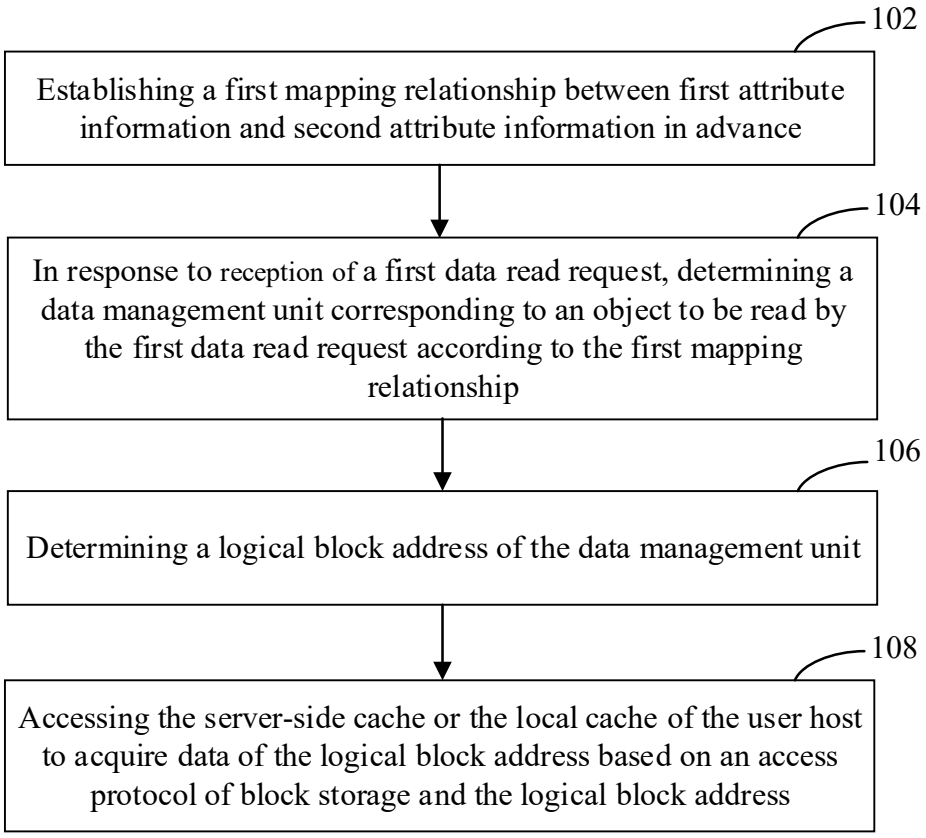
102
Establishing a first mapping relationship between first attribute information and second attribute information in advance
104
In response to reception of a first data read request, determining a data management unit corresponding to an object to be read by the first data read request according to the first mapping relationship
106
Determining a logical block address of the data management unit
108
Accessing the server-side cache or the local cache of the user host to acquire data of the logical block address based on an access protocol of block storage and the logical block address

FIG. 1

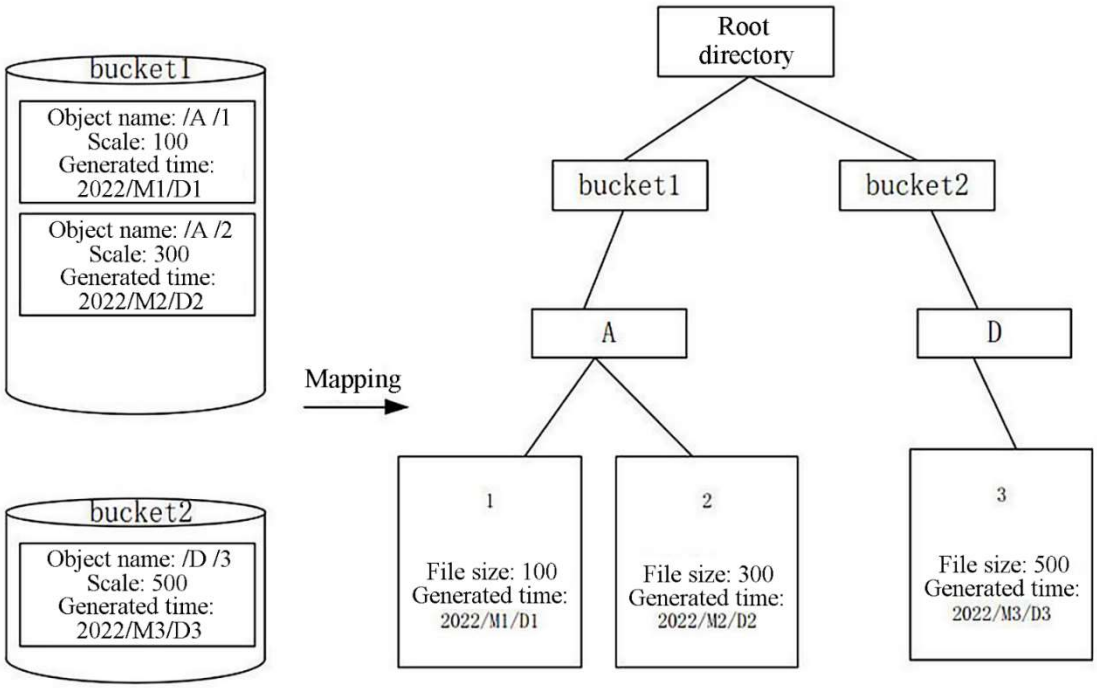
bucket1
Object name: /A /1
Scale: 100
Generated time: 2022/M1/D1
Object name: /A /2
Scale: 300
Generated time: 2022/M2/D2
bucket2
Object name: /D /3
Scale: 500
Generated time: 2022/M3/D3
Mapping
Root directory
bucket1
bucket2
A
D
1
File size: 100
Generated time: 2022/M1/D1
2
File size: 300
Generated time: 2022/M2/D2
3
File size: 500
Generated time: 2022/M3/D3

