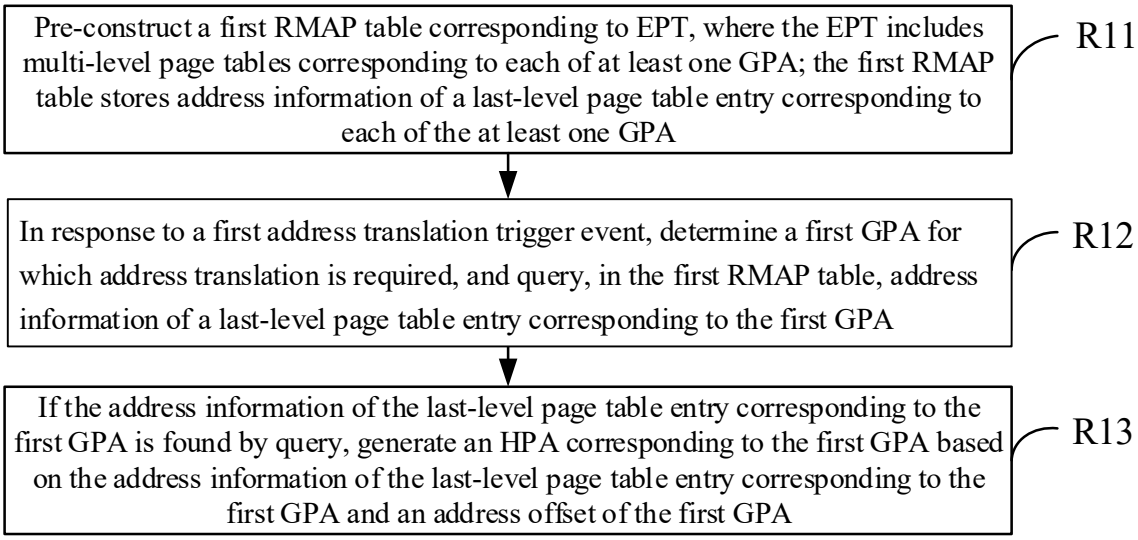

Pre-construct a first RMAP table corresponding to EPT, where the EPT includes multi-level page tables corresponding to each of at least one GPA; the first RMAP table stores address information of a last-level page table entry corresponding to each of the at least one GPA
R11
In response to a first address translation trigger event, determine a first GPA for which address translation is required, and query, in the first RMAP table, address information of a last-level page table entry corresponding to the first GPA
R12
If the address information of the last-level page table entry corresponding to the first GPA is found by query, generate an HPA corresponding to the first GPA based on the address information of the last-level page table entry corresponding to the first GPA and an address offset of the first GPA
R13

