fog05

ECLIPSE FOUNDATION

EDGE NATIVE

ADLINK®

Leading EDGE COMPUTING

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ETSI NFV/MEC Integration

Fog Infrastructure Manager

Virtualises the **hardware** infrastructure, such as **computational**, **communication**, **storage** and **I/O resources**, and abstract the key **primitives** provided by system software, such as the **OS**

Provides **primitives** for **managing** these virtualised **infrastructure**

Provides **infrastructure** level **monitoring** information.

Fog Deployment Unit

A Fog Deployment Unit (FDU) is **an indivisible unit of deployment**, such as, a binary executable, a uni-kernel, a container or a virtual machine.

An FDU **requires** a certain kinds of **resources** as a precondition to its execution. The life-cycle of an FDU is defined by a Finite State Machine (FSM).

FDU maps to **VDU** in **ETSI NFV**

FDU descriptors

FDU descriptor is based on **YANG** models.

FDU descriptor is a super-set of the ETSI MEC and ETSI NFV.

```
"id": "lxd_example_fdu",
"name": "test_1",
"computation_requirements": {
    "cpu_arch": "x86_64",
    "cpu_min_freq": 0,
    "cpu_min_count": 1,
    "ram_size_mb":
    "storage_size_g
},
"image": {
    "uri": "lxd://a
    "checksum": "",
    "format": ""
},
"storage": [],
"hypervisor": "LXD"
"migration_kind": "
"interfaces": [
```

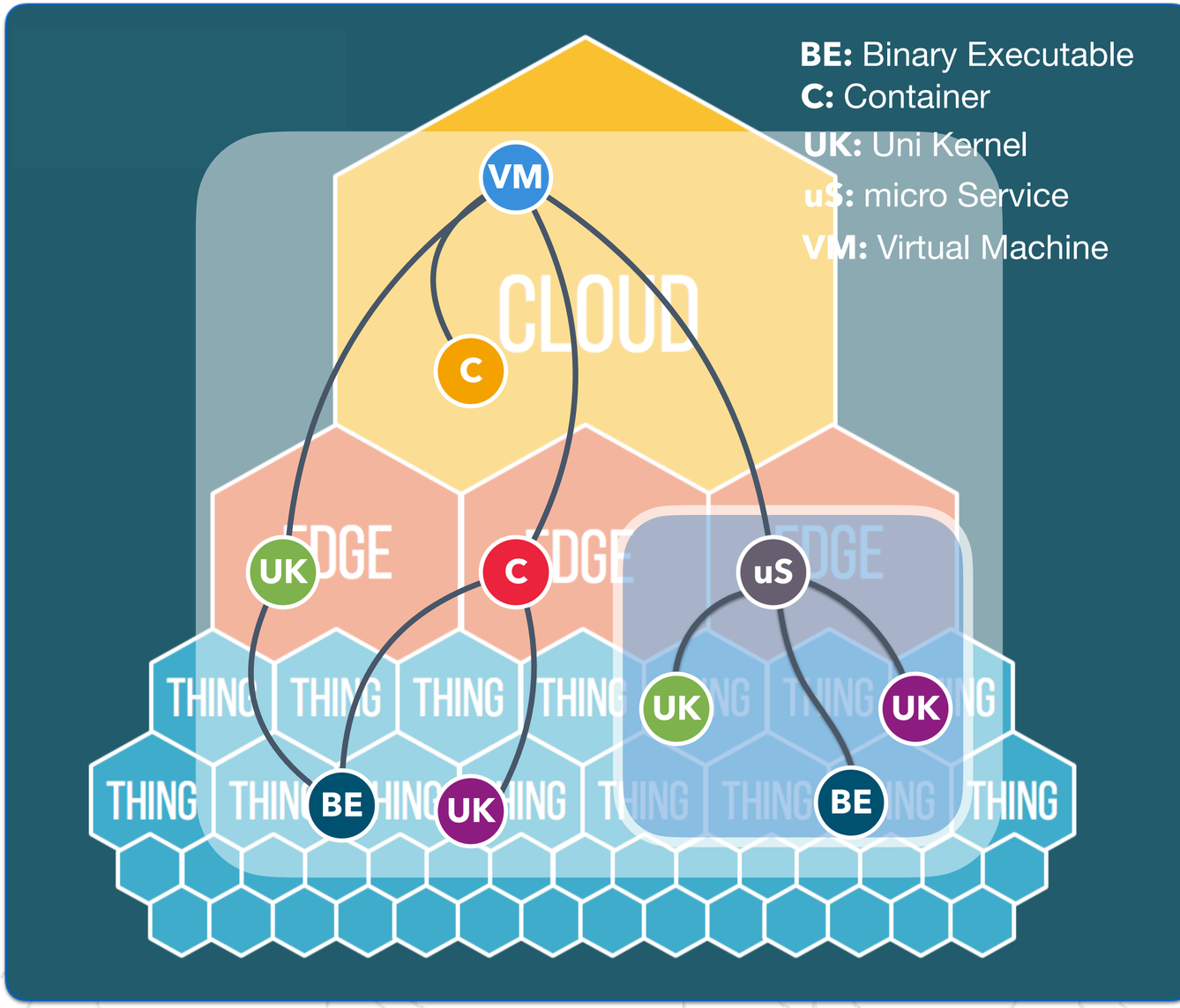
```
vnfd:vnfd-catalog:
    vnfd:
    - id: hackfest_basic-vnf
      name: hackfest_basic-vnf
      short-name: hackfest_basic-vnf
      version: '1.0'
      description: A basic VNF descriptor w/ one VDU
      logo: osm.png
      connection-point:
      - name: vnf-cp0

      vdu:
      - id: hackfest_basic-VM
        vm-flavor:
          vcpu-count: '1'
          memory-mb: '1024'
          storage-gb: '10'
        name: hackfest_basic-VM
        image: ubuntu1604
```

