(54) Title: DEVICE AND METHOD FOR VERIFYING CONNECTIVITY

A portable desktop device and method for host computer system hardware recognition and configuration are provided. The portable desktop device once authenticated provides access to a portable desktop application that provides a beat signal to the portable desktop device. In an absence of the beat signal, the portable desktop device prevents access to the portable desktop application and / or data associated therewith.
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[Diagram of device verification process]

(57) Abstract: A portable desktop device and method for host computer system hardware recognition and configuration are provided. The portable desktop device once authenticated provides access to a portable desktop application that provides a heartbeat signal to the portable device. In the absence of the heartbeat signal, the portable desktop device prevents access to the portable desktop application and/or data associated therewith.

[Continued on next page]

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DEVICE AND METHOD FOR VERIFYING CONNECTIVITY

FIELD OF THE INVENTION

[01] The invention relates to portable desktops, and more particularly to the recognition of hardware of a host of a portable desktop.

BACKGROUND OF THE INVENTION

[02] A portable desktop allows a user to utilize the hardware of a host computer system and thus provides a portable computing environment. A portable desktop may be physically embodied in portable storage media and more often is embodied in a portable device which includes processing hardware, storage, and input/output (I/O) hardware for communication with the host system and/or authentication by a user. The portable computing environment, hereinafter referred to as the portable desktop, is portable in the sense that any changes made to data files, software, settings, user preferences, or any other configuration or aspect of that computing environment made during a session on the host computer system, which are intended to be permanent, are stored in the portable device such that the portable desktop has continuity across multiple sessions. The appearance, functionality, content and/or configuration of the portable desktop should also be independent of any changes made to any particular host computer system, as well as be independent of the particular host computer system used for any session. Portability, therefore, depends upon the ability of the portable desktop device to function with different host computer systems.

[03] One type of portable desktop device is a USB memory device used to transport and store the portable desktop data. In a typical situation, the device is inserted into a host computer USB port from which it derives power. The host computer provides power to the device until the host computer is powered
down or until the device is removed from the USB port thereof. From powering of the USB memory device, security features thereon are enabled. Once accessed, the device acts to support portable desktop functionality. Typically, this involves rebooting the host computer or powering it up from an unpowered state. Further typically, the portable desktop environment is discontinued when the host computer is powered down or when the USB memory device is removed from the USB port thereof.

[04] A known security problem exists when a secure device is kept in a powered state once use of the device is completed. For example, if a USB hub were introduced between the host computer and USB devices coupled therewith, and the USB hub were powered, then a USB device would retain a power on state even when the hub was removed from the host computer. When this happens, it is often the case that some of the security of the USB memory device remains disabled as the device is already enabled for use; as such, the device is still accessible differently from what was intended.

[05] It would be advantageous for there to be a method or system for supporting secure portable desktops that overcomes security and/or other limitations of known portable desktop approaches.

SUMMARY OF THE INVENTION

[06] According to one aspect, the invention provides for a method comprising: coupling a portable desktop device comprising portable desktop data stored therein to a host computer system; enabling access to the portable desktop data, wherein a user authentication operation is performed prior to supporting a portable desktop application; executing on the host computer system the portable desktop application received from the portable desktop device; at intervals known to the portable desktop device, transmitting from the host computer system to the portable desktop device a beat signal indicating a presence and operability of the host computer system; and, when the portable
desktop device other than receives the beat signal at the known intervals, disabling access to the portable desktop data and preventing access thereto absent a further user authentication operation; wherein a content of the beat signal transmitted from the host computer system to the portable desktop device varies with variation that is known to the portable desktop device; and wherein the beat signal beats at intervals of between 1 and 30 milliseconds, such that timing of the beat signal is less than an amount of time required to disconnect and reconnect the portable desktop device.

[07] In accordance with another embodiment of the invention there is provided a portable desktop device comprising: input/output (I/O) hardware for coupling the portable desktop device to a host computer system; memory storage comprising: a portable desktop storage block comprising a portable desktop operating system (O/S) configured for executing a portable desktop application on the host computer system, wherein a user authentication operation is performed prior to supporting the portable desktop application on the host computer system; and a processor for use with the portable desktop device in a powered state, the processor configured for: receiving a beat signal from the host computer system at intervals known to the portable desktop device; and in the absence of receiving the beat signal at the known intervals preventing access to the memory storage absent a further user authentication operation; wherein a content of the beat signal transmitted from the host computer system to the portable desktop device varies with variation that is known to the portable desktop device; and wherein the beat signal beats at intervals of between 1 and 30 milliseconds, such that timing of the beat signal is less than an amount of time required to disconnect and reconnect the portable desktop device.

