Universal Sync Solutions for Critical Network Infrastructures

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MEINBERG

The Synchronization Experts.

Introducing Meinberg

Founded in 1979

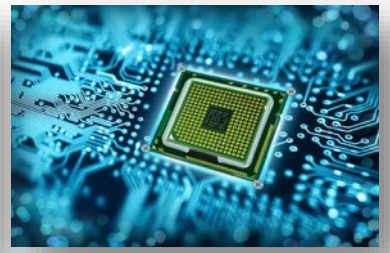
- HQ in Bad Pyrmont, Northern Germany
- Entirely Focused on Synchronization
- Global NTP & PTP Technology Leader
- Consistent Track Record of Growth

Meinberg – Global Leadership in Time Synchronization

Meinberg products synchronize a lot of critical infrastructure on this planet:

- Many of the top tier international stock exchanges and some of the largest banks and financial institutions
- Power grid control systems and substation automation networks in more than 80 countries
- Bleeding edge live TV production facilities and OB trucks
- Major mobile telecommunication networks providing voice and data services to tens of millions of customers
- Large scale communication networks in the defense domain as well as a lot of tactical networks on land-based, maritime and airborne platforms
- Radar and control center systems of several national of multinational air traffic control authorities





Meinberg Products – Three Main Platforms

M200

M300

LANTIME NTP Server

- Synchronize all systems which support NTP or SNTP
- Highly stable internal oscillator bridges periods of interference or temporary loss of synchronization signal
- Guarantees high accuracy at any time
- Can be individually configured
- Suitable for almost any application

IMS-M1000

IMS-M3000

IMS-Series

- Combines a universal Sync Core with application specific input and output interfaces
- Allows in-the-field upgrades and replacements with hot-swapping and hot-plugging support
- Almost no hardware dependencies allow uncounted combinations of interfaces and modules
- Unmatched scalability and future-proofness with zero or minimum costs for the end user

microSync^{HR}

microSync^{RX}

microSync-Series

- Compact and powerful IEEE 1588 PTP Time Server
- High performance (S)NTP server
- DIN rail, half rack and full rack solution for a space efficient design
- Different Oscillator options for advanced holdover performance
- Modern software architecture
- Meinberg Device Manager for configuration and status monitoring

Timing Security, Resilience and GNSS Issues

Multiple Strategies for Protecting GNSS and Other Timing Sources:

1. **Maximizing Holdover Capabilities**
   - Better Oscillators
   - External Atomic Clocks (Rubidium, Cesium, Hydrogen Maser)

2. **Implementing Consistency and Integrity Checks in GNSS Receiver Firmware**
3. **Support Multiple Sources and Compare Them**
   - Dual GNSS Receivers in a Chassis
   - PTP, NTP, IRIG
   - Serial Time Strings and PPS

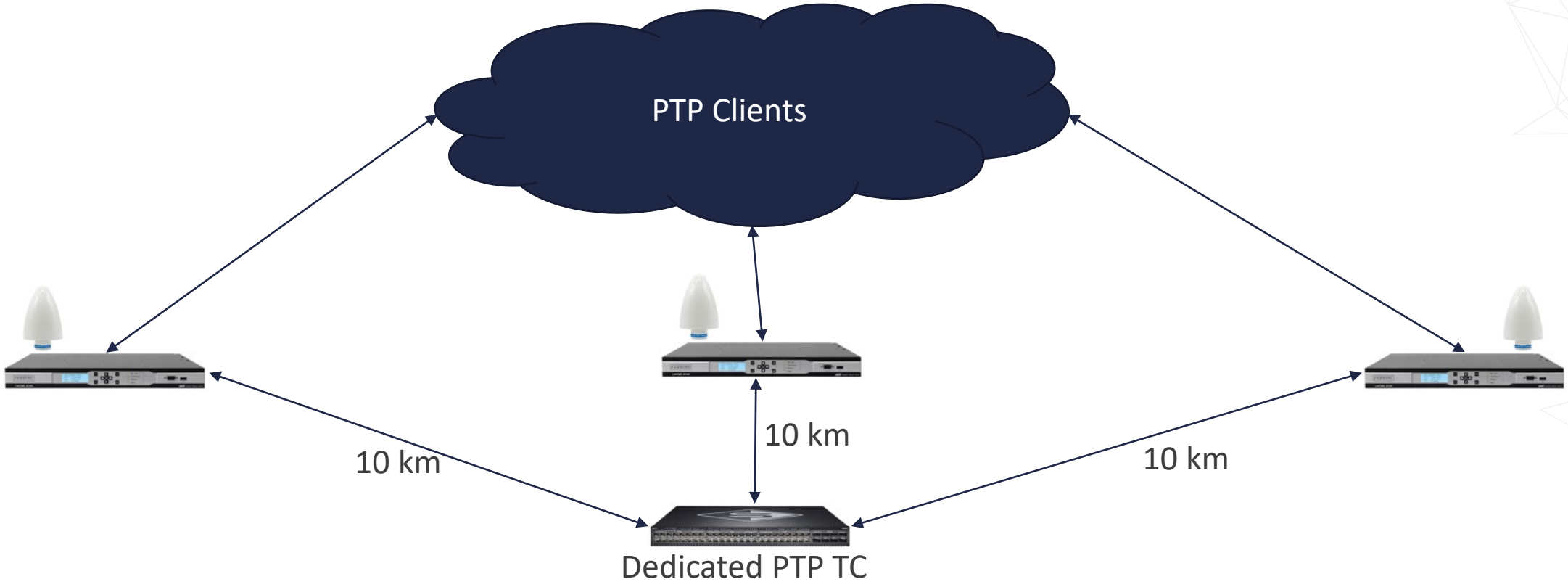
4. **Use PTP to Connect Multiple Systems and Allow to Failover**
   - Comparison Allows to Detect Spoofing/Time Manipulation on One Device

