State Efforts to Establish Terrestrial GPS Backup Systems

18 March 2025

IWCE
Connecting Critical Communications

#IWCE25

Agenda and Presenters

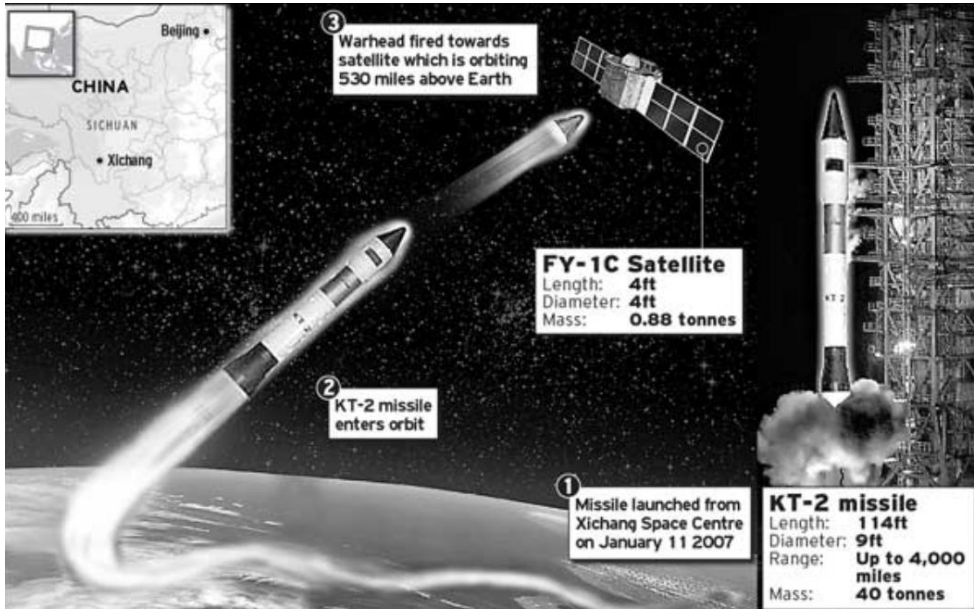
- Walt Magnussen Ph.D.
  - Director TAMUS ITEC
- Logan Freeman
  - Sr. Research Network Engineer
- Jared Vandenheuvel
  - Texas DPS
- Joe Fournier
  - Defense Research/Development Canada

- DHS Support and MCX Background
- Technical Solutions
- State of Texas Plan
- Canadian participation

Why is this important

- GPS is inexpensive, reliable (until it's not) and pervasive.
- GPS has been embedded in most of our critical infrastructure increasing our dependence.
- If you wanted to do serious damage to the United States GPS denial could result in loss of life, harm to our economy and civil unrest "Leave the World Behind".
- Next Generation Warfare will require Next Generation defensive systems.

Examples of current threats



RESILIENT NAVIGATION and TIMING FOUNDATION
Speaking Up for GPS/GNSS Users

HOME JOIN NOW WHO WE ARE WI

FCC investigates Amazon over alleged marketing of wireless signal jammers – NBC

by Editor | Mar 25, 2024 | Blog

Figure 1. Commercial pilots are reportedly concerned with an increasing number of GPS spoofing incidents, during which false signals are sent to them while in the air (Reuters)

Shutterstock

Russia is signaling it could take out the West's internet and GPS. There's no good backup plan. - Aol.

DHS funded Position Navigation and Timing (PNT) Testing and Research

- Two phases funded by DHS for a total of approximately $1 million
  - Phase I – Oct 22 to Sept 23
    - What are potential alternate sources for PNT?
    - What are PNT requirements (LMR and other Critical Infrastructure)?
    - Other PNT research and testing.
    - What are the requirements for a PNT Test Range?
    - Final report submitted..
  - Phase II – Oct 23 to Sept 24 This is a SWOT analysis of the National Guard Bureau National Integration of Time Resiliency for Operations (NITRO)
    - NITRO to place about 180 Master synchronization nodes across the United States. Use NIST for original timing source and sync all 180 nodes with each other.
    - Determine best methods for States to distribute timing to all critical infrastructure within their states. Evaluating PTP, Data Casting and SOOP.
    - Document Physical, Social, Economic and Legal Considerations.
    - Final Report submitted

What Critical Infrastructure is at risk.

