Persistence / durability
Share files between users/processes
User-friendly names/pathnames
Why interesting?

Abstraction is useful

Crash safety ← Wecl.

Disk layout

Performance

Storage devices are slow

buffer cache concurrency
write(Fd, "deq", 3)
unlink("x/y", "y/x"),
link("x/y", "X/2")
write("fd", "abc", 3)
Fd = open("x/y", "r")
Each node contains an object
open file count \text{ } \Rightarrow \text{ both are 0}
link count

inode #

node #

node \Rightarrow \text{ info, independent of name}

The system structures
\[
\frac{10ahr}{\text{Node 10 Depth} \times 64} + 32 
\]
<table>
<thead>
<tr>
<th>Path Name</th>
<th>Linum</th>
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</thead>
<tbody>
<tr>
<td>Path Name</td>
<td></td>
</tr>
<tr>
<td>Dir = File or Some Structure</td>
<td></td>
</tr>
<tr>
<td>(X:Y)</td>
<td></td>
</tr>
<tr>
<td>Directories</td>
<td></td>
</tr>
<tr>
<td>kernel</td>
<td></td>
</tr>
<tr>
<td>Scan file back for root (t)</td>
<td></td>
</tr>
<tr>
<td>Scan back for one (t)</td>
<td></td>
</tr>
<tr>
<td>Scan back for one</td>
<td></td>
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<tr>
<td>Real inode (x)</td>
<td></td>
</tr>
<tr>
<td>Scan it back for x</td>
<td></td>
</tr>
<tr>
<td>Envy</td>
<td></td>
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</tbody>
</table>
two keys & binding

LRU
Sleep locks

On copy of block in mem

Block block twice
Med: Crash Safety
Block cards

Very simple

\( f_S = \text{on} - \text{disk data structure} \)