Network Maps from MIBs - II

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Abstract

In this paper, we show the way to draw network maps from the configuration information obtained from routers. Simple algorithms to position the various elements of the map evenly over the canvas and represent the connections, and to generate the configuration files necessary to feed this information to AIMS, a network management package, are discussed.

Introduction

The network routers/gateways, maintain the information regarding the various interconnections and costs. Routers use this information to build their routing tables. The two widely used routing protocols OSPF and BGP both have MIBs (Management Information Bases) which may be queried using the Simple Network Management Protocol. Using the MIBs it is possible to construct the network map and the cost of the interconnections. In the following sections, we give the details of getting the information from the routers, and constructing a network map from it. In this paper, we concentrate on the OSPF mib to network map generation.

Network configuration in MIBs

The various network layer entities possess information on network configuration. This information may be accessed via the various MIBs that have been defined. In the following we outline some of the MIBs which offer some pieces of information on the network interconnectivity.

MIB-II

The *interfaces* table and the *routing* table provide information on the local network configuration.

RIP-2 MIB

The *interfaces* table contains interface-specific configuration information, and the optional *neighbor* table contains information that is helpful in finding out neighbor relationships.

OSPF MIB

The *Area Data Structure* describes the OSPF Areas that a router participates in. The *Link State Database* provides detailed information for on the network configuration of the area or the AS. The *interface* table and the *interface metric* table together describe the various IP interfaces to OSPF.

BGP MIB

The useful components in BGP-MIB are the *BGP peer* table and the *BGP received path attribute* table. The *peer* table reflects information about BGP peer connections, such as their state and current activity. The *received path attribute* table contains all attributes received from all peers before local routing policy has been applied. The actual attributes used in determining a route are a subset of the received attribute table.

Map creation

This section gives the steps involved in creating the network map file from the data given by OSPF mib.

- For the inter-AS connectivity information use the BGP-MIB. By chaining from a BGP-speaker in one AS to its peer in another AS the AS map of the entire network may be constructed. [Provided ofcourse the BGP-MIB is implemented and accessible from the peer]

  For the intra-AS connectivity it will suffice to query any Router implementing the OSPF-MIB in an AS [or in an area - if there are areas].

  In case OSPF is not used then the situation gets somewhat more complex. There the RIP2-MIB and the MIB-II will need to be used to put together information about the network.
- *snmpwalk*[1]. will be done to get the first step of the information.
- Go through the router link array and create the router, network and interface arrays.
- Write the window and the router, network and interface array details in the network map file, consulting the old geometric information when it exists.

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[1]The CMU-SNMP *snmpwalk* utility is used. The utility is part of the publicly available CMU-SNMP package

While the algorithm is quite simple, it is also necessary to take care of details like unnumbered interfaces, representation of different types of networks (PTP, LAN etc.), possible duplication of information and so on.

Positioning of elements in Map

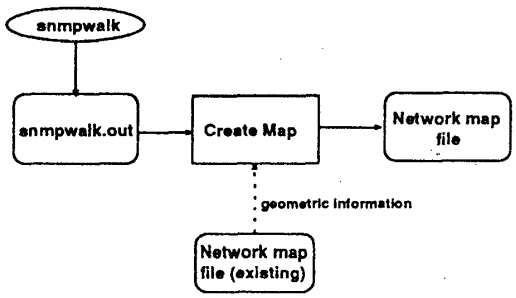
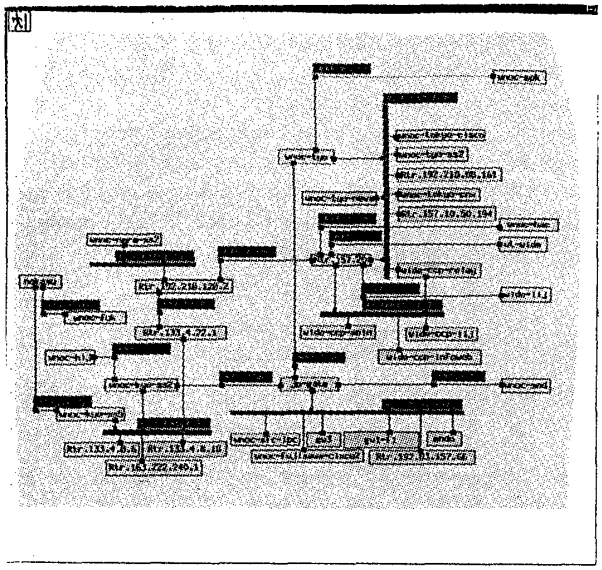


FIG. 1 CREATION OF NETWORK MAP



Positioning of the elements within the map is an important part of the program, as without this, the editing to get a clearer picture becomes far too tedious and time consuming. If there is already a map containing at least some of the elements, this map is consulted in getting the geometric position and the size of the elements. This is shown in the figure above, where the earlier map generated (which has already been painstakingly edited), is read and the position and size of the elements is stored. In case there is no existing map, there is a default algorithm. Depending on the type of element, router, network (type of network) or interface, the geometric position is computed. The simple default algorithm is as follows:

- Routers - These are positioned uniformly over the canvas.
- Networks - These PTP networks are positioned midway between the connected routers, and the others closest to the first connected router.
- Interface - These are positioned uniformed at the periphery of the parent element to which they belong.

The changes which take place in the network are directly reflected in the map, leading to a dynamic map which is very useful in detecting the source of any problems which may occur and also providing means of bypassing problematic links.

A sample output generated by this program is given.

Conclusion

In this paper, we have outlined the method to create the nework map files from the OSPF/BGP/RIP/MIB-II details. The method is very simple, consisting of extracting the connection details given by snmpwalk, a widely available utility, and generating the output file. The major advantage of this kind of map generation is that it is dynamic and the changes as they occur in the network are reflected in the map, which leads to better fault and route management.

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