FIG. 2

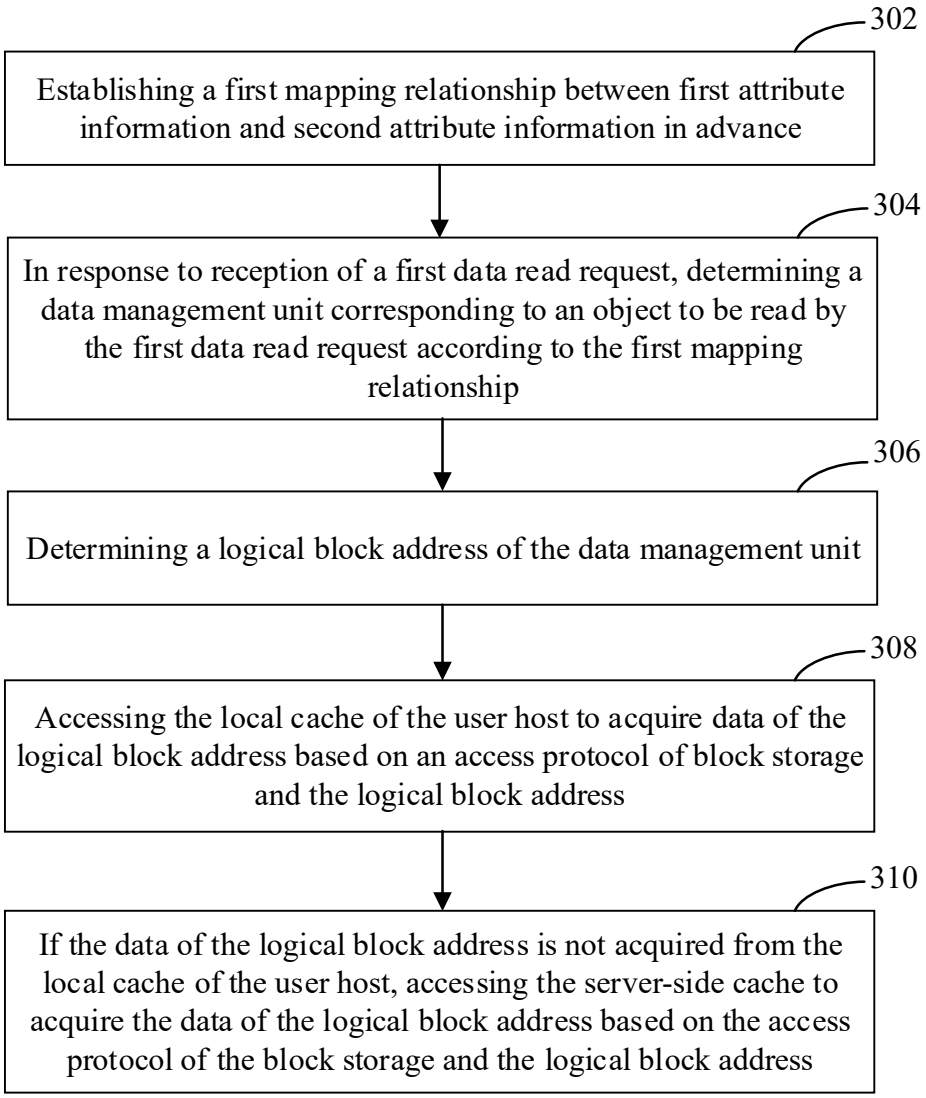
302
Establishing a first mapping relationship between first attribute information and second attribute information in advance
304
In response to reception of a first data read request, determining a data management unit corresponding to an object to be read by the first data read request according to the first mapping relationship
306
Determining a logical block address of the data management unit
308
Accessing the local cache of the user host to acquire data of the logical block address based on an access protocol of block storage and the logical block address
310
If the data of the logical block address is not acquired from the local cache of the user host, accessing the server-side cache to acquire the data of the logical block address based on the access protocol of the block storage and the logical block address

