

### **SOAL NOMOR 1 - Infrastructure Provisioning**

Sevima, sebuah perusahaan yang bergerak di bidang teknologi informasi, memiliki rencana besar untuk mengembangkan infrastruktur mereka dengan membangun sebuah pusat data (data center). Pusat data ini diharapkan mampu menunjang performa aplikasi serta berfungsi sebagai cadangan (backup) sehingga jika terjadi kendala, recovery dapat dilakukan dengan cepat dan efisien. Anda, sebagai calon System Administrator, diberi tugas penting untuk merancang dan mengimplementasikan topologi jaringan untuk pusat data ini menggunakan Cisco Packet Tracer.

Tugas Anda tidak hanya berhenti di situ. Sevima juga berencana untuk memperluas jangkauan operasional mereka dengan membuka cabang di tiga kota besar di Indonesia: Jakarta, Bandung, dan Surabaya. Anda harus memastikan bahwa jaringan di ketiga cabang tersebut terhubung satu sama lain dengan baik.

## SOAL NOMOR 2: Make Your Web Great Again

### A. Konfigurasi Dasar

- 1) Buat user dengan Akses Sudo, Login menggunakan kata sandi dan menggunakan pubkey.

Name	Password
sevima-adm{1..13003}	w3bsite#1..1300 (buat password 1-1300 sesuai jumlah user)

Jawab :

```
#!/bin/bash
for i in $(seq 1 1200); do
  USER="sevima-adm${i}"
  PASS="w3bsite#${i}"
  useradd $USER
  echo "$USER:$PASS" | chpasswd
  usermod -s /bin/bash $USER
  mkdir -p /home/$USER/.ssh
  chmod 700 /home/$USER/.ssh
  touch /home/$USER/.ssh/authorized_keys
  chmod 600 /home/$USER/.ssh/authorized_keys
  chown -R $USER:$USER /home/$USER/.ssh
done

root    ALL=(ALL)        ALL
administrator    ALL=(ALL)        ALL
%wheel  ALL=(ALL)        ALL
```

Hasil :

```
[sevima-adm1300@testsevima ~]$ su - sevima-adm1299
Password:
[sevima-adm1299@testsevima ~]$
```

```
[sevima-adm1299@testsevima ~]$ sudo whoami

We trust you have received the usual lecture from the local System
Administrator. It usually boils down to these three things:

#1) Respect the privacy of others.
#2) Think before you type.
#3) With great power comes great responsibility.

[sudo] password for sevima-adm1299:
Sorry, try again.
[sudo] password for sevima-adm1299:
root
[sevima-adm1299@testsevima ~]$
```

