NFV aplicado a la virtualización de acceso a Internet (demo)

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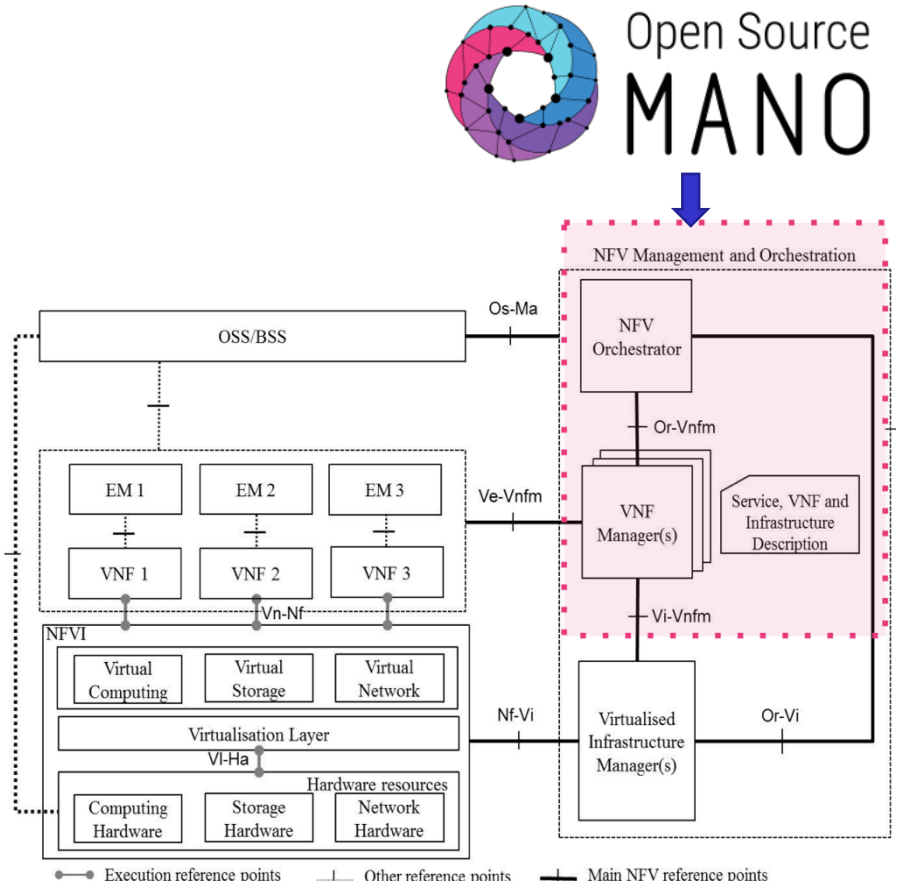
Contenido

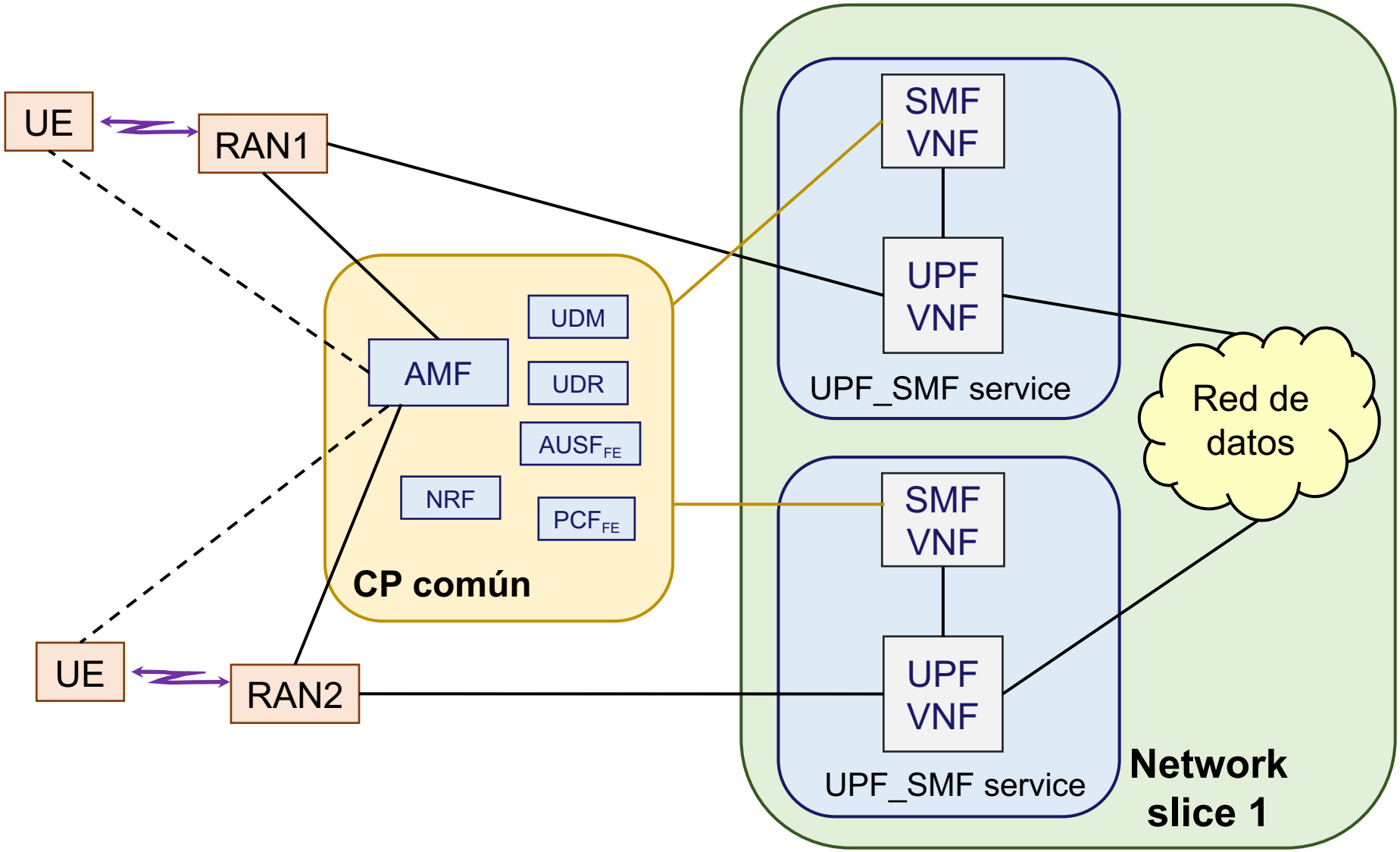
- VFN, NS y Network slice en OSM
  - Ejemplo 5G
- NFV para virtualización de acceso a Internet

