

Henrich Electronics (Suzhou) Co. Ltd.

White Paper

RingOn™ Technical

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Key Words:

IPv4, RingOn™, Single Ring, Couple Ring, Trunking Ring

Abstract:

This paper introduces RingOn redundancy technology launched by Henrich Electronics. RingOn redundancy technology is designed and developed for industrial control network application with high reliability. This paper also analyzes all types of redundant ring networks in detail, and provides corresponding network topology for reference.

Acronyms:

Acronyms	Full Names
LACP	Link Aggregation Control Protocol
STP	Spanning Tree Protocol
RSTP	Rapid Spanning Tree Protocol
MSTP	Multiple Spanning Tree Protocol

Content

1. Introduction	1
2. RingOn Technology Implementation	2
2.1 RingOn Introduction.....	2
2.2 RingOn Working Mechanisms.....	2-4
3. Typical Networking Application	5
3.1 Networking Diagram.....	5
3.2 Networking Requirements.....	5-6
4. References	6

1. Introduction

Generally speaking, most Ethernet network applies Star network topology or Dual Homing network topology. The Star network topology is usually applied to access layer, without redundant protection, and key single-point fault will cause network unavailable. While for Dual Homing network topology, in order to guarantee the reliability between Tandem Exchange and Central Office, double uplink is needed. These two traditional network topologies have some demerits on network response time, protection mechanism and multicast application. Ethernet ring network technology, as one metropolitan area networking technology, provides a comprehensive solution and overcomes the defeats of traditional networks, such as weak data protection, long recovery time, etc. Theoretically speaking, it provides 15ms rapid protection and it is compatible with traditional Ethernet protocols, being an indispensable choice in core network innovation.

According to Ethernet ring network mainstream technology, Ethernet ring network is mainly controlled by software management, while different companies have different software protocols. Henrich applies in-house developed RingOn technology with ideal recovery time (less than 15ms).

Comparisons among different Ethernet protection			
Parameters	Port Trunking LACP	STP/RSTP/MSTP	Ethernet RingOn
Fault Recovery Time	Long	Long	Short
Networking	Point-to-point	Point-to-point, Ring	Ring
Application Layer	Access Layer, Convergence Layer	Access Layer, Convergence Layer, Core Layer	Access Layer, Convergence Layer, Core Layer
Equipment Resources Occupancy	Less	More	Less
Equipment Performance Requirements	Low	High	Small

2. RingOn™ Technology Implementation

2.1 RingOn™ Introduction

Ethernet ring redundancy is one network redundant mechanism, when switch network gets interrupted suddenly, the switches will get the signal and activate its backup port, to make sure the network communication recover and operate normally again. RingOn technology is based on the following principles: two switches connect with each other though private protocols and manage the data flow within the whole ring. All the switches within one ring should be selected from one manufacturer since the protocols are private.

RingOn technology is designed and developed for high-reliable industrial network system. The multiple ring network can be built through up to 250 switches and self-recover within 15ms. RingOn technology can provide multiple ring networks (Single Ring, Couple ring, Trunking Ring, etc.) to build flexible and reliable network structure. When the network connection or ring gets interrupted, the failure signal will be sent through Email and Relay Alarm Warning.

2.2 RingOn™ Working Mechanisms

The two ports of each switch are connected with each other through electric cable or optical cable to build a ring network structure. RingOn can be configured by Web server or the console port.



When the switches power on, the ring-building ports display Forward or Down, after finishing the configuration, the ring-building ports respectively display Forward and Block. When all the switches power on simultaneously, the blocking path will be determined by the minimum MAC address, and the ring-building ports of this switch respectively display Forward and Block.

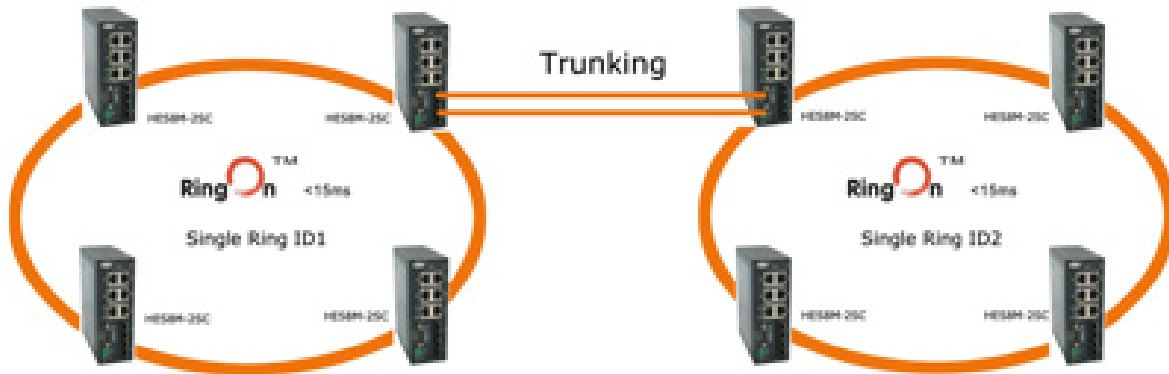
Response to main link connection failure—when the link gets interrupted, the Block port of the switch will swiftly change to Forward. The new network structure will be built within 15ms to guarantee the normal communication.

Recover the normal operation—the redundant link will be removed when the faulty cables get fixed, remove the redundant link and the switch will operate normally.

