

# 🌐 IT 네트워크 시스템 *IT Network Systems Administration*

✍ Written by **Donghyun Choi (KGU)**

❖ - Worldskills Korea - Assessment Task (IT Network Systems) - [ Written by NullBins ]

- By default, the commands are executed as a root user.

[ Project-1 ] <🐧 Linux Environments>

## 1. 네트워크 구성 (Network Configuration)

- ⚡ 서버 및 호스트 네트워크 IP 설정 호스트네임 변경 및 IP 주소 지정.

< Configuration >

- [ DONG-R ]

```
ip link show           # 네트워크 이더넷 이름 확인 (ex. ens3X | ens32, ens33)
```

```
vim /etc/network/interfaces
```

```
auto ens32 ens33
iface ens32 inet static
    address 117.121.35.100/24
iface ens33 inet static
    address 192.168.1.254/24
    dns-nameservers 192.168.1.1
```

```
vim /etc/resolv.conf
```

```
nameserver 192.168.1.1
domain donghyun.net
search donghyun.net
```

```
vim /etc/hosts
```

```
127.0.1.1 DONG-R.donghyun.net DONG-R
```

```
hostnamectl set-hostname DONG-R  
reboot
```

- [ **DONG-SRV1** ]

```
ip link show # 네트워크 이더넷 이름 확인 (ex. ens3X | ens32)
```

```
vim /etc/network/interfaces
```

```
auto ens32  
iface ens32 inet static  
    address 192.168.1.1/24  
    gateway 192.168.1.254  
    dns-nameservers 192.168.1.1 192.168.1.2
```

```
vim /etc/resolv.conf
```

```
nameserver 192.168.1.1  
nameserver 192.168.1.2  
domain donghyun.net  
search donghyun.net
```

```
vim /etc/hosts
```

```
127.0.1.1 DONG-SRV1.donghyun.net DONG-SRV1
```

```
hostnamectl set-hostname DONG-SRV1  
reboot
```

- [ DONG-SRV2, DAE-R, DAE-SRV ] -> 과제지를 참고하여 위처럼 동일하게 설정.

## 2. SAMBA AD 서비스 구성 (Samba Active Directory Service Configuration)

- ⚡ DONG-SRV1 // Samba Active Directory Service 구성 시 패키지 도구는 BIND9 및 SAMBA-AD-DC를 사용함.

### < Configuration >

- [ DONG-SRV1 ]

```
apt install bind9 krb5-user krb5-config winbind samba smbclient migrationtools  
ldb-tools -y
```

When users attempt to use Kerberos realm that principal belongs to, of a Kerberos service running on domain.

Default Kerberos version 5 realm:

DONGHYUN.NET

Configuring Kerberos Authentication  
Enter the hostnames of Kerberos servers in the DONGHYUN.NET Kerberos  
Kerberos servers for your realm:

DONG-SRV1.donghyun.net

<OK>

Configuring Kerberos Authentication  
Enter the hostname of the administrative (password changing) server for the DONGHYUN.NET  
Administrative server for your Kerberos realm:

DONG-SRV1.donghyun.net

<OK>

```
mv /etc/samba/smb.conf /etc/samba/smb.conf.bak  
samba-tool domain provision --use-rfc2307 --interactive
```

```
root@DONG-SRV1:~# samba-tool domain provision --use-rfc2307 --interactive  
Realm [DONGHYUN.NET]:  
Domain [DONGHYUN]:  
Server Role (dc, member, standalone) [dc]:  
DNS backend (SAMBA_INTERNAL, BIND9_FLATFILE, BIND9_DLZ, NONE) [SAMBA_INTERNAL]: BIND9_DLZ  
Administrator password:  
Retype password:
```

```
cp /var/lib/samba/private/krb5.conf /etc/
```

```
vim /var/lib/samba/bind-dns/named.conf
```

```
dlz "donghyun.net" {  
    database "dlopen /usr/lib/x86_64-linux-gnu/samba/bind9/dlz_bind9_16.so";  
};
```

```
cat /var/lib/samba/bind-dns/named.txt | grep tkey >> /etc/bind/named.conf
```

```
vim /etc/bind/named.conf
```

```
// include "/etc/bind/named.conf.options";  
// include "/etc/bind/named.conf.local";  
include "/etc/bind/named.conf.default-zones";  
include "/var/lib/samba/bind-dns/named.conf";  
  
options {  
    directory "/var/cache/bind";  
    listen-on { any; };  
    allow-query { any; };  
    allow-update { 192.168.1.254; };  
    dnssec-validation no;  
    tkey-gssapi-keytab "/var/lib/samba/bind-dns/dns.keytab";  
};  
  
zone "1.168.192.in-addr.arpa" {  
    type master;  
    file "192.rev";  
};
```

```
zone "daeseong.net" {
    type forward;
    forwarders { 172.16.1.1; };
};
```

```
systemctl restart bind9
systemctl stop smbd nmbd winbind
systemctl disable smbd nmbd winbind
systemctl unmask samba-ad-dc
systemctl enable samba-ad-dc
systemctl restart samba-ad-dc
kinit Administrator
cd /usr/share/migrationtools/
```

```
vim migrate_common.ph
```

```
$NAMINGCONTEXT{'passwd'} = "ou=DONG";
$DEFAULT_MAIL_DOMAIN = "donghyun.net";
$DEFAULT_BASE = "dc=donghyun,dc=net";
```

```
cp migrate_common.ph /usr/share/perl5/
./migrate_base.pl > ou.ldif
```

```
vim ou.ldif
```

```
1 dn: ou=DONG,dc=donghyun,dc=net
2 ou: DONG
3 objectClass: top
4 objectClass: organizationalUnit
```

```
ldbadd -H /var/lib/samba/private/sam.ldb ou.ldif
```

```
vim /root/users.sh
```

```
#!/bin/bash
for i in {01..05}
do
    samba-tool user create user1$i Skill39 --userou=OU=DONG --uid-number=10$i
    --gid-number=1000 --script-path=/bin/bash --home-directory=/home/user1$i
    samba-tool user create visitor1$i Skill39 --userou=OU=DONG --uid-
    number=20$i --gid-number=2000 --script-path=/bin/bash --home-
    directory=/home/visitor1$i
done
```

```
chmod +x /root/users.sh
bash /root/users.sh
```

```
kinit Administrator
klist
wbinfo -u
```

- [ DONG-SRV2 ]

```
apt install krb5-user krb5-config winbind samba smbclient -y
mv /etc/samba/smb.conf /etc/samba/smb.conf.bak
scp DONG-SRV1:/etc/krb5.conf /etc/
kinit Administrator
samba-tool domain join donghyun.net DC -UAdministrator
systemctl stop smbd nmbd winbind
systemctl disable smbd nmbd winbind
systemctl unmask samba-ad-dc
systemctl enable samba-ad-dc
systemctl restart samba-ad-dc
```

## 2. DNS 서비스 구성 (DNS Service Configuration)

- ⚡ DONG-SRV 및 DAE-SRV, DNS 도메인 네임서버 구성 구성 시 패키지 도구는 BIND9을 사용함.

< Configuration >

- [ DONG-SRV1 ]

```
kinit Administrator
```

```
samba-tool dns add 192.168.1.1 donghyun.net www.donghyun.net CNAME DONG-SRV1.donghyun.net
samba-tool dns add 192.168.1.1 donghyun.net mail.donghyun.net CNAME DONG-SRV2.donghyun.net
samba-tool dns add 192.168.1.1 donghyun.net @ MX "mail.donghyun.net 10"
samba-tool dns query 192.168.1.1 donghyun.net @ ALL -U Administrator
```

```
cp /etc/bind/db.127 /var/cache/bind/192.rev
chown bind:bind -R /var/cache/bind/
sed -i "s/localhost/DONG-SRV1.donghyun.net/g" /var/cache/bind/192.rev
```

```
vim /var/cache/bind/192.rev
```