FIG. 3

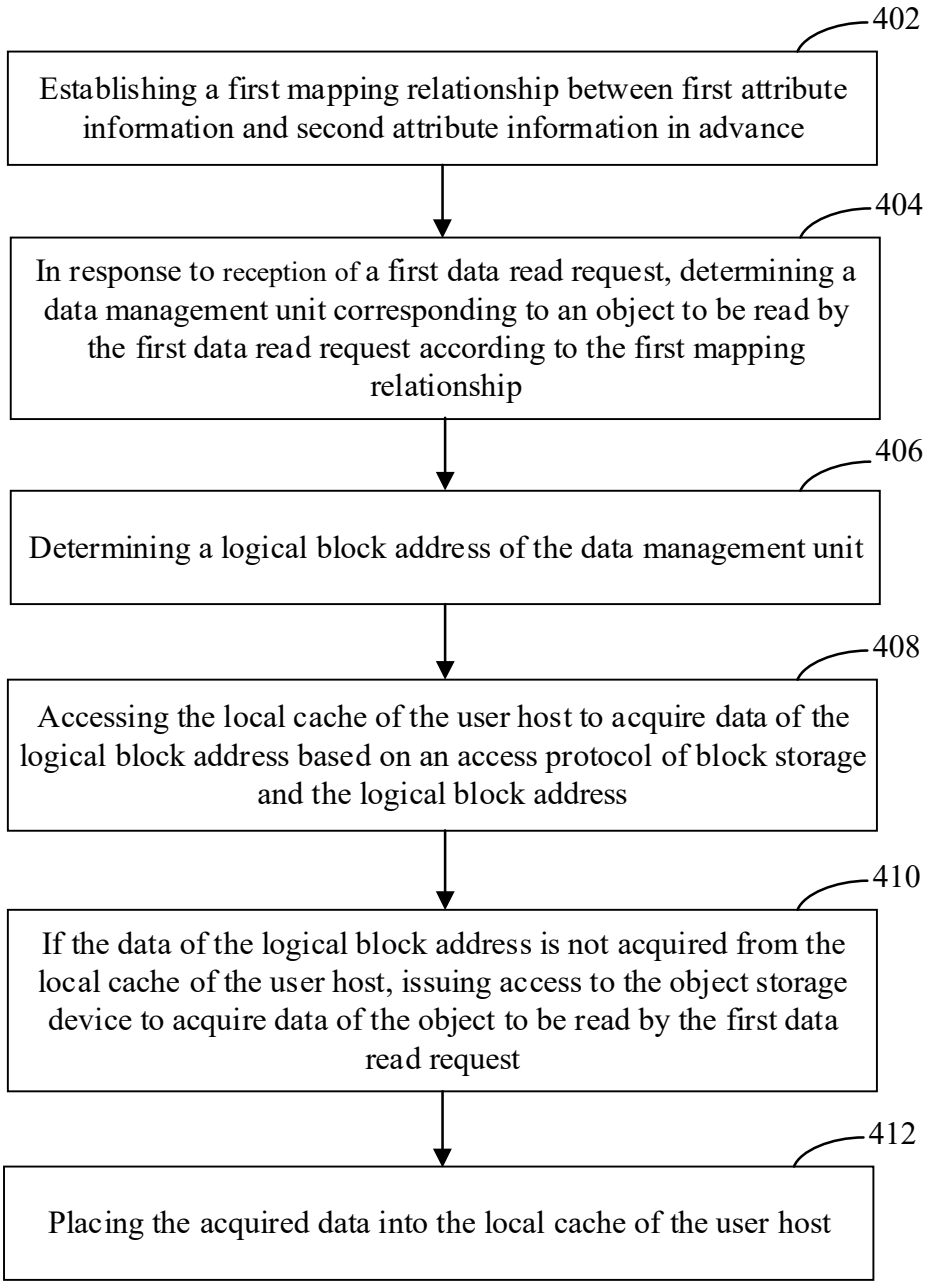
402
Establishing a first mapping relationship between first attribute information and second attribute information in advance
404
In response to reception of a first data read request, determining a data management unit corresponding to an object to be read by the first data read request according to the first mapping relationship
406
Determining a logical block address of the data management unit
408
Accessing the local cache of the user host to acquire data of the logical block address based on an access protocol of block storage and the logical block address
410
If the data of the logical block address is not acquired from the local cache of the user host, issuing access to the object storage device to acquire data of the object to be read by the first data read request
412
Placing the acquired data into the local cache of the user host