[08] In accordance with another embodiment of the invention there is provided a portable desktop device comprising: input/output (I/O) hardware for coupling the portable desktop device to a host computer system; memory storage comprising: a portable desktop storage block comprising a portable
desktop operating system (O/S) for executing on the host computer system a portable desktop application, wherein a user authentication operation is performed prior to supporting the portable desktop application on the host computer system; and a processor for use while the portable desktop device is in a powered state, the processor configured for: providing to the host computer system at second intervals a challenge signal; in response thereto receiving a beat signal from the host computer system at first intervals; and in the absence of receiving the beat signal at the first intervals, preventing access to the memory storage absent a further user authentication operation; wherein a content of the beat signal transmitted from the host computer system to the portable desktop device varies with variation that is known to the portable desktop device; and wherein the beat signal beats at intervals of between 1 and 30 milliseconds, such that timing of the beat signal is less than an amount of time required to disconnect and reconnect the portable desktop device.

BRIEF DESCRIPTION OF THE DRAWINGS

[09] The features and advantages of the invention will become more apparent from the following detailed description of the preferred embodiment(s) with reference to the attached figures, wherein:

[10] FIG. 1 is a block diagram illustrating a portable desktop device according to an embodiment of the invention and its host computer system and associated hardware devices.

[11] Fig. 2 is a functional block diagram illustrating a method of portable desktop host hardware recognition and configuration.

[12] Fig. 3 is a simplified flow diagram of a method according to an embodiment of the invention.

[13] Fig. 4 is a simplified flow diagram of a method according to an embodiment of the invention.
[14] Fig. 5 is a simplified flow diagram of a method according to an embodiment of the invention.
[15] Fig. 6 is a simplified flow diagram of a method according to an embodiment of the invention.

[16] It is noted that in the attached figures, like features bear similar labels.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[17] Referring to FIG. 1, a portable desktop device 1000 according to an embodiment of the invention will now be discussed in terms of structure.

[18] The portable desktop device 1000 is shown connected to its host computer system 1900. The host computer system 1900 is coupled to a number of hardware devices 1950. Some of the hardware devices 1950 are external to the host computer system 1900 while others are internal hardware devices. For the purposes of the invention, no distinction is made between an external or an internal hardware device, and as such hardware devices 1950 includes any and all hardware connected to and controlled by the host computer system 1900.

[19] The host computer system 1900 is any computer system capable of interfacing with the portable desktop device 1000. The portable desktop device 1000 is in the form of a powered peripheral device capable of interfacing with the host computer system 1900 and in some embodiments is a universal serial bus (USB) storage and processing device.

[20] The portable desktop device 1000 is connected to the host computer system 1900 by input/output (I/O) hardware 1300. In addition to I/O hardware 1300, the portable desktop device 1000 comprises a processor 1100, authentication hardware 1400, and memory storage 1200. The processor 1100 is coupled to the I/O hardware 1300, the authentication hardware 1400, and the memory storage 1200. The authentication hardware 1400 may comprise biometric authentication hardware such as a fingerprint, retinal, or other scanner or may comprise some other input hardware for receiving a bar code, encryption key, combination, password or other authentication information.
Alternatively, the authentication hardware forms part of the host computer system 1900.

[21] The memory storage 1200 comprises a boot process 1220 application data storage block including application storage for a security process 1222 and a portable desktop storage block 1224. The portable desktop storage block 1224 comprises a portable desktop O/S 1242. The portable desktop storage block 1224 also includes a storage block for the portable desktop user data 1244. The portable desktop O/S 1242 may include user data in the form of O/S preferences or configuration settings for a user. The portable desktop user data 1244 may include user installed applications which do not form part of the O/S along with preferences or configuration settings thereof, as well as any other data files associated with the portable desktop the user may have. In embodiments for which multiple users are supported, per user files, preferences or configuration settings are stored in the portable desktop O/S 1242 and multiple instances of portable desktop user data 1244, one for each user, are present in the portable desktop storage block 1224 (not shown). Optionally, in other embodiments, further portable desktop storage blocks are present in the memory storage 1200, each having its own portable desktop O/S and portable desktop user data block. This allows for further separation among users and/or groups of users, insuring not only that data and functions of each portable desktop environment are separated but that each user or group of users that can access one portable desktop environment have no knowledge of there being other users who use other desktop environments. A second portable desktop storage block 1250 is shown in dashed lines in FIG. 1.

