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(54) **APPARATUS, SYSTEM, AND METHOD FOR SECURE MASS STORAGE BACKUP**

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H04L 9/00 (2006.01)

(52) **U.S. Cl.** **713/189**; 713/191; 713/193

(58) **Field of Classification Search** 713/193, 713/189, 191

See application file for complete search history.

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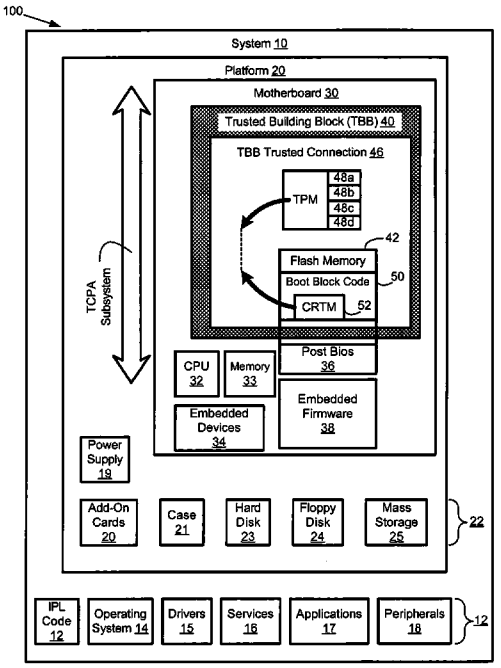
(57) **ABSTRACT**

An apparatus for securely backing up data using a cryptographic module includes a mass storage device having a first accessible portion and a second encrypted portion. The mass storage device is initialized to only decrypt the encrypted portion on the system that first created the encrypted portion. The cryptographic module may be a Trusted Platform Module (TPM) based on specifications from the Trusted Computer Group. The mass storage device comprises a trusted platform interface module configured to communicate with the TPM. The system may include a motherboard having a TPM, and the mass storage device. The method in one embodiment comprises providing a computer readable mass storage device, initializing a password module, transmitting an encrypted password to the cryptographic module, authenticating the encrypted password, decrypting the encrypted password, transmitting the decrypted password to the computer readable medium, and decrypting the second encrypted portion using the decrypted password.

24 Claims, 6 Drawing Sheets



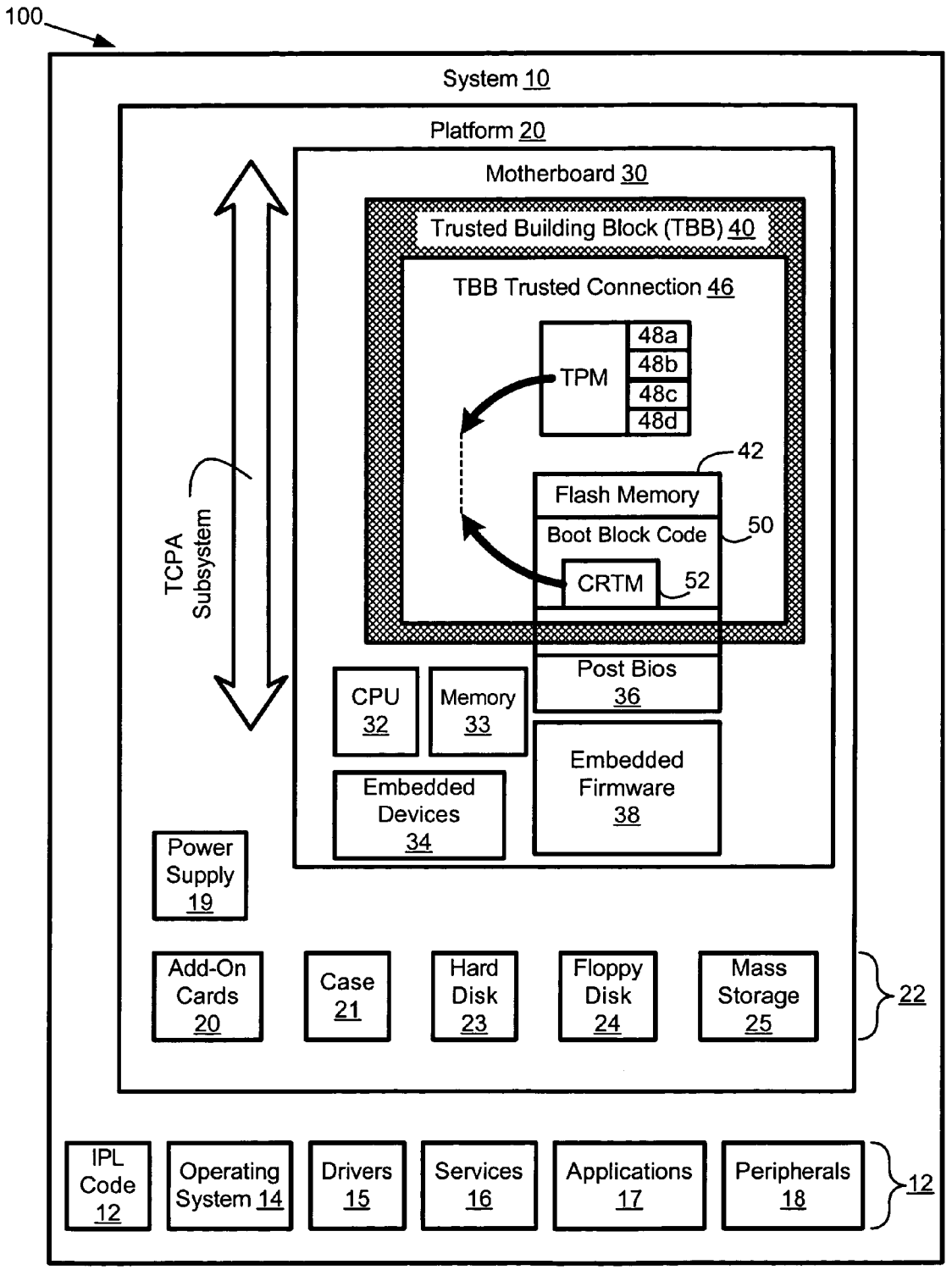

100
System 10
Platform 20
Motherboard 30
Trusted Building Block (TBB) 40
TBB Trusted Connection 46
TPM
48a
48b
48c
48d
42
Flash Memory
Boot Block Code
50
CRTM
52
TCPA Subsystem
Post Bios 36
CPU 32
Memory 33
Embedded Devices 34
Embedded Firmware 38
Power Supply 19
Add-On Cards 20
Case 21
Hard Disk 23
Floppy Disk 24
Mass Storage 25
22
IPL Code 12
Operating System 14
Drivers 15
Services 16
Applications 17
Peripherals 18
12

