



A DISTRIBUTED
CLOUD &
RADIO
PLATFORM FOR
5G NEUTRAL
HOSTS

Mobile/Multi-Access Edge Computing – Empowering Cities Infrastructure

*2nd Multi-provider, multi-vendor, multi-player
orchestration: from distributed cloud to edge and
fog environments in 5G (@EuCNC 2018)*

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5GCity's VISION



Design, develop, deploy and demonstrate, in operational conditions, a distributed cloud & radio platform for municipalities and infrastructure owners acting as 5G neutral hosts (BCN, Bristol & Lucca)

Objectives:

- ✓ Build & deploy a common, multi-tenant, open platform that extends the (centralized) cloud model to the extreme edge of the network
- ✓ Distributed, 3-tier architecture with network sharing, slicing & MEC capabilities.
- ✓ MEC node virtualization platform and guest optimizations
- ✓ Network virtualization @ edge
- ✓ Scalable edge management & orchestration and service programming models
- ✓ City-wide pilots' deployment and validation & commercial outreach and standardization

5GCity MEC deployments in NFV



5GCity considers NFV based network services (composed of VNFs and applications) as well as MEC applications.

NFV and MEC have similarities and a common heritage, but clearly show some differences.

- Application Type
 - NFV addresses a wide variety of existing network functions and applications whereas MEC is designed to support service associated with radio access.
- Application Scope
 - NFV addresses a broader set of arbitrary network applications whereas MEC is designed for high-level mobility applications.
- Application Location
 - NFV is targeted at deployments through out network whereas MEC is designed to implemented in the access part.

A specific ETSI MEC working group has been created to design a solution which maps ETSI MEC to an ETSI NFV architecture.

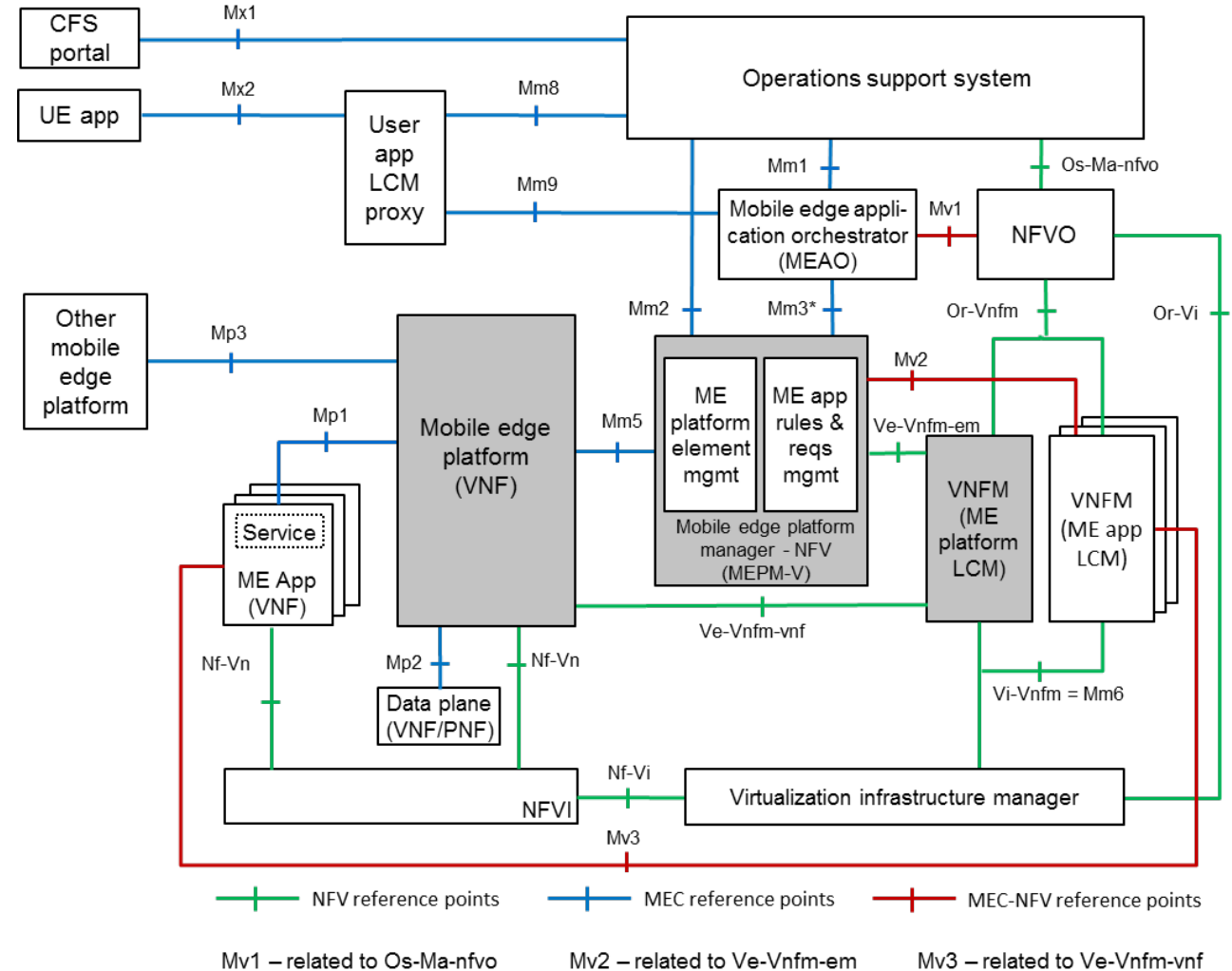
ETSI, “ETSI GR MEC 017 V1.1.1,” February 2018. [Online]. Available:
http://www.etsi.org/deliver/etsi_gr/MEC/001_099/017/01.01.01_60/gr_MEC017v010101p.pdf.

