Operating System Principles CSC 415

Project Name

File System

Team Details / Section 01

Team Name: MJ's
Madina Ahmadzai (ID# : 921835158)
Muhammed Nafees (ID# : 921941329)
Janelle Lara (ID# : 920156598)
John Santiago (ID# : 909606963)
GitHub Name: aktails

"Milestone 1"

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Hex Dumps

Volume Control Block

```
student@student-VirtualBox:~/Documents/csc415-filesystem-aktails$ Hexdump/h
exdump.linux --file TestVolume --count 1 --start 1
Dumping file TestVolume, starting at block 1 for 1 block:

000200: EB 00 90 4D 53 44 4F 53  35 2E 30 00 02 01 02 00 | ◆.◆MSDOS5.0.....
000210: 02 00 00 00 00 F8 00 00  00 00 00 00 00 00 00 00 | .....◆..........
000220: 10 27 00 00 4F 00 00 00  00 00 00 00 02 00 00 00 | .'..O...........
000230: 01 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000240: 80 00 29 39 05 00 00 4D  4A 27 73 46 53 00 00 00 | ◆.)9...MJ'sFS...
000250: 00 00 46 41 54 33 32 00  00 00 00 00 00 00 00 00 | ..FAT32.........
000260: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000270: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000280: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000290: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0002A0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0002B0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0002C0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0002D0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0002E0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0002F0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................

000300: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000310: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000320: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000330: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000340: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000350: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000360: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000370: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000380: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000390: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0003A0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0003B0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0003C0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0003D0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0003E0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0003F0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 55 AA | ..............U◆

student@student-VirtualBox:~/Documents/csc415-filesystem-aktails$
```

FSInfo

```
student@student-VirtualBox:~/Documents/csc415-filesystem-aktails$ Hexdump/h
exdump.linux --file TestVolume --count 1 --start 2
Dumping file TestVolume, starting at block 2 for 1 block:

000400: 52 52 61 41 00 00 00 00  00 00 00 00 00 00 00 00 | RRaA............
000410: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000420: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000430: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000440: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000450: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000460: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000470: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000480: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000490: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0004A0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0004B0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0004C0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0004D0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0004E0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0004F0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................

000500: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000510: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000520: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000530: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000540: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000550: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000560: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000570: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000580: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
000590: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0005A0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0005B0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0005C0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0005D0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0005E0: 00 00 00 00 72 72 41 61  6F 26 00 00 A1 00 00 00 | ....rrAao&..◆...
0005F0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 55 AA | ..............U◆

student@student-VirtualBox:~/Documents/csc415-filesystem-aktails$
```

