

## Solution 3 - Journaling (or Write-Ahead Logging)

Write "intent" down to disk before updating file system

➡ Called the "Write Ahead Logging" or "journal"  
originated from database community

When crash occurs, look through log to see what was going on

- Use contents of log to fix file system structures
- The process is called "recovery"

# Case Study - Linux Ext3

**Physical journaling** - write real block contents of the update to log

1. Commit dirty blocks to journal as one transaction (TxBegin, inodes, bitmaps and data blocks)
2. Write commit record (TxEnd)
3. Copy dirty blocks to real file system (checkpointing)
4. Reclaim the journal space for the transaction

**Logical journaling** - write logical record of the operation to log

- "Add entry F to directory data block D"
- Complex to implement
- May be faster and save disk space