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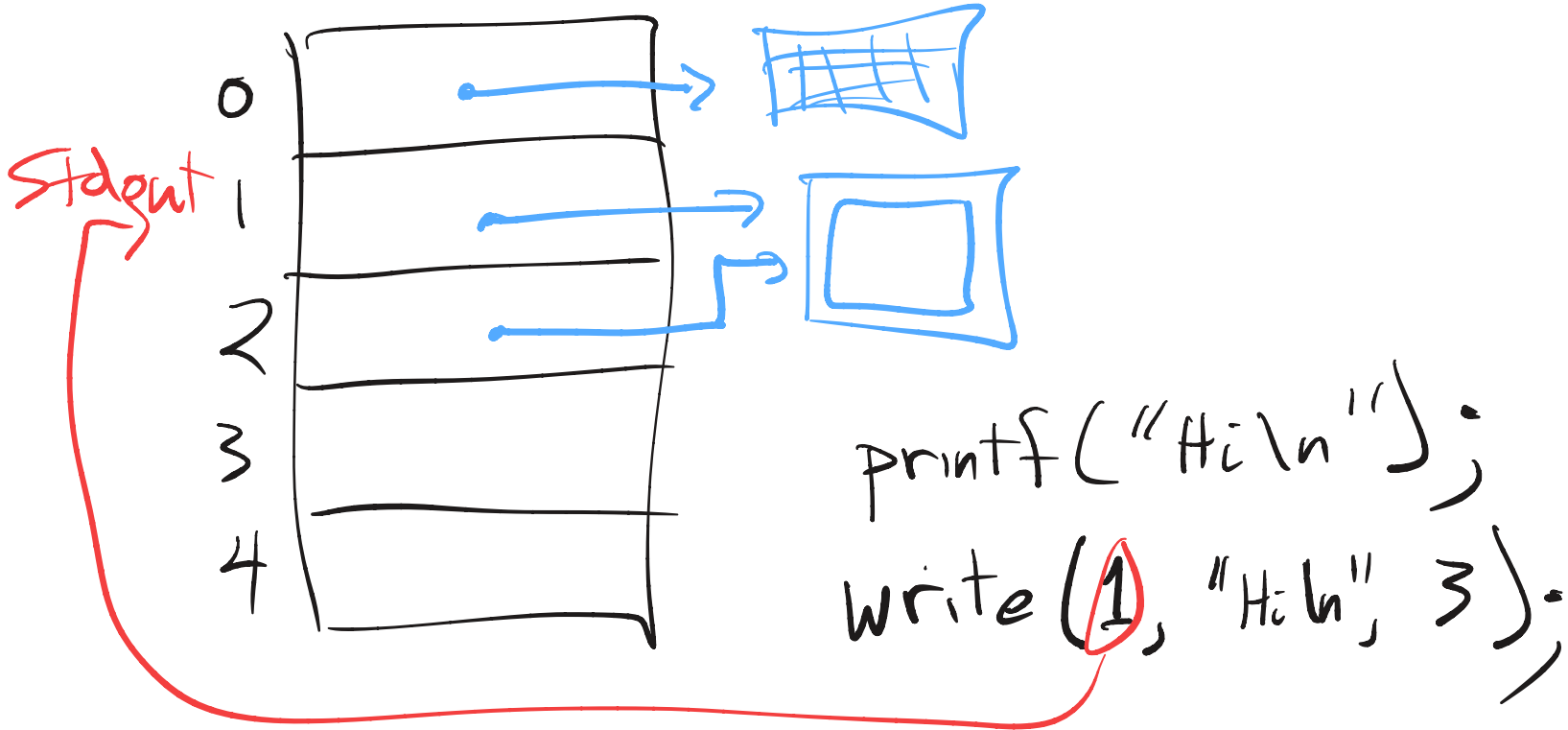
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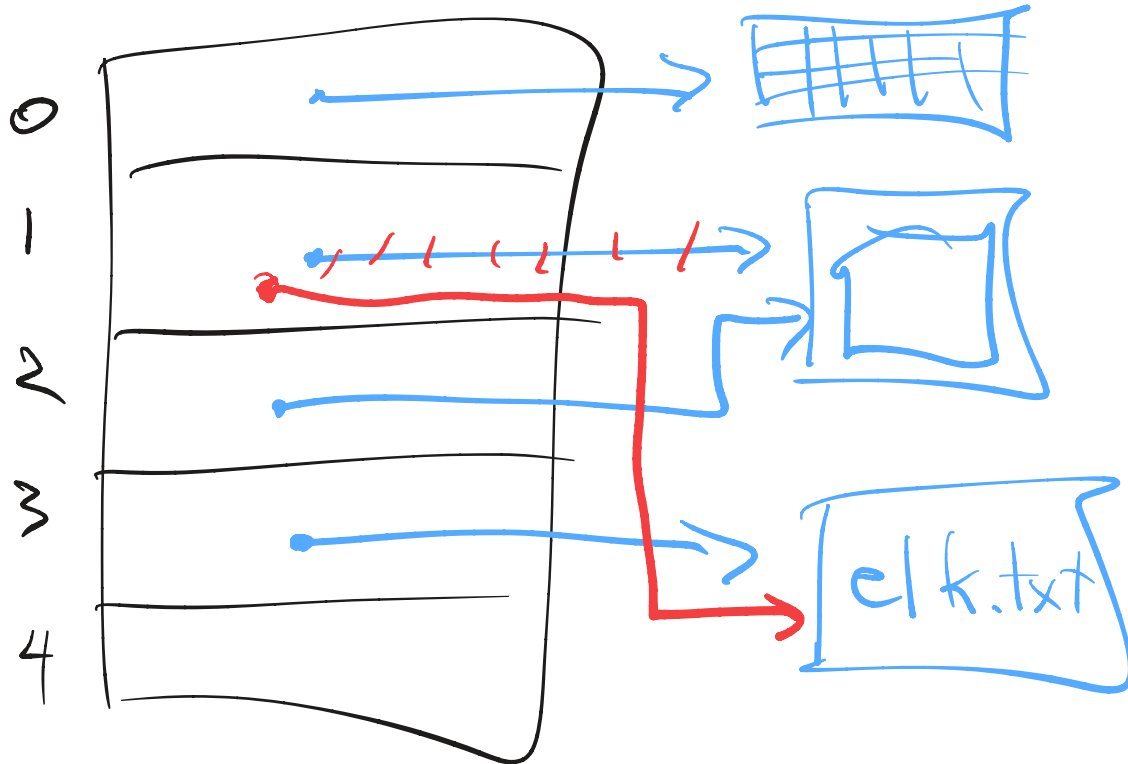
CS 208

