Input/Output

- How to input/output data in script
- Data streams, redirects
- What is a heredoc

TRAINING
CENTER

Data Streams

Data streams are terms of transferring data between two points. Any command that you run, and even shell itself, use streams. Every stream has its own file descriptor by default, that is a number pointing to a certain file.

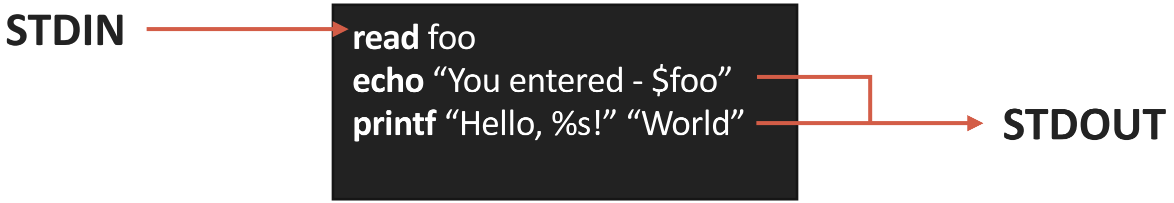
Stream	Description	File Descriptor
STDIN	standard input, receives text as input.	0 → /dev/stdin
STDOUT	standard output, sends text as an output.	1 → /dev/stdout
STDERR	standard error, sends only error text, so it doesn't mix up with stdout.	2 → /dev/stderr

Every command can one way or another receive data from **STDIN**, output it's result to **STDOUT** and send error messages to **STDERR**. Everytime you see a result of your command in Bash, that means the command you've run sent its **STDOUT** data to the terminal that printed out the result.

Learn to Read and Write Again

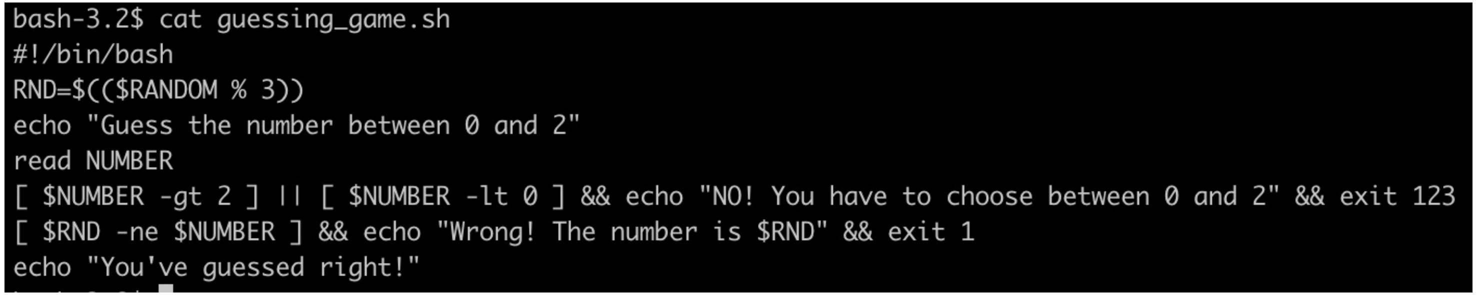
Now, when you know more about data streams, you may learn more about the commands you've already used numerous times.

READ	WRITE
read – reads one(!) string from STDIN	**echo** – writes a string to STDOUT **printf** – echo with formatting powers

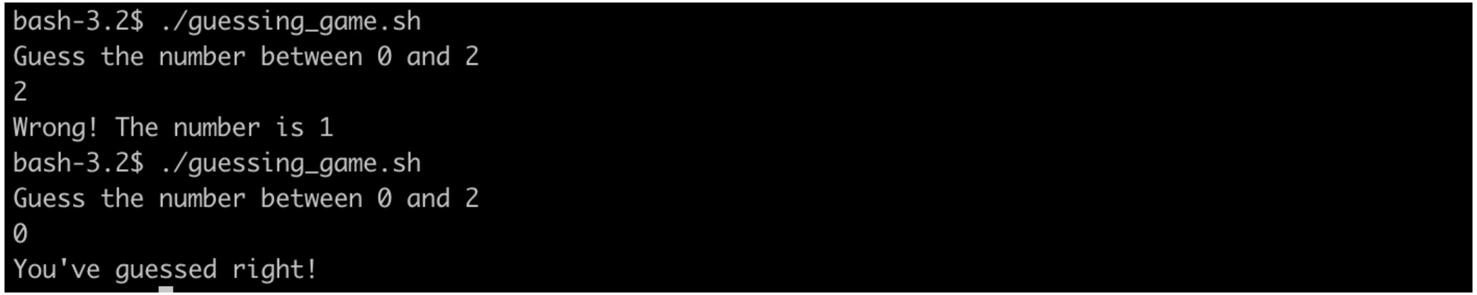


```
read foo
echo "You entered - $foo"
printf "Hello, %s!" "World"
```

