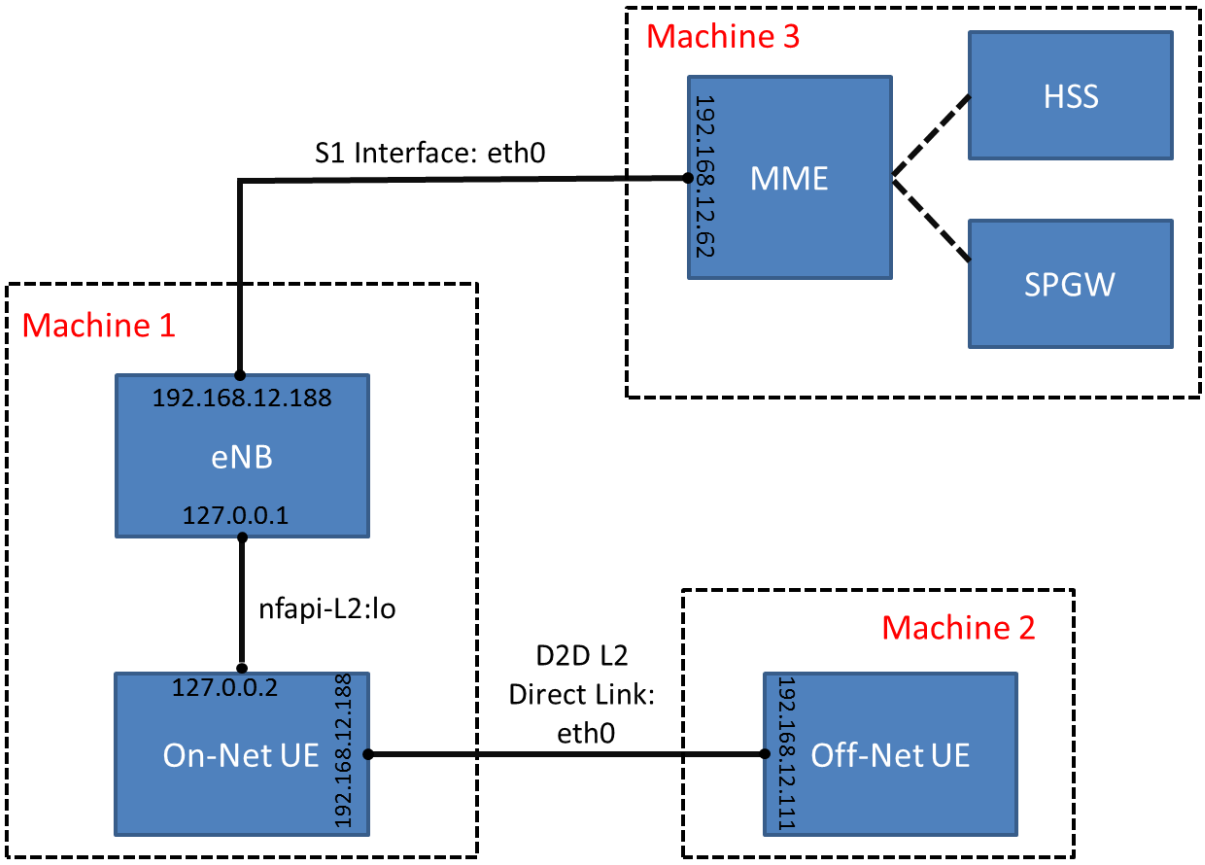
Instructions for launching the D2D On-Net emulator

The following guide describes the necessary steps to configure, build and launch the nfapi-L2-emulator in coordination with the D2D L2 emulator. For the D2D-specific emulation configuration you should still refer to the d2d-emulator-setup.txt document.