FAT1

```
student@student-VirtualBox:~/Documents/csc415-filesystem-aktails$ Hexdump/h
exdump.linux --file TestVolume --count 79 --start 3
Dumping file TestVolume, starting at block 3 for 79 blocks:

000600: 01 00 00 00 01 00 00 00  03 00 00 00 04 00 00 00 | ................
000610: 05 00 00 00 06 00 00 00  07 00 00 00 08 00 00 00 | ................
000620: 09 00 00 00 0A 00 00 00  0B 00 00 00 0C 00 00 00 | ................
000630: 0D 00 00 00 0E 00 00 00  0F 00 00 00 10 00 00 00 | ................
000640: 11 00 00 00 12 00 00 00  13 00 00 00 14 00 00 00 | ................
000650: 15 00 00 00 16 00 00 00  17 00 00 00 18 00 00 00 | ................
000660: 19 00 00 00 1A 00 00 00  1B 00 00 00 1C 00 00 00 | ................
000670: 1D 00 00 00 1E 00 00 00  1F 00 00 00 20 00 00 00 | ............ ...
000680: 21 00 00 00 22 00 00 00  23 00 00 00 24 00 00 00 | !..."...#...$...
000690: 25 00 00 00 26 00 00 00  27 00 00 00 28 00 00 00 | %...&...'...(...
0006A0: 29 00 00 00 2A 00 00 00  2B 00 00 00 2C 00 00 00 | )...*...+...,...
0006B0: 2D 00 00 00 2E 00 00 00  2F 00 00 00 30 00 00 00 | -......./...0...
0006C0: 31 00 00 00 32 00 00 00  33 00 00 00 34 00 00 00 | 1...2...3...4...
0006D0: 35 00 00 00 36 00 00 00  37 00 00 00 38 00 00 00 | 5...6...7...8...
0006E0: 39 00 00 00 3A 00 00 00  3B 00 00 00 3C 00 00 00 | 9...:...;...<...
0006F0: 3D 00 00 00 3E 00 00 00  3F 00 00 00 40 00 00 00 | =...>...?...@...

000700: 41 00 00 00 42 00 00 00  43 00 00 00 44 00 00 00 | A...B...C...D...
000710: 45 00 00 00 46 00 00 00  47 00 00 00 48 00 00 00 | E...F...G...H...
000720: 49 00 00 00 4A 00 00 00  4B 00 00 00 4C 00 00 00 | I...J...K...L...
000730: 4D 00 00 00 4E 00 00 00  4F 00 00 00 50 00 00 00 | M...N...O...P...
000740: FF FF FF 0F 52 00 00 00  53 00 00 00 54 00 00 00 | ◆◆◆.R...S...T...
000750: 55 00 00 00 56 00 00 00  57 00 00 00 58 00 00 00 | U...V...W...X...
000760: 59 00 00 00 5A 00 00 00  5B 00 00 00 5C 00 00 00 | Y...Z...[...\...
000770: 5D 00 00 00 5E 00 00 00  5F 00 00 00 60 00 00 00 | ]...^..._...`...
000780: 61 00 00 00 62 00 00 00  63 00 00 00 64 00 00 00 | a...b...c...d...
000790: 65 00 00 00 66 00 00 00  67 00 00 00 68 00 00 00 | e...f...g...h...
0007A0: 69 00 00 00 6A 00 00 00  6B 00 00 00 6C 00 00 00 | i...j...k...l...
0007B0: 6D 00 00 00 6E 00 00 00  6F 00 00 00 70 00 00 00 | m...n...o...p...
0007C0: 71 00 00 00 72 00 00 00  73 00 00 00 74 00 00 00 | q...r...s...t...
0007D0: 75 00 00 00 76 00 00 00  77 00 00 00 78 00 00 00 | u...v...w...x...
0007E0: 79 00 00 00 7A 00 00 00  7B 00 00 00 7C 00 00 00 | y...z...{...|...
0007F0: 7D 00 00 00 7E 00 00 00  7F 00 00 00 80 00 00 00 | }...~......◆...

000800: 81 00 00 00 82 00 00 00  83 00 00 00 84 00 00 00 | ◆...◆...◆...◆...
000810: 85 00 00 00 86 00 00 00  87 00 00 00 88 00 00 00 | ◆...◆...◆...◆...
000820: 89 00 00 00 8A 00 00 00  8B 00 00 00 8C 00 00 00 | ◆...◆...◆...◆...
000830: 8D 00 00 00 8E 00 00 00  8F 00 00 00 90 00 00 00 | ◆...◆...◆...◆...
000840: 91 00 00 00 92 00 00 00  93 00 00 00 94 00 00 00 | ◆...◆...◆...◆...
000850: 95 00 00 00 96 00 00 00  97 00 00 00 98 00 00 00 | ◆...◆...◆...◆...
000860: 99 00 00 00 9A 00 00 00  9B 00 00 00 9C 00 00 00 | ◆...◆...◆...◆...
000870: 9D 00 00 00 9E 00 00 00  9F 00 00 00 FF FF FF 0F | ◆...◆...◆...◆◆◆.
000880: FF FF FF 0F 00 00 00 00  00 00 00 00 00 00 00 00 | ◆◆◆.............
000890: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0008A0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0008B0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
```