F, 15 May 2026

# file descriptor table



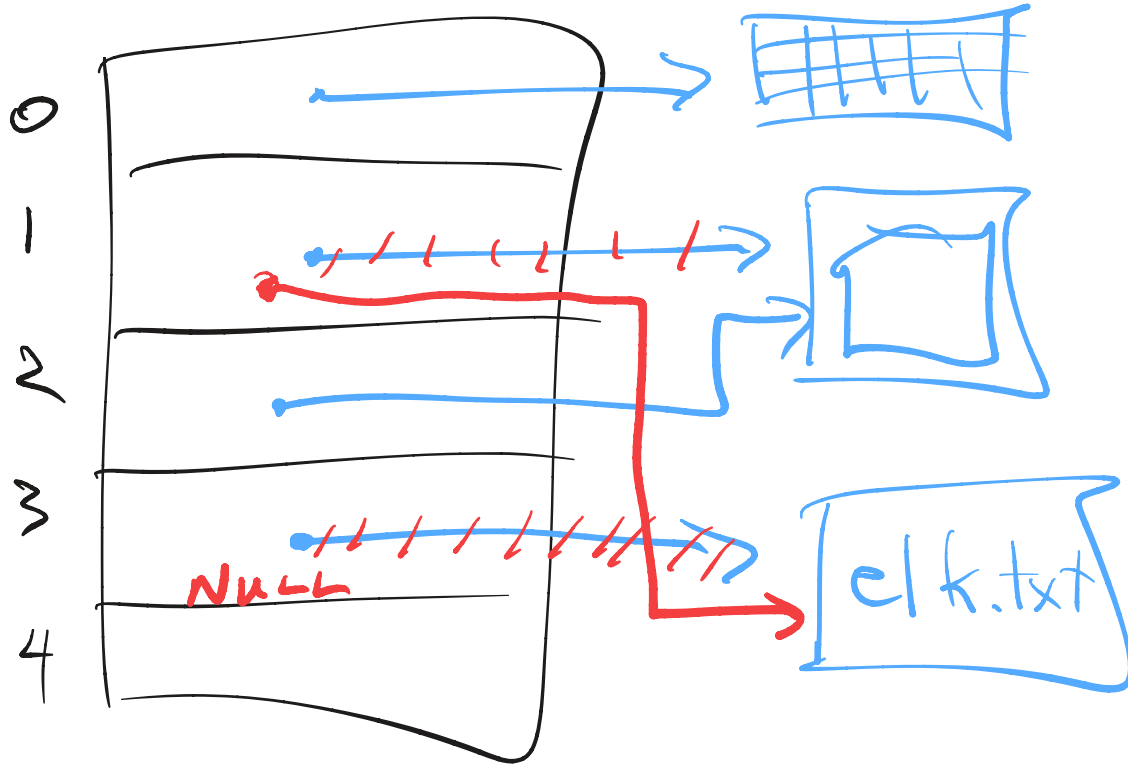
# redirect.c



`dup2(3, 1);`  
copy ptr in  
slot 3  
to slot 1

`printf("hi") ~ write(1, "hi", 2) ~ write to elk.txt`

# redirect.c



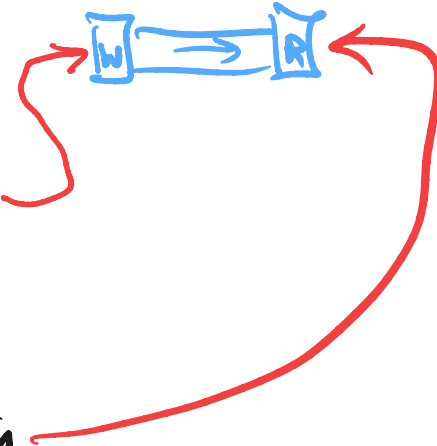
```
dup2(3, 1);  
close(3);
```

our  
shell

ls -l | wc -l

parent (shell 208)

- ' create pipe
- ' fork child1
  - ' redirect stdout
  - ' close stuff
  - ' execvp ls -l
- ' fork child2
  - ' redirect stdin
  - ' close
  - ' execvp wc -l
- ' close
- ' wait
- ' wait



# Alternative

parent

fork child1

create pipe

redirect stdout to pipe

fork child2

redirect stdin  
close

exec wc -l

close

exec ls -l

wait

When does the  
prompt come  
back?

messier code  
structure

Zombies



# What's a Pipe?

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operations: write bytes to the write-end  
read " " " read-end

queue

lock

—

don't want writing  
process + reading  
process to mess w/  
queue simultaneously

can lead to  
queue corruption → race  
condition