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(54) APPARATUS AND METHOD FOR SECURE PROGRAM UPGRADE

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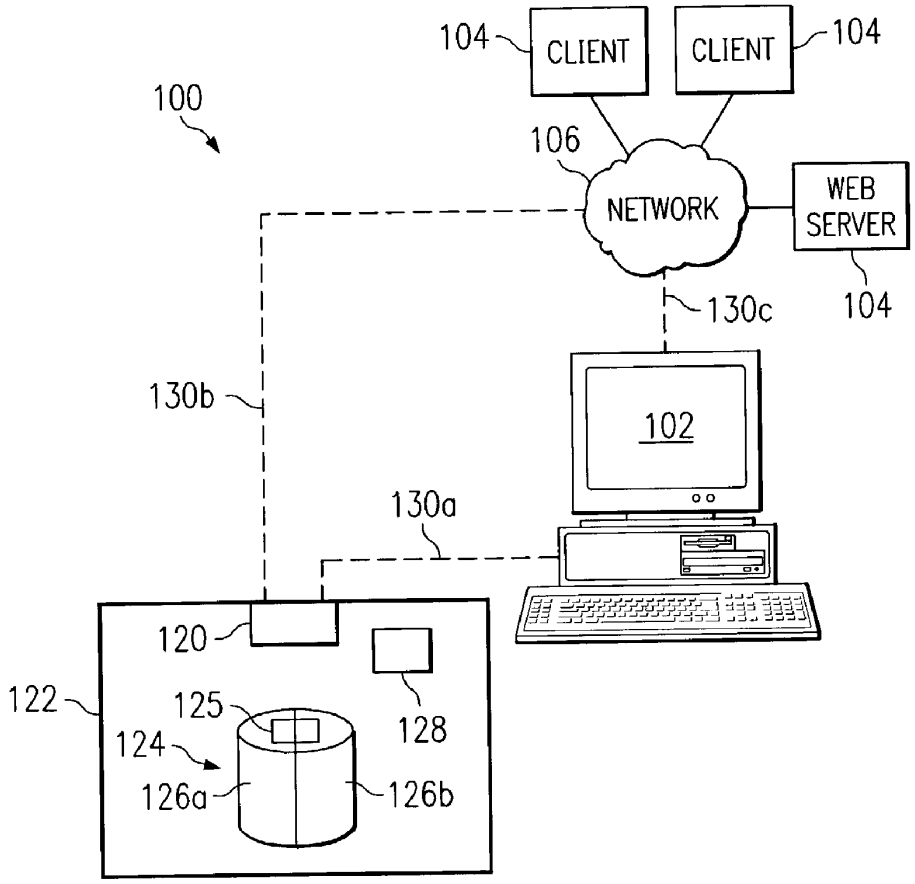
(57) **ABSTRACT**

An appliance includes a memory having at least a hidden partition of memory. The hidden partition of memory operates to store at least a portion of a program capable of contributing to one or more functions of the appliance. The appliance also includes a controller operable to process at least a portion of the program stored on the hidden portion of memory. The appliance further includes an external interface operable to provide access to at least an open portion of the memory. In one particular embodiment, the hidden portion of memory is inaccessible through the external interface.



