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(54) **DYNAMICALLY SELF-UPDATING BY A SOFTWARE APPLICATION ON A DEVICE**

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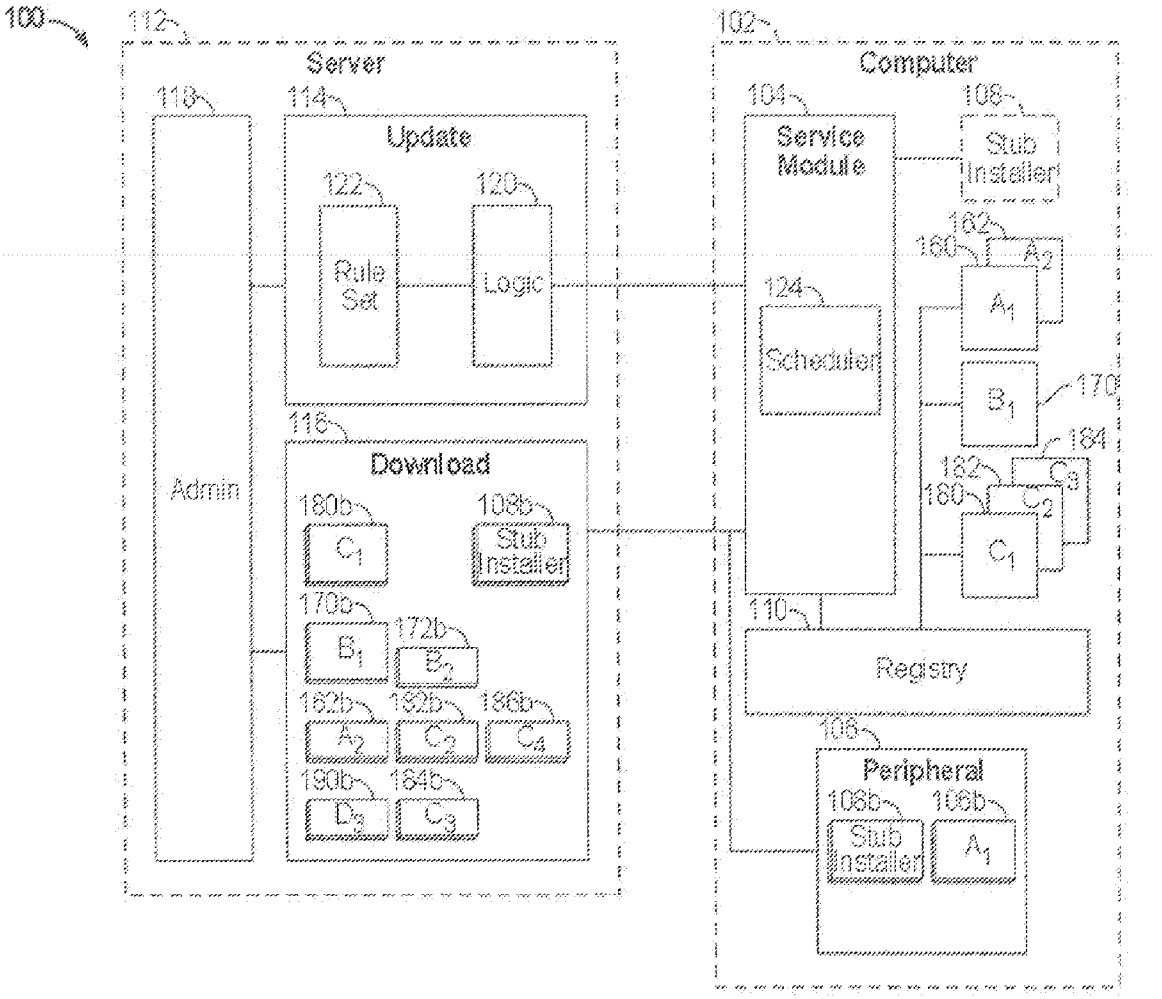
(57) **ABSTRACT**

Described are systems and methods for self-updating software applications on a computer system. Installed software applications register with a service module installed on the computer. The service module requests updates for the installed software applications, including itself, and receives identification of available updates, including an update for itself. After receiving the identification, the service module automatically installs the identified updates, including updating itself.



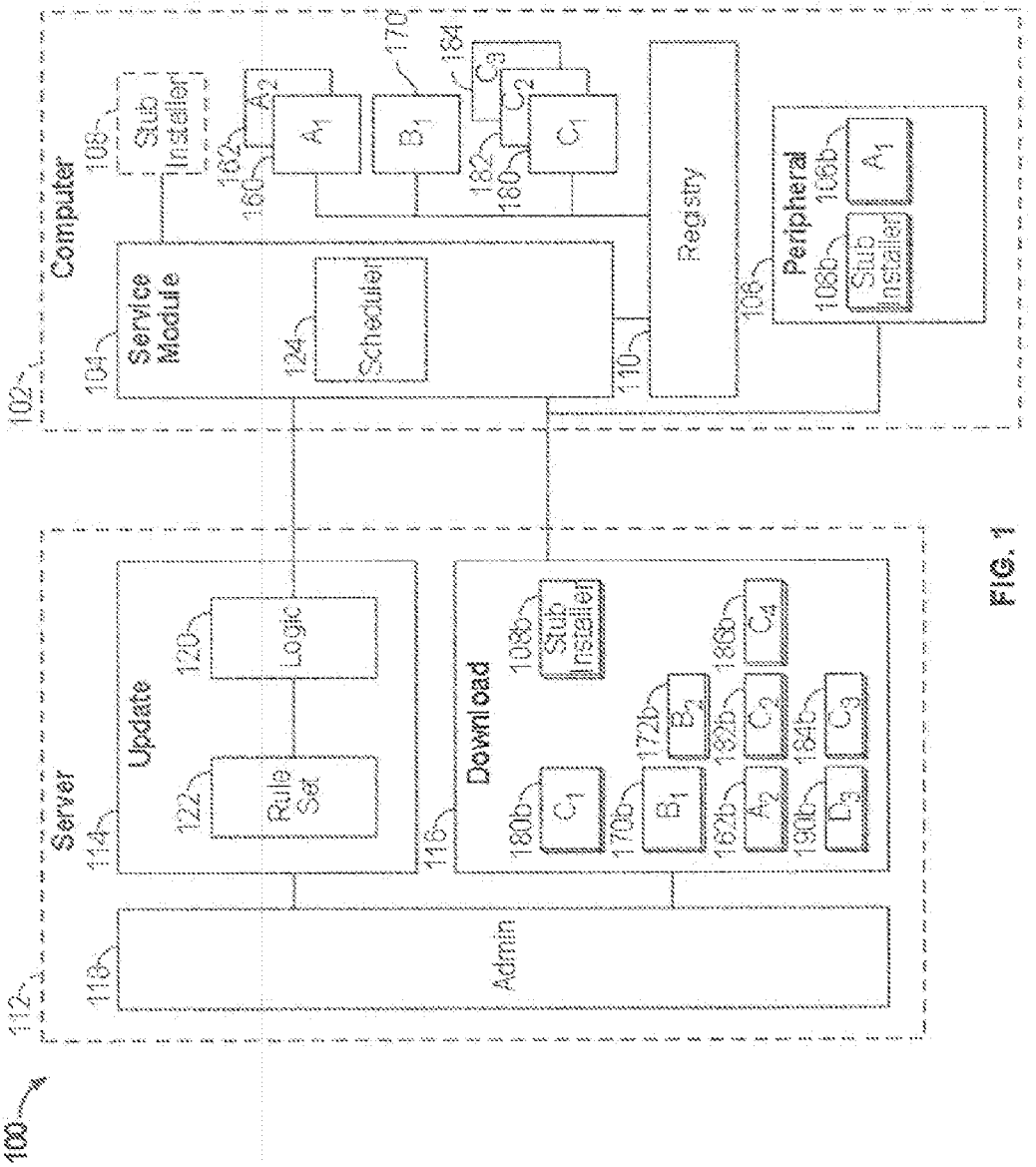

100
102
Computer
104
Service Module
108
Stub Installer
124
Scheduler
160
162
A_1
A_2
170
164
B_1
C_a
C_2
C_1
180
182
110
Registry
106
Peripheral
106b
108b
Stub Installer
A_1
112
Server
114
Update
120
Logic
122
Rule Set
116
Download
108a
Stub Installer
180b
C_1
170b
172b
B_1
B_1
182b
A_2
C_2
184b
D_3
C_3
180a
C_4
118
Admin