1	IN	PTR	DONG-SRV1.donghyun.net
2	IN	PTR	DONG-SRV2.donghyun.net

```
systemctl restart bind9
```

- [ **DAE-SRV** ]

```
apt install bind9 -y
```

```
vim /etc/bind/named.conf
```

```
// include "/etc/bind/named.conf.options";
// include "/etc/bind/named.conf.local";
// include "/etc/bind/named.conf.default-zones";

options {
    directory "/var/cache/bind";
    listen-on { any; };
    allow-query { any; };
    dnssec-validation no;
};

view int {
    match-clients { 192.168.1.0/24; 172.16.1.0/24; localhost; };
```

```
include "/etc/bind/named.conf.default-zones";
zone "daeseong.net" {
    type master;
    file "int-daeseong.zone";
    allow-update { 172.16.1.254; };
};

zone "donghyun.net" {
    type forward;
    forwarders { 192.168.1.1; };
};

view ext {
    match-clients { 117.121.35.0/24; };
    include "/etc/bind/named.conf.default-zones";
    zone "daeseong.net" {
        type master;
        file "ext-daeseong.zone";
    };
};
```

```
cp /etc/bind/db.0 /var/cache/bind/int-daeseong.zone
cp /etc/bind/db.0 /var/cache/bind/ext-daeseong.zone
chown bind:bind -R /var/cache/bind/
sed -i "s/localhost/DAE-SRV.daeseong.net/g" /var/cache/bind/int-daeseong.zone
sed -i "s/localhost/DAE-SRV.daeseong.net/g" /var/cache/bind/ext-daeseong.zone
```

```
vim /var/cache/bind/int-daeseong.zone
```

```
DAE-SRV      IN  A   172.16.1.1
www          IN  CNAME  DAE-SRV
```

```
vim /var/cache/bind/ext-daeseong.zone
```

```
DAE-SRV      IN  A   117.121.35.150
www          IN  CNAME  DAE-SRV
```

```
systemctl restart bind9
```

### 3. DHCP 서버 구성 (DHCP Service Configuration)

- ☞ DONG-R 및 DAE-R, DHCP 서버 구성 시 패키지 도구는 ISC-DHCP-SERVER를 사용함.

#### < Configuration >

- [ DONG-R ]

```
apt install isc-dhcp-server -y
```

```
vim /etc/default/isc-dhcp-server
```

```
INTERFACESv4="ens33"      # 해당 인터페이스는 내부망 이더넷으로 지정해야 함.
```

```
vim /etc/dhcp/dhcpd.conf
```

```
subnet 192.168.1.0 netmask 255.255.255.0 {
    range 192.168.1.150 192.168.1.200;
    option routers 192.168.1.254;
    option domain-name "donghyun.net";
    option domain-name-servers 192.168.1.1;
    default-lease-time 600;
    max-lease-time 7200;
}

zone donghyun.net {
    primary 192.168.1.1;
}

zone 1.168.192.in-addr.arpa {
    primary 192.168.1.1;
}

ddns-update-style standard;
```

```
systemctl restart isc-dhcp-server
```

- [ DAE-R ]

```
apt install isc-dhcp-server -y
```

```
vim /etc/default/isc-dhcp-server
```

```
INTERFACESv4="ens33"      # 해당 인터페이스는 내부망 이더넷으로 지정해야 함.
```

```
vim /etc/dhcp/dhcpd.conf
```

```
subnet 172.16.1.0 netmask 255.255.255.0 {
    range 172.16.1.150 172.16.1.200;
    option routers 172.16.1.254;
    option domain-name "daeseong.net";
    option domain-name-servers 172.16.1.1;
    default-lease-time 600;
    max-lease-time 7200;
}

zone daeseong.net {
    primary 172.16.1.1;
}

ddns-update-style standard;
```

```
systemctl restart isc-dhcp-server
```

## 4. [S2S] GRE-over-IPsec VPN 구성 (GRE-over-IPsec VPN Configuration)

- ☞ DONG-R 및 DAE-R, VPN SITE 구성 시 패키지 도구는 STRONGSWAN을 사용함.

