

Disadvantages of Industrial Ethernet Switches



Overview

The goal of this paper is to describe and categorize some variants of industrial ethernet protocols (IE), compare their efficiency, and evaluate their respective advantages and disadvantages.

Key Takeaways

Industrial Ethernet switches, while robust and high-performing, face challenges such as environmental vulnerability, bandwidth limitations, protocol overhead, and higher costs compared to standard switches.

Environmental and Physical Limitations

Industrial Ethernet switches are designed for harsh environments, but extreme conditions can still impact performance. Factors such as high temperatures, dust, humidity, vibrations, and electromagnetic interference (EMI) can degrade signal quality and cause packet loss if not properly mitigated with ruggedized hardware, shielding, and specialized cabling. Even with IP-rated enclosures and vibration-resistant designs, installation and maintenance in such environments can be complex and costly.

Bandwidth and Performance Constraints



Many industrial switches have limited bandwidth, particularly when connecting multiple PLCs or I/O devices. Packet sizes are often restricted (around 500 bytes for some PLCs), which can slow down operations in data-heavy applications. Additionally, TCP/IP protocol overhead consumes processing resources, potentially reducing real-time performance for critical automation tasks.

Network congestion, long cable runs, and inadequate switch capacity can further contribute to latency issues.

Protocol and Compatibility Challenges

Industrial Ethernet relies on specialized protocols like PROFINET, EtherCAT, EtherNet/IP, and Powerlink. While these protocols enable real-time communication, they can introduce complexity in configuration and integration, especially when bridging legacy systems or devices with varying standards. Some switches may lack full support for all protocols, limiting interoperability and requiring additional converters or gateways.

Management and Diagnostic Limitations

Unmanaged switches are simple to deploy but lack remote management, fault diagnosis, and advanced monitoring capabilities. Even managed switches may require specialized knowledge to configure VLANs, QoS policies, or security features. Generic diagnostics are often insufficient, necessitating custom solutions for each device, which increases maintenance time and costs.

Cost Considerations

Industrial switches are generally more expensive than commercial-grade switches due to their ruggedized design, environmental protections, and specialized features. Overpowered solutions may be unnecessary for certain applications, leading to higher upfront costs without proportional benefits.

Summary

While industrial Ethernet switches provide reliable connectivity and real-time communication in demanding environments, their disadvantages include environmental sensitivity, bandwidth and latency limitations, protocol complexity, diagnostic challenges, and higher costs. Careful planning, proper hardware selection, and network design are essential to mitigate these drawbacks and ensure optimal performance in industrial automation systems.

Article Content

Industrial Ethernet: Challenges and Advantages

The goal of this paper is to describe and categorize some variants of industrial ethernet protocols (IE), compare their efficiency, and evaluate their respective advantages and disadvantages.

Top 7 Industrial Ethernet Challenges & Smart Solutions 2025

Manufacturing facilities expose industrial ethernet equipment to extreme temperatures, humidity fluctuations, dust particles, and constant vibrations that can compromise network performance.

How to Pick the Right Industrial Ethernet Switch: Managed vs.

Durability: Industrial-grade unmanaged switches are built with rugged enclosures to handle challenging conditions. **Low Maintenance:** With no software or configuration tools to manage,

Adding Ethernet for I/O: Pros, Cons and Crucial Things to Know for ...

It was created to overcome the shortcomings of traditional IEEE, which had two major problems: Traditional IEEE wasn't suited to handle all the complex, data-heavy processes involved in modern

Comprehensive Analysis of Industrial Switches

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Learn About a Few Foreseen Industrial Ethernet Switches Challenges

Industrial networks are exposed to threats like unauthorized intrusion and data theft. In the future, the risk of higher data loss is possible in high-capacity networks if advanced security

Industrial Ethernet Switches: Benefits, Applications & Buying Guide

An industrial grade Ethernet switch is a network device specifically engineered to operate in challenging industrial settings. Unlike standard commercial switches, these are built to withstand

Industrial ethernet explained

Industrial Ethernet is the same Ethernet used in homes, offices and data centers with two important differences: An industrial ethernet network must contend with a myriad of hazards ranging from

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This is particularly helpful in industrial settings where integrating managed Ethernet switches is frequently delegated to controls or automation

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That experience is why I take switches seriously. A switch is deceptively simple—either it connects things or it doesn't—but the tradeoffs ripple through performance, security, reliability, and

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What Is An Industrial Ethernet Switch? Learn its definition, functions, key features, differences from standard switches, applications, and selection tips for reliability.

Managed vs Unmanaged Ethernet Switches: Which One You Need

Managed vs. Unmanaged Switches in Industrial Automation: A Practical Guide In industrial automation, the choice between managed and unmanaged Ethernet switches significantly impacts network

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How to pick the right Industrial Ethernet Switch for critical networks

Industrial Ethernet switches are comprised of managed and unmanaged switches with Gigabit, PoE, and various industry certifications. Featured industrial-grade reliability, network redundancy, strengthened

Why Your Industrial Network Needs an Industrial

Industrial Ethernet Switches - How to select and what you need to know. How will an industrial ethernet switch improve my network performance?

Why Use Industrial Ethernet Switches?

An Industrial Ethernet Switch is a more complex device with built-in intelligence to connect Ethernet nodes. The switch eliminates the problem of network determinism by providing full

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