Automatic Topology Discovery and Virtual Connection Trace for ATM Networks Using SNMP *

H. C. Lin, C. S. Ye
Department of Computer Science
National Tsing Hua University
Hsinchu, Taiwan, R.O.C.
{hclin, ycz}@cs.nthu.edu.tw

C. C. Lin
Technology Service Division
Institue for Information Industry
Taipei, Taiwan, R.O.C.
zcclin@iii.org.tw

Keyworks

ATM networks, topology discovery, virtual connection trace, SNMP

1. Introduction

The topology of an ATM network is referred to as the map of the network consisting of the devices in the network and the connections among them. Network topology information is useful for network administration and planning. For examples, network problems, traffic bottlenecks, and other important information can be shown directly on the topology map such that a network administrator has a clear view of the current status of the network. The current topology information is also useful for planning new configuration when an expansion is needed. Entering the network topology information manually is a tedious task if the number of network devices is large. Therefore, a tool for generating the network topology automatically is desirable.

In ATM networks, the values of VPI and VCI have only local significance. It does not explicitly reveal information about the source, destination, and path of the virtual connection. To find the source, destination, and path for the connection, one need to trace the VPIs and VCIs in the ATM switches. A tool for tracing the path of a virtual connection is useful.

2. ATM topology discovery

We shall first describes the MIB objects in the *ATM-MIB* module defined in RFC1695 and the *Fore-Switch-MIB* module defined by Fore Systems, Inc. which are useful in automatic discovery of ATM network topologies. Then, the key idea for ATM topology discovery is given.

The *ATM-MIB* module contains definitions of ATM and AAL5 related objects for managing ATM interfaces, ATM virtual links, ATM switches, ATM networks,

*This research was supported by the National Science Council, Taiwan, R.O.C., under grant NSC 85-2221-E-007-017, and by the Institute for Information Industry, Taipei, Taiwan, R.O.C. under grant 86-0701.

and etc. The *atmInterfaceConfTable* in the ATM-MIB module contains the ATM specific configuration information related to ATM interfaces. The value of the *atmInterfaceMyNeighborIpAddress* object in this table identifies the IP address of the neighbor network device connected to the far end of this interface.

The *Fore-Switch-MIB* module contains the MIB information maintained in a Fore ATM switch. The *portTable* in the *portGroup* of the *Fore-Switch-MIB* module contains information about the ports on the ATM switch. The value of the *portRemoteIpAddress* object in the *portTable* identifies the IP address of the device connected to the port. The value of the *portOperStatus* object in the *portTable* indicates whether the current operational state of the port is *up* or *down*.

Given the IP address of an ATM switch, the topology of the ATM network can be discovered starting from the ATM switch. The Neighboring devices of this ATM switches are discovered first. Then this process continues until all of the devices in the network are discovered or a limit on the number of hops from the starting ATM switch is reached.

3. Tracing ATM virtual connections

In addition to the MIB objects described in the previous section, the MIB objects in RFC1695 and *Fore-Switch-MIB* module which are useful in tracing ATM virtual connections are described first. Then the key idea for tracing an ATM virtual connection is presented.

In the *ATM-MIB* module, the translation of a port number and a pair of input VPI/VCI to another port number and another pair of VPI/VCI is called a VC cross-connect. Information about VC cross-connects are in the *atmVcCrossConnectTable*. In the *Fore-Switch-MIB* module, the *channelRouteTable* contains information about mappings of input ports and input VPI/VCI pairs to output ports and output VPI/VCI pairs. A number of objects in the tables are useful in tracing virtual connections.

Given the IP address of an ATM switch, an input port number, and input VPI/VCI values, our tool traces the path of the virtual connection to the source end in the backward direction. Then it traces the virtual connection from the source end to the destination end(s) in the forward direction. This method can be used to trace both unicast and multicast virtual connections.

4. Conclusion

This paper describes the MIB objects in the *ATM-MIB* module defined in RFC1695 and the *Fore-Switch-MIB* module defined by Fore Systems, Inc. which are useful in automatic discovery of ATM network topologies and tracing ATM virtual connections. The key ideas for automatic topology discovery and virtual connecton trace for ATM networks are presented. We have implmented an ATM topology discovery tool and a virtual connection trace tool using the Tcl language on a Sun workstation.