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Attorneys for Plaintiff
ClearPath Networks, Inc.

UNITED STATES DISTRICT COURT

CENTRAL DISTRICT OF CALIFORNIA

CLEARPATH NETWORKS, INC., a Delaware corporation,

Plaintiff,

v.

MERAKI, INC., a Delaware corporation; and CISCO SYSTEMS, INC., a California corporation,

Defendants.

CASE NO. CV13-00259 RSWL (AGRx)

COMPLAINT FOR PATENT INFRINGEMENT

DEMAND FOR JURY TRIAL

Plaintiff ClearPath Networks, Inc. alleges:

JURISDICTION AND VENUE

1. This action arises under the patent laws of the United States, 35 U.S.C. §§ 271 *et seq.* This Court has subject matter jurisdiction pursuant to 28 U.S.C. §§ 1338(a) and 1331.

2. Venue is proper in this judicial district pursuant to 28 U.S.C. §§ 1391(b) and (c) and 1400(b) because: (a) acts of patent infringement occurred here; (b) Plaintiff ClearPath Networks, Inc. has its principal place of business and developed the invention at issue here; and (c) Defendants are corporations deemed to "reside" here because they advertise and sell their infringing products in this district and are subject to personal jurisdiction here.

3. Upon information and belief, Defendants are subject to personal jurisdiction in the Central District of California.

PARTIES

4. Plaintiff ClearPath Networks, Inc. ("ClearPath") is a corporation organized and existing under the laws of the state of Delaware, with its principal place of business at 300 North Continental Boulevard, El Segundo, California 90245. ClearPath is a pioneer in the virtual networking revolution. It was founded in 2002 to enable small to mid-market companies, who do not have the necessary information technology staff and budget resources to acquire and maintain a traditional network infrastructure, to easily and cost effectively deploy and manage a distributed wide area network. Such an infrastructure is ordinarily comprised of hardware, software and systems that must be manually configured and managed. ClearPath created a novel method for activation and delivery of computer network configurations, and for remote monitoring and management of such systems from the cloud. ClearPath was awarded patents for those methods not only in the United

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States but also China, Japan, Canada, and India. Using its patented methods, ClearPath launched the world's first cloud managed networking offering, and has continued to evolve this technology into a comprehensive cloud-based virtual network services platform. This platform also enables service providers to offer cloud managed network services both for on-premise networks and cloud-based networking. ClearPath's technology has been described as game changing and has been adopted by some of the largest information technology and telecommunications companies in the world.

5. Defendant Meraki, Inc. ("Meraki") is a corporation organized and existing under the laws of the state of Delaware, with its principal place of business at 660 Alabama Street, San Francisco, California 94110. ClearPath is informed and believes that Meraki was formed in 2006, well after ClearPath's patents were filed. Meraki provides cloud managed networking services and products.

6. Defendant Cisco Systems, Inc. ("Cisco") is a corporation organized and existing under the laws of the state of California, with its principal place of business at 170 West Tasman Dr., San Jose, California 95134.

7. ClearPath is informed and believes that on or about December 20, 2012, Cisco acquired Meraki, that Meraki is now a wholly owned subsidiary of Cisco, and that from and after December 20, 2012, Cisco has been, and now is, controlling and participating in the acts of infringement alleged below.

8. Meraki and Cisco are sometimes referred to collectively as "Defendants."

9. On November 18, 2012, Cisco released a blog post by Hilton Romanski, titled Cisco Announces Intent to Acquire Meraki. In the blog post Mr. Romanski stated: "Today, we are excited to announce an important acquisition that addresses the rapidly occurring shift to cloud networking as a key part of Cisco's overall strategy. San Francisco-based Meraki, a leader in cloud networking, offers

customers on-premise networking solutions that are centrally managed from the cloud."

10. Cliff Young, ClearPath's CEO, became aware of the acquisition and investigated Meraki's use of cloud managed networking. ClearPath's investigation found pervasive infringement of ClearPath patents. On November 28, 2012, ClearPath informed Meraki in writing of such infringement but invited discussions about amicable resolution before filing a complaint in federal court.

11. On November 28, 2012, Mr. Young also wrote to Mr. Hilton Romanski, Vice President Head of Corporate Development for Cisco, informing Cisco that ClearPath's "patented technology is being pervasively infringed upon by the core Meraki platform." Mr. Young requested Mr. Romanski's assistance in resolving the matter and supplied supporting infringement analysis. Mr. Romanski asserted that Cisco was not able to actively engage in Meraki matters because of the pending anti-trust review process.

12. On December 18, 2012, as part of discussions about resolving the infringement claims, ClearPath's patent counsel forwarded a more detailed claims analysis to Stefani Shanberg, Meraki's counsel, demonstrating pervasive infringement of ClearPath's patents.

13. On December 20, 2012, after Meraki completed its sale to Cisco, representatives of ClearPath, Meraki, and Cisco met both in San Francisco, California and telephonically to discuss a potential resolution of Cisco's patent resolution claims. At the meeting, ClearPath reasserted its belief that ClearPath patents were being infringed by Meraki's cloud managed process and reviewed the detailed claims analysis prepared by ClearPath patent counsel. After private consultations, Meraki and Cisco representatives requested that ClearPath propose licensing fees for the use of its patented technology by Meraki and Cisco. The parties agreed that ClearPath would make a licensing proposal to which Meraki and Cisco would respond by January 11, 2012. ClearPath agreed in good faith to

refrain from filing its infringement complaint pending receipt of the Meraki/Cisco response.

14. On January 11, 2012, without prior notice, Meraki filed an anticipatory complaint for declaratory relief in in the Northern District of California, Case No. 130145. The complaint alleges among other things that that ClearPath's patents are invalid, and thus that Defendants have a right to continue providing products and services without a patent license from ClearPath. The complaint alleges as purportedly invalidating prior art other patents not owned by Meraki and fundamentally different from ClearPath patents. Meraki also asserts invalidity on the basis that ClearPath websites dating back to 2002 suggest its methods were used more than one year before being patented. This is false. In addition the complaint alleges that, on December 7, 2012, Mr. Young sent an email to Meraki's investors but omits the fact that these investors were Meraki's board members.

GENERAL ALLEGATIONS

15. On August 24, 2010, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 7,783,800 ("the '800 Patent") for an invention entitled "SYSTEMS AND METHODS FOR MANAGING A NETWORK." A full and correct copy of the '800 Patent is attached as Exhibit 1.

16. On December 13, 2011, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,078,777 ("the '777 Patent") for an invention entitled "SYSTEMS AND METHODS FOR MANAGING A NETWORK." A full and correct copy of the '777 Patent is attached as Exhibit 2.

17. On December 25, 2012, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,341,317 ("the '317 Patent") for an invention entitled "SYSTEMS AND METHODS FOR MANAGING A NETWORK." A full and correct copy of the '317 Patent is attached as Exhibit 3.

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18. By virtue of assignment, ClearPath has acquired and continues to maintain all right, title and interest in and to the '800 Patent, the '777 Patent and the '317 Patent.

FIRST COUNT

(Infringement of U.S. Patent No. 7,783,800)

19. ClearPath incorporates by reference each allegation in paragraphs 1 through 12, inclusive, above.

20. ClearPath states the allegations in this paragraph on information and belief. Defendants, without the permission of ClearPath, have infringed (directly and under the doctrine of equivalents) and continue to infringe the '800 Patent by, among other things, making, using, selling and offering for sale within the United States products and services and/or performing methods that fall within the scope of one or more claims of the '800 Patent, including, without limitation, claims 1-24. Defendants infringe those claims of the '800 Patent by making, using, selling and offering for sale an infrastructure that leverages software for configuring and managing remote appliances and for receiving network traffic information in which, among other things, Defendants provide for the automatic configuration, management and performance reporting of the appliances from a cloud-based management center. When a Meraki (now Cisco) appliance connects to the Internet, it contacts the cloud-based management center, which has certain configurations (*e.g.,* a Virtual Private Network ("VPN") configuration and/or an internet protocol ("IP") routing and network interface configuration). The cloud based management center stores the configuration(s) and automatically transmits the stored configuration(s) to the appliance in response to a request from the appliance. Similarly the configurations may be changed by an end user in the portal and pushed to the appliance over the internet. Upon receipt of the

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configuration(s), the appliance is caused to provide VPN, IP routing and/or network interface services to a customer's network.

21. As a result of Defendants' infringement of the '800 patent, ClearPath has been damaged.

22. Unless a permanent injunction is issued enjoining Defendants and their agents, servants, employees, representatives, affiliates, and all others acting in concert with them, or any of them, from infringing the '800 patent, ClearPath will be greatly and irreparably harmed.

23. To the extent that facts learned in discovery show that Defendants' infringement of the '800 Patent is or has been willful, ClearPath reserves the right to request such a finding at the time of trial.

COUNT TWO

(Infringement of U.S. Patent No. 8,078,777)

24. ClearPath incorporates by reference each allegation in paragraphs 1 through 12, inclusive, above.

25. ClearPath states the allegations in this paragraph on information and belief. Defendants, without the permission of ClearPath, have infringed (directly and under the doctrine of equivalents) and continue to infringe the '777 Patent by, among other things, making, using, selling and offering for sale within the United States products and services and/or by performing methods, that fall within the scope of one or more claims of the '777 Patent, including, without limitation, claims 1- 20. Defendants infringe those claims of the '777 Patent by making, using, selling and offering for sale an infrastructure that leverages software for configuring and managing remote appliances and for receiving network traffic information in which, among other things, Defendants provide for the automatic configuration, management and performance reporting of the appliances from a cloud-based management center. When a Meraki (now Cisco) appliance connects

to the Internet, it contacts the cloud-based management center, which has certain configurations. These configurations include, for example, a Quality of Service ("QOS") configuration and one or more other configurations, such as a content filtering configuration, a VPN configuration, an IP routing and network interface configuration, an anti-virus configuration, and/or a device monitoring configuration. The cloud based management center stores the configuration(s) and automatically transmits the stored configuration(s) to the appliance in response to a request from the appliance. Similarly the configurations may be changed by an end user in the portal and pushed to the appliance over the internet. Upon receipt of the configuration(s), the appliance is caused to provide QOS and other services (*e.g.* content filtering, VPN, anti-virus and/or IP routing and network interface services and/or device monitoring services) to a customer's network.

26. As a result of Defendants' infringement of the '777 patent, ClearPath has been damaged.

27. Unless a permanent injunction is issued enjoining Defendants and their agents, servants, employees, representatives, affiliates, and all others acting in concert with them, or any of them, from infringing the '777 patent, ClearPath will be greatly and irreparably harmed.

28. To the extent that facts learned in discovery show that Defendants' infringement of the '777 Patent is or has been willful, ClearPath reserves the right to request such a finding at the time of trial.

COUNT THREE

(Infringement of U.S. Patent No. 8,341,317)

29. ClearPath incorporates by reference each allegation in paragraphs 1 through 12, inclusive, above.

30. ClearPath states the allegations in this paragraph on information and belief. Defendants, without the permission of ClearPath, have infringed (directly

and under the doctrine of equivalents) and continue to infringe the '317 Patent by, among other things, making, using, selling and offering for sale within the United States products and services and/or by performing methods, that fall within the scope of one or more claims of the '317 Patent, including, without limitation, claims 1-15. Defendants infringe those claims of the '317 Patent by making, using, selling and offering for sale an infrastructure that leverages software for configuring and managing remote appliances and receiving network traffic information in which, among other things, Defendants provide for the automatic configuration, management and performance reporting of the appliances from a cloud-based management center. When a Meraki (now Cisco) appliance connects to the Internet, it contacts the cloud-based management center, which has certain configurations. These configurations include, for example, a Quality of Service ("QOS") configuration and one or more other configurations, such as a content filtering configuration, a VPN configuration, an IP routing and network interface configuration, a content filtering configuration, and/or a device monitoring configuration. The cloud based management center stores the configuration(s) and automatically transmits the stored configuration(s) to the appliance in response to a request from the appliance. Similarly the configurations may be changed by an end user in the portal and pushed to the appliance over the internet. Upon receipt of the configuration(s), the appliance is caused to provide QOS and other services (*e.g.* content filtering, VPN, and/or IP routing and network interface services and/or device monitoring services) to a customer's network. The customer may use the portal receiving information from the management center to manage a single network or simultaneously manage multiple customer networks over the same portal receiving information from the same management center.

31. As a result of Defendants' infringement of the '317 patent, ClearPath has been damaged.

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32. Unless a permanent injunction is issued enjoining Defendants and their agents, servants, employees, representatives, affiliates, and all others acting in concert with them, or any of them, from infringing the '317 patent, ClearPath will be greatly and irreparably harmed.

33. To the extent that facts learned in discovery show that Defendants' infringement of the '317 Patent is or has been willful, ClearPath reserves the right to request such a finding at the time of trial.

PRAYER FOR RELIEF

ClearPath seeks the following relief:

1. A judgment that Defendants have infringed one of more claims of the '800 Patent;

2. A judgment that Defendants have directly infringed one of more claims of the '777 Patent;

3. A judgment that Defendants have directly infringed one of more claims of the '317 Patent;

4. A permanent injunction enjoining Defendants and their respective officers, directors, agents, servants, affiliates, employees, divisions, branches, subsidiaries, parents, and all other acting in concert with them, or any of them, from infringing the '800 Patent;

5. A permanent injunction enjoining Defendants and their respective officers, directors, agents, servants, affiliates, employees, divisions, branches, subsidiaries, parents, and all other acting in concert with them, or any of them, from infringing the '777 Patent;

6. A permanent injunction enjoining Defendants and their respective officers, directors, agents, servants, affiliates, employees, divisions, branches, subsidiaries, parents, and all other acting in concert with them, or any of them, from infringing the '317 Patent;

7. An award of damages in accordance with 35 U.S.C.§ 284;

8. A judgment and order requiring Defendants, and each of them, to provide an accounting and to pay supplemental damages to ClearPath, together with interest thereon;

9. A decree that this action is an "exceptional case" within the meaning of 35 U.S.C.§ 285 and a reasonable award of attorneys' fees; and

10. Such other and further relief as may be proper under the circumstances.

DATED: January 14, 2013

KEVIN E. GAUT
KARIN G. PAGNANELLI
MITCHELL SILBERBERG & KNUPP LLP

By: _____
Kevin E. Gaut
Attorneys for Plaintiff
ClearPath Networks, Inc.

JURY TRIAL DEMAND

ClearPath hereby demands a trial by jury of all issues so triable.

DATED: January 14, 2013

KEVIN E. GAUT
KARIN G. PAGNANELLI
MITCHELL SILBERBERG & KNUPP LLP

By: _____
Kevin E. Gaut
Attorneys for Plaintiff
ClearPath Networks, Inc.

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EXHIBIT 1

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US007783800B2

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

(10) **Patent No.: US 7,783,800 B2**
(45) **Date of Patent: Aug. 24, 2010**

(54) **SYSTEMS AND METHODS FOR MANAGING A NETWORK**

(75) Inventors: **Robert T. Staats**, Lahabra Heights, CA (US); **Clifford H. Young**, Marina del Rey, CA (US)

(73) Assignee: **Clearpath Networks, Inc.**, El Segundo, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 973 days.

(21) Appl. No.: **11/106,837**

(22) Filed: **Apr. 15, 2005**

(65) **Prior Publication Data**

US 2005/0235352 A1 Oct. 20, 2005

Related U.S. Application Data

(60) Provisional application No. 60/562,596, filed on Apr. 15, 2004, now abandoned.

(51) **Int. Cl.**
G06F 13/12 (2006.01)
G06F 15/177 (2006.01)
G06F 15/173 (2006.01)

(52) **U.S. Cl.** **710/64**; 709/220; 709/221; 709/222; 709/223

(58) **Field of Classification Search** 710/64; 709/220–223

See application file for complete search history.

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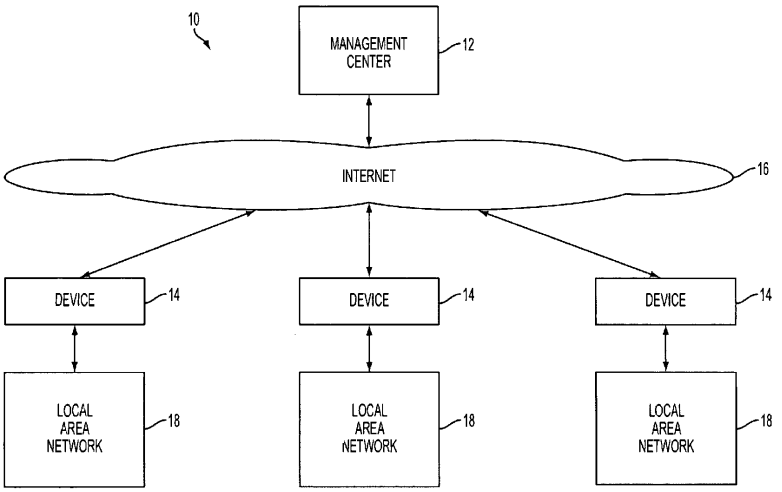
Primary Examiner—Niketa I Patel
(74) *Attorney, Agent, or Firm*—K&L Gates LLP

(57) **ABSTRACT**

A method of managing a network. The method includes receiving an activation key transmitted from a device connected to the network, automatically transmitting a configuration to the device, automatically maintaining the configuration of the device, and receiving log information from the device.

24 Claims, 14 Drawing Sheets



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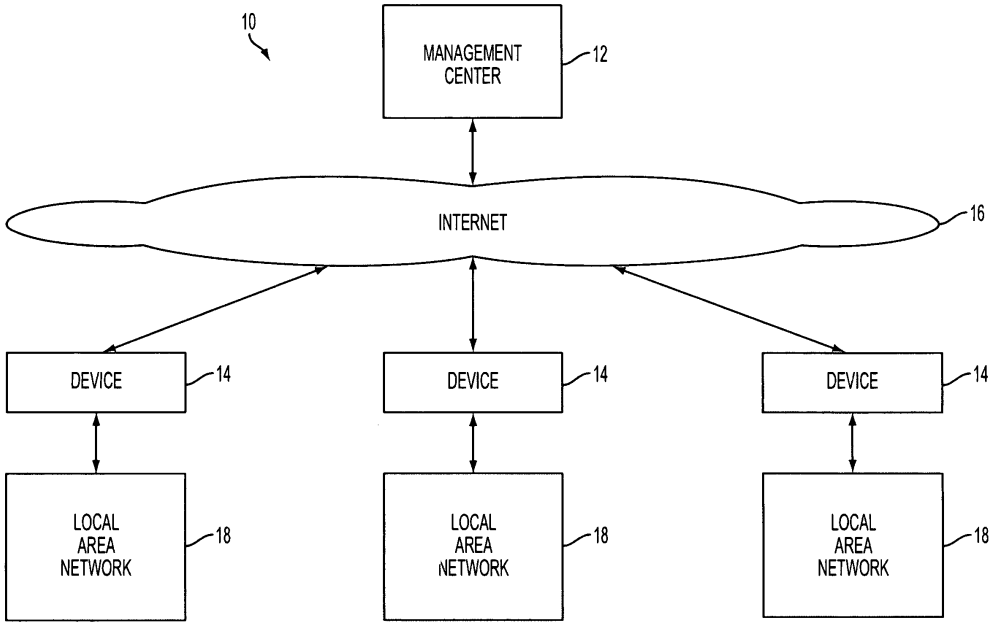

FIG. 1

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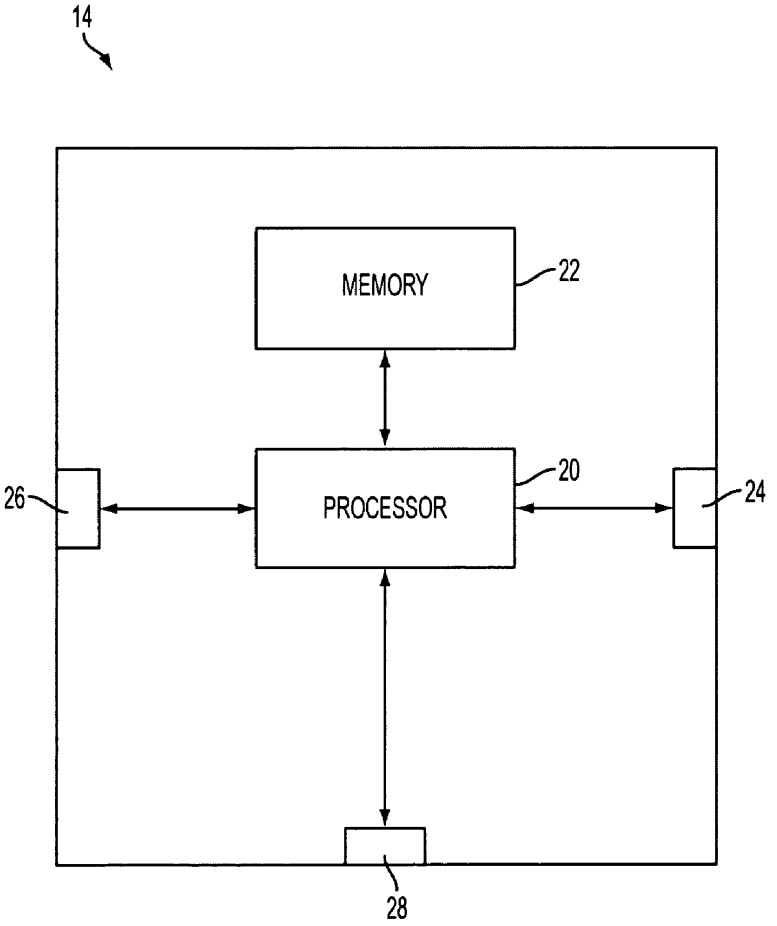

FIG. 2

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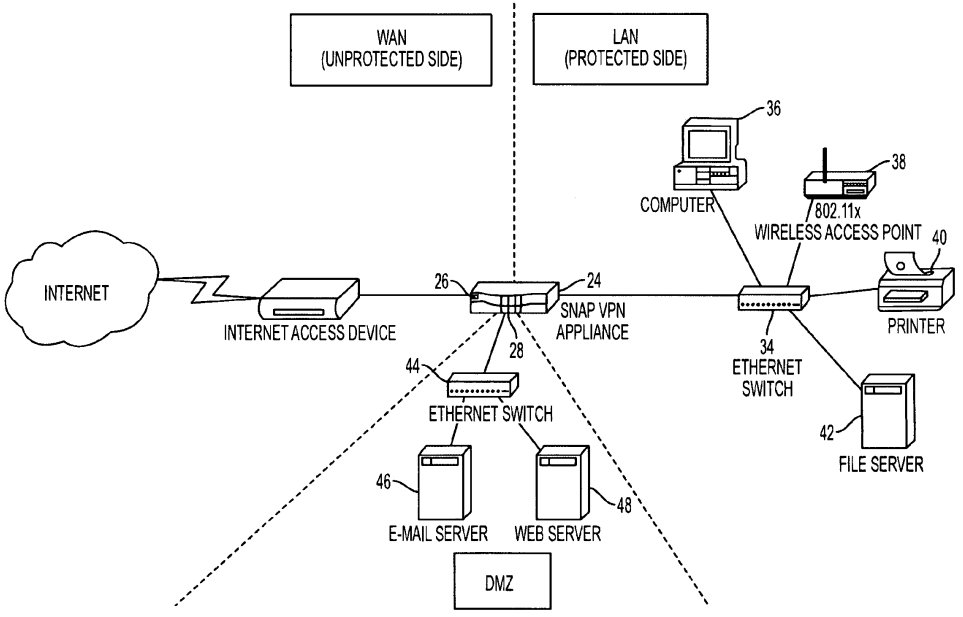

FIG. 3

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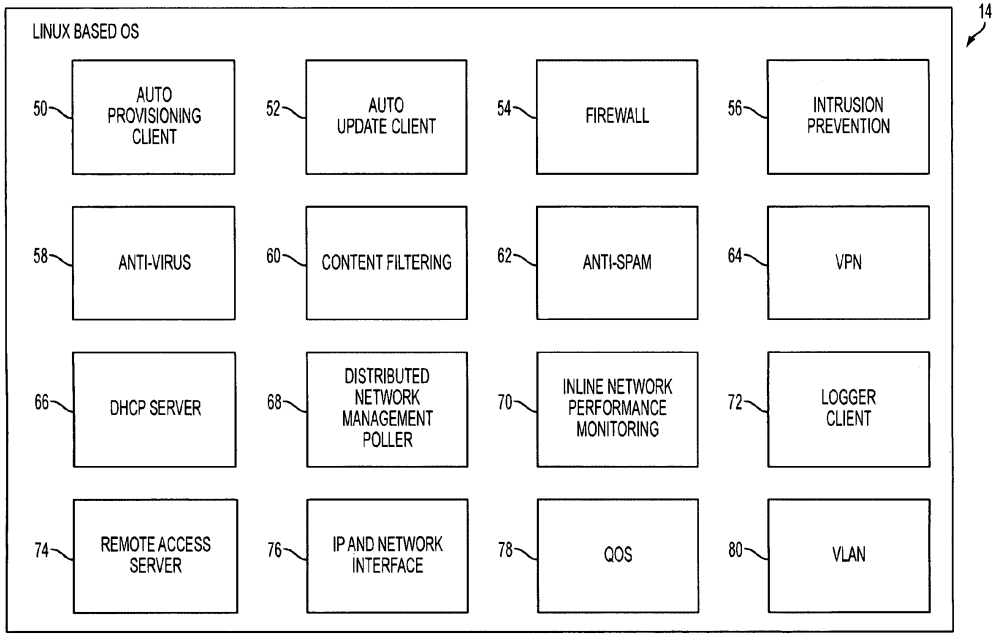

FIG. 4

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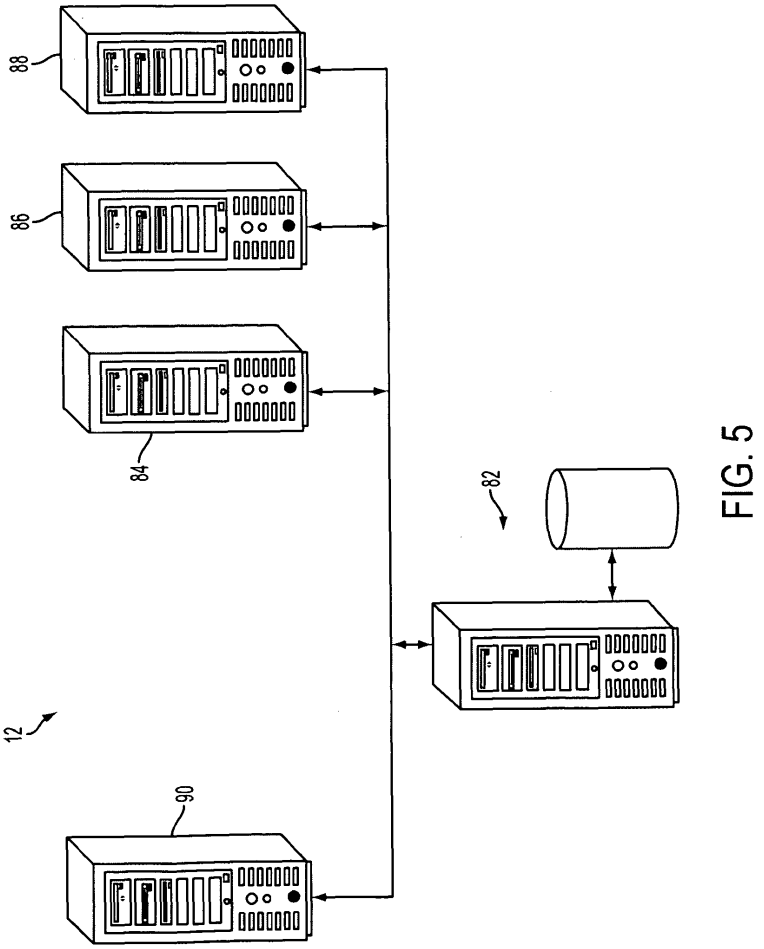

FIG. 5

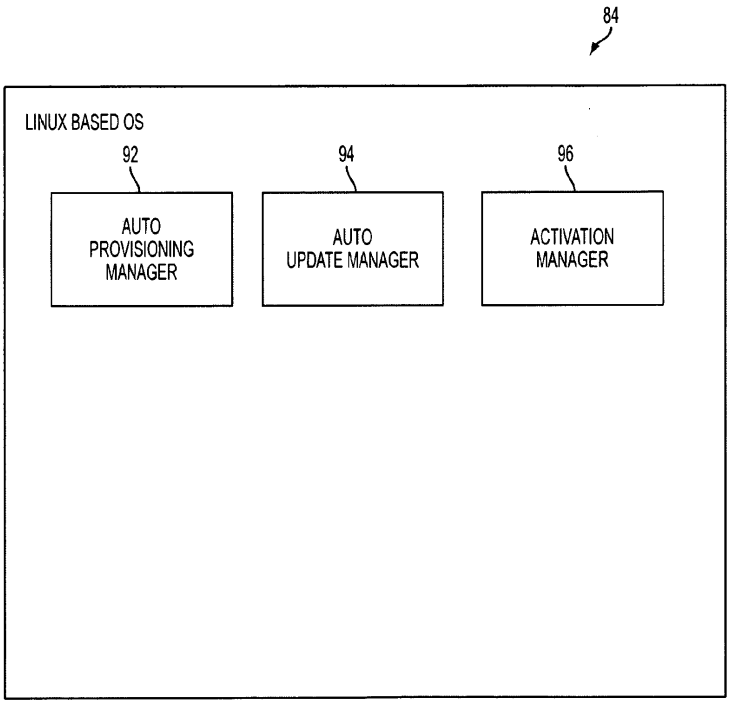

FIG. 6

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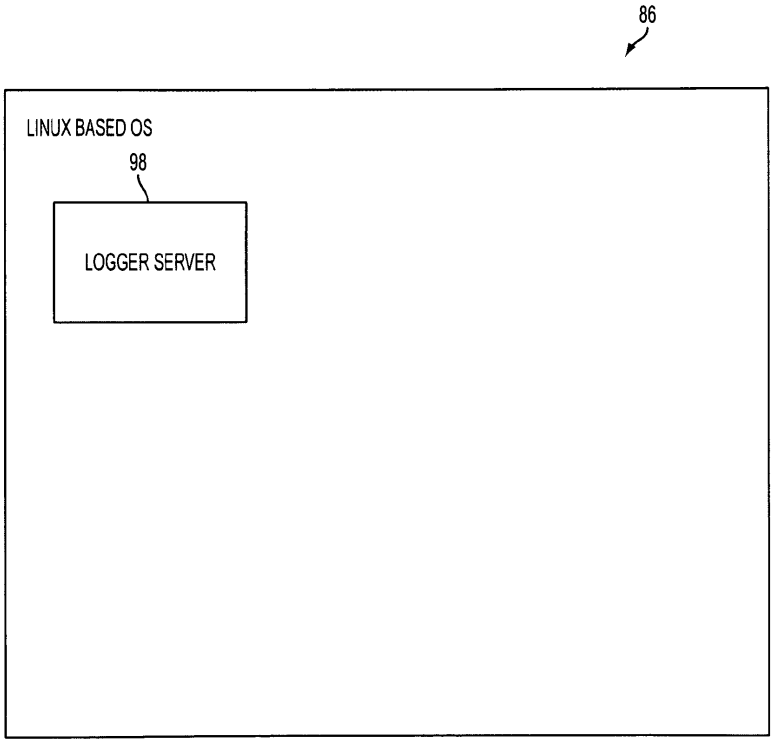

FIG. 7

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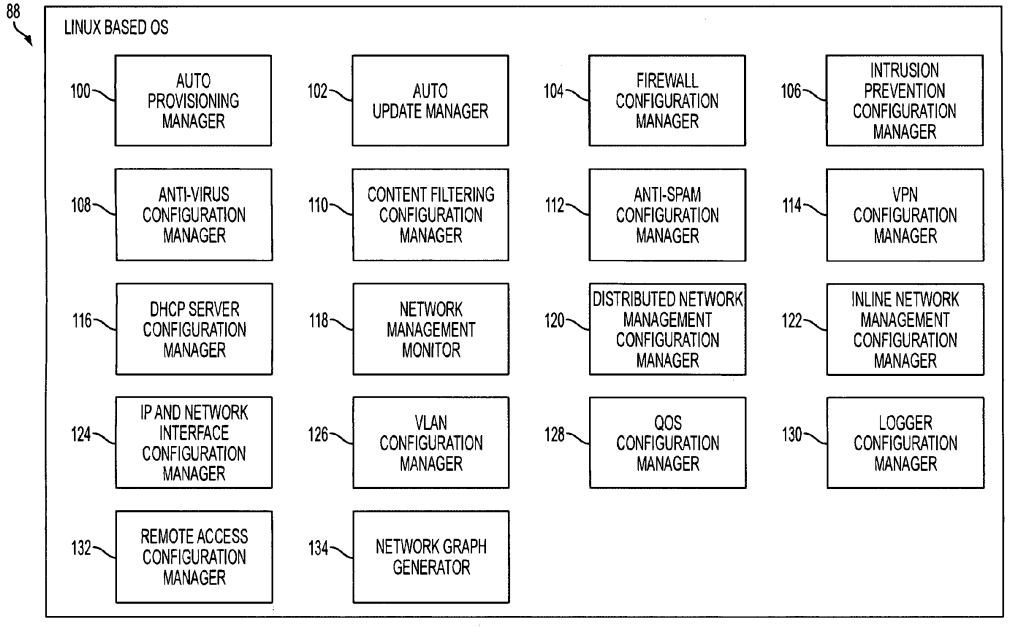

