Why Ethernet Switches Can Take the Heat (or Cold)

By leveraging industrial-grade Ethernet switches that are designed and built to withstand extreme conditions, organizations can build redundant networks that will operate regardless of location.

With more and more outdoor applications, Ethernet switches are going to the extreme and need to operate in either high heat or frigid cold temperatures. Without rugged and temperature-rated equipment, weather can affect network operation and overall system reliability.

THIS SUMMER SAW RECORD TEMPERATURES in many parts of the United States, Europe and other parts of the world. High heat conditions not only affect outdoor and indoor environments, but also network connectivity and data transmission between locations. The same can be said for the harsh cold of the winter months – extreme cold can have an equally harmful effect on network equipment.

In the age of Ethernet everywhere, Ethernet switches have moved beyond the "friendly confines" of a climate-controlled wiring closet or data center, and are now being used outdoors in more remote locations to collect and monitor field equipment. Examples include Ethernet use across offshore rigs, pipelines, power stations, water/wastewater facilities, bridges, tunnels, wind farms and more.

For organizations without the right rugged and temperature-rated equipment in place, weather can adversely affect a network. This can cause costly service delays, interruptions or downtime that can negatively affect both a business and its customers. This downtime can also prevent important security and safety systems from working efficiently. They also create a financial liability, since emergency repairs cost much more than planned preventive maintenance, especially in remote locations. This is why maximum network availability is essential for successful business operations.

COMMERCIAL VS. INDUSTRIAL-GRADE

So, what are the main differences between indoor and outdoor environments? And what equipment can help ensure system uptime regardless of extremes?

First, environmental conditions are one important difference in an industrial setting. Commercial network equipment is designed to operate in climate-controlled indoor offices or wiring closets, where temperature and humidity are maintained at.

ACCEPTABLE TEMPERATURE RANGES

Acceptable temperature ranges for Ethernet switches are frequently listed among specifications. Typically, the temperature tolerance range for standard commercial-grade switches is about 0°C to 45°C (32°F to 113°F), while the temperature range expands to approximately -40°C to 85°C (-40°F to 185°F) for industrial-grade equipment. Wider operational temperature range support can prove to be the crucial difference between a fully operational and a nonresponsive network.

What would happen to a commercial-grade switch if it was exposed to some of the extremes mentioned above? As an Ethernet switch approaches the limits of its acceptable temperature range, the device may start slowing down and dropping packets. Dropped packets can cause a number of different latency issues that may include "choppy" video, blank screens, interrupted emails and other degraded data transfers.

When a switch exceeds the limits of its operating temperature range, it simply stops functioning and may completely power off and fail. That means all data, including voice and video traffic, can no longer be transferred, causing some elements of daily business operations to cease.

TEMPERATURE-RESISTANT NETWORKS

To build a temperature-resistant network, industrial-grade Ethernet switches are essential. These rugged switches are designed and
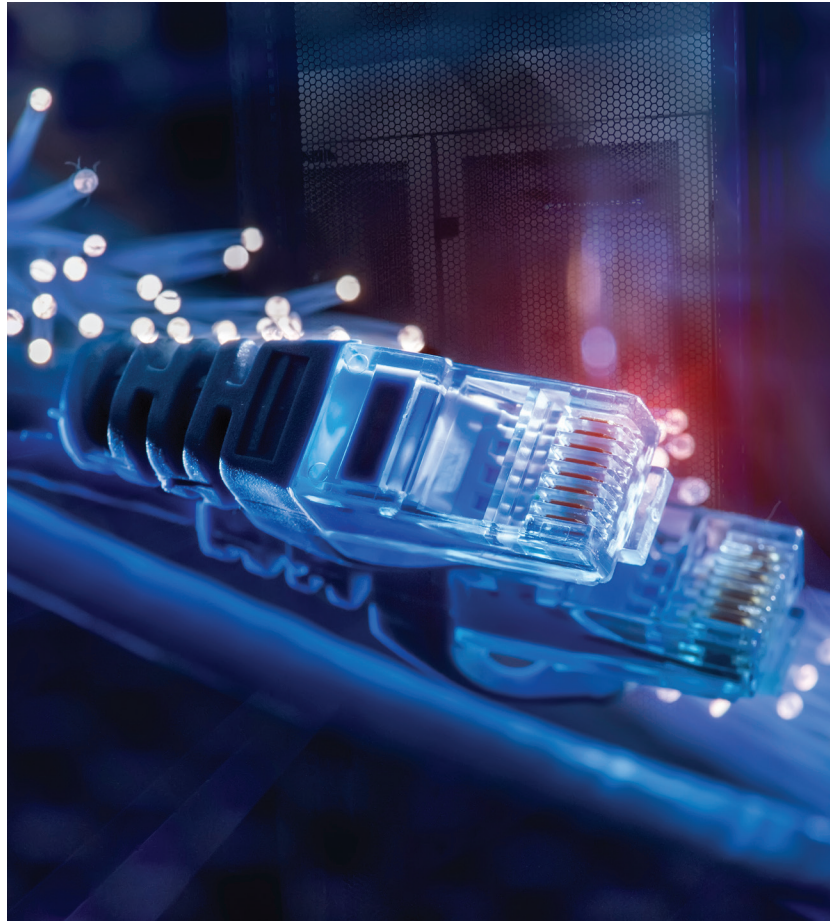
built to withstand the fluctuations of high and low temperatures coupled with other extreme outdoor conditions. The chips, internal circuitry, connectors and housings found in rugged switches are designed and manufactured specifically to withstand high and low temperatures, as well as vibration and are made to last a lifetime ~ 1M hours.

The accompanying chart presents a side-by-side comparison of the specifications of both commercial and industrial switches. Industrial switches, for example, are capable of operating for 20 to 30 years in the field, while the Mean Time between Failure (MTBF) for commercial switches is often less than 3 three years.

How do industrial-grade switches handle these harsh environments? When looking "under the hood" of these rugged switches, one apparent difference is that, although they are very heat resistant, they do not require moving parts like fans in their designs.

While Ethernet switches with fans are common in commercial installations, they are not recommended in industrial environments because the MTBF of a fan motor is about 25,000 hours. Maximum uptime is a must in industrial environments because equipment is often located in hard to access remote areas without IT staff on hand to repair or replace switch components. The fact that fans are not needed in industrial-grade Ethernet switches is a testament to their ruggedness and ability to withstand extreme temperatures.

Industrial switches are designed for longer life and rugged reliability.

WARNING SYSTEMS CAN HELP

Many industrial-grade Ethernet switches offer diagnostic tools, management software and even continuous network monitoring capabilities that help prevent downtime or network issues by issuing an alert before extreme temperatures or other environmental issues may cause problems.

For example, one optional feature is for a switch to regularly send diagnostic packets that a network management system or a Human Machine Interface (HMI) can view. The system monitoring the switch can then identify problematic network nodes, data congestion and/or degraded or misaligned fiber optic connectors that could cause a potential problem.

More advanced switches can provide even more monitoring and alerting capabilities, which are well suited for remotely troubleshooting network issues.

RIGHT RUGGED INFRASTRUCTURES

Integrating rugged industrial Ethernet switches into existing networks is an easy way to upgrade infrastructures to provide more reliability, visibility and performance without requiring massive infrastructure changes. By leveraging industrial-grade Ethernet switches that are designed and built to withstand extreme conditions, organizations can build redundant networks that will operate regardless of location. This can help to protect network-based operations and keep things running smoothly, even when conditions are far from ideal.

> It is important to ensure that what is added to the switch is industrial rated, for example fiber SFP.

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