LAPORAN

PROYEK SISTEM TERDISTRIBUSI

HIGH AVAILABLE WEB SERVER

Disusun Oleh:

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FAKULTAS ILMU KOMPUTER

UNIVERSITAS DIAN NUSWANTORO

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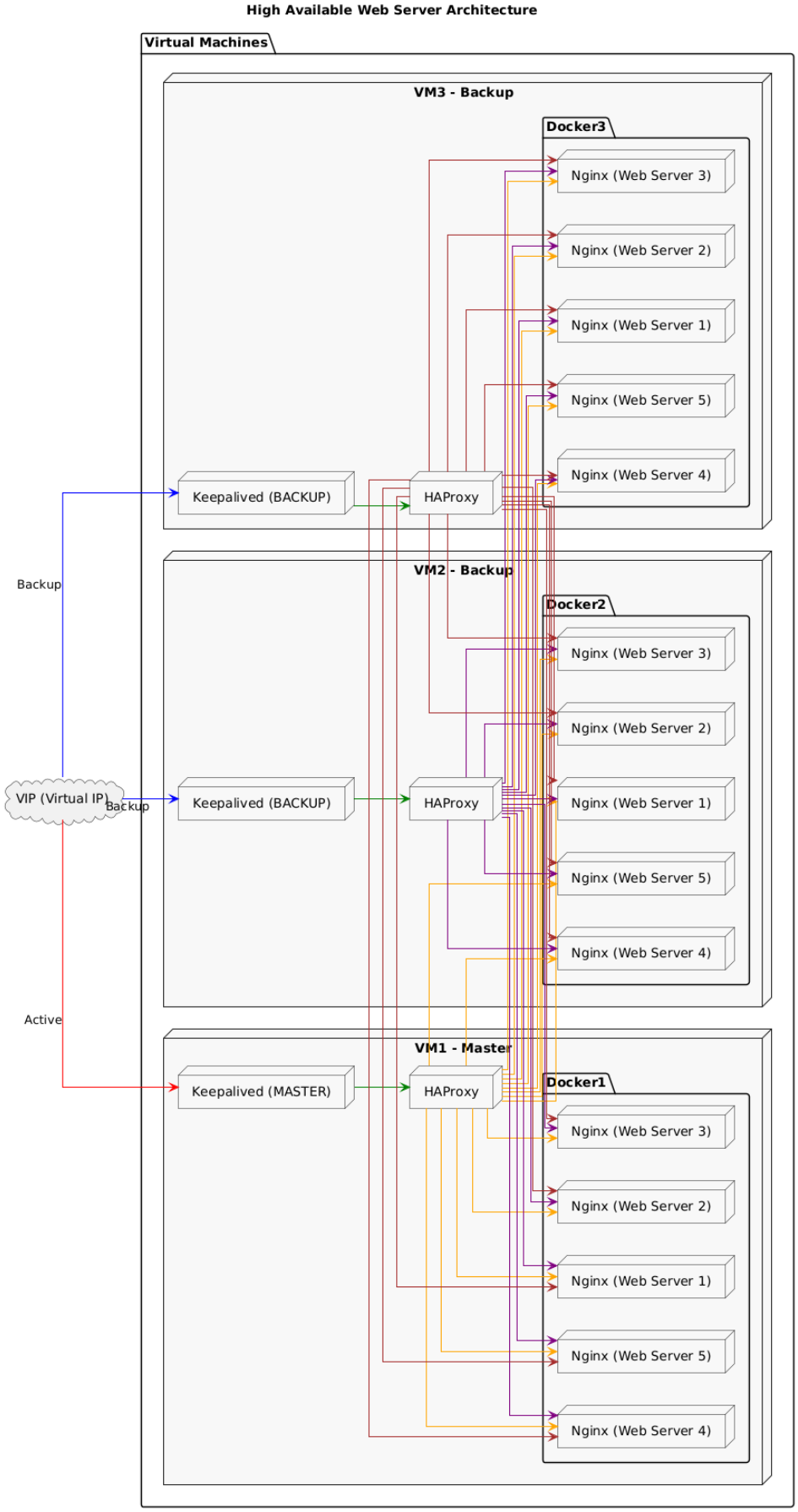
ARSITEKTUR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PROSES PEMBUATAN

