



CS 1550

Week 12

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Project 4

Teaching Assistant

Henrique Potter

Overview

- FUSE is a **Linux kernel extension** that allows for a user space program to provide the implementations for the various file-related syscalls
- Goal: Use FUSE to create our own file system

Overview

User

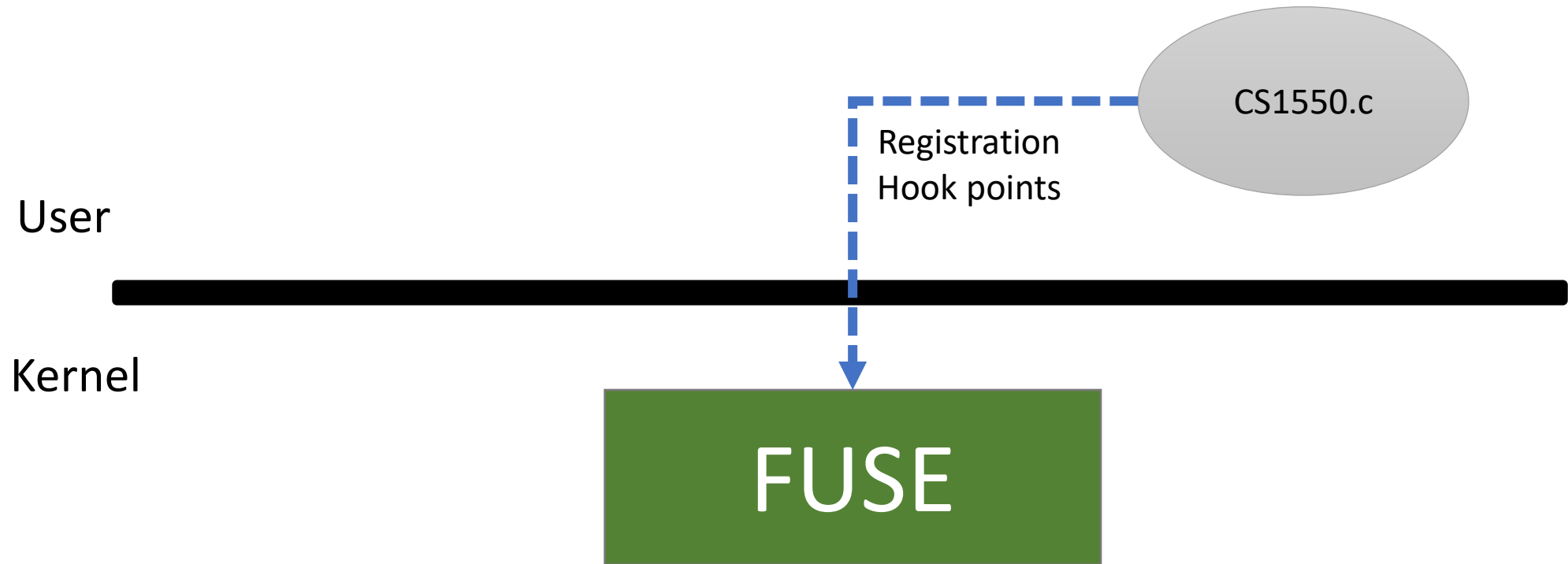
CS1550.c

Kernel

FUSE



Overview

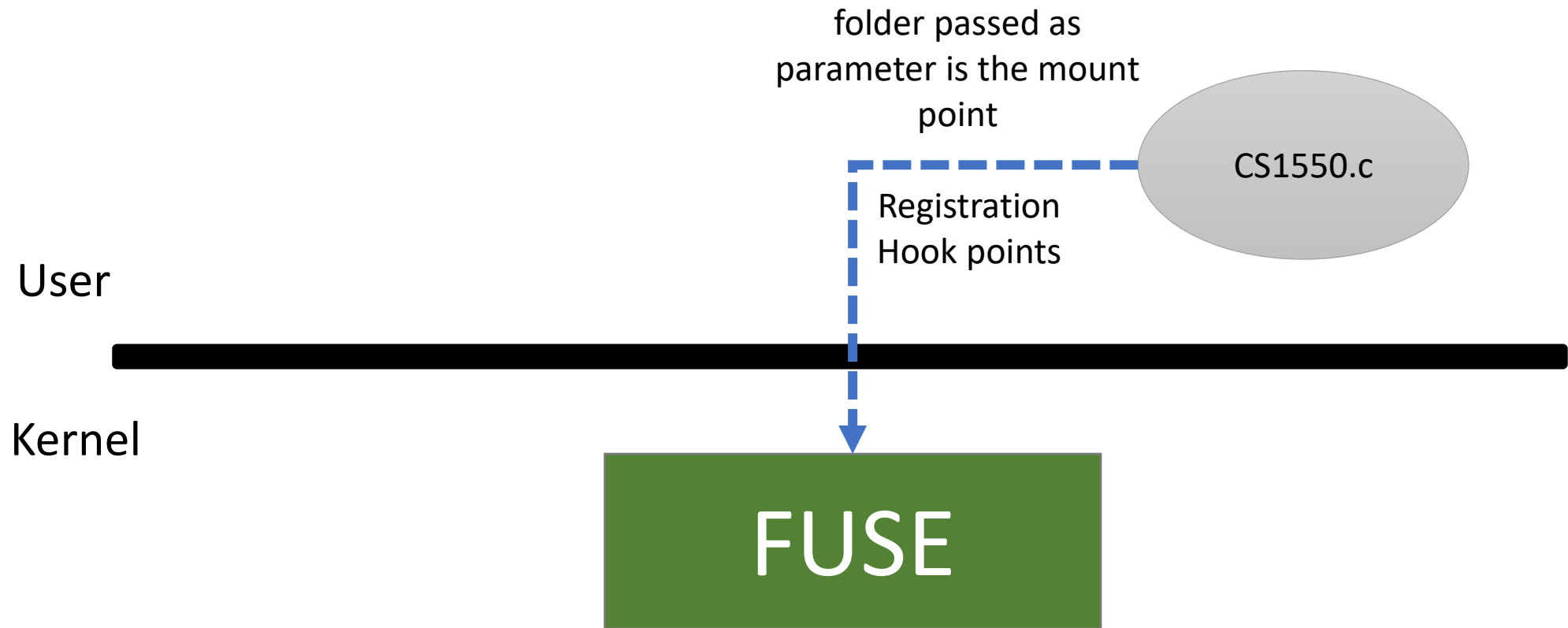


Overview

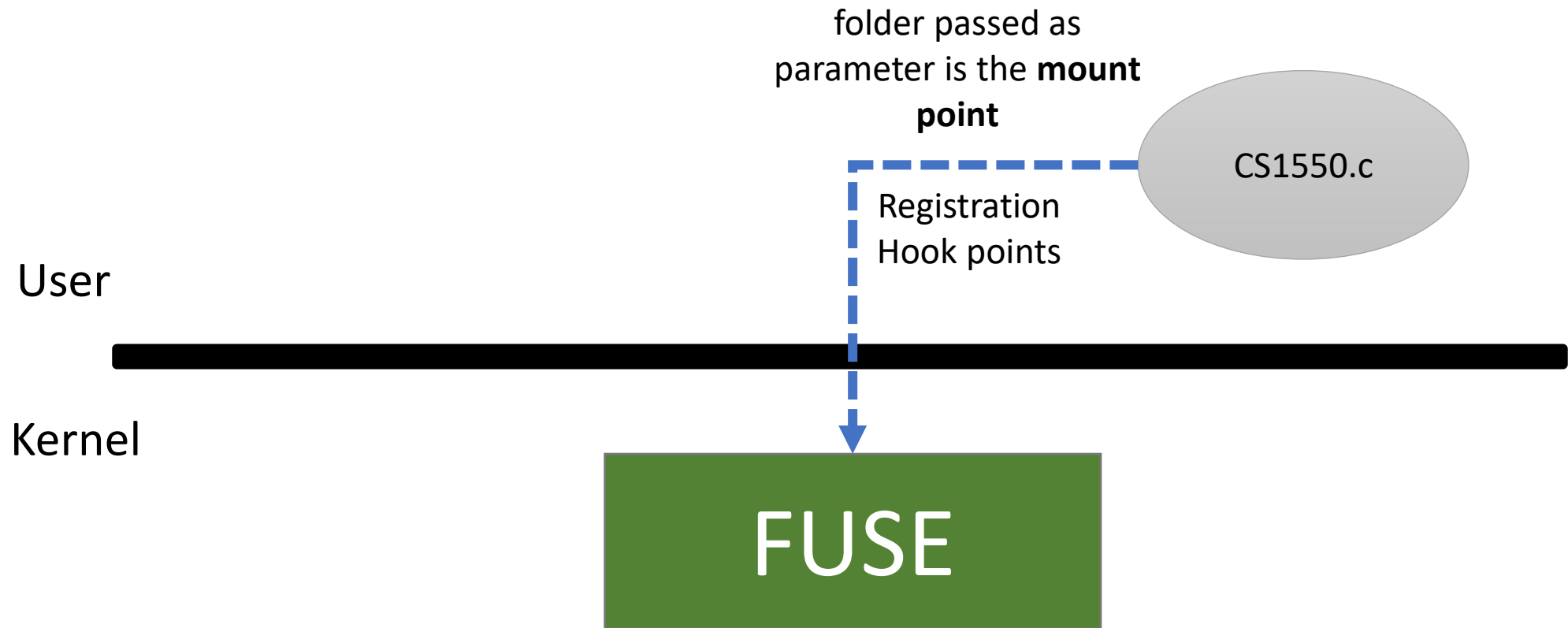
- In hello.c

```
static struct fuse_operations hello_oper = {  
    .getattr  = hello_getattr,  
    .readdir  = hello_readdir,  
    .open     = hello_open,  
    .read     = hello_read,  
};
```