FIG. 4

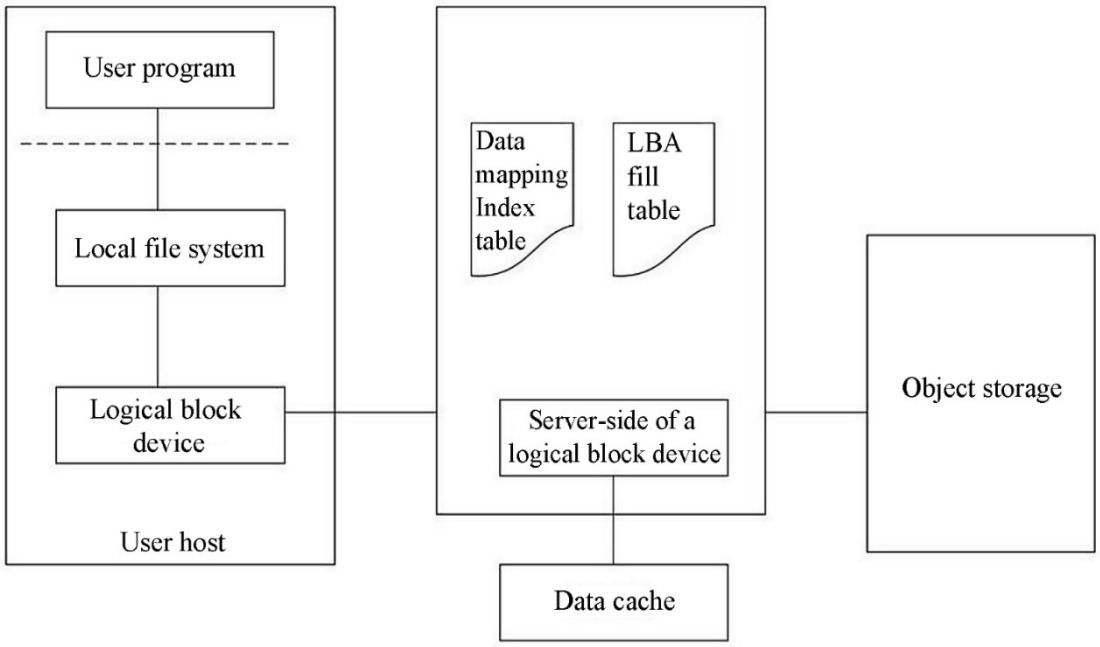
User program
Local file system
Logical block device
User host
Data mapping Index table
LBA fill table
Server-side of a logical block device
Data cache
Object storage

