Method of Measuring the Switching Time of Dual Redundant NIC

Zhengrong Tao, Jiangsu Automation Research Institute, China
Zhenxing Yin, Jiangsu Automation Research Institute, China

ABSTRACT

In this paper, the authors present a method of measuring the switching time of a dual redundant NIC. The accuracy of the authors’ method of measuring switching time can reach milliseconds. The authors’ method uses Internet Control Message Protocol (ICMP) packets to test, is easy to operate, has high precision, and can be applied to all types of dual redundant device switching time measurement.

Keywords: Dual Redundant Architecture, Dual Redundant LAN, Dual Redundant NIC, Measurement Methods, Networks, Switching Time

1. INTRODUCTION

With the increasing popularity of computers, ethernet is in every corner of people’s lives, and networks appear everywhere. To ensure the smooth flow of the network, the important parts of the network generally use dual redundant architecture, so that once a certain node or network connection has failure, dual redundant LAN connections automatically switch to the backup to ensure that the network still works properly. For dual redundant networks, switching time is an important indicator to measure its performance level, and higher requirement of real-time needs shorter switching time (Stevens, 2000; Wei, Liqiang Liu, & Gannan Yuan, 2003).

This paper describes a precise method to measure the dual redundant LAN card switching time, and can also be used to promote the acceptance testing of the dual redundant network equipment performance.

2. THEORY OF DUAL REDUNDANT NETWORK

Typical basic dual redundant network architecture is shown in Figure 1.

In Figure 1, all computers are respectively connected to switch 1 and switch 2 through dual redundant LAN cards, where the solid lines represent the main connections, and the dotted lines represent the backup connections. Under normal circumstances, dual redundant network cards work on the main connecting

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links, and transmit Ethernet data through the connections; the Backup connecting links are in hot standby state, which could not transmit Ethernet data. When some device’s main connecting link fails, the device’s dual redundant LAN card automatically switches to the backup link to work (Wang & Li, 2008; Win-River, 2003).

For example, if the primary link of computer 1 has problem, its dual redundant computer network card will automatically switch to the backup connection link to work. At the same time the status of other equipment is not affected which is unchanged, and the whole network work normally again with the smallest cost.

For large-scale dual redundant network, the switch parts may connect in different layers, such as the access layer, convergence layer and the core layer. However, no matter what kind of layer connection is used, the basic principle is the same as Figure 1.

3. SWITCHING TIME MEASUREMENT PRINCIPLE

The test methods in this paper mainly use the ICMP (Internet Control Message Protocol) packets to test (Sinmwalla, Sharma, & Kesbav, 1999). As shown in Figure 2, when a device sends an ICMP request to another device, the receiver will return an ICMP response.

The test method here uses this characteristic of the ICMP packet, and when the test equipment continuously sends ICMP request to the device under test, the device under test will generate ICMP response in the primary connection link continuously while there is no response in the backup link. When the primary connection is interrupted, after the dual redundant network card switches automatically, the backup connection generates ICMP response while the primary link has none. In the switching process, neither of the primary and backup

Figure 1. Dual redundant network structure

![Image of dual redundant network structure]

Figure 2. Request and reply of ICMP packets

![Image of ICMP request and response]
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