method. To fully unleash the benefits of PNT across different industries and use cases, diversity and market choice must prevail.

ABOUT THE ALLIANCE

The Open PNT Industry Alliance is a coalition of manufacturers and service providers dedicated to helping their customers back up GPS/GNSS by delivering alternative forms of positioning, navigation, and timing (PNT).

The aims of the coalition are to:

1. ensure that critical infrastructure owners and operators have the freedom to adopt commercially available alternative PNT solutions that best meet their operational needs at the earliest opportunity;
2. make certain that national government requirements for GPS/GNSS backup are sufficiently broad to include a range of technological solutions; *and*
3. secure national government commitments to policies and funding for long-term sustainability of diverse PNT solutions.

Members share the following core principles:

Building Resilience	The United States and other countries face a serious PNT resilience issue. True resilience requires the widest possible diversity, meaning that a singular sole-source technology will not only fail to meet the need in terms of reliability and performance but also be unable to evolve the optimal attack prevention and threat response capabilities.
Promoting Heterogeneity	The technological landscape is diverse enough to allow multiple alternatives to GPS/GNSS with varied operational characteristics to deliver against a complex and ever-expanding set of customer requirements.
Thinking Big	The ingenuity of the private sector, spurred by competition and public and private investment, will drive the emergence of multiple cost-effective GPS/GNSS alternatives that evolve according to technological innovations and market dynamics. Similarly, unbridled innovation will address new and still evolving use cases not supported by GPS/GNSS.
Avoiding Monopolies	As governments consider frameworks for regulation and funding, they can best pursue national interest through a multi-technology approach to PNT resilience and establish a robust and self-sustaining funding framework that allows for the development and adoption of multiple sources of PNT that meet the needs of various sectors and industries.
Fostering Cooperation	National governments are in a position to set policy, define regulations, and enact legislation, but they may lack the technical expertise to effectively achieve their policy goals. The collective intellect of industry should be harnessed in a collaboration between the public sector and private sector to develop solutions at scale.
Developing Appropriate Financing Models	To recoup the cost of alternative PNT systems, the government should create a financing mechanism that is cost-neutral for critical infrastructure providers. These mechanisms will unlock the unbridled innovation and ingenuity of the private sector to address current and evolving use cases. The Alliance will work with Governments worldwide to establish a robust and long-term self-sustaining funding framework that allows for the broad deployment and sustenance of multiple sources of PNT.

POLICY VIEW: EXECUTIVE ORDER ON PNT

Background

Executive Order 13905 entitled “Strengthening National Resilience through Responsible Use of Positioning, Navigation, and Timing Service” went into effect in the United States on February 12, 2020. The purpose of E.O. 13905 is to establish policy and implementation steps to strengthen the resilience of PNT services, upon which U.S.

The policy set out by the E.O. is to ensure that disruption or manipulation of PNT services do not undermine reliable and efficient functioning of its critical infrastructure. To this end, the Federal Government shall engage the public and private sectors to identify and promote the responsible use of PNT services.

The E.O. specifies nine separate but related policy implementation steps and assigns action responsibility primarily to the Departments of Commerce and Homeland Security as well as to the White House Office of Science and Technology Policy (OSTP).

Alliance Position

The Open PNT Industry Alliance believes Executive Order 13905 is a good first step in enabling alternative PNT systems. The directives of this executive order support and accelerate the federal government’s efforts to avoid disruption of our national critical infrastructure in those sectors that depend on PNT services.

Resilience is of paramount importance	The concept of assured PNT — i.e., being able to obtain precise PNT information from multiple sources — is at the heart of this executive order. Assured PNT is an essential safeguard for telecommunications networks, electrical power grids, transportation systems, emergency management services, and other types of infrastructure that rely on PNT to operate even if the U.S. Global Positioning System (GPS) is unavailable or degraded.
There is strength in diversity	It makes sense that GPS and other global navigation satellite systems (GNSS) in medium Earth orbit (MEO) and above should be augmented and backed up by a range of technologies. Alliance members include private sector companies providing PNT solutions that are different from GPS/GNSS, thereby conforming to the various service delivery requirements and technical performance characteristics demanded by the actions of this executive order.
The time to act is now	With this executive order, the White House has provided both the roadmap and the urgent timeline to ensure that proper alternate PNT measures are in place to protect our critical infrastructure and enhance its capabilities. The companies that make up the Open PNT Industry Alliance stand ready to fulfill the mandate of this executive order.

