# An identification based network link backup method

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**Absrtact:** in order to solve the problem of network link failure or link congestion, this paper proposes an identification based link backup method, which uses the identification network to carry out collaborative backup of links, formulates the link level through the network identification mechanism, divides the routing characteristics through the link level, and calculates the link level through the link backup protocol between routers. When the high priority link fails or the link congestion occurs, the low priority link can be used for routing; When the transmission rate of a single link decreases, the low priority link can also be enabled. So as to achieve network load balancing and maximize link utilization. Through mini net simulation, the experimental topology is built and verified. The results show that this method can quickly repair the link failure, quickly switch the link, reduce the network interruption delay, when the high priority link failure or congestion, it can quickly establish the route update, and quickly recover, so as to achieve the purpose of network load balancing.

**Keywords:** identification network;link backup;load balancing

## 1 Introduction

In order to solve the problems of network link failure and link congestion, the traditional link backup mechanism is based on IP routing, such as literature. It is necessary to re-establish the network link and use OSFP and BGP to reconstruct the route.

The traditional IP network lacks architecture in controllability and manageability. Sdn, NDN, intelligent collaborative network and other networks have introduced the identification structure architecture to solve the defects of IP architecture. The identification network can improve user service quality in fine granularity, better control network traffic, carry out network traffic engineering, and improve network load balancing and network transmission efficiency.

In reference, SDN separates the control layer from the data layer, and focuses on the deployment of high availability tree subgraphs in the control layer to reduce the delay between the switch layer and the control layer. In reference, an enhanced neighbor discovery protocol is designed to effectively avoid the problems that affect the network performance in the wireless environment caused by unidirectional links, This paper proposes a new active routing nolsr based on OLSR (optimized link state routing). Literature uses ant colony optimization (ACO) algorithm to find the shortest path, which improves the performance, cost and probability ratio of the algorithm; Reference gives the processing method of double link fault, uses link protection separately for two faulty links, and proposes backup link mutual exclusion (BLME); Reference studies the scheme of fast reroute link failure in SDN networks.

These solutions to link failure or link backup do not use the identification method to solve the link backup problem. Inspired by the solutions of these networks, this paper proposes a link backup method based on identification network, which can guarantee the routing transmission when link failure or link congestion occurs, so as to realize network load balancing and maximize link utilization.

## 2 Related network architecture

This paper uses the identification architecture of Intelligent Collaborative Network to divide the network into “three layers” and “two domains”. See references for the operation mechanism. Using this network structure and related mapping system can better realize the control and management of the network. The identification based link backup method designed in this paper works in the component layer, which is divided into control layer and data layer. The control layer has control cache function module and routing control function module; The data layer has the functions of data forwarding and data caching.

## 3 Identification based link backup method

1. Scene design

This scheme optimizes the traditional tree topology and adopts the fattree topology and switch only topology. The whole fattree topology network is divided into three layers, edge layer, aggregate layer and core layer. Multiple switches in the convergence layer and the edge layer form a pod.

2. Simple link backup example

As shown in Figure 1, there is a service provider and a service recipient. R1-r3 is an identified router, in which there are two links, one is a high priority link, the path is the service recipient-r1-r2-service provider, and the other is a low priority link, the path is the service recipient-r1-r3-r2-service provider. Link backup is mainly used to back up the fsib entries generated by the routing protocol. It requires that there are more than two links between the service requestor and the service recipient for communication. The priority of the network path is calculated through the routing protocol and routing calculation. When the high priority link fails or is congested, the low priority link is enabled. The priority of the link is determined through dynamic routing. When the high priority link is disconnected, the low priority link will start automatically without network interruption or retransmission.

