

Full Stack for Frontend Engineers

3

FS
FE

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 Jem Young






**FRONT END
HAPPY HOUR**

Web Assembly (Wasm)


Learn foundational, low-level programming such as binary, hexadecimal, array buffers, memory management, and unsigned integers.

3 hours, 43 minutes 

[Watch Course](#)




Introduction to Web Assembly



Interviewing for Front-End Engineers

Prepare for the recruiter prescreen questions, from the phone screen to real cultural and technical interview questions that companies use to screen candidates.

2 hours, 53 minutes 

[Watch Course](#) 

Interviewing for Front-End Engineers

Introduction

- ❖ Prerequisites
- ❖ Modern computing
- ❖ Full Stack engineering

Prerequisites

- Some familiarity with coding
- Access to a terminal
- Internet access
- Credit card*
- A sense of adventure

*for buying a domain



UI



Server



Database

Modern computing

browsers

mobile devices

cars

desktop

televisions

appliances



user interfaces



servers

APIs

logging

authentication

development platform



databases

structured data storage

data analytics



frontend



backend



```
return (  
  <div sx={styles.wrapper} data-testid="header">  
    <Box sx={styles.menuIcon}>  
      <button sx={styles.menuButton} onClick={onOpen}>  
        <Menu size={25} />  
      </button>  
    </Box>  
  </div>  
) ;
```



```
const server = require('https').createServer({
  key: fs.readFileSync( cfg.ssl_key ),
  cert: fs.readFileSync( cfg.ssl_cert )
});

const wss = new WebSocketServer({ server: server });
const app = express();
```



```
const sqlite3 = require('sqlite3').verbose();
const db = new sqlite3.Database(':memory:');

db.serialize(() => {
  db.run("CREATE TABLE fsfe3 (info TEXT)");

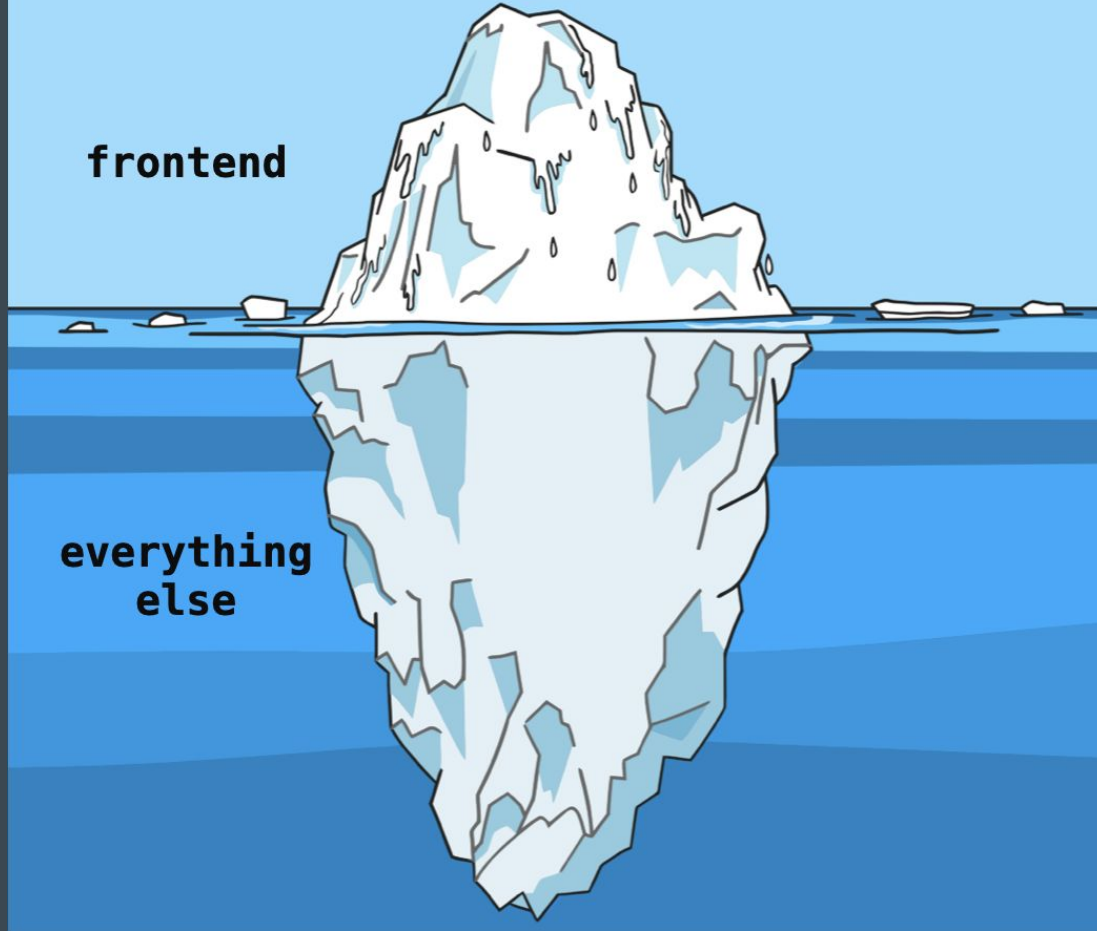
  const stmt = db.prepare("INSERT INTO fsfe3 VALUES (?)");
  for (let i = 0; i < 10; i++) {
    stmt.run("test " + i);
  }
  stmt.finalize();
});

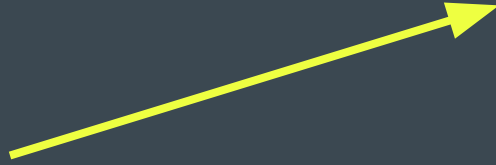
db.close();
```

software engineering

frontend

everything
else





What are we going to cover in this course?

- Deep dive into servers and networking
- Database overview
- How the internet works
- Relationships between systems

What does it mean
to be a Full Stack
engineer?

What is a stack?



What is a stack?



UI

web server

database

operating system

application server

Popular stacks

MEAN

Mongo
Express
Angular
Node . JS

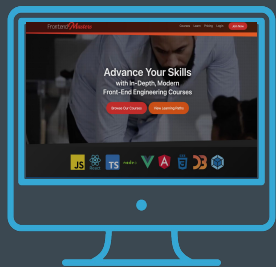
LAMP

Linux
Apache
MySQL
PHP

MERN

Mongo
Express
React
Node . JS





React

Angular

Vue



NodeJS

Tomcat

Apache



Redis

MySQL

Postgres

Full Stack Engineer

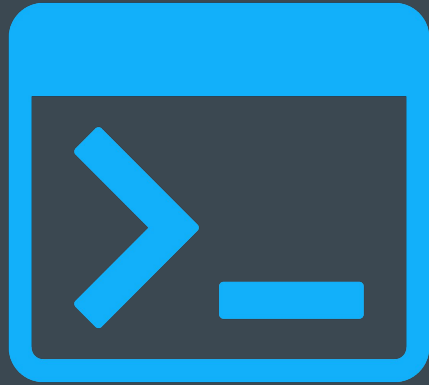


An engineer who can create and manage both the frontend and backend of an application

Diving in

- ❖ Terminals and command line
- ❖ VIM
- ❖ Shells

Terminal and command line



\$command line



Terminal and command line

```
Starting MS-DOS...

HIMEM is testing extended memory...done.

C:\>C:\DOS\SMARTDRV.EXE /X

MODE prepare code page function completed

MODE select code page function completed
C:\>dir

Volume in drive C is MS-DOS_6
Volume Serial Number is 40B4-7F23
Directory of C:\

DOS             <DIR>                12.05.20   15:57
COMMAND.COM     54 645 94.05.31    6:22
WINA20.386      9 349 94.05.31    6:22
CONFIG.SYS      144 12.05.20   15:57
AUTOEXEC.BAT    188 12.05.20   15:57
               5 file(s)          64 326 bytes
               24 760 320 bytes free

C:\>_
```

- fast
- consistent
- low overhead

ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS

```
ping [-AaCddfnOqqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netservertime] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p pattern]
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdfLnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficclass]
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION

The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit ECHO_REPLY datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" and a packet. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received or when trip times that are longer than the interval between transmissions, further when the number of unperceived packets has increased.
- a Audible. Output a bell (ASCII 0x07) character when any packet is received or when any packets are perceived.
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will send count packets.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A period "." is printed, while for every ECHO_REPLY received a backspace "\b" are being dropped. Only the super-user may use this option. This can be dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

Exercise

Welcome to your terminal



iTerm2

Terminal and command line

- **ls** - list directory contents
- **cd** - change directory
- **mkdir** - make directory
- **rmdir** - remove directory

- **cat** - show file contents
- **man** - command manual
- **less** - show file contents by page
- **touch** - creates an empty file
- **rm** - remove file
- **echo** - repeat input

Terminal and command line

1. Navigate to your home directory
2. Make a directory called *temp*
3. Move into *temp*
4. List the directory contents
5. Make a file called *hello*
6. List the directory contents
7. Move out of *temp*
8. Delete *temp*

In case you get lost

- `cd ..` - move up one directory
- `pwd` - print working directory
- `clear` - clear terminal output
- `ctrl + c` - exit program
- `cd ~` - navigate to home directory

ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS

```
ping [-AaCDdfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdfLnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficecl]
[-P policy] [-p pattern] [-S src_addr] [-s packetSize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION

The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit an ICMP ECHO_REPLY from a target system, usually another computer. ECHO_REQUEST datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" of user data. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received within a certain interval. Also output trip times that are longer than the interval between transmissions, further outputting the number of dropped packets has increased.
- a Audible. Output a bell (ASCII 0x07) character when any packet is received. Also output trip times that are longer than the interval between transmissions, further outputting the number of dropped packets has increased.
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will stop after count packets are received. If this option is specified in conjunction with ping flood, each sweep will stop after count packets are received.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

Exercise

VIM

VIM

insert mode

Text editing

normal mode

Primary mode

command mode

Searching, saving, exiting

VIM

save and exit :wq

insert mode

i

normal mode

ESC

command mode

:

1. Navigate to your home directory
2. Make a directory called *temp*
3. Open a file named *test* with vi
4. Write a few lines
5. Save and exit

In case you get stuck

ESC : q !



VIM Fundamentals

https://vim.fandom.com/wiki/All_the_right_moves

<https://linuxmoz.com/vi-command-s-cheat-sheet/>

<https://www.openvim.com/>

Shells

Show your current shell

```
echo $0
```

```
echo $SHELL
```

zsh - more extensible version of bash

```
~/.zshrc
```

bash - Bourne again shell

```
~/.bash_profile
```

Reload shell

```
source <shell config location>
```

```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdflnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficecl]
[-P policy] [-p pattern] [-S src_addr] [-s packetSize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION
The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit replies. ECHO_REQUEST datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" of zeros. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received within a certain interval. Also output trip times that are longer than the interval between transmissions, further outputting the number of dropped packets has increased.
- a Audible. Output a bell (ASCII 0x07) character when any packet is received. This option is only available when any ping options are present.
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will stop after count packets are received.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

Exercise


Shell configuration

Shell configuration

1. Open your shell config
2. Add a line to make your shell tell you good morning

Introduction to Bash, VIM & Regex

Take control of the Unix command line, automate tasks with shell scripts, compose regular expressions and easily edit files with the popular Vim editor.

4 hours, 18 minutes 

[Watch Course](#) 

<https://ohmyz.sh/>

Introduction to Bash, VIM, and Regex

Servers

- ❖ What is a server
- ❖ Cloud computing
- ❖ VPS
- ❖ Operating systems
- ❖ SSH



What is a server?

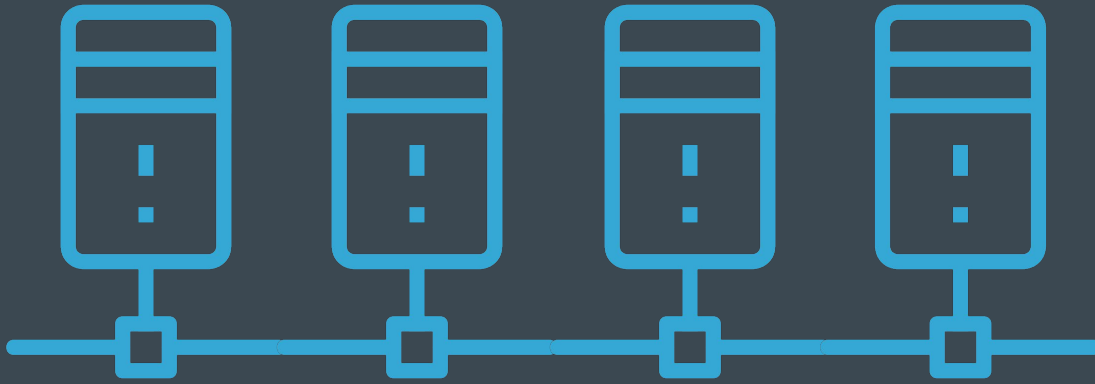
Basic node server

1. Make a file called simpleServer.js
2. Create a basic server using Node.JS running on port 3000

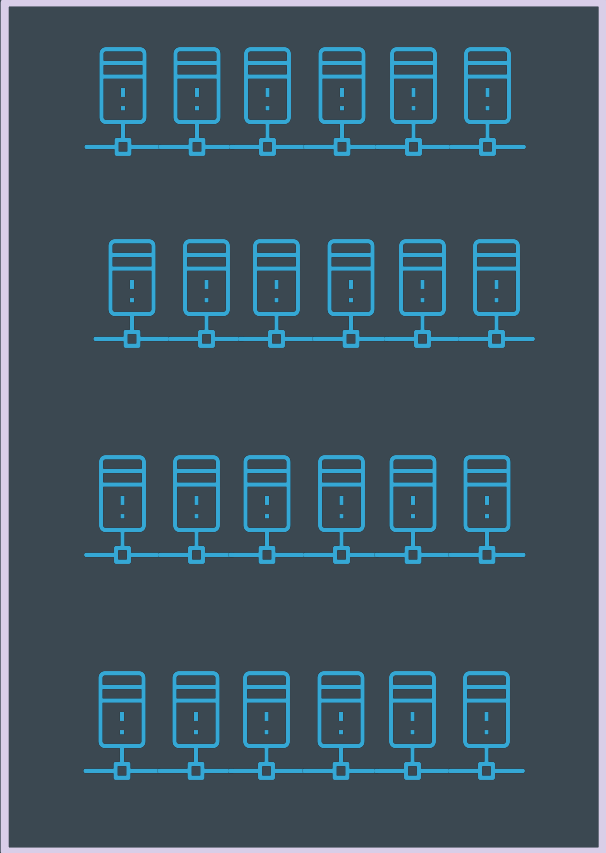
Basic node server

```
const http = require("http");
const fs = require('fs');
const PORT = 3000;

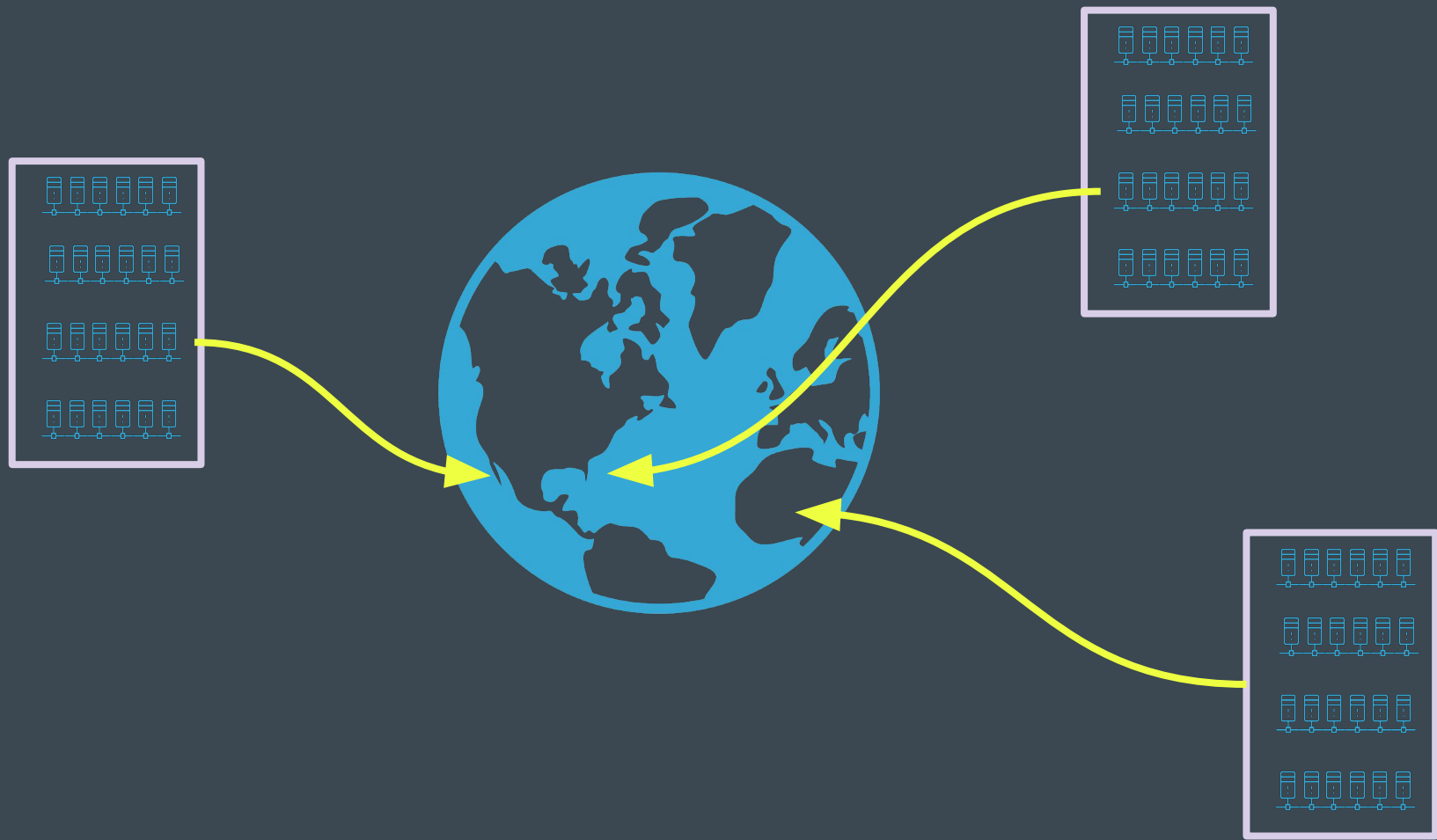
const server = http.createServer(function (req, res) {
  res.writeHead(200, { 'content-type': 'text/html' });
  fs.createReadStream('index.html').pipe(res);
});
server.listen(PORT);
console.log(`Server started on port ${PORT}`);
```



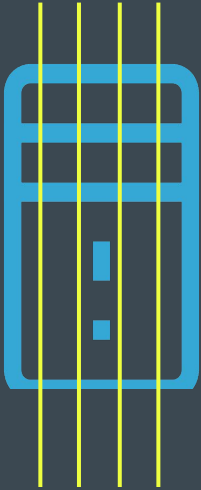
Datacenter



Cloud computing



Cloud computing



virtualization - dividing a servers resources into virtual computers

virtual machine - digital version of a physical computer

VPS - virtual private server

