

190905104
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Lab 4

1)

// Write a program to find the inode number of an existing file in a directory. Take the input as a filename and print the inode number of the file.

```
#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
#include <stdio.h>
#include <stdlib.h>

int main (int argc, char *argv[]){
    struct stat sb;
    int ret;

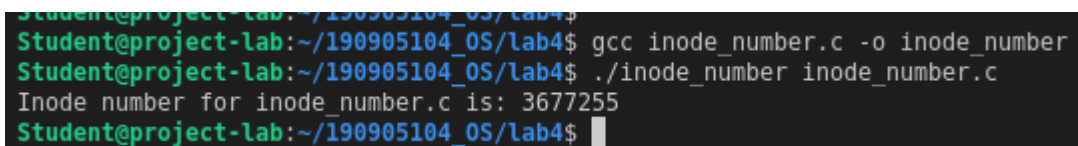
    if (argc < 2)    {
        fprintf (stderr, "usage: %s <file>\n", argv[0]);
        return 1;
    }

    ret = stat(argv[1], &sb);

    if (ret){
        perror("stat");
        return 1;
    }

    printf("Inode number for %s is: %ld\n", argv[1], sb.st_ino);

    return 0;
}
```



```
Student@project-lab:~/190905104_OS/lab4$ gcc inode_number.c -o inode_number
Student@project-lab:~/190905104_OS/lab4$ ./inode_number inode_number.c
Inode number for inode_number.c is: 3677255
Student@project-lab:~/190905104_OS/lab4$
```

2)

// Write a program to print out the complete stat structure of a file.

```
#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <dirent.h>
#include <time.h>
```

```

char* todate(char* str, time_t val){
    strftime(str, 36, "%d.%m.%Y %H:%M:%S", localtime(&val));
    return str;
}

int main(int argc, char* argv[]){
    struct stat sb;
    int ret;
    char date[100];
    if(argc < 2){
        fprintf(stderr, "usage: %s <file>\n", argv[0]);
        return 1;
    }

    ret = stat(argv[1], &sb);

    if (ret){
        perror("stat");
        return 1;
    }

    printf("ID of device: %ld\n", sb.st_dev);
    printf("Inode number: %ld\n", sb.st_ino);
    printf("File mode - %hu\n", sb.st_mode);
    printf("Number of hard links - %ld\n", sb.st_nlink);
    printf("User ID - %d\n", sb.st_uid);
    printf("Group owner - %d\n", sb.st_gid);
    printf("File size - %ld\n", sb.st_size);
    printf("Blocksize - %ld\n", sb.st_blksize);
    printf("Number of Blocks - %ld\n", sb.st_blocks);
    printf("Last access time - %s\n", todate(date,sb.st_atime));
    printf("Last modification time - %s\n", todate(date,sb.st_mtime));
    printf("Last change time - %s\n", todate(date,sb.st_ctime));

    DIR * dp;

    struct dirent * entry;
    struct stat statbuf;

    if((dp = opendir(".")) == NULL)
    {
        printf("Cannot open directory \n");
        return 0;
    }

    chdir(".");

    while((entry = readdir(dp)) != NULL){
        lstat(entry->d_name,&statbuf);

        if(!S_ISDIR(statbuf.st_mode)){

```

```

if(strcmp(entry->d_name,argv[1])==0){
    printf("Permissions\t");
    printf((S_ISDIR(statbuf.st_mode)) ? "d" : "-");
    printf((statbuf.st_mode & S_IRUSR) ? "r" : "-");
    printf((statbuf.st_mode & S_IWUSR) ? "w" : "-");
    printf((statbuf.st_mode & S_IXUSR) ? "x" : "-");
    printf((statbuf.st_mode & S_IRGRP) ? "r" : "-");
    printf((statbuf.st_mode & S_IWGRP) ? "w" : "-");
    printf((statbuf.st_mode & S_IXGRP) ? "x" : "-");
    printf((statbuf.st_mode & S_IROTH) ? "r" : "-");
    printf((statbuf.st_mode & S_IWOTH) ? "w" : "-");
    printf((statbuf.st_mode & S_IXOTH) ? "x" : "-");
    printf("\n");
}
}
}
}