FIG. 1a

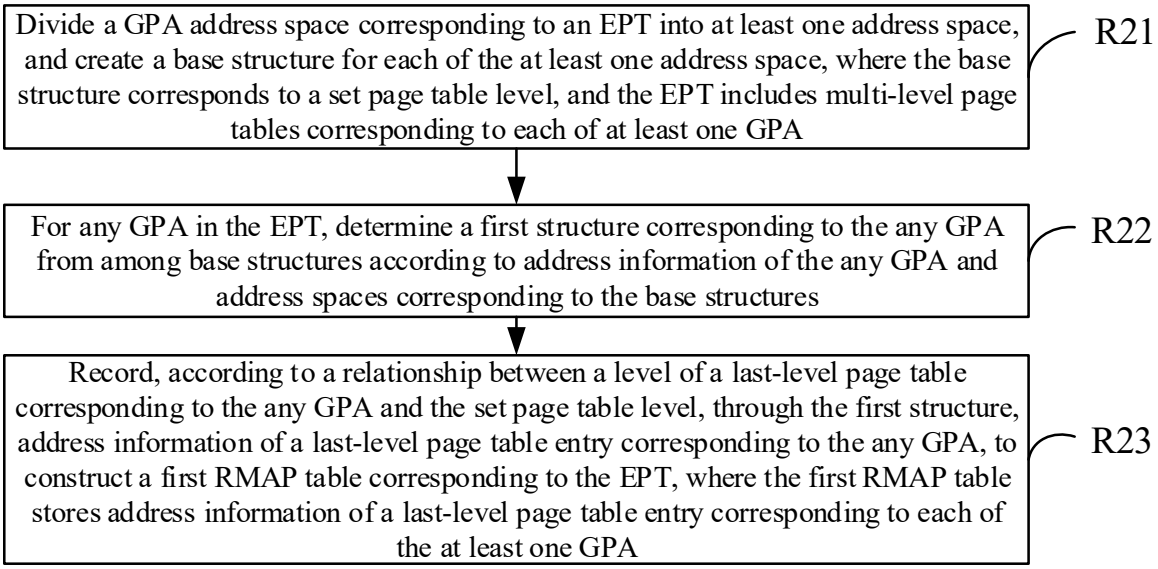

Divide a GPA address space corresponding to an EPT into at least one address space, and create a base structure for each of the at least one address space, where the base structure corresponds to a set page table level, and the EPT includes multi-level page tables corresponding to each of at least one GPA
R21
For any GPA in the EPT, determine a first structure corresponding to the any GPA from among base structures according to address information of the any GPA and address spaces corresponding to the base structures
R22
Record, according to a relationship between a level of a last-level page table corresponding to the any GPA and the set page table level, through the first structure, address information of a last-level page table entry corresponding to the any GPA, to construct a first RMAP table corresponding to the EPT, where the first RMAP table stores address information of a last-level page table entry corresponding to each of the at least one GPA
R23

FIG. 1b

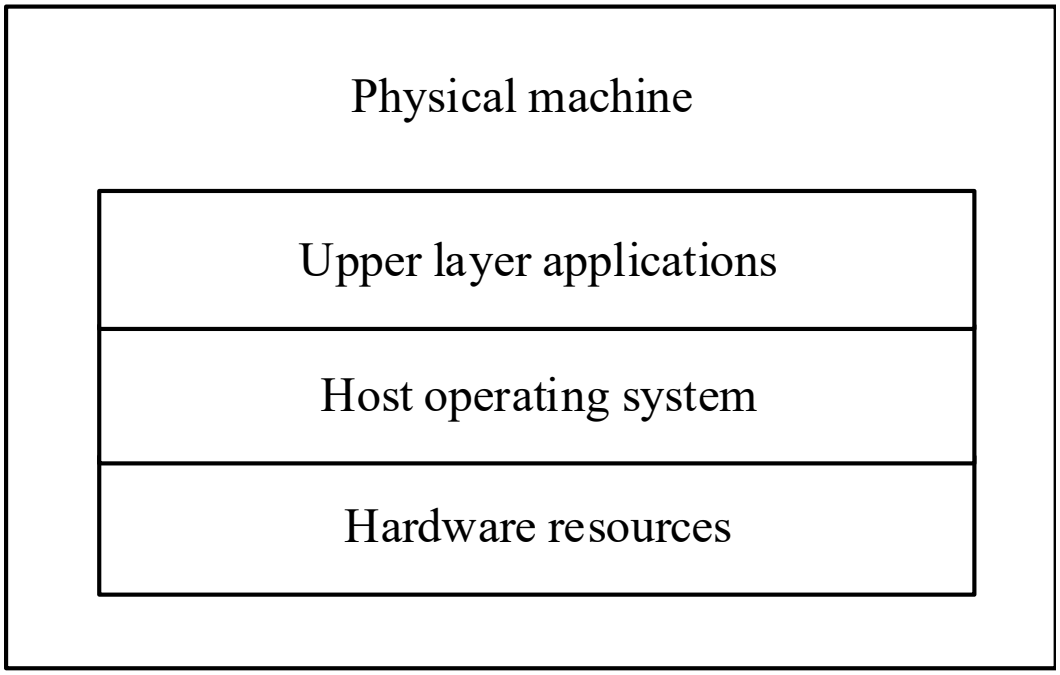

Physical machine
Upper layer applications
Host operating system
Hardware resources