```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdflnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficcl
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION
The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit
datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" of
packet. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received. Also output
- a Audible. Output a bell (ASCII 0x07) character when any packet is received. Also output
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will stop after count sweeps.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

Exercise

Buying a VPS

www.digitalocean.com

Operating Systems



Ubuntu



Fedora



Debian



CentOS

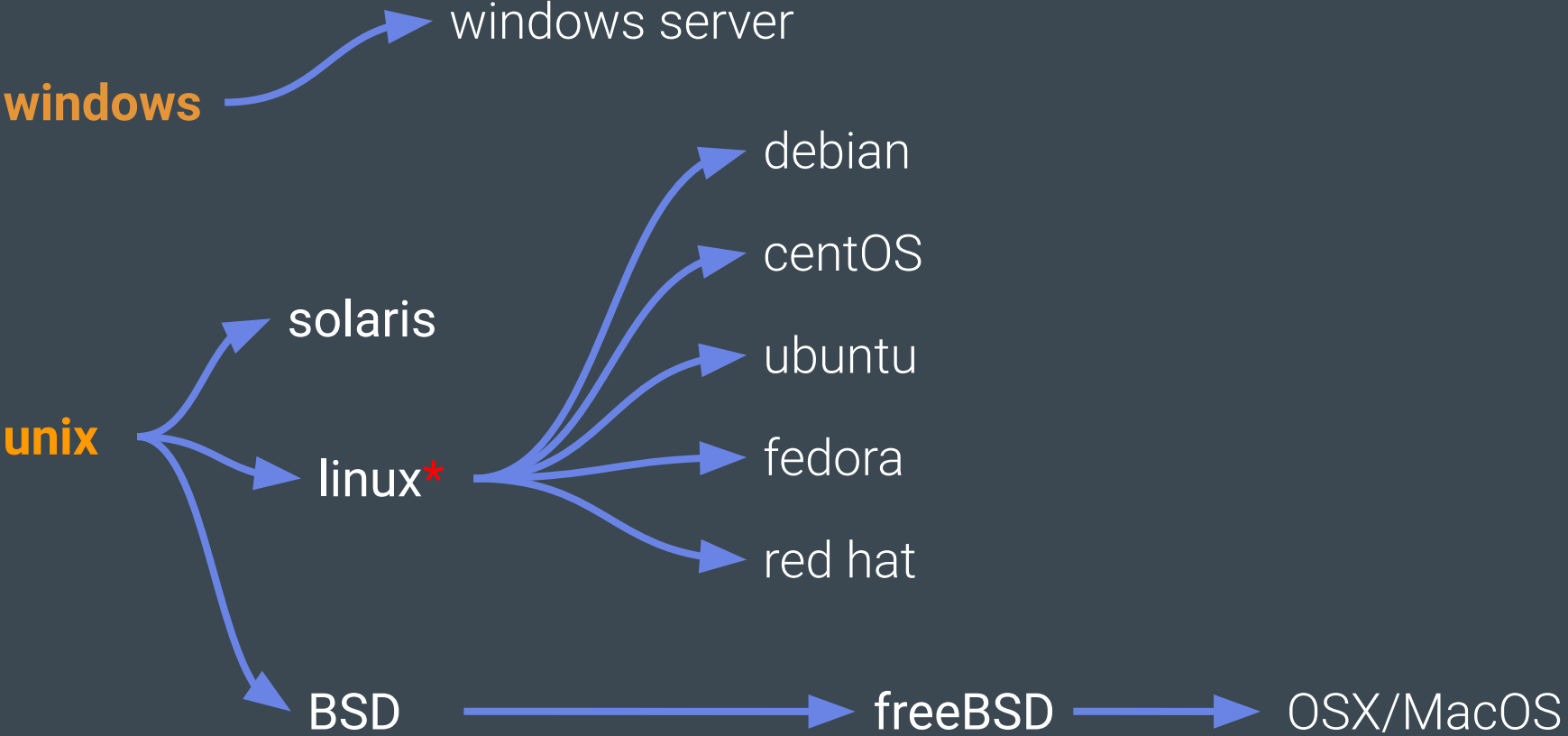


AlmaLinux

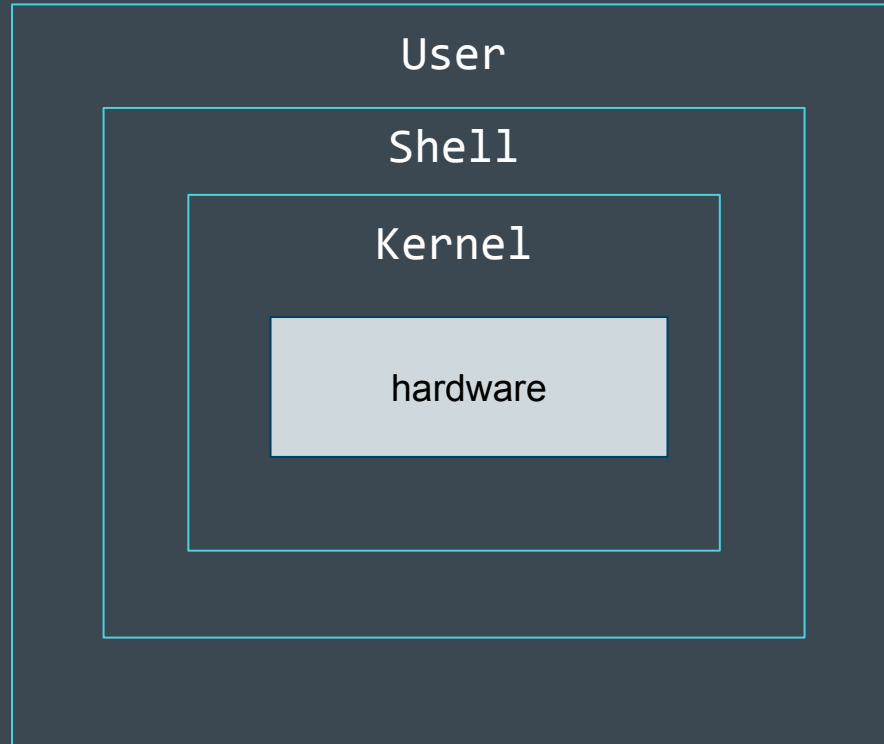


Rocky Linux

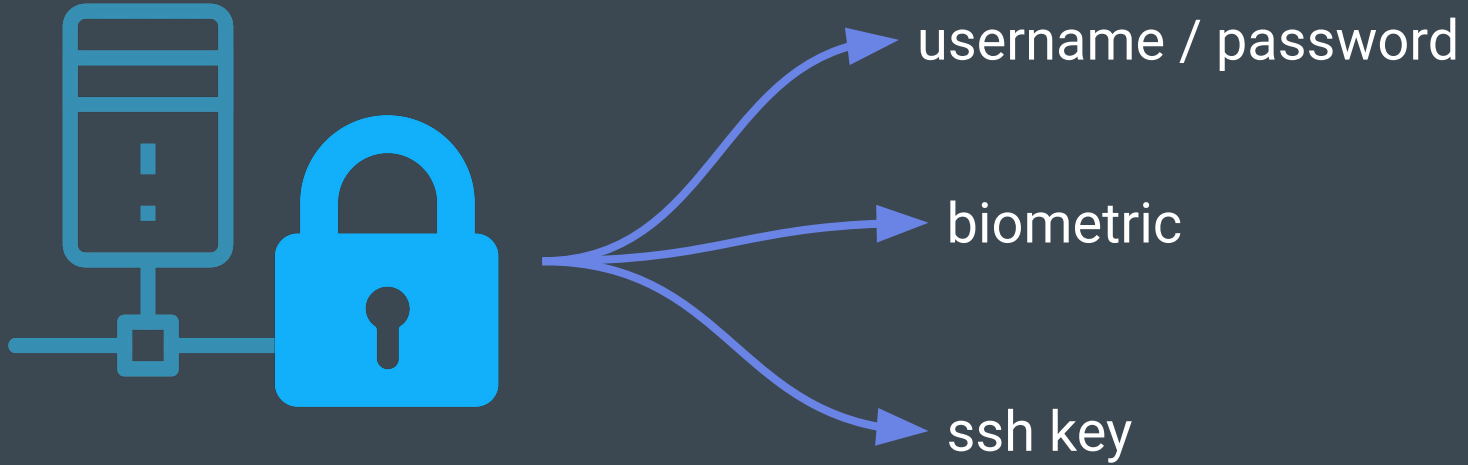
Operating Systems



Operating systems



Security



Security

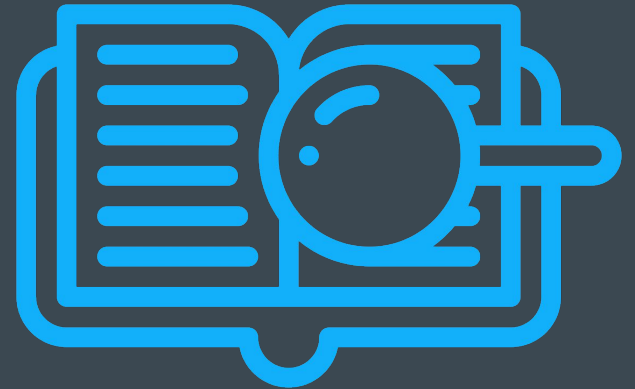
Number of characters	Upper and lowercase letters a-Z	Number, upper and lowercase letters, symbols 0-9 a-Z %\$!
6	instant	20 seconds
7	instant	49 minutes
8	13 minutes	5 days
9	6 hours	2 years
10	6 days	330 years
11	138 days	50 thousand years
12	20 years	8 million years

Dictionary attack

- 123456
- 123456789
- qwerty
- password
- 12345
- qwerty123
- 1q2w3e
- 12345678
- 111111
- 1234567890

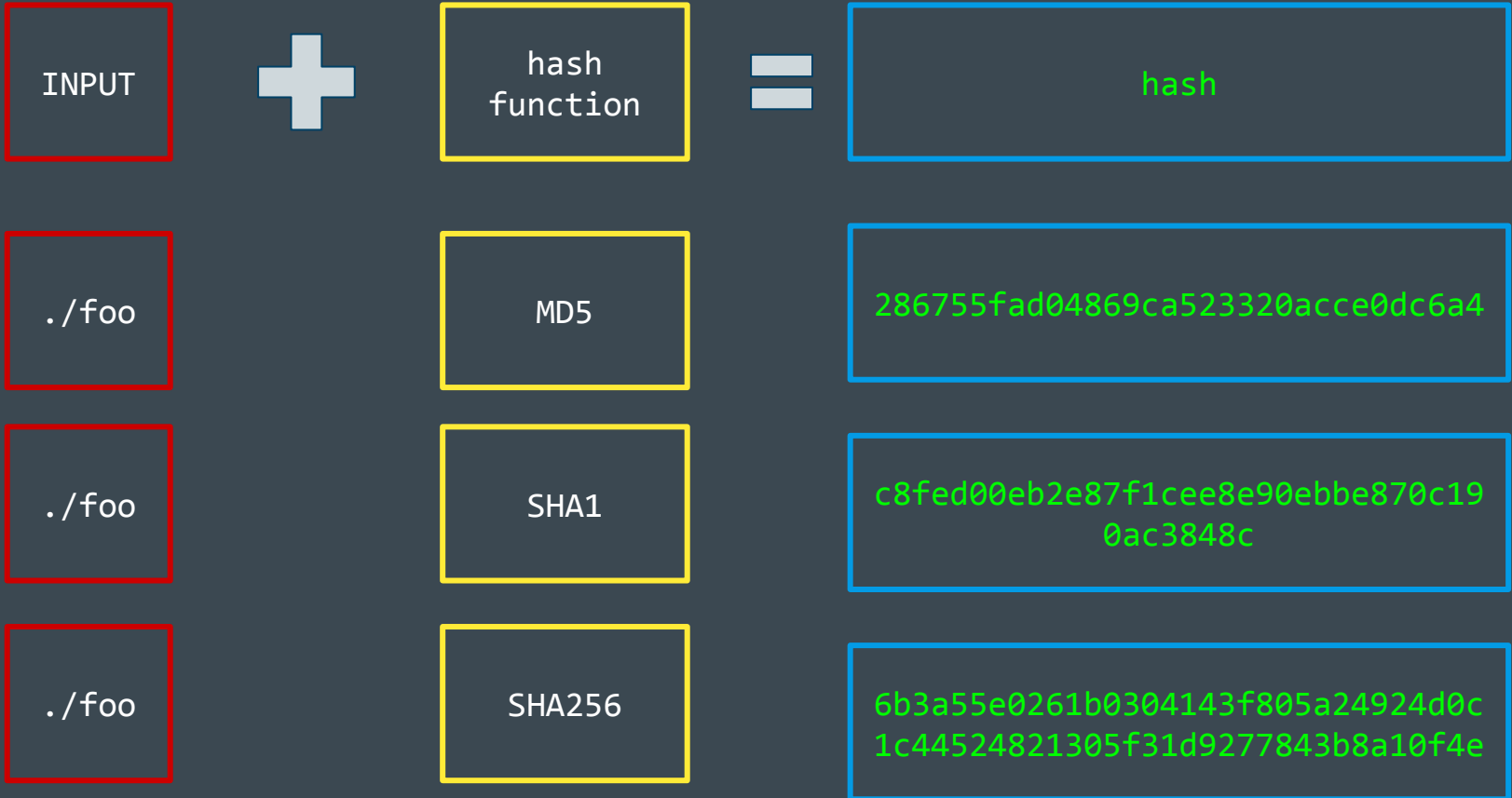
X p@ssword12

✓ p_#s2!\$DR



Hashing

```
echo password >> foo
```



Rainbow table

password

c8fed00eb2e87f1cee8e90e
bbe870c190ac3848c

p@ssword

35a90e0e7af38a53156d71b
453d332cf2ad3dd73

SHA1

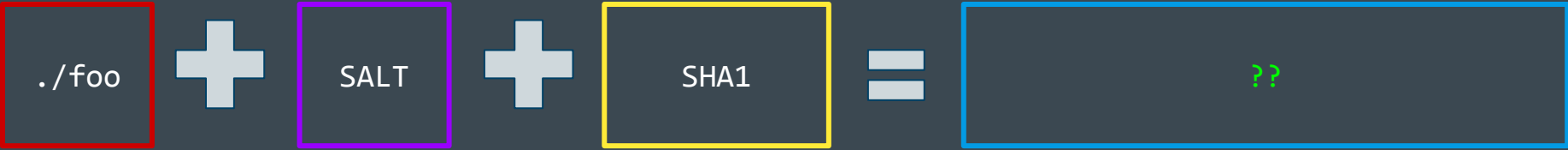
password1

a4483ce7bd7083999bef6a7
4117a443239e67fac

password12

092d8e7e86f8eba71f86ee9
fe841dede7e547d6e

Hashing + salt



Hashing

Bitcoin
SHA256

Ethereum
Keccak-256

Ransomware



SSH

SSH

SSH key pair

public key

private key

SSH - secure socket shell

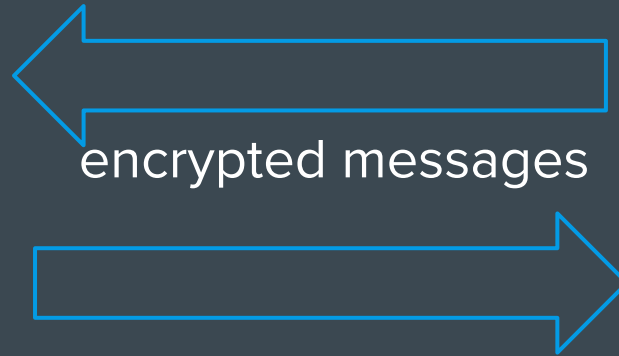
SSH

your computer

private key
(secret)

server

public key



```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdflnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficecl]
[-P policy] [-p pattern] [-S src_addr] [-s packetSize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION
The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit an ICMP ECHO_REPLY from a target system, which may be a host or a remote router. The ping utility sends a series of datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" of data. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received within a certain interval. Also output the round trip times that are longer than the interval between transmissions, further output the number of packets that have been dropped and packets has increased.
- a Audible. Output a bell (ASCII 0x07) character when any packet is received. Also output the round trip times that are longer than a certain interval.
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will stop after count sweeps. If this option is specified in conjunction with ping flood, each sweep will stop after count sweeps.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

Exercise

SSH Key

SSH key

1. Move into the `~/.ssh` directory
2. Generate a key using `ssh-keygen`
3. Name your key "fsfe"

SSH key

1. Move into the ~/.ssh directory

```
cd ~/.ssh
```

2. Generate a key using ssh-keygen

```
ssh-keygen
```

SSH key

```
→ .ssh ls | grep fsfe
```

fsfe



private key

fsfe.pub



public key

1. Copy the public key into Digital Ocean
2. Finish setting up the server

```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdflnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficcl
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

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datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" of
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- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

Exercise

Logging in

1. ssh into your server

```
ssh root@<your_IP>
```

2. ssh into your server your private key

```
ssh -i ~/.ssh/fsfe root@<your_IP>
```

3. Exit your server

```
exit
```

1. Make sure keychain is active

```
vi ~/.ssh/config
```

2. Add private key to keychain

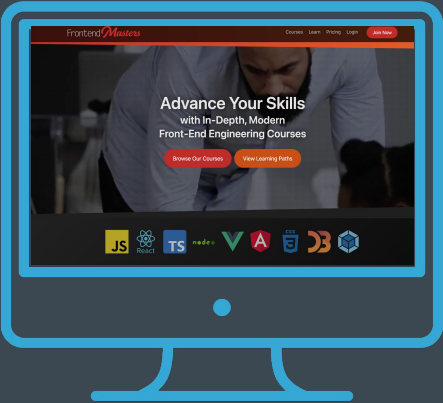
```
ssh-add --apple-use-keychain fsfe
```

```
Host *  
  AddKeysToAgent yes  
  UseKeychain yes
```

Understanding the internet

- ❖ How the internet works
- ❖ Buying a domain
- ❖ Putting it together

How does the
internet work?



magic?

