

Research on User Dynamic Selection Network Technology

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Abstract—As the world has entered the Internet era, more and more network operators have also developed one after another, which has been widely used in communities, schools, banks and other regions. Due to the uneven distribution of network providers in different regions, a certain network line is not running smoothly. In order to solve this problem, this paper puts forward a method that users can dynamically choose networks according to their preferences, and the problem can be solved by static routing and network address translation. At first, set the internal IP addresses of different users and the external IP addresses provided by internet providers on the ports on both sides of the user LAN router. During network address translation, a fixed one-to-one relationship established by the internal IP and the external IP is loaded into the routing table of the user LAN as a static route. Finally, users can actively and dynamically set the internal IP of the user LAN router in the router list in the user computer and realize the method that the user dynamically selects different interconnection networks.

Keywords-Dynamically Choose Networks; Network Address Translation; Internal IP

I. USER DYNAMIC SELECTION NETWORK

Regional Internet Service Provider (ISP) provides services for community ISP who is

similar to a unified relay station provides directly network support for users. In this way, the packet cannot be transmitted directly, but are transmitted after some preprocessing in the middle [1].

There are three methods for users to choose the Internet.

One is that the network ports provided by the community ISP and a regional ISP only is connected, as shown in Figure 1(a). The main drawback of this method is that once the network fails, the user LAN will be completely paralyzed. And the speed of accessing the network will become very slow when the user visits reach the peak [2].

The other is that the community ISP provides a main line and a standby line port, which are connected with the network port provided by the region as shown in Figure 1(b). The advantage of this method is that when the main line fails, the standby line still keeps running. But that line is extremely low and cannot run smoothly. Obviously, this situation cannot provide users with dynamic choice of internet.

The third is that the network ports provided by community providers are connected with the network ports provided by different regions, as

shown in Figure 1(c). The advantage of this method is that when a line goes wrong, it can be switched to other lines at any time, ensuring the reliability of data transmission [3]. At the same time, it also provides an optimal method for users to dynamically select networks.

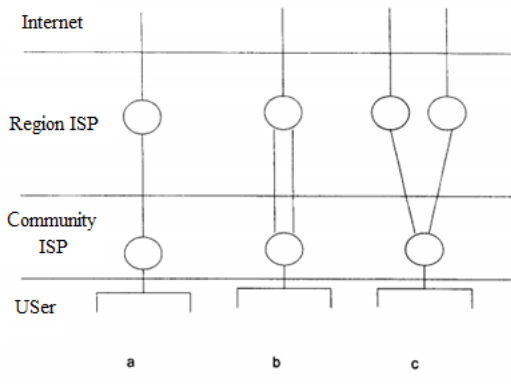


Figure 1. Connection methods of three modes of computer LAN accessing internet

By comparison, the third route selection method is adopted. Because users can dynamically select the network provided by different ISP. When a line fails or is not smooth, users can also choose a better route according to their personal preferences.

II. PRINCIPLE OF METHOD

IP addresses provided by different region ISP are different when the region provides services for a community. If the community switches different network ports, it must return the network ports provided by this region ISP, and then allocate IP addresses provided by another region provider for each computer in the community.

Obviously, this method is inconvenient and greatly affects the timeliness of dynamic network allocation. But Network Address Translation

(NAT) function can be introduced into the community router to solve this problem [4]. NAT allows the whole group to share a public IP address in the Internet. In fact, it is an Internet technology that can convert the private address of the internal network into a public address [5]. It can not only share a public address, but also use the bandwidth provided by the local network service provider to access the Internet safely at high speed [6], hiding and protecting the computers inside the network.

As shown in Fig. 2, IP addresses assigned by ISP1 and ISP2 to router ports of user LAN in community are 200.10.45.253 and 200.33.67.253 respectively, and IP address pools assigned to user local area network in community are 200.10.46.0/24 and 200.33.68.0/24 respectively. All of which are true IP addresses on the internet.

For example, if the user wants to change the ISP1 to the ISP2, the address pool allocated by ISP1 for the community LAN must be returned to it, and then each computer in the community is allocated the IP address 200.33.68.0/24 provided by ISP2. Obviously, this method is inconvenient and also leads to the waste of IP addresses.

If the NAT is introduced into the router in the community, and a LAN is set up in the community to use the internal IP address. Finally, the problem will be solved. For example, the internal IP is 192.168.0.0/8. When the user 192.168.0.5 sends data packets to the 203.120.10.30 on the Internet. The community Router first finds the next hop 200.10.45.253 of the best route in its routing table, so NAT converts 192.168.0.5 into an external address, that is, a true IP address assigned by ISP1.

