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Woodard et al.

(54) METHOD AND SYSTEM FOR SCANNING NETWORK DEVICES

(76) Inventors: **Keith Woodard**, Norfolk, MA (US); **Fernando Trias**, Medfield, MA (US)

Correspondence Address:
TESTA, HURWITZ & THIBEAULT, LLP
HIGH STREET TOWER
125 HIGH STREET
BOSTON, MA 02110 (US)

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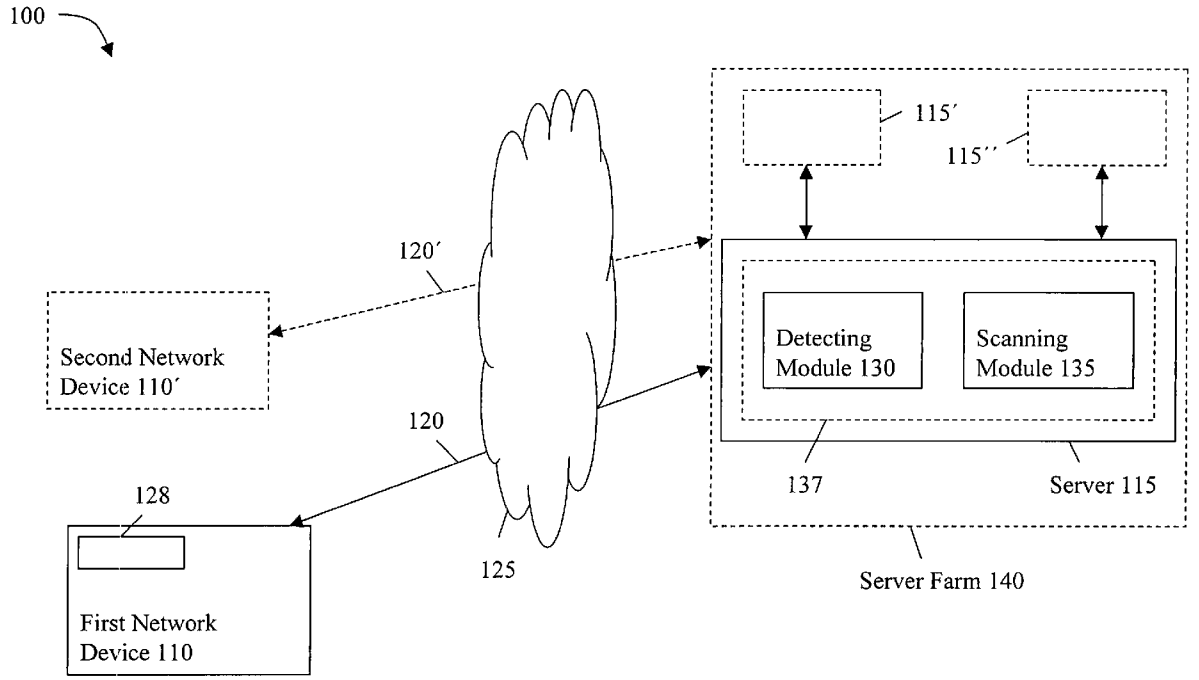
(57) ABSTRACT

The present invention includes a method and system for scanning network devices connected to a network by detecting connection of a first network device to the network and performing remote scanning of the first network device in response to detection of the first network device.