FIG. 8

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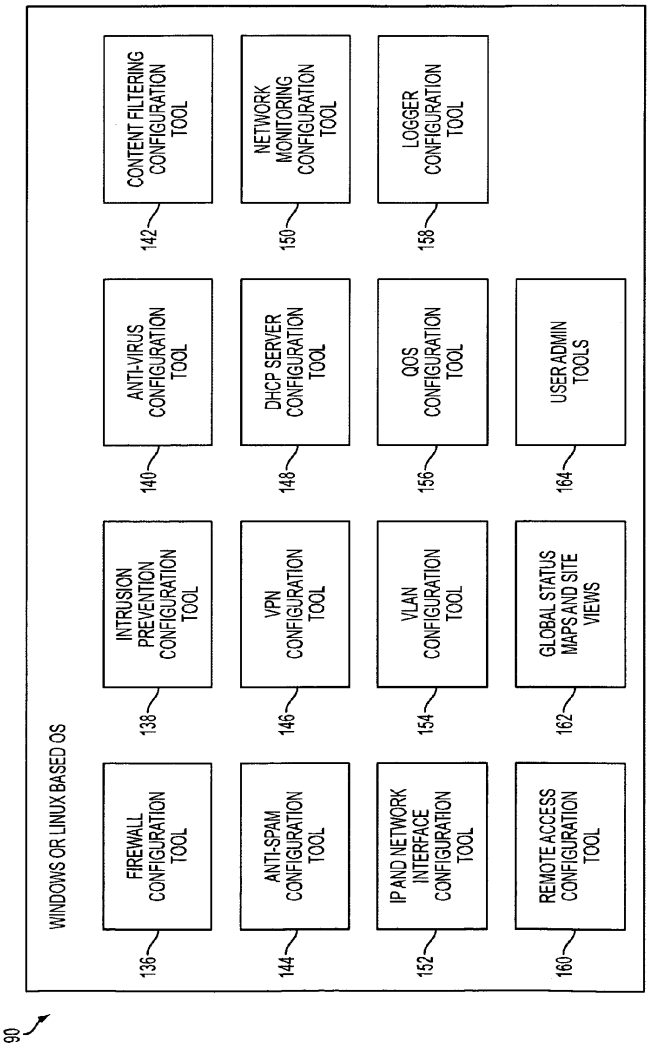

FIG. 9

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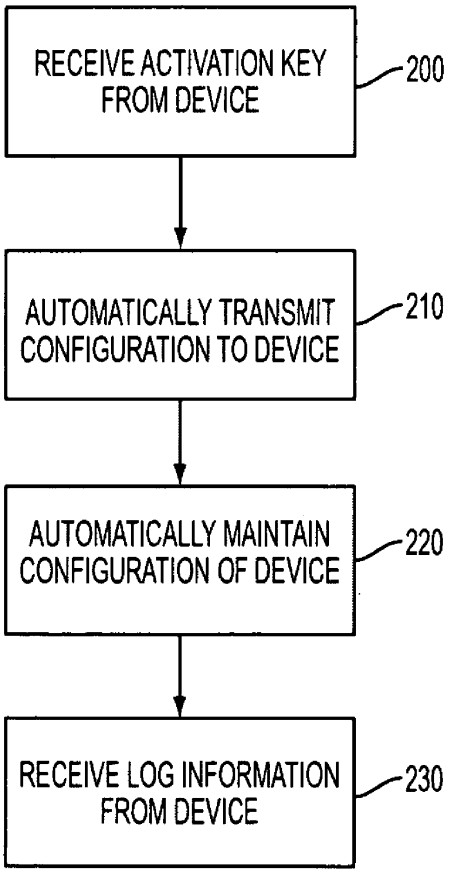
RECEIVE ACTIVATION KEY FROM DEVICE
200
AUTOMATICALLY TRANSMIT CONFIGURATION TO DEVICE
210
AUTOMATICALLY MAINTAIN CONFIGURATION OF DEVICE
220
RECEIVE LOG INFORMATION FROM DEVICE
230

FIG. 10

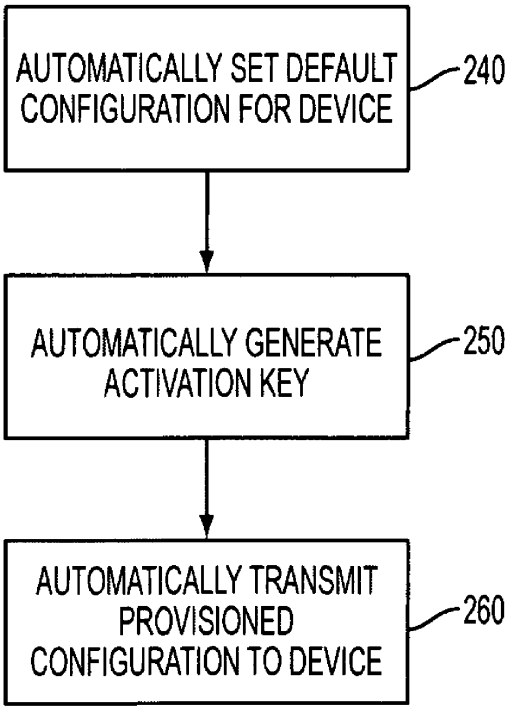

FIG. 11

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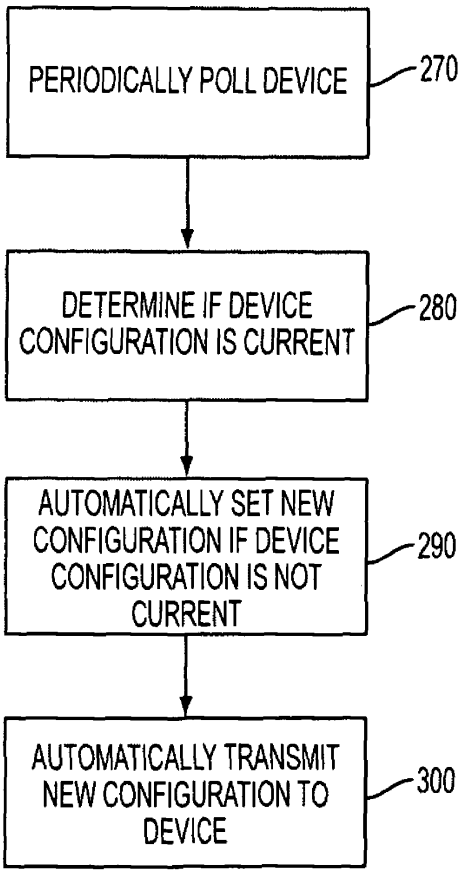

FIG. 12

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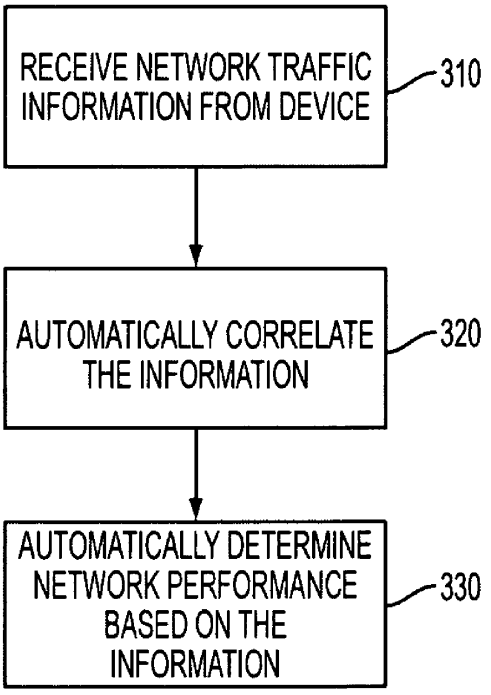

FIG. 13

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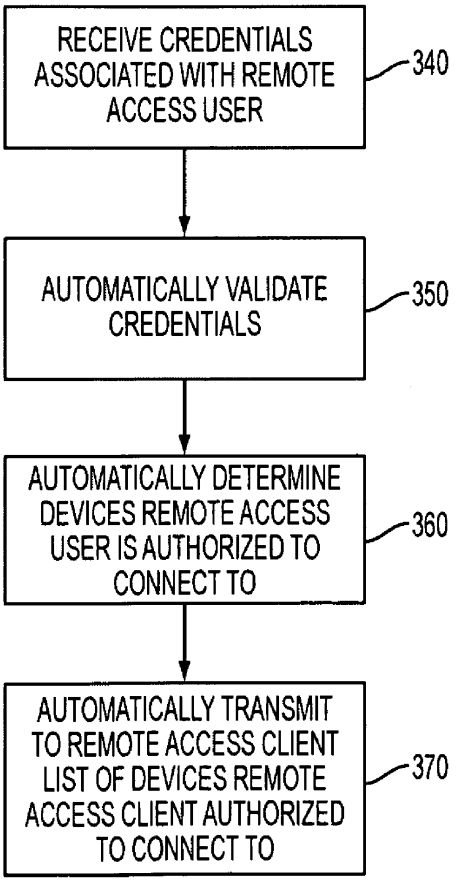

FIG. 14

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SYSTEMS AND METHODS FOR MANAGING A NETWORK

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the priority benefit of U.S. Provisional Application No. 60/562,596, which was filed on Apr. 15, 2004 and is incorporated by reference in its entirety.

BACKGROUND

This application discloses an invention that is related, generally and in various embodiments, to systems and methods for managing a network.

Some network environments provide companies with critical information technology (IT) services for installing, connecting, managing and securing their network environment. However, traditional network implementations have required that network infrastructure capable of supporting computer applications be assembled using disparate hardware, software and systems that must be manually configured and managed. As a result, these traditional network implementations have been utilized primarily by large enterprises with large information technology (IT) budgets.

Small and medium businesses (SMBs) represent the majority of businesses, and their network management and security needs are no less critical that that of larger enterprises. However, due to budgetary and technological constraints, traditional secure network management systems, services, and elements are usually not a viable option for SMBs. Most SMBs lack the necessary IT staff and budget resources to effectively manage secure network environments that may be leveraged to deploy distributed applications that run on these networks and make those businesses more competitive.

SUMMARY

In one general respect, this application discloses a method of managing a network. According to various embodiments, the method includes receiving an activation key automatically transmitted from a device connected to the network, automatically transmitting a configuration to the device, automatically maintaining the configuration of the device, and receiving log information from the device.

According to various embodiments, the method includes automatically setting a default configuration for the device, automatically generating an activation key associated with a device, and automatically transmitting a provisioned configuration to the device after the device is connected to the network.

According to various embodiments, the method includes periodically polling a device connected to the network, automatically determining whether a configuration of the device is current, automatically setting a new configuration for the device when the configuration is not current, and automatically transmitting the new configuration to the device.

According to various embodiments, the method includes receiving network traffic information from a device connected to the network, automatically correlating the information, and automatically determining network performance based on the information.

According to various embodiments, the method includes receiving credentials associated with a remote access user, automatically validating the credentials, automatically determining which devices connected to the network the remote access user is authorized to connect to, and automatically transmitting to a remote access client a list of devices the remote access user is authorized to connect to.

In another general respect, this application discloses a system for managing a network. According to various embodiments, the system includes a device connected to the network and a management center in communication with the device via the Internet. The device includes a processor and a memory. The management center includes a first module for provisioning a configuration of the device, a second module for automatically transmitting the configuration to the device, and a third module for automatically maintaining the configuration of the device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates various embodiments of a system for managing a network;

FIG. **2** illustrates various embodiments of a device;

FIG. **3** illustrates various embodiments of the device;

FIG. **4** illustrates various embodiments of the device;

FIG. **5** illustrates various embodiments of a management center;

FIG. **6** illustrates various embodiments of a server;

FIG. **7** illustrates various embodiments of a server;

FIG. **8** illustrates various embodiments of a server;

FIG. **9** illustrates various embodiments of a web-based management portal;

FIG. **10** illustrates various embodiments of a method of managing a network;

FIG. **11** illustrates various embodiments of a method of managing a network;

FIG. **12** illustrates various embodiments of a method of managing a network;

FIG. **13** illustrates various embodiments of a method of managing a network; and

FIG. **14** illustrates various embodiments of a method of managing a network.

DETAILED DESCRIPTION

The systems and methods described herein may be utilized to provide for the automated delivery of managed services. It is to be understood that the figures and descriptions of the disclosed invention have been simplified to illustrate elements that are relevant for a clear understanding of the invention, while eliminating, for purposes of clarity, other elements. Those of ordinary skill in the art will recognize, however, that these and other elements may be desirable. However, because such elements are well known in the art, and because they do not facilitate a better understanding of the invention, a discussion of such elements is not provided herein.

FIG. **1** illustrates various embodiments of a system **10** for managing a network. The system **10** may be utilized to provide a company with critical information technology (IT) services for installing, connecting, managing and securing their network environment without having to rely on several discrete systems.

According to various embodiments, the system **10** includes a management center **12** and at least one device **14** in communication with the management center **12** via the Internet **16**. Although only three devices **14** are shown in FIG. **1**, the system **10** may include any number of devices **14** in communication with the management center **12** via the Internet **16**. Each device **14** may be located at a different customer location, and each device **14** may be connected to a different local area network **18**.

FIGS. **2-4** illustrate various embodiments of the device **14** of FIG. **1**. As shown in FIG. **2**, the device **14** includes a processor **20** and a memory **22**. According to various embodiments, the device **14** may also include a first fast ethernet port **24**, a second fast ethernet port **26**, and a third fast ethernet port **28**. As shown in FIG. **3**, the device **14** may be connected to a local area network **18** via the first fast ethernet port **24**, to a service provider wide area network **30** via the second fast ethernet port **26**, and to a demilitarized zone **32** via the third fast ethernet port **28**. The device **14** may serve to act as a security device to protect the local area network **18** and the demilitarized zone **32** from outside threats originating from the wide area network **30**. According to various embodiments, in lieu of being connected to the demilitarized zone **32** via the third fast ethernet port **28**, the device **14** may be connected to a redundant wide area network (not shown) via the third fast ethernet port **28**.

The local area network **18** may include network elements such as, for example, an ethernet switch **34**, a computer **36**, a wireless access point **38**, a printer **40**, a file server **42** and any other network elements known by those skilled in the art to comprise a portion of a local area network. The demilitarized zone **32** may include network elements such as, for example, an ethernet switch **44**, an e-mail server **46**, a web server **48** and any other network elements known by those skilled in the art to comprise a portion of a demilitarized zone.

As shown in FIG. **4**, the device **14** may include a Linux based operating system and the following modules: an auto-provisioning module **50**, an auto-update module **52**, a firewall module **54**, an intrusion prevention module **56**, an anti-virus module **58**, a content filtering module **60**, an anti-spam module **62**, a VPN module **64**, a DHCP server module **66**, a distributed network management poller module **68**, an inline network performance monitoring module **70**, a logger module **72**, a remote access server module **74**, an IP and network interface module **76**, a QOS module **78**, and a VLAN module **80**.

The auto-provisioning module **50** of the device **14** is operable to provide the device **14** with auto-provisioning functionality. For example, according to various embodiments, the auto-provisioning module **50** allows for the device **14** to be auto-configured based on an activation code entered by an installer during installation of the device **14** at a customer location.

The auto-update module **52** of the device **14** is operable to provide the device **14** with auto-update functionality. For example, according to various embodiments, the auto-update module **52** allows for the device **14** to be automatically updated whenever updates to the device **14** are available. The updates may include, for example, operating system updates, intrusion prevention rule updates, anti-virus signature updates, and content filtering database updates.

The firewall module **54** of the device **14** is operable to provide the device **14** with firewall functionality. For example, according to various embodiments, the firewall module **54** allows for the device **14** to perform deep packet inspection, stateful inspection, network address translation, port address translation and port forwarding.

The intrusion prevention module **56** of the device **14** is operable to provide the device **14** with intrusion prevention functionality. For example, according to various embodiments, the intrusion prevention module **56** allows for the device **14** to perform real-time traffic analysis and logging, protocol analysis, and content searching and matching. The intrusion prevention module **56** may also allow for the device **14** to detect a variety of attacks and probes such as, for example, buffer overflows, operating system fingerprinting attempts, common gateway interface attacks and port scans.

The anti-virus module **58** of the device **14** is operable to provide the device **14** with anti-virus functionality. For example, according to various embodiments, the anti-virus module **58** of the device **14** allows for the device **14** to provide an Internet gateway protection service that protects against viruses and malicious code that may be downloaded from the Internet **16** to the local area network **18**. According to various embodiments, the anti-virus module **58** of the device **14** allows for the integration of the device **14** and an anti-virus client installed on one or more devices that comprise a portion of the local area network **18**. The anti-virus module **58** allows for the device **14** to block access to the Internet **16** for any device of the local area network **18** that does not have the most current anti-virus client and anti-virus signature database installed thereon. The anti-virus module **58** of the device **14** may redirect such blocked devices to a webpage that will allow for the device to be updated to include the most current anti-virus client and anti-virus signature database.

The content filtering module **60** of the device **14** is operable to provide the device **14** with content filtering functionality. For example, according to various embodiments, the content filtering module **60** of the device **14** allows for the device **14** to act as a transparent proxy which inspects each request made from the local area network **18** to the Internet **16**. The content filtering module **60** may determine whether to grant or deny the request to access a particular website based on defined policies. For instances where the request is granted, the content filtering module **60** may further determine which types of files are allowed to be downloaded from the Internet **16** to the local area network **18**. According to various embodiments, each policy may be defined as a blacklist or a whitelist. If the policy is defined as a blacklist, the content filtering module **60** operates to allow access to all sites except those explicitly defined to be blocked. If the policy is defined as a whitelist, the content filtering module **60** operates to block access to all sites except those explicitly defined to be allowed.

The anti-spam module **62** is operable to provide the device **14** with anti-spam and e-mail anti-virus functionality. For example, according to various embodiments, the anti-spam module **62** of the device **14** allows for the device **14** to act as a transparent proxy which inspects each e-mail message that transits the device **14** for viruses and malicious code. If the anti-spam module **62** identifies an e-mail as SPAM, the device **14** may block the e-mail. If the anti-spam module **62** identifies an e-mail as containing a virus, the device **14** may attempt to disinfect the e-mail. If the e-mail is cleaned, the device **14** may forward the cleaned e-mail along with a message that the e-mail contained a virus. If it is not possible to disinfect the e-mail, the device **14** may block the e-mail.

The VPN module **64** of the device **14** is operable to provide the device **14** with VPN functionality. For example, according to various embodiments, the VPN module **64** provides the encryption protocol for the automatic building of a site to site VPN which is implemented as a secure tunnel that connects two different devices **14**. A secure socket layer (SSL) is used to create the encrypted tunnel between the two devices **14**. In instances where a device **14** is assigned a new WAN IP Address, the VPN module **64** allows for all of the tunnels connecting the device **14** to other devices **14** to automatically reconfigure themselves to establish new tunnels to the device **14** at the new IP Address. According to various embodiments, the VPN module **64** of the device **14** allows for the cooperation of the device **14** and a remote access client.

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The DHCP server module **66** of the device **14** is operable to provide the device **14** with DHCP server functionality. For example, according to various embodiments, the DHCP server module **66** allows the device **14** to provide IP addresses and configuration parameters to network devices requesting this information using the DHCP protocol. IP address pools with characteristics such as default gateways, domain names, and DNS servers can be defined. Static assignments can also be defined based on MAC address.

The distributed network management poller module **68** of the device **14** is operable to provide the device **14** with distributed network management poller functionality. For example, according to various embodiments, the distributed network management poller module **68** allows the device **14** to poll network elements that comprise a portion of a local area network **18** and are in communication with the device **14**. For example, the distributed network management poller module **68** may utilize Internet control message protocol pings to determine a reachability value and a latency value for one or more of the network elements. The distributed network management poller module **68** may also utilize simple network management protocol (SNMP) to poll SNMP information from network elements that are SNMP capable. Such SNMP information may include, for example, CPU utilization or server temperature.

The inline network performance monitoring module **70** of the device **14** is operable to provide the device **14** with inline network performance monitoring functionality. For example, according to various embodiments, the inline network performance monitoring module **70** allows the device **14** to inspect each packet that transits the device **14** and record certain information such as source/destination IP address, protocol, and source/destination ports.

According to various embodiments, the inline network performance monitoring module **70** also allows the device **14** to monitor all network traffic that passes between the device **14** and another device **14**. Each device **14** has its time synchronized precisely to network time protocol servers (not shown). This allows for each device **14** to reference packet information with a common time reference. According to various embodiments, the inline network performance monitoring module **70** can record the exact time every packet leaves a device **14**, and record items such as, for example, source/destination IP address, protocol, sequence number and source/destination port. As the packets travel across the Internet **16**, the packets eventually reach the destination device **14**. The inline network performance monitoring module **70** of the destination device **14** records the exact time the packet is received by the destination device **14** and items such as, for example, source/destination IP address, protocol, sequence number and source/destination port.

The logger module **72** of the device **14** is operable to provide the device **14** with logging functionality. For example, according to various embodiments, the logger module **72** allows information obtained by the device **14** (e.g., intrusion prevention detections, anti-virus detections, network device polling results, source/destination IP addresses, application performance measurements, etc.) to be recorded, processed and transmitted to the management center **12**. According to various embodiments, the data collected by the inline network management monitoring module **70** of each device **14** is forwarded to the logger module **72** of the associated device **14**. After receiving the data, the logger modules **72** wait a random amount of time (e.g., between approximately 120 and 240 seconds) before transmitting the data to the management center **12**. This random delay is to prevent all the devices **14** from sending their data back to the management center **12** at the same time. If the management center **12** cannot be reached, the device **14** may queue the data locally until the management center **12** can be reached. When the management center **12** is reached, the logger module **72** will transmit all of the queued data. The data that is transmitted uses a system queue which insures that regular user network traffic will always have priority and this data transfer will only use the unused bandwidth on the network connection.

The remote access server module **74** of the device **14** is operable to provide the device **14** with remote access capability. For example, according to various embodiments, the remote access server module **74** allows for the cooperation of the device **14** with a remote access client.

The IP and network interface module **76** is operable to provide the device **14** with the capability to configure the network interface characteristics such as IP Address type (e.g., static IP, DHCP, or PPPOE), IP address, subnet mask, speed and duplex. The IP and network interface module **76** is also operable to provide the device **14** with the capability to configure IP routing.

The QOS module **78** of the device **14** is operable to provide the device **14** with QOS functionality. For example, according to various embodiments, the QOS module **78** allows the device **14** to selectively transmit packets based on the relative importance of the packet. The QOS module **48** may also allow the device **14** to inspect each packet and determine a particular queue to send the packet to based on defined rules. Rules may be defined, for example, based on source/destination IP address and/or port information. If a packet does not match any rule, it may be sent to a default queue.

The VLAN module **80** of the device **14** is operable to provide the device **14** with VLAN functionality. For example, according to various embodiments, the first and third fast Ethernet ports **24**, **28** of the device **14** that are connected to the local area network **18** and the demilitarized zone **32** may be configured as 802.1q trunk ports. The VLAN module **80** allows the device **14** to connect to many different VLANS from an Ethernet switch that has enabled trunking.

According to various embodiments, the device **14** may also automatically transmit performance information to the management center **12**. The performance information may include, for example, a CPU utilization value for the device **14**, a memory utilization value for the device **14**, and a network interface bandwidth utilization value for the device **14**. The performance data may also include, for example, the information obtained by the distributed network management poller module **68** of the device **14**.

FIG. **5** illustrates various embodiments of the management center **12** of FIG. **1**. The management center **12** includes a database cluster **82**, an activation server **84**, a logger server **86**, a manager server **88** and a web-based management portal **90**. The management center **12** is located external to any customer sites and may provide a shared infrastructure for multiple customers. According to various embodiments, the database cluster **82** includes a plurality of databases and structural query language (SQL) servers. According to various embodiments, the database cluster **82** includes a combination of structural query language servers and open source MySQL servers. The databases hold all of the data required by the activation server **84**, the logger server **86**, the manager server **88** and the web-based management portal **90**.

FIG. **6** illustrates various embodiments of the activation server **84**. The activation server **84** may include a Linux based operating system, and may include an auto-provisioning manager module **92**, an auto-update manager module **94** and an activation manager module **96**. The auto-provisioning manager module **92** is operable to configure any device **14**

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that is in the process of being activated. The auto-update manager module **94** is operable to update the operating system of any device **14** that is in the process of being activated. The auto-update update manager module **94** is also operable to update the various databases and signature files used by applications resident on the device **14** (e.g., intrusion prevention, anti-virus, content filtering). The activation manager module **96** is operable to communicate with the back-end SQL servers of the database cluster **82** to gather the necessary data required by the auto-provisioning manager module **92** to generate device configurations. The activation manager module **96** is also operable to authenticate incoming devices **14** and determine their identity based on the activation key.

According to various embodiments, the activation server **84** is a collection of hosted servers that are utilized to set up the initial configuration of each device **14**. Based on an activation key received from the device **14** when the device **14** is first installed, the activation server **84** automatically sends the appropriate configuration to the device **14**. The activation server **84** also assigns the device **14** to a redundant pair of logger servers **86** and a redundant pair of manager servers **88**.

FIG. **7** illustrates various embodiments of the logger server **86**. The logger server **86** may include a Linux based operating system and a logger server module **98**. According to various embodiments, the logger server **86** is a collection of hosted servers that receive log information from the devices **14** and correlates the information.

FIG. **8** illustrates various embodiments of the manager server **88**. The manager server **88** may include a Linux based operating system and the following modules: an auto-provisioning manager module **100**, an auto-update manager module **102**, a firewall configuration manager module **104**, an intrusion prevention configuration manager module **106**, an anti-virus configuration manager module **108**, a content filtering configuration manager module **110**, an anti-spam configuration manager module **112**, a VPN configuration manager module **114**, a DCHP server configuration manager module **116**, a network management monitor module **118**, a distributed network management configuration manager module **120**, an inline network management configuration manager module **122**, an IP and network interface configuration manager **124**, a VLAN configuration manager module **126**, a QOS configuration manager module **128**, a logger configuration manager module **130**, a remote access configuration manager module **132**, and a network graph generator module **134**.

According to various embodiments, the manager server **88** is a collection of servers that are utilized to manage the devices **14**. The manager server **88** transmits the configuration and the updates to the device **14**. The manager server **88** also monitors the device **14**, stores performance data, and generates graphs for each device **14** and each network element monitored by the device **14**. For example, the auto-update manager module **102** may periodically poll each device **14** and determines whether each device **14** has the most current version of the device operating system, the anti-virus signature database, the content filtering database and the intrusion protection database. If the auto-update manager module **102** determines that a particular device **14** does not have the most current version of the operating system and databases, the auto-update manager module **102** operate to will automatically transmit the appropriate update to the device **14**.

The VPN configuration manager module **114** may automatically configure the VPN tunnels for each device **14**. When the particular device **14** is first activated, the device **14** contacts the manager server **88** and reports its public Internet address. The auto-provisioning manager module **100** records the reported address and stores it in the database cluster **82**. The VPN configuration manager module **114** may also gather all of the VPN configuration information from the database cluster **82** for each device **14** that is provisioned to have a VPN connection to the particular device **14**. The VPN configuration manager module **114** may also create configuration files for each of the devices **14**. After the manager server **88** transmits the configurations to each of the devices **14**, secure encrypted tunnels are established between each of the devices **14**.

When a particular device **14** is issued a new IP address, the device **14** automatically transmits its new IP address to the manager server **88**. The auto-update manager module **102** responds to this IP address change and automatically generates new configurations for all of the devices **14** that have tunnels to the particular device **14**. The VPN configuration manager module **114** automatically transmits the new configurations to the devices **14** and the encrypted tunnels automatically reconverge.

FIG. **9** illustrates various embodiments of the web-based management portal **90**. The web-based management portal **90** may include a Windows or Linux based operating system and the following modules: a firewall configuration tool module **136**, an intrusion prevention configuration tool module **138**, an anti-virus configuration tool module **140**, a content filtering configuration tool module **142**, an anti-spam configuration tool module **144**, a VPN configuration tool module **146**, a DHCP server configuration tool module **148**, a network monitoring configuration tool module **150**, an IP and network interface configuration tool module **152**, a VLAN configuration tool module **154**, a QOS configuration tool module **156**, a logger configuration tool module **158**, a remote access configuration tool module **160**, a global status maps and site views module **162** and a user administration tool module **164**.

According to various embodiments, the web-based management portal **90** includes a collection of integrated centralized network management systems and a grouping of customer management tools. According to various embodiments, the web-based management portal **90** is a combination of many different web servers running Microsoft Internet Information Server or Apache. The web pages may be written in Microsoft's ASP.NET or PHP, and the web applications may interface with the SQL servers of the database cluster **82** to synchronize changes to the network environment as changes are made to the configuration of the devices **14** via the web-based management portal **90**. The web-based management portal **90** may further include the capability for firewall management, intrusion prevention management, anti-virus management, content filtering management, anti-spam management, site to site and remote access virtual private network management, network monitoring, network configuration, account management and trouble ticketing.

The firewall configuration tool module **136** allows for centralized management of the firewall policies for each device **14**. According to various embodiments, the firewall for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The firewall configuration tool module **136** allows a user to efficiently and securely manage all of the firewalls and define global policies that are easily applied to all firewalls at once. The firewall configuration tool module **136** also allows the customer to set custom firewall polices to each individual firewall. Each firewall can also have individual user permissions to restrict which user accounts can modify which firewalls. This capability may provide an administrator at each site the ability to

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manage their own firewall and yet restrict them from changing the configuration of any other firewalls in the network. A notification can be automatically sent to a group of administrators every time a change is made to a firewall policy. A firewall validation tool allows a user to run a security check against their current firewall settings and report on which ports are open and any vulnerabilities that are detected. The firewall configuration tool module **136** may also be used to view firewall log information.

The intrusion prevention configuration tool module **138** allows for the centralized management of the intrusion prevention rules for each device **14**. According to various embodiments, the intrusion prevention system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The intrusion prevention configuration tool module **138** allows a user to efficiently and securely manage all of the intrusion prevention systems and define global policies that are easily applied to all intrusion prevention systems at once. The intrusion prevention configuration tool module **138** also allows the customer to set custom intrusion prevention rules to each individual intrusion prevention system. Each intrusion prevention system can also have individual user permissions to restrict which user accounts can modify which intrusion prevention system. This capability may provide an administrator at each site the ability to manage their own intrusion prevention system and yet restrict them from changing the configuration of any other intrusion prevention systems in the network. An e-mail notification can be automatically sent to a group of administrators every time a change is made to an intrusion prevention system configuration. The intrusion prevention configuration tool module **138** may also be used to view intrusion protection log information.

The anti-virus configuration tool module **140** allows for the centralized management of the anti-virus policies for each device **14**. According to various embodiments, the anti-virus service includes two anti-virus systems. The first anti-virus system for a given local area network **18** may be embodied as an anti-virus gateway service that resides on the device **14** associated with the given local area network **18**. The second anti-virus system is a desktop anti-virus agent that resides on each customer computer (e.g., computer **36**) that requires anti-virus protection. The anti-virus configuration tool module **140** allows a user to efficiently and securely manage both of the anti-virus systems and define global policies that are easily applied to all anti-virus systems at once. The anti-virus configuration tool module **140** also allows a user to set custom anti-virus policies to each individual anti-virus gateway. Each anti-virus system can also have individual user permissions to restrict which user accounts can modify which anti-virus system. This capability may provide an administrator at each site the ability to manage their own anti-virus policies and yet restrict them from changing the configuration of any other anti-virus systems in the network. An e-mail notification can be automatically sent to a group of administrators every time a change is made to an anti-virus system configuration. The anti-virus configuration tool module **140** may also be used to view anti-virus log information.

The content filtering configuration tool module **142** allows for the centralized management of the content filtering policies for each device **14**. According to various embodiments, the content filtering system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The content filtering configuration tool module **142** allows a user to efficiently and securely manage all of the content filtering systems and define global policies that are easily applied to all content filtering systems at once. The content filtering configuration tool module **142** also allows the customer to set custom content filtering policies to each individual content filtering system. Each content filtering system can also have individual user permissions to restrict which user accounts can modify which content filtering system. This capability may provide an administrator at each site the ability to manage their own content filtering system and yet restrict them from changing the configuration of any other content filtering systems in the network. An e-mail notification can be automatically sent to a group of administrators every time a change is made to a content filtering system configuration. The content filtering configuration tool module **142** may also be used to view content filtering log information.

The anti-spam configuration tool module **144** allows for the centralized management of the anti-spam policies for each device **14**. According to various embodiments, the anti-spam system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The anti-spam configuration tool module **144** allows a user to efficiently and securely manage all of the anti-spam systems and define global policies that are easily applied to all anti-spam systems at once. The anti-spam configuration tool module **144** also allows a user to set custom anti-spam policies to each individual anti-spam system. Each anti-spam system can also have individual user permissions to restrict which user accounts can modify which anti-spam system. This capability may provide an administrator at each site the ability to manage their own anti-spam system and yet restrict them from changing the configuration of any other anti-spam systems in the network. A notification can be automatically sent to a group of administrators every time a change is made to an anti-spam system configuration. The anti-spam configuration tool module **144** may also be used to view anti-spam log information.