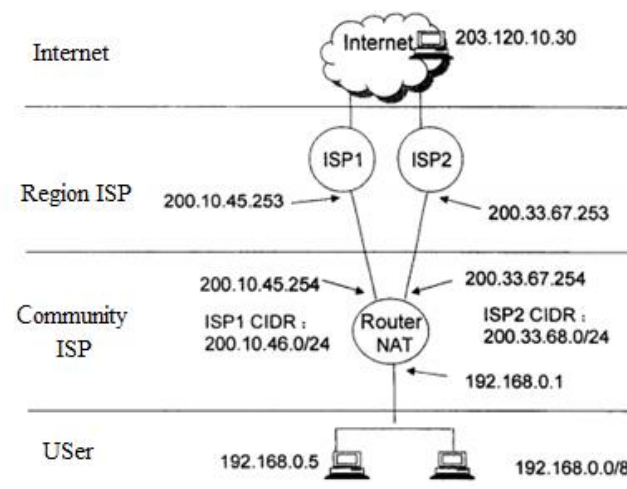


Figure 2. Connection block diagram for users to dynamically select different regional ISP

In this way, for 203.120.10.30, the data packet is sent from 200.10.46.8. When the packet is returned, it is returned to 200.10.46.8, and then NAT converts the address into 192.168.0.5. In this process, few public IP is reused for private network, which greatly reduces the address usage [7]. The community LAN router can automatically select the best route, but the user can't control this route.

III. DYNAMICALLY SELECTS NETWORKS PROCESS

The purpose of this paper is to provide a method for users to dynamically select region ISPs that users can choose different ISPs to access the Internet at any time according to their preferences through community LAN. And pay fees for such access services according to the prior agreement.

The method for users to dynamically select the internet mainly comprises the following steps:

Step1: Connect the routers of the user LAN with the routers of several regional network providers.

Step2: Set different internal IP addresses at the port of the user LAN router, and set various external IP addresses at the other port of the user LAN router.

Step3: When the network address is translated, a fixed one-to-one relationship established by the internal IP and the external IP of the ports on both sides is loaded into the routing table of the user LAN as a static route.

Step4: The user actively and dynamically sets the internal IP address of the user LAN router in the router list in the user computer according to his preference.

The flow chart of user's dynamic selection of network is shown in Figure 3.

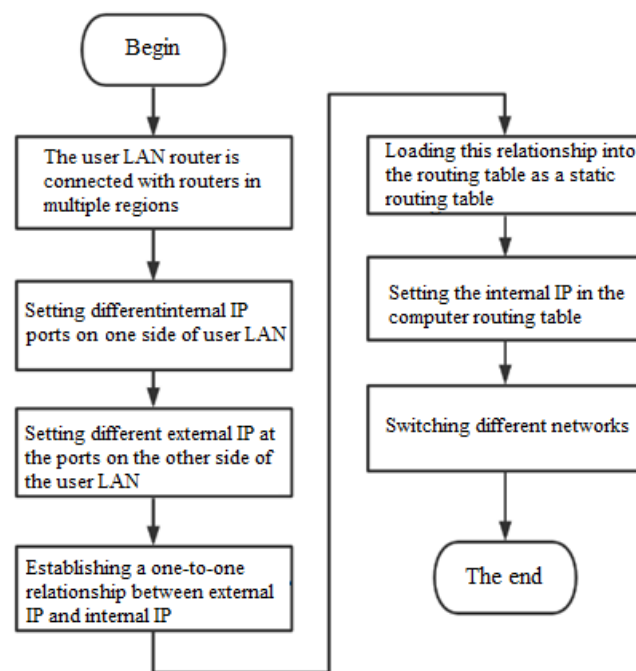


Figure 3. Flow chart of user's dynamic selection of network

IV. LOADING THE ROUTER LIST

There are three ways to set the internal IP address of the user LAN router in the router list in the computer: first, only one internal IP address of the router is reserved; Second, keeping all the internal IP addresses of the router, but with different priorities and filtering conditions; Third, keeping all the internal IP of the router, but with the same priority and filtering conditions;

Filtering conditions refer to the stability, price and bandwidth of region ISP.

According to these three router list configurations, routers in community LAN also have three strategies:

First, the user's data packets are sent and received according to the internal IP address and external IP address recorded in the routing table.