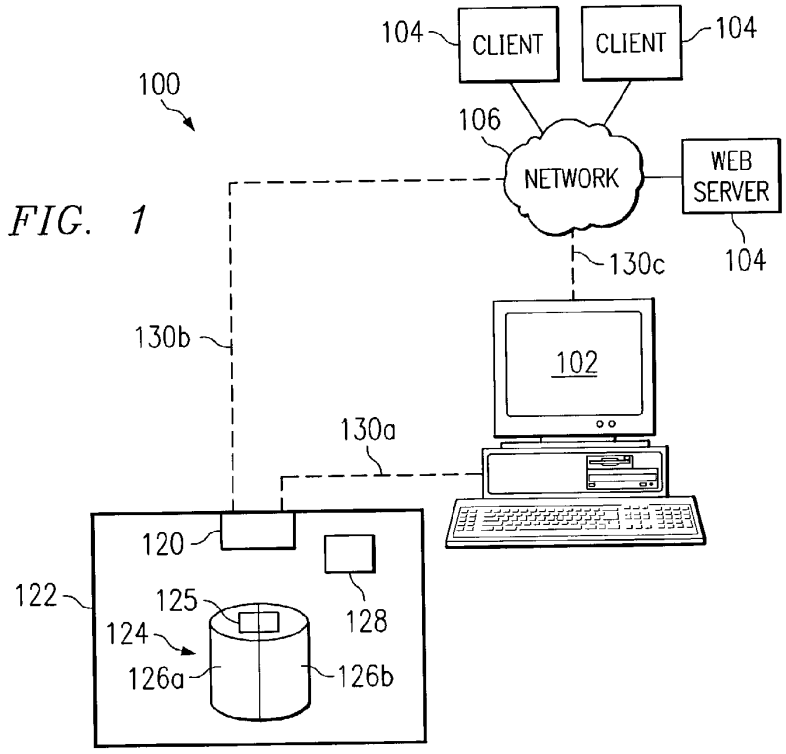

100
104
CLIENT
CLIENT
104
106
NETWORK
WEB SERVER
104
130c
102
130b
130a
120
122
125
128
124
126a
126b

FIG. 1

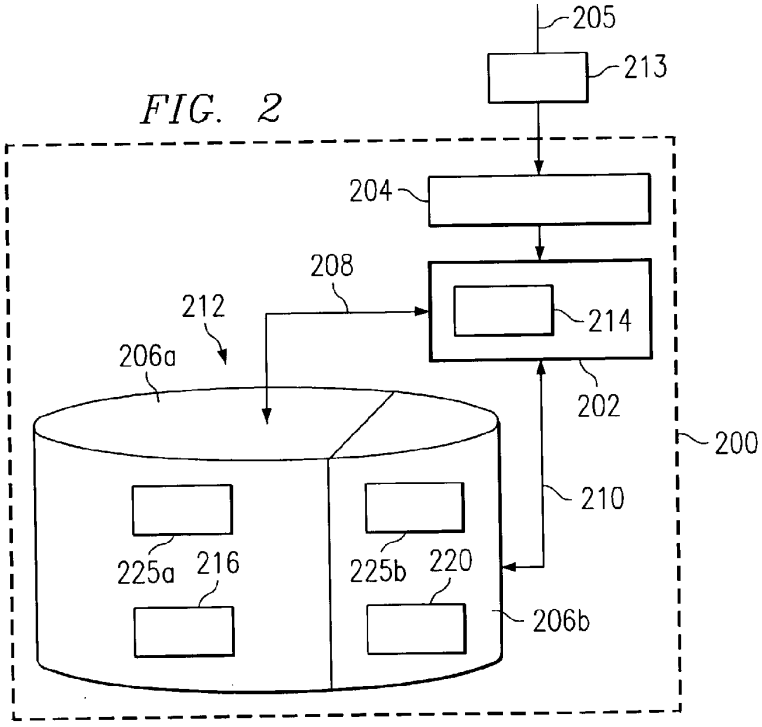

205
213
204
208
212
214
206a
202
200
210
225a
216
225b
220
206b

FIG. 2

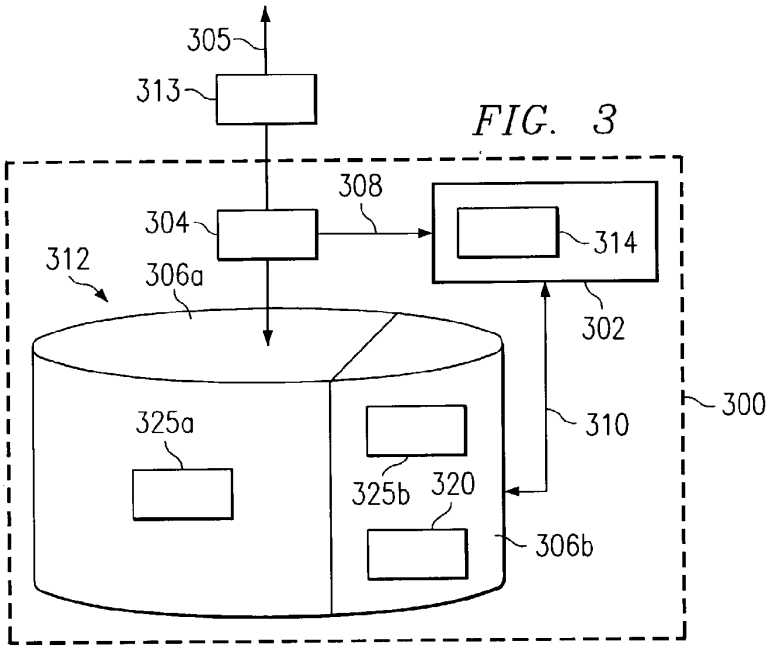
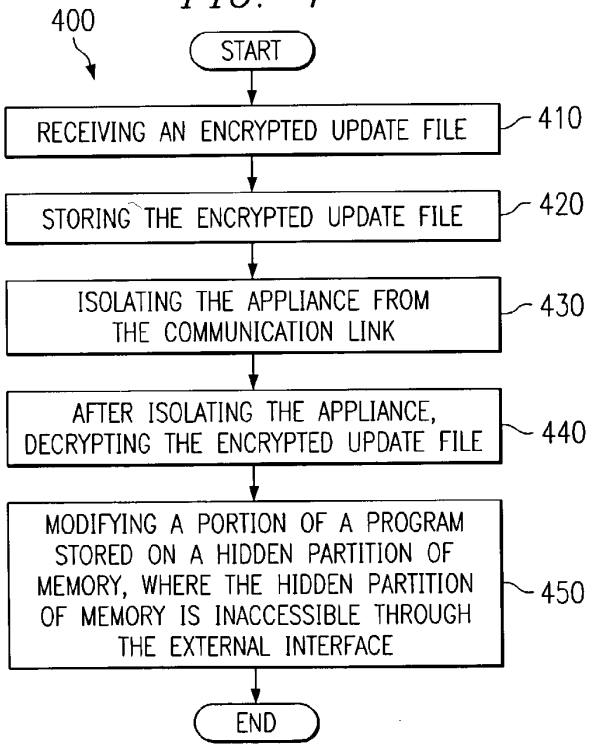