Read and Write Example


```
bash-3.2$ cat guessing_game.sh
#!/bin/bash
RND=$(($RANDOM % 3))
echo "Guess the number between 0 and 2"
read NUMBER
[ $NUMBER -gt 2 ] || [ $NUMBER -lt 0 ] && echo "NO! You have to choose between 0 and 2" && exit 123
[ $RND -ne $NUMBER ] && echo "Wrong! The number is $RND" && exit 1
echo "You've guessed right!"
```

example code


```
bash-3.2$ ./guessing_game.sh
Guess the number between 0 and 2
2
Wrong! The number is 1
bash-3.2$ ./guessing_game.sh
Guess the number between 0 and 2
0
You've guessed right!
```

example output

Data Redirects

File descriptors of data streams are treated like normal files but exist to have an interface to the streams. That is handy when you want to do data flow redirects. You can redirect one data streams to file descriptors of other data streams, create new ones, and redirect into normal files.

./some_script.sh > ./some_file.txt Redirecting output of the script (stdout) to a file.	./some_script.sh < some_file.txt Sending file contents to a STDIN of a script. Can be further worked with via /dev/stdin or **read** command.
./some_script.sh >/dev/null 2>&1 Redirecting both STDOUT to /dev/null, then redirecting STDERR to STDOUT, completely silencing the script output	./some_script.sh >> ./log.txt 2>> ./error_log.txt Write script output to log.txt, and errors to error_log.txt. Will not overwrite files.

Most common usecases are redirecting output of a script to file or muting output or just errors of a command by redirecting it to /dev/null

Heredoc

Sometimes you need to pass a multiline text block to a command or variable. Bash has a special type of redirect called Here document (heredoc) that allows you to do that

```
[COMMAND] <<[-] 'DELIMITER'
  your multiline
  text here ☺
DELIMITER
```

- Any word may be used as a DELIMITER.
- If the initial DELIMITER is quoted, variables in multiline text will not be interpolated.
- Adding minus sign after the redirection operator will tell Bash to ignore all leading tabs (not whitespaces)

```
cat << EOF
Hello,
World!
EOF
```

Sends multiline string to STDIN of **cat** command

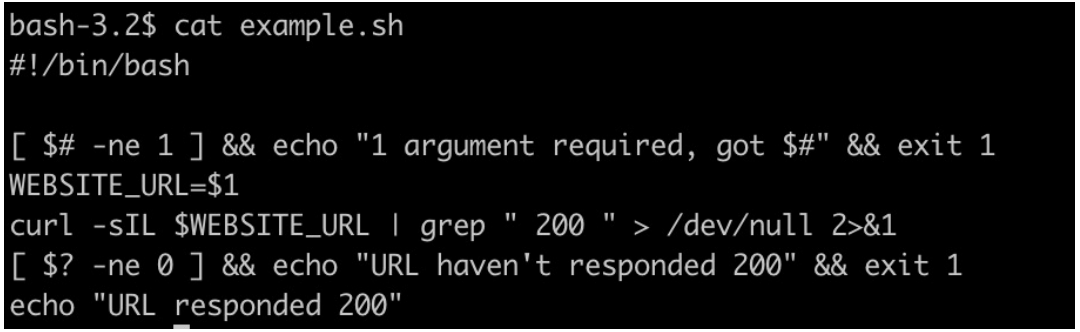
```
cat << EOF > some_file.txt
Hello,
World!
EOF
```

The same, but the output of **cat** then redirects to a file

Don't overdo! If you have only several lines, use \n instead

```
printf "Hello,\nWorld!\n"
```