Open Source MANO (OSM)

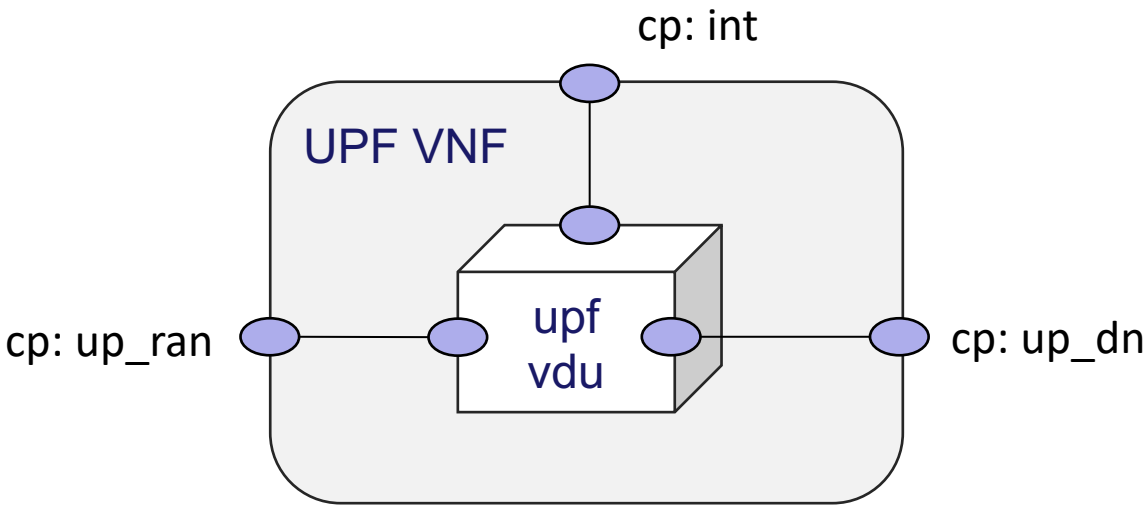
- Open Source NFV Management and Orchestration (MANO) software stack alineado con la arquitectura de ETSI NFV.
  - Implementación apoyada por ETSI
- Multi VIM: OpenVIM, OpenStack, OpenNebula, Vmware vCloud, AWS
- VIM para emulación (Vim-emu):
  - emula la API de OpenStack
  - VNFs como Contenedores Dockers
  - Topologías de red emuladas



Escenario ejemplo 5G (simplificado)



