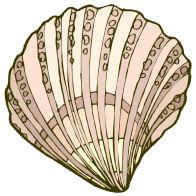
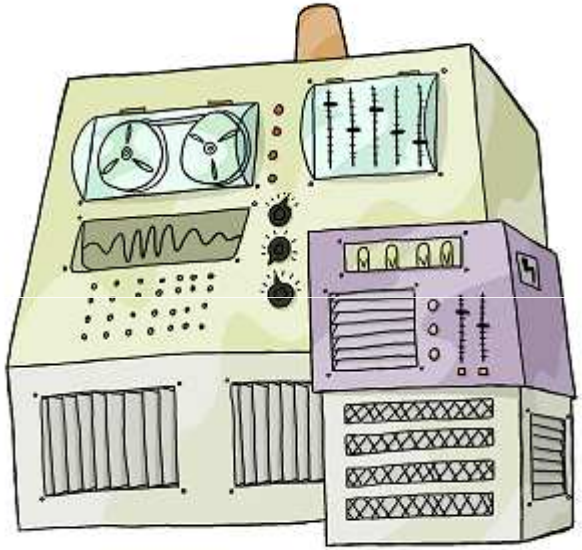
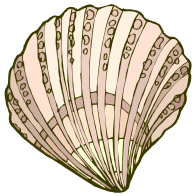
The Unix Shell

Job Control



shell





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```
$ wc -l *.pdb | sort | head -1
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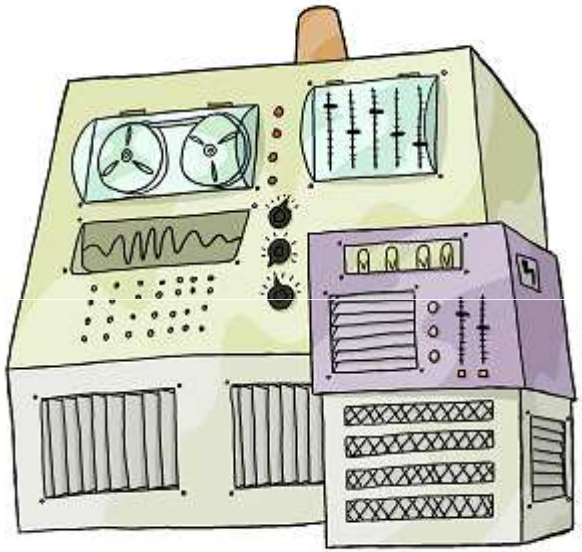

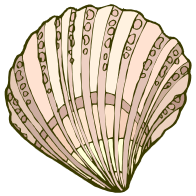

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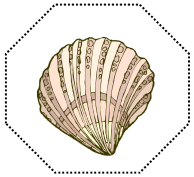