FIG. 1

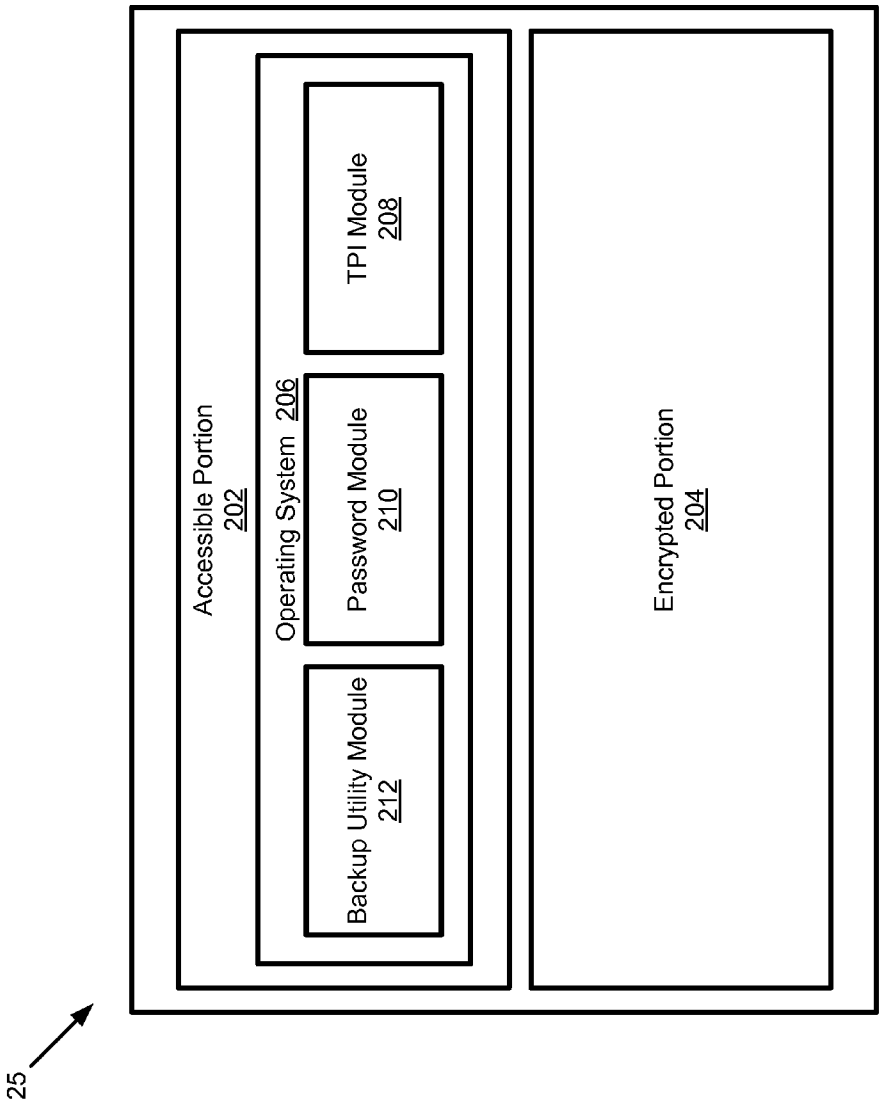

25
Accessible Portion
202
Operating System 206
Backup Utility Module
212
Password Module
210
TPI Module
208
Encrypted Portion
204

FIG. 2

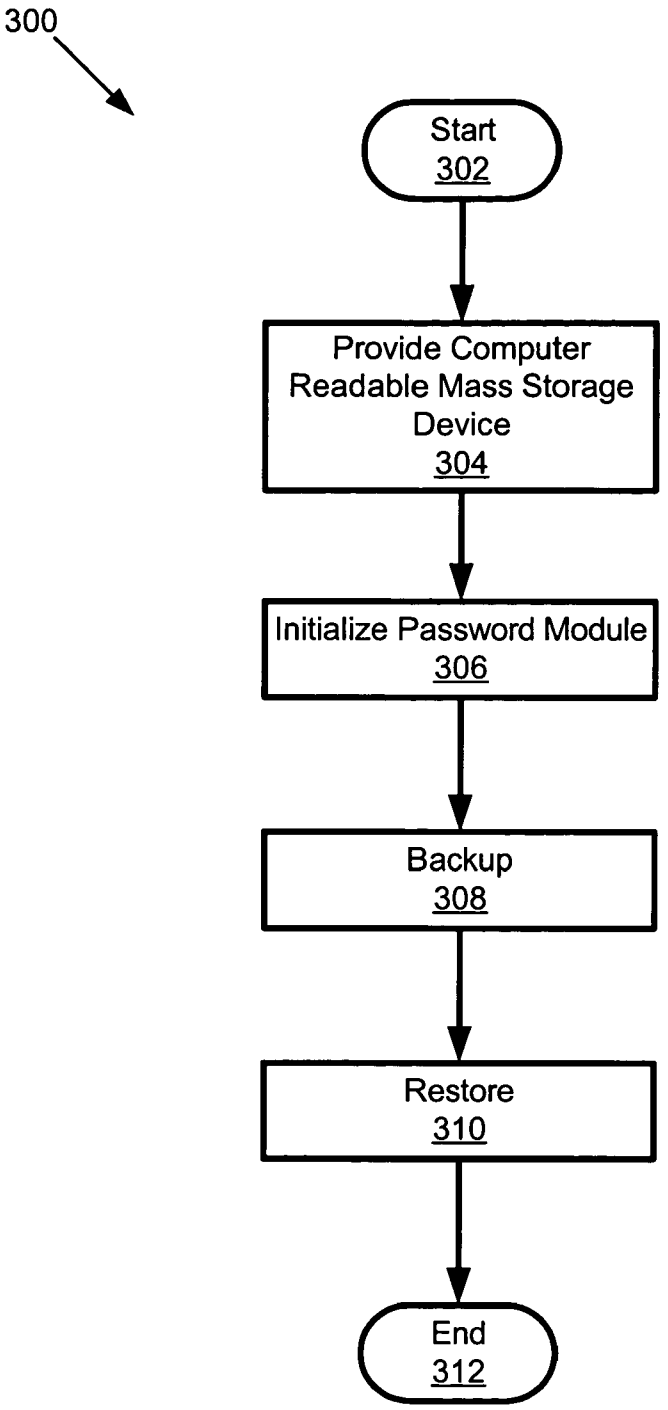

300
Start
302
Provide Computer Readable Mass Storage Device
304
Initialize Password Module
306
Backup
308
Restore
310
End
312