305
313
308
304
314
312
306a
302
300
310
325a
325b
320
306b

FIG. 3

FIG. 4


400
START
RECEIVING AN ENCRYPTED UPDATE FILE
410
STORING THE ENCRYPTED UPDATE FILE
420
ISOLATING THE APPLIANCE FROM THE COMMUNICATION LINK
430
AFTER ISOLATING THE APPLIANCE, DECRYPTING THE ENCRYPTED UPDATE FILE
440
MODIFYING A PORTION OF A PROGRAM STORED ON A HIDDEN PARTITION OF MEMORY, WHERE THE HIDDEN PARTITION OF MEMORY IS INACCESSIBLE THROUGH THE EXTERNAL INTERFACE
450
END

APPARATUS AND METHOD FOR SECURE PROGRAM UPGRADE

RELATED APPLICATION

[0001] This application claims the benefit under 35 U.S.C. §119(e) of U.S. Provisional Application Serial No. 60/322,252, filed Sep. 10, 2001.

[0002] Technical Filed of the Invention

[0003] This invention relates generally to the field of computing systems, and more particularly to an apparatus and method for secure program upgrading.

[0004] Overview

[0005] Technological advances have typically reduced the amount of time a business unit allots between development and manufacture of communication and/or computation devices. As a result, device manufacturers are typically unable to test the complete functionality of the device before delivery to a user. This can result in the identification of mistakes and/or bugs in a program stored on the device after delivery of the device to the user. In other cases, it may be desirable to provide enhanced functionality to a device over the capabilities originally supplied with that device. Consequently, device manufacturers typically need a means of securely updating the device after delivery to the user.

SUMMARY OF EXAMPLE EMBODIMENTS

[0006] The present invention provides an improved apparatus and method for secure firmware upgrades. In accordance with the present invention, an apparatus, and method for secure firmware upgrades is provided that reduce or eliminate at least some of the shortcomings associated with prior approaches.

[0007] In one embodiment, an appliance comprises a memory comprising at least a hidden portion of memory operable to store at least a portion of a program capable of contributing to one or more functions of the appliance. The appliance also comprises a controller operable to process at least a portion of the program stored on the hidden portion of memory. The appliance further comprises an external interface operable to provide access to at least an open portion of the memory. In one particular embodiment, the hidden portion of memory is inaccessible through the external interface.

[0008] In another embodiment, an appliance comprises an external interface operable to receive a program update. The appliance also comprises a memory comprising a hidden portion inaccessible through the external interface, wherein at least a portion of program to be updated resides in the hidden portion of memory. The appliance further comprises a controller operable to modify at least a portion of the program residing on the hidden portion of memory based at least in part on the program update received at the external interface.

[0009] In a method embodiment, a method of upgrading a program stored on an appliance comprises receiving from a communication link an encrypted update file at an external interface of an appliance. The method also comprises storing the encrypted update file on an open portion of a memory accessible through the external interface. The method further comprises isolating the appliance from the communication link. After isolating the appliance, the method comprises decrypting the encrypted update file. The method further comprises modifying at least a portion of a program stored on a hidden partition of memory based at least in part on the decrypted update file. In one particular embodiment, the hidden partition of memory is inaccessible through the external interface.

[0010] In another method embodiment, a method of upgrading a program stored on an appliance comprises receiving from a communication link an encrypted update file at an external interface of an appliance. The method also comprises storing the encrypted update file on a portion of a memory accessible through an external interface. The method further comprises decrypting the encrypted update file. After decrypting the encrypted update file, the method also comprises modifying at least a portion of a program stored on a hidden partition of memory based at least in part on the decrypted update file. In one particular embodiment, the hidden partition of memory is inaccessible through the external interface.

[0011] Depending on the specific features implemented, particular embodiments of the present invention may exhibit some, none, or all of the following technical advantages. Various embodiments substantially restrict access to portions of a program stored in a memory accessible to an appliance. Restricting access to programs and/or portions of a program can help prevent a user from deleting or corrupting those portions of the program, which can lead to an improved reliability of the appliance. In addition, restricting access to portions of the program can assist program designers in the protection of licensed code, firmware, and/or software. Some embodiments allow for a secure program upgrade of the restricted access portions of the program stored in a memory accessible to the appliance.

[0012] Other technical advantages will be readily apparent to one skilled in the art from the following figures, descriptions and claims. Moreover, while specific advantages have been enumerated above, various embodiments may include all, some or none of the enumerated advantages.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] For a more complete understanding of the present invention, and for further features and advantages thereof, reference is now made to the following description taken in conjunction with the accompanying drawings, in which:

[0014] **FIG. 1** is a block diagram illustrating one example of a computing system including an appliance;

[0015] **FIG. 2** is a block diagram illustrating one exemplary embodiment of an appliance implementing at least a hidden portion of memory;

[0016] **FIG. 3** is a block diagram illustrating another exemplary embodiment of an appliance implementing at least a hidden portion of memory; and

[0017] **FIG. 4** is a flow chart illustrating an exemplary method for securely upgrading a program file stored on a hidden portion of memory.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

[0018] **FIG. 1** is a block diagram illustrating one example of a computing system **100** including an appliance **122**. In

the illustrated embodiment, system **100** includes at least one appliance **122** capable of performing a desired communicating and/or computing functionality. Appliance **122** may comprise any device or combination of devices including one or more software and/or firmware modules operable to affect the function of the device. In some non-limiting examples, appliance **122** could comprise a computing and/or communicating device, such as, for example, a personal digital assistant (PDA), a cell phone, a digitized audio recorder/player, or any other digital or analog device. In other non-limiting examples of appliance **122** include any device that implements a program operable to carry out a desired functionality, such as, a home appliance (e.g., refrigerator or dishwasher), a power tool, or any other digital or analog device.