Mapping b/w ETSI MEC and ETSI NFV architectures

It encompasses all the reference points described in

- ETSI NFV (green lines) and
- ETSI MEC (blue line),
- while further suggesting a new category of cross-area reference point (red lines)

This mapping raises a number of issues which are reported in the document with potential solutions and proposals.

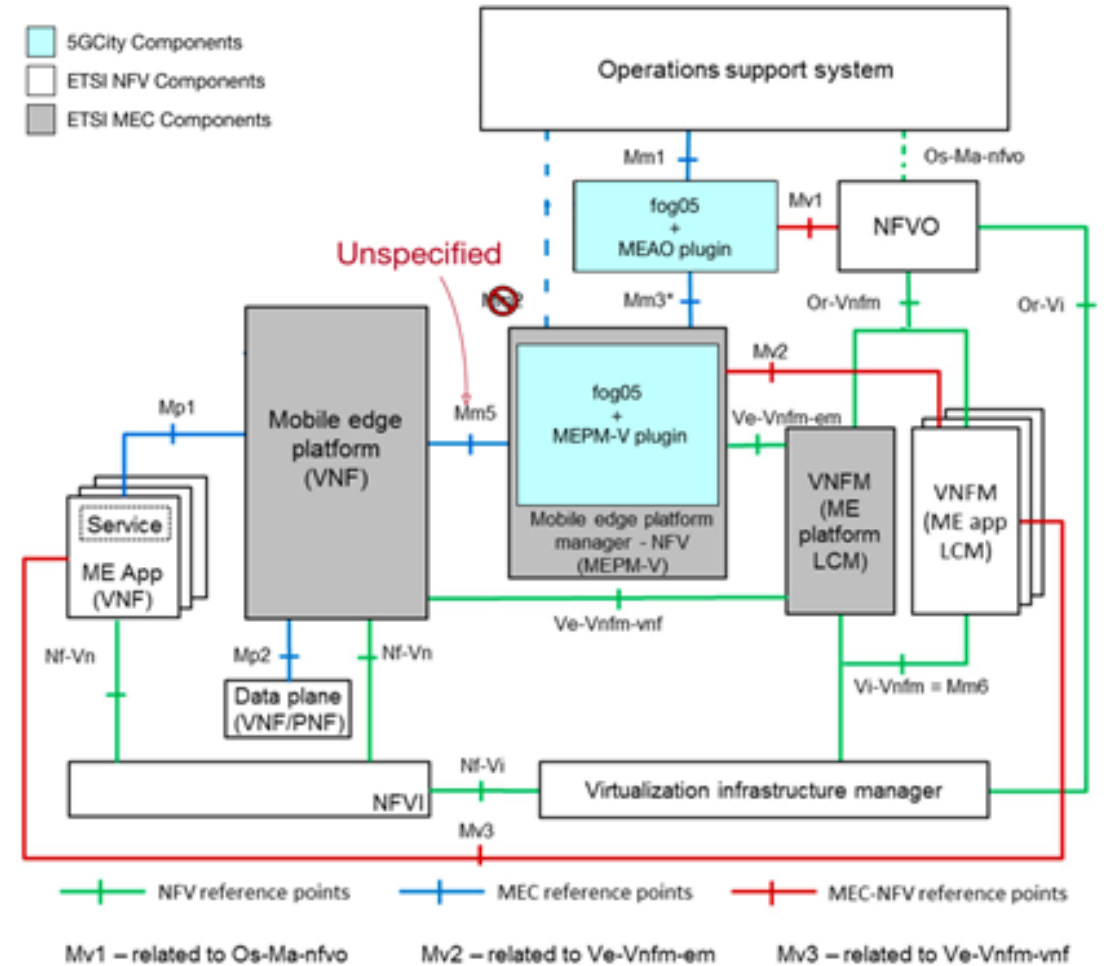


5GCity Approach: MEC NFV Mapping

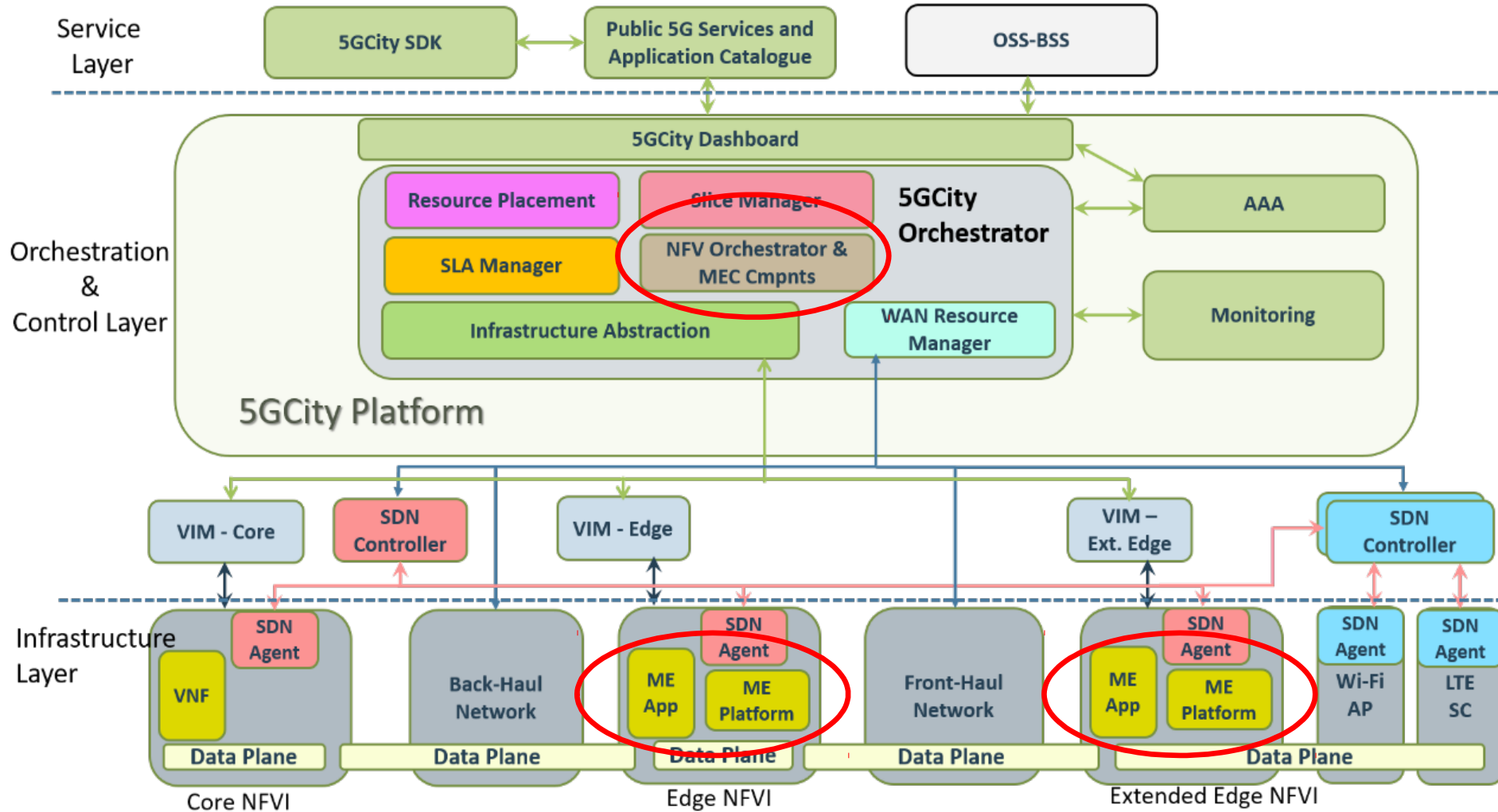
ETSI NFV and MEC share the same principles and can be combined in a single infrastructure.