FIG. 5

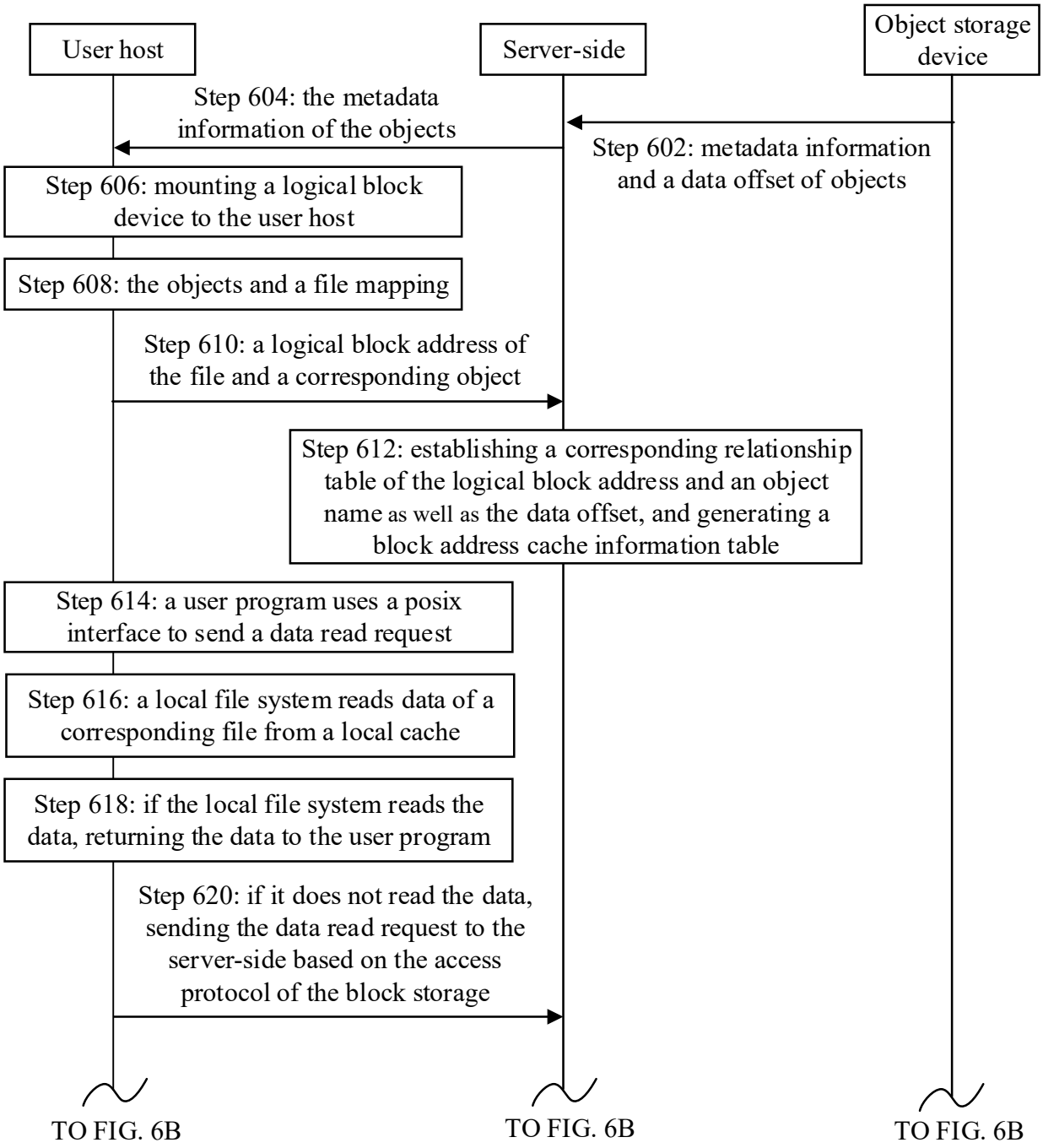
User host
Server-side
Object storage device
Step 604: the metadata information of the objects
Step 602: metadata information and a data offset of objects
Step 606: mounting a logical block device to the user host
Step 608: the objects and a file mapping
Step 610: a logical block address of the file and a corresponding object
Step 612: establishing a corresponding relationship table of the logical block address and an object name as well as the data offset, and generating a block address cache information table
Step 614: a user program uses a posix interface to send a data read request
Step 616: a local file system reads data of a corresponding file from a local cache
Step 618: if the local file system reads the data, returning the data to the user program
Step 620: if it does not read the data, sending the data read request to the server-side based on the access protocol of the block storage
TO FIG. 6B
TO FIG. 6B
TO FIG. 6B