```

```

Student@project-lab:~/190905104_OS/Lab4$ ./stat
usage: ./stat <file>
Student@project-lab:~/190905104_OS/Lab4$ ./stat inode_number.c
ID of device: 2054
Inode number: 3677255
File mode - 33204
Number of hard links - 1
User ID - 1002
Group owner - 1002
File size - 620
Blocksize - 4096
Number of Blocks - 8
Last access time - 28.10.2021 13:15:43
Last modification time - 28.10.2021 13:15:35
Last change time - 28.10.2021 13:15:35
Permissions -rw-rw-r--
Student@project-lab:~/190905104_OS/Lab4$ ./stat inode_number
ID of device: 2054
Inode number: 3677412
File mode - 33277
Number of hard links - 1
User ID - 1002
Group owner - 1002
File size - 8576
Blocksize - 4096
Number of Blocks - 24
Last access time - 28.10.2021 13:15:45
Last modification time - 28.10.2021 13:15:43
Last change time - 28.10.2021 13:15:43
Permissions -rwxrwxr-x

```

3)

// Write a program to create a new hard link to an existing file and unlink the same. Accept the old path as input and print the newpath.

```
#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <dirent.h>
#include <time.h>

int main(int argc, char* argv[]){
    struct stat sb;
    int ret;

    if (argc < 2) {
        fprintf(stderr, "usage: %s <file>\n", argv[0]);
        return 1;
    }

    ret = stat(argv[1], &sb);

    if (ret){
        perror("stat");
        return 1;
    }

    printf("Number of hard links: %ld\n", sb.st_nlink);

    char* new_path = "q2_stat.c";

    int ret2 = link(argv[1], new_path);

    printf("Linking %s to %s\n", argv[1], new_path);

    struct stat intermediate;
    int ret3 = stat(argv[1], &intermediate);
    printf("Number of hard links: %ld\n", intermediate.st_nlink);

    printf("Unlinking\n");
    int ret4 = unlink(argv[1]);

    struct stat final;
    int ret5 = stat(new_path, &final);
    printf("Number of hard links: %ld\n", final.st_nlink);

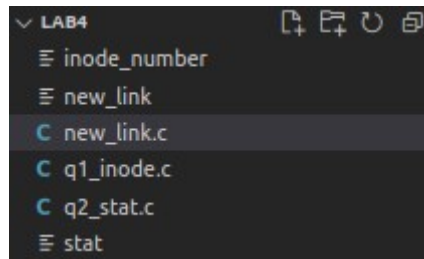
    return 0;
}
```

```

Student@project-lab:~/190905104_05/lab4$ gcc new_link.c -o new_link
Student@project-lab:~/190905104_05/lab4$ ./new_link stat_structure.c
Number of hard links: 1
Linking stat_structure.c to q2_stat.c
Number of hard links: 2
Unlinking
Number of hard links: 1
Student@project-lab:~/190905104_05/lab4$

```

Directory after execution. stat_structure.c has been linked to q2_stat.c and stat_structure.c has been unlinked and hence can not be seen.



4)

// Write a program to create a new soft link to an existing file and unlink the same. Accept the old path as input and print the newpath.

```

#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <dirent.h>
#include <time.h>

int main(int argc, char* argv[]){
    struct stat sb;
    int ret;

    if (argc < 2)    {
        fprintf (stderr, "usage: %s <file>\n", argv[0]);
        return 1;
    }

    ret = stat(argv[1], &sb);

    if (ret){
        perror("stat");
        return 1;
    }
}