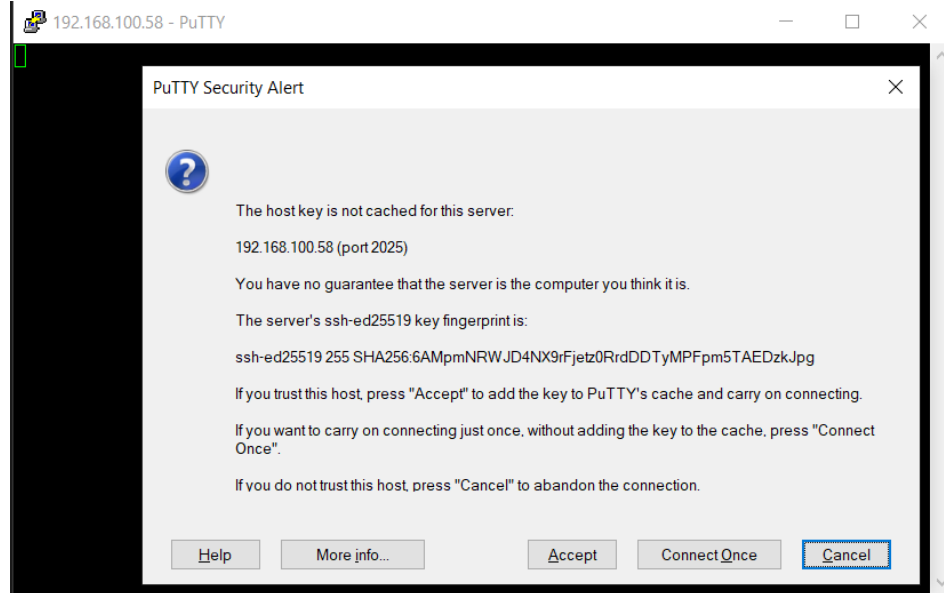
- 2) Ubah port ssh menjadi 2025

Config :

```
#Port 2025
#AddressFamily any
#ListenAddress 0.0.0.0
#ListenAddress ::

HostKey /etc/ssh/ssh_host_rsa_key
#HostKey /etc/ssh/ssh_host_dsa_key
HostKey /etc/ssh/ssh_host_ecdsa_key
HostKey /etc/ssh/ssh_host_ed25519_key
```

Hasil :



- 3) Aktifkan seluruh log aktivitas

```
[root@testsevima ~]# systemctl enable rsyslog
[root@testsevima ~]# systemctl start rsyslog

[root@testsevima ~]# visudo

Defaults    env_reset
Defaults    env_keep = "COLORS DISPLAY HOSTNAME HISTSIZE KDEDIR LS_COLORS"
Defaults    env_keep += "MAIL PS1 PS2 QTDIR USERNAME LANG LC_ADDRESS LC_CTYPE"
Defaults    env_keep += "LC_COLLATE LC_IDENTIFICATION LC_MEASUREMENT LC_MESSAGES"
Defaults    env_keep += "LC_MONETARY LC_NAME LC_NUMERIC LC_PAPER LC_TELEPHONE"
Defaults    env_keep += "LC_TIME LC_ALL LANGUAGE LINGUAS _XKB_CHARSET XAUTHORITY"
Defaults    logfile="/var/log/sudo.log"
Defaults    !log_input,log_output
```

- 4) Sesuaikan penggunaan sumber daya sesuai kebutuhan dengan ulimit

```
[root@testsevima ~]# vi /etc/security/limits.conf  
[root@testsevima ~]#
```

```
sevima-adm* soft nproc 100  
sevima-adm* hard nproc 200  
sevima-adm* soft nofile 1024  
sevima-adm* hard nofile 2048
```

Hasil :

```
[root@testsevima ~]# ulimit -a  
core file size          (blocks, -c) 0  
data seg size           (kbytes, -d) unlimited  
scheduling priority     (-e) 0  
file size               (blocks, -f) unlimited  
pending signals         (-i) 64095  
max locked memory       (kbytes, -l) 64  
max memory size         (kbytes, -m) unlimited  
open files              (-n) 1024  
pipe size               (512 bytes, -p) 8  
POSIX message queues    (bytes, -q) 819200  
real-time priority      (-r) 0  
stack size              (kbytes, -s) 8192  
cpu time                (seconds, -t) unlimited  
max user processes      (-u) 64095  
virtual memory          (kbytes, -v) unlimited  
file locks              (-x) unlimited
```

## B. Certificate Authority

- 1) Set up root certificate authority menggunakan OpenSSL pada direktori /root/ca.

Konfigurasi :

```
mkdir -p /root/ca/{certs,crl,newcerts,private}  
chmod 700 /root/ca/private  
touch /root/ca/index.txt  
echo 1000 > /root/ca/serial  
cp /etc/pki/tls/openssl.cnf /root/ca/openssl.cnf  
vi /root/ca/openssl.cnf  
nano /root/ca/openssl.cnf  
nano /root/ca/openssl.cnf  
openssl genrsa -out /root/ca/private/cacert.key 4096  
openssl rsa -in /root/ca/private/cacert.key -out /root/ca/private/cacert.key -text -noout
```

- 2) Buat Root Certificate cacert.pem and cacert.key dengan menggunakan informasi di bawah ini :
- Country Code: ID
  - Organization: PT. Sentra Vidya Utama
  - Common Name: SEVIMA CA
  - Create additional certificate

Issued Certificate	Note
www.sevima.site	Web
utara.sevima.site	Web
timur.sevima.site	Web
barat.sevima.site	Web

Konfigurasi :

