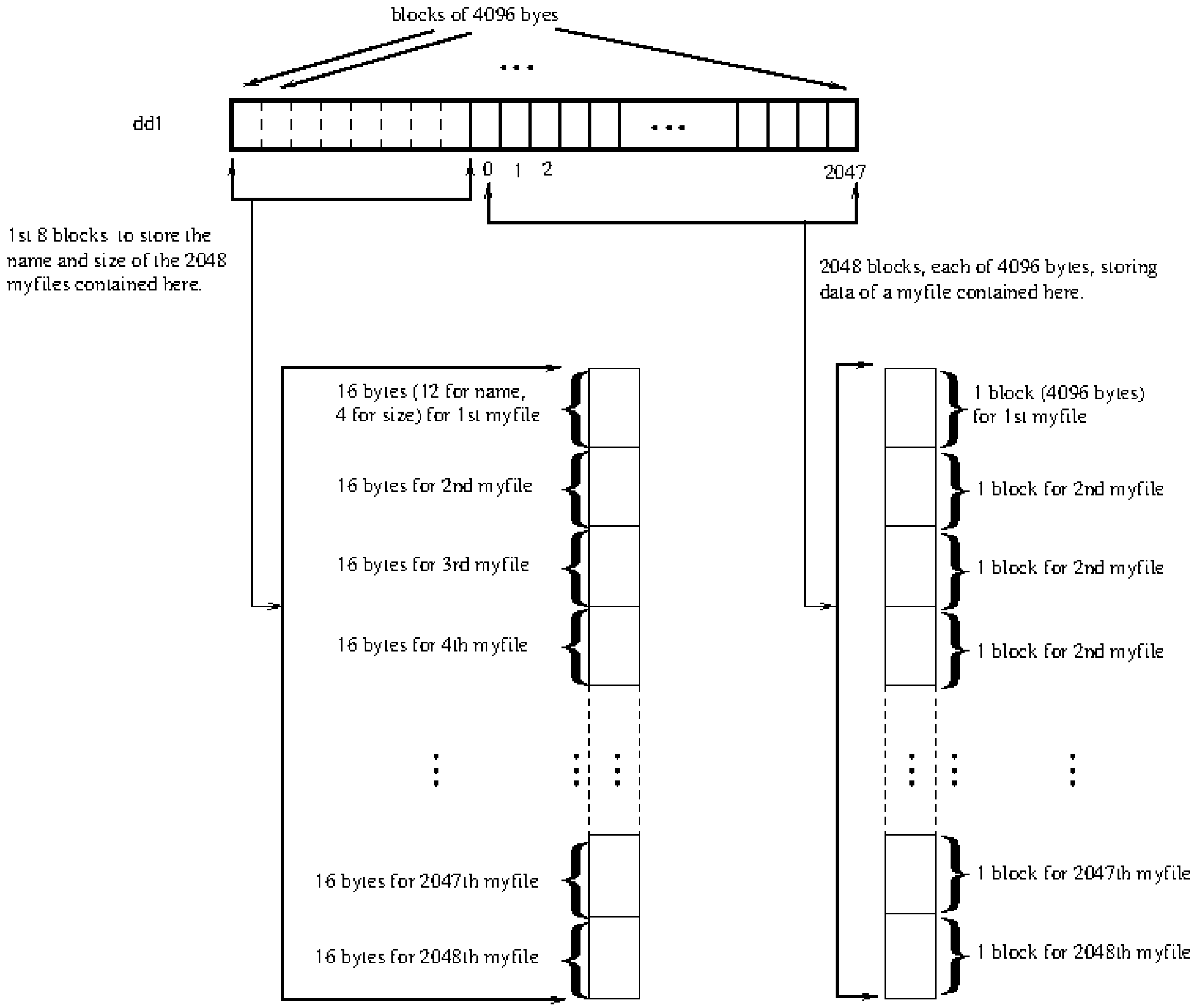
Operating System Laboratory

Assignment Statement for March 18, 2025

In the previous week a trivial filesystem (myfs) was inplemented in a regular Linux file (dd1). The organization of myfs is depicted in the following figure.


blocks of 4096 byes
...
dd1
...
0
1
2
2047
1st 8 blocks to store the name and size of the 2048 myfiles contained here.
2048 blocks, each of 4096 bytes, storing data of a myfile contained here.
16 bytes (12 for name, 4 for size) for 1st myfile
16 bytes for 2nd myfile
16 bytes for 3rd myfile
16 bytes for 4th myfile
16 bytes for 2047th myfile
16 bytes for 2048th myfile
1 block (4096 bytes) for 1st myfile
1 block for 2nd myfile
1 block for 2nd myfile
1 block for 2nd myfile
1 block for 2047th myfile
1 block for 2048th myfile

The key points (and limitations) of myfs is given below.

