Case Study

How Precision Time Protocol Saved a Data Center from Frequent Power Losses

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*Multiple Power Failures affecting customers in **40** countries*

+2,000

Multiple cable runs of over 2,000 ft

PTP

Solution: PTP Time Protocol w/GPS master clock

The Customer

For more than two decades, a data center in the American Southwest had been serving customers in more than 40 countries with a host of IT services including colocation, disaster recovery, network services, and cloud computing. Power failures occurring within the data center repeatedly interrupted those services, causing difficulties for customers and rendering the data center's Service Level Agreements problematic. With four electrical equipment rooms and thousands of feet of cable distributing power throughout the operation, data center engineers found it impossible to identify the cause of frequent power failures.

Whether caused by an electrical anomaly, a momentary loss of power, a nuisance overload trip, or a complete outage, losing power is costly. Circuit breakers can malfunction, UPS systems can fail to activate, and a host of other events internal and external to the data center's electrical distribution system can all lead to power interruptions. Without having an accurate and detailed account of what happened, determining the cause of a power failure after the fact can be both ineffective and time consuming.

To address this, a solution was implemented using sequence of events recording to synchronize the clocks of all IEDs as well as precision time monitoring of the input status of all circuit breakers.

The Challenge

While implementing the sequence of events recording system, it was discovered there was an issue keeping a consistent time sync to all the devices. A cross-functional engineering team (consisting of engineers from Cyber Sciences and cooperation from a global OEM) was asked to help resolve the issue. The first issue they identified was with the master clock responsible for providing an accurate time source. The time signal had a voltage which was 80% lower than expected. The customer installed a solid-state relay to boost the signal to the required voltage, however, this created undue noise, degrading the signal. The second issue to solve was how to reliably carry this time signal to each of the electrical rooms which were a considerable distance apart. Some cable runs were more than 2,000 feet long.

The Solution

To resolve the first issue of an unreliable time source, a Cyber Sciences STR-100 was installed as the master clock. This provided the time signal required by the devices at the expected voltage. Also, without the need for the relay, the noise was also eliminated from the signal. Now the team could focus on how to eliminate the intermittent time synchronization from the STR-100 to all the downstream devices. In trying to troubleshoot the issue, the team realized the intricacy and complexity of the wiring scheme implemented to tie all the devices in the four electrical rooms together prevented them from determining what was causing the intermittency.

From this, the team suggested bypassing the thousands of feet in the original wiring scheme and adopting a solution that used Precision Time Protocol (PTP). This protocol, as defined by IEEE 1588, is native to the design of the Cyber Sciences' Sequence of Events Recorders. PTP precisely syncs devices over Ethernet with accuracy in the sub-micro-second range. This eliminates the need for wiring between the SERs, different pieces of equipment such as switchgear and different electrical rooms. Because the center's 30-plus SERs were already connected via an Ethernet network, it made sense to use the existing Ethernet cabling to carry PTP signals to each SER.

In addition, it was suggested all other devices such as power meters be directly wired to the SERs using Cyber Sciences' PTP Legacy Interface (PLX) modules instead of back through terminal blocks used in the original wiring scheme. Choosing this solution would allow for the removal of additional thousands of feet of two-conductor cable that carried the time signal and would simplify the sheer complexity of the original wiring design.

The data center initially rejected this solution because it was unfamiliar with PTP and the data center technicians felt they could solve the problems noted. After more than a year of working on the existing system with no positive results, the data center again contacted Cyber Sciences.

The team again paid a visit and proposed an approach that would use PTP to synchronize the SERs to a uniform time while also allowing the data center to continue to sync the hundreds of downstream devices.

The Results

The data center accepted this solution, and after the upgrade was completed, the entire network fell into synchronization helping the customer to have system level view of all the inputs and quickly determine the source of power failures. Today, the SERs continue to provide the data needed to determine where and precisely when faults occur in the complex electrical system.

About Cyber Sciences

Cyber Sciences, Inc. (CSI) is a global leader in precision time solutions for commercial and industrial facilities, including data centers, hospitals, universities, microgrids, and alternative energy sources. Key applications include SER and GPS time synchronization and helping facility managers and engineers ensure the reliability, efficiency, and safety of their normal and emergency power systems. CSI is a privately held corporation located in Murfreesboro, Tennessee, 25 miles southeast of Nashville.

For more information about the CyTime Event Manager or SERs, please contact the company by phone at: 1-615-890-6709, by email at sales@cybersciences.com, or visit the company's website at www.cyber-sciences.com.

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