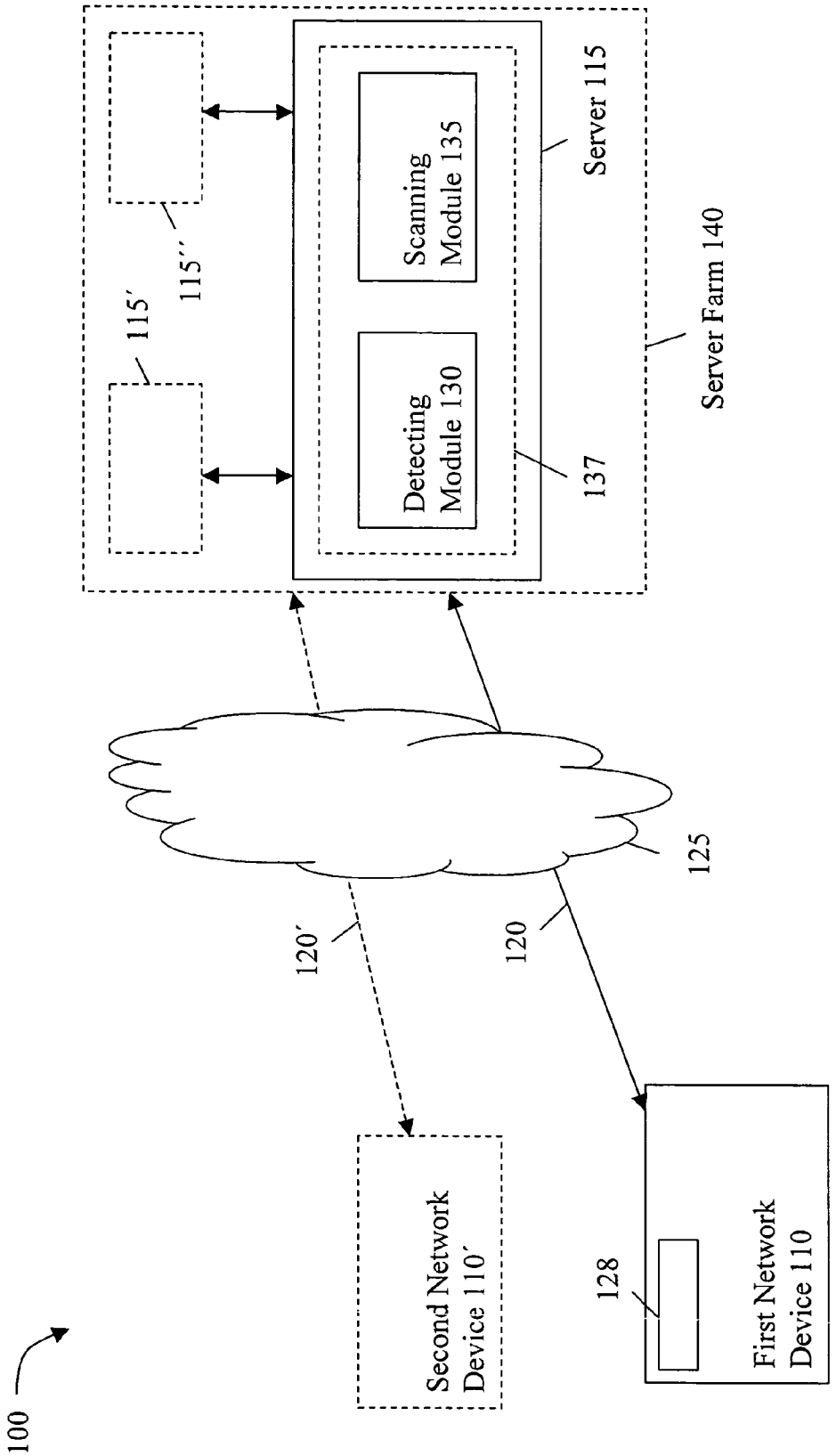

100
Second Network Device 110′
First Network Device 110
128
120′
120
125
115′
115″
Detecting Module 130
Scanning Module 135
137
Server 115
Server Farm 140

FIG. 1

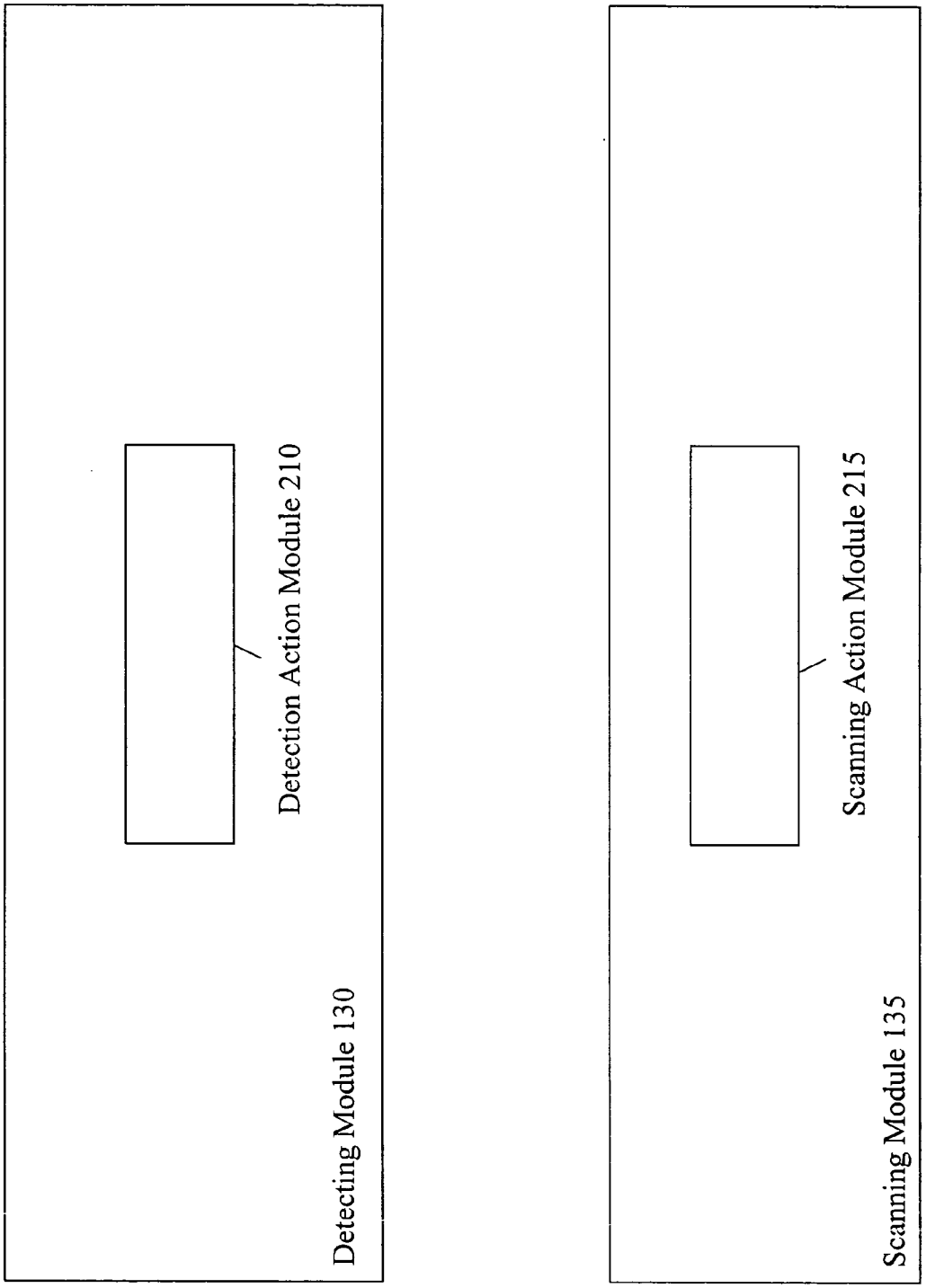

Detection Action Module 210
Detecting Module 130
Scanning Action Module 215
Scanning Module 135

