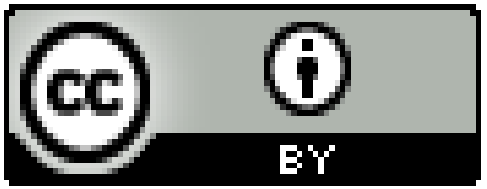
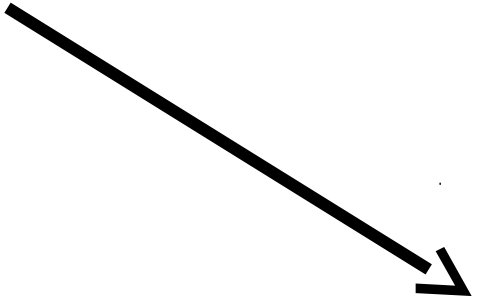
The Unix Shell

Advanced Shell Tricks



"How should I do this?"



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"There's an app for that… check this out!"

"How should I do this?"

With smartphones, you'll often hear people say something like

"There's an app for that… check this out!"

Whereas Unix shell programmers will say

"There's a shell trick for that… check this out!"

In previous episodes, we've seen how to:

– Combine existing programs using pipes & filters

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

In previous episodes, we've seen how to:

- Combine existing programs using pipes & filters
- Redirect output from programs to files

```
$ wc –l *.pdb > lengths
```

In previous episodes, we've seen how to:

- Combine existing programs using pipes & filters
- Redirect output from programs to files
- Use variables to control program operation

```
$ SECRET_IDENTITY=Dracula
$ echo $SECRET_IDENTITY
Dracula
```

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- Redirect output from programs to files
- Use variables to control program operation

Very powerful when used together

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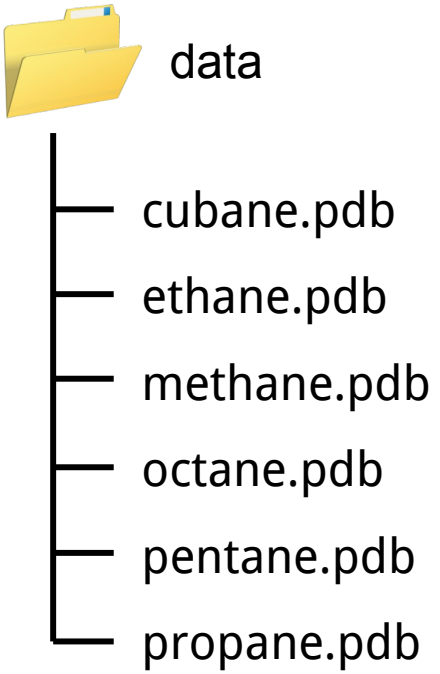
But there are other useful things we can do with these – let's take a look...

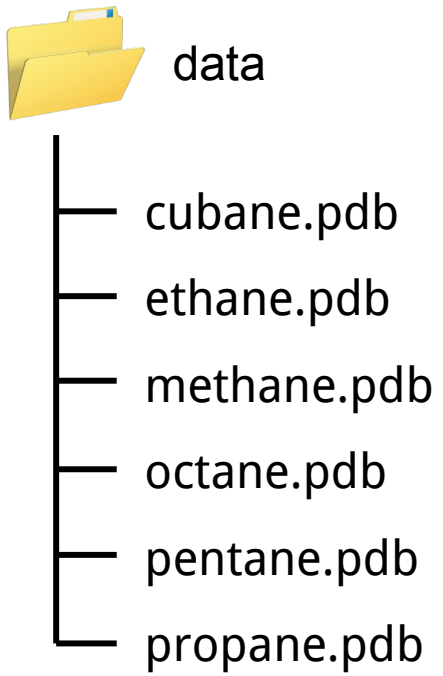
First, let's revisit redirection...



First, let's revisit redirection...

```
$ ls *.pdb > files
```

← list all pdb files
redirect to a file



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← list all pdb files
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The 'redirection' operator

data

- cubane.pdb
- ethane.pdb
- methane.pdb
- octane.pdb
- pentane.pdb
- propane.pdb

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- heptane.ent
- hexane.ent
- nonane.ent
- decane.ent

First, let's revisit redirection...

```
$ ls *.pdb > files
```

← list all pdb files redirect to a file

But what about adding this together with other results generated later?

```
$ ls *.ent > more-files
```

data

- cubane.pdb
- ethane.pdb
- methane.pdb
- octane.pdb
- pentane.pdb
- propane.pdb
- butane.ent
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$ ls *.pdb > files
```

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redirect to a file

But what about adding this together with other results generated later?

