TC COMMUNICATIONS®
THE LEADER IN FIBER OPTIC CONNECTIVITY

Power Utility Teleprotection

Teleprotection-over-IP:

- Extend C37.94, G703/64k Interfaces over Ethernet/MPLS
- Latency as low as 1.5 msec (optimized) & 3.0 msec (nominal)
- Support Mirrored Bits®
- 600 Ω vAnalog-over-IP

Transporting teleprotection protective relays signals between substations is a critical application for power utilities. These signals help manage power grid load and protect power equipment from severe damage. TC's JumboSwitch® is a proven teleprotection-over-IP solution that meets the rigorous latency and reliability requirements demanded by Power Utilities. Via the TCLateView®, a latency monitoring software tool, it monitors real-time latency. In addition, no packets are lost with 1+1 hitless switching. The JumboSwitch is an economical solution for integrating Ethernet and legacy applications on one industrial hardened Multi-Service Ethernet Platform.

Tucson Electric Power

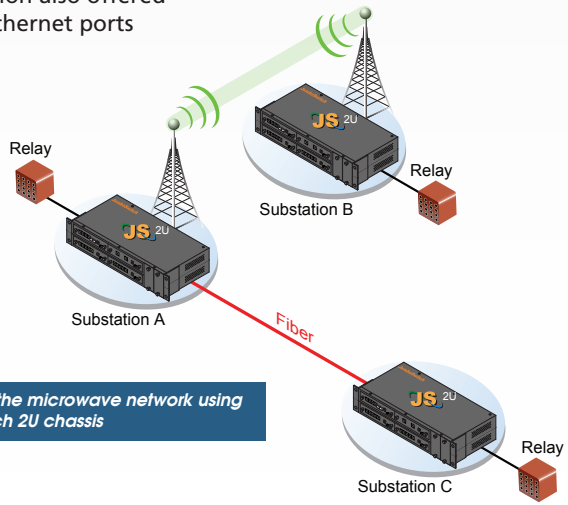
Requirement

Tucson Electric Power (TEP) needed a low latency industrial hardened Ethernet serial server to connect SEL 311L relays between substations over fiber and microwave. TEP quickly determined that most currently available hardened serial servers were unsuitable. For example, one popular hardened serial server from a major Power Industry manufacturer tested out at an eye-popping 250 msec. of delay!

Solution

Specifically designed for low latency teleprotection applications, the TC3847-3 JumboSwitch RS-232 "Turbo-Serial" card has typical readings of less than 3 msec., exceeding TEP's requirement for a delay (excluding relays) of less than 10 msec. Because the JumboSwitch teleprotection solution also offered a Dry Contact card and 4 bonus Ethernet ports on the existing management card, TEP was able to reduce costs by eliminating hardware devices used previously for these applications.

TC3847-3 Turbo Serial-Over-IP



Simplified representation of the microwave network using JumboSwitch 2U chassis

Texas New Mexico Power

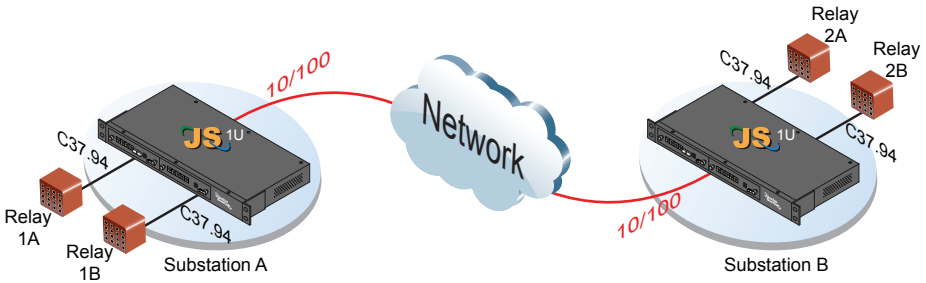
Requirement

Texas New Mexico Power (TNMP) needed to find a temperature hardened C37.94 to Ethernet device to link protective GE L90 and SEL 411L relays over layer 2/3 networks between substations. Latency requirements needed were minimal.

Solution

After extensive latency testing, TNMP chose the JumboSwitch 1U chassis solution with a C37.94 card (model TC3846-2). The TC3846-2 tested out to have a delay less than 5 msec (end-to-end) over TNMP's layer 2 Ethernet network and less than 14 msec. on its layer 3 Ethernet network. The four additional Ethernet ports provided by the 1U chassis as a standard feature gave TNMP an additional benefit.

