US006684241B1

(12) **United States Patent**
Sandick et al.

(10) **Patent No.: US 6,684,241 B1**
(45) **Date of Patent: Jan. 27, 2004**

(54) **APPARATUS AND METHOD OF CONFIGURING A NETWORK DEVICE**

(75) Inventors: **Haldon J. Sandick**, Durham, NC (US); **Kedarnath Poduri**, Santa Clara, CA (US); **Matthew B. Squire**, Raleigh, NC (US)

(73) Assignee: **Nortel Networks Limited**, St. Laurent (CA)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/408,380**

(22) Filed: **Sep. 29, 1999**

(51) **Int. Cl.**[7] **G06F 15/177**
(52) **U.S. Cl.** **709/220**; 709/224; 709/227; 709/238; 370/254
(58) **Field of Search** 709/220, 224, 709/227, 238, 244, 245; 370/389, 401, 254, 229

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,557,748 A		9/1996	Norris	395/200.1
5,708,778 A		1/1998	Monot	395/200.1
5,717,853 A	*	2/1998	Deshpande et al.	709/209
5,838,907 A		11/1998	Hansen	395/200.5
5,867,706 A		2/1999	Martin et al.	
5,913,921 A	*	6/1999	Tosey et al.	709/220
5,940,376 A		8/1999	Yanacek et al.	370/250
5,963,540 A		10/1999	Bhaskaran	370/218
5,999,948 A		12/1999	Nelson et al.	707/506
6,012,088 A		1/2000	Li et al.	709/219
6,047,325 A		4/2000	Jain et al.	709/227
6,070,187 A	*	5/2000	Subramaniam et al.	709/220
6,091,732 A	*	7/2000	Alexander et al.	370/389
6,098,097 A		8/2000	Dean et al.	709/220
6,175,865 B1		1/2001	Dove et al.	709/220
6,256,314 B1	*	7/2001	Rodrig et al.	370/401
6,263,387 B1		7/2001	Chrabaszcz	710/103
6,282,201 B1	*	8/2001	Alexander et al.	370/389
6,286,038 B1		9/2001	Reichmeyer et al.	709/220

OTHER PUBLICATIONS

Fuller. V., et al.; "Classless Inter–Domain Routing 9CIDR): and Address Assignment and Aggregation Strategy"; ftp://ftp.isi.edu/in–notes/rfc1516: Network Working Group; p. 1.

http://www.faqs.org/rfcs/ Network Working Group RFC# 1583, J. Moy, Mar. 1994 pp. 1–156.

http://www.faqs.org/rfcs/ Network Working Group RFC# 2453, G. Malkin, Nov. 1998 pp. 1–30.

htttp://www.faqs.org/rfcs/ Network Working Group RFC#2338, S. Knight, Apr.–1998, pp. 1–22.

http://www.faqs.org/rfcs/ Network Working group RFC # 1240, C. Shue, Jun.–1991 pp. 1–7.

http://www.faqs.org/rfcs/ Network Working group RFC# 1885, S. Deering, Dec. 1995, pp. 1–13.

Haritsa J. et al., "Mandate: Managing Networks Using Database Technology", IEEE Journal on Selected Areas in Communications, IEEE Inc. New York, US, vol. 11, Nr. 9, pp. 1360–1372, 12/93.

"TCP/IP Illustrated", vol. I, The Protocols, W. Richard Stevens, 1994, pp. 62–63.

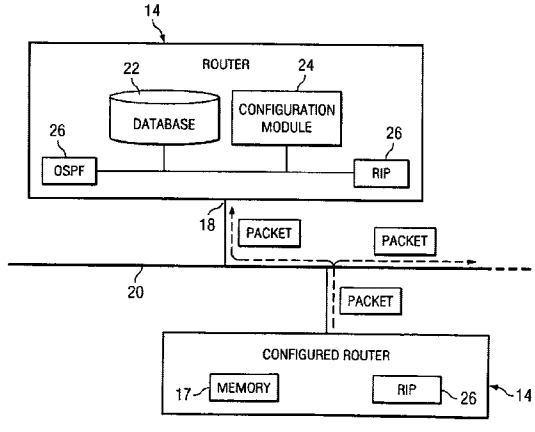
"ICMP Router Discovery Messages," Network Working Group, S. Deering, Sep. 1991.

