Some system calls related to files

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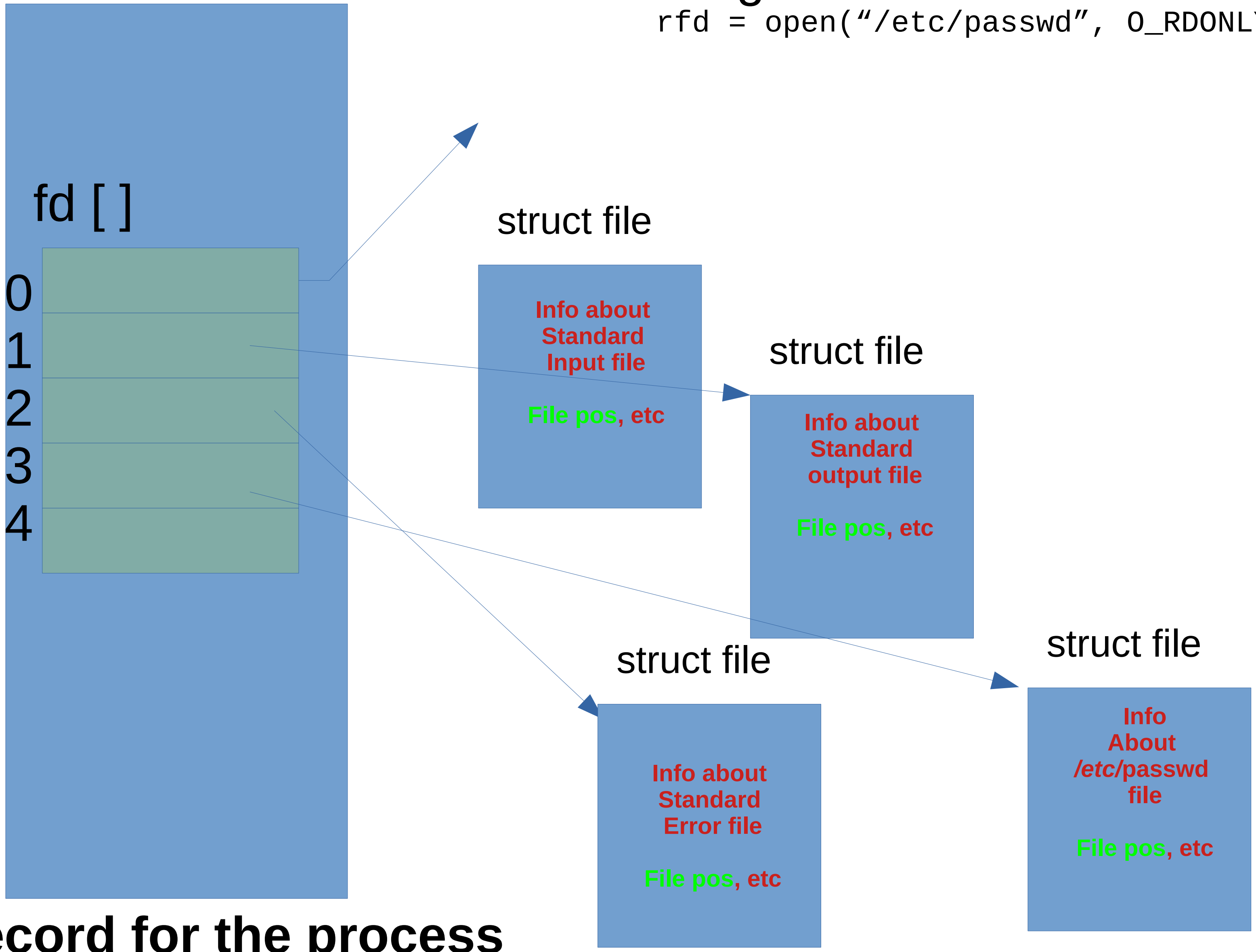
System Calls

- Kernel provided functions
- Run in Kernel mode
- Essentially invoked through the Software Interrupt instruction (“INT”)
  - INT -> Lookup in IVT -> jump to kernel code

List of open files

Program did

```
rfd = open("/etc/passwd", O_RDONLY)
```


fd [ ]
0
1
2
3
4
struct file
Info about Standard Input file
File pos, etc
struct file
Info about Standard output file
File pos, etc
struct file
Info about Standard Error file
File pos, etc
struct file
Info About /etc/passwd file
File pos, etc

In kernel, record for the process

File system related system calls

- To get permission to “access” the file
  - open()
- To read sequentially from a file that has ben open() ed
  - read()
- To write sequetially to a file that has been open() ed
  - write()
- To change “file position” anywhere
  - lseek()
- To release access to the file
  - close()
- More: dup(), dup3(), fcntl(), flock(), lockf(), ...

Example: cat program

```
int main(int argc, char *argv[]) {
    int fd;
    char ch;
    fd = open(argv[1], O_RDONLY);
    if(fd == -1) {
        perror("mycat: ");
        exit(errno);
    }
    while(read(fd, &ch, 1))
        putchar(ch);
    return 0;
}
```

Example: cp program

```
    int fd, fdw;
    char ch;
    fd = open(argv[1], O_RDONLY);
    if(fd == -1) {
        perror("open failed:");
        return errno;
    }
    fdw = open(argv[2], O_WRONLY | O_CREAT,
S_IRUSR);
    if(fdw == -1) {
        perror("open failed:");
        return errno;
    }
    while(read(fd, &ch, 1))
        write(fdw, &ch, 1);
    return 0;
```

Standard file descriptors

- stdin (0), stdout(1), stderr(2)
- Already open when a process begins
- Can be closed!
- stdin
  - Read from keyboard
- stdout, stderr
  - Write to screen, but two different “streams”

Standard file descriptors

- Stdin(0)

  ch= getchar();

  is equivalent to

  read(0, &ch, 1);

- Stdout(1)

  printf(“hello”)

  is equivalent to

  write(1, “hello”, 5);

- Stderr(2)

  fprintf(stderr, ‘hello’)

  is equivalent to

  write(2, “hello”, 5);

Redirection

- Output redirection

```
close(1);
fd = open(...., O_WRONLY);
```

- Input redirection

```
close(0);
fd = open(...., O_RDONLY);
```

dup()

- Duplicates a file descriptor
  - Essentially the “struct file *” in the kernel fdarray is copied !
- Example

```
fd = open(..., O_RDONLY);
close(0);
dup(fd);
```