1. Server

   Membuat 5 web server nginx menggunakan docker container:

   a. Install docker

      i. menambahkan repositori docker

```
alfath@server1:~$ # Add Docker's official GPG key:
sudo apt-get update
sudo apt-get install ca-certificates curl
sudo install -m 0755 -d /etc/apt/keyrings
sudo curl -fsSL https://download.docker.com/linux/debian/gpg -o /etc/apt/keyrings/docker.asc
sudo chmod a+r /etc/apt/keyrings/docker.asc

# Add the repository to Apt sources:
echo \
  "deb [arch=$(dpkg --print-architecture) signed-by=/etc/apt/keyrings/docker.asc] https://download.docker.com/linux/debian \
  $(. /etc/os-release && echo "$VERSION_CODENAME") stable" | \
  sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
sudo apt-get update
```

      ii. install docker

OBJ

```
alfath@server1:~$ sudo apt-get install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-plugin_
```

      iii. memberi ijin user untuk mengelola docker

```
alfath@server1:~$ sudo usermod -aG docker alfath_
```

      keluar lalu login kembali untuk memastikan ijin user sudah teraplikasi

      iv. tes docker

```
alfath@server1:~$ docker ps
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS     NAMES
```

   b. Membuat container

      i. membuat file compose.yml

```
alfath@server1:~/project$ mkdir web1
alfath@server1:~/project$ cd web1/
alfath@server1:~/project/web1$ nano compose.yml
```

```
  GNU nano 7.2                                                compose.yml
services:
  nginx:
    image: nginx:latest
    container_name: app1
    restart: always
    ports:
      - "8081:80"
    volumes:
      - ./nginx.conf:/etc/nginx/nginx.conf:ro
      - ./html:/usr/share/nginx/html:ro
      - ./logs:/var/log/nginx
```

      ii. membuat file nginx.conf

```
alfath@server1:~/project/web1$ nano nginx.conf_
```

```
 GNU nano 7.2                                                    nginx.conf *
events {}

http {
    server {
        listen 80;
        server_name localhost;

        location / {
            root /usr/share/nginx/html;
            index index.html;
        }

        location /server-info {
            return 200 "Server 1 - NGINX\n";
        }

        error_page 404 /404.html;
        location = /404.html {
            root /usr/share/nginx/html;
        }
    }
}_
```

iii. copy folder

```
alfath@server1:~/project/web1$ cd ..
alfath@server1:~/project$ cp -r web1 web2
alfath@server1:~/project$ cp -r web1 web3
alfath@server1:~/project$ cp -r web1 web4
alfath@server1:~/project$ cp -r web1 web5
```

iv. edit port dan container_name pada file compose.yml untuk setiap folder hasil copy

```
alfath@server1:~/project/web2$ nano compose.yml_
```

```
 GNU nano 7.2                                                    compose.yml *
services:
  nginx:
    image: nginx:latest
    container_name: app1
    restart: always
    ports:
      - "8082:80"
    volumes:
      - ./nginx.conf:/etc/nginx/nginx.conf:ro
      - ./html:/usr/share/nginx/html:ro
      - ./logs:/var/log/nginx
```

web1 = 8081:80 dan app1
web2 = 8082:80 dan app2
web3 = 8083:80 dan app3
web4 = 8084:80 dan app4

web5 = 8085:80 dan app5

v. edit nama server pada file nginx.conf untuk setiap folder hasil copy

```
alfath@server1:~/project/web2$ nano nginx.conf_
```

```
location /server-info {
    return 200 "Server 2_- NGINX\n";
}
```