- www.sevima.site

```
[root@testsevilla ~]# openssl req -new \
> -key /root/ca/private/www.sevima.site.key \
> -out /root/ca/www.sevima.site.csr
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [XX]:ID
State or Province Name (full name) []:East Java
Locality Name (eg, city) [Default City]:Surabaya
Organization Name (eg, company) [Default Company Ltd]:PT. Sentra Vidya Utama
Organizational Unit Name (eg, section) []:IT
Common Name (eg, your name or your server's hostname) []:www.sevima.site
Email Address []:

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
```

```
[root@testsevilla ~]# openssl ca -config /root/ca/openssl.cnf \
> -extensions server_cert \
> -days 825 -notext -md sha256 \
> -in /root/ca/www.sevima.site.csr \
> -out /root/ca/certs/www.sevima.site.crt
Using configuration from /root/ca/openssl.cnf
Check that the request matches the signature
Signature ok
The Subject's Distinguished Name is as follows
countryName             :PRINTABLE:'ID'
stateOrProvinceName     :ASN.1 12:'East Java'
localityName            :ASN.1 12:'Surabaya'
organizationName        :ASN.1 12:'PT. Sentra Vidya Utama'
organizationalUnitName  :ASN.1 12:'IT'
commonName              :ASN.1 12:'www.sevima.site'
Certificate is to be certified until Apr  6 17:30:03 2028 GMT (825 days)
Sign the certificate? [y/n]:y

1 out of 1 certificate requests certified, commit? [y/n]:y
Write out database with 1 new entries
Data Base Updated
```

- utara.sevima.site

```
[root@testsevima ~]# openssl req -new \  
> -key /root/ca/private/utara.sevima.site.key \  
> -out /root/ca/utara.sevima.site.csr  
You are about to be asked to enter information that will be incorporated  
into your certificate request.  
What you are about to enter is what is called a Distinguished Name or a DN.  
There are quite a few fields but you can leave some blank  
For some fields there will be a default value,  
If you enter '.', the field will be left blank.  
-----  
Country Name (2 letter code) [XX]:ID  
State or Province Name (full name) []:East Java  
Locality Name (eg, city) [Default City]:Surabaya  
Organization Name (eg, company) [Default Company Ltd]:PT. Sentra Vidya Utama  
Organizational Unit Name (eg, section) []:utara.sevima.site  
Common Name (eg, your name or your server's hostname) []:utara.sevima.site  
Email Address []:  
  
Please enter the following 'extra' attributes  
to be sent with your certificate request  
A challenge password []:  
An optional company name []:
```

```
[root@testsevima ~]# openssl ca -config /root/ca/openssl.cnf \  
> -extensions server_cert \  
> -days 825 -notext -md sha256 \  
> -in /root/ca/utara.sevima.site.csr \  
> -out /root/ca/certs/utara.sevima.site.crt  
Using configuration from /root/ca/openssl.cnf  
Check that the request matches the signature  
Signature ok  
The Subject's Distinguished Name is as follows  
countryName          :PRINTABLE:'ID'  
stateOrProvinceName  :ASN.1 12:'East Java'  
localityName         :ASN.1 12:'Surabaya'  
organizationName     :ASN.1 12:'PT. Sentra Vidya Utama'  
organizationalUnitName:ASN.1 12:'utara.sevima.site'  
commonName           :ASN.1 12:'utara.sevima.site'  
Certificate is to be certified until Apr  6 17:34:49 2028 GMT (825 days)  
Sign the certificate? [y/n]:y  
  
1 out of 1 certificate requests certified, commit? [y/n]y  
Write out database with 1 new entries  
Data Base Updated
```

