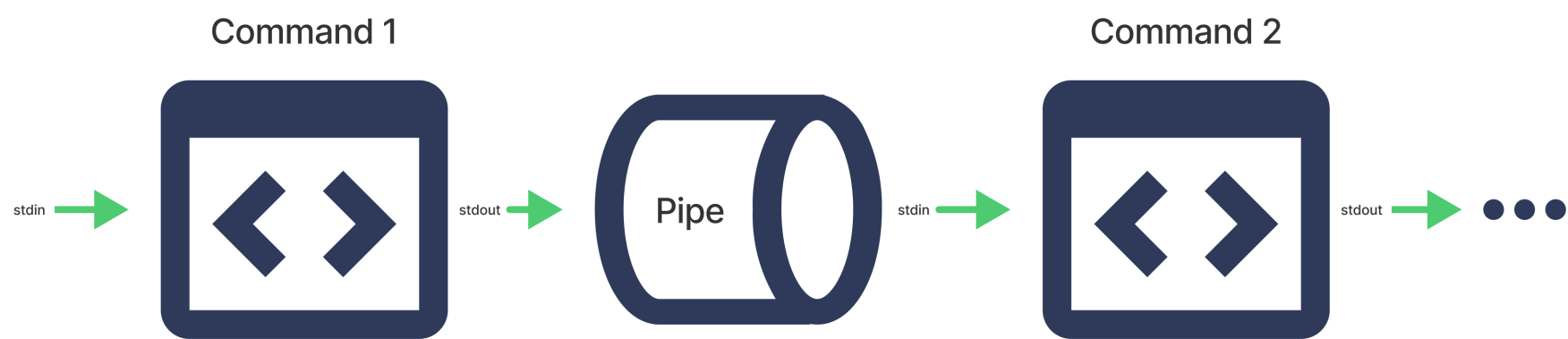


# Pipes



## What are pipes?

Put simply, pipes are commands in Linux which allow you to use the output of one command as the input of another.

Pipes `"|"` use the following format:

```
[command 1] | [command 2] | [command 3] ... | [command n]
```

(no limit to the number of times in a row u can pipe!)

## Pipe examples

### Ex 1:

Let's start with a commonly used example.

Recall the commands:

- `sort`: sorts lines in input
- `uniq`: prints input with consecutive repeated lines collapsed to a single, unique line

With the help of the pipe operator, you can combine these commands to print all the unique lines in a file!

Suppose you have the file `pets.txt` with the following contents:

```
$ cat pets.txt
goldfish
dog
cat
parrot
dog
goldfish
goldfish
```

If you *only* use `sort` on `pets.txt`, you get:

```
$ sort pets.txt
cat
dog
dog
goldfish
goldfish
goldfish
parrot
```

And if you *only* use `uniq`, you get:

```
$ uniq pets.txt
goldfish
dog
cat
parrot
dog
goldfish
```

But by combining the two commands in the correct order, you get back:

```
$ sort pets.txt | uniq
cat
dog
goldfish
parrot
```

which are the sorted, unique lines from `pets.txt`!

## Ex 2:

Some commands, such as `tr`, *only* accept "standard input" as input (not strings or filenames):

- `tr` (translate) - replaces characters in input text.
  - Syntax: `tr [OPTIONS] [target characters] [replacement characters]`

In cases like this, we can use piping to apply the command to strings and file contents.

With strings, you could, for example, use `echo` in combination with `tr` to replace all vowels in a string with underscores, as follows:

```
$ echo "Linux and shell scripting are awesome!" | tr "aeiou" "_"
L_n_x _nd sh_ll scr_pt_ng _r_ _w_s_m_!
```

To perform the complement of the operation from the previous example, that is, to replace all consonants with an underscore, you can use the `-c` option like this:

```
$ echo "Linux and shell scripting are awesome!" | tr -c "aeiou" "_"
_i_u_a___e____i_i__a_e_a_e_o_e_
```

With files, you could use `cat` in combination with `tr` to change all of the text to upper case as follows:

```
$ cat pets.txt | tr "[a-z]" "[A-Z]"
GOLDFISH
DOG
CAT
PARROT
DOG
GOLDFISH
GOLDFISH
```

The possibilities are endless! For example:

```
$ sort pets.txt | uniq | tr "[a-z]" "[A-Z]"
CAT
DOG
GOLDFISH
PARROT
```

## Ex 3:

You can even use `curl` in combination with the `grep` command to extract components of URL data by piping the output of `curl` to `grep`. Let's see how you can use this pattern to get the current price of BTC (Bitcoin) in USD.

