

Industrial Switch Ring Network Configuration



Overview

Redundancy Protocol Configuration Guide, Cisco Device Level Ring (DLR) is a Layer 2 protocol that enables redundancy in a ring topology, Ethernet Ring Redu.

Key Takeaways

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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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

- Ensure all switches support the selected redundancy protocol.

- Verify that port speed and number meet network requirements.
- Maintain proper port-to-port correspondence to avoid misconfigurations.
- Conduct thorough testing under realistic conditions to validate network stability.
- 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 .

Article Content

EtherNet/IP Device Level Ring

Depending on their firmware capabilities, both devices and switches can operate as supervisors or ring participants on a DLR

Fiber Optic Ring Redundancy Design for Industrial Ethernet Switches

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

Get To Know Ethernet Ring Protection Switching (ERPS)

Ethernet Ring Protection Switching (ERPS) is a standardized methodology for network design, ensuring high-level

Network Basics: Beginners Guide to Ethernet Ring Protection Switching

Ethernet Ring Protection Switching (ERPS) is a feature that provides security to networks without blocking all traffic.

Star vs Ring Topology for EtherNet/IP Network Design

Compare star vs ring topology for Allen-Bradley EtherNet/IP networks using Stratix switches, 1783-ETAPS, and Point

Redundant Ring Technology for Industrial Ethernet Applications

Next, we introduce “redundant ring” technology, and point out the advantages that redundant rings have over traditional systems. In

Rapid Spanning Tree Protocol in Ring Network Topology RSTP ...

In this case, Industrial Ethernet Switches provide some protocols to ensure this service. Ring protocol, HRP, MRP,

X-Ring Plus Ethernet Industrial Ring Technology

Introduction to X-Ring Plus Ethernet Industrial Ring Technology What is X-Ring plus resilient ring technology? The original X-Ring as

Industrial Ring Networks | ERPS | Antaira Technologies

Industrial Ethernet switches are critical components in network infrastructures, often used in harsh environments and mission-critical

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