[22] Referring also to Fig. 2, the portable desktop device 1000 of Figure 1 will now be described in terms of its functioning. In most embodiments of the invention, in which the portable desktop device 1000 is a USB device, the device is inserted at 201 before a boot process is executed such that the portable desktop device 1000 can disable a hard drive of the host computer system 1900 at 202. Use of the portable desktop device 1000 occurs when the host computer
system 1900 is turned on and goes through a boot process while the portable
desktop device 1000 is connected to the host computer system 1900. Prior to
this, a main board or other booting hardware of the host computer system 1900
is configured to boot from the portable desktop device 1000 or is configured to
boot from internal and external devices in an order such that when the portable
desktop device 1000 is connected to the host computer system 1900 at the time
the host computer system 1900 is turned on, the host computer system 1900
(HCS) will boot from the portable desktop device 1000 (PDD) as it does in step
200 of FIG. 2.

[23] In some embodiments, hot-plugging the portable desktop device 1000
will trigger the host computer system 1900 to detect the portable desktop device
1000 and prompt the user to confirm whether or not the system should be
restarted in order to commence the portable desktop session.

[24] During a boot of the host computer system 1900 from the portable
desktop device 1000, the host computer system 1900 requests, through the I/O
hardware 1300, a bootable process, for example the portable desktop O/S
within data storage of the memory storage 1200 and executes the portable
desktop O/S. Typically, the portable desktop device 1000 is initially secured.
Prior to supporting a portable desktop application, the portable desktop device
1000 typically requires user authentication. For example, when the portable
desktop device 1000 comprises a fingerprint platen, a fingerprint of a user is
authenticated at 203 to “unlock” the portable desktop data at 204. Alternatively,
another form of user authentication is performed. Further alternatively,
authentication is performed using input/output devices of the host computer
system 1900.

[25] After user authentication and once the portable desktop device 1000 is
“unlocked,” for example during execution of the portable desktop O/S at 205, a
signal is transmitted at 206 from the host computer to the portable desktop
device at intervals to indicate that the host computer is still active. The signal
transmitted is optionally a beat signal sent every so often to indicate activity. For example the beat signal is a periodic signal. Alternatively, the beat signal is transmitted at time intervals that vary in a fashion known to the portable desktop device 1000. Further alternatively, a content of the beat signal varies in a fashion known to the portable desktop device 1000. Alternatively, the beat signal is a response to a challenge provided from the portable desktop device to the host computer. Further optionally, the beat signal comprises a response to a challenge issued between beats or to another previously issued challenge. When the beat signal is received at the portable desktop device, the device continues normal operation at 207.

[26] In such an embodiment, removal of the portable desktop device connection to the host computer system while maintaining power to the device is detectable as a potential security threat since the beat signal is not provided to the portable desktop device 1000 during the disruption.

[27] When a beat signal is other than detected by the portable desktop device 1000, the portable desktop device is locked at 209 and access thereto is prevented absent a further user authentication operation.

[28] Timing of the beat signal is preferably significantly less than the amount of time required to disconnect and reconnect the portable desktop device. For example, the timing is on the order of a few milliseconds. Further preferably, the content of the beat signal is not easily copied or determined in order to prevent another device from mimicking the beat signal once the host computer system is disconnected.

[29] Referring to Fig. 3, a simplified flow diagram of a method according to an embodiment of the invention is presented. Here, a portable desktop device 1000 is coupled to a host computer system 1900 at 301. Once a user has authenticated to the portable desktop device 1000 at 302, the host computer system begins a communication exchange with the device. In the communication exchange, a first device seeds the communication exchange
with an initial message at 305a. The other device transforms the message and provides a reply at 305b. This transform and reply process continues between the two devices – the portable desktop device 1000 and the host computer system 1900. Between transform operations, the host computer system executes portable desktop operations at 307. If the communication path between devices is interrupted, the communication exchange is absent and the portable desktop device “locks” itself at 209 as described hereinabove.