FIG. 2a

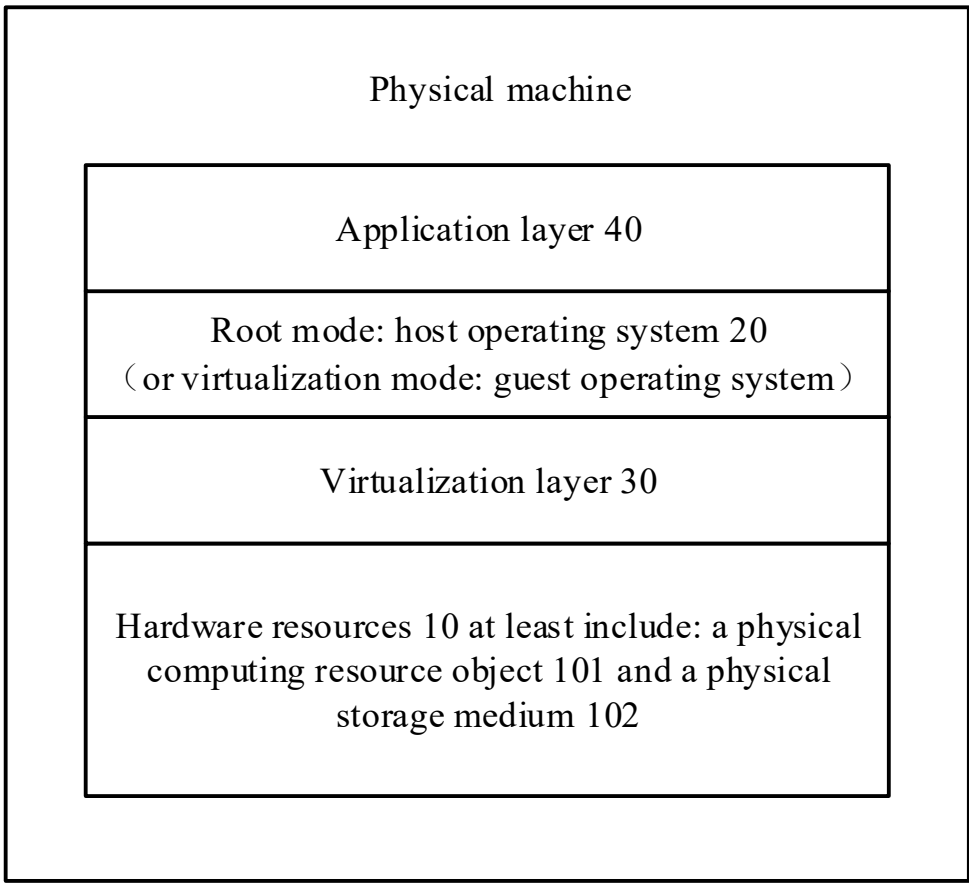

Physical machine
Application layer 40
Root mode: host operating system 20
（or virtualization mode: guest operating system）
Virtualization layer 30
Hardware resources 10 at least include: a physical computing resource object 101 and a physical storage medium 102

FIG. 2b

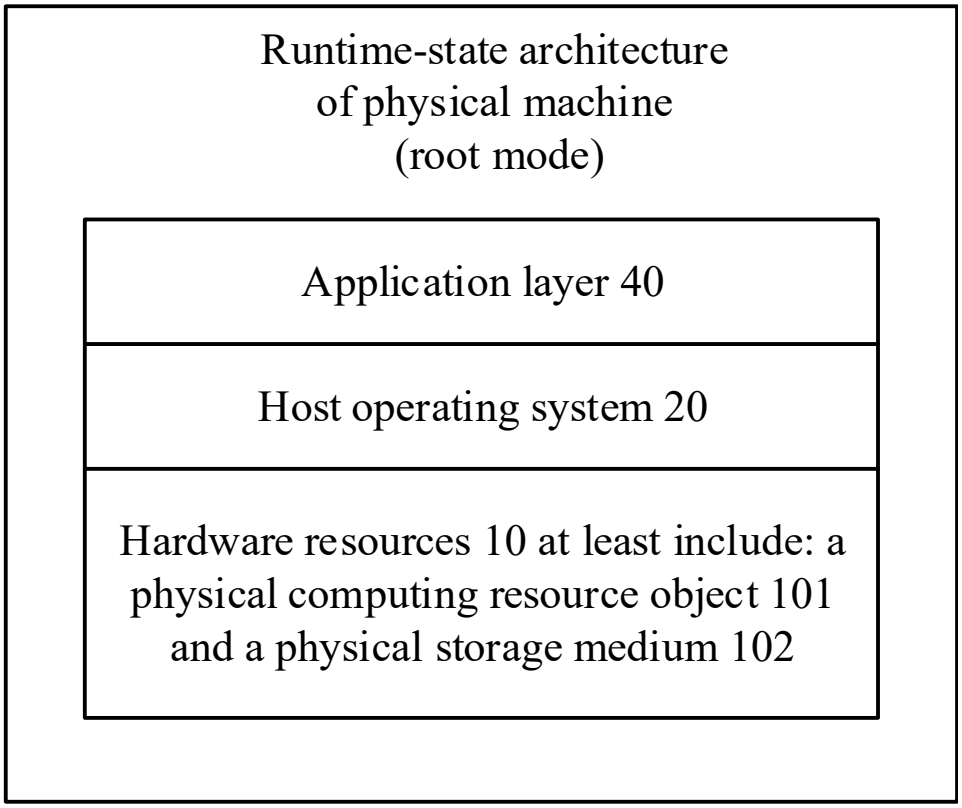

Runtime-state architecture
of physical machine
(root mode)
Application layer 40
Host operating system 20
Hardware resources 10 at least include: a
physical computing resource object 101
and a physical storage medium 102