### < Configuration >

- [ DONG-R ]

```
vim /etc/network/interfaces
```

```
auto tun0
iface tun0 inet tunnel
    address 10.0.0.1
    netmask 255.255.255.252
    dstaddr 10.0.0.2
    local 117.121.35.100
    endpoint 117.121.35.150
    mode gre
    ttl 255
    post-up ip route add 172.16.1.0/24 dev tun0
    pre-down ip route add 172.16.1.0/24 dev tun0
```

```
modprobe ip_gre
systemctl restart networking
```

```
apt install strongswan -y
```

```
vim /etc/ipsec.conf
```

```
conn GRE-IPSEC-VPN
    left=117.121.35.100
    leftprotoport=gre
    right=117.121.35.150
    rightprotoport=gre
    type=transport
    authby=secret
    keyexchange=ikev2
    auto=start
```

```
vim /etc/ipsec.secrets
```

```
117.121.35.150 117.121.35.100 : PSK "Skill39"
```

```
systemctl restart strongswan-starter
```

- [ DAE-R ]

```
vim /etc/network/interfaces
```

```
auto tun0
iface tun0 inet tunnel
    address 10.0.0.2
    netmask 255.255.255.252
    dstaddr 10.0.0.1
    local 117.121.35.150
    endpoint 117.121.35.100
    mode gre
    ttl 255
    post-up ip route add 192.168.1.0/24 dev tun0
    pre-down ip route add 192.168.1.0/24 dev tun0
```

```
modprobe ip_gre
systemctl restart networking
```

```
apt install strongswan -y
```

```
vim /etc/ipsec.conf
```

```
conn S2S-VPN
    left=117.121.35.100
    leftprotoport=gre
    right=117.121.35.150
    rightprotoport=gre
    type=transport
    authby=secret
    keyexchange=ikev2
    auto=start
```

```
vim /etc/ipsec.secrets
```

```
117.121.35.100 117.121.35.150 : PSK "Skill39"
```

```
systemctl restart strongswan-starter
```

## 4. Certificate Authority 구성 (Certificate Authority Configuration)

- ☞ DONG-SRV1 에서 DONG-CA 인증기관 설립 구성 시 패키지 도구는 OPENSSL를 사용함.

### < Configuration >

- [ DONG-SRV1 ]

```
apt install openssl -y
```

```
vim /etc/ssl/openssl.cnf
```

```
[ CA_default ]
dir = /etc/ssl/DONG-CA
x509_extensions = v3_req
policy = policyAnything

[ req_distinguished_name ]
countryName_default = KR
#stateOrProvinceName_default = Some-State
organizationName_default = DONG
```

```
vim /usr/lib/ssl/misc/CA.pl
```

```
my $CADAYS = "-days 1825";      # 5년
my $CATOP = "/etc/ssl/DONG-CA";
```

```
/usr/lib/ssl/misc/CA.pl -newca      # CN=DONG-CA 설정
```

```
Common Name (e.g. server FQDN or YOUR name) [] :DONG-CA
```

```
cp /etc/ssl/DONG-CA/cacert.pem /usr/local/share/ca-certificates/ca.crt
update-ca-certificates
```

## 4. LDAP 서버 구성 (LDAP Service Configuration)

- DAE-SRV에서 LDAP 서버 구성 시 패키지 도구는 SLAPD를 사용함.