web2 = Server 2
web3 = Server 3
web4 = Server 4
web5 = Server 5

vi. buat container

```
alfath@server1:~/project/web1$ docker compose up -d
 [+] Running 2/2
  ✔ Network web1_default  Created                                    0.1s
  ✔ Container app1        Started                                    0.6s
alfath@server1:~/project/web1$ cd ../web2
alfath@server1:~/project/web2$ docker compose up -d
 [+] Running 2/2
  ✔ Network web2_default  Created                                    0.2s
  ✔ Container app2        Started                                    0.4s
alfath@server1:~/project/web2$ cd ../web3
alfath@server1:~/project/web3$ docker compose up -d
 [+] Running 2/2
  ✔ Network web3_default  Created                                    0.2s
  ✔ Container app3        Started                                    0.4s
alfath@server1:~/project/web3$ cd ../web4
alfath@server1:~/project/web4$ docker compose up -d
 [+] Running 2/2
  ✔ Network web4_default  Created                                    0.2s
  ✔ Container app4        Started                                    0.6s
alfath@server1:~/project/web4$ cd ../web5
alfath@server1:~/project/web5$ docker compose up -d
 [+] Running 2/2
  ✔ Network web5_default  Created                                    0.2s
  ✔ Container app5        Started                                    0.4s
```

vii. mengubah ijin file container

```
alfath@server1:~/project$ sudo chown -R alfath:alfath web1
alfath@server1:~/project$ sudo chown -R alfath:alfath web2
alfath@server1:~/project$ sudo chown -R alfath:alfath web3
alfath@server1:~/project$ sudo chown -R alfath:alfath web4
alfath@server1:~/project$ sudo chown -R alfath:alfath web5
```

viii. membuat file index.html

```
alfath@server1:~/project/web1$ cd html/
alfath@server1:~/project/web1/html$ nano index.html_
```

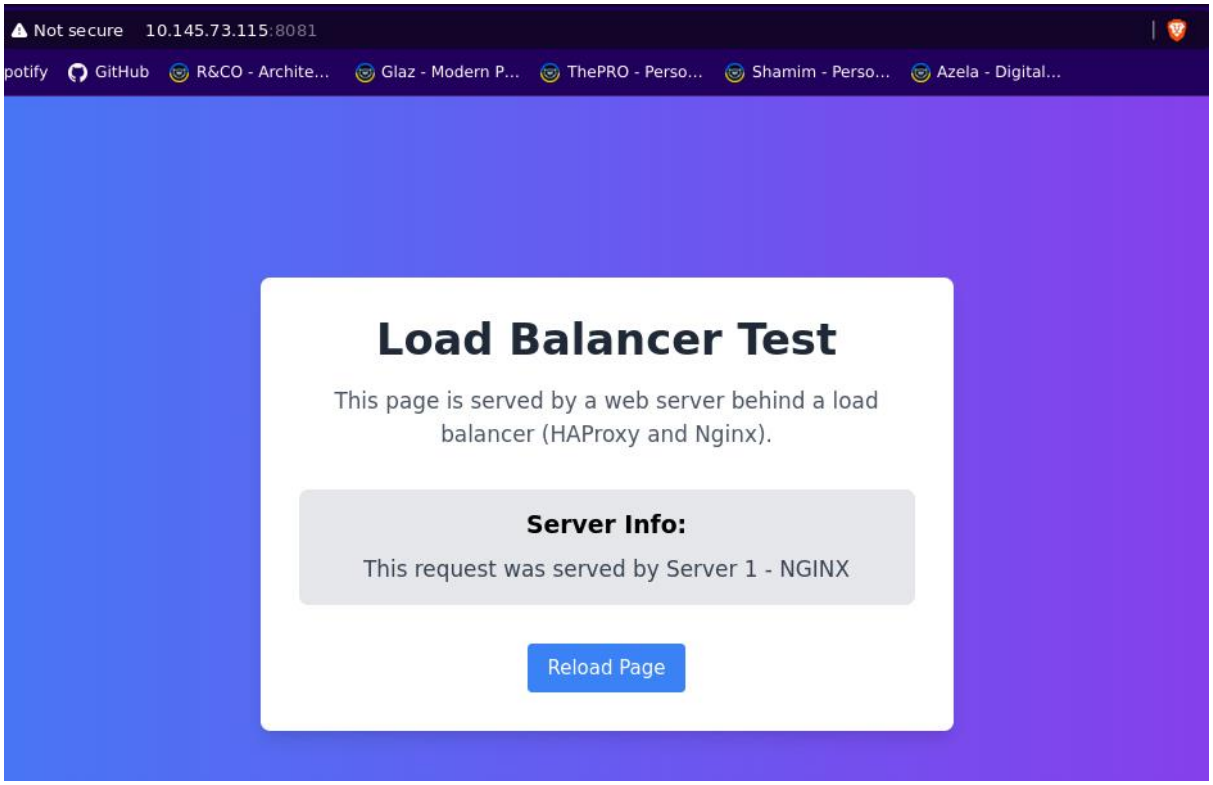
```
 GNU nano 7.2                                                  index.html *
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Load Balancer Test</title>
    <script src="https://cdn.tailwindcss.com"></script>
</head>
<body class="bg-gray-100 font-sans antialiased">

    <div class="flex items-center justify-center min-h-screen bg-gradient-to-r from-blue-500 to-purple-600">
        <div class="text-center p-8 bg-white rounded-lg shadow-lg max-w-xl w-full">
            <h1 class="text-4xl font-bold text-gray-800 mb-4">Load Balancer Test</h1>
            <p class="text-lg text-gray-600 mb-8">This page is served by a web server behind a load balancer (HAProxy and Nginx).</p>

            <div class="bg-gray-200 p-4 rounded-lg">
                <p class="text-xl font-semibold">Server Info:</p>
                <p id="server-info" class="text-lg text-gray-700 mt-2">Loading...</p>
            </div>

            <div class="mt-8">
                <button id="reload-btn" class="px-4 py-2 bg-blue-500 text-white rounded hover:bg-blue-700 transition">
                    Reload Page
                </button>
            </div>
        </div>
    </div>

    <script>
        // Simulate server response
        document.addEventListener('DOMContentLoaded', () => {
            const serverInfo = document.getElementById('server-info');

            // Simulate fetching the server name or ID (could come from backend)
            fetch('/server-info')
                .then(response => response.text())
                .then(data => {
                    serverInfo.textContent = `This request was served by ${data}`;
                })
                .catch(error => {
                    serverInfo.textContent = "Error fetching server info.";
                });

            // Reload button functionality (optional)
            const reloadBtn = document.getElementById('reload-btn');
            reloadBtn.addEventListener('click', () => {
                location.reload();
            });
        });
    </script>

</body>
</html>
```