* cited by examiner

Primary Examiner—Frantz B Jean
(74) *Attorney, Agent, or Firm*—Kevin L. Smith

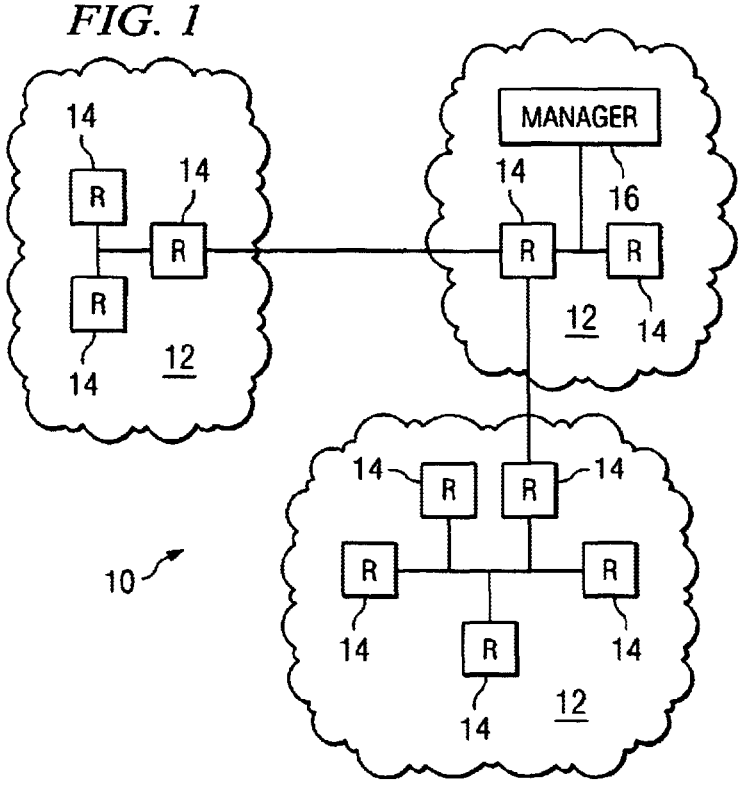
(57) **ABSTRACT**

An apparatus and method of configuring a first network device that is a part of a subnet ascertains configuration data from packets in a subnet having configuration dat. More particularly, the packets, which are transmitted by a second network device in the subnet, first are retrieved and then parsed to ascertain the configuration data. At least a portion of the configuration data is stored in a configuration database. In addition, at least one datum from the configuration data is processed to produce additional configuration data that also is stored in the configuration database. The first network device consequently operates in accord with the data in the configuration database.