FIG. 2c

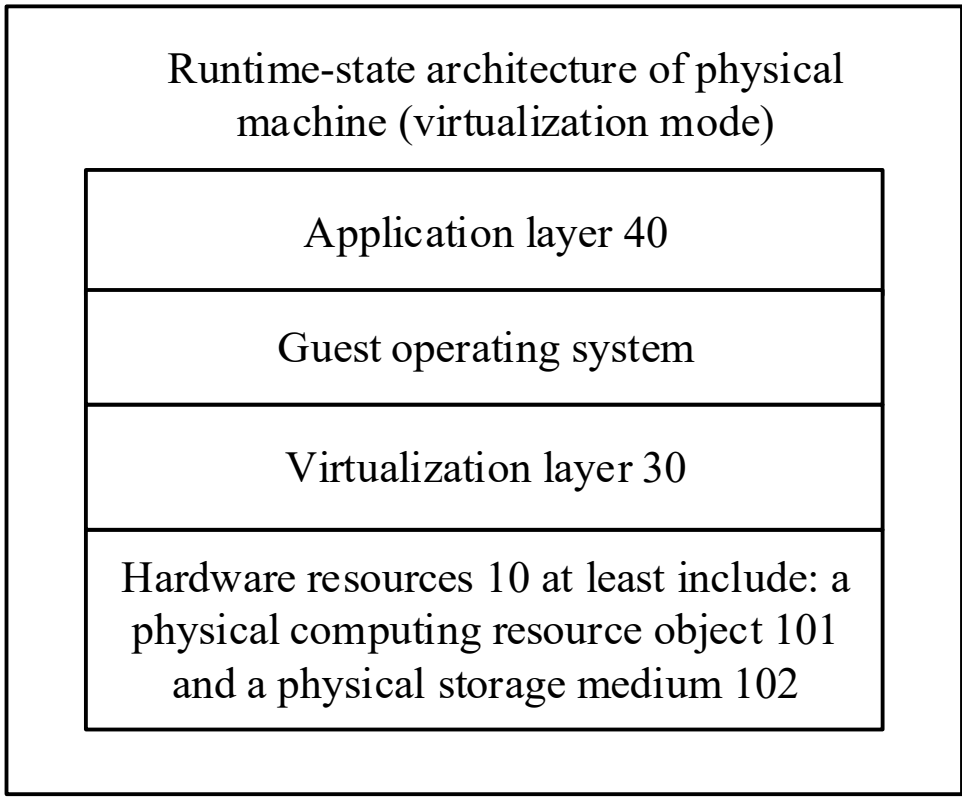

Runtime-state architecture of physical
machine (virtualization mode)
Application layer 40
Guest operating system
Virtualization layer 30
Hardware resources 10 at least include: a
physical computing resource object 101
and a physical storage medium 102