Redirects Example

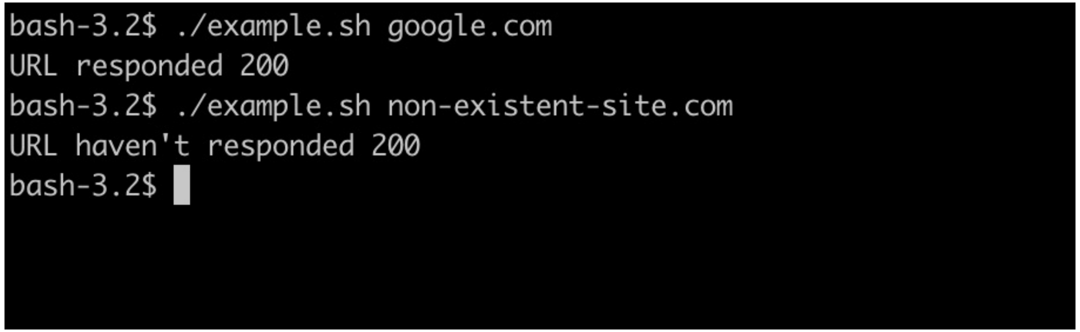


```
bash-3.2$ cat example.sh
#!/bin/bash

[ $# -ne 1 ] && echo "1 argument required, got $#" && exit 1
WEBSITE_URL=$1
curl -sIL $WEBSITE_URL | grep " 200 " > /dev/null 2>&1
[ $? -ne 0 ] && echo "URL haven't responded 200" && exit 1
echo "URL responded 200"
```

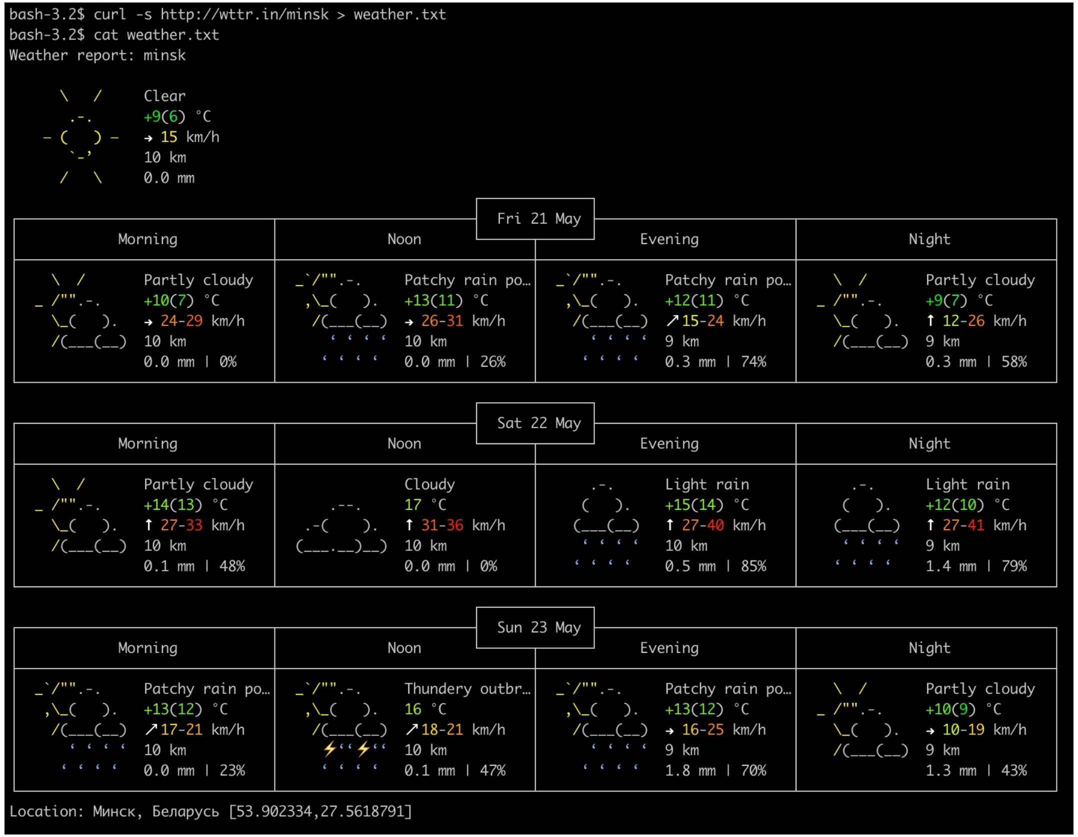
example code

example output



```
bash-3.2$ ./example.sh google.com
URL responded 200
bash-3.2$ ./example.sh non-existent-site.com
URL haven't responded 200
bash-3.2$ 
```