Describing your application

A **fogØ5 application** is represented by a graph where the nodes are **Fog Deployment Units (FDUs)** and the edges are **dependencies**

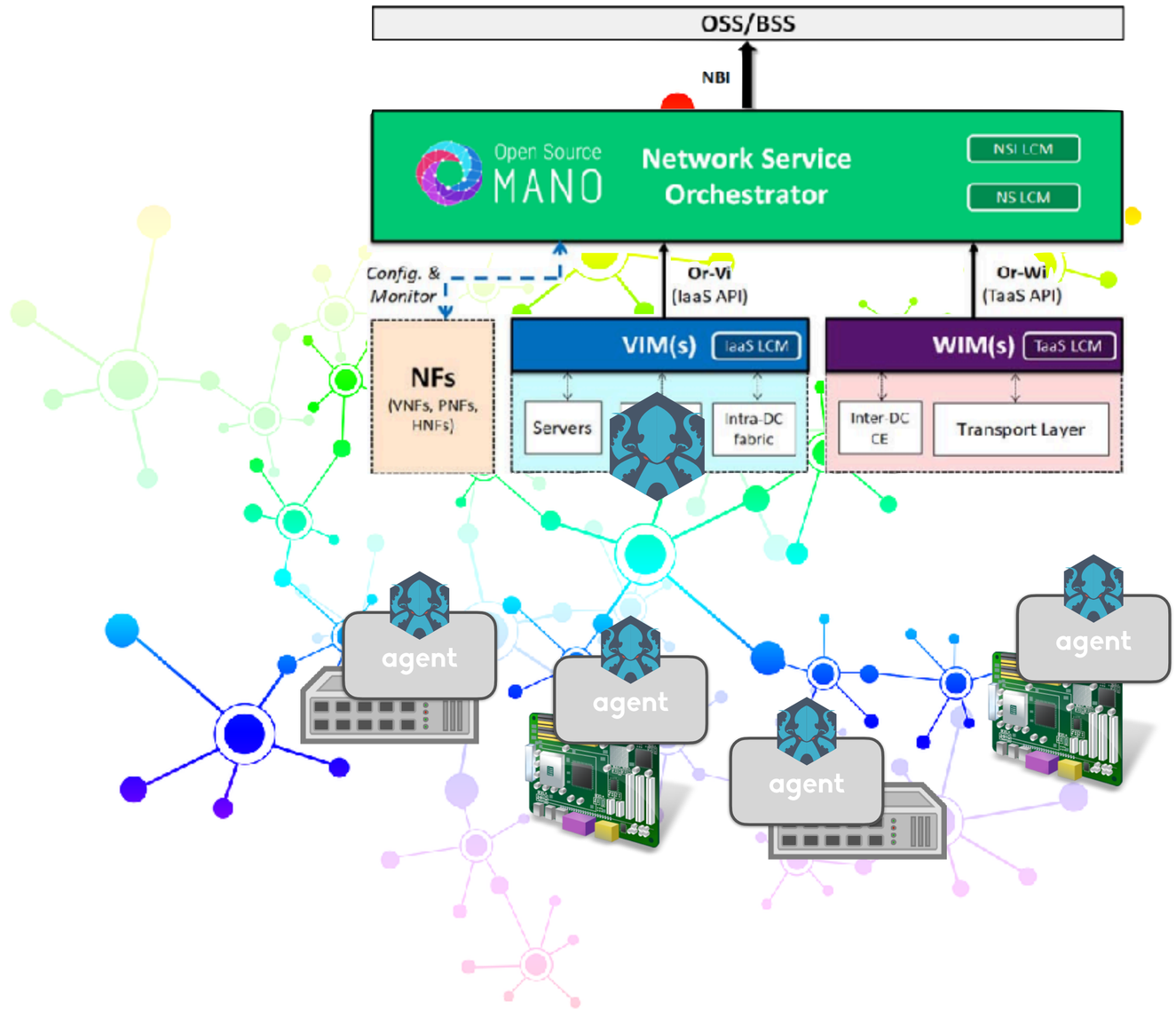
A **fogØ5 application** maps to **NS** in **ETSI NFV**



