SATELLITE TIME & LOCATION

greater signal strength than GPS, exceptional reliability, and high security

As one of the most important innovations of the last 50 years, GPS has revolutionized how we travel and how we communicate, and it is also crucial to our safety. Our national critical infrastructure — which includes communications networks in addition to the power grid, financial exchanges, transportation systems, and others — depends on synchronizing local clocks using GPS to accuracies of better than a millionth of a second.

The more that our society relies on GPS signals, the more important it is to safeguard them. Unfortunately, there is no backup in place. This means critical infrastructure is vulnerable to radio signal interference that disrupts GPS service, susceptible to counterfeit signals that misinform GPS devices, and subject to potential GPS outages that could have disastrous implications. That's why the time to implement a backup to GPS is now.

A Sense of Urgency

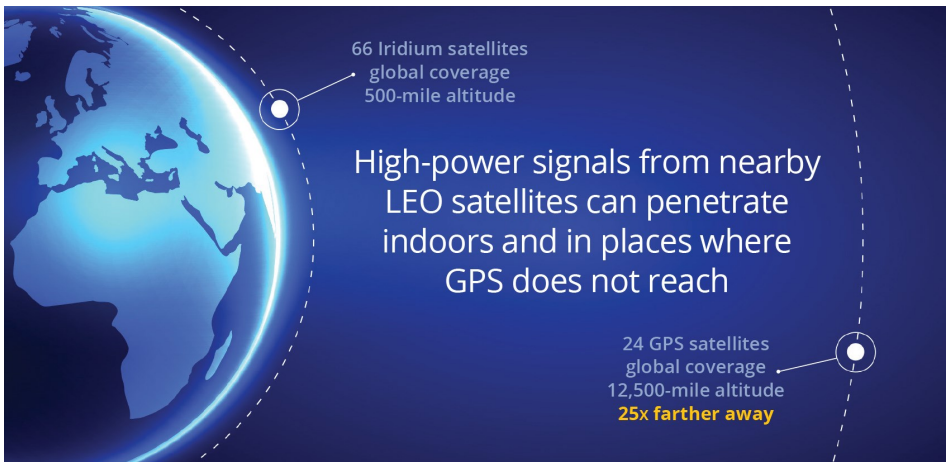
A presidential executive order was issued on February 12, 2020, for the purpose of strengthening the resilience of positioning, navigation, and timing (PNT) services upon which U.S. critical infrastructure depends. The policy is to ensure that disruption or manipulation of PNT services do not undermine reliable and efficient functioning of our critical infrastructure.

The executive order directs that critical infrastructure owners and operators in the U.S. implement alternative sources of PNT as a backup to GPS. Satelles® is prepared to help communications providers, wireless carriers, and cable operators understand the timeline of the order, navigate through the service-related policy implementation steps, and implement practical and affordable alternative PNT solutions.

GPS Backup and Augmentation Solution

Satellite Time and Location (STL) from Satelles provides an alternative PNT service that is complimentary to GPS. Using the Iridium® Low-Earth-Orbit (LEO) satellite constellation, STL is unique in that its signals are powerful, extremely secure, and available worldwide.

- STL's high-power signals are 1,000 times stronger than GPS, allowing them to penetrate deep into GPS-challenged environments where signals are obstructed or degraded, including indoors and underground.
- The complex, overlapping beam patterns of the satellites combined with modern cryptographic techniques allow Satelles to deliver a trusted time and location capability that is highly secure.
- An innovative mesh architecture of 66 cross-linked LEO satellites forms a global network in space to ensure a robust time and location service everywhere – including all urban and rural locations.
- Timing solutions are available with sub-microsecond and sub-hundred-nanosecond accuracies, with zero long-term drift.



The Advantages of STL as Alternative PNT for Wireless Carriers and Cable Operators

Wireless communications networks around the world rely on accurate timing and synchronization from GPS (or GNSS) signals to function properly. The loss of GPS via disruption, manipulation, equipment failure, or spacecraft anomaly has been known to disable critical equipment, including macrocells, distributed antenna system (DAS) installations, and small cells.

