

Defense Matters

PNT Standards Development

Homeland Security taps IEEE to set standard, puts PNT resilience on the right path

The Department of Homeland Security (DHS) announced this summer that it had transitioned its effort to develop international industry standards for resilient PNT user equipment to the Institute of Electrical and Electronics Engineers (IEEE).

The development and pursuit of standards has many benefits. From the perspective of equipment design, standards serve as fundamental building blocks that contribute to compatibility and interoperability, reduce risk and speed development. Standards also make it easier to understand and compare competing products. Additionally, they are often used as references in procurement contracts to baseline a product's requirements and measure the degree of conformance.

Until the June 30, 2021 announcement the Resilient Positioning, Navigation, and Timing (PNT) Conformance Framework had been a joint project of DHS's Science and Technology Directorate (S&T) and the Cybersecurity and Infrastructure Security Agency National Risk Management Center.

The transition marked "a major milestone for the department," said Kathryn Coulter Mitchell, S&T's acting under secretary in a press release, and would "impact the future design, acquisition, and deployment of resilient PNT systems within our national critical infrastructure."

Standards From the Start

Indeed, standards played a key role in making GPS what it is today, a fact reflected in the Clinton-era Presidential Decision Directive (PDD NSTC-6) which said the U.S. would "advocate the acceptance of GPS and U.S. Government augmentations as standards for international use."

This first national GPS policy document also made standards part of the work of the Department of Transportation. DOT, "in cooperation with the Departments of Commerce, Defense and State," NSTC-6 said, was to "take the lead in promoting commercial applications of GPS technologies and the acceptance of GPS and U.S. Government augmentations as standards in domestic and international transportation systems."

The Coast Guard had already been working with the Radio Technical Commission for Maritime Services (RTCM) developing the maritime "Standards for Differential Navstar GPS Service" through Special Committee 104 (SC 104). Similarly, the Federal Aviation Administration was developing the Wide Area Augmentation System (WAAS) Minimum Operating Performance Standards (MOPS) with the Radio Technical Commission for Aeronautics (RTCA).

These signal-in-space, service-related augmentation standards, when coupled with the GPS Standard Position Service (SPS) Performance Standard, were powerful tools in achieving the goal of making GPS the world's "Gold Standard" for delivering PNT information.

But the success of GPS has now led to overdependence. Although multiple national policy statements on space-based PNT have addressed the need for backup PNT capabilities in case of GPS disruption, none of the viable options that have been evaluated and recommended have been adopted or advocated for general use by responsible civil government agencies.

This new DHS S&T initiative is a very positive development. It will leverage the capabilities of IEEE's Standards Association (SA), one of the world's largest standards organizations. It actually parallels how the DoD has taken on the challenge of dealing with its own over-dependence challenge in the Strategy for the Department of Defense PNT Enterprise (Public Release August 15, 2019). The strategy is to pursue an open system architecture that enables the incorporation of plug and play PNT devices to meet the demands of diverse mission scenarios.

The Details

The IEEE effort, called Project 1952 (P1952), held its first kickoff meeting on Wednesday, September 15, 2021.

The standard being developed, as defined in the Project Authorization Request (PAR), will specify "technical requirements and expected behaviors for resilient Positioning, Navigation, and Timing (PNT) User Equipment (UE)." The scope is limited, according to the PAR, to "the reception, ingestion, processing, handling, and output of PNT data, information, and signals" and does not include standards relating to the characteristics of

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Prodigy's Graduation Highlights STEM Education Efforts

The recent high school graduation of Alena Wicker, a 12-year-old Texas prodigy with aspirations to become a NASA engineer, brought fresh attention to efforts to boost science, technology, engineering, and math (STEM) education with a special emphasis on programs that could nurture both talent and diversity.

Buoyed by a full scholarship, Wicker has begun pursuing a double major in astronomical and planetary science at Arizona State University. The scholarship was made possible by support from the Phoenix Mercury women's basketball team, Desert Financial Credit Union and Arizona State.

Wicker is already laying the groundwork to pay it forward. She recently launched theBrownSTEMGirl.com to encourage and support girls of color under the age of 18 to pursue their interests in STEM.

Wicker is not the only one looking to bolster STEM opportunities. Groups like the ones below, often locally focused, have built programs to inspire, encourage and support students from grade school through college as they launch their professional lives in STEM.



Alena is awarded a 4-year scholarship to Arizona State University courtesy of the Phoenix Mercury WNBA team, Desert Financial Credit Union and Arizona State.

Photo courtesy of the Desert Financial Credit Union

STEM NOLA — New Orleans, LA

A grassroots New Orleans nonprofit with a long list of corporate partners, STEM NOLA designs and delivers events and other learning opportunities for grades K-12 with an emphasis on reaching kids in the city's under-served communities. Through the schools they offer students demonstrations and hands-on experience with experiments, building kits, and collaborative projects. There are also weeks of robotics summer camps,

which are free to those who qualify based on location or need. To support STEM learning during COVID, STEM NOLA offered weekly at-home programs on STEM topics like rockets, biology and weather.

New Orleans has other STEM efforts as well. The Greater New Orleans STEM Initiative supports teacher training, a LEGO league and a robotics competition that teaches skills in business as well as hardware.

There is also the Greater New Orleans Science & Engineering Fair for middle and high school students. Launched in 1956 it is one of the oldest such events in the United States and now offers more than \$60,000 in cash and prizes.

STEMSTL — St. Louis, MO

The St. Louis Regional STEM Learning Ecosystem (STEMSTL) has built a network of 16 partner organizations to help it offer STEM learning opportunities. It helps connect teachers with lesson plans and other resources and is building a website to aid students and families in finding STEM opportunities outside of school.

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PNT sources.


Based on technical requirements, the new standard will define different levels of resilience to enable users to select a level that is appropriate based on their risk tolerance, budget, and application criticality. This standard applies to user equipment that outputs PNT solutions and includes "PNT systems of systems, integrated PNT receivers, and PNT source components (such as Global Navigation Satellite System (GNSS) chipsets)."

"This standard defines expected behaviors in resilient PNT UE and facilitates

development and adoption of those behaviors through a common framework that enables improved risk management, determination of appropriate mitigations, and decision making by PNT users," the need statement says. "The standard allows stakeholders to define and communicate resilient PNT UE needs and evaluate proposed resilience solutions in a consistent, uniform manner."

The stakeholders for the standard include manufacturers of PNT UE, public and private sector users of PNT UE, and providers of PNT services focused

on critical infrastructure, says the PAR. "These include Power Generation and Utility, Telecommunications, Finance, Transportation, Agriculture, Space, and Emergency Services sectors."

The engagement of the IEEE in this effort, which is expected to take a year, promises that the future critical infrastructure needs for resilient PNT user equipment beyond just GPS will finally be addressed. We can all be optimistic that this will be the case and should continue to encourage the IEEE to expeditiously complete this project. 

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