ETSI OSM interoperability

fogØ5 VIM connector allows **ETSI OSM** to deploy VNFs closer to the users.

VIM connector **abstracts** the **heterogeneity** and exposes a **unified** infrastructure to **OSM**

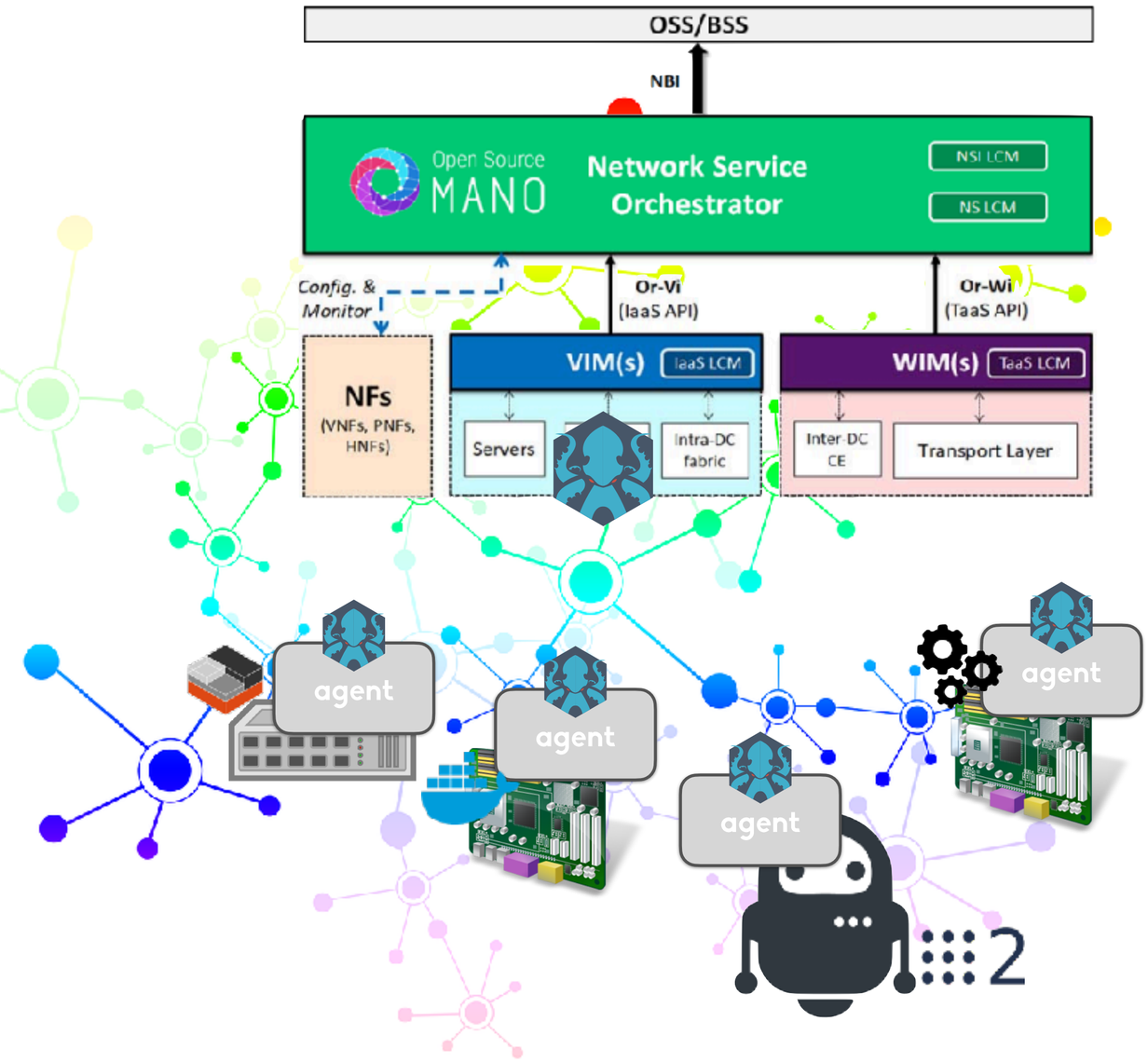


Heterogeneous VNFs

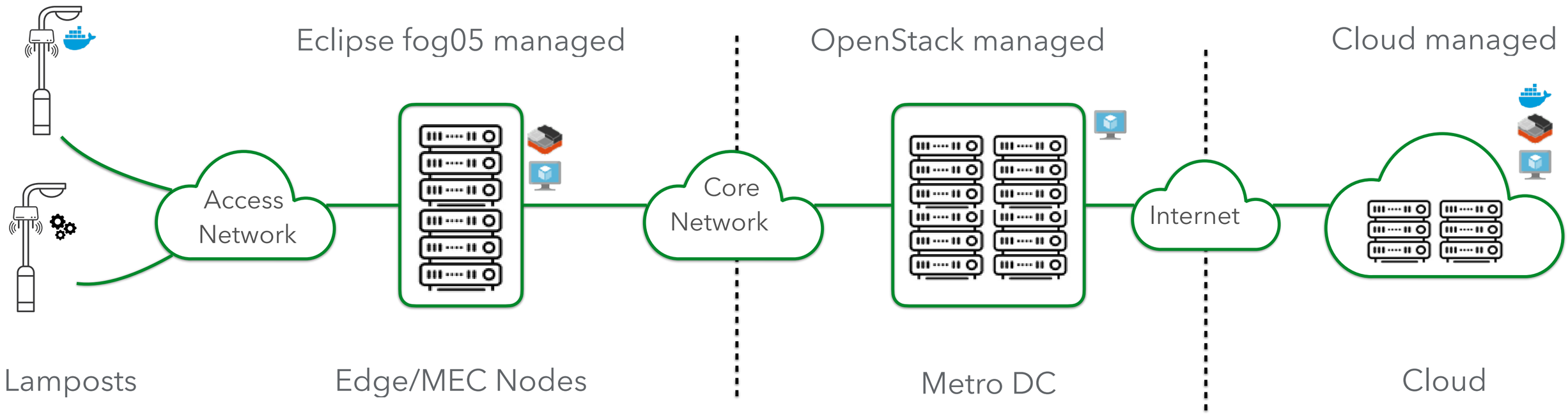
fogØ5 VIM connector enables heterogeneity in VNFs

Through the same connector OSM can leverage all the technologies supported by **fogØ5**