### < Configuration >

- [ DAE-SRV ]

```
apt install slapd migrationtools -y      # 설치시 비밀번호는 "Skill39"를 사용함.
```

```
vim /etc/ldap/ldap.conf
```

```
BASE    dc=daeseong,dc=net
URI     ldapi://
```

```
systemctl restart slapd
ldapsearch -x      # dn: dc=daeseong,dc=net 확인
```

```
vim /root/users.sh
```

```
#!/bin/bash
for i in {01..05}
do
    echo -e "Skill39\nSkill39" | adduser --gecos "" --uid 20$i user2$i
done
```

```
chmod +x /root/users.sh
bash /root/users.sh
cd /usr/share/migrationtools/
```

```
vim migrate_common.ph
```

```
$NAMINGCONTEXT{ 'passwd' }      = "ou=users";
$DEFAULT_MAIL_DOMAIN = "daeseong.net";
$DEFAULT_BASE = "dc=daeseong,dc=net";
```

```
cp migrate_common.ph /usr/share/perl5/
./migrate_base.pl > ou.ldif
```

```
vim ou.ldif      # ou=users 제외하고 전부 삭제
```

```
1 dn: ou=users,dc=daeseong,dc=net
2 ou: users
3 objectClass: top
4 objectClass: organizationalUnit
```

```
./migrate_passwd.pl /etc/passwd > passwd.ldif
```

```
vim passwd.ldif      # user201 ~ user205 제외하고 전부 삭제
```

```
1 dn: uid=user201,ou=users,dc=daeseong,dc=net
2 uid: user201
3 cn: user201
4 objectClass: account
5 objectClass: posixAccount
6 objectClass: top
7 objectClass: shadowAccount
8 userPassword: {crypt}y$j9T$.2502N.0ZMPcxAADvGuVn1$5e1B0ApNLiC./uDguyRBN7cSDZCgsPhwTrCKtHWG094
9 shadowLastChange: 20479
10 shadowMax: 99999
11 shadowWarning: 7
12 loginShell: /bin/bash
13 uidNumber: 2001
14 gidNumber: 65534
15 homeDirectory: /home/user201
16 gecos: ,,,
```

해당 사진처럼 user201 ~ user205 유저들만 남긴다.

```
ldapadd -cWD "cn=admin,dc=daeseong,dc=net" -f ou.ldif          # PW: Skill39
ldapadd -cWD "cn=admin,dc=daeseong,dc=net" -f passwd.ldif       # PW: Skill39
ldapsearch -x | grep dn
```

```
dn: dc=daeseong,dc=net
dn: ou=users,dc=daeseong,dc=net
dn: uid=user201,ou=users,dc=daeseong,dc=net
dn: uid=user202,ou=users,dc=daeseong,dc=net
dn: uid=user203,ou=users,dc=daeseong,dc=net
dn: uid=user204,ou=users,dc=daeseong,dc=net
dn: uid=user205,ou=users,dc=daeseong,dc=net
```

해당 사진처럼 출력되어야 한다.

```
vim /root/users.sh
```

```
#!/bin/bash
for i in {01..05}
do
    # echo -e "Skill39\nSkill39" | adduser --gecos "" --uid 20$i user2$i
    userdel -r user2$i
done
```

```
bash /root/users.sh
```

- ☞ DAE-CLI에서 LDAP 서버 인증 설정 구성 시 패키지 도구는 LIBNSS-LDAPD를 사용함.
- [ DONG-CLI ]

```
apt install libnss-ldapd -y
```

Multiple URIs can be separated by spaces.

LDAP server URI:

ldap://DAE-SRV.daeseong.net/

<0k>

LDAP server search base:

dc=daeseong,dc=net

<0k>

```
You can select the services that should have LDAP lookups. New LDAP lookups will be added as the last datasource. These changes.
```

```
Name services to configure:
```

```
[*] passwd  
[*] group  
[ ] shadow  
[ ] hosts  
[ ] networks
```

```
<0k>
```

사진대로 설정

```
vim /etc/ldap/ldap.conf
```

```
BASE      dc=daeseong,dc=net  
URI       ldap://DAE-SRV.daeseong.net/
```

```
echo "session optional pam_mkhomedir.so" >> /etc/pam.d/common-session  
reboot
```



.....



```
Creating directory '/home/user203'.
```

사진처럼 user201 ~ user205 유저로 로그인 되는지 확인

## 4. Web 서버 구성 (Web Service Configuration)

- DAE-SRV에서 Web 서버 구성 시 패키지 도구는 APACHE2를 사용함.