FIG. 2d

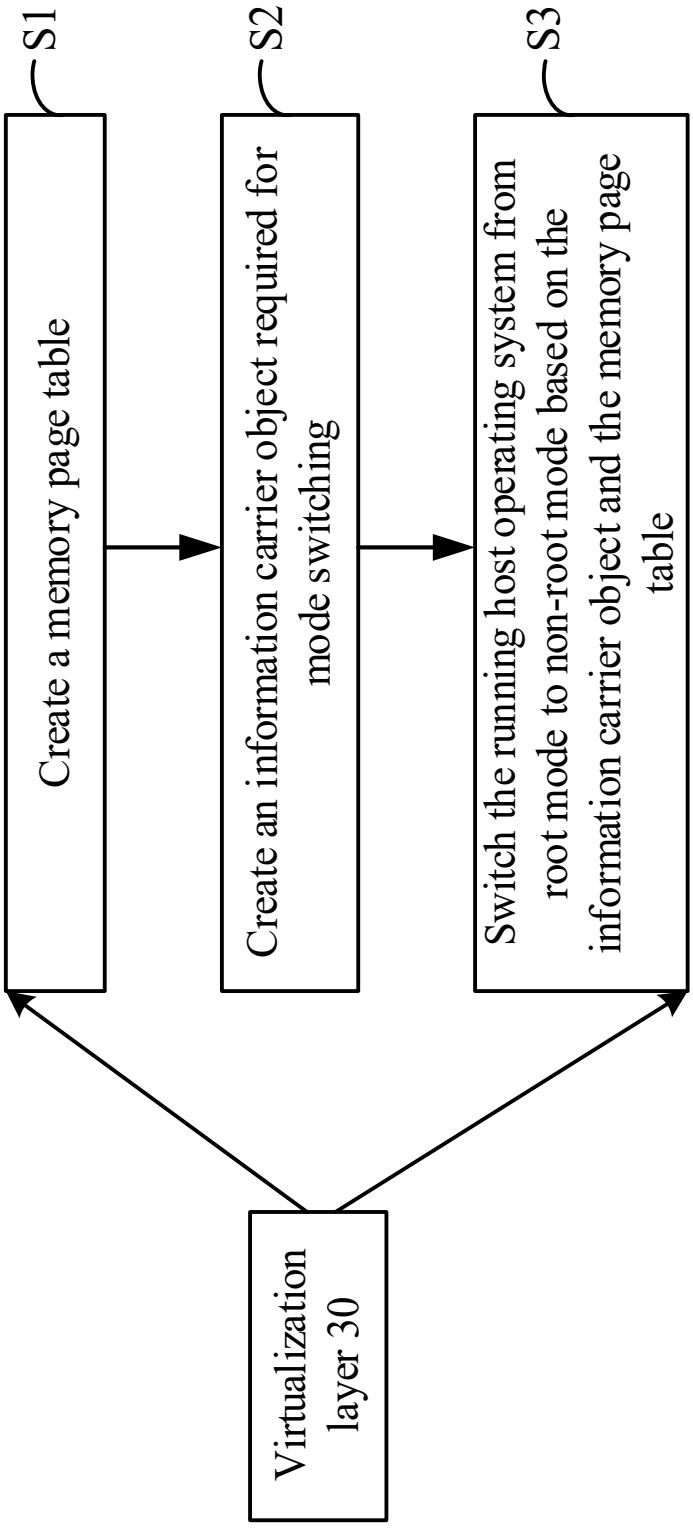

S1
S2
S3
Create a memory page table
Create an information carrier object required for mode switching
Switch the running host operating system from root mode to non-root mode based on the information carrier object and the memory page table
Virtualization layer 30

FIG. 3a

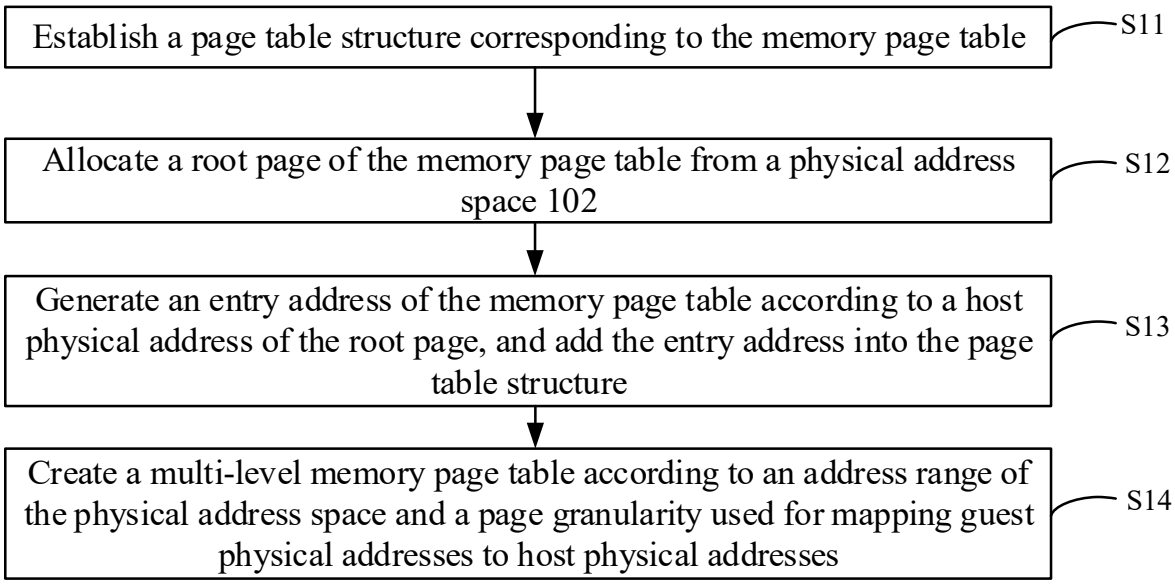

Establish a page table structure corresponding to the memory page table
S11
Allocate a root page of the memory page table from a physical address space 102
S12
Generate an entry address of the memory page table according to a host physical address of the root page, and add the entry address into the page table structure
S13
Create a multi-level memory page table according to an address range of the physical address space and a page granularity used for mapping guest physical addresses to host physical addresses
S14