[**0019**] In this embodiment, appliance **122** executes one or more programs **125***a*-**125***n* capable of at least partially contributing to one or more functions of appliance **122**. That is, programs **125** are not required to be capable of performing a desired function of appliance **122** alone, but may contribute to the performance of the function as part of a larger routine. Programs **125** stored on memory device **124** may include, for example, software, firmware, code, portions of code, data compilations, and/or a combination of these or any other type of information. In various embodiments, program **125** stored on memory device **124** may include firmware having a software image for an embedded device.

[**0020**] As the amount of time between the development and manufacture of digital and/or analog communication and/or computation appliances decrease, appliance manufacturers are unable to test the complete functionality of the appliance before delivery to a user. This typically results in the identification of mistakes and/or bugs in the program stored on the appliance after delivery of the appliance to the user. Addition, appliance manufacturers may desire to provide enhanced functionality to the appliance over the capabilities originally supplied with that appliance. Consequently, appliance manufacturers typically need a means of updating the appliance after delivery to the user.

[**0021**] From time to time, it may be desirable to update one or more programs **125** stored in appliance **122** and/or to add additional programs **125**. In this example, appliance **122** operates to receive an update file capable of updating and/or adding one or more programs **125** stored in appliance **122**. The update file may comprise, for example, any software, firmware, code, data compilation, operating software applications, and/or combinations of these or any other type of information. In various embodiments, the update file can be generated by an authoring tool capable of encrypting the update file before communicating the update file to client **104** and/or storing the update file on a storage medium (e.g., compact disk, floppy disk, etc.).

[**0022**] In one particular embodiment, appliance **122** operates to receive the update file through a network **106** coupled to appliance **122**. As used throughout this document, the term "couple" and/or "coupled" refers to any direct or indirect communication between two or more elements, whether or not those elements are in physical contact with one another. In one particular embodiment, appliance **122** couples to network **106** through communications link **130***b*. Communicating the update file through network **106** is useful, for example, when the update file is stored on a client **104** coupled to network **106**. Locating the update file on client **104** enables a user of the appliance to access a URL and download the update file. In some embodiments, appliance **122** can automatically search a designated URL for the update file and, if found, download the update file to appliance **122**. In those embodiments, appliance **122** can automatically search the designated URL periodically, randomly, and/or on command.

[**0023**] Network **106** may comprise, for example, a data network, a public switched telephone network (PSTN), an integrated services digital network (ISDN), a local area network (LAN), a wide area network (WAN), a metropolitan area network (MAN), all or a portion of the global computer network known as the Internet, and/or other communication systems or combination of communication systems at one or more locations. Network **106** may comprise any wireless network, wireline network, or combination of wireless and wireline networks capable of supporting communication between network elements using ground-based and/or space-based components.

[**0024**] One or more clients **104** may couple to network **106**. Each client **104** may include any computing and/or communicating device operable to communicate and/or receive information over network **106**. Each client may include, for example, a web server, a workstation, a mainframe computer, a mini-frame computer, a desktop computer, a laptop computer, a personal digital assistant, or any other computing or communicating device. In operation, client **104** may execute with any of the well-known MS-DOS, PC-DOS, OS-2, MAC-OS, WINDOWSTI, UNIX, or other appropriate operating systems.

[**0025**] In an alternative embodiment, appliance **122** operates to receive an update file through a host **102** coupled to appliance **122**. In various embodiments, the update file may be downloaded to host **102** from network **106**. In some embodiments, the update file may be loaded onto host **102** from a compact disk or floppy disk. In one particular embodiment, appliance **122** couples to a host **102** through communications link **130***a*. In an alternative embodiment, appliance couples to network **106** indirectly through host **102** through communications link **130***c*. Host **102** may comprise, for example, a desktop computer, a laptop computer, a personal digital assistant, an external drive coupled to appliance **122**, or any other computing or communicating device.

[**0026**] In the illustrated embodiment, system **100** includes a communications link **130** operable to facilitate the communication of information to and/or from appliance **122**. Communications link **130** may include any hardware, software, firmware, or combination thereof. In various embodiments, communications link **130** may comprise any communications medium capable of assisting in the communication of analog and/or digital signals. Communications link **130** may, for example, comprise a twisted-pair copper telephone line, a fiber optic line, a Digital Subscriber Line (DSL), a wireless link, a USB bus, a PCI bus, an ethernet interface, or any other suitable interface operable to assist in the communication of information to and/or from appliance **122**.

[**0027**] In the illustrated embodiment, appliance **122** includes an external interface **120** capable of facilitating the

communication of information at least to and possibly from appliance **122**. In one particular embodiment, interface **120** directly facilitates communication between appliance **122** and network **106** through a communications link **130***b*. In an alternative embodiment, interface **120** indirectly facilitates communication between appliance **122** and network **106** through communications link **130***c*.

