File System Usability

CS439: Principles of Computer Systems

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Bringing It Together

- Virtual address spaces are mapped onto physical address spaces in physical memory
  - Pages are mapped to frames!
  - Lots of policies to consider: demand paging, page replacement, working set, …
- The heap is part of a process's virtual address space (and is thus paged!)
  - Can be explicitly or automatically managed
- I/O devices are important for system usability.
  - Each one consists of the device, the controller, a bus, and a port
  - One of the most important I/O devices is the disk, which provides stable storage.
- File systems make the disk usable
  - Goals include: efficiency, usability, reliability
  - File system metadata is in a superblock
  - File metadata is in a file header (inode in Linux/Unix)
  - File data is on disk in some format (contiguous, …)
  - File systems demonstrate mechanical sympathy, including through reserved space, block groups, first-free allocation…)
  - Users organize files using directories
    - Directories are just special files that contain name/file number mappings
  - Programmers access the file system using the API

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Vocabulary

usability
relative path
link
absolute path
directory
folder
unlink
path
..
multi-level hierarchical
.
home directories
fsync
current working directory
user-based directories
FS API
parent directory
resource ordering
currently allocated
banker's algorithm
circular wait
ostrich algorithm
unsafe state
allocated to
maximum needed
mutual exclusion
bounded resources
hold and wait
no pre-emption
detection
maximum possible request
resource allocation graph
waiting for
safe state
necessary resources
deadlock prevention
recovery
processes
sufficient available
avoidance
cycle

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