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# OSM 4<sup>th</sup> Hackfest – Introduction to NFV and OSM

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# Agenda

- **Quick review of NFV**
- Introduction to OSM Release 4
- Contributing to the Community



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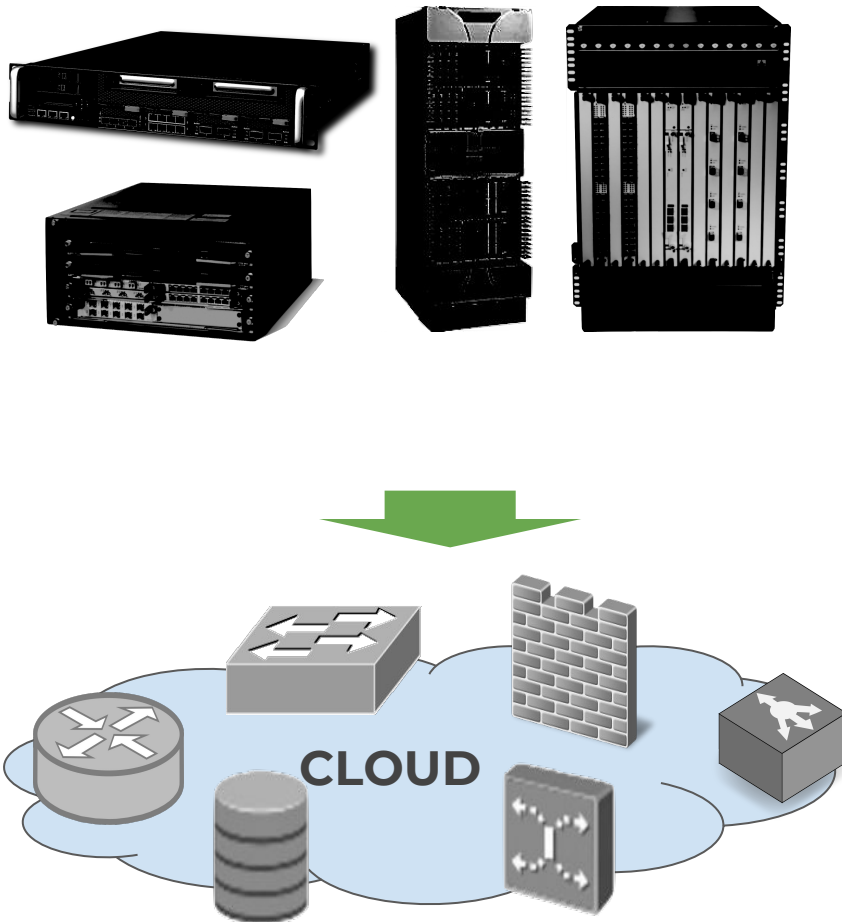
# Quick review of NFV

ETSI



**Home of NFV**

# What is NFV trying to address?



- Network Function Virtualization (NFV) proposes to virtualize network functions that typically run in dedicated appliances
- The main goal is to support virtualized functions over COTS servers.
- Virtual Network Functions (VNFs) acquire all the advantages of Cloud Applications!

# How was this originated?

- A white paper was written in 2012 by the world's leading telecom network operators.
- This group evolved to the ETSI NFV ISG (Industry Specification Group), formed today by 300+ companies.
- Their main motivation had to do with the increasing TCO of building a network with proprietary hardware appliances.

## Network Functions Virtualisation

*An Introduction, Benefits, Enablers, Challenges & Call for Action*

### **OBJECTIVES**

This is a non-proprietary white paper authored by network operators.

The key objective for this white paper is to outline the benefits, enablers and challenges for Network Functions Virtualisation (as distinct from Cloud/SDN) and the rationale for encouraging an international collaboration to accelerate development and deployment of interoperable solutions based on high volume industry standard servers.