The second is to select the internal IP address with higher priority from the list of routers in the user's computer. If the corresponding external IP

address reaches the screening index, the user's packet will be forwarded along this route. On the contrary, if it fails to reach the index, the internal IP address with a lower priority is selected to judge whether it reaches the index. Repeat this step until you find a route that meets the filter criteria; If there is no route that meets the filtering criteria, the user's packet is not sent.

Thirdly, an internal IP address is randomly selected from the routing list in the user's computer. If the corresponding external IP address reaches the screening index, the data packet will be sent and received according to this route; On the contrary, if the index is not reached, another internal IP address is taken to judge whether it meets the index; Repeat this step until you find out the route that reaches the screening index; If there is no route reaching the screening index, the packet will not be sent.

The first way to configure the router list is to manually select the network according to the

preference. However, the latter two are that the community LAN automatically selects the internet provided by the regional providers who can meet the screening criteria.

V. DETAILED DESCRIPTION OF THE METHOD

In the technology of user dynamic selection of network, network address translation can be realized by router with NAT function [8] or by a separate device with conversion function. Two routers (RNAT1 and RNAT2) with translation function are connected to the Ethernet switch of the user LAN, and a fixed one-to-one relationship established by the internal IP and the external IP of the ports on both sides through the network address translation device is loaded into the routing table of the user LAN as a static route. In this way, the internet provided by regional providers can be dynamically switched by users.

As shown in Fig. 4. The internal IP addresses set up at the ports connecting RNAT1 and RNAT2 to LAN are 192.168.0.1 and 192.168.0.2 respectively, and the external IP addresses 200.10.45.254 and 200.33.67.254 provided by the ISP1 and ISP2 are located on the port where RNAT1 connects to ISP1 and the port RNAT2 connects to ISP2 respectively.

A fixed one-to-one relationship recorded in the routing table of the user LAN as a static route between two routes is established through network address translation. And RNAT1 and RNAT2 ports connected to regional ISP correspond to true IP addresses 200.10.45.254 and 200.33.67.254, respectively. When the user is willing to use ISP1, 192.168.0.1 is uniquely set in the router list on his computer; And vice versa.

At the same time, the user can also record the two internal IP addresses 192.168.0.1 and 192.168.0.2 in the computer, and set different

priorities for them with filtering conditions; Or the priority is the same with filter conditions.

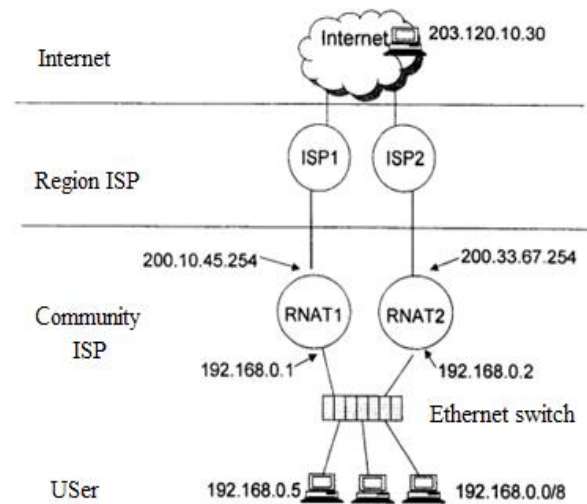


Figure 4. Application Example of User Dynamic Selection Network Method

VI. METHOD IMPROVEMENT

A. For technical improvements

Figure 5 is an application diagram for further improvement of technology, which is equivalent to merging two routers with NAT function. Router NAT assigns different internal IP addresses to Ethernet interfaces.

For example, the external IP addresses 200.10.45.254 and 200.33.67.254 provided by region ISP1 and ISP2 are respectively located at the port where Router NAT is connected to ISP1 and where Router NAT is connected to ISP2; Then a fixed one-to-one correspondence recorded in the routing table of the user LAN as a static route between the two routes is established through NAT translation. And the next hops of 200.10.45.254 and 200.33.67.254 are fixed to router port 200.10.45.253 of SP1 and router port 200.33.67.253 of ISP2 respectively.