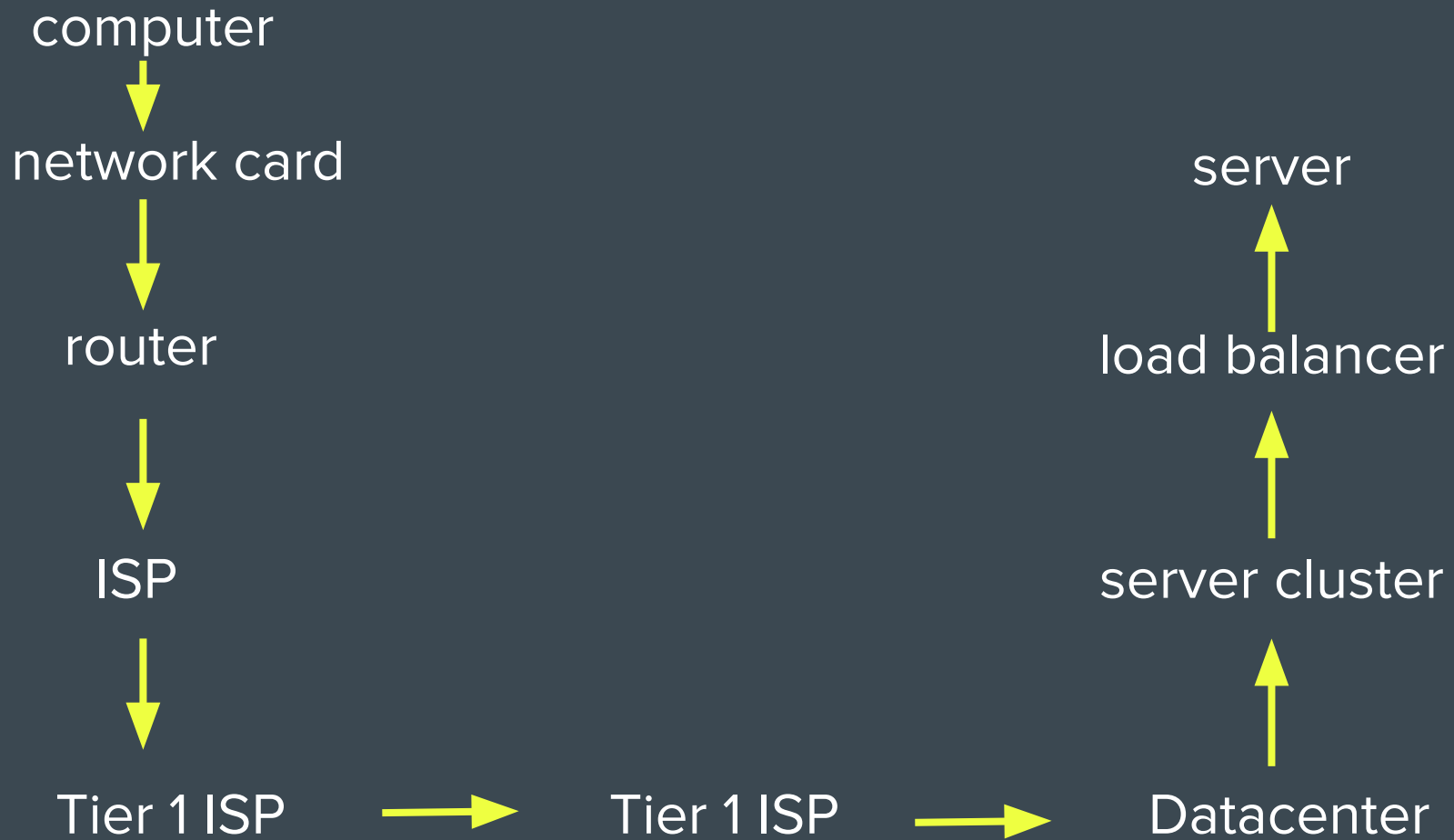


extra magic?





The internet is built on
cooperation and rules



Terminology



Internet - a network of networks

Intranet - private network

LAN - local area network

WAN - wide area network

Terminology



IP - internet protocol

IP Address - numeric label
assigned to an internet connected
device

IPv4

8.8.8.8

IPv6

2001:4860:4860:8888

```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDffnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p pattern]
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdflnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficclass]
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION
The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit
datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" and
packet. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received.
 trip times that are longer than the interval between transmissions, further
 if the number of dropped packets has increased.
- a Allow the use of wildcards in the host argument. The results of any ping
 operations are printed.
- b boundif Bind the socket to interface boundif for sending. This option is an Apple
 extension.
- C Prohibit the socket from using the cellular network interface. This option
 is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this
 option is specified in conjunction with ping sweeps, each sweep will
 stop after count packets are received.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times
 a period "." is printed, while for every ECHO_REPLY received a backspace
 are being dropped. Only the super-user may use this option. This can be
 dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This
 option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This
 option is an Apple extension.

Exercise

Network tools

- Check status of a network host

```
ping google.com
```

- Follow the path of your request

```
tracert google.com
```

- Show network status

```
netstat -lt | less
```

Terminology



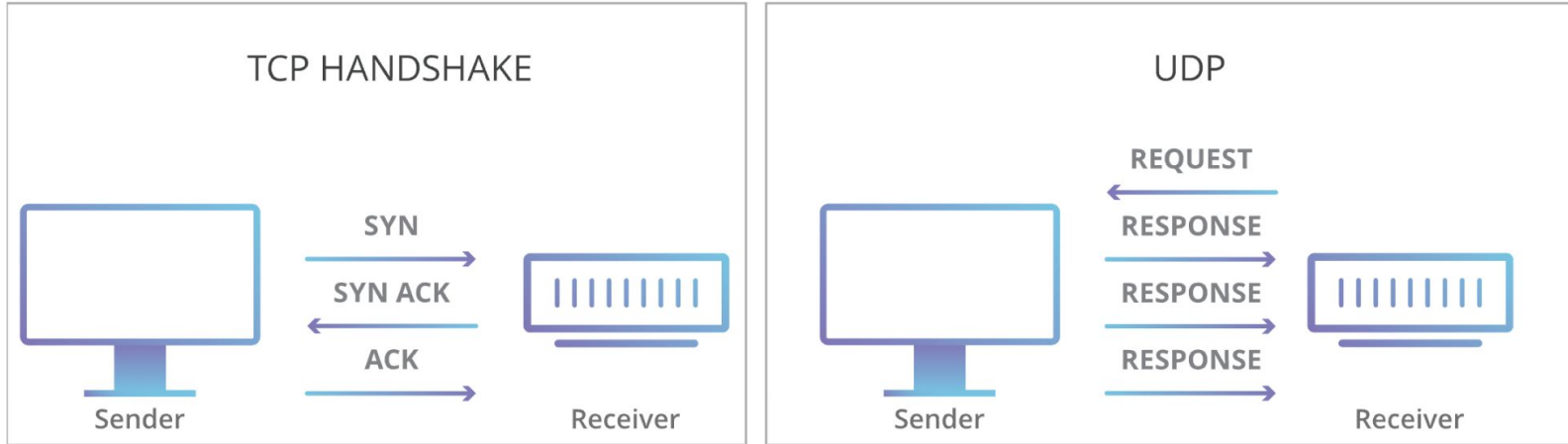
TCP - transmission control protocol

UDP - user datagram protocol

ICMP - internet control message
protocol

Packet - unit of data transmitted over a
network

TCP vs UDP Communication

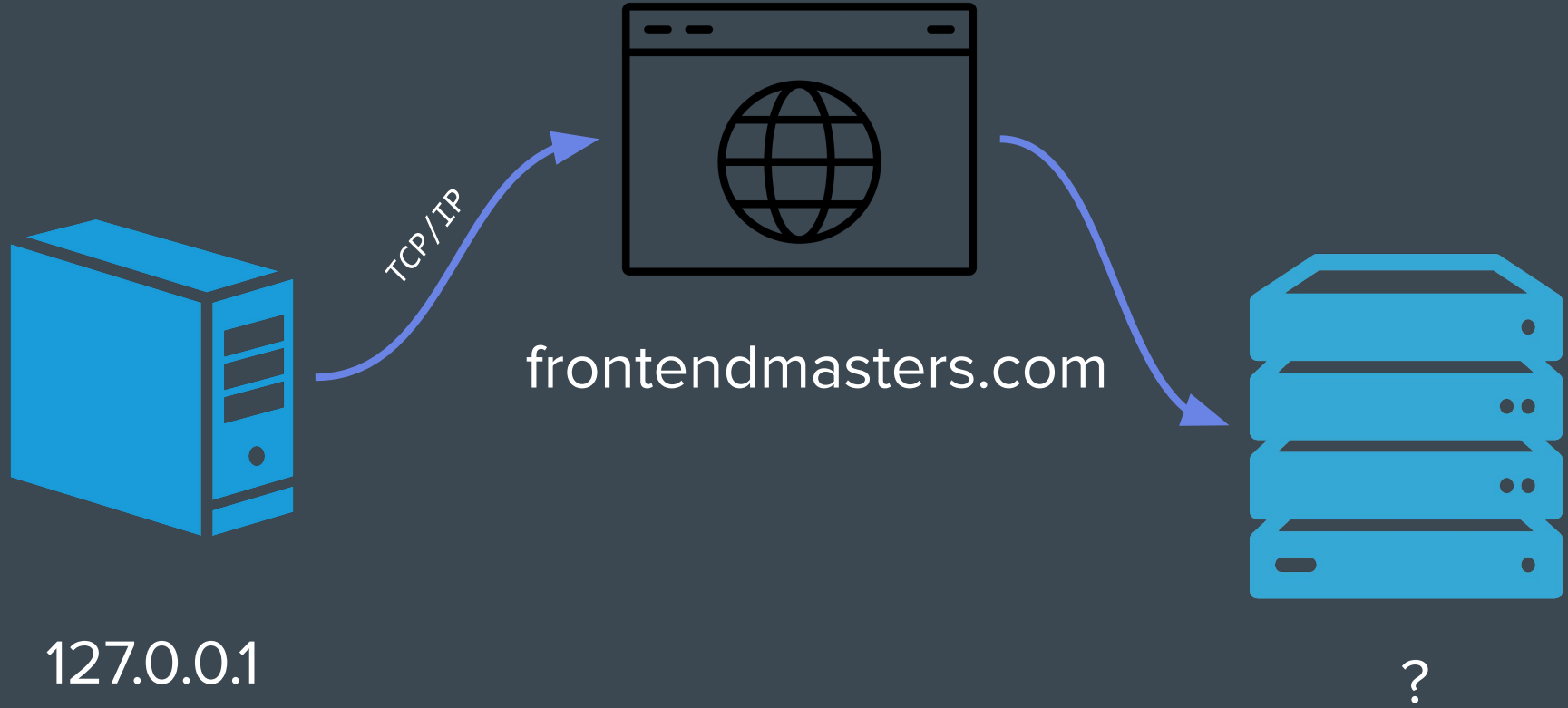


source: <https://www.cloudflare.com/learning/ddos/glossary/user-datagram-protocol-udp/>



TCP/IP

How the internet works



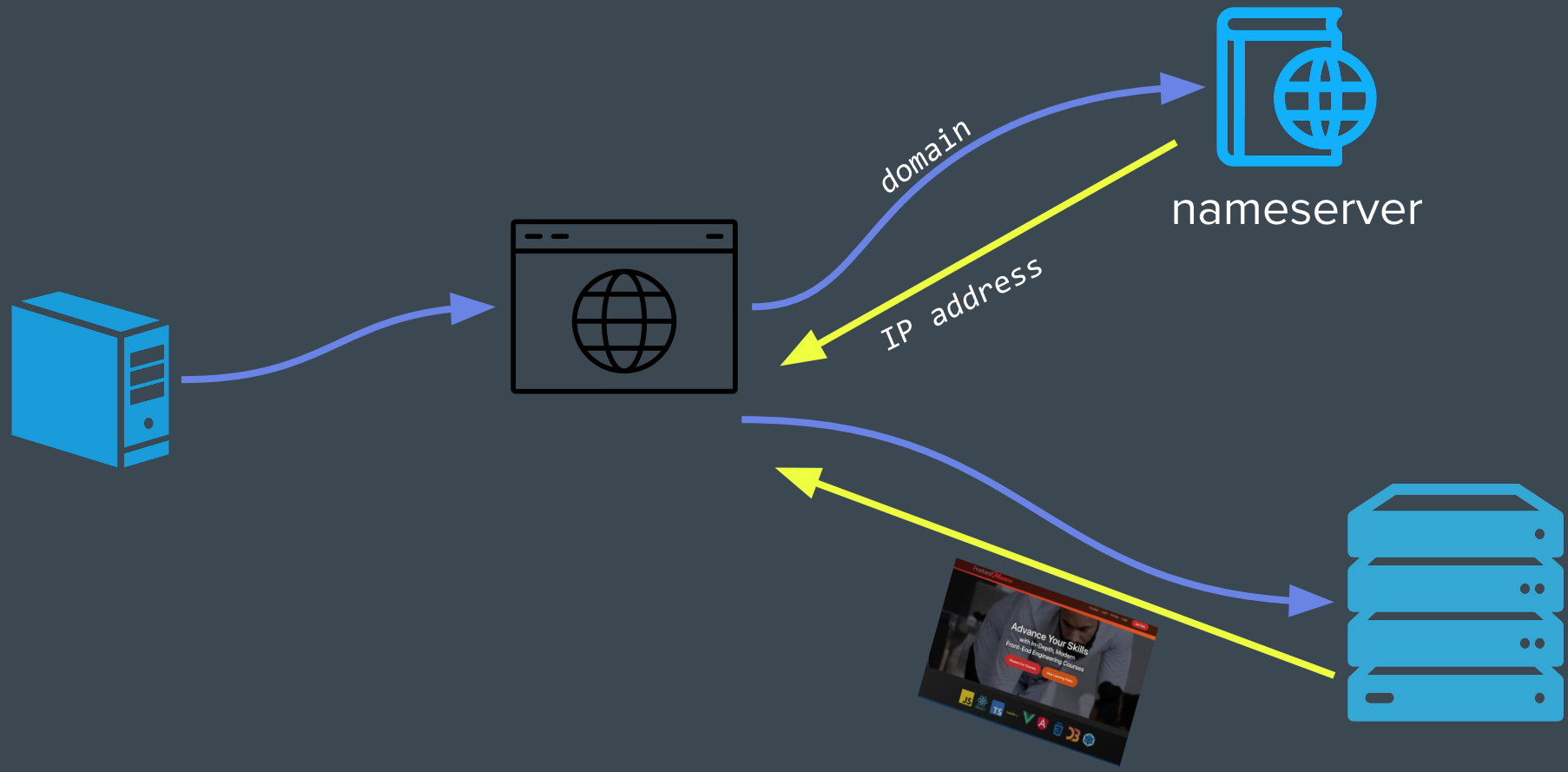
Terminology

DNS - domain name system

Nameserver - hold DNS records to translate domain names into IP addresses



How the internet works



DNS records



A record - maps name to IP address

CNAME - maps name to name

ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS

```
ping [-AaCddfnOqqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p pattern]
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdfLnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficclass]
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION

The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit ECHO_REPLY datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" and a packet. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received or when trip times that are longer than the interval between transmissions, further when the number of unperceived packets has increased.
- a Audible. Output a bell (ASCII 0x07) character when any packet is received or when any option are present.
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will send count packets.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times a period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