5. **Trusted Reference Source (TRS)**
   - Use a Very Stable External Rubidium to Detect Anomalies in the GNSS and Ignore Them

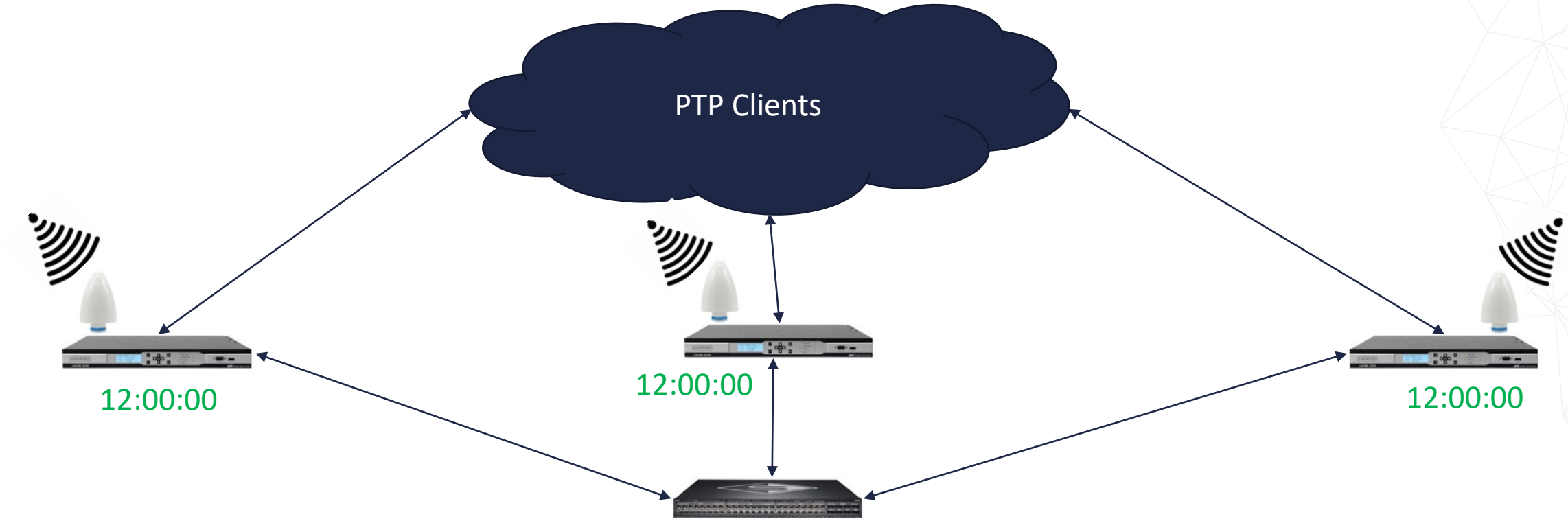
Timing Security, Resilience and GNSS Issues

Example: using PTP to connect multiple systems, detect spoofing and allow to failover

- System A, B and C connected via dedicated PTP network
- Comparison allows to detect spoofing/time manipulation on one device
- Using Single Mode Fiber means up to 10km distance between each device and the central switch



