Henrich Electronics (Suzhou) Co. Ltd.

White Paper

RingOpen™ Technical

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Key Words:

IPv4, RingOpen™

Abstract:

This paper introduces RingOpen technology launched by Henrich Electronics. RingOpen redundancy technology, designed and developed for industrial control network application with high reliability, aims to provide compatibility with the third-party device. This paper also analyzes all types of redundant ring networks in detail, and provides corresponding network topology for reference.

Content

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 RingOpen 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. RingOpen™ Technology Implementation

2.1 RingOpen™ 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. RingOpen technology is based on the following principles: two Henrich switches connect with each other though private protocols, and one Henrich switch connect with third-party device(s), this switch is named the peripheral switch, while its connected ports named peripheral ports. When all the switches connect with each other, the third party device(s) is regarded as a network cloud, and non-peripheral Henrich switches will randomly assign one of them as the Block switch, to manage the data flow within the whole ring. Thereby, one redundant ring network compatible with the third-party devices is successfully built.

RingOpen technology is designed and developed for high-reliable industrial network system. When the network connection or ring gets interrupted, the failure signal will be sent through Email and Relay Alarm Warning.

2.2 RingOpen™ Working Mechanisms

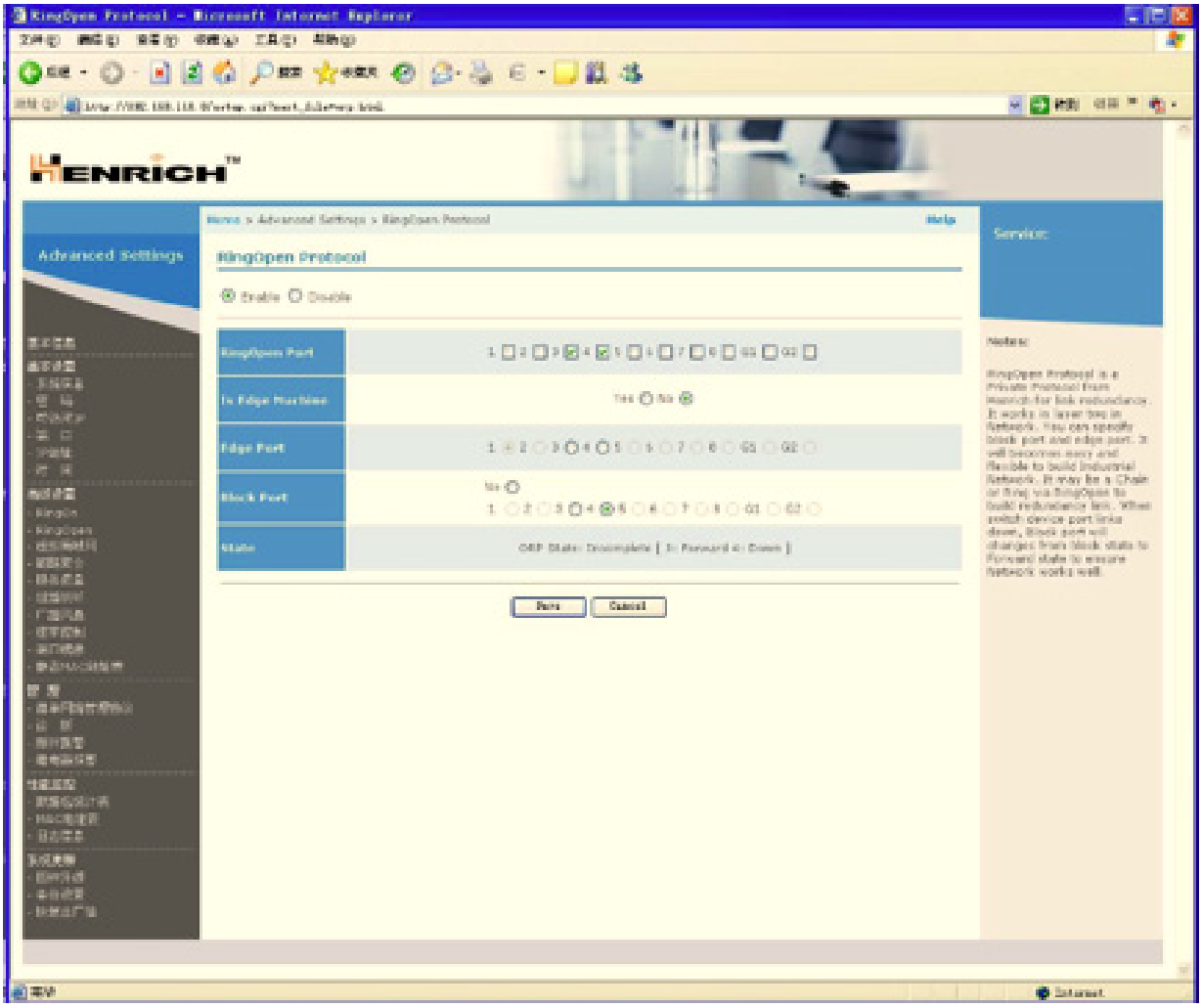
The two ports of each switch are connected with each other through electric cable or optical cable to build a ring network structure. RingOpen can be configured by Web server or the console port.

