Transition from a satellite to terrestrial based system

OPNT end-to-end solution components
Runs on *existing* optical infrastructure

The OPNT time and frequency distribution system can provide Europe-wide timing by leveraging existing telecommunication fiber networks to connect multiple National Metrology Institutes (NMIs) to a stationary user. The European NMIs are responsible for producing the legal European UTC time. The OPNT offering makes use of the existing fiber-based telecom infrastructure to connect to National Metrology Institutes and transforms the fiber network into the equivalent of a fully distributed and highly redundant *UTC-synchronized atomic clock*, resulting in a very cost efficient, wide area timing solution with accuracy levels ranging from nanoseconds down to hundreds of picoseconds, based on user accuracy requirements.

The foundation for traceable UTC timing and SLA based services offering:
• Real time network monitoring
• Link health monitoring
• Roundtrip time monitoring
• Offset monitoring
• Full integration into 3rd party NMS

OPNT makes use of the "*White Rabbit*" technology developed by CERN, which combines PTP packets with the frequency base of Synchronous Ethernet (SyncE) to provide sub-nanosecond time transfer accuracy. A new update of PTP, PTP version 2.1, is now finalizing and includes White Rabbit generalized as its High Accuracy Profile. OPNT's network-based, fully redundant and GNSS-independent offering provides SLA-ensured performance, utilizing a combination of industry-proven IEEE 1588/PTPv2, tightly integrated with the emerging PTPv2.1 High Accuracy Profile. OPNT's advanced fault detection and recovery mechanisms take advantage of *multiple timing input sources and levels of redundancy*, along with *continuous time quality checks and end-to-end traceability*.

135 Miles, Netherlands - Dark Fiber (Calibrated)
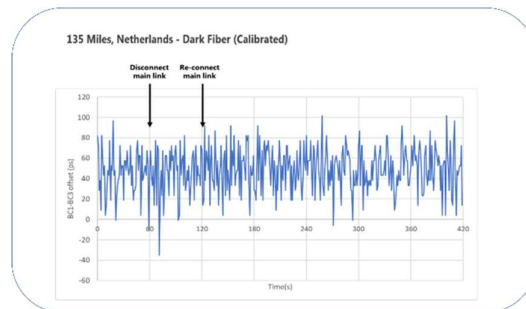
The OPNT products are using the SSH and SNMPv3 protocols for management and communication and they will typically be installed in secured facilities accessible only by authorized personnel. The products and services are constantly monitored by OPNT via secured VPN connections using the mentioned management protocols. Appropriate alarms are generated when unauthorized attempts of tempering with the products or services are being made.

OPNT's solution is based on optical links and therefore it is not susceptible to any form of RF or EMP interference. The system is scalable for worldwide deployment with plans to cover the US and Europe in the upcoming years. Security is achieved through redundant links with continuous monitoring and comparing timestamps from various sources and detecting if a link/source is compromised. The equipment is secured with industry standard encryption protocols and placed in locations that are not accessible by unauthorized personnel. Constant monitoring of the roundtrip time of Ethernet packets and link status protects against potential fiber / equipment inserts (man in the middle attacks). OPNT scored a perfect 100 in this category as part of the U.S. DOT / DHS demonstration program.