FIG. 1

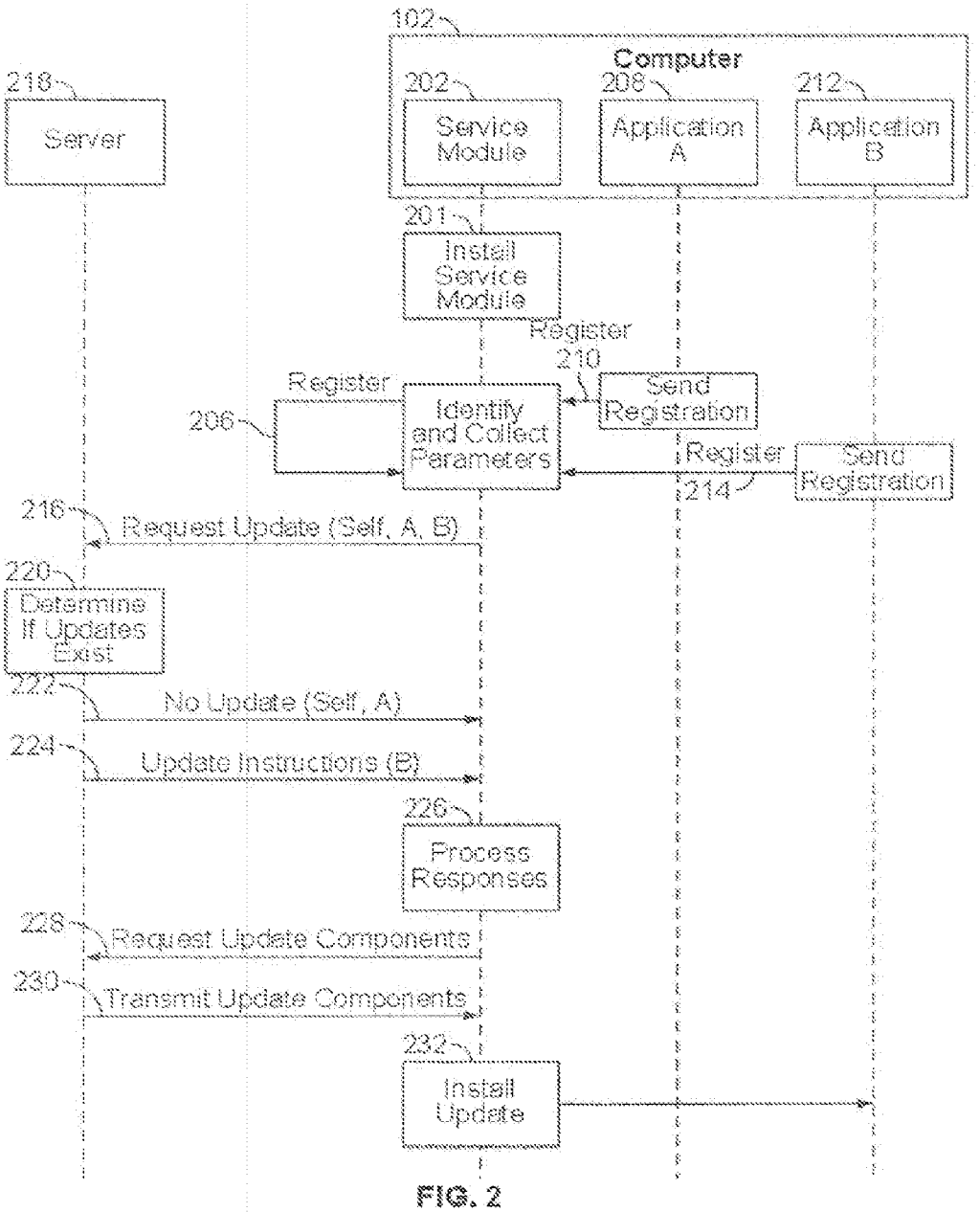

102
Computer
218
Server
202
Service Module
208
Application A
212
Application B
201
Install Service Module
Register
210
Send Registration
Register
206
Identify and Collect Parameters
Register
214
Send Registration
216
Request Update (Self, A, B)
220
Determine If Updates Exist
222
No Update (Self, A)
224
Update Instructions (B)
226
Process Responses
228
Request Update Components
230
Transmit Update Components
232
Install Update

FIG. 2

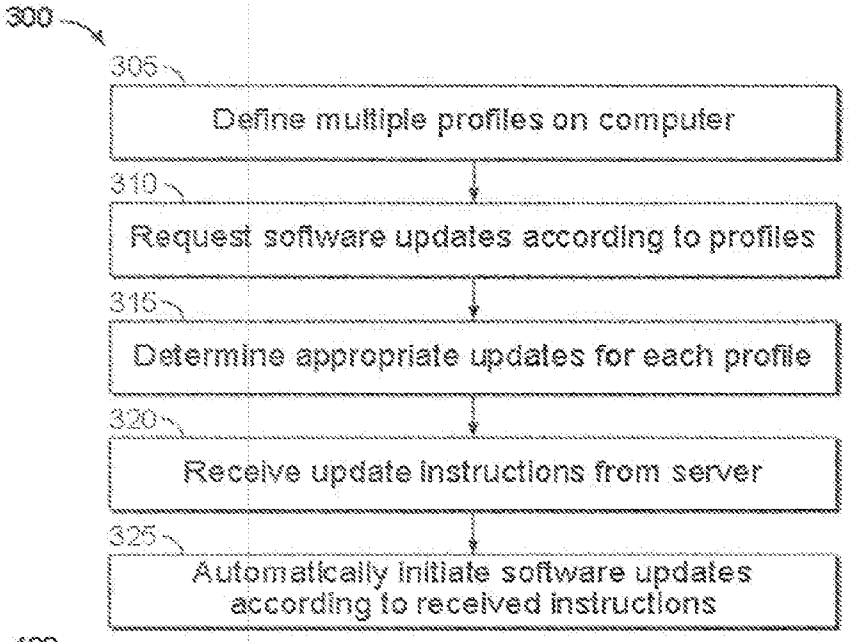

300
305
Define multiple profiles on computer
310
Request software updates according to profiles
315
Determine appropriate updates for each profile
320
Receive update instructions from server
325
Automatically initiate software updates according to received instructions

FIG. 3

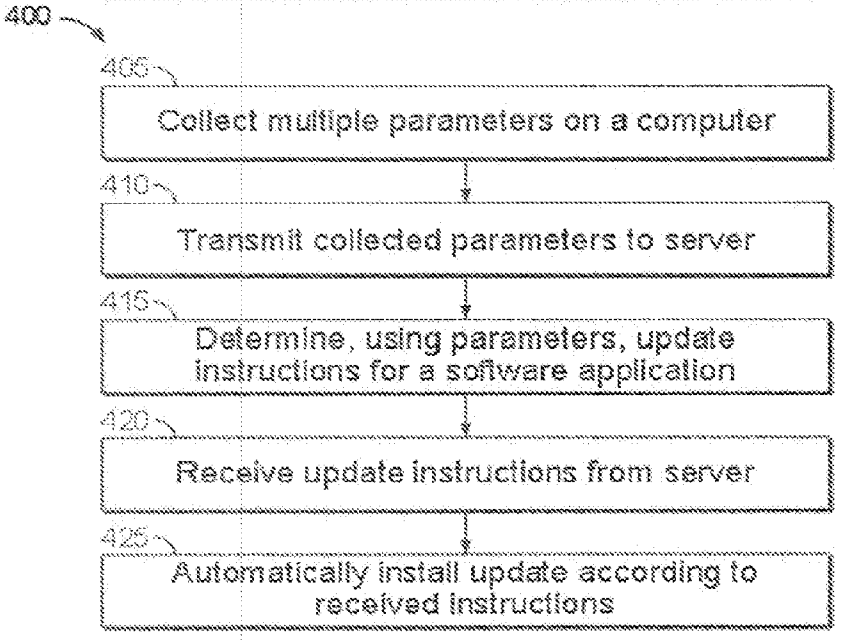

400
405
Collect multiple parameters on a computer
410
Transmit collected parameters to server
415
Determine, using parameters, update instructions for a software application
420
Receive update instructions from server
425
Automatically install update according to received instructions