[**0028**] In various embodiments, external interface **120** enables client **104** to communicate an update file to appliance **122** over network **106**. In other embodiments, external interface **120** can enable host **102** to communicate an update file to appliance **122** over communications link **130***a*. Communicating the update file from client **104** to appliance **122** allows a user and/or appliance **122** to update the program stored on appliance **122** after delivery of appliance **122** to the user.

[**0029**] External interface **120** facilitates the communication of information to and/or from appliance **122**. Interface **120** may include any hardware (e.g., modem, network, interface card, etc.), software (e.g., multi-layer protocol support, protocol conversion, data processing, data modulation, etc.), firmware, or combination thereof operable to facilitate communication with one or more elements external to appliance **122**.

[**0030**] In this embodiment, appliance **122** includes a controller **128** capable of processing at least a portion of one or more programs **125** stored on appliance **122**. For example, where appliance **122** comprises a digital audio player, controller **128** can operate to load a digital audio decoder file and to execute the file-decode sequence. Controller **128** may include any hardware, software, firmware, or combination thereof capable of processing at least a portion of the program stored on appliance **122**. Although this example depicts controller **128** as a single processing device, controller **128** may comprise multiple processors, a processor array, or any other suitable processor or processors without departing from the scope of the present disclosure.

[**0031**] In this embodiment, appliance **122** includes a memory **124** operable to store one or more programs **125**. Memory **124** may include any hardware, software, firmware, or combination thereof operable to store and facilitate retrieval of information. Memory **124** may store information using any of a variety of data structures, arrangements, and/or compilations. Memory **124** may, for example, include a dynamic random access memory (DRAM), a static random access memory (SRAM), a NAND flash memory, or any other suitable volatile or nonvolatile storage and retrieval device or combination of devices. Although this example depicts memory **124** as a single medium, memory **124** may comprise any additional number of storage media without departing from the scope of the present disclosure. All or part of memory **124** could reside locally within appliance **122** or could reside in a location remote from and accessible to appliance **122**.

[**0032**] In one particular embodiment, memory **124** includes at least an open partition of memory **126***a* and at least a hidden partition of memory **126***b*. Although this example uses two partitions of memory **126***a* and **126***b*, any number of partitions can be used without departing from the scope of the present disclosure. In an alternative embodiment, open partition **126***a* and hidden partition **126**b can comprise physically separate memory devices. As used throughout this document, the term "hidden partition" or "hidden portion" of memory refers to a part of memory **124** that is substantially free from access by a user through an external interface. A memory device **124** comprising at least hidden partition **126***b* is advantageous in substantially preventing a user from deleting or corrupting portions of the program stored on hidden partition **126***b* of memory **124**, which can lead to an improved reliability of appliance **122**. In addition, hidden partition **126***b* can enable program designers to substantially protect licensed code and/or software stored on memory device **124**.

[**0033**] One aspect of this disclosure recognizes that hidden partition **126***b* enables upgrading of a program stored on appliance **122** in a relatively secure manner. That is, hidden partition **126***b* enables upgrading of the program by preventing access to the update file by a user and/or a device without the appropriate decryption sequence. In various embodiments, the update file comprises an encrypted format that substantially prevents installation/use of the update file without the appropriate decryption sequence.

[**0034**] **FIG. 2** is a block diagram illustrating an exemplary embodiment of an appliance **200** implementing at least a hidden memory partition **206***b*. In various embodiments, the structure and function of appliance **200** can be substantially similar to appliance **122** of **FIG. 1**. In this example, appliance **200** includes an external interface **204** capable of communicating information to and possibly from appliance **200**. In various embodiments, the structure and function of external interface **204** can be substantially similar to external interface **120** of **FIG. 1**. In this particular embodiment, external interface **204** operates to couple to a host through a communications link **205**. In this particular example, communications link **205** comprises a universal serial bus (USB). Other types of communication links could be implemented without departing from the scope of the present disclosure.

[**0035**] In this embodiment, appliance **200** includes a memory **212** operable to store one or more programs **225** capable of contributing to one or more functions of appliance **200**. Memory **212** may comprise any suitable storage and/or retrieval device or combination of devices. In this particular embodiment, memory **212** comprises NAND flash memory. In various embodiments, the structure and function of memory **212** can be substantially similar to memory **124** of **FIG. 1**. In this example, memory **212** comprises a single storage medium. Although this example illustrates memory **212** as a single storage medium, any additional number of storage media can be used without departing from scope of the present disclosure.

[**0036**] In this embodiment, memory **212** includes'at least an open partition of memory **206***a* and at least a hidden partition of memory **206***b*. Open partition **206***a* operates to store those portions **225***a* of program **225** that are accessible to the user through external interface **204**. In various embodiments, open partition **206***a* may store, for example, media files, data files, and/or any other information desired by program designers to be made accessible to the user. Similarly, hidden partition **206***b* operates to store at least a portion **225***b* of program **225** that a program designer desires to be made inaccessible to a user of appliance **200**. Hidden partition **206***b* can store, for example, executable files, the operating portion of the program, operating system appli-

cations, Mass Storage Class drivers, decryption sequence libraries, firmware, software, data files, data libraries, rights management information, and/or any other desired information.