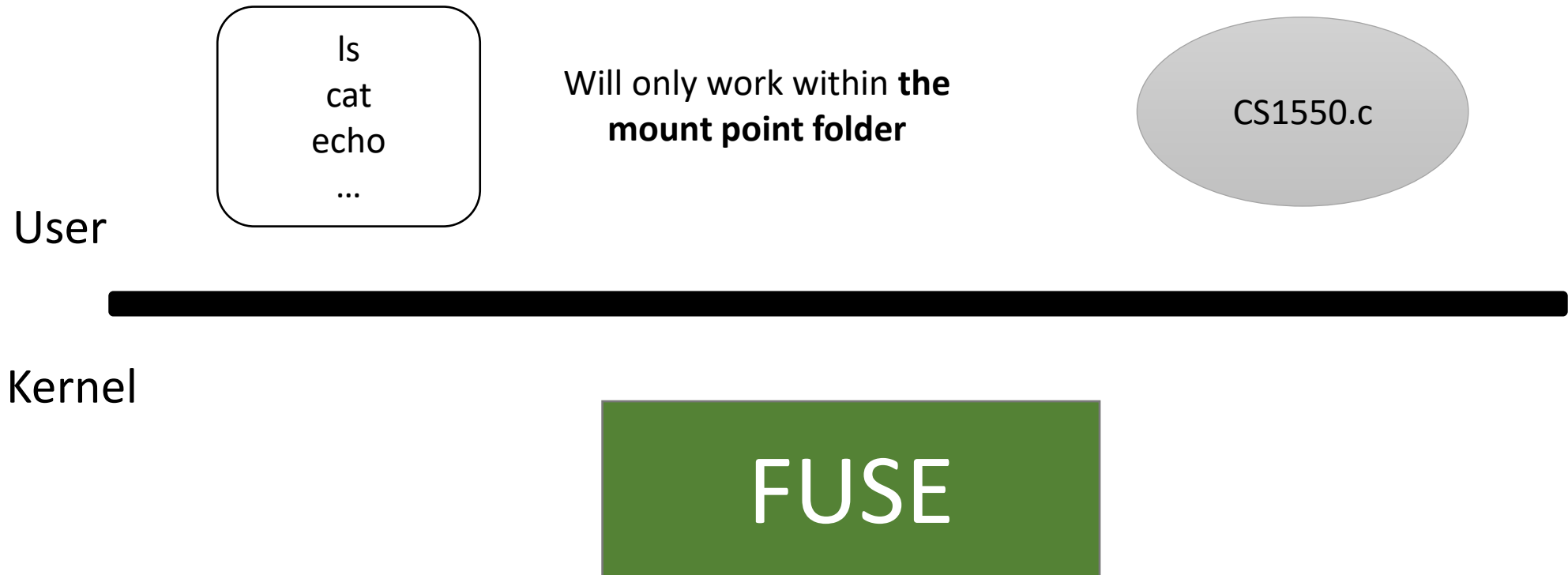
Overview



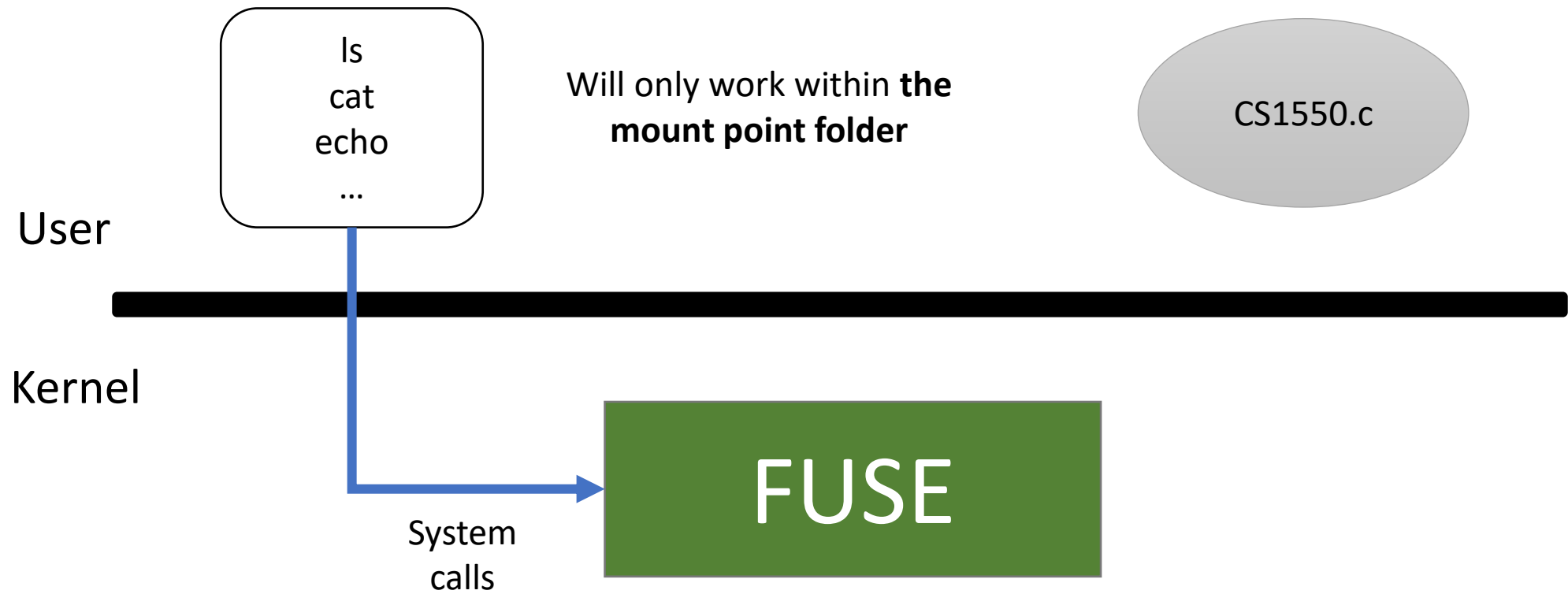
Overview



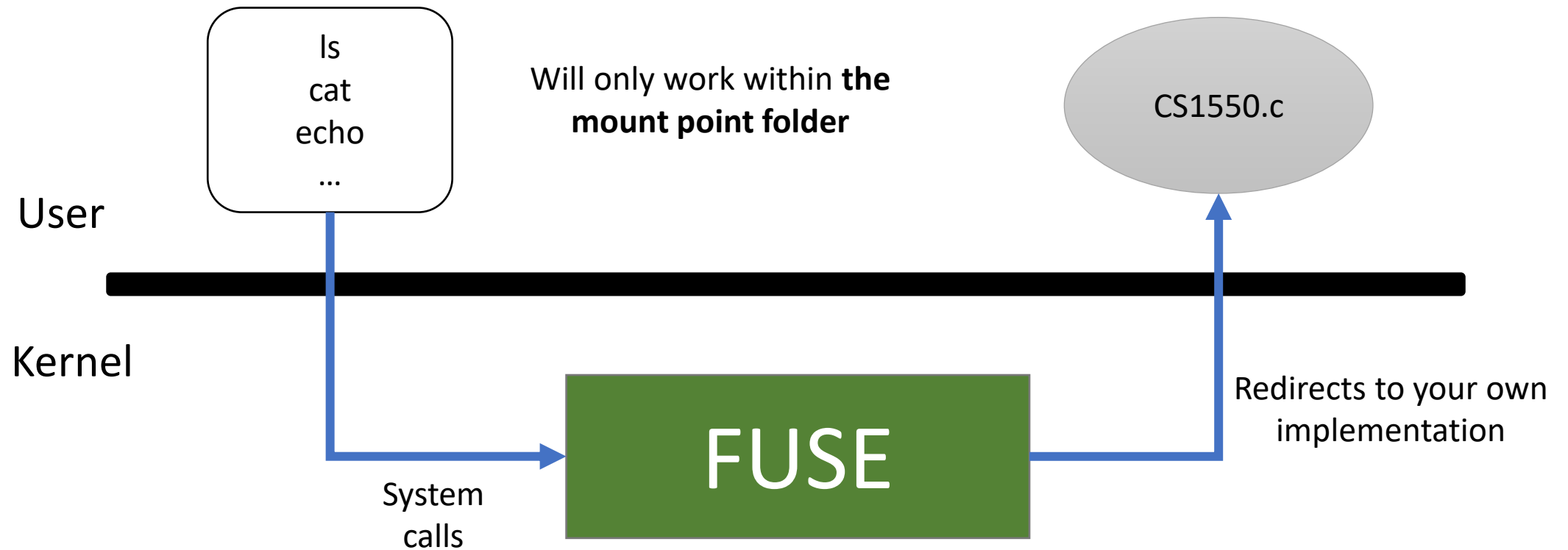
Overview



Overview



Overview



Installation of FUSE

- Install libraries and example programs

```
cd /u/OSLab/USERNAME
```

```
cp /u/OSLab/original/fuse-2.7.0.tar.gz .
```

```
tar xvfz fuse-2.7.0.tar.gz
```

```
cd fuse-2.7.0
```

```
./configure
```

```
make
```

Installation of FUSE

- Install libraries and example programs

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cd /u/OSLab/USERNAME
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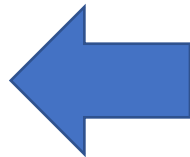
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```

```
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```

```
make
```



This compiles the examples.

FUSE Example

```
cd /u/OSLab/USERNAME/
```

FUSE Example

```
cd /u/OSLab/USERNAME/  
cd fuse-2.7.0/example
```

FUSE Example

```
cd /u/OSLab/USERNAME/
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```
cd fuse-2.7.0/example
```

```
mkdir testmount (create mount point)
```