- Commercial wireless
- Public Safety LMR (simulcast)
- Transportation
- Utility Power Distribution
- Banking and Finance Systems

What can we do -

- Research, fund and deploy a terrestrial resilient PNT network.
- In place or being built in Russia, China, North Korea and Iran.
- Two parts to this network –
  - Core timing and synchronization nodes (distributed)
  - Distribution to critical infrastructure sites – no one best solution

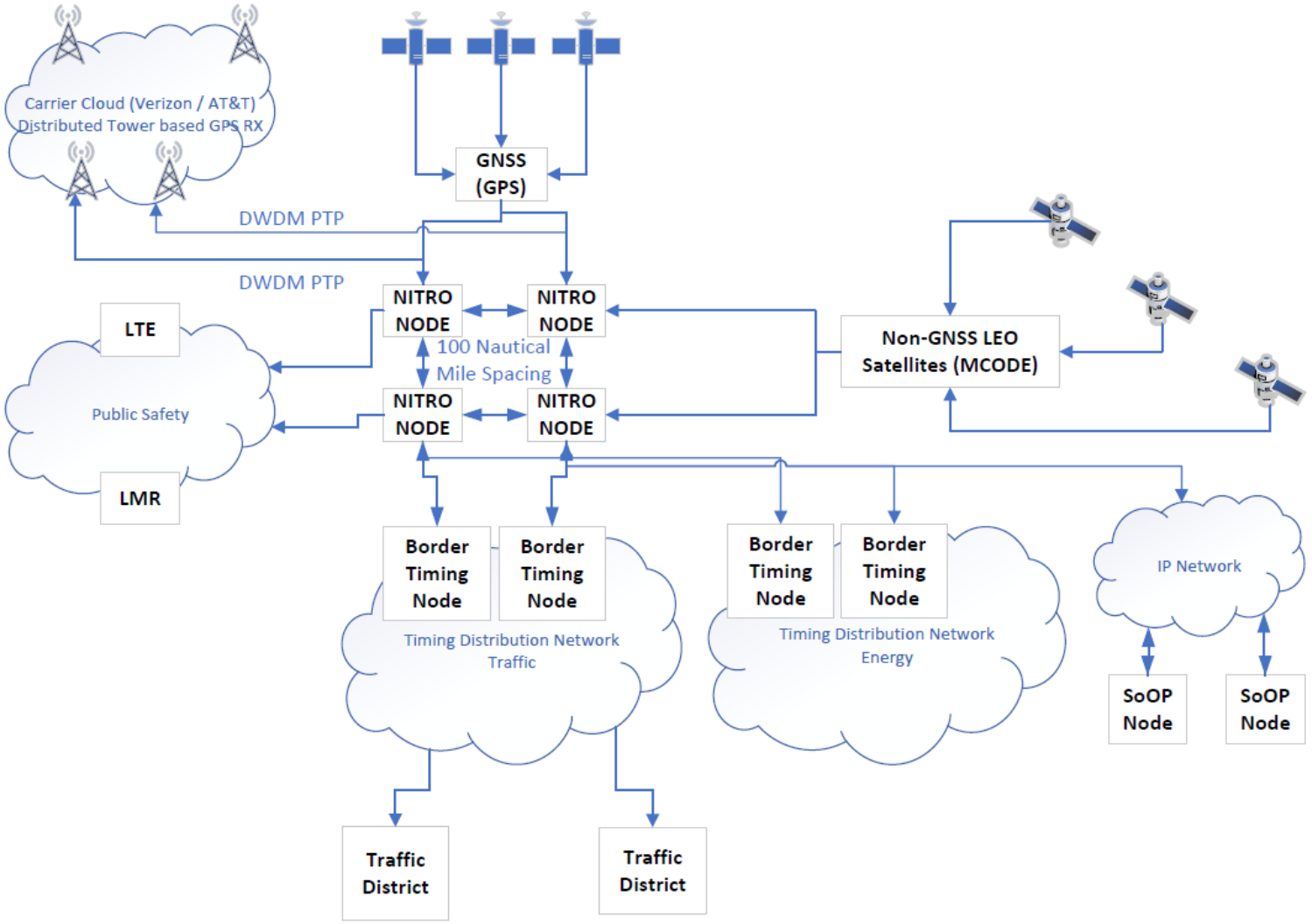
Nationwide Integration of Time Resiliency for Operations (NITRO)

