GPS Architecture Resiliency

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COMMANDER, MISSION DELTA 31

Highest Overall Classification:
UNCLASSIFIED

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PNT Delta (P) to Mission Delta 31

Mission Delta 31 will be activated on 15 October 2024

Mission Delta 31

- **31st Capability Development Squadron (31 CDS)**
- **2d Navigation Warfare Squadron (2 NWS)**
- **31st Sustainment Squadron (31 STS)**
- **MD 31 Detachment 1 (DET 1)**

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As of: 9/23/2024

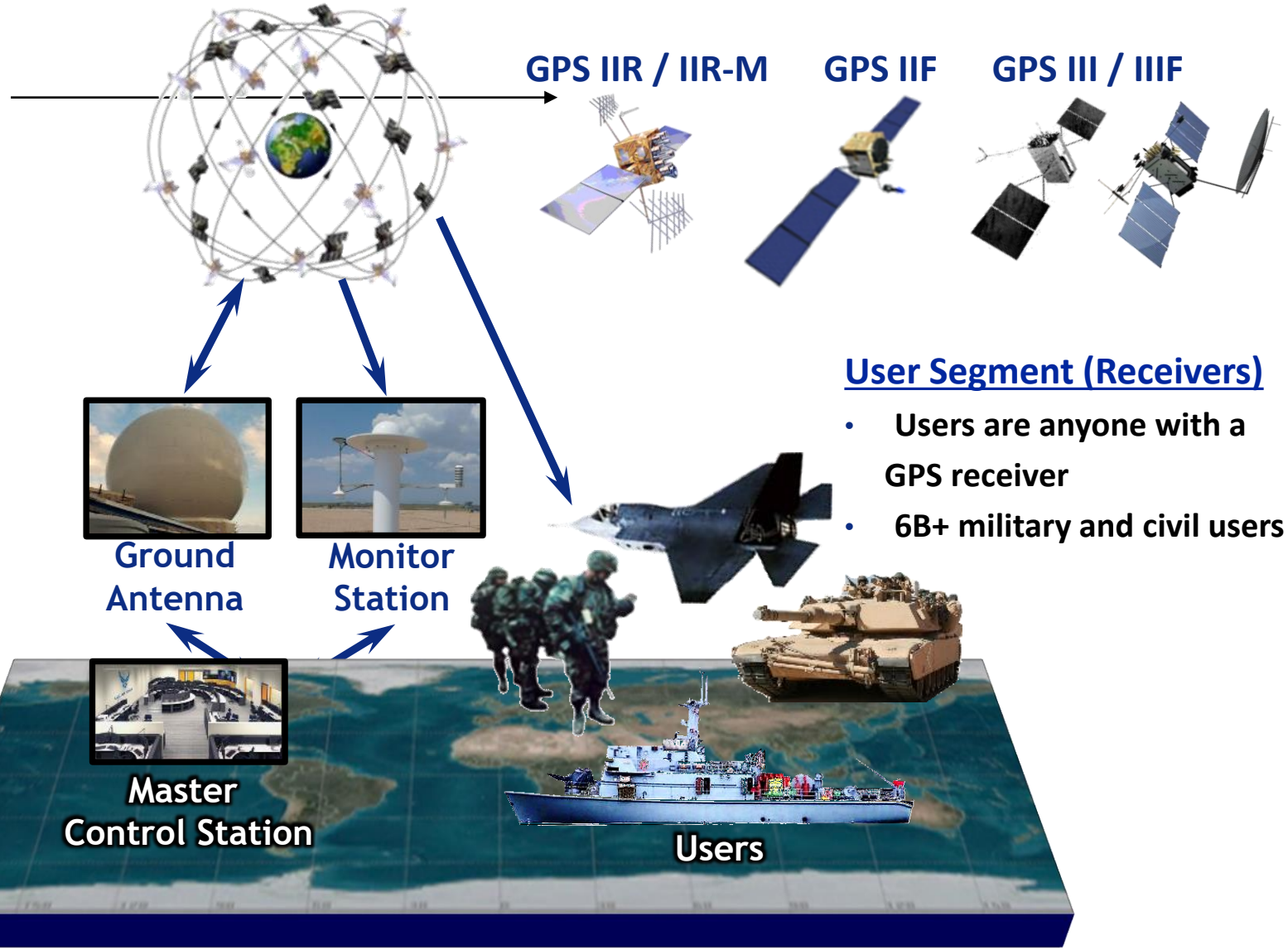
GPS Enterprise Architecture

Space Segment (Satellites)

- Current: 31 broadcasting, plus residuals (6)
  - 6 orbital planes, 4/5 satellites each
  - Semi-synchronous orbit

Control Segment (Ground)

