

CSc 360

Operating Systems

More on FS Implementation

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Review

- File system implementation
 - e.g., FDT
 - e.g., FAT

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Free space management

- Keep track of free blocks
- Bitmap
 - 1 bit indicates whether a block is free or not
- Linked-list
 - “a big free file”
- Grouping: list of free blocks
- Counting: contiguous blocks



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Efficiency and performance

- Efficiency: tradeoff
 - e.g., FDT/FAT/block size, # of blocks/entries
 - static vs dynamic data structure
- Performance: further tradeoff
 - buffer vs page cache
 - unified buffer cache
 - free-behind, read-ahead: sequential access
 - RAM disk

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Consistency check

- Inconsistency
 - between files and their meta-information
 - due to hardware/software failure
- Consistency check
 - e.g., fsck: file systems consistency check
 - superblock consistency
 - wrong counters
 - inode consistency
 - unreferenced inodes, missing free blocks, bad *free* blocks

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Backup and restore

- Backup to another medium
 - magnetic, optical, etc
- Full backup
- Incremental backup
 - last backup time
 - last modify time
- Backup cycle
 - full backup, {incremental backup}*

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Log-structured file system

- Transactions: updates to file system
 - considered committed when written to a log
 - file system may not be updated yet
 - asynchronously update file system
 - performance improvement as well
- After system crashes
 - transactions still to be completed
 - file system remains consistency

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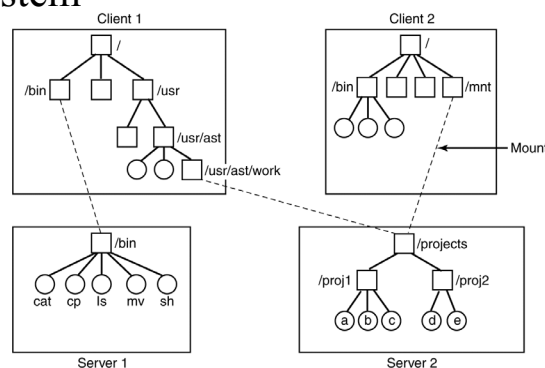
SunOS NFS

- Access remote file system
- Initially on UDP
- With RPC/XDR
- Transparency
- Mount protocol
 - server: exportfs
 - access control
 - client: mount server:dir dir

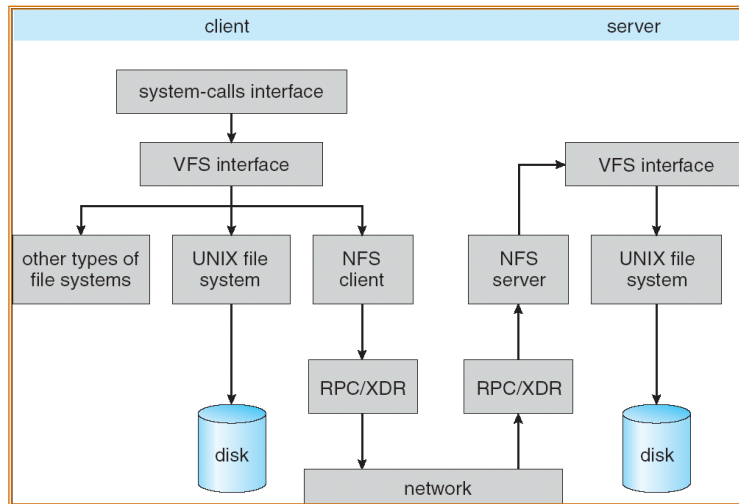
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NFS architecture



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This lecture

- File system implementation
 - free-space management
 - efficiency and performance
 - consistency and recovery
 - log-structured file system
 - NFS
- Explore further
 - /sbin/fsck
 - /etc/exports

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Next lecture

- Mass storage
 - read OSC7Ch12