FIG. 3

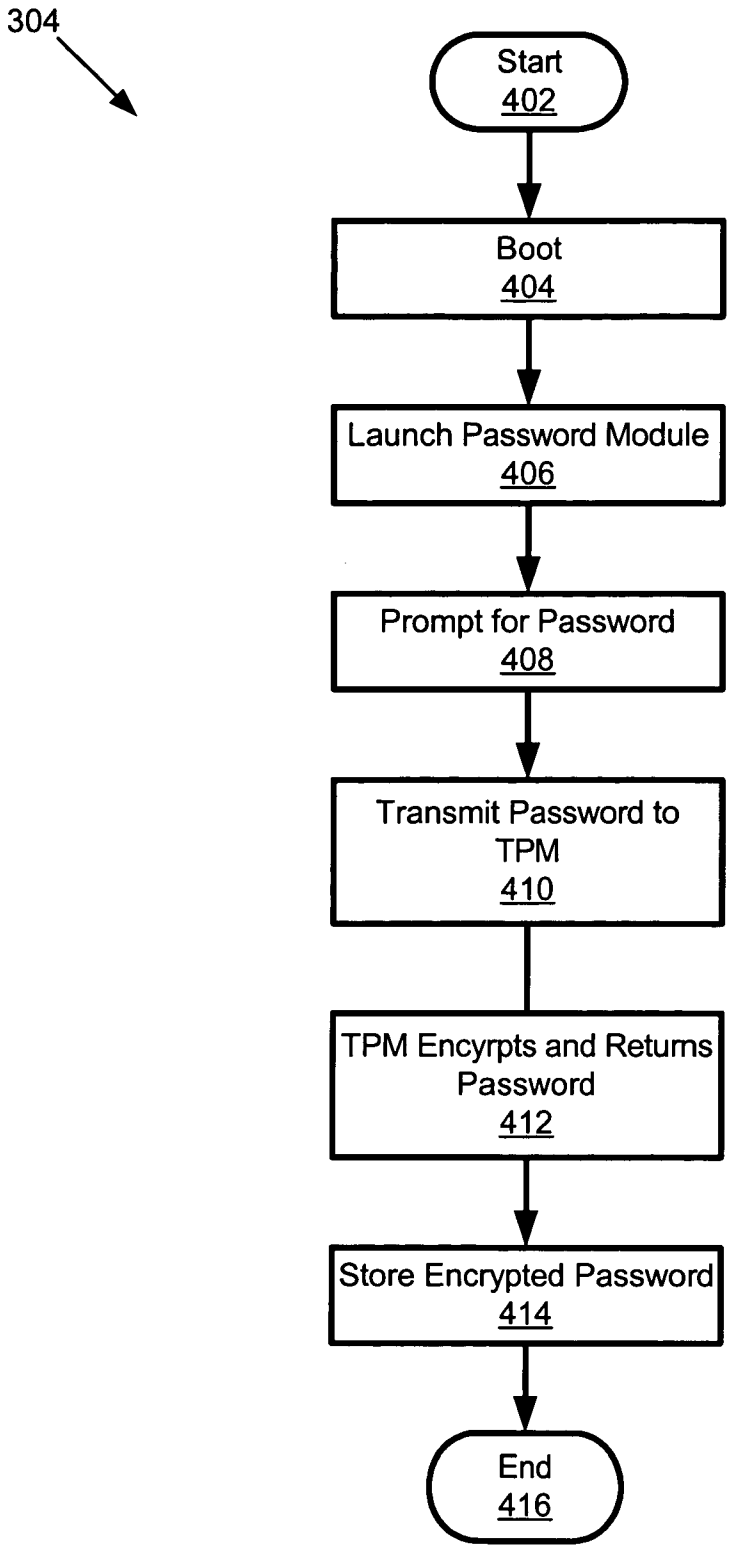

304
Start
402
Boot
404
Launch Password Module
406
Prompt for Password
408
Transmit Password to TPM
410
TPM Encyrpts and Returns Password
412
Store Encrypted Password
414
End
416

FIG. 4

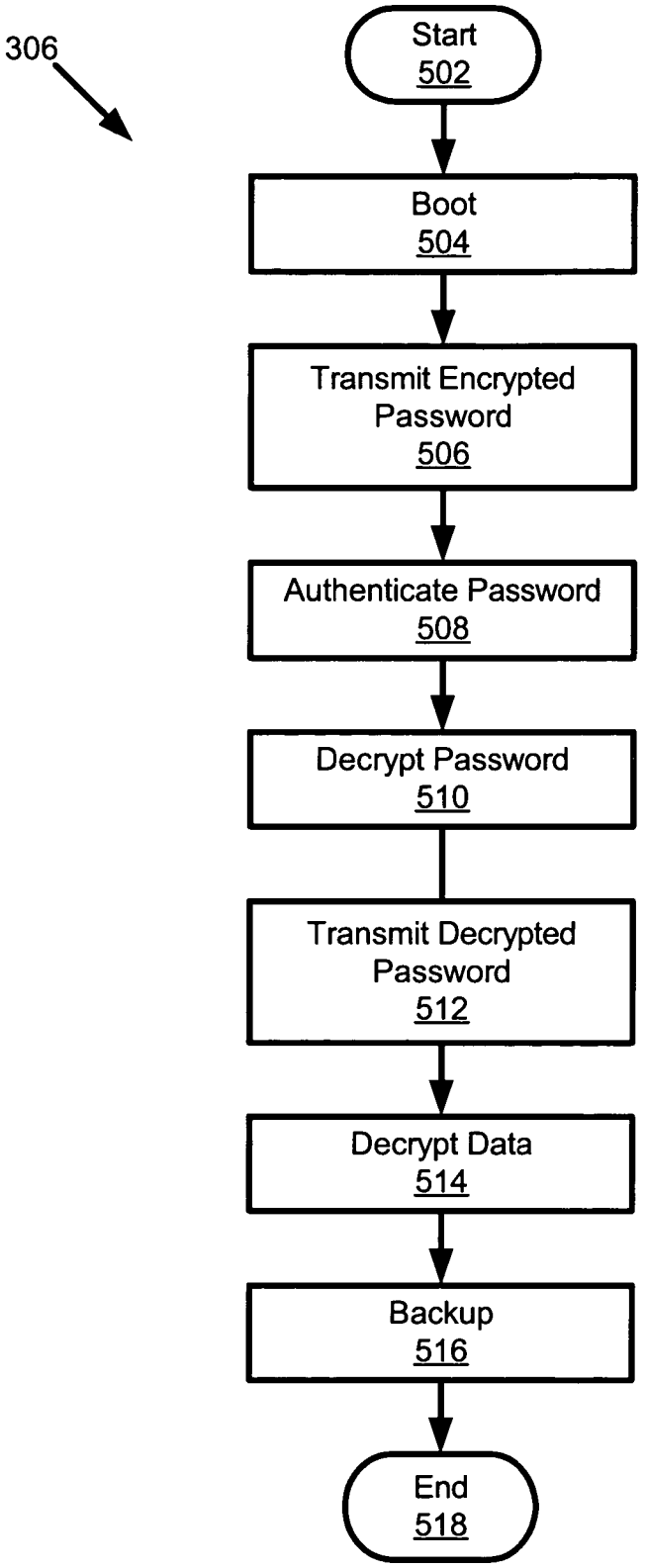

306
Start
502
Boot
504
Transmit Encrypted Password
506
Authenticate Password
508
Decrypt Password
510
Transmit Decrypted Password
512
Decrypt Data
514
Backup
516
End
518