FIG. 2

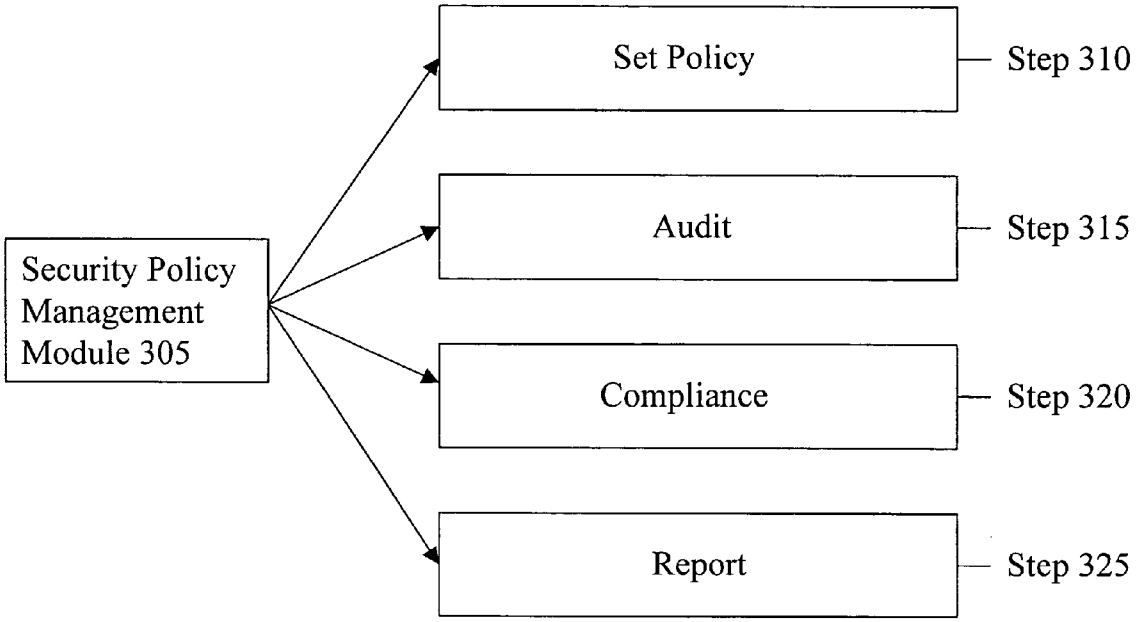

Security Policy Management Module 305
Set Policy
Step 310
Audit
Step 315
Compliance
Step 320
Report
Step 325

FIG. 3

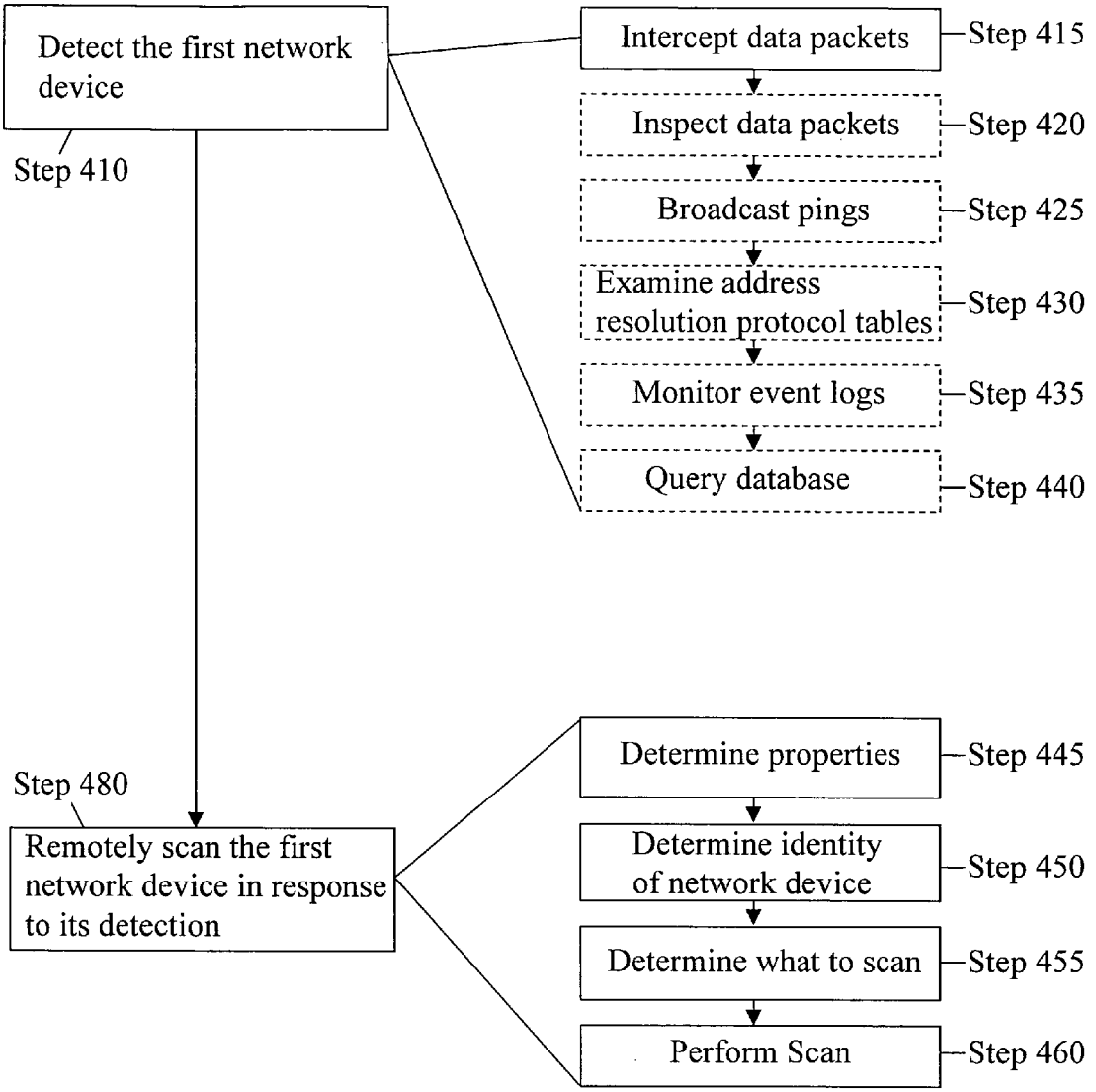

Detect the first network device
Step 410
Intercept data packets
Step 415
Inspect data packets
Step 420
Broadcast pings
Step 425
Examine address resolution protocol tables
Step 430
Monitor event logs
Step 435
Query database
Step 440
Step 480
Remotely scan the first network device in response to its detection
Determine properties
Step 445
Determine identity of network device
Step 450
Determine what to scan
Step 455
Perform Scan
Step 460

FIG. 4

METHOD AND SYSTEM FOR SCANNING NETWORK DEVICES

FIELD OF THE INVENTION

[0001] The present invention relates to scanning one or more network devices. More specifically, the present invention relates to performing scans of network devices upon detecting their connection to the network.

BACKGROUND OF THE INVENTION

[0002] The use of a computer to communicate over a network has become mainstream over the past decade. As a result, organizations and individuals typically rely on their networks to conduct business, communicate with others, and search for and retrieve data. In addition to helping businesses and individuals communicate and conduct business over a greater distance, the increased use of networks has also put computers at a greater risk. For example, the data stored on a computer communicating over a network such as the World Wide Web is vulnerable to viruses infecting the computer and destroying its data. Consequently, network security has become an item of paramount importance to organizations and individuals alike.

