Project: DeuCeng Virtual Machine

The aim of the project is to implement a simplified virtual machine partially.

General Information

In our virtual machine there are three parts: CPU, Disk and RAM. CPU processes the command set. The structures to process commands are in RAM. The function of the virtual Disk (vdisk) is to provide permanency. Mainly, vdisk is simulated in the project.

RAM

- In the RAM, file structures include name, size and diskstart. The diskstart indicates the start of the file on the vdisk.
- Commands and files to be worked on must be kept on RAM for quick access.
- All files must be synchronized in RAM and vdisk.
- The memory structures of the files in the RAM must be sorted by diskstart address and the file name.

VDISK

- The vdisk consists of 30 blocks (1-30).
- Each block contains 11 byte/characters.
    - The first 10 byte/characters contains data.
    - The 11th byte indicates the next block.
        - 1-30 : Next block of the file
        - 0   : End of file
- Vdisk data character set: 0-9, a-z, A-Z, space
- Special characters: . and @
    - . : no character/data
    - @ : start of the file
- File name should begin with @ character and the first block is used for file name.

The first block structure for a file

1	2	3	4	5	6	7	8	9	10	11
@	f	i	l	e	n	a	m	e	.	Index of next block

Other blocks' structure for a file

1	2	3	4	5	6	7	8	9	10	11
Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Index of next block

CPU

CPU is the part which processes the following command set.

```
load file.txt          // load and run an executable batch file from harddisk
print filename         // print the content of the file on the screen
create filename        // create a file
append filename "Hello World"      // append data to the end of the file (as a block/blocks)
insert filename 3 "Hello World"      // insert data into the file from the 3rd block (as a block/blocks)
delete filename        // delete file
delete filename 5 7    // delete blocks from 5 to 7
printdisk              // print all vdisk on the screen
defrag                // defragment vdisk
store                 // save vdisk to harddisk as a file (vdisk.txt)
restore               // restore vdisk from harddisk, clear RAM structures,
                      // and create appropriate new memory structures in the RAM
```

Sample Files

```
batch1.txt
create file1
append file1 "Hello World Hello Sun"
printdisk
```

```
bat4.txt
create aaa
append aaa "Democracy"
append aaa "Democracy"
```

```
correct.txt
delete aaa 2 2
printdisk
insert aaa 1 "Welcome"
printdisk
```