The VPN configuration tool module **146** allows for the centralized management of the VPN policies for each device **14**. According to various embodiments, the VPN system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The VPN configuration tool module **146** allows a user to efficiently and securely manage all of the VPN systems and define global policies that are easily applied to all VPN systems at once. The VPN configuration tool module **146** also allows a user to set custom VPN policies to each individual VPN system. Each VPN system can also have individual user permissions to restrict which user accounts can modify which VPN system. This capability may provide an administrator at each site the ability to manage their own VPN system and yet restrict them from changing the configuration of any other VPN systems in the network. A notification can be automatically sent to a group of administrators every time a change is made to a VPN system configuration.

The DHCP server configuration tool module **148** allows for the centralized management of the DHCP server policies for each device **14**. According to various embodiments, the DHCP server for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The DHCP server configuration tool module **148** allows a user to efficiently and securely manage all of the DHCP servers and define global policies that are easily applied to all DHCP servers at once. The DHCP server configuration tool module **148** also allows a user to set custom DHCP server policies to each individual DHCP server. Each DHCP server can also have individual user permissions to restrict which user accounts can modify which DHCP server. This capability may provide an administrator at each site the ability to

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manage their own DHCP server and yet restrict them from changing the configuration of any other DHCP server in the network. A notification can be automatically sent to a group of administrators every time a change is made to a DHCP server configuration.

The network monitoring configuration tool module **150** allows for the centralized management of the network monitoring policies for each device **14**. According to various embodiments, the network monitoring system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The network monitoring configuration tool module **150** allows a user to efficiently and securely manage all of the network monitoring systems and define global policies that are easily applied to all network monitoring systems at once. The network monitoring configuration tool module **150** also allows a user to set custom network monitoring policies to each individual network monitoring system. Each network monitoring system can also have individual user permissions to restrict which user accounts can modify which network monitoring system. This capability may provide an administrator at each site the ability to manage their own network monitoring system and yet restrict them from changing the configuration of any other network monitoring systems in the network. A notification can be automatically sent to a group of administrators every time a change is made to a network monitoring system configuration.

The IP and network interface configuration tool module **152** allows for the centralized management of the network configuration for each device **14**. The centralized management of the network configuration may include, for example, managing IP Address, IP Types (static IP, DHCP, PPPOE), IP routing, Ethernet Trunking, VLANs, and QOS configuration. According to various embodiments, the IP and network interface configuration tool module **152** allows a user to efficiently and securely manage all of the devices **14**. Each device **14** can also have individual user permissions to restrict which user accounts can modify the network configuration. This capability may provide an administrator at each site the ability to manage their own network configuration and yet restrict them from changing the configuration of any other devices **14** in the network. A notification can be automatically sent to a group of administrators every time a change is made to a device network configuration.

The global status maps and site views module **162** allows an authorized user to view the real-time status of their network, devices **14**, and network elements that are monitored by the devices **14**. This global status maps and site views module **162** provides a global map of the world, and countries and continents on this map are color coded to represent the underlying status of any devices **14** that reside in that region. For example a customer may have devices **14** in the United States, Japan, and Italy. If all of devices **14** and network elements monitored by the devices **14** are operating as expected, the countries on the map will be shown as green. When a device **14** in Japan ceases to operate as expected, the portion of the map representing Japan may turn red or yellow depending on the severity of the problem. The countries on the map can be selected to drill down into a lower level map. For example, the authorized user could select the United States from the world map and be presented with a state map of the United States. The individual states may be color coded to represent the underlying status of any devices **14** that reside in that state. For each state selected, a list of the sites and devices **14** in that state may be shown. The states on the map can be selected to drill down into a lower level sub map. The lower level sub map may show for example, a particular region, city, or customer site.

The global status maps and site views module **162** may read the latest data polled for each device **14** and the network elements that are monitored by them. It may also check the data against preset thresholds that determine what the status of each device **14** should be set to. It may determine the color for the lowest level map item that contains the device **14** and set the status appropriately. The status and color for each higher level map is set to represent the status of the underlying map. The color of each map item represents the severity of the most severe problem of a device **14** in that region. For example, if a device **14** is not operating as expected, all of the maps that have a region that include this device **14** will be shown as red. If a device **14** is operating in a manner associated with the color yellow, all of the maps that have a region that include this device **14** will be shown as yellow. A map region will only be shown as green if all devices **14** included in that map region are operating as expected.

The user administration tool module **164** allows for the centralized management of a number of functionalities. According to various embodiments, the user administration tool module **164** allows a user to set up an account profile and manage different aspects of a user profile such as name, address and account name. According to various embodiments, the user administration tool module **164** allows a user to manage all orders for secure network access platform products and services including a description and status of orders and allows a user to order additional items as well. According to various embodiments, the user administration tool module **164** allows a user to manage bills, including reading current invoices, making payment, updating billing information, downloading previous statements, and invoices.

According to various embodiments, the user administration tool module **164** allows a user to add and change user accounts, delete user accounts, change passwords, create new groups, move users into certain individuals and groups, and set permissions for those individuals and groups. The permissions may allow access to different portions of the web-based management portal **90**. For example, a finance employee may be given access to only account administration tools for billing and order management. Similarly, a technical employee may be given access to only the technical sections of the web-based management portal **90** and not to billing center or order management sections. According to various embodiments, the user administration tool module **164** may allow a user to open trouble tickets, track the status of existing trouble tickets, and run some of the diagnostic tools available in the secure network access platform environment.

According to various embodiments, the management center **12** may correlate all information received from the devices **14**, including performance information received from the devices **14**.

Each of the modules described hereinabove may be implemented as microcode configured into the logic of a processor, or may be implemented as programmable microcode stored in electrically erasable programmable read only memories. According to other embodiments, the modules may be implemented by software to be executed by a processor. The software may utilize any suitable algorithms, computing language (e.g., C, C++, Java, JavaScript, Visual Basic, VBScript, Delphi), and/or object oriented techniques and may be embodied permanently or temporarily in any type of computer, computer system, device, machine, component, physical or virtual equipment, storage medium, or propagated signal capable of delivering instructions. The software may be

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stored as a series of instructions or commands on a computer readable medium (e.g., device, disk, or propagated signal) such that when a computer reads the medium, the described functions are performed.

Although the system **10** is shown in FIG. **1** as having wired data pathways, according to various embodiments, the network elements may be interconnected through a secure network having wired or wireless data pathways. The secure network may include any type of delivery system comprising a local area secure network (e.g., Ethernet), a wide area secure network (e.g., the Internet and/or World Wide Web), a telephone secure network, a packet-switched secure network, a radio secure network, a television secure network, a cable secure network, a satellite secure network, and/or any other wired or wireless communications secure network configured to carry data. The secure network may also include additional elements, such as intermediate nodes, proxy servers, routers, switches, and adapters configured to direct and/or deliver data.

FIG. **10** illustrates various embodiments of a method of managing a network. According to various embodiments, the method includes receiving an activation key automatically transmitted from a device connected to the network, automatically transmitting a configuration to the device, automatically maintaining the configuration of the device, and receiving log information from the device. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **200**, where the management center **12** receives an activation key automatically transmitted from a device **14** connected to the network. Prior to the start of the process at block **200**, the configuration of the device **14** is provisioned by an entity such as, for example, an administrator or a managed service provider. The entity may initiate the provisioning of the device **14** by logging onto the web-based management portal **90** and entering a license key associated with the device **14**. The license key may be generated by a managed service provider and may be issued with the purchase of the device **14**. The license key may include information such as the product type of the device **14**, the term length of the license associated with the device **14**, and the seller of the license. A hash function may be used to embed the information in the key to obscure the data, and the data may be read by the network manager to verify the authenticity of the license key.

Once the license key is received by the web-based management portal **90**, the configuration of the device **14** may be provisioned via the web-based management portal **90**. Setting the configuration of the device **14** may include setting the IP address of the device **14**, and setting the configurations for the firewall configuration, the intrusion prevention configuration, the anti-virus configuration, the content filtering configuration, the anti-spam configuration, the VPN configuration, the DHCP server configuration, the network management configuration, the network interface configuration, the VLAN configuration, the QOS configuration and any other device configurations. Each configuration provisioned for the device **14** may be stored in the database cluster **82**. According to various embodiments, a default configuration may be selected for the device **14**.

During the provisioning process, an activation key associated with the device **14** is generated and may be printed out or e-mailed for later use. The configuration of the device **14** and the generation of the activation key may be completed from any location by accessing the web-based management portal **90**.

Once the provisioning process is completed, the device **14** may be installed at the customer location. After the device **14** is connected to the local area network **18**, the device **14** automatically attempts to DHCP for a wide area network IP address. As most Internet service providers assign IP addresses using DHCP, in most cases the device **14** will automatically obtain its wide area network IP address. For Internet service providers who do not use DHCP, the wide area network IP address can be obtained using PPPOE. Alternatively, a wide area network IP address may be statically assigned to the device **14**.

According to various embodiments, the device **14** is configured with the DNS names of a number of the hosted servers that comprise the activation server **84**. Once the device **14** obtains a wide area network IP address, the device **14** automatically attempts to communicate with one of the hosted servers that comprise the activation server **84**. When the communication is successful, the activation key is entered and the device **14** transmits the activation key to the activation server **84**. The activation key may be entered by an installer of the device **14**. The process associated with block **200** may be repeated for any number of devices **14**.

From block **200**, the process advances to block **210**, where the activation server **84** automatically transmits the configuration provisioned at block **200** to the device **14**. After the device **14** receives its configuration from the activation server **84**, an installer of the device **14** may be prompted to reboot the device **14**. Once the device **14** reboots, the device **14** automatically connects to its assigned manager server **88** and the installation of the device **14** is complete. The process associated with block **210** may be repeated for any number of devices **14**

From block **210**, the process advances to block **220**, where the management center **12** automatically maintains the configuration of the device **14**. According to various embodiments, a flag is set in the database servers of the database cluster **82** when a change to the configuration of the device **14** is entered via the web-based management portal **90**. According to various embodiments, the auto-provisioning manager module **100** periodically polls the database cluster **82** looking for changes to the configurations of the devices **14** managed by the manager server **88**. When the auto-provisioning manager module **100** detects a device configuration that needs to be changed, the appropriate module (e.g., firewall, intrusion prevention, anti-virus, etc.) will generate the new configuration for the particular service and make the necessary configuration changes to the device **14** that needs to be updated. The process associated with block **220** may be repeated for any number of devices **14**.

From block **220**, the process advances to block **230**, where the logger manager **86** receives log information from the device **14**. As explained previously, the log information received from each device **14** may be compressed and encrypted, and may represent information associated with, for example, a firewall system, an intrusion prevention system, an anti-virus system, a content filtering system, an anti-spam system, etc. residing at the particular device **14**. Once the logger manager **86** receives the log information, the logger manager **86** correlates the log information and makes it available to other elements of the management center **12**. The correlated information may be utilized to determine both the real time and historical performance of the network.

FIG. **11** illustrates various embodiments of a method of managing a network. According to various embodiments, the

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method includes automatically setting a default configuration for the device, automatically generating an activation key associated with a device, and automatically transmitting a provisioned configuration to the device after the device is connected to the network. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **240**, where a default configuration is set for the device **14**. According to various embodiments, the web-based management portal **90** may provide the default configuration that serves as the basis for the device configuration. The process associated with block **240** may be repeated for any number of devices **14**.

From block **240**, the process advances to block **250**, where an activation key associated with a device is automatically generated. According to various embodiments, the activation key may be generated by the web-based management portal **90** during the provisioning of the device **14**. The provisioning of the device **14** may include changing some of the settings of the default configuration. The process associated with block **250** may be repeated for any number of devices **14**.

From block **250**, the process advances to block **260**, where the provisioned configuration is automatically transmitted to the device **14** after the device **14** is connected to the network. According to various embodiments, the activation server **84** may automatically transmit a provisioned configuration to the device **14** after the device **14** is connected to the network. The process associated with block **260** may be repeated for any number of devices **14**.

FIG. **12** illustrates various embodiments of a method of managing a network. According to various embodiments, the method includes periodically polling a device connected to the network, automatically determining whether a configuration of the device is current, automatically setting a new configuration for the device when the configuration is not current, and automatically transmitting the new configuration to the device. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **270**, where a device **14** connected to the network is periodically polled. According to various embodiments, the periodic polling may be conducted by the manager server **88**. The process associated with block **270** maybe repeated for any number of devices **14**.

From block **270**, the process advances to block **280**, where it is automatically determined whether the configuration of the device **14** is current. According to various embodiments, the automatic determination may be made by the manager server **88**. The process associated with block **280** maybe repeated for any number of devices **14**.

From block **280**, the process advances to block **290**, where a new configuration is automatically set for the device **14** when the configuration of the device **14** is not current. According to various embodiments, the new configuration may be automatically set by the manager server **88**. The process associated with block **290** maybe repeated for any number of devices **14**.

From block **290**, the process advances to block **300**, where the new configuration is automatically transmitted to the device **14**. According to various embodiments, the new configuration may be automatically transmitted to the device **14** by the manager server **88**. The process associated with block **300** maybe repeated for any number of devices **14**.

FIG. **13** illustrates various embodiments of a method of managing a network. According to various embodiments, the method includes receiving network traffic information from a device connected to the network, automatically correlating the information, and automatically determining network performance based on the information. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **310**, where network traffic information is received from a device **14** connected to the network. The network traffic information may represent information that travels from one device **14** to another device **14**. According to various embodiments, the network traffic information is captured at the device **14** and may include, for example, source/destination IP address, protocol, sequence number and source/destination port. According to various embodiments, the network traffic information transmitted from the device **14** is received by the manager server **88**. The process associated with block **310** maybe repeated for any number of devices **14**.

From block **310**, the process advances to block **320**, where the information is correlated. According to various embodiments the information may be correlated with network traffic information transmitted from any number of devices **14**. According to various embodiments, the correlation of the information is conducted by the manager server **88**.

From block **320**, the process advances to block **330**, where the network performance is determined based on the information. According to various embodiments, the network performance determination is made by the manager server **88**. For example, assume that ten VOIP packets leave a first device **14** destined for a second device **14**. As explained previously, the first device **14** may record the exact time each VOIP packet leaves, and the source/destination IP Address, protocol, sequence number and source/destination port for each VOIP packet. The first device **14** may then send this information to the manager server **88**. Further assume that these ten VOIP packets travel over the Internet **16**, the third and eighth VOIP packets are lost, dropped by a router that is over-utilized. The second device **14** will only see eight VOIP packets arrive, not knowing that the third and eighth packets were lost. The second device **14** may then record the exact time each packet is received and the source/destination IP Address, protocol, sequence number, and source/destination port for each received packet. The second device **14** may then send this information to the manager server **88**. The manager server **88** may then examine the information transmitted from the first and second devices **12**, **14** and determine, based on the IP Address, protocol, sequence number, and source/destination port that the packets recorded by both the first and second devices **14** are part of the same packet stream. Armed with this information, the manager server **88** may then determine the exact latency and jitter of each packet, and the packet loss (20% in this example) on a real application data stream. The process associated with block **330** may be repeated for network traffic information received from any number of devices **14**.

FIG. **14** illustrates various embodiments of a method of managing a network. According to various embodiments, the method includes receiving credentials associated with a remote access user, automatically validating the credentials,

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automatically determining which devices connected to the network the remote access user is authorized to connect to, and automatically transmitting to a remote access client a list of devices the remote access user is authorized to connect to. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **340**, where credentials associated with a remote access user is received from a remote access client. The remote access user is a user who is located at a site that does not have a device **14** associated therewith. According to various embodiments, the credentials are received by the web-based management portal **90**. The remote access client may be implemented as a software client installed on a personal computer such as, for example, a desktop computer or a laptop computer. According to various embodiments, when the software client is launched, it requires the remote access user to input their credentials (e.g., company ID, username, password). After the remote access user enters the credentials, the software client may make a secure socket layer connection to the web-based management portal **90**. The process associated with block **340** may be repeated for any number of remote access users.

From block **340**, the process advances to block **350**, where the credentials are automatically validated. According to various embodiments, the credentials may be automatically validated by the web-based management portal **90**. If the credentials are not valid, the web-based management portal **90** may return an error message to the remote access client which may then prompt the remote access user to reenter their credentials. The process associated with block **350** may be repeated for any number of remote access users.

From block **350**, the process advance to block **360**, where it is determined which devices **14** connected to the network the remote access user is authorized to connect to. According to various embodiments, the determination is made by the web-based management portal **90**. The process associated with block **360** may be repeated for any number of remote access users.

From block **360**, the process advances to block **370**, where a list of the devices **14** is automatically transmitted to a remote access client associated with the remote access user. According to various embodiments, the list is automatically transmitted from the web-based management portal **90**. Once the list is presented to the remote access user and a particular device **14** is selected, an encrypted tunnel may be established between the personal computer and the selected device **14**. The process associated with block **370** may be repeated for any number of remote access users.

Each of the methods described above may be performed by the system **10** of FIG. **1** or by any suitable type of hardware (e.g., device, computer, computer system, equipment, component); software (e.g., program, application, instruction set, code); storage medium (e.g., disk, device, propagated signal); or combination thereof.

While several embodiments of the invention have been described, it should be apparent, however, that various modifications, alterations and adaptations to those embodiments may occur to persons skilled in the art with the attainment of some or all of the advantages of the disclosed invention. For example, the system **10** may further include a plurality of graphical user interfaces to facilitate the management of the network. The graphical user interfaces may be presented through an interactive computer screen to solicit information from and present information to a user in conjunction with the described systems and methods. The graphical user interfaces may be presented through a client system including a personal computer running a browser application and having various input/output devices (e.g., keyboard, mouse, touch screen, etc.) for receiving user input. It is therefore intended to cover all such modifications, alterations and adaptations without departing from the scope and spirit of the disclosed invention as defined by the appended claims.

What is claimed is:

1. A method for providing a managed network, comprising:

in a management center, setting at least one configuration of a first network management device located at a first location, the at least one configuration to cause the first network management device to provide a corresponding at least one managed network service for a first network after the at least one configuration is transmitted to the first network management device, wherein setting the at least one configuration comprises setting at least one of:

a virtual private network (VPN) configuration to cause the first network management device to provide a VPN service, the VPN service to enable the first network management device to communicate with at least one of: a second network management device located at a second location, a remote access client, and the management center; and

an internet protocol (IP) routing and network interface configuration to cause the first network management device to provide an IP routing and network interface service;

storing the at least one configuration in the management center; and

automatically transmitting the stored at least one configuration to the first network management device via a second network in response to receiving an activation key at the management center, the activation key transmitted from the first network management device to the management center via the second network after the first network management device is connected to the second network at the first location;

wherein the management center is external to the first network and to the first and second locations, and wherein the management center comprises a shared infrastructure for simultaneously providing managed network services to users of multiple networks at multiple locations.

2. The method of claim **1**, wherein setting at least one configuration of a first network management device comprises generating the activation key.

3. The method of claim **1**, wherein setting at least one configuration of a first network management device comprises setting at least one of:

an anti-virus configuration to cause the first network management device to provide an anti-virus service;

a content filtering configuration to cause the first network management device to provide a content filtering service;

an anti-spam configuration to cause the first network management device to provide an anti-spam service;

a quality of service (QOS) configuration to cause the first network management device to provide a QOS service; and

a device monitoring configuration to cause the first network management device to provide a device monitoring service, the device monitoring service to monitor one or more network elements, the one or more network

elements connected to the first network and external to the network management device.

4. The method of claim **3**, comprising receiving log information from the first network management device, the log information associated with at least one managed network service.

5. The method of claim **4**, comprising:

correlating the received log information; and

determining one or more of a real time performance and a historical performance of the first network based on the correlated log information.

6. The method of claim **3**, further comprising:

receiving performance information from the first network management device;

correlating the received performance information; and

determining one or more of a real time performance and a historical performance of the first network based on the correlated information.

7. The method of claim **6**, wherein receiving performance information from the first network management device comprises receiving at least one of the following:

a CPU utilization value;

a memory utilization; and

a network interface bandwidth utilization value.

8. The method of claim **6**, wherein receiving performance information from the first network management device comprises receiving performance information gathered from the one or more network elements.

9. The method of claim **8**, wherein receiving performance information gathered from the one or more network elements comprises receiving at least one of the following:

a reachability value;

a latency value; and

a CPU utilization value.

10. The method of claim **1**, comprising updating the at least one configuration within the first network management device.

11. The method of claim **10**, wherein updating the at least one configuration within the first network management device comprises:

periodically polling the first network management device;

determining whether the at least one configuration of the first network management device is current;

setting a new configuration for each of the at least one configuration that is not current; and

transmitting the new configurations to the first network management device.

12. A computer-readable disk or device having instructions stored thereon, which, when executed by a processor, cause the processor to:

in a management center, set at least one configuration of a first network management device located at a first location, the at least one configuration to cause the first network management device to provide a corresponding at least one managed network service for a first network after the at least one configuration is transmitted to the first network management device, wherein the at least one configuration comprises at least one of:

a virtual private network (VPN) configuration to cause the first network management device to provide a VPN service, the VPN service to enable the first network management device to communicate with at least one of: a second network management device located at a second location, a remote access client, and the management center; and

an internet protocol (IP) routing and network interface configuration to cause the first network management device to provide an IP routing and network interface service;

store the at least one configuration in the management center; and

automatically transmit the stored at least one configuration to the first network management device via a second network in response to receiving an activation key at the management center, the activation key transmitted from the first network management device to the management center via the second network after the first network management device is connected to the second network at the first location;

wherein the management center is external to the second network and to the first and second locations, and wherein the management center comprises a shared infrastructure for simultaneously providing managed network services to users of multiple networks at multiple locations.

13. A system for managing a network, the system comprising:

a first network management device located at a first location and comprising a processor and a memory; and

a management center to communicate with the first network management device via the Internet, the management center to:

set at least one configuration for the first network management device, the at least one configuration to cause the first network management device to provide a corresponding at least one managed network service for a first network after the at least one configuration is transmitted to the first network management device, wherein the at least one configuration comprises at least one of:

a virtual private network (VPN) configuration to cause the first network management device to provide a VPN service, the VPN service to enable the first network management device to communicate with at least one of: a second network management device located at a second customer location, a remote access client, and the management center; and

an internet protocol (IP) routing and network interface configuration to provide an IP routing and network interface configuration service;

store the at least one configuration; and

automatically transmit the stored at least one configuration to the network management device via the Internet in response to receiving an activation key at the management center, the activation key transmitted from the first network management device to the management center via the Internet after the network management device is connected to the Internet;

wherein the management center is external to the first network and to the first and second locations, and wherein the management center comprises a shared infrastructure for simultaneously providing managed network services to users of multiple networks at multiple locations.

14. The system of claim **13**, wherein the at least one configuration includes at least one of:

an anti-virus configuration to cause the first network management device to provide an anti-virus service;

a content filtering configuration to cause the first network management device to provide a content filtering service;

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an anti-spam configuration to cause the first network management device to provide an anti-spam service;

a quality of service (QOS) configuration to cause the first network management device to provide a QOS service; and

a device monitoring configuration to cause the first network management device to provide a device monitoring service, the device monitoring service to monitor one or more network elements, the one or more network elements connected to the first network and external to the network management device.

15. The system of claim **14**, wherein the management center is to:

receive performance information from the network management device;

correlate the received performance information; and

determine one or more of a real time performance and a historical performance of the first network based on the correlated information.

16. The system of claim **15**, wherein performance information comprises at least one of the following:

a CPU utilization value;

a memory utilization value; and

a network interface bandwidth utilization value.

17. The system of claim **15**, wherein the performance information comprises performance information gathered from the one or more network elements.

18. The system of claim **17**, wherein the performance information comprises at least one of the following:

a reachability value;

a latency value; and

a CPU utilization value.

19. The system of claim **17**, wherein the network management device is to gather performance information from the one or more network elements utilizing Internet control message protocol.

20. The system of claim **17**, wherein the network management device is to gather performance information from the one or more network elements utilizing simple network management protocol.

21. The system of claim **13**, wherein the management center is to update the at least one configuration within the network management device.

22. The system of claim **21**, wherein the management center is to:

periodically poll the network management device;

determine whether the at least one configuration of the network management device is current;

set a new configuration for each of the at least one configuration that is not current; and

transmit the new configurations to the network management device.

23. The system of claim **13**, wherein the management center is to receive log information from the network management device, the log information associated with the at least one managed network service.

24. The system of claim **23**, wherein the management center is to:

correlate the received log information; and

determine one or more of a real time performance and a historical performance of the first network based on the correlated log information.

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EXHIBIT 2

US008078777B2

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

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(54) **SYSTEMS AND METHODS FOR MANAGING A NETWORK**

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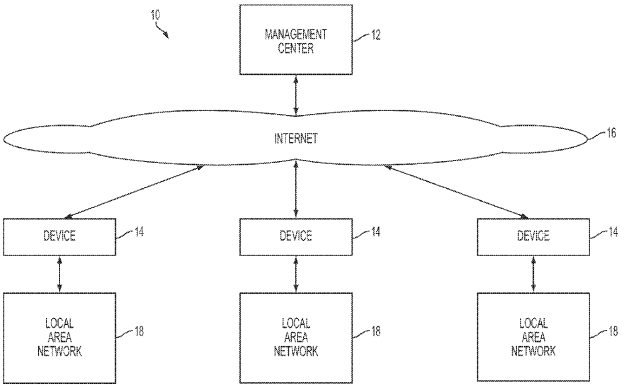
(Continued)

Primary Examiner — Alford W Kindred
Assistant Examiner — Farley Abad

(57) **ABSTRACT**

A method of managing a network. The method includes receiving an activation key transmitted from a device connected to the network, automatically transmitting a configuration to the device, automatically maintaining the configuration of the device, and receiving log information from the device.