```
$ ls *.ent > more-files
```

We just want the ent files

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- cubane.pdb
- ethane.pdb
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First, let's revisit redirection...

```
$ ls *.pdb > files
```

list all pdb files
redirect to a file

But what about adding this together with other results generated later?

```
$ ls *.ent > more-files
$ cat files more-files > all-files
```

append files into a single new file

data

- cubane.pdb
- ethane.pdb
- methane.pdb
- octane.pdb
- pentane.pdb
- propane.pdb
- butane.ent
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But what about adding this together with other results generated later?

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$ ls *.ent > more-files
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```

← append files into a single new file

Instead, we can do...

```
$ ls *.ent >> files
```

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$ cat files more-files > all-files
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← append files into a single new file

Instead, we can do...

```
$ ls *.ent >> files
```

Note the double >'s – the append' operator

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We know that...

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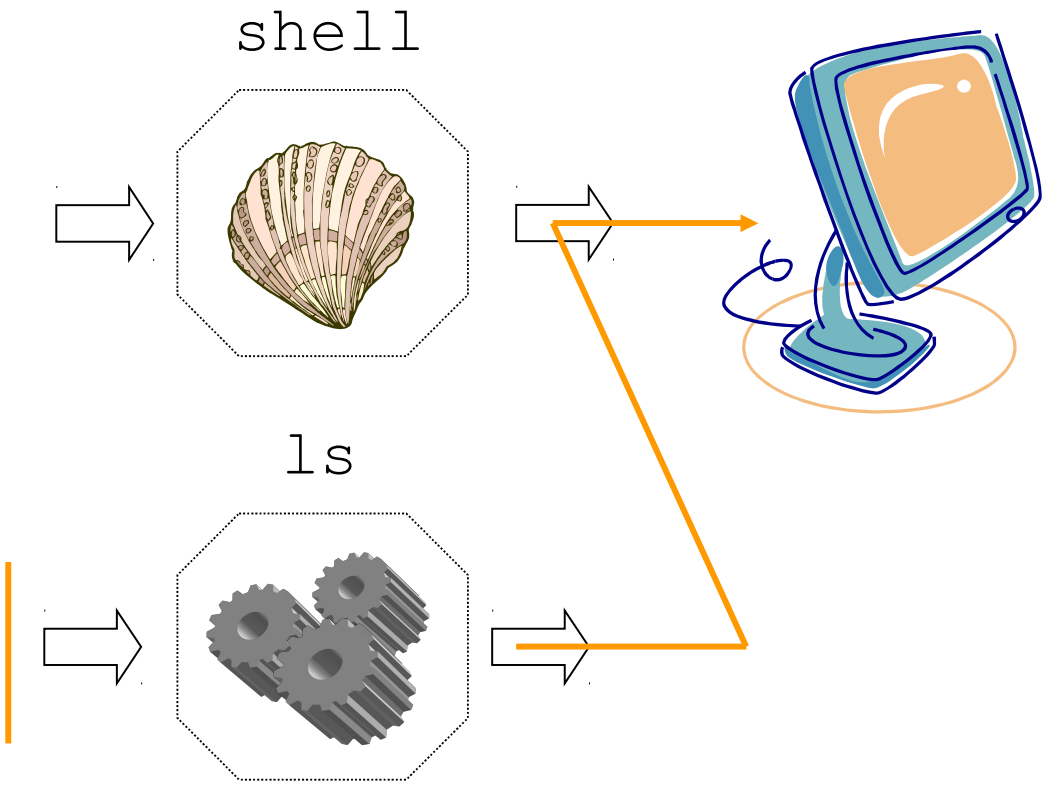
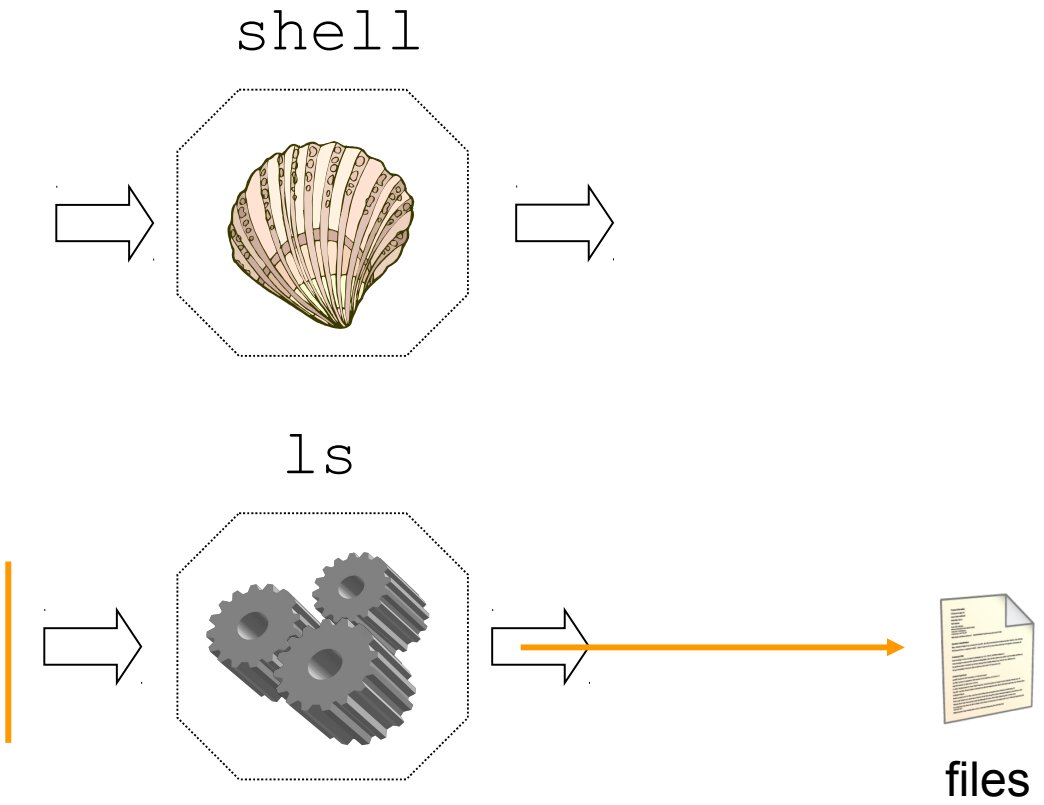


We know that...

Normally, standard output is directed to a display:

But we have redirected it to a file instead:



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For example...