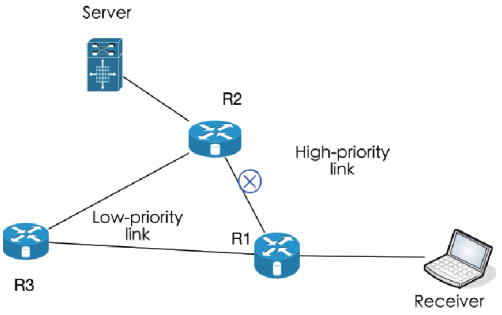


**Figure 1 Schematic diagram of link backup**

3. Link backup process

By configuring the network segment to be monitored, the backup link can be started when the high priority link fails. The link is described as follows: (1) route update detection; (2) Check whether there are at least two effective routes; (3) Determine the path priority according to LSA and routing protocol identification options, and mark it in fsib; (4) If the high priority link fails or is congested, enable the backup link and change the relevant route fsib; (5) After the low priority link is enabled, if a high priority link is found, the original link route can be restored according to the link priority marked by fsib.

## 4 Experiment and result analysis

1. Experimental environment

The experimental environment is based on ubutu1604 system, mininet simulation platform improves the transmission mode of ryu controller, realizes the identification routing of intelligent collaborative network, the deployed link backup method, and the network topology adopts fattree. The bandwidth value is set to 100mbit/s, and the iperf is used to simulate the network traffic. The overall shape of the traffic conforms to the characteristics of the network traffic, and the effect of verifying the network traffic scheduling will be more obvious. Because the communication between different pods will lead to the increase of the possibility of core layer link congestion, load is selected_X this flow mode is tested.

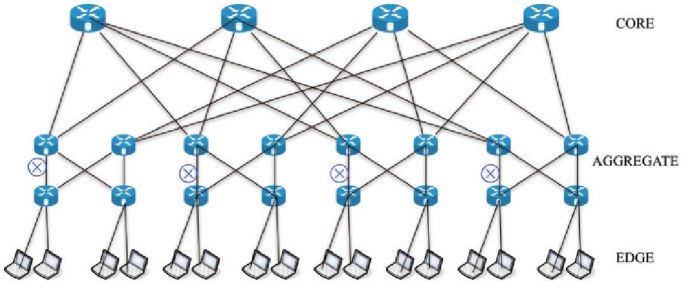


**Figure 2 network simulation topology**

As shown in Figure 2, a four element fattree network topology is built on the mininet simulation platform, and the number of terminals and routers are 16 and 20 respectively. Iperf simulates network streaming, and the duration of streaming is set to 100s. The UDP message size is set to 256 bytes, and the traffic load gradually increases from 0.1mbps/s to 1mbps/s.

2. Result analysis

Set the round-trip delay of the high priority link to 30ms, and the round-trip delay of the low priority link to 100ms. Disconnect the link marked in Figure 2 every 10s. The service requester Ping the service provider to verify the link connectivity. The Ping packet interval is 0.1s, and the experiment is conducted for 100s. Disconnect the direct link between R1 and R2 in the figure every 10s, and restore the link after 10ms. The measured round-trip delay and handover delay are shown in Figure 3.

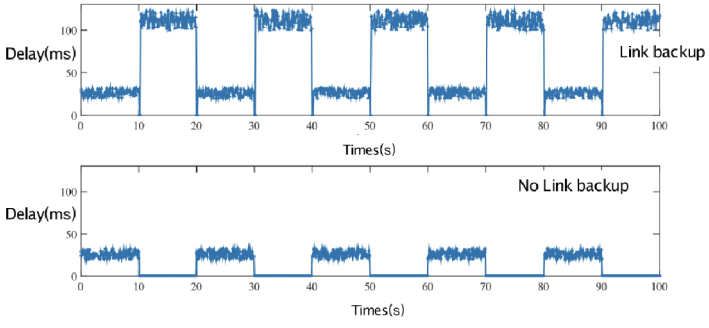


**Figure 3 transmission delay**

When the link backup method is adopted, the handover interruption occurs in the early stage of down and up operations, and the average handover delay is calculated to be 0.037s.

## 5 Conclusion

The identification based link backup method designed in this paper formulates the link level through the network identification mechanism, divides the routing characteristics through the link level, and calculates the link level through the link backup protocol between routers. When the high priority link fails or the link congestion occurs, the low priority link is used for routing; When the transmission rate of a single link decreases, the low priority link can also be enabled. The experimental results show that this method can quickly repair the link failure, reduce the network interruption delay, and quickly recover when the high priority link is recovered, so as to realize the network load balancing and maximize the link utilization.

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