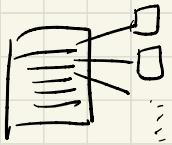
11/18 FS Designs

Data Allocation

→ contiguous, linked, indexed



Direct Pointer tracks 4KB
Indirect Pointer tracks 2MB
Double indirect tracks 1 GB
Triple indirect tracks 512 GB

Fast File System (FFS)

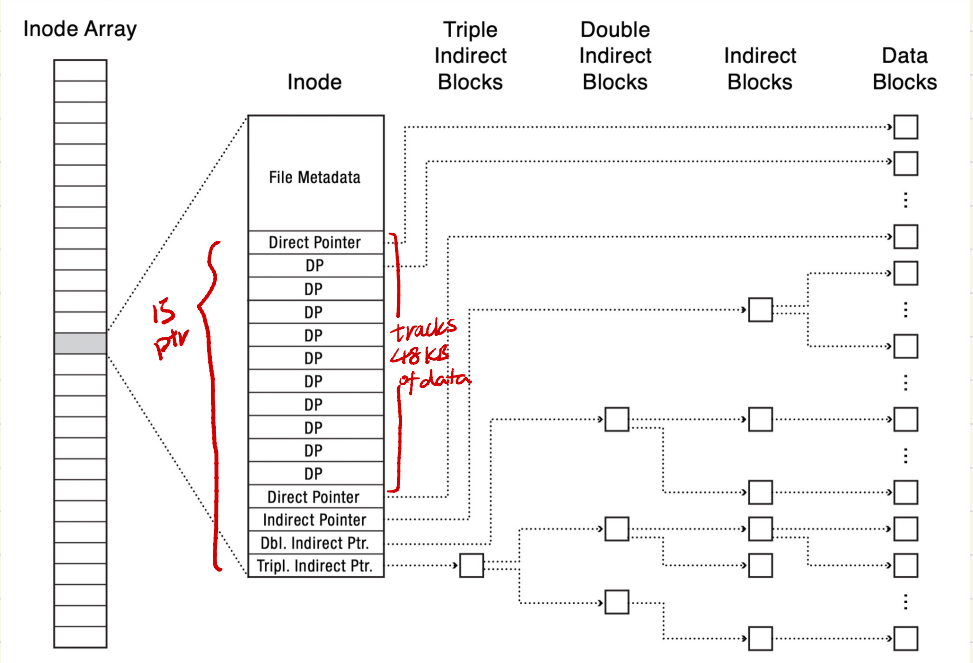
→ designed to work well on disk

→ data layout = multilevel index

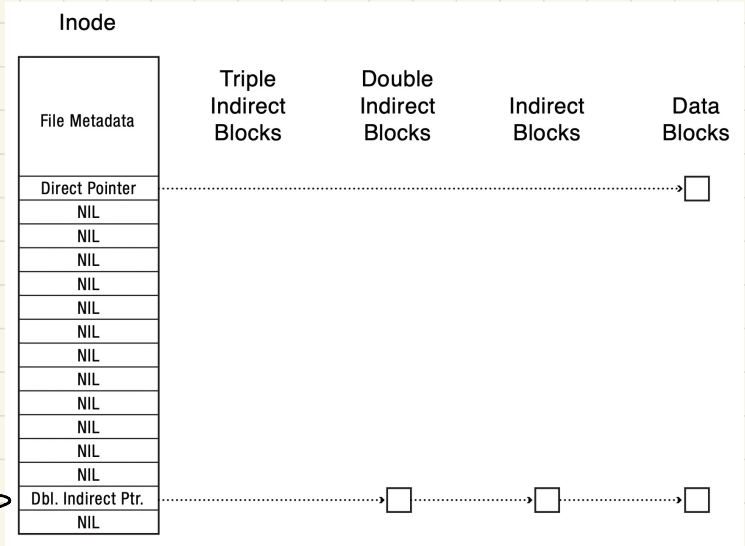
Block size = 4KB (8 sectors)