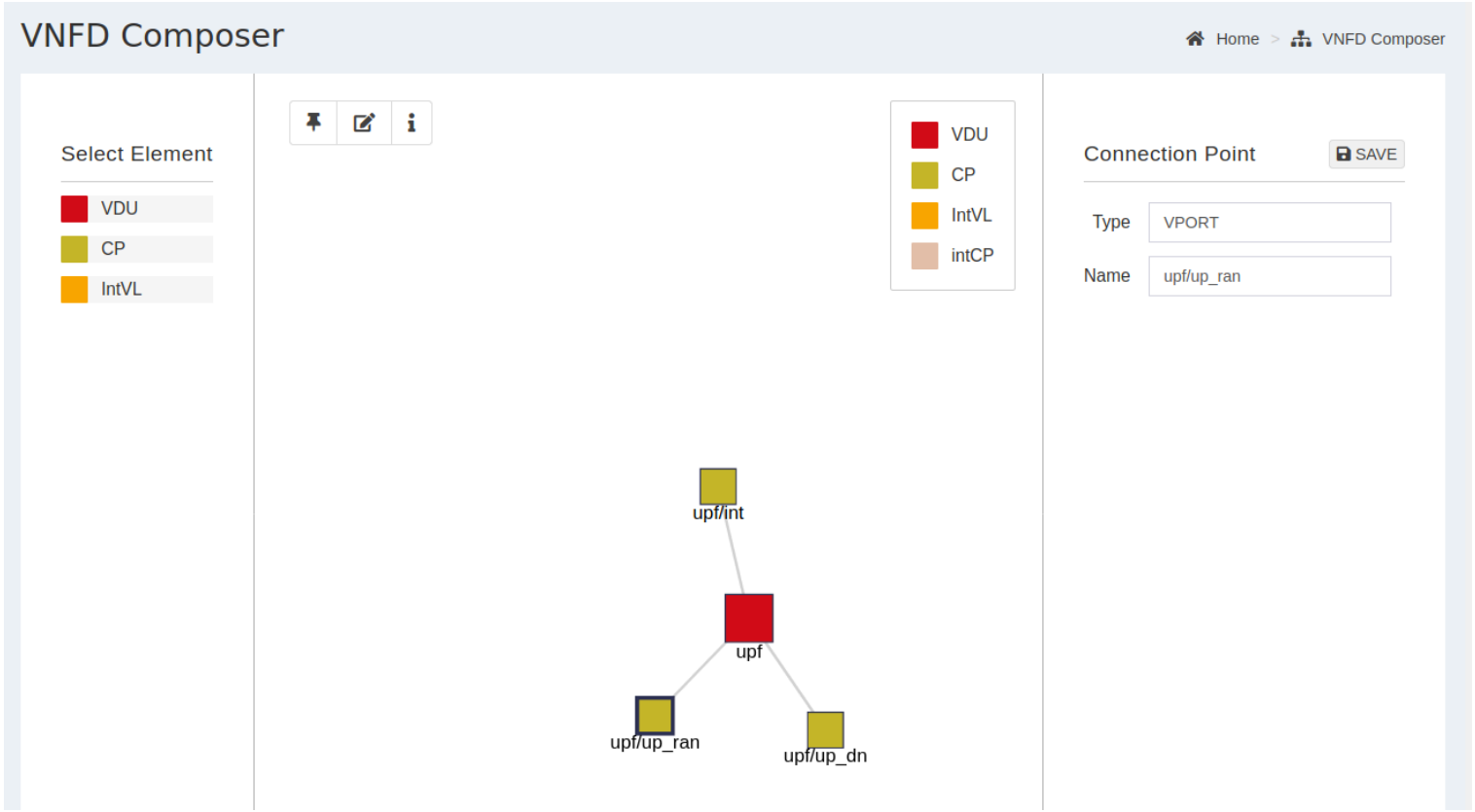
UPF VNF



UPF VNF: descriptor en YAML

```
vnfd-catalog:
    vnfd:
    -   connection-point:
        -   name: upf/int
            type: VPORT
        -   name: upf/up_ran
            type: VPORT
        -   name: upf/up_dn
            type: VPORT
        description: Placeholder UPF based on ubuntu:tru
        id: upf
        mgmt-interface:
            cp: upf/int
        name: upf
        short-name: upf
        vdu:
        -   id: upf
            image: ubuntu:trusty
            interface:
            -   external-connection-point-ref: upf/int
                name: int
                type: EXTERNAL
                virtual-interface:
                    type: VIRTIO
            -   external-connection-point-ref: upf/up_ran
                name: up_ran
                type: EXTERNAL
                virtual-interface:
                    type: VIRTIO
            -   external-connection-point-ref: upf/up_dn
                name: up_dn
                type: EXTERNAL
                virtual-interface:
                    type: VIRTIO
            name: upf
            vm-flavor:
                memory-mb: 512
                storage-gb: 10
                vcpu-count: 1
    vendor: Luis_Bellido_UPM
    version: 0.1
```

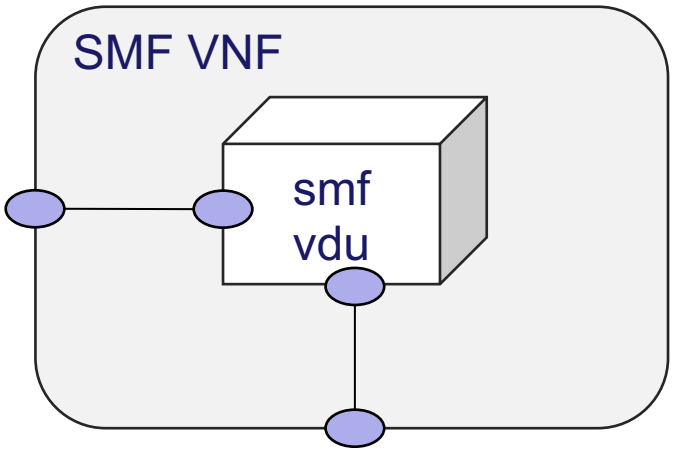
UPF VNF: representación gráfica

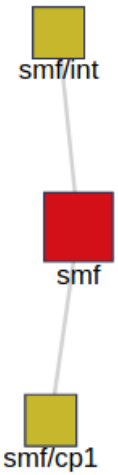


VDU = Virtual Deployment Unit
CP = Connection Point
IntVL = Internal Virtual Link
IntCP = Internal Connection Point

