# Open5Gs Installation

### Getting MongoDB

Install MongoDB with package manager. It is used as database for NRF/PCF/UDR and PCRF/HSS.

```
$ sudo apt update
$ sudo apt install mongodb
$ sudo systemctl start mongodb (if '/usr/bin/mongod' is not running)
$ sudo systemctl enable mongodb (ensure to automatically start it on system boot)
```

### Setting up TUN device (not persistent after rebooting)

Create the TUN device with the interface name ogstun.

```
$ sudo ip tuntap add name ogstun mode tun
$ sudo ip addr add 10.45.0.1/16 dev ogstun
$ sudo ip addr add 2001:db8:cafe::1/48 dev ogstun
$ sudo ip link set ogstun up
```

### Building open5Gs

Install the dependencies for building the source code.

```
$ sudo apt install python3-pip python3-setuptools python3-wheel ninja-build build-essential flex bison git libsctp-dev libgnutls28-dev libgcrypt-dev libssl-dev libidn11-dev libmongoc-dev libbson-dev libyaml-dev libnghttp2-dev libmicrohttpd-dev libcurl4-gnutls-dev libnghttp2-dev libtins-dev net-tools libtalloc-dev meson
```

Git clone.

```
$ cd ~
$ sudo git clone https://github.com/open5gs/open5gs
```

To compile with meson:

```
$ cd ~/open5gs
$ sudo meson build --prefix=`pwd`/install
$ sudo ninja -C build
```

You need to perform the **installation process**.

```
$ cd ~/open5gs/build
$ sudo ninja install
```

### Building the WebUI of Open5GS

Node.js is required to build WebUI of Open5GS

```
$ sudo apt install curl
$ sudo curl -fsSL https://deb.nodesource.com/setup_14.x | sudo -E bash -
$ sudo apt install nodejs
```

Install the dependencies to run WebUI

```
$ cd ~/open5gs/webui
$ sudo npm ci --no-optional
```

The WebUI runs as an npm script

```
$ sudo npm run dev
```

## Register Subscriber Information

**Open browser and Connect to http://127.0.0.1:3000 and login with admin account**

Username : admin
Password : 1423

To add subscriber information, you can do WebUI operations in the following order:

1. Go to Subscriber Menu.
2. Click + Button to add a new subscriber.
3. Fill the
   IMSI: 001010000000100
   Subscriber Key: 465B5CE8B199B49FAA5F0A2EE238A6BC
   USIM Type: OPc
   Operator Key: E8ED289DEBA952E4283B54E88E6183CA of the subscriber.
4. Click SAVE Button

# UERANSIM Installation

### Dependencies

```
$ sudo apt update
$ sudo apt upgrade
$ sudo apt install net-tools git make gcc g++ libsctp-dev lksctp-tools
iproute2
$ sudo apt-get install snapd
$ sudo snap install cmake --classic
```

### Getting the UERANSIM

```
$ cd ~
```
**$ sudo git clone** https://github.com/aligungr/UERANSIM

### Building

```
$ cd ~/UERANSIM
$ sudo make
```

در این مرحله به منظور اطمینان از قابل دسترس بودن دو VM نسبت به یکدیگر، بررسی کنید که آیا می‌توانند یکدیگر را ping کنند یا خیر. در آموزش پیش‌رو فرض بر این است که آدرس دو VM به صورت زیر می‌باشد.

| | |
|---|---|
| **VM1** | 192.168.0.111 |
| **VM2** | 192.168.0.112 |

# Open5GS Configuration

**Edit configuration files of open5Gs 5G (VM1)**

**open5gs/install/etc/open5gs/amf.yaml**

```
--- amf.yaml.orig       2021-04-20 14:19:04.000000000 +0000
+++ amf.yaml    2021-08-29 11:42:33.671647271 +0000
@@ -180,23 +180,23 @@
       - addr: 127.0.0.5
         port: 7777
     ngap:
-      - addr: 127.0.0.5
+      - addr: 192.168.0.111
     guami:
       - plmn_id:
-          mcc: 901
-          mnc: 70
+          mcc: 001
+          mnc: 01
         amf_id:
           region: 2
           set: 1
     tai:
       - plmn_id:
-          mcc: 901
-          mnc: 70
+          mcc: 001
+          mnc: 01
         tac: 1
     plmn_support:
       - plmn_id:
-          mcc: 901
-          mnc: 70
+          mcc: 001
+          mnc: 01
         s_nssai:
           - sst: 1
     security:
```

