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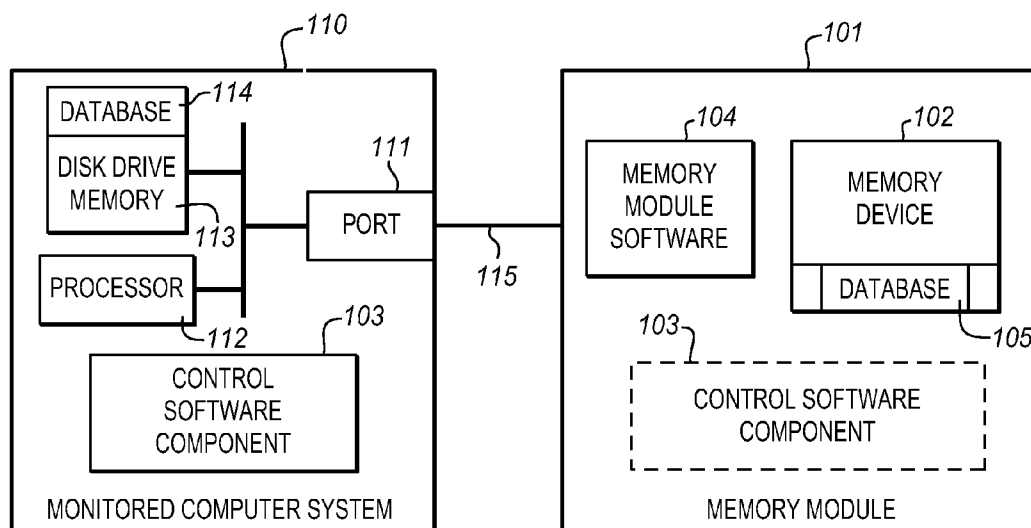
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(54) **Title:** SYSTEM FOR AUTOMATICALLY SHADOWING DATA AND FILE DIRECTORY STRUCTURES THAT ARE RECORDED ON A COMPUTER MEMORY



(57) **Abstract:** The Data Shadowing System comprises a memory module that is connected to the monitored computer system via an existing input/output port to store the shadowed data. The memory module includes a memory device for data storage as well as software, including a control software component that is automatically installed on the monitored computer system when the memory module is first connected to the monitored computer system, as well as associated module software for maintaining a record of the data stored on the memory device. The Data Shadowing System automatically stores the data on the memory module in a single format, while representing it in a data management database in two formats: disk sectors and files. The Data Shadowing System thereby efficiently tracks and stores the state of multiple file systems over time, while allowing for correct disk-level and file-level restoration to a point-in-time without storing redundant data.

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AMENDED CLAIMS**Received by the International Bureau on 06 August 2008 (06.08.08)**

1, (Currently amended) A data shadowing system for the automatic backup storage of data that is written in the memory of a monitored computer system and the selective retrieval of this data for restoration to said memory, comprising:

memory module means, exclusively connected to a monitored computer system, for storing a shadow copy of the data which is written in the memory of the monitored computer system; and

customer data file management means, resident in ~~each of said plurality of~~ monitored computer system systems, for autonomously storing customer data files, comprising all non-NTFS files resident on said monitored computer system, on said memory module means, comprising:

customer data file mapping means for autonomously mapping file directory structures associated with the customer data comprising all non-NTFS files written in the memory of the monitored computer system into file tree information which identifies original names of customer data files as stored on said monitored computer system, and a location in said memory module means which stores said customer data, and

mapping database means for storing said file tree information in a database in said monitored computer system.

2, (Original) The data shadowing system of claim 1 wherein said customer data file management means further comprises:

customer data file hash means for processing each of said customer data files to generate an associated hash value of each of said customer data files;

wherein said memory module means comprises:

customer data file storage means for storing each of said customer data files and said associated hash value in said memory module means; and

wherein said mapping database means stores said hash value of each of said customer data files in said database.

3, (Original) The data shadowing system of claim 2 wherein said customer data file storage means additionally stores said file tree information with each of said customer data files and said associated hash value in said memory module means.

4. (Original) The data shadowing system of claim 2, further comprising:

system file management means, resident in each of said plurality of monitored computer systems, for autonomously storing system files on said memory module means, comprising:

system file mapping means for autonomously mapping file directory structures associated with system files written in the memory of the monitored computer system into system file tree information which identifies original names of system files as stored on said monitored computer system, and a location in said memory module means which stores said system files, wherein said mapping database means stores said system file tree information in a database in said monitored computer system.

5. (Original) The data shadowing system of claim 4 wherein said system files comprise:

computer files, exclusive of customer provided data, including at least one of: master boot record, partition table, and programs.

6. (Original) The data shadowing system of claim 4 wherein said system file management means further comprises:

system file hash means for processing each of said system files to generate an associated hash value of each of said system files;

wherein said memory module means further comprises:

system file storage means for storing each of said system files and said associated hash value in said memory module means; and

wherein said mapping database means stores said hash value of each of said customer data files in said database.

