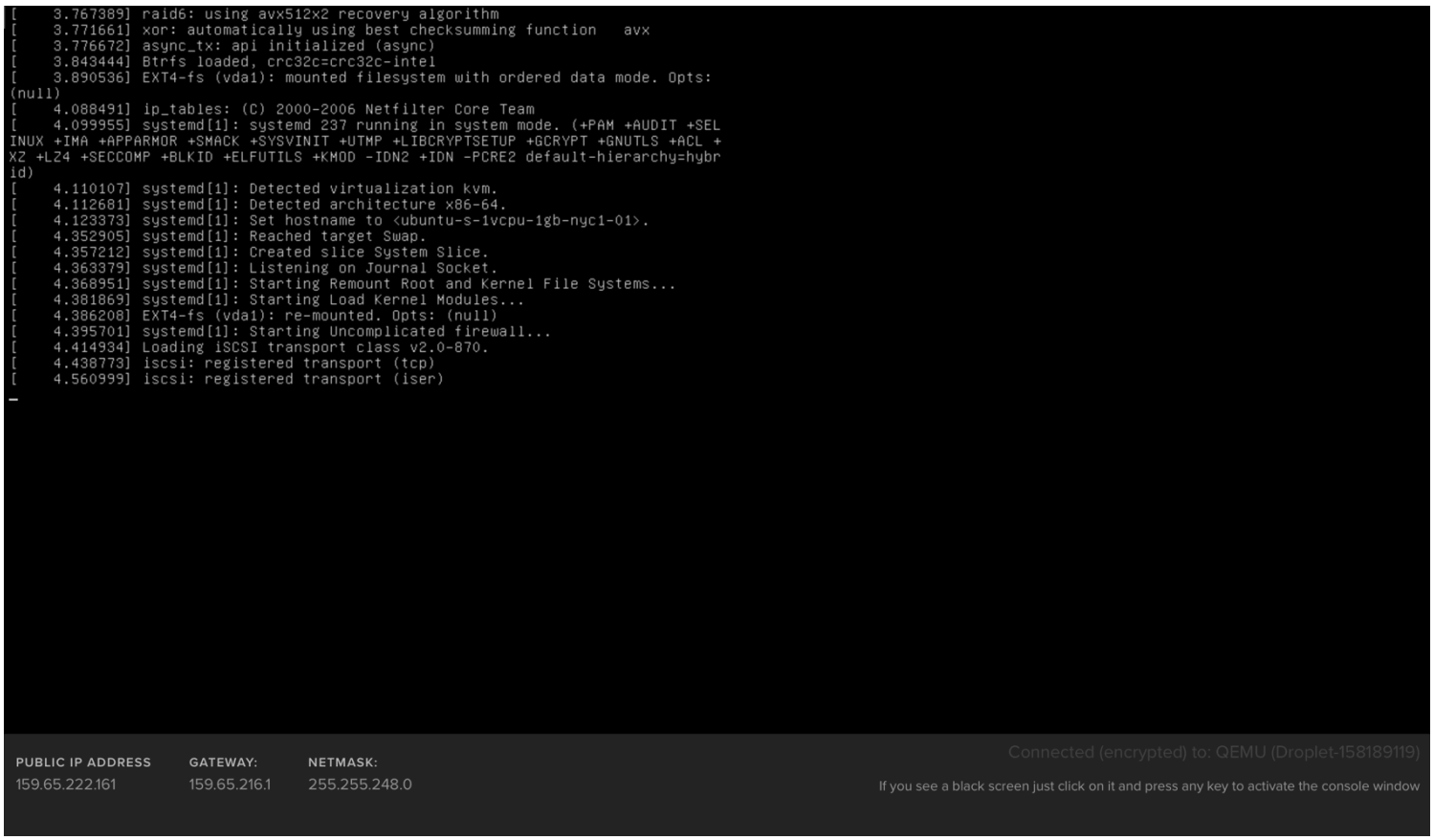
Lab 03 Report - Leonid Lygin

Task 1 - Bootloader

Here's a screenshot of boot log with services:



GRUB config changes that were required (not including whole config for brevity):

1. Change `GRUB_TIMEOUT` to `5`
2. Change `GRUB_TIMEOUT_STYLE` to `menu`

Task 2 - Name resolution

My DNS hosting allows configuration only through a web interface, so here's a screenshot (digitalocean):