FAT2

```
student@student-VirtualBox:~/Documents/csc415-filesystem-aktails$ Hexdump/h
exdump.linux --file TestVolume --count 79 --start 82
Dumping file TestVolume, starting at block 82 for 79 blocks:

00A400: 01 00 00 00 01 00 00 00  03 00 00 00 04 00 00 00 | ................
00A410: 05 00 00 00 06 00 00 00  07 00 00 00 08 00 00 00 | ................
00A420: 09 00 00 00 0A 00 00 00  0B 00 00 00 0C 00 00 00 | ................
00A430: 0D 00 00 00 0E 00 00 00  0F 00 00 00 10 00 00 00 | ................
00A440: 11 00 00 00 12 00 00 00  13 00 00 00 14 00 00 00 | ................
00A450: 15 00 00 00 16 00 00 00  17 00 00 00 18 00 00 00 | ................
00A460: 19 00 00 00 1A 00 00 00  1B 00 00 00 1C 00 00 00 | ................
00A470: 1D 00 00 00 1E 00 00 00  1F 00 00 00 20 00 00 00 | ............ ...
00A480: 21 00 00 00 22 00 00 00  23 00 00 00 24 00 00 00 | !..."...#...$...
00A490: 25 00 00 00 26 00 00 00  27 00 00 00 28 00 00 00 | %...&...'...(...
00A4A0: 29 00 00 00 2A 00 00 00  2B 00 00 00 2C 00 00 00 | )...*...+...,...
00A4B0: 2D 00 00 00 2E 00 00 00  2F 00 00 00 30 00 00 00 | -......./...0...
00A4C0: 31 00 00 00 32 00 00 00  33 00 00 00 34 00 00 00 | 1...2...3...4...
00A4D0: 35 00 00 00 36 00 00 00  37 00 00 00 38 00 00 00 | 5...6...7...8...
00A4E0: 39 00 00 00 3A 00 00 00  3B 00 00 00 3C 00 00 00 | 9...:...;...<...
00A4F0: 3D 00 00 00 3E 00 00 00  3F 00 00 00 40 00 00 00 | =...>...?...@...

00A500: 41 00 00 00 42 00 00 00  43 00 00 00 44 00 00 00 | A...B...C...D...
00A510: 45 00 00 00 46 00 00 00  47 00 00 00 48 00 00 00 | E...F...G...H...
00A520: 49 00 00 00 4A 00 00 00  4B 00 00 00 4C 00 00 00 | I...J...K...L...
00A530: 4D 00 00 00 4E 00 00 00  4F 00 00 00 50 00 00 00 | M...N...O...P...
00A540: FF FF FF 0F 52 00 00 00  53 00 00 00 54 00 00 00 | ◆◆◆.R...S...T...
00A550: 55 00 00 00 56 00 00 00  57 00 00 00 58 00 00 00 | U...V...W...X...
00A560: 59 00 00 00 5A 00 00 00  5B 00 00 00 5C 00 00 00 | Y...Z...[...\...
00A570: 5D 00 00 00 5E 00 00 00  5F 00 00 00 60 00 00 00 | ]...^..._...`...
00A580: 61 00 00 00 62 00 00 00  63 00 00 00 64 00 00 00 | a...b...c...d...
00A590: 65 00 00 00 66 00 00 00  67 00 00 00 68 00 00 00 | e...f...g...h...
00A5A0: 69 00 00 00 6A 00 00 00  6B 00 00 00 6C 00 00 00 | i...j...k...l...
00A5B0: 6D 00 00 00 6E 00 00 00  6F 00 00 00 70 00 00 00 | m...n...o...p...
00A5C0: 71 00 00 00 72 00 00 00  73 00 00 00 74 00 00 00 | q...r...s...t...
00A5D0: 75 00 00 00 76 00 00 00  77 00 00 00 78 00 00 00 | u...v...w...x...
00A5E0: 79 00 00 00 7A 00 00 00  7B 00 00 00 7C 00 00 00 | y...z...{...|...
00A5F0: 7D 00 00 00 7E 00 00 00  7F 00 00 00 80 00 00 00 | }...~......◆...

00A600: 81 00 00 00 82 00 00 00  83 00 00 00 84 00 00 00 | ◆...◆...◆...◆...
00A610: 85 00 00 00 86 00 00 00  87 00 00 00 88 00 00 00 | ◆...◆...◆...◆...
00A620: 89 00 00 00 8A 00 00 00  8B 00 00 00 8C 00 00 00 | ◆...◆...◆...◆...
00A630: 8D 00 00 00 8E 00 00 00  8F 00 00 00 90 00 00 00 | ◆...◆...◆...◆...
00A640: 91 00 00 00 92 00 00 00  93 00 00 00 94 00 00 00 | ◆...◆...◆...◆...
00A650: 95 00 00 00 96 00 00 00  97 00 00 00 98 00 00 00 | ◆...◆...◆...◆...
00A660: 99 00 00 00 9A 00 00 00  9B 00 00 00 9C 00 00 00 | ◆...◆...◆...◆...
00A670: 9D 00 00 00 9E 00 00 00  9F 00 00 00 FF FF FF 0F | ◆...◆...◆...◆◆◆.
00A680: FF FF FF 0F 00 00 00 00  00 00 00 00 00 00 00 00 | ◆◆◆.............
00A690: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
00A6A0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
00A6B0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 |
```