20 Claims, 14 Drawing Sheets



EX. 2 - 38

EX. 3 - 92

EX. 3 - 103

EX. 3 - 103

EX. 3 - 103

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EX. 2 - 39

EX. 3 - 93

EX. 3 - 104

EX. 3 - 104

EX. 3 - 104

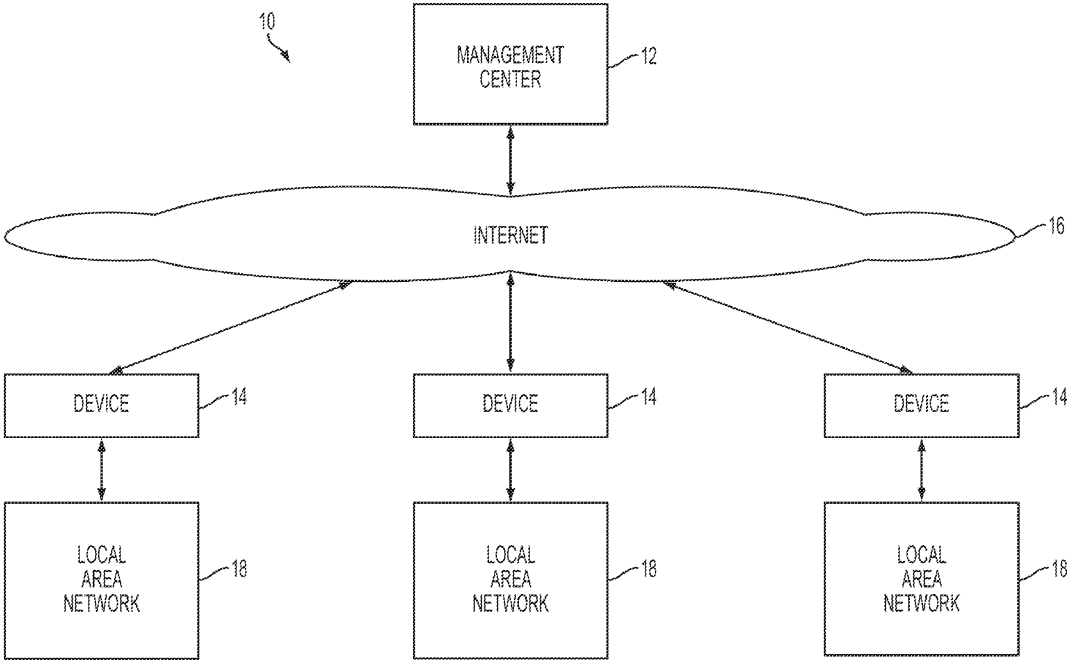

FIG. 1

EX. 2 - 40

EX. 3 - 94

EX. 3 - 105

EX. 3 - 105

EX. 3 - 105

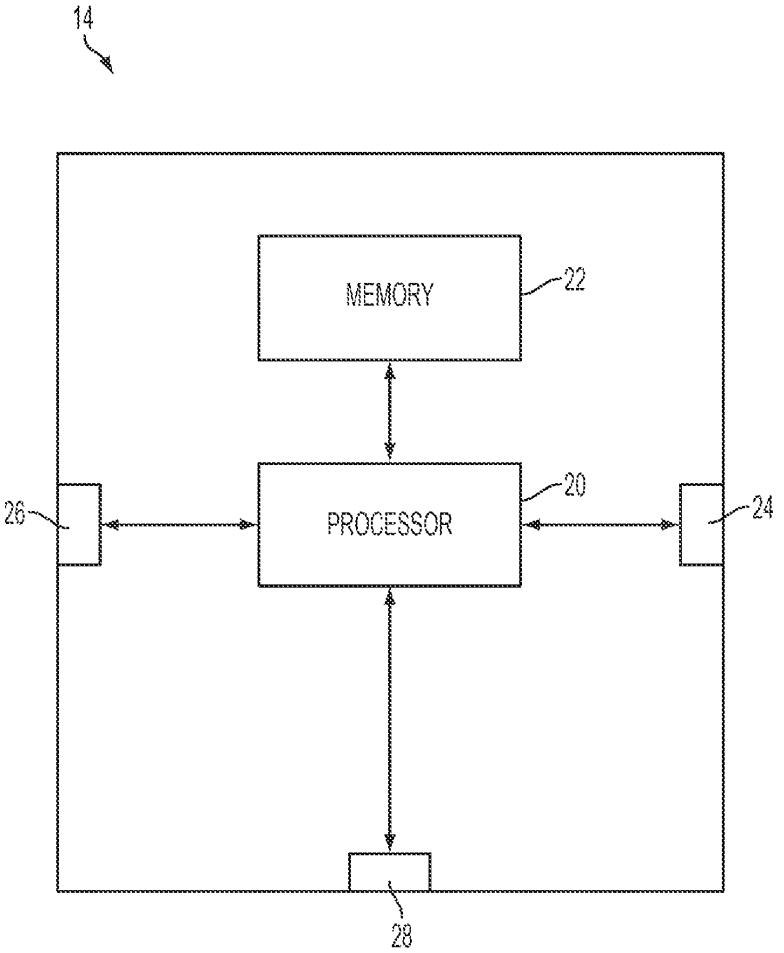

FIG. 2

EX. 2 - 41

EX. 3 - 95

EX. 3 - 106

EX. 3 - 106

EX. 3 - 106

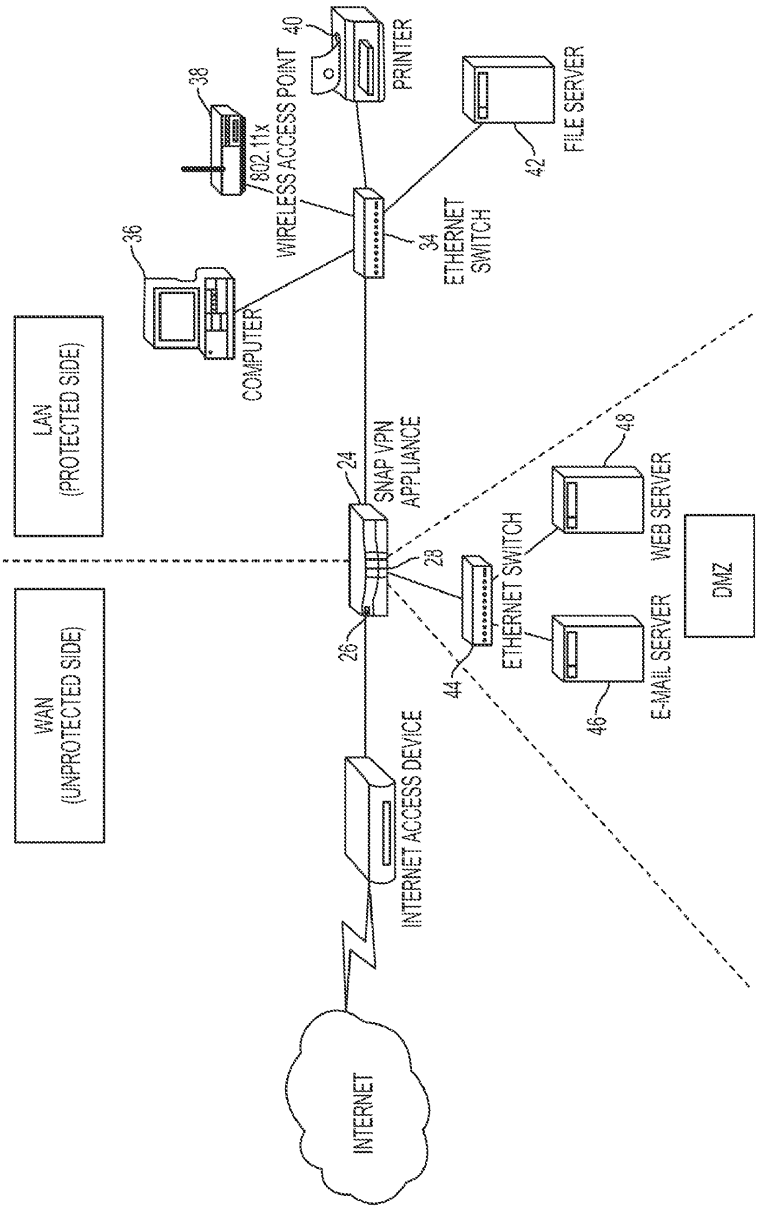

FIG. 3

EX. 2 - 42

EX. 3 - 96

EX. 3 - 107

EX. 3 - 107

EX. 3 - 107

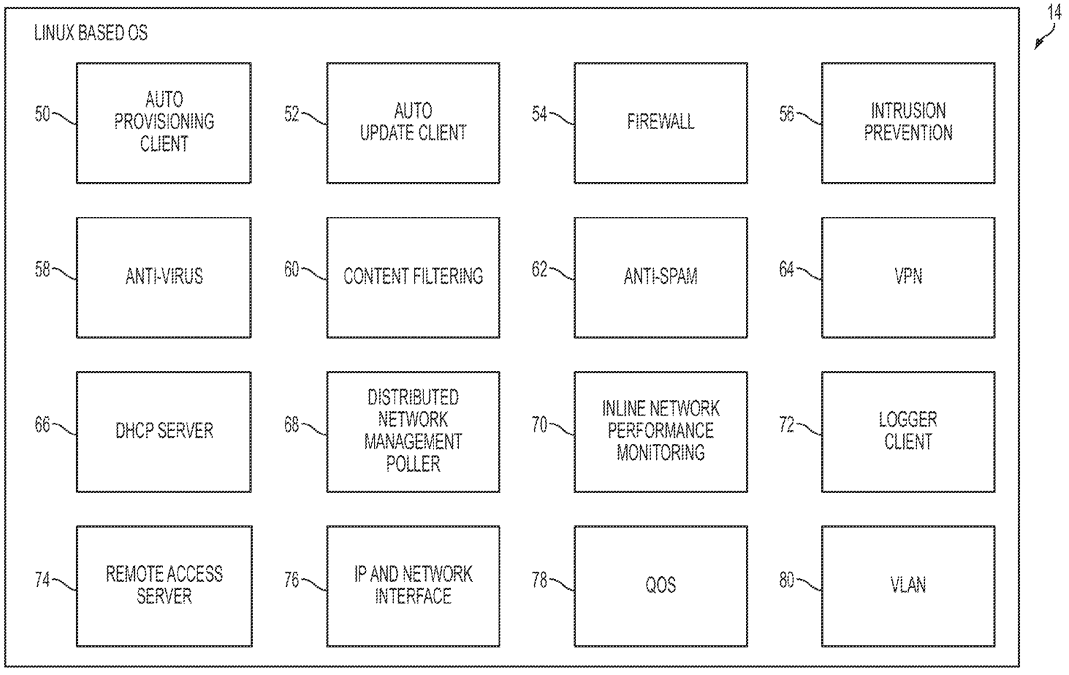

FIG. 4

EX. 2 - 43

EX. 3 - 97

EX. 3 - 108

EX. 3 - 108

EX. 3 - 108

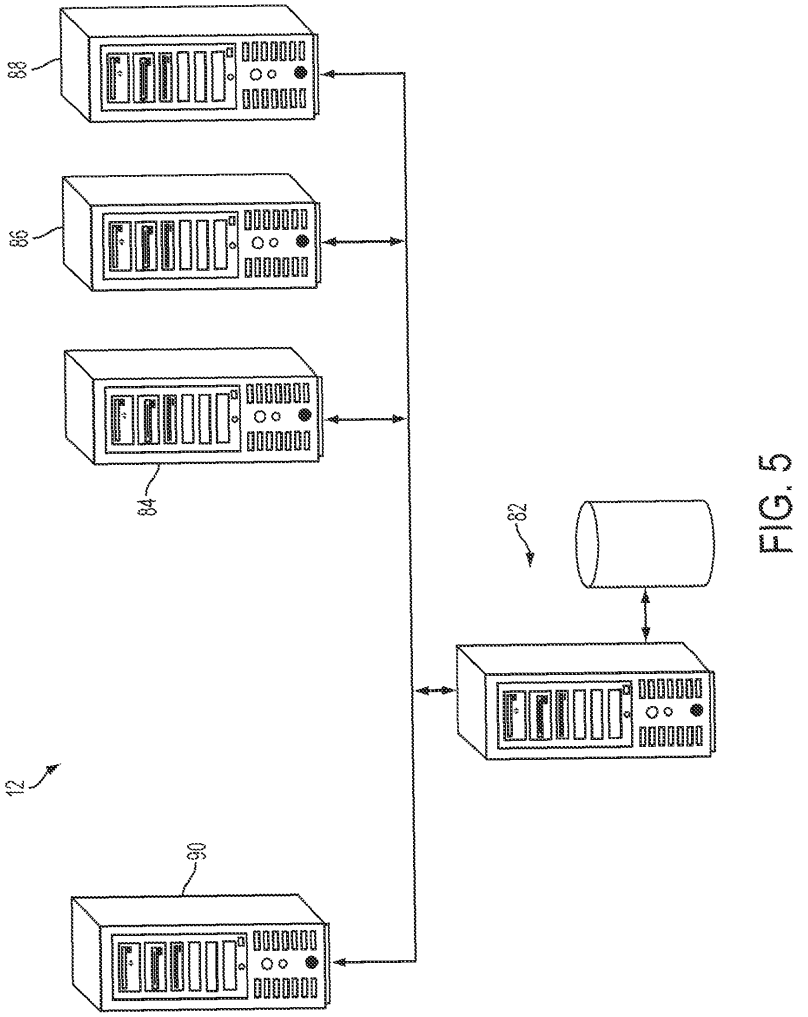

FIG. 5

EX. 2 - 44

EX. 3 - 98

EX. 3 - 109

EX. 3 - 109

EX. 3 - 109

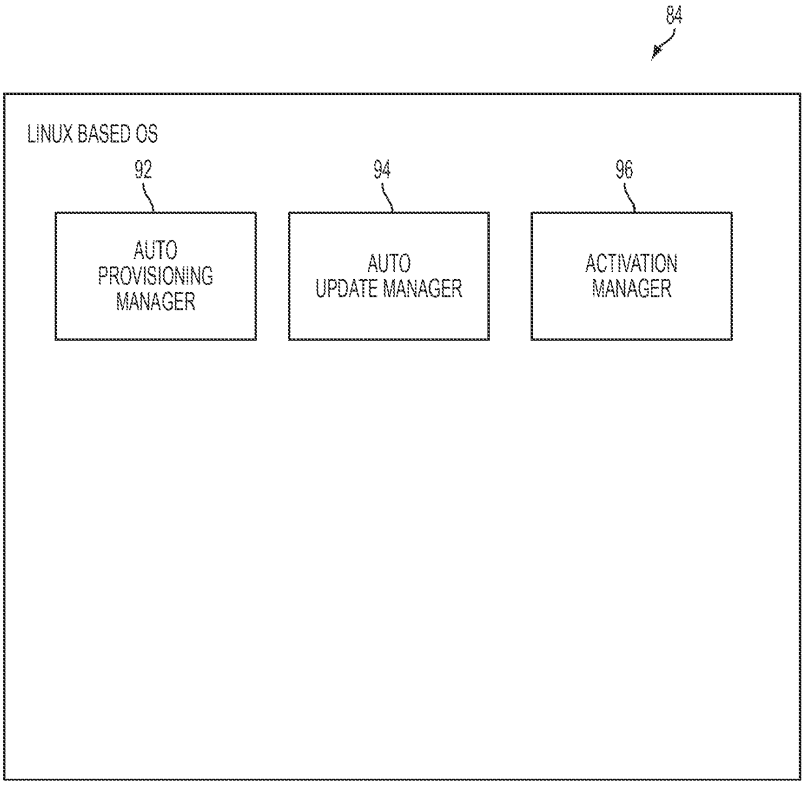

FIG. 6

EX. 2 - 45

EX. 3 - 99

EX. 3 - 110

EX. 3 - 110

EX. 3 - 110

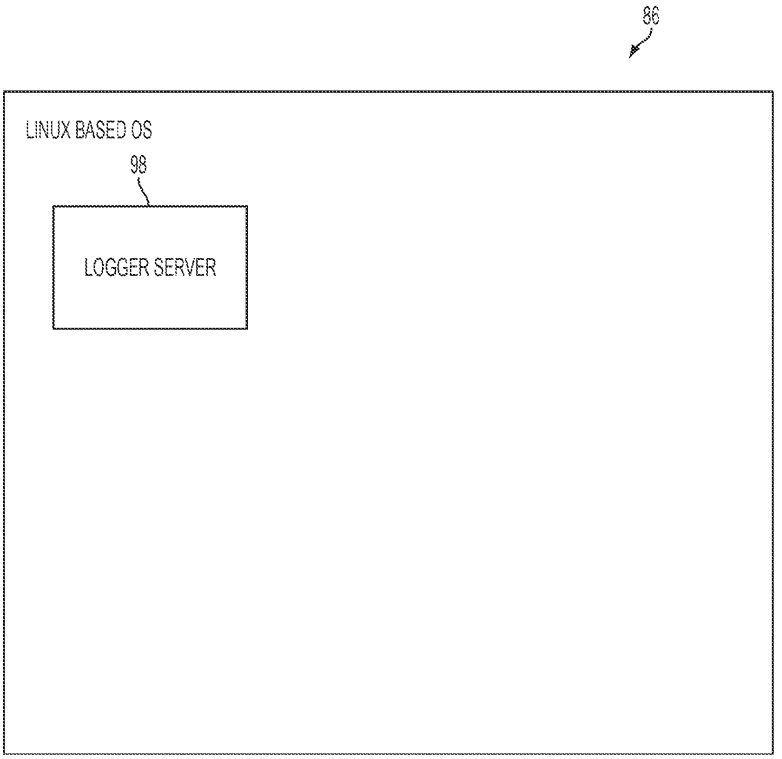

FIG. 7

EX. 2 - 46

EX. 3 - 100

EX. 3 - 111

EX. 3 - 111

EX. 3 - 111

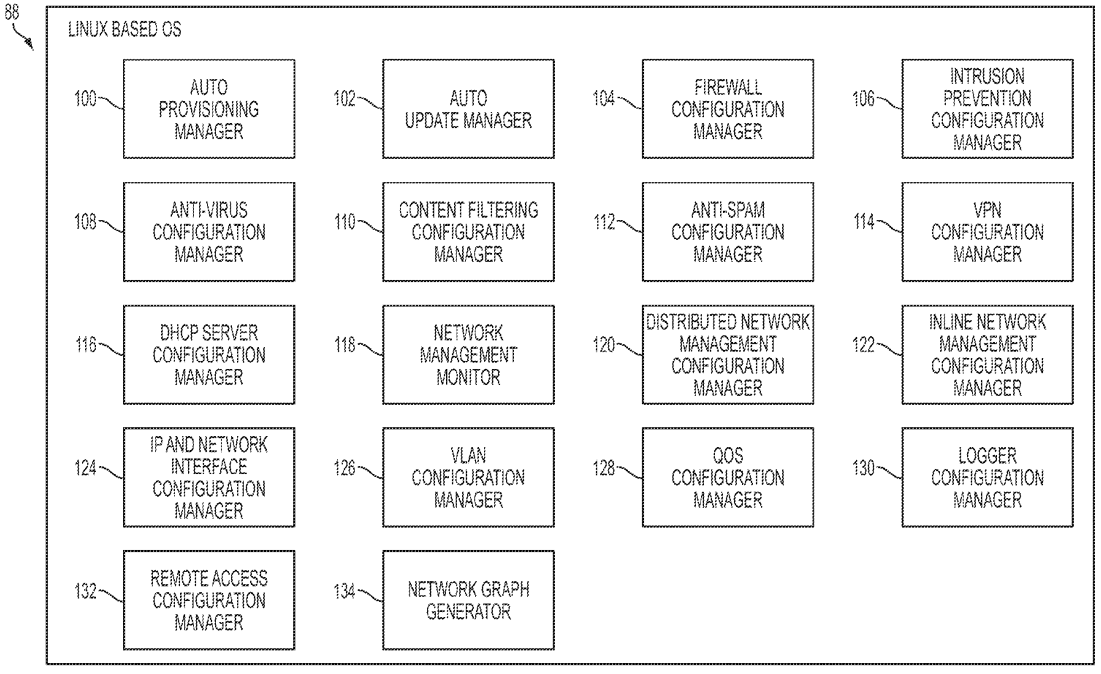

FIG. 8

EX. 2 - 47

EX. 3 - 101

EX. 3 - 112

EX. 3 - 112

EX. 3 - 112

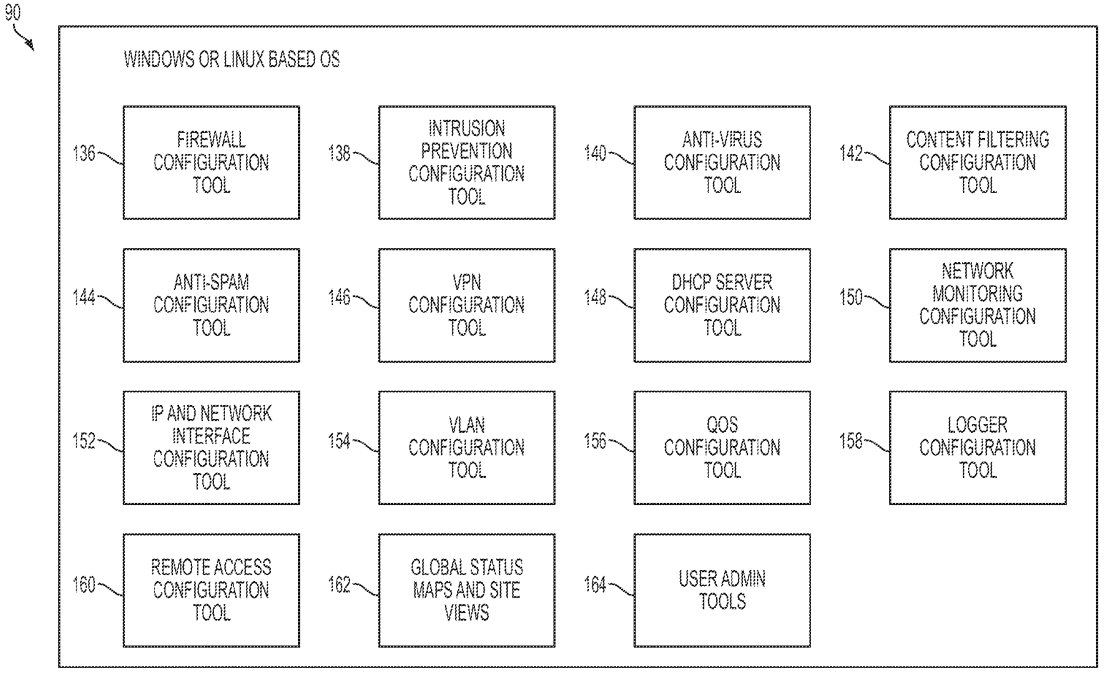

FIG. 9

EX. 2 - 48

EX. 3 - 102

EX. 3 - 113

EX. 3 - 113

EX. 3 - 113

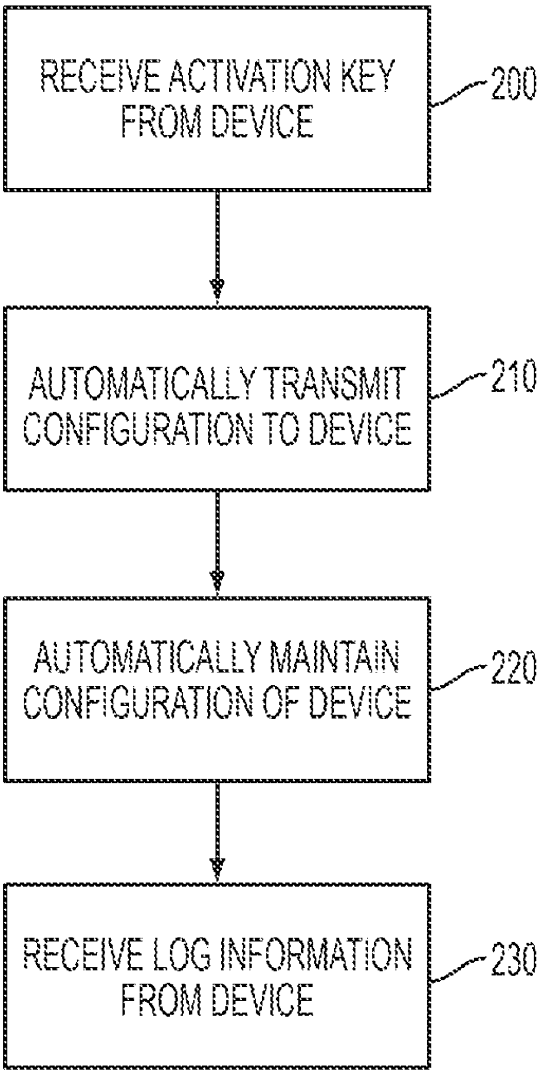

FIG. 10

EX. 2 - 49

EX. 3 - 103

EX. 3 - 114

EX. 3 - 114

EX. 3 - 114

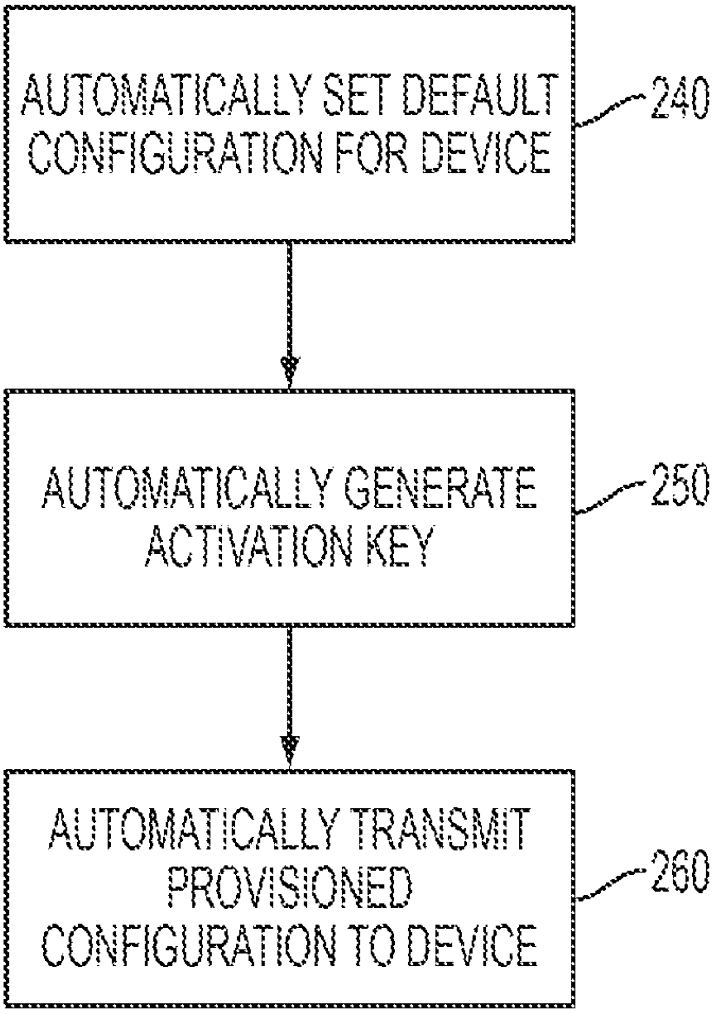

FIG. 11

EX. 2 - 50

EX. 3 - 104

EX. 3 - 115

EX. 3 - 115

EX. 3 - 115

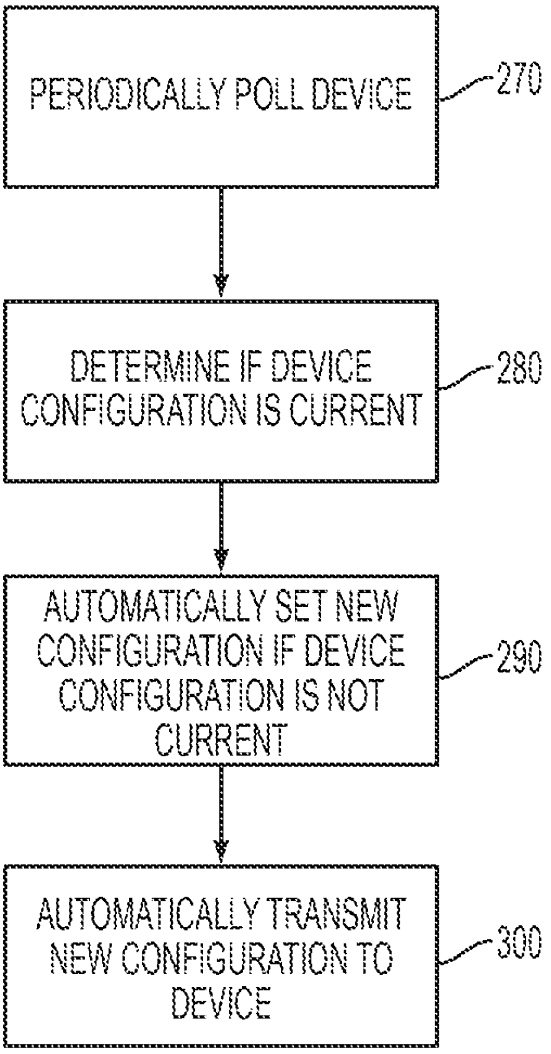

FIG. 12

EX. 2 - 51

EX. 3 - 105

EX. 3 - 116

EX. 3 - 116

EX. 3 - 116

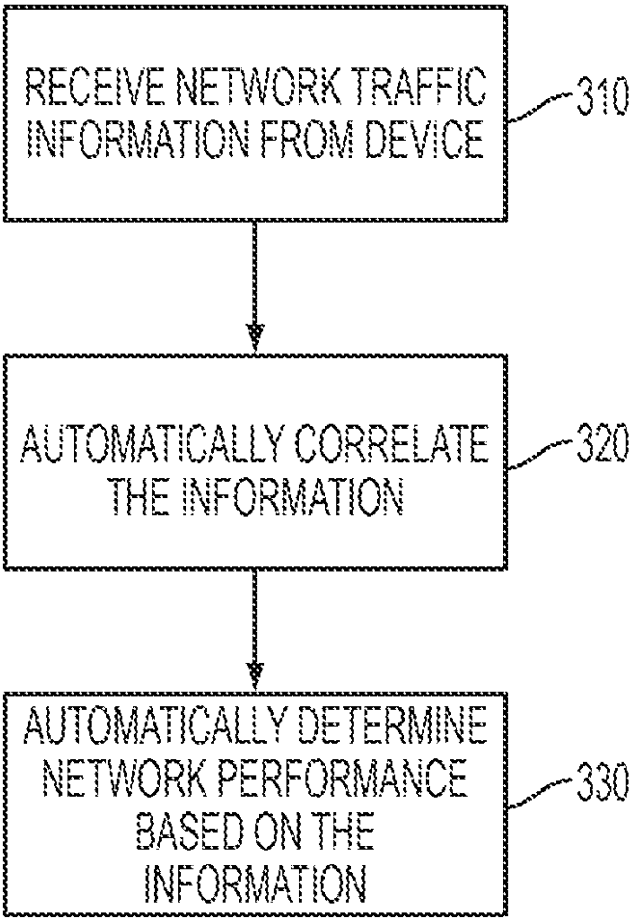

FIG. 13

EX. 2 - 52

EX. 3 - 106

EX. 3 - 117

EX. 3 - 117

EX. 3 - 117

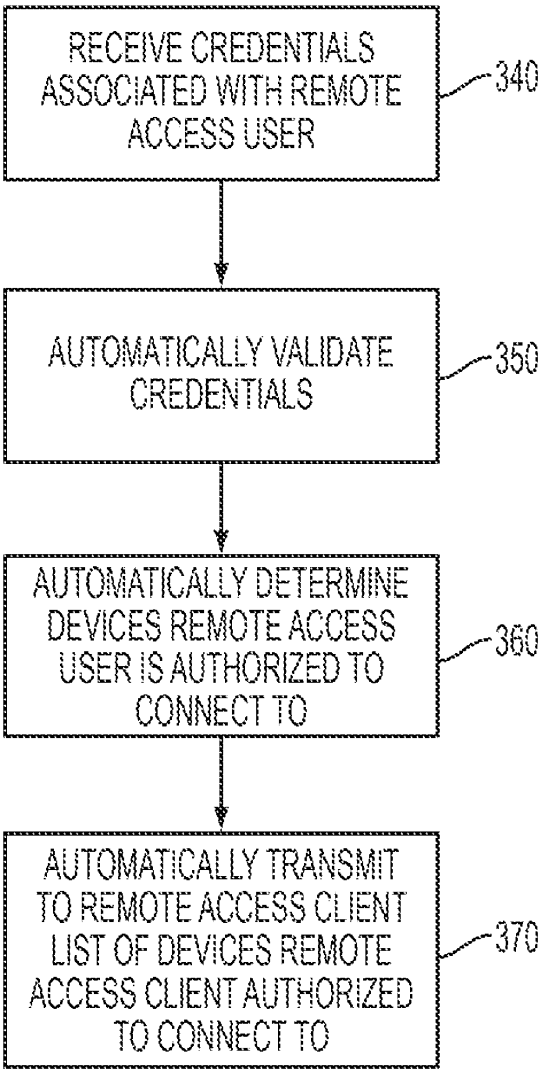

FIG. 14

EX. 2 - 53

EX. 3 - 107

EX. 3 - 118

EX. 3 - 118

EX. 3 - 118

SYSTEMS AND METHODS FOR MANAGING A NETWORK

CROSS-REFERENCE TO RELATED APPLICATION

This application is a divisional application of U.S. patent application Ser. No. 11/106,837 filed Apr. 15, 2005, now U.S. Pat. No. 7,783,800 which claims the benefit under 35 U.S.C. §119(e) to U.S. Provisional Patent Application Ser. No. 60/562,596 filed on Apr. 15, 2004, the disclosure of which is incorporated herein by reference.

BACKGROUND

This application discloses an invention that is related, generally and in various embodiments, to systems and methods for managing a network.

Some network environments provide companies with critical information technology (IT) services for installing, connecting, managing and securing their network environment. However, traditional network implementations have required that network infrastructure capable of supporting computer applications be assembled using disparate hardware, software and systems that must be manually configured and managed. As a result, these traditional network implementations have been utilized primarily by large enterprises with large information technology (IT) budgets.

Small and medium businesses (SMBs) represent the majority of businesses, and their network management and security needs are no less critical that that of larger enterprises. However, due to budgetary and technological constraints, traditional secure network management systems, services, and elements are usually not a viable option for SMBs. Most SMBs lack the necessary IT staff and budget resources to effectively manage secure network environments that may be leveraged to deploy distributed applications that run on these networks and make those businesses more competitive.

SUMMARY

In one general respect, this application discloses a method of managing a network. According to various embodiments, the method includes receiving an activation key automatically transmitted from a device connected to the network, automatically transmitting a configuration to the device, automatically maintaining the configuration of the device, and receiving log information from the device.

According to various embodiments, the method includes automatically setting a default configuration for the device, automatically generating an activation key associated with a device, and automatically transmitting a provisioned configuration to the device after the device is connected to the network.

According to various embodiments, the method includes periodically polling a device connected to the network, automatically determining whether a configuration of the device is current, automatically setting a new configuration for the device when the configuration is not current, and automatically transmitting the new configuration to the device.

According to various embodiments, the method includes receiving network traffic information from a device connected to the network, automatically correlating the information, and automatically determining network performance based on the information.

According to various embodiments, the method includes receiving credentials associated with a remote access user, automatically validating the credentials, automatically determining which devices connected to the network the remote access user is authorized to connect to, and automatically transmitting to a remote access client a list of devices the remote access user is authorized to connect to.

In another general respect, this application discloses a system for managing a network. According to various embodiments, the system includes a device connected to the network and a management center in communication with the device via the Internet. The device includes a processor and a memory. The management center includes a first module for provisioning a configuration of the device, a second module for automatically transmitting the configuration to the device, and a third module for automatically maintaining the configuration of the device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates various embodiments of a system for managing a network;

FIG. **2** illustrates various embodiments of a device;

FIG. **3** illustrates various embodiments of the device;

FIG. **4** illustrates various embodiments of the device;

FIG. **5** illustrates various embodiments of a management center;

FIG. **6** illustrates various embodiments of a server;

FIG. **7** illustrates various embodiments of a server;

FIG. **8** illustrates various embodiments of a server;

FIG. **9** illustrates various embodiments of a web-based management portal;

FIG. **10** illustrates various embodiments of a method of managing a network;

FIG. **11** illustrates various embodiments of a method of managing a network;

FIG. **12** illustrates various embodiments of a method of managing a network;

FIG. **13** illustrates various embodiments of a method of managing a network; and

FIG. **14** illustrates various embodiments of a method of managing a network.

DETAILED DESCRIPTION

The systems and methods described herein may be utilized to provide for the automated delivery of managed services. It is to be understood that the figures and descriptions of the disclosed invention have been simplified to illustrate elements that are relevant for a clear understanding of the invention, while eliminating, for purposes of clarity, other elements. Those of ordinary skill in the art will recognize, however, that these and other elements may be desirable. However, because such elements are well known in the art, and because they do not facilitate a better understanding of the invention, a discussion of such elements is not provided herein.

FIG. **1** illustrates various embodiments of a system **10** for managing a network. The system **10** may be utilized to provide a company with critical information technology (IT) services for installing, connecting, managing and securing their network environment without having to rely on several discrete systems.

According to various embodiments, the system **10** includes a management center **12** and at least one device **14** in communication with the management center **12** via the Internet **16**. Although only three devices **14** are shown in FIG. **1**, the system **10** may include any number of devices **14** in communication with the management center **12** via the Internet **16**.

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Each device **14** may be located at a different customer location, and each device **14** may be connected to a different local area network **18**.

FIGS. **2-4** illustrate various embodiments of the device **14** of FIG. **1**. As shown in FIG. **2**, the device **14** includes a processor **20** and a memory **22**. According to various embodiments, the device **14** may also include a first fast ethernet port **24**, a second fast ethernet port **26**, and a third fast ethernet port **28**. As shown in FIG. **3**, the device **14** may be connected to a local area network **18** via the first fast ethernet port **24**, to a service provider wide area network **30** via the second fast ethernet port **26**, and to a demilitarized zone **32** via the third fast ethernet port **28**. The device **14** may serve to act as a security device to protect the local area network **18** and the demilitarized zone **32** from outside threats originating from the wide area network **30**. According to various embodiments, in lieu of being connected to the demilitarized zone **32** via the third fast ethernet port **28**, the device **14** may be connected to a redundant wide area network (not shown) via the third fast ethernet port **28**.

The local area network **18** may include network elements such as, for example, an ethernet switch **34**, a computer **36**, a wireless access point **38**, a printer **40**, a file server **42** and any other network elements known by those skilled in the art to comprise a portion of a local area network. The demilitarized zone **32** may include network elements such as, for example, an ethernet switch **44**, an e-mail server **46**, a web server **48** and any other network elements known by those skilled in the art to comprise a portion of a demilitarized zone.

As shown in FIG. **4**, the device **14** may include a Linux based operating system and the following modules: an auto-provisioning module **50**, an auto-update module **52**, a firewall module **54**, an intrusion prevention module **56**, an anti-virus module **58**, a content filtering module **60**, an anti-spam module **62**, a VPN module **64**, a DHCP server module **66**, a distributed network management poller module **68**, an inline network performance monitoring module **70**, a logger module **72**, a remote access server module **74**, an IP and network interface module **76**, a QOS module **78**, and a VLAN module **80**.

The auto-provisioning module **50** of the device **14** is operable to provide the device **14** with auto-provisioning functionality. For example, according to various embodiments, the auto-provisioning module **50** allows for the device **14** to be auto-configured based on an activation code entered by an installer during installation of the device **14** at a customer location.

The auto-update module **52** of the device **14** is operable to provide the device **14** with auto-update functionality. For example, according to various embodiments, the auto-update module **52** allows for the device **14** to be automatically updated whenever updates to the device **14** are available. The updates may include, for example, operating system updates, intrusion prevention rule updates, anti-virus signature updates, and content filtering database updates.

The firewall module **54** of the device **14** is operable to provide the device **14** with firewall functionality. For example, according to various embodiments, the firewall module **54** allows for the device **14** to perform deep packet inspection, stateful inspection, network address translation, port address translation and port forwarding.

The intrusion prevention module **56** of the device **14** is operable to provide the device **14** with intrusion prevention functionality. For example, according to various embodiments, the intrusion prevention module **56** allows for the device **14** to perform real-time traffic analysis and logging, protocol analysis, and content searching and matching. The intrusion prevention module **56** may also allow for the device **14** to detect a variety of attacks and probes such as, for example, buffer overflows, operating system fingerprinting attempts, common gateway interface attacks and port scans.