FIG. 5

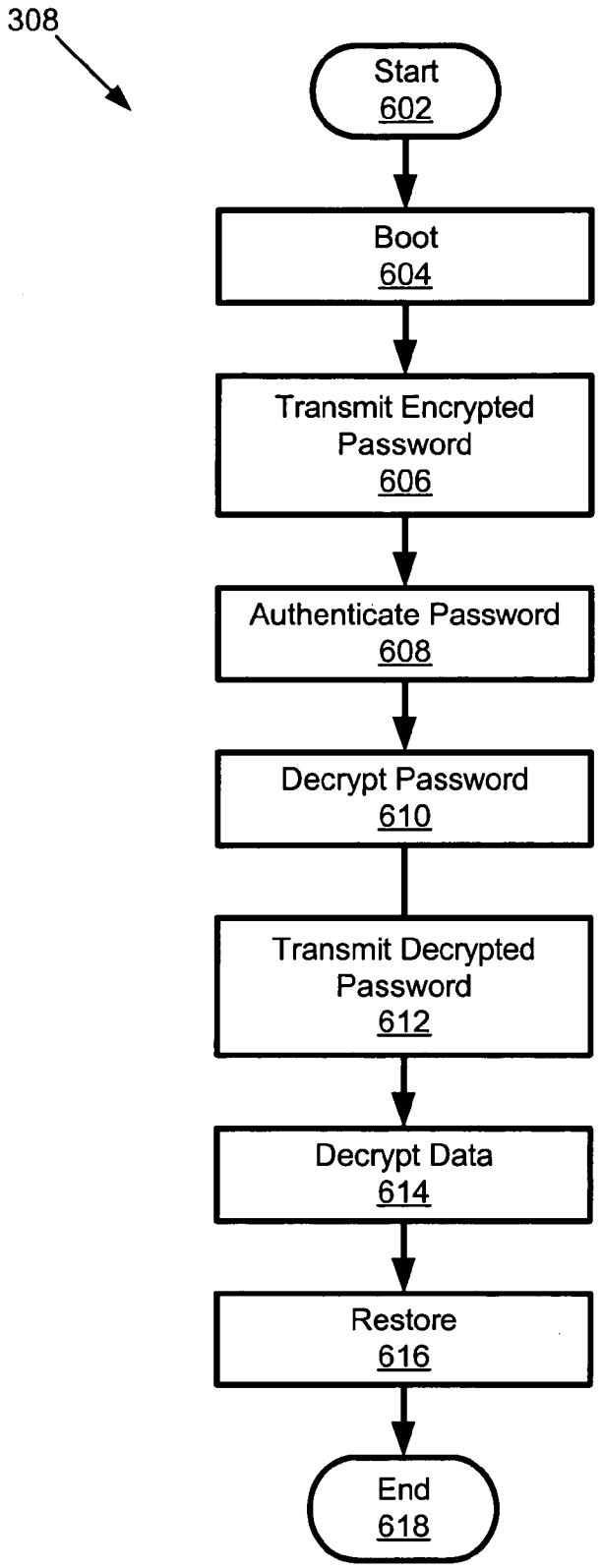

308
Start
602
Boot
604
Transmit Encrypted Password
606
Authenticate Password
608
Decrypt Password
610
Transmit Decrypted Password
612
Decrypt Data
614
Restore
616
End
618

FIG. 6

APPARATUS, SYSTEM, AND METHOD FOR SECURE MASS STORAGE BACKUP

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to the field of trusted and secure computing systems, and more particularly to securely backing up and restoring data using mass storage devices.

2. Description of the Related Art

With the advent of computer systems, there has always existed a need to transport, backup, or restore data. In the 1960's, IBM invented the forerunner of current removable media, the floppy disk. At first, the floppy disk was a read only disk with a large eight-inch form factor. Eventually, the floppy disk was adapted to be writable as well as readable, and the form factor shrunk to the common day 3-½ inch form factor. The floppy disk was a popular choice for removable media because of portability and cost. However, the floppy disk was never popular for backing up and restoring data due to the small data capacity (approximately 1.4 MB).

In order to transport or backup and restore any significant amount of data, a storage device other than a floppy disk is needed. One such device that offers higher data capacities is a tape drive. The tape drive, like the floppy disk, is an electromagnetic storage device that can store many gigabytes, even terabytes, of data. The tape drive is an ideal solution for corporations, but for the individual business or home user the tape drive is not practical. This is due in part to the hardware required to utilize a tape drive. Alternatively, many have turned to optical disks such as CD's or DVD's to store data. Optical disks offer large data capacities, currently ranging from 700 MB to 8.7 GB, and optical disks offer portability. However, just as with the tape drive, optical disks require specialized hardware in order to write data to the disk.

An alternative solution to backing up and restoring data is a flash memory based Universal Serial Bus (USB) drive. USB drives are commonly known as USB mass storage devices, and are available in many different form factors. A popular form factor is the keychain drive. These devices are small, often one to two inches in length, highly portable and currently have data capacities of up to 2 GB. Since desktop and portable computers generally have multiple USB ports, no proprietary hardware is required to use a USB drive.

All of the above discussed removable media are viable solutions depending upon the situation. However, with the portability of removable media comes the increased risk of losing the storage device that may contain highly sensitive data. While many removable media manufacturers have made individual strides towards increasing security by adding "smart cards" or embedded security chips to their new models, the lack of a concerted effort by the removable media industry to develop security technology could prevent the evolution of this technology in a consistent and compatible way between manufacturers.

One current solution to this problem is to password encrypt the data on the removable media device. The password, however, does not prevent the removable media device, such as a USB drive, to be used in multiple systems. For example, assume a business traveler loses a USB drive in the airport, and a person retrieves the USB drive. Commonly available password breaking tools will allow a person to potentially retrieve the data from the USB drive. Additionally, people may forget passwords, and then the data becomes lost in the sense that a person may never be able to

access the encrypted data again. What is needed is a system, method, and apparatus that only allows data stored on removable media to be accessed on the system that created the data, and thereby negates the need of user-interaction.