39 Claims, 3 Drawing Sheets

FIG. 1


MANAGER
R
14
16
12
10

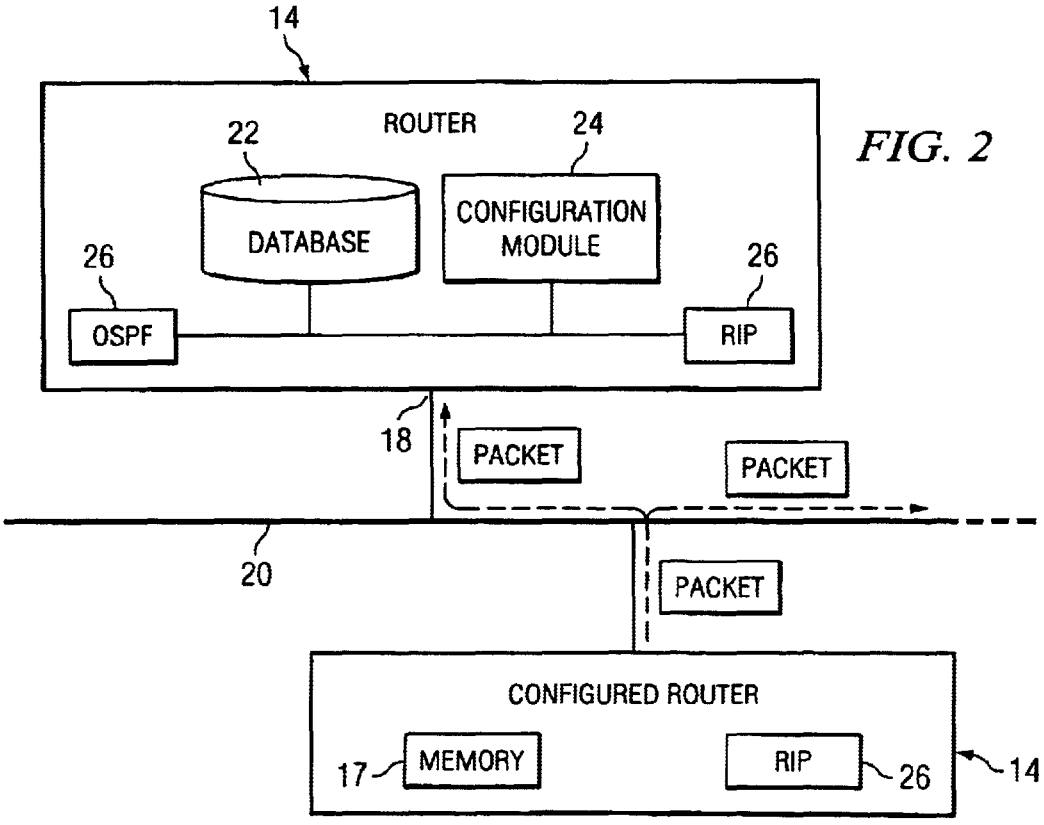

14
ROUTER
22
24
DATABASE
CONFIGURATION MODULE
26
OSPF
RIP
18
PACKET
20
CONFIGURED ROUTER
17
MEMORY

FIG. 2

FIG. 3

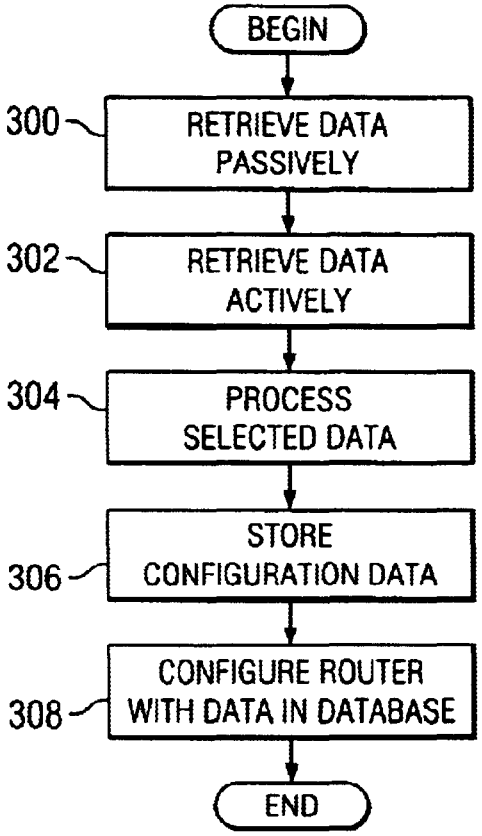


FIG. 4

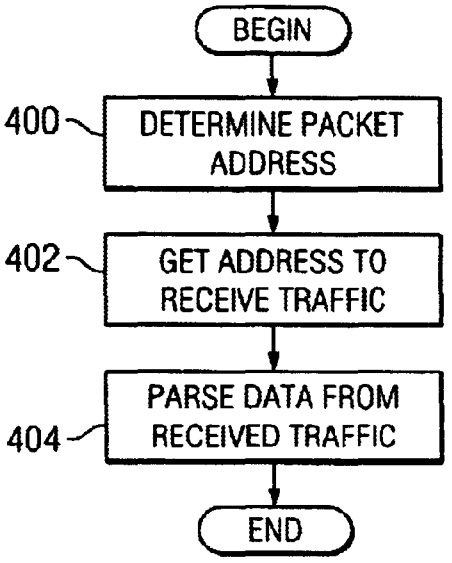


FIG. 5

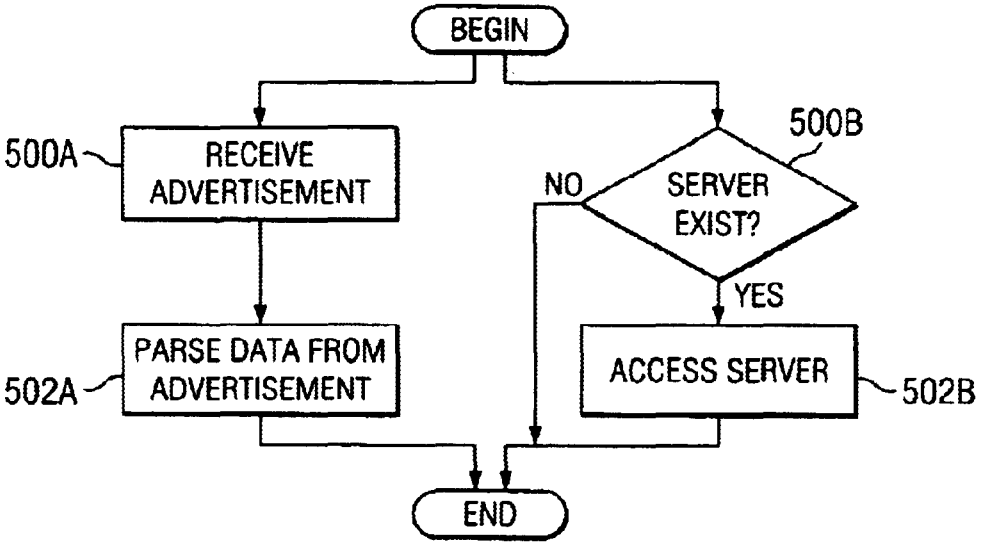
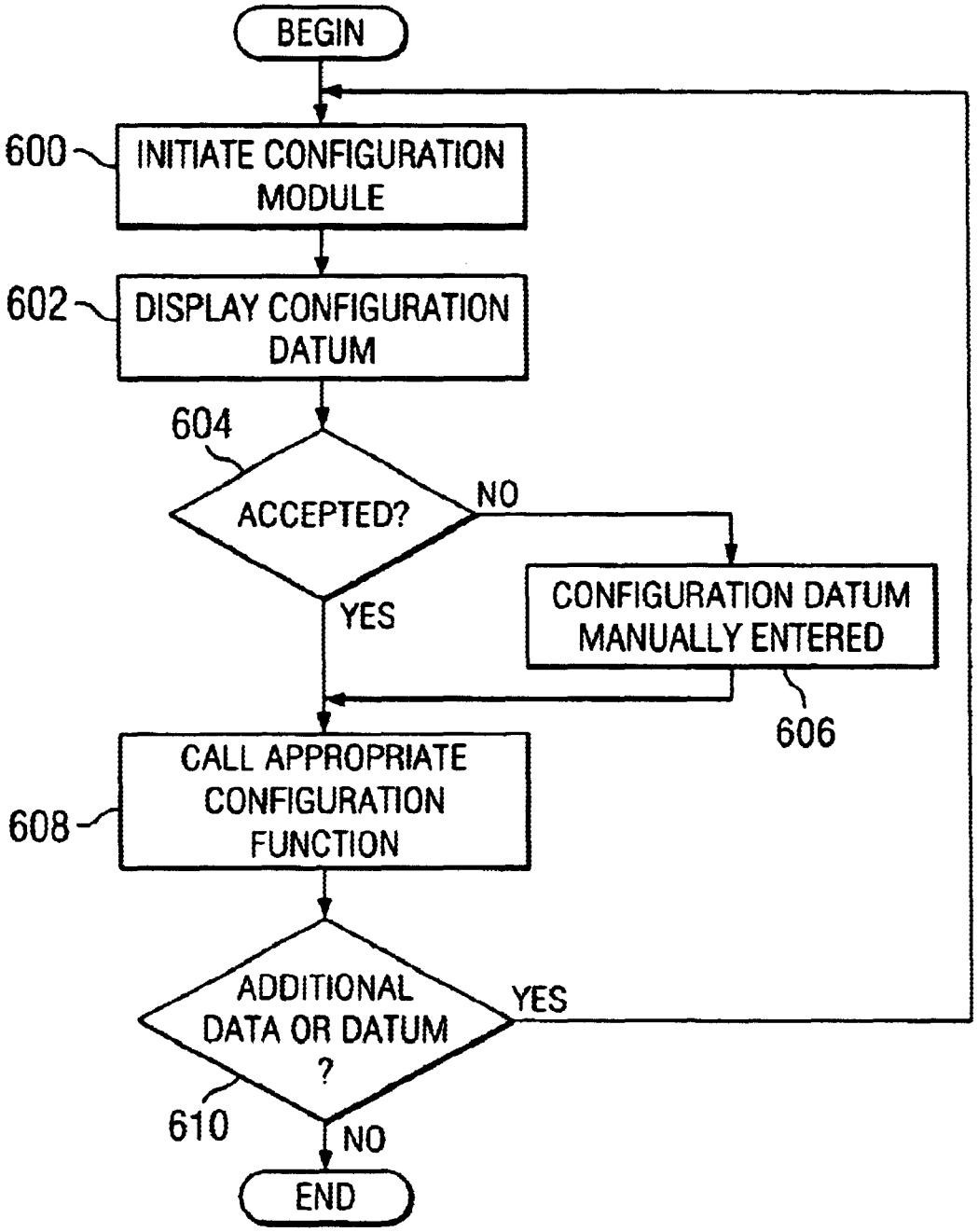