Information Brief

April 26, 2023

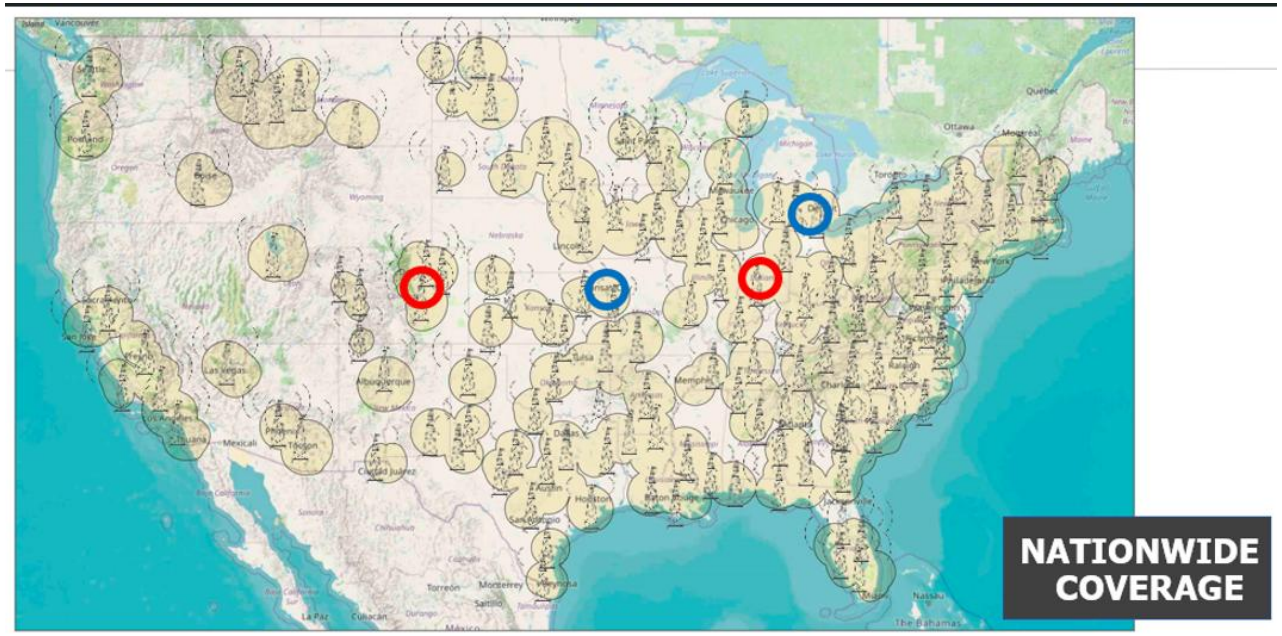
Version 1

High Level Architecture NITRO



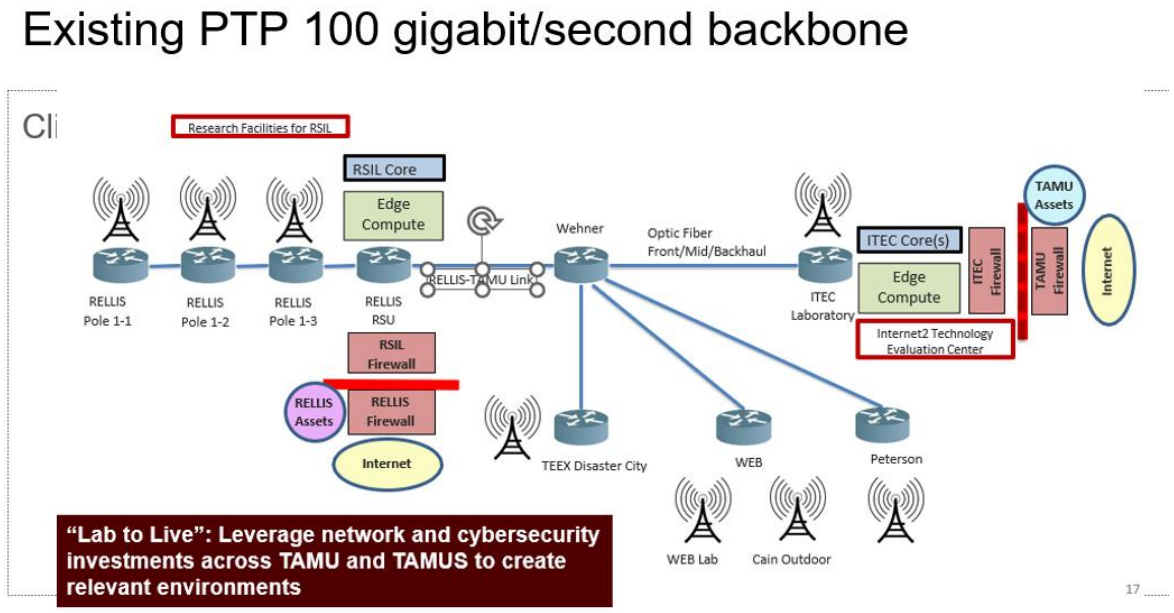
Last Mile Distribution methods

- ATSC-3 Television Broadcast
  - Embed timing and navigation info into TV broadcast
  - Receivers available today
  - Medium range coverage (50 to 70 miles)
  - Can not provide ubiquitous coverage
  - Business Model unknown