Redirects Example



```
bash-3.2$ curl -s http://wttr.in/minsk > weather.txt
bash-3.2$ cat weather.txt
Weather report: minsk

      \   /     Clear
       .-.      +9(6) °C
    ― (   ) ―   → 15 km/h
       `-’      10 km
      /   \     0.0 mm
                                                       ┌─────────────┐
┌──────────────────────────────┬───────────────────────┤  Fri 21 May ├───────────────────────┬──────────────────────────────┐
│            Morning           │             Noon      └──────┬──────┘     Evening           │             Night            │
├──────────────────────────────┼──────────────────────────────┼──────────────────────────────┼──────────────────────────────┤
│    \  /       Partly cloudy  │  _`/"".-.     Patchy rain po…│  _`/"".-.     Patchy rain po…│    \  /       Partly cloudy  │
│  _ /"".-.     +10(7) °C      │   ,\_(   ).   +13(11) °C     │   ,\_(   ).   +12(11) °C     │  _ /"".-.     +9(7) °C       │
│    \_(   ).   → 24-29 km/h   │    /(___(__)  → 26-31 km/h   │    /(___(__)  ↗ 15-24 km/h   │    \_(   ).   ↑ 12-26 km/h   │
│    /(___(__)  10 km          │      ‘ ‘ ‘ ‘  10 km          │      ‘ ‘ ‘ ‘  9 km           │    /(___(__)  9 km           │
│               0.0 mm | 0%    │     ‘ ‘ ‘ ‘   0.0 mm | 26%   │     ‘ ‘ ‘ ‘   0.3 mm | 74%   │               0.3 mm | 58%   │
└──────────────────────────────┴──────────────────────────────┴──────────────────────────────┴──────────────────────────────┘
                                                       ┌─────────────┐
┌──────────────────────────────┬───────────────────────┤  Sat 22 May ├───────────────────────┬──────────────────────────────┐
│            Morning           │             Noon      └──────┬──────┘     Evening           │             Night            │
├──────────────────────────────┼──────────────────────────────┼──────────────────────────────┼──────────────────────────────┤
│    \  /       Partly cloudy  │               Cloudy         │      .-.      Light rain     │      .-.      Light rain     │
│  _ /"".-.     +14(13) °C     │      .--.     17 °C          │     (   ).    +15(14) °C     │     (   ).    +12(10) °C     │
│    \_(   ).   ↑ 27-33 km/h   │   .-(    ).   ↑ 31-36 km/h   │    (___(__)   ↑ 27-40 km/h   │    (___(__)   ↑ 27-41 km/h   │
│    /(___(__)  10 km          │  (___.__)__)  10 km          │     ‘ ‘ ‘ ‘   10 km          │     ‘ ‘ ‘ ‘   9 km           │
│               0.1 mm | 48%   │               0.0 mm | 0%    │    ‘ ‘ ‘ ‘    0.5 mm | 85%   │    ‘ ‘ ‘ ‘    1.4 mm | 79%   │
└──────────────────────────────┴──────────────────────────────┴──────────────────────────────┴──────────────────────────────┘
                                                       ┌─────────────┐
┌──────────────────────────────┬───────────────────────┤  Sun 23 May ├───────────────────────┬──────────────────────────────┐
│            Morning           │             Noon      └──────┬──────┘     Evening           │             Night            │
├──────────────────────────────┼──────────────────────────────┼──────────────────────────────┼──────────────────────────────┤
│  _`/"".-.     Patchy rain po…│  _`/"".-.     Thundery outbr…│  _`/"".-.     Patchy rain po…│    \  /       Partly cloudy  │
│   ,\_(   ).   +13(12) °C     │   ,\_(   ).   16 °C          │   ,\_(   ).   +13(12) °C     │  _ /"".-.     +10(9) °C      │
│    /(___(__)  ↗ 17-21 km/h   │    /(___(__)  ↗ 18-21 km/h   │    /(___(__)  → 16-25 km/h   │    \_(   ).   → 10-19 km/h   │
│      ‘ ‘ ‘ ‘  10 km          │     ⚡‘‘⚡‘‘   10 km          │      ‘ ‘ ‘ ‘  9 km           │    /(___(__)  9 km           │
│     ‘ ‘ ‘ ‘   0.0 mm | 23%   │     ‘ ‘ ‘ ‘   0.1 mm | 47%   │     ‘ ‘ ‘ ‘   1.8 mm | 70%   │               1.3 mm | 43%   │
└──────────────────────────────┴──────────────────────────────┴──────────────────────────────┴──────────────────────────────┘
Location: Минск, Беларусь [53.902334,27.5618791]
```

Input/Output

Thanks for watching!