Block pointer = 8 bytes

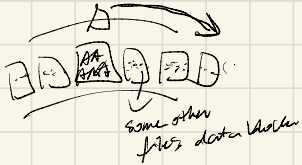
☆ supports both small & large files



Allocate sparse file



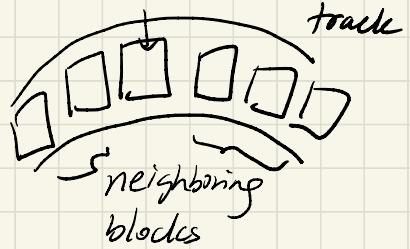
Data Placement
- bitmap
- when we need a block, use the bitmap to find the first available blocks.



Data Placement

→ bitmap

→ when we need a block, use the bitmap to find the first available block



neighboring blocks contain things that were allocated close in time (not necessarily things that are likely accessed around the same time)

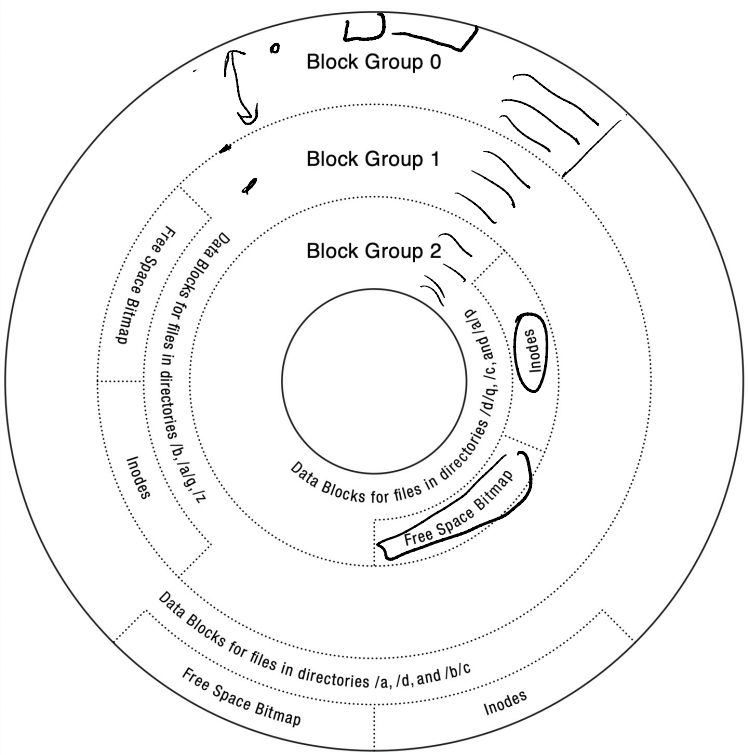
Locality Heuristics