### **CONTRIBUTING ORGANISATIONS & AUTHORS**

<b>AT&amp;T:</b>	Margaret Chiosi.
<b>BT:</b>	Don Clarke, Peter Willis, Andy Reid.
<b>CenturyLink:</b>	James Feger, Michael Bugenhagen, Waqar Khan, Michael Fargano.
<b>China Mobile:</b>	Dr. Chunfeng Cui, Dr. Hui Deng.
<b>Colt:</b>	Javier Benitez.
<b>Deutsche Telekom:</b>	Uwe Michel, Herbert Damker.
<b>KDDI:</b>	Kenichi Ogaki, Tetsuro Matsuzaki.
<b>NTT:</b>	Masaki Fukui, Katsuhiro Shimano.
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<b>Telecom Italia:</b>	Ivano Guardini, Elena Demaria, Roberto Minerva, Antonio Manzalini.
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<b>Telstra:</b>	Frank Ruhl.
<b>Verizon:</b>	Prodip Sen.

### **PUBLICATION DATE**

October 22-24, 2012 at the "SDN and OpenFlow World Congress", Darmstadt-Germany.

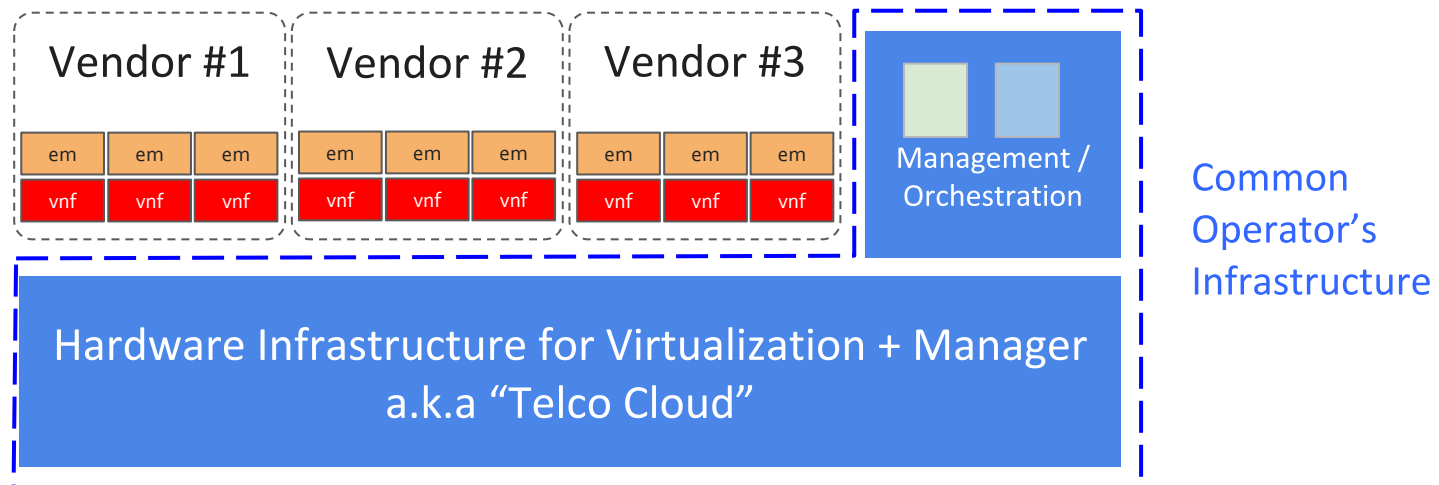
# ETSI Publications

- Based on member's feedback, field experiences and proof of concepts, standard documents have evolved.
- 60+ publications exist today, including the following three main documents:
  - NFV Architectural Framework  
[http://www.etsi.org/deliver/etsi\\_gs/NFV/001\\_099/002/01.02.01\\_60/gs\\_NFV002v010201p.pdf](http://www.etsi.org/deliver/etsi_gs/NFV/001_099/002/01.02.01_60/gs_NFV002v010201p.pdf)
  - NFV Infrastructure Overview  
[http://www.etsi.org/deliver/etsi\\_gs/NFV-INF/001\\_099/001/01.01.01\\_60/gs\\_NFV-INF001v010101p.pdf](http://www.etsi.org/deliver/etsi_gs/NFV-INF/001_099/001/01.01.01_60/gs_NFV-INF001v010101p.pdf)
  - NFV Management and Orchestration  
[http://www.etsi.org/deliver/etsi\\_gs/NFV/001\\_099/002/01.02.01\\_60/gs\\_NFV002v010201p.pdf](http://www.etsi.org/deliver/etsi_gs/NFV/001_099/002/01.02.01_60/gs_NFV002v010201p.pdf)



