

ABCs of Ethernet Redundancy

What is Ethernet network redundancy? Ethernet network redundancy is the ability of the network to survive a single cable failure in its switch-to-switch links. The network survives by providing alternate data path(s) when a cable fault occurs.

Why should I care about redundancy? Network redundancy is important to you if you have a system or process that is highly integrated and a failure in the communication links can result in disastrous consequences such as production loss, poor quality, equipment damage or danger to personnel.

What types of redundancy are available? The IEEE has published two protocols that deal specifically with network redundancy: **Spanning Tree Protocol (STP)** (IEEE 802.1D) and **Rapid Spanning Tree Protocol (RSTP)** (IEEE 802.1w). Also available are many **proprietary ring** technologies and **trunking** schemes.

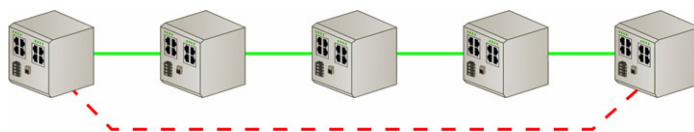
What is STP Redundancy? Spanning Tree Protocol (STP) allows networks to be wired in almost any topology. STP normally provides network recovery times of from 30 to 60 seconds.

What is RSTP Redundancy? Rapid Spanning Tree Protocol (RSTP) is an updated form of STP and is backward compatible. This protocol was designed to provide a faster recovery time — generally, in 1 to 2 seconds.

What is network recovery time? Network recovery time is the time it takes to restore the network after a cable failure. The faster the recovery time the better.

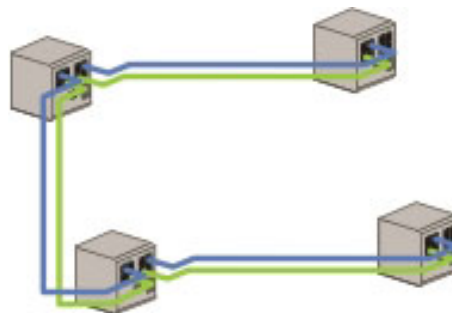
Why should I care about the network recovery time? A few minutes lost in an office environment is merely annoying and inconvenient, but even a few seconds interruption of an industrial communication network can result in thousands of dollars of lost production. To maximize system reliability, most proprietary ring networks self heal in less than 300 ms.

What is a ring network? A ring network is simply a bus with one extra link that connects the last switch to the first switch. In the accompanying illustration, the bus connections are shown in green and the red dashed line is the additional link needed to make a ring. The ring network requires that each switch supports a redundancy protocol. Otherwise, messages would travel around the network indefinitely. Ring protocols generally disable one link (the backup link) to stop messages from circulating the network. When a link in the ring fails then the back-up link is enabled to restore the network.



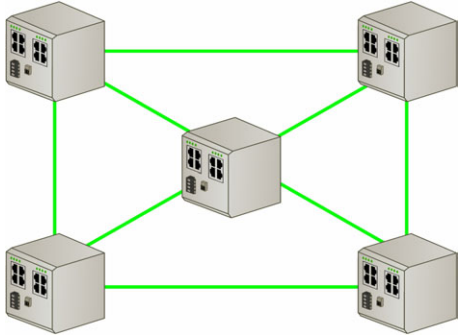
Adding One Link Converts a Bus to a Ring

What is trunking redundancy? Trunking allows switches to be interconnected with multiple parallel cables. The more cables you add between switches, the more bandwidth you achieve — and with selected products, the more levels of redundancy you provide. With two cables between two switches, you have one level of redundancy. With three cables you have, two levels of redundancy and so on. The managed switches from Contemporary Controls can provide recovery times of less than 10 ms when using trunking.



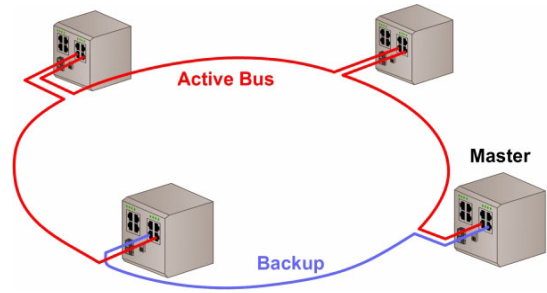
Trunking Uses Multiple Cables

How do STP/RSTP and proprietary rings compare? A number of vendors offer STP and RSTP. Generally, both protocols require over 1 second for recovery. To achieve the fastest recovery time with RSTP, you must connect the network as a *mesh* (see below). A mesh requires at least three connections between each switch and neighboring switches. Ring networks provide faster recovery times than STP/RSTP and to support the ring, each switch uses fewer ports than do the switches in the mesh topology.



Mesh Topology Consumes More Ports

What is RapidRing™? RapidRing is a proprietary ring network technology from Contemporary Controls that can provide recovery in under 300 ms. The ring must specify one of its switches as the master to manage the backup link (see below). When a cable break occurs, the master invokes the backup, each nearby switch alerts the user via its relay contact closure, blinking LEDs and SNMP traps. Once the cable fault is repaired, the nearby switches notify the master who then restores normal operation by disabling the backup link. RapidRing supports a dual ring topology and can use copper or fiber in the rings. For more information on RapidRing technology go to www.RapidRing.com.



RapidRing Recovers in Under 300 ms

How do STP, RSTP, Rings and Trunking compare?

	STP	RSTP	Ring	Trunking
Recovery Time	30 to 60 Seconds	1 to 2 seconds	Less that 300 milliseconds	Less than 10 milliseconds
Flexibility of wiring	High	High	Medium	Low
Protocol	IEEE 802.1D	IEEE 802.1w	Proprietary	Proprietary
# of ports used	Medium	Medium	Low	High

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