
Efficient Synchronization of Linux Memory Regions over a Network: A Comparative Study and Implementation (Notes)

A user-friendly approach to application-agnostic state synchronization

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- Abstract: A comparative analysis and implementation of various methods for synchronizing Linux memory options over a network
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 - Use cases for memory region synchronization
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 - Introduction to `userfaultfd`
 - Implementing `userfaultfd` handlers and registration in Go
 - Transferring sockets between processes
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 - Performance assessment of this approach
- Option 2: Utilizing `mmap` for change notifications
 - Concept: `mmap` a memory region with `MMAP_SHARED` to track changes in a file
 - Method 1 for detecting file changes: `inotify`
 - Limitations: `mmap` does not generate `WRITE` events
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 - Comparing hashes of local and remote `mmaped` regions
 - Evaluation of hashing algorithms
 - Introduction to delta synchronization (e.g., `rsync`)
 - Custom protocol for delta synchronization
 - Multiplexing synchronization streams
 - The function of `msync`
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- Option 4: Detecting changes with a custom filesystem implementation
 - Intercepting writes to the `mmaped` region using a custom filesystem
 - Exploring methods for creating a new, custom Linux filesystem
 - ★ In the kernel
 - ★ NBD
 - ★ CUSE
 - ★ BUSE
 - ★ FUSE
 - ★ Upcoming options (`ublk`, etc.)
 - Detailed analysis of the NBD protocol (client & server)
 - Implementing the client and server in Go based on the protocol

- Server backend interface and example implementations
 - Asynchronous writeback protocol and caching mechanism
 - Performance assessment of this approach
- Summary:
 - Comparing options in terms of ease of implementation, CPU load, and network traffic
 - Identifying the optimal solution for specific use cases: data change frequency, kernel/OS compatibility, etc.