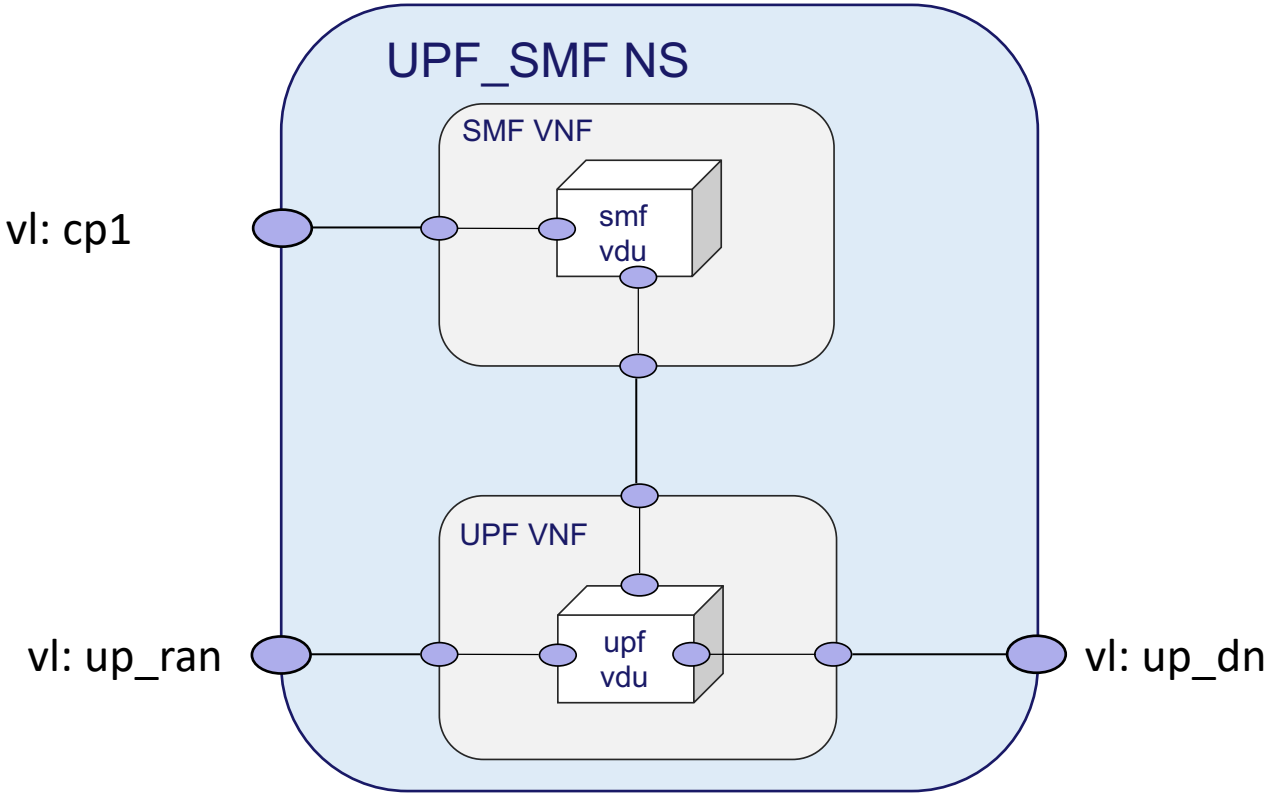
SMF VNF

cp: cp1
(control plane)