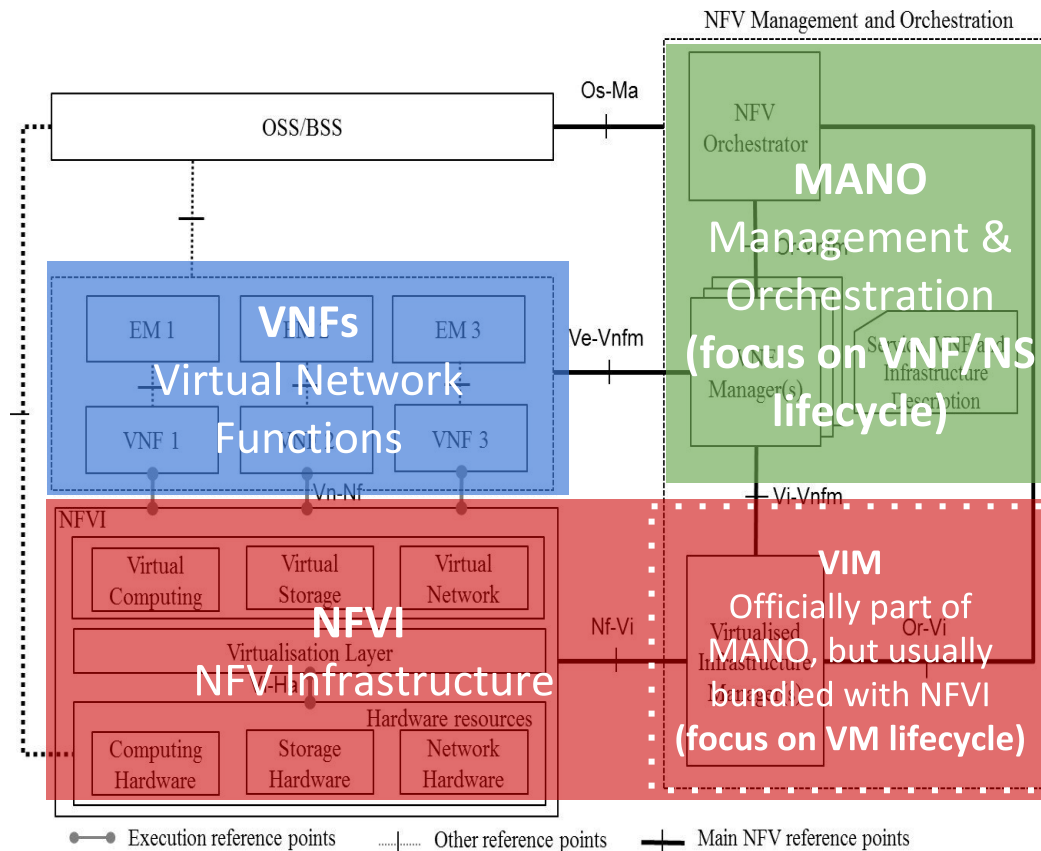
# Benefits of a standard NFV architecture

We are looking for a **unified and generic virtualization infrastructure**, compatible with any vendor's Virtual Networking Function (VNF), **so standardization is a must.**



# The ETSI NFV Architecture

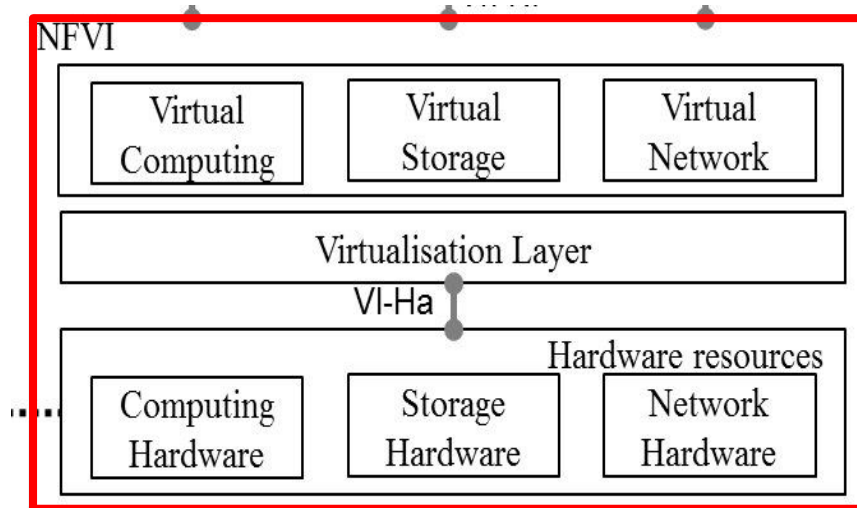
The standard architecture can be better understood in three blocks:





# NFVI: NFV Infrastructure

- NFVI goal is to provide a virtualization environment for VNFs, including virtual compute, storage and networking resources.

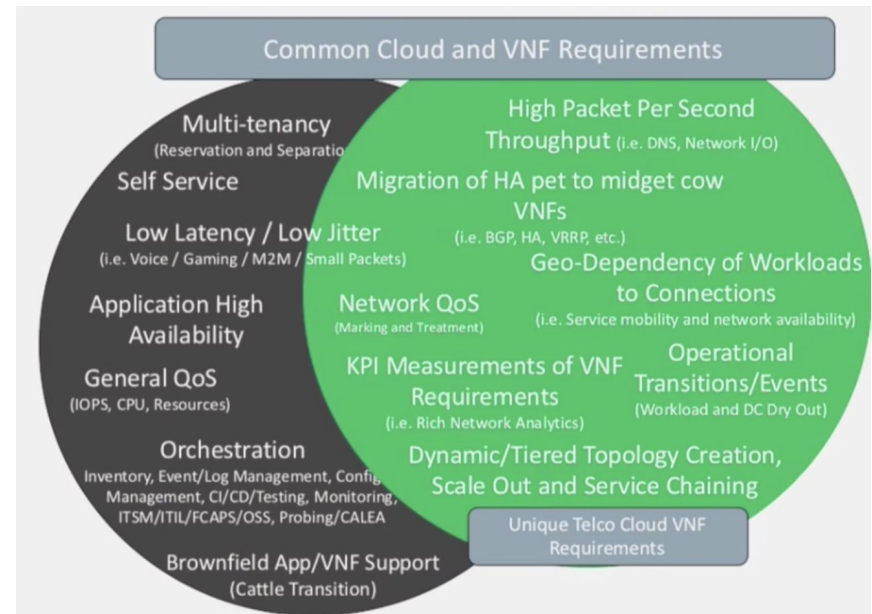


- But! networking applications may have more strict performance requirements, we will discuss that later.

# VNF Special Requirements

VNFs, especially data-plane ones, usually have additional requirements than common cloud applications, including:

- Minor latency (disk I/O & network)  
→ faster disks, QoS, higher BW
- Geographical distribution  
→ multi-site cloud
- Horizontal auto-scaling  
→ automated operations
- Higher throughput or PPS  
→ EPA: Enhanced Platform Awareness



*OpenStack Austin 2016: Telco Cloud Requirements: What VNF's Are Asking For*

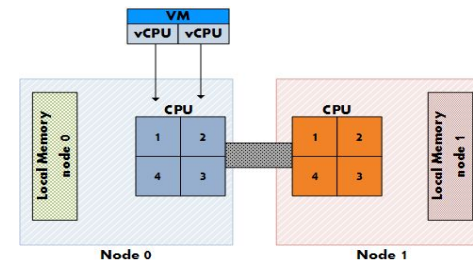
# VNF Special Requirements

EPA covers the different approaches that can be taken at the NFVI layer to increase performance while maintaining a generic (COTS) infrastructure. VIM and MANO should be able to request them.