- VMs
- OCI containers
- Native Applications
- ROS2 Applications



Heterogenous End-to-End network service



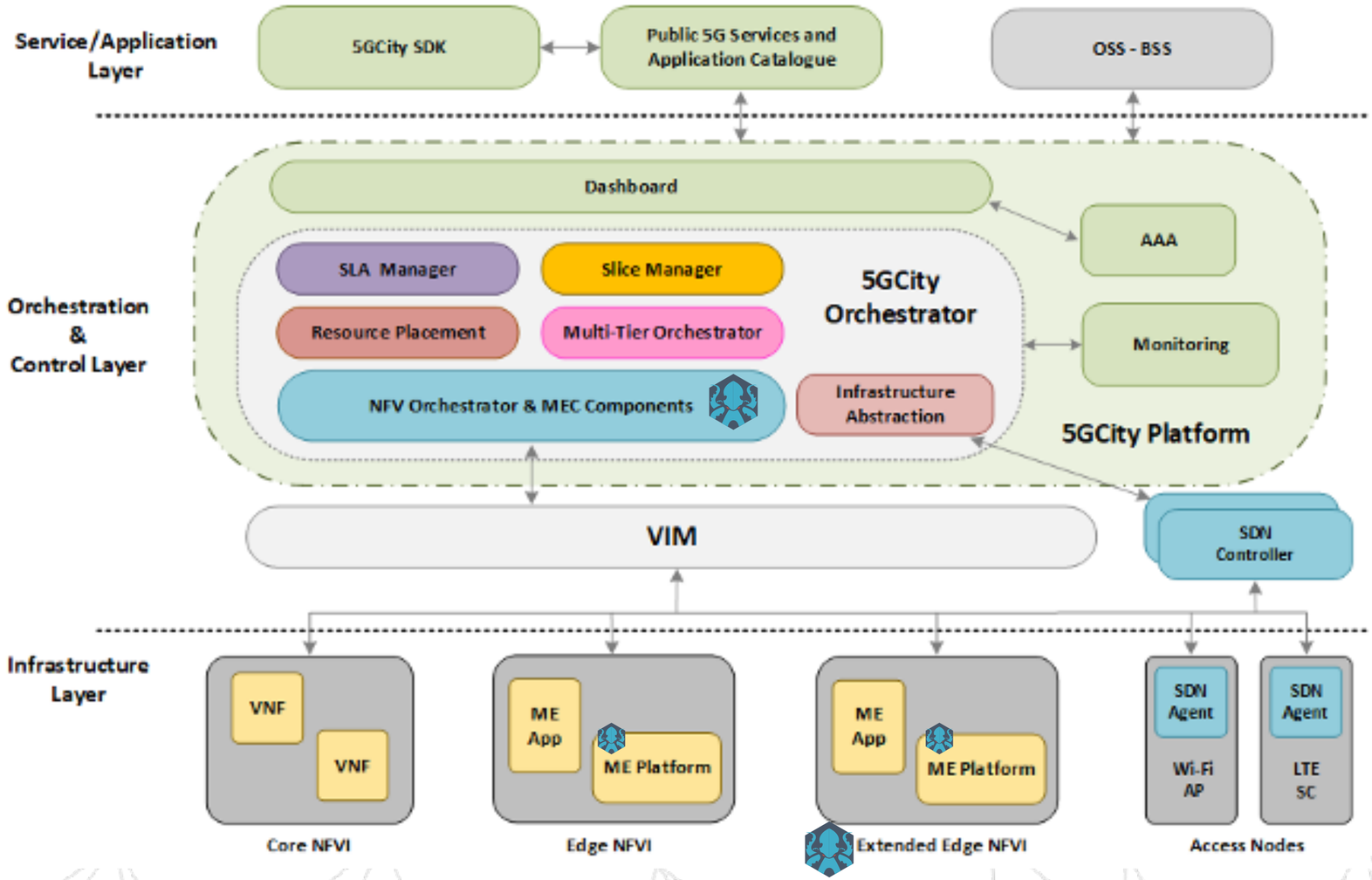
Use of the most suitable technology for each segment of the Network Service

- Container/Binaries at “far-edge”
- Container/VMs at Edge
- VMs at metro DC
- Whatever in the cloud

UC: Neutral Hosting

5GCity Neutral Hosting Platform

- 5GCity Dashboard
- 5GCity AAA Module
- 5GCity Monitoring Engine
- 5GCity Orchestrator
- Slice Manager
- Multi-Tier Orchestrator
- SLA Manager
- Resource Placement
- NFV Orchestrator (OSM rel 6)
- MEC Orchestrator (MEAO) & MEC Platform (Eclipse Fog05)
- Infrastructure Abstraction
- 5GCity Service Platform
- SDK
- 5G Catalogue