→ FFS places things that are likely accessed together in the same block group

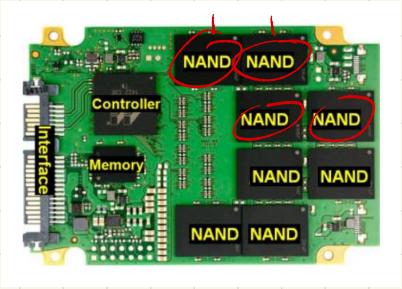
→ data blocks for the same file

→ metadata & data for a file

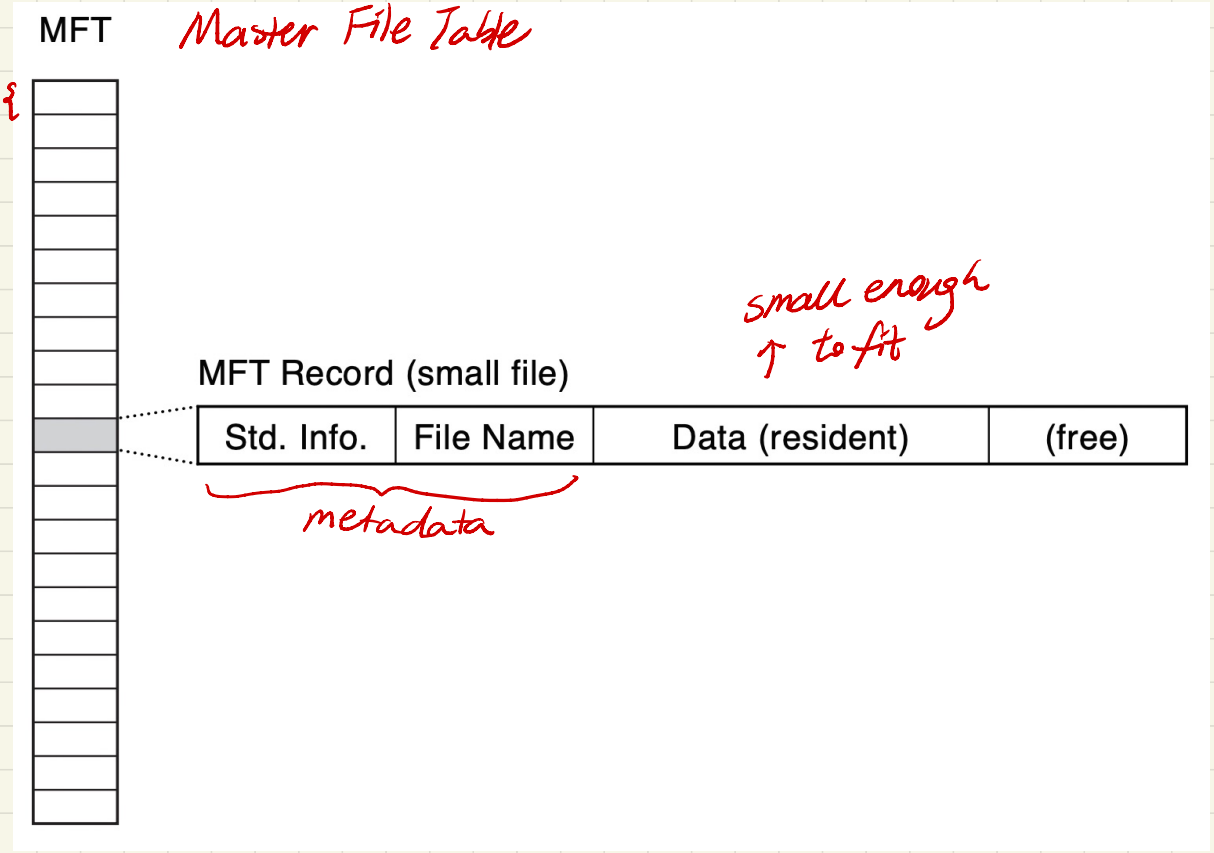
→ files within the same directory

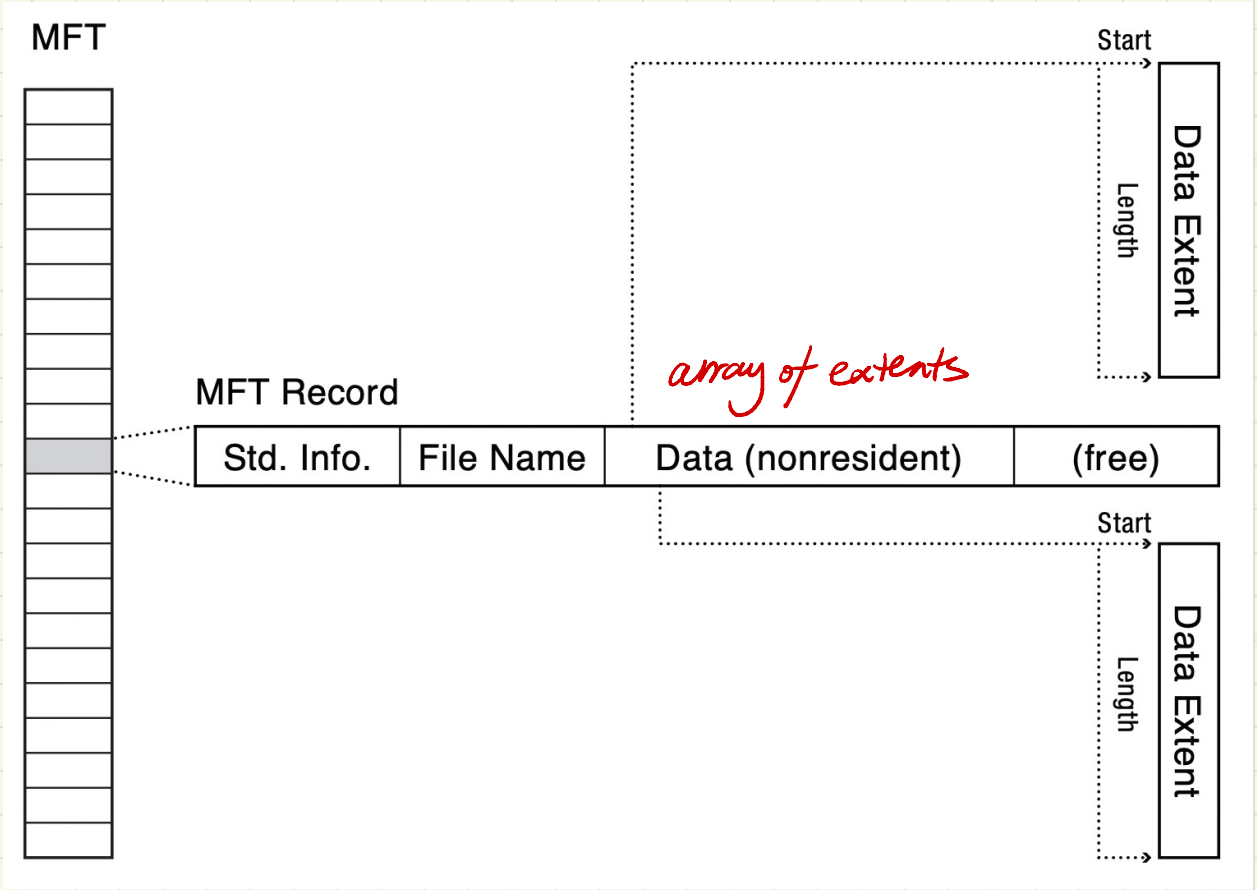


Free Space Reserve (~10%)