FIG. 4

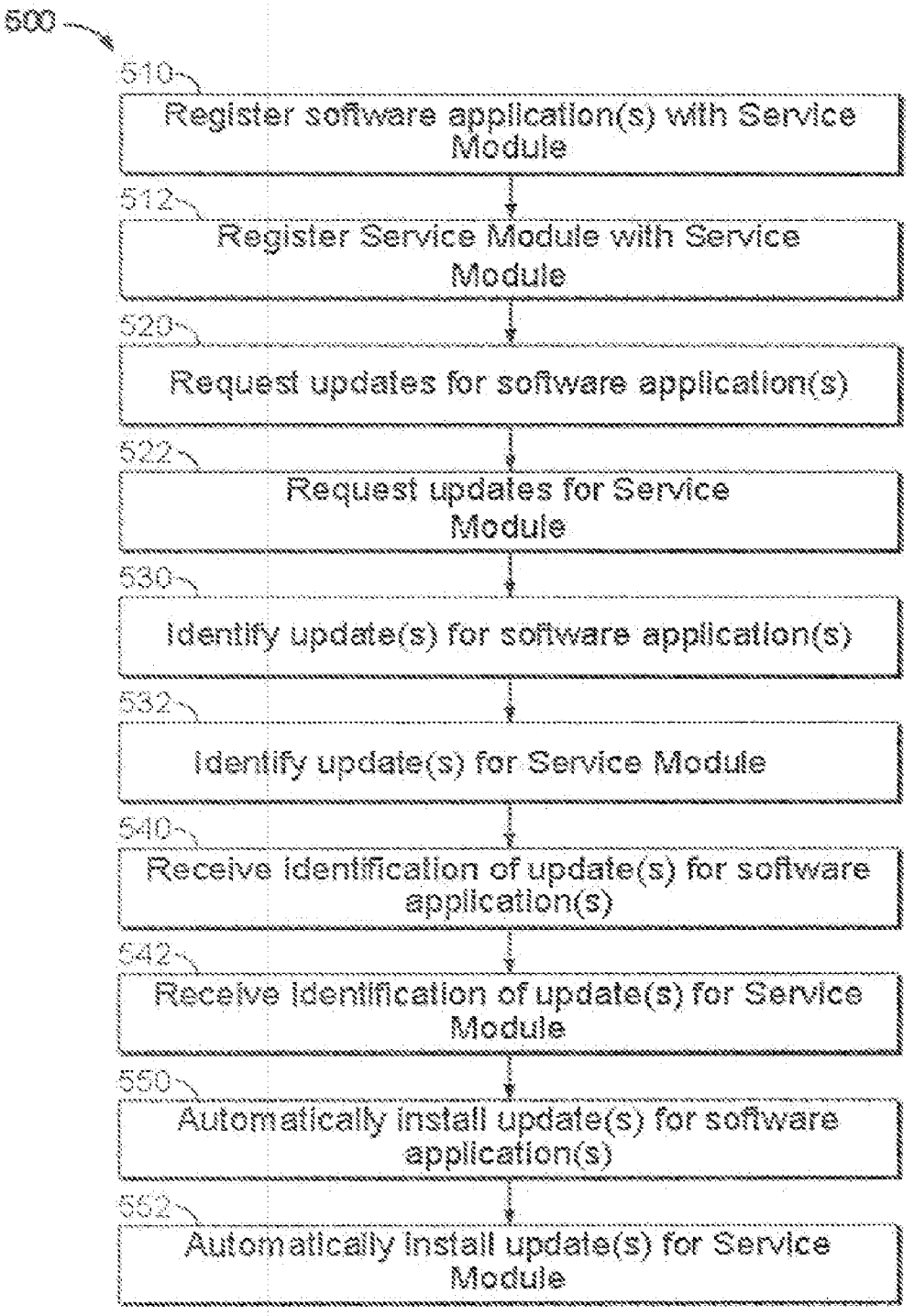

500
510
Register software application(s) with Service Module
512
Register Service Module with Service Module
520
Request updates for software application(s)
522
Request updates for Service Module
530
Identify update(s) for software application(s)
532
Identify update(s) for Service Module
540
Receive identification of update(s) for software application(s)
542
Receive identification of update(s) for Service Module
550
Automatically install update(s) for software application(s)
552
Automatically install update(s) for Service Module

FIG. 5

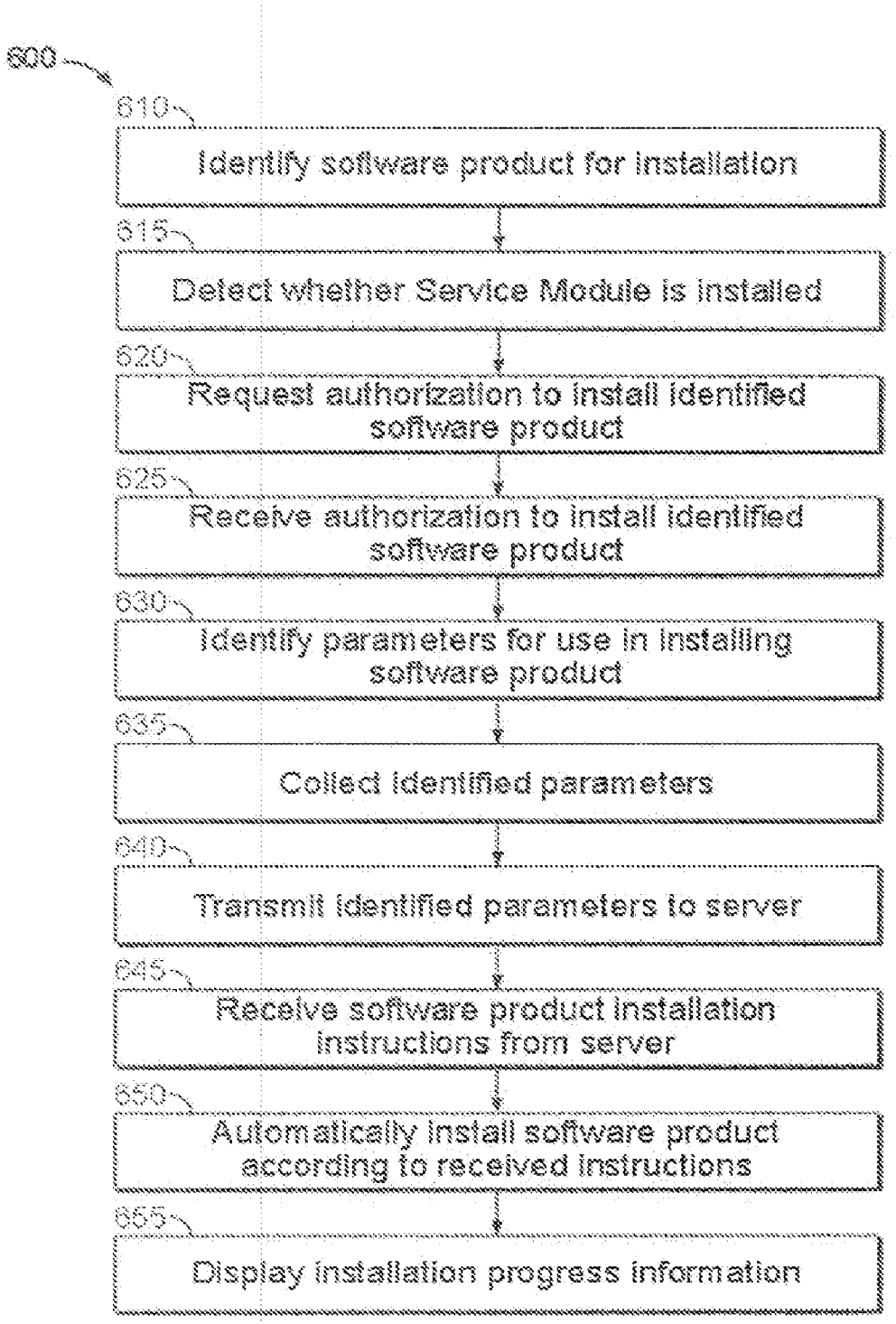

600
610
Identify software product for installation
615
Detect whether Service Module is installed
620
Request authorization to install identified software product
625
Receive authorization to install identified software product
630
Identify parameters for use in installing software product
635
Collect identified parameters
640
Transmit identified parameters to server
645
Receive software product installation instructions from server
650
Automatically install software product according to received instructions
655
Display installation progress information

FIG. 6

DYNAMICALLY SELF-UPDATING BY A SOFTWARE APPLICATION ON A DEVICE

TECHNICAL FIELD

[0001] This description relates to code installation and configuration management.

