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 -( 1 of 1 )

United States Patent -10,318,165

Xia ,   et al. -June 11, 2019

Data operating method, device, and system

What is claimed is:

1. A method, comprising: receiving, by a storage control device, a write instruction sent by a central processing unit (CPU), wherein the write instruction indicates first to-be-written data and is used to perform a data write operation on a block device, and wherein the write instruction comprises data content of the first to-be-written data and write address information of the first to-be-written data in the block device; obtaining the data content and the write address information of the first to-be-written data from the write instruction; after obtaining the data content and the write address information, writing the data content of the first to-be-written data to a cache of the storage control device and writing the write address information of the first to-be-written data to the cache of the storage control device; and generating a first data block that comprises the first to-be-written data, and writing the first data block into the block device.

2. The method according to claim 1, wherein generating the first data block that comprises the first to-be-written data comprises: reading, from the block device according to the write address information of the first to-be-written data, a second data block corresponding to the write address information, and combining the second data block and the first to-be-written data into the first data block, wherein the second data block is a data block that is stored in the block device and into which the first to-be-written data is to be written.

3. The method according to claim 1, wherein generating the first data block that comprises the first to-be-written data comprises: determining that historical to-be-written data and the first to-be-written data that are stored in the cache meet a data block generating condition, wherein the historical to-be-written data is second to-be-written data that is not written into the block device and that is stored in the cache before the first to-be-written data is written into the cache; and generating the first data block using the historical to-be-written data and the first to-be-written data.

4. The method according to claim 3, wherein determining that the historical to-be-written data and the first to-be-written data that are stored in the cache meet the data block generating condition comprises: determining that write address information of the historical to-be-written data and the write address information of the first to-be-written data are consecutive, and that a total data size of the historical to-be-written data and the first to-be-written data accords with a block granularity for writing data into the block device.

5. The method according to claim 1, wherein before writing the first to-be-written data indicated by the write instruction, the method further comprises: determining to-be-replaced data in the cache when no idle space exists in the cache, and writing the to-be-replaced data into the block device, wherein the to-be-replaced data is historical to-be-written data stored in the cache.

6. The method according to claim 1, wherein a total data size of the first to-be-written data is less than 512 bytes, and wherein a block granularity of the block device is greater than or equal to 512 bytes.

7. A storage control device, comprising: a cache configured to cache data; a memory configured to store instructions; and a processor coupled to the memory and configured to execute the instructions to receive a write instruction indicating first to-be-written data, the write instruction being sent by a central processing unit (CPU), wherein the write instruction is used to perform a data write operation on a block device, and wherein the write instruction comprises data content of the first to-be-written data and write address information of the first to-be-written data in the block device, obtain the data content and the write address information of the first to-be-written data from the write instruction, after obtaining the data content and the write address information, write the data content of the first to-be-written data to the cache and write the write address information of the first to-be-written data to the cache, and generate a first data block that comprises the first to-be-written data, and write the first data block into the block device.

8. The device according to claim 7, wherein the processor is further configured to execute the instructions to: read a second data block from the block device according to the write address information of the first to-be-written data, and combine the second data block and the first to-be-written data into the first data block, wherein the second data block is a data block that is stored in the block device and into which the first to-be-written data is to be written.

9. The device according to claim 7, wherein the processor is further configured to execute the instructions to: determine that historical to-be-written data and the first to-be-written data that are stored in the cache meet a data block generating condition, wherein the historical to-be-written data is second to-be-written data that is not written into the block device and that is stored in the cache before the first to-be-written data is written into the cache; and generate the first data block using the historical to-be-written data and the first to-be-written data.

10. The device according to claim 9, wherein the processor is further configured to execute the instructions to: determine that write address information of the historical to-be-written data and the write address information of the first to-be-written data are consecutive, and that a total data size of the historical to-be-written data and the first to-be-written data accords with a block granularity for writing data into the block device.

