MRAMFS: A file system for non-volatile RAM using inode compression

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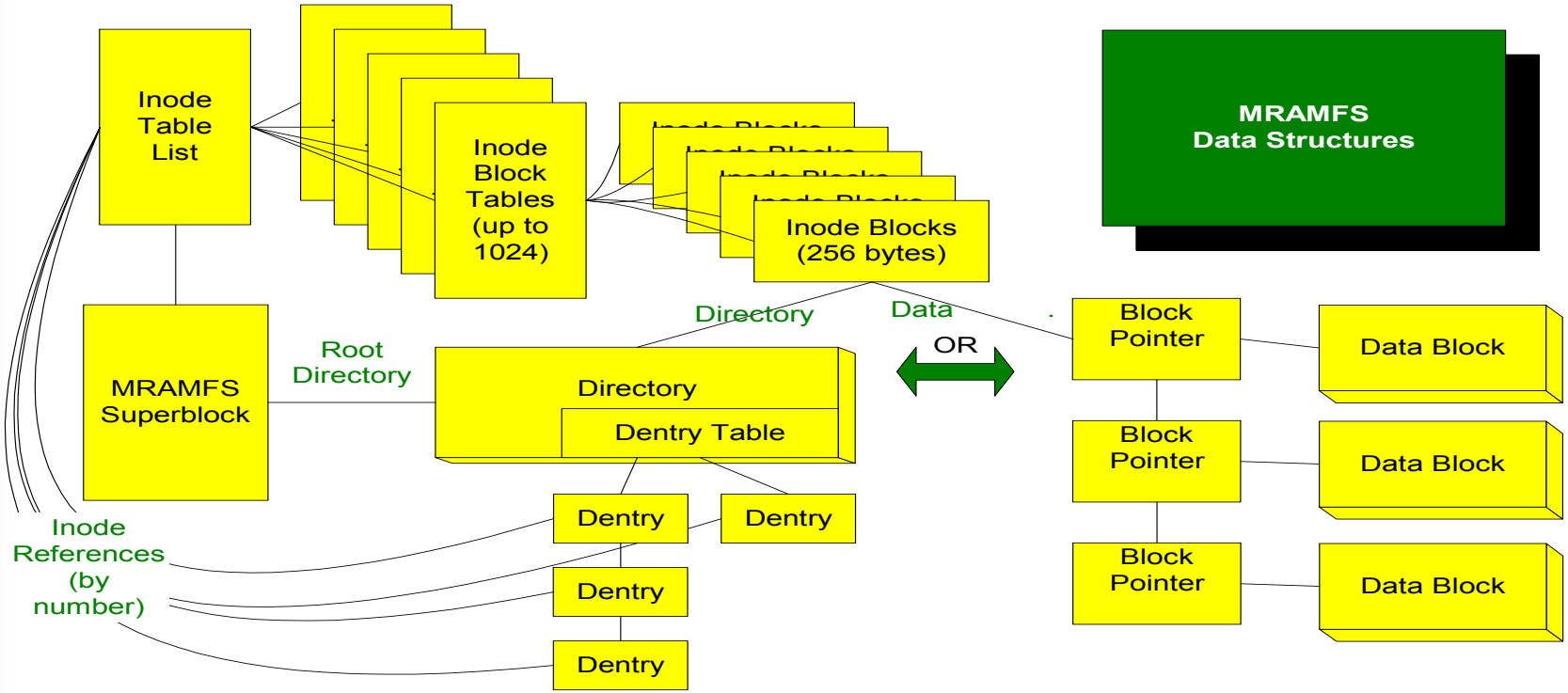
Introduction

- New storage technology: Magnetic RAM (MRAM)
- MRAM in the file system?
- Why use compression for MRAM file systems:
  - Compression for on-disk file systems doesn't make sense
  - Disk is cheap, but memory is relatively expensive
  - Hybrid file systems combining disk and MRAM
- *Compress only small objects*
  - Shifts more data from slow disk to faster memory
  - Memory is still slow, compared to the CPU
  - In-memory data structures are more flexible

Architecture of MRAMFS



- Some classic UNIX elements (Inodes, Superblock)
- Hashed directories
- Direct memory references

Features of MRAMFS

- Segregated, in-memory data storage
  - Not as fast as *ramfs* or *tmpfs* because of copies
  - Can work on NVRAM separate from main memory
- Compression of Inodes
  - Using Gamma compression
  - Using a Permissions Table
  - Compressible from 128 down to 15-20 bytes
- Compression of file data
  - Block-by-block at present
- Simple list implementation for data blocks
- Persist to disk on unmount

Status and Future work

- Reasonably stable module for experimentation
  - Without data compression, but with compressed inodes, Performance seems comparable to ext2 on ram disk
  - Early prototype: will do better with optimization
- Future Work
  - Improved data compression performance
  - Test performance given varying memory characteristics
  - Hybrid disk/ram file system
  - Linking file system