ix. copy file index.html ke setiap folder

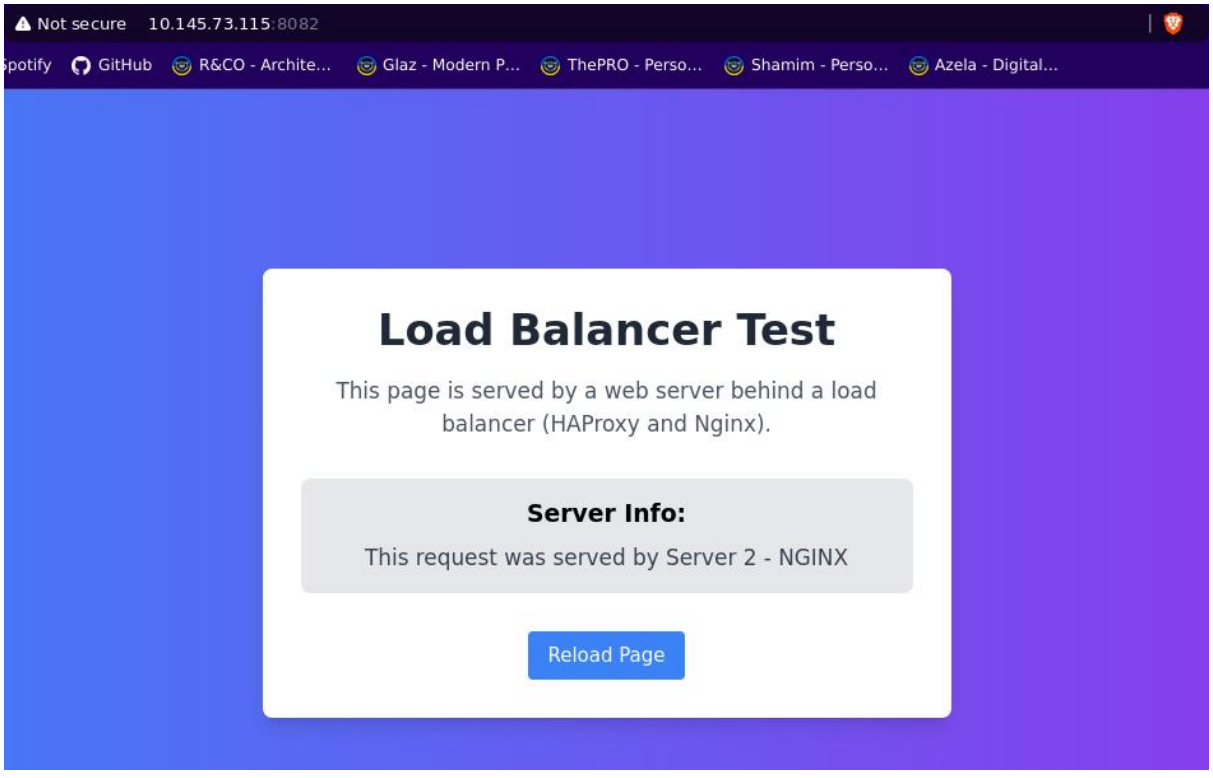
```
alfath@server1:~/project/web1/html$ cp index.html ../../web2/html/index.html
alfath@server1:~/project/web1/html$ cp index.html ../../web3/html/index.html
alfath@server1:~/project/web1/html$ cp index.html ../../web4/html/index.html
alfath@server1:~/project/web1/html$ cp index.html ../../web5/html/index.html
```