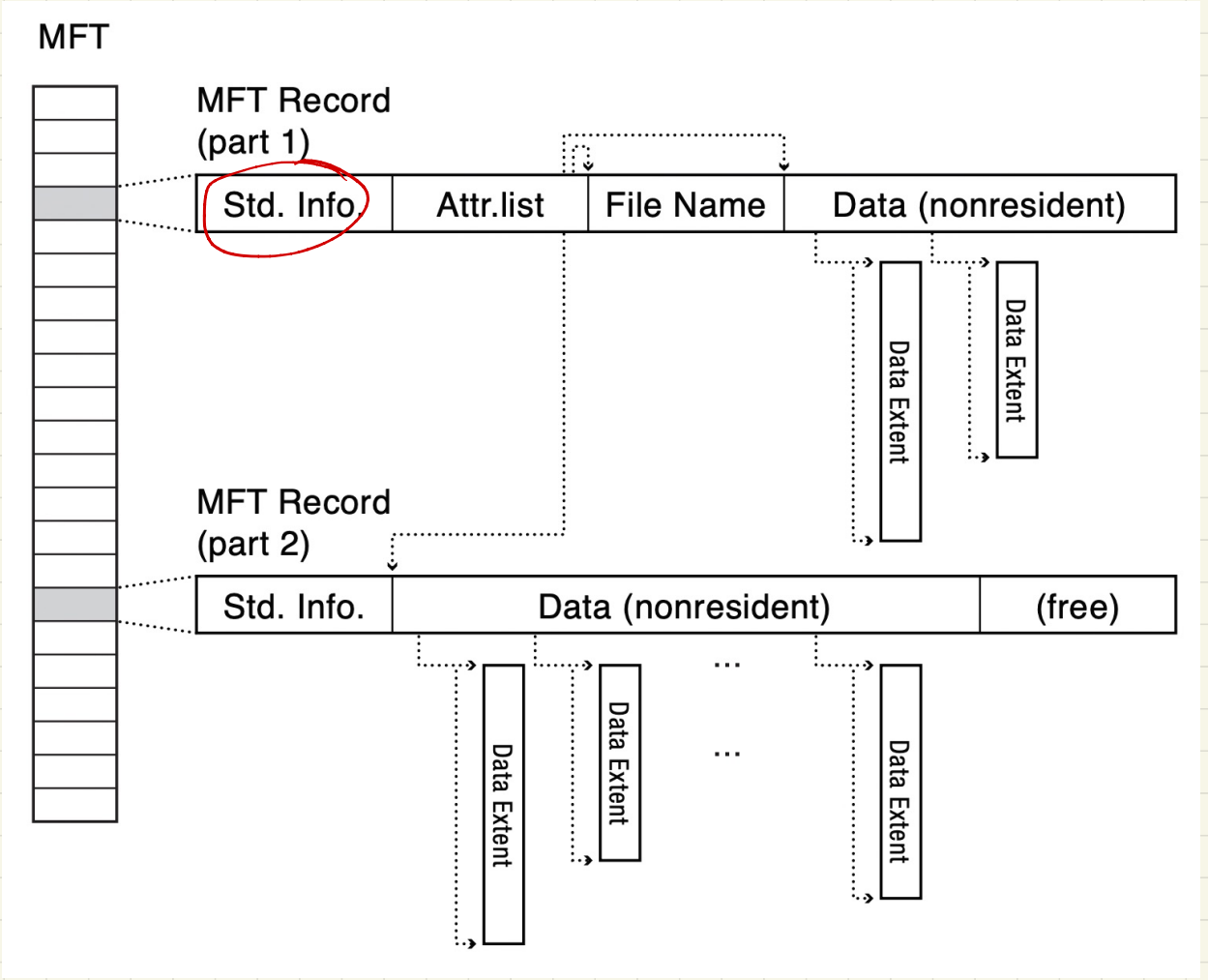


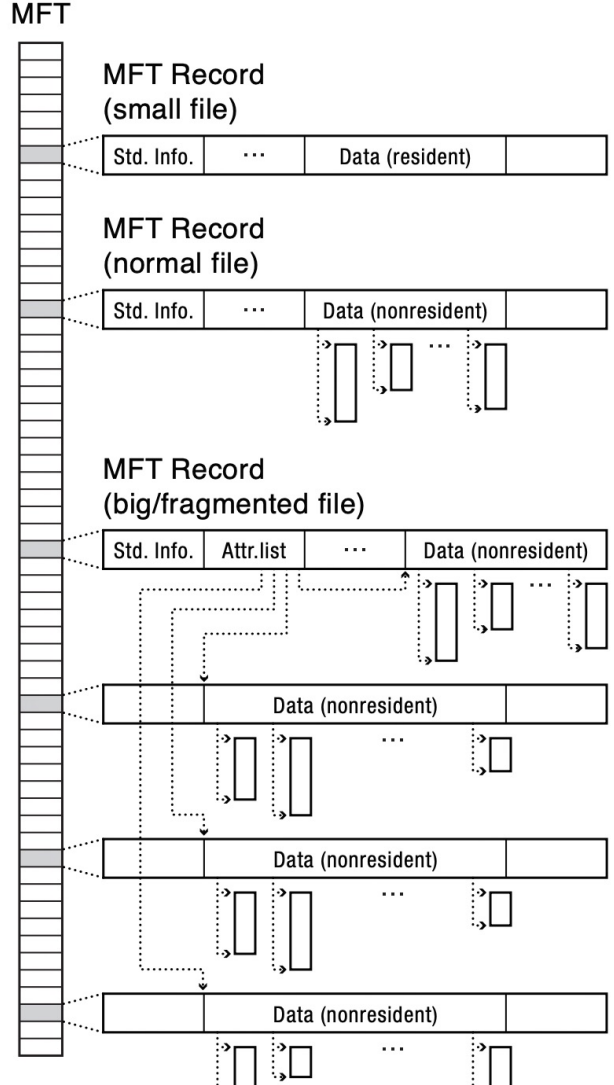
NTFS.