Some components of the 5GCity architecture need to be adapted and/or extended to support both ETSI NFV specific components (e.g., the NFVO) and MEC descriptors and deltas.

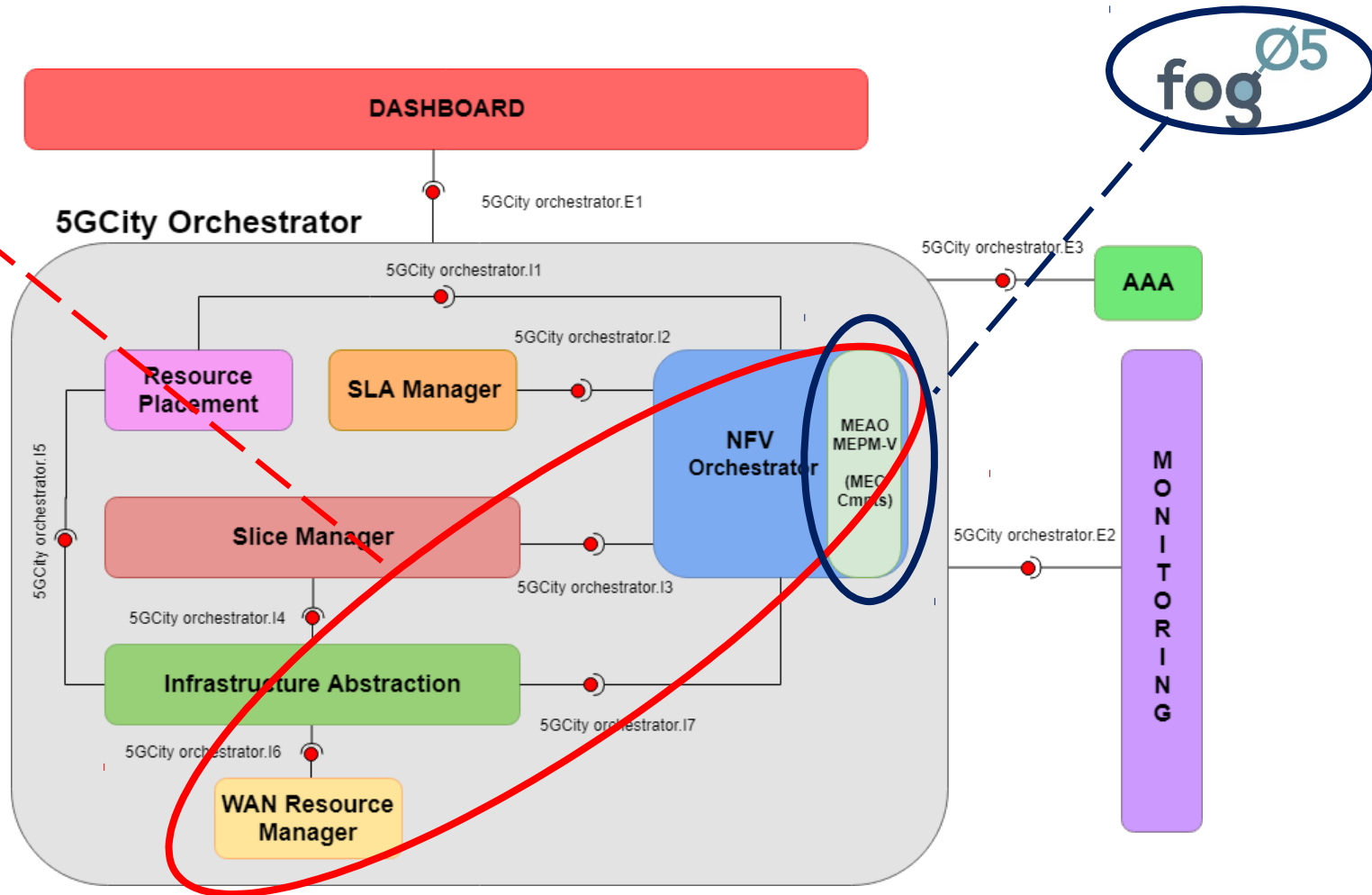
5GCity will leverage on OSM and fog05 for its integration of ETSI MEC and NFV.