TC3846-2 C37.94-Over-IP



Simplified representation of teleprotection between relays using the JumboSwitch TC3846-2 C37.94 Ethernet/IP Gateway interface card

Power Transmission Utility

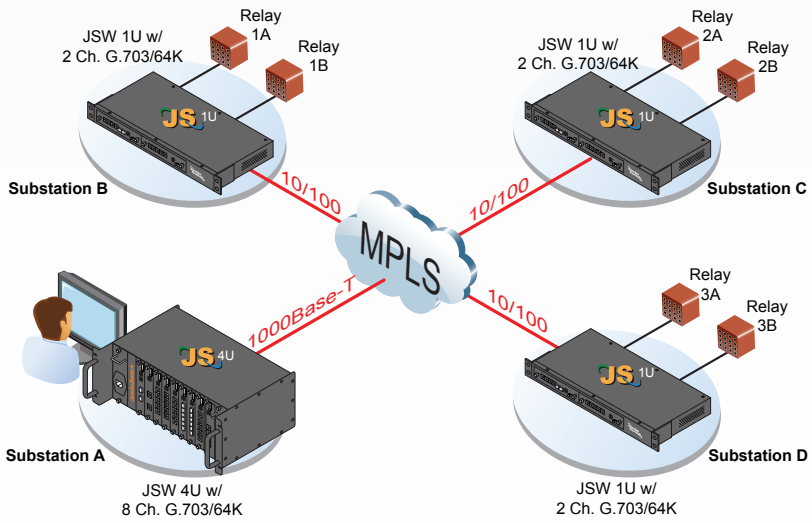
Requirement

A large Power Transmission Utility in Alberta, Canada needed a teleprotection G.703/64K to Ethernet connection to link Siemens SIPROTEC relays between substations with a delay of less than 10 msec (end-to-end). Other requirements included -48VDC power and the ability to withstand harsh winter conditions.

Solution

After extensive testing, the JumboSwitch model TC3846-1 interface card met all of the Power Utility's latency, power and environmental requirements. End-to-end latency was less than 8 msec. The TC3846-1 also provided built-in management capability (web GUI). In addition, TCLateView, a software program which works in conjunction with the TC3846-1 card, enabled the Power Utility to monitor real time latency on its Ethernet network, as well as immediately accessing current and historic network delay readings.

TC3846-1 G.703/64K-Over-IP



Simplified representation of the teleprotection network using JumboSwitch 4U chassis with TC3846-1 G.703/64K interface cards

Jamaica Public Service

Requirement

Jamaica Public Service Company Limited (JPS) needed a serial-over-IP technology to connect protective relays between substations over fiber. Being hit hard by hurricanes, it was crucial that Jamaica have redundant power supplies operating in 1+1 protection at all times. Additional JPS protective relay communications required a total end-to-end delay time of less than 10 msec. Standard serial servers typically have an average delay of more than 40 msec.

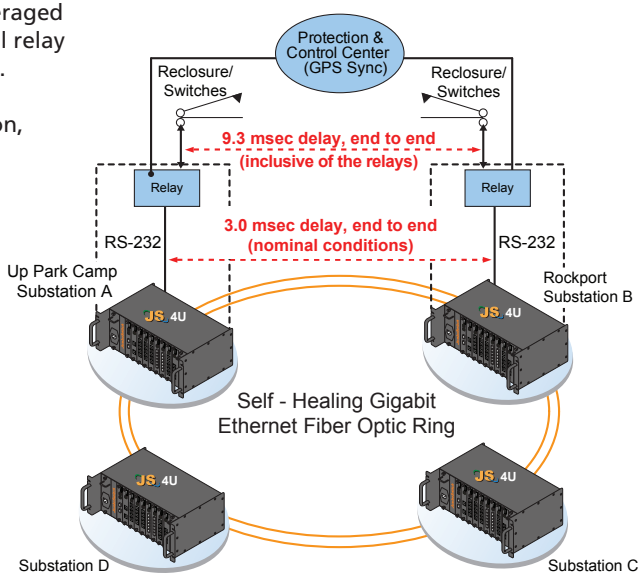
Solution

JPS network technicians conducted an exhaustive series of latency tests between JumboSwitch units fitted with "Turbo-Serial" TC3847-3 interface cards and SEL 321L relays at two different substations.

The results confirmed that the delay on the JumboSwitch's special teleprotection card consistently tested out at less than 3.0 msec., end to end. Total delay averaged 9.3 msec. when the internal relay processing time was added.

In addition to teleprotection, the JumboSwitch multi-service Ethernet platform helped support a variety of other applications including SCADA, substation telephones, revenue metering and distribution automation.

TC3847-3 Turbo Serial-Over-IP



Simplified representation showing teleprotection between two JPS substations using JumboSwitch 4U chassis with TC3847-3 Turbo Serial interface cards

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