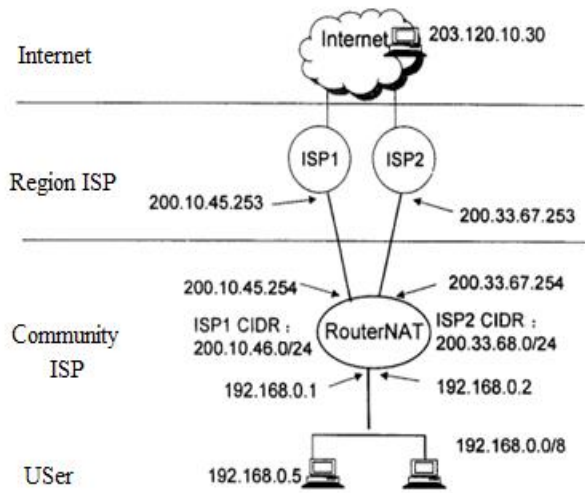


Figure 5. Application Example of Method Improvement Scheme

Assume the user 192.168.0.5 sends a packet to 203.120.10.30. Because there is no this address in the community LAN, the packet flows to 191.68.0.1, passes through 200.10.45.254 to the port address 200.10.45.253 of ISP1. And Router NAT converts 192.168.0.5 to 200.10.46.8. Therefore, it seems to ISP1 that the data packet is sent from 200.10.46.8. When 203.120.10.30 returns data, the steps are the same as above.

If 192.168.0.5 wants the service of ISP2, it directly changes the unique address in the router

list on its computer to 192.168.0.2, and the process is similar to the above.

At the same time, the user can keep two internal IP addresses of the router, and set different priorities for them with filtering conditions or set same priorities with filter conditions.

B. Improvement scheme for a large number of users

When there are a large number of users using the network in the community, the community LAN is divided into several subnets, such as LAN1, LAN2 and LAN3 in Figure 6. Each subnet connected with two NAT devices through different Ethernet switches is connected to the Internet through R1 or R2, and then a one-to-one correspondence between the internal IP and the external IP of the ports on both sides of the router is established.

When 192.168.2.6 in LAN2 wants to access ISP2, 192.168.2.2 is uniquely set in the router list of its computer. When users want to access ISP1, the steps are the same as above.

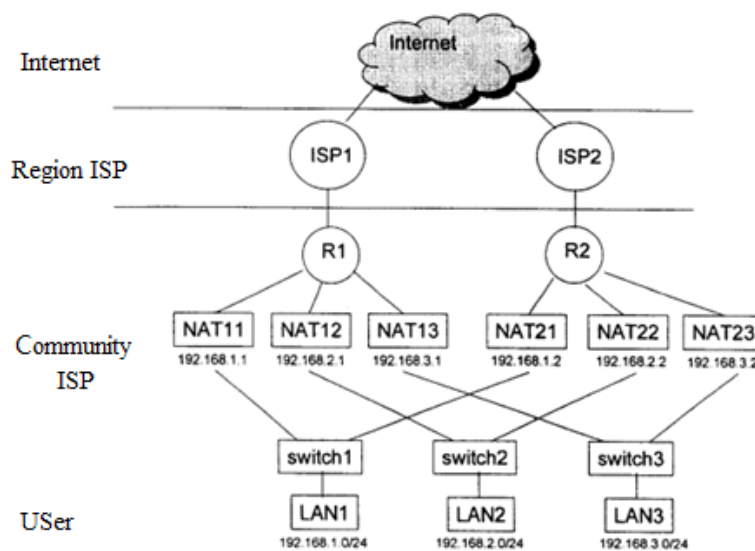


Figure 6. An application example in complex community

The method can also provide users with a technical scheme of entrusting routers to select on their behalf, that is, allowing users to propose a set of conditions for determining routes, which are called screening conditions. Such as routing stability, price, bandwidth, etc. Routers regularly carry out statistical analysis on routes to providers in various regions, and calculate screening indicators for each route. When the route used by the user changes, the router compares the filtering indexes of each route with the conditions proposed by the user, and then selects a satisfactory route for the user to use.

VII. CONCLUSION

The main purpose of this paper is to improve the user's experience in using the network, and to enable users to dynamically choose the network methods provided by different operators in the user LAN. Because the frequency distribution of users using the network at different times is uneven. Through connecting the routers of the user LAN with the routers provided by the operators, and then the internal IP address of the user LAN is converted into the external IP address provided by the operators through the network address conversion technology. So that users can dynamically select the networks, and the smooth operation of the network can be realized during the peak period of the network. Compared with the traditional network, this method greatly improves the fluency of users in the process of using the network. And this method has been put into use in

YiZhuang, and won the first place in the construction project of "YiZhuang 12 square kilometers triple play demonstration zone".

ACKNOWLEDGEMENT

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