CLAIMS:

1. A switching device comprising:

Peripheral Component Interconnect Express (PCIe) upstream ports configured to couple to a host;

a PCIe downstream port coupled to the PCIe upstream ports and configured to couple to an input/output (I/O) device;

an internal connection line; and

an internal processing apparatus coupled to the PCIe downstream port using the internal connection line and configured to:

transmit a configuration read/write packet to the PCIe downstream port using the internal connection line,

receive, from the PCIe downstream port, in response to the configuration read/write packet, and using the internal connection line, a configuration read/write response packet comprising a completer identification, ~~and~~

determine, according to the completer identification, that the switching device is coupled to the I/O device whose identification is the completer identification;

whereby when it is determined that the switching device is coupled to the I/O device whose identification is the completer identification, PCIe configuration content of the I/O device is stored, a function of the I/O device is virtualized; and a mapping between a first PCIe domain corresponding to the host and a second PCIe domain corresponding to the I/O device is implemented.

~~2. The switching device of claim 1, wherein the internal processing apparatus is further configured to:~~

~~store PCIe configuration content of the I/O device;~~

~~virtualize a function of the I/O device; and~~

~~implement a mapping between a first PCIe domain corresponding to the host and a second PCIe domain corresponding to the I/O device.~~

23. The switching device of claim 12, wherein the internal processing apparatus is further configured to store a first mapping relationship from a first identification in the first PCIe domain to a second identification in the second PCIe domain.

34. The switching device of claim 23, wherein the internal processing apparatus is further configured to store a second mapping relationship from the second identification to the first identification.

45. The switching device of claim 34, wherein the switching device is configured to store a mapping table comprising a base address register (BAR) address and a BAR size of a virtual function of the I/O device.

56. The switching device of claim 12, further comprising:

a host switching device comprising the PCIe upstream ports;

an Ethernet interface; and

an I/O switching device coupled to the host switching device via the Ethernet interface and comprising:

the internal processing apparatus,

a virtual endpoint device,

a mirroring endpoint device, and

the PCIe downstream port.

67. The switching device of claim 1, wherein the internal processing apparatus is further configured to:

receive an initialization instruction from a management baseboard management controller (BMC) in the host; and

further transmit the configuration read/write packet according to the initialization instruction

7~~8~~. The switching device of claim 6~~7~~, wherein the internal processing apparatus is further configured to report, to the management BMC after the I/O device couples to the switching device, identification information identifying the I/O device.

8~~9~~. The switching device of claim 1, wherein the internal processing apparatus is further configured to:

receive configuration management information from a management baseboard management controller (BMC) in the host; and

configure the PCIe upstream ports and the PCIe downstream port according to the configuration management information.

9~~10~~. The switching device of claim 1, wherein the internal processing apparatus is further configured to process an exception event and a hot swap event.

10~~1~~. A Peripheral Component Interconnect Express (PCIe) system comprising:

a host comprising a management baseboard management controller (BMC), wherein the management BMC comprises a configuration management function;

an input/output (I/O) device; and

a switching device comprising:

Peripheral Component Interconnect Express (PCIe) upstream ports configured to couple to the host;

a PCIe downstream port coupled to the PCIe upstream ports and configured to couple to the I/O device;

an internal connection line; and

an internal processing apparatus coupled to the PCIe downstream port using the internal connection line and configured to:

transmit a configuration read/write packet to the PCIe downstream port using the internal connection line,

receive, from the PCIe downstream port, in response to the configuration read/write packet, and using the internal connection line, a configuration read/write response packet comprising a completer identification, ~~and~~

determine, according to the completer identification, that the switching device is coupled to the I/O device whose identification is the completer identification;

whereby when it is determined that the switching device is coupled to the I/O device whose identification is the completer identification, PCIe configuration content of the I/O device is stored, a function of the I/O device is virtualized; and a mapping between a first PCIe domain corresponding to the host and a second PCIe domain corresponding to the I/O device is implemented.

112. The PCIe system of claim 10~~1~~, further comprising a PCIe switch, wherein the PCIe downstream port is further configured to further couple to the I/O device using the PCIe switch.

123. The PCIe system of claim 10~~1~~, further comprising a shelf management module (SMM), wherein the management BMC is configured to send, to the SMM, networking configuration information of the host, the switching device, and the I/O device.

~~14. A method for initializing a Peripheral Component Interconnect Express (PCIe) system, implemented by the PCIe system, and comprising:~~

~~sending, by a management baseboard management controller (BMC) in a host to an internal processing apparatus in a switching device, an initialization instruction;~~

~~determining, by the internal processing apparatus according to the initialization instruction, a first input/output (I/O) device connected to the switching device;~~

~~reporting, to the management BMC, first information about the first I/O device;~~

~~obtaining, by the host, second information about a second I/O device connected to the host; and~~

loading, by the host according to the second information, a virtual function drive and a physical function drive of the second I/O device.

15. The method of claim 14, further comprising:

sending, by the host, a configuration read packet;

receiving, by a target virtual endpoint device module of the switching device and using a PCIe upstream port of the switching device, the configuration read packet;

sending, by the target virtual endpoint device module, to the host, and according to the configuration read packet, a configuration read response packet; and

sending, by the host according to the configuration read response packet, a configuration write packet.

16. The method of claim 15, further comprising:

receiving, by the target virtual endpoint device module, from the host, and using the PCIe upstream port, the configuration write packet;

forwarding, by the target virtual endpoint device module, to a target I/O device, and using a PCIe downstream port of the switching device, the configuration write packet; and

receiving, by the target I/O device, from the target virtual endpoint device module, and using the PCIe downstream port, the configuration write packet.

17. The method of claim 16, further comprising:

sending, by the target I/O device, to the switching device, and according to the configuration write packet, a configuration write response packet;

receiving, by the switching device and from the target I/O device, the configuration write response packet;

forwarding, by the switching device, to the host, and using the PCIe upstream port, the configuration write response packet; and

~~obtaining, by the host from the configuration write response packet, information about the target virtual endpoint device module.~~

~~18. The method according to claim 17, further comprising:~~

~~obtaining, by the internal processing apparatus and from the target virtual endpoint device module, and the information; and~~

~~configuring, by the internal processing apparatus and according to the information, a mapping module of the switching device.~~

~~19. The method of claim 14, further comprising further loading, by the management BMC, a second physical function drive of a third I/O device when a virtual endpoint device module is configured to virtualize a virtual function of the third I/O device.~~

~~20. The method of claim 14, further comprising further loading, by a processor of a second host, a physical function drive of a third I/O device when a virtual endpoint device module is configured to virtualize a physical function of the third I/O device.~~