ered. 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 non-transitory computer-readable storage medium comprising a plurality of instructions executable with a processor, the instructions including:

instructions executable to receive, at a client device from a component in the client device, a request to allocate a portion of external memory, wherein external memory is memory that is external to the client device but is primary memory to the client device, wherein a memory appliance and the client device are connected by a network, and a region of memory on the memory appliance is allocated as external memory prior to receipt of the request to allocate the portion of external memory at the client device;

instructions executable to select, at the client device and in response to the request to allocate the portion of external memory, a subset of the region of memory; and

instructions executable to map, at the client device, the portion of the external memory to a virtual address space, wherein data in the portion of the external memory is accessible via client-side memory access in which a communication interface of the memory appliance is configured to access the region of memory on the memory appliance.

2. The computer-readable storage medium of claim **1** comprising instructions executable to cause a request for allocation of the region of memory to be transmitted from the client device over the network to the memory appliance, and wherein the region of memory on the memory appliance is allocated in response to the request for allocation of the region of memory.

3. The computer-readable storage medium of claim **2**, wherein a portion of the region of memory is allocated and/or initialized on the memory appliance prior to the request for allocation of the region of memory being received at the memory appliance.

4. The computer-readable storage medium of claim **2**, wherein the request for allocation of the region of memory is a request to add memory to a previously allocated region of memory.

5. The computer-readable storage medium of claim **1** comprising instructions executable to cause the data received from the memory appliance to be decrypted and/or to cause the data to be encrypted prior to transmission to the memory appliance.

6. The computer-readable storage medium of claim **1**, further comprising instructions executable to free a portion of the region of memory by causing a request for resizing the region of memory on the memory appliance to be transmitted from the client device over the network to the memory appliance.

7. The computer-readable storage medium of claim **1** further comprising instructions executable to allocate additional external memory for use by the component in the client device through a resize of the region of memory on the memory appliance and/or through an allocation of a second region of memory on the memory appliance or on a second memory appliance.

8. A method comprising:

receiving a memory allocation request at a client device from a component of the client device;

selecting, at the client device and in response to the memory allocation request, a subset of a region of memory on the memory appliance to be a portion of memory allocated at the client device, wherein the client device and the memory appliance are interconnected by a network, and wherein the region of memory on the memory appliance is memory allocated to the client device before receipt of the memory allocation request at the client device; and

mapping, at the client device, the portion of memory to a virtual address space, wherein data in the portion of memory is accessible via a client-side memory access, wherein a communication interface of the memory appliance is configured to access the subset of the region of memory on the memory appliance, as part of the client-side memory access, over an interconnect logically between the communication interface and a memory controller of the memory appliance.

9. The method of claim **8**, wherein the selecting is performed by logic operating within a virtualization instance.

10. A system comprising:

a communication interface configured to communicate over a network;

a memory comprising a region of memory;

a memory controller configured to access the memory; and

a processor configured to:

allocate the region of memory as external memory for a client device in response to a first memory allocation request received from the client device over the network, wherein the external memory is memory that is external to the client device but primary memory to the client device, wherein the client device is configured to allocate a subset of the region of memory as a portion

of external memory in response to a second memory allocation request, and wherein data in the portion of external memory is accessible by the client device via client-side memory access through the communication interface, the communication interface configured to access the subset of the region of memory through the memory controller in response to the client-side memory access of the data in the portion of external memory.

11. The system of claim **10**, wherein the processor is configured to encrypt the data before the data is written to a backing store, and/or the processor is configured to decrypt the data read from the backing store.

12. The system of claim **10**, wherein an access parameter and/or an access permission associated with the region of memory specifies a manner in which the region of memory is accessible.

13. The system of claim **12**, wherein the access parameter includes an identifier of at least one device allowed to access the region of memory, and the at least one device includes: at least one client device, at least one memory appliance, at least one management server, a communication interface of a client device, a communication interface of a memory appliance, and/or a communication interface of a management server.

14. The system of claim **12**, wherein the access parameter identifies a password and/or an encryption key with which access to the region of memory is authenticated.

15. The system of claim **12**, wherein the access permission indicates that data read and/or write access is to be allowed and/or denied for a corresponding at least one device, wherein the at least one device includes: at least one client device, at least one memory appliance, at least one management server, a communication interface of a client device, a communication interface of a memory appliance, and/or a communication interface of a management server.

16. The system of claim **12**, wherein the access permission indicates that metadata read and/or write access is to be allowed and/or denied for a corresponding at least one device, wherein the at least one device includes at least one client device, at least one memory appliance, at least one management server, a communication interface of a client device, a communication interface of a memory appliance, and/or a communication interface of a management server.

17. The system of claim **10**, wherein the communication interface is configured to treat a portion of the region of memory as not-present.

18. The system of claim **17**, wherein the non-present treatment prevents access to a freed portion of the region of memory.

19. The system of claim **10**, wherein the region of memory is a first region included in a first memory appliance, wherein the processor is configured to cause data in the first region to be copied to a second region of memory on a second memory appliance and the client device uses the second region instead of the first region as the external memory.

20. The system of claim **19**, wherein the data is copied by the first memory appliance writing to the second region of the second memory appliance and/or by the second memory appliance reading the data from the first region of the first memory appliance.

21. The system of claim **19**, wherein the copying of data from the first region to the second region is a first copy operation and the processor is configured to cause data that was modified since starting the first copy operation to be copied from the first region to the second region.

22. The system of claim **19**, wherein the processor is configured to cause the second region to be created and/or reconfigured.

23. The system of claim **10**, wherein the communication interface, the memory controller, and/or the processor is included in a FPGA (Field-Programmable Gate Array) and/or an ASIC (Application-specific Integrated Circuit).

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