Chapter 2
PBMN and Technology for Operating and Monitoring

In the current Internet system, problems due to the abuse of the anonymity of the network communication occur. For example, personal information leak and crimes using the Internet system occur. Considering that the TCP/IP protocol, which is used in the current Internet system, does not have the user identification information on the communication data, it is difficult to supervise the user who performs the abovementioned acts immediately. Among the studies and technologies for the management of the current Internet system, which include the TCP/IP, there are the following:

1. Domain name system (DNS) (Mockapetris & Dunlap, 1988)
2. Routing protocol
3. Interior gateway protocol (IGP) such as Routing information protocol (RIP) (Rekhter & Hares, 2016) and Open shortest path first (OSPF) (Egevang & Francis, 1994)
4. Exterior gateway protocol (EGP) such as Border gateway protocol (BGP) (Chan, 2016)
5. Fire wall (F/W) (Liu & Gouda, 2008)
6. Network address translation (NAT) (Durham, 2000) / Network address port translation (NAPT) (Ferdous, Chowdhury, & Acharjee, 2007)
7. Load balancing (Das, Harvey, & Biswas, 2002)
8. Virtual private network (VPN) (Metz, 2003)
9. Public key infrastructure(PKI) (Perlman, 1999)
10. Virtualization Technology (Singh, Korupolu, & Mohapatra, 2008)
11. Technology for the operation and monitoring

Various kinds of other studies are performed elsewhere. However, they are conducted to manage specific parts of the current Internet system, rather than aiming at solving the abovementioned problems.

In relation to this, there is the study area about PBNM. This scheme is used to manage the whole LAN through communication control in increment of the user. Since this existing PBNM manages the whole LAN by making anonymous non-anonymous communications, it becomes possible for the system administrator to identify the user who steals personal information and commits a crime swiftly and easily. In PBNM, the control of the network devices which are distributed and located on the network is performed automatically and intensively by the operation method and the control of the network device being expressed in the form of policy rule. As a result, the effective operation of the whole network system is realized. When the system administrator sets the movement and function of the network device, it becomes possible to set it through the useful user interface. In the user interface, the structure and function of the network device are abstracted and are expressed, and it is possible to make the operational rule of the network device that is called policy rule. Therefore, the rule setting in the user interface is enabled without being conscious of the command of the network device. In addition, given that the common interface which absorbs the difference between each network device is offered, it becomes possible to reduce the load of the system operation in the multi-vender environment. In the operation and management of the conventional network system, the system administrator logged in to each network device and changed the setting information in the form of using the network command, such as the telnet and the SSH. Even though the system administrator does not have to go to the place where the network device is, it is necessary for individual setting to be accomplished in increments of the network device. In the case of the PBNM, the setting of the network device is accomplished on one place of the screen intensively. The setting work for each network device is carried out automatically for the cause in the setting information. In other words, the central control system of the network is built. Then, given that the policy rule is expressed abstractly to some extent, when the value of the setting does not match the actual situation of the operation, it is possible to perform the adjustment of the setting information. The rule and the value of the setting which are derived as the result of such adjustments are visualized in the form of the policy rule, thus it becomes a precious method in the operation of the network system. When a similar network system is built newly, it is possible to misappropriate the policy rule to some extent. Consequently, it is possible to divert the policy rule to the network with the same purpose. When the network administrator

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