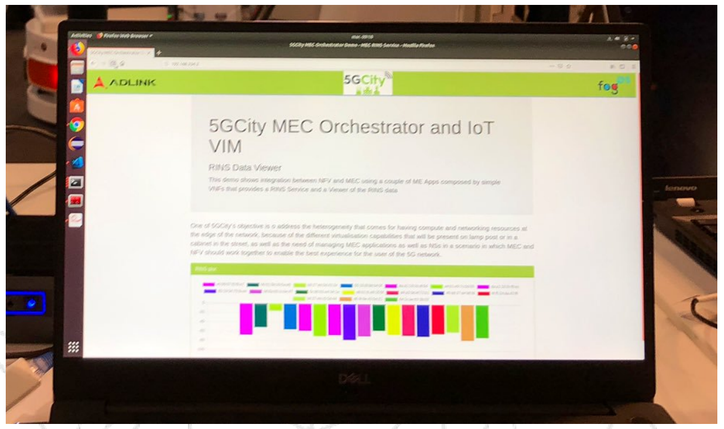


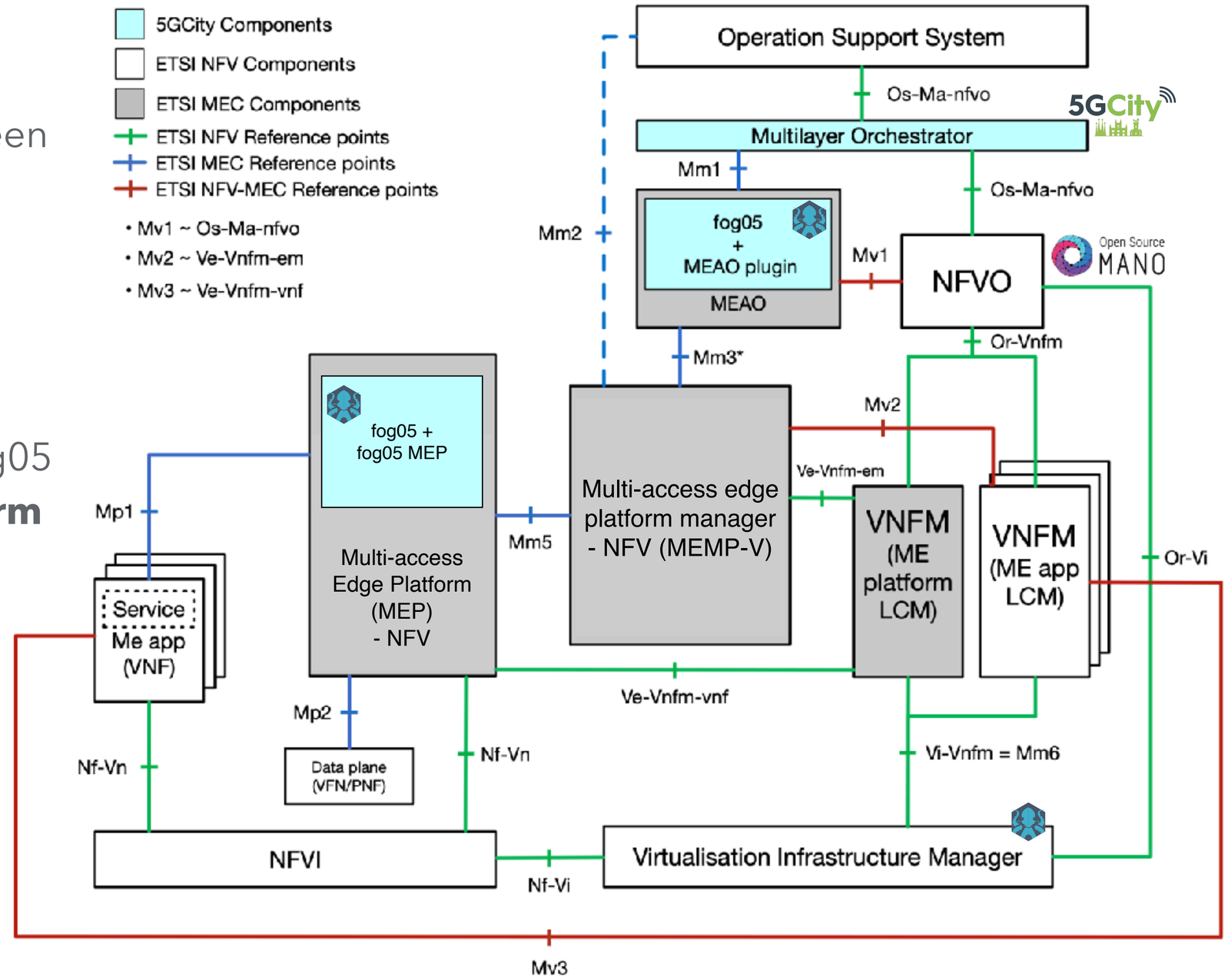
UC: MEC in NFV

Eclipse fog05 used as glue between ETSI **MEC** and ETSI **NFV**

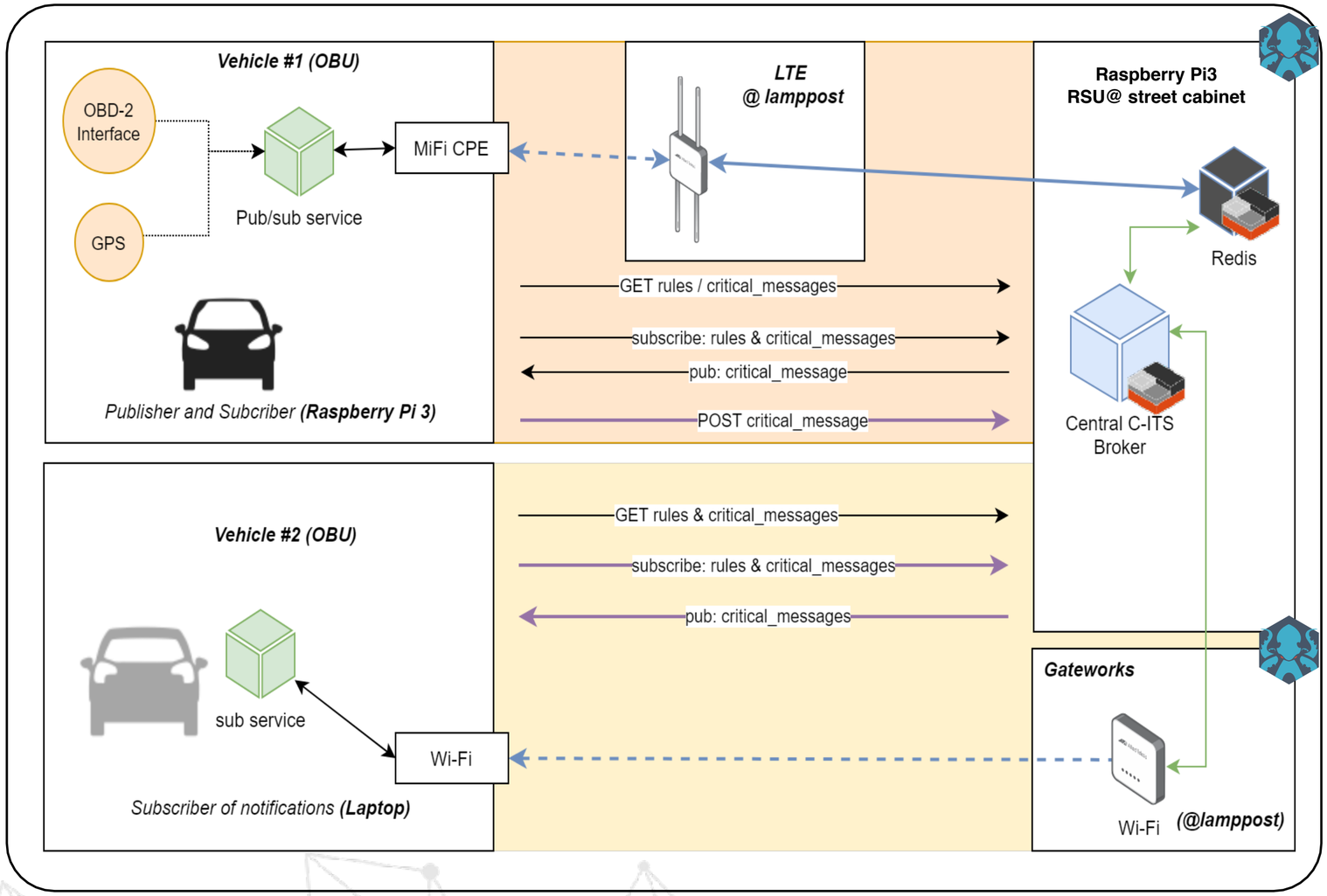
MEC Platform instantiated as LXD container via fog05

ME Apps VNFs instantiated via fog05 and connected to the **MEC Platform**





UC: Cooperative, Connected and Automated Mobility



KPI	Target Value	Obtained Value
Service Instantiation Time	<= 120 s	**73.31 s**
messages/s	10 messages/s per vehicle	**26.41** messages/s (for two vehicles)
Service Latency	<= 30 ms	OK for **42.6%** of all exchanged messages * (I2V over Wi-Fi)
V2I2V_delta	<= 60 ms	OK for **25.86%** of all exchanged messages *
ack_waiting	<= 1% of all received messages	**12.31%** **