```
$ ls /some/nonexistent/path > files
ls: /some/nonexistent/path: No such file or directory
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No files are listed in *files*, as you might expect.

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For example...

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$ ls /some/nonexistent/path > files
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No files are listed in *files*, as you might expect.

But why isn't the error message in *files*?

This is because error messages are sent to the *standard error* (stderr), separate to stdout

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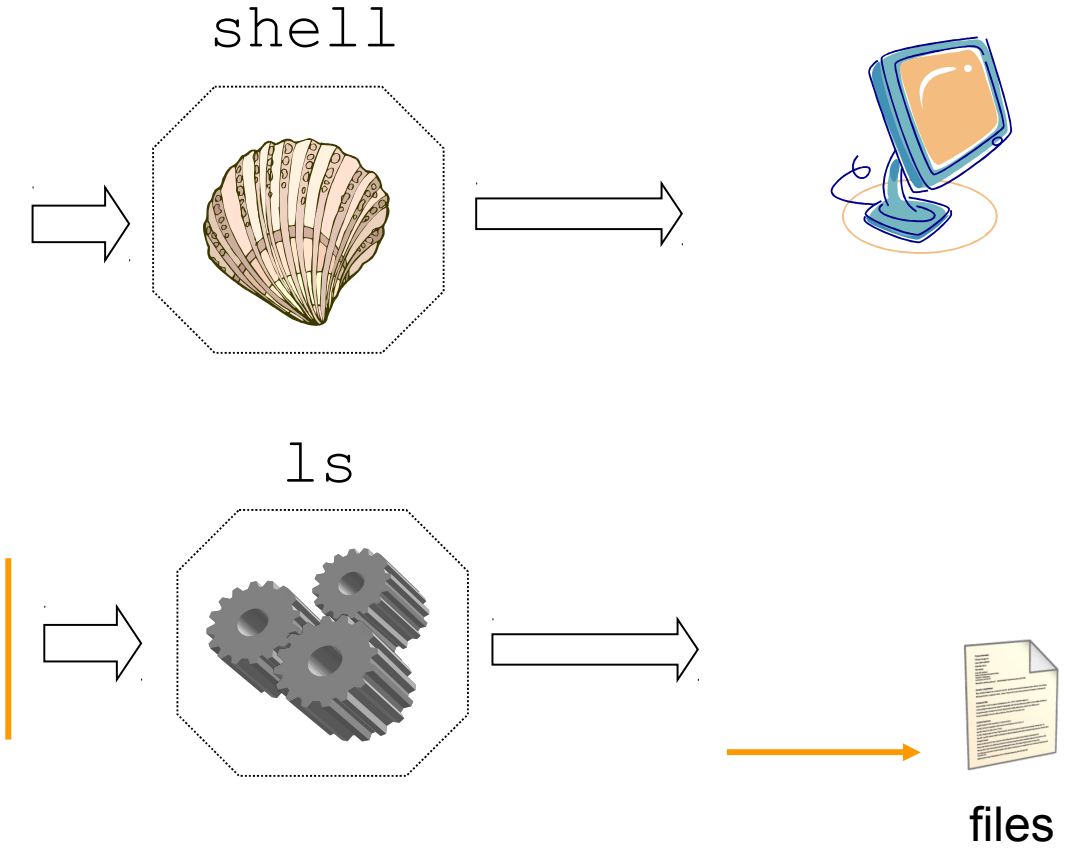
So what was happening with the previous example?