An open alliance between major manufacturers was formed to develop and propose a standard that would adopt hardware and software technologies to strengthen security at the system or platform level. The open alliance, formerly known as the Trusted Computing Platform Alliance (TCPA) (currently referred to as the Trusted Computing Group (TCG) but will be referred to herein as the TCPA), has proposed a standard including new hardware, BIOS and operating system specifications so manufacturers can provide a more trusted and secure PC platform based on common industry standards, the details of which are provided in the TCPA PC Specific Implementation Specification, 1.00 RC1 (Aug. 16, 2001) (http://www.trustedcomputinggroup.org), hereby incorporated by reference.

The alliance has successfully created a cryptographic module generally called a Trusted Platform Module (TPM). However, no method or apparatus exists to interface removable media devices with the TPM in order to take advantage of the cryptographic capabilities of the TPM. What are needed is a process, apparatus, and system that interface a removable media storage device with the TPM. Beneficially, such a process, apparatus, and system would allow secure backup and restore of data only on the system that created the data.

SUMMARY OF THE INVENTION

The present invention has been developed in response to the present state of the art, and in particular, in response to the problems and needs in the art that have not yet been fully solved by currently available removable media devices. Accordingly, the present invention has been developed to provide a process, apparatus, and system for secure mass storage backup and restore that overcome many or all of the above-discussed shortcomings in the art.

An apparatus for secure computer readable mass storage backup is provided. In one embodiment, the apparatus may comprise a computer readable mass storage device having at least a first accessible portion and a second encrypted portion, and a trusted platform interface module operatively coupled with the computer readable medium and configured to communicate with a cryptographic module. The cryptographic module may comprise a trusted platform module (TPM). The computer readable mass storage device may be implemented as a computer readable peripheral such as a hard disk drive, a universal serial bus storage device, a floppy disk, an optical storage disk, a flash memory storage device, or a network attached storage drive.

Additionally, the apparatus comprises a password module configured to store and transmit an encrypted password to the cryptographic module, and receive an unencrypted password from the cryptographic module. In one embodiment, the encrypted password comprises a unique password configured to be decrypted by the cryptographic module that first created the encrypted password. In a further embodiment, the apparatus further comprises a backup utility configured to selectively copy data from a storage device source, detect newer versions of data stored on the storage device source, and replace older versions of the data on the computer readable medium with newer versions of the data.

The present invention may also comprise a device for secure computer readable medium backup. In one embodiment, the device comprises a motherboard, and a crypto-

graphic module coupled to the motherboard and configured to communicate with a computer readable medium. Additionally, the cryptographic module may be configured to receive an encrypted password from a trusted platform interface module, decrypt the password, and transmit the decrypted password to the trusted platform interface module. In a further embodiment, the motherboard further comprises a memory, and a processor coupled to the memory.

A system for secure computer readable medium backup is also provided. In one embodiment, the system may comprise a motherboard, a cryptographic module coupled to the motherboard configured to decrypt encrypted passwords, a computer readable medium module having at least a first accessible portion and a second encrypted portion, and a trusted platform interface module operatively coupled with the computer readable media module and configured to communicate with a cryptographic module. The system may also comprise a password module configured to store and transmit an encrypted password to the cryptographic module, and receive an unencrypted password from the cryptographic module.

In a further embodiment of the present invention, a computer readable storage medium comprising computer readable code is provided. The computer readable code may be configured to carry out a method for secure computer readable medium backup. In one embodiment, the method comprises providing a computer readable medium having at least a first accessible portion and a second encrypted portion, initializing a password module according to unique data stored within a cryptographic module, transmitting an encrypted password to the cryptographic module, authenticating the encrypted password, decrypting the encrypted password, transmitting the decrypted password to the computer readable medium module, and decrypting the second encrypted portion using the decrypted password.

An apparatus for secure computer readable medium backup is also provided. The apparatus comprises means for providing a computer readable medium having at least a first accessible portion and a second encrypted portion, means for initializing a password module according to unique data stored within a cryptographic module, means for transmitting an encrypted password to the cryptographic module, means for authenticating the encrypted password, means for decrypting the encrypted password, means for transmitting the decrypted password to the computer readable medium module, and means for decrypting the second encrypted portion using the decrypted password.

A process of the present invention is also presented for secure mass storage backup. The process in the disclosed embodiments substantially includes the steps necessary to carry out the functions presented above with respect to the operation of the described apparatus and system.

Reference throughout this specification to features, advantages, or similar language does not imply that all of the features and advantages that may be realized with the present invention should be or are in any single embodiment of the invention. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the present invention. Thus, discussion of the features and advantages, and similar language, throughout this specification may, but do not necessarily, refer to the same embodiment.

Furthermore, the described features, advantages, and characteristics of the invention may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize that the invention can be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the invention.

These features and advantages of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the invention as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the advantages of the invention will be readily understood, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments that are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings, in which:

FIG. **1** is a schematic block diagram illustrating one embodiment of a Trusted Computing Platform Alliance (TCPA) based system in accordance with the present invention;

FIG. **2** is a schematic block diagram illustrating one embodiment of a mass storage device in accordance with the present invention;

FIG. **3** is a schematic flow chart diagram illustrating one embodiment of a method for use of a secure mass storage backup system in accordance with the present invention;

FIG. **4** is a schematic flow chart diagram illustrating one embodiment of a method for initializing a password within the mass storage device in accordance with the present invention;

FIG. **5** is a schematic flow chart diagram illustrating one embodiment of a method for backing up data in accordance with the present invention; and

FIG. **6** is a schematic flow chart diagram illustrating one embodiment of a method for restoring data in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Many of the functional units described in this specification have been labeled as modules, in order to more particularly emphasize their implementation independence. For example, a module may be implemented as a hardware circuit comprising custom VLSI circuits or gate arrays, off-the-shelf semiconductors such as logic chips, transistors, or other discrete components. A module may also be implemented in programmable hardware devices such as field programmable gate arrays, programmable array logic, programmable logic devices or the like.

Modules may also be implemented in software for execution by various types of processors. An identified module of executable code may, for instance, comprise one or more physical or logical blocks of computer instructions which may, for instance, be organized as an object, procedure, or function. Nevertheless, the executables of an identified module need not be physically located together, but may comprise disparate instructions stored in different locations which, when joined logically together, comprise the module and achieve the stated purpose for the module.

Indeed, a module of executable code could be a single instruction, or many instructions, and may even be distributed over several different code segments, among different programs, and across several memory devices. Similarly, operational data may be identified and illustrated herein within modules, and may be embodied in any suitable form and organized within any suitable type of data structure. The operational data may be collected as a single data set, or may be distributed over different locations including over different storage devices.