BACKGROUND

[0002] When a user desires to install a software application on a computer, the process typically involves a long series of prompts to which the user must respond in order to complete the installation process. Furthermore, if the user is a member of a larger enterprise, there may be issues of security and authorization that must be addressed with each software installation request. Such issues may require action by a systems administrator or other high level security agent. When more than one user has access to a computer, the software application may be installed such that some users have access to certain versions of the software application, other users have access to other versions of the software application, and still other users are restricted from accessing the software application. Any of the installed software applications, including those supporting separate versions, may require maintenance in the form of software updates in order to provide additional features, to fix bugs, to increase robustness, to block security holes, or to address other issues.

SUMMARY

[0003] Software applications installed on a computer system will occasionally require updating. Systems and methods can be implemented to detect and dynamically update installed software applications on a computer system.

[0004] In one general aspect, a service module installed on the computer system transmits a request for available updates for the software applications installed on the computer, including available updates for itself. The service module receives identification of available updates for installed software applications and receives identification of an available update to itself. The service module then automatically installs the identified updates to installed software applications and automatically installs the identified update to itself.

[0005] Implementations can include one or more of the following features. The software applications and the service module register with the service module prior to receiving updates. The update requests occur according to a predefined time schedule and/or occur in response to a triggering event. The service module receives instructions for installing the update from a server. The installation instructions can specify the location of components, including downloadable components, required to complete the installation. The installation components can be located on the same server that sends the instructions or on a different server.

[0006] The details of one or more implementations are set forth in the accompanying drawings and the description below. Other features will be apparent from the description and drawings, and from the claims.

DESCRIPTION OF DRAWINGS

[0007] FIG. **1** is a block diagram illustrating an example configuration of a shared automatic installation and update system for multiple software products.

[0008] FIG. **2** is an example signaling and flow diagram illustrating operations of a shared automatic installation and update system for multiple software products.

[0009] FIG. **3** is a flow diagram of an example process for maintaining multiple versions of a software application on a computer system.

[0010] FIG. **4** is a flow diagram of an example process for updating software applications on a computer system.

[0011] FIG. **5** is a flow diagram illustrating an example process for dynamic self-updating by a software application supported by an automatic installation and update system.

[0012] FIG. **6** is a flow diagram illustrating an example process for installing a software product supported by an automatic installation and update system on a computer system with minimal user interaction.

[0013] Like reference symbols in the various drawings indicate like elements.

DETAILED DESCRIPTION

[0014] Typical software applications are installed and updated on an individual basis. In other words, each software application has its own corresponding installer and update mechanism. A shared automatic installation and update system for multiple software products, however, can provide more efficient and beneficial results. FIG. **1** illustrates an example configuration for a shared automatic installation and update system **100** for multiple software products **160**, **162**, **170**, **180**, **182**, **184**, and **190**.

[0015] Prior to or concurrent with the first installation of a software application supported by the automatic installation and update system **100** on a computer **102**, a software maintenance service module **104** ("service module") may be installed on the computer **102**. In some implementations, the installation of the service module **104** is completely transparent to the user of the computer **102**, and occurs in conjunction with the installation of the software application. Installation may be initiated, for example, when the user of the computer **102** visits a web page offering the software application for download, or when the user accesses a CD-ROM, DVD, or other storage peripheral containing the binary files necessary to complete an installation of the software application.

[0016] When the user starts the download process, such as by clicking a button on the web page or by accessing the storage peripheral, a stub installer **108** for the service module **104** may be invoked by accessing the binary files necessary to complete the installation of the service module **104** and by executing the stub installer **108**. In some implementations, the stub installer binary files are less than 172 kilobytes in size and take less than one minute to download over a 28.8 kbps link at **10** wire bits per 8 data bits. The stub installer **108** may contain references providing at least enough information for the service module **104** to complete the installation of the requested software product. In some implementations, a full installer can be provided to facilitate installation of the requested software product when a network connection is unavailable. If multiple software products are requested, the stub installer **108** may queue the multiple requests to enable the service module **104** to complete the multiple software product installations. The stub installer **108** may terminate and may be deleted or otherwise effectively removed from the computer **102** after the service module **104** and the requested software products are installed.

[0017] For example, in some implementations, if a user of the computer **102** installs Software Application A **160** from a

CD-ROM **106**, and Software Application A **160** is the first software product supported by the automatic installation and update system **100** installed on computer **102**, then the binary files **108***b* can be accessed and the stub installer **108** can be invoked to install the service module **104** on the computer **102**. The service module **104** may be installed without requiring any user action beyond that required to install Software Application A **160**. The service module **104** then completes the download of Software Application A **160** by accessing the binary files **160***b* from the CD-ROM **106**. The stub installer **108** can then terminate after the requested installation of Software Application A **160** is complete. In other implementations, instead of installing from a CD-ROM **106**, the Software Application A **160**, the stub installer **108**, and/or the binary files **108***b* can be retrieved across a network connection (e.g., an Internet connection) from a download server **116**.

[0018] After the service module **104** is installed on the user computer **102**, subsequent requests to install one or more software products supported by the automatic installation and update system **100** may also invoke the stub installer **108** (or a different instance of the stub installer **108** that accompanies the one or more software products). In this case, the stub installer **108** may upgrade the service module **104** if a newer version is available, launch the service module **104** if the service module **104** is installed but not running, and terminate. If the stub installer **108** recognizes that the service module **104** is already installed, the stub installer **108** may initiate an uninstall process on itself.

[0019] In some implementations, the service module **104** includes a Microsoft WINDOWS™ ("WINDOWS™") system service and the stub installer **108** is based on a traditional WINDOWS™ installer. In other implementations, the service module **104** and the stub installer **108** include features of other operating systems. The service module **104** may perform multiple installations and/or updates in parallel, multiple sequential installations and/or updates, and may resume or restart partially completed installations and/or updates.

[0020] In some implementations, a service module **104** installed and running on a computer **102** can consist of three major parts: (1) a runtime component which may handle the core update and install services; (2) a web browser control (e.g., ActiveX for Internet Explorer) which may allow web pages and applications supported by the automatic installation and update system **100** to send requests to the service module **104**; and (3) a graphical user interface layer which may provide progress and feedback to the user during installation, updates, or any other services provided by the service module **104**.

[0021] In some implementations, the service module **104** runtime functionality may be divided between a WINDOWS™ system service and worker processes. In some implementations, if the user has administrator privileges, the service module **104** is fully installed on the computer **102**, the system service runs perpetually as a system entity, and the system service spawns worker processes to handle installations, updates, and other services provided by the service module **104**. In this case, the spawned worker processes may also run as system entities when installing or updating software products according to a system profile, but may run as user entities when installing or updating software products according to a user profile. If the user lacks administrator privileges, the service module **104** may be installed as a user entity rather than a system entity, and may rely solely on worker processes that terminate when the user's session is terminated. In some implementations, if an instance of the service module **104** is installed as a user entity, and another instance of the service module **104** is subsequently installed as a system entity, the user instance will terminate while the more privileged system instance will survive.

[0022] In addition to installations according to a system profile, in which the software product is installed for general use by all users of the computer **102**, and installations according to a user profile, in which the software product is installed for use by a particular user of the computer **102**, software products may be installed according to a function profile, a role profile, or any other profile under which users can log onto the computer **102**. For example, a software product may be installed for use by only those users who fulfill a particular role, such as developer of the software product or tester of the software product. In a second example, a software product may be installed for use by only those users who require a particular functionality in the software, such as those users who require that the software product provide French language output, or those users who require that the software product produce debug messages. Other types of profiles may also be available, and individual users may, for example, have access to or be allocated multiple different profiles.