c. testing

i. <alamat ip server>:8081 pada web browser



<alamat ip server>:8082 pada web browser



dan seterusnya.

2. Load Balancer

   Membuat load balancer menggunakan haproxy:

   a. install haproxy

```
alfath@server1:~/project$ sudo apt install haproxy_
```

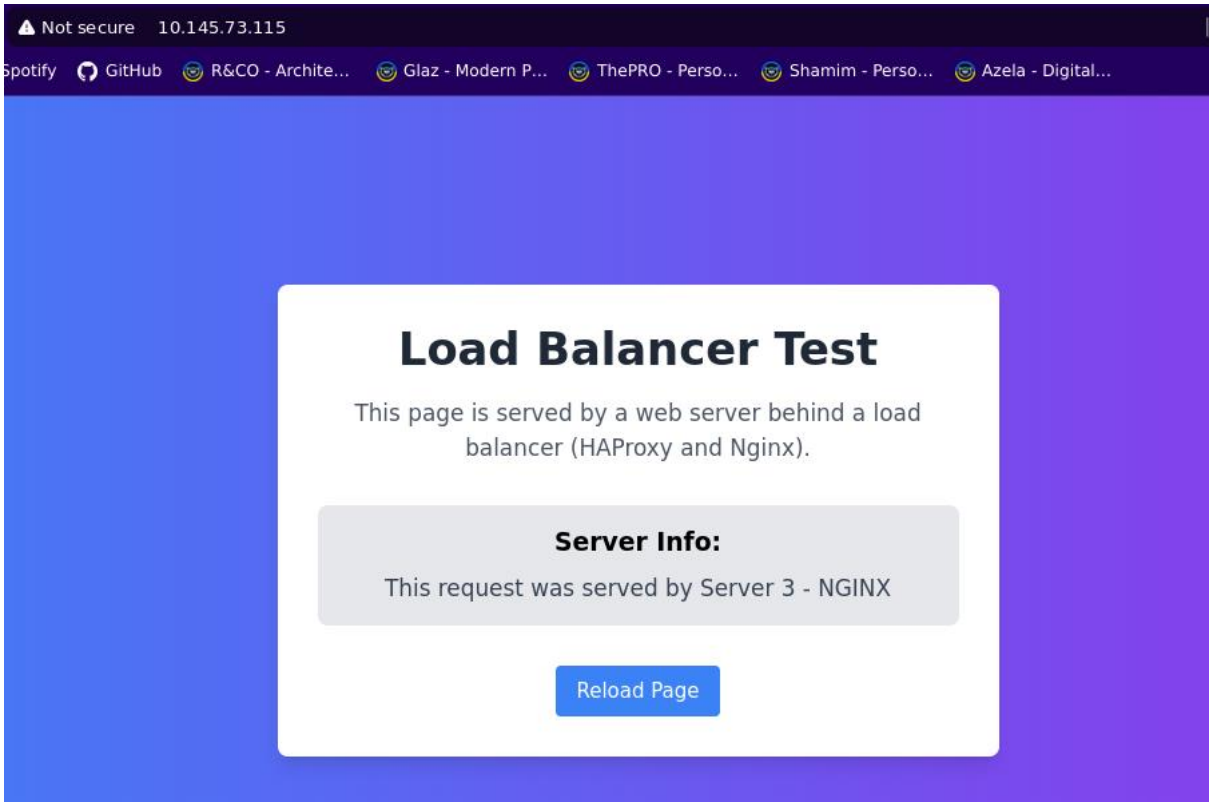
   b. konfigurasi haproxy

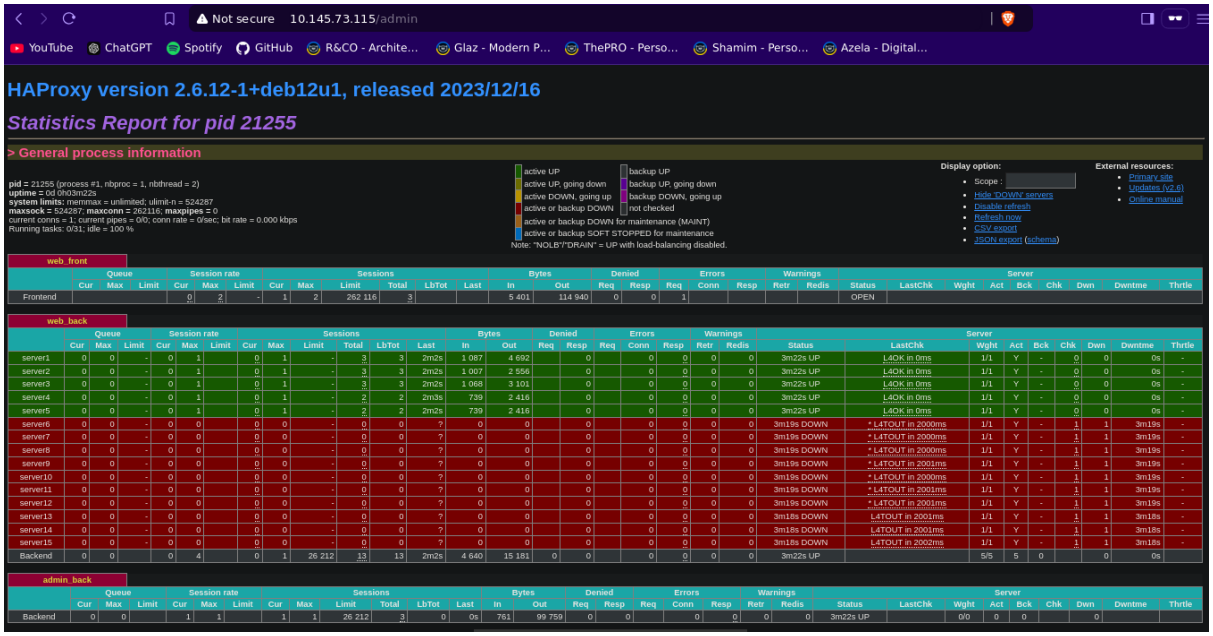
```
  GNU nano 7.2                                          /etc/haproxy/haproxy.cfg *
frontend web_front
        bind *:80
        acl is_admin path_beg /admin
        use_backend admin_back if is_admin
        default_backend web_back

backend web_back
        balance roundrobin
        server server1 10.145.73.115:8081 check
        server server2 10.145.73.115:8082 check
        server server3 10.145.73.115:8083 check
        server server4 10.145.73.115:8084 check
        server server5 10.145.73.115:8085 check
        server server6 10.145.73.116:8081 check
        server server7 10.145.73.116:8082 check
        server server8 10.145.73.116:8083 check
        server server9 10.145.73.116:8084 check
        server server10 10.145.73.116:8085 check
        server server11 10.145.73.117:8081 check
        server server12 10.145.73.117:8082 check
        server server13 10.145.73.117:8083 check
        server server14 10.145.73.117:8084 check
        server server15 10.145.73.117:8085 check

backend admin_back
        stats enable
        stats uri /admin
        stats realm Haproxy\ Statistics
        stats refresh 10s_
```