**open5gs/install/etc/open5gs/upf.yaml**

```
--- upf.yaml.orig       2021-08-29 10:41:25.138837531 +0000
+++ upf.yaml    2021-08-29 11:31:23.351000087 +0000
@@ -150,12 +150,16 @@
 #
 upf:
     pfcp:
       - addr: 127.0.0.7
     gtpu:
-      - addr: 127.0.0.7
+      - addr: 192.168.0.111
     subnet:
       - addr: 10.45.0.1/16
       - addr: 2001:230:cafe::1/48
```

# UERANSIM Configuration

**Edit configuration files of UERNSIM (VM2)**

UERANSIM/config/open5gs-gnb.yaml

```
--- open5gs-gnb.yaml.orig       2021-04-20 11:07:30.000000000 +0000
+++ open5gs-gnb.yaml    2021-08-29 11:53:34.170068022 +0000
@@ -1,17 +1,17 @@
-mcc: '901'          # Mobile Country Code value
-mnc: '70'           # Mobile Network Code value (2 or 3 digits)
+mcc: '001'          # Mobile Country Code value
+mnc: '01'           # Mobile Network Code value (2 or 3 digits)

 nci: '0x000000010'  # NR Cell Identity (36-bit)
 idLength: 32        # NR gNB ID length in bits [22...32]
 tac: 1              # Tracking Area Code

-linkIp: 127.0.0.1   # gNB's local IP address for Radio Link Simulation
(Usually same with local IP)
-ngapIp: 127.0.0.1   # gNB's local IP address for N2 Interface (Usually same
with local IP)
-gtpIp: 127.0.0.1    # gNB's local IP address for N3 Interface (Usually same
with local IP)
+linkIp: 192.168.0.112   # gNB's local IP address for Radio Link Simulation
(Usually same with local IP)
+ngapIp: 192.168.0.112   # gNB's local IP address for N2 Interface (Usually
same with local IP)
+gtpIp: 192.168.0.112    # gNB's local IP address for N3 Interface (Usually
same with local IP)

 # List of AMF address information
 amfConfigs:
-  - address: 127.0.0.5
+  - address: 192.168.0.111
     port: 38412

 # List of supported S-NSSAIs by this gNB
```

UERANSIM/config/open5gs-ue.yaml

```
--- open5gs-ue.yaml.orig        2021-08-15 14:16:46.000000000 +0000
+++ open5gs-ue0.yaml    2021-08-29 11:46:16.784524371 +0000
@@ -1,9 +1,9 @@
 # IMSI number of the UE. IMSI = [MCC|MNC|MSISDN] (In total 15 digits)
-supi: 'imsi-901700000000001'
+supi: 'imsi-001010000000100'
 # Mobile Country Code value of HPLMN
-mcc: '901'
+mcc: '001'
 # Mobile Network Code value of HPLMN (2 or 3 digits)
-mnc: '70'
+mnc: '01'
```

```
 # Permanent subscription key
 key: '465B5CE8B199B49FAA5F0A2EE238A6BC'
@@ -20,7 +20,7 @@

 # List of gNB IP addresses for Radio Link Simulation
 gnbSearchList:
-  - 127.0.0.1
+  - 192.168.0.112

 # UAC Access Identities Configuration
 uacAic:
```

# Open5GS Execution

### Run Open5GS 5G (VM1)

```
$ ./install/bin/open5gs-nrfd |
./install/bin/open5gs-smfd |
./install/bin/open5gs-amfd |
./install/bin/open5gs-ausfd |
./install/bin/open5gs-udmd |
./install/bin/open5gs-udrd |
./install/bin/open5gs-pcfd |
./install/bin/open5gs-nssfd |
./install/bin/open5gs-bsfd |
./install/bin/open5gs-upfd |
```

# UERANSIM Execution

### Run UERANSIM gNB(VM2)

```
$./nr-gnb -c ../config/open5gs-gnb.yaml
```

### Run UERANSIM UE(VM2)

```
$ ./nr-ue -c ../config/open5gs-ue0.yaml
```

بعد از اجرای اجزای هسته شبکه و شبکه دسترسی ، برای اطمینان از ایجاد اتصالات گفته شده، از ابزار Wireshark استفاده کنید.