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, only the Block switch gets the blocking point.

Response to main link connection failure—when the link gets interrupted, the port “Block” of the switch will swiftly change to “Forward”.

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.

Refer to the configuration page below:



3. Typical Networking Application

3.1 Networking Topology

MX6028-4G-20SFP-220VADC/110VAC

Installation Step

- The switch can be installed with panel mounting. The operation temperature for “MX” series of switches ranges from -40℃ to 85℃ . The ambient relative humidity ranges of 5% ~ 95%, no condensing.

- Rack mount brackets installation: the switch itself is equipped with two pairs of rack mount brackets, refer to the following figure during installation.

- Rack mount clips installation: the rack mount clips are included in the accessories. When using the rack mount clips, firstly remove the rackets on the switches, then fasten the clips onto the device and attach the corresponding M12 screws to both sides of the chassis. Please make sure the clips are tightly fixed.

- MX6028-4G-20SFP-220VADC/110VAC supports relay alarm warning. The alarm will be triggered in the following situations: a. the ports get connected or disconnected; b. the RingOn™ gets interrupted.

- MX6028-4G-20SFP-220VADC/110VAC supports 4 10/100Base T(x) copper ports, 20 100Base-Fx SFP optical fiber ports and 4 1000Base-x SFP optical fiber ports. When using the switch, you can insert the Cat5 cable directly into the copper ports, or plug corresponding SFP modules into the 100Base-Fx SFP optical fiber ports and 1000Base-x SFP optical fiber ports. Please refer to the figure below when using the SFP modules. For MX6028-4G-20SFP-220VADC/110VAC, all copper ports support Full/ Half Duplex, Auto-negotiation, and all the optical fiber ports support Single mode and mutli-mode modules.

- MX6028-4G-20SFP-220VADC/110VAC switch support dual power supply, ranges of 85 to 264VAC input and 120 to 370VDC input. PWR 1(PWR short for power) or PWR 2 or both power supplies are available according to practical applications. When using the switch power supplies, connect the power cord with cable terminal and then plug into power terminal. When

using alternating current circuit, plug the neutral wire and fire wire into the N/L ports, and plug yellow earth wire into GND port; the situation changes when choosing the direct current circuit, you should put power wires into +/-ports. Please make sure the power cord is correctly and tightly connected with power terminals before power on. Whichever power is chosen, the corresponding LED indicator will work.

Note: For more about software configuration, refer to the user manual.

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.

The combination of RingOn protocol and RingOpen protocol will provide an ideal and reliable redundant ring network. The core layer adopt the RingOpen protocol, while the convergence layer adopt the RingOn protocol, with one layer-two switch belong to both ring networks, these two rings can achieve seamless switching.

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
- IEEE 802.1D-2004: Media Access Control (MAC) Bridges
- 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