FIG. 3b

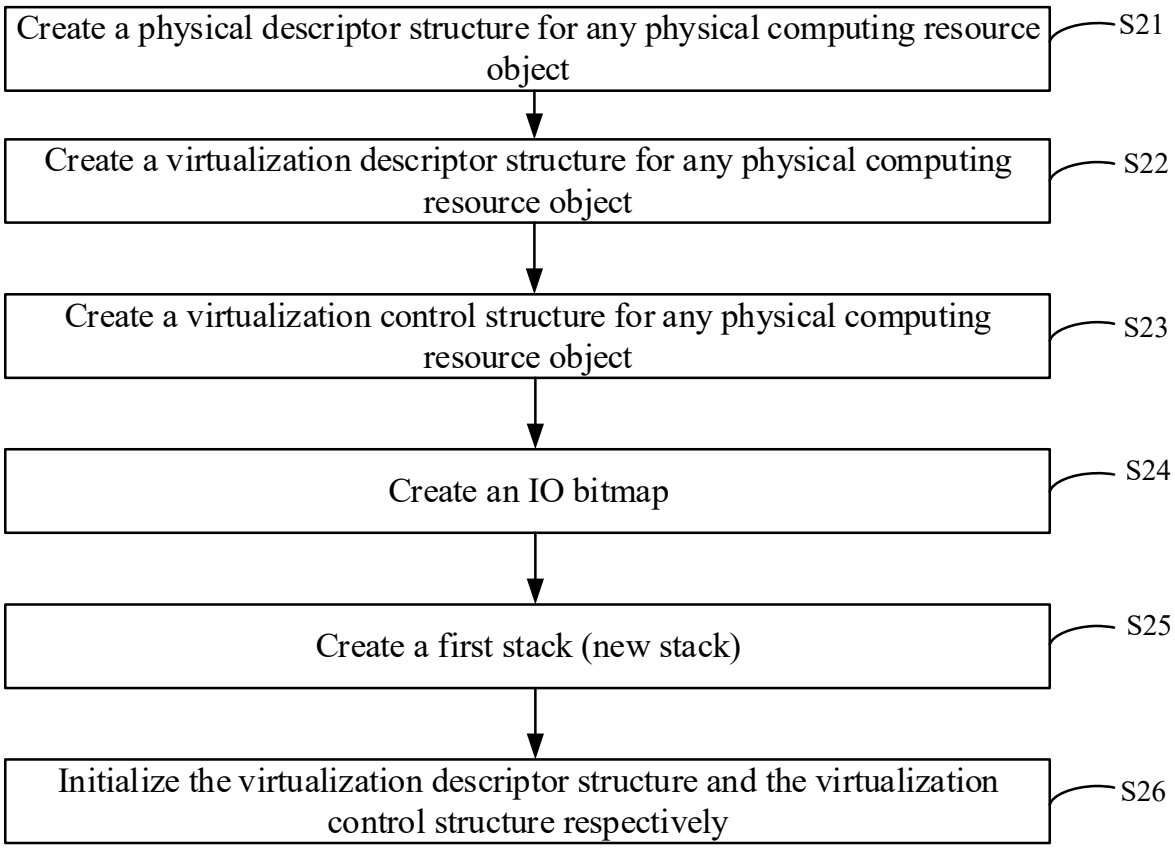

Create a physical descriptor structure for any physical computing resource object
S21
Create a virtualization descriptor structure for any physical computing resource object
S22
Create a virtualization control structure for any physical computing resource object
S23
Create an IO bitmap
S24
Create a first stack (new stack)
S25
Initialize the virtualization descriptor structure and the virtualization control structure respectively
S26

