National Positioning Navigation and Timing Architecture

Civil GPS Service Interface Committee Meeting

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Overview

• PNT Architecture Background
• Architecture Development
• Guiding Principles
• Recommendations
• Next Steps
More Effective & Efficient PNT and an Evolutionary Path for Government Provided Systems & Services

- **RITA** will lead effort on behalf of DOT for the civil community
- **NSSO** will develop a National PNT Architecture
- **NPCO** will initiate an effort with NSSO
Primary Objective

“...provide more effective and efficient PNT capabilities focused on the 2025 timeframe and an evolutionary path for government provided systems and services.”

--- Terms of Reference

**Capability**

- Near & Mid Term Decisions Guided by Architecture
- Based on Long Term Vision

**System Emphasis**

- Evolved Baseline (EBL)
- Should-Be Architecture

**Architecture Emphasis**

- As-Is Architecture
- Without Enterprise Architecture Strategy

**Timeline**

- Now
- 5 Years
- 10 Years
- 15 Years
- 20 Years
**Scope**

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*Broad Scope Required Innovative Approaches and Focused Analysis Efforts*
Primary PNT Gaps

- Gaps primarily drawn from military’s PNT Joint Capabilities Document, with additions and modifications from parallel civil community documents and discussions
  - Operations in Physically Impeded Environments
  - Operations in Electromagnetically Impeded Environments
  - Higher accuracy with integrity
  - Notification of Hazardously Misleading Info (Integrity)
  - High Altitude/Space Position and Orientation
  - Geospatial information - access to improved GIS data (regarding intended path of travel)
  - Insufficient modeling capability
Cumulative Process

Data Gathering

Needs & Gaps

Environment, Technology & Evolved Baseline

Concept Development

Trade Space, Features & Architectures

Analysis & Assessment

Guiding Principles

Community Involvement

Architecture Development Team, Subject Matter Experts, Small Working Groups & Industry

Analytical Framework
Guiding Principles

VISION
US Leadership in Global PNT

STRATEGY
Greater Common Denominator

VECTOR
Multiple Phenomenologies

VECTOR
Interchangeable Solutions

VECTOR
Synergy of PNT & Communications

VECTOR
Cooperative Organizational Structures
US Leadership in Global PNT

• Based on a foundation of national policy
• Efficiently develop and field the best technologies and systems (e.g. cost, schedule, acceptable risks, user impact)
• Promulgate stable policies (commitment to funding, commitment to performance, advanced notice of change, etc)
• Foster innovation through competition within the commercial sector
• Ensure robust and enduring inter-agency coordination and cooperation
• Maximize the practical use of military, civil, commercial and foreign systems and technologies
• Judiciously develop and apply standards and best practices
Strategy

The US can Best Achieve Efficiency and Effectiveness through a Greater Common Denominator Approach

• Recommendations
  – Maintain GPS as a cornerstone of the National PNT Architecture
  – Monitor PNT signals to verify service levels, observe environmental effects, detect anomalies, and identify signal interference for near real-time dissemination
  – Transition or divest US GNSS augmentation assets that are unnecessarily redundant after capability is available from GPS modernization or other methods
  – Continue to investigate methods to provide high-accuracy-with-integrity solutions for safety-of-life applications
  – Develop a national approach to protect military PNT advantage
Vector: Multiple Phenomenologies

- Recommendations
  - Encourage appropriate development and employment of equipment that integrates information from diverse sources and information paths.
  - Assess the potential for the use of foreign PNT systems for safety-of-life applications and critical infrastructure users and, as appropriate, develop clear standards and criteria for their use.
  - Continue military PNT exclusive use policy while studying development of capabilities to enable military use of other signals.
  - Promote standards for PNT pseudolites and beacons to facilitate interchangeability and avoid interference.
  - Study evolution of space-based and terrestrial PNT capabilities to support diversity in PNT sources and information paths.
  - Ensure critical infrastructure precise time and time interval users have access to and take advantage of multiple available sources.
Vector: Interchangeable Solutions

• **Recommendations**
  
  – Use participation in international PNT-related activities to promote the interchangeability of PNT sources while assuring compatibility
  
  – Evolve standards, calibration techniques, and reference frames to support future accuracy and integrity needs
  
  – Identify and develop common standards that meet users’ needs for PNT information exchange, assurance and protection
  
  – Establish common standards that meet users’ needs for the depiction of position information for local and regional operations
Vector: Synergy of PNT & Communications

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Pursue, where Appropriate, Fusion of PNT with New and Evolving Communications Capabilities

• Recommendation
  – Identify and evaluate methods, standards and potential capabilities for fusion of PNT with communications
Vector: Cooperative Organizational Structures

Promote Interagency Coordination & Cooperation to Ensure the Necessary levels of Information Sharing

- Recommendations
  - Develop a national PNT coordination process
  - Identify and leverage centers of excellence for PNT phenomenology and applications
  - Define, develop, sustain, and manage a PNT modeling and simulation core analytical framework
Recommendation Tree

US Leadership in Global PNT

The US can Best Achieve Efficiency and Effectiveness through a Greater Common Denominator Approach

Vision

Strategy

Vectors

Recommendations

1. Multiple Phenomenologies
2. Interchangeable Solutions
3. Synergy of PNT & Communications
4. Cooperative Organizational Structures
5. Protect Strategic Advantage
6. Integrated User Equipment
7. Civil Use of Foreign PNT
8. US Military Use of Non-Military Signals
9. PNT Pseudolites & Beacons
10. Evolution of PNT Capabilities
11. Critical Infrastructure & Time
12. Interchangeability with Foreign PNT Sources
13. Standards & Reference Frames
15. Grids & Coordinate Systems
16. Synergy of PNT & Communications
17. National PNT Coordination Process
18. Phenomenology & Application Champions
19. Modeling & Simulation Framework
A Plan to Achieve the Should-Be Architecture is Produced & Implementation Begins

The National PNT Architecture Effort Employs an Iterative, Interagency Process to Plan US Leadership in Global PNT

Architecture Development Transition Planning Implementation

v1 Should-Be Architecture

v2 Should-Be Architecture

vN

Effort Re-Examines the PNT Environment and Crafts and Implements the Next 20-Year Should-Be Architecture

Effort Repeats--the Next New Should-Be Architecture is Developed, Planned, and Implemented

Transition Plan provided to agencies

Architecture Effort and Schedule
Next Steps

- **Workshop(s) to Obtain Public Feedback on Recommendations**
    - **Date:** September 16
    - **Time:** 1PM – 4PM, starting with a presentation by NSSO
    - **Location:** Savannah International Trade and Convention Center, Rooms 105 & 106

- **Influence update to PNT planning documents**
  - Federal Radionavigation Plan
  - Five-Year National Space-Based PNT Plan

- **Architecture Transition Plan**
  - Event-based implementation timeline
  - Coordinate through Decision Coordination Group members and co-sponsors as appropriate
Points of Contact

• National Security Space Office
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