Timing Security, Resilience and GNSS Issues



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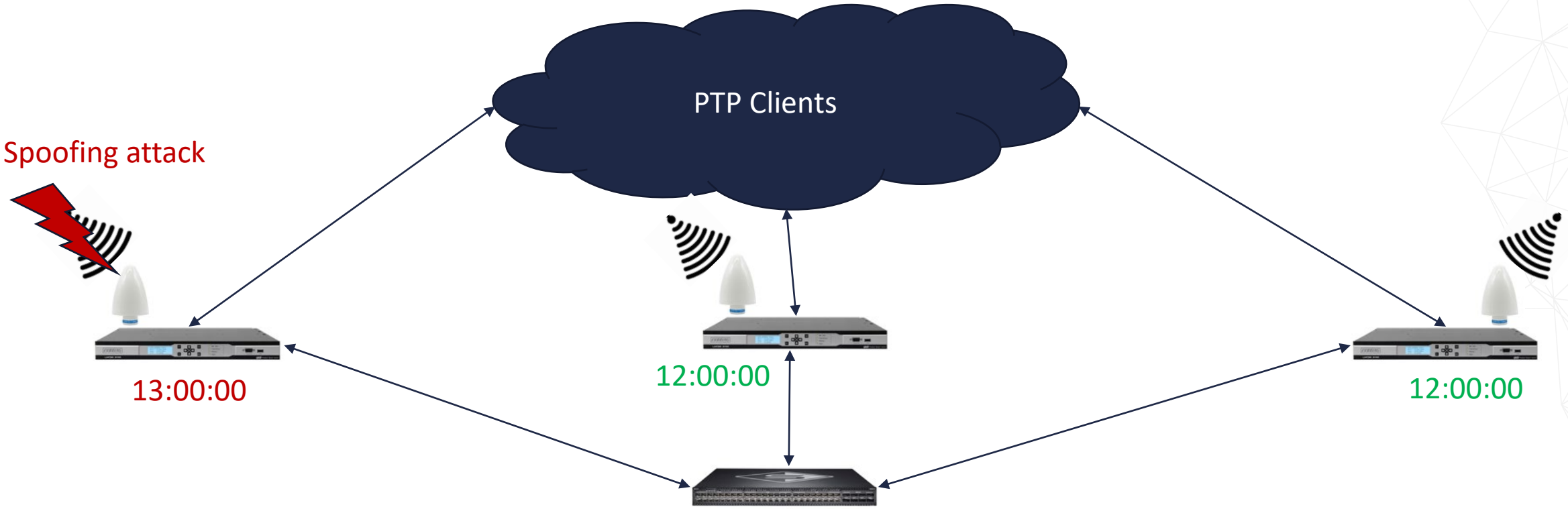
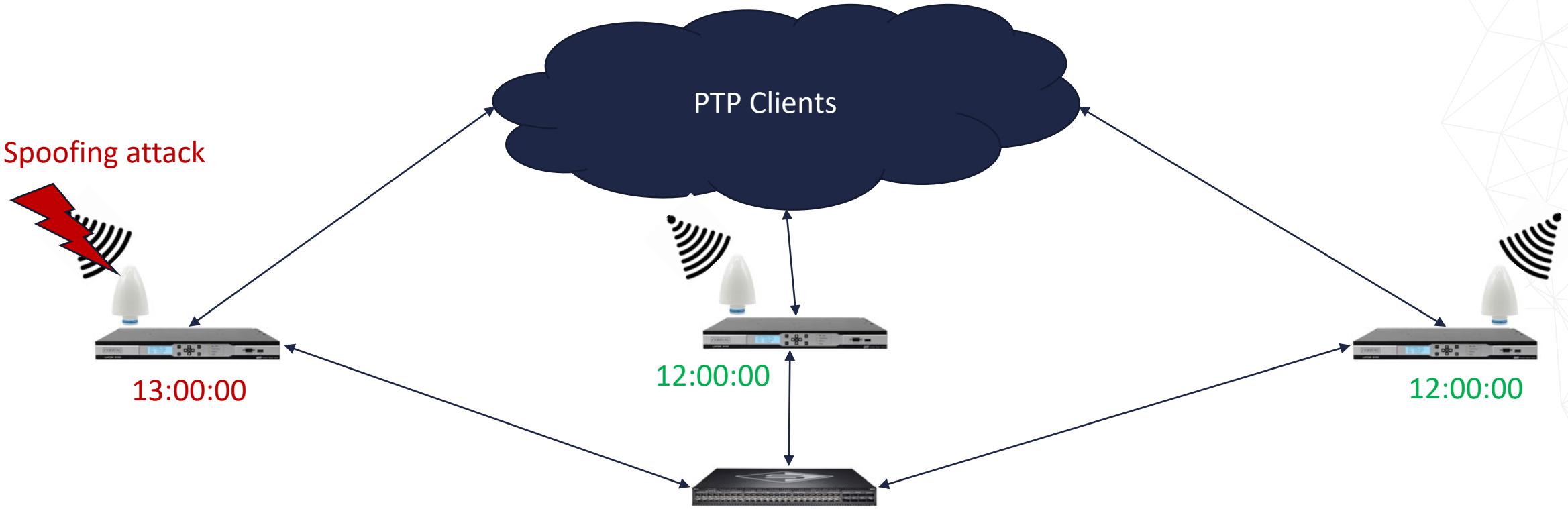
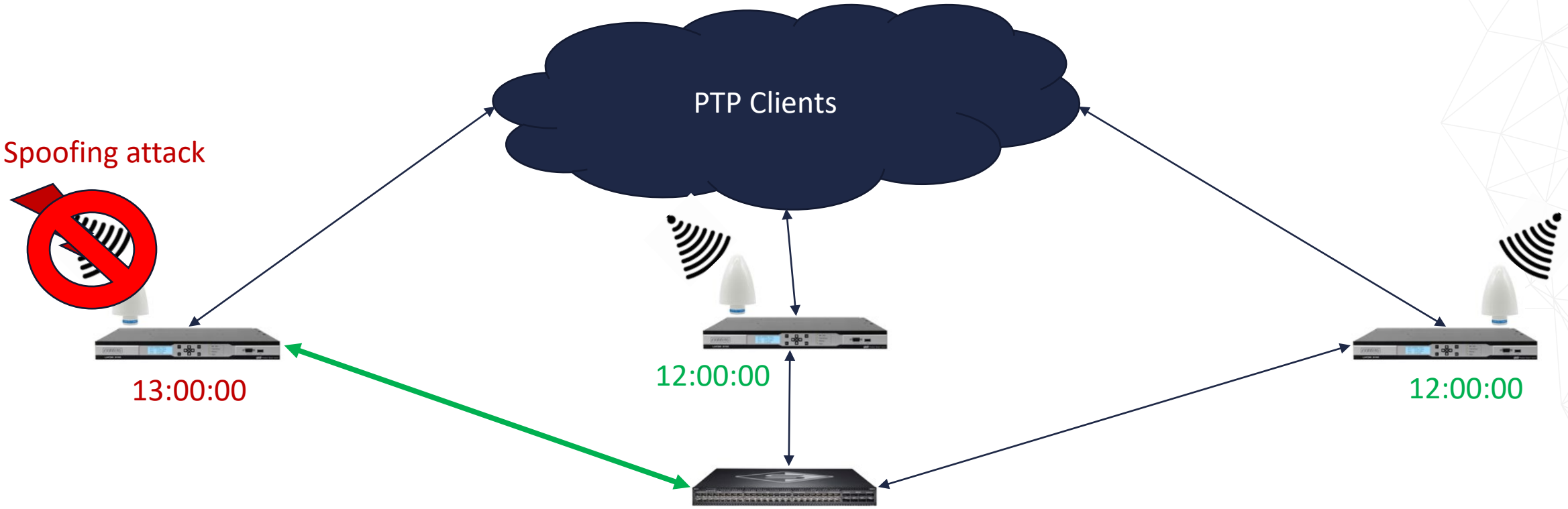