[30] Referring to Fig. 4, a simplified flow diagram of a method according to an embodiment of the invention is presented. Here, a portable desktop device 1000 is coupled to a host computer system 1900. Once a user has authenticated to the portable desktop device 1000, the device begins a communication exchange with the host computer system. In the communication exchange, the portable desktop device 1000 transmits a challenge to the host computer system 1900 at 405a. The host computer system 1900 provides a reply at 405b. This challenge and reply process continues between the two devices – the portable desktop device 1000 and the host computer system 1900. If the communication path between devices is interrupted, the reply is not received and the portable desktop device “locks” itself at 209 as described hereinabove.

[31] Referring to Fig. 5, a simplified flow diagram of a method according to an embodiment of the invention is presented. Here, a portable desktop device 1000 is coupled to a host computer system 1900. The host initiates communication with the portable device which then authenticates the user thereto. Once a user has authenticated to the portable desktop device 1000, the device continues a communication exchange with the host computer system. In the communication exchange, the portable desktop device 1000 transmits a challenge at 505a to the host computer system 1900. The host computer system 1900 provides a reply comprising a sequence of replies provided at known intervals at 505d and 505b. The portable desktop device 1000 receives the plurality of replies provided from the host computer system 1900 at 505c. The plurality of replies are provided until a further challenge is received, which is
followed by a second plurality of replies (to the further challenge). This challenge and reply process continues between the two devices – the portable desktop device 1000 and the host computer system 1900. If the communication path between devices is interrupted, the reply is not received and the portable desktop device “locks” itself at 209 as described hereinabove.

[32] Referring to Fig. 6, a simplified flow diagram of a method according to an embodiment of the invention is presented. Here, a portable desktop device 1000 is coupled to a host computer system 1900. Once a user has authenticated to the portable desktop device 1000, the device begins a communication exchange with the host computer system. In the communication exchange, the host computer system 1900 provides a beat signal periodically at 605b. Typically, the periods are fixed and are on the order of milliseconds. If the communication path between devices is interrupted, the beat signal is not received and the portable desktop device “locks” itself at 209 as described hereinabove.

[33] The embodiments presented are exemplary only and persons skilled in the art would appreciate that variations to the embodiments described above may be made without departing from the scope of the invention, which is solely defined by the appended claims.
WHAT IS CLAIMED IS:

1. A method comprising:
   
   coupling a portable desktop device comprising portable desktop data stored therein to a host computer system;

   enabling access to the portable desktop data, wherein a user authentication operation is performed prior to supporting a portable desktop application;

   executing on the host computer system the portable desktop application received from the portable desktop device;

   at intervals known to the portable desktop device, transmitting from the host computer system to the portable desktop device a beat signal indicating a presence and operability of the host computer system; and,

   when the portable desktop device other than receives the beat signal at the known intervals, disabling access to the portable desktop data and preventing access thereto absent a further user authentication operation;

   wherein a content of the beat signal transmitted from the host computer system to the portable desktop device varies with variation that is known to the portable desktop device; and

   wherein the beat signal beats at intervals of between 1 and 30 milliseconds, such that timing of the beat signal is less than an amount of time required to disconnect and reconnect the portable desktop device.

2. A method according to claim 1, wherein the portable desktop device comprises circuitry for receiving a power signal.

3. A method according to claim 1, wherein the portable desktop device comprises a battery for providing power thereto, and wherein removal of the portable desktop device from the host computer system while maintaining power to the portable desktop device is detected as a potential security threat.
4. A method according to any one of claims 1 to 3, wherein the beat signal comprises a digital value transmitted from the host computer system to the portable desktop device periodically at the known intervals.

5. A method according to claim 4, wherein the digital value is a same digital value transmitted at intervals repeatedly.

6. A method according to any one of claims 1 to 3, wherein the beat signal comprises digital values following a known series.

7. A method according to claim 6, wherein the known series is determined from an initial seed value provided from the portable desktop device to the host computer system.

8. A method according to any one of claims 1 to 3, wherein the beat signal comprises a plurality of known series of values each determined from a respective initial seed value provided from the portable desktop device to the host computer system, the respective initial seed values provided at second intervals.

9. A method according to claim 7, wherein the beat signal comprises a set of responses to challenges provided from the portable desktop device to the host computer system, the challenges provided at intervals.

10. A method according to claim 9, wherein the beat signal comprises a digital signature of data relating to the challenges provided.