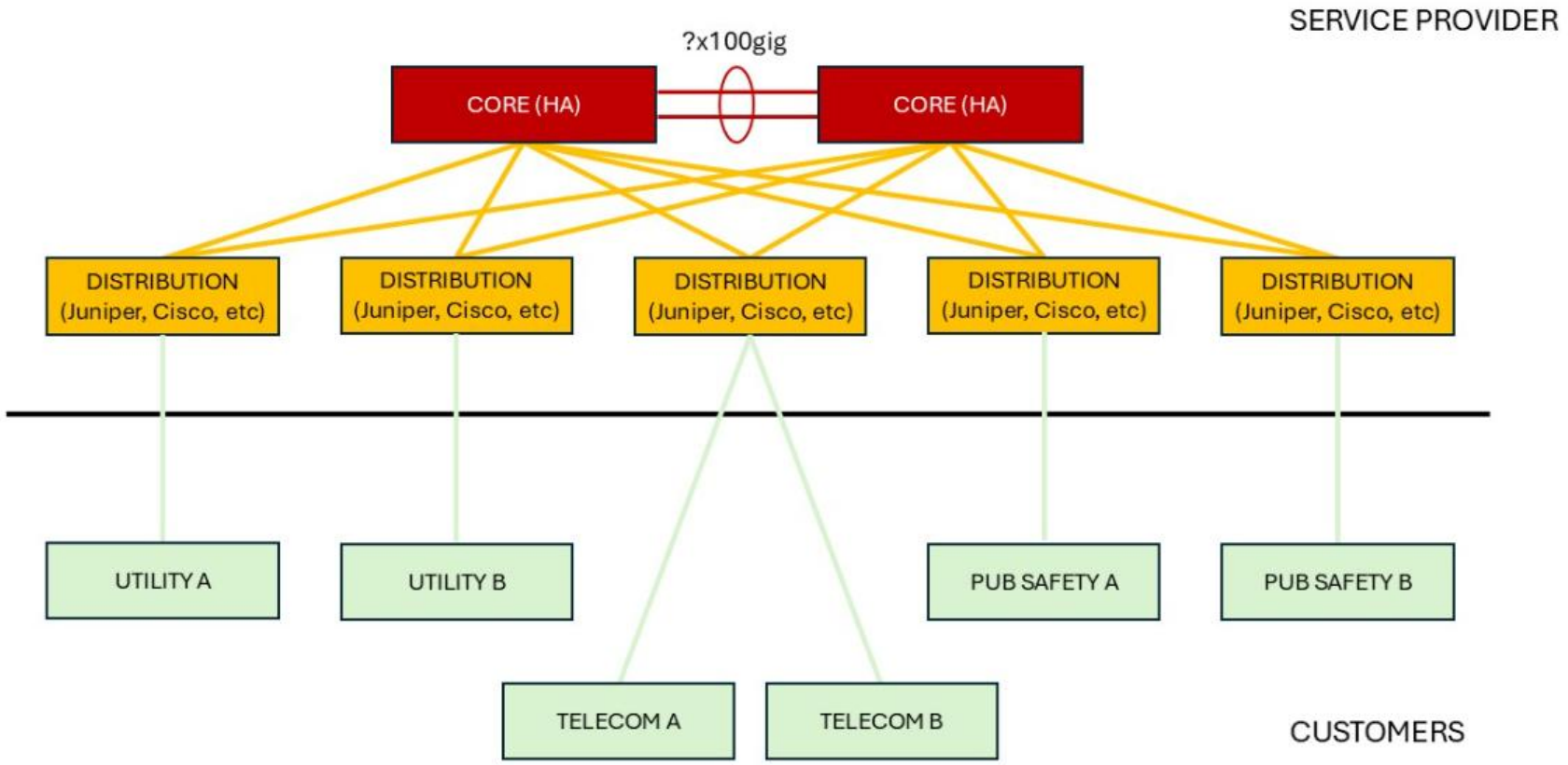


Last Mile Distribution methods - Continued

- Fiber Based Precision Timing Protocol
  - Fiber is widely deployed by service providers and others.
  - PTP Protocol is IEEE 1588 standard based.
  - Sub msec accuracy (good for Next G wireless).
  - Increased cost
    - PTP enabled network devices (relatively small incremental cost)