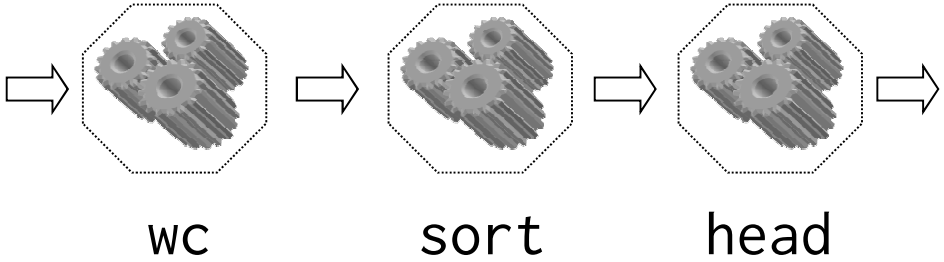

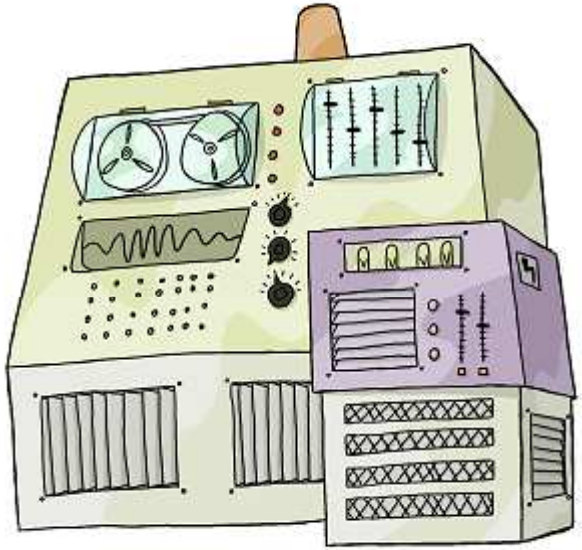

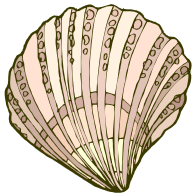

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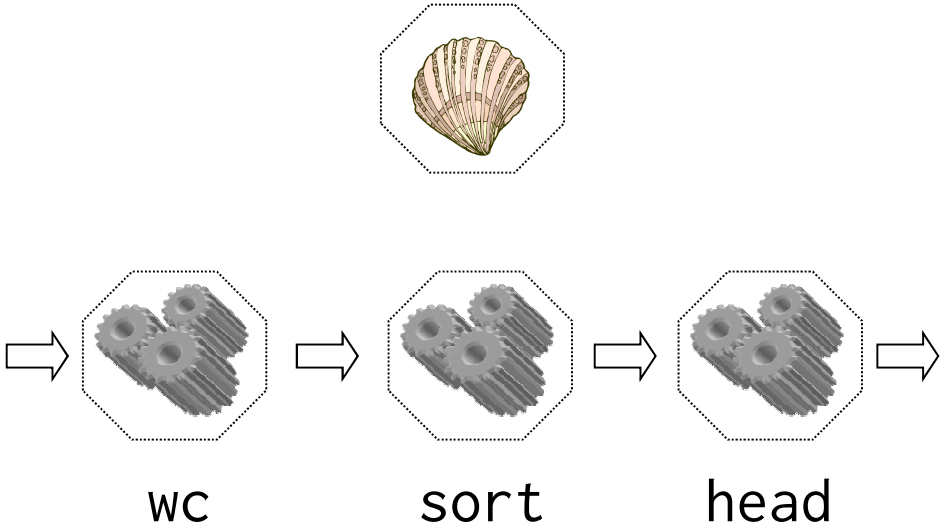
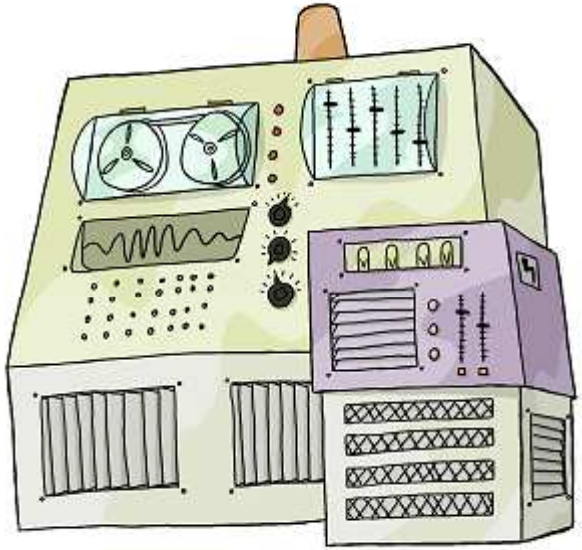
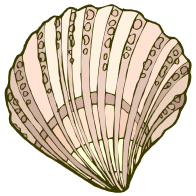