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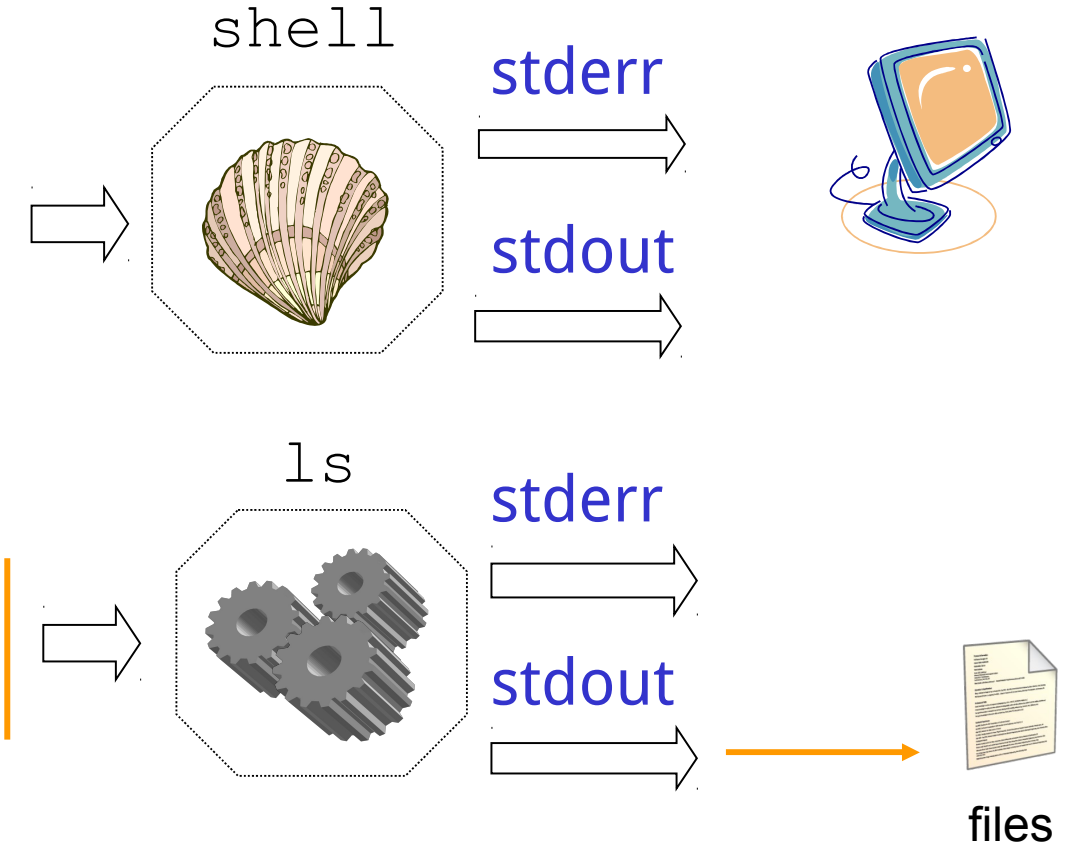