- timur.sevima.site

```
[root@testsevima ~]# openssl req -new \  
> -key /root/ca/private/timur.sevima.site.key \  
> -out /root/ca/timur.sevima.site.csr  
You are about to be asked to enter information that will be incorporated  
into your certificate request.  
What you are about to enter is what is called a Distinguished Name or a DN.  
There are quite a few fields but you can leave some blank  
For some fields there will be a default value,  
If you enter '.', the field will be left blank.  
-----  
Country Name (2 letter code) [XX]:ID  
State or Province Name (full name) []:East Java  
Locality Name (eg, city) [Default City]:Surabaya  
Organization Name (eg, company) [Default Company Ltd]:PT. Sentra Vidya Utama  
Organizational Unit Name (eg, section) []:IT  
Common Name (eg, your name or your server's hostname) []:timur.sevima.site  
Email Address []:  
  
Please enter the following 'extra' attributes  
to be sent with your certificate request  
A challenge password []:  
An optional company name []:  
  
[root@testsevima ~]# openssl ca -config /root/ca/openssl.cnf \  
> -extensions server_cert \  
> -days 825 -notext -md sha256 \  
> -in /root/ca/timur.sevima.site.csr \  
> -out /root/ca/certs/timur.sevima.site.crt  
Using configuration from /root/ca/openssl.cnf  
Check that the request matches the signature  
Signature ok  
The Subject's Distinguished Name is as follows  
countryName          :PRINTABLE:'ID'  
stateOrProvinceName  :ASN.1 12:'East Java'  
localityName         :ASN.1 12:'Surabaya'  
organizationName     :ASN.1 12:'PT. Sentra Vidya Utama'  
organizationalUnitName:ASN.1 12:'IT'  
commonName           :ASN.1 12:'timur.sevima.site'  
Certificate is to be certified until Apr  6 17:37:18 2028 GMT (825 days)  
Sign the certificate? [y/n]:y  
  
1 out of 1 certificate requests certified, commit? [y/n]y  
Write out database with 1 new entries  
Data Base Updated
```

- barat.sevima.site

```
[root@testsevima ~]# openssl req -new \
> -key /root/ca/private/barat.sevima.site.key \
> -out /root/ca/barat.sevima.site.csr
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [XX]:ID
State or Province Name (full name) []:East Java
Locality Name (eg, city) [Default City]:Surabaya
Organization Name (eg, company) [Default Company Ltd]:PT. Sentra Vidya Utama
Organizational Unit Name (eg, section) []:IT
Common Name (eg, your name or your server's hostname) []:barat.sevima.site
Email Address []:

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:

[root@testsevima ~]# openssl ca -config /root/ca/openssl.cnf \
> -extensions server_cert \
> -days 825 -notext -md sha256 \
> -in /root/ca/barat.sevima.site.csr \
> -out /root/ca/certs/barat.sevima.site.crt
Using configuration from /root/ca/openssl.cnf
Check that the request matches the signature
Signature ok
The Subject's Distinguished Name is as follows
countryName             :PRINTABLE:'ID'
stateOrProvinceName     :ASN.1 12:'East Java'
localityName            :ASN.1 12:'Surabaya'
organizationName        :ASN.1 12:'PT. Sentra Vidya Utama'
organizationalUnitName  :ASN.1 12:'IT'
commonName              :ASN.1 12:'barat.sevima.site'
Certificate is to be certified until Apr  6 17:39:41 2028 GMT (825 days)
Sign the certificate? [y/n]:y
```

Hasil :

```
[root@testsevima ~]# openssl x509 -in /root/ca/cacert.pem -noout -subject -issuer
subject= /C=ID/ST=East Java/L=Surabaya/O=PT. Sentra Vidya Utama/OU=IT/CN=SEVIMA CA
issuer= /C=ID/ST=East Java/L=Surabaya/O=PT. Sentra Vidya Utama/OU=IT/CN=SEVIMA CA
[root@testsevima ~]# openssl x509 -in /root/ca/certs/www.sevima.site.crt -noout -subject -issuer
subject= /C=ID/ST=East Java/O=PT. Sentra Vidya Utama/OU=IT/CN=www.sevima.site
issuer= /C=ID/ST=East Java/L=Surabaya/O=PT. Sentra Vidya Utama/OU=IT/CN=SEVIMA CA
```



### C. Web Server

- a. Install web server menggunakan apache2 and nginx di host yang sama.
  1. Buat virtual host HTTP-only untuk melayani utara.sevima.site menggunakan apache2 pada port 80 + ID peserta Contoh: jika ID peserta adalah 23, maka gunakan port 8023.
    - a) Halaman website harus menampilkan "Hello World from Utara Site"
    - b) Tambahkan HTTP header berikut:
      - X-Owner-By: diisi dengan nama peserta
      - X-Served-By: diisi dengan jenis web server (apache2)

```
ServerRoot "/etc/httpd"

#
# Listen: Allows you to bind Apache to specific IP addresses and/or
# ports, instead of the default. See also the <VirtualHost>
# directive.
#
# Change this to Listen on specific IP addresses as shown below to
# prevent Apache from glomming onto all bound IP addresses.
#
#Listen 12.34.56.78:80
Listen 8023
```