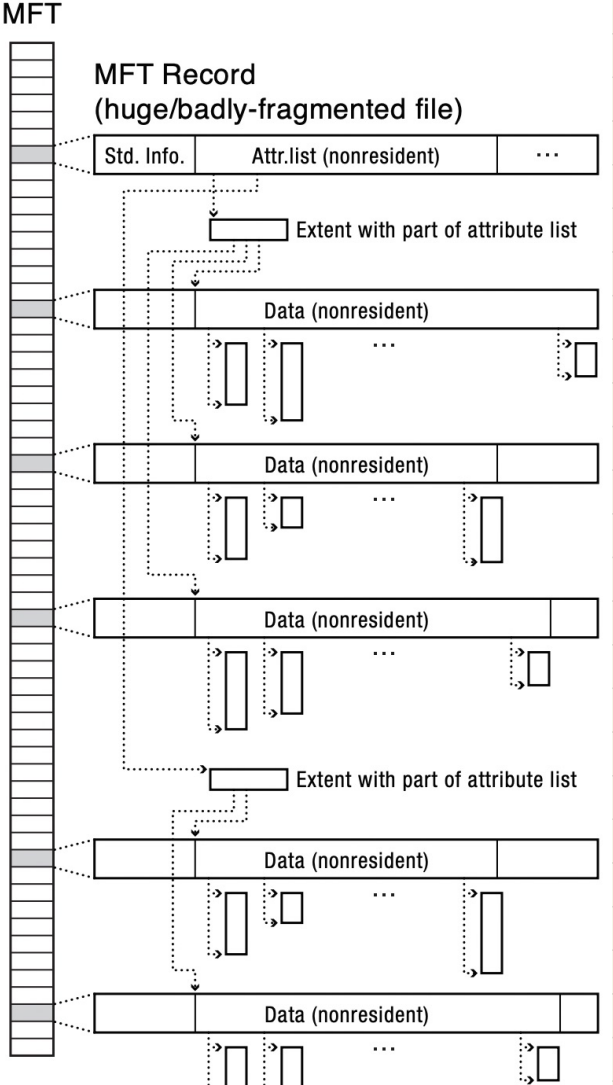

MFT
Master File Table
record
1KB.
MFT Record (small file)
small enough
to fit
Std. Info.
File Name
Data (resident)
(free)
metadata



variable sized extents


MFT
MFT Record
(part 1)
Std. Info.
Attr.list
File Name
Data (nonresident)
Data Extent
Data Extent
MFT Record
(part 2)
Std. Info.
Data (nonresident)
(free)
Data Extent
Data Extent
Data Extent


MFT
MFT Record
(small file)
Std. Info.
Data (resident)
MFT Record
(normal file)
Std. Info.
Data (nonresident)
MFT Record
(big/fragmented file)
Std. Info.
Attr.list
Data (nonresident)
Data (nonresident)
Data (nonresident)
Data (nonresident)


MFT
MFT Record
(huge/badly-fragmented file)
Std. Info.
Attr.list (nonresident)
Extent with part of attribute list
Data (nonresident)
Data (nonresident)
Data (nonresident)
Extent with part of attribute list
Data (nonresident)
Data (nonresident)