5GCity Architecture



5GCity Platform



NFV MEC Mapping Issues- 1



| Issue | Description | 5GCity Solution | Comment |
|---------|--|---|---|
| ISSUE#1 | Mapping between ME app VNFs and NS | The MEAO will have a map between ME app VNFs inside NSs | The map comes when the MEAO takes the descriptors form NFVO |
| ISSUE#2 | NSD should express eventual dependency to other NSs. | 5GCity information model will address this issue. | Extending NSD with MEC relevant fields. |
| ISSUE#3 | Communication between MEAO and NFVO. | Communication goes through Mv1 ~ Os-Ma-nfvo, OSM REST API | |
| ISSUE#4 | Communication between MEMP-V and VNFM. | Communication goes through Mv2 ~ Ve-Vnfm-em. MEMP-V act as Element Manager for the Mobile Edge Platform need to keep track of LCM operation initiated by the NFVO, it also needs to access to PM counters for the virtualized resources in which ME apps VNFs related to the ME platform that is managed by the MEMP-V. PM information uses OSM MON tool. | Ve-Vnfm-em is not exposed in OSM, we have to implement this interface for the MEMP-V. |

NFV MEC Mapping Issues- 2



| Issue | Description | 5GCity Solution | Comment |
|---------|---|---|--|
| ISSUE#5 | Communication between VNFM and ME App VNFs. | As Mv3 ~ Ve-vnfm-vnf no changes are needed. | MEC doesn't cover this part, we can use the NFV approach. |
| ISSUE#6 | MEC AppD vs NFV VFND. | 5GCity information model will take in account both descriptors. MEAO stores only MEC information. NFVO stores only NFV information. | Need to extend out Information Model to cover relevant MEC fields. |
| ISSUE#7 | Packages of ME Apps vs VNFs. | 5GCity packages will contains files related to NFV and MEC. | MEAO will store only MEC part, and NFVO only NFV part. |
| ISSUE#8 | NS/ME app onboarding. | NFVO is the master, and MEAO is the slave, this means that the onboarding comes first to NFVO that validate eventual MEC information, store the mapping between ME app and NS, and send MEC information to MEAO and NFV information will be used by the NFVO. | |

NFV MEC Mapping Issues- 3



| Issue | Description | 5GCity Solution | Comment |
|----------|--|---|---|
| ISSUE#9 | Management of traffic redirection. | The ME platform ask traffic redirection through Mm5 (which is an unspecified reference point) then this information goes to MEAO through Mm3* and the MEAO create a NFP based on the new traffic rules and uses Mv1 to ask the NFVO to instantiate. | The MEAO is the trigger for traffic redirection, then the actual configuration is done by NFVO for the NFV part and by the ME platform for the MEC related part. |
| ISSUE#10 | Comparison between AppD and VNFD data structures | See issue 6. | |
| ISSUE#11 | Multi-access Edge Host in NFV. | ME Host can be the NFVI in a cabinet. MEAO need to be able to ask NFVO to deploy in specific cabinets. Each NFVI-PoP can be a ME Host. | MEC should be able to reuse such as NFVI-PoP (basically, a data centre) and Zone (a set of co-located and well-connected physical resources which is a subset of an NFVI-PoP). This can be mapped to well known definition of availability-zone in an OpenStack deployment. |
| ISSUE#12 | ME App VNF Instance Relocation | The MEAO and NFVO should collaborate when is time to relocate a ME App instance, this communication goes through a reference point separate from Mv1 | Relocation is triggered by MEAO based on information coming from MEPM-V |
| ISSUE#13 | Application instantiation | Same as issue#12 | Instantiation is triggered by MEAO |
| ISSUE#14 | Application instance termination | Same as issue#12 | Termination in triggered by MEAO based on information coming from MEPM-V |

Conclusion



Mobile Network Operators are interested in MEC deployments in NFV environment.

ETSI, “ETSI GR MEC 017 V1.1.1

- A set of initial assumptions;
- A potential solution which provides a mapping of MEC to NFV architecture;
- An ordered list of open issues, which are raised by the proposed mapping.

5GCity will give a shot at MEC to NFV mapping implementation leveraging on OSM and fog05.