

sleep" $\left[\begin{array}{l} \text{cal -m4} \rightarrow \text{cat} \rightarrow \text{WC} \end{array} \right]$ | $\left. \begin{array}{l} \text{echo "hi"} \\ \text{cat} \end{array} \right\} \begin{array}{l} \text{cal -m4} > \text{my pipe} \\ \text{cat} < \text{my pipe} \end{array}$

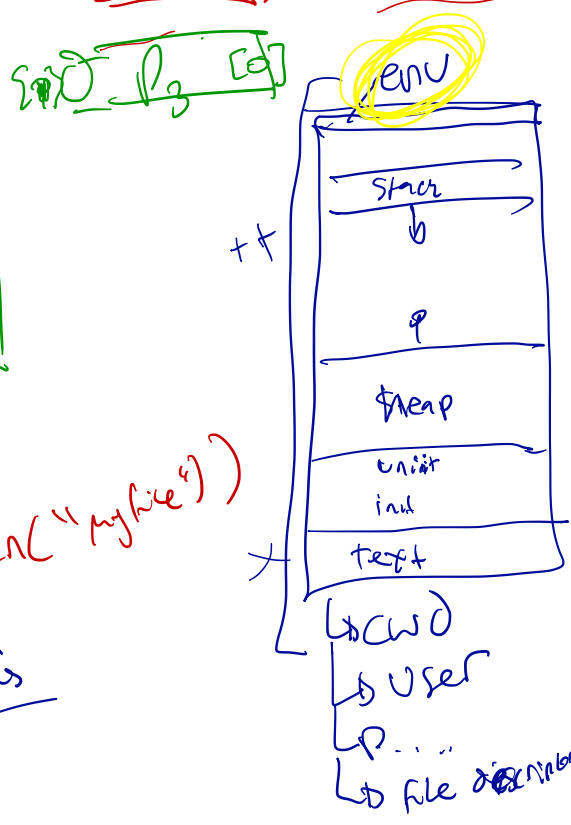
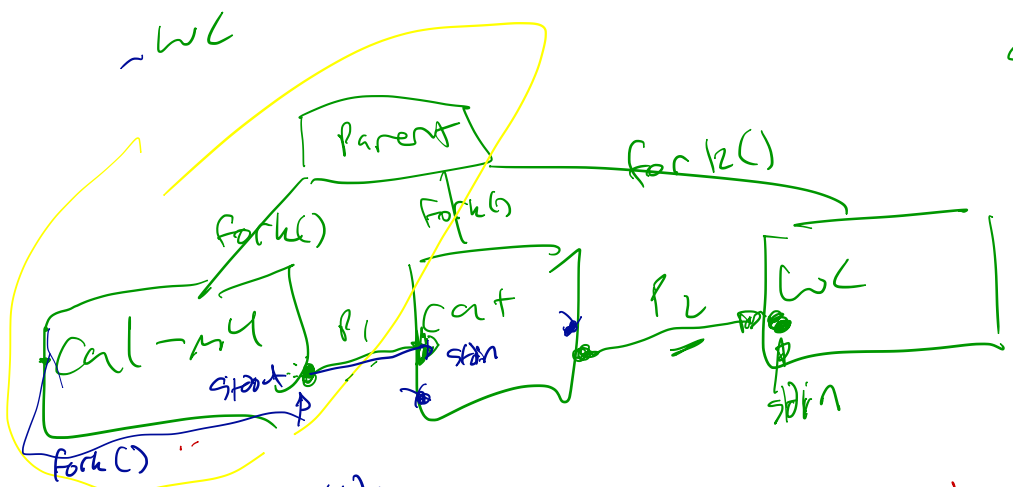
- Cal PIPE
- Cat PIPE
- WC

num pipes = 2

$[i3] [o3]$
 $[i2] [o2]$

$[i1] [o1]$

$[i0] [o0]$



```

Parent wait(NULL);
child: close(p1[0]); close(p2[0]);
close(...); // close(1)
dup(p1[1]);
dup2(p1[1], STDOUT_FILENO);
close(p1[1]);
execvp("cat", {"cat", "-m4", NULL});
  
```

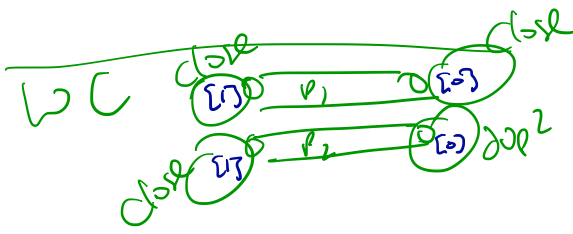
$\text{dup2}(\text{open}(\text{"myfile"}))$

stdin/stdout streams



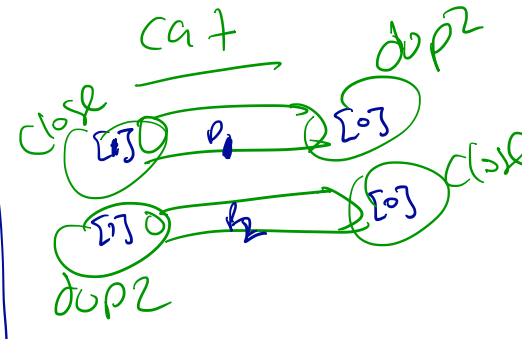
Parent: $\text{wait}(\text{NULL});$ ✓
 $\text{wait}(\text{pid})$ ✓
 * 0 -- pid
 * 0 -- until sees child
 * -1 -- any child

WNOHANG - if not finished keep going wait but don't block
WUNTRACED -



```

Parent
wait(NULL);
close(p1[0]); (p1[0])
close(p2[0]); (p2[0])
  
```



```

execvp("cat", {"cat", "-m4", NULL});
  
```

execvp(...)