FIG. 6


BEGIN
600
INITIATE CONFIGURATION MODULE
602
DISPLAY CONFIGURATION DATUM
604
ACCEPTED?
NO
YES
CONFIGURATION DATUM MANUALLY ENTERED
606
608
CALL APPROPRIATE CONFIGURATION FUNCTION
ADDITIONAL DATA OR DATUM ?
YES
610
NO
END

APPARATUS AND METHOD OF CONFIGURING A NETWORK DEVICE

CROSS REFERENCE TO RELATED APPLICATIONS

U.S. patent application entitled, "SYSTEM, DEVICE, AND METHOD FOR DETERMINING A PROTOCOL ADDRESS AND SUBNET MASK FOR A NETWORK DEVICE IN A COMMUNICATION NETWORK", filed on even date herewith and identified by U.S. application Ser. No. 09/408,386, the disclosure of which is incorporated herein, in its entirety, by reference; and U.S. patent application entitled, "METHODS FOR AUTO-CONFIGURING A ROUTER ON AN IP SUBNET", filed on even date herewith and identified by U.S. application Ser. No. 09/407,915, the disclosure of which is incorporated herein, in its entirety, by reference.

FIELD OF THE INVENTION

The invention generally relates to networks and, more particularly, the invention relates to configuring a network device that is a member of a subnet.

BACKGROUND OF THE INVENTION

The task of configuring network devices is becoming increasingly burdensome on overworked computer administrative staffs. As the size of individual networks grow, the complexity of their configuration and management increases. Moreover, with the addition of new networks, new protocols, and new services, the already difficult task of configuring and managing a network can become overwhelming.

The difficulties of network management arise from many sources. First, configuring a network device is a labor intensive process that requires training. Specifically, current configuration methods require an administrator to initiate and perform the actual configuration before the network device can become a functional part of the network. In addition, when a network device must be reconfigured due to network growth or change, an administrator again must be personally involved to execute the reconfiguration process.

Second, configuration is more complicated in the current multi-vendor network environment where there is no single standard configuration method for every network device. Specifically, there are many possible ways to configure network devices, such as by using SNMP, command line interfaces, and configuration files using FTP. In fact, the preferred method of configuring a single type of network device frequently varies from vendor to vendor. Recently, this problem has become worse by the increased number of acquisitions in the network industry. For example, an acquired company's products often are configured differently than its acquiring vendor's existing products. Accordingly, even within a single vendor's product line, it often is necessary to support multiple configuration methods.

Finally, the process of configuring a network device is prone to error and difficult to debug. While some configuration tools are beginning to become available, most currently available tools do little or no semantic and/or consistency checking between related configuration options. As a consequence, overworked and understaffed network administration departments often perform the error and consistency checking.

SUMMARY OF THE INVENTION

In accordance with one aspect of the invention, an apparatus and method of configuring a first network device that is a part of a subnet ascertains configuration data from packets in a subnet having configuration data. More particularly, the packets, which are transmitted by a second network device in the subnet, first are retrieved and then parsed to ascertain the configuration data. At least a portion of the configuration data is stored in a configuration database. In addition, at least one datum from the configuration data is utilized to produce additional configuration data that also is stored in the configuration database. The first network device consequently operates in accord with the data in the configuration database.

In preferred embodiments, the subnet is a local area network having a plurality of other network devices in addition to the second network device. The retrieved packets may be transmitted in accord with an inter-router protocol, and may be control packets or data packets. Instead of or in addition to message data, the retrieved packets also may have configuration data relating to the inter-router protocol. The retrieved packets may have a destination field with a destination address. Accordingly, the first network device sets an interface to have the destination address and/or port number. The subnet may be coupled with a network.