7. (Original) The data shadowing system of claim 6 wherein said system file storage means additionally stores said system file tree information with each of said system files and said associated hash value in said memory module means.

8. (Original) The data shadowing system of claim 2 wherein said customer data file management means further comprises:

change journal means for automatically tracking changes to said customer

data files, including: customer data file creation, customer data file movement, customer data file content changes, and customer data file renaming.

9. (Original) The data shadowing system of claim 5 wherein said customer data file management means further comprises:

file history means, responsive to a modification of a customer data file, for generating file change data indicative of a difference between said customer data file and said modified customer data file; and

wherein said customer data file storage means stores said file change data in said memory module means and substitutes said modified customer data file for said customer data file in said memory module means.

10. (Original) The data shadowing system of claim 2 wherein said customer data file management means further comprises:

data compression means for compressing said customer data file prior to storage in said memory module means.

11. (Original) The data shadowing system of claim 1 wherein said customer data file management means further comprises;

metadata means for indexing the active customer data file systems to extract relevant metadata for every file object in the file system; and

database means for recording said metadata in a database.

12. (Original) The data shadowing system of claim 1 wherein said customer data file management means further comprises:

file system snapshot means for indexing all active customer data files at a selected point in time; and

snapshot storage means for storing said indexing in memory as an Integrity Point representative of a present content of all said customer data files.

13. (Currently amended) A method for the automatic backup storage of data that is written in the memory of a monitored computer system and the selective retrieval of this data for restoration to said memory, comprising:

storing, in a memory module which is exclusively connected to a monitored computer system, a shadow copy of the data which is written in the memory of the monitored computer system; and

autonomously storing customer data files, comprising all non-NTFS files resident on said monitored computer system, on said memory module means, comprising:

autonomously mapping file directory structures associated with the customer data comprising all non-NTFS files written in the memory of the monitored computer system into file tree information which identifies original names of customer data files as stored on said monitored computer system, and a location in said memory module which stores said customer data, and storing said file tree information in a database in said monitored computer system.

14. (Original) The method for the automatic backup storage of data of claim 13 wherein said step of autonomously storing customer data files further comprises:

processing each of said customer data files to generate an associated hash value of each of said customer data files;

wherein said step of storing a shadow copy of the data comprises:

storing each of said customer data files and said associated hash value in said memory module; and

wherein said mapping data database stores said hash value of each of said customer data files in said database.

15. (Original) The method for the automatic backup storage of data of claim 14 wherein said step of storing each of said customer data file additionally stores said file tree information with each of said customer data files and said associated hash value in said memory module.

16. (Original) The method for the automatic backup storage of data of claim 14, further comprising:

autonomously storing system files on said memory module, comprising:

autonomously mapping system files written in the memory of the monitored computer system into system file tree information which identifies original names of system files as stored on said monitored computer system, and a location in said memory module which stores said system files, and

storing said system file tree information in a database in said monitored

computer system.

17. (Original) The method for the automatic backup storage of data of claim 16 wherein said system files comprise:

computer files, exclusive of customer provided data, including at least one of: master boot record, partition table, and programs.

18. (Original) The method for the automatic backup storage of data of claim 16 wherein said step of autonomously storing system files further comprises:

processing each of said system files to generate an associated hash value of each of said system files;

wherein said step of storing a shadow copy of the data comprises:

storing each of said system files and said associated hash value in said memory module; and

wherein said mapping data database stores said hash value of each of said customer data files in said database,

19. (Original) The method for the automatic backup storage of data of claim 18 wherein said step of storing each of said system files additionally stores said system file tree information with each of said system files and said associated hash value in said memory module.

20. (Original) The method for the automatic backup storage of data of claim 14 wherein said step of autonomously storing customer data files further comprises:

autonomously tracking changes to said customer data files, including: customer data file creation, customer data file movement, customer data file content changes, and customer data file renaming.

21. (Original) The method for the automatic backup storage of data of claim 20 wherein said step of autonomously storing customer data files further comprises:

generating, in response to a modification of a customer data file, file change data indicative of a difference between said customer data file and said modified customer data file;

wherein said step of storing a shadow copy of the data stores said file change data in said memory module and substitutes said modified customer data file for said

customer data file in said memory module.

22. (Original) The method for the automatic backup storage of data of claim 14 wherein said step of autonomously storing customer data files further comprises:

compressing said customer data file prior to storage in said memory module.

23. (Original) The method for the automatic backup storage of data of claim 13 wherein said step of autonomously storing customer data files further comprises:

indexing the active customer data file systems to extract relevant metadata for every file object in the file system; and

recording said metadata in a database.

24. (Original) The method for the automatic backup storage of data of claim 13 wherein said step of autonomously storing customer data files further comprises:

indexing all active customer data files at a selected point-in-time; and

storing said indexing in memory as an Integrity Point representative of a present content of all said customer data files.