server1 hingga server5 adalah container1 hingga container5 pada vm server1.
server6 hingga server10 adalah container1 hingga container5 pada vm server2.
server11 hingga server15 adalah container1 hingga container5 pada vm server3.

```
alfath@server1:~/project$ sudo haproxy -c -f /etc/haproxy/haproxy.cfg
Configuration file is valid
alfath@server1:~/project$ sudo systemctl restart haproxy
```

c. testing





pada server6 hingga 15 berwarna merah menandakan server down atau tidak aktif, hal tersebut dikarenakan memang vm server2 dan server3 belum dibuat.

3. Failover

   Membuat failover menggunakan keepalived:

   a. install keepalived

```
alfath@server1:~/project$ sudo apt install keepalived_
```

   b. konfigurasi keepalived

```
alfath@server1:~$ sudo nano /etc/keepalived/keepalived.conf
```

```
 GNU nano 7.2                                  /etc/keepalived/keepalived.conf
vrrp_instance VI_1 {
    state MASTER
    interface enp1s0
    virtual_router_id 51
    priority 101
    advert_int 1
    authentication {
        auth_type PASS
        auth_pass 1111
    }
    virtual_ipaddress {
        10.145.73.126
    }
}
```

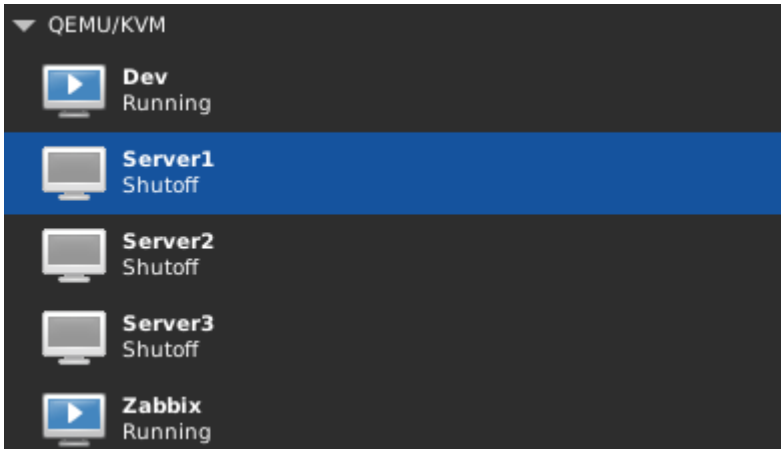
sesuaikan interface dengan interface host
pastikan virtual_ipaddress berada didalam subnet

```
alfath@server1:~/project$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
       valid_lft forever preferred_lft forever
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 52:54:00:32:3d:de brd ff:ff:ff:ff:ff:ff
    inet 10.145.73.115/28 brd 10.145.73.127 scope global enp1s0
       valid_lft forever preferred_lft forever
    inet6 fe80::5054:ff:fe32:3dde/64 scope link
       valid_lft forever preferred_lft forever
```

```
alfath@server1:~/project$ sudo systemctl restart keepalived
```

4. Clone Vm

klik kanan pada vm lalu pilih clone
pastikan vm dalam kondisi mati terlebih dahulu.



jika sudah berhasil diclone, jalankan semua vm.

5. Konfigurasi VM clone

```
alfath@server1:~$ sudo nano /etc/network/interfaces
```

sesuaikan dengan konfigurasi jaringan

```
alfath@server1:~$ sudo nano /etc/hosts
```

```
  GNU nano 7.2
127.0.0.1       localhost
10.145.73.116   server2.sister.lab      server2

# The following lines are desirable for IPv6 capable hosts
::1     localhost ip6-localhost ip6-loopback
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
```