FIG. 3c

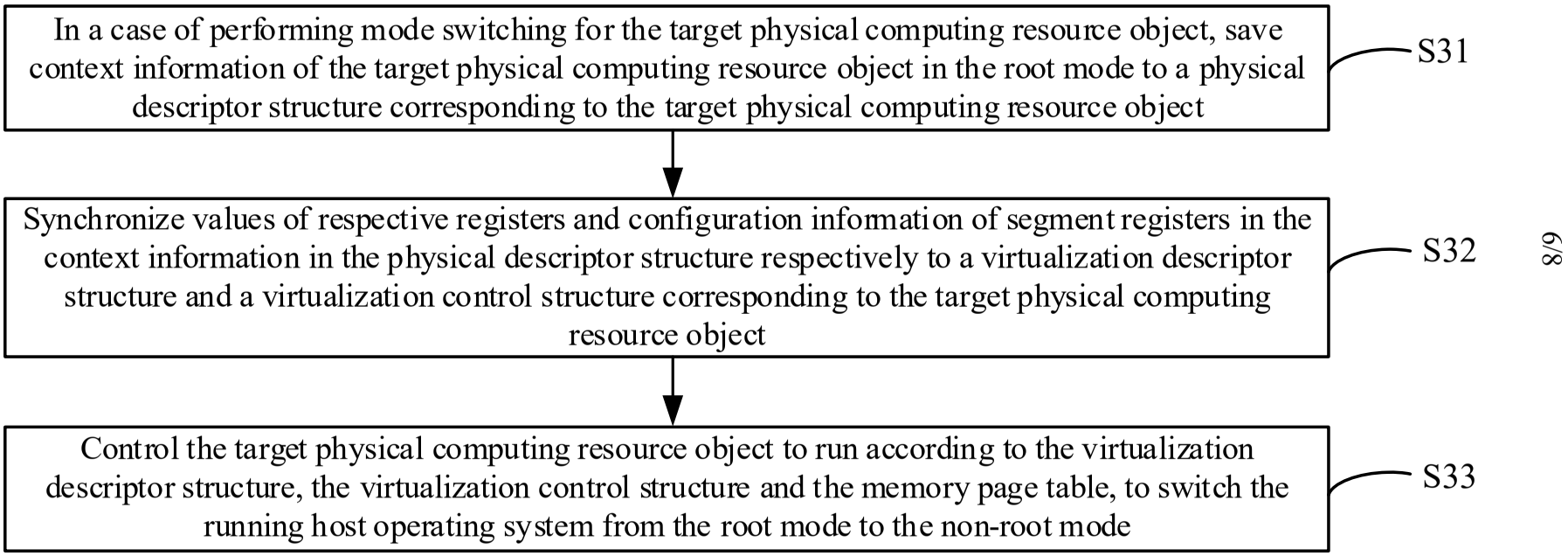

In a case of performing mode switching for the target physical computing resource object, save context information of the target physical computing resource object in the root mode to a physical descriptor structure corresponding to the target physical computing resource object
S31
Synchronize values of respective registers and configuration information of segment registers in the context information in the physical descriptor structure respectively to a virtualization descriptor structure and a virtualization control structure corresponding to the target physical computing resource object
S32
Control the target physical computing resource object to run according to the virtualization descriptor structure, the virtualization control structure and the memory page table, to switch the running host operating system from the root mode to the non-root mode
S33

FIG. 3d

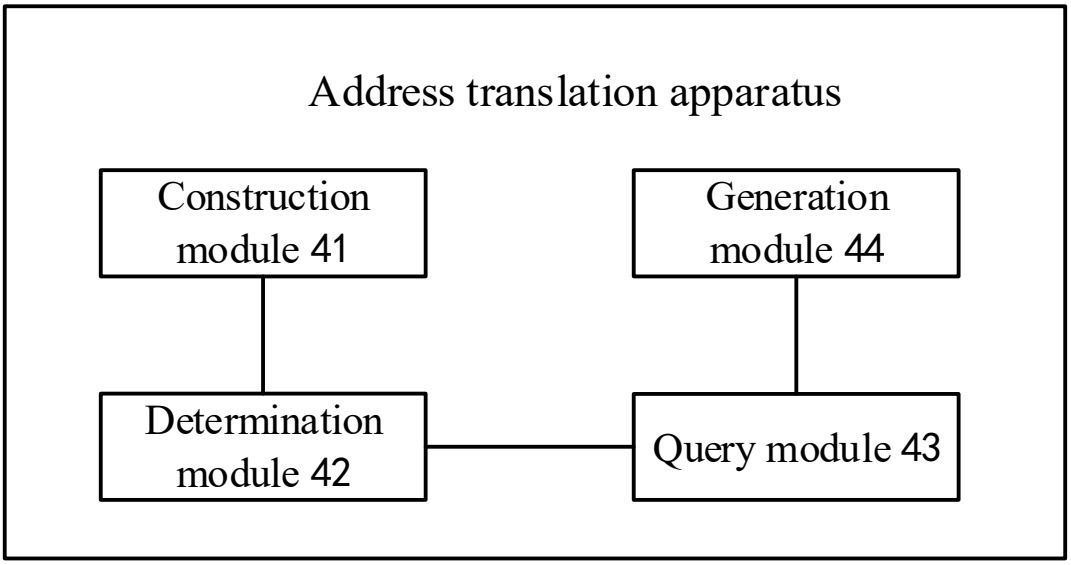

Address translation apparatus
Construction module 41
Generation module 44
Determination module 42
Query module 43