Control programs while they run



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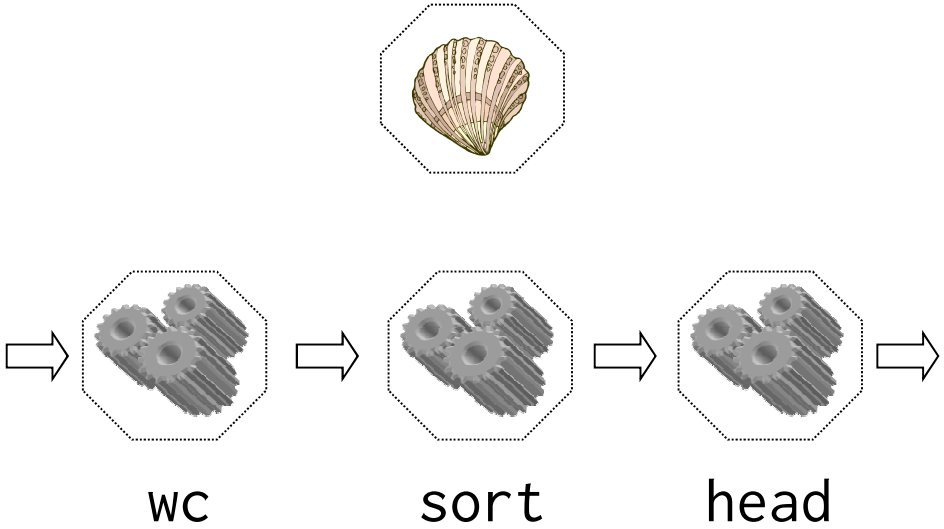

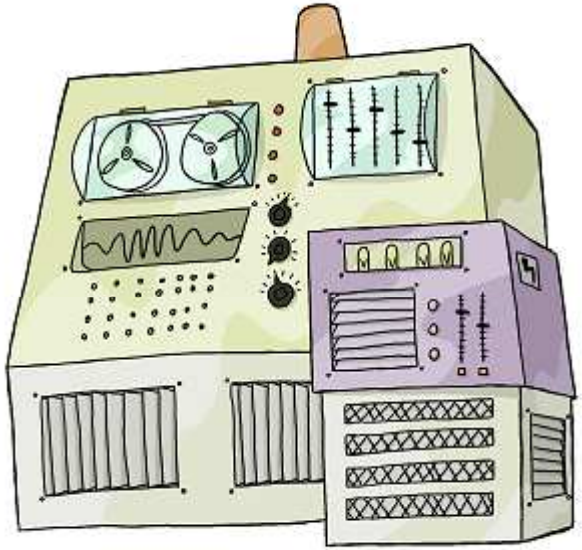

processes

Control ~~programs~~ while they run

A *process* is a running program

A *process* is a running program

Some are yours

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Most belong to the operating system (or other users)

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Use `ps` to get a list

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Most belong to the operating system (or other users)

Use `ps` to get a list

```
$ ps
PID     PPID    PGID    TTY    UID      STIME    COMMAND
2152       1    2152    con   1000   13:19:07    /usr/bin/bash
2276    2152    2276    con   1000   14:53:48    /usr/bin/ps
$
```

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PID     PPID    PGID    TTY    UID      STIME    COMMAND
2152       1    2152    con   1000   13:19:07    /usr/bin/bash
2276    2152    2276    con   1000   14:53:48    /usr/bin/ps
$
```

Process ID (unique at any moment)

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2152       1    2152    con   1000   13:19:07    /usr/bin/bash
2276    2152    2276    con   1000   14:53:48    /usr/bin/ps
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```

Parent process ID

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$
```

Parent process ID

What process created this one?

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```
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PID     PPID    PGID    TTY    UID      STIME    COMMAND
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2276    2152    2276    con   1000   14:53:48    /usr/bin/ps
$
```

Process group ID

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```
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PID     PPID    PGID    TTY    UID      STIME    COMMAND
2152       1    2152    con   1000   13:19:07    /usr/bin/bash
2276    2152    2276    con   1000   14:53:48    /usr/bin/ps
$
```

What terminal (TTY) is it running in?

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PID     PPID    PGID    TTY    UID      STIME    COMMAND
2152       1    2152    con   1000   13:19:07    /usr/bin/bash
2276    2152    2276    con   1000   14:53:48    /usr/bin/ps
$
```

What terminal (TTY) is it running in?

'?' indicates a system service (no TTY)

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```
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PID     PPID    PGID    TTY    UID      STIME    COMMAND
2152       1    2152    con   1000   13:19:07    /usr/bin/bash
2276    2152    2276    con   1000   14:53:48    /usr/bin/ps
$
```

The user ID of the process's owner

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```
$ ps
PID     PPID    PGID    TTY    UID      STIME    COMMAND
2152       1    2152    con   1000   13:19:07    /usr/bin/bash
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$
```

The user ID of the process's owner

Controls what the process can read, write, execute, ...

A *process* is a running program

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Use `ps` to get a list

```
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PID     PPID    PGID    TTY    UID     STIME     COMMAND
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2276    2152    2276    con   1000   14:53:48   /usr/bin/ps
$
```

When the process was started

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```
$ ps
PID     PPID    PGID    TTY    UID      STIME    COMMAND
2152       1    2152    con   1000   13:19:07    /usr/bin/bash
2276    2152    2276    con   1000   14:53:48    /usr/bin/ps
$
```

The program the process is executing

Can stop, pause, and resume running processes

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
```

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
```

...a few minutes pass...