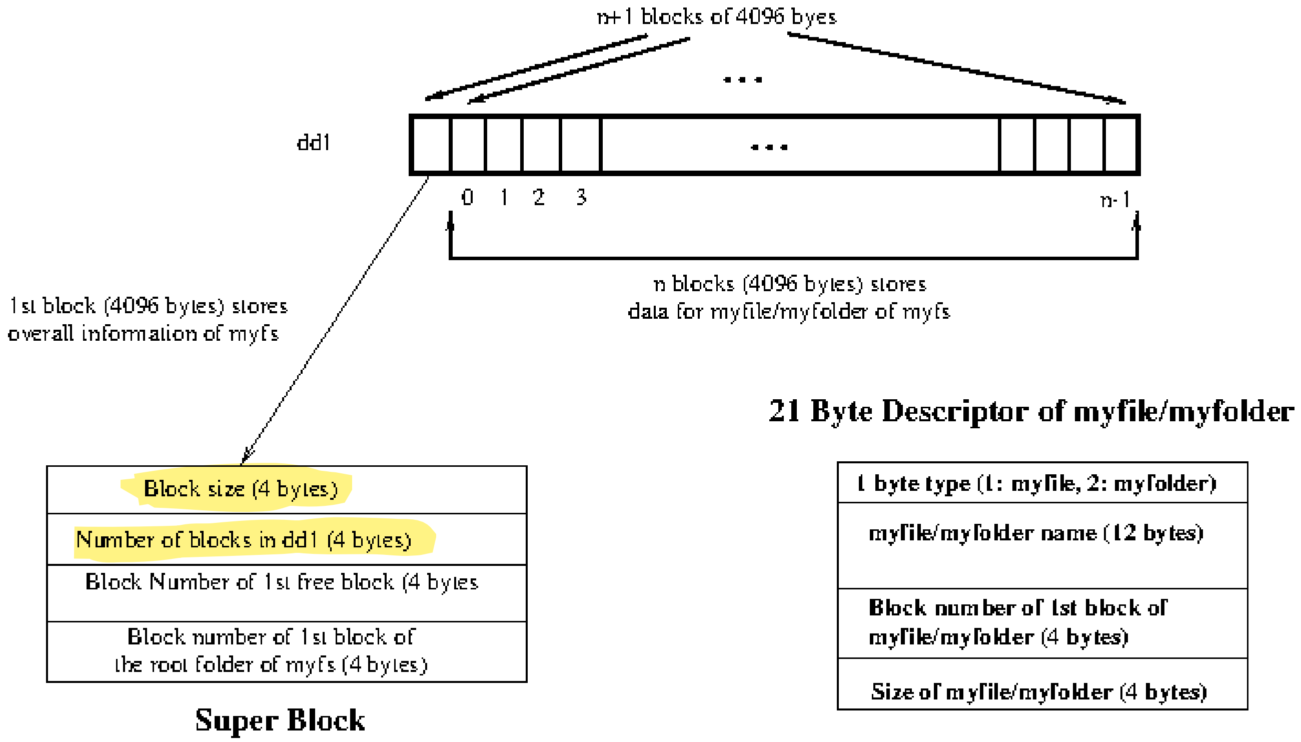
I. Size of dd1 was fixed (2056 blocks, each of 4096 bytes)
II. There was no idea of folder, it was a flat filesystem.
III. myfs can have at most 2048 myfiles.
IV. Each myfile in myfs could have at most 4096 bytes.
V. myfile names in myfs can be of maximum 12 characters.

VI. 4 functions were provided on myfs:
   A. mymkfs <Linux File> {Eg., mymkfs dd1)
   B. mycopyto
   C. mycopyfrom
   D. myrm

Today’s assignment is an extension of the above mentioned assignment supporting the following features (overriding previous version of myfs).

I. dd1 can have any number of blocks.
II. Folders (myfolder) are supported.
III. myfiles can be of any size
IV. myfolder can contain any number of sub myfolders, and/or myfiles.

The organization of myfs, now, will be as shown in the following figure.


n+1 blocks of 4096 byes
dd1
0
1
2
3
n-1
n blocks (4096 bytes) stores
data for myfile/myfolder of myfs
1st block (4096 bytes) stores
overall information of myfs

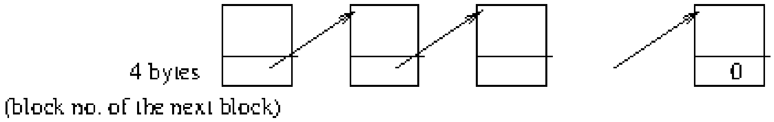
Super Block
Block size (4 bytes)
Number of blocks in dd1 (4 bytes)
Block Number of 1st free block (4 bytes
Block number of 1st block of the root folder of myfs (4 bytes)

Super Block

21 Byte Descriptor of myfile/myfolder

21 Byte Descriptor of myfile/myfolder
1 byte type (1: myfile, 2: myfolder)
myfile/myfolder name (12 bytes)
Block number of 1st block of myfile/myfolder (4 bytes)
Size of myfile/myfolder (4 bytes)

myfile/myfolder data blocks, and free blocks in myfs are kept as chains



Please note that myfile (myfolder) needs multiple blocks. These blocks will be maintained as a chain, that is, the last 4 bytes of a block would contain the block number of the next block of myfile (myfolder). myfile descriptor now have one additional field (4 byte), block number of the 1st block of the myfile (myfolder). The data part of a myfolder will be collection of 21 byte descriptors of the myfiles or submyfolders that the myfolder contains.

Like in the previous assignment, you have to implement 4 functions for this extended myfs

E. mymkfs <Linux File> {Eg., mymkfs dd1)
F. mycopyto
G. mycopyfrom
H. myrm