Exercise

DNS

Lookup the nameservers for an domain

```
nslookup frontendmasters.com
```

Lookup the DNS records for a domain

```
dig frontendmasters.com
```

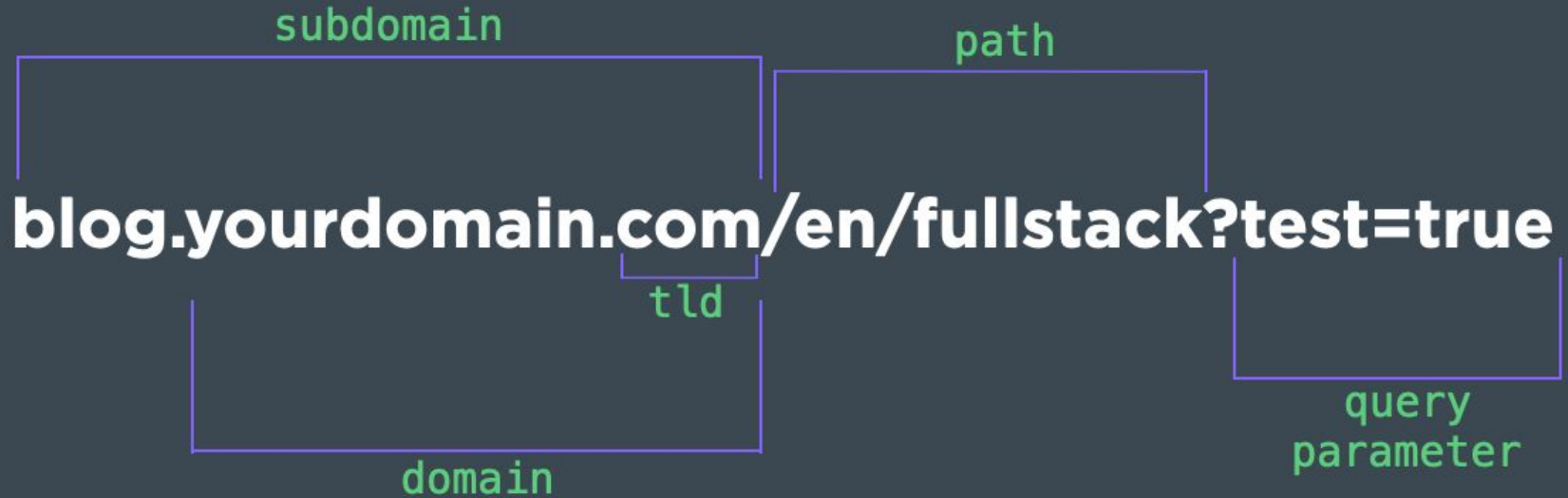
View browser DNS cache

Chrome - <chrome://net-internals/#dns>

Firefox - <about:networking#dns>

Anatomy of a URL

URL - uniform resource locator



```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdflnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficcl
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION
The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit
datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" of
packet. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received. Also print round trip times that are longer than the interval between transmissions, further print the number of dropped packets has increased.
- a Audible. Output a bell (ASCII 0x07) character when any packet is received. Also print round trip times that are longer than the interval between transmissions, further print the number of dropped packets has increased.
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will stop after count sweeps.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

Exercise

Buying a domain

www.namecheap.com

1. Buy a domain with a registrar
 - a. Update the nameserver to use Digital Ocean
2. On Digital Ocean, add two A records with your IP address
 - @
 - WWW

Server Setup

- ❖ Server setup
- ❖ Web Servers
- ❖ NodeJS

Brand new server

1. Update software
2. Restart your server
3. Create a new user
4. Make that user a **superuser**
5. Enable login for new user
6. Disable root login

Updating and restarting

1. ssh into your server
2. Update software

```
apt update  
apt upgrade
```

3. Restart your server

```
shutdown now -r
```

sudo



root - highest permission level. Allows unrestricted access to the OS

sudo - super user do. Allows you to run commands and programs as root

Creating and updating users

1. Create a new user

```
adduser <your_username>
```

2. Add user to "sudo" group

```
usermod -aG sudo <your_username>
```

3. Switch user

```
su <your_username>
```

4. Check sudo access

```
sudo cat /var/log/auth.log
```

Enable login as new user

1. Create authorized_keys file

```
~/.ssh/authorized_keys
```

2. Paste your public key
3. Exit
4. Login with new user

```
ssh <your_username>@<your_IP>
```

Security

1. Change file permission

```
chmod 644 ~/.ssh/authorized_keys
```

2. Disable root login

```
sudo vi /etc/ssh/sshd_config
```

3. Restart ssh daemon

```
sudo service sshd restart
```

Web servers



Web servers



NGINX

Web servers

- Web server
- Reverse proxy
- Forward proxy

Ngīnx
(engine-x)

Web servers

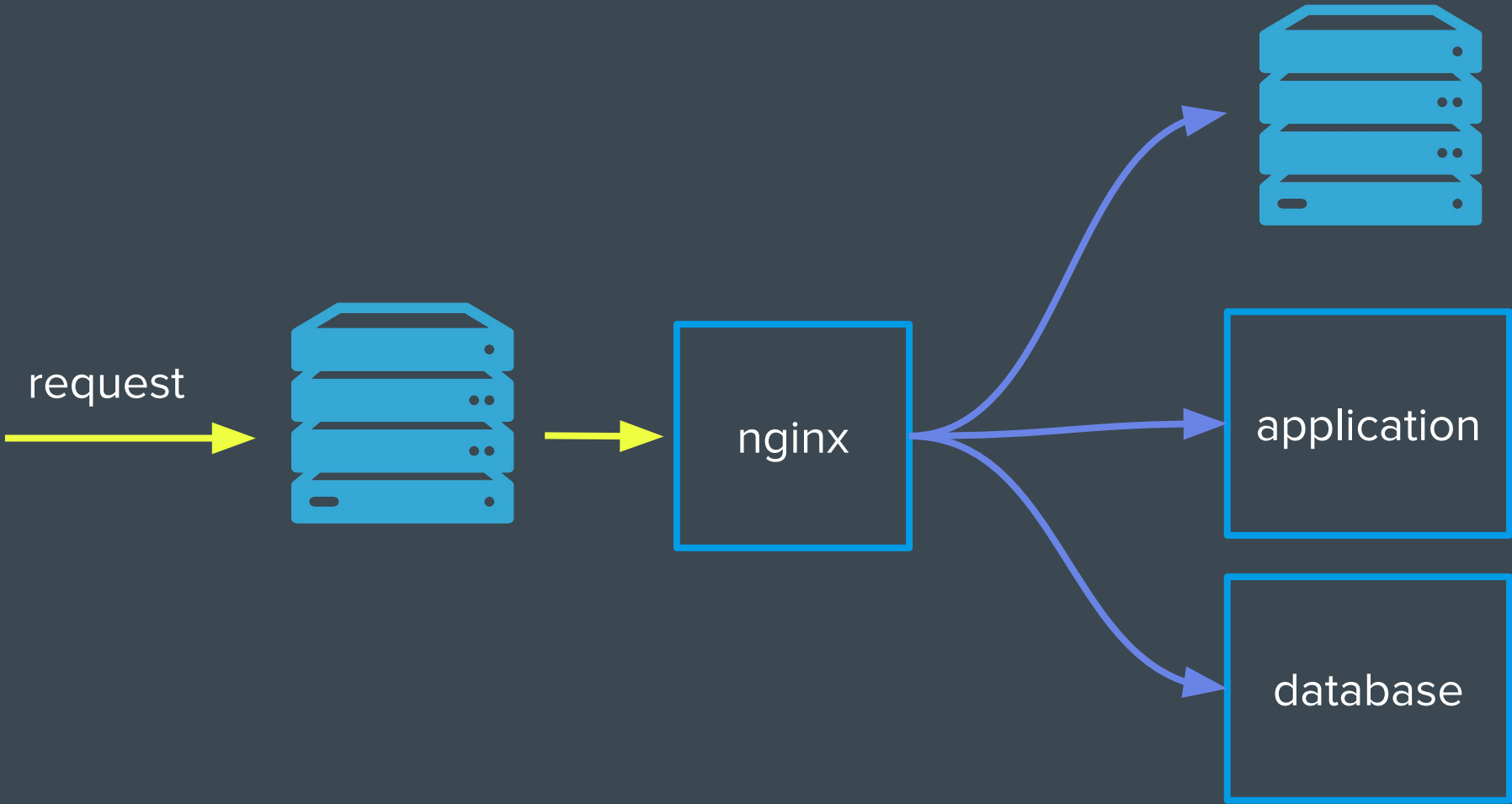
request



application

database

Web servers



ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS

```
ping [-AaCDdfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdfLnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficecl]
[-P policy] [-p pattern] [-S src_addr] [-s packetSize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION

The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit an ICMP ECHO_REPLY from a target system, which may be a host or a remote router. The ping utility sends a series of datagrams ("pings") having an IP and ICMP header, followed by a "struct timeval" of data. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received within a certain interval. Also output trip times that are longer than the interval between transmissions, further outputting the number of dropped packets has increased.
- a Audible. Output a bell (ASCII 0x07) character when any packet is received. This option is only available when any packet are received.
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is only available on iOS.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will stop after count packets are received. If this option is specified in conjunction with ping flood, each sweep will stop after count packets are received.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is only available when using ping sweeps.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is only available when using ping sweeps.

Nginx

Nginx

1. Install nginx

```
sudo apt install nginx
```

2. Start nginx

```
sudo service nginx start
```

3. Navigate to your server in the browser!

Nginx configuration

View default nginx configuration

```
less /etc/nginx/sites-available/default
```

Nginx configuration

```
root /var/www/html;
```

← **base directory for requests**

```
# Add index.php to the list if you are using PHP
index index.html index.htm index.nginx-debian.html;
```

```
server_name _;
```

```
location / {
```

```
    # First attempt to serve request as file, then
    # as directory, then fall back to displaying a 404.
    try_files $uri $uri/ =404;
```

```
}
```

Nginx configuration

```
root /var/www/html;
```

```
# Add index.php to the list if you are using PHP  
index index.html index.htm index.nginx-debian.html;
```

```
server_name _;
```

location block



```
location / {  
    # First attempt to serve request as file, then  
    # as directory, then fall back to displaying a 404.  
    try_files $uri $uri/ =404;  
}
```

Nginx configuration

```
root /var/www/html;
```

```
# Add index.php to the list if you are using PHP  
index index.html index.htm index.nginx-debian.html;
```

```
server_name _;
```

```
location / {  
    # First attempt to serve request as file, then  
    # as directory, then fall back to displaying a 404.  
    try_files $uri $uri/ =404;  
}
```




directive

Nginx configuration

html defaults

```
root /var/www/html;
```

```
# Add index.php to the list if you are using PHP
index index.html index.htm index.nginx-debian.html;
```



```
server_name _;
```

```
location / {
    # First attempt to serve request as file, then
    # as directory, then fall back to displaying a 404.
    try_files $uri $uri/ =404;
}
```

Nginx configuration

Create and edit default page

```
sudo vi /var/www/html/index.html
```

Diving into the server

- ❖ Application setup
- ❖ Process management
- ❖ Version control

```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdflnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficcl
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION
The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit
datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" of
packet. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received. Also output
- a Audible. Output a bell (ASCII 0x07) character when any packet is received. Also output
- b boundif Bind the socket to interface boundif for sending. This option is an Apple
- C Prohibit the socket from using the cellular network interface. This option is an Apple
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an

Exercise

Application setup

Node.JS



Node.js

1. Link to newest node.js source

```
curl https://deb.nodesource.com/setup_19.x |  
sudo -E bash -
```

2. Install node.js

```
sudo apt-get install nodejs
```

3. Install git

```
sudo apt install git
```

Application setup

1. Establish application file system
2. Enable version control
3. Create a node.js server

Application setup

1. Change ownership of /www

```
sudo chown -R $USER:$USER /var/www
```

2. Make an application directory

```
mkdir /var/www/app
```

3. Initialize empty git repo in /app

```
git init
```

Application setup

1. Create app file

```
touch app.js
```

2. Initialize project

```
npm init
```

3. Create a basic node server in app.js

4. Start your application

Basic node server

```
const http = require("http");

http.createServer(function (req, res) {
  res.write("On the way to being a full stack engineer!");
  res.end();
}).listen(3000);

console.log("Server started on port 3000");
```

Proxy pass

```
location / {  
    proxy_pass URL_TO_PROXY_TO;  
}
```

Proxy pass

Create a new nginx server and proxy requests

```
sudo vi /etc/nginx/sites-enabled/fsfe
```

Proxy pass

```
server {  
  
    listen 80 default_server;  
    listen [::]:80 default_server;  
  
    root /var/www/html;  
    index index.html;  
  
    server_name <your_domain>;  
  
    location / {  
        proxy_pass http://127.0.0.1:3000/;  
    }  
}
```

Proxy pass

Point nginx to new server

```
sudo vi /etc/nginx/nginx.conf
```

```
##  
# Virtual Host Configs  
##  
  
include /etc/nginx/conf.d/*.conf;  
include /etc/nginx/sites-enabled/fsfe;
```

Application setup

Validate nginx configuration

```
sudo nginx -t
```

Restart nginx

```
sudo service nginx restart
```

PM2

1. Install PM2

```
sudo npm i -g pm2
```

2. Start PM2

```
pm2 start app.js --watch
```

3. Setup auto restart

```
pm2 save  
pm2 startup
```

Version control



version control - record changes to a file system to preserve history

git

subversion

mercurial

ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS

```
ping [-AaCddfnOqqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdfLnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficcl
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION

The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit ECHO_RESPONSE datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" and a packet. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received, and trip times that are longer than the interval between transmissions, further if no unperceived packets has increased.
- a Audible. Output a bell (ASCII 0x07) character when any packet is received, and trip times that are longer than the interval between transmissions, further if no unperceived packets has increased.
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will send count packets.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A period "." is printed, while for every ECHO_REPLY received a backspace "\b" are being dropped. Only the super-user may use this option. [This can be dangerous](#).
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

Exercise

Git

Git

1. Create a git repository
2. On your server, create an SSH key called gh_key
3. Add the SSH key to Github
4. Add remote repo
5. Ensure new SSH key is used
6. Push local repository to Github

Git

1. Ensure git uses your new ssh key

```
vi ~/.ssh/config
```

2. Change permission of config to 600

```
chmod 600 ~/.ssh/config
```

3. Change permission of gh_key to 600

```
chmod 600 ~/.ssh/gh_key
```

```
Host github.com  
  Hostname github.com  
  IdentityFile ~/.ssh/gh_key
```

In case you get stuck

Stop a running process

```
kill <process>
```

Test your ssh connection

```
ssh -vT git@github.com
```

Save a readonly file in vim

```
:w !sudo tee %
```

View permissions as numbers

```
stat -c %a <file_name>
```

I might need security

- ❖ Access Control
- ❖ Securing applications
- ❖ Firewalls
- ❖ Permissions
- ❖ Updating software

Read auth log

```
sudo cat /var/log/auth.log
```

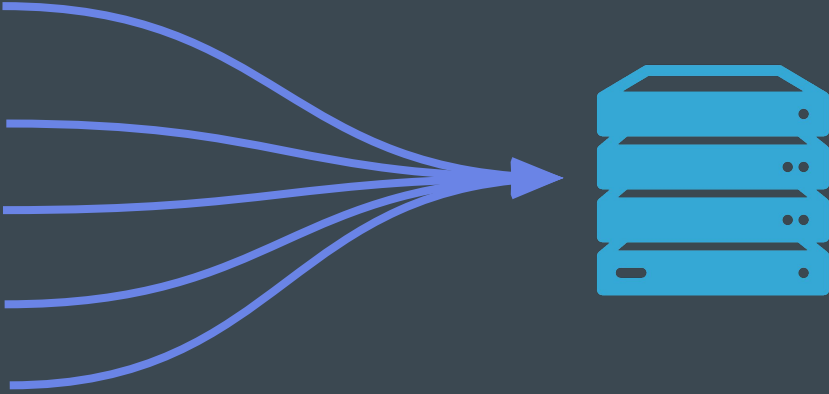
What could someone do if they
gained ~~root~~ access to your server?

Security

- SSH
- Firewalls
- Updates
- Two factor authentication
- VPN

Ports

port - Communication endpoint that maps to specific process or network service



See well known ports

```
less /etc/services
```

ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS

```
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netservertime] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdflnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficecl]
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION

The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit an ICMP ECHO_REPLY from a target system. These datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" of user-specified size. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received within the specified interval. Also output trip times that are longer than the interval between transmissions, further outputting the number of dropped packets if the number of dropped packets has increased.
- a Audible. Output a bell (ASCII 0x07) character when any packet is received. Also output trip times that are longer than the interval between transmissions, further outputting the number of dropped packets if the number of dropped packets has increased.
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will stop after count packets are received. If this option is specified in conjunction with ping floods, each sweep will stop after count packets are received.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

nmap

nmap

1. Install nmap

```
sudo apt install nmap
```

2. Run nmap

```
nmap <your_server_ip>
```

3. Extra service/version information

```
nmap -sV <your_server_ip>
```

Firewall

“A network security device that monitors incoming and outgoing network traffic and decides whether to allow or block specific traffic based on a defined set of security rules.”

<https://www.cisco.com/c/en/us/products/security/firewalls/what-is-a-firewall.html>

Firewall

Firewall



ufw - uncomplicated firewall

Firewall

http

https

```
$ ufw allow ssh  
deny  
reject
```

ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS

```
ping [-AaCDdfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdfLnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficecl]
[-P policy] [-p pattern] [-S src_addr] [-s packetSize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION

The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit an ICMP ECHO_REPLY from a target system, which may be a host or a router. The datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" of user-specified size. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received within a certain interval. Also output the round-trip times that are longer than the interval between transmissions, further output the number of lost packets and the number of packets that has increased.
- a Audible. Output a bell (ASCII 0x07) character when any packet is received. Also output the round-trip times that are longer than a certain interval.
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will stop after count packets are received. If this option is specified in conjunction with ping flood, each sweep will stop after count packets are received.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

Exercise

ufw

1. Check firewall status

```
sudo ufw status
```

2. Allow ssh

```
sudo ufw allow ssh
```

3. Allow http

```
sudo ufw allow http
```

4. Enable firewall

```
sudo ufw enable
```

How would you create a
ufw rule to block all HTTP
connections?

```
sudo ufw reject http
```

Permissions

owner group everyone
 else

rwX **rwX** **rwX**
(4+2+1) (4+2+1) (4+2+1)

7 7 7

rw- **---** **---**
(4+2+0) (0+0+0) (0+0+0)

6 0 0

read 4
write 2
execute 1

Permissions

rwX rwX rwX

chmod 777 filename
chmod -R 777 dir

Anybody can read, write, execute.

rwX rwX r-X

chmod 775 filename
chmod -R 775 dir

Owner & Group can read, write, execute. Everyone else can read, execute.

rwX rwX r-

chmod 774 filename
chmod -R 774 dir

Owner & Group can read, write, execute. Everyone else can read.

