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## **A SYSTEM RESTORATION METHOD CAPABLE OF RESERVING UPDATED DATA**

### **FIELD OF THE INVENTION**

- 5 This invention relates to the computer technical domain, especially involving a system restoration method capable of reserving the updated data when the system is being restored.

### **BACKGROUND OF THE INVENTION**

- 10 In public places like the computer rooms in the school or cybercafe, one computer is generally provided to multiple users in different time periods. This plan has obvious advantages. However, there is also insufficiency in the practical operation. One relatively evident problem is that when the last user intentionally or accidentally (faulty operation/catching viruses, etc.) modifies the files or configuration of the  
15 system, it may directly influence the normal use of the users coming later. In order to solve this problem, a relatively typical solution is to install hard disk recovery card. Thus, only with a restart, the software system can recover to the original status.

- The principle for the realization of common restoration methods (Figure 1) is mainly  
20 to intercept the write operation towards the disk, and then redirect this write operation interval to free interval to write in and meanwhile record the correspondent relation between this write operation interval and the redirected interval. At last, finish this write operation. When the disk write operation is intercepted, carry out determining treatment with the combination of the correspondent relation of the recorded  
25 redirected interval. If this read operation interval has no intersection with the interval in the recorded redirected correspondent relation, implement read operation according to normal read procedures and finish this read operation at last; if there is intersection between the two, first read the content of non-intersection interval according to normal read procedures, and then combine the correspondent relation of the redirected  
30 interval to read the content of this intersection interval that is redirected. After combing the content read from the two kinds of reading operation, complete the



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reading operation. Combing the processing of read and write operations by the abovementioned restoration program, the restoration program only needs to empty the last correspondent relation of the redirected interval and the space occupied by the redirected interval after the restart of the system to recover the software system to the original status so as to achieve the goal of restoration.

However, with the development of the computer, the maintenance of the computer which has been installed with similar recovery card with restoration function becomes troublesome when the software also requires regular updating. Generally, the administrator is required to first use the administrator access to switch the computer to the non-restoration status, and then restart the system, install or update the software, set up the restoration status, cancel the administrator access and at last restart the system. Apparently, using this kind of method to maintain tens or even hundreds of computers is of low efficiency.

## SUMMARY OF THE INVENTION

The purpose of this invention is to provide a method to safely control and update the software system on the basis of the realization of the restoration function.

A system restoration method capable of reserving the updated data includes the following steps:

### Step I

- a) Designate the reserved space for redirection in the disk;
- b) Designate the first space used for the recording of correspondent relation in the disk or the memory;
- c) Generate the private interface used to update data;

The said reserved space has been pre-divided prior to the startup of the operating system, or it applies to the operating system for reserved space after the startup of the operating system.

After designating the reserved space, all read and write operation of the users directly target at the non-reserved space, instead of the mentioned reserved space.

## 5 Step II

Intercept the read and write operations of the disk by the upper layer software. The read and write operations intercepted can be processed as follows:

### **About Write Operation**

- 10 a) If this write operation is not initiated through the private interface, redirect the original disk space aimed by this operation to the reserved space said in Step I, i.e. writ the data involved in this write operation in the reserved space;

Also record the corresponding relation between the original disk space this write operation focuses on and the actually written in reserved space to the said first  
15 space; in other words, the original disk space this write operation focuses on has been redirected.

- b) If this write operation is initiated through the private interface, carry out the write operation directly without redirection processing according to the normal write  
20 operation procedures.

### **About Read Operation**

- a) It this read operation is initiated through the private interface, carry out the read operation directly without redirection processing according to the normal read  
25 operation procedures.

- b) It this read operation is not initiated through the private interface, carry out the following determinations with the combination of the corresponding relation recorded in the first interval:

If the interval the read operation focuses on has no intersection with the reference interval, carry out the read operation according to the normal read procedures and complete this read operation at last;

- 5 If the interval the read operation focuses on has intersection with the reference interval, carry out read operation on the content of the non-intersection interval according to normal read procedures; as for the content in the intersection interval, read relevant content from the reserved space according to the correspondent relation between this intersection interval and the reserved space, and read relevant
- 10 contents from the reserved space; at last, combine the content in the non-intersection space and that in the intersection space read and finish this read operation; there is no strict sequence requirement for reading the contents in the non-intersection interval and the intersection interval. The following three conditions are acceptable:

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- a. First read Content A of the non-interaction interval and Content B of the intersection interval from the non-reserved space, and then read Content B' correspondent to intersection interval from the reserved space and afterwards cover the Content B of the intersection interval read from the non-reserved
- 20 space with Content B' of the intersection interval read from the reserved space to form a complete content of AB'.