Reference throughout this specification to "one embodiment," "an embodiment," or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment," "in an embodiment," and similar language throughout this specification may, but do not necessarily, all refer to the same embodiment.

Furthermore, the described features, structures, or characteristics of the invention may be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided, such as examples of programming, software modules, user selections, network transactions, database queries, database structures, hardware modules, hardware circuits, hardware chips, etc., to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention can be practiced without one or more of the specific details, or with other methods, components, materials, and so forth. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

A brief discussion of the boot process of a computing system is deemed appropriate here. Computing systems require a basic input/output system (BIOS) in order to operate. The BIOS is code that controls basic hardware operations, such as interactions with disk drives, hard drives, floppy drives, and the keyboard.

When a computer resets or is initially powered-on, a boot process begins. First, a power on self-test (POST) begins executing. POST is an initialization code which configures the system utilizing initialization settings stored in storage. Once POST has configured the system, BIOS then controls the basic operation of the hardware, utilizing the hardware as it was configured by POST. The boot process is complete once an operating system has been handed control of the system. In order for the boot process to be complete, POST must complete its execution.

POST and BIOS may be both stored as a single flash image in a storage device such as a flash memory. This image may be referred to as the "boot code." If the flash image of POST and BIOS is corrupted, the boot of the system will not be able to be completed.

To recover from a defective flash image error, a system may include a boot block. A boot block may refer to an area within a flash memory containing code, referred to as the "boot block code," which includes a segment of code sufficient to bring the computer system up and to read a recovery image from a boot media or bootable device. In other words, the boot block code may be considered to be a self-contained "miniBIOS" with enough code so as to read the new BIOS image off a boot media or the like. The boot block code may be executed when a computer is powered up or reset. The boot block code may further be executed when a computer is awakened from a sleep state as discussed further below.

FIG. **1** is a schematic block diagram illustrating a Trusted Computing Platform Alliance (TCPA) computing system **100** in accordance with TCPA standards. As illustrated, the PC architecture includes a system **10**, platform **20**, motherboard or planar **30**, and trusted building block (TBB) **40**. The system **10** includes the platform **20** and all post-boot components **12**. Post-boot components **12** may include Initial Program Load (IPL) code **13**, an operating system **14**, drivers **15**, services **16**, applications **17** and peripherals **18**. The platform **20** presents and receives information to and from the user. The platform **20** includes the motherboard **30** and the peripherals **22** attached to the motherboard **30**. The peripherals **22** may include add-on cards **20**, a case **21**, a hard disk **23**, a floppy disk **24**, and a mass storage device **25**. The platform **20** may also comprise a power supply **19**.

The motherboard **30** is provided by a manufacturer and includes one or more CPUs **32**, a memory **33** and all primary peripheral or embedded devices **34**. In addition, the motherboard **30** may comprise a BIOS **36**, embedded firmware **38**, and a Trusted Building Block (TBB) **40**. The TBB **40** is the center of the trusted platform, and includes a portion of a flash memory **42** storing a boot block code **50**, which includes a Core Root of Trust for Measurement (CRTM) **52**. The TBB **40** further includes a cryptographic module **44**. In one embodiment, the cryptographic module **44** comprises a Trusted Platform Module (TPM) **44**, and a trusted connection **46** of CRTM **52** and TPM **44** to the motherboard **30**.

According to the TCPA specification, CRTM **52** and TPM **44** are the only trusted components on the motherboard **30**, i.e., they are presumably secure and isolated from tampering by a third party vendor or software. Only the authorized platform manufacturer (or agent thereof) can update or modify code contained therein. The CRTM **52** is the executable component of the TBB **40** that gains control of the platform **20** upon a platform reset. Thus, for all types of platform resets, the CPU **32** always begins executing CRTM code **52** within boot block code **50**. The trust in the platform is based on CRTM **52**, and trust in all measurements is based on its integrity.

The basic premise underlying the trusted platform is ensuring that untrusted devices or software have not been loaded onto the system. Trust is established during a pre-boot state that is initiated by a platform reset. The platform reset can either be a cold boot (power-on), a hardware reset, or a warm boot typically caused by a user keyboard input. Following a platform reset, the CPU **32** executes code with CRTM's **52** platform initialization code. The chain of trust begins at CRTM **52**.

In this architecture, the BIOS includes boot block code **50** and a POST BIOS **36**. Boot block code **50** and POST BIOS **36** are independent components and each may be updated independent of the other. Boot block code **50** is located in a portion of flash memory **42** within TBB **40**, while POST BIOS **36** is located in another portion of flash memory **42** outside TBB **40**. Thus, while the manufacturer or a third party supplier may update, modify or maintain POST BIOS **36**, only the manufacturer can modify or update boot block code **50**.

As stated above, the CRTM **52** and the TPM **44** are presumptively trusted. Thus, following a platform reset, the CRTM **52** in boot block code **50** is executed, which measures the entity to which it will transfer control, in this case, Post BIOS **36**. "Measuring an entity" means hashing code in the entity to produce a log of the code, which is then extended into a platform configuration register (PCR) **48** in the TPM **44**. The TPM **44** may comprise a plurality of PCRs **48** (**48***a-d*), a portion of which are designated to the pre-boot

environment and referred to collectively as boot PCRs **48**. Each boot PCR **48** is dedicated to collecting specific information related to a particular stage of a boot sequence. For example, one boot PCR **48** (PCR[0]) may store measurements from the CRTM **52**, the POST BIOS **36**, and all firmware **38** physically bound to the motherboard **30**.

Once POST BIOS **36** has been measured, control is transferred to the POST BIOS **36**, which then continues to boot the system by ensuring that hardware devices are functional. The POST BIOS **36** may move code, referred to herein as "legacy BIOS code," stored in the flash memory **42** within the TBB **40** to memory **33** during the POST operation. The legacy BIOS code may refer to code that provides certain core functions such as keyboard and basic video support. Further, POST BIOS **36** may move code from the flash memory **42** to memory **33** used to support the functions of the legacy BIOS code such as Universal Serial Bus (USB) interface support code for USB operations as well as code used for power management routines, e.g., Advanced Configuration and Power Interface (ACPI) code. These codes may be stored in a different location in the memory address space in memory **33** than the location of the legacy BIOS code.

Further, once the POST BIOS **36** gains control, it is responsible for measuring any entity to which it will transfer control. As the POST BIOS **36** progresses through the boot sequence, values in the boot PCRs **48***a* change whenever an entity is measured.