In accordance with another aspect of the invention, an apparatus and method of configuring a first network device that is a part of a subnet first retrieves packets with configuration data. The retrieved packets are transmitted by a second network device that also is a part of the subnet. The retrieved packets are parsed to ascertain the configuration data, at least one datum of which being utilized to produce additional configuration data. The configuration data and additional configuration data are utilized to control the operation of the first network device.

In accordance with still another aspect of the invention, a method of configuring a first network device that is a part of a subnet first transmits packets having configuration data from a second network device to the first network device. In preferred embodiments, the second network device is a member of the subnet. The packet traffic in the subnet is monitored to retrieve the packets. The retrieved packets then are parsed to ascertain the configuration data. At least a portion of the configuration data parsed from the retrieved packets is stored in a configuration database. At least one datum of the configuration data is utilized to produce additional configuration data, which also is stored in the configuration database. The first network device therefore operates in accord with the data in the configuration database.

Preferred embodiments of the invention are implemented as a computer program product having a computer usable medium with computer readable program code thereon. The computer readable code may be read and utilized by the computer system in accordance with conventional processes.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and advantages of the invention will be appreciated more fully from the following further description thereof with reference to the accompanying drawings wherein:

FIG. **1** schematically shows an exemplary network arrangement in which preferred embodiments of the invention may be implemented.

FIG. **2** schematically shows an unconfigured router configured to monitor network traffic transmitted by a configured router.

FIG. **3** shows a preferred process of configuring a given router that is added to a given subnet.

FIG. **4** shows a preferred process of passively retrieving configuration data from monitored packet traffic.

FIG. **5** shows a preferred process of actively retrieving configuration data relating to a given subnet shown in FIG. **1**.

FIG. **6** shows a preferred process of configuring a given router based upon configuration data in a configuration database.

DESCRIPTION OF PREFERRED EMBODIMENTS

FIG. **1** schematically shows an exemplary network **10** in which preferred embodiments of the invention may be implemented. More particularly, the network **10** includes a plurality of interconnected subnets **12** that each include one or more routers **14**. Each subnet **12**, for example, may be a local area network interconnecting a plurality of client computers (not shown) via their respective routers **14**. The network **10** also includes a network manager server ("manager server **16**") for use by a network administrator to manage the operation of the network **10**. Although not shown, the network **10** may be in communication with other networks, such as the Internet.

The routers **14** may be any conventional router, such as an ACCELAR™ router (manufactured by Nortel Networks Corporation of Montreal, Quebec, Canada) that includes the logic described herein to be self-configuring. In accordance with preferred embodiments of the invention and as discussed in greater detail below, each router **14** therefore is capable of monitoring traffic in its local subnet **12** and, based upon the monitored traffic, configuring itself to successfully communicate with the other routers **14**. In some embodiments, a given router **14** may be a member of more than one subnet **12**. The manager server **16** may be any server configured to administer a network with a network configuration system, such as the OPTIVITY™ network configuration system, also available from Nortel Networks Corporation. In preferred embodiments, the manager server **16** can communicate with any network device in the network **10**.

FIG. **2** schematically shows an unconfigured router **14** having the preferred logic to monitor network traffic transmitted by an already configured router **14**. The configured router **14** includes memory **17** for storing configuration data relating to the subnet **12**. The unconfigured router **14** preferably includes an interface **18** that couples with the subnet **12**, which is transmitting data packets. The data packets may include message data (e.g., data packets), control data (e.g., control packets), or any other type of data transported by packets. In addition, the unconfigured router **14** also includes, among other things, a configuration database **22** for storing configuration data parsed and processed from monitored packets, a configuration module **24** for configuring the given router **14** in accord with the data in the configuration database **22**, and a plurality of inter-router protocol modules **26** for communicating with other routers **14**. The inter-router protocol modules **26** may support any well known protocol, such as the Routing Information Protocol ("RIP") and the Open Shortest Path First protocol ("OSPF"). Of course, other protocols not shown also may be supported with other protocol modules **26**. As shown in the figure, packets are transmitted from the configured router **14** across the bus **20**.

FIG. **3** shows a preferred process of configuring a given router **14** that is added to a given subnet **12**. In a manner similar to the processes shown in other figures, those skilled in the art should appreciate that various steps in this process can be executed in a different order than that shown. The process preferably is executed each time a new, unconfigured router **14** is to be added to the given subnet **12**.

The process begins at step **300** in which the given router **14** passively retrieves configuration data from the given subnet **12**. To that end, FIG. **4** shows a preferred process of passively retrieving such data. The process begins at step **400** in which the destination address and port of various packets having configuration data is ascertained in accord with conventional processes. For example, when utilized with the RIP protocol, a multicast address designated to receive control packets is determined from a published source. Accordingly, once this address is determined, an interface and port on the given router **14** are set to be that address and port to receive such packets (step **402**). In alternative embodiments, all subnet packets are retrieved. All received packets then are filtered to determine which packets include data for configuring the given router **14** Once received, the packets are parsed, in accord with conventional processes, to determine the configuration data (step **404**). The configuration data may be stored in the configuration database **22** for subsequent use in configuring the given router **14**. This process of retrieving packets may be referred to herein as "snooping" packets, or as "monitoring" traffic on the given subnet **12**.