FIG. 6A

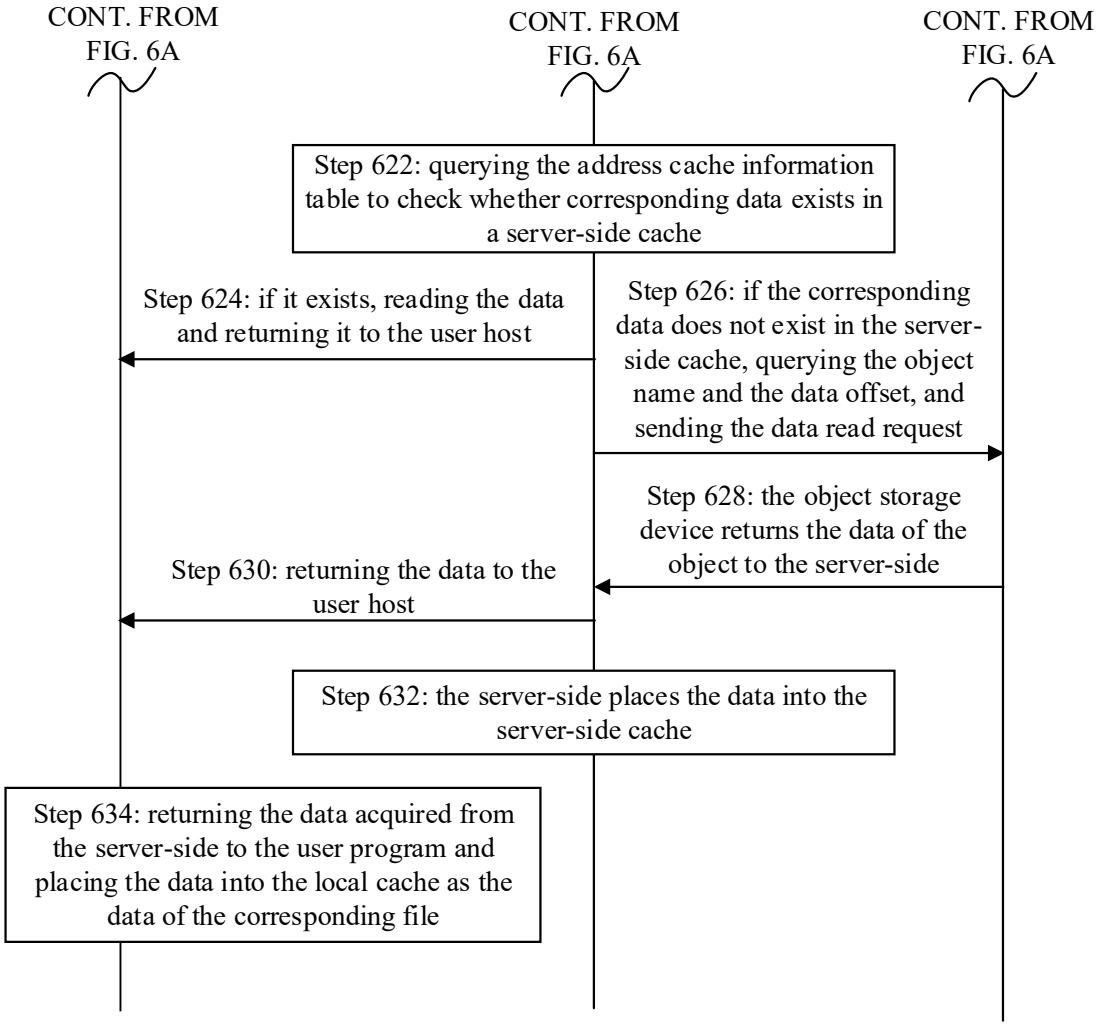
CONT. FROM FIG. 6A
CONT. FROM FIG. 6A
CONT. FROM FIG. 6A
Step 622: querying the address cache information table to check whether corresponding data exists in a server-side cache
Step 624: if it exists, reading the data and returning it to the user host
Step 626: if the corresponding data does not exist in the server-side cache, querying the object name and the data offset, and sending the data read request
Step 628: the object storage device returns the data of the object to the server-side
Step 630: returning the data to the user host
Step 632: the server-side places the data into the server-side cache
Step 634: returning the data acquired from the server-side to the user program and placing the data into the local cache as the data of the corresponding file

FIG. 6B

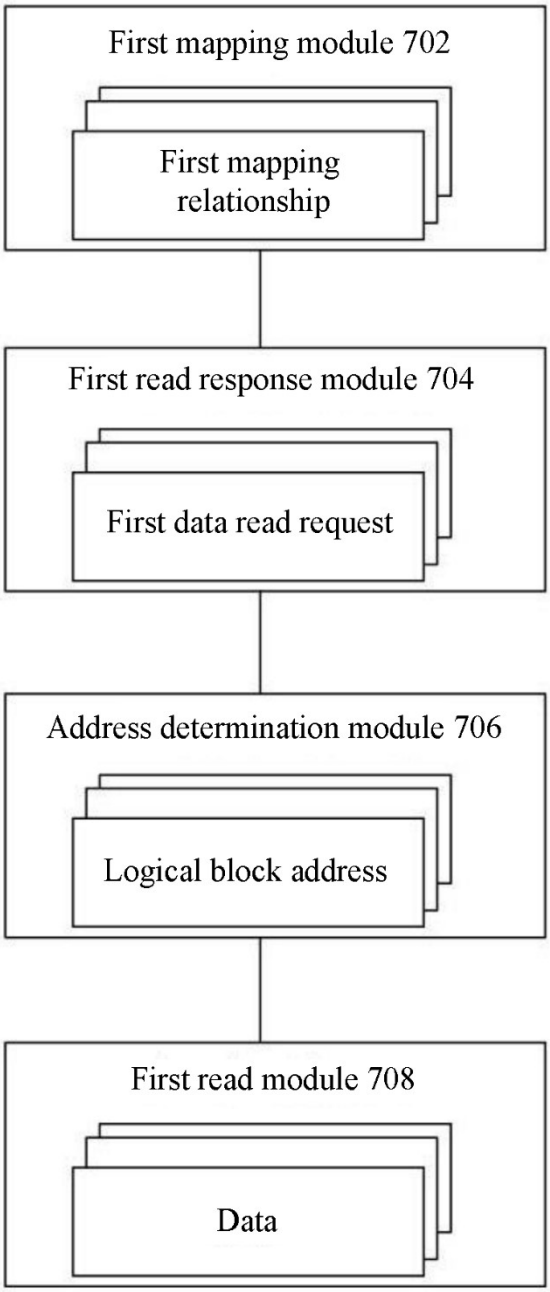
First mapping module 702
First mapping relationship
First read response module 704
First data read request
Address determination module 706
Logical block address
First read module 708
Data