rwX r-X r-X

chmod 755 filename
chmod -R 755 dir

Owner can read, write, execute. Everyone else can read, execute.

```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdflnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficcl
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION
The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit
datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" of
packet. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received. Also output
- a Audible. Output a bell (ASCII 0x07) character when any packet is received. Also output
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will stop after count packets have been received. If this option is specified in conjunction with ping floods, each sweep will stop after count packets have been received. If this option is specified in conjunction with ping sweeps, each sweep will stop after count packets have been received. If this option is specified in conjunction with ping floods, each sweep will stop after count packets have been received.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be used to test the system's ability to handle a flood of incoming traffic.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

Exercise

Application updates

Application Updates

1. Install unattended upgrades

```
sudo apt install unattended-upgrades
```

2. Enable upgrades

```
sudo dpkg-reconfigure --priority=low  
unattended-upgrades
```

Diving into the server pt 2

- ❖ CI/CD
- ❖ Shell scripting
- ❖ Cron

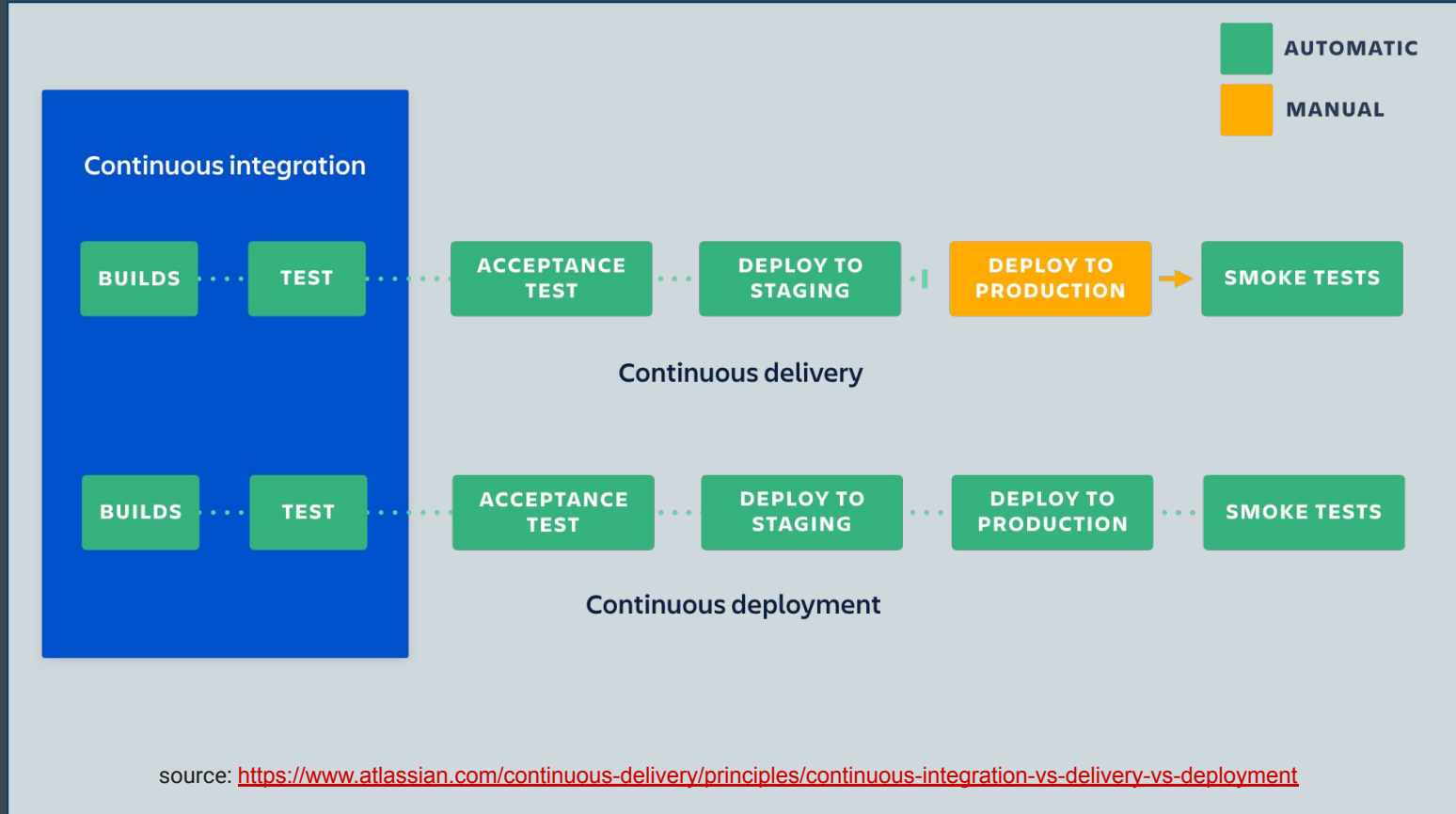
CI / CD



Continuous integration - Code changes are validated and merged back into main branch as often as possible.

Continuous delivery - Code changes are automatically built and ready for production.

Continuous deployment - Builds are automatically deployed to production environments.



SEARCH

ACCOUNT

my-kubernetes-account

REGION

default

STACK

(none)
 prod
 stage

STATUS

Healthy
 Unhealthy
 Disabled
 Starting
 Out of Service
 Unknown

AVAILABILITY ZONES

default

INSTANCE TYPES

INSTANCE COUNT

Min: Max:

Clusters Edit multiple Show Instances with details Create Server Group

MY-KUBERNETES-ACCOUNT mdservice-prod 128 ▲ : 100%

DEFAULT

V059: spinnaker-1022/mdservice:5c0220767b237ad0fd7e007304a7796cb5a2fafd 128 ▲ : 100%

MY-KUBERNETES-ACCOUNT mdservice-stage 2 ▲ : 100%

DEFAULT

V073: spinnaker-1022/mdservice:5c0220767b237ad0fd7e007304a7796cb5a2fafd 2 ▲ : 100%

V072: spinnaker-1022/mdservice:165d775bcd90cc4a4002ce26ec7db20d1aae9714

V071: spinnaker-1022/mdservice:bace3150dddaadff1e3f0ee84e155da49d588921

V070: spinnaker-1022/mdservice:58e1c233b8414286543dcaf41b828af2852d28d9

mdservice-prod-v059

Server Group Actions

- Rollback
- Resize
- Disable
- Destroy
- Clone

HEALTH

Pods 128 ▲ : 100%

DEPLOYMENT

No deployment found.

REPLICAS

Min 128
Max 128
Current 128

HORIZONTAL POD AUTOSCALING

Desired 128
Target CPU 40%
Current CPU 0%
Latest Rescale a minute ago

cron - executes commands on a schedule

```
0 10 * * 1-5 sh ./myscript.sh
```

“Run `./myscript.sh` at 10:00 on every day-of-week from Monday through Friday.”

shell scripting

```
#!/usr/bin/bash  
  
now=$(date +%r)  
read -p "What is your name? " name  
echo "The time is $now. Have a wonderful day $name"
```

```
What is your name? Jem  
The time is 05:30:09 AM. Have a wonderful day Jem
```

```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdflnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficcl
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION
The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit
datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" of
packet. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received. Also output round trip times that are longer than the interval between transmissions, further output if the number of dropped packets has increased.
- a Audible. Output a bell (ASCII 0x07) character when any packet is received. Also output round trip times that are longer than the interval between transmissions, further output if the number of dropped packets has increased.
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will stop after count sweeps.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

Exercise

Fake CI/CD

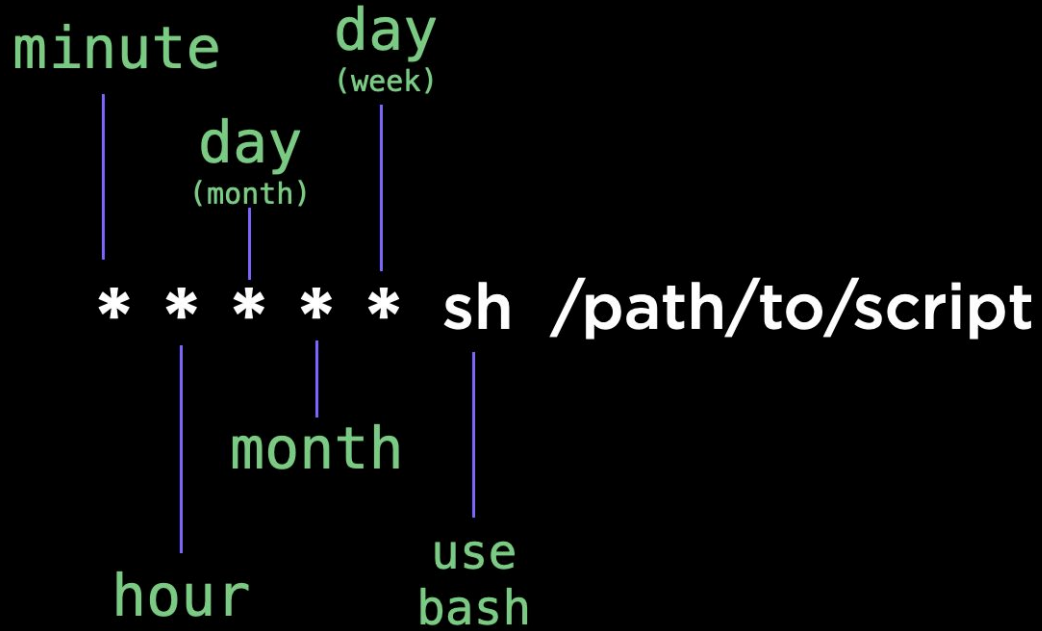
1. Create a bash script that git pulls from main branch
2. Create a cron job to execute script every 2 minutes

```
#!/ <location of bash>  
<commands to run>
```

Shows location of bash shell

```
which bash
```

cron



Shows cronjobs

```
crontab -e
```

Diving into your terminal

- ❖ Logs and how to read them
- ❖ Standard streams
- ❖ Redirection
- ❖ Finding things

/var/log/

- syslog
- auth.log
- nginx/access.log

tail - Output the last part of a file

head - Output the first part of a file

less - Output one page at time

cat - Output entire file

Follow the output of a file

```
tail -f
```

Standard Streams

- standard output
 - `stdout`
- standard input
 - `stdin`
- standard error
 - `stderr`

Redirection

- |
 - read from stdout
- >
 - write stdout to file
- >>
 - append stdout to file
- <
 - read from stdin
- 2>&1
 - redirect both stderr and stdout

Redirection

What does this do?

```
foo > bar
```

Finding things

`find`

find - search file **names**

`grep`

grep - search file **contents**

Finding things

```
$ find /bar -name foo.txt
```

find

find

directory

option

file/folder

Finding things

useful options

- -name
- -type
- -empty
- -executable
- -writable

find

```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdflnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficcl
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION
The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit
datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" of
packet. The options are as follows:

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- a Audible. Output a bell (ASCII 0x07) character when any packet is received. Also output
- b boundif Bind the socket to interface boundif for sending. This option is an Apple
- C Prohibit the socket from using the cellular network interface. This option is an Apple
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an

Exercise

Finding things

Find

1. Find all log files in `/var/log/`
2. Find all directories with the name log

Find

1. Find all log files in /var/log

```
find /var/log -type f -name "*.log"
```

2. Find all directories with the name log

```
find / -type d -name log
```

grep

```
$ grep -i 'jem' /var/www
```

grep

grep

options

search
expression

directory

```
$ zgrep FILE
```

search inside gzip file

grep

Find running node processes

```
ps aux | grep node
```

Nginx

- ❖ Nginx redirection
- ❖ Gzip
- ❖ Subdomains

Redirect

```
location /help {  
    return 301 https://developer.mozilla.org/en-US/;  
}
```

Gzip

```
##  
# Gzip Settings  
##  
  
gzip on;  
  
# gzip_vary on;  
# gzip_proxied any;  
# gzip_comp_level 6;  
# gzip_buffers 16 8k;  
# gzip_http_version 1.1;
```

/etc/nginx/nginx.conf

Gzip

/etc/nginx/nginx.conf

```
##  
# Gzip Settings  
##  
  
gzip on;  
  
# gzip_vary on;  
# gzip_proxied any;  
# gzip_comp_level 6;  
# gzip_buffers 16 8k;  
# gzip_http_version 1.1;
```

00001110100000

4 0

3 1

1 0

1 1

5 0

Subdomain

1. Create a subdomain called “blog”
 - a. Create an A record
 - b. Create a server
2. Update nginx.conf
3. Restart nginx

Subdomain

```
server {  
    listen 80;  
    listen [::]:80;  
    server_name blog.<your_domain>;  
  
    location / {  
        proxy_pass http://localhost:3000;  
    }  
}
```

Realtime & databases

- ❖ Websockets
- ❖ Files
- ❖ Databases

```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdflnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficecl]
[-P policy] [-p pattern] [-S src_addr] [-s packetSize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION
The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit an ICMP ECHO_REPLY from a target system. These datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" of user-supplied data. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received within a certain interval. Also output trip times that are longer than the interval between transmissions, further output the number of dropped packets has increased.
- a Audible. Output a bell (ASCII 0x07) character when any packet is received. Also output trip times that are longer than the interval between transmissions, further output the number of dropped packets has increased.
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will stop after count sweeps. If this option is specified in conjunction with ping flood, each sweep will stop after count sweeps.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred times per second. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings. This option is an Apple extension.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings. This option is an Apple extension.

Exercise

Websockets

Websockets

1. Update nginx configuration
2. Create a new node.js server
3. Enable websockets

websocket - persistent
bidirectional connection
between client and server

Websockets

```
location / {  
    proxy_set_header Upgrade $http_upgrade;  
    proxy_set_header Connection "upgrade";  
    proxy_pass http://127.0.0.1:3000;  
}
```

Websockets

```
const express = require('express');
const server = require('http').createServer();
const app = express();

app.get('/', function(req, res) {
  res.sendFile('index.html', {root: __dirname});
});

server.on('request', app);
server.listen(3000, function () { console.log('Listening on 3000'); });
```

Websockets

[Link to websocket example](#)

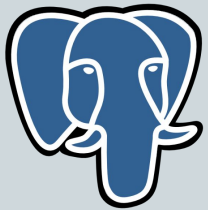
Files



Why not save everything to a file?

Databases

relational



PostgreSQL



- SQL
- Tables
- Related data
- Strict structure

non-relational



redis



elastic



mongoDB®

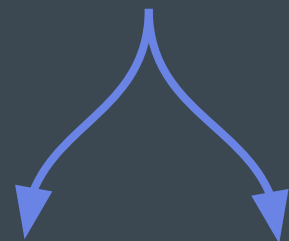


cassandra

- NoSQL
- Data agnostic
- Loose structure

Databases

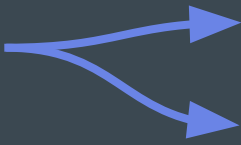
fields



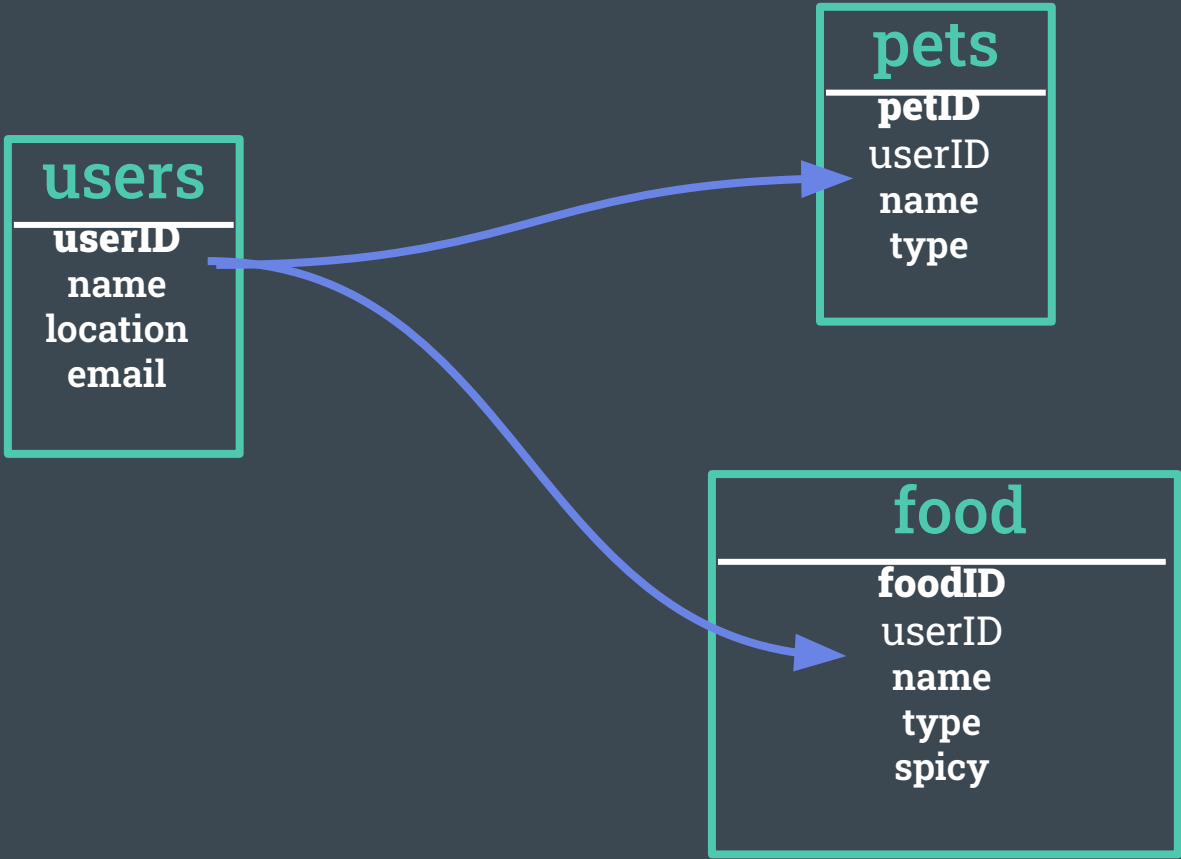
Users

userID	name (string)	location (string)
1	Jem	California
2	Marc	Minnesota

records



Databases



Databases

SQL - structured query language

users
userID
name
location
email

pets
petID
userID
name
type

food
foodID
userID
name
type
spicy



```
SELECT * FROM users WHERE name = Jem
```

```
SELECT food.type, users.name  
FROM food  
LEFT JOIN users ON users.userID = food.userID  
WHERE food.name = ramen
```

```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netservertime] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-R
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdfLnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k traffic]
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION
The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit ICMP Echo Replies from other hosts. Echo Request datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" packet. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received within the interval between transmissions, for which the number of received packets has increased.
- a AppleLink. Output a bell (ASCII 0x07) character when any of the options of the address is resolved.
- b boundif Bind the socket to interface boundif for sending. This option is an AppleLink option.
- C Prohibit the socket from using the cellular network interface. This is an AppleLink option.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will send count packets. If this option is specified in conjunction with ping flood, the number of packets sent will be limited to count.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred packets per second, whichever is less. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be used to test the ability of a host to handle incoming traffic.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings.

Exercise

Databases



1. Install sqlite3