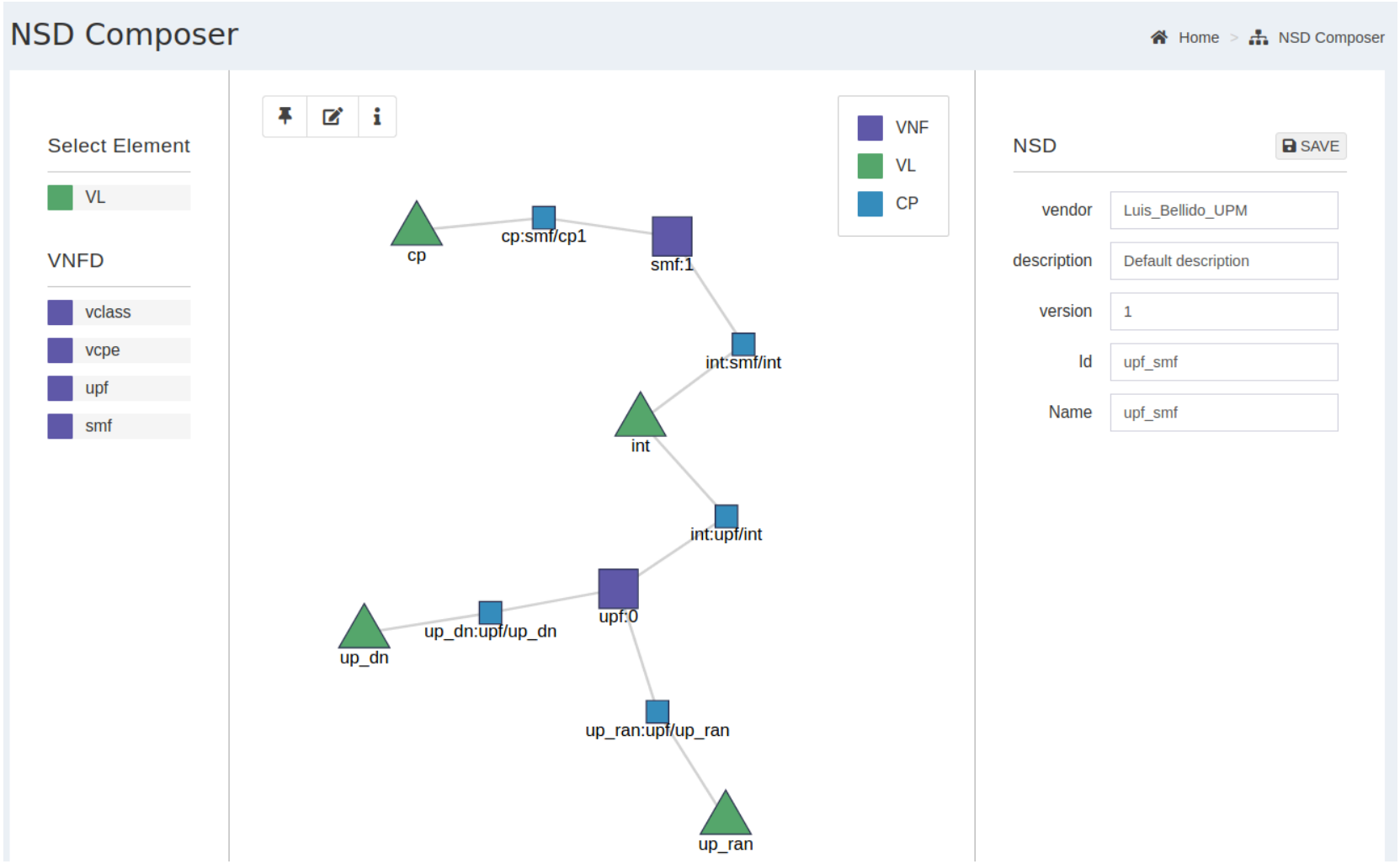
UPF_SMF Network service



UPF_SMF: descripción en YAML

```yaml
nsd-catalog:
    nsd:
    -   connection-point:
        -   name: upf_smf_up_ran
            vld-id-ref: up_ran
        -   name: upf_smf_up_dn
            vld-id-ref: up_dn
        -   name: upf_smf_cp
            vld-id-ref: cp
        -   name: upf_smf_int
            vld-id-ref: int
        constituent-vnfd:
        -   member-vnf-index: 0
            vnfd-id-ref: upf
        -   member-vnf-index: 1
            vnfd-id-ref: smf
        description: Default description
        id: upf_smf
        name: upf_smf
        vendor: Luis_Bellido_UPM
        version: 1
    vld:
    -   id: up_ran
        name: up_ran
        type: ELAN
        vim-network-name: default
        vnfd-connection-point-ref:
        -   member-vnf-index-ref: 0
            vnfd-connection-point-ref: upf/up_ran
            vnfd-id-ref: upf
    -   id: up_dn
        name: up_dn
        type: ELAN
        vim-network-name: default
        vnfd-connection-point-ref:
        -   member-vnf-index-ref: 0
            vnfd-connection-point-ref: upf/up_dn
            vnfd-id-ref: upf
    -   id: cp
        name: cp
        type: ELAN
        vim-network-name: default
        vnfd-connection-point-ref:
        -   member-vnf-index-ref: 1
            vnfd-connection-point-ref: smf/cp1
            vnfd-id-ref: smf
    -   id: int
        name: int
        vim-network-name: default
        vnfd-connection-point-ref:
        -   member-vnf-index-ref: 0
            vnfd-connection-point-ref: upf/int
            vnfd-id-ref: upf
        -   member-vnf-index-ref: 1
            vnfd-connection-point-ref: smf/int
            vnfd-id-ref: smf
```

UPF_SMF: representación grafica



Comandos

- On-boarding

  osm vnfd-create upf-vnfd.tar.gz
  osm vnfd-create smf-vnfd.tar.gz
  osm nsd-create upf-smf-nsd.tar.gz

- Lista de descriptores NS y VNF

```
> osm vnfd-list
+------------+--------------------------------------+
| nfpkg name | id                                   |
+------------+--------------------------------------+
| upf        | eb60a1fc-195b-466e-9800-a2a370552f0b |
| smf        | 35db9d50-304c-44d7-92f9-2538874a07aa |
+------------+--------------------------------------+
> osm nsd-list
+----------+--------------------------------------+
| nsd name | id                                   |
+----------+--------------------------------------+
| upf_smf  | 0e1b3fdd-0922-4cd5-b5a6-d15b249848b5 |
+----------+--------------------------------------+
```

Comandos (II)

- Arranque de un instancia del servicio de red

  osm ns-create --nsd_name upf_smf --ns_name upf_smf_test --vim_account emu-vim

- NS y VNF activas

```
$ osm ns-list
+------------------+--------------------------------------+---------------------+----------+--------------------+---------------+
| ns instance name | id                                   | date                | ns state | current operation  | error details |
+------------------+--------------------------------------+---------------------+----------+--------------------+---------------+
| upf_smf_test     | abeb3018-31b8-4b46-a6f4-c6f8d72da68c | 2020-11-19T00:13:18 | READY    | IDLE (None)        | N/A           |
+------------------+--------------------------------------+---------------------+----------+--------------------+---------------+

+------------------+--------------------------------------+---------------------+----------+--------------------+-----
$ osm vnf-list
+--------------------------------------+------+--------------------------------------+--------------------+------------+
| vnf id                               | name | ns id                                | vnf member index | vnfd name  |
+--------------------------------------+------+--------------------------------------+--------------------+------------+
| 811b6f49-4f4d-4eb0-910f-0f50762d6541 | -    | abeb3018-31b8-4b46-a6f4-c6f8d72da68c | 0                  | upf        |
| 44988ab7-5b59-497b-81a0-575ac62b18bf | -    | abeb3018-31b8-4b46-a6f4-c6f8d72da68c | 1                  | smf        |
+--------------------------------------+------+--------------------------------------+--------------------+------------+
+--------------------------------------+------------+
| vim account id                       | ip address |
+--------------------------------------+------------+
| 8cd2329a-cbc2-4dfe-bdd7-1f926891cb02 | 172.17.0.6 |
| 8cd2329a-cbc2-4dfe-bdd7-1f926891cb02 | 172.17.0.7 |
+--------------------------------------+------------+
```