[0037] In the illustrated embodiment, hidden partition **206***b* comprises at least a portion of memory **212**. In various embodiments, the structure and function of hidden partition **206***b* can be substantially similar to hidden partition of memory **126***b* of **FIG. 1**. In this particular embodiment, hidden partition **206***b* is substantially free from access by a user through external interface **204**. Restricting access to portions **225***b* of program **225** is advantageous in substantially preventing a user from deleting and/or corrupting those portions of the program. The restricted access can lead to an improved reliability of appliance **200**. In addition, hidden partition **206***b* can enable program designers to substantially protect licensed code, firmware, and/or software.

[0038] In this particular embodiment, hidden partition **206***b* comprises an atypical protocol and/or format that is generally incapable of being registered by a host through external interface **204**. Implementing an atypical protocol and/or format allows hidden partition **206***b* to be substantially free from access by a user through external interface **204**. In other embodiments, hidden partition **206***b* can comprise an encrypted file stored on memory **212**. The encrypted file can be substantially free from access without the appropriate decryption sequence. In an alternative embodiment, hidden partition **206***b* can comprise a separate independent memory device that is not coupled to and/or capable of being isolated, at least temporarily, from external interface **204**.

[0039] In this embodiment, appliance **200** includes a controller **202** capable of processing at least a portion of the program stored on memory **212**. In various embodiments, the structure and function of controller **202** can be substantially similar to controller **128** of **FIG. 1**. In other embodiments, controller **202** can comprise a digital signal processor (DSP). As one particular nonlimiting example, controller **202** could comprise a C**54**x based digital signal processor. In this example, controller **202** couples to open partition **206***a* and hidden partition **206***b* through communication links **208** and **210**, respectively. Communication links **208** and **210** may include any hardware, software, firmware, or combination thereof operable to facilitate communication between controller **202** and memory **212**.

[0040] In some embodiments, appliance **200** operates to receive an update file through external interface **204**. The update file received by appliance **200** may comprise, for example, software, firmware, code, data compilations, and/or combinations of these or any other type of information. In this particular embodiment, the update file received by appliance **200** comprises an encrypted update file **213**, where the encryption is based at least in part on a unique product identification, such as an electronic serial number or the link, uniquely associated with appliance **200**. Associating the encryption with a produce identification uniquely identifying appliance **122** helps to ensure that the program update can only be applied to the intended appliance. In this example, controller **202** couples external interface **204** to open partition **206***a* and routes the encrypted update file for storage on open partition **206***a*.

[0041] In this embodiment, controller **202** comprises a secure program upgrade utility **214** operable to search open partition **206***a* for an encrypted update file and operable to upgrade at least a portion of the program stored on hidden partition **206***b*. In some embodiments, secure program upgrade utility **214** can cause controller **202** to periodically search for encrypted update files on open partition **206***a*. In other embodiments, secure program upgrade utility **214** can cause controller **202** to randomly search for encrypted update files on open partition **206***a*. In an alternative embodiment, an external command can instruct controller **202** to search for an encrypted update file on open partition **206***a*.

[0042] Upon identification of encrypted update file **213**, secure program upgrade utility **214** of controller **202** operates to authenticate update file **213**. In this particular embodiment, secure program upgrade utility **214** authenticates update file **213** based at least in part on a product identification uniquely associated with appliance **200**. In this example, after controller **202** identifies a valid update file, controller **202** operates to isolate communications link **205** coupled to external interface **204** from appliance **200**. The isolation of communication link **205** can be accomplished by various program commands and does not necessarily require a physical disconnection of the communication link. For example, controller **202** can instruct external interface **204** not to facilitate communication to and/or from communication link **205**.

[0043] In this example, controller **202** loads a decryption sequence **220** from hidden partition **206***b* after isolation of the communication link. Decryption sequence **220** facilitates decryption of encrypted update file **213**. Storing decryption sequence **220** in hidden partition **206***b*, while not required, provides an advantage of protecting the integrity of the decryption sequence. In various embodiments, controller **202** can load decryption sequence **220** before or simultaneously with the isolation of communication link **205**. In this particular example, decryption sequence **220** loaded by controller **202** is based at least in part on a file extension associated with encrypted update file **213**. In some embodiments, controller **202** can store decryption sequence **220** locally, eliminating a need to first load decryption sequence **220** from hidden partition **206***b*.

[0044] Following the isolation of communication link **205** and loading of decryption sequence **220**, controller **202** operates to decrypt encrypted update file **213** and to store a decrypted update file **216** on open partition **206***a*. In an alternative embodiment, decrypted update file **216** can be stored on hidden partition **206***b* after decryption by controller **202**. Storing decrypted update file **216** on hidden partition **206***b* before upgrading can result in a larger portion of memory **212** being reserved for hidden partition **206***b*. Storing decrypted update file **216** temporarily on either open partition **206***a* or hidden partition **206***b* advantageously allows verification of decrypted update file **216** before upgrading the portion of the program stored on hidden partition **206***b*.