Retrieved packets include a multitude of useful configuration data that may be utilized to configure the given network device. For example, parsing a packet transmitted in accord with the RIP protocol can produce at least the following information:

- which other routers **14** in the subnet **12** are executing RIP;
- the version of RIP utilized by the other routers **14**; and
- the ports or interfaces that are coupled to routers **14** executing RIP.

As a further example, parsing a packet transmitted in accord with the OSPF protocol can produce at least the following information:

- which other routers **14** in the subnet **12** are executing OSPF; and
- the ports or interfaces that are coupled to routers **14** executing OSPF;
- the Internet Protocol subnet mask for the given subnet **12**;
- the OSPF area in use by other routers **14**; and
- the OSPF timers in use by the other routers **14**.

In a similar manner, packets received from modules **26** executing other protocols, such as DHCP (Dynamic Host Configuration Protocol), VRRP (Virtual Router Redundancy Protocol) MLT (multi-link trunking) and VLAN (virtual local area network) also include relevant configuration data. In the case of a VLAN packet, for example, tags appended or prepended to the packets are parsed to ascertain the relevant configuration data. It should be noted that discussion of specific protocols is by example only and should not be construed as a limitation of preferred embodiments of the invention.

In preferred embodiments, packets are snooped regardless of:

1. The VLAN tag on any given packet;
2. Whether the protocol module **26** on the given router **14** is actually enabled; and
3. The state of the spanning tree on the port.

Returning to step **300** in FIG. **3**, it should be noted that some data cannot be retrieved passively. Accordingly, the given router **14** often actively retrieves configuration data

from other network devices in the given subnet **12** (step **302**). To that end, FIG. **5** shows a preferred process of actively retrieving configuration data. More particularly, the process in FIG. **5** includes two subprocesses executing simultaneously. In alternative embodiments, the two subprocesses execute consecutively. Each subprocess will be discussed below.

The first subprocess in FIG. **5** begins at step **500**A in which an advertisement from another router **14** in the given subnet **12** is received by the given router **14**. Accordingly, in preferred embodiments, a router **14** transmitting an advertisement is preconfigured to transmit specified data via the advertisement. In preferred embodiments, the information in an advertisement includes, among other things:

VLAN identifiers;

STG (spanning tree group) identifiers;

VLAN/STG associations;

VLAN types;

Subnet mask;

Static mask;

Static default route;

DHCP (dynamic host configuration protocol) server; and

DHCP relay mode.

Upon receipt of an advertisement, the subprocess continues to step **502**A in which the data is parsed from the advertisement.

The second subprocess begins at step **500**B, in which it is determined if the given router has access to the manager server **16**. If determined to have no such access, the subprocess end. Conversely, if determined to have such access, then the process continues to step **502**B, in which the server is accessed. To that end, the given router **14** generates a data request message having the Internet Protocol address of each router **14** in its subnet **12**. Of course, these Internet Protocol addresses are ascertained by monitoring the subnet traffic in step **300** above. Once generated, the request message is forwarded to the manager server **16**.

Upon receipt of the request message, the manager server **16** accesses its memory to ascertain information relating to the subnet routers **14** identified in the request message. In preferred embodiments, the manager server **16** includes a management information base (a "MIB") for storing such information. In alternative embodiments, such information is stored in a conventional database. Once the relevant (configuration) information is retrieved, the manager server **16** generates a reply message that includes the relevant information. The reply message then is transmitted across the network **10** to the given router **14**. In preferred embodiments, the given router **14** and manager server **16** communicate by means of the well known Simple Network Management protocol ("SNMP").

returning to step **302** in the process shown in FIG. **3**, once the configuration data is actively retrieved, then the process continues to step **304** in which selected data retrieved in either or both of steps **300** and **302** are utilized (i.e., processed in many cases) to determine additional configuration data. Any necessary data may be calculated. For example, the IP address of the given router **14** and subnet mask may be determined. In preferred embodiments, the IP address and subnet mask are determined in a manner described in the above referenced copending U.S. patent application entitled, "SYSTEM, DEVICE, AND METHOD FOR DETERMINING A PROTOCOL ADDRESS AND SUBNET MASK FOR A NETWORK DEVICE IN A COMMUNICATION NETWORK" and identified by U.S. application Ser. No. 09/408,386. As an additional example, the default router **14** for the given router **14** in the given subnet **12** may be designated. In particular, as known by those skilled in the art, a default router **14** is the router **14** through which packets destined for another subnet **12** are transmitted. Some subnets **12**, however, may include two or more default routers **14**. Accordingly, in preferred embodiments, the given router **14** determines which of the default routers **14** that it is to use. In preferred embodiments, the default router **14** having the shortest route to the given router **14** is designated for the given router **14** in the given subnet **12** since its use is most efficient.

Once the configuration data is parsed and/or generated from all sources (i.e., steps **300**, **302**, and **304** above), then the process continues to step **306** in which the configuration data is stored in the configuration database **22** on the given router **14**. As suggested above, depending upon the type of configuration data, any configuration data could be stored in the configuration database **22** immediately upon receipt, and/or be utilized immediately upon receipt.

The process then continues to step **308** in which the given router **14** is configured with the data in the database **22**, thus ending the process. To that end, FIG. **6** shows a preferred process of utilizing the configuration data in the configuration database **22** for configuring the given router **14**. This process is executed by a network administrator communicating with the given router **14**. In preferred embodiments, the network administrator accesses a command line interface on the given router **14** via a coupled console, or via a Telnet connection from another network device. For additional details of this process, see the above noted copending U.S. patent application entitled "METHODS FOR AUTO-CONFIGURING A ROUTER ON AN IP SUBNET" identified by U.S. application Ser. No. 09/407,915.