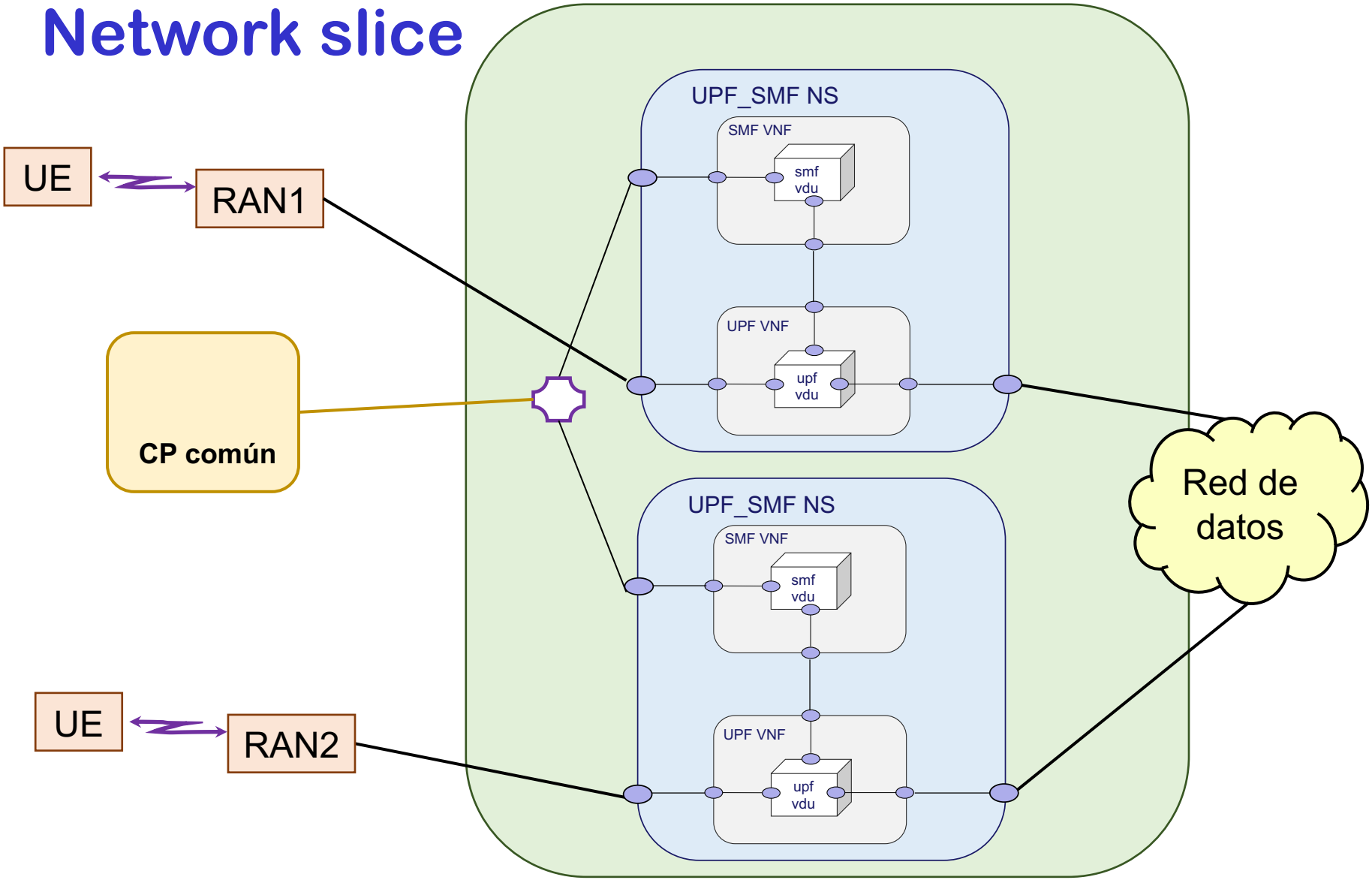
Acceso a contenedores

```
$ sudo docker exec -it mn.dc1_upf_smf_test-0-upf-1 ifconfig -s
Iface   MTU Met   RX-OK RX-ERR RX-DRP RX-OVR    TX-OK TX-ERR TX-DRP TX-OVR Flg
eth0       1500 0          0      0      0 0           0      0      0      0 BMRU
int-0      1500 0          0      0      0 0           0      0      0      0 BMRU
lo        65536 0          0      0      0 0           0      0      0      0 LRU
up-dn-0    1500 0          0      0      0 0           0      0      0      0 BMRU
up-ran-0   1500 0          0      0      0 0           0      0      0      0 BMRU
```

```
$ sudo docker exec -it mn.dc1_upf_smf_test-1-smf-1 ifconfig -s
Iface   MTU Met   RX-OK RX-ERR RX-DRP RX-OVR    TX-OK TX-ERR TX-DRP TX-OVR Flg
cp1-0      1500 0          0      0      0 0           0      0      0      0 BMRU
eth0       1500 0          0      0      0 0           0      0      0      0 BMRU
int-1      1500 0          0      0      0 0           0      0      0      0 BMRU
lo        65536 0          0      0      0 0           0      0      0      0 LRU
```

eth0: conexión a docker0 (Internet)
lo: interfaz de lookpback

Network slice



Network slice: plantilla

```yaml
nst:
-   SNSSAI-identifier:
        slice-service-type: URLLC
    id: slice_upf_smf
    name: slice_upf_smf
    netslice-subnet:
    -   description: NetSlice Subnet (service) composed by UPF, SMF and 3 cp
        id: upf_smf_1
        is-shared-nss: 'false'
        nsd-ref: upf_smf
    -   description: NetSlice Subnet (service) composed by UPF, SMF and 3 cp
        id: upf_smf_2
        is-shared-nss: 'false'
        nsd-ref: upf_smf
    netslice-vld:
    -   id: sl_ran1
        mgmt-network: 'false'
        name: sl_ran1
        nss-connection-point-ref:
        -   nsd-connection-point-ref: up_ran
            nss-ref: upf_smf_1
        type: ELAN
    -   id: sl_ran2
        mgmt-network: 'false'
        name: sl_ran2
        nss-connection-point-ref:
        -   nsd-connection-point-ref: up_ran
            nss-ref: upf_smf_2
        type: ELAN
    -   id: sl_dn
        mgmt-network: 'false'
        name: sl_dn
        nss-connection-point-ref:
        -   nsd-connection-point-ref: up_dn
            nss-ref: upf_smf_1
        -   nsd-connection-point-ref: up_dn
            nss-ref: upf_smf_2
        type: ELAN
    -   id: sl_cp
        mgmt-network: 'true'
        name: sl_cp
        nss-connection-point-ref:
        -   nsd-connection-point-ref: cp
            nss-ref: upf_smf_1
        -   nsd-connection-point-ref: cp
            nss-ref: upf_smf_2
        type: ELAN
    quality-of-service:
        id: 2
```