FIG. 7

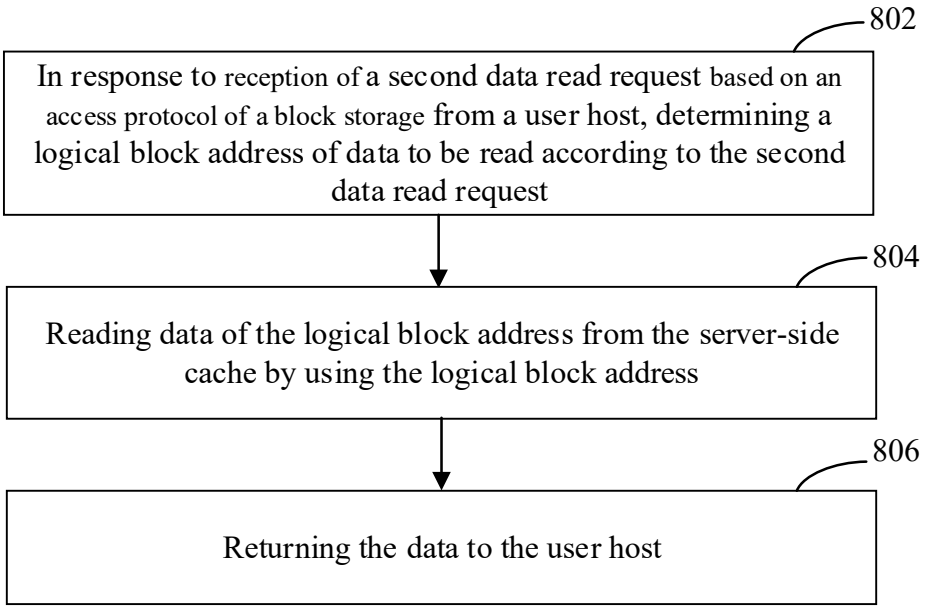
802
In response to reception of a second data read request based on an access protocol of a block storage from a user host, determining a logical block address of data to be read according to the second data read request
804
Reading data of the logical block address from the server-side cache by using the logical block address
806
Returning the data to the user host

FIG. 8

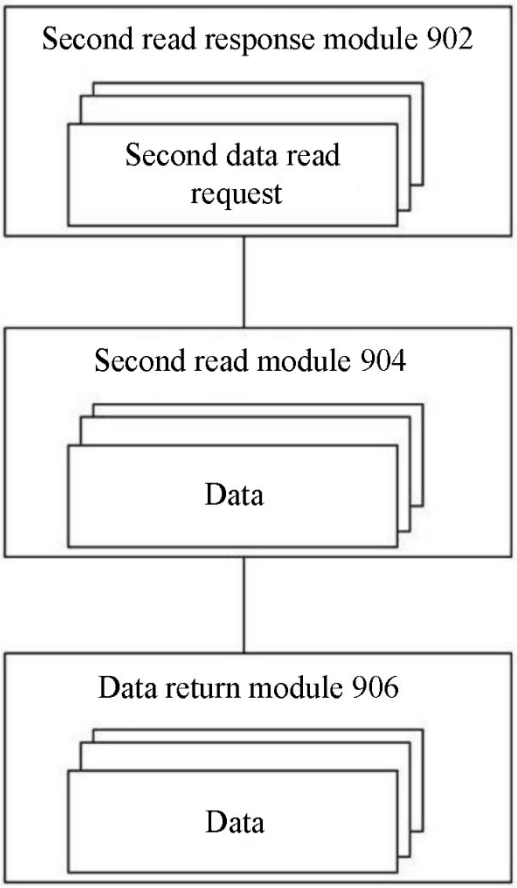
Second read response module 902
Second data read request
Second read module 904
Data
Data return module 906
Data

