CLAIMS

What is claimed is:

1. A memory paging method, comprising:

determining (S201, S1) a guest physical address needing page table update;

deleting (S2) the guest physical address from a page table of an MMU of a host;

blocking (S3) an access of a CPU of a virtual machine to the guest physical address;

determining (S202, S4), from a page table stored in an IOMMU of the host, a first host physical address corresponding to the guest physical address;

determining (S203, S5) a second host physical address from idle physical addresses stored in a host memory;

copying (S204) data stored in the first host physical address to the second host physical address;

updating (S205) a host physical address that corresponds to the guest physical address and is recorded in the page table of the IOMMU to the second host physical address;

the method further comprising:

determining (S6) a third host physical address from the idle physical addresses of the host memory;

after copying the data stored in the first host physical address to the second host physical address, copying data stored in the second host physical address to the third host physical address;

in a case that the data stored in the first host physical address is the same as data stored in the third host physical address, releasing (S12) a memory space corresponding to the third host physical address; and

updating a host physical address that corresponds to the guest physical address and is recorded in the page table of the MMU to the second host physical address.

2. The method according to claim 1, wherein the blocking (S3) the access of the CPU to the guest physical address comprises:

acquiring an access request of the CPU for the guest physical address;

querying the page table of the MMU by utilizing the guest physical address;

executing a Page fault procedure in a case that a host physical address corresponding to the guest physical address is not found in the page table of the MMU; and

performing locking processing for a page table replacement progress of the MMU in a process of executing the Page fault procedure, to block the access of the CPU to the guest physical address.

3. The method according to claim 1, further comprising:

in a case that different data exists between the data stored in the first host physical address and the data stored in the third host physical address, for a first logical address where data is different, determining (S10) whether data at the first logical address from the data stored in the second host physical address is the same as data at the first logical address from the data stored in the third host physical address;

if a determination result is that the data at the first logical address from the data stored in the second host physical address is not the same as the data at the first logical address from the data stored in the third host physical address, releasing (S12) the memory space corresponding to the third host physical address; and

updating the host physical address that corresponds to the guest physical address and is recorded in the page table of the MMU to the second host physical address.

4. The method according to claim 3, further comprising:

if the determination result is that the data at the first logical address from the data stored in the second host physical address is the same as the data at the first logical address from the data stored in the third host physical address, updating (S11) the data at the first logical address from the data stored in the second host physical address to

data at the first logical address from the data stored in the first host physical address;

releasing (S12) the memory space corresponding to the third host physical address; and

updating the host physical address that corresponds to the guest physical address and is recorded in the page table of the MMU to the second host physical address.

5. The method according to claim 1, further comprising:

comparing (S9), in units of byte, the data stored in the first host physical address with the data stored in the third host physical address.

6. The method according to claim 3 or 4, further comprising:

after updating the host physical address that corresponds to the guest physical address and is recorded in the page table of the MMU to the second host physical address, restoring the access of the CPU of the virtual machine to the guest physical address.

7. The method according to claim 1, wherein the determining (S201, S1) the guest physical address needing page table update comprises:

acquiring a page table update request; and acquiring, from the page table update request, the guest physical address needing page table update.

8. A computing system, comprising: a host (10) and a virtual machine manager (20); wherein

the host (10) is deployed with a virtual machine (101), and is mounted with a pass-through device (102) to which the virtual machine (101) directly accesses; the host (10) further comprises: an IOMMU; a page table stored in the IOMMU records a correspondence relationship between guest physical addresses of virtual machines (101) and host physical addresses; and the pass-through device (102) accesses a memory of the host (10) based on the correspondence relationship between the guest physical

addresses of the virtual machines (101) and the host physical addresses; and

the virtual machine manager (20) is used for: determining a guest physical address needing page table update; deleting the guest physical address from a page table of an MMU of the host; blocking an access of a CPU of a virtual machine to the guest physical address; determining, from the page table stored in the IOMMU, a first host physical address corresponding to the guest physical address; determining a second host physical address from idle physical addresses in the memory of the host; copying data stored in the first host physical address to the second host physical address; updating a host physical address that corresponds to the guest physical address and is recorded in the page table of the IOMMU to the second host physical address;

the virtual machine manager (20) is further used for determining a third host physical address from the idle physical addresses of the host memory; after copying the data stored in the first host physical address to the second host physical address, copying data stored in the second host physical address to the third host physical address; in a case that the data stored in the first host physical address is the same as data stored in the third host physical address, releasing a memory space corresponding to the third host physical address; and updating a host physical address that corresponds to the guest physical address and is recorded in the page table of the MMU to the second host physical address.

9. A computer-readable storage medium storing computer instructions that, when executed by one or more processors, cause the one or more processors to execute steps in the method as described in any one of claims 1-7.