[0003] When configuring a network, a network security policy is often employed to ensure that each device communicating on the network is configured with specific and accepted security standards. For example, a corporation may have a security policy that states that all computers using the corporation's network must have a functioning virus scanner. This security policy may also specify the virus scanner that each device must have, such as by specifying that each device have Norton AntiVirus (manufactured by Symantec of Cupertino, Calif.).

[0004] As the number of devices communicating on the network increases, it usually becomes more difficult to make sure that each device communicating on the network meets the required security policy. Further, a breach in the security of the network may have a crippling effect, possibly resulting in down-time, computer repairs, and large costs to fix.

[0005] Traditionally, to lessen the risk of a security breach and ensure compliance with the security policy (e.g., having a functioning virus scanner), a security administrator or auditor uses a scanning application to scan a computer. The scanning application may be installed on each device communicating on the network to examine the device. This local scanning, however, introduces numerous problems. First, each individual device has the scanning application installed on the device. This may result in different devices having different versions of the scanning application. Moreover, the initiation of the scanning ordinarily occurs on the device itself. This may require a separate initiation sequence for each device. Further, the time required to deploy the scanning application on each device in the network is often too burdensome of a task to implement. Thus, local scanning is often too onerous to initiate and maintain.

[0006] Rather than using agent software to scan a device locally, a scanning application may instead periodically scan the networked computers remotely to locate any devices that do not follow the security policy. There are, however, numerous drawbacks associated with this scanning technique. One drawback is that the scan may not be comprehensive because some devices may have, for some reason, been turned off at the time of the scan and, consequently, may not have been scanned. Another shortcoming with periodic scanning is that there may be a significant delay between the time that a device attaches, or connects, to the network and the time that the scan occurs during the next scheduled scan. This time lag may result in a network being infected before a scan has occurred. Therefore, the periodic scanning, by its nature, does not enforce the security policy at all times.

[0007] A third weakness is that the periodic scan does not work well with computers that ordinarily connect to the network using transient means, such as with a virtual private network connection or using a wireless access point. In particular, the device may not be available at the time that the scan occurs because of the transient nature of the connection.

SUMMARY OF THE INVENTION

[0008] The present invention addresses the weaknesses of the scanning techniques described above and enables enforcement of a network security policy in a more robust and comprehensive manner. The present invention also increases scalability, coverage, and responsiveness of scanning while decreasing the implementation time. In one aspect, the invention includes a method for scanning network devices connected to a network by detecting connection of a first network device to the network and performing remote, agentless scanning of the first network device in response to detection of the first network device.

[0009] In one embodiment, the detecting module detects connection of the first network device by inspecting data packets communicated over the network. The detecting module can also detect connection of the first network device by querying a database. For example, the detecting module can continuously broadcast pings over the network, continuously examine address resolution protocol (ARP) tables, continuously monitor event logs, transmit a Lightweight Directory Access Protocol (LDAP) query (e.g., poll an LDAP server or execute a persistent LDAP search), and/or transmit a Domain Name System (DNS) query.

[0010] The method can also include determining whether the first network device is connecting to the network via wireless access, determining whether the first network device is connecting to the network via a Virtual Private Network (VPN), and/or determining whether the first network device is plugged into a wall socket.

[0011] In another embodiment, the remote agentless scanning step includes the steps of finding properties (e.g., credentials) associated with the first network device and determining the identity (e.g., type) of the first network device. Further, determining the identity of the first network device can include querying a database where the identity (e.g., type) has been determined, examining network traffic, analyzing network behavior, probing the first network device for signature responses, attempting to log into the device using a series of protocols, logging into the first network device and/or querying data within the device. In another embodiment, the remote agentless scanning also includes scanning, on the first network device, one or more of a configuration, a file, data, a software version, a patch, inventory, hardware, and/or a security vulnerability. The

scanning step can also include updating one or more of these items, such as installing a software patch on the first network device. The scanning step can also include installing anti-virus software on the first network device and/or determining if the first network device is part of a windows domain.

[0012] In another embodiment, the method includes the step of comparing a security setting of the first network device with a predetermined security setting. In yet another embodiment, the method includes the step of enabling the first network device to have additional access to the network, denying the first network device some or all access to the network, notifying another (e.g., authorities) about the first network device based on results of the scan, and/or quarantining the first network device.

[0013] In another embodiment, the method also includes the steps of setting a security policy on the first network device, auditing the security policy of the first network device, ensuring compliance with a predetermined security policy, and/or reporting results (e.g., of a scan).

[0014] In another aspect, an apparatus for remote agentless scanning of network devices connected to a network includes a detecting module that detects connection of a first network device to the network and a scanning module that performs remote agentless scanning of the first network device in response to the detection of the first network device.

[0015] In one embodiment, the detecting module continuously polls a database for data corresponding to newly attached (connected) network devices. Further, the scanning module remotely scans the first network device upon detecting data corresponding to the first network device in the database. The apparatus can also include a history database to store scan results of a scan. In another embodiment, the scanning module can enable the first network device to have additional access to the network, can deny the first network device some or all access to the network, can notify another (e.g., authorities) about the first network device based on results of the scan, and/or can quarantine the first network device.

[0016] The apparatus can also include a security policy management module for setting a security policy on the first network device, auditing the security policy of the first network device, ensuring compliance with a predetermined security policy, and/or reporting results (e.g., of a scan).

[0017] In yet another aspect, a method for examining a first network device connected to a network includes querying a database for data representing connection of network devices to a network, determining connection of a first network device to the network by locating data about the first network device in the database, determining properties (e.g., credentials, identity) of the first network device, determining the items to scan based on the properties (e.g., based on the identity of the first network device), and performing remote scanning of the first network device in response to the determination of the connection of the first network device to the network.

[0018] In one embodiment, the properties of the first network device include credentials of the first network device and/or the identity of the first network device. The identity of the first network device can include the type of the first network device. In one embodiment, the network device's type can be determined by querying a database where the type has already been determined, by examining network traffic, by analyzing network behavior, by probing the first network device for signature responses, and/or by logging into and querying the first network device. Moreover, a set of security policy settings can be selected for an audit.