The anti-virus module **58** of the device **14** is operable to provide the device **14** with anti-virus functionality. For example, according to various embodiments, the anti-virus module **58** of the device **14** allows for the device **14** to provide an Internet gateway protection service that protects against viruses and malicious code that may be downloaded from the Internet **16** to the local area network **18**. According to various embodiments, the anti-virus module **58** of the device **14** allows for the integration of the device **14** and an anti-virus client installed on one or more devices that comprise a portion of the local area network **18**. The anti-virus module **58** allows for the device **14** to block access to the Internet **16** for any device of the local area network **18** that does not have the most current anti-virus client and anti-virus signature database installed thereon. The anti-virus module **58** of the device **14** may redirect such blocked devices to a webpage that will allow for the device to be updated to include the most current anti-virus client and anti-virus signature database.

The content filtering module **60** of the device **14** is operable to provide the device **14** with content filtering functionality. For example, according to various embodiments, the content filtering module **60** of the device **14** allows for the device **14** to act as a transparent proxy which inspects each request made from the local area network **18** to the Internet **16**. The content filtering module **60** may determine whether to grant or deny the request to access a particular website based on defined policies. For instances where the request is granted, the content filtering module **60** may further determine which types of files are allowed to be downloaded from the Internet **16** to the local area network **18**. According to various embodiments, each policy may be defined as a blacklist or a whitelist. If the policy is defined as a blacklist, the content filtering module **60** operates to allow access to all sites except those explicitly defined to be blocked. If the policy is defined as a whitelist, the content filtering module **60** operates to block access to all sites except those explicitly defined to be allowed.

The anti-spam module **62** is operable to provide the device **14** with anti-spam and e-mail anti-virus functionality. For example, according to various embodiments, the anti-spam module **62** of the device **14** allows for the device **14** to act as a transparent proxy which inspects each e-mail message that transits the device **14** for viruses and malicious code. If the anti-spam module **62** identifies an e-mail as SPAM, the device **14** may block the e-mail. If the anti-spam module **62** identifies an e-mail as containing a virus, the device **14** may attempt to disinfect the e-mail. If the e-mail is cleaned, the device **14** may forward the cleaned e-mail along with a message that the e-mail contained a virus. If it is not possible to disinfect the e-mail, the device **14** may block the e-mail.

The VPN module **64** of the device **14** is operable to provide the device **14** with VPN functionality. For example, according to various embodiments, the VPN module **64** provides the encryption protocol for the automatic building of a site to site VPN which is implemented as a secure tunnel that connects two different devices **14**. A secure socket layer (SSL) is used to create the encrypted tunnel between the two devices **14**. In instances where a device **14** is assigned a new WAN IP Address, the VPN module **64** allows for all of the tunnels connecting the device **14** to other devices **14** to automatically reconfigure themselves to establish new tunnels to the device **14** at the new IP Address. According to various embodiments,

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the VPN module **64** of the device **14** allows for the cooperation of the device **14** and a remote access client.

The DHCP server module **66** of the device **14** is operable to provide the device **14** with DHCP server functionality. For example, according to various embodiments, the DHCP server module **66** allows the device **14** to provide IP addresses and configuration parameters to network devices requesting this information using the DHCP protocol. IP address pools with characteristics such as default gateways, domain names, and DNS servers can be defined. Static assignments can also be defined based on MAC address.

The distributed network management poller module **68** of the device **14** is operable to provide the device **14** with distributed network management poller functionality For example, according to various embodiments, the distributed network management poller module **68** allows the device **14** to poll network elements that comprise a portion of a local area network **18** and are in communication with the device **14**. For example, the distributed network management poller module **68** may utilize Internet control message protocol pings to determine a reachability value and a latency value for one or more of the network elements. The distributed network management poller module **68** may also utilize simple network management protocol (SNMP) to poll SNMP information from network elements that are SNMP capable. Such SNMP information may include, for example, CPU utilization or server temperature.

The inline network performance monitoring module **70** of the device **14** is operable to provide the device **14** with inline network performance monitoring functionality. For example, according to various embodiments, the inline network performance monitoring module **70** allows the device **14** to inspect each packet that transits the device **14** and record certain information such as source/destination IP address, protocol, and source/destination ports.

According to various embodiments, the inline network performance monitoring module **70** also allows the device **14** to monitor all network traffic that passes between the device **14** and another device **14**. Each device **14** has its time synchronized precisely to network time protocol servers (not shown). This allows for each device **14** to reference packet information with a common time reference. According to various embodiments, the inline network performance monitoring module **70** can record the exact time every packet leaves a device **14**, and record items such as, for example, source/destination IP address, protocol, sequence number and source/destination port. As the packets travel across the Internet **16**, the packets eventually reach the destination device **14**. The inline network performance monitoring module **70** of the destination device **14** records the exact time the packet is received by the destination device **14** and items such as, for example, source/destination IP address, protocol, sequence number and source/destination port.

The logger module **72** of the device **14** is operable to provide the device **14** with logging functionality. For example, according to various embodiments, the logger module **72** allows information obtained by the device **14** (e.g., intrusion prevention detections, anti-virus detections, network device polling results, source/destination IP addresses, application performance measurements, etc.) to be recorded, processed and transmitted to the management center **12**. According to various embodiments, the data collected by the inline network management monitoring module **70** of each device **14** is forwarded to the logger module **72** of the associated device **14**. After receiving the data, the logger modules **72** wait a random amount of time (e.g., between approximately 120 and 240 seconds) before transmitting the data to the management center **12**. This random delay is to prevent all the devices **14** from sending their data back to the management center **12** at the same time. If the management center **12** cannot be reached, the device **14** may queue the data locally until the management center **12** can be reached. When the management center **12** is reached, the logger module **72** will transmit all of the queued data. The data that is transmitted uses a system queue which insures that regular user network traffic will always have priority and this data transfer will only use the unused bandwidth on the network connection.

The remote access server module **74** of the device **14** is operable to provide the device **14** with remote access capability. For example, according to various embodiments, the remote access server module **74** allows for the cooperation of the device **14** with a remote access client.

The IP and network interface module **76** is operable to provide the device **14** with the capability to configure the network interface characteristics such as IP Address type (e.g., static IP, DHCP, or PPPOE), IP address, subnet mask, speed and duplex. The IP and network interface module **76** is also operable to provide the device **14** with the capability to configure IP routing.

The QOS module **78** of the device **14** is operable to provide the device **14** with QOS functionality. For example, according to various embodiments, the QOS module **78** allows the device **14** to selectively transmit packets based on the relative importance of the packet. The QOS module **48** may also allow the device **14** to inspect each packet and determine a particular queue to send the packet to based on defined rules. Rules may be defined, for example, based on source/destination IP address and/or port information. If a packet does not match any rule, it may be sent to a default queue.

The VLAN module **80** of the device **14** is operable to provide the device **14** with VLAN functionality. For example, according to various embodiments, the first and third fast Ethernet ports **24**, **28** of the device **14** that are connected to the local area network **18** and the demilitarized zone **32** may be configured as 802.1q trunk ports. The VLAN module **80** allows the device **14** to connect to many different VLANS from an Ethernet switch that has enabled trunking.

According to various embodiments, the device **14** may also automatically transmit performance information to the management center **12**. The performance information may include, for example, a CPU utilization value for the device **14**, a memory utilization value for the device **14**, and a network interface bandwidth utilization value for the device **14**. The performance data may also include, for example, the information obtained by the distributed network management poller module **68** of the device **14**.

FIG. **5** illustrates various embodiments of the management center **12** of FIG. **1**. The management center **12** includes a database cluster **82**, an activation server **84**, a logger server **86**, a manager server **88** and a web-based management portal **90**. The management center **12** is located external to any customer sites and may provide a shared infrastructure for multiple customers. According to various embodiments, the database cluster **82** includes a plurality of databases and structural query language (SQL) servers. According to various embodiments, the database cluster **82** includes a combination of structural query language servers and open source MySQL servers. The databases hold all of the data required by the activation server **84**, the logger server **86**, the manager server **88** and the web-based management portal **90**.

FIG. **6** illustrates various embodiments of the activation server **84**. The activation server **84** may include a Linux based operating system, and may include an auto-provisioning manager module **92**, an auto-update manager module **94** and

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an activation manager module **96**. The auto-provisioning manager module **92** is operable to configure any device **14** that is in the process of being activated. The auto-update manager module **94** is operable to update the operating system of any device **14** that is in the process of being activated. The auto-update manager module **94** is also operable to update the various databases and signature files used by applications resident on the device **14** (e.g., intrusion prevention, anti-virus, content filtering). The activation manager module **96** is operable to communicate with the back-end SQL servers of the database cluster **82** to gather the necessary data required by the auto-provisioning manager module **92** to generate device configurations. The activation manager module **96** is also operable to authenticate incoming devices **14** and determine their identity based on the activation key.

According to various embodiments, the activation server **84** is a collection of hosted servers that are utilized to set up the initial configuration of each device **14**. Based on an activation key received from the device **14** when the device **14** is first installed, the activation server **84** automatically sends the appropriate configuration to the device **14**. The activation server **84** also assigns the device **14** to a redundant pair of logger servers **86** and a redundant pair of manager servers **88**.

FIG. **7** illustrates various embodiments of the logger server **86**. The logger server **86** may include a Linux based operating system and a logger server module **98**. According to various embodiments, the logger server **86** is a collection of hosted servers that receive log information from the devices **14** and correlates the information.

FIG. **8** illustrates various embodiments of the manager server **88**. The manager server **88** may include a Linux based operating system and the following modules: an auto-provisioning manager module **100**, an auto-update manager module **102**, a firewall configuration manager module **104**, an intrusion prevention configuration manager module **106**, an anti-virus configuration manager module **108**, a content filtering configuration manager module **110**, an anti-spam configuration manager module **112**, a VPN configuration manager module **114**, a DCHP server configuration manager module **116**, a network management monitor module **118**, a distributed network management configuration manager module **120**, an inline network management configuration manager module **122**, an IP and network interface configuration manager **124**, a VLAN configuration manager module **126**, a QOS configuration manager module **128**, a logger configuration manager module **130**, a remote access configuration manager module **132**, and a network graph generator module **134**.

According to various embodiments, the manager server **88** is a collection of servers that are utilized to manage the devices **14**. The manager server **88** transmits the configuration and the updates to the device **14**. The manager server **88** also monitors the device **14**, stores performance data, and generates graphs for each device **14** and each network element monitored by the device **14**. For example, the auto-update manager module **102** may periodically poll each device **14** and determines whether each device **14** has the most current version of the device operating system, the anti-virus signature database, the content filtering database and the intrusion protection database. If the auto-update manager module **102** determines that a particular device **14** does not have the most current version of the operating system and databases, the auto-update manager module **102** operate to will automatically transmit the appropriate update to the device **14**.

The VPN configuration manager module **114** may automatically configure the VPN tunnels for each device **14**. When the particular device **14** is first activated, the device **14** contacts the manager server **88** and reports its public Internet address. The auto-provisioning manager module **100** records the reported address and stores it in the database cluster **82**. The VPN configuration manager module **114** may also gather all of the VPN configuration information from the database cluster **82** for each device **14** that is provisioned to have a VPN connection to the particular device **14**. The VPN configuration manager module **114** may also create configuration files for each of the devices **14**. After the manager server **88** transmits the configurations to each of the devices **14**, secure encrypted tunnels are established between each of the devices **14**.

When a particular device **14** is issued a new IP address, the device **14** automatically transmits its new IP address to the manager server **88**. The auto-update manager module **102** responds to this IP address change and automatically generates new configurations for all of the devices **14** that have tunnels to the particular device **14**. The VPN configuration manager module **114** automatically transmits the new configurations to the devices **14** and the encrypted tunnels automatically reconverge.

FIG. **9** illustrates various embodiments of the web-based management portal **90**. The web-based management portal **90** may include a Windows or Linux based operating system and the following modules: a firewall configuration tool module **136**, an intrusion prevention configuration tool module **138**, an anti-virus configuration tool module **140**, a content filtering configuration tool module **142**, an anti-spam configuration tool module **144**, a VPN configuration tool module **146**, a DHCP server configuration tool module **148**, a network monitoring configuration tool module **150**, an IP and network interface configuration tool module **152**, a VLAN configuration tool module **154**, a QOS configuration tool module **156**, a logger configuration tool module **158**, a remote access configuration tool module **160**, a global status maps and site views module **162** and a user administration tool module **164**.

According to various embodiments, the web-based management portal **90** includes a collection of integrated centralized network management systems and a grouping of customer management tools. According to various embodiments, the web-based management portal **90** is a combination of many different web servers running Microsoft Internet Information Server or Apache. The web pages may be written in Microsoft's ASP.NET or PHP, and the web applications may interface with the SQL servers of the database cluster **82** to synchronize changes to the network environment as changes are made to the configuration of the devices **14** via the web-based management portal **90**. The web-based management portal **90** may further include the capability for firewall management, intrusion prevention management, anti-virus management, content filtering management, anti-spam management, site to site and remote access virtual private network management, network monitoring, network configuration, account management and trouble ticketing.

The firewall configuration tool module **136** allows for centralized management of the firewall policies for each device **14**. According to various embodiments, the firewall for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The firewall configuration tool module **136** allows a user to efficiently and securely manage all of the firewalls and define global policies that are easily applied to all firewalls at once. The firewall configuration tool module **136** also allows the customer to set custom firewall polices to each individual firewall. Each firewall can also have individual user permissions to restrict

which user accounts can modify which firewalls. This capability may provide an administrator at each site the ability to manage their own firewall and yet restrict them from changing the configuration of any other firewalls in the network. A notification can be automatically sent to a group of administrators every time a change is made to a firewall policy. A firewall validation tool allows a user to run a security check against their current firewall settings and report on which ports are open and any vulnerabilities that are detected. The firewall configuration tool module **136** may also be used to view firewall log information.

The intrusion prevention configuration tool module **138** allows for the centralized management of the intrusion prevention rules for each device **14**. According to various embodiments, the intrusion prevention system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The intrusion prevention configuration tool module **138** allows a user to efficiently and securely manage all of the intrusion prevention systems and define global policies that are easily applied to all intrusion prevention systems at once. The intrusion prevention configuration tool module **138** also allows the customer to set custom intrusion prevention rules to each individual intrusion prevention system. Each intrusion prevention system can also have individual user permissions to restrict which user accounts can modify which intrusion prevention system. This capability may provide an administrator at each site the ability to manage their own intrusion prevention system and yet restrict them from changing the configuration of any other intrusion prevention systems in the network. An e-mail notification can be automatically sent to a group of administrators every time a change is made to an intrusion prevention system configuration. The intrusion prevention configuration tool module **138** may also be used to view intrusion protection log information.

The anti-virus configuration tool module **140** allows for the centralized management of the anti-virus policies for each device **14**. According to various embodiments, the anti-virus service includes two anti-virus systems. The first anti-virus system for a given local area network **18** may be embodied as an anti-virus gateway service that resides on the device **14** associated with the given local area network **18**. The second anti-virus system is a desktop anti-virus agent that resides on each customer computer (e.g., computer **36**) that requires anti-virus protection. The anti-virus configuration tool module **140** allows a user to efficiently and securely manage both of the anti-virus systems and define global policies that are easily applied to all anti-virus systems at once. The anti-virus configuration tool module **140** also allows a user to set custom anti-virus policies to each individual anti-virus gateway. Each anti-virus system can also have individual user permissions to restrict which user accounts can modify which anti-virus system. This capability may provide an administrator at each site the ability to manage their own anti-virus policies and yet restrict them from changing the configuration of any other anti-virus systems in the network. An e-mail notification can be automatically sent to a group of administrators every time a change is made to an anti-virus system configuration. The anti-virus configuration tool module **140** may also be used to view anti-virus log information.

The content filtering configuration tool module **142** allows for the centralized management of the content filtering policies for each device **14**. According to various embodiments, the content filtering system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The content filtering configuration tool module **142** allows a user to efficiently and securely manage all of the content filtering systems and define global policies that are easily applied to all content filtering systems at once. The content filtering configuration tool module **142** also allows the customer to set custom content filtering policies to each individual content filtering system. Each content filtering system can also have individual user permissions to restrict which user accounts can modify which content filtering system. This capability may provide an administrator at each site the ability to manage their own content filtering system and yet restrict them from changing the configuration of any other content filtering systems in the network. An e-mail notification can be automatically sent to a group of administrators every time a change is made to a content filtering system configuration. The content filtering configuration tool module **142** may also be used to view content filtering log information.

The anti-spam configuration tool module **144** allows for the centralized management of the anti-spam policies for each device **14**. According to various embodiments, the anti-spam system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The anti-spam configuration tool module **144** allows a user to efficiently and securely manage all of the anti-spam systems and define global policies that are easily applied to all anti-spam systems at once. The anti-spam configuration tool module **144** also allows a user to set custom anti-spam policies to each individual anti-spam system. Each anti-spam system can also have individual user permissions to restrict which user accounts can modify which anti-spam system. This capability may provide an administrator at each site the ability to manage their own anti-spam system and yet restrict them from changing the configuration of any other anti-spam systems in the network. A notification can be automatically sent to a group of administrators every time a change is made to an anti-spam system configuration. The anti-spam configuration tool module **144** may also be used to view anti-spam log information.

The VPN configuration tool module **146** allows for the centralized management of the VPN policies for each device **14**. According to various embodiments, the VPN system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The VPN configuration tool module **146** allows a user to efficiently and securely manage all of the VPN systems and define global policies that are easily applied to all VPN systems at once. The VPN configuration tool module **146** also allows a user to set custom VPN policies to each individual VPN system. Each VPN system can also have individual user permissions to restrict which user accounts can modify which VPN system. This capability may provide an administrator at each site the ability to manage their own VPN system and yet restrict them from changing the configuration of any other VPN systems in the network. A notification can be automatically sent to a group of administrators every time a change is made to a VPN system configuration.

The DHCP server configuration tool module **148** allows for the centralized management of the DHCP server policies for each device **14**. According to various embodiments, the DHCP server for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The DHCP server configuration tool module **148** allows a user to efficiently and securely manage all of the DHCP servers and define global policies that are easily applied to all DHCP servers at once. The DHCP server configuration tool module **148** also allows a user to set custom DHCP server policies to each individual DHCP server. Each DHCP server can also have individual user permissions to restrict which

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user accounts can modify which DHCP server. This capability may provide an administrator at each site the ability to manage their own DHCP server and yet restrict them from changing the configuration of any other DHCP server in the network. A notification can be automatically sent to a group of administrators every time a change is made to a DHCP server configuration.

The network monitoring configuration tool module **150** allows for the centralized management of the network monitoring policies for each device **14**. According to various embodiments, the network monitoring system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The network monitoring configuration tool module **150** allows a user to efficiently and securely manage all of the network monitoring systems and define global policies that are easily applied to all network monitoring systems at once. The network monitoring configuration tool module **150** also allows a user to set custom network monitoring policies to each individual network monitoring system. Each network monitoring system can also have individual user permissions to restrict which user accounts can modify which network monitoring system. This capability may provide an administrator at each site the ability to manage their own network monitoring system and yet restrict them from changing the configuration of any other network monitoring systems in the network. A notification can be automatically sent to a group of administrators every time a change is made to a network monitoring system configuration.

The IP and network interface configuration tool module **152** allows for the centralized management of the network configuration for each device **14**. The centralized management of the network configuration may include, for example, managing IP Address, IP Types (static IP, DHCP, PPPOE), IP routing, Ethernet Trunking, VLANs, and QOS configuration. According to various embodiments, the IP and network interface configuration tool module **152** allows a user to efficiently and securely manage all of the devices **14**. Each device **14** can also have individual user permissions to restrict which user accounts can modify the network configuration. This capability may provide an administrator at each site the ability to manage their own network configuration and yet restrict them from changing the configuration of any other devices **14** in the network. A notification can be automatically sent to a group of administrators every time a change is made to a device network configuration.

The global status maps and site views module **162** allows an authorized user to view the real-time status of their network, devices **14**, and network elements that are monitored by the devices **14**. This global status maps and site views module **162** provides a global map of the world, and countries and continents on this map are color coded to represent the underlying status of any devices **14** that reside in that region. For example a customer may have devices **14** in the United States, Japan, and Italy. If all of devices **14** and network elements monitored by the devices **14** are operating as expected, the countries on the map will be shown as green. When a device **14** in Japan ceases to operate as expected, the portion of the map representing Japan may turn red or yellow depending on the severity of the problem. The countries on the map can be selected to drill down into a lower level map. For example, the authorized user could select the United States from the world map and be presented with a state map of the United States. The individual states may be color coded to represent the underlying status of any devices **14** that reside in that state. For each state selected, a list of the sites and devices **14** in that state may be shown. The states on the map can be selected to drill down into a lower level sub map. The lower level sub map may show for example, a particular region, city, or customer site.

The global status maps and site views module **162** may read the latest data polled for each device **14** and the network elements that are monitored by them. It may also check the data against preset thresholds that determine what the status of each device **14** should be set to. It may determine the color for the lowest level map item that contains the device **14** and set the status appropriately. The status and color for each higher level map is set to represent the status of the underlying map. The color of each map item represents the severity of the most severe problem of a device **14** in that region. For example, if a device **14** is not operating as expected, all of the maps that have a region that include this device **14** will be shown as red. If a device **14** is operating in a manner associated with the color yellow, all of the maps that have a region that include this device **14** will be shown as yellow. A map region will only be shown as green if all devices **14** included in that map region are operating as expected.

The user administration tool module **164** allows for the centralized management of a number of functionalities. According to various embodiments, the user administration tool module **164** allows a user to set up an account profile and manage different aspects of a user profile such as name, address and account name. According to various embodiments, the user administration tool module **164** allows a user to manage all orders for secure network access platform products and services including a description and status of orders and allows a user to order additional items as well. According to various embodiments, the user administration tool module **164** allows a user to manage bills, including reading current invoices, making payment, updating billing information, downloading previous statements, and invoices.

According to various embodiments, the user administration tool module **164** allows a user to add and change user accounts, delete user accounts, change passwords, create new groups, move users into certain individuals and groups, and set permissions for those individuals and groups. The permissions may allow access to different portions of the web-based management portal **90**. For example, a finance employee may be given access to only account administration tools for billing and order management. Similarly, a technical employee may be given access to only the technical sections of the web-based management portal **90** and not to billing center or order management sections. According to various embodiments, the user administration tool module **164** may allow a user to open trouble tickets, track the status of existing trouble tickets, and run some of the diagnostic tools available in the secure network access platform environment.

According to various embodiments, the management center **12** may correlate all information received from the devices **14**, including performance information received from the devices **14**.

Each of the modules described hereinabove may be implemented as microcode configured into the logic of a processor, or may be implemented as programmable microcode stored in electrically erasable programmable read only memories. According to other embodiments, the modules may be implemented by software to be executed by a processor. The software may utilize any suitable algorithms, computing language (e.g., C, C++, Java, JavaScript, Visual Basic, VBScript, Delphi), and/or object oriented techniques and may be embodied permanently or temporarily in any type of computer, computer system, device, machine, component, physical or virtual equipment, storage medium, or propagated signal capable of delivering instructions. The software may be

stored as a series of instructions or commands on a computer readable medium (e.g., device, disk, or propagated signal) such that when a computer reads the medium, the described functions are performed.

Although the system **10** is shown in FIG. **1** as having wired data pathways, according to various embodiments, the network elements may be interconnected through a secure network having wired or wireless data pathways. The secure network may include any type of delivery system comprising a local area secure network (e.g., Ethernet), a wide area secure network (e.g., the Internet and/or World Wide Web), a telephone secure network, a packet-switched secure network, a radio secure network, a television secure network, a cable secure network, a satellite secure network, and/or any other wired or wireless communications secure network configured to carry data. The secure network may also include additional elements, such as intermediate nodes, proxy servers, routers, switches, and adapters configured to direct and/or deliver data.

FIG. **10** illustrates various embodiments of a method of managing a network. According to various embodiments, the method includes receiving an activation key automatically transmitted from a device connected to the network, automatically transmitting a configuration to the device, automatically maintaining the configuration of the device, and receiving log information from the device. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **200**, where the management center **12** receives an activation key automatically transmitted from a device **14** connected to the network. Prior to the start of the process at block **200**, the configuration of the device **14** is provisioned by an entity such as, for example, an administrator or a managed service provider. The entity may initiate the provisioning of the device **14** by logging onto the web-based management portal **90** and entering a license key associated with the device **14**. The license key may be generated by a managed service provider and may be issued with the purchase of the device **14**. The license key may include information such as the product type of the device **14**, the term length of the license associated with the device **14**, and the seller of the license. A hash function may be used to embed the information in the key to obscure the data, and the data may be read by the network manager to verify the authenticity of the license key.

Once the license key is received by the web-based management portal **90**, the configuration of the device **14** may be provisioned via the web-based management portal **90**. Setting the configuration of the device **14** may include setting the IP address of the device **14**, and setting the configurations for the firewall configuration, the intrusion prevention configuration, the anti-virus configuration, the content filtering configuration, the anti-spam configuration, the VPN configuration, the DHCP server configuration, the network management configuration, the network interface configuration, the VLAN configuration, the QOS configuration and any other device configurations. Each configuration provisioned for the device **14** may be stored in the database cluster **82**. According to various embodiments, a default configuration may be selected for the device **14**.

During the provisioning process, an activation key associated with the device **14** is generated and may be printed out or e-mailed for later use. The configuration of the device **14** and the generation of the activation key may be completed from any location by accessing the web-based management portal **90**.

Once the provisioning process is completed, the device **14** may be installed at the customer location. After the device **14** is connected to the local area network **18**, the device **14** automatically attempts to DHCP for a wide area network IP address. As most Internet service providers assign IP addresses using DHCP, in most cases the device **14** will automatically obtain its wide area network IP address. For Internet service providers who do not use DHCP, the wide area network IP address can be obtained using PPPOE. Alternatively, a wide area network IP address may be statically assigned to the device **14**.

According to various embodiments, the device **14** is configured with the DNS names of a number of the hosted servers that comprise the activation server **84**. Once the device **14** obtains a wide area network IP address, the device **14** automatically attempts to communicate with one of the hosted servers that comprise the activation server **84**. When the communication is successful, the activation key is entered and the device **14** transmits the activation key to the activation server **84**. The activation key may be entered by an installer of the device **14**. The process associated with block **200** may be repeated for any number of devices **14**.

From block **200**, the process advances to block **210**, where the activation server **84** automatically transmits the configuration provisioned at block **200** to the device **14**. After the device **14** receives its configuration from the activation server **84**, an installer of the device **14** may be prompted to reboot the device **14**. Once the device **14** reboots, the device **14** automatically connects to its assigned manager server **88** and the installation of the device **14** is complete. The process associated with block **210** may be repeated for any number of devices **14**

From block **210**, the process advances to block **220**, where the management center **12** automatically maintains the configuration of the device **14**. According to various embodiments, a flag is set in the database servers of the database cluster **82** when a change to the configuration of the device **14** is entered via the web-based management portal **90**. According to various embodiments, the auto-provisioning manager module **100** periodically polls the database cluster **82** looking for changes to the configurations of the devices **14** managed by the manager server **88**. When the auto-provisioning manager module **100** detects a device configuration that needs to be changed, the appropriate module (e.g., firewall, intrusion prevention, anti-virus, etc.) will generate the new configuration for the particular service and make the necessary configuration changes to the device **14** that needs to be updated. The process associated with block **220** may be repeated for any number of devices **14**.

From block **220**, the process advances to block **230**, where the logger manager **86** receives log information from the device **14**. As explained previously, the log information received from each device **14** may be compressed and encrypted, and may represent information associated with, for example, a firewall system, an intrusion prevention system, an anti-virus system, a content filtering system, an anti-spam system, etc. residing at the particular device **14**. Once the logger manager **86** receives the log information, the logger manager **86** correlates the log information and makes it available to other elements of the management center **12**. The correlated information may be utilized to determine both the real time and historical performance of the network.

FIG. **11** illustrates various embodiments of a method of managing a network. According to various embodiments, the

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method includes automatically setting a default configuration for the device, automatically generating an activation key associated with a device, and automatically transmitting a provisioned configuration to the device after the device is connected to the network. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **240**, where a default configuration is set for the device **14**. According to various embodiments, the web-based management portal **90** may provide the default configuration that serves as the basis for the device configuration. The process associated with block **240** may be repeated for any number of devices **14**.

From block **240**, the process advances to block **250**, where an activation key associated with a device is automatically generated. According to various embodiments, the activation key may be generated by the web-based management portal **90** during the provisioning of the device **14**. The provisioning of the device **14** may include changing some of the settings of the default configuration. The process associated with block **250** may be repeated for any number of devices **14**.

From block **250**, the process advances to block **260**, where the provisioned configuration is automatically transmitted to the device **14** after the device **14** is connected to the network. According to various embodiments, the activation server **84** may automatically transmit a provisioned configuration to the device **14** after the device **14** is connected to the network. The process associated with block **260** may be repeated for any number of devices **14**.

FIG. **12** illustrates various embodiments of a method of managing a network. According to various embodiments, the method includes periodically polling a device connected to the network, automatically determining whether a configuration of the device is current, automatically setting a new configuration for the device when the configuration is not current, and automatically transmitting the new configuration to the device. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **270**, where a device **14** connected to the network is periodically polled. According to various embodiments, the periodic polling may be conducted by the manager server **88**. The process associated with block **270** maybe repeated for any number of devices **14**.

From block **270**, the process advances to block **280**, where it is automatically determined whether the configuration of the device **14** is current. According to various embodiments, the automatic determination may be made by the manager server **88**. The process associated with block **280** maybe repeated for any number of devices **14**.

From block **280**, the process advances to block **290**, where a new configuration is automatically set for the device **14** when the configuration of the device **14** is not current. According to various embodiments, the new configuration may be automatically set by the manager server **88**. The process associated with block **290** maybe repeated for any number of devices **14**.

From block **290**, the process advances to block **300**, where the new configuration is automatically transmitted to the device **14**. According to various embodiments, the new configuration may be automatically transmitted to the device **14** by the manager server **88**. The process associated with block **300** maybe repeated for any number of devices **14**.

FIG. **13** illustrates various embodiments of a method of managing a network. According to various embodiments, the method includes receiving network traffic information from a device connected to the network, automatically correlating the information, and automatically determining network performance based on the information. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **310**, where network traffic information is received from a device **14** connected to the network. The network traffic information may represent information that travels from one device **14** to another device **14**. According to various embodiments, the network traffic information is captured at the device **14** and may include, for example, source/destination IP address, protocol, sequence number and source/destination port. According to various embodiments, the network traffic information transmitted from the device **14** is received by the manager server **88**. The process associated with block **310** maybe repeated for any number of devices **14**.

From block **310**, the process advances to block **320**, where the information is correlated. According to various embodiments the information may be correlated with network traffic information transmitted from any number of devices **14**. According to various embodiments, the correlation of the information is conducted by the manager server **88**.

From block **320**, the process advances to block **330**, where the network performance is determined based on the information. According to various embodiments, the network performance determination is made by the manager server **88**. For example, assume that ten VOIP packets leave a first device **14** destined for a second device **14**. As explained previously, the first device **14** may record the exact time each VOIP packet leaves, and the source/destination IP Address, protocol, sequence number and source/destination port for each VOIP packet. The first device **14** may then send this information to the manager server **88**. Further assume that these ten VOIP packets travel over the Internet **16**, the third and eighth VOIP packets are lost, dropped by a router that is over-utilized. The second device **14** will only see eight VOIP packets arrive, not knowing that the third and eighth packets were lost. The second device **14** may then record the exact time each packet is received and the source/destination IP Address, protocol, sequence number, and source/destination port for each received packet. The second device **14** may then send this information to the manager server **88**. The manager server **88** may then examine the information transmitted from the first and second devices **12**, **14** and determine, based on the IP Address, protocol, sequence number, and source/destination port that the packets recorded by both the first and second devices **14** are part of the same packet stream. Armed with this information, the manager server **88** may then determine the exact latency and jitter of each packet, and the packet loss (20% in this example) on a real application data stream. The process associated with block **330** may be repeated for network traffic information received from any number of devices **14**.

FIG. **14** illustrates various embodiments of a method of managing a network. According to various embodiments, the method includes receiving credentials associated with a remote access user, automatically validating the credentials,

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automatically determining which devices connected to the network the remote access user is authorized to connect to, and automatically transmitting to a remote access client a list of devices the remote access user is authorized to connect to. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **340**, where credentials associated with a remote access user is received from a remote access client. The remote access user is a user who is located at a site that does not have a device **14** associated therewith. According to various embodiments, the credentials are received by the web-based management portal **90**. The remote access client may be implemented as a software client installed on a personal computer such as, for example, a desktop computer or a laptop computer. According to various embodiments, when the software client is launched, it requires the remote access user to input their credentials (e.g., company ID, username, password). After the remote access user enters the credentials, the software client may make a secure socket layer connection to the web-based management portal **90**. The process associated with block **340** may be repeated for any number of remote access users.

From block **340**, the process advances to block **350**, where the credentials are automatically validated. According to various embodiments, the credentials may be automatically validated by the web-based management portal **90**. If the credentials are not valid, the web-based management portal **90** may return an error message to the remote access client which may then prompt the remote access user to reenter their credentials. The process associated with block **350** may be repeated for any number of remote access users.

From block **350**, the process advance to block **360**, where it is determined which devices **14** connected to the network the remote access user is authorized to connect to. According to various embodiments, the determination is made by the web-based management portal **90**. The process associated with block **360** may be repeated for any number of remote access users.