DNS records

Type	Hostname	Value	TTL (seconds)	
CNAME	sna-alias.ionagamed.ru	is an alias of sna.ionagamed.ru.	43200	More
A	sna.ionagamed.ru	directs to 52.59.167.12	3600	More

Here's a `dig` output for the alias, showing both the `CNAME` and the `A` records:

```
$ dig sna-alias.ionagamed.ru

; <<>> DiG 9.10.6 <<>> sna-alias.ionagamed.ru
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 20271
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;sna-alias.ionagamed.ru.                IN      A

;; ANSWER SECTION:
sna-alias.ionagamed.ru. 43200   IN      CNAME   sna.ionagamed.ru.
sna.ionagamed.ru.       3596    IN      A       52.59.167.12

;; Query time: 0 msec
;; SERVER: 192.168.1.1#53(192.168.1.1)
;; WHEN: Mon Sep 09 14:10:03 MSK 2019
;; MSG SIZE  rcvd: 85
```

Task 3 - HTTPD

3.1 Application setup

I have chosen to create a simple WebSocket-capable application. It can be found on my github: https://github.com/ionagamed/sna-labs. I have cloned the repo, then copied `./lab03/app` to `/srv`, and then created a systemd unit which would run it. After that systemd needs to reload unit data, and then we can start and enable the service.

```
ubuntu@ip-172-31-40-194:/srv/sna-app$ cat /etc/systemd/system/sna-app.service
[Unit]
Description=SNA websocket application

[Service]
Type=simple
ExecStart=/srv/sna-app/run.py
WorkingDirectory=/srv/sna-app

[Install]
WantedBy=multi-user.target
ubuntu@ip-172-31-40-194:/srv/sna-app$ sudo systemctl daemon-reload
ubuntu@ip-172-31-40-194:/srv/sna-app$ sudo systemctl restart sna-app
ubuntu@ip-172-31-40-194:/srv/sna-app$ sudo systemctl enable sna-app
Created symlink /etc/systemd/system/multi-user.target.wants/sna-app.service → /etc/systemd
```

3.2 Reverse proxy

I have chosen `nginx`. To install, simply use `apt`:

```
$ sudo apt-get install nginx
```

`/etc/nginx/nginx.conf` (after removing some gunk):

```
user www-data;
worker_processes auto;
pid /run/nginx.pid;
include /etc/nginx/modules-enabled/*.conf;

events {
        worker_connections 768;
}

http {
        server {
                listen 443 ssl http2 default_server;
                location / {
                        proxy_pass http://localhost:9000;
                }
                location /ws {
                        proxy_pass http://localhost:9000;
                        proxy_http_version 1.1;
                        proxy_set_header Upgrade $http_upgrade;
                        proxy_set_header Connection "upgrade";
                }
                ssl_certificate /etc/letsencrypt/live/sna.ionagamed.ru/cert.pem;
                ssl_certificate_key /etc/letsencrypt/live/sna.ionagamed.ru/privkey.pem;
        }

        server {
                listen 80;
                return 301 https://$host$request_uri;
        }

        sendfile on;
        tcp_nopush on;
        tcp_nodelay on;
        keepalive_timeout 65;
        types_hash_max_size 2048;
        include /etc/nginx/mime.types;
        default_type application/octet-stream;
        ssl_protocols TLSv1 TLSv1.1 TLSv1.2; # Dropping SSLv3, ref: POODLE
        ssl_prefer_server_ciphers on;
        access_log /var/log/nginx/access.log;
        error_log /var/log/nginx/error.log;
        gzip on;
}
```

The important lines are 11-29: there we specify two listening ports - 443 for SSL, and 80 for a redirect to SSL. Locations `/` and `/ws` are separate, because `/ws` uses WebSockets and

requires additional headers to upgrade the connection.

3.3 SSL

Using letsencrypt CA with automatic certificate management from `certbot` (but not automatic configuration management, we have to point nginx to the certificates manually in lines 22-23 of the config).

