



# Timing Systems and GNSS Vulnerabilities

Fall 2016 STAC Summit



# Spectracom

- Data centers and financial
- Defense & aerospace
- Communications & global networks
- Emergency services and security
- Digital broadcast
- High end test & measurement
- GNSS simulation



# Upcoming Leap Second Event



**LEAP SECOND**: A one-second adjustment that is occasionally applied to Coordinated Universal Time (UTC) in order to keep its time of day close to the mean solar time, or UT1.

**December 31, 2016 @ Midnight UTC**

**Start testing now!** Contact Spectracom for questions or assistance.

# Sources of GNSS Interference

## LOSS OF GNSS SIGNAL

- **Example:** Someone accidentally cuts the cable to antenna
- **Impact:** Go into holdover mode, run off internal oscillator

## GNSS PERTURBATIONS

- **Example:** Jan 25, 2016 anomaly of 13 usec error in UTC from GPS
- **Impact:** Go into holdover mode, run off internal oscillator

## JAMMING

- **Example:** Personal privacy jammers, malfunctioning electronics
- **Impact:** Loss in precision, Loss of reception

## INTENTIONAL SPOOFING

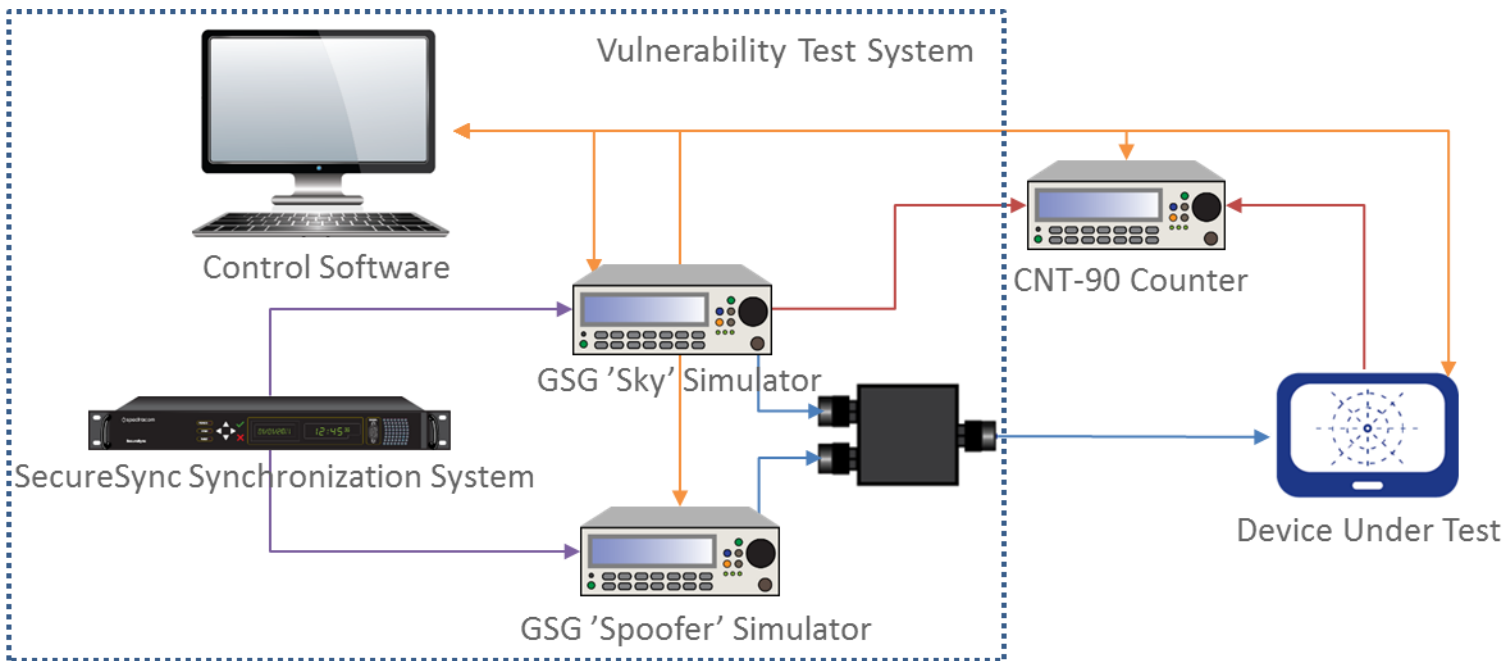
- **Example:** Intentional perturbation of the system
- **Impact:** Clock drifting, potentially silently

# Tests: GNSS Jamming / Interference

*What happens to your system in the presence of GPS/GNSS interference/jamming?*

- Malfunction? Fault?
- Time sync drift?
- Does it issue an ALERT or does it just FAIL SILENTLY?
- *Which is worse?*

# Vulnerability Test System



- **SYSTEM INCLUDES:**

- 2 GNSS Simulators
- Time server
- RF Combiner
- PC Control System

- Full system to understand the reaction of GNSS-based systems
- Easy control of “real” signal versus “fake” one
- Powerful tool to evaluate and harden Timing Systems

**AVAILABLE AS A SERVICE FROM  
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# Take Aways

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## GNSS Jamming / Interference:

- Most common, less impactful – can be harmful, but likely handled by high-end Timing Systems with good oscillators

## Spoofing:

- Very uncommon, high impact – Potentially very harmful, but very difficult to achieve

## **It is best practice for a Timing System to have:**

- Time smoothing (filtering jittery signals)
- High-end Oscillator
- Multiple/Redundant Time Sources with Cross Checking
- Time Monitoring and Logging