A mount point is a location in the UNIX hierarchical file system where a new device or file system is located

FUSE Example

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cd /u/OSLab/USERNAME/
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```
cd fuse-2.7.0/example
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```
ls -al testmount
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FUSE Example

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./hello testmount
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FUSE Example

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cd /u/OSLab/USERNAME/
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```
ls -al testmount
```

```
./hello testmount
```

```
ls -al testmount
```

Should see . , .., hello

FUSE Example

- `fusermount -u testmount`

Unmount the file system we just used when we are done, or need to make changes to the program.

Always need to do unmount!

Setting up the Environment Variables

- `cd ~`
- `chmod u+w .bash_profile`
Gives you the write permission to `.bash_profile`
- `nano .bash_profile`
- Scroll down to the end of the file until you see the line:
“# Define your own private shell functions and other commends here”
- Add the following lines (spacing around '[' and ']' characters need to be there!)
if [“\$HOSTNAME” = “thoth.cs.pitt.edu”]; then
source /opt/set_specific_profile.sh;
fi
- Save the file and quit
- `chmod u-w .bash_profile`
- `.bash_profile` will not run until the next time you log in
- `source /opt/set_specific_profile.sh`

Debug Mode

- Testing is to launch a FUSE application with the `-d` option
 `./hello -d testmount`
 This will keep the program in the foreground, and it will print out every message that the application receives, and interpret the return values that you're getting back.
- Open a second terminal window and try your testing procedures.
- If you do a CTRL + C in the first window, you may not need to unmount the file system.
- **IMPORTANT:** if your program crashes or you abort it, you definitely need to do the `fusermount`. Otherwise, you will get a confusing "Transport endpoint not connected" message the next time you try to mount the system.