From block **360**, the process advances to block **370**, where a list of the devices **14** is automatically transmitted to a remote access client associated with the remote access user. According to various embodiments, the list is automatically transmitted from the web-based management portal **90**. Once the list is presented to the remote access user and a particular device **14** is selected, an encrypted tunnel may be established between the personal computer and the selected device **14**. The process associated with block **370** may be repeated for any number of remote access users.

Each of the methods described above may be performed by the system **10** of FIG. **1** or by any suitable type of hardware (e.g., device, computer, computer system, equipment, component); software (e.g., program, application, instruction set, code); storage medium (e.g., disk, device, propagated signal); or combination thereof.

While several embodiments of the invention have been described, it should be apparent, however, that various modifications, alterations and adaptations to those embodiments may occur to persons skilled in the art with the attainment of some or all of the advantages of the disclosed invention. For example, the system **10** may further include a plurality of graphical user interfaces to facilitate the management of the network. The graphical user interfaces may be presented through an interactive computer screen to solicit information from and present information to a user in conjunction with the described systems and methods. The graphical user interfaces may be presented through a client system including a personal computer running a browser application and having various input/output devices (e.g., keyboard, mouse, touch screen, etc.) for receiving user input. It is therefore intended to cover all such modifications, alterations and adaptations without departing from the scope and spirit of the disclosed invention as defined by the appended claims.

What is claimed is:

1. A method for providing a managed network, comprising:

in a management center, setting at least one configuration to be transmitted to a first network management device, the at least one configuration to cause the first network management device to provide a corresponding at least one managed network service for a first network after the at least one configuration is transmitted to and received by the first network management device, wherein setting the at least one configuration comprises setting:

a quality of service (QOS) configuration to cause the first network management device to enable selective transmission of information by the first network management device based on a relative metric of the information; and

wherein setting the at lest one configuration further comprises setting at least one of:

an anti-virus configuration to cause the first network management device to provide an anti-virus service;

a content filtering configuration to cause the first network management device to provide a content filtering service;

an anti-spam configuration to cause the first network management device to provide an anti-spam service;

a virtual private network (VPN) configuration to cause the first network management device to provide a VPN service, the VPN service to enable the first network management device to communicate with at least one of: a second network management device located at a second location, a remote access client, and the management center;

an internet protocol (IP) routing and network interface configuration to cause the first network management device to provide an IP routing and network interface service; and

a device monitoring configuration to cause the first network management device to provide a device monitoring service, the device monitoring service to monitor one or more network elements, the one or more network elements connected to the first network and external to the first network management device; and

transmitting the at least one configuration to the first network management device via a second network in response to receiving an activation key at the management center, the activation key transmitted from the first network management device to the management center via the second network after the first network management device is connected to the second network at a first location.

2. The method of claim **1**, wherein setting at least one configuration of a first network management device comprises generating the activation key.

3. The method of claim **1**, comprising updating the at least one configuration within the first network management device.

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EX. 3 - 127

4. The method of claim 3, wherein updating the at least one configuration within the first network management device comprises:

periodically polling the first network management device;

determining whether the at least one configuration of the first network management device is current;

setting a new configuration for each of the at least one configuration that is not current; and

transmitting the new configurations to the first network management device.

5. The method of claim 1, comprising receiving log information from the first network management device, the log information associated with at least one managed network service.

6. The method of claim 5, comprising:

correlating the received log information; and

determining one or more of a real time performance and a historical performance of the first network based on the correlated log information.

7. The method of claim 1, comprising:

receiving performance information from the first network management device;

correlating the received performance information; and

determining one or more of a real time performance and a historical performance of the first network based on the correlated performance information.

8. The method of claim 7, wherein receiving performance information from the first network management device comprises receiving at least one of the following:

a CPU utilization value;

a memory utilization; and

a network interface bandwidth utilization value.

9. The method of claim 7, wherein receiving performance information from the first network management device comprises receiving performance information gathered from one or more network elements connected to the first network and external to the first network management device.

10. The method of claim 9, wherein receiving performance information gathered from the one or more network elements comprises receiving at least one of the following:

a reachability value;

a latency value; and

a CPU utilization value.

11. The method of claim 1, wherein the first network management device is in communication with the first network via an ethernet port of the first network management device.

12. A system for managing a network, the system comprising:

a first network management device comprising a processor and a memory, the first network management device to provide at least one managed network service for a first network after a corresponding at least one configuration is transmitted to and received by the first network management device; and

a management center to communicate with the first network management device via a second network, the management center to:

set the least one configuration to be transmitted to a first network management device, wherein the at least one configuration comprises:

a quality of service (QOS) configuration to cause the first network management device to enable selective transmission of information by the first network management device based on a relative metric of the information; and

at least one of:

an anti-virus configuration to cause the first network management device to provide an anti-virus service;

a content filtering configuration to cause the first network management device to provide a content filtering service;

an anti-spam configuration to cause the first network management device to provide an anti-spam service;

a virtual private network (VPN) configuration to cause the first network management device to provide a VPN service, the VPN service to enable the first network management device to communicate with at least one of: a second network management device located at a second location, a remote access client, and the management center;

an internet protocol (IP) routing and network interface configuration to cause the first network management device to provide an IP routing and network interface service; and

a device monitoring configuration to cause the first network management device to provide a device monitoring service, the device monitoring service to monitor one or more network elements, the one or more network elements connected to the first network and external to the first network management device; and

transmit the at least one configuration to the first network management device via the second network in response to receiving an activation key at the management center, the activation key transmitted from the first network management device to the management center via the second network after the first network management device is connected to the second network at a first location.

13. The system of claim 12, wherein the management center is to update the at least one configuration within the first network management device.

14. The system of claim 13, wherein the management center is to:

periodically poll the first network management device;

determine whether the at least one configuration of the first network management device is current;

set a new configuration for each of the at least one configuration that is not current; and

transmit the new configurations to the first network management device.

15. The system of claim 12, wherein the management center is to receive log information from the first network management device, the log information associated with the at least one managed network service.

16. The system of claim 15, wherein the management center is to:

correlate the received log information; and

determine one or more of a real time performance and a historical performance of the first network based on the correlated log information.

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EX. 3 - 128

EX. 3 - 128

17. The system of claim 12, wherein the management center is to:

receive performance information from the first network management device;

correlate the received performance information; and

determine one or more of a real time performance and a historical performance of the first network based on the correlated information.

18. The system of claim 17, wherein performance information comprises at least one of the following:

a CPU utilization value;

a memory utilization value; and

a network interface bandwidth utilization value.

19. The system of claim 17, wherein the performance information comprises at least one of the following:

a reachability value;

a latency value; and

a CPU utilization value.

20. The system of claim 12, wherein the first network management device is in communication with the first network via an ethernet port of the first network management device.

* * * * *

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EXHIBIT 3

US008341317B2

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

(10) **Patent No.: US 8,341,317 B2**
(45) **Date of Patent: *Dec. 25, 2012**

(54) **SYSTEMS AND METHODS FOR MANAGING A NETWORK**

(75) Inventors: **Robert T. Staats**, Lahabra Heights, CA (US); **Clifford H. Young**, Marina del Rey, CA (US)

(73) Assignee: **Clearpath Networks, Inc.**, El Segundo, CA (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/272,311**

(22) Filed: **Oct. 13, 2011**

(65) **Prior Publication Data**

US 2012/0036234 A1 Feb. 9, 2012

Related U.S. Application Data

(60) Continuation of application No. 12/833,832, filed on Jul. 9, 2010, now Pat. No. 8,078,777, and a division of application No. 11/106,837, filed on Apr. 15, 2005, now Pat. No. 7,783,800.

(60) Provisional application No. 60/562,596, filed on Apr. 15, 2004.

(51) **Int. Cl.**

G06F 13/12	(2006.01)
G06F 13/38	(2006.01)
G06F 15/177	(2006.01)
G06F 15/173	(2006.01)

(52) **U.S. Cl.** **710/64**; 709/220; 709/221; 709/222; 709/223

(58) **Field of Classification Search** 710/64; 709/220, 221, 222, 223

See application file for complete search history.

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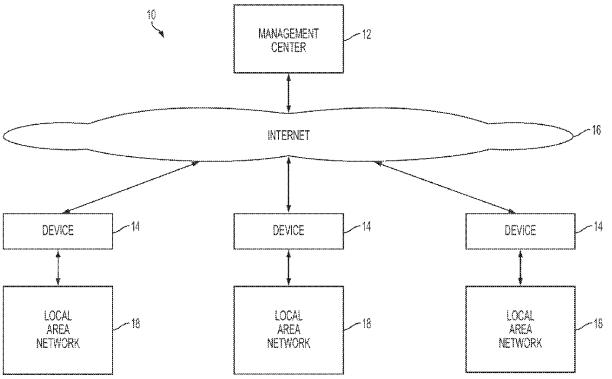
Primary Examiner — Chun-Kuan Lee
Assistant Examiner — Farley Abad
(74) *Attorney, Agent, or Firm* — K&L Gates LLP

(57) **ABSTRACT**

A method of managing a network. The method includes receiving an activation key transmitted from a device connected to the network, automatically transmitting a configuration to the device, automatically maintaining the configuration of the device, and receiving log information from the device.

15 Claims, 14 Drawing Sheets



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EX. 3 - 131

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Notice of Allowance for U.S. Appl. No. 11/106,837 mailed Apr. 5, 2010.
First Office Action issued on Jul. 11, 2008 in Chinese Application No. 200580019475.4.
Second Office Action issued on Nov. 6, 2009 in Chinese Application No. 200580019475.4.
Non-Final Rejection for U.S. Appl. No. 12/833,832 mailed Dec. 22, 2010.
Notice of Allowance for U.S. Appl. No. 12/833,832 mailed Jul. 11, 2011.
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EX. 3 - 66

EX. 3 - 121

EX. 3 - 132

EX. 3 - 132

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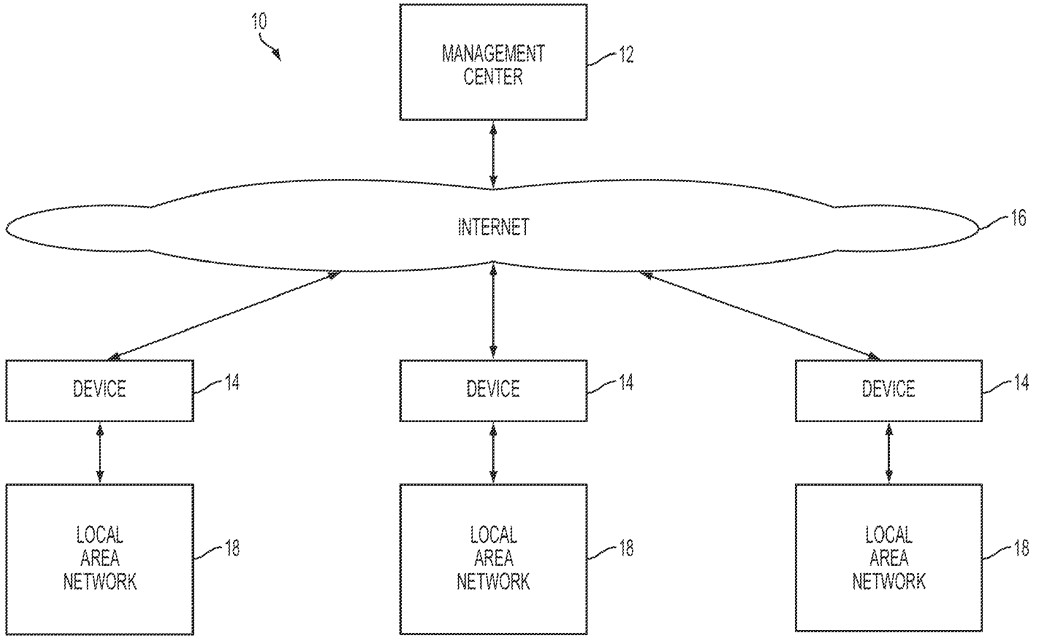
10
MANAGEMENT CENTER
12
INTERNET
16
DEVICE
14
DEVICE
14
DEVICE
14
LOCAL AREA NETWORK
18
LOCAL AREA NETWORK
18
LOCAL AREA NETWORK
18

FIG. 1

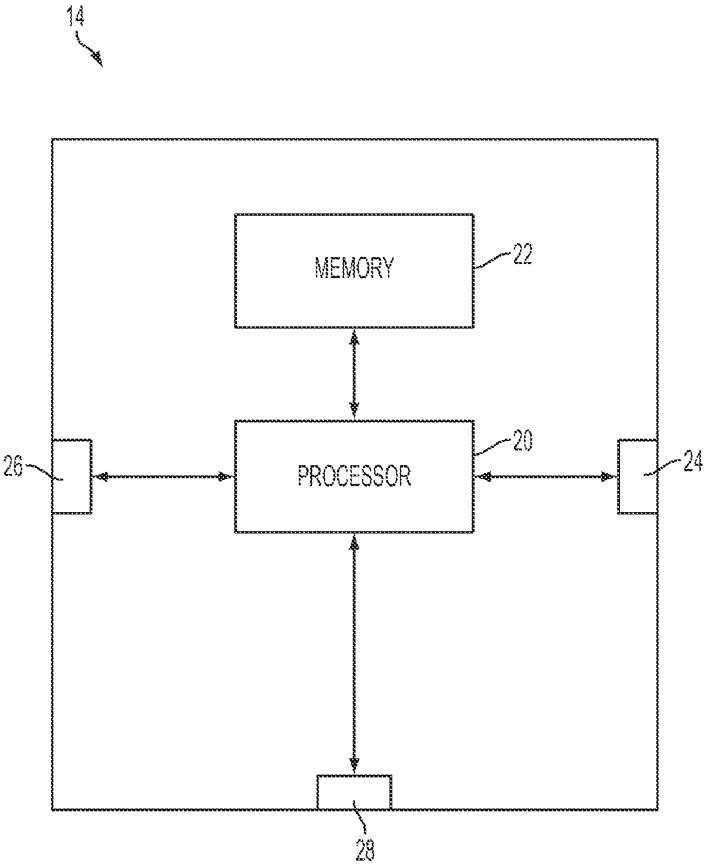

FIG. 2

EX. 3 - 68

EX. 3 - 123

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EX. 3 - 134

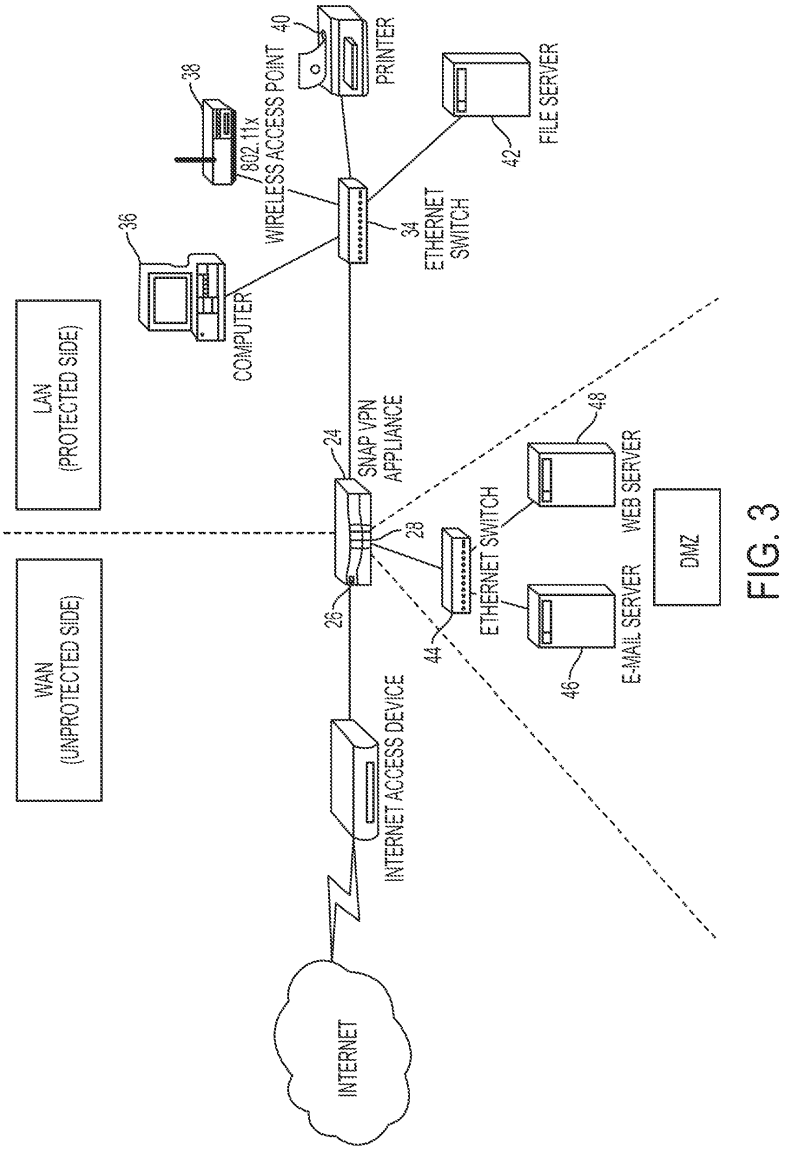

FIG. 3

EX. 3 - 69

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EX. 3 - 135

EX. 3 - 135

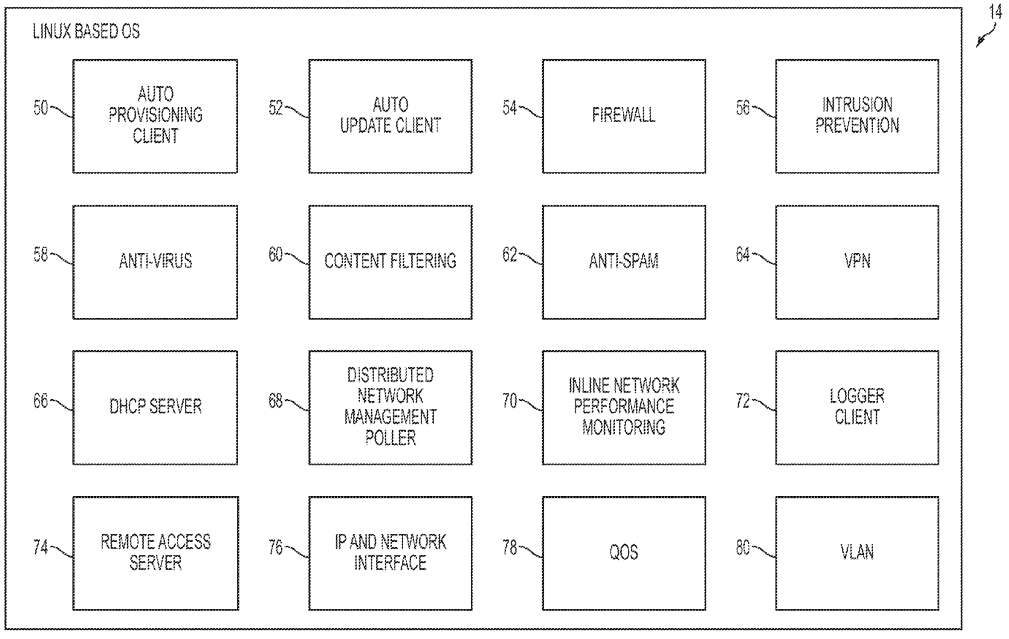

FIG. 4

EX. 3 - 70

EX. 3 - 125

EX. 3 - 136

EX. 3 - 136

EX. 3 - 136

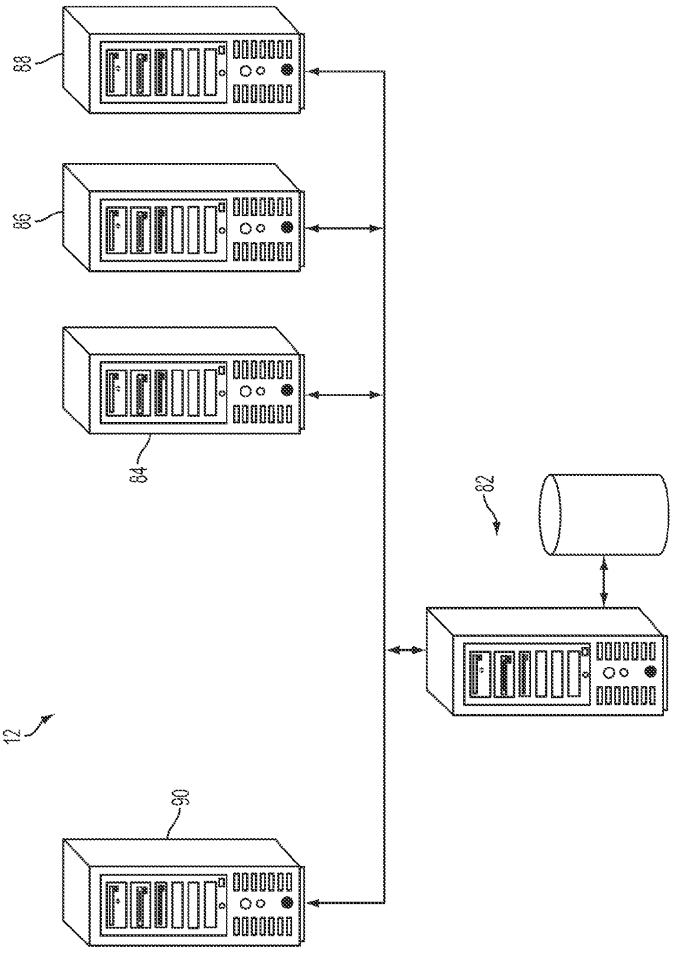

FIG. 5

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EX. 3 - 137

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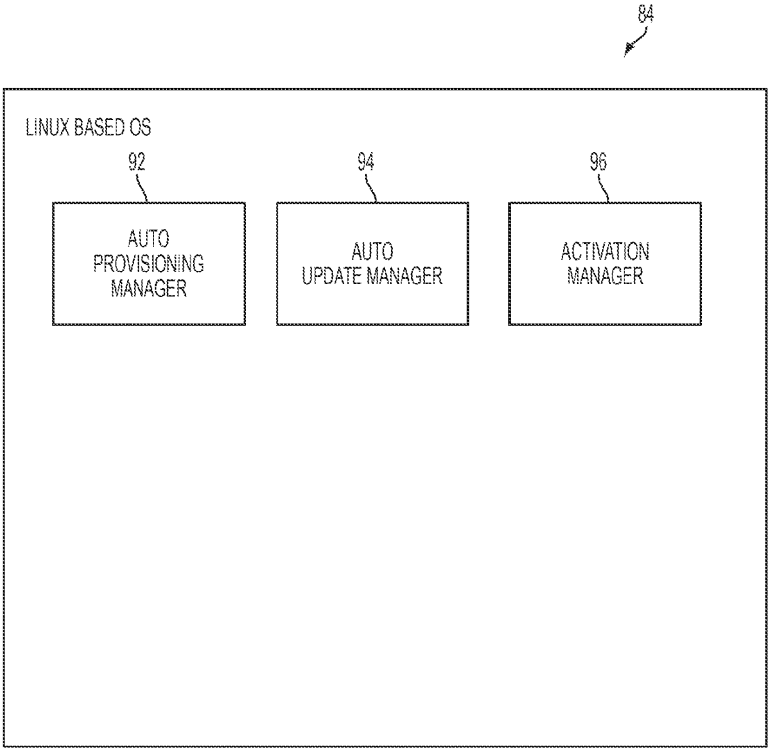

FIG. 6

EX. 3 - 72

EX. 3 - 127

EX. 3 - 138

EX. 3 - 138

EX. 3 - 138

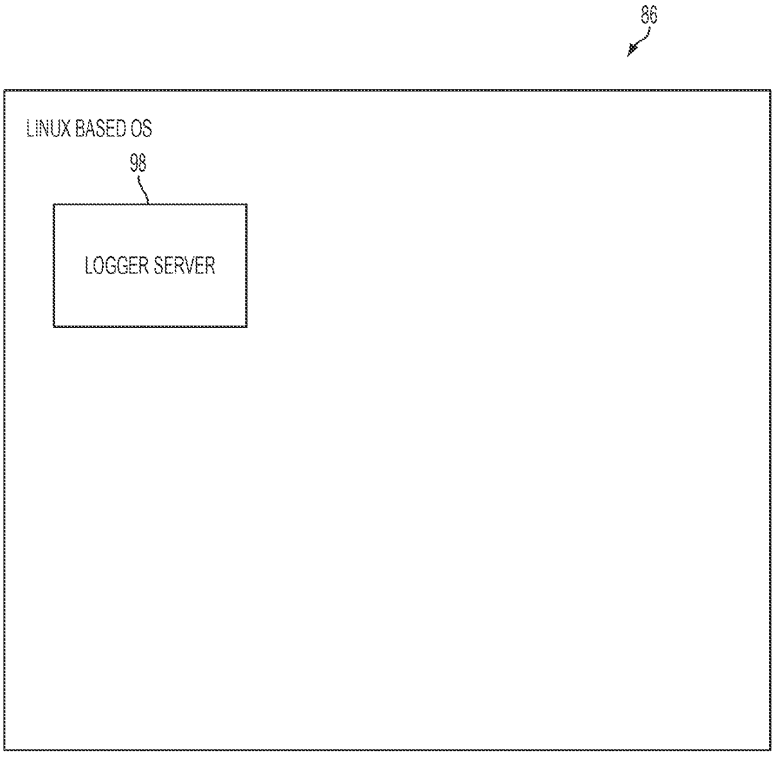

FIG. 7

EX. 3 - 73

EX. 3 - 128

EX. 3 - 139

EX. 3 - 139

EX. 3 - 139

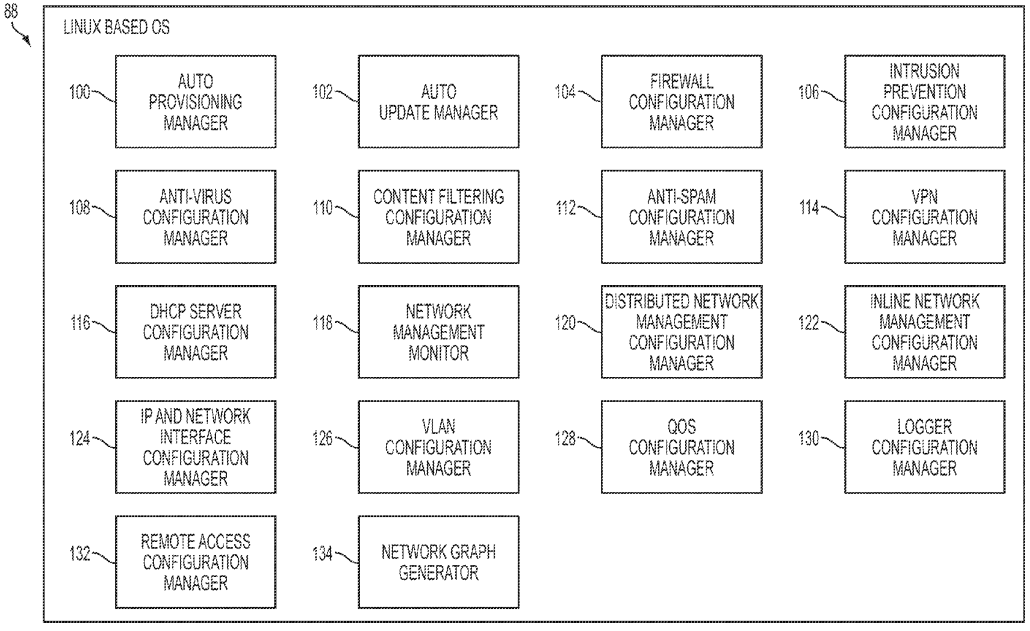

FIG. 8

EX. 3 - 74

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EX. 3 - 140

EX. 3 - 140

EX. 3 - 140

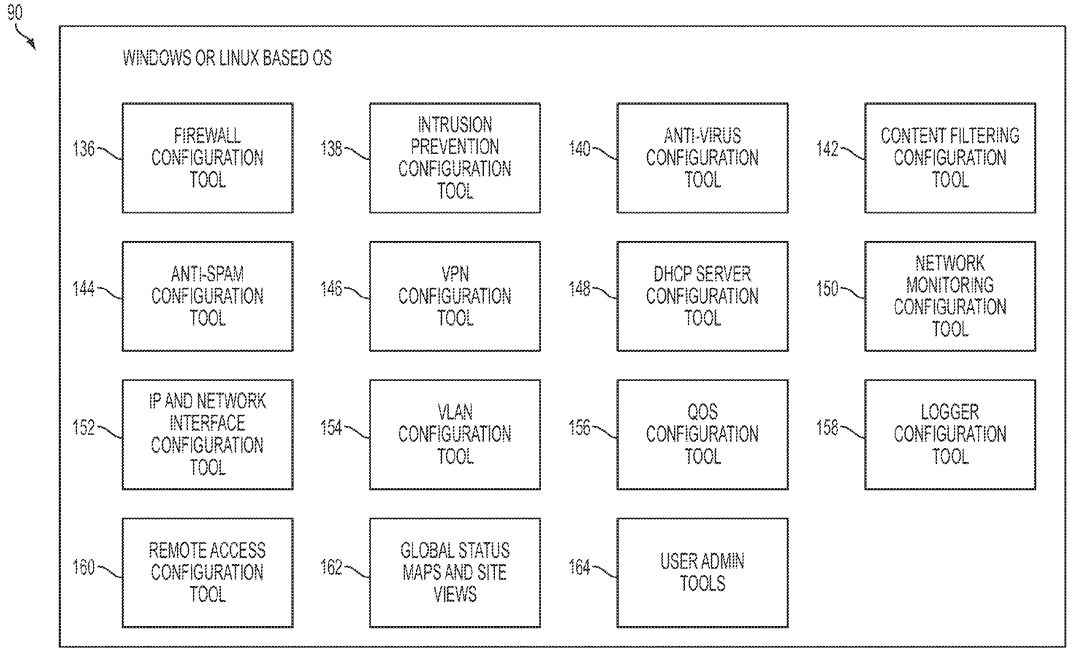
90
WINDOWS OR LINUX BASED OS
136
FIREWALL CONFIGURATION TOOL
138
INTRUSION PREVENTION CONFIGURATION TOOL
140
ANTI-VIRUS CONFIGURATION TOOL
142
CONTENT FILTERING CONFIGURATION TOOL
144
ANTI-SPAM CONFIGURATION TOOL
146
VPN CONFIGURATION TOOL
148
DHCP SERVER CONFIGURATION TOOL
150
NETWORK MONITORING CONFIGURATION TOOL
152
IP AND NETWORK INTERFACE CONFIGURATION TOOL
154
VLAN CONFIGURATION TOOL
156
QOS CONFIGURATION TOOL
158
LOGGER CONFIGURATION TOOL
160
REMOTE ACCESS CONFIGURATION TOOL
162
GLOBAL STATUS MAPS AND SITE VIEWS
164
USER ADMIN TOOLS

FIG. 9

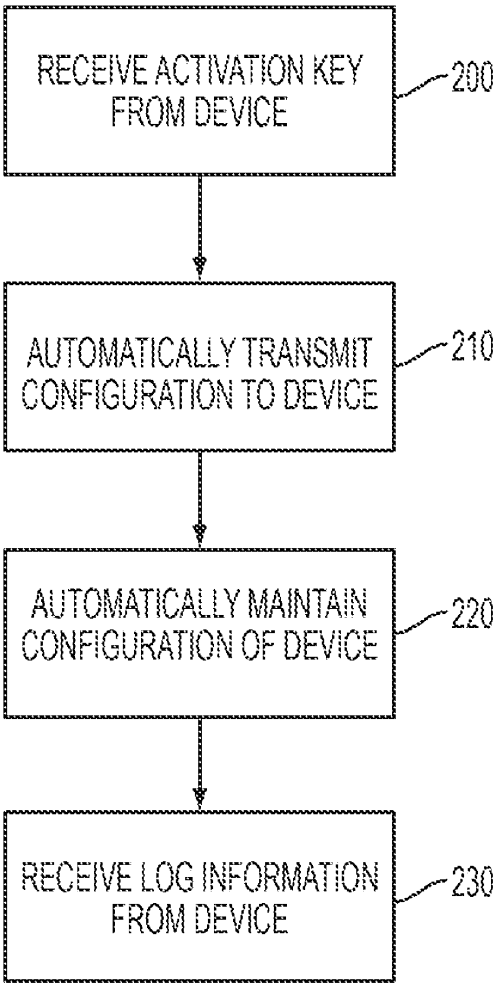
RECEIVE ACTIVATION KEY FROM DEVICE
200
AUTOMATICALLY TRANSMIT CONFIGURATION TO DEVICE
210
AUTOMATICALLY MAINTAIN CONFIGURATION OF DEVICE
220
RECEIVE LOG INFORMATION FROM DEVICE
230