[0045] In this example, controller **202** verifies decrypted update file **216** before upgrading the portion of the program stored on hidden partition **206***b*. In an alternative embodiment, decrypted update file **216** can directly upgrade that portion **225***b* of program **225** stored on hidden partition **206***b* without verification. In this example, after verification, controller **202** upgrades portion **225***b* of program **225** stored on

hidden partition **206***b* by writing over the existing program. Once hidden partition **206***b* has been upgraded, controller **202** deletes decrypted update file **216** from open partition **206***a*. Controller **202** then re-establishes the connection with communication link **205** coupled to external interface **204**.

[**0046**] **FIG. 3** is a block diagram illustrating an exemplary embodiment of an appliance **300** implementing at least a hidden partition of memory **306***b*. In this example, the structure and function of appliance **300** can be substantially similar to appliance **122** of **FIG. 1**. In this example, appliance **300** includes an external interface **304** capable of communicating information to and possibly from appliance **300**. In various embodiments, the structure and function of external interface **304** can be substantially similar to external interface **120** of **FIG. 1**. In this particular embodiment, external interface **304** operates to couple to a host through a communication link **305**.

[**0047**] In this particular example, appliance **300** includes a memory **312** operable to store one or more programs **325** capable of at least partially contributing to one or more functions of appliance **300**. In this particular embodiment, memory **312** comprises NAND flash memory. In various embodiments, the structure and function of memory **312** can be substantially similar to memory **212** of **FIG. 2**. In this embodiment, memory **312** comprises a single storage medium. Although this example illustrates memory **312** as a single storage medium, any additional number of storage media can be used without departing from scope of the present disclosure.

[**0048**] In this embodiment, memory **312** includes at least an open partition of memory **306***a* and at least a hidden partition of memory **306***b*. Although this example illustrates two partitions of memory **312**, any additional number of partitions can be used without departing from the scope of the present disclosure. The structure and function of open partition **306***a* can be substantially similar to open partition **206***a* of **FIG. 2**. The structure and function of hidden partition **306***b* can be substantially similar to hidden partition **206***b* of **FIG. 2**.

[**0049**] In this embodiment, appliance **300** includes a controller **302** capable of processing at least a portion of program **325** stored on memory **312**. In various embodiments, the structure and function of controller **302** can be substantially similar to controller **202** of **FIG. 2**. In this example, controller **302** couples to open partition **306***a* and hidden partition **306***b* through communication links **308** and **310**, respectively. Communication links **308** and **310** may include any hardware, software, firmware, or combination thereof operable to facilitate communication between controller **302** and memory **312**.

[**0050**] In this particular example, appliance **300** operates to receive an update file **313** through external interface **304**. The structure and function of update file **313** can be substantially similar to update file **213** of **FIG. 2**. In this example, external interface **204** routes update file **313** for storage on open partition **306***a*.

[**0051**] In this embodiment, controller **302** comprises a secure program utility **314**. In various embodiments, the structure and function of secure program utility **314** can be substantially similar to secure program utility **214** of **FIG. 2**. In this example, after secure program utility **314** identifies encrypted update file **313** and isolates communication link **305** from external interface **304**, controller **302** loads a decryption sequence **320** from hidden partition **306***b*. In various embodiments, the structure and function of decryption sequence **320** can be substantially similar to decryption sequence **220** of **FIG. 2**.

[**0052**] **FIG. 4** is a flow chart illustrating an exemplary method for securely upgrading at least a portion of a program stored on a hidden partition of memory in an appliance. In one particular embodiment, the portion of a program stored on the hidden partition depicted in **FIG. 2** can be securely upgraded. In this example, method **400** begins at step **410** where appliance **200** receives an encrypted update file **213**. In various embodiments, encrypted update file **213** can be received, for example, from a communications link **205** at an external interface **204**.

[**0053**] In this example, encrypted update file **213** is stored in open partition **206***a* at step **420**. In this example, controller **202** operates to route encrypted update file **213** from external interface **204** for storage on an open partition of memory **206***a*. In an alternative embodiment, external interface **204** can operate to route the encrypted update file to the open partition of memory. In this example, a secure program utility **214** operates to search open partition **206***a* for encrypted update file **213** and to authenticate update file **213**. In various embodiments, secure program utility **214** searches open partition **206***a* periodically and/or randomly. In some embodiments, the authentication of update file **213** is based at least in part on a product identification uniquely associated with appliance **200**.

[**0054**] In an alternative embodiment, encrypted update file **213** is stored in hidden partition **206***b*. In this example, controller **202** operates to route encrypted update file **213** from external interface **204** for storage on hidden partition of memory **206***b*. In some embodiments, a secure program utility **214** operates to search hidden partition **206***b* for encrypted update file **213** and to authenticate update file **213**. In various embodiments, secure program utility **214** searches open partition **206***b* periodically and/or randomly. In some embodiments, the authentication of update file **213** is based at least in part on a product identification uniquely associated with appliance **200**.

[**0055**] In this example, appliance **200** is isolated from communication link **205** at step **430**. The isolation of communication link **205** can be accomplished by various program commands and does not necessarily require a physical disconnection of communication link **205**. In this example, controller **202** loads a decryption sequence **220** from hidden partition **206***b* after isolation of communication link **205**. In various embodiments, controller can load decryption sequence **220** before or simultaneously with isolating communication link **205**. In other embodiments, controller **202** can store decryption sequence **220** locally.