Upon booting to the operating system (OS) **14**, the operating system **14** verifies the trustworthiness of platform **20** by comparing the values in the boot PCRs **48** with precalculated values known by the operating system **14**. If the values match, the operating system **14** is assured of a secure boot and that the platform is trusted. The system **100** may then be available for use. If the values do not match, the operating system **14** is alerted of a possible breach, and the operating system **14** can take measures to reestablish trust. In one embodiment, the operating system **14** may reside within the hard disk **23**. Alternatively, the operating system **14** may reside within the mass storage device **25**.

Referring now to FIG. **2**, shown therein is a schematic block diagram illustrating one embodiment of the mass storage device **25** of the present invention. The mass storage device **25** may comprise a USB flash-memory based storage device. The mass storage device **25** may be configured to interface with the motherboard **30**. Alternatively, the mass storage device **25** may comprise computer readable media such as, but not limited to, hard disk drives, floppy disks, optical disks, flash memory devices, and tape drives. In one embodiment, the mass storage device **25** comprises an accessible portion **202** and an encrypted portion **204**. In one embodiment, the accessible portion **202** and the encrypted portion **204** comprise a first and a second partition on the mass storage device **25**. For example, in a common personal computer system, the accessible partition **202** would be represented as "C drive," and the encrypted partition as "D drive." Alternatively, both the accessible portion **202** and the encrypted portion **204** may reside within the same partition of the mass storage device. Alternatively, the encrypted portion **204** can reside in a nonreadable portion of the mass storage device **25**. This nonreadable portion can only be "unlocked" or become readable once a correct password is presented to the device. The advantage of this implementation is that the backuped files cannot be corrupted or lost by mistake.

The accessible portion **202** comprises the elements required by the system to complete the boot process as described above. In one embodiment, the accessible portion comprises the operating system **14** of system **10**. Alternatively, the accessible portion may comprise an operating system **206** having a trusted platform interface (TPI) module **208**, a password module **210**, and a backup utility module **212**. The mass storage device **25** is configured as a removable media device, recognizable by the motherboard **30**. Such removable devices are well known in the art, and therefore do not require further discussion.

Upon booting to the operating system **206**, the TPI module **208** interfaces with the TPM **44** of FIG. **1**, and verifies the trustworthiness of the platform **20** by comparing values in the boot PCRs **48** with precalculated values known by the TPI module **208**. If the values match, the operating system **206** is assured of a secure boot and that the platform **20** is trusted. The known precalculated values are the result of the hash or "measuring of the entity." In one embodiment, the TPI module **208** is configured to trust only the system **10** to which the TPI module **208** first interfaced.

Once booted, the operating system **206** attempts to access the encrypted portion **204**. The password module **210** is configured to store an encrypted password (not shown) that will unlock the encrypted portion **204**. However, the encrypted password must first be decrypted. Only the TPM **44** that first encrypted the password is able to decrypt the password. The process by which the TPM **44** encrypts and decrypts data is described by the TCPA specification and therefore further discussion is not required. Accordingly, the TPI module **208** may be configured to transmit the encrypted password to the TPM **44**. The TPM **44** then authenticates the encrypted password, and if successful, returns a decrypted password to the TPI module **208**. The password module **210** then unlocks the encrypted portion **204**, and makes the encrypted portion **204** available to the operating system **206**.

The backup utility module **212** may be configured to automatically backup data from the system **10**. In one embodiment, the backup utility **212** is configured to detect the presence of the hard disk **23** of FIG. **1**, and create a copy of the data to be stored within the encrypted portion **204**. Alternatively, the copy of the data may be stored in an unaccessible portion of the mass storage device **25**. Additionally, the backup utility module **212** may be configured to automatically detect the data that has changed since the previous backup, and only update the changed data. In a further embodiment, the backup utility module **212** is configured to restore data residing within the mass storage device **25** to the hard disk **23** in the event of a system **10** failure.

FIG. **3** is a schematic flow chart diagram illustrating one embodiment of a method **300** for secure mass storage backup in accordance with the present invention. The method **300** starts **302** and a computer readable mass storage device **25** is provided **304** with a first accessible portion **202** and a second encrypted (or lockable) portion **204**. The method then initializes **306** the password, creates **308** a backup, and restores **310** the backup if necessary at which point the method **300** ends.

FIG. **4** is a schematic flow chart diagram illustrating one embodiment of a method **306** for initializing the mass storage device **25** of the present invention. The method **306** starts **402** and the system **10** is booted **404**. In one embodiment, booting **404** the system **100** comprises coupling the mass storage device **25** to the system **10**, and booting **404** the operating system **206** as described with reference to FIGS. **1** and **2**. The first time the mass storage device **25** is booted, the operating system **206** may be configured to detect and automatically launch **406** the password module **210**. The

password module **210** prompts **408** a user for a password and then the TPI module **208** transmits **410** the password to the TPM **44**. The password is encrypted and returned **412** by the TPM **44**, at which point the password module **210** stores **414** the encrypted password. The method **306** then ends **416**.

Once initialized, the mass storage device **25** maybe booted on any system, but the encrypted portion **204** is only viewable on the system **10** that initialized the password. Beneficially, once initialized no user interaction is required to authenticate and decrypt the encrypted portion **204**. Additionally, a user may configure the password module **210** to store multiple encrypted passwords for use on multiple systems. The user must enter the same initialization password for each system initialized.

FIG. **5** is a schematic flow chart diagram illustrating one embodiment of a method **308** for backing up data utilizing the TPM **44** of the present invention. The method **308** starts **502** and the system **10** is booted **504**. The operating system **206** launches the TPI module **208** which transmits **506** the encrypted password. The TPM **44** receives the encrypted password and authenticates **508** the encrypted password. As described above, authenticating the password may comprise comparing the values of the PCRs **48** to a precalculated value and only decrypting the password if the PCRs match the expected value. If authenticated **508**, the TPM **44** decrypts **510** the password and transmits **512** the decrypted password to the TPI module **208**.

Subsequently, the password module **210** receives the decrypted password and either decrypts **514** the encrypted portion **204** or unlocks the locked partition which contains the backup data. The password module **210** makes the portion **204** available to the operating system **202**. Once available, the backup utility module **212** may then proceed to backup **516** data stored on the system **10**. The backup process may be automatic or a user may specify the data to be copied. In one embodiment, the backup method **308** may be automated. For example, the user couples the mass storage device **25** to the system **10** and powers on the system **10**. The system **10** boots to the mass storage device **25**, and the operating system **206** takes control, automatically transmitting the encrypted password, decrypting the encrypted portion **204**, backing up the data, and subsequently powering down the system.