[0023] As one example, a first version of Software Application C **180** may be installed according to a system profile, wherein any authorized user of the computer **102** can access the first version of Software Application C **180**. A second version of Software Application C **182** may be installed according to a user profile for User X, wherein only User X can access the second version of Software Application C **182**. A third version of Software Application C **184** may be installed according to a role profile for users designated as Developers. In this case, if User X is also designated as a Developer, then User X may be permitted to access all three versions of the Software Application C **180**, **182**, **184** installed on the computer **102**. If User Y is also designated as a Developer, then User Y may be permitted to access both the first version of Software Application C **180** and the third version of Software Application C **184**, but User Y may not be permitted to access the second version of Software Application C **182**. If User Y is not designated as a developer, then User Y may be permitted to access only the first version of Software Application C **180**.

[0024] After the service module **104** is installed on the computer **102**, it may be invoked, for example, automatically. For system installations, the service module **104** may be invoked at power up, and a failover procedure may restart the service module **104** in case of a computer failure. For user installations, the service module **104** may be invoked as a worker process at user login. Although the service module **104** is described in the context of system installations and user installations, the same service module **104** (i.e., the same piece of code stored on the computer **102**) may be invoked regardless of the type of active profile.

[0025] In some implementations, the service module **104** can provide for the simplified installation of applications supported by the automatic installation and update system **100**. For example, the user may visit a web site providing access to a server **112** where at least one application supported by the automatic installation and update system **100** is available for download and installation. When the user selects an application for download and installation, such as by clicking a button on the web site, the service module **104** may

identify and transmit to the server **112** any required installation parameters to facilitate the installation. The server **112** may then transmit installation instructions to the service module **104**, allowing the download and installation to proceed with no further action required by the user (effectively providing for a "one-click" installation process). The installation instructions may include instructions to retrieve executable installation components from a particular server location. In some cases, the server location may be on the same server **112** that transmitted the instructions. In other cases, the server location may be on a different server remote from server **112**.

[0026] The parameters transmitted by the service module **104** to the server **112** can provide information regarding security settings, privileges, user preferences, computing environment, or any other information relevant to the installation of the software application. In some cases, this information is provided to the service module **104** in conjunction with a prior installation of a software application on the computer **102**. This information may be associated with a profile associated with the user, with a system profile, or with another profile that is either an active profile (e.g., a user is currently logged under the profile) or on behalf of which the service module **104** is otherwise authorized to perform updates.

[0027] In some implementations, the service module **104** can check whether any new versions of installed software applications are available and can facilitate the installation of the new versions for those profiles authorized to access the updates. The updates may occur with full, limited, or no user knowledge or input. For example, the service module **104** may communicate with a remote server to determine that a new version **162** is available for the installed Software Application A **160** and that updating to the new version **162** requires no additional authorization. In that case, the service module **104** may perform the update in the background or when the system is idle without notifying the user that the update is occurring, or may provide a status bar or some other indication that the update is occurring. In some cases, the service module **104** may prompt the user at least once for permission to perform the update.

[0028] Before an installed software application can receive updates, it may be necessary for the application to register with the service module **104**. In some implementations, the application registration mechanism is based on WINDOWS™ registry. When a software application supported by the automatic installation and update system **100** is installed on a computer **102**, the application may register with the service module **104** by creating and storing a key in the registry **110** on the computer **102**. In some implementations, the key contains the installed software application's version number. For per-machine installations, the application may store the key in a location designated for system information, while for per-user installations, the application may store the key in a location designated for the specific user. The service module **104** may also register itself as an installed software product in order to check for the availability of new versions, security patches or other fixes, or other updates to the service module **104**.

[0029] In some implementations, after one or more software applications have been installed on the computer **102** and have registered with the service module **104**, the service module **104** will occasionally (e.g., periodically) check for updates and update the software applications when updates become available in accordance with known profiles. For example, a system instance of the service module **104** may occasionally update all applications installed according to a system profile, but may only update applications installed according to a user profile when the user is logged in. In another example, a user instance of the service module **104** may occasionally update applications installed specifically for that user, or may update applications installed for function profiles or role profiles associated with that user. Alternatively, in some implementations, it may be possible for the service module **104** to update multiple different applications or versions of applications that span across different system and/or user profiles.

[0030] Checks for updates by the service module **104** may be event-driven, such as when a user visits a particular web site. Checks for updates by the service module **104** may be periodic, for example, hourly or daily. To facilitate periodic updates as well as other periodic tasks associated with the service module **104**, a scheduler **124** may be provided within the service module **104**. In some implementations, the scheduler **124** runs inside the system service for a system instance of the service module **104**, and the scheduler **124** runs inside the worker process for a user instance of the service module **104**. The scheduler **124** may be provided as part of the operating system of the computer (e.g., the WINDOWS™ scheduler).

[0031] In some implementations, the service module **104** determines when updates are available for installed software applications **160**, **162**, **170**, **180**, **182**, and **184** by communicating with a server **112** associated with the automatic installation and update system **100**. The server **112** may be configured with two components: an update server component **114** and a download server component **116**. When the update server **114** receives an update request from the service module **104**, the update server **114** may respond with instructions pertaining to whether and how to update the set of installed software applications **160**, **162**, **170**, **180**, **182**, and **184** on the client computer **102**. The download server **116** may be primarily for hosting binary files associated with update requests. In some implementations, the server **112** can be a Java-based servlet engine and the update server **114** can receive requests and can reply with data in a response. The server **112** may receive information from the service module **104**, such as software product identification and version number, embedded in a Uniform Resource Locator (URL) as query parameters, and return a response to be parsed by the service module **104**.

[0032] For example, the service module **104** may send an update request to the server **112** identifying Software Application A **160**, Software Application B **170**, a first version of Software Application C **180**, and a second version of Software Application C **182** as currently installed on the computer **102**. In some implementations, a single update request identifies all installed software applications supported by the automatic installation and update system **100**. In some implementations, a separate request identifies each software application supported by the automatic installation and update system **100**. In addition to identifying which software applications are installed and which versions of those applications are installed, service module **104** may identify a particular profile for each software installation reported. For example, the service module **104** may associate Software Application A **160** with a system profile allowing access to all users of the computer **102**, may associate Software Application B **170** with a User X profile, may associate first version of Software Application C **180** with a system installation allowing access

to all users, and may associate second version of Software Application C **182** with a Developer profile. In some implementations, the update request may identify only software applications associated with a subset of the software applications and/or versions based, for example, on which profile or profiles are currently active. The request may identify a particular profile or simply identify specific parameters associated with the particular profile. In some implementations, the specific parameters included in the update request may be determined in accordance with information provided by the server **112**.

[0033] The server **112** may then employ logic **120** and rule set **122** to determine whether updates exist for the installed software applications **160**, **170**, **180**, and **182**, and if so, whether the updates should be provided according to the identified user profiles and/or parameters. For example, the server **112** may determine that an update **162** exists for Software Application A **160** and that the update **162** is approved for all users. The server **112** may then communicate this information to the service module **104** along with instructions to update Software Application A and the location of the update files **162***b*. In some cases, such as if the update **162** is not approved for all users, the server **112** may instruct the service module **104** to retain the current version of Software Application A **160** for use by some users while installing the updated version **162** for use by those users operating under a particular profile. In another example, the server **112** may determine that an update **172** exists for Software Application B **170**, but that the update is not available for User X. In that case, the server **112** may inform the service module **104** that no updates are available for Software Application B **170**. In another example, the server **112** may determine that updates **184** and **186** exist for Software Application C, but that neither update is approved for all users or for Developers. In that case, the server **112** may inform the service module **104** that no updates are available for either first version Software Application C **180** or second version Software Application C **182**. However, the server may inform the service module **104** that a third version of Software Application C **184** should be installed for users operating in a particular computing environment, i.e., a particular environmental profile.

[0034] The server **112** may have an administrative function **118** that supports creating and editing the configuration data, which may include the rule set **122** and/or the parameters that the server **112** instructs the service module **104** to collect, for the automatic installation and update system **100**. In some implementations, this administrative function **118** is performed by a corporate servlet engine employing access control to create or edit entries. A web application may be responsible for simple error checking, such as verifying that a download URL is valid, and for providing an auditable change log.