- b. First read Content A of the non-interaction interval from the non-reserved space according to normal procedures and then read Content B' correspondent to intersection interval from the reserved space. After
- 25 combination, the complete content of AB' is formed.

- c. First read Content B' correspondent to intersection interval from the reserved space, and then read Content A of the non-interaction interval from
- 30 the non-reserved space according to normal procedures. After combination, the complete content of AB' is formed.

The said reference interval refers to all the intervals going through redirection and being recorded in the first interval during the write operation process;

### Step III

- 5 When carrying out system restoration, empty the content used to record the correspondent relation in the first space.

If the reserved space is applied with the operating system after the startup of the operating system, release this reserved space.

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If the said reserved space is pre-divided prior to the startup of the operating system, no operation is required.

- One thing that needs explaining is that when using the method of this invention to  
15 carry out system restoration, the process of emptying the first space and releasing the reserved space selectively has been completed before entering the user login interface after the restart of the operating system, which is the same as the existing technology. For example, the first space will be emptied when the computer is shut down, while the selective releasing of the reserved space will be finished upon the restart of the  
20 operating system.

Since the read and write operations on the updated data are required to be initiated through the private interface, they will be kept in the disk, and will not be deleted even when the system is being restored.

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- A safe and controllable private interface is added in this invention on the basis of the system restoration methods using existing technologies for the use of upper layer administration program. When intercepted read and write operations on the disk are carried out through the private interface, the operations in this area will be directly  
30 implemented without redirection, and at last finish the read and write operations through this private interface. Therefore, when the system is restarted and restored,

the content written in through the private interface will be eliminated, but the updated content through the private interface is reserved. Through this method, the workload for the maintenance of the computer is greatly reduced, and in the meantime, high flexibility is provided.

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## **BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 is the schematic diagram for the principle of the realization of system restoration methods in the existing technology.

Figure 2 is the schematic diagram for the principle of the realization of the system restoration method capable of reserving the updated date of this invention.

## **15 DETAILED DESCRIPTION OF THE INVENTION**

The data updating method of this invention is explained with the combination of the specific hardware and network resource. Take the updating of the game data as the example.

20 In the following detailed instructions, specific details have been described to provide a comprehensive understanding of this invention. However, the technicians in this profession will acknowledge that this invention can also be implemented through other similar details.

25 Although this invention is not limited to this, as a specific embodiment of this invention, one condition is that there are two partitions, C partition and D partition in the hard disk with the installation of Windows XP system in C partition, and the D partition is for reserved space.

30 Refer to Figure 2. Use the method provided in this invention to carry out the restoration of the modification of the content (for example, the original content is all

0xAA) of the first sector of File A in C partition and the reservation of the content (for example, the original content is all 0BB) of the first sector of File B in C partition. The updating steps are as follow:

- 5 The method provided in this invention can be realized through write restoration software. This software includes an underlying drive program, Driver.sys, for example, and an upper layer administration program, Manager.exe, for example. During the initiation stage, Driver is attached to the system equipment \Device\HarddiskVolume1 representing C partition through the call of system  
10 function IoAttachDevice. Thus, after the operation of this Driver.sys, the read and write operation in the disk area of C partition of the system can be intercepted. This Driver.sys names the function interface intercepted by the write operation as ProtectWrite, and that intercepted by the read operation as ProtectRead. Meanwhile, it creates another private device name, \Device\PassthruC for example by calling the  
15 system function of IoCreateDevice for the use of Manager.exe, i.e. generates a private interface for updating the data.

Also, apply a part of memory space when this Driver.sys initially runs, like designating as Map, used to record the corresponding relation of the redirection  
20 interval, i.e. the first space.

Meanwhile, apply a part of disk space from D partition, designated as Sway, used to save the content after redirect operation, i.e. reserved space.

- 25 When the user carries out modification write-in operation on the first sector of File A, for example, the content of this sector is all changed into 0x00, and then it will be intercepted by Driver.sys. Afterwards, it will enter ProtectWrite interface. During the execution process of this interface function, first call the system function ObQueryNameString to obtain the name of this write operation initiation device as  
30 \Device\HarddiskVolume1. We can get to know that this operation is not initiated through the private interface, and thus this write operation content is written to the

first sector of the previously applied Swap space through the call of system function ZwWriteFile to finish the redirection of the write operation. Meanwhile, in the previously applied Map, record the relation of this redirection to show that the first sector File A is redirected to the first sector of Swap. At last, this write request is  
5 completed. When the user updates the first sector of File B through Manager.exe provided by the software system of this invention (for example, the content of the sector is all changed to 0xFF), the write operation will be carried out through the private device name \Device\PassthruC. Thus, when it is intercepted by Driver.sys and implemented to ProtectWrite interface, the write operation initiation device name  
10 of \Device\PassthruC is obtained through the call of system function of ObQueryNameString. So we know that the operation is initiated through the private interface. Under this condition, directly call ZwWriteFile without going through redirection, and then write it into the first sector of File B to finish the write request through the private interface.

