Disk Allocation Methods

- Contiguous
  - Simple and efficient, but
  - Not very flexible, but
  - Other formats strive for it

- Linked List
  - Great for sequential access, but
  - Not so good for random access.
  - File Allocation Table (FAT) – links in separate table

- Indexed
  - Good for both random and sequential access, but
  - Large files require lots of indices.
  - Unix uses indirect blocks
Master Boot Record

Block zero on the disk

0. BIOS transfers to location 0000h
1. Locate "active" partition
2. Load 1st sector of partition into memory
3. Transfer execution to that code

Boot Code

0000h

Partition Table

01BEh
Partition 1
01CEh
Partition 2
01DEh
Partition 3
01EEh
Partition 4
01FEh
Signature

AA55h
DOS Partition

Disk Partition

Boot Block
0x00 0x02 <Jump to bootstrap>
0x03 0x0a Computer mfg name
0x0b 0x0c Bytes per block (bpb)
0x0d 0x0e Blocks/cluster (bpc)
0x0f 0x10 Reserved blocks (for boot record) (rb)
0x10 0x11 # of FATs (nFAT)
0x11 0x12 # of root directory entries (nrd)
0x13 0x14 # of logical blocks
0x15 0x15 Medium Descriptor
0x16 0x17 # of blocks/FAT (bpf)
0x18 0x19 Sectors/track
0x1a 0x1b # of heads (surfaces)
0x1c 0x1d # of hidden blocks (hb)
0x1e .... Bootstrap program

Beginning of data area on disk
DOS Directory Entry

8 bytes

<table>
<thead>
<tr>
<th>Name</th>
<th>Ext</th>
<th>Reserved</th>
<th>T</th>
<th>D</th>
<th>CN</th>
<th>Size</th>
</tr>
</thead>
</table>

- **0x00** - Unused
- **0xE5** - Deleted

Attribute
- Read-only (0x01)
- Hidden (0x02)
- System (0x04)
- Volume label (0x08)
- Subdirectory (0x10)
- Archive (0x20)
- Unused
- Unused

7 6 5 4 3 2 1 0

Y-1980

M

D

H

M

S/2

8 entries per block
FAT File Example

Directory

FILE.TXT

02

File Allocation Table (FAT)

03 - 14

Disk Blocks

FF
NTFS "Regular" Files

Small Files

<table>
<thead>
<tr>
<th>Standard Information</th>
<th>Filename</th>
<th>Security Descriptor</th>
<th>Data</th>
</tr>
</thead>
</table>

Large Files

<table>
<thead>
<tr>
<th>Standard Information</th>
<th>Filename</th>
<th>Security Descriptor</th>
<th>Data</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Starting VCN</th>
<th>Starting LCN</th>
<th>No. of Clusters</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1555</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>1872</td>
<td>6</td>
</tr>
</tbody>
</table>

VCN 0 1 2 3

<table>
<thead>
<tr>
<th>LCN</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1355</td>
<td></td>
</tr>
<tr>
<td>1356</td>
<td></td>
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<td>1357</td>
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<td>1358</td>
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<td>1872</td>
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<tr>
<td>1873</td>
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<td>1874</td>
<td></td>
</tr>
<tr>
<td>1875</td>
<td></td>
</tr>
</tbody>
</table>
NTFS Directory Files

Small Files

- Standard Information
- Filename
- Security Descriptor
- Index of files
  - File1
  - File2
  - File3
  ...

Large Files

- Standard Information
- Filename
- Security Descriptor
- Index of files
  - File4
  - File5
- Data
  - File1
  - File2
  - File3
  - File5
  - File6