The process begins at step **600** in which the network administrator initiates the configuration module **24** to begin configuring the given router **14**. Once initiated, the configuration module **24** produces a graphical user interface, or a command line interface, for displaying the configuration data on a display device (step **602**). In preferred embodiments, the command line interface is utilized to display configuration data in discrete amounts. For example, the configuration data in the configuration database **22** may be reviewed one datum at a time. When a datum is displayed, the process continues to step **604** in which it is determined if the administrator reviewing the datum accepts the datum. Acceptance of a configuration datum indicates that such datum is to be used to configure the given router **14**.

If not accepted, then the datum is not utilized as configuration data and the administrator may manually enter a different configuration datum (step **606**). Alternatively, if accepted, then the datum is utilized to configure the given router **14** and the process continues to step **608**. The appropriate configuration calls then are made to implement either the accepted configuration datum or the manually entered configuration datum (step **608**). Of course, the function calls notify the given router **14** of the specified configuration datum, which is implemented in the given router **14** accordingly. It then is determined at step **610** if an additional datum or additional data is to be examined. The process loops back to step **602** if additional datum or data is to be examined. If none remains, then the process ends.

Instead of utilizing the process in FIG. **6**, the given router **14** can automatically configure itself. Specifically, the configuration module **24** in the given router **14** may automatically retrieve the data in the configuration database **22**, and then call various well known configuration function calls to configure the given network device. In yet other

embodiments, the given router **14** can be manually configured, in accord with conventional processes, by utilizing the data in the configuration database **22**.

Preferred embodiments of the invention may be implemented in any conventional computer programming language. For example, preferred embodiments may be implemented in a procedural programming language (e.g., "C") or an object oriented programming language (e.g., "C++" or "JAVA"). Alternative embodiments of the invention may be implemented as preprogrammed hardware elements (e.g., application specific integrated circuits or digital signal processors), or other related components.

Alternative embodiments of the invention also may be implemented as a computer program product for use with a computer system. Such implementation may include a series of computer instructions fixed either on a tangible medium, such as a computer readable media (e.g., a diskette, CD-ROM, ROM, or fixed disk), or transmittable to a computer system via a modem or other interface device, such as a communications adapter connected to a network over a medium. The medium may be either a tangible medium (e.g., optical or analog communications lines) or a medium implemented with wireless techniques (e.g., microwave, infrared or other transmission techniques). The series of computer instructions preferably embodies all or part of the functionality previously described herein with respect to the system. Those skilled in the art should appreciate that such computer instructions can be written in a number of programming languages for use with many computer architectures or operating systems. Furthermore, such instructions may be stored in any memory device, such as semiconductor, magnetic, optical or other memory devices, and may be transmitted using any communications technology, such as optical, infrared, microwave, or other transmission technologies. It is expected that such a computer program product may be distributed as a removable medium with accompanying printed or electronic documentation (e.g., shrink wrapped software), preloaded with a computer system (e.g., on system ROM or fixed disk), or distributed from a server or electronic bulletin board over the network (e.g., the Internet 16 or World Wide Web).

Although various exemplary embodiments of the invention have been disclosed, it should be apparent to those skilled in the art that various changes and modifications can be made that will achieve some of the advantages of the invention without departing from the true scope of the invention. These and other obvious modifications are intended to be covered by the appended claims.

We claim:

1. A method of configuring an unconfigured first network device that is a part of a subnet, the subnet having a second network device, the method comprising:

retrieving packets having configuration data at the unconfigured first network device, the retrieved packets being transmitted by the second network device;

parsing the retrieved packets to ascertain the configuration data;

storing at least a portion of the configuration data parsed from the retrieved packets in a configuration database associated with the unconfigured first network device;

utilizing at least one datum of the configuration data to produce additional configuration data; and

storing the additional configuration data in the configuration database, the first network device operating in accord with the data in the configuration database.

2. The method as defined by claim **1** further comprising:

configuring the first network device to operate in accord with the data in the configuration database.

3. The method as defined by claim **1** wherein the subnet is a local area network having a plurality of other network devices in addition to the second network device.

4. The method as defined by claim **1** wherein the retrieved packets are transmitted in accord with an inter-router protocol.

5. The method as defined by claim **1** wherein the retrieved packets are control packets.

6. The method as defined by claim **1** wherein the retrieved packets are data packets.

7. The method as defined by claim **1** wherein the retrieved packets have a field with a destination address, the first network device setting an interface to have the destination address.

8. The method as defined by claim **1** wherein the second network device includes memory for storing configuration data.

9. The method as defined by claim **1** wherein the first network device includes an inter-router protocol module, the act of retrieving comprising:

retrieving packets having configuration data relating to the inter-router protocol.

10. The method as defined by claim **1** wherein the subnet is coupled to a network.

11. An apparatus for configuring an unconfigured first network device that is a part of a subnet, the subnet having a second network device, the method comprising:

a monitoring module that monitors subnet traffic, the monitoring module retrieving packets having configuration data at the unconfigured first network device, the retrieved packets being transmitted by the second network device;

a data parser operatively coupled with the monitoring module, the data parser parsing the retrieved packets to ascertain the configuration data;

a processor operatively coupled with the data parser, the processor utilizing at least one datum of the configuration data to produce additional configuration data; and

data storage operatively coupled with the data parser, the data storage having a configuration database associated with the unconfigured first network device that stores at least a portion of the configuration data parsed from the retrieved packets, the configuration database also storing the additional configuration data, the first network device operating in accord with the data in the configuration database.