Installing certbot:

```
$ sudo apt-get install certbot python-certbot-nginx
```

Generating certificates:

```
ubuntu@ip-172-31-40-194:~$ sudo certbot certonly --nginx
Saving debug log to /var/log/letsencrypt/letsencrypt.log
Plugins selected: Authenticator nginx, Installer nginx
No names were found in your configuration files. Please enter in your domain
name(s) (comma and/or space separated)  (Enter 'c' to cancel): sna.ionagamed.ru,sna-alias.ionag
Obtaining a new certificate
Performing the following challenges:
http-01 challenge for sna.ionagamed.ru
http-01 challenge for sna-alias.ionagamed.ru
Using default address 80 for authentication.
Using default address 80 for authentication.
Waiting for verification...
Cleaning up challenges

IMPORTANT NOTES:
 - Congratulations! Your certificate and chain have been saved at:
   /etc/letsencrypt/live/sna.ionagamed.ru/fullchain.pem
   Your key file has been saved at:
   /etc/letsencrypt/live/sna.ionagamed.ru/privkey.pem
   Your cert will expire on 2019-12-08. To obtain a new or tweaked
   version of this certificate in the future, simply run certbot
   again. To non-interactively renew *all* of your certificates, run
   "certbot renew"
 - If you like Certbot, please consider supporting our work by:

   Donating to ISRG / Let's Encrypt:   https://letsencrypt.org/donate
   Donating to EFF:                    https://eff.org/donate-le
```

Task 4 - CROND

My only cron job is updating the forementioned TLS certificates for letsencrypt using certbot.

`/etc/crontab` :

```
SHELL=/bin/sh
PATH=/usr/local/sbin:/usr/local/bin:/sbin:/bin:/usr/sbin:/usr/bin
MAILTO=ionagamed@gmail.com

# m h dom mon dow user  command
0 */12  * * *   root    /usr/bin/certbot -q renew
```

(the comment here is for reference)

Configuring emails:

```
$ apt-get install mailutils sendmail
```

From here, emails will be sent to `MAILTO` from the crontab.

Judging by the logs, STARTTLS is used (`/var/log/mail.log`):

```
Sep  9 11:59:01 ip-172-31-40-194 sm-mta[7421]: x89Bx1iP007421: from=<root@ip-172-31-40-194
Sep  9 11:59:01 ip-172-31-40-194 sendmail[7420]: x89Bx1VC007420: to=ionagamed@gmail.com, c
Sep  9 11:59:01 ip-172-31-40-194 sm-mta[7423]: STARTTLS=client, relay=gmail-smtp-in.l.goog
Sep  9 11:59:01 ip-172-31-40-194 sm-mta[7423]: x89Bx1iP007421: to=<ionagamed@gmail.com>, c
```

Task 5 - FTPD

At first I wanted to use docker, but network setup with manual NAT turned out to be a hassle, so this is done on two separate machines (shell commands have a "fake" hostname). `m1` would be the "internet" machine, and `m2` would run in the DMZ.

Downloading source:

```
m2$ wget https://security.appspot.com/downloads/vsftpd-3.0.3.tar.gz
m2$ tar xzf vsftpd-3.0.3.tar.gz
```

This package does not use automake, and, subsequently, it is enough to run:

```
m2$ make
m2$ sudo make install
```

Oh, turns out it needs some man directory, let's create it and hope everyting doesn't break:

```
m2$ mkdir -p /usr/local/man/man8
m2$ mkdir -p /usr/local/man/man5
m2$ sudo make install
```

Yeah, it worked.
Let's add a user for ftp:

```
m2$ useradd -m ftp
```

Also a directory for the default `secure_chroot_dir` :

```
m2$ mkdir -p /usr/share/empty
```

Finally, let's run the daemon in the foreground (for testing purposes):

```
m2$ vsftpd
```

Validating that it works:

```
local$ nc <ip> 21
220 (vsFTPd 3.0.3)
```

For the NAT to work with this server configuration, we need to add two rules to the gateway - source NAT and destination NAT, and the first one would be done using iptables' MASQUERADE

```
m1$ iptables -t nat -A PREROUTING -p tcp -m tcp --dport 21 -j DNAT --to-destination 18.197.202.
m1$ iptables -t nat -A POSTROUTING -p tcp -m tcp --dport 21 -j MASQUERADE
```

And also we need to enable forwaring in the kernel:

```
m1$ echo 1 > /proc/sys/net/ipv4/ip_forward
```

After all that, testing:

```
local$ nc sna.ionagamed.ru 21
220 (vsFTPd 3.0.3)
```

We have got the greeting, hooray.