

## Profile of Responsible Use of PNT Services

Ascent Technologies was founded in 2004 by Moises Carreon II. Moises has over 30 years of GPS experience and our staff bring over 100 years of company-wide consolidated experience. POC-Liz Carreon - (301)455-1751 or (719)559-3897

Specializing in systems engineering and all facets of testing and integration, including PNT, Ascent is a key member of the Global Positioning System (GPS) control segment development. Our customers include Lockheed Martin, Raytheon, Northrup Grumman and the USAF.

## Profile of Responsible Use of PNT Services - Response

The problem space: improve the PNT signal integrity and enhance performance of critical civil users. There are 2 sets of users: stationary and mobile.

### Stationary users:

For power grids, agriculture, cell towers, ...

**SNR check** – The receiver system discards signals that are above a certain threshold. This requires Signal to Noise Ratio (SNR) profile for each GPS satellite (SV). The system would measure the SV signal and if it was outside the SNR profile and its tolerance, the SV would be rejected as a potential spoof.

**Antenna upgrades** – Upgrade the antenna to provide better signal strength and directional capabilities. If the signal does not match the expected pseudo range and doppler based on the SV orbit (from the almanac), then the SV is rejected.

**Solution cross check** – The receiver system calculates a solution using C/A, L2C and L5 to cross check the received SV signal. This will confirm the solution. Spoofing a single signal is straightforward but more difficult when there are several codes that need to be spoofed.

**Survey the stationary sites.** If a receiver solution provides a location outside the surveyed point and its tolerance, the SV is excluded, and the solution recomputed with a different set of SVs.

### Mobile users:

**SNR check** – The receiver system discards signals that are above a certain threshold. This would require a signal survey where the Signal to Noise Ratio (SNR) profile is captured for each GPS satellite (SV). The system would measure the SV signal and if it was outside the SNR profile and its tolerance, the SV signal would be rejected.

**Antenna upgrades** – Upgrade the antenna to provide better signal strength and directional capabilities. If the signal does not match the expected pseudo range and doppler based on the SV orbit (from the almanac), then it is rejected.

**Solution cross check** – The receiver system calculates a solution using C/A, L2C and L5 to cross check the received SV signal. This will confirm the solution. Spoofing a single signal is straightforward but more difficult when there are several codes that need to be spoofed.

### Potential upgrades:

Upgrade the civil signal to contain digital signatures. Only critical users are provided the specifics to check the digital signature that will change periodically.

### Outstanding question:

Receiver S/W updates to provide SNR checks, directional checks for the SV signal, cross check solutions using other civil signals.

### Submitted by:

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