[0035] Update request messages sent from the service module **104** may be in the form of a secure Hypertext Transfer Protocol (HTTPS) POST. The POST body can contain an Extensible Markup Language (XML) document with one or more request elements (e.g., for one or more applications, versions of applications, profiles, etc.). The server **112** response can be in the form of a Hypertext Transfer Protocol (HTTP) status and message body. The body can be an XML document with a response element corresponding to each of the client request elements. Each request can include an identification attribute corresponding to a particular installed software application that may be returned in the attributes of the corresponding response. Identification attributes, which may be echoed back by the server **112**, may be limited to numeric characters only.

[0036] Client request elements may contain fields that identify attributes of the installed application specified in the request. Attributes of the client computer **102**, of the system environment (e.g., other installed software applications, available peripherals, and the like), or of the service module **104** itself may also be passed to the server **112** in fields of the request. Such attributes may be associated with the system profile, with a user profile, with a function profile, and/or with any other profile and may include the version of the installed application. In some implementations, the version numbers assigned to software applications supported by the automatic installation and update system **100** are assigned according to the scheme of n1.n2.n3.n4, where n1 is the major revision number, n2 is the minor revision number, n3 is the build number, and n4 is the patch number. Multiple versions of a software application may be available for download to different classes of users according to their profiles. For example, version 1.1.54.0 may represent the latest public release of the software application, available to a general class of users; version 2.0.72.0 may represent the initial public pre-release of the 2.0 version of the software application, available to a class of trusted testers; version 2.0.73.0 may represent a test release, available to class of internal users; and version 2.0.76.0 may represent the latest development build, available to a class of developers.

[0037] A positive response to a service module **104** update request may be indicated by a status of "ok." Such a response may indicate that an updated version of the identified installed software application is available for the specified user profile, and the response may identify a location where the requested update is maintained, whether administrator privileges are required for the update, instructions for obtaining and performing the update, and size and hash data. The size and hash data provide security assurance that the update is authentic. The size may be a decimal number of bytes, and the hash data may be a series of hexadecimal digits.

[0038] A negative response to a service module **104** update request may be indicated by a status of "no_update." Such a response may indicate that no updates are available for the specified installed software application or for the particular profile for which the update is requested. A request to update an application that that is not supported by the server **112** may be indicated by a status of "unknown application."

[0039] The server **112** may determine whether specified installed software applications should be updated, and if so with which particular version, by examining the attributes contained in the request from the service module **104**, by examining tokens or other external variables, by a combination of the two methods, or by any other method of identifying the software application and the profile for which the software application is installed. Examples of external variables include, but are not limited to, corporate credentials or other authorization tokens, Internet Protocol (IP) address, and shared secrets such as registry keys, embedded application tokens, etc. For example, a secret registry key plus an IP address may limit access to a software revision intended solely for developers, while an embedded application token may provide access to a software revision in beta release for testing.

[0040] Using the attributes contained in the request, the server **112** may inspect one or more attributes to determine

which updates to provide for a particular application and/or version of an application. Another method the server **112** may employ is to compare the version of an installed application with the latest version available for each class of users. For example, if the comparison shows that a currently installed version is a version only available to a class of developers, then the server **112** may provide the most recent version of the software application available to the class of developers for installation by the service module **104**.

[0041] FIG. **2** provides a signaling and flow diagram illustrating an example operation of a shared automatic installation and update system **200** for multiple software products installed on a computer **102**. In FIG. **2**, after a service module **202** is installed on the computer **102** at **201**, the service module **202** registers **206** with itself as a software application supported by the shared automatic installation and update system **200**. Application A **208** then registers **210** with the service module **202** as a software application supported by the shared automatic installation and update system **200**. Application B **212** then registers **214** with the service module **202** as a software application supported by the shared automatic installation and update system **200**. Within process **204**, the service module **202** may identify and collect information regarding itself **202** and Applications A **208** and B **212**, including the version or versions of the software applications installed, information regarding preferences associated with users of the software applications **202**, **208**, **212**, information regarding the system environment (e.g., the operating system, other installed applications, system hardware, and the like), information regarding profiles associated with the system, the software applications, and/or the users of the system, and other information in order to formulate a request for updates. Process **204** may continually run in the background on the computer **102**.

[0042] The service module **202** then sends a request for updates **216** to the server **218**. In the example of FIG. **2**, the service module **202** sends one request **216** requesting updates for all installed software applications registered with the shared automatic installation and update system **200**, in this case, itself **216**, Software Application A **208**, and Software Application B **212**. In some implementations, the service module **202** may send multiple requests instead of a single request. Upon receiving the request for updates **216**, the server **218**, within process **220**, may determine whether updates exist for the requested software applications based on information supplied by the service module **202** in the request **216**. The server **218** may also use rule sets and other information in addition to the supplied information to determine whether to instruct the service module **202** to update any of the installed software applications.

[0043] In the example of FIG. **2**, the server **218** determines that no updates are available for the service module itself **202** and for Software Application A **208**. The server **218** communicates this information to the service module **202** in response **222**. Although, in the example shown, the server **218** sends one response **222** for both applications **202**, **208** that require no update, in some implementations, the server **218** may send multiple responses, such as an individual response for each of the installed software applications that require no update. In the example of FIG. **2**, the server **218** determines that an update is necessary for Software Application B **212**, and sends update instructions **224** to the service module **202**. Although depicted as separate responses, the responses **222** and **224** may be sent in a single message.

[0044] The update instructions may include an identification of a server location from which software components representing the update and/or for installing the update can be retrieved. In process **226**, the service module processes the responses **222**, **224** received from the server **218** to determine that no updates are available for itself **202** or for Application A **208** but that an update is available for Application B **212**. Accordingly, the service module **202** automatically sends a request **228** to retrieve update components from server **218**. In some implementations, however, the update components may be retrieved from a different server (e.g., in a different location) and/or some of the update components may have been previously stored on the computer **102**. In some implementations in response to the request **228**, the server **218** sends **230** the requested update and/or installation components to the service module **202**. The service module **202** then proceeds with installing **232** the update of Software Application B **212** in accordance with the instructions provided in the response **224**. In general, all of the operations performed by the service module **202** can be done automatically without requiring input from a user of the computer **102**. In some implementations, however, the user may be prompted in a web browser to supply authorization to initiate the installation of a software application or an update to a software application.

[0045] FIG. **3** is a flow diagram of an example process **300** for maintaining multiple versions of a software application on a computer system. The process **300** may be implemented by an update software module installed on a computer in combination with an update server. Multiple different profiles may be defined on the computer at **305**. Each profile may have at least one attribute that differs from other profiles on the computer. For example, some attributes for a profile, such as the operating system or browser software, may be shared by many or all of the profiles on the computer, while other attributes may be unique to specific profiles. Each profile may be associated with multiple software applications or versions of software application. Thus, different profiles may be associated with different applications or different versions of the same application. In some cases, the different profiles may be associated with different users. Alternatively, a single user may have access to two or more different profiles (e.g., a system profile, a standard user profile, and a developer profile).

[0046] Separate requests for available software updates for a first profile and for a second profile are transmitted to the remote update server at **310**. The requests may identify the different attributes or parameters associated with the first profile and the second profile for use in determining whether any updates are available and which updates are appropriate for each profile. The requests may be sent at the same time or at different times (e.g., when users of the different profiles log onto the computer concurrently or at different times). The requests may be sent automatically by the update module according to a predetermined time schedule or some other triggering event. For example, each request may be sent when the corresponding profile becomes active (e.g., a user logs onto the computer under the particular profile).

[0047] One or more appropriate updates for each profile are determined at **315**. For example, the update server may analyze the different attributes for each profile, including an identification of one or more software applications associated with each profile, to determine whether any updates are available and which ones should be applied. Updates may be

applied differently depending on the identified versions of software applications, language preferences, profile type, whether the profile has administrator privileges, etc. The update server may then generate instructions for updating the software applications associated with the different profiles. Again, these instructions may be generated at the same time or different times according to when the requests are received and may provide different instructions for different versions of the same software application installed on the same computer.

[0048] The instructions for updating the software applications or versions of applications associated with the different profiles are received from the server at **320**. The instructions may be received by the update module on the computer, which may be adapted for carrying out the instructions, including retrieving any necessary update or installer components and executing the installation of the components with little or no user involvement or action required.