    - Cost of fiber-based network resources (service provider)

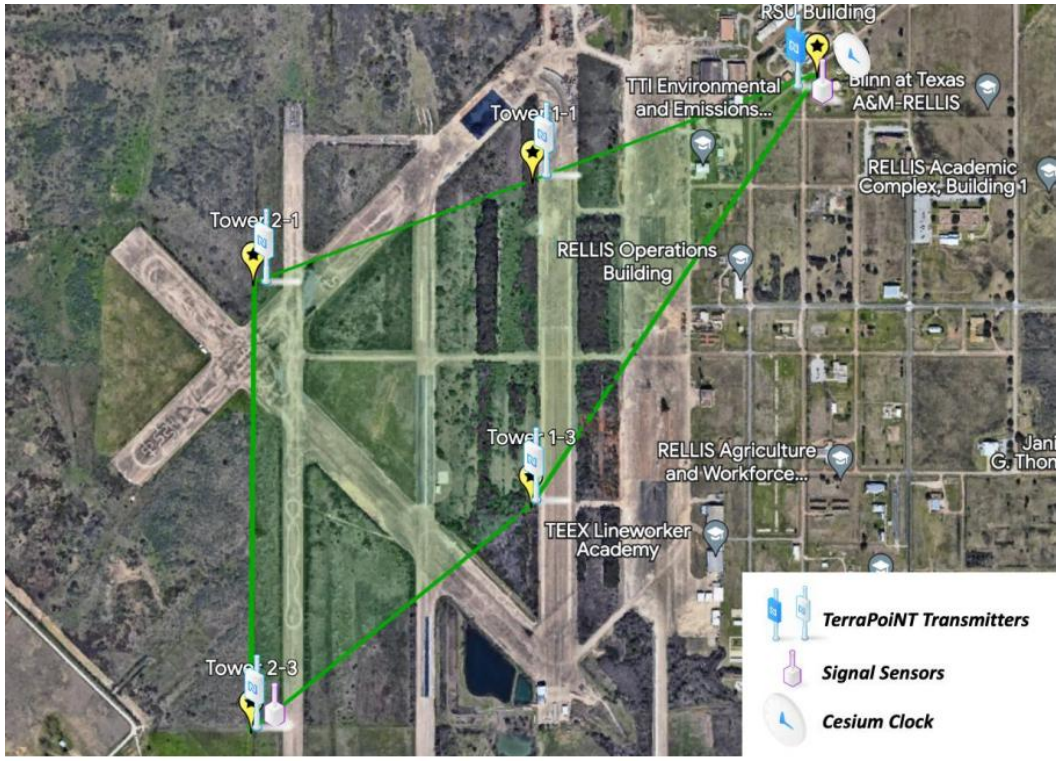


Typical Service Provider's Metro Ethernet Today



Last Mile Distribution methods - Continued

- **Next Nav**
  - Local RF transmitters
  - Operates at 900 MHz – good building penetration in dense environments
  - Local Control of operations
  - Better suited for urban environments.