FIG. 10

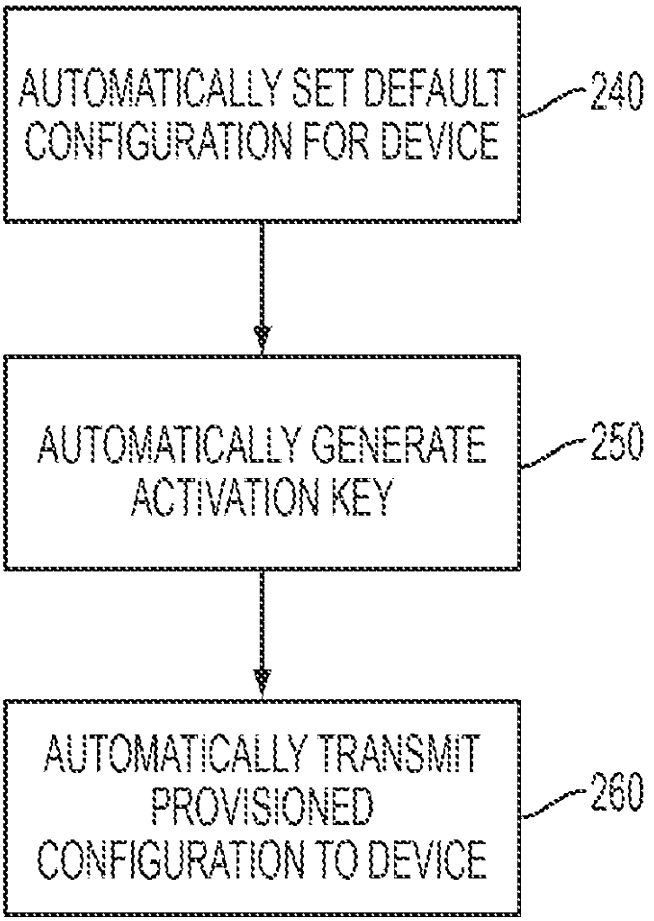

FIG. 11

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EX. 3 - 143

EX. 3 - 143

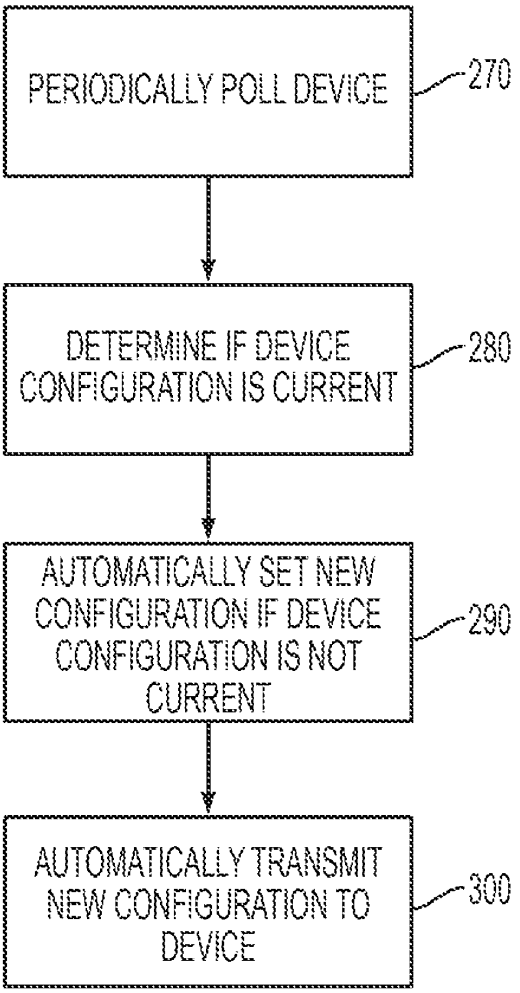

FIG. 12

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EX. 3 - 144

EX. 3 - 144

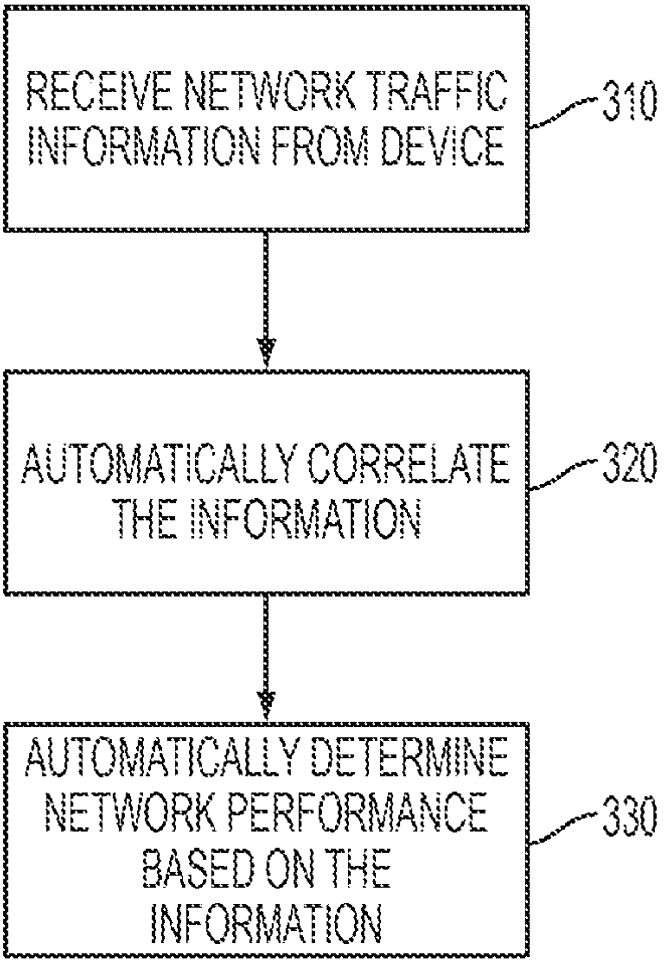

FIG. 13

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EX. 3 - 145

EX. 3 - 145

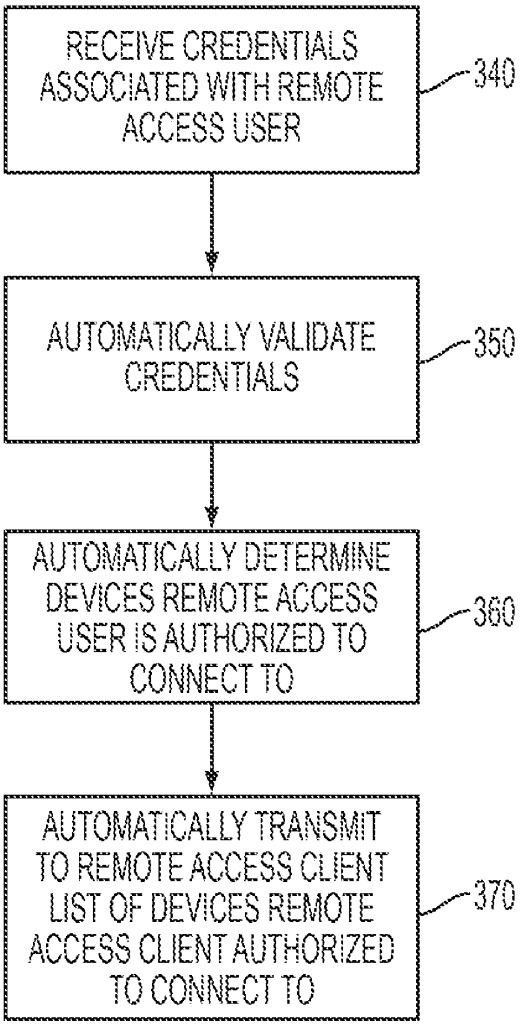
RECEIVE CREDENTIALS ASSOCIATED WITH REMOTE ACCESS USER
340
AUTOMATICALLY VALIDATE CREDENTIALS
350
AUTOMATICALLY DETERMINE DEVICES REMOTE ACCESS USER IS AUTHORIZED TO CONNECT TO
360
AUTOMATICALLY TRANSMIT TO REMOTE ACCESS CLIENT LIST OF DEVICES REMOTE ACCESS CLIENT AUTHORIZED TO CONNECT TO
370

FIG. 14

SYSTEMS AND METHODS FOR MANAGING A NETWORK

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation of U.S. patent application Ser. No. 12/833,832, filed on Jul. 9, 2010 now U.S. Pat. No. 8,078,777, which is incorporated herein by reference in its entirety and is a divisional application of U.S. patent application Ser. No. 11/106,837, filed Apr. 15, 2005 now U.S. Pat. No. 7,783,800, which is incorporated herein by reference in its entirety and claims the benefit under 35 U.S.C. §119(e) to U.S. Provisional Application No. 60/562,596, which was filed on Apr. 15, 2004 and is incorporated herein by reference in its entirety.

BACKGROUND

This application discloses an invention that is related, generally and in various embodiments, to systems and methods for managing a network.

Some network environments provide companies with critical information technology (IT) services for installing, connecting, managing and securing their network environment. However, traditional network implementations have required that network infrastructure capable of supporting computer applications be assembled using disparate hardware, software and systems that must be manually configured and managed. As a result, these traditional network implementations have been utilized primarily by large enterprises with large information technology (IT) budgets.

Small and medium businesses (SMBs) represent the majority of businesses, and their network management and security needs are no less critical that that of larger enterprises. However, due to budgetary and technological constraints, traditional secure network management systems, services, and elements are usually not a viable option for SMBs. Most SMBs lack the necessary IT staff and budget resources to effectively manage secure network environments that may be leveraged to deploy distributed applications that run on these networks and make those businesses more competitive.

SUMMARY

In one general respect, this application discloses a method of managing a network. According to various embodiments, the method includes receiving an activation key automatically transmitted from a device connected to the network, automatically transmitting a configuration to the device, automatically maintaining the configuration of the device, and receiving log information from the device.

According to various embodiments, the method includes automatically setting a default configuration for the device, automatically generating an activation key associated with a device, and automatically transmitting a provisioned configuration to the device after the device is connected to the network.

According to various embodiments, the method includes periodically polling a device connected to the network, automatically determining whether a configuration of the device is current, automatically setting a new configuration for the device when the configuration is not current, and automatically transmitting the new configuration to the device.

According to various embodiments, the method includes receiving network traffic information from a device connected to the network, automatically correlating the information, and automatically determining network performance based on the information.

According to various embodiments, the method includes receiving credentials associated with a remote access user, automatically validating the credentials, automatically determining which devices connected to the network the remote access user is authorized to connect to, and automatically transmitting to a remote access client a list of devices the remote access user is authorized to connect to.

In another general respect, this application discloses a system for managing a network. According to various embodiments, the system includes a device connected to the network and a management center in communication with the device via the Internet. The device includes a processor and a memory. The management center includes a first module for provisioning a configuration of the device, a second module for automatically transmitting the configuration to the device, and a third module for automatically maintaining the configuration of the device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates various embodiments of a system for managing a network;

FIG. **2** illustrates various embodiments of a device;

FIG. **3** illustrates various embodiments of the device;

FIG. **4** illustrates various embodiments of the device;

FIG. **5** illustrates various embodiments of a management center;

FIG. **6** illustrates various embodiments of a server;

FIG. **7** illustrates various embodiments of a server;

FIG. **8** illustrates various embodiments of a server;

FIG. **9** illustrates various embodiments of a web-based management portal;

FIG. **10** illustrates various embodiments of a method of managing a network;

FIG. **11** illustrates various embodiments of a method of managing a network;

FIG. **12** illustrates various embodiments of a method of managing a network;

FIG. **13** illustrates various embodiments of a method of managing a network; and

FIG. **14** illustrates various embodiments of a method of managing a network.

DETAILED DESCRIPTION

The systems and methods described herein may be utilized to provide for the automated delivery of managed services. It is to be understood that the figures and descriptions of the disclosed invention have been simplified to illustrate elements that are relevant for a clear understanding of the invention, while eliminating, for purposes of clarity, other elements. Those of ordinary skill in the art will recognize, however, that these and other elements may be desirable. However, because such elements are well known in the art, and because they do not facilitate a better understanding of the invention, a discussion of such elements is not provided herein.

FIG. **1** illustrates various embodiments of a system **10** for managing a network. The system **10** may be utilized to provide a company with critical information technology (IT) services for installing, connecting, managing and securing their network environment without having to rely on several discrete systems.

According to various embodiments, the system **10** includes a management center **12** and at least one device **14** in communication with the management center **12** via the Internet **16**. Although only three devices **14** are shown in FIG. **1**, the system **10** may include any number of devices **14** in communication with the management center **12** via the Internet **16**. Each device **14** may be located at a different customer location, and each device **14** may be connected to a different local area network **18**.

FIGS. **2-4** illustrate various embodiments of the device **14** of FIG. **1**. As shown in FIG. **2**, the device **14** includes a processor **20** and a memory **22**. According to various embodiments, the device **14** may also include a first fast ethernet port **24**, a second fast ethernet port **26**, and a third fast ethernet port **28**. As shown in FIG. **3**, the device **14** may be connected to a local area network **18** via the first fast ethernet port **24**, to a service provider wide area network **30** via the second fast ethernet port **26**, and to a demilitarized zone **32** via the third fast ethernet port **28**. The device **14** may serve to act as a security device to protect the local area network **18** and the demilitarized zone **32** from outside threats originating from the wide area network **30**. According to various embodiments, in lieu of being connected to the demilitarized zone **32** via the third fast ethernet port **28**, the device **14** may be connected to a redundant wide area network (not shown) via the third fast ethernet port **28**.

The local area network **18** may include network elements such as, for example, an ethernet switch **34**, a computer **36**, a wireless access point **38**, a printer **40**, a file server **42** and any other network elements known by those skilled in the art to comprise a portion of a local area network. The demilitarized zone **32** may include network elements such as, for example, an ethernet switch **44**, an e-mail server **46**, a web server **48** and any other network elements known by those skilled in the art to comprise a portion of a demilitarized zone.

As shown in FIG. **4**, the device **14** may include a Linux based operating system and the following modules: an auto-provisioning module **50**, an auto-update module **52**, a firewall module **54**, an intrusion prevention module **56**, an anti-virus module **58**, a content filtering module **60**, an anti-spam module **62**, a VPN module **64**, a DHCP server module **66**, a distributed network management poller module **68**, an inline network performance monitoring module **70**, a logger module **72**, a remote access server module **74**, an IP and network interface module **76**, a QOS module **78**, and a VLAN module **80**.

The auto-provisioning module **50** of the device **14** is operable to provide the device **14** with auto-provisioning functionality. For example, according to various embodiments, the auto-provisioning module **50** allows for the device **14** to be auto-configured based on an activation code entered by an installer during installation of the device **14** at a customer location.

The auto-update module **52** of the device **14** is operable to provide the device **14** with auto-update functionality. For example, according to various embodiments, the auto-update module **52** allows for the device **14** to be automatically updated whenever updates to the device **14** are available. The updates may include, for example, operating system updates, intrusion prevention rule updates, anti-virus signature updates, and content filtering database updates.

The firewall module **54** of the device **14** is operable to provide the device **14** with firewall functionality. For example, according to various embodiments, the firewall module **54** allows for the device **14** to perform deep packet inspection, stateful inspection, network address translation, port address translation and port forwarding.

The intrusion prevention module **56** of the device **14** is operable to provide the device **14** with intrusion prevention functionality. For example, according to various embodiments, the intrusion prevention module **56** allows for the device **14** to perform real-time traffic analysis and logging, protocol analysis, and content searching and matching. The intrusion prevention module **56** may also allow for the device **14** to detect a variety of attacks and probes such as, for example, buffer overflows, operating system fingerprinting attempts, common gateway interface attacks and port scans.

The anti-virus module **58** of the device **14** is operable to provide the device **14** with anti-virus functionality. For example, according to various embodiments, the anti-virus module **58** of the device **14** allows for the device **14** to provide an Internet gateway protection service that protects against viruses and malicious code that may be downloaded from the Internet **16** to the local area network **18**. According to various embodiments, the anti-virus module **58** of the device **14** allows for the integration of the device **14** and an anti-virus client installed on one or more devices that comprise a portion of the local area network **18**. The anti-virus module **58** allows for the device **14** to block access to the Internet **16** for any device of the local area network **18** that does not have the most current anti-virus client and anti-virus signature database installed thereon. The anti-virus module **58** of the device **14** may redirect such blocked devices to a webpage that will allow for the device to be updated to include the most current anti-virus client and anti-virus signature database.

The content filtering module **60** of the device **14** is operable to provide the device **14** with content filtering functionality. For example, according to various embodiments, the content filtering module **60** of the device **14** allows for the device **14** to act as a transparent proxy which inspects each request made from the local area network **18** to the Internet **16**. The content filtering module **60** may determine whether to grant or deny the request to access a particular website based on defined policies. For instances where the request is granted, the content filtering module **60** may further determine which types of files are allowed to be downloaded from the Internet **16** to the local area network **18**. According to various embodiments, each policy may be defined as a blacklist or a whitelist. If the policy is defined as a blacklist, the content filtering module **60** operates to allow access to all sites except those explicitly defined to be blocked. If the policy is defined as a whitelist, the content filtering module **60** operates to block access to all sites except those explicitly defined to be allowed.

The anti-spam module **62** is operable to provide the device **14** with anti-spam and e-mail anti-virus functionality. For example, according to various embodiments, the anti-spam module **62** of the device **14** allows for the device **14** to act as a transparent proxy which inspects each e-mail message that transits the device **14** for viruses and malicious code. If the anti-spam module **62** identifies an e-mail as SPAM, the device **14** may block the e-mail. If the anti-spam module **62** identifies an e-mail as containing a virus, the device **14** may attempt to disinfect the e-mail. If the e-mail is cleaned, the device **14** may forward the cleaned e-mail along with a message that the e-mail contained a virus. If it is not possible to disinfect the e-mail, the device **14** may block the e-mail.

The VPN module **64** of the device **14** is operable to provide the device **14** with VPN functionality. For example, according to various embodiments, the VPN module **64** provides the encryption protocol for the automatic building of a site to site VPN which is implemented as a secure tunnel that connects two different devices **14**. A secure socket layer (SSL) is used to create the encrypted tunnel between the two devices **14**. In

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instances where a device **14** is assigned a new WAN IP Address, the VPN module **64** allows for all of the tunnels connecting the device **14** to other devices **14** to automatically reconfigure themselves to establish new tunnels to the device **14** at the new IP Address. According to various embodiments, the VPN module **64** of the device **14** allows for the cooperation of the device **14** and a remote access client.

The DHCP server module **66** of the device **14** is operable to provide the device **14** with DHCP server functionality. For example, according to various embodiments, the DHCP server module **66** allows the device **14** to provide IP addresses and configuration parameters to network devices requesting this information using the DHCP protocol. IP address pools with characteristics such as default gateways, domain names, and DNS servers can be defined. Static assignments can also be defined based on MAC address.

The distributed network management poller module **68** of the device **14** is operable to provide the device **14** with distributed network management poller functionality. For example, according to various embodiments, the distributed network management poller module **68** allows the device **14** to poll network elements that comprise a portion of a local area network **18** and are in communication with the device **14**. For example, the distributed network management poller module **68** may utilize Internet control message protocol pings to determine a reachability value and a latency value for one or more of the network elements. The distributed network management poller module **68** may also utilize simple network management protocol (SNMP) to poll SNMP information from network elements that are SNMP capable. Such SNMP information may include, for example, CPU utilization or server temperature.

The inline network performance monitoring module **70** of the device **14** is operable to provide the device **14** with inline network performance monitoring functionality. For example, according to various embodiments, the inline network performance monitoring module **70** allows the device **14** to inspect each packet that transits the device **14** and record certain information such as source/destination IP address, protocol, and source/destination ports.

According to various embodiments, the inline network performance monitoring module **70** also allows the device **14** to monitor all network traffic that passes between the device **14** and another device **14**. Each device **14** has its time synchronized precisely to network time protocol servers (not shown). This allows for each device **14** to reference packet information with a common time reference. According to various embodiments, the inline network performance monitoring module **70** can record the exact time every packet leaves a device **14**, and record items such as, for example, source/destination IP address, protocol, sequence number and source/destination port. As the packets travel across the Internet **16**, the packets eventually reach the destination device **14**. The inline network performance monitoring module **70** of the destination device **14** records the exact time the packet is received by the destination device **14** and items such as, for example, source/destination IP address, protocol, sequence number and source/destination port.

The logger module **72** of the device **14** is operable to provide the device **14** with logging functionality. For example, according to various embodiments, the logger module **72** allows information obtained by the device **14** (e.g., intrusion prevention detections, anti-virus detections, network device polling results, source/destination IP addresses, application performance measurements, etc.) to be recorded, processed and transmitted to the management center **12**. According to various embodiments, the data collected by the inline network management monitoring module **70** of each device **14** is forwarded to the logger module **72** of the associated device **14**. After receiving the data, the logger modules **72** wait a random amount of time (e.g., between approximately 120 and 240 seconds) before transmitting the data to the management center **12**. This random delay is to prevent all the devices **14** from sending their data back to the management center **12** at the same time. If the management center **12** cannot be reached, the device **14** may queue the data locally until the management center **12** can be reached. When the management center **12** is reached, the logger module **72** will transmit all of the queued data. The data that is transmitted uses a system queue which insures that regular user network traffic will always have priority and this data transfer will only use the unused bandwidth on the network connection.

The remote access server module **74** of the device **14** is operable to provide the device **14** with remote access capability. For example, according to various embodiments, the remote access server module **74** allows for the cooperation of the device **14** with a remote access client.

The IP and network interface module **76** is operable to provide the device **14** with the capability to configure the network interface characteristics such as IP Address type (e.g., static IP, DHCP, or PPPOE), IP address, subnet mask, speed and duplex. The IP and network interface module **76** is also operable to provide the device **14** with the capability to configure IP routing.

The QOS module **78** of the device **14** is operable to provide the device **14** with QOS functionality. For example, according to various embodiments, the QOS module **78** allows the device **14** to selectively transmit packets based on the relative importance of the packet. The QOS module **48** may also allow the device **14** to inspect each packet and determine a particular queue to send the packet to based on defined rules. Rules may be defined, for example, based on source/destination IP address and/or port information. If a packet does not match any rule, it may be sent to a default queue.

The VLAN module **80** of the device **14** is operable to provide the device **14** with VLAN functionality. For example, according to various embodiments, the first and third fast Ethernet ports **24**, **28** of the device **14** that are connected to the local area network **18** and the demilitarized zone **32** may be configured as 802.1q trunk ports. The VLAN module **80** allows the device **14** to connect to many different VLANS from an Ethernet switch that has enabled trunking.

According to various embodiments, the device **14** may also automatically transmit performance information to the management center **12**. The performance information may include, for example, a CPU utilization value for the device **14**, a memory utilization value for the device **14**, and a network interface bandwidth utilization value for the device **14**. The performance data may also include, for example, the information obtained by the distributed network management poller module **68** of the device **14**.

FIG. **5** illustrates various embodiments of the management center **12** of FIG. **1**. The management center **12** includes a database cluster **82**, an activation server **84**, a logger server **86**, a manager server **88** and a web-based management portal **90**. The management center **12** is located external to any customer sites and may provide a shared infrastructure for multiple customers. According to various embodiments, the database cluster **82** includes a plurality of databases and structural query language (SQL) servers. According to various embodiments, the database cluster **82** includes a combination of structural query language servers and open source MySQL servers. The databases hold all of the data required

by the activation server **84**, the logger server **86**, the manager server **88** and the web-based management portal **90**.

FIG. **6** illustrates various embodiments of the activation server **84**. The activation server **84** may include a Linux based operating system, and may include an auto-provisioning manager module **92**, an auto-update manager module **94** and an activation manager module **96**. The auto-provisioning manager module **92** is operable to configure any device **14** that is in the process of being activated. The auto-update manager module **94** is operable to update the operating system of any device **14** that is in the process of being activated. The auto-update manager module **94** is also operable to update the various databases and signature files used by applications resident on the device **14** (e.g., intrusion prevention, anti-virus, content filtering). The activation manager module **96** is operable to communicate with the back-end SQL servers of the database cluster **82** to gather the necessary data required by the auto-provisioning manager module **92** to generate device configurations. The activation manager module **96** is also operable to authenticate incoming devices **14** and determine their identity based on the activation key.

According to various embodiments, the activation server **84** is a collection of hosted servers that are utilized to set up the initial configuration of each device **14**. Based on an activation key received from the device **14** when the device **14** is first installed, the activation server **84** automatically sends the appropriate configuration to the device **14**. The activation server **84** also assigns the device **14** to a redundant pair of logger servers **86** and a redundant pair of manager servers **88**.

FIG. **7** illustrates various embodiments of the logger server **86**. The logger server **86** may include a Linux based operating system and a logger server module **98**. According to various embodiments, the logger server **86** is a collection of hosted servers that receive log information from the devices **14** and correlates the information.

FIG. **8** illustrates various embodiments of the manager server **88**. The manager server **88** may include a Linux based operating system and the following modules: an auto-provisioning manager module **100**, an auto-update manager module **102**, a firewall configuration manager module **104**, an intrusion prevention configuration manager module **106**, an anti-virus configuration manager module **108**, a content filtering configuration manager module **110**, an anti-spam configuration manager module **112**, a VPN configuration manager module **114**, a DCHP server configuration manager module **116**, a network management monitor module **118**, a distributed network management configuration manager module **120**, an inline network management configuration manager module **122**, an IP and network interface configuration manager **124**, a VLAN configuration manager module **126**, a QOS configuration manager module **128**, a logger configuration manager module **130**, a remote access configuration manager module **132**, and a network graph generator module **134**.

According to various embodiments, the manager server **88** is a collection of servers that are utilized to manage the devices **14**. The manager server **88** transmits the configuration and the updates to the device **14**. The manager server **88** also monitors the device **14**, stores performance data, and generates graphs for each device **14** and each network element monitored by the device **14**. For example, the auto-update manager module **102** may periodically poll each device **14** and determines whether each device **14** has the most current version of the device operating system, the anti-virus signature database, the content filtering database and the intrusion protection database. If the auto-update manager module **102** determines that a particular device **14** does not have the most current version of the operating system and databases, the auto-update manager module **102** operate to will automatically transmit the appropriate update to the device **14**.

The VPN configuration manager module **114** may automatically configure the VPN tunnels for each device **14**. When the particular device **14** is first activated, the device **14** contacts the manager server **88** and reports its public Internet address. The auto-provisioning manager module **100** records the reported address and stores it in the database cluster **82**. The VPN configuration manager module **114** may also gather all of the VPN configuration information from the database cluster **82** for each device **14** that is provisioned to have a VPN connection to the particular device **14**. The VPN configuration manager module **114** may also create configuration files for each of the devices **14**. After the manager server **88** transmits the configurations to each of the devices **14**, secure encrypted tunnels are established between each of the devices **14**.

When a particular device **14** is issued a new IP address, the device **14** automatically transmits its new LP address to the manager server **88**. The auto-update manager module **102** responds to this IP address change and automatically generates new configurations for all of the devices **14** that have tunnels to the particular device **14**. The VPN configuration manager module **114** automatically transmits the new configurations to the devices **14** and the encrypted tunnels automatically reconverge.

FIG. **9** illustrates various embodiments of the web-based management portal **90**. The web-based management portal **90** may include a Windows or Linux based operating system and the following modules: a firewall configuration tool module **136**, an intrusion prevention configuration tool module **138**, an anti-virus configuration tool module **140**, a content filtering configuration tool module **142**, an anti-spam configuration tool module **144**, a VPN configuration tool module **146**, a DHCP server configuration tool module **148**, a network monitoring configuration tool module **150**, an IP and network interface configuration tool module **152**, a VLAN configuration tool module **154**, a QOS configuration tool module **156**, a logger configuration tool module **158**, a remote access configuration tool module **160**, a global status maps and site views module **162** and a user administration tool module **164**.

According to various embodiments, the web-based management portal **90** includes a collection of integrated centralized network management systems and a grouping of customer management tools. According to various embodiments, the web-based management portal **90** is a combination of many different web servers running Microsoft Internet Information Server or Apache. The web pages may be written in Microsoft's ASP.NET or PHP, and the web applications may interface with the SQL servers of the database cluster **82** to synchronize changes to the network environment as changes are made to the configuration of the devices **14** via the web-based management portal **90**. The web-based management portal **90** may further include the capability for firewall management, intrusion prevention management, anti-virus management, content filtering management, anti-spam management, site to site and remote access virtual private network management, network monitoring, network configuration, account management and trouble ticketing.

The firewall configuration tool module **136** allows for centralized management of the firewall policies for each device **14**. According to various embodiments, the firewall for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The firewall con-

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figuration tool module **136** allows a user to efficiently and securely manage all of the firewalls and define global policies that are easily applied to all firewalls at once. The firewall configuration tool module **136** also allows the customer to set custom firewall polices to each individual firewall. Each firewall can also have individual user permissions to restrict which user accounts can modify which firewalls. This capability may provide an administrator at each site the ability to manage their own firewall and yet restrict them from changing the configuration of any other firewalls in the network. A notification can be automatically sent to a group of administrators every time a change is made to a firewall policy. A firewall validation tool allows a user to run a security check against their current firewall settings and report on which ports are open and any vulnerabilities that are detected. The firewall configuration tool module **136** may also be used to view firewall log information.

The intrusion prevention configuration tool module **138** allows for the centralized management of the intrusion prevention rules for each device **14**. According to various embodiments, the intrusion prevention system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The intrusion prevention configuration tool module **138** allows a user to efficiently and securely manage all of the intrusion prevention systems and define global policies that are easily applied to all intrusion prevention systems at once. The intrusion prevention configuration tool module **138** also allows the customer to set custom intrusion prevention rules to each individual intrusion prevention system. Each intrusion prevention system can also have individual user permissions to restrict which user accounts can modify which intrusion prevention system. This capability may provide an administrator at each site the ability to manage their own intrusion prevention system and yet restrict them from changing the configuration of any other intrusion prevention systems in the network. An e-mail notification can be automatically sent to a group of administrators every time a change is made to an intrusion prevention system configuration. The intrusion prevention configuration tool module **138** may also be used to view intrusion protection log information.

The anti-virus configuration tool module **140** allows for the centralized management of the anti-virus policies for each device **14**. According to various embodiments, the anti-virus service includes two anti-virus systems. The first anti-virus system for a given local area network **18** may be embodied as an anti-virus gateway service that resides on the device **14** associated with the given local area network **18**. The second anti-virus system is a desktop anti-virus agent that resides on each customer computer (e.g., computer **36**) that requires anti-virus protection. The anti-virus configuration tool module **140** allows a user to efficiently and securely manage both of the anti-virus systems and define global policies that are easily applied to all anti-virus systems at once. The anti-virus configuration tool module **140** also allows a user to set custom anti-virus policies to each individual anti-virus gateway. Each anti-virus system can also have individual user permissions to restrict which user accounts can modify which anti-virus system. This capability may provide an administrator at each site the ability to manage their own anti-virus policies and yet restrict them from changing the configuration of any other anti-virus systems in the network. An e-mail notification can be automatically sent to a group of administrators every time a change is made to an anti-virus system configuration. The anti-virus configuration tool module **140** may also be used to view anti-virus log information.

The content filtering configuration tool module **142** allows for the centralized management of the content filtering policies for each device **14**. According to various embodiments, the content filtering system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The content filtering configuration tool module **142** allows a user to efficiently and securely manage all of the content filtering systems and define global policies that are easily applied to all content filtering systems at once. The content filtering configuration tool module **142** also allows the customer to set custom content filtering policies to each individual content filtering system. Each content filtering system can also have individual user permissions to restrict which user accounts can modify which content filtering system. This capability may provide an administrator at each site the ability to manage their own content filtering system and yet restrict them from changing the configuration of any other content filtering systems in the network. An e-mail notification can be automatically sent to a group of administrators every time a change is made to a content filtering system configuration. The content filtering configuration tool module **142** may also be used to view content filtering log information.

The anti-spam configuration tool module **144** allows for the centralized management of the anti-spam policies for each device **14**. According to various embodiments, the anti-spam system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The anti-spam configuration tool module **144** allows a user to efficiently and securely manage all of the anti-spam systems and define global policies that are easily applied to all anti-spam systems at once. The anti-spam configuration tool module **144** also allows a user to set custom anti-spam policies to each individual anti-spam system. Each anti-spam system can also have individual user permissions to restrict which user accounts can modify which anti-spam system. This capability may provide an administrator at each site the ability to manage their own anti-spam system and yet restrict them from changing the configuration of any other anti-spam systems in the network. A notification can be automatically sent to a group of administrators every time a change is made to an anti-spam system configuration. The anti-spam configuration tool module **144** may also be used to view anti-spam log information.

The VPN configuration tool module **146** allows for the centralized management of the VPN policies for each device **14**. According to various embodiments, the VPN system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The VPN configuration tool module **146** allows a user to efficiently and securely manage all of the VPN systems and define global policies that are easily applied to all VPN systems at once. The VPN configuration tool module **146** also allows a user to set custom VPN policies to each individual VPN system. Each VPN system can also have individual user permissions to restrict which user accounts can modify which VPN system. This capability may provide an administrator at each site the ability to manage their own VPN system and yet restrict them from changing the configuration of any other VPN systems in the network. A notification can be automatically sent to a group of administrators every time a change is made to a VPN system configuration.

The DHCP server configuration tool module **148** allows for the centralized management of the DHCP server policies for each device **14**. According to various embodiments, the DHCP server for a given local area network **18** resides on the device **14** associated with the given local area network **18**.

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The DHCP server configuration tool module **148** allows a user to efficiently and securely manage all of the DHCP servers and define global policies that are easily applied to all DHCP servers at once. The DHCP server configuration tool module **148** also allows a user to set custom DHCP server policies to each individual DHCP server. Each DHCP server can also have individual user permissions to restrict which user accounts can modify which DHCP server. This capability may provide an administrator at each site the ability to manage their own DHCP server and yet restrict them from changing the configuration of any other DHCP server in the network. A notification can be automatically sent to a group of administrators every time a change is made to a DHCP server configuration.