```
npm install sqlite3
```

2. Set up a database

- a. Create a table named "visitors"
- b. Create a column named "count"
- c. Create a column named "time"

3. On connection, save current visitor count

SQLite

<https://github.com/young/fullstack-for-frontend3/blob/main/apps/database/index.js>

MySQL

<https://github.com/mysqljs/mysql>

HTTP

- ❖ HTTP
- ❖ Headers
- ❖ Status codes
- ❖ HTTPS
- ❖ Certificates
- ❖ HTTP/*

HTTP

HTTP - hypertext transport protocol

request



response

HTTP

```
GET / HTTP/1.1
Host: jemyoung.com
User-Agent: Mozilla/5.0 (Macintosh; Intel
Mac OS X 10_14_5) AppleWebKit/537.36
(KHTML, like Gecko) Chrome/76.0.3809.132
Safari/537.36
Accept: text/html
Accept-Encoding: gzip, br
Accept-Language: en,en-US
```

request

Headers

```
GET / HTTP/1.1
Host: jemyoung.com
User-Agent: Mozilla/5.0 (Macintosh; Intel
Mac OS X 10_14_5) AppleWebKit/537.36
(KHTML, like Gecko) Chrome/76.0.3809.132
Safari/537.36
Accept: text/html
Accept-Encoding: gzip, br
Accept-Language: en,en-US
```

request

Headers

common headers

User-agent	The requesting device type
Accept	What the device will handle
Accept-language	Browser languages
Content-type	The type of media
Set-cookie	Sets stateful information
X-	Typically used for custom headers

HTTP



HTTP/1.1 200 OK

Server: nginx/1.14.0 (Ubuntu)

Date: Wed, 25 Sep 2019 02:13:13 GMT

Content-Type: text/html; charset=utf-8

Content-Length: 12

response

Status Codes

200	OK
301	Moved permanently
302	Found (temporary redirect)
401	Not authorized
500	Internal server error

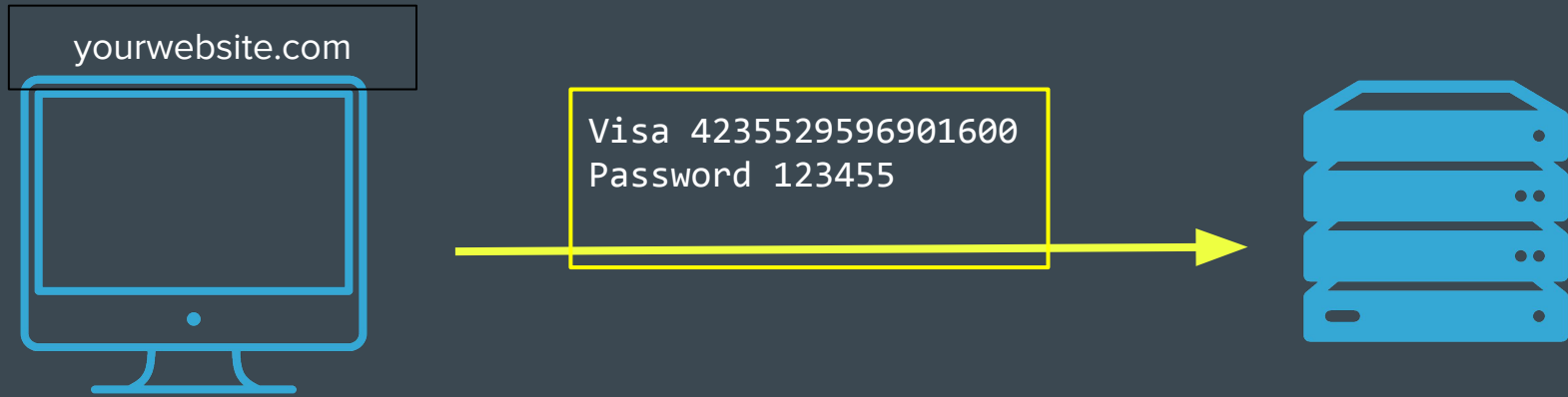
status code - indicates status of an http request

Status Codes

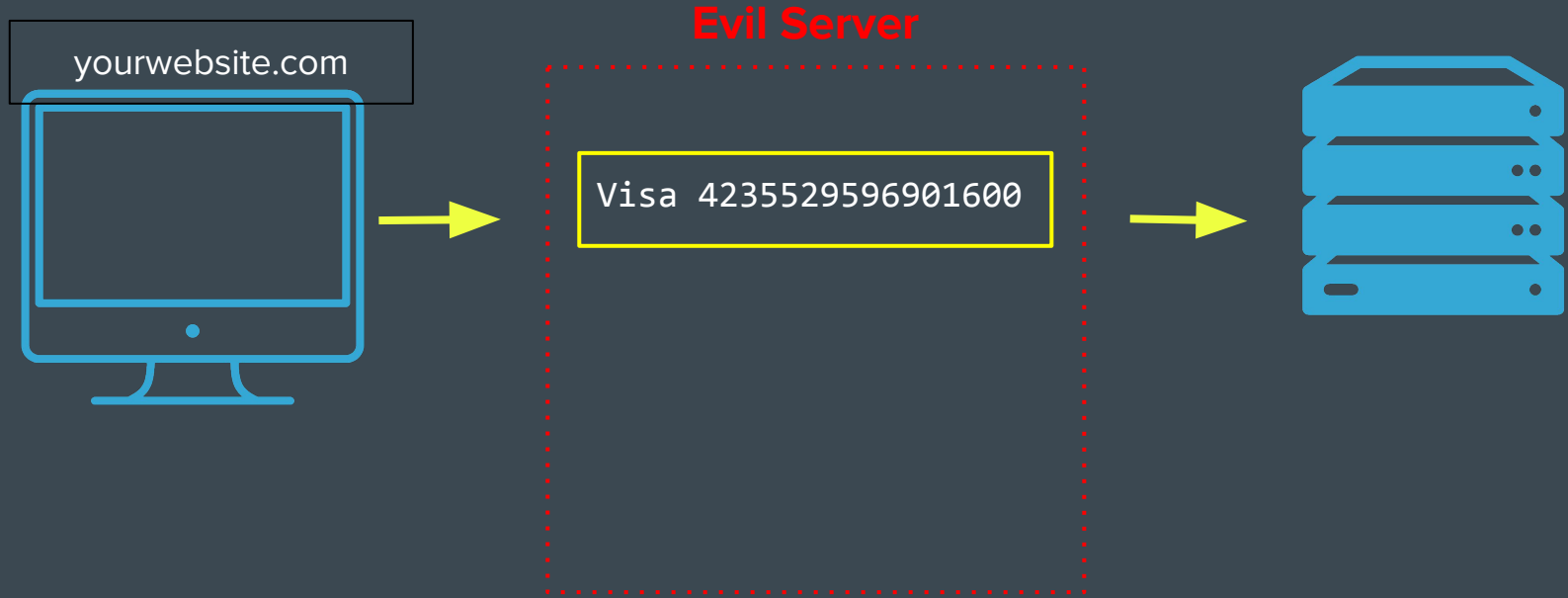
1xx	Information
2xx	Success
3xx	Redirect
4xx	Client error
5xx	Server error

What is the proper status
code for a successful
POST request?

HTTPS



HTTPS



HTTPS

yourwebsite.com



*Ifkfi24fh243&&o9#\$kD#!8b



```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize]
[-K netservicetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-p
[-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdFLnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k traffic]
[-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout]
mcast-group
```

DESCRIPTION
The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit
datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval"
packet. The options are as follows:

- A Audible. Output a bell (ASCII 0x07) character when no packet is received. Also output round-trip times that are longer than the interval between transmissions, further output if the number of received packets has increased.
- a ...
- b boundif Bind the socket to interface boundif for sending. This option is an Apple extension.
- C Prohibit the socket from using the cellular network interface. This option is an Apple extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will stop after count packets are received. If this option is specified in conjunction with ping floods, each sweep will stop after count packets are received. If this option is specified in conjunction with ping sweeps, each sweep will stop after count packets are received. If this option is specified in conjunction with ping floods, each sweep will stop after count packets are received.
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- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings.
- g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings.

Exercise

https

HTTPS

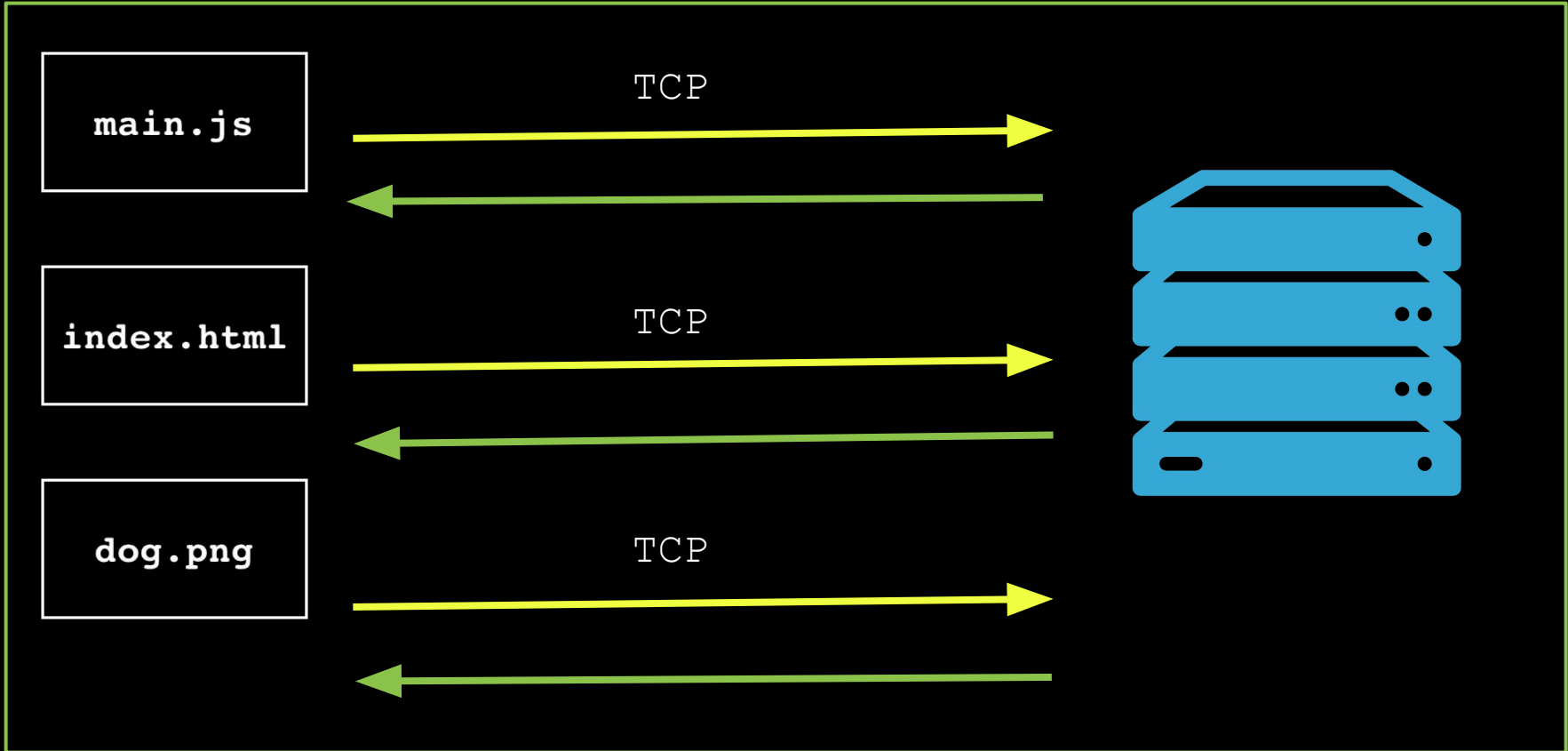
1. Install and use certbot
2. Open firewall



<https://certbot.eff.org/instructions>

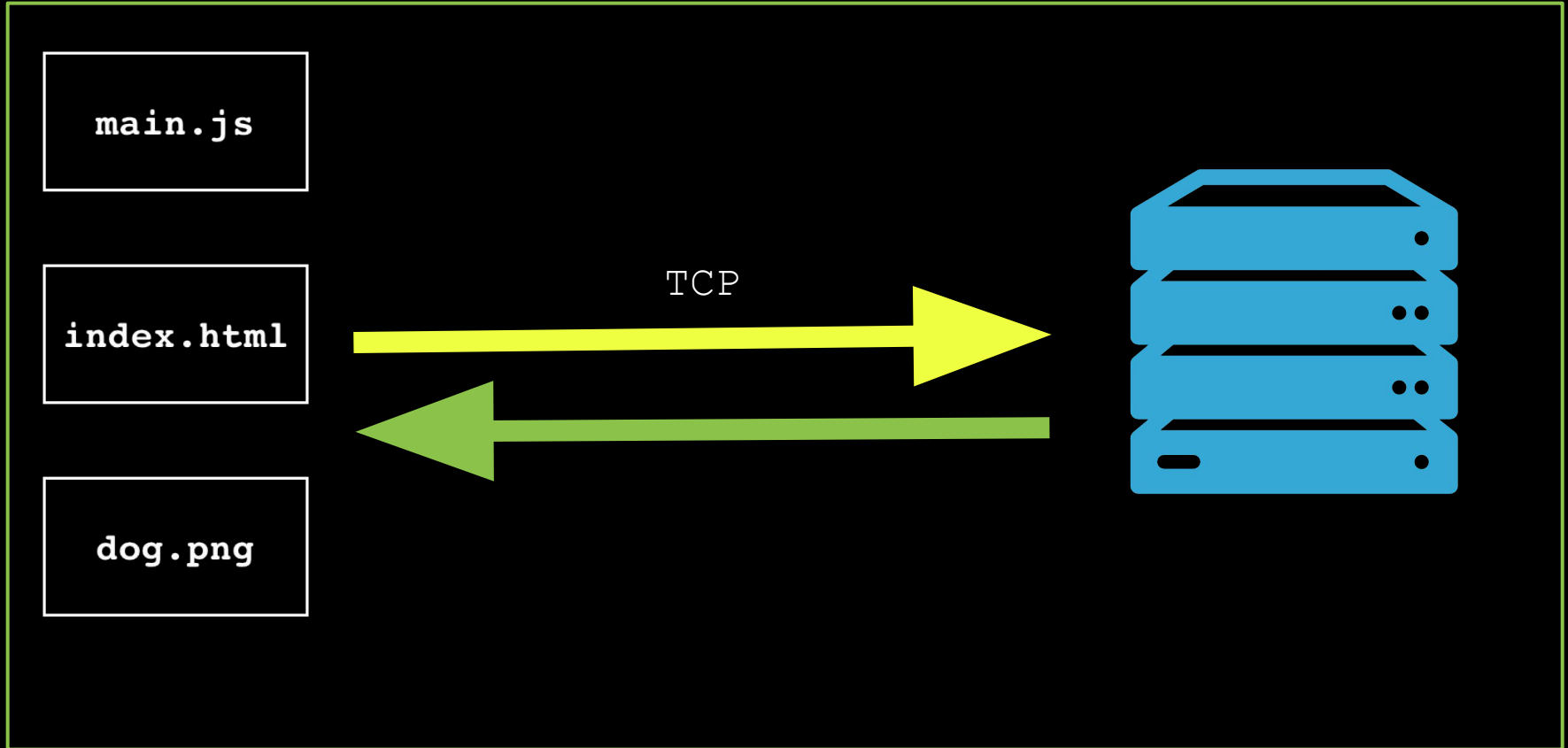
HTTP/2

http/1.1



HTTP/2

http/2



```
NAME
ping - send ICMP ECHO_REQUEST packets to network hosts

SYNOPSIS
ping [-AaCdDfnoQqRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize] [-K netserVICETYPE] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-W waittime] [-z tos] [--apple-connect] [--apple-time] host
ping [-AaDdfLnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k trafficclass] [-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t time] [mcast-group]

DESCRIPTION
The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit ICMP Echo Replies from other hosts. Echo request datagrams ("pings") have an IP and ICMP header, followed by a "struct timeval" packet. The options are as follows:

-A Audible. Output a bell (ASCII 0x07) character when no packet is received within the specified timeout. Also output trip times that are longer than the interval between transmissions, if the number of received packets has increased.
-a Audible. Output a bell (ASCII 0x07) character when an option address is resolved.
-b boundif Bind the socket to interface boundif for sending. This option is an alias for -I boundif.
-C Prohibit the socket from using the cellular network interface. This option is an alias for -I none.
-c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If this option is specified in conjunction with ping sweeps, each sweep will send count packets.
-D Set the Don't Fragment bit.
-d Set the SO_DEBUG option on the socket being used.
-f Flood ping. Outputs packets as fast as they come back or one hundred per second. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This option is an alias for -F.
-G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings.
-g sweepminsize Specify the size of ICMP payload to start with when sending sweeping pings.
```

Exercise

http/2

HTTP/2

Method	Status	Protocol	Scheme
GET	200	h2	https
GET	200	h2	https

Update nginx server