```

```

char* new_path = "inode_number.c";
system("ls");
printf("Linking %s to %s\n", argv[1], new_path);

int ret2 = symlink(argv[1], new_path);

struct stat intermediate;
int ret3 = stat(argv[1], &intermediate);
system("ls");

printf("Unlinking\n");
int ret4 = unlink(argv[1]);

struct stat final;
int ret5 = stat(new_path, &final);
system("ls");
}

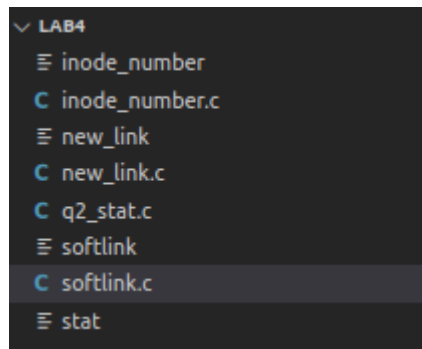
```

```

Student@project-lab:~/190905104_OS/lab4$ ./softlink q1_inode.c
inode_number new_link new_link.c q1_inode.c q2_stat.c softlink softlink.c stat
Linking q1_inode.c to inode_number.c
inode_number inode_number.c new_link new_link.c q1_inode.c q2_stat.c softlink softlink.c stat
Unlinking
inode_number inode_number.c new_link new_link.c q2_stat.c softlink softlink.c stat

```

Directory after execution. q1_inode.c has been softlinked to inode_number.c and then q1_inode.c was deleted.



```

LAB4
├── inode_number
├── inode_number.c
├── new_link
├── new_link.c
├── q2_stat.c
├── softlink
├── softlink.c
└── stat

```

Additional

1)

// Inode number of all files in directory

```

#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
#include <stdio.h>
#include <stdlib.h>
#include <dirent.h>

```

```

int main(int argc, char* argv[]){

    struct stat sb;
    int ret;

    if (argc < 2)    {
        fprintf (stderr, "usage: %s <file>\n", argv[0]);
        return 1;
    }

    DIR * dp;

    struct dirent * entry;
    struct stat statbuf;

    if((dp = opendir(argv[1])) == NULL)
    {
        printf("Cannot open directory \n");
        return 0;
    }

    chdir(argv[1]);

    while((entry = readdir(dp)) != NULL){
        lstat(entry->d_name,&statbuf);

        if(!S_ISDIR(statbuf.st_mode)){
            printf("Inode number for %s: %ld\n", entry->d_name, statbuf.st_ino);
        }
    }
    return 0;
}

```

```

Student@project-lab:~/190905104_OS/lab4$ gcc inode_number_directory.c -o inodeall
Student@project-lab:~/190905104_OS/lab4$ ./inodeall
usage: ./inodeall <file>
Student@project-lab:~/190905104_OS/lab4$ ./inodeall .
Inode number for q2_stat.c: 3677413
Inode number for new_link: 3677514
Inode number for 190905104_OS_lab4.odt: 3677428
Inode number for q1_inode.c: 3677432
Inode number for inode_number.c: 3677424
Inode number for new_link.c: 3677422
Inode number for softlink: 3677423
Inode number for inode_number: 3677412
Inode number for inode_number_directory.c: 3677425
Inode number for softlink.c: 3677584
Inode number for ~/.lock.190905104_OS_lab4.odt#: 3677427
Inode number for stat: 3677421
Inode number for inodeall: 3677436
Student@project-lab:~/190905104_OS/lab4$ █