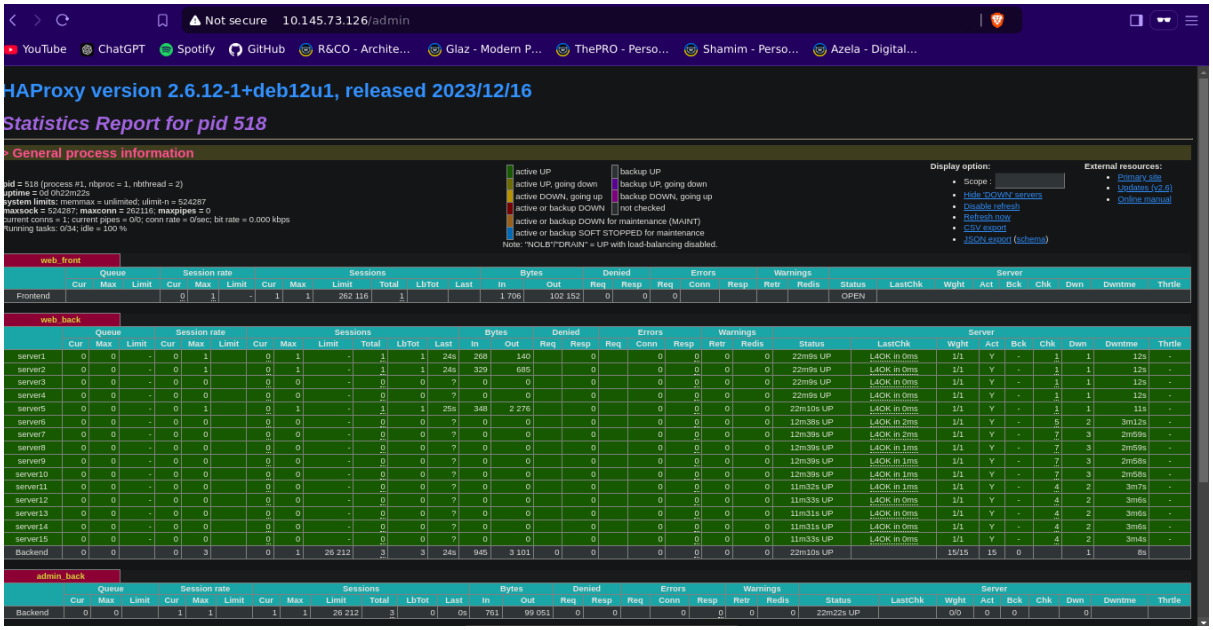
```
alfath@server1:~$ sudo nano /etc/hostname
```

```
alfath@server1:~$ sudo nano /etc/keepalived/keepalived.conf
```

```
  GNU nano 7.2
vrrp_instance VI_1 {
    state BACKUP
    interface enp1s0
    virtual_router_id 51
    priority 100
    advert_int 1
    authentication {
        auth_type PASS
        auth_pass 1111
    }
    virtual_ipaddress {
        10.145.73.126
    }
}
```

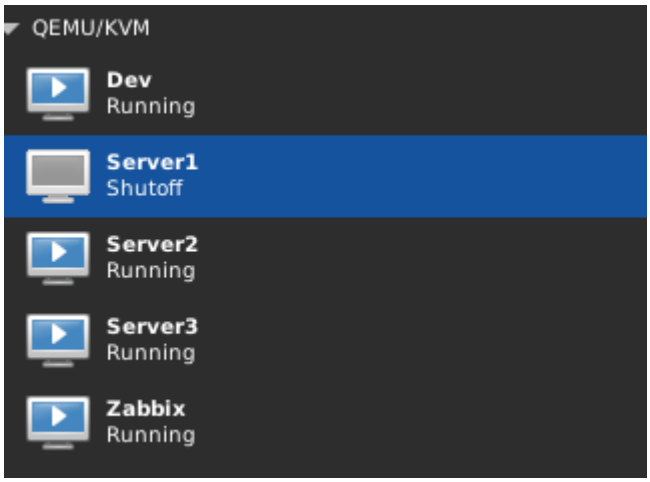
ubah pada state menjadi BACKUP dan priority dibawah priority dari MASTER.
restart vm.
lakukan hal yang sama pada Server3.

6. Testing load balancer



7. Testing failover

matikan vm server 1



akses virtual ip di browser