[0019] In yet another aspect, a method for scanning network devices connected to a network includes detecting connection of a first network device to the network and performing remote scanning of the first network device in response to detection of the first network device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The advantages of the invention described above, together with further advantages, may be better understood by referring to the following description taken in conjunction with the accompanying drawings. In the drawings, like reference characters generally refer to the same parts throughout the different views. Also, the drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention.

[0021] **FIG. 1** is a block diagram of an embodiment of a security system having a detecting module and a scanning module constructed in accordance with the invention.

[0022] **FIG. 2** is a more detailed block diagram of an embodiment of the detecting module and the scanning module of **FIG. 1**.

[0023] **FIG. 3** is a block diagram illustrating an embodiment of a security policy management module.

[0024] **FIG. 4** is a flow diagram illustrating an embodiment of the steps performed by the detecting module and the scanning module of **FIG. 1**.

DETAILED DESCRIPTION

[0025] **FIG. 1** illustrates a block diagram of an embodiment of a security system **100**. The security system **100** includes a first network device **110** communicating with a server **115**. The first network device **110** can be any personal computer, smart or dumb terminal, network computer, wireless device (e.g., cellular telephone or personal digital assistant), information appliance, workstation, minicomputer, mainframe computer or other computing device. The first network device **110** can also include a network infrastructure device, such as a router, switch, or firewall.

[0026] The first network device **110** is in communication with the server **115** over a first network device-server communication channel **120**. Example embodiments of the communication channel **120** include standard telephone lines, LAN or WAN links (e.g., T1, T3, 56 kb, X.25), broadband connections (ISDN, Frame Relay, ATM), and wireless connections. The connections over the communication channel **120** can be established using a variety of communication protocols (e.g., HTTP, HTTPS, TCP/IP, IPX, SPX, NetBIOS, Ethernet, RS232, messaging application programming interface (MAPI) protocol, real-time streaming protocol (RTSP), real-time streaming protocol used for user datagram protocol scheme (RTSPU), the Progressive Networks Multimedia (PNM) protocol devel-

oped by RealNetworks, Inc. of Seattle, Wash., manufacturing message specification (MMS) protocol, and direct asynchronous connections).

[0027] In one embodiment, the first network device-server communication channel **120** is established over a network **125**. Exemplary embodiments of the network **125** include the World Wide Web (i.e., "web"), the Internet, and a Virtual Private Network (VPN). In one embodiment, the first network device **110** includes a web browser **128**, such as INTERNET EXPLORER developed by Microsoft Corporation of Redmond, Wash., to connect to the network **125**. Moreover, the security system **100** can include any number of network devices, such as the first network device **110** and a second network device **110'**. Although described above and below with respect to the first network device **110**, the description also applies to the second network device **110'**.

[0028] The server **115** can be any of the devices (e.g., wireless device, personal computer, etc.) described above for the first network device **110**. The server **115** includes a detecting module **130** and a scanning module **135**. Although shown as modules **130**, **135** that are executing on the server **115**, one or both of the modules **130**, **135** may also execute on another device that is separate from the server **115**. For example, the detecting module **130** can execute on another device (not shown) and communicate with the scanning module **135** on the server **115**. In another embodiment, the detecting module **130** and the scanning module **135** are incorporated into a single software module, such as a network examining module **137**.

[0029] The detecting module **130** and the scanning module **135** can be plug-in modules or stand-alone modules. Further, the detecting module **130** and/or the scanning module **135** can be downloaded to the server **115** over the web (e.g., from a web site), can be installed via portable means (e.g., disk, CD-ROM, etc.), can be received in an email (e.g., an email attachment), and the like.

[0030] The detecting module **130** detects connection of the first network device **110** to the network **125** when the first network device **110** connects to the network **125**. In one embodiment, attachment (or connection) to the network **125** occurs when the first network device **110** communicates with any other device or node of the network **125**. The scanning module **135** performs remote scanning of the first network device **110** in response to the detection of the first network device **110**. In particular, the scanning module **135** performs remote, agentless scanning of the first network device **110**. Therefore, the scanning module **135** scans the first network device **110** without the use of software loaded on the first network device **110**. The remote agentless scan can include a vulnerability scan and/or an audit scan. A vulnerability scan includes, for instance, a port scan and/or probing the first network device **110** against a large list of known vulnerabilities. An audit scan can include comparing current settings to a security policy or group of expected results. In one embodiment, the scanning module **135** takes an inventory of the first network device **110**. For example, the scanning module **135** can determine which software is loaded onto or executing on the first network device **110**, how frequently each software module or program executes or is accessed, the first network device's security policy, and the like.

[0031] In a further embodiment, the server **115** is a member of a server farm **140**, or server network, which is a logical group of one or more servers that are administered as a single entity. In one embodiment, a server farm **140** includes multiple servers **115**, **115'**, **115"** (generally **115**). Although the embodiment shown in **FIG. 1** has three servers **115**, the server farm **140** can have any number of servers. In other embodiments, the server farm **140** is a protected network that is inaccessible by unauthorized individuals, such as corporate Intranet, VPN, or secure extranet. Additionally, the servers **115** making up the server farm **140** may communicate over any of the networks described above (e.g., WAN, LAN) using any of the protocols discussed. Although described above and below as operating within a client-server network **125**, the detecting module **130** and/or the scanning module **135** can alternatively be implemented in any type of network (e.g., peer-to-peer network).

[0032] **FIG. 2** shows a more detailed block diagram of the detecting module **130** and the scanning module **135**. The detecting module **130** includes a detection action module **210** that performs one or more actions to detect when the first network device **110** attaches to the network **125**. The scanning module **135** includes a scanning action module **215** that performs one or more actions upon the detection of the first network device's connection to the network **125**.

[0033] To detect the first network device's connection to the network **125**, the detection action module **210** can, for instance, continuously poll a database for data about connections to the network **125**. In one embodiment, continuous polling of the database can be an unending repetition of checking the database at an extremely short frequency. In one embodiment, the first network device **110** registers with a database (e.g., a registration database) when the first network device **110** connects to the network **125**. Registration includes, for instance, sending particular data (e.g., network address) about the first network device **110** to the registration database when the first network device **110** connects to the network **125**. In one embodiment, the detection action module **210** continuously polls a LDAP server (e.g., a Directory System Agent (DSA)) in order to determine when the first network device **110** attaches to the network. In another embodiment, the registration database (e.g., on a DSA) is triggered (e.g., using a Structured Query Language trigger) when a new network device (e.g., the first network device **110**) registers with the database. The detection action module **210** can communicate with the registration database when the database is triggered.