Root Directory

```
student@student-VirtualBox:~/Documents/csc415-filesystem-aktails$ Hexdump/h
exdump.linux --file TestVolume --count 1 --start 161
Dumping file TestVolume, starting at block 161 for 1 block:

014200: 2E 00 00 00 00 00 00 00  00 00 00 10 00 00 00 00 | ................
014210: 00 00 00 00 00 00 99 50  85 54 A0 00 00 02 00 00 | .......P.T......
014220: 2E 2E 00 00 00 00 00 00  00 00 00 10 00 00 00 00 | ................
014230: 00 00 00 00 00 00 99 50  85 54 A0 00 00 02 00 00 | .......P.T......
014240: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014250: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014260: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014270: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014280: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014290: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0142A0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0142B0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0142C0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0142D0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0142E0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0142F0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................

014300: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014310: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014320: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014330: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014340: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014350: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014360: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014370: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014380: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
014390: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0143A0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0143B0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0143C0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0143D0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0143E0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................
0143F0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 | ................

student@student-VirtualBox:~/Documents/csc415-filesystem-aktails$
```

Volume Control Block

We are creating a FAT32 compliant file system so we followed the specifications of the BIOS Parameter Block for FAT32 volumes to create our VCB.

Field Name	Offset	Size (Bytes)	Description
jmpBoot	0	3	Jump instruction to boot code. Not needed for our file system but included for FAT32 compliance.
OEMName	3	8	String indicator of what system formatted the volume.
BytesPerSector	11	2	Count of bytes per sector.
SectorPerCluster	13	1	Number of sectors per allocation unit (cluster).
RsvdSectorCount	14	2	Count of reserved sectors of the volume.
NumOfFATs	16	1	Count of FAT data structures on the volume.
RootEntryCount	17	2	For FAT12 and FAT16 volumes. FAT32 volumes have this value set to 0.
TotalSectors16	19	2	For FAT12 and FAT16 volumes. FAT32 volumes have this value set to 0.
Media	21	1	0xF8 is used for “fixed” media. 0xF0 for removable media.
FATSz16	22	2	For FAT12 and FAT16 volumes. FAT32 volumes have this value set to 0.
SectorsPerTrack	24	2	Not sure if this is used for our file system so we just set it to 0.
NumberOfHeads	26	2	Not sure if this is used for our file system so we just set it to 0.
HiddenSectors	28	4	Not sure if this is used for our file system so we just set it to 0.
TotalSectors32	32	4	Count of all Sectors on the volume.
FATSz32	36	4	Count of sectors occupied by one FAT data structure.
ExtFlags	40	2	Bits 0-3: Active FAT starting from 0. Only valid when bit7 is 1. Bits 4-6: Reserved.

			Bit 7: 0 means that the FAT is mirrored into all FATs at runtime. 1 means that only one FAT indicated by bits 0-3 is active. Bits 8-15: Reserved.
FSVer	42	2	Version number of FAT32 volume.
RootCluster	44	4	Set to the cluster number of the first cluster of the root directory or the first usable cluster available.
FSInfo	48	2	Sector number of FSInfo data structure in the volume.
BkBootSector	50	2	If non-zero, indicates the sector number of the volume that holds a copy of the boot record.
Reserved0	52	12	Reserved.
DriverNumber	64	1	Usually set to 0x00 for floppy disks and 0x80 for hard disks. Operating system specific.
Reserved1	65	1	Reserved.
BootSig	66	1	Extended boot signature.
VolumeID	67	4	Volume serial number.
VolumeLabel	71	11	Volume label/name.
FileSystemType	82	8	Informational string that does not determine FAT type.
Reserved2	90	420	Reserved.
Signature	510	2	Signature for FAT32 Volume. Byte 510 = 0x55, Byte 511 = 0xAA

Free Space Management

The free space management is based on the FAT from the FAT32 file system format. It consists of the structure fsFat that contains an array of unsigned integers with 10,000 elements for the FAT as well as an unsigned integer variable for storing the starting block. The VCB is located at block 0. There is another structure called FSInfo (shown below) which is located at block 1.