First, you find a public URL API. In this example, you will use one provided by [CoinStats](https://api.coinstats.app/public/v1/coins/bitcoin?currency=USD).

Specifically, they provide a public API (no key required) `https://api.coinstats.app/public/v1/coins/bitcoin?currency=USD` which returns some json about the current BTC price in USD.

You can see what this looks like in your browser:

```
← → ↻ 🔒 api.coinstats.app/public/v1/coins/bitcoin?currency\=USD ☆ 👤 ⋮

{"coin":
{"id":"bitcoin","icon":"https://static.coinstats.app/coins/Bitcoin6l39t.png","name":"Bitcoin","symbol":"BTC","rank":1,"price":58241.582859709466,"priceBtc":1,"volume":42923267434.05484,"marketCap":1099617799725.5955,"availableSupply":18880287,"totalSupply":21000000,"priceChange1h":0.92,"priceChange1d":-0.97,"priceChange1w":-11.06,"websiteUrl":"http://www.bitcoin.org","twitterUrl":"https://twitter.com/bitcoin","exp":["https://blockchair.com/bitcoin/","https://btc.com/","https://btc.tokenview.com/"]}}
```

Entering the following command returns the BTC price data, displayed as a json object:

```
$ curl -s --location --request GET https://api.coinstats.app/public/v1/coins/bitcoin\?currency\=USD
{
  "coin": {
    "id": "bitcoin",
    "icon": "https://static.coinstats.app/coins/Bitcoin6l39t.png",
    "name": "Bitcoin",
    "symbol": "BTC",
    "rank": 1,
    "price": 57907.78008618953,
    "priceBtc": 1,
    "volume": 48430621052.9856,
    "marketCap": 1093175428640.1146,
    "availableSupply": 18877868,
    "totalSupply": 21000000,
    "priceChange1h": -0.19,
    "priceChange1d": -0.4,
    "priceChange1w": -9.36,
    "websiteUrl": "http://www.bitcoin.org",
    "twitterUrl": "https://twitter.com/bitcoin",
    "exp": [
      "https://blockchair.com/bitcoin/",
      "https://btc.com/",
      "https://btc.tokenview.com/"
    ]
  }
}
```

(The output is formatted for your convenience in this lab).

The json field you want to grab here is `"price": [numbers].[numbers]`. To grab this you can use the following `grep` command to extract it from the json text:

```
grep -oE "\"price\"\\s*:\\s*[0-9]*?\\.?[0-9]*"
```

Let's break down the details of this statement:

- `-o` tells `grep` to *only* return the matching portion
- `-E` tells `grep` to be able to use extended regex symbols such as `?`
- `"price\"` matches the string `"price"`
- `\\s*` matches any number (including 0) of whitespace (`\\s`) characters
- `:` matches `:`
- `[0-9]*` matches any number of digits (from 0 to 9)
- `?\\.?` optionally matches a `.` (this is in case price were an integer)

Now that you have the `grep` statement that you need, you can pipe the BTC data to it using the `curl` command from above:

```
$ curl -s --location --request GET https://api.coinstats.app/public/v1/coins/bitcoin\?currency\=USD | \
  grep -oE "\"price\"\\s*:\\s*[0-9]*?\\.?[0-9]*"
"price": 57907.78008618953
```

The backslash `\\` character used here after the pipe `|` allows you to write the expression on multiple lines.

Finally, to get *only* the value in the price field, and drop the "price" label, you can use chaining to pipe the same output to another `grep`:

```
$ curl -s --location --request GET https://api.coinstats.app/public/v1/coins/bitcoin\?currency\=USD | \
  grep -oE "\"price\"\\s*:\\s*[0-9]*?\\.?[0-9]*" | \
  grep -oE "[0-9]*?\\.?[0-9]*"
57907.78008618953
```

Beautiful 😊