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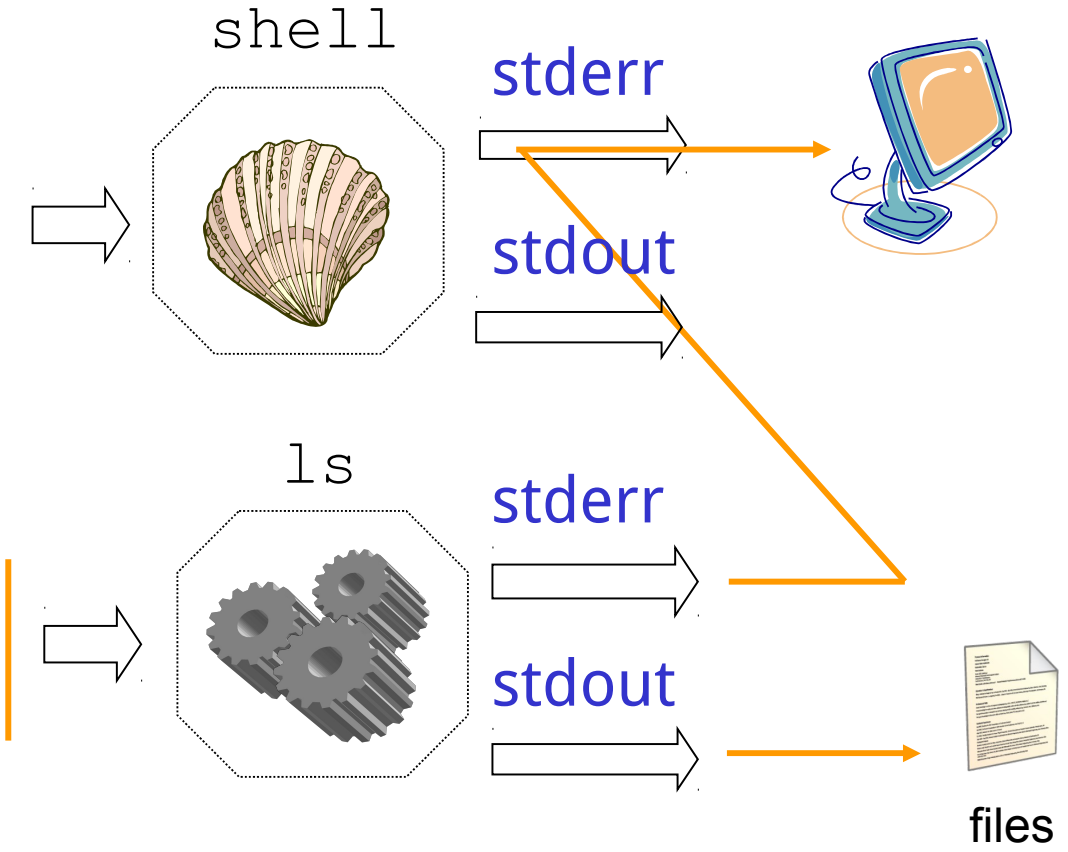

We can capture standard error as well as standard output

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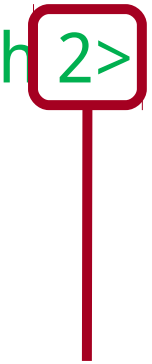
To redirect the standard error to a file, we can do:

```
$ ls /some/nonexistent/path 2> error-log
```



Redirect as before, but with a slightly different operator

We can capture standard error as well as standard output

To redirect the standard error to a file, we can do:

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Now we have any error messages stored in *error-log*

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To redirect the standard error to a file, we can do:

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To redirect both stdout and stderr, we can then do:

```
$ ls /usr /some/nonexistent/path > files 2> error-log
```

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```

We can use both stdout and stderr redirection – at the same time

We can capture standard error as well as standard output

To redirect the standard error to a file, we can do:

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Now we have any error messages stored in *error-log*

To redirect both stdout and stderr, we can then do:

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```

Which would give us contents of */usr* in *files* as well.

So why a ‘2’ before the ‘>’ ?

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Both stdout and stderr can be referenced by numbers:

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$ ls /usr /some/nonexistent/path 1> files 2> error-log
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Refers to stdout

Refers to stderr

So why a ‘2’ before the ‘>’ ?

Both stdout and stderr can be referenced by numbers:

```
$ ls /usr /some/nonexistent/path 1> files 2> error-log
```

To just redirect both to the same file we can also do:

```
$ ls /usr /some/nonexistent/path &> everything
```

With ‘&’ denoting both stdout and stderr

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Both stdout and stderr can be referenced by numbers:

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With ‘&’ denoting both stdout and stderr

We can also use append for each of these too:

```
$ ls /usr /some/nonexistent/path 1>> files 2>> error-log
```

>	1>	Redirect stdout to a file
	2>	Redirect stderr to a file
	&>	Redirect both stdout and stderr to the same file

>	1>	Redirect stdout to a file
	2>	Redirect stderr to a file
	&>	Redirect both stdout and stderr to the same file
>>	1>>	Redirect and append stdout to a file
	2>>	Redirect and append stderr to a file
	&>>	Redirect and append both stdout and stderr to a file

We've seen how pipes and filters work with using a single program on some input data...