11. A portable desktop device comprising:

   input/output (I/O) hardware for coupling the portable desktop device to a host computer system;

   memory storage comprising:

   a portable desktop storage block comprising a portable desktop operating system (O/S) configured for executing a portable desktop application on the host computer system, wherein a user authentication operation is
performed prior to supporting the portable desktop application on the host computer system; and

a processor for use with the portable desktop device in a powered state, the processor configured for:

receiving a beat signal from the host computer system at intervals known to the portable desktop device; and

in the absence of receiving the beat signal at the known intervals preventing access to the memory storage absent a further user authentication operation;

wherein a content of the beat signal transmitted from the host computer system to the portable desktop device varies with variation that is known to the portable desktop device; and

wherein the beat signal beats at intervals of between 1 and 30 milliseconds, such that timing of the beat signal is less than an amount of time required to disconnect and reconnect the portable desktop device.

12. A portable desktop device according to claim 11, wherein the I/O hardware comprises a USB interface and the portable desktop device is inserted into a host computer USB port from which it derives power.

13. A portable desktop device according to claim 11 or 12, comprising a user authentication data transducer for receiving user authentication data from a user thereof.

14. A portable desktop device according to claim 13, comprising first data stored therein for use in user authentication wherein the processor is configured for:

receiving the user authentication data from the user authentication transducer;

comparing at least an aspect of the user authentication data with the first data; and
when the comparison is indicative of a match, unlocking at least one of
the portable desktop O/S and data associated therewith and stored within the
portable desktop device.

15. A portable desktop device comprising:

input/output (I/O) hardware for coupling the portable desktop device to
a host computer system;

memory storage comprising:

a portable desktop storage block comprising a portable desktop
operating system (O/S) for executing on the host computer system a portable
desktop application, wherein a user authentication operation is performed prior
to supporting the portable desktop application on the host computer system;

and

a processor for use while the portable desktop devise is in a powered
state, the processor configured for:

providing to the host computer system at second intervals a challenge
signal;

in response thereto receiving a beat signal from the host computer
system at first intervals; and

in the absence of receiving the beat signal at the first intervals,
preventing access to the memory storage absent a further user authentication
operation;

wherein a content of the beat signal transmitted from the host computer
system to the portable desktop device varies with variation that is known to the
portable desktop device; and

wherein the beat signal beats at intervals of between 1 and 30
milliseconds, such that timing of the beat signal is less than an amount of time
required to disconnect and reconnect the portable desktop device.
16. A portable desktop device according to claim 15, wherein the first intervals and the second intervals have a same interval length.

17. A portable desktop device according to claim 15, wherein the second intervals are longer than the first intervals.

18. A portable desktop device according to any one of claims 15 to 17, comprising cipher circuitry and wherein the beat signal comprises a digital signature of data relating to the challenge signal.
2/6

Insert device

Disable hard drive of host computer system

Authenticate user

Yes

"Unlock" portable desktop

Execution of portable desktop O/S

Transmit signals at intervals from the host computer to the portable desktop device

Beat received?

No

"Lock" portable desktop

Yes

Continue normal operation

Fig. 2
Fig. 3

1. Couple portable desktop device to host computer (301)
2. Communication exchange between device and host computer
   - Authentication (302)
     - Yes: Host computer system transforms message and provides reply (305b)
     - No: Stop (301)
3. Execute portable desktop operations (307)
4. Portable desktop device "locked" (209)
5. Yes: Filters communication with initial message exchange or sends communication
6. No: Portable desktop device "locked" (209)
Fig. 4

Portable desktop device transmits a challenge to host computer system

Beat received?

Yes

No

Portable desktop device "locked"

Couple portable desktop device to host computer

Authentication?

Yes

No

Begin communication exchange between device and host computer

Host computer system provides a reply

Execute portable desktop operations

Stop
Couple portable desktop device to host computer

301

Authentication?

No → Stop

Yes → 302

Begin communication
Exchange between device and host computer

505a

Portable desktop device transmits a challenge to host computer system

505b

Host computer system provides a reply

Host computer system provides a reply

Yes → New challenge?

No → 209

Beat received?

Yes → lock

No → New challenge?

Yes
Couple portable desktop device to host computer

Authentication?  
No → Stop
Yes

Begin communication exchange between device and host computer

Provide a beat signal periodically

Beat received?  
Yes
No

Portable desktop device "locked"

Fig. 6
Insert device

Disable hard drive of host computer system

Authenticate user

Authentication?

No

Yes

“Unlock” portable desktop

Execution of portable desktop O/S

Transmit signals at intervals from the host computer to the portable desktop device

Beat received?

No

“Lock” portable desktop

Yes

Continue normal operation