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
...a few minutes pass...
^C
$
```

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
...a few minutes pass...
^C
$
```

Stop the running program

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
...a few minutes pass...
^C
$ ./analyze results*.dat &
$
```

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
...a few minutes pass...
^C
$ ./analyze results*.dat &
$
```

Run in the background

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
...a few minutes pass...
^C
$ ./analyze results*.dat &
$
```

Run in the *background*

Shell returns right away instead of waiting for the program to finish

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
...a few minutes pass...
^C
$ ./analyze results*.dat &
$ fbcmd events
$
```

Can run other programs in the *foreground*
while waiting for background process(es) to finish

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
...a few minutes pass...
^C
$ ./analyze results*.dat &
$ fbcmd events
$ jobs
[1] ./analyze results01.dat results02.dat results03.dat
$
```

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
...a few minutes pass...
^C
$ ./analyze results*.dat &
$ fbcmd events
$ jobs
[1] ./analyze results01.dat results02.dat results03.dat
$
```

Show background processes

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
...a few minutes pass...
^C
$ ./analyze results*.dat &
$ fbcmd events
$ jobs
[1] ./analyze results01.dat results02.dat results03.dat
$ fg
```

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
...a few minutes pass...
^C
$ ./analyze results*.dat &
$ fbcmd events
$ jobs
[1] ./analyze results01.dat results02.dat results03.dat
$ fg
```

Bring background job to foreground

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
...a few minutes pass...
^C
$ ./analyze results*.dat &
$ fbcmd events
$ jobs
[1] ./analyze results01.dat results02.dat results03.dat
$ fg
```

Bring background job to foreground

Use `fg %1`, `fg %2`, etc. if there are several background jobs

Can stop, pause, and resume running processes

```
$ ./analyze results*.dat
...a few minutes pass...
^C
$ ./analyze results*.dat &
$ fbcmd events
$ jobs
[1] ./analyze results01.dat results02.dat results03.dat
$ fg
...a few minutes pass...
$
```

← And finally it's done

Use `^Z` to pause a program that's already running

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`fg` to resume it in the foreground

Use `^Z` to pause a program that's already running

`fg` to resume it in the foreground

Or `bg` to resume it as a background job

Use `^Z` to pause a program that's already running

`fg` to resume it in the foreground

Or `bg` to resume it as a background job

```
$ ./analyze results01.dat
```

Use `^Z` to pause a program that's already running

`fg` to resume it in the foreground

Or `bg` to resume it as a background job

```
$ ./analyze results01.dat
^Z
[1]  Stopped   ./analyze results01.dat
$
```

Use `^Z` to pause a program that's already running

`fg` to resume it in the foreground

Or `bg` to resume it as a background job

```
$ ./analyze results01.dat
^Z
[1]  Stopped   ./analyze results01.dat
$ bg %1
$
```

Use `^Z` to pause a program that's already running

`fg` to resume it in the foreground

Or `bg` to resume it as a background job

```
$ ./analyze results01.dat
^Z
[1]  Stopped   ./analyze results01.dat
$ bg %1
$ jobs
[1] ./analyze results01.dat
$
```

Use `^Z` to pause a program that's already running

`fg` to resume it in the foreground

Or `bg` to resume it as a background job

```
$ ./analyze results01.dat
^Z
[1]  Stopped   ./analyze results01.dat
$ bg %1
$ jobs
[1] ./analyze results01.dat
$ kill %1
$
```

Job control mattered a lot when users only had one terminal window

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Less important now: just open another window

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Less important now: just open another window

Still useful when running programs remotely

software carpentry

created by

Greg Wilson

August 2010