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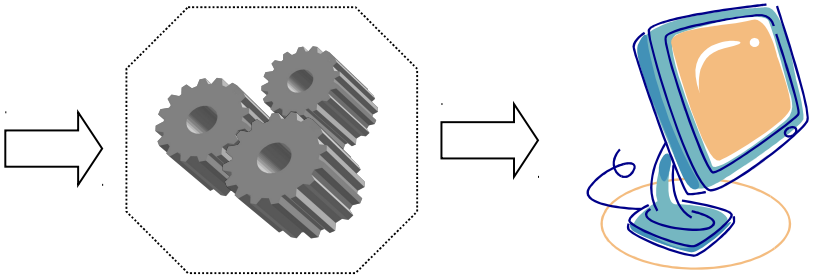
```
a_program 1 2 3
```



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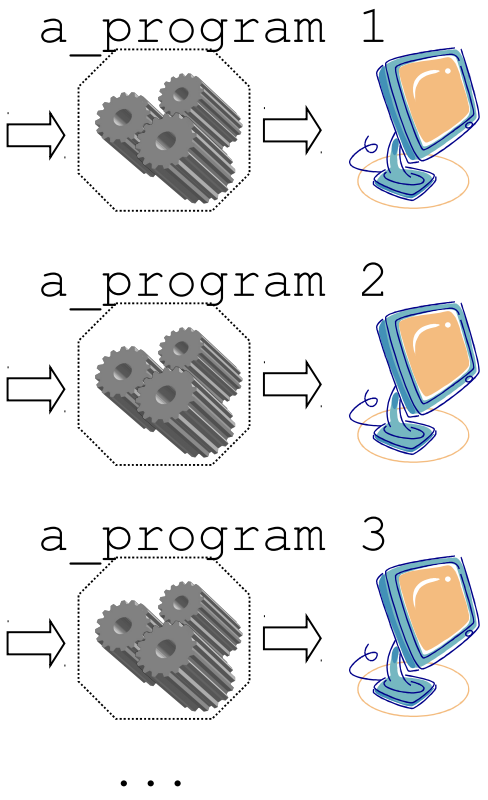

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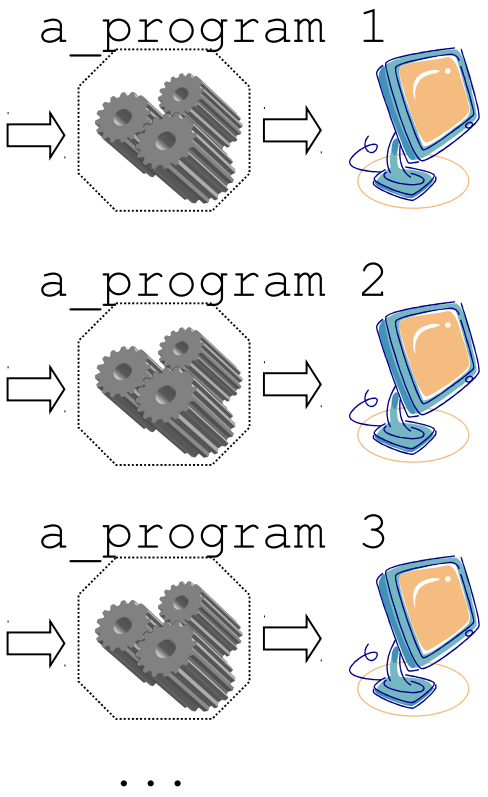

We can use *loops* for this...

So what can we do with loops?

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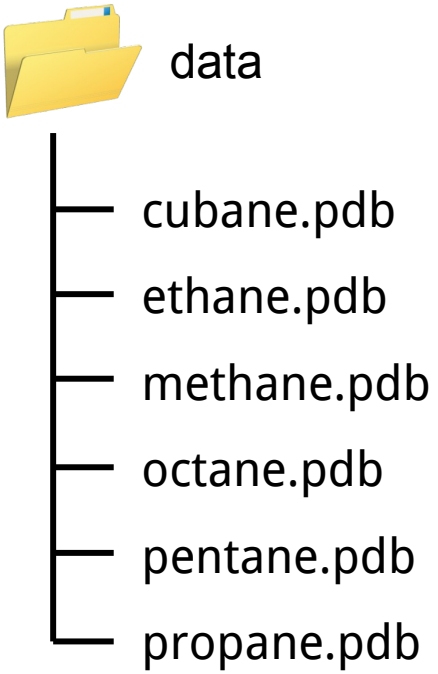
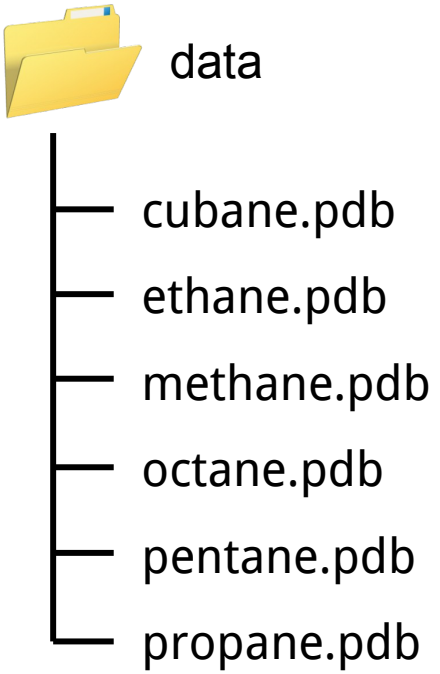
Let's go back to our first set of pdb files, and assume we want to compress each of them