FIG. 4

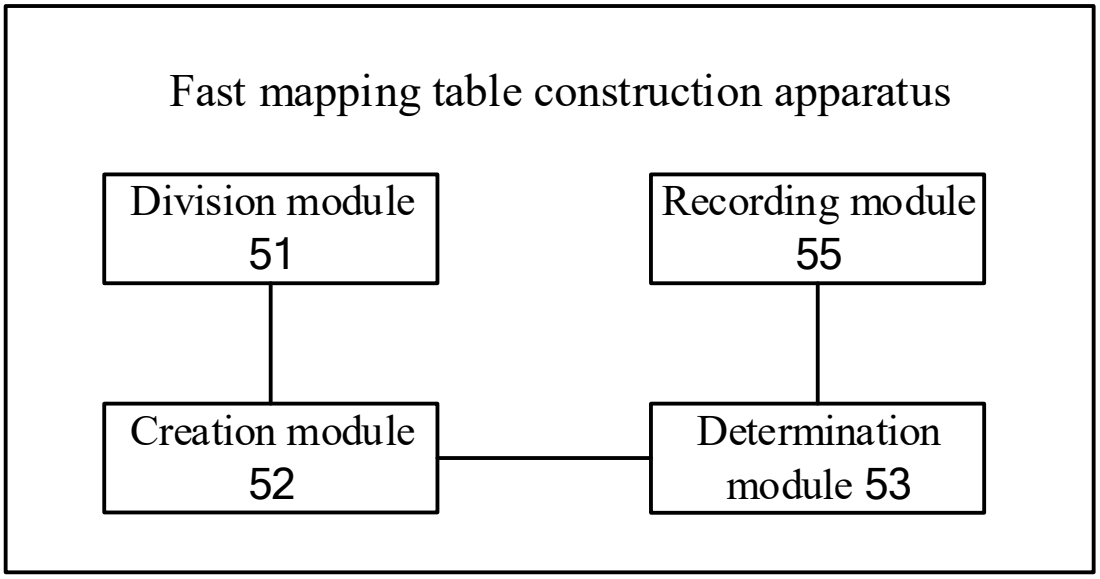

Fast mapping table construction apparatus
Division module 51
Recording module 55
Creation module 52
Determination module 53

FIG. 5

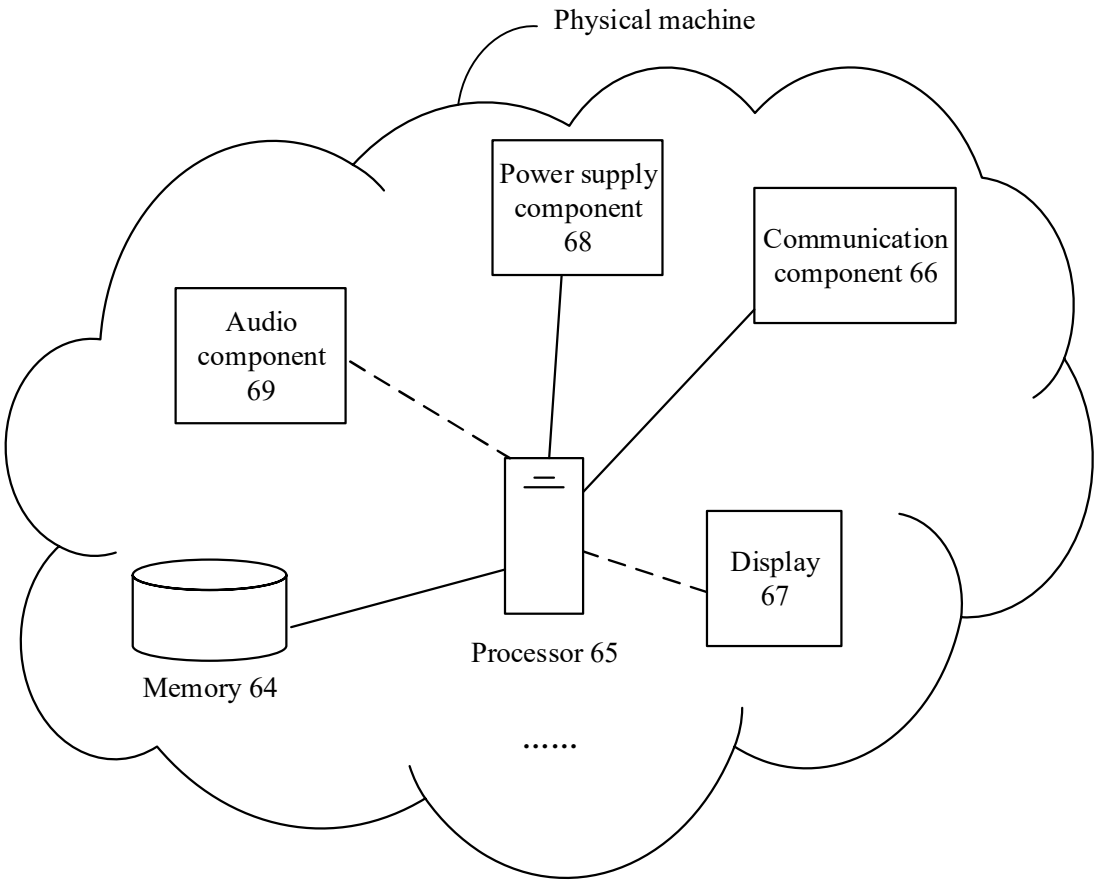

Physical machine
Power supply component 68
Communication component 66
Audio component 69
Display 67
Processor 65
Memory 64
.....

FIG. 6