[0034] In another embodiment, the detection action module **210** can communicate with a browser service to detect when the first network device **110** connects to the network **125**. In yet another embodiment, the detection action module **210** communicates with a DNS server to determine when the first network device **110** connects to the network **125**. The detection action module **210** can also perform indirect queries, such as using an LDAP persistent search, to detect the first network device **110** when the device connects to the network **110**.

[0035] When the detection action module **210** determines that the first network device **110** has connected to the network **125**, the detection action module **210** notifies the scanning module **135** of the new attachment. The scanning module **135** then automatically and remotely scans the first network device **110** without using an agent (i.e., agentless).

[0036] The scanning module **135** can take an inventory of the first network device **110**. In one embodiment, the scan-

ning action module **215** scans the first network device **110** for all software programs loaded on and/or executing on the first network device **110**. The scanning action module **215** can also scan the first network device **110** for particular software programs (e.g., programs loaded before a specific date, programs created by a particular developer, a specific virus (e.g., Blaster worm), etc.). Moreover, the scanning action module **215** can also interrogate the first network device **110** with a query about a particular item (e.g., program).

[**0037**] For example, the scanning module **135** can scan the first network device **110** for the latest patches, to determine if anti-virus software is installed, to determine whether firewall software is installed (and what kind), to determine if the first network device **110** belongs to an appropriate windows domain, and/or the privileges of the users of the first network device **110** (e.g., which users have administrative privileges). The scanning module **135** can also scan the first network device **110** to determine how the first network device **110** communicates with the network **125** and/or how the first network device **110** receives power (e.g., whether the first network device **110** is plugged into a wall socket (e.g., if the first network device **110** is a laptop), if the first network device **110** connects to the network **125** via a wireless access, or connects to the network **125** via a VPN).

[**0038**] The scanning module **135** can also perform maintenance, such as by fixing/updating software on the first network device **110**. The scanning module **135** can perform these fixes automatically (e.g., periodically), as part of a manually invoked scan, or through a scheduled scan. With respect to the first network device's security policy, for example, the scanning module **135** can assign priority to items and fix individual items, groups of items, or global problems in the security policy. For example, the scanning module **135** can fix deviations in the security policy of the first network device **110** relative to a predetermined security policy. In another embodiment, the scanning module **135** applies a software patch to the first network device **110**. The scanning module **135** can apply this patch automatically, can first notify the first network device **110** and wait for the device's response, can only notify the first network device **110** that the particular patch is needed to update the first network device's software, etc. Additionally, the scanning module **135** can also enable a rollback of the fix if the fix causes unexpected side effects.

[**0039**] The scanning module **135** can also detect anomalies. For example, if the first network device **110** is a server that always services requests from other devices, an anomaly occurs when the server begins making requests. If the scanning module **135** determines that this is occurring, the server is likely a security risk and/or infected with a virus. The scanning action module **215** can then perform one or more of the actions described above or below (e.g., quarantine the first network device **110**, report the anomaly, ensure compliance with a security policy, etc.). Another example of an anomaly that warrants maintenance is if the first network device **110** maintains and has maintained (e.g., for years) a particular load (e.g., 5% load) and then unexpectedly maintains a load of approximately 95%. This load increase can be a sign of an infected device that may need to be quarantined or fixed.

[**0040**] In further embodiments, the scanning module **135** enables a user to view the scans (i.e., scan results) in real-time for substantially immediate feedback and early detection and response planning. Alternatively, the scanning module **135** saves scans to one or more files or databases for offline analysis and reporting. Moreover, the scanning module **135** can follow a schedule for the timing of its scans. The scanning module **135** can also scan the first network device **110** as the first network device **110** attaches to a quarantined network. The first network device **110** can then switch to the corporate network if the first network device **110** passes an agentless scan.

[**0041**] In one embodiment, the scanning module **135** archives the results of scans in a history database. The history database can be part of the scanning module **135** or may communicate with the scanning module **135**. The scanning module **135** can also cache the type of device that the scanning module **135** scanned.

[**0042**] In some embodiments, the scanning module **135** quarantines (or enables quarantining of) software on the first network device **110**. For example, if the scanning module **135** locates a particular virus within a program on the first network device **110**, the scanning module **135** may quarantine the program having the virus or the first network device **110**. The scanning module **135** can quarantine the program to enable subsequent analysis of the program, such as to enable the disinfecting of the program, in a "closed" environment (i.e., not connected to a network). Moreover, the quarantining of the software program having a virus bolsters security by further ensuring that the virus does not affect other network devices (e.g., the second network device **110'**) or other programs executing or loaded onto the first network device **110** (e.g., other user's software executing on the first network device **110**). The scanning module **135** can also quarantine the first network device **110** that failed a scan by turning off the router port for the first network device **110** (e.g., at the switch). The scanning module **135** may also perform security functions for the first network device **110**.

[**0043**] Although shown as separate modules **210**, **215**, the detection action module **210** and/or the scanning action module **215** can be incorporated into the detecting module **130** and/or the scanning module **135**. Moreover, the scanning module **135** and the detecting module **130** can be incorporated into a single module.

[**0044**] In one embodiment and referring to **FIG. 3**, the scanning module **135** includes a security policy management module **305**. The security policy management module **305** performs security policy management functions to the security policy of the first network device **110**. For example, the security policy management module **305** can set the security policy of the first network device **110** (step **310**). In one embodiment, the security policy management module **305** sets the first network device's security policy as a security policy that is an industry standard, such as, for example, a security policy developed by Microsoft Corporation of Redmond, Wash., System Administration, Networking, and Security (SANS) Institute, National Security Agency (NSA), National Institute of Standards and Technology (NIST), Center for Internet Security (CIS), and the Department of U.S. Navy. Additionally, the security policy management module **305** can also enable customization of the security policy. This customization can be, for instance, expression based.