Timing Security, Resilience and GNSS Issues



Comparison shows outlier 13:00:00
Device A != B != C
Device B = C but != A
Device C = B but != A

Timing Security, Resilience and GNSS Issues



On Device A: disable GNSS and use PTP as fallback and send alarms to NOC/operators on A, B and C

Fallback can also be used to protect against jamming or other failures (antenna, constellation, etc.)

Meinberg Leadership – High Quality Combined with Expertise

- 40+ years of Experience in Synchronization
- Complete knowledge of trends and new requirements due to the broad market approach
- Participation in important standardization work and industry bodies

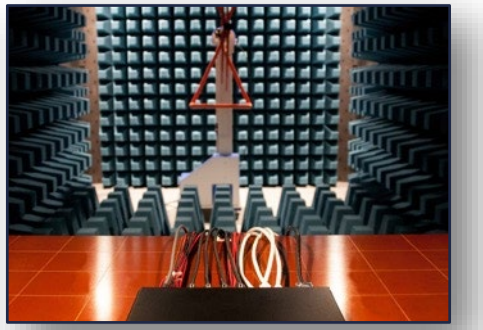
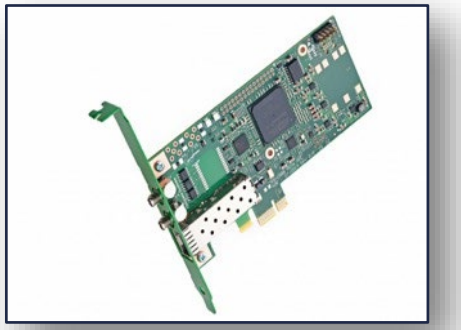
Manufacturing

- Own in-house production facilities
- All products go through a full 7-day burn-in test procedure before being shipped to customers
- Integrated Optical Tests in Production plus multi-level functional tests (boards, modules, systems)

Global Subsidiaries

- Oregano Systems, a Meinberg Company in Vienna, Austria
- Meinberg USA Inc. in Santa Rosa, CA to serve and support US customers

Distributors and Partners in over 40 countries


Thank You!

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