The alliance advocates for partnerships between civil government officials and private sector leaders to implement solutions that provide uninterrupted access to PNT sources that strengthen the resilience of critical infrastructure.

POLICY VIEW: DHS REPORT ON PNT

Background

On April 8, 2020, the U.S. Department of Homeland Security submitted a report on alternative sources of PNT to U.S. congressional committee leaders. The *Report on Positioning, Navigation, and Timing (PNT) Backup and Complementary Capabilities to the Global Positioning System (GPS)* was subsequently released to the public on May 6, 2020.

This important report highlights the urgent need for GPS backup for critical applications, and it identifies and characterizes a variety of solutions that are available to meet this need today. The report also describes the essential role of the Federal Government in urging industry to implement multiple technologies instead of endorsing or investing in a single solution to back up GPS.

Alliance Position

As directed by the National Defense Authorization Act for Fiscal Year 2017 (NDAA 2017), the focus of the report is on the requirements of the owners and operators of national critical infrastructure. While the report only highlights PNT use cases from a subset of the 16 critical infrastructure sectors — primarily those that have the highest reliance on PNT information — the pragmatic recommendations from DHS address a range of requirements across all sectors.

With respect to PNT needs for backing up GPS, DHS acknowledges the differences between and commonalities among the sectors and offers exceptional guidance for leveraging the capabilities of diverse forms of commercially available alternative PNT rather than endorsing a single, anti-competitive, government-imposed solution. In doing so, the report is aligned with Executive Order 13905 on the responsible use of PNT by directing a market-based approach that is technology agnostic.

We applaud the Federal Government's efforts to avoid disruption of our national critical infrastructure in those sectors that depend on PNT services, and we fully agree with the recommendations and findings of this thorough report, including:

Many out-of-domain solutions exist today	DHS notes that "critical infrastructure systems that would cease to operate without [the primary PNT domain of] GPS do so because of design choices, cost factors, increasing efficiency, or other considerations—not because of a lack of available additional means to navigate, determine location, or synchronize." As DHS goes on to say, "there are smart, market-oriented solutions that will contribute to enhanced resilience that the U.S. Government should continue to promote, enable, and stimulate."
Each critical infrastructure sector has different needs, but there are certain baseline requirements	We believe that a heterogeneous backup to GPS is in the public interest, so we agree with the report's statement that "DHS could not identify generic specifications for a national backup" because "[t]he position and navigation functions in critical infrastructure are so diverse that no single PNT system, including GPS, can fulfill all user requirements and applications." However, as DHS explains, "a minimal acceptable precision of anywhere between 65-240 nanoseconds […] supports all critical infrastructure requirements." The report states that this range "is expected to meet future requirements, including 5G."

The Federal Government should neither provide nor select a single PNT solution; rather, it should encourage diversity and invest in multiple technologies	With regard to any kind of government preference for a particular PNT system, DHS states that “the government would have to consider the repercussions of such a system in the marketplace” because “[a] free government system would negatively impact commercially available PNT systems by directly competing with them.” Our view is that a truly resilient and globally available GPS backup capability is only possible with an open, technology-neutral approach that encourages diversity. We agree with DHS that “[t]he Federal Government should encourage adoption of multiple PNT sources [by] critical infrastructure owners and operators [and] focus on facilitating the availability and adoption of PNT sources in the open market.”
Commercial implementation will not happen without directives and requirements from the U.S. Government	“[W]ithout regulatory requirements or positive benefit-cost equations, adoption of non-GNSS services is unlikely,” DHS states in its report, adding that “business decisions, the lack of a Federal mandate, and potentially an underappreciation of the risk associated with GPS dependence are factors in the lack of resilience to GPS disruption.” We agree that an action plan is needed, which is why we are delighted to see that the findings of the report are aligned with the executive order on PNT. DHS directs that “[w]hatever the source of the PNT, it is incumbent on users to apply the principles found in Executive Order 13905, Strengthening National Resilience Through Responsible Use of Positioning, Navigation, and Timing Services [to] reduce the risk associated with the disruption or manipulation of PNT services.”