[**0045**] The security policy management module **305** can also audit the security of the first network device **110** (step

315). In one embodiment, the auditing step includes a data collection process that gathers data from each device (e.g., the first network device **110**) over the network **125**. The security policy management module **305** stores the collected data in, e.g., a database. The amount of and type of data that the security policy management module **305** collects can vary depending on, for example, the function of the first network device **110** (e.g., if the first network device **110** is a web server, a database, a file server, etc.) and the platform of the first network device **110** (e.g., UNIX (developed by Bell Laboratories of Murray Hill, N.J.) or WindowsXP® (developed by Microsoft Corporation of Redmond, Wash.)).

[**0046**] In one embodiment, the security policy management module **305** enables multiple levels of settings, multiple patches (e.g., for applications and the operating system), software and/or hardware inventory, complete and/or sparse audits, and can also enable a user (e.g., an auditor) to view their rights and/or responsibilities. These rights/responsibilities are associated with the user's role and scope of the project. The rights/responsibilities can be associated with the first network device **110**, specific security policy files, scanning, and the like. Moreover, the security policy management module **305** can also audit a group of devices (e.g., the first and second network devices **110**, **110'**), can fix security settings on the first network device **110** (or any number of additional network devices), and/or can audit on-demand or on a schedule.

[**0047**] The security policy management module **305** can also identify missing patches and identify unauthorized software (e.g., software with back doors), delete unlicensed or unauthorized software, identify unauthorized hardware (e.g., modems, wireless access points), eliminate unused system administration passwords on distributed systems, and/or provide control of external auditors' rights and responsibilities.

[**0048**] The security policy management module **305** can also automatically ensure that the first network device **110** complies with the requisite security policy (previously set) (step **320**). For example, the security policy management module **305** can configure the first network device **110** with the correct security settings, can identify, manage, and/or update patches that the first network device **110** needs or has, and/or can add/delete software and/or hardware.

[**0049**] In more detail, the security policy management module **305** can verify and/or change, for instance, passwords, system level settings, users, groups, rights, account policies, key permissions, file permissions, registry settings, and/or weak passwords. Moreover, the security policy management module **305** can detect, for example, an operating system, software inventory, the version level of the software, hardware devices, and/or unauthorized modems. Additionally, the security policy management module **305** can be scalable to any device or enterprise and enables remote, agentless auditing and reporting. In other embodiments, the security policy management module **305** restores any or all system settings, files, or file attributes of the first network device **110**.

[**0050**] The security policy management module **305** can also address additional security vulnerabilities of the first network device **110**. Particular examples include assuring password compliance, discovering and configuring unauthorized modems, managing licensed software and revisions, and/or verifying virus detection software and updates.

[**0051**] The security policy management module **305** can also report the security policy information (step **325**) or transmit the report to the first network device **110** (or any other device). The report can include detailed reports, such as reports with item-by-item and device-by-device listings, roll-up reports with device summaries for finding problem areas, executive summary reports with overall status reporting and high level charts, and trend reports that can be used to graph progress over time.

[**0052**] Although described above with a particular order (e.g., step **310**, step **315**, etc.), the functions that the security policy management module **305** performs can occur in any order and at any time. Further, these steps can be implemented in any of the modules (e.g., scanning module **135**) described above and below.

[**0053**] Referring to **FIG. 4**, the detecting module **130** detects the first network device **110** when the first network device **110** connects to the network **125** (step **410**). In one embodiment, the detecting module **130** intercepts data packets transmitted by the first network device **110** to detect the first network device **110** (step **415**). The detecting module **130** may also inspect data packets that are communicated over the network **125** for any data packets associated with the first network device **110** (step **420**).

[**0054**] As part of the interception (step **415**) and/or inspection (step **420**) of data packets over the network **125**, the detecting module **130** can perform one or more of a Network Basic Input/Output System (NetBios) broadcast, an ARP request or broadcast, a dynamic DNS registration, a Dynamic Host Configuration Protocol (DHCP) request, a Bootstrap Protocol (BOOTP) request, a Windows Domain Registration, a DNS query, and a "first packet seen" determination. The detection step **410** can also include port authentication.

[**0055**] The detection step **410** can also include continuous queries of, for example, a data source such as a database. These include broadcasting pings (step **425**) to all network devices connected to the network **125** to detect any network devices that have not yet been detected, querying one or more ARP tables of one or more network communication devices (e.g., router and/or switch) to determine if an address associated with a new network device (e.g., the first network device **110**) is located on the table (step **430**), monitoring event log/syslog (step **435**), a Simple Network Management Protocol (SNMP) query (e.g., to a router), LDAP query (e.g., to an Active Directory) (step **440**), DNS query (step **440**), switch port or Virtual Local Area Network (VLAN) status, and/or "sniffing" the network **125**.

[**0056**] In response to detecting the first network device **110**, the scanning module **135** remotely scans the first network device **110**. In one embodiment, the detecting module **130** communicates the detection to the scanning module **135** upon the detection of the first network device **110**.

[**0057**] To scan the first network device **110**, the scanning module **135** can determine properties (e.g., credentials) associated with the first network device **110** (step **445**) so that the scanning module **135** can perform the scan on the first network device **110**. The properties can come from a database (e.g., a "credentials store"), or the properties of the process performing the scan may enable a scan. The prop-

erties can include, for instance, a user name and password to log into the first network device **110**.

[**0058**] In one embodiment, the scanning module **135** then determines the identity (e.g., type) of the first network device **110** (step **450**). The scanning module **135** determines the identity of the first network device **110** to determine the protocols and/or application program interfaces (APIs) to use in the scanning of the first network device **110**. To determine the identity of the first network device **110**, the scanning module **135** can query a database where the identity has already been determined (e.g., querying an Active Directory or Structured Query Language (SQL) Server), examine network traffic, analyze network behavior, probe the device **110** for "signature" responses (i.e., responses known to be unique to that type of device **110**), and/or attempt to log into the first network device **110** using a series of protocols (e.g., Windows Networking Protocol (developed by Microsoft of Redmond, Wash.), Secure Shell (SSH) logged in, the scanning module **135** can query the first network device **110** for data, such as by looking for the presence of the file/etc/passwd to deduce a UNIX computer, or perform a Registry query on a Windows computer. Further, the determination of the properties of the first network device can also include the determining of the identity of the first network device **110** (i.e., steps **445** and **450** can be combined into a single step).