*due to acknowledgement overhead introduced in the application logic

**ACKs to be received once the trial stopped were not measured

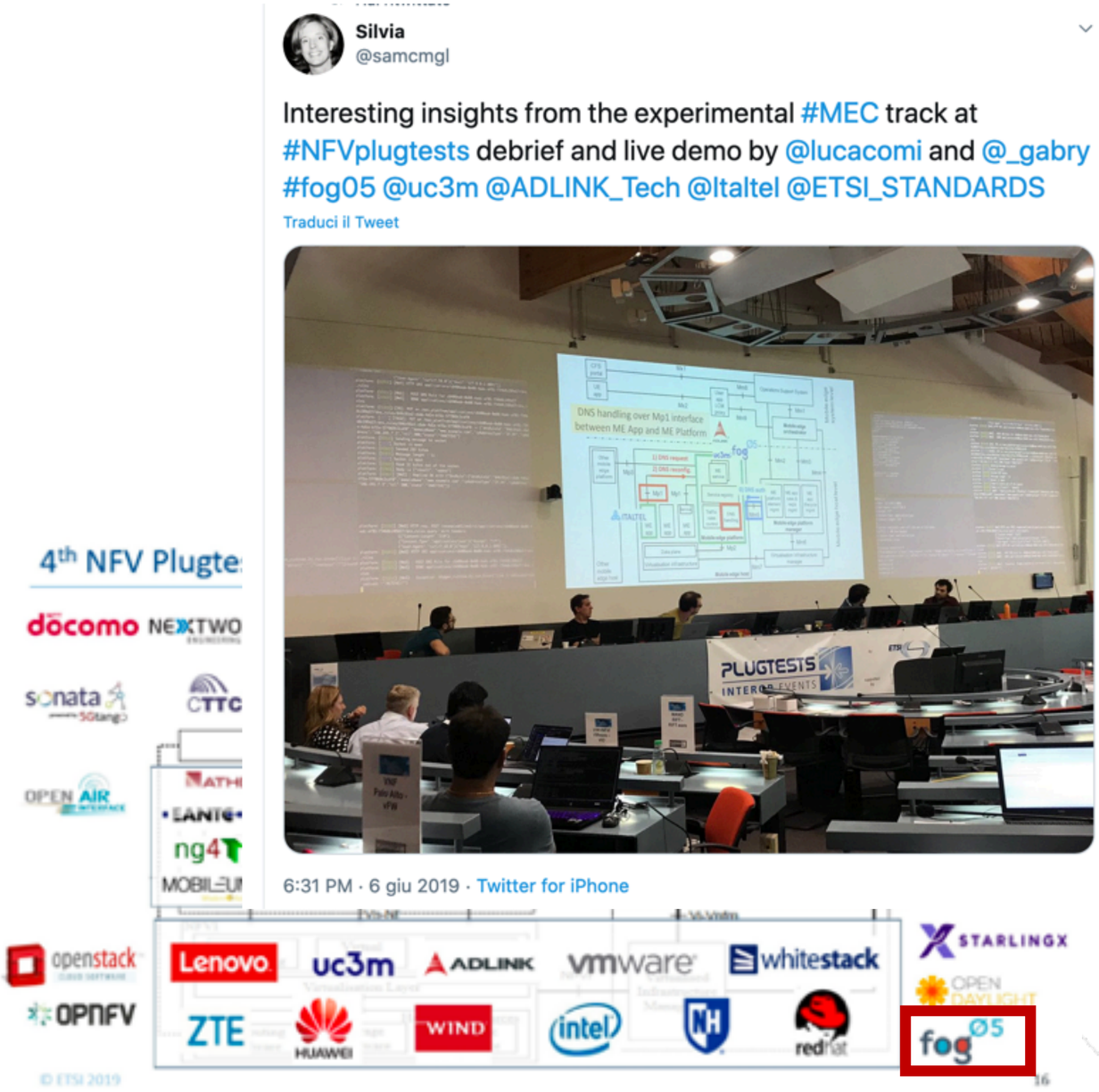
Instantiation of **LXD** containers on lamppost through **ETSI OSM** orchestration.

Image size ~600MB

ETSI NVF and MEC interoperability

Supporting **ETSI** Network Function Virtualisation (**NFV**) interoperability via integration with ETSI Open Source MANO (**OSM**)

Providing a **ETSI** Multi-access Edge Computing (**MEC**) compatible **MEC Platform** for edge application and services



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Questions?

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