throughout this disclosure may be provided on computer-readable media or memories or other tangible media, such as a cache, buffer, RAM, removable media, hard drive, other computer readable storage media, or any other tangible media or any combination thereof. The tangible media include various types of volatile and nonvolatile storage media. The functions, acts or tasks illustrated in the figures or described herein may be executed in response to one or more sets of logic or instructions stored in or on computer readable media. The functions, acts or tasks are independent of the particular type of instructions set, storage media, processor or processing strategy and may be performed by software, hardware, integrated circuits, firmware, micro code, or any type of other processor, operating alone or in combination. Likewise, processing strategies may include multiprocessing, multitasking, parallel processing and/or any other processing strategy known now or later discovered. In one embodiment, the instructions are stored on a removable media device for reading by local or remote systems. In other embodiments, the logic or instructions are stored in a remote location for transfer through a computer network or over telephone lines. In yet other embodiments, the logic or instructions are stored within a given computer, CPU, GPU, or system.

A second action may be said to be "in response to" a first action independent of whether the second action results directly or indirectly from the first action. The second action may occur at a substantially later time than the first action and still be in response to the first action. Similarly, the second action may be said to be in response to the first action even if intervening actions take place between the first action and the second action, and even if one or more of the intervening actions directly cause the second action to be performed. For example, a second action may be in response to a first action if the first action sets a flag and a third action later initiates the second action whenever the flag is set.

To clarify the use of and to hereby provide notice to the public, the phrases "at least one of <A>, <B>, . . . and <N>" or "at least one of <A>, <B>, . . . <N>, or combinations thereof" or "<A>, <B>, . . . and/or <N>" are defined by the Applicant in the broadest sense, superseding any other implied definitions hereinbefore or hereinafter unless expressly asserted by the Applicant to the contrary, to mean one or more elements selected from the group comprising A, B, . . . and N. In other words, the phrases mean any combination of one or more of the elements A, B, . . . or N including any one element alone or the one element in combination with one or more of the other elements which may also include, in combination, additional elements not listed.

While various embodiments of the innovation have been described, it will be apparent to those of ordinary skill in the art that many more embodiments and implementations are possible within the scope of the innovation. Accordingly, the innovation is not to be restricted except in light of the attached claims and their equivalents.

What is claimed is:

1. A method performed by a client device, the method comprising:

receiving a memory allocation request for allocating primary memory from a component of the client device;

in response to the memory allocation request, selecting a subset of a region of memory in a memory device to be a portion of primary memory allocated for the client device, wherein the region of memory in the memory device is allocated for the client device before the memory allocation request is received;

mapping at least the portion of primary memory to an address space; and

accessing, by a hardware-accessible interface of the client device, data in the portion of primary memory via a client-side memory access, wherein a communication interface of the memory device is configured to access the subset of the region of memory in the memory device as part of the client-side memory access.

2. The method of claim **1**, wherein the client device communicates with the memory device based on a Peripheral Component Interconnect Express (PCIe) protocol.

3. The method of claim **1**, wherein the client-side memory access is performed by using a protocol for accessing memory.

4. The method of claim **3**, wherein the protocol comprises a PCIe protocol.

5. The method of claim **1**, wherein the client device and the memory device are in communication over at least one of: a network; or a switched fabric.

6. The method of claim **1**, wherein another client device accesses the data in the portion of primary memory as shared memory with the client device.

7. The method of claim **1**, wherein the client-side memory access comprises one or more atomic operations.

8. The method of claim **7**, wherein the one or more atomic operations comprise at least one of: a fetch-and-add operation or a compare-and-swap operation.

9. The method of claim **1**, wherein the client device comprises a chipset or a processor, and wherein the chipset or the processor comprises a component of the hardware-accessible interface.

10. The method of claim **9**, wherein, in response to a cache-invalidate indication of a memory access protocol, the component of the hardware-accessible interface causes one or more cache lines of the client device to be invalidated.

11. The method of claim **1**, wherein at least a portion of the region of memory in the memory device is accessed by an application component via a second client-side memory access.

12. The method of claim **1**, wherein at least a portion of the region of memory is registered with the communication interface of the memory device.

13. The method of claim **1**, wherein the client-side memory access indicates a starting memory location corresponding to the portion of primary memory.

14. The method of claim **1**, wherein the portion of primary memory is accessed in response to the client-side memory access, and wherein the client-side memory access comprises a corresponding address indicative of the portion of primary memory.

15. The method of claim **1**, wherein another device is prevented from accessing the data in the portion of primary memory based on one or more access controls.

16. The method of claim **1**, wherein the region of memory in the memory device is allocated by an allocation logic.

17. The method of claim **1**, wherein a region access logic enforces one or more access controls for the region of memory in the memory device.

18. A client device comprising a memory for storing computer instructions and a processor in communication with the memory, wherein, when the processor executes the computer instructions, the processor is configured to cause the client device to:

receive a memory allocation request for allocating primary memory from a component of the client device;

in response to the memory allocation request, select a subset of a region of memory in a memory device to be a portion of primary memory allocated for the client device, wherein the region of memory in the memory device is allocated for the client device before the memory allocation request is received;

map at least the portion of primary memory to an address space; and

access, by a hardware-accessible interface of the client device, data in the portion of primary memory via a client-side memory access, wherein a communication interface of the memory device is configured to access the subset of the region of memory in the memory device as part of the client-side memory access.

19. The client device of claim 18, wherein the client device communicates with the memory device based on a Peripheral Component Interconnect Express (PCIe) protocol.

20. A non-transitory storage medium for storing computer readable instructions, the computer readable instructions, when executed by a processor in a client device, causing the processor to:

receive a memory allocation request for allocating primary memory from a component of the client device;

in response to the memory allocation request, select a subset of a region of memory in a memory device to be a portion of primary memory allocated for the client device, wherein the region of memory in the memory device is allocated for the client device before the memory allocation request is received;

map at least the portion of primary memory to an address space; and

access, by a hardware-accessible interface of the client device, data in the portion of primary memory via a client-side memory access, wherein a communication interface of the memory device is configured to access the subset of the region of memory in the memory device as part of the client-side memory access.

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