

# Pipes 1

COMS10012 / COMSM0085

Software Tools

# standard IO

# Unix Philosophy

It is easier to maintain 10 small programs than one large program. Therefore,

1. Each program should do one thing well.
2. Programs should be able to cooperate to perform larger tasks.
3. The universal interface between programs should be a text stream.

# source

```
#include <stdio.h>
// gives stdin etc.
// fread, fwrite, FILE* - C abstraction
#include <unistd.h>
// pulls in /usr/include/sys/unistd.h
// read, write - POSIX abstraction
#define STDIN_FILENO      0
#define STDOUT_FILENO     1
#define STDERR_FILENO     2
```

# standard input/output

Internally, programs read(fd, buffer, size) and write(fd, buffer, size).

Each program starts with three file descriptors open:

0 = standard input

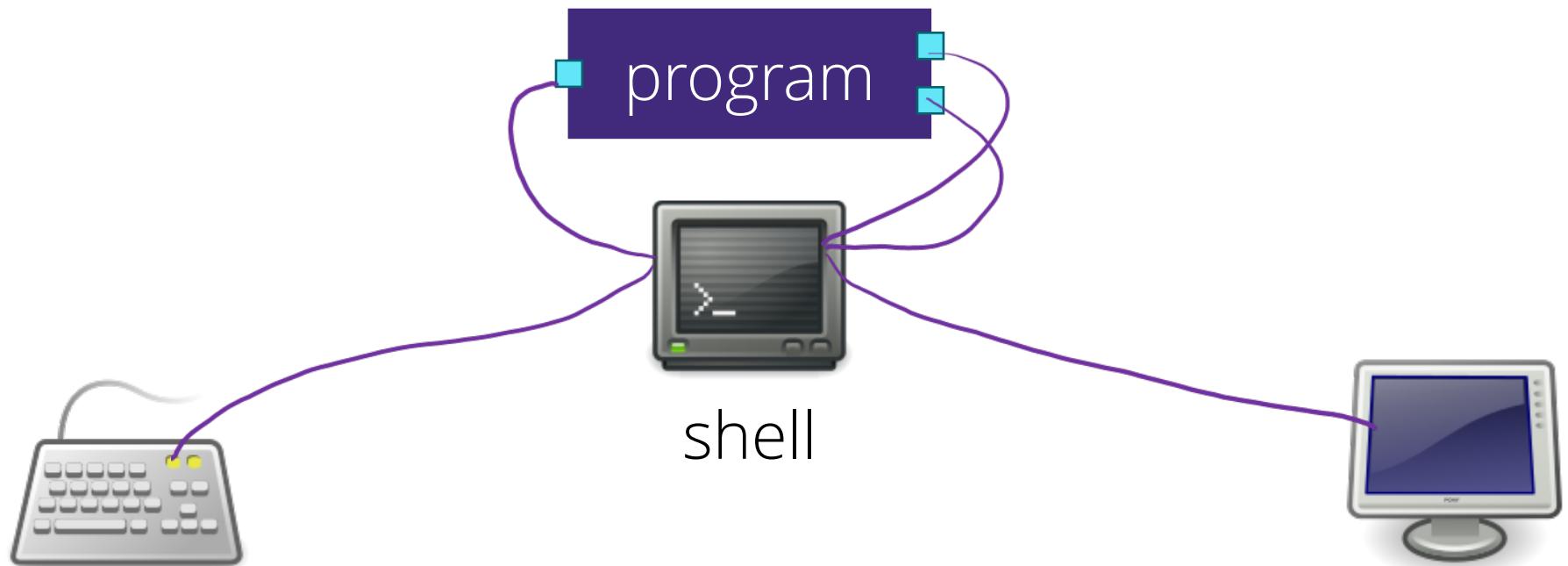
1 = standard output

2 = standard error



# standard input/output

Running a program in the terminal:



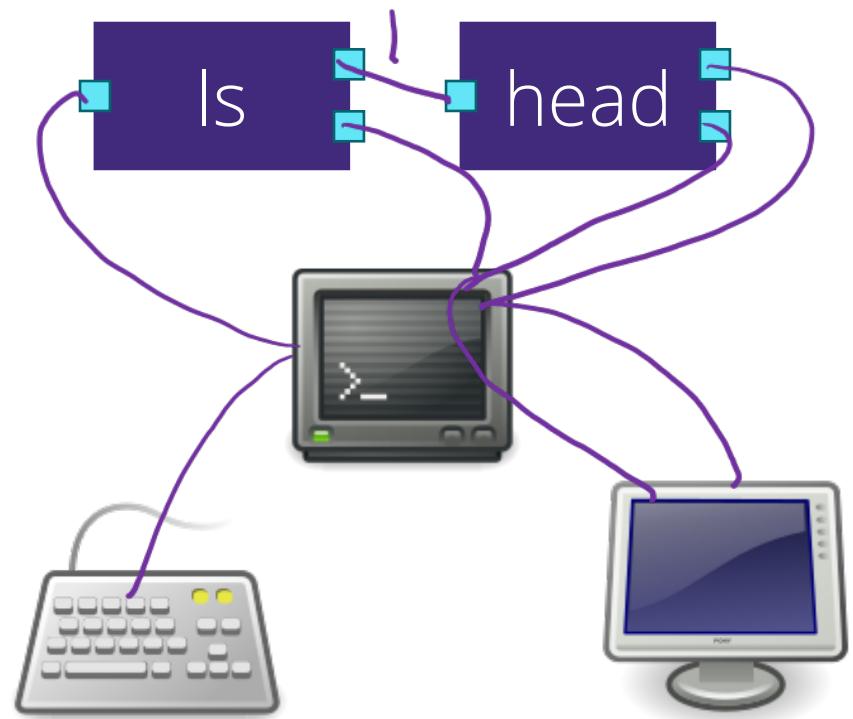
# pipes

# pipe

```
$ ls -1 | head
```

head [-n NUM]

tail [-n NUM]



# pipe

```
$ ls -1 | grep software | sort -r
```

grep: "global regular expression parser"

sort: read all lines into buffer, sort,  
output

uniq: remove duplicates immediately following  
best used as: command | sort | uniq

# grep

```
$ grep PATTERN FILENAMES
```

```
$ grep -nHi PATTERN FILENAMES
```

```
$ grep [OPTIONS] PATTERN
```

# sort

```
$ sort
```

aaa

ccc

bbb

**^D**

aaa

bbb

ccc

\$