Note: konfigurasi saya tulis 8023 karena saya tidak tau untuk nomor peserta nya maka dari itu saya mengikuti default yaitu 80+23

```
VirtualHost *:8023>
    ServerName utara.sevima.site
    DocumentRoot /var/www/utara

    <Directory /var/www/utara>
        AllowOverride None
        Require all granted
    </Directory>

    Header set X-Owner-By "Wahyu Ristho Ramadhani"
    Header set X-Served-By "apache2"
</VirtualHost>
```

Hasil :

```
[root@testsevima administrator]# curl http://localhost:8023
Hello World from Utara Site
```

2. Buat virtual host HTTP-only untuk melayani timur.sevima.site menggunakan nginx pada port 81 + ID peserta Contoh: jika ID peserta adalah 23, maka gunakan port 8123.
  - a) Halaman website harus menampilkan "Hello World from Timur Site".
  - b) Tambahkan HTTP header berikut:
    - X-Owner-By: diisi dengan nama peserta.
    - X-Served-By: diisi dengan jenis web server (apache2).

Konfigurasi :

```
server {  
    listen 8123;  
    server_name timur.sevima.site;  
  
    root /usr/share/nginx/timur;  
    index index.html;  
  
    add_header X-Owner-By "Wahyu Ristho Ramadhani";  
    add_header X-Served-By "nginx";  
}
```

Note: konfigurasi saya tulis 8023 karena saya tidak tau untuk nomor peserta nya maka dari itu saya mengikuti default yaitu 80+23

Hasil :

```
[root@testsevima administrator]# curl http://localhost:8123  
Hello World from Timur Site
```

3. Buat virtual host HTTPS untuk melayani barat.sevima.site menggunakan nginx dengan port https angka acak (contoh: 4435).
  - a) Aktifkan HTTPS menggunakan Certificate Authority dari SEVIMA CA.
  - b) Redirect semua permintaan HTTP ke HTTPS.
  - c) Pastikan localhost dan laptop kamu dapat mengakses tanpa peringatan apa pun.

Konfigurasi :

```
server {
    listen 80;
    server_name barat.sevima.site;
    return 301 https://$host:4435$request_uri;
}

server {
    listen 4435 ssl;
    server_name barat.sevima.site;

    ssl_certificate /etc/nginx/ssl/barat.sevima.site.crt;
    ssl_certificate_key /etc/nginx/ssl/barat.sevima.site.key;

    ssl_trusted_certificate /etc/nginx/ssl/cacert.pem;

    root /usr/share/nginx/html;
    index index.html;

    add_header X-Owner-By "Wahyu Ristho Ramadhani";
    add_header X-Served-By "nginx";
}
```

Update SSL ke VM

```
cp: overwrite '/etc/pki/ca-trust/source/anchors/cacert.pem'? yes
[root@testsevima administrator]# update-ca-trust
```

Hasil :

```
[root@testsevima administrator]# curl https://barat.sevima.site:4435
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<html>
<head>
  <title>Welcome to CentOS</title>
  <style rel="stylesheet" type="text/css">

    html {
      background-image:url(img/html-background.png);
      background-color: white;
      font-family: "DejaVu Sans", "Liberation Sans", sans-serif;
      font-size: 0.85em;
      line-height: 1.25em;
      margin: 0 4% 0 4%;
    }

    body {
      border: 10px solid #fff;
      margin:0;
      padding:0;
      background: #fff;
    }

    /* Links */

    a:link { border-bottom: 1px dotted #ccc; text-decoration: none; color: #204d92; }
    a:hover { border-bottom:1px dotted #ccc; text-decoration: underline; color: green; }
    a:active { border-bottom:1px dotted #ccc; text-decoration: underline; color: #204d92; }
    a:visited { border-bottom:1px dotted #ccc; text-decoration: none; color: #204d92; }
    a:visited:hover { border-bottom:1px dotted #ccc; text-decoration: underline; color: green; }

    .logo a:link,
    .logo a:hover,
    .logo a:visited { border-bottom: none; }
```

#### D. Load Balancer HAProxy

- 1) Konfigurasi load balancer HTTP/HTTPS untuk www.sevima.site, yang dihosting oleh utara.sevima.site dan timur.sevima.site menggunakan apache2 dan nginx.
- 2) Gunakan sertifikat dari SEVIMA CA.
- 3) Gunakan algoritma round-robin.
- 4) Pastikan localhost dapat mengakses tanpa peringatan apa pun.