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We could do the following for each:

```
$ zip cubane.pdb.zip cubane.pdb
  adding: cubane.pdb (deflated 73%)
```

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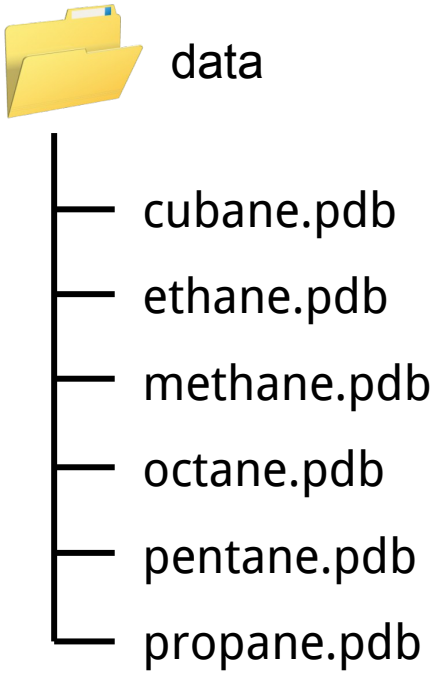


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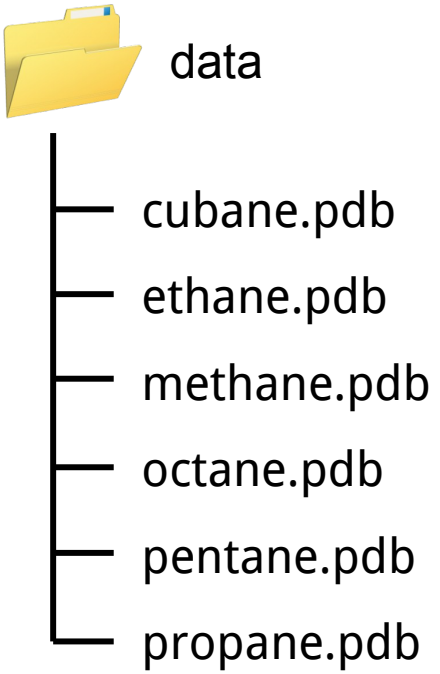


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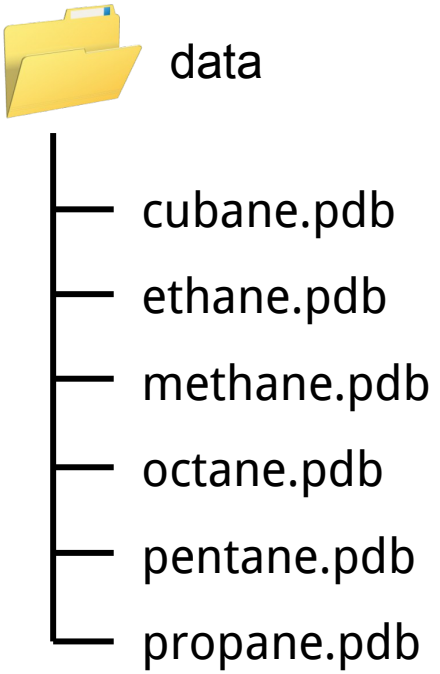


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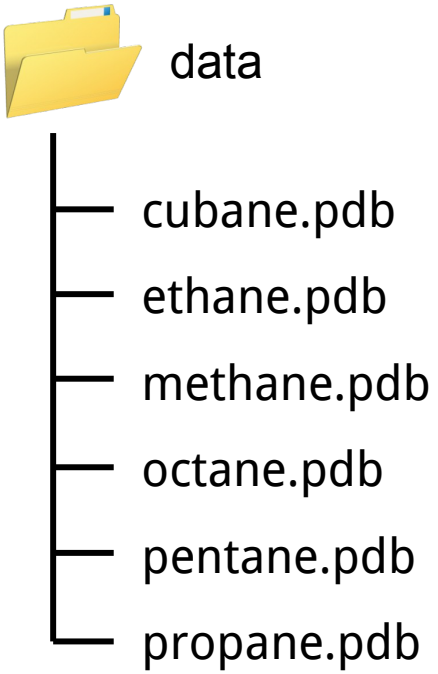
typical output from the zip command