### < Configuration >

- [ DAE-SRV ]

```
apt install apache2 php libapache2-mod-php -y
```

```
cd /etc/ssl/DONG-CA/certs  
openssl req -new -out dae-www.req -newkey rsa:2048 -keyout dae-www.key -nodes  
# CN=www.daeseong.net
```

```
vim san
```

```
subjectAltName = DNS:www.daeseong.net
```

```
openssl ca -in dae-www.req -out dae-www.crt -extfile san # PW: Skill39
```

```
vim /etc/apache2/apache2.conf
```

```
<Directory /var/www/php>  
AuthType basic  
AuthName "ldap"  
AuthBasicProvider ldap  
AuthLDAPURL "ldap://DAE-SRV.daeseong.net/dc=daeseong,dc=net?uid"  
Require valid-user  
</Directory>
```

```
vim /etc/apache2/sites-available/default-ssl.conf
```

```
<IfModule mod_ssl.c>  
<VirtualHost _default_:443>
```

```

    ServerName www.daeseong.net
    DocumentRoot /var/www/php

    SSLCertificateFile      /etc/ssl/DONG-CA/certs/dae-www.crt
    SSLCertificateKeyFile   /etc/ssl/DONG-CA/certs/dae-www.key

    SSLCACertificatePath    /etc/ssl/DONG-CA/
    SSLCACertificateFile   /etc/ssl/DONG-CA/cacert.pem
</VirtualHost>
</IfModule>
```

```
mkdir -p /var/www/php
```

```
vim /var/www/php/index.php
```

```

<?php
    $username = $_SERVER['REMOTE_USER'];
    echo "<center><h2>Welcome to Daeseong Networks, $username</h2></center>";
>
```

```

1 <?php
2     $username = $_SERVER['REMOTE_USER'];
3     echo "<center><h2>Welcome to Daeseong Networks, $username</h2></center>";
4 ?>
```

```
a2enmod ssl authnz_ldap
systemctl restart apache2
```

- ⚡ DONG-CLI 및 DAE-CLI // 서버 인증 설정 DONG-CA에서 RootCA 인증서를 가져와 인증합니다.
- [ DONG-CLI ]

```

scp root@dong-srv.donghyun.net:/etc/ssl/DONG-CA/cacert.pem /usr/local/share/ca-
certificates/ca.crt
update-ca-certificates
```

The screenshot shows the Firefox Privacy & Security settings page. The 'Privacy & Security' tab is selected and highlighted with a red box. The 'Enhanced Tracking Protection' section is displayed, featuring a shield icon and text explaining how Firefox blocks trackers. Below this, there's a 'Certificates' section with a checkbox for querying OCSP responder servers and buttons for 'View Certificates...' and 'Security Devices...'. A list of certificates is shown, including 'AC Camerfirma SA CIF A82743287' and its issuers. At the bottom, there are buttons for 'View...', 'Edit Trust...', 'Import...', 'Export...', and 'Delete or Distrust...'. The 'Import...' button is also highlighted with a red box. A file selection dialog is open, prompting to 'Select File containing CA certificate(s) to import'. A file named 'ca.crt' is listed in the dialog.

View Certificates...