What is Next

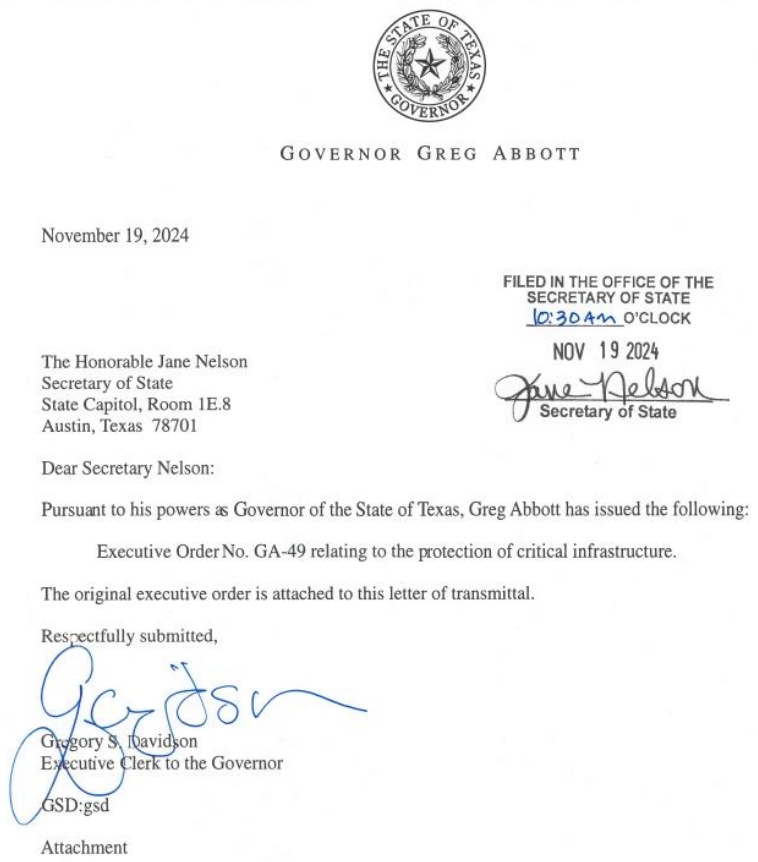
- National Guard Bureau Design
  - Nationally coordinated effort for core networks
  - State driven implementation “If you’ve seen one state, you’ve seen one state”
- Federal Role – TBD
  - Coordinate distribution of State nodes
  - National level monitoring Are attacks coordinated?
- State Roles
  - Determine best technology for each state
  - Work with border states.
  - Manage operational contracts.
  - Coordinate critical infrastructure efforts.

Texas Efforts

- Establish Texas Stakeholders Group
  - Texas Military Department (TMD)
  - Texas Department of Public Safety (including SWIC)
  - Texas Department of Transportation
  - Texas Transportation Institute
  - Texas Division of Emergency Management
  - Texas Department of Information Resources
  - Energy Reliability Council of Texas (ERCOT)
  - Harris County
  - Texas A&M University System ITEC (technology SME)

Other Efforts in this Space

- GA – 49 How do we protect critical infrastructure?
- Promoting the Development of Positioning, Navigation and Timing Technologies and Solutions - FCC NOI WT Docket No. 25-110. To be voted on by Commission 03/27/2025.



GOVERNOR GREG ABBOTT

November 19, 2024

FILED IN THE OFFICE OF THE SECRETARY OF STATE
10:30 AM O'CLOCK
NOV 19 2024
Secretary of State

The Honorable Jane Nelson
Secretary of State
State Capitol, Room 1E.8
Austin, Texas 78701

Dear Secretary Nelson:

Pursuant to his powers as Governor of the State of Texas, Greg Abbott has issued the following:

Executive Order No. GA-49 relating to the protection of critical infrastructure.

The original executive order is attached to this letter of transmittal.

Respectfully submitted,

Gregory S. Davidson
Executive Clerk to the Governor

GSD:gsd

Attachment

Positioning, navigation and timing technologies

The Global Positioning System (GPS) is indispensable to the military and other industries for precise positioning, navigation and timing (PNT). However, satellite signals are increasingly vulnerable to accidental or intentional interference and are generally unavailable in certain locations, such as indoors, underground or underwater. Additionally, satellites are susceptible to damage or destruction by space debris or attack. Consequently, transitioning to non-GPS dependent solutions for PNT is essential to ensure resilience of existing and future civilian and military platforms.

Next Steps

- Funding of a Resilient GPS test bed - $4 million
  - All technologies available for testing –
  - POC to look at technology mixes, governance, requirements etc.
- Coordinated efforts between states.
- Plan for Federal leadership
  - National Guard Bureau
  - US DoT
  - US DoD
  - US DHS
- International Coordination

Questions ???

- Contact Dr. Walt Magnussen
  - Email w-Magnussen@tamu.edu
  - Cell +1 979-777-0999