The network monitoring configuration tool module **150** allows for the centralized management of the network monitoring policies for each device **14**. According to various embodiments, the network monitoring system for a given local area network **18** resides on the device **14** associated with the given local area network **18**. The network monitoring configuration tool module **150** allows a user to efficiently and securely manage all of the network monitoring systems and define global policies that are easily applied to all network monitoring systems at once. The network monitoring configuration tool module **150** also allows a user to set custom network monitoring policies to each individual network monitoring system. Each network monitoring system can also have individual user permissions to restrict which user accounts can modify which network monitoring system. This capability may provide an administrator at each site the ability to manage their own network monitoring system and yet restrict them from changing the configuration of any other network monitoring systems in the network. A notification can be automatically sent to a group of administrators every time a change is made to a network monitoring system configuration.

The IP and network interface configuration tool module **152** allows for the centralized management of the network configuration for each device **14**. The centralized management of the network configuration may include, for example, managing IP Address, IP Types (static IP, DHCP, PPPOE), IP routing, Ethernet Trunking, VLANs, and QOS configuration. According to various embodiments, the IP and network interface configuration tool module **152** allows a user to efficiently and securely manage all of the devices **14**. Each device **14** can also have individual user permissions to restrict which user accounts can modify the network configuration. This capability may provide an administrator at each site the ability to manage their own network configuration and yet restrict them from changing the configuration of any other devices **14** in the network. A notification can be automatically sent to a group of administrators every time a change is made to a device network configuration.

The global status maps and site views module **162** allows an authorized user to view the real-time status of their network, devices **14**, and network elements that are monitored by the devices **14**. This global status maps and site views module **162** provides a global map of the world, and countries and continents on this map are color coded to represent the underlying status of any devices **14** that reside in that region. For example a customer may have devices **14** in the United States, Japan, and Italy. If all of devices **14** and network elements monitored by the devices **14** are operating as expected, the countries on the map will be shown as green. When a device **14** in Japan ceases to operate as expected, the portion of the map representing Japan may turn red or yellow depending on the severity of the problem. The countries on the map can be selected to drill down into a lower level map. For example, the authorized user could select the United States from the world map and be presented with a state map of the United States. The individual states may be color coded to represent the underlying status of any devices **14** that reside in that state. For each state selected, a list of the sites and devices **14** in that state may be shown. The states on the map can be selected to drill down into a lower level sub map. The lower level sub map may show for example, a particular region, city, or customer site.

The global status maps and site views module **162** may read the latest data polled for each device **14** and the network elements that are monitored by them. It may also check the data against preset thresholds that determine what the status of each device **14** should be set to. It may determine the color for the lowest level map item that contains the device **14** and set the status appropriately. The status and color for each higher level map is set to represent the status of the underlying map. The color of each map item represents the severity of the most severe problem of a device **14** in that region. For example, if a device **14** is not operating as expected, all of the maps that have a region that include this device **14** will be shown as yellow. If a device **14** is operating in a manner associated with the color yellow, all of the maps that have a region that include this device **14** will be shown as yellow. A map region will only be shown as green if all devices **14** included in that map region are operating as expected.

The user administration tool module **164** allows for the centralized management of a number of functionalities. According to various embodiments, the user administration tool module **164** allows a user to set up an account profile and manage different aspects of a user profile such as name, address and account name. According to various embodiments, the user administration tool module **164** allows a user to manage all orders for secure network access platform products and services including a description and status of orders and allows a user to order additional items as well. According to various embodiments, the user administration tool module **164** allows a user to manage bills, including reading current invoices, making payment, updating billing information, downloading previous statements, and invoices.

According to various embodiments, the user administration tool module **164** allows a user to add and change user accounts, delete user accounts, change passwords, create new groups, move users into certain individuals and groups, and set permissions for those individuals and groups. The permissions may allow access to different portions of the web-based management portal **90**. For example, a finance employee may be given access to only account administration tools for billing and order management. Similarly, a technical employee may be given access to only the technical sections of the web-based management portal **90** and not to billing center or order management sections. According to various embodiments, the user administration tool module **164** may allow a user to open trouble tickets, track the status of existing trouble tickets, and run some of the diagnostic tools available in the secure network access platform environment.

According to various embodiments, the management center **12** may correlate all information received from the devices **14**, including performance information received from the devices **14**.

Each of the modules described hereinabove may be implemented as microcode configured into the logic of a processor, or may be implemented as programmable microcode stored in electrically erasable programmable read only memories. According to other embodiments, the modules may be implemented by software to be executed by a processor. The soft-

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ware may utilize any suitable algorithms, computing language (e.g., C, C++, Java, JavaScript, Visual Basic, VBScript, Delphi), and/or object oriented techniques and may be embodied permanently or temporarily in any type of computer, computer system, device, machine, component, physical or virtual equipment, storage medium, or propagated signal capable of delivering instructions. The software may be stored as a series of instructions or commands on a computer readable medium (e.g., device, disk, or propagated signal) such that when a computer reads the medium, the described functions are performed.

Although the system **10** is shown in FIG. **1** as having wired data pathways, according to various embodiments, the network elements may be interconnected through a secure network having wired or wireless data pathways. The secure network may include any type of delivery system comprising a local area secure network (e.g., Ethernet), a wide area secure network (e.g., the Internet and/or World Wide Web), a telephone secure network, a packet-switched secure network, a radio secure network, a television secure network, a cable secure network, a satellite secure network, and/or any other wired or wireless communications secure network configured to carry data. The secure network may also include additional elements, such as intermediate nodes, proxy servers, routers, switches, and adapters configured to direct and/or deliver data.

FIG. **10** illustrates various embodiments of a method of managing a network. According to various embodiments, the method includes receiving an activation key automatically transmitted from a device connected to the network, automatically transmitting a configuration to the device, automatically maintaining the configuration of the device, and receiving log information from the device. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **200**, where the management center **12** receives an activation key automatically transmitted from a device **14** connected to the network. Prior to the start of the process at block **200**, the configuration of the device **14** is provisioned by an entity such as, for example, an administrator or a managed service provider. The entity may initiate the provisioning of the device **14** by logging onto the web-based management portal **90** and entering a license key associated with the device **14**. The license key may be generated by a managed service provider and may be issued with the purchase of the device **14**. The license key may include information such as the product type of the device **14**, the term length of the license associated with the device **14**, and the seller of the license. A hash function may be used to embed the information in the key to obscure the data, and the data may be read by the network manager to verify the authenticity of the license key.

Once the license key is received by the web-based management portal **90**, the configuration of the device **14** may be provisioned via the web-based management portal **90**. Setting the configuration of the device **14** may include setting the IP address of the device **14**, and setting the configurations for the firewall configuration, the intrusion prevention configuration, the anti-virus configuration, the content filtering configuration, the anti-spam configuration, the VPN configuration, the DHCP server configuration, the network management configuration, the network interface configuration, the VLAN configuration, the QOS configuration and any other device configurations. Each configuration provisioned for the device **14** may be stored in the database cluster **82**. According to various embodiments, a default configuration may be selected for the device **14**.

During the provisioning process, an activation key associated with the device **14** is generated and may be printed out or e-mailed for later use. The configuration of the device **14** and the generation of the activation key may be completed from any location by accessing the web-based management portal **90**.

Once the provisioning process is completed, the device **14** may be installed at the customer location. After the device **14** is connected to the local area network **18**, the device **14** automatically attempts to DHCP for a wide area network IP address. As most Internet service providers assign IP addresses using DHCP, in most cases the device **14** will automatically obtain its wide area network IP address. For Internet service providers who do not use DHCP, the wide area network IP address can be obtained using PPPOE. Alternatively, a wide area network IP address may be statically assigned to the device **14**.

According to various embodiments, the device **14** is configured with the DNS names of a number of the hosted servers that comprise the activation server **84**. Once the device **14** obtains a wide area network IP address, the device **14** automatically attempts to communicate with one of the hosted servers that comprise the activation server **84**. When the communication is successful, the activation key is entered and the device **14** transmits the activation key to the activation server **84**. The activation key may be entered by an installer of the device **14**. The process associated with block **200** may be repeated for any number of devices **14**.

From block **200**, the process advances to block **210**, where the activation server **84** automatically transmits the configuration provisioned at block **200** to the device **14**. After the device **14** receives its configuration from the activation server **84**, an installer of the device **14** may be prompted to reboot the device **14**. Once the device **14** reboots, the device **14** automatically connects to its assigned manager server **88** and the installation of the device **14** is complete. The process associated with block **210** may be repeated for any number of devices **14**

From block **210**, the process advances to block **220**, where the management center **12** automatically maintains the configuration of the device **14**. According to various embodiments, a flag is set in the database servers of the database cluster **82** when a change to the configuration of the device **14** is entered via the web-based management portal **90**. According to various embodiments, the auto-provisioning manager module **100** periodically polls the database cluster **82** looking for changes to the configurations of the devices **14** managed by the manager server **88**. When the auto-provisioning manager module **100** detects a device configuration that needs to be changed, the appropriate module (e.g., firewall, intrusion prevention, anti-virus, etc.) will generate the new configuration for the particular service and make the necessary configuration changes to the device **14** that needs to be updated. The process associated with block **220** may be repeated for any number of devices **14**.

From block **220**, the process advances to block **230**, where the logger manager **86** receives log information from the device **14**. As explained previously, the log information received from each device **14** may be compressed and encrypted, and may represent information associated with, for example, a firewall system, an intrusion prevention system, an anti-virus system, a content filtering system, an anti-spam system, etc. residing at the particular device **14**. Once

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the logger manager **86** receives the log information, the logger manager **86** correlates the log information and makes it available to other elements of the management center **12**. The correlated information may be utilized to determine both the real time and historical performance of the network.

FIG. **11** illustrates various embodiments of a method of managing a network. According to various embodiments, the method includes automatically setting a default configuration for the device, automatically generating an activation key associated with a device, and automatically transmitting a provisioned configuration to the device after the device is connected to the network. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **240**, where a default configuration is set for the device **14**. According to various embodiments, the web-based management portal **90** may provide the default configuration that serves as the basis for the device configuration. The process associated with block **240** may be repeated for any number of devices **14**.

From block **240**, the process advances to block **250**, where an activation key associated with a device is automatically generated. According to various embodiments, the activation key may be generated by the web-based management portal **90** during the provisioning of the device **14**. The provisioning of the device **14** may include changing some of the settings of the default configuration. The process associated with block **250** may be repeated for any number of devices **14**.

From block **250**, the process advances to block **260**, where the provisioned configuration is automatically transmitted to the device **14** after the device **14** is connected to the network. According to various embodiments, the activation server **84** may automatically transmit a provisioned configuration to the device **14** after the device **14** is connected to the network. The process associated with block **260** may be repeated for any number of devices **14**.

FIG. **12** illustrates various embodiments of a method of managing a network. According to various embodiments, the method includes periodically polling a device connected to the network, automatically determining whether a configuration of the device is current, automatically setting a new configuration for the device when the configuration is not current, and automatically transmitting the new configuration to the device. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **270**, where a device **14** connected to the network is periodically polled. According to various embodiments, the periodic polling may be conducted by the manager server **88**. The process associated with block **270** maybe repeated for any number of devices **14**.

From block **270**, the process advances to block **280**, where it is automatically determined whether the configuration of the device **14** is current. According to various embodiments, the automatic determination may be made by the manager server **88**. The process associated with block **280** maybe repeated for any number of devices **14**.

From block **280**, the process advances to block **290**, where a new configuration is automatically set for the device **14** when the configuration of the device **14** is not current. According to various embodiments, the new configuration may be automatically set by the manager server **88**. The process associated with block **290** maybe repeated for any number of devices **14**.

From block **290**, the process advances to block **300**, where the new configuration is automatically transmitted to the device **14**. According to various embodiments, the new configuration may be automatically transmitted to the device **14** by the manager server **88**. The process associated with block **300** maybe repeated for any number of devices **14**.

FIG. **13** illustrates various embodiments of a method of managing a network. According to various embodiments, the method includes receiving network traffic information from a device connected to the network, automatically correlating the information, and automatically determining network performance based on the information. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **310**, where network traffic information is received from a device **14** connected to the network. The network traffic information may represent information that travels from one device **14** to another device **14**. According to various embodiments, the network traffic information is captured at the device **14** and may include, for example, source/destination IP address, protocol, sequence number and source/destination port. According to various embodiments, the network traffic information transmitted from the device **14** is received by the manager server **88**. The process associated with block **310** maybe repeated for any number of devices **14**.

From block **310**, the process advances to block **320**, where the information is correlated. According to various embodiments the information may be correlated with network traffic information transmitted from any number of devices **14**. According to various embodiments, the correlation of the information is conducted by the manager server **88**.

From block **320**, the process advances to block **330**, where the network performance is determined based on the information. According to various embodiments, the network performance determination is made by the manager server **88**. For example, assume that ten VOIP packets leave a first device **14** destined for a second device **14**. As explained previously, the first device **14** may record the exact time each VOIP packet leaves, and the source/destination IP Address, protocol, sequence number and source/destination port for each VOIP packet. The first device **14** may then send this information to the manager server **88**. Further assume that these ten VOIP packets travel over the Internet **16**, the third and eighth VOIP packets are lost, dropped by a router that is over-utilized. The second device **14** will only see eight VOIP packets arrive, not knowing that the third and eighth packets were lost. The second device **14** may then record the exact time each packet is received and the source/destination IP Address, protocol, sequence number, and source/destination port for each received packet. The second device **14** may then send this information to the manager server **88**. The manager server **88** may then examine the information transmitted from the first and second devices **12**, **14** and determine, based on the IP Address, protocol, sequence number, and source/destination port that the packets recorded by both the first and second devices **14** are part of the same packet stream. Armed with this information, the manager server **88** may then determine the exact latency and jitter of each packet, and the packet loss (20% in this example) on a real application data stream.

The process associated with block **330** may be repeated for network traffic information received from any number of devices **14**.

FIG. **14** illustrates various embodiments of a method of managing a network. According to various embodiments, the method includes receiving credentials associated with a remote access user, automatically validating the credentials, automatically determining which devices connected to the network the remote access user is authorized to connect to, and automatically transmitting to a remote access client a list of devices the remote access user is authorized to connect to. The network may be, for example, a local area network, or a number of local area networks that rely on the Internet to communicate with one another. The device may be, for example, the device **14** described hereinabove. The method may be utilized to provide an automated managed service for a complex network environment.

The process starts at block **340**, where credentials associated with a remote access user is received from a remote access client. The remote access user is a user who is located at a site that does not have a device **14** associated therewith. According to various embodiments, the credentials are received by the web-based management portal **90**. The remote access client may be implemented as a software client installed on a personal computer such as, for example, a desktop computer or a laptop computer. According to various embodiments, when the software client is launched, it requires the remote access user to input their credentials (e.g., company ID, username, password). After the remote access user enters the credentials, the software client may make a secure socket layer connection to the web-based management portal **90**. The process associated with block **340** may be repeated for any number of remote access users.

From block **340**, the process advances to block **350**, where the credentials are automatically validated. According to various embodiments, the credentials may be automatically validated by the web-based management portal **90**. If the credentials are not valid, the web-based management portal **90** may return an error message to the remote access client which may then prompt the remote access user to reenter their credentials. The process associated with block **350** may be repeated for any number of remote access users.

From block **350**, the process advance to block **360**, where it is determined which devices **14** connected to the network the remote access user is authorized to connect to. According to various embodiments, the determination is made by the web-based management portal **90**. The process associated with block **360** may be repeated for any number of remote access users.

From block **360**, the process advances to block **370**, where a list of the devices **14** is automatically transmitted to a remote access client associated with the remote access user. According to various embodiments, the list is automatically transmitted from the web-based management portal **90**. Once the list is presented to the remote access user and a particular device **14** is selected, an encrypted tunnel may be established between the personal computer and the selected device **14**. The process associated with block **370** may be repeated for any number of remote access users.

Each of the methods described above may be performed by the system **10** of FIG. **1** or by any suitable type of hardware (e.g., device, computer, computer system, equipment, component); software (e.g., program, application, instruction set, code); storage medium (e.g., disk, device, propagated signal); or combination thereof.

While several embodiments of the invention have been described, it should be apparent, however, that various modifications, alterations and adaptations to those embodiments may occur to persons skilled in the art with the attainment of some or all of the advantages of the disclosed invention. For example, the system **10** may further include a plurality of graphical user interfaces to facilitate the management of the network. The graphical user interfaces may be presented through an interactive computer screen to solicit information from and present information to a user in conjunction with the described systems and methods. The graphical user interfaces may be presented through a client system including a personal computer running a browser application and having various input/output devices (e.g., keyboard, mouse, touch screen, etc.) for receiving user input. It is therefore intended to cover all such modifications, alterations and adaptations without departing from the scope and spirit of the disclosed invention as defined by the appended claims.

What is claimed is:

1. A method for providing a managed network, comprising:

sending, by a computer network management device, via a first network and to a management center external to the managed network, an activation key indicating the activation of the computer network management device;

in response to the sending of the activation key, receiving, by the computer network management device, from the management center and via the first network, at least one configuration to cause the computer network management device to provide at least one managed network service for the managed network, wherein the at least one configuration comprises:

a virtual private network (VPN) configuration to cause the computer network management device to provide a VPN service, the VPN service to enable a remote access client device in communication with the network management device via the first network to communicate securely with at least one network element of the managed network; and

an internet protocol (IP) routing and network interface configuration to cause the computer network management device to provide an IP routing and network interface service.

2. The method of claim **1**, wherein the management center comprises a shared infrastructure for simultaneously providing managed network services to users of multiple networks including the managed network.

3. The method of claim **1**, wherein the at least one configuration further comprises:

a quality of service (QOS) configuration to cause the computer network management device to enable selective transmission of information by the computer network management device based on a relative metric of the information;

an anti-virus configuration to cause the computer network management device to provide an anti-virus service to the managed network;

a content filtering configuration to cause the computer network management device to provide a content filtering service to the managed network;

an anti-spam configuration to cause the computer network management device to provide an anti-spam service to the managed network; and

a device monitoring configuration to cause the computer network management device to provide a device monitoring service, the device monitoring service to monitor one or more network elements, the one or more network elements connected to the managed network and external to the computer network management device.

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4. The method of claim 1, further comprising generating the activation key.

5. The method of claim 1, further comprising:

determining whether the at least one configuration of the computer network management device is current; and

setting a new configuration for each of the at least one configuration that is not current.

6. The method of claim 1, further comprising:

transmitting performance information from the computer network management device, wherein the performance information comprises at least one of:

a CPU utilization value;

a memory utilization; and

a network interface bandwidth utilization value.

7. The method of claim 6, wherein the performance information comprises performance information gathered from one or more network elements connected to the managed network and external to the computer network management device.

8. The method of claim 7, wherein the performance information gathered from the one or more network elements comprises at least one of the following:

a reachability value;

a latency value; and

a CPU utilization value.

9. A system for providing a managed network, the system comprising:

a computer network management device comprising at least one processor and operatively associated memory, the computer network management device programmed to:

send via a first network and to a management center external to the managed network, an activation key indicating the activation of the computer network management device;

in response to the sending of the activation key, receive from the management center and via the first network at least one configuration to cause the computer network management device to provide at least one managed network service for the managed network, wherein the at least one configuration comprises:

a virtual private network (VPN) configuration to cause the computer network management device to provide a VPN service, the VPN service to enable a remote access client device in communication with the network management device via the first network to communicate securely with at least one network element of the managed network; and

an internet protocol (IP) routing and network interface configuration to cause the computer network management device to provide an IP routing and network interface service.

10. The system of claim 9, wherein the management center comprises a shared infrastructure for simultaneously providing managed network services to users of multiple networks including the managed network.

11. The system of claim 9, wherein the at least one configuration further comprises:

a quality of service (QOS) configuration to cause the computer network management device to enable selective transmission of information by the by the computer network management device based on a relative metric of the information;

an anti-virus configuration to cause the computer network management device to provide an anti-virus service to the managed network;

a content filtering configuration to cause the computer network management device to provide a content filtering service to the managed network;

an anti-spam configuration to cause the computer network management device to provide an anti-spam service to the managed network; and

a device monitoring configuration to cause the computer network management device to provide a device monitoring service, the device monitoring service to monitor one or more network elements, the one or more network elements connected to the managed network and external to the computer network management device.

12. The system of claim 9, wherein the computer network management device is further programmed to:

determine whether the at least one configuration of the first network management device is current; and

set a new configuration for each of the at least one configuration that is not current.

13. The system of claim 9, wherein the computer network management device is further programmed to transmit performance information to a management center, the performance information comprising at least one of the following:

a CPU utilization value;

a memory utilization value; and

a network interface bandwidth utilization value.

14. The system of claim 13, wherein the performance information comprises performance information gathered from one or more network elements connected to the managed network and external to the computer network management device.

15. The system of claim 14, wherein the performance information gathered from the one or more network elements comprises at least one of the following:

a reachability value;

a latency value; and

a CPU utilization value.

* * * * *

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UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

NOTICE OF ASSIGNMENT TO UNITED STATES MAGISTRATE JUDGE FOR DISCOVERY

This case has been assigned to District Judge Ronald S. W. Lew and the assigned discovery Magistrate Judge is Alicia G. Rosenberg.

The case number on all documents filed with the Court should read as follows:

CV13- 259 RSWL (AGRx)

Pursuant to General Order 05-07 of the United States District Court for the Central District of California, the Magistrate Judge has been designated to hear discovery related motions.

All discovery related motions should be noticed on the calendar of the Magistrate Judge

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NOTICE TO COUNSEL

A copy of this notice must be served with the summons and complaint on all defendants (if a removal action is filed, a copy of this notice must be served on all plaintiffs).

Subsequent documents must be filed at the following location:

☐ **Western Division**
312 N. Spring St., Rm. G-8
Los Angeles, CA 90012

☐ **Southern Division**
411 West Fourth St., Rm. 1-053
Santa Ana, CA 92701-4516

☐ **Eastern Division**
3470 Twelfth St., Rm. 134
Riverside, CA 92501

Failure to file at the proper location will result in your documents being returned to you.

KEVIN E. GAUT (SBN 117352) keg@msk.com
KARIN G. PAGNANELLI (SBN 174763) kgp@msk.com
MITCHELL SILBERBERG & KNUPP LLP
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Los Angeles, CA 90064
Telephone: (310) 312-2000
Facsimile: (310) 312-3100

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

CLEARPATH NETWORKS, INC., a Delaware corporation,

PLAINTIFF(S)

v.

MERAKI, INC., a Delaware corporation, and CISCO SYSTEMS, INC., a California corporation,

DEFENDANT(S).

CASE NUMBER

CV13-00259 RSWL(AGRx)

SUMMONS

TO: DEFENDANT(S): MERAKI, INC. and CISCO SYSTEMS, INC.

A lawsuit has been filed against you.

Within 21 days after service of this summons on you (not counting the day you received it), you must serve on the plaintiff an answer to the attached ☒ complaint ☐ _____ amended complaint ☐ counterclaim ☐ cross-claim or a motion under Rule 12 of the Federal Rules of Civil Procedure. The answer or motion must be served on the plaintiff's attorney, Kevin E. Gaut, whose address is Mitchell Silberberg & Knupp LLP, 11377 W. Olympic Boulevard, Los Angeles, CA 90064. If you fail to do so, judgment by default will be entered against you for the relief demanded in the complaint. You also must file your answer or motion with the court.

Dated: JAN 14 2013

Clerk, U.S. District Court

By: JULIE PRADO
Deputy Clerk

(Seal of the Court)

[Use 60 days if the defendant is the United States or a United States agency, or is an officer or employee of the United States. Allowed 60 days by Rule 12(a)(3)].

UNITED STATES DISTRICT COURT, CENTRAL DISTRICT OF CALIFORNIA
CIVIL COVER SHEET

I (a) PLAINTIFFS (Check box if you are representing yourself ☐)	DEFENDANTS
CLEARPATH NETWORKS, INC., a Delaware corporation	MERAKI, INC.,, a Delaware corporation; and CISCO SYSTEMS, INC., a California corporation
(b) Attorneys (Firm Name, Address and Telephone Number. If you are representing yourself, provide same.) KEVIN E. GAUT (SBN 117352) keg@msk.com KARIN G. PAGNANELLI (SBN 174763) kgp@msk.com MITCHELL SILBERBERG & KNUPP LLP 11377 W. Olympic Blvd., Los Angeles, CA 90064 Telephone: (310) 312-2000; Facsimile: (310) 312-3100	Attorneys (If Known)

II. BASIS OF JURISDICTION (Place an X in one box only.)

☐ 1 U.S. Government Plaintiff ☒ 3 Federal Question (U.S. Government Not a Party)
☐ 2 U.S. Government Defendant ☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES - For Diversity Cases Only (Place an X in one box for plaintiff and one for defendant.)

	PTF	DEF		PTF	DEF
Citizen of This State	☐ 1	☐ 1	Incorporated or Principal Place of Business in this State	☐ 4	☐ 4
Citizen of Another State	☐ 2	☐ 2	Incorporated and Principal Place of Business in Another State	☐ 5	☐ 5
Citizen or Subject of a Foreign Country	☐ 3	☐ 3	Foreign Nation	☐ 6	☐ 6

IV. ORIGIN (Place an X in one box only.)

☒ 1 Original Proceeding ☐ 2 Removed from State Court ☐ 3 Remanded from Appellate Court ☐ 4 Reinstated or Reopened ☐ 5 Transferred from another district (specify): ☐ 6 Multi-District Litigation ☐ 7 Appeal to District Judge from Magistrate Judge

V. REQUESTED IN COMPLAINT: JURY DEMAND: ☒ Yes ☐ No (Check 'Yes' only if demanded in complaint.)
CLASS ACTION under F.R.C.P. 23: ☐ Yes ☒ No ☒ **MONEY DEMANDED IN COMPLAINT: $** according to proof

VI. CAUSE OF ACTION (Cite the U. S. Civil Statute under which you are filing and write a brief statement of cause. Do not cite jurisdictional statutes unless diversity.)
35 U.S.C. Section 271, et seq.

VII. NATURE OF SUIT (Place an X in one box only.)

OTHER STATUTES
☐ 400 State Reapportionment
☐ 410 Antitrust
☐ 430 Banks and Banking
☐ 450 Commerce/ICC Rates/etc.
☐ 460 Deportation
☐ 470 Racketeer Influenced and Corrupt Organizations
☐ 480 Consumer Credit
☐ 490 Cable/Sat TV
☐ 810 Selective Service
☐ 850 Securities/Commodities/ Exchange
☐ 875 Customer Challenge 12 USC 3410
☐ 890 Other Statutory Actions
☐ 891 Agricultural Act
☐ 892 Economic Stabilization Act
☐ 893 Environmental Matters
☐ 894 Energy Allocation Act
☐ 895 Freedom of Info. Act
☐ 900 Appeal of Fee Determination Under Equal Access to Justice
☐ 950 Constitutionality of State Statutes

CONTRACT
☐ 110 Insurance
☐ 120 Marine
☐ 130 Miller Act
☐ 140 Negotiable Instrument
☐ 150 Recovery of Overpayment & Enforcement of Judgment
☐ 151 Medicare Act
☐ 152 Recovery of Defaulted Student Loan (Excl. Veterans)
☐ 153 Recovery of Overpayment of Veteran's Benefits
☐ 160 Stockholders' Suits
☐ 190 Other Contract
☐ 195 Contract Product Liability
☐ 196 Franchise

REAL PROPERTY
☐ 210 Land Condemnation
☐ 220 Foreclosure
☐ 230 Rent Lease & Ejectment
☐ 240 Torts to Land
☐ 245 Tort Product Liability
☐ 290 All Other Real Property

TORTS PERSONAL INJURY
☐ 310 Airplane
☐ 315 Airplane Product Liability
☐ 320 Assault, Libel & Slander
☐ 330 Fed. Employers' Liability
☐ 340 Marine
☐ 345 Marine Product Liability
☐ 350 Motor Vehicle
☐ 355 Motor Vehicle Product Liability
☐ 360 Other Personal Injury
☐ 362 Personal Injury-Med Malpractice
☐ 365 Personal Injury-Product Liability
☐ 368 Asbestos Personal Injury Product Liability

IMMIGRATION
☐ 462 Naturalization Application
☐ 463 Habeas Corpus-Alien Detainee
☐ 465 Other Immigration Actions

TORTS PERSONAL PROPERTY
☐ 370 Other Fraud
☐ 371 Truth in Lending
☐ 380 Other Personal Property Damage
☐ 385 Property Damage Product Liability

BANKRUPTCY
☐ 22 Appeal 28 USC 158
☐ 423 Withdrawal 28 USC 157

CIVIL RIGHTS
☐ 441 Voting
☐ 442 Employment
☐ 443 Housing/Accommodations
☐ 444 Welfare
☐ 445 American with Disabilities – Employment
☐ 446 American with Disabilities – Other
☐ 440 Other Civil Rights

PRISONER PETITIONS
☐ 510 Motions to Vacate Sentence Habeas Corpus
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☐ 535 Death Penalty
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☐ 550 Civil Rights
☐ 555 Prison Condition

FORFEITURE / PENALTY
☐ 610 Agriculture
☐ 620 Other Food & Drug
☐ 625 Drug Related Seizure of Property 21 USC 881
☐ 630 Liquor Laws
☐ 640 R.R.& Truck
☐ 650 Airline Regs
☐ 660 Occupational Safety /Health
☐ 690 Other

LABOR
☐ 710 Fair Labor Standards Act
☐ 720 Labor/Mgmt. Relations
☐ 730 Labor/Mgmt. Reporting & Disclosure Act
☐ 740 Railway Labor Act
☐ 790 Other Labor Litigation
☐ 791 Empl. Ret. Inc. Security Act

PROPERTY RIGHTS
☐ 820 Copyrights
☒ 830 Patent
☐ 840 Trademark

SOCIAL SECURITY
☐ 61 HIA(1395ff)
☐ 862 Black Lung (923)
☐ 863 DIWC/DIWW 405(g))
☐ 864 SSID Title XVI
☐ 865 RSI (405(g))

FEDERAL TAX SUITS
☐ 870 Taxes (U.S. Plaintiff or Defendant)
☐ 871 IRS-Third Party 26 USC 7609

CV13-00259

FOR OFFICE USE ONLY: Case Number: _____

AFTER COMPLETING THE FRONT SIDE OF FORM CV-71, COMPLETE THE INFORMATION REQUESTED BELOW.

UNITED STATES DISTRICT COURT, CENTRAL DISTRICT OF CALIFORNIA
CIVIL COVER SHEET

VIII(a). IDENTICAL CASES: Has this action been previously filed in this court and dismissed, remanded or closed? ☒ No ☐ Yes
If yes, list case number(s): _____

VIII(b). RELATED CASES: Have any cases been previously filed inthis court that are related to the present case? ☒ No ☐ Yes
If yes, list case number(s): _____

Civil cases are deemed related if a previously filed case and the present case:

(Check all boxes that apply) ☐ A. Arise from the same or closely related transactions, happenings, or events; or
☐ B. Call for determination of the same or substantially related or similar questions of law and fact; or
☐ C. For other reasons would entail substantial duplication of labor if heard by different judges; or
☐ D. Involve the same patent, trademark or copyright, and one of the factors identified above in a, b or c also is present.

IX. VENUE: (When completing the following information, use an additional sheet if necessary.)

(a) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** named plaintiff resides.
☐ Check here if the government, its agencies or employees is a named plaintiff. If this box is checked, go to item (b).

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
Los Angeles	

(b) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** named defendant resides.
☐ Check here if the government, its agencies or employees is a named defendant. If this box is checked, go to item (c).

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
Los Angeles	

(c) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** claim arose.
Note: In land condemnation cases, use the location of the tract of land involved.

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
Los Angeles	

*** Los Angeles, Orange, San Bernardino, Riverside, Ventura, Santa Barbara, or San Luis Obispo Counties**
Note: In land condemnation cases, use the location of the tract of land involved

X. SIGNATURE OF ATTORNEY (OR PRO PER): _____ **Date** January 14, 2013
Kevin E. Gaut

Notice to Counsel/Parties: The CV-71 (JS-44) Civil Cover Sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law. This form, approved by the Judicial Conference of the United States in September 1974, is required pursuant to Local Rule 3 -1 is not filed but is used by the Clerk of the Court for the purpose of statistics, venue and initiating the civil docket sheet. (For more detailed instructions, see separate instructions sheet.)

Key to Statistical codes relating to Social Security Cases:

Nature of Suit Code	Abbreviation	Substantive Statement of Cause of Action
861	HIA	All claims for health insurance benefits (Medicare) under Title 18, Part A, of the Social Security Act, as amended. Also, include claims by hospitals, skilled nursing facilities, etc., for certification as providers of services under the program. (42 U.S.C. 1935FF(b))
862	BL	All claims for "Black Lung" benefits under Title 4, Part B, of the Federal Coal Mine Health and Safety Act of 1969. (30 U.S.C. 923)
863	DIWC	All claims filed by insured workers for disability insurance benefits under Title 2 of the Social Security Act, as amended; plus all claims filed for child's insurance benefits based on disability. (42 U.S.C. 405(g))
863	DIWW	All claims filed for widows or widowers insurance benefits based on disability under Title 2 of the Social Security Act, as amended. (42 U.S.C. 405(g))
864	SSID	All claims for supplemental security income payments based upon disability filed under Title 16 of the Social Security Act, as amended.
865	RSI	All claims for retirement (old age) and survivors benefits under Title 2 of the Social Security Act, as amended. (42 U.S.C. (g))