Sample Screens/Commands

```
command> load batch1.txt
create file1 : OK
append file1 "Hello World Hello Sun" : OK
printdisk:
01:  @file1.... 2      Hello Worl 3      d Hello Su 4      n......... 0      ......... 0
06:  ......... 0       ......... 0       ......... 0       ......... 0       ......... 0
11:  ......... 0       ......... 0       ......... 0       ......... 0       ......... 0
16:  ......... 0       ......... 0       ......... 0       ......... 0       ......... 0
21:  ......... 0       ......... 0       ......... 0       ......... 0       ......... 0
26:  ......... 0       ......... 0       ......... 0       ......... 0       ......... 0

command> append file1 "Hello Saturn"
OK

command> printdisk
01:  @file1.... 2      Hello Worl 3      d Hello Su 4      n......... 5      Hello Satu 6
06:  rn........ 0       ......... 0       ......... 0       ......... 0       ......... 0
11:  ......... 0       ......... 0       ......... 0       ......... 0       ......... 0
16:  ......... 0       ......... 0       ......... 0       ......... 0       ......... 0
21:  ......... 0       ......... 0       ......... 0       ......... 0       ......... 0
26:  ......... 0       ......... 0       ......... 0       ......... 0       ......... 0

command> load bat4.txt
create aaa : OK
append aaa "Democracy" : OK
append aaa "Democracy" : OK
```

```
command> printdisk
01:  @file1.... 2      Hello Worl 3      d Hello Su 4      n......... 5      Hello Satu 6
```

```
06:  rn........ 0      @aaa...... 8     Democracy. 9     Democracy. 0     .......... 0
11:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0
16:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0
21:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0
26:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0


command> load batch1.txt
create file1 : Error - File exists
append file1 "Hello World Hello Sun" : OK
printdisk:
01:  @file1.... 2      Hello Worl 3     d Hello Su 4     n......... 5     Hello Satu 6
06:  rn........ 10     @aaa...... 8     Democracy. 9     Democracy. 0     Hello Worl 11
11:  d Hello Su 12     n......... 0     .......... 0     .......... 0     .......... 0
16:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0
21:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0
26:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0

command> insert file2 1 "abcdefgh12345678"
Error - No such file

command> create file2
OK

command> printdisk
01:  @file1.... 2      Hello Worl 3     d Hello Su 4     n......... 5     Hello Satu 6
06:  rn........ 10     @aaa...... 8     Democracy. 9     Democracy. 0     Hello Worl 11
11:  d Hello Su 12     n......... 0     @file2.... 0     .......... 0     .......... 0
16:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0
21:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0
26:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0

command> insert file2 1 "abcdefgh12345678"
OK

command> printdisk
01:  @file1.... 2      Hello Worl 3     d Hello Su 4     n......... 5     Hello Satu 6
06:  rn........ 10     @aaa...... 8     Democracy. 9     Democracy. 0     Hello Worl 11
11:  d Hello Su 12     n......... 0     @file2.... 14    abcdefgh12 15    345678.... 0
16:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0
21:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0
26:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0

command> load correct.txt
delete aaa 2 2 : OK
printdisk
01:  @file1.... 2      Hello Worl 3     d Hello Su 4     n......... 5     Hello Satu 6
06:  rn........ 10     @aaa...... 8     Democracy. 0     .......... 0     Hello Worl 11
11:  d Hello Su 12     n......... 0     @file2.... 14    abcdefgh12 15    345678.... 0
16:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0
21:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0
26:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0
insert aaa 1 "Welcome" : OK
printdisk
01:  @file1.... 2      Hello Worl 3     d Hello Su 4     n......... 5     Hello Satu 6
06:  rn........ 10     @aaa...... 16    Democracy. 0     .......... 0     Hello Worl 11
11:  d Hello Su 12     n......... 0     @file2.... 14    abcdefgh12 15    345678.... 0
16:  Welcome... 8      .......... 0     .......... 0     .......... 0     .......... 0
21:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0
26:  .......... 0      .......... 0     .......... 0     .......... 0     .......... 0


command> insert file1 2 "Hello Jupiter and Venus"
OK
```

```
command> printdisk
01:  @file1.... 2      Hello Worl 17    d Hello Su 4     n......... 5     Hello Satu 6
06:  rn........ 10     @aaa...... 16    Democracy. 0     .......... 0     Hello Worl 11
```

```
11:   d Hello Su 12      n......... 0      @file2.... 14      abcdefgh12 15      345678.... 0
16:   Welcome... 8       Hello Jupi 18     ter and Ve 19      nus....... 3       .......... 0
21:   .......... 0       .......... 0      .......... 0       .......... 0       .......... 0
26:   .......... 0       .......... 0      .......... 0       .......... 0       .......... 0

command> defrag
OK

command> printdisk
01:   @file1.... 2       Hello Worl 3      Hello Jupi 4       ter and Ve 5       nus....... 6
06:   d Hello Su 7       n......... 8      Hello Satu 9       rn........ 10      Hello Worl 11
11:   d Hello Su 12      n......... 0      @aaa...... 14      Welcome... 15      Democracy. 0
16:   @file2.... 17      abcdefgh12 18     345678.... 0       .......... 0       .......... 0
21:   .......... 0       .......... 0      .......... 0       .......... 0       .......... 0
26:   .......... 0       .......... 0      .......... 0       .......... 0       .......... 0
```