```
sudo vi /etc/nginx/sites-enabled/fsfe
```



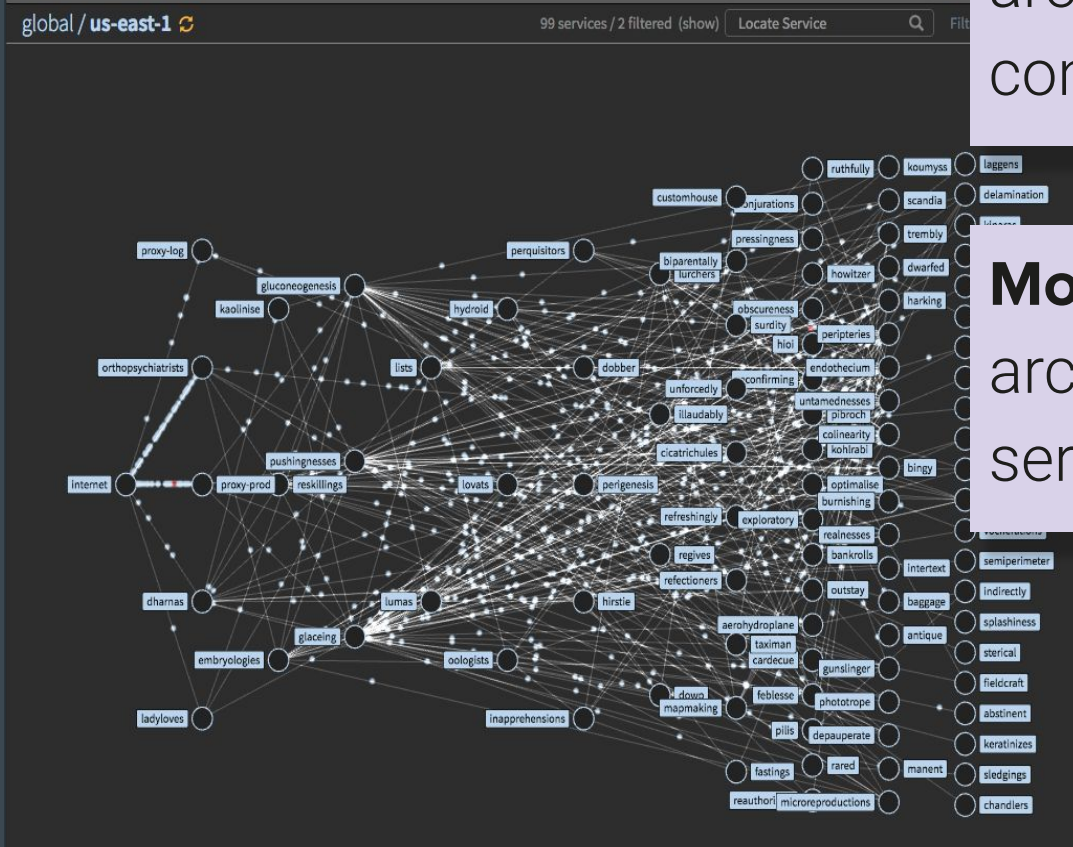
```
listen 443 http2 ssl;
```

Containers

- ❖ Microservices
- ❖ Containers
- ❖ Orchestration
- ❖ Load balancers
- ❖ Deployments

Microservices - Software architecture of loosely connected services

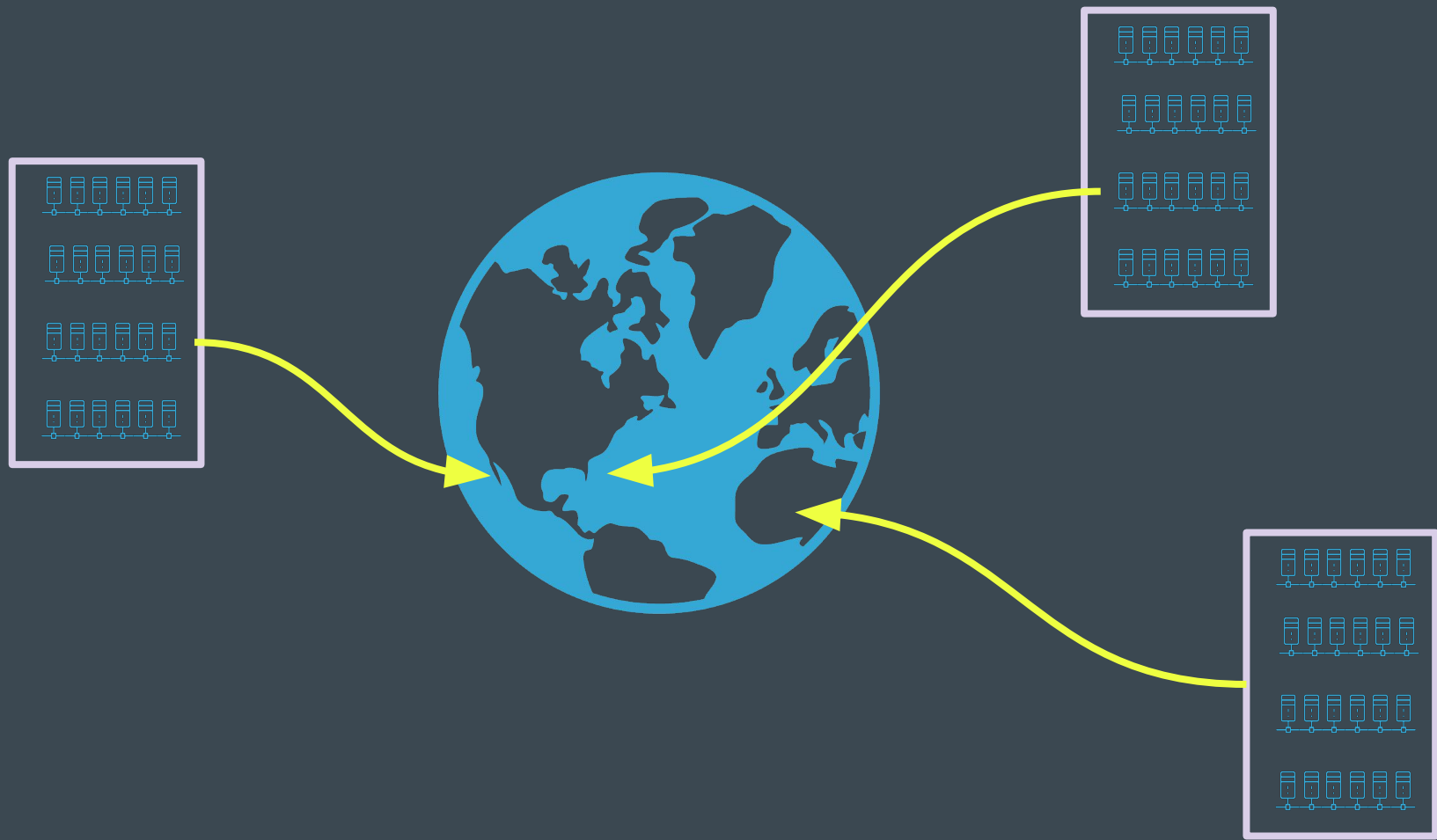
Monolith - Software architecture of tightly coupled services



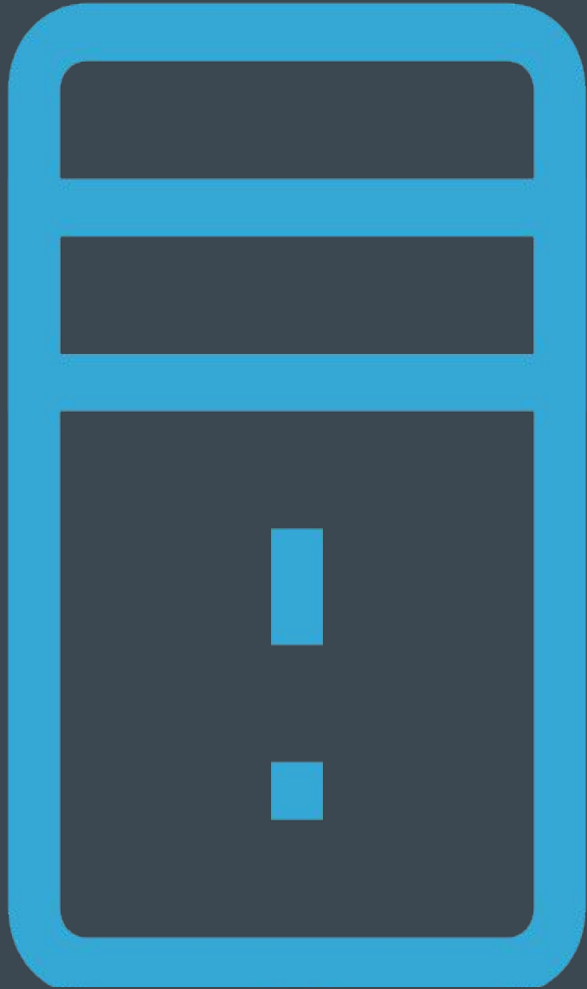


Containers

Cloud computing



Containers



Ubuntu

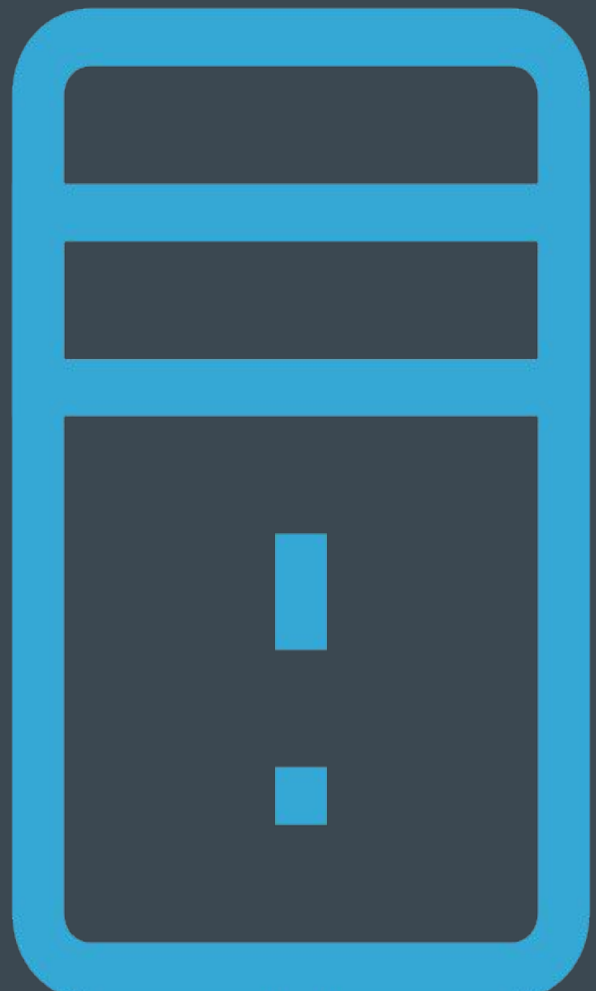
NodeJS

MySQL

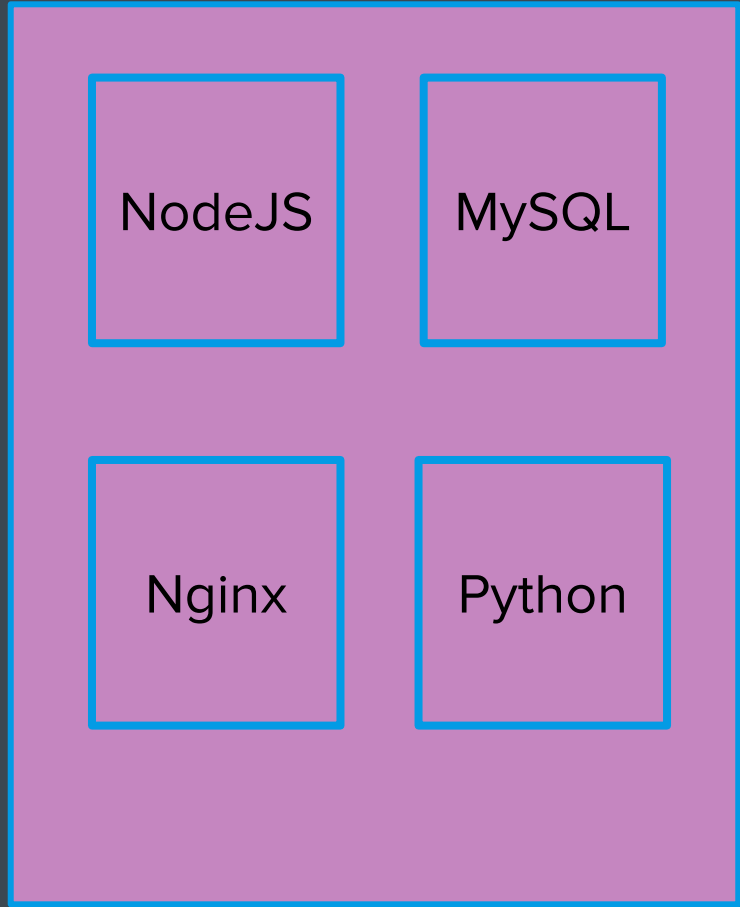
Nginx

Python

Containers



Ubuntu



Containers

OSX

NodeJS

MySQL

Nginx

Python

Fedora

NodeJS

MySQL

Nginx

Python

Containers

- Lightweight
- Portable
- Easier for development
- Easier to manage
- Faster startup
- Decouple application from infrastructure

Containers



docker

- Amazon ECS
- Apache Mesos
- CoreOS rkt

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SYNOPSIS