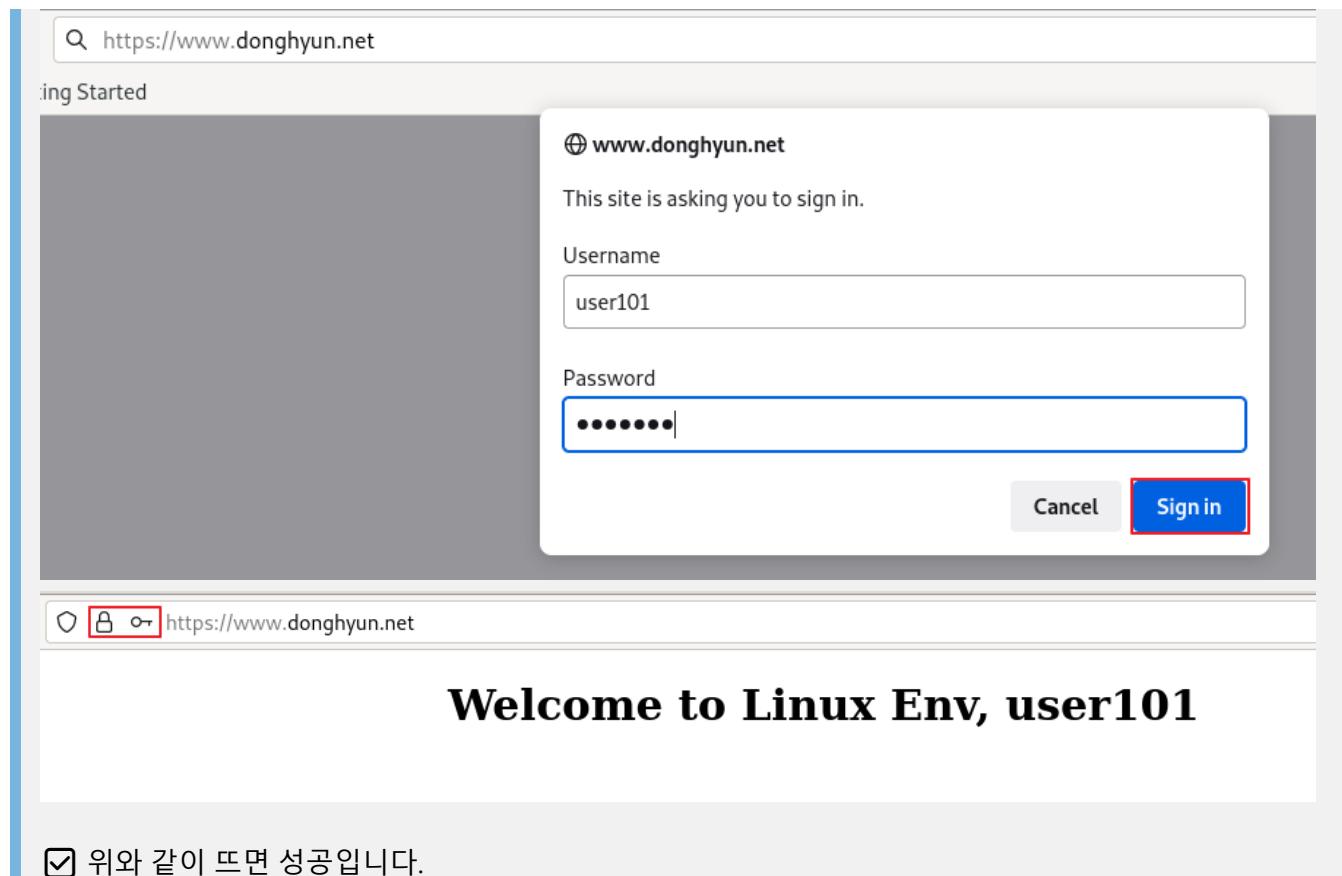
Security Devices...

Import...

Name	Location	Size	Type	Accessed
ca.crt	/usr/local/share/ca-certificates	4.2 kB	X.509 Certificate	06:39

위와 같이 설정합니다.

- Web 서버 접속 테스트



위와 같이 뜨면 성공입니다.

- [ DAE-SRV, DAE-CLI ] -> 과제지를 참고하여 위처럼 동일하게 Web Service 설정.

## 5. Network 패킷 제어 (Network Packet Control)

- DAE-R 및 DONG-R에서 Destination NAT 및 Filtering 설정 구성 시 패키지 도구는 IPTABLES를 사용함.

### < Configuration >

- [ DAE-R ]

```
apt install iptables -y
```

```
vim /etc/network/interfaces
```

...

# 부가적으로 밑의 내용을 추가합니다.

```
up iptables -t nat -A PREROUTING -s 117.121.35.0/24 -d 117.121.35.150 -p tcp
--dport 443 -j DNAT --to 172.16.1.1
up iptables -t nat -A PREROUTING -s 117.121.35.0/24 -d 117.121.35.150 -p udp
--dport 53 -j DNAT --to 172.16.1.1
```

```
up iptables -t nat -A PREROUTING -s 117.121.35.0/24 -d 117.121.35.150 -p tcp  
--dport 53 -j DNAT --to 172.16.1.1
```

reboot

---