The zip file we wish to create

The file(s) we wish to add to the zip file



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```
$ zip cubane.pdb.zip cubane.pdb
  adding: cubane.pdb (deflated 73%)
```

Not efficient for many files

Using a loop, we can iterate over each file, and run *zip* on each of them:

```
$ for file in *.pdb; do zip $file.zip $file; done
```

Using a loop, we can iterate over each file, and run *zip* on each of them:

```
$ for file in *.pdb; do zip $file.zip $file; done
```

For each pdb file in this directory…

Using a loop, we can iterate over each file, and run *zip* on each of them:

```
$ for file in *.pdb; do zip $file.zip $file; done
```

Run this command

Using a loop, we can iterate over each file, and run *zip* on each of them:

```
$ for file in *.pdb; do zip $file.zip $file; done
```

This is the end of the loop

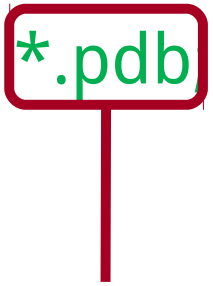
Using a loop, we can iterate over each file, and run *zip* on each of them:

```
$ for file in *.pdb; do zip $file.zip $file; done
```

The semicolons separate each part of the loop construct

Using a loop, we can iterate over each file, and run *zip* on each of them:

```
$ for file in *.pdb; do zip $file.zip $file; done
```



This expands to a list of every pdb file

Using a loop, we can iterate over each file, and run *zip* on each of them:

```
$ for file in *.pdb; do zip $file.zip $file; done
```

This variable holds the next pdb file in the list

Using a loop, we can iterate over each file, and run *zip* on each of them:

```
$ for file in *.pdb; do zip $file.zip $file; done
```

We reference the 'file' variable, and use '.' to add the zip extension to the filename

Using a loop, we can iterate over each file, and run *zip* on each of them:

```
$ for file in *.pdb; do zip $file.zip $file; done
```

We reference the 'file' variable again

Using a loop, we can iterate over each file, and run *zip* on each of them:

```
$ for file in *.pdb; do zip $file.zip $file; done
  adding: cubane.pdb (deflated 73%)
  adding: ethane.pdb (deflated 70%)
  adding: methane.pdb (deflated 66%)
  adding: octane.pdb (deflated 75%)
  adding: pentane.pdb (deflated 74%)
  adding: propane.pdb (deflated 71%)
```

Using a loop, we can iterate over each file,
and run *zip* on each of them:

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In one line, we've ended up with all files zipped

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  adding: cubane.pdb (deflated 73%)
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...
```

In one line, we've ended up with all files zipped

```
$ ls *.zip
cubane.pdb.zip    methane.pdb.zip   pentane.pdb.zip
ethane.pdb.zip    octane.pdb.zip    propane.pdb.zip
```

Now instead, what if we wanted to output the first line of each pdb file?

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We could use head -1 *.pdb for that, but it would produce:

```
==> cubane.pdb <==
COMPND    CUBANE

==> ethane.pdb <==
COMPND    ETHANE

==> methane.pdb <==
COMPND    METHANE
...
```

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We could use head -1 *.pdb for that, but it would produce:

head produces this
(it's not in the file)

==> cubane.pdb <==
COMPND CUBANE

==> ethane.pdb <==
COMPND ETHANE

==> methane.pdb <==
COMPND METHANE
...

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head produces this (it's not in the file)

this is actually the first line in this file!

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COMPND    CUBANE

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COMPND    ETHANE

==> methane.pdb <==
COMPND    METHANE
...
```

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COMPND    CUBANE

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COMPND    ETHANE

==> methane.pdb <==
COMPND    METHANE
...
```

Perhaps we only want the actual first lines...

However, using a loop:

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```
$ for file in *.pdb; do head -1 $file; done
```

However, using a loop:

```
$ for file in *.pdb; do head -1 $file; done
```

We use $file as we did before, but this time with the head command

However, using a loop:

```
$ for file in *.pdb; do head -1 $file; done
COMPND    CUBANE
COMPND    ETHANE
COMPND    METHANE
COMPND    OCTANE
COMPND    PENTANE
COMPND    PROPANE
```

What if we wanted this list sorted in reverse afterwards?

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Simple!

```
$ (for file in ls *.pdb; do head -1 $file; done) | sort –r
```

What if we wanted this list sorted in reverse afterwards?

Simple!

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```

Using a pipe, we can just add this on the end

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COMPND    PROPANE
COMPND    PENTANE
COMPND    OCTANE
COMPND    METHANE
COMPND    ETHANE
COMPND    CUBANE
```

`zip`	Create a compressed zip file with other files in it
`for …; do … done;`	Loop over a list of data and run a command once for each element in the list

created by

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