FIG. 9

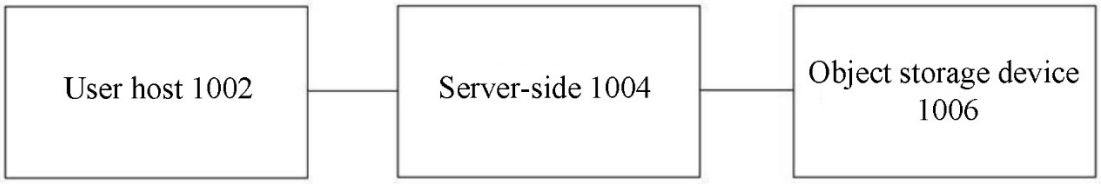
User host 1002
Server-side 1004
Object storage device 1006

FIG. 10

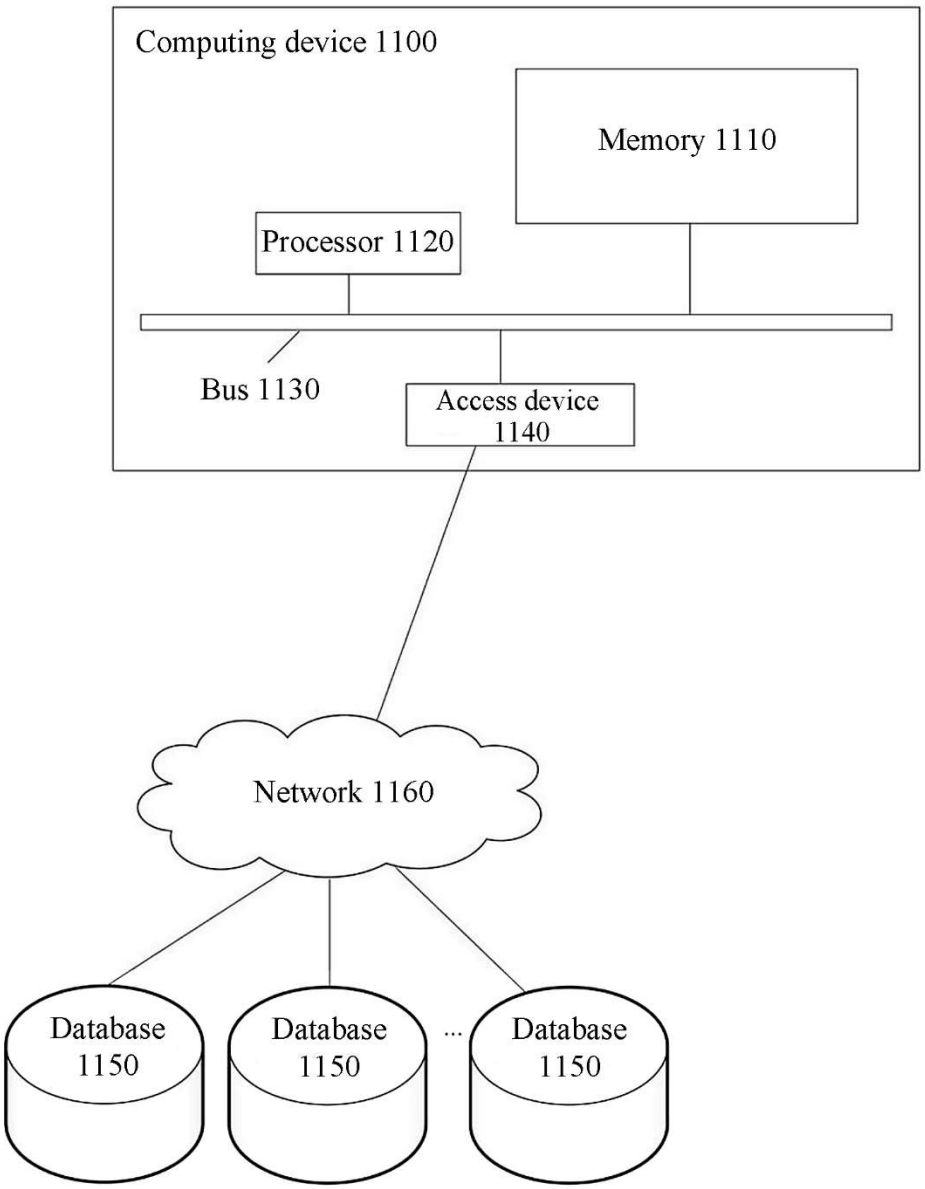
Computing device 1100
Memory 1110
Processor 1120
Bus 1130
Access device 1140
Network 1160
Database 1150
Database 1150
...
Database 1150

FIG. 11