11. The device according to claim 7, wherein the processor is further configured to execute the instructions to: determine to-be-replaced data in the cache when no idle space exists in the cache, and write the to-be-replaced data into the block device, wherein the to-be-replaced data is historical to-be-written data stored in the cache.

12. The device according to claim 7, wherein, wherein a total data size of the first to-be-written data is less than 512 bytes, and wherein a block granularity of the block device is greater than or equal to 512 bytes.

13. A system, comprising: a central processing unit (CPU), configured to send a write instruction, wherein the write instruction indicates first to-be-written data and is used to perform a data write operation on a block device, and wherein the write instruction comprises data content of the first to-be-written data and write address information of the first to-be-written data in the block device; and a storage control device, configured to receive the write instruction sent by the CPU, obtain the data content and the write address information of the first to-be-written data from the write instruction, after obtaining the data content and the write address information, write the data content of the first to-be-written data to a cache of the storage control device and write the write address information of the first to-be-written data to the cache, and generate a first data block that comprises the first to-be-written data, and write the first data block into the block device.

14. The system according to claim 13, wherein, wherein a total data size of the first to-be-written data is less than 512 bytes, and wherein a block granularity of the block device is greater than or equal to 512 bytes.

15. A method, comprising: receiving, by a storage control device, a write instruction sent by a central processing unit (CPU), wherein the write instruction is used to perform a data write operation on a block device; writing, to a cache of the storage control device, first to-be-written data indicated by the write instruction; determining that historical to-be-written data and the first to-be-written data that are stored in the cache meet a data block generating condition, wherein the historical to-be-written data is second to-be-written data that is not written into the block device and that is stored in the cache before the first to-be-written data is written into the cache; and generating a first data block using the historical to-be-written data and the first to-be-written data, the first data block comprising the first to-be-written data, and writing the first data block into the block device.

16. The method according to claim 15, wherein determining that the historical to-be-written data and the first to-be-written data that are stored in the cache meet the data block generating condition comprises: determining that write address information of the historical to-be-written data and the write address information of the first to-be-written data are consecutive, and that a total data size of the historical to-be-written data and the first to-be-written data accords with a block granularity for writing data into the block device.

17. A storage control device, comprising: a cache configured to cache data; a memory configured to store instructions; and a processor coupled to the memory and configured to execute the instructions to receive a write instruction sent by a central processing unit (CPU), wherein the write instruction is used to perform a data write operation on a block device, write first to-be-written data indicated by the write instruction to the cache, determine that historical to-be-written data and the first to-be-written data that are stored in the cache meet a data block generating condition, wherein the historical to-be-written data is second to-be-written data that is not written into the block device and that is stored in the cache before the first to-be-written data is written into the cache, and generate a first data block using the historical to-be-written data and the first to-be-written data, the first data block comprising the first to-be-written data, and write the first data block into the block device.

18. The device according to claim 17, wherein the processor is further configured to execute the instructions to: determine that write address information of the historical to-be-written data and the write address information of the first to-be-written data are consecutive, and that a total data size of the historical to-be-written data and the first to-be-written data accords with a block granularity for writing data into the block device.

19. A system, comprising: a central processing unit (CPU), configured to send a write instruction, wherein the write instruction is used to perform a data write operation on a block device; and a storage control device, configured to receive the write instruction sent by the CPU, write first to-be-written data indicated by the write instruction to a cache of the storage control device, determine that historical to-be-written data and the first to-be-written data that are stored in the cache meet a data block generating condition, wherein the historical to-be-written data is second to-be-written data that is not written into the block device and that is stored in the cache before the first to-be-written data is written into the cache, and generate a first data block using the historical to-be-written data and the first to-be-written data, the first data block comprising the first to-be-written data, and write the first data block into the block device.

20. The device according to claim 19, wherein the storage control device is further configured to: determine that write address information of the historical to-be-written data and the write address information of the first to-be-written data are consecutive, and that a total data size of the historical to-be-written data and the first to-be-written data accords with a block granularity for writing data into the block device.