LTE networks are particularly vulnerable to timing anomalies and often have timing requirements of one microsecond or better. The requirements of 5G are even more stringent. Single-tower timing errors outside of this range have the potential to disrupt communications over a broad local region, and a widespread outage of GPS could potentially render communications inoperable over entire nations.

For DAS and other in-building wireless installations, STL offers the added advantage of timing signals that penetrate most structures, including buildings with low-emissivity (Low-E) windows or metal and concrete siding and roofing. This means that in-building wireless installations that leverage STL can maintain synchronous timing without the need for an external GPS antenna. Femtocells — which are typically found in indoor locations where GPS is not available — also require precision location (to support emergency services) as well as timing, and STL offers both time and location for these devices.

Having a signal that passes through structures is especially important for buildings where securing roof rights, obtaining landlord permissions, or complying with local zoning restrictions are a challenge. An indoor solution for assured PNT also lowers cost and reduces the risks of installation and maintenance.

Modules using STL are capable of receiving both STL and GNSS signals, offering operators the best of both technologies. PNT solutions based on STL also detect and mitigate GPS/GNSS signal disruption and manipulation.

Executive Order 13905 — "Strengthening National Resilience through Responsible Use of Positioning, Navigation, and Timing Service"

The order signed by the President in February 2020 specifies several interrelated policy implementation steps and assigns actions to multiple executive branch departments and agencies. This federated approach will define PNT needs for the 16 critical infrastructure sectors (including the Communications sector).

For example, the executive order outlines multiple directives, some of which were fulfilled within the first year:

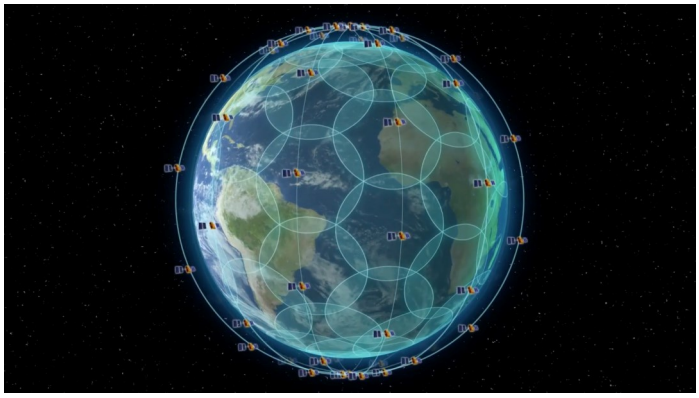
- make available a **GNSS-independent source of Coordinated Universal Time**
- publish a **national R&D plan for PNT**
- develop a **foundational PNT profile**, a cybersecurity framework for the responsible use of PNT

Now that the foundational PNT profile is available, the executive order directs the U.S. Department of Commerce to work with the federal government department and agency heads of the critical infrastructure sectors to **develop sector-specific PNT profiles**. The aim is to encourage critical infrastructure owners and operators to include the responsible use of PNT services in cybersecurity plans by supporting efforts to:

- identify systems dependent on PNT
- identify appropriate PNT sources
- detect disturbances and manipulation of PNT services
- manage the risks to these systems

Future actions under the executive order include implementing pilot programs to engage with critical infrastructure owners and operators to evaluate the responsible use of PNT services; incorporating PNT profile information into federal contracts for products, systems, and services that integrate or utilize PNT services; and performing ongoing updates to the PNT profiles and the national plan for alternative PNT.

Visit www.satellesinc.com/e-o-13905/ for additional details about Executive Order 13905.



Count on Assured PNT with STL

Satelles offers alternative PNT at levels of stability, reliability, and trust required by commercial enterprises and government entities across a range of critical infrastructure applications. STL is available today, offers both urban and rural coverage, and has the operational readiness that private sector leaders and civil government officials expect when ensuring uninterrupted access to PNT sources that backup GPS and strengthen the resilience of our national critical infrastructure.

Evaluation kits are available for wireless carriers and cable operators to help determine the suitability of STL for commercial applications. Please contact Satelles for more information.

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