[0049] An update of the software applications associated with each of the profiles is automatically initiated in accordance with the received instructions at **325**. For example, the update module on the computer may automatically install the necessary updates.

[0050] FIG. **4** is a flow diagram of an example process **400** for updating software applications on a computer system. The process **400** may be implemented by an update software module installed on a computer in combination with an update server. Multiple parameters on a computer are collected at **405**. The parameters may include an identification of one or more software applications installed on the computer and/or associated or registered with the update module, an identification of the version of the software application stored on the computer, data relating to user preferences, computer environment data (e.g., operating system, available peripherals, available computer hardware, installed browser software, and the like), profile data (e.g., type of profile, attributes of the profile, and the like), and/or data relating to the update module itself. The parameters may be associated with a particular profile on the computer, such as a system profile, a user profile, a function profile, or a role profile. In some implementations, parameters may be collected for multiple different profiles either concurrently or during different active login sessions. The parameters may be collected using the update module, which may have been previously installed on the computer (e.g., during an earlier software installation). In some implementations, the parameters may identify one of multiple versions of a software application that are currently installed on the computer. The identified version may be associated with an active profile while the other versions may be associated with one or more inactive profiles or profiles for which updates have already recently been updated. The particular parameters collected may also be based on which profile or profiles are currently active. For example, one or more of the parameters may be associated with the profile on the computer rather than with the computer itself.

[0051] The collected parameters are transmitted from the computer to a remote server at **410**. The parameters may be automatically transmitted by the update module according to a predetermined time schedule. The time schedule may have been previously assigned by a remote server and may call for periodic transmissions and/or transmissions that are triggered by some other event (e.g., opening a particular application). When parameters are collected for multiple different profiles, the different sets of parameters associated with each profile can be transmitted to the remote server in a single message or in different messages, which may be sent at different times. The parameters may be transmitted as part of a request for available software updates that is sent from the update module to the remote update server.

[0052] In response to the transmitted parameters and/or the request for available software updates, instructions for installing an update to a software application installed on the computer are determined based, at least in part, on the parameters at **415**. The software application and the particular version of the application may be identified by one or more of the transmitted parameters. Moreover, different instructions may be provided for different sets of parameters. For example, the particular update to be installed on the computer may depend on the current version, the type of profile, the operating system, etc. The instructions may be dynamically generated based on the parameters according to rules stored at the remote update server. Thus, different updates may be provided to the same or different computers for different versions of a software application and/or for different sets of transmitted parameters. The instructions may also pertain to updates for more than one software application. For example, the update server may identify different updates for different software applications (based on the same or different sets of transmitted parameters) or even for different versions of the same software application (generally based on different sets of transmitted parameters). Once the instructions are generated or otherwise determined, they can be transmitted from the update server to the remote computer.

[0053] The instructions for installing an updated are received at **420**. The instructions may direct the update module to retrieve one or more installer components from a remote download server, which may be at the same or a different location from the update server, and/or from a storage location on the computer, where one or more of the components may have been previously stored. In some implementations, instructions for updating one or more applications may be received in a single response message. In cases where different updates are identified for different software applications or different versions of the same software application, the instructions may be directed to a single computer or update module associated with the different software applications or different versions of the same application or may be directed to different computers having different sets of parameters.

[0054] The update is then automatically installed on the computer in accordance with the instructions at **425**. For example, the instructions may direct the update module to retrieve installer and/or components from the remote download server and/or a local storage location and execute at least one executable component of the components. Thus, the instructions may identify one or more components and identify a location where the components can be found. The update module may also automatically install multiple updates for multiple software applications or versions of applications. In this manner, the update module can run silently (i.e., without disturbing the user), using a relative small number of resources because of the small size of the module, and also serve to maintain multiple different software applications by separating much of the intelligence for the updating from the update framework provided by the update module (and the remote update server and download server).

[0055] FIG. **5** illustrates an example process **500** for dynamic self-updating by a software application. One or more software applications supported by an automatic installation and update system may register with a service module installed on and executing in the application environment of a device (e.g., a computer) at **510**. The service module may launch automatically, for example at computer startup or at profile activation, such as when a user logs in. Alternatively, the service module may launch in response to some triggering activity, such as the expiration of a scheduling timer. The software applications may actively register with the service module by sending registration messages or other communications. Alternatively, the software applications may be passively registered by the service module. For example, the registration may occur in conjunction with the initial installations of the software applications or with the initial installation of the service module. In some implementations, the service module may monitor for certain newly installed applications and/or search a computer for previously installed applications. The service module may also register with itself, identifying itself as a software application supported by the automatic installation and update system at **512**.

[0056] The service module may then periodically or in response to some triggering activity check whether any updates are available for the supported software applications at **520** or for itself at **522**. The service module may accomplish this by transmitting a request message to one or more update servers supported by the automatic installation and update system. The request may identify all installed supported software applications, a single installed supported software application, or some number of installed supported software applications, such as, for example, those available under an active profile or those available to a logged in user. Additionally, the request may provide a number of parameters describing the environment associated with each of the software applications, such as the computing environment, security requirements, profile data, or other information useful in determining whether updates are available for the installed software applications.

[0057] In response to receiving an update request from the service module, the update server may then determine that updates are available for at least one of the installed software applications at **530** and/or for the service module itself at **532**. The server may make this determination based on information received in the request, by applying rules for determining whether updates are appropriate, or both. The service module may then receive from the server the identification of the available updates for the appropriate installed software application at **540** and/or for itself at **542**. Identification of multiple available updates may be received in single response or in multiple responses. The server's identification response may include installation instructions for the update, for example, information on where to locate components, such as executable files, data files, etc., necessary to complete the update, and/or information specifying for which profiles the software application should be updated. The transmitted update instructions may have been generated by the server or generated by another entity and delivered to the server for transmission to the service module.

[0058] The service module may then proceed to install updates to the software applications at **550** and to itself at **552** in accordance with the information received from the server. The service module may retrieve one or more components from one or more servers, including the update server. In some implementations, the service module may perform the appropriate updates, including those to itself, in a manner that is transparent to the users of the software applications. In other implementations, the service module may prompt the user for permission to proceed, may provide a status bar or other indication of download progress, may request that the user restart the computer after the updates have finished, or otherwise engage the user in the process. When the service module proceeds transparently, it may perform the updates in the background or when the computer is idle.

[0059] FIG. **6** illustrates an example process **600** for installing on a computer, with minimal user interaction, a software product supported by an automatic installation and update system. A software product not currently installed on a user's computer may be identified for installation at **610**. For example, a computer user may load an installation disk containing a new software application into the computer's CD-ROM drive, may click an installation button on a web site, or may attempt to perform a function not supported by any software product currently installed on the user's computer. In some implementations, a stub installer associated with the automatic installation and update system may be invoked to detect whether the service module is currently installed at **615**. If the stub installer determines that the service module is not currently installed, the stub installer may install the service module and subsequently terminate. Alternatively, the stub installer may simply terminate after determining that the service module is currently installed, which may have occurred in association with a previous installation of a software product supported by an automatic installation and update system.

[0060] The service module may, in some implementations, request authorization from the user to proceed with the installation of the requested software product at **620**, and receive the requested authorization at **625**. In some implementations, the user's actions that resulted in identifying the software product may have also provided the necessary authorization, making an authorization request from the service module unnecessary. In some implementations, the service module may determine that installation is appropriate without user authorization, basing this determination on, for example, system security requirements, prior authorizations, profiles associated with the user, and/or profiles associated with the software product.

[0061] The service module may then identify one or more parameters on the computer for use in installing the identified software product at **630**. These parameters may include information relating to security settings, privileges, computer environment attributes, profiles associated with the user, and/or profiles associated with the software product, and may include parameters associated with a previous installation of this or another software product. The service module may then collect the identified parameters at **635** and transmit the identified parameters at **640** to a server supported by the automatic installation and update system.

[0062] The service module may then receive installation instructions from the server at **645**, for example, information on where to locate components, such as executable files, data files, etc., necessary to complete the installation, and/or information specifying for which profiles the software product should be installed. In some implementations, the installation instructions may direct the service module to retrieve components necessary to complete the installation from the server itself, from a different server, or from the user computer. The

transmitted installation instructions may have been generated by the server or generated by another entity and delivered to the server for transmission to the service module.

