A New Routing Method Based on Station ID

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ABSTRACT

There are two problems on routing packets by means of IP address in a seamlessly wide area radio networks: (1) conflicting IP address on routing infomations and (2) little flexibility to accomodate and isolate the differences among local network policies. To solve them , it is important to use a routing method based on the callsign of radio station. A new method is presented in this paper with an emphasis on the use of the callsign. This protocol employs Station ID (SID), which is a combination of callsign and a system number.

KEYWORDS

routing, TCP/IP, SID, SSID, NET/ROM

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1. Routing Based on Station ID

In spite of non-unique private II? address, we are assigned highly unique call sign for each amateur radio station. This uniqueness is guaranteed by the law enforcement worldwide; an address duplicate immediately implies at most one is valid and the rest may be strongly urged to corrent the identification.

For this reason, amateur radio packet communication commonly uses a Station ID, which consists of the call sign and a system number, for example, JH1FBM-1. In this method, since the routing is performed based on SID, it is capable of handling any network protocol. The largest benefit of this method is the ability to distinguish the logical network even where some terminals of different logical networks share the same communication medium.

There are easy and better for the routing system to use the SID as physical address and exchange the IP address over SID.

2. Background

More recently, TCP/IP and NET/ROM have offered better solution. TCP/IP, in particular, has been popularly implemented in various operating systems, and attempted to apply for amateur radio communication. For the popularity and abundant application softwares already developed, it is beneficial to build our network based on IP network. However, in building networks of large scale, the capability of the protocol is currently not fully used.

When the AX.25 protocol was established, digipeating feature for packet relaying was only a temporary solution until another standard for the network layer would be accepted. Digipeating

requires for the sender to specify all the path on the way to reach the receiver; it demands too much for the sender and lacks flexibility. Therefore, it is not a satisfactory standard.

NET/ROM is 1st dynamic routing protocol based on Station ID. But, NET/ROM didn't work well as the Wide area network. Because NET/ROM capacity was limited. IP networks seem work well, but they have other problems.

3. Problems on IP Address Based Routing

Owing to rapid growth of the Internet, the IP address space is being depleted. The terminals in a private network (not directly connected to the Internet) are usually assigned private IP addresses to save the IP addresses used. Such private address can be freely used in a private network. When a terminal in a private network communicate through the Internet, the firewall of the network exchanges the packet in behalf of the terminal, to avoid the non-unique private address to appear on the Internet.

However, a new problem arises when we manage seamless wide area network, including amateur radio network, by the use of private IP addresses. This is because all the terminals exist in a same space; when two terminals have the identical IP address, the correct routing is impossible.

If we adhere to routing based on the IP address, we are left between two choices: (1) to assign Internet-valid IP address or (2) to control the use of private addresses so that unique assignment is guaranteed.

The first choice does not completely solve the problem, because there is no regulation that prohibits the use of an arbitrary IP address on amateur radio network. The second one requires a large amount of labor to manage the unique assignment of the address especially if the network is of large scale or wide area.

4. Problems on the NET/ROM.

NET/ROM worked as network protocol. But its capability was limited. A procedure of this SID based exchange system is almost same as that of NET/ROM's. We must study the reason of NET/ROM limitation to avoid making same weak point in our system.

Why the NET/ROM capability is limited.

(1) Capacity of routing table was limited. Number of table entry is much smaller than number of operating stations. This limitation is due to memory capacity of 8bit Z80 CPU

(2) Connection type protocol's overhead is heavy. NET/ROM is designed based on AX.25. Protocol overhead is heavy and lengthy for some specific upper layer protocol. For example, TCP layer itself act as error free transfer method, it needs light lower layer to enhance system thoughput.

(3) Physical speed is limited. Using 1200bps BELL 202 modem limits address exchanging capability. Exchanging large routing table will choke network traffic.

5. How do we solve the limitation

(1) Capacity of address routing table. The size of this table for supporting a million stations will be around 16Mbytes. It is easy to get this size of memory on today's personal computer to hold the table,

(2) Connectionless lower layer. We have capability to develop original protocol stacks on open software platforms like FreeBSD or Linux. Making original connectionless protocol is not difficult. In fact, I made prototype on FreeBSD 2.2.6 and it is under stability checking.

(3) Higher speed modem. A new designed 808kbps Spread Spectrum radio is running on the PRUG96 system. This radio will serve us enough link capacity to exchange large address routing table between tens of thousands of radio stations in a few seconds. Based on a simple simulation on the PC, twenty thousands of stations will complete exchanging their routing tables each other only in three seconds.

6. Experiment

We are experimenting this protocol with PRUG96 system. And we will describe Address Resolution Protocol (ARP) , which resolve IP Address to SID of physical address. Further questions or inquiry on the latest result should be addressed by e-mail to Noriton@nemoto.com.

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