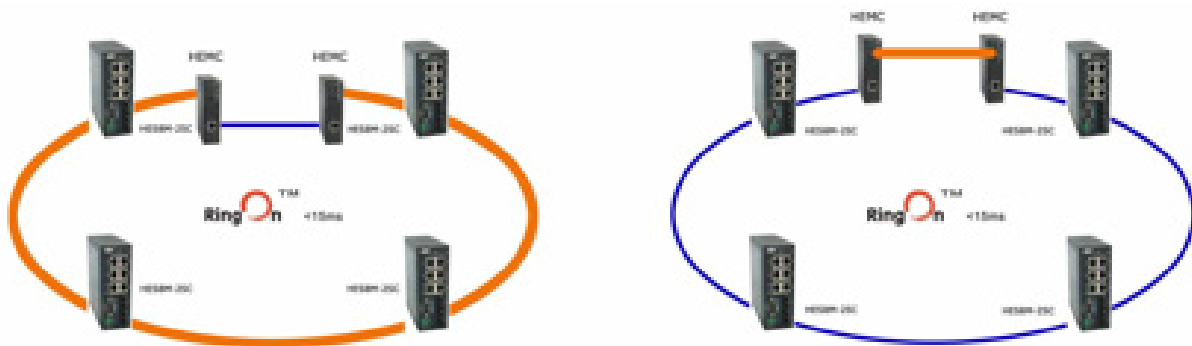
Couple ring is one unique ring-building approach. It connects two Single rings with each other and builds one redundant link between these two rings. Couple ring provides the Industrial Ethernet network system one link backup and guarantees higher reliability and stability.



Trunking Ring is another distinguishable ring-building approach. The two Single rings can be connected with each other to extend bandwidth and also provide redundant link. Trunking Ring can be applied when building much more large-scale network.

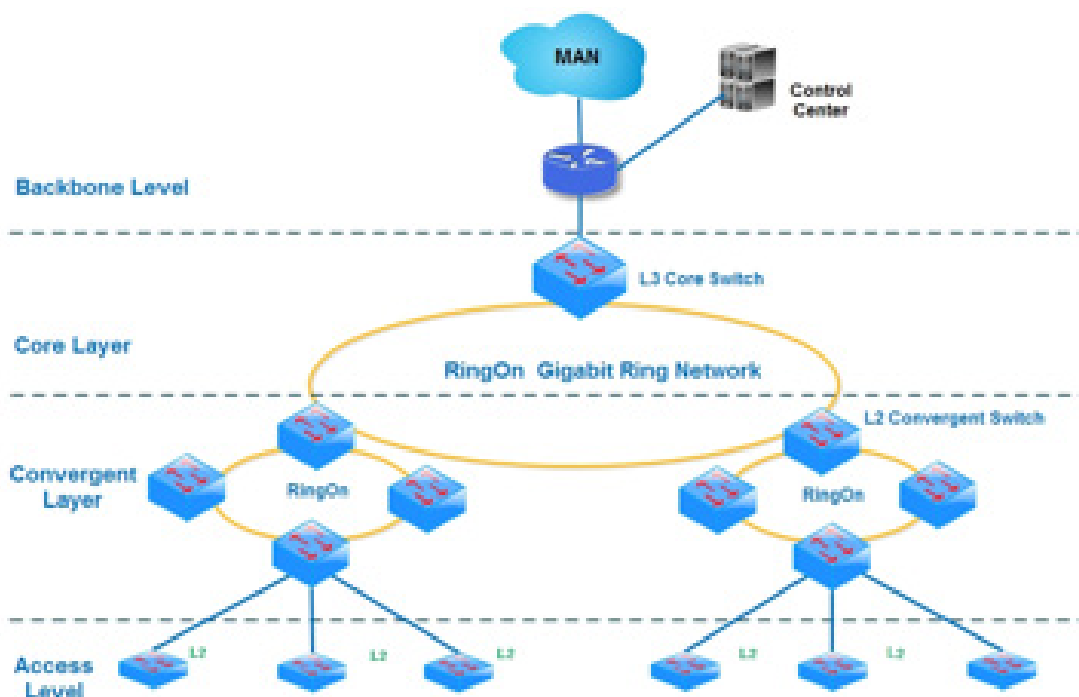


Besides, the media converter can also be added to the ring for more flexible application.



3. Typical Networking Application

3.1 Networking Topology



3.2 Networking Requirements

The network solution is suitable for electronic power system communication. The electronic communication network, as the safeguard of the electronic power system, not only manages the power system, but also provides services for the administration and automation information transmission. The electronic power communication transmission network can be divided into trunk transmission network and local network/ MAN. In order to achieve a large capacity business operation, trunk transmission network is mainly responsible for the business management among regional-level power companies. Local network/ MAN is mainly in charge of information transmission between power companies and their affiliated institutions. These affiliated institutions consist of power plants, power distribution stations, transformer substations, substations, power authorities, etc. Local network/ MAN can be divided into the core network and access network. The core network is mainly in charge of business convergence, while the access network is mainly responsible for the multi-service access and adaptation for each site.

The power distribution automation network system includes two parts. The first part is the backbone network system of distribution automation, including electric power dispatching centers, substations, etc. The second part is the distribution automation access network, composing multiple ring networks based on substations. The distribution automation backbone network system, based on municipal power dispatch center and its affiliated substations, forms a whole backbone network by virtue of the different locations of the substations.

4. Reference

- RFC 4318: Definitions of Managed Objects for Bridges with Rapid Spanning Tree Protocol
- IEEE 802.1D-1998: Media Access Control (MAC) Bridges
- IEEE 802.1w: Media Access Control (MAC) Bridges-Amendment 2: Rapid Reconfiguration
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- IEEE 802.1s: Virtual Bridged Local Area Networks-Amendment 3: Multiple Spanning Trees
- 802.1Q-2011: Media Access Control (MAC) Bridges and Virtual Bridge Local Area Networks

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