

Article Overview

An industrial switch ring network ensures high reliability and fault tolerance by connecting switches in a closed loop with redundancy protocols like DLR, RSTP, ERPS, or MRP.

Overview of Ring Network Topology

A ring network connects devices in a loop, where each switch links to at least two others, forming a closed path. This topology allows data to continue flowing even if one link fails, improving network reliability and minimizing downtime in industrial environments . Ring networks are commonly used in factory automation, process control, and industrial IoT applications.

Key Protocols for Ring Redundancy

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Device Level Ring (DLR): A Layer 2 EtherNet/IP protocol that provides fast fault detection and reconfiguration. DLR requires at least one ring supervisor node, which monitors network health using beacon frames. Other nodes act as ring participants, passing data and reporting faults. DLR supports redundant gateways to connect the ring to the broader network .

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Rapid Spanning Tree Protocol (RSTP): An IEEE standard (802.3w) that prevents broadcast storms by blocking one path in the ring and quickly switching to a backup link if a failure occurs. RSTP offers heal times of 2-3 seconds, suitable for industrial networks requiring fast recovery .

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Ethernet Ring Protection Switching (ERPS): Designed specifically for Ethernet rings, ERPS isolates faulty links and restores communication rapidly, ensuring minimal disruption .

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Media Redundancy Protocol (MRP): Used in PROFINET networks, MRP provides loop-free communication and fast error detection, compatible with devices from multiple manufacturers .

Steps to Set Up a Ring Network

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Select Industrial Switches: Choose switches with sufficient ports, industrial-grade reliability, and support for the desired redundancy protocol. Consider environmental factors like temperature, vibration, and EMI resistance .

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Industrial Switch Ring Network Solution

Determine Topology: Decide between a single ring (simpler, suitable for small networks) or multi-ring (higher redundancy for larger networks).

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Configure Switches: Enable the redundancy protocol (DLR, RSTP, ERPS, or MRP) on all switches. Assign one switch as the ring supervisor if using DLR. Ensure port assignments match the physical ring connections .

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Connect Switches: Physically connect switches in a loop. Verify that each switch has at least two active connections to neighboring switches.

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Test Network Performance: Simulate link failures to ensure the ring reconfigures correctly and that data continues to flow. Check latency, throughput, and failover times .

Best Practices and Precautions

- o Ensure all switches support the selected redundancy protocol.
- o Verify that port speed and number meet network requirements.
- o Maintain proper port-to-port correspondence to avoid misconfigurations.
- o Conduct thorough testing under realistic conditions to validate network stability.
- o Document the network layout and configuration for maintenance and troubleshooting.

By following these steps and using appropriate redundancy protocols, an industrial switch ring network can achieve high availability, fast fault recovery, and reliable data transmission in demanding industrial environments .

X-Ring Plus resilient ring technology is provided with network operating system 2.0 & is an enhanced version of Case

Immersion-Gold-Technologie Diese Technologie ermöglicht es PBC, die Korrosionsbeständigkeit und Leitfähigkeit zu verbessern

This article will deeply analyze the solutions to ring network redundancy from three dimensions: technical principles, implementation

ERPS Rings simplify network management by providing a vendor-neutral solution that can be used with industrial switches and ports

Industrial Switch Ring Network Solution

Introduction The Real-time Redundant Ring Switch offers fault-tolerant industrial Ethernet with ring network topology. The built-in ICP

We offer network and security solutions to connect your automation products to each other and to the rest of your enterprise.

Learn how to design a fiber optic ring network with practical diagrams, topologies, and

5. Redundancy Design as the “Lifeline” of Industrial Networks Fiber optic ring redundancy design represents not just a technical

The key features of industrial switches that contribute to the effectiveness of ring networks include their high availability, reliability,

Cyber-Ring self-healing Ethernet technology is a proprietary developed by ICP DAS that can be used to help establish industrial

Extreme Industrial Switches are an excellent choice for industrial environments, including intelligent transportation systems, utilities,

Learn what network redundancy is and why it matters for industrial communication systems. Explore device, link, ring,

This solution builds a basic two-layer ring network architecture designed to decrease complexity, enhance security, and increase

The workshop deploys two independent fiber optic ring networks (Ring A and Ring B), each containing eight USR-ISG-8G industrial

How do Industrial Ethernet Switches work? Learn about industrial network switch and Ruggedized Industrial Ethernet Switch

Perle P-Ring Protocol Preventing a switch loop scenario and enabling communication if a failure occurs in the ring The Ring

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