1. Testbed Setup



2. Launch EPC blocks

Provided that you have installed the individual EPC blocks (HSS, MME, SPGW), you can launch them through the respective commands in machine 3 from *openair-cn/scripts*:

- ./run_hss

When launching the hss, you should get some parameters that will be needed for the UE authentication configuration (section 3). Particularly, you will need the **K** and **OPC** fields (see following example) and also make sure that the **IMSI** of your on-network UE exists in the database:

```
IMSI: 208930000000001 Key:
11.11.11.11.11.11.11.11.11.11.11.11.11.11.11.11.

OPc: f4.7f.37.e4.71.9a.9c.37.9e.34.47.f0.89.b1.f1.0a.

RijndaelKeySchedule: K 11111111111111111111111111111111

Compute opc:

    K:    11111111111111111111111111111111

    In:   11111111111111111111111111111111

    Rinj: E56E26F5608B8D268F2556E198A0E01B

    Out:  F47F37E4719A9C379E3447F089B1F10A

Query: UPDATE `users` SET
`OPc`=UNHEX('f47f37e4719a9c379e3447f089b1f10a') WHERE
`users`.`imsi`='208930000000997'

IMSI 208930000000997 Updated OPc
f47f37e4719a9c379e3447f089b1f10a ->
f47f37e4719a9c379e3447f089b1f10a
```

- ./run_mme
- ./run_spgw

3. Nfapi-L2-emulator for eNB<->UE scope

As shown in the schema describing the testbed, both eNB and connected UE will run as separate processes within the same machine (connected through the loopback interface).

- Create lte-softmodem executable for the eNB from *LTE-D2D/cmake_targets*:
  ./build_oai --eNB -x -t ETHERNET

- Before creating the respective executable for the UE side, you need to preconfigure some authentication parameters so that they correspond to those acquired after launching the HSS. Particularly you need to modify file *openair3/NAS/TOOLS/ue_eurecom_test_sfr.conf,* as shown in the following example:

```
SIM: {
      MSIN="0000000001";
      USIM_API_K= "11111111111111111111111111111111";
      OPC="f47f37e4719a9c379e3447f089b1f10a";
      MSISDN="33611123456";
    };

    # Home PLMN Selector with Access Technology
    HPLMN= "20893";
```

- Create lte-uesoftmodem executable for the UE from *LTE-D2D/cmake_targets*:
  ./build_oai --UE

- Before launching the eNB executable, you need to configure the IP address of the connected MME and SPGW, as well as the IP address of the eNB within *targets/PROJECTS/GENERIC-LTE-EPC/CONF/rcc.band7.tm1.50PRB.nfapi.conf,* as shown in the example:

```
////////// MME parameters:
    mme_ip_address      = ( { ipv4       = "192.168.12.62";
                              ipv6       = "192:168:30::17";
                              active     = "yes";
                              preference = "ipv4";
```

```
                        }
                    );

    NETWORK_INTERFACES :
    {

        ENB_INTERFACE_NAME_FOR_S1_MME  = "enp0s31f6";
        ENB_IPV4_ADDRESS_FOR_S1_MME    = "192.168.12.188/24";
        ENB_INTERFACE_NAME_FOR_S1U     = "enp0s31f6";
        ENB_IPV4_ADDRESS_FOR_S1U      = "192.168.12.188/24";
        ENB_PORT_FOR_S1U              = 2152; # Spec 2152
    };
```

- You also need to add a new loopback interface address:
  sudo ifconfig lo: 127.0.0.2 netmask 255.0.0.0 up

- Launch the eNB executable from *cmake_targets/lte_build_oai/build:*

  sudo ./lte-softmodem -O PATH_OF:rcc.band7.tm1.50PRB.nfapi.conf

- Launch the connected UE executable from
  cmake_targets/lte_build_oai/build:

  sudo ./lte-uesoftmodem -U -O PATH_OF:oaiL1.nfapi.usrpb210.conf --L2-emul 3 --D2D-emul 1 --emul-iface enp0s31f6

4. Remote UE

- Launch the off-net UE executable from *cmake_targets/lte_build_oai/build:*

  sudo ./lte-uesoftmodem -U --D2D-emul 1 --emul-iface enp0s31f6