[0063] The service module may then proceed to automatically install the software product at **650** in accordance with the information received from the server with no further user action required. In some implementations, the service module may provide a status bar or other indication of download progress at **655**.

[0064] The invention and all of the functional operations described in this specification can be implemented in digital electronic circuitry, or in computer software, firmware, or hardware, including the structural means disclosed in this specification and structural equivalents thereof, or in combinations of them. The invention can be implemented as one or more computer program products, i.e., one or more computer programs tangibly embodied in an information carrier, e.g., in a machine readable storage device or in a propagated signal, for execution by, or to control the operation of, data processing apparatus, e.g., a programmable processor, a computer, or multiple computers. A computer program (also known as a program, software, software application, or code) can be written in any form of programming language, including compiled or interpreted languages, and it can be deployed in any form, including as a stand alone program or as a module, component, subroutine, or other unit suitable for use in a computing environment. A computer program does not necessarily correspond to a file. A program can be stored in a portion of a file that holds other programs or data, in a single file dedicated to the program in question, or in multiple coordinated files (e.g., files that store one or more modules, sub programs, or portions of code). A computer program can be deployed to be executed on one computer or on multiple computers at one site or distributed across multiple sites and interconnected by a communication network.

[0065] The processes and logic flows described in this specification, including the method steps of the invention, can be performed by one or more programmable processors executing one or more computer programs to perform functions of the invention by operating on input data and generating output. The processes and logic flows can also be performed by, and apparatus of the invention can be implemented as, special purpose logic circuitry, e.g., an FPGA (field programmable gate array) or an ASIC (application specific integrated circuit).

[0066] Processors suitable for the execution of a computer program include, by way of example, both general and special purpose microprocessors, and any one or more processors of any kind of digital computer. Generally, the processor will receive instructions and data from a read only memory or a random access memory or both. The essential elements of a computer are a processor for executing instructions and one or more memory devices for storing instructions and data. Generally, a computer will also include, or be operatively coupled to receive data from or transfer data to, or both, one or more mass storage devices for storing data, e.g., magnetic, magneto optical disks, or optical disks. Information carriers suitable for embodying computer program instructions and data include all forms of non volatile memory, including by way of example semiconductor memory devices, e.g., EPROM, EEPROM, and flash memory devices; magnetic disks, e.g., internal hard disks or removable disks; magneto optical disks; and CD ROM and DVD-ROM disks. The processor and the memory can be supplemented by, or incorporated in, special purpose logic circuitry.

[0067] To provide for interaction with a user, the invention can be implemented on a computer having a display device, e.g., a CRT (cathode ray tube) or LCD (liquid crystal display) monitor, for displaying information to the user and a keyboard and a pointing device, e.g., a mouse or a trackball, by which the user can provide input to the computer. Other kinds of devices can be used to provide for interaction with a user as well; for example, feedback provided to the user can be any form of sensory feedback, e.g., visual feedback, auditory feedback, or tactile feedback; and input from the user can be received in any form, including acoustic, speech, or tactile input.

[0068] The invention can be implemented in a computing system that includes a back-end component, e.g., as a data server, or that includes a middleware component, e.g., an application server, or that includes a front-end component, e.g., a client computer having a graphical user interface or a Web browser through which a user can interact with an implementation of the invention, or any combination of such back-end, middleware, or front-end components. The components of the system can be interconnected by any form or medium of digital data communication, e.g., a communication network. Examples of communication networks include a local area network ("LAN") and a wide area network ("WAN"), e.g., the Internet.

[0069] The computing system can include clients and servers. A client and server are generally remote from each other and typically interact through a communication network. The relationship of client and server arises by virtue of computer programs running on the respective computers and having a client-server relationship to each other.

[0070] A number of implementations have been described. Nevertheless, it will be understood that various modifications may be made. For example, although various operations are described in an particular or implied order, some operations may be performed concurrently or in a different order than described. In addition, although operations are described as being performed by particular devices or software modules, operations may be performed by components other than those described and illustrated. Accordingly, other implementations are within the scope of the following claims.

What is claimed is:

1. A method, comprising:

transmitting a request for available updates for one or more software applications installed on a device, wherein the request for available updates to the one or more software applications is transmitted using a service module installed on the device;

transmitting a request for available updates for the service module, wherein the request for available updates to the service module is transmitted using the service module;

receiving an identification of at least one available update for the one or more software applications;

receiving an identification of at least one available update for the service module;

automatically installing the at least one available update for the one or more software applications using the service module; and

automatically installing the at least one available update for the service module using the service module.

2. The method of claim 1, further comprising:
registering the service module and each of the one or more software applications with the service module to receive software updates.

3. The method of claim 1, wherein the request for available updates for one or more software applications and the request for available updates for the service module are transmitted automatically in accordance with a scheduling module installed on the device.

4. The method of claim 3, wherein the respective requests are transmitted periodically.

5. The method of claim 3, wherein the respective requests are transmitted in response to a predetermined triggering activity.

6. The method of claim 1, further comprising:
identifying the at least one available update for the one or more software applications and the at least one available update for the service module in response to the respective requests using one or more remote update devices.

7. The method of claim 1, wherein receiving the identification of at least one available update for the one or more software applications and receiving the identification of at least one available update for the service module comprises receiving instructions for installing the at least one available update.

8. The method of claim 7, wherein automatically installing the at least one available update for the one or more software applications and installing the at least one available update for the service module comprises retrieving one or more update components in accordance with the instructions.

9. The method of claim 8, wherein automatically installing the at least one available update for the one or more software applications and installing the at least one available update for the service module comprises executing at least one executable update component from the retrieved update components.

10. The method of claim 1, wherein the respective requests are transmitted in a single request message and the respective identifications of at least one available update are received in a single response to the request message.

11. An article comprising:
a machine-readable medium storing a service module, wherein the service module includes software instructions adapted to cause data processing apparatus to perform operations comprising:
recording a first registration of a software application installed on a device;
recording a second registration of the service module;
transmitting to an update device a first request for available software updates to the software application based on the first registration;
transmitting to the update device a second request for available software updates to the service module based on the second registration;
receiving a message from the update device in response to the first request indicating whether any software updates are available for the software application; and
receiving a message from the update device in response to the second request indicating whether any software updates are available for the service module.

12. The article of claim 11, wherein the service module is adapted to automatically launch at startup of the device.

13. The article of claim 11, wherein the service module is adapted to automatically launch at activation of a profile on the device.

14. The article of claim 11, wherein the service module is adapted to launch in response to an activation by a scheduling module.

15. The article of claim 11, wherein the message from the update device in response to the first request includes installation instructions for installing at least one available software update for the software application and the message from the update device in response to the second request includes installation instructions for installing at least one available software update for the service module.

16. The article of claim 15, wherein the service module includes software instructions adapted to cause data processing apparatus to perform further operations comprising automatically installing the at least one available software update for the software application and automatically installing the at least one available software update for the service module according to the respective installation instructions.

17. The article of claim 16, wherein automatically installing the at least one available software update for the software application and automatically installing the at least one available software update for the service module each comprise retrieving at least one software installation component.

18. The article of claim 15, wherein a single message comprises the message from the update device in response to the first request and the message from the update device in response to the second request.

19. A system for facilitating updates to at least one software product, the system comprising:
a device including an application environment, the application environment including one or more software applications;
a service module installed on the device, wherein the service module is adapted to:
automatically transmit requests for software updates for the service module and for at least one of the one or more software applications; and
automatically install software updates identified in response to the requests.

20. The system of claim 19, further comprising an update device adapted to receive the requests for software updates and to identify any available software updates for the service module and for the at least one software application.

21. The system of claim 20, wherein the update device is further adapted to:
generate instructions for installing available software updates; and
transmit the instructions to the service module.

22. The system of claim 21, wherein the instructions identify at least one installation component for use in installing an available software update.

23. The system of claim 22, wherein the service module is further adapted to retrieve the at least one installation component in response to the instructions.

24. The system of claim 19, wherein the service module is further adapted to:
register with itself for conducting automatic update requests to the service module; and
receive registration messages from the one or more software applications for conducting update requests relating to the one or more software applications.

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