

CLAIMS

What is claimed:

1. A method, implemented at a computer system (100) that includes at least one processor (102), for using metadata for a contentless file to provide a guest context access to file content, the method comprising:

within a guest context (108a) at the computer system:

mounting (116a) a first filesystem namespace (207) from a container image (201) that includes (i) metadata (203) defining one or more filesystem properties of a first file (209c) contained within the first filesystem namespace, the container image lacking content of the first file; and (ii) mapping data (204) that includes information usable to identify a second file (212) within a second filesystem namespace (210) that is external to the guest context, and from which the content of the first file is obtainable;

based on the one or more filesystem properties of the first file, performing (118a) a filesystem operation involving the first file without switching to a host context (107) at the computer system; and

based on the one or more filesystem properties of the first file, responding (118a) to a requested access to the content of the first file, including:

based on the mapping data, communicating (117a), to the host context, a request for the host context to supply the content of the first file to the guest context; and

after returning from a context switch to the host context, responding (118a) to the requested access based at least on supplying content (214) of the second file from one or more guest context memory pages, the one or more guest context memory pages mapped to one or more host context memory pages containing the content of the second file.

2. The method of claim 1 comprising, within the host context: based on receiving the request from the guest context, identifying the second file within the second filesystem namespace; and based on identifying the second file within the second filesystem namespace, performing at least one of: identifying a mapping between the one or more host context memory pages and the one or more guest context memory pages, and configuring the one or more host context memory pages to contain the content of the second file; or mapping the one or more host context memory pages to the one or more guest context memory pages, and

configuring the one or more host context memory pages to contain the content of the second file.

3. The method of claim 1 or claim 2, wherein the guest context mounting the first filesystem namespace from the container image comprises the guest context reserving the one or more guest context memory pages for accessing the first file, wherein the guest context communicating the request for access to file content of the second file to the host context comprises the guest context initiating a page fault on the one or more guest context memory pages upon an attempted access to the first file, and wherein the host context identifying the second file within the second filesystem namespace is based on the mapping data.

4. The method of claim 1 or claim 2, wherein the guest context communicating the request for access to the file content of the second file to the host context comprises the guest context sending a message to the host context, the message including the information usable to identify the second file within the second filesystem namespace.

5. The method of claim 4, wherein the guest context sending the message to the host context comprises the guest context performing at least one of:

- calling an application programming interface (API) of a network filesystem; or
- calling an API of a container management system.

6. The method of any preceding claim, wherein the information usable to identify the second file within the second filesystem namespace comprises at least one of a path within the second filesystem namespace, a file name identifier within the second filesystem namespace, a hash based on the second file, or a file record within the second filesystem namespace.

7. The method of any preceding claim, wherein the second filesystem namespace is accessed by the host context from a source external to the computer system.

8. The method of claim 7, wherein the one or more host context memory pages are filled with the file content of the second file by remote direct memory access.

9. The method of any preceding claim, wherein the guest context is a virtual address backed virtual machine, wherein the one or more guest context memory pages are guest physical memory pages, and wherein the one or more host context memory pages are at least one of host physical memory pages or host virtual memory pages.

10. A computer system that includes at least one processor and a computer readable media having stored thereon computer-executable instructions that are executable by the at least one processor to cause the computer system to perform a method for using

metadata for a contentless file to provide a guest context access to file content, the method comprising, within a guest context at the computer system:

mounting (116a) a first filesystem namespace (207) from a container image (201) that includes (i) metadata (203) defining one or more filesystem properties of a first file (209c) contained within the first filesystem namespace, the container image lacking content of the first file; and (ii) mapping data (204) that includes information usable to identify a second file (212) within a second filesystem namespace (210) that is external to the guest context, and from which the content of the first file is obtainable;

based on the one or more filesystem properties of the first file, performing (118a) a filesystem operation involving the first file without switching to a host context (107) at the computer system; and

based on the one or more filesystem properties of the first file, responding (118a) to a requested access to the content of the first file, including:

based on the mapping data, communicating (117a), to the host context, a request for the host context to supply the content of the first file to the guest context; and

after returning from a context switch to the host context, responding (118a) to the requested access based at least on supplying content (214) of the second file from one or more guest context memory pages, the one or more guest context memory pages mapped to one or more host context memory pages containing the content of the second file.

11. The computer system of claim 10, further comprising, within the host context: based on receiving the request from the guest context, identifying the second file within the second filesystem namespace; and

based on identifying the second file within the second filesystem namespace, performing at least one of:

identifying a mapping between the one or more host context memory pages and the one or more guest context memory pages, and configuring the one or more host context memory pages to contain the content of the second file; or

mapping the one or more host context memory pages to the one or more guest context memory pages, and configuring the one or more host context memory pages to contain the content of the second file.

12. The computer system of any of claims 10 to 11, further comprising reserving the one or more guest context memory pages for accessing the content of the first file, and

wherein communicating the request for the host context to supply the content of the first file to the guest context comprises initiating a page fault on the one or more guest context memory pages upon an attempted access to the content of the first file.

13. The computer system of any of claims 10 to 11, wherein communicating the request for the host context to supply the content of the first file to the guest context comprises the guest context sending a message to the host context, the message including the information usable to identify the second file within the second filesystem namespace, the information usable to identify the second file within the second filesystem namespace comprising at least one of a path within the second filesystem namespace, a file name identifier within the second filesystem namespace, a hash based on the second file, or a file record within the second filesystem namespace.

14. The computer system of any of claims 10 to 13, wherein the guest context is a virtual address backed virtual machine, wherein the one or more guest context memory pages are guest physical memory pages, and wherein the one or more host context memory pages are at least one of host physical memory pages or host virtual memory pages.

15. The computer system of any of claims 10 to 14, wherein communicating the request for the host context to supply the content of the first file to the guest context triggers the context switch to the host context.