Comandos (III)

- Arranque de una network slice

  osm nsi-create --nsi_name 5g-slice-test --nst_name slice_upf_smf --vim_account emu-vim

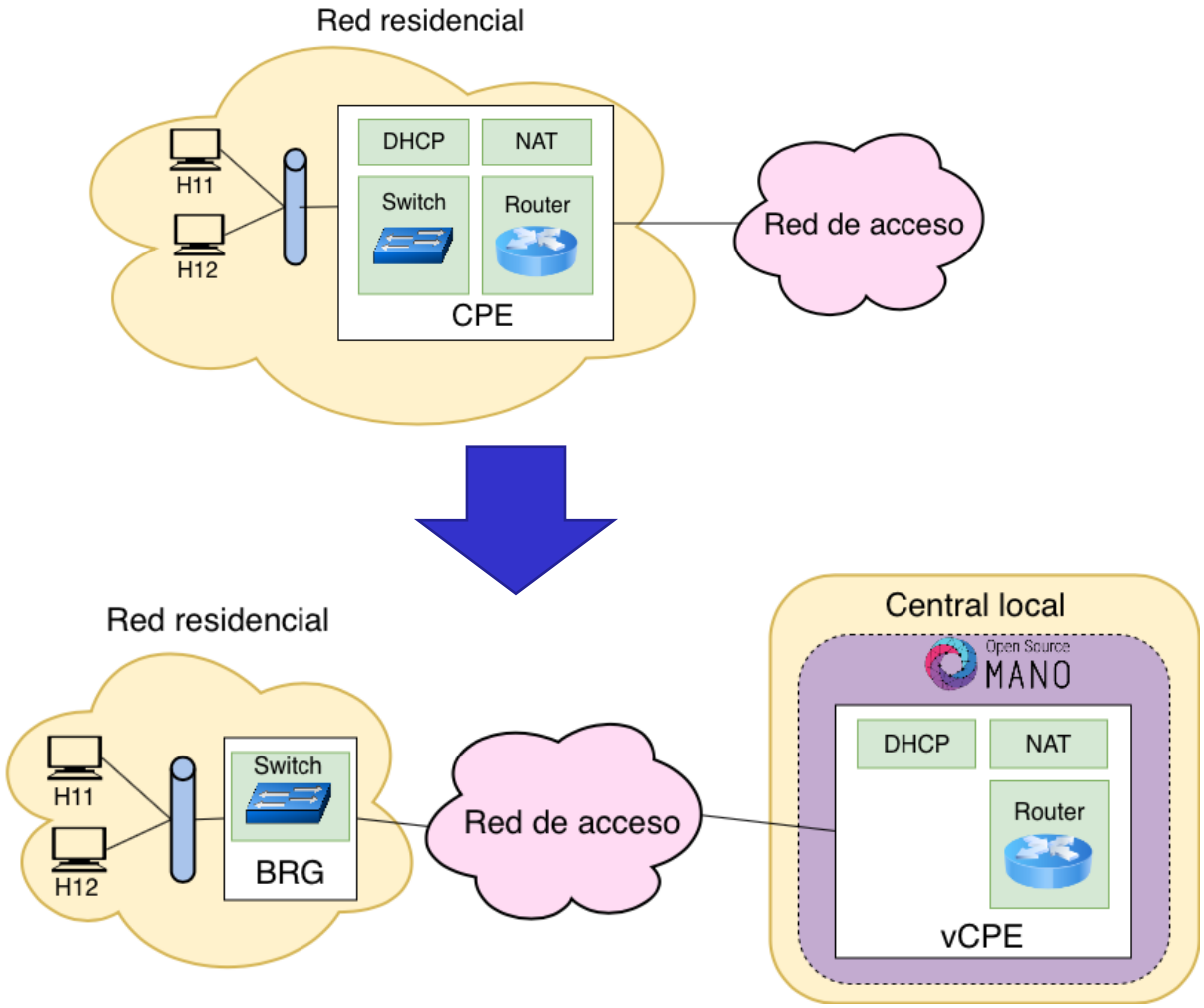
- Network slices activas

```
$ osm nsi-list
+------------------------+--------------------------------------+--------------------+---------------+-----------------+
| netslice instance name | id                                   | operational status | config status | detailed status |
+------------------------+--------------------------------------+--------------------+---------------+-----------------+
| 5g-slice-test          | f45fe616-46fa-4e04-b38e-46a3e833cda0 | running            | configured    | done            |
+------------------------+--------------------------------------+--------------------+---------------+-----------------+
```