[**0059**] The scanning module **135** then determines what to scan (step **455**). As described above and depending on the identity of device **110** and user preferences, the scanning module **135** can determine which policy settings to audit. For example, on a Microsoft Windows computer **110**, the scanning module **135** may scan for missing Windows Hotfixes. On a Solaris® computer (developed by Sun Microsystems, Inc. of Santa Clara, Calif.), the scanning module **135** can scan for missing Solaris® patches.

[**0060**] The scanning module **135** can also execute and/or remove software from the first network device **110** as part of its scan. The scanning module **135** can additionally compare security settings of the first network device **110** with predefined security settings to, e.g., ensure compliance with the predefined security settings. For instance, a template may be followed for a group security policy. In one embodiment, if the scanning module **135** determines that three settings in the first network device's policy are different than the template, the scanning module **135** may change the settings to match the template or may take another action as a result of the difference. Alternatively, the scanning module **135** reports the difference as a result of the comparison.

[**0061**] In some embodiments, the scanning module **135** enables the first network device **110** to have additional access to the network **125** or denies the first network device's access to the network **125**. In one embodiment, enabling additional access to the network **125** includes enabling access to new areas of the network **125**, such as if the network **125** is segmented by firewalls or filtering routers (e.g., it is in a limited quarantine). Further, the scanning module **135** may also notify another (e.g., the authorities) when data obtained from the scan poses a security threat. For example, the scanning module **135** can compare the scan results to a list of predetermined security terms and notify the authorities if a match is found.

[**0062**] In one embodiment, the scanning module **135** and/or the detecting module **130** can notify the customer (e.g., the user of the first network device **110**) when a security setting changes. This notification can be with a phone call, e-mail, or directly with another software application. In another embodiment, the scanning module **135** is integrated into a software application's help desk software so that a help desk ticket is automatically opened when a failed scan occurs. The help desk ticket can result in a network administrator visiting the first network device **110** to interrogate the device **110**. Although illustrated with particular steps (e.g., steps **415-460**), the detecting module **130** and/or the scanning module **135** can perform any combination of these steps in any order.

[**0063**] Although the present invention has been described with reference to specific details, it is not intended that such details should be regarded as limitations upon the scope of the invention, except as and to the extent that they are included in the accompanying claims.

What is claimed is:

1. A method for scanning network devices connected to a network, comprising:

(a) detecting connection of a first network device to the network; and

(b) performing remote agentless scanning of the first network device in response to detection of the first network device.

2. The method of claim 1 wherein step (a) further comprises inspecting data packets communicated over the network.

3. The method of claim 1 wherein the detecting step further comprises querying a database.

4. The method of claim 3 further comprising continuously broadcasting pings on the network, continuously examining address resolution protocol tables, continuously monitoring event logs, transmitting a Lightweight Directory Access Protocol (LDAP) query, and transmitting a Domain Name System query.

5. The method of claim 1 wherein step (b) further comprises determining at least one of whether the first network device is plugged into a wall socket, whether the first network device is connecting to the network via wireless access, and whether the first network device is connecting to the network via a Virtual Private Network.

6. The method of claim 1 wherein step (b) further comprises determining a property of the first network device.

7. The method of claim 1 wherein step (b) further comprises determining identity of the first network device.

8. The method of claim 7 wherein the determining of the identity of the first network device further comprises at least one of querying a database where the type has been determined, examining network traffic, analyzing network behavior, probing the first network device for signature responses, attempting to log into the device using a series of protocols, logging into the first network device and querying data within the device.

9. The method of claim 1 wherein step (b) further comprises scanning at least one of a configuration, file, data, a software version, a patch, inventory, hardware, and a security vulnerability of the first network device.

10. The method of claim 1 wherein step (b) further comprises updating at least one of a configuration, file, data, a software version, inventory, and a security vulnerability of the first network device.

11. The method of claim 1 wherein step (b) further comprises comparing at least one security setting of the first network device with a predetermined security setting.

12. The method of claim 1 wherein step (b) further comprises at least one of installing a software patch on the first network device, installing anti-virus software on the first network device, and determining if the first network device is part of a windows domain.

13. The method of claim 1 further comprising at least one of enabling the first network device to have additional access to the network, denying the first network device access to the network, notifying another about the first network device based on results of the scan, and quarantining the first network device.

14. The method of claim 1 further comprising at least one of setting a security policy on the first network device, auditing the security policy of the first network device, ensuring compliance with a predetermined security policy, and reporting results.

15. An apparatus for remote agentless scanning of network devices on a network comprising:

(a) a detecting module that detects connection of a first network device to the network; and

(b) a scanning module that performs remote agentless scanning of the first network device in response to the detection of the first network device.

16. The apparatus of claim 15 wherein the detecting module continuously polls a database for data corresponding to newly attached network devices.

17. The apparatus of claim 16 wherein the scanning module remotely scans the first network device upon detecting data corresponding to the first network device in the database.

18. The apparatus of claim 15 further comprising a history database storing scan results of a scan performed by the scanning module.

19. The apparatus of claim 15 wherein the scanning module can at least one of enable the first network device to have additional access to the network, deny the first network device access from the network, notify another about the first network device based on results of the scan, and quarantine the first network device.

20. The apparatus of claim 15 further comprising a security policy management module for at least one of setting a security policy on the first network device, auditing the security policy of the first network device, ensuring compliance with a predetermined security policy, and reporting results.

21. A method for examining a first network device connected to a network, comprising:

(a) querying a database for data representing connection of network devices to a network;

(b) determining connection of a first network device to the network by locating data about the first network device in the database;

(c) determining properties associated with the first network device to determine the identity of the first network device;

(d) determining items to scan based on at least one of the properties; and

(e) performing remote scanning of the first network device in response to the determination of the connection of the first network device to the network.

22. The method of claim 21 wherein step (c) further comprises determining at least one of credentials associated with the first network device and type of the first network device.

23. The method of claim 21 wherein step (c) further comprises at least one of querying a database where the identity has already been determined, examining network traffic, analyzing network behavior, probing the device for signature responses, and logging into the device to query data.

24. The method of claim 21 wherein step (e) further comprises selecting a set of security policy settings to audit.

25. The method of claim 21 further comprising at least one of allowing the first network device to have additional access to the network, denying access to the network, notifying another about the first network device based on results of the remote scanning, and quarantining the first network device.

26. A method for scanning network devices connected to a network, comprising:

(a) detecting connection of a first network device to the network; and

(b) performing remote scanning of the first network device in response to detection of the first network device.

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