Konfigurasi :

```
#-----
# common defaults that all the 'listen' and 'backend' sections will
# use if not designated in their block
#-----
defaults
    mode                http
    log                 global
    option              httplog
    option              dontlognull
    option http-server-close
    option forwardfor   except 127.0.0.0/8
    option              redispatch
    retries              3
    timeout http-request 10s
    timeout queue        1m
    timeout connect      5s
    timeout client       50s
    timeout server       50s
    timeout http-keep-alive 10s
    timeout check        10s
    maxconn              3000

#-----
# main frontend which proxys to the backends
#-----
frontend www_http
    bind *:80
    redirect scheme https if !{ ssl_fc }

frontend www_https
    bind *:443 ssl crt /etc/haproxy/www.pem
    default_backend web_servers

#-----
# static backend for serving up images, stylesheets and such
#-----
backend web_servers
    balance roundrobin
    server utara 192.168.100.58:8023 check
    server timur 192.168.100.58:8123 check
```

Hasil :

Jika service Nginx dan Httpd dimatikan haproxy tersebut berhasil running

```
[root@testsevima administrator]# curl -I https://www.sevima.site
HTTP/1.0 503 Service Unavailable
Cache-Control: no-cache
Connection: close
Content-Type: text/html
```

Namun jika Nginx dan Httpd di start maka service haproxy bentrok antar port nya dan menyebabkan service mati

```
[root@testsevima administrator]# ss -tulnp | grep :80
tcp        LISTEN  0      128          *:80          *:80          users: (("nginx",pid=2108,fd=6), ("nginx",pid=2107,fd=6))
tcp        LISTEN  0      128          [::]:80       [::]:80       users: (("nginx",pid=2108,fd=9), ("nginx",pid=2107,fd=9))
tcp        LISTEN  0      128          [::]:8023     [::]:8023     users: (("httpd",pid=2061,fd=4), ("httpd",pid=2060,fd=4), ("httpd",pid=2057,fd=4), ("httpd",pid=2056,fd=4))
```

```
haproxy.service - HAProxy Load Balancer
Loaded: loaded (/usr/lib/systemd/system/haproxy.service; enabled; vendor preset: disabled)
Active: failed (Result: exit-code) since Sat 2026-01-03 03:01:16 WIB; 5s ago
Process: 2115 ExecStart=/usr/sbin/haproxy-systemd-wrapper -f /etc/haproxy/haproxy.cfg -p /run/haproxy.pid $OPTIONS (code=exited, status=1/FAILURE)
Main PID: 2115 (code=exited, status=1/FAILURE)

Jan 03 03:01:16 testsevima systemd[1]: Started HAProxy Load Balancer.
Jan 03 03:01:16 testsevima haproxy-systemd-wrapper[2115]: haproxy-systemd-wrapper: executing /usr/sbin/haproxy -f /etc/haproxy/haproxy.cfg -p /run/haproxy.pid -Ds
Jan 03 03:01:16 testsevima haproxy-systemd-wrapper[2115]: [WARNING] 002/030116 (2116) : Setting tune.ssl.default-dh-param to 1024 by default, if your workload permits it you s... di
Jan 03 03:01:16 testsevima haproxy-systemd-wrapper[2115]: [ALERT] 002/030116 (2116) : Starting frontend www.http: cannot bind socket [0.0.0.0:80]
Jan 03 03:01:16 testsevima systemd[1]: haproxy.service: main process exited, code=exited, status=1/FAILURE
Jan 03 03:01:16 testsevima haproxy-systemd-wrapper[2115]: haproxy-systemd-wrapper: exit, haproxy RC=1
Jan 03 03:01:16 testsevima systemd[1]: Unit haproxy.service entered failed state.
Jan 03 03:01:16 testsevima systemd[1]: haproxy.service failed.
Hint: Some lines were ellipsized, use -l to show in full.
[root@testsevima administrator]#
```