```
ping [-AaCdDfnOqQrRrv] [-b boundif] [-c count] [-G sweepmaxsize] [-g sweepminsize] [-K netserVICetype] [-l preload] [-M mask | time] [-m ttl] [-P policy] [-W waittime] [-z tos] [--apple-connect] [--apple-time] host  
ping [-AaDdfLnoQqRrv] [-b boundif] [-c count] [-I iface] [-i wait] [-k traffic] [-P policy] [-p pattern] [-S src_addr] [-s packetsize] [-T ttl] [-t timeout] [-t timeout] mcast-group
```

DESCRIPTION

The ping utility uses the ICMP protocol's mandatory ECHO_REQUEST datagram to elicit a reply from the target host or a remote router. "Pings" have an IP and ICMP header, followed by a "struct timeval" packet. The options are as follows:

- A Audible. Output a bell (ASCII Bx07) character when no packet is received within the specified timeout. Also output the round-trip times that are longer than the interval between transmissions, for which the number of unperceived packets has increased.
- a Audible. Output a bell (ASCII Bx07) character when any packet is received. This option is useful for testing the receive path when any packets are expected to be received.
- b boundif Bind the socket to interface boundif for sending. This option is an AIX extension.
- C Prohibit the socket from using the cellular network interface. This option is an AIX extension.
- c count Stop after sending (and receiving) count ECHO_RESPONSE packets. If the option is specified in conjunction with ping sweeps, each sweep must be terminated with the -C option. If this option is specified in conjunction with ping sweeps, each sweep must be terminated with the -C option.
- D Set the Don't Fragment bit.
- d Set the SO_DEBUG option on the socket being used.
- f Flood ping. Outputs packets as fast as they come back or one hundred packets per second. A period "." is printed, while for every ECHO_REPLY received a backspace are being dropped. Only the super-user may use this option. This can be dangerous.
- G sweepmaxsize Specify the maximum size of ICMP payload when sending sweeping pings.
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Docker

Docker

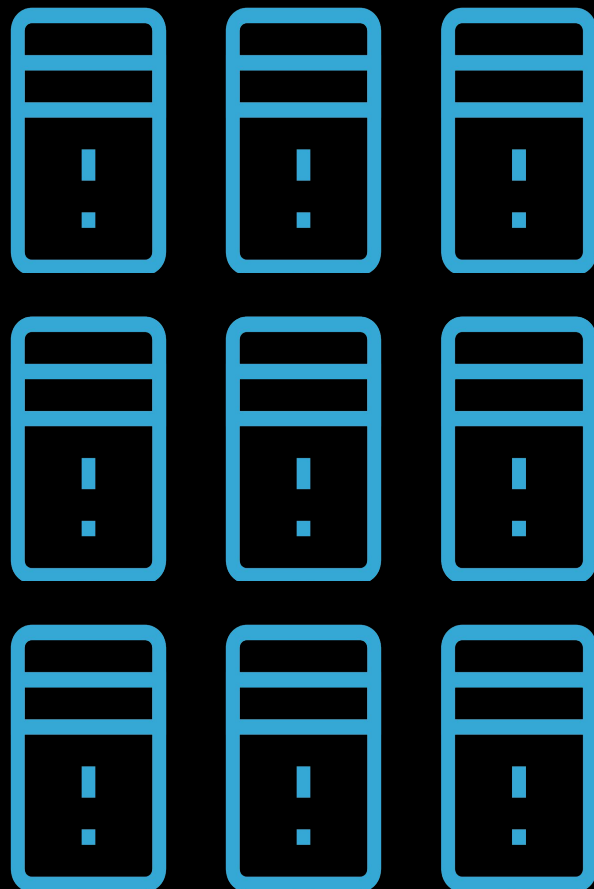
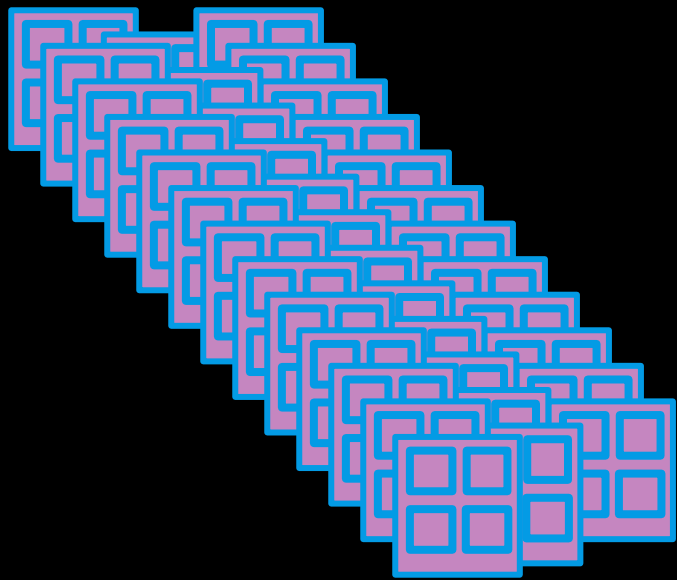
1. Create a docker container for our app

<https://github.com/young/fullstack-for-fronten-d3/blob/main/apps/simpleServer/Dockerfile>



Orchestration

Orchestration



Orchestration



Kubernetes
“K8s”

- Docker Swarm
- Amazon EKS
- Apache Mesos
- AKS

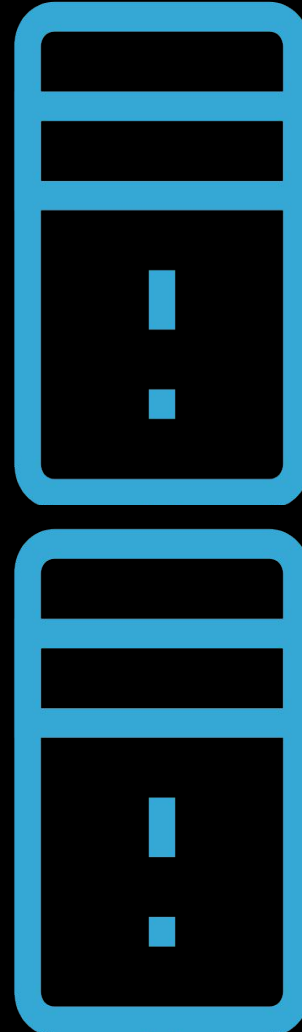


Load Balancer

Load Balancers



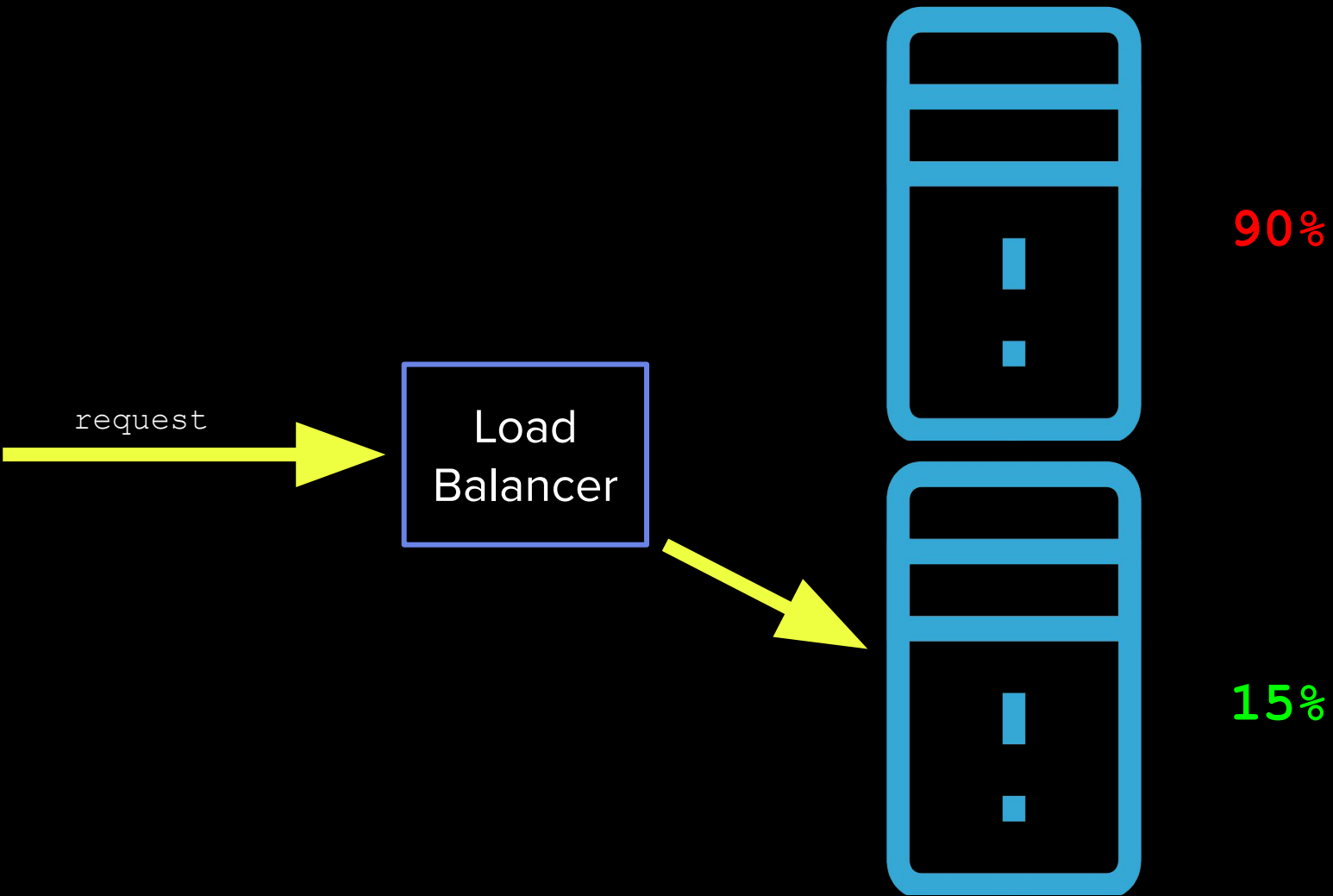
?



90%

15%

Load Balancers



Load Balancers

Scheduling Algorithms

- Round Robin*
- IP Hashing
- Random Choice
- Least Connections
- Least Load

```
NAME
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```

Exercise

Load balancer

top

Display running processes

htop

Load Balancers

```
upstream backend {  
    server backend1.example.com;  
    server backend2.example.com;  
    server 192.0.0.1 backup;  
}  
  
server {  
    location / {  
        proxy_pass http://backend;  
    }  
}
```

Load Balancers

```
upstream backend {  
    least_conn;  
    server backend1.example.com;  
    server backend2.example.com;  
}
```

<https://docs.nginx.com/nginx/admin-guide/load-balancer/http-load-balancer/>

Deployments

Deployments



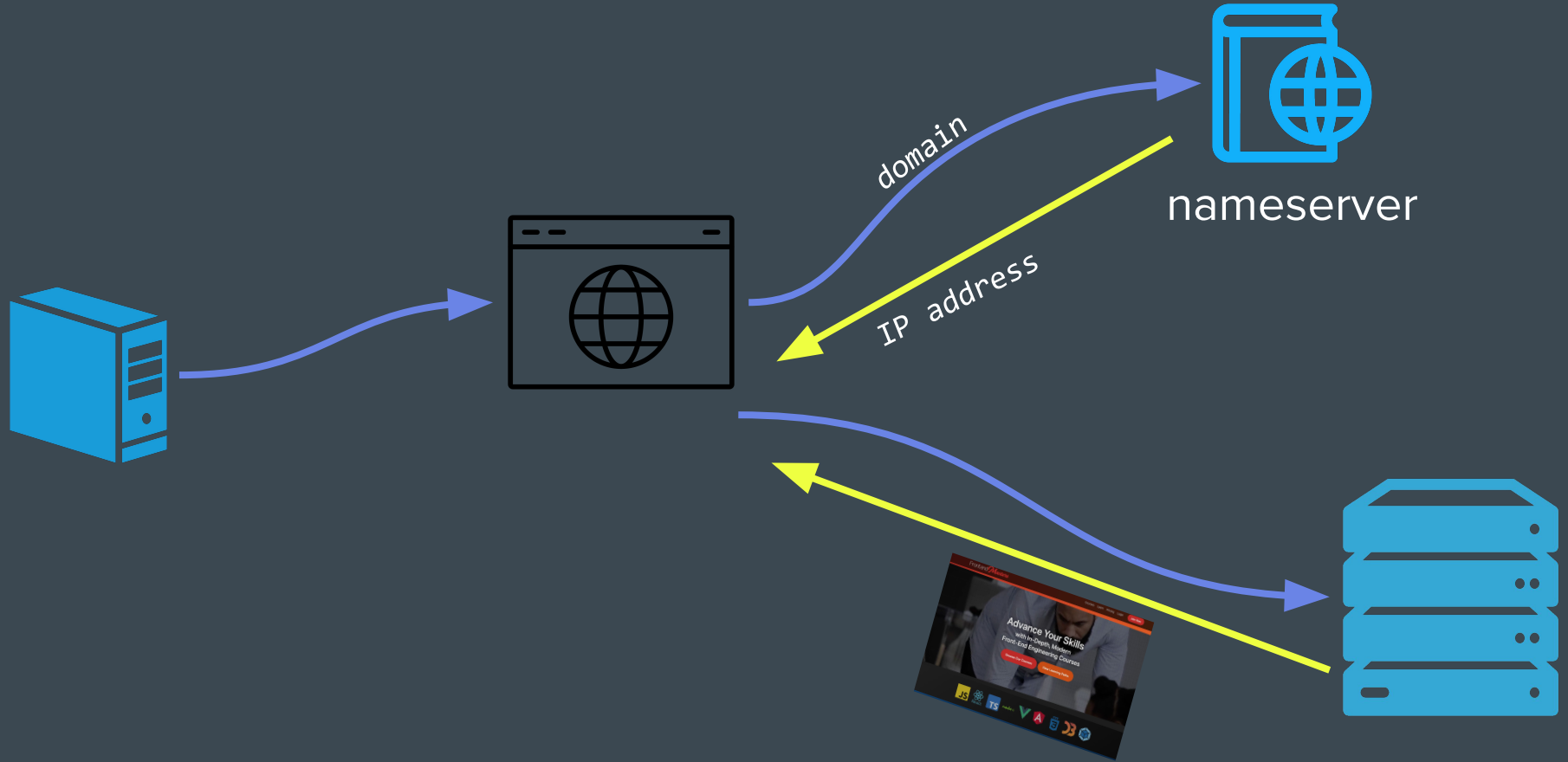
ANSIBLE

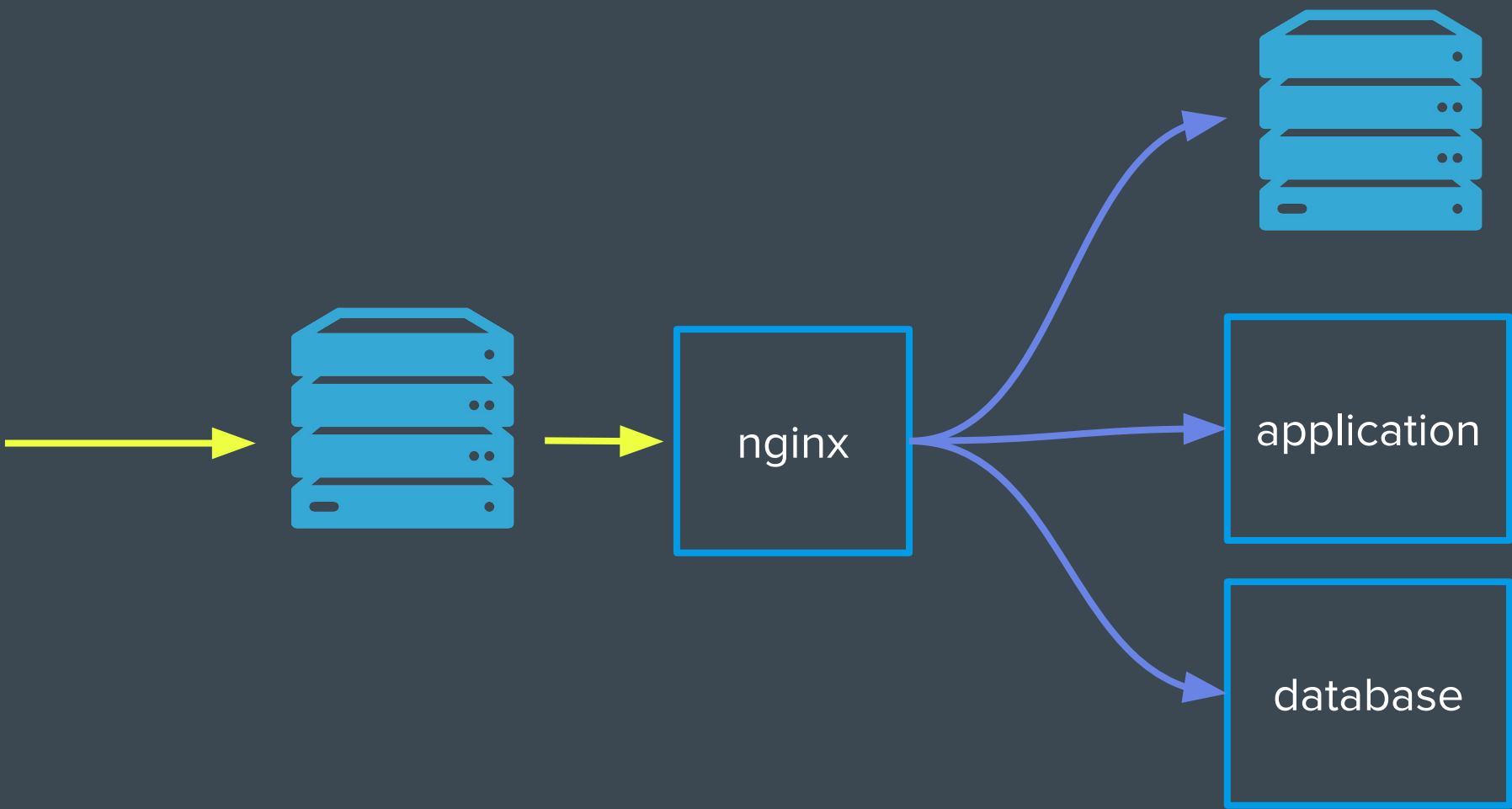


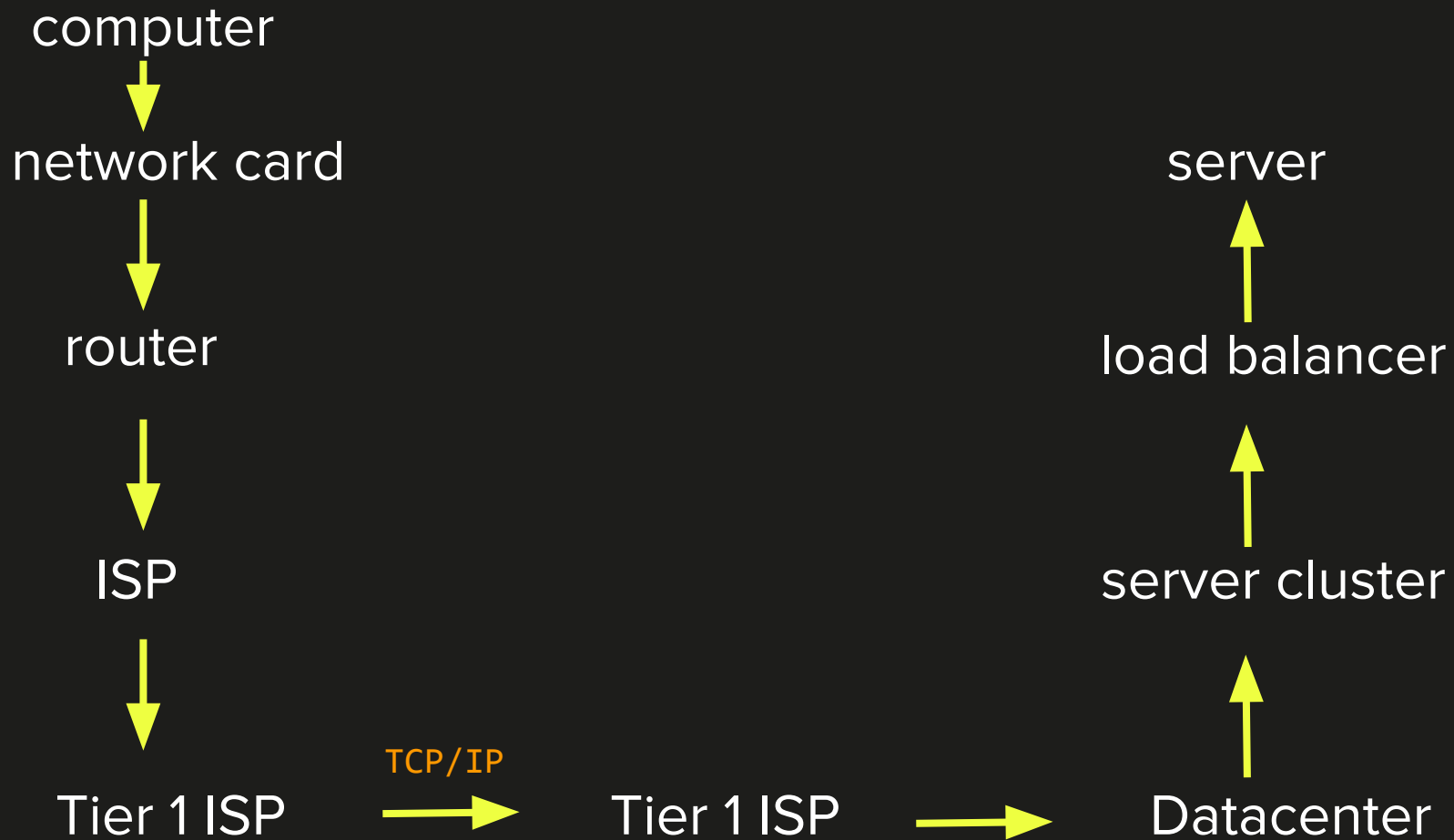
VAGRANT



puppet







Full Stack for Frontend Engineers

3

FS
FE

@jemyoung