

Introduction to Operating Systems

What are Operating Systems?

COM S 352

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What are Operating Systems?

Question: What do you think of when you hear Operating System?



Example Program

```
public String read(FileReader fr) throws IOException {  
    return fr.read();  
}  
  
public void readFile(String fileName) throws IOException {  
    FileReader fr = new FileReader(fileName);  
    String str;  
  
    while ((str = read(fr)) != null) {  
        System.out.print(str + " ");  
    }  
  
    fr.close();  
}  
  
...
```

Problem: What to Do When Waiting for I/O?

Example Program

```
public String read(FileReader fr) throws IOException {  
    while (!fr.readyToRead()) {  
        // not ready so find some other process that is ready to run  
        for (var p : processes) {  
            if (p.readyToRun()) {  
                p.run();  
            }  
        }  
    }  
    return fr.read();  
}  
  
public void readFile(String fileName) throws IOException {  
    FileReader fr = new FileReader(fileName);  
    String str;  
  
    while ((str = read(fr)) != null) {  
        System.out.print(str + " ");  
    }  
  
    fr.close();  
}  
  
...
```

Problem: How to Stop Process Hogging CPU?

Example Program

```
public String read(FileReader fr) throws IOException {
    return fr.read();
}

public void readFile(String fileName) throws IOException {
    FileReader fr = new FileReader(fileName);
    String str;

    while ((str = read(fr)) != null) {
        System.out.print(str + " ");

        // check if some other process that is ready to run
        for (var p : processes) {
            if (p.readyToRun()) {
                p.run();
            }
        }
    }

    fr.close();
}

...
```

CPU Virtualization

Programs are written with the assumption they are the only thing running on the CPU

The OS presents a virtual CPU

A topic of this class will be how the OS provides CPU virtualization

Problem: Where do Variables go in Memory?

Example Program

```
public void readFile(String fileName) throws
IOException {
    // #0x0000FFAABB9900
    FileReader fr = new FileReader(fileName);

    String str;

    while ((str = read(fr)) != null) {
        System.out.print(str + " ");
    }

    fr.close();
}
```

Memory Virtualization

Programs are written with the assumption they can write anywhere in memory

The OS presents a virtual address space that is mapped somewhere in physical memory

A topic of this class will be how the OS provides memory virtualization