Field Name	Offset	Size (Bytes)	Description
FSI_LeadSig	0	4	Lead signature used to validate start of FSInfo structure in sector. Value set to 0x41615252
FSI_Reserved1	4	480	Reserved Space, all set to 0
FSI_StrucSig	484	4	Additional signature used to validate the integrity of FSInfo structure. Value set to 0x61417272.
FSI_Free_Count	488	4	Last known free cluster block on the volume. Free count isn't known if its value is 0xFFFFFFFF. Contents must be validated at volume mount.
FSI_Nxt_Free	492	4	Cluster number of next available cluster on the volume.
FSI_Reserved2	496	12	Reserved Space, all set to 0
FSI_TrailSig	508	4	Trail signature used to validate the integrity of data in the sector with FSInfo structure. Value is set to 0xAA550000

There is a function called initFAT that first allocates space for the FSInfo structure and then initializes its contents. Then the FSInfo structure is written to disk using LBAwrite. Next, space for the fsFat structure is allocated and the 0th and 1st blocks are marked as used for the VCB and FSInfo structure, respectively. The rest of the blocks are initialized to 0. This process is repeated for the copy of the FAT. Then the function keeps track of the blocks for writing both FATs to disk as well as initializing the EOF value at the last element used. Then, the FSI_Free_Count and the FSI_Nxt_Free are updated. Lastly, we write the FSInfo structure to disk again because its contents were just changed.

Directory System

We followed the FAT32 structure in terms of the directory structure. The directory is essentially a container which holds other files along with subdirectories. The directory of the data consists of 32 byte directory entries.

Field Name	Offset	Size (Bytes)	Description
DIR_Name	0	11	File name which is only limited to 11 characters
DIR_Attr	11	1	The two upper bits of the attribute byte are reserved and need to be set to 0 when creating a file. These are not interpreted.
DIR_NTRes	12	1	This is reserved and needs to be set to 0.
DIR_CrtTimeTenth	13	1	Optional. Set to 0.
DIR_CrtTime	14	2	Optional. Set to 0.
DIR_CrtDate	16	2	Optional. Set to 0.
DIR_LstAccDate	18	2	Optional. Set to 0.
DIR_FstClusHI	20	2	This is the high word of the first data cluster that is described by this entry This is only valid for FAT32 which in our case is relevant.
DIR_WrtTime	22	2	This one is the last modification (write) time and the value of it needs to be equal to the creation time.
DIR_WrtDate	24	2	This is the last modification (write) date and the value must be equal to the creation date
DIR_FstClusLO	26	2	The low word of the first data cluster number for the file/ directory with this entry

DIR_FileSize	28	4	32-bit quantity which contains the size of the file/directory described in bytes

Work Distribution	
Member Name	**Tasks/Responsibilities**
Madina	Directory entry structure
Muhammed	FATs and FSInfo
Janelle	Directory entry structure
John	VCB structure, Combined and refactored code, debugging, hexdumps

Teamwork

Our team communicated through discord which is convenient for sharing information, voice and video chats, and discussions. We met through voice chat twice to discuss the milestone, split up the tasks, and ask each other questions. Other than that, we communicated through our group chat often for questions or coordination. We had divided up the tasks for this milestone according to how long the task seemed.

Issues faced/Resolution

One of the issues we faced was that our group members did not know if we had to specifically write code on fat32. They had created code which was perfectly running but was not a code for fat 32 then later we figured out that we have to specifically work on fat 32 as mentioned in milestone one then we redo everything and we did not really face a lot of issues. We were doing our work while we were on discord chat or call so we were asking questions from each other and we were solving it right there by a lot of research and all the resources given by professor which was very helpful so we did not really face a serious or big issue to mention here all the issue we had was like missing out with the some of the data type that we were not allowed to use in fat 32 and we solved by researchers and asking around our group.