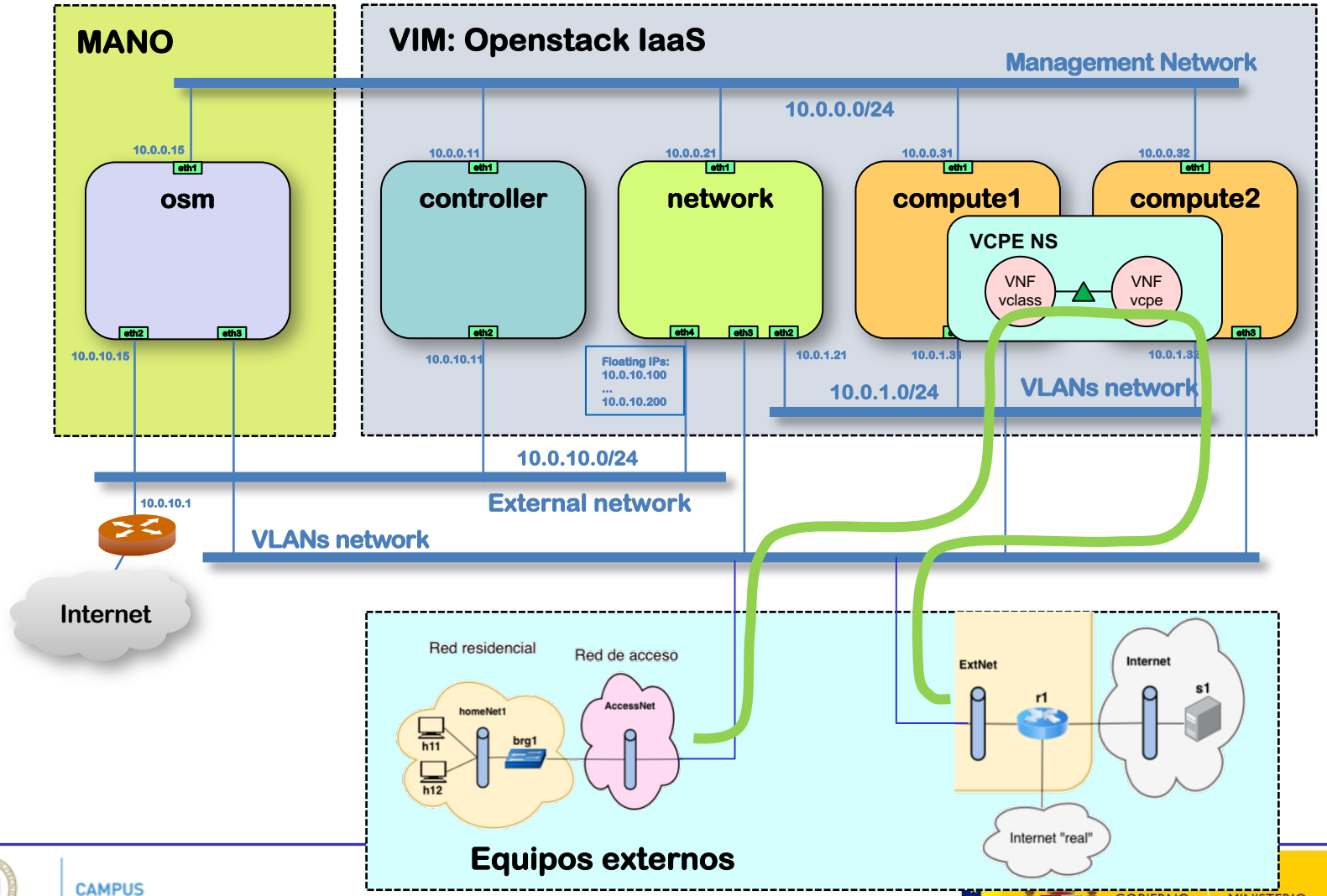
Contenido

- VFN, NS y Network slice en OSM
  - Ejemplo 5G
- NFV para virtualización de acceso a Internet

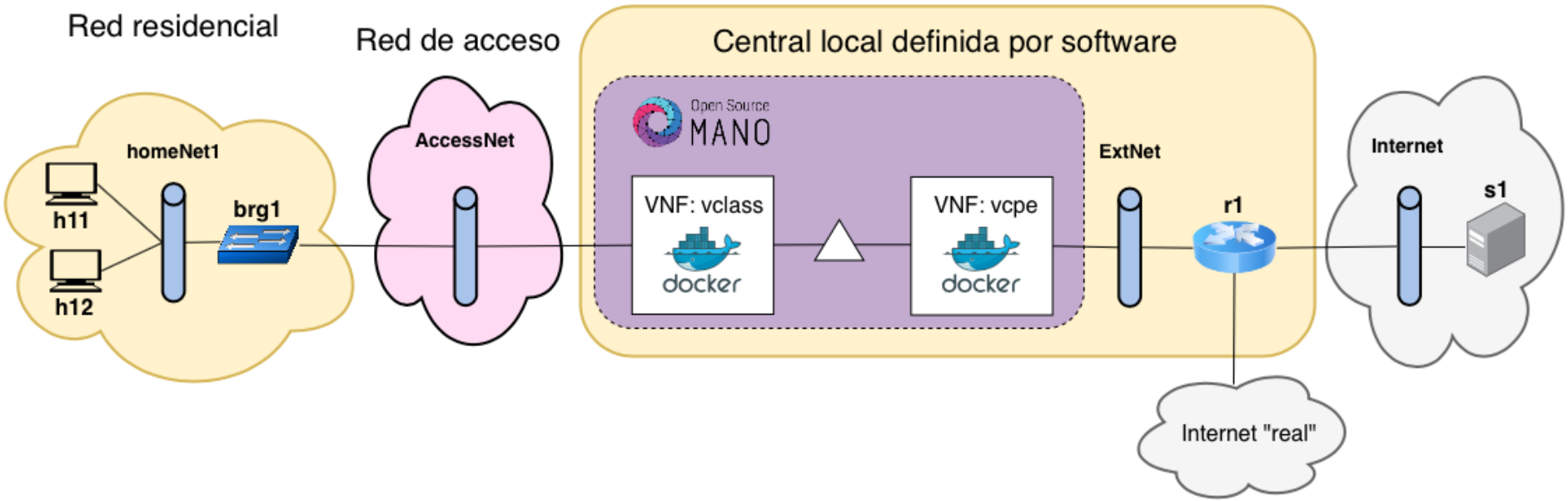
Virtualización del acceso a Internet



Escenario virtual OSM-Openstack



Escenario virtual OSM-vimemu



Detalles del escenario