[**0056**] Following the isolation of communication link **205**, controller **202** operates to decrypt the encrypted update file at step **440**. In various embodiments, decrypted update file **216** can be stored on open partition **206***a*. In other embodiments, decrypted update file **216** can be stored on hidden partition **206***b*. In some embodiments, decrypted update file can modify

[**0057**] At least a part of portion **225***b* of program **225** stored on hidden partition **206***b* is modified at step **450** based

at least in part on decrypted update file **216**. In this example, hidden partition **206***b* is substantially inaccessible through external interface **204**. In various embodiments, controller **202** can operate to verify decrypted update file **216** before modifying portion **225***b* of program **225** stored on hidden partition **206***b*. In other embodiments, controller **202** can operate to modify at least a part of portion **225***b* of program **225** directly without verification or storing decrypted update file **216**.

[**0058**] In some embodiments, after modifying at least a part of portion **225***b* of program **225**, controller **202** operates to delete decrypted update file **216** from open partition **206***a*. Following the deletion of decrypted update file **216**, controller **202** operates to re-establish the connection with communication link **205**.

[**0059**] In an alternative embodiment, appliance **200** is not isolated from communication link **205** at step **430**. For example, controller **202** can receive and decrypt encrypted update file **213** without storing update file on a portion of memory **212**. In that case, controller **202** operates to route the decrypted update file to hidden partition **206***b* to modify at least a part of portion **225***b* of program **225** stored on hidden partition **206***b*. In this example, controller **202** operates to modify at least a part of portion **225***b* of program **225** directly without verification or storing decrypted update file **216**.

[**0060**] Although the present invention has been described in several embodiments, a myriad of changes, variations, alterations, transformations, and modifications may be suggested to one skilled in the art, and it is intended that the present invention encompass such changes, variations, alterations, transformations, and modifications as falling within the spirit and scope of the appended claims.

What is claimed is:

1. An appliance, comprising:

a memory comprising at least a hidden portion of memory operable to store at least a portion of a program capable of contributing to one or more functions of the appliance;

a controller operable to process at least a portion of the program stored on the hidden portion of memory; and

an external interface operable to provide access to at least an open portion of the memory;

wherein the hidden portion of memory is inaccessible through the external interface.

2. The appliance of claim 1, wherein the appliance comprises a device selected from the group consisting of a personal digital assistant, a cell phone, a digitized audio recorder/player and a household appliance.

3. The appliance of claim 1, wherein the open portion and the hidden portion of memory reside within a single storage medium.

4. The appliance of claim 1, wherein the open portion and the hidden portion of memory reside within separate storage media.

5. The appliance of claim 1, wherein the controller comprises a secure program upgrade utility operable to upgrade the at least a portion of the program stored on the hidden portion.

6. The appliance of claim 1, wherein the portion of the program stored in the hidden portion of memory comprises at least a portion of an operating system module.

7. The appliance of claim 1, wherein the portion of the program stored in the hidden portion of memory comprises a portion selected from the group consisting of a decryption sequence library, a data library, a Mass Storage Class driver, firmware, and software.

8. An appliance, comprising:

an external interface operable to receive a program update;

a memory comprising a hidden portion inaccessible through the external interface, wherein at least a portion of program to be updated resides in the hidden portion of memory;

a controller operable to modify at least a portion of the program residing on the hidden portion of memory based at least in part on the program update received at the external interface.

9. The appliance of claim 8, wherein the program update comprises an encrypted file that is decrypted by the controller before modification of the at least a portion of the program residing in the hidden portion of memory.

10. The appliance of claim 8, wherein the program update is loaded on an open portion of memory accessible through the external interface before updating the at least a portion of the program residing on the hidden portion of memory.

11. The appliance of claim 8, wherein the controller operates to disable the external interface for at least some time between receiving the program update and modifying the portion of the program residing on the hidden portion.

12. The appliance of claim 8, wherein the controller operates to substantially prevent access to a decrypted portion of the program update without disabling the external interface.

13. The appliance of claim 8, wherein the controller couples to the external interface, and the external interface resides between the memory and a communication link coupled to the external interface.

14. A method of upgrading a program stored on an appliance, comprising:

receiving from a communication link an encrypted update file at an external interface of an appliance;

storing the encrypted update file on an open portion of a memory accessible through the external interface;

isolating the appliance from the communication link;

after isolating the appliance, decrypting the encrypted update file;

modifying at least a portion of a program stored on a hidden portion of memory based at least in part on the decrypted update file;

wherein the hidden portion of memory is inaccessible through the external interface.

15. The method of claim 14, wherein decrypting the update file is based at least in part on a product identification associated with the appliance.

16. The method of claim 14, further comprising:

searching the open portion of the memory for the encrypted update file;

authenticating the encrypted update file based at least in part on a product identification associated with the appliance; and

loading a decryption sequence from the hidden portion of memory.

17. The method of claim 16, wherein searching the open portion of memory comprises a periodic search.

18. The method of claim 16, wherein searching the open portion of memory comprises a random search.

19. The method of claim 14, further comprising:

storing the decrypted update file on the open portion of memory; and

verifying the decrypted update file.

20. The method of claim 14, further comprising:

after modifying the at least a portion of the program, deleting the decrypted update file from the open portion of memory; and

after deleting the decrypted update file, allowing communication between the communication link and the appliance.

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