Referring now to FIG. **6**, shown therein is a method **310** for restoring data from the mass storage device **25** according to the present invention. The method **310** for restoring data starts **602** and similarly boots **604**, transmits **606** the encrypted password. The TPM **44** authenticates **608** the encrypted password, and decrypts **610** the password. The TPM **44** then transmits **612** the decrypted password, and the password module **210** decrypts **614** or unlocks the encrypted portion **204**. The backup utility module **212** may then restore **616** data to the system **10** that may have suffered a failure. The method **310** then ends **618**.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed is:

1. An apparatus for secure computer readable medium backup, the apparatus comprising:

a computer readable medium having at least a first accessible portion and a second encrypted portion; and

a trusted platform interface module operatively coupled with the computer readable medium and configured to communicate with a cryptographic module, wherein the trusted platform interface module comprises a password module, the trusted platform interface module initializing the password module in response to verifying the cryptographic module by comparing a known value stored on the password module to a cryptographic module platform configuration register value storing a hash of POST BIOS code, wherein only the cryptographic module may initialize the password module, the password module configured to store and transmit an encrypted password to the cryptographic module, and receive an unencrypted password from the cryptographic module.

2. The apparatus of claim **1**, wherein the cryptographic module comprises a trusted platform module (TPM).

3. The apparatus of claim **1**, wherein the computer readable medium comprises a computer readable peripheral selected from the group consisting of a hard disk drive, a universal serial bus storage device, a floppy disk, an optical storage disk, a flash memory storage device, and a network attached storage drive.

4. The apparatus of claim **1**, wherein the encrypted password comprises a unique password configured to be decrypted by the cryptographic module that first created the encrypted password.

5. The apparatus of claim **1**, wherein the computer readable medium module further comprises a backup utility module configured to selectively copy data from a storage device source, detect newer versions of data stored on the storage device source, and replace older versions of the data on the computer readable medium with newer versions of the data.

6. A device for secure computer readable medium backup, the device comprising:

a motherboard;

a cryptographic module coupled to the motherboard and configured to communicate with a computer readable medium; and

the computer readable medium comprising a trusted platform interface module configured to communicate with the cryptographic module, wherein the trusted platform interface module comprises a password module, the trusted platform interface module initializing the password module in response to verifying the cryptographic module by comparing a known value stored on the password module to a cryptographic module platform configuration register value storing a hash of POST BIOS code, wherein only the cryptographic module may initialize the password module, the password module configured to store and transmit an encrypted password to the cryptographic module, and receive an unencrypted password from the cryptographic module.

7. The device of claim **6**, wherein the cryptographic module is configured to receive the encrypted password from trusted platform interface module, decrypt the password, and transmit the decrypted password to the trusted platform interface module.

8. The device of claim **6**, wherein the cryptographic module comprises a TPM.

9. The device of claim **6**, wherein the motherboard further comprises a memory and a processor coupled to the memory.

10. The apparatus of claim **6**, wherein the computer readable medium comprises a computer readable peripheral selected from the group consisting of a hard disk drive, a

universal serial bus storage device, a floppy disk, an optical storage disk, a flash memory storage device, and a network attached storage drive.

11. A system for secure computer readable medium backup, the system comprising:

a motherboard;

a cryptographic module coupled to the motherboard configured to decrypt encrypted passwords;

a computer readable medium module having at least a first accessible portion and a second encrypted portion; and

a trusted platform interface module operatively coupled with the computer readable media module and configured to communicate with the cryptographic module, wherein the trusted platform interface module comprises a password module, the trusted platform interface module initializing the password module in response to verifying the cryptographic module by comparing a known value stored on the password module to a cryptographic module platform configuration register value storing a hash of POST BIOS code, wherein only the cryptographic module may initialize the password module, the password module configured to store and transmit an encrypted password to the cryptographic module, and receive an unencrypted password from the cryptographic module.

12. The system of claim **11**, wherein the encrypted password is configured to be decrypted by the cryptographic module that first created the encrypted password.

13. The apparatus of claim **11**, wherein the computer readable medium further comprises a backup utility configured to selectively copy data from a storage device source, detect newer versions of data stored on the storage device source, and replace older versions of the data on the computer readable medium module with newer versions of the data.

14. A computer readable storage medium comprising computer readable code configured to carry out a method for secure computer readable medium backup, the method comprising:

providing a computer readable medium having at least a first accessible portion and a second encrypted portion;

initializing a password module in response to a cryptographic module by comparing a known value stored on the password module to a cryptographic module platform configuration register value storing a hash of POST BIOS code, wherein only the cryptographic module may initialize the password module;

transmitting an encrypted password to the cryptographic module;

authenticating the encrypted password;

decrypting the encrypted password;

transmitting the decrypted password to the computer readable medium module; and

decrypting the second encrypted portion using the decrypted password.

15. The computer readable storage medium of claim **14**, wherein the method further comprises copying data from a source storage device, and storing the data in the second encrypted portion of the computer readable medium.

16. The computer readable storage medium of claim **14**, wherein the method further comprises restoring data to the source storage device from the computer readable medium.

17. The computer readable storage medium of claim **14**, wherein the method further comprises storing and transporting data in the accessible portion of the computer readable medium.

18. A method for secure computer readable medium backup, the method comprising:

providing a computer readable medium having at least a first accessible portion and a second encrypted portion;

initializing a password module in response to verifying a cryptographic module by comparing a known value stored on the password module to a cryptographic module platform configuration register value storing a hash of POST BIOS code, wherein only the cryptographic module may initialize the password module;

transmitting an encrypted password to the cryptographic module;

authenticating the encrypted password;

decrypting the encrypted password;

transmitting the decrypted password to the computer readable medium; and

decrypting the second encrypted portion using the decrypted password.

19. The method of claim **18**, further comprising copying data from a source storage device, and storing the data in the second encrypted portion of the computer readable medium.

20. The method of claim **18**, further comprising restoring data to the source storage device from the computer readable medium.

21. The method of claim **18**, further comprising storing and transporting data in the accessible portion of the computer readable medium.

22. An apparatus for secure computer readable medium backup, the apparatus comprising:

means for providing a computer readable medium having at least a first accessible portion and a second encrypted portion;

means for initializing a password module in response to verifying a cryptographic module by comparing a known value stored on the password module to a cryptographic module platform configuration register value storing a hash of POST BIOS code, wherein only the cryptographic module may initialize the password module;

means for transmitting an encrypted password to the cryptographic module;

means for authenticating the encrypted password;

means for decrypting the encrypted password;

means for transmitting the decrypted password to the computer readable medium module; and

means for decrypting the second encrypted portion using the decrypted password.

23. The apparatus of claim **22**, further comprising means for copying data from a source storage device, and storing the data in the second encrypted portion of the computer readable medium.

24. The apparatus of claim **22**, further comprising restoring data to the source storage device from the computer readable medium.

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