12. The apparatus as defined by claim **11** further comprising:

a configuration module operatively coupled with the configuration database, the configuration module retrieving configuration data and additional configuration data to configure the first network device.

13. The apparatus as defined by claim **11** wherein the subnet is a local area network having a plurality of other network devices in addition to the second network device.

14. The apparatus as defined by claim **11** wherein the retrieved packets are transmitted in accord with an inter-router protocol.

15. The apparatus as defined by claim **11** wherein the retrieved packets are control packets.

16. The apparatus as defined by claim **11** wherein the retrieved packets are data packets.

17. The apparatus as defined by claim **11** wherein the retrieved packets have a field with a destination address, the

first network device having an interface that is set to have the destination address.

18. The apparatus as defined by claim **11** wherein the second network device includes memory for storing configuration data.

19. The apparatus as defined by claim **11** further including:

an inter-router protocol module; and

a packet retrieving module that retrieves packets having configuration data relating to the inter-router protocol.

20. The apparatus as defined by claim **11** wherein the subnet is coupled to a network.

21. A computer program product for use on a computer system for configuring an unconfigured first network device that is a part of a subnet, the subnet having a second network device, the computer program product comprising a computer usable medium having computer readable program code thereon, the computer readable program code including:

program code for retrieving packets having configuration data at the unconfigured first network device, the retrieved packets being transmitted by the second network device;

program code for parsing the retrieved packets to ascertain the configuration data;

program code for storing at least a portion of the configuration data parsed from the retrieved packets in a configuration database associated with the unconfigured first network device;

program code for utilizing at least one datum of the configuration data to produce additional configuration data; and

program code for storing the additional configuration data in the configuration database, the first network device operating in accord with the data in the configuration database.

22. The computer program product as defined by claim **21** further comprising:

program code for configuring the first network device to operate in accord with the data in the configuration database.

23. The computer program product as defined by claim **21** wherein the subnet is a local area network having a plurality of other network devices in addition to the second network device.

24. The computer program product as defined by claim **21** wherein the retrieved packets are control packets.

25. The computer program product as defined by claim **21** wherein the retrieved packets are data packets.

26. The computer program product as defined by claim **21** wherein the retrieved packets have a field with a destination address, the first network device setting an interface to have the destination address.

27. The computer program product as defined by claim **21** wherein the second network device includes memory for storing configuration data.

28. The computer program product as defined by claim **21** wherein the first network device includes an inter-router protocol module, the program code for retrieving comprising:

program code for retrieving packets having configuration data relating to the inter-router protocol.

29. The computer program product as defined by claim **21** wherein the subnet is coupled to a network.

30. A method of configuring an unconfigured first network device that is a part of a subnet, the subnet having a second network device, the method comprising:

retrieving packets having configuration data at the unconfigured first network device, the retrieved packets being transmitted by the second network device;

parsing the retrieved packets to ascertain the configuration data;

storing the configuration data in a memory associated with the unconfigured first network device:

utilizing at least one datum of the configuration data to produce additional configuration data; and

utilizing the configuration data and additional configuration data to control the operation of the first network device.

31. The method as defined by claim **30** further comprising:

storing the configuration data and additional configuration data in a configuration database.

32. The method as defined by claim **30** wherein the retrieved packets are at least one of control packets and data packets.

33. The method as defined by claim **30** wherein the retrieved packets have a field with a destination address, the first network setting an interface to have the destination address.

34. A computer program product for use on a computer system for configuring an unconfigured first network device that is a part of a subnet, the subnet having a second network device, the computer program product comprising a computer usable medium having computer readable program code thereon, the computer readable program code including:

program code for retrieving packets having configuration data at the unconfigured first network device, the retrieved packets being transmitted by the second network device;

program code for parsing the retrieved packets to ascertain the configuration data;

program code for storing the configuration data in a memory associated with the unconfigured first network device;

program code for utilizing at least one datum of the configuration data to produce additional configuration data; and

program code for utilizing the configuration data and additional configuration data to control the operation of the first network device.

35. The computer program product as defined by claim **34** further comprising:

storing the configuration data and additional configuration data in a configuration database.

36. The computer program product as defined by claim **34** wherein the retrieved packets are at least one of control packets and data packets.

37. The computer program product as defined by claim **34** wherein the retrieved packets have a field with a destination address, the first network setting an interface to have the destination address.

38. The computer program product as defined by claim **34** further comprising:

program code for actively retrieving configuration data.

39. A method of configuring an unconfigured first network device that is a part of a subnet, the subnet having a second network device, the method comprising:

the second network device transmitting packets having configuration data;

monitoring packet traffic in the subnet;

retrieving packets monitored in the subnet at the unconfigured first network device;

parsing the retrieved packets to ascertain the configuration data;

storing at least a portion of the configuration data parsed from the retrieved packets in a configuration database associated with the unconfigured first network device;

utilizing at least one datum of the configuration data to produce additional configuration data; and

storing the additional configuration data in the configuration database, the first network device operating in accord with the data in the configuration database.

* * * * *