The coalition looks forward to supporting the efforts of DHS and other departments to work with infrastructure owners and operators to follow the PNT guidelines in the DHS report on alternative PNT and implement the directives of Executive Order 13905.

POLICY VIEW: DOT REPORT ON PNT

Background

The U.S. Department of Transportation published an in-depth report for Congress entitled *Complementary Positioning, Navigation, and Timing (PNT) and GPS Backup Technologies Demonstration Report*. This January 2021 report follows up a DOT-organized demonstration of 11 PNT providers that was conducted in March 2020.

Alliance Position

The members of the Open PNT Industry Alliance understand the threats and develop and deploy technologies that back up and augment GPS/GNSS to increase national resilience. The views of the coalition are aligned with the following seminal statement from the Conclusions and Recommendations section of DOT's new report (p. 194):

> *"The demonstration indicates that there are suitable, mature, and commercially available technologies to backup or complement the timing services provided by GPS. However, the demonstration also indicates that none of the systems can universally backup the positioning and navigations capabilities provided by GPS and its augmentations. The critical infrastructure positioning and navigation requirements are so varied that function, application, and end-user specific positioning and navigation solutions are needed. This necessitates a diverse universe of positioning and navigation technologies."*

DOT's findings and guidance are consistent with these core principles of the Open PNT Industry Alliance:

- The technological landscape is diverse enough to allow multiple alternatives to GPS/GNSS with varied operational characteristics to deliver against a complex and ever-expanding set of customer requirements.
- True resilience requires the widest possible diversity, meaning that a singular sole-source technology will not only fail to meet the need in terms of reliability and performance but also be unable to evolve the optimal attack prevention and threat response capabilities.

The ingenuity of the private sector, spurred by competition and public and private investment, will drive the emergence of multiple cost-effective GPS/GNSS alternatives that evolve according to technological innovations and market dynamics. Similarly, unbridled innovation will address new and still evolving use cases not supported by GPS/GNSS.

The Open PNT Industry Alliance believes that DOT is in an excellent position to strengthen economic and national security by supporting U.S. Government efforts to accelerate the implementation of many types of backup PNT capabilities for critical infrastructure. Furthermore, we encourage government and business leaders to take steps now to adopt alternative PNT for civil and commercial applications. Read full statement for additional insight.

COMMON QUESTIONS

Why is having a backup to GPS/GNSS such a big deal?	Failure to implement fully capable GPS/GNSS backup solutions in a timely manner would pose an unacceptable risk to the effective functioning of our nation's critical infrastructure for communications, finance, power distribution, and transportation. As such, the alliance fully supports the efforts of national governments (e.g., Executive Order 13905) to require effective alternative PNT capabilities for national critical infrastructure.
Given the scale and scope of GPS/GNSS, it seems that it would be a good idea to have just a single, all-encompassing backup, right?	No. This is because establishing any particular system as the sole backup to GPS/GNSS would continue to expose any nation to a single point of vulnerability for a primary or backup capability. A heterogeneous backup to GPS/GNSS is in the best public interest. Thankfully, there are existing, mature PNT systems developed in the commercial sector that are available today and currently being used by critical infrastructure providers for a variety of applications as secure and robust GPS/GNSS backup solutions.
Wouldn't a system mandated by the government offer the best technology?	No. Member companies are concerned that there are those in industry and government who believe that developing and implementing a single, government-imposed solution is the best approach to solve this resilience issue. Also alarming is that others have sought a government mandate that stipulates a specific technology with certain technical requirements that clearly describe only one specific solution. Members of the alliance hold that only the spirit of free enterprise will ensure the most viable offerings. This is because an open and competitive marketplace is essential to provide full resilience, drive continuing innovation, and deliver cost-effective solutions. In other words, truly resilient and globally available GPS/GNSS backup capabilities are only possible with an open, technology-neutral approach that encourages technology diversity throughout our industry.
What new capabilities could additional PNT systems support?	Using a combination of alternative systems will meet a range of performance specifications and operational characteristics as well as ensure the most resilient backup to GPS/GNSS. Various applications across multiple industry sectors have different timing and location requirements in terms of precision, availability indoors/underground, geographic coverage, 2D vs. 3D positioning, security, support for autonomous vehicles, etc.