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When the user carries out read operation on the first sector of File A, it will be intercepted by Driver.sys at this moment, and enter ProtectRead interface. During the execution process of this interface function, make the intersection between this read operation interval and the corresponding relation in the Map, and we can discover that  
20 this read operation interval has already been redirected to the first sector of Swap. According to this redirection relation, Driver.sys can read this content (all is 0x00) from the first sector of Swap and finish this read request by calling the system function of ZwReadFile. If the first sector and second sector of File A are read, the content of the second sector of File A not redirected can be directly read. Then, the  
25 first sector content of Swap redirected will be read. After combining the contents read in the two times, this read request will be finally completed. However, as for the reading initiated by Manager.exe through the private interface, the redirection processing is not required. After carrying out the read operation directly, this read request is completed.

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When the system is restarted and the restoration system runs again, the last applied Map has been emptied and released upon the shutdown of the computer. At this point, it is possible to apply a certain content space and also name it as Map. As for the Swap applied in the last time, it can be deleted and re-applied again or reused directly.

- 5 For example, the user carries out the read operation on the first sector of File A later. At this moment, there is no redirection relation in this sector of Map, and thus directly call the system function of ZwReadFile to read the originally content (all is 0xAA, not 0x00 written in the last time) of the first sector of File A so as to achieve the goal of restoration. As for the read operation carried out in the first sector of File B, similarly,
- 10 read the content of this interval (all is 0xFF, not original 0xBB). Therefore, the content read at this moment is all 0xFF, achieving the goal of reserving the update.

- Although some characteristics and a realizing method of this invention are described here, many modification, replacement, change and equivalent replacement will
- 15 emerge for the technicians in this profession. Therefore, the protective scope of this invention shall be in line with the scope of claims attached.

## Claims

1. A system restoration method capable of reserving updated data. Its features lie in the following steps:

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### Step I

- a) Designate the reserved space for redirection in the disk;
- b) Designate the first space used for the recording of correspondent relation in the disk or the memory;
- 10 c) Generate the private interface used to update data;

The said reserved space has been pre-divided prior to the startup of the operating system, or it applies to the operating system after the startup of the operating system;

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### Step II

Intercept the read and write operations of the disk by the upper layer software. The read and write operations intercepted can be processed as follows:

#### **About Write Operation**

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- a) If this write operation is not initiated through the private interface, redirect the original disk space aimed by this operation to the reserved space said in Step I.
- b) If this write operation is initiated through the private interface, carry out the write operation directly;

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#### **About Read Operation**

- a) If this read operation is initiated through the private interface, carry out the read operation directly;
- b) If this read operation is not initiated through the private interface, carry out the following judgment:

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If the interval the read operation focuses on has no intersection with the reference interval, carry out read operation directly;

- 5 If the interval the read operation focuses on has intersection with the reference interval, carry out read operation on the content of the non-intersection interval directly; as for the content in the intersection interval, read relevant content from the reserved space according to the correspondent relation between this intersection interval and the reserved space; at last, combine the content in the non-intersection space and that in the intersection space read and finish this read operation;
- 10 The said reference interval refers to all the intervals going through redirection and being recorded in the first interval during the write operation process;

### Step III

- 15 When carrying out system restoration, empty the content used to record the correspondent relation in the first space; if the reserved space applies to the operating system after the startup of the operating system, release this reserved space.

2. Like the system restoration method capable of reserving the updated data said in Claim 1, its feature lies in that in the read operation b) of Step II, first read Content A of the non-interaction interval and Content B of the intersection interval from the non-reserved space, and then read Content B' correspondent to intersection interval from the reserved space and afterwards cover the Content B of the intersection interval read from the non-reserved space with Content B' of the intersection interval read from the reserved space to form a complete content of AB'.
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3. Like the system restoration method capable of reserving the updated data said in Claim 1; its feature lies in that in the read operation b) of Step II, first read Content A of the non-interaction interval from the non-reserved space and then
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read Content B' correspondent to intersection interval from the reserved space.  
After combination, the complete content of AB' is formed.

- 5      4. Like the system restoration method capable of reserving the updated data said in Claim 1, its feature lies in that in the read operation b) of Step II, first read Content B' correspondent to intersection interval from the reserved space, and then read Content A of the non-interaction interval from the non-reserved space. After combination, the complete content of AB' is formed.