

Framing the GPS dependency issue

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Let's take as a given:

- Utilities depend on GPS and Global Navigation Satellite Systems for a variety of real-time operational needs beyond phasor systems, including communications (timing) and field workforce management (navigation).
- GPS and other GNSS can fail due to system or local, natural or malicious causes
- We need redundant back-ups or fail-over methods for timekeeping if synchrophasor technology is to become trusted and mission-critical.
- Hardening or defending utility GPS against attack won't protect GPS against many potential causes of failure.
- For mission-critical real-time utility applications, it's more useful and pressing for us to address timing than navigation issues.

Here are the questions we need to be able to answer about GPS and GNSS:

- 1) How can we tell if signals from a GPS receiver (or other timekeeping system) are trust-worthy?
- 2) If you determine that the timing signal is untrustworthy, can the PMU or PDC fail over to a back-up time source?
- 3) If we use SONET or other network time sources or on-board clocks as a back-up or alternate time source, how long will that time source remain accurate or drift to an unacceptable time offset?

More timekeeping questions

- 4) Once we have multiple PMUs and PDCs operating on distributed time sources, how do we coordinate time and synch data across these devices on dispersed time sources?
- 5) For real-time phasor data applications, how do we treat data from PMUs with potentially compromised time stamps?
- 6) How do we tell when the GPS or other external time signal is trustworthy again?
- 7) When GPS/GNSS is trustworthy again, how do we resynch timing from multiple PMUs and PDCs?

Big picture questions

- 8) Does GPS have so many vulnerabilities that the utility industry should use other timing systems or methods (rather than GPS) for electric industry mission-critical applications?
- 9) Should we be asking North American PMU and PDC manufacturers and buyers to design and procure devices that offer a back-up or alternate timing system in addition to GNSS?
- 10) Since telecom networks depend on GPS, what can the utility industry do to reduce our vulnerability to communications network GPS dependence?