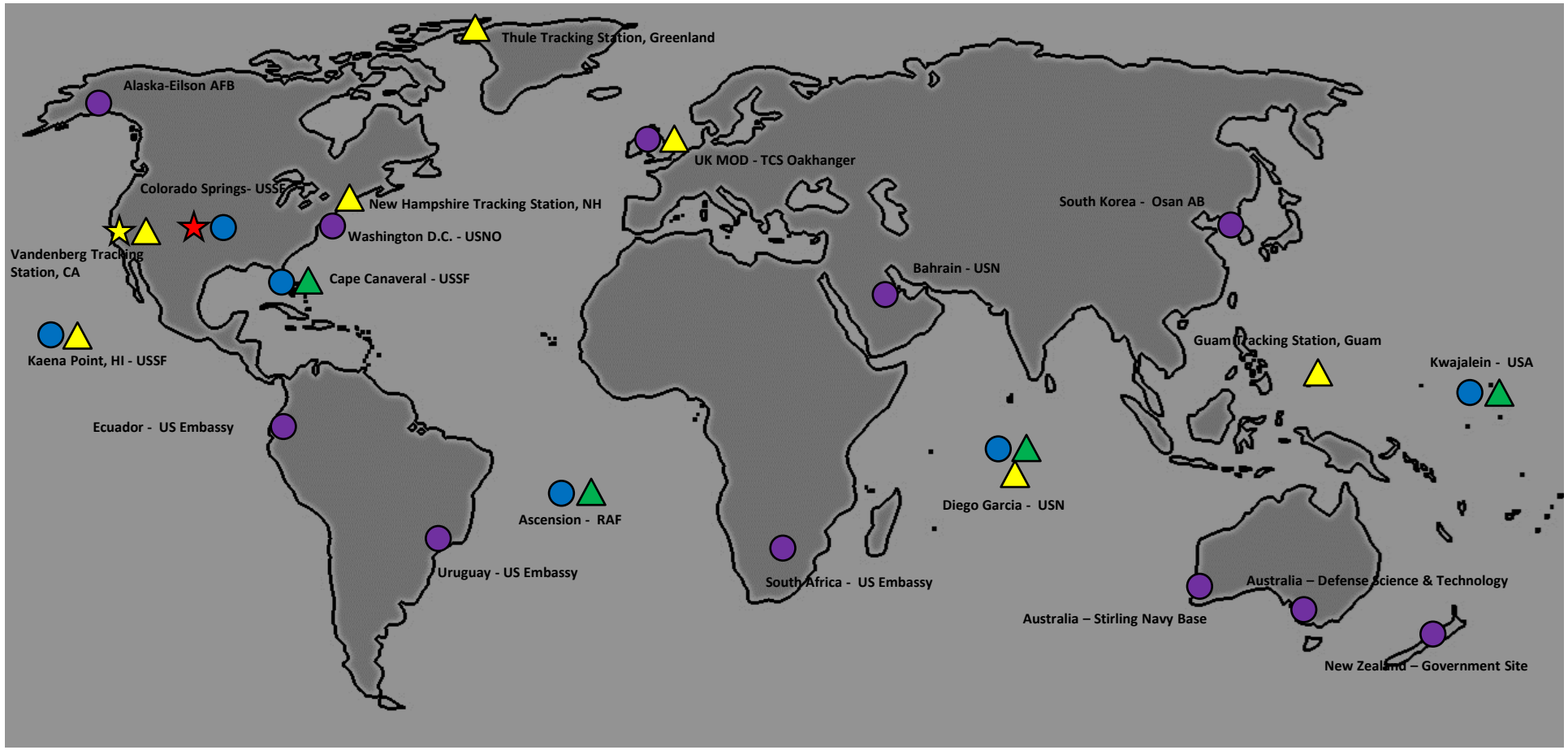
- Master Control Station (MCS) - Schriever SFB
- Ground Antennas (4) and USSF Monitor Stations (17)
- Backup facility – Vandenberg SFB, CA



User Segment (Receivers)

- Users are anyone with a GPS receiver
- 6B+ military and civil users

Global Architecture & Mission Partners



- Master Control Station (MCS)
- Alternate Master Control Station (AMCS)
- Ground Antenna
- Satellite Control Network (SCN) Remote Tracking Station
- National Geospatial Agency (NGA) Monitor Stations
- Space Force Monitor Station

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Control Stations

Master Control Station, Schriever SFB, CO

- The Master Control Station (MCS) is located at Schriever SFB, Colorado. GPS is controlled 24/7 from this site.
- The Alternate MCS is located at Vandenberg SFB, California, enabling continuity of operations in the event of ground systems failure at the MCS.

Operating Locations

Ascension Island – 2 SOPS OL-A

Kwajalein Atoll – 2 SOPS OL-B

Cape Canaveral – 2 SOPS OL-C

Diego Garcia – 2 SOPS OL-D

Exercises

A series of intel-driven, Mission Delta 31-wide exercises that will stress operations and personnel in order to define minimum thresholds and executable response options

Criteria:

- 24-hour minimum outage. The scenarios will span multiple crews with multiple changeovers
- Affects real operations. Not a table-top discussion
- Units will be tested on mission planning, debriefing & quality of changeover
- Scenarios may escalate & compound the initial injects

Goals:

- Discover solutions to tactics & system limitations
- Identify operations & personnel stress thresholds
- All units will execute & provide lessons learned
- Utilize Mission Planning for exercise planning

User Range Error (URE)

What is a URE?
Used to describe the discrepancy between the actual position of a GPS receiver and the position estimated based on the signals it receives from satellites. Essentially, URE reflects the inaccuracies in the location data provided to users.

New CONOPs (Early 2024)

- Continency Nav Uploads are now at 0.7m instead of 3.0m
- Clock Swaps
  - All Rubidium Atomic Frequency Standard

Results

- Baseline NGA URE: 48.87 cm
- Current NGA URE: 23.7 cm
  - 48% decrease in error from 2023 Q4 Baseline

User Impact

- Warfighter
- DoT/FAA
- HANU

Future Consideration

- Aging clocks and satellites
- Switching back to Cesium frequency standards on Block IIF Space Vehicles will degrade constellation performance
- Launching new satellites is the only solution to maintain current level of performance

Discussion

- or -

Questions?