```

2) Stat structure for directory

// Write a program to print out the complete stat structure of a file.

```
#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <dirent.h>
#include <time.h>
#include <string.h>

char* todate(char* str, time_t val){
    strftime(str, 36, "%d.%m.%Y %H:%M:%S", localtime(&val));
    return str;
}

int main(int argc, char* argv[]){
    struct stat sb;
    int ret;

    if (argc < 2) {
        fprintf(stderr, "usage: %s <file>\n", argv[0]);
        return 1;
    }

    DIR * dp;

    struct dirent * entry;
    struct stat statbuf;

    if((dp = opendir(argv[1])) == NULL)
    {
        printf("Cannot open directory \n");
        return 0;
    }

    chdir(argv[1]);
    char date[100];

    while((entry = readdir(dp)) != NULL){
        if(strcmp(entry->d_name, ".")==0 || strcmp(entry->d_name, "..")==0) continue;

        ret = stat(entry->d_name,&sb);

        printf("Stat for %s\n", entry->d_name);

        printf("\tID of device: %ld\n", sb.st_dev);
        printf("\tInode number: %ld\n", sb.st_ino);
        printf("\tFile mode - %hu\n", sb.st_mode);
```



```

printf("\tNumber of hard links - %ld\n", sb.st_nlink);
printf("\tUser ID - %d\n", sb.st_uid);
printf("\tGroup owner - %d\n", sb.st_gid);
printf("\tFile size - %ld\n", sb.st_size);
printf("\tBlocksize - %ld\n", sb.st_blksize);
printf("\tNumber of Blocks - %ld\n", sb.st_blocks);
printf("\tLast access time - %s\n", todate(date,sb.st_atime));
printf("\tLast modification time - %s\n", todate(date,sb.st_mtime));
printf("\tLast modification time - %s\n", todate(date,sb.st_mtime));
printf("\tLast change time - %s\n", todate(date,sb.st_ctime));

printf("\tPermissions\t");
printf((S_ISDIR(sb.st_mode)) ? "d" : "-");
printf((sb.st_mode & S_IRUSR) ? "r" : "-");
printf((sb.st_mode & S_IWUSR) ? "w" : "-");
printf((sb.st_mode & S_IXUSR) ? "x" : "-");
printf((sb.st_mode & S_IRGRP) ? "r" : "-");
printf((sb.st_mode & S_IWGRP) ? "w" : "-");
printf((sb.st_mode & S_IXGRP) ? "x" : "-");
printf((sb.st_mode & S_IROTH) ? "r" : "-");
printf((sb.st_mode & S_IWOTH) ? "w" : "-");
printf((sb.st_mode & S_IXOTH) ? "x" : "-");
printf("\n");
}

```

```
Student@project-lab:~/190905104_OS/lab4$ gcc full_stat_directory.c -o fullstat
Student@project-lab:~/190905104_OS/lab4$ ./fullstat .
Stat for q2_stat.c
  ID of device: 2054
  Inode number: 3677413
  File mode - 33204
  Number of hard links - 1
  User ID - 1002
  Group owner - 1002
  File size - 2390
  Blocksize - 4096
  Number of Blocks - 8
  Last access time - 28.10.2021 13:43:35
  Last modification time - 28.10.2021 13:30:05
  Last modification time - 28.10.2021 13:30:05
  Last change time - 28.10.2021 13:43:35
  Permissions      -rw-rw-r--
Stat for new_link
  ID of device: 2054
  Inode number: 3677514
  File mode - 33277
  Number of hard links - 1
  User ID - 1002
  Group owner - 1002
  File size - 8680
  Blocksize - 4096
  Number of Blocks - 24
  Last access time - 28.10.2021 13:43:35
  Last modification time - 28.10.2021 13:43:28
  Last modification time - 28.10.2021 13:43:28
  Last change time - 28.10.2021 13:43:28
  Permissions      -rwxrwxr-x
Stat for 190905104_OS_lab4.odt
  ID of device: 2054
  Inode number: 3677428
  File mode - 33204
  Number of hard links - 1
  User ID - 1002
  Group owner - 1002
  File size - 166517
  Blocksize - 4096
  Number of Blocks - 328
  Last access time - 28.10.2021 14:14:49
  Last modification time - 28.10.2021 14:14:49
  Last modification time - 28.10.2021 14:14:49
  Last change time - 28.10.2021 14:14:49
  Permissions      -rw-rw-r--
Stat for ql_inode.c
  ID of device: 2054
```