FUSE Example cont.

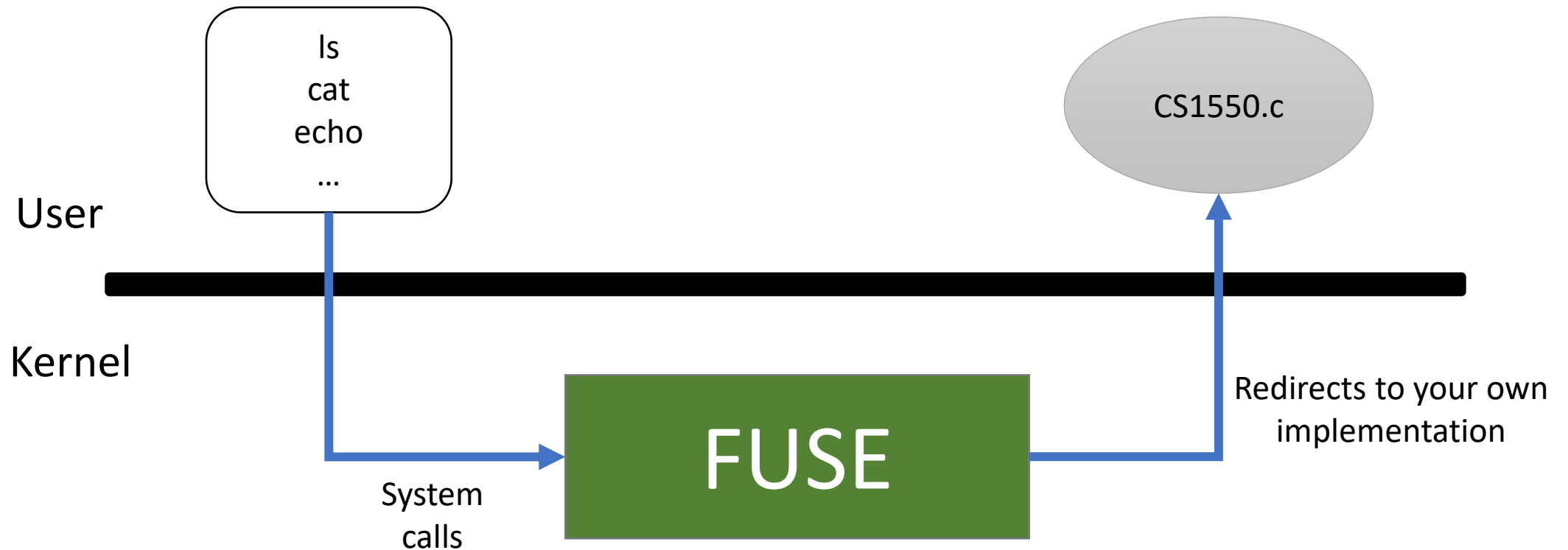
cat testmount/hello

- Hello world
- If we cat a file that doesn't really exist, how do we get meaningful output?

FUSE Example cont.

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- If we cat a file that doesn't really exist, how do we get meaningful output?



FUSE Example cont.

```
static int hello_read(const char *path, char *buf, size_t
size, off_t offset, struct fuse_file_info *fi)
{
    ...
}
```

FUSE Example cont.

```
static int hello_read(const char *path, char *buf, size_t
size, off_t offset, struct fuse_file_info *fi)
{
    ...
    if (offset < len) {
        ...
        memcpy(buf, hello_str + offset, size);
    } else
        size = 0;
    return size;
}
```

FUSE Example cont.

- Unmount the file system

fusermount -u testmount

What You Need To Do

- Create the **cs1550 file system** as a **FUSE application**

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What You Need To Do

- Create the cs1550 file system as a FUSE application
- A code skeleton has been provided under the FUSE zip examples directory as cs1550.c
- Automatically built when make
- Implement **using a single file**, named **.disk 512-byte blocks**



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