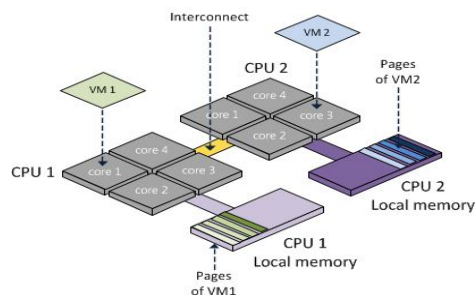
## Huge Pages



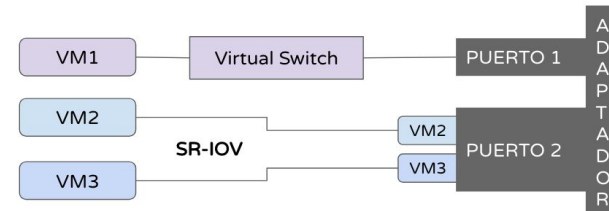
## NUMA Topology Awareness



## CPU Pinning

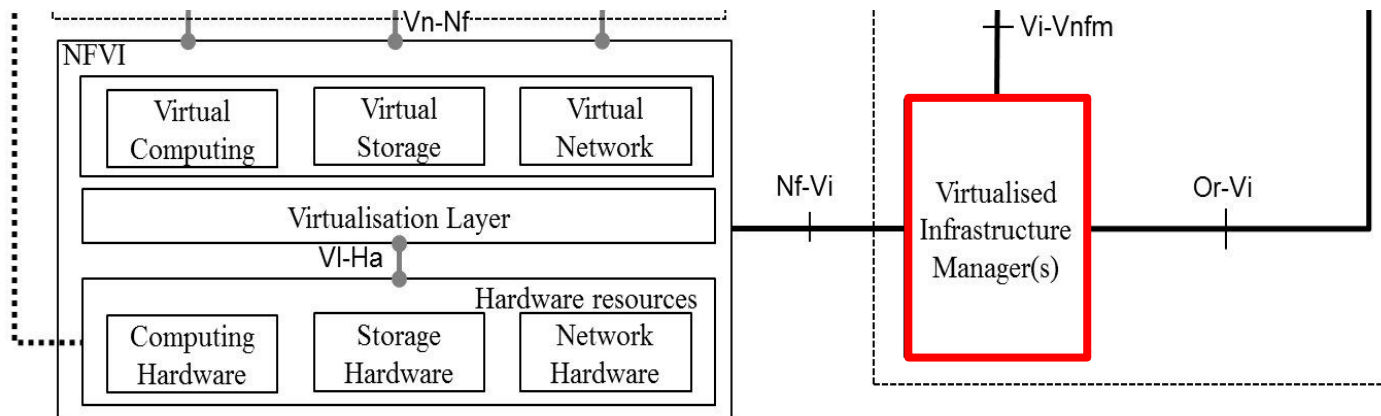


## Data Plane assignment



# MANO: Virtualized Infrastructure Manager (VIM)

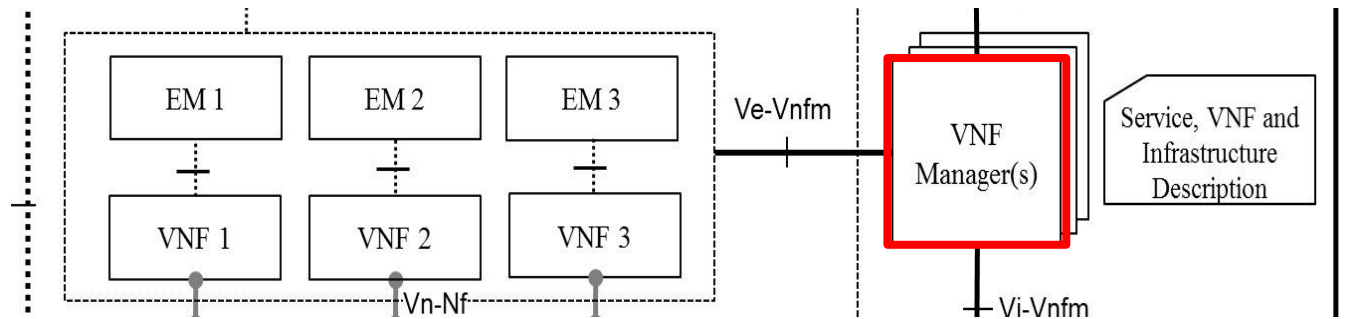
- The Virtualized Infrastructure Manager is part of the 'MANO Stack' and addresses provides lifecycle management for virtualized resources (VMs, volumes, networking paths and connectivity, etc.)



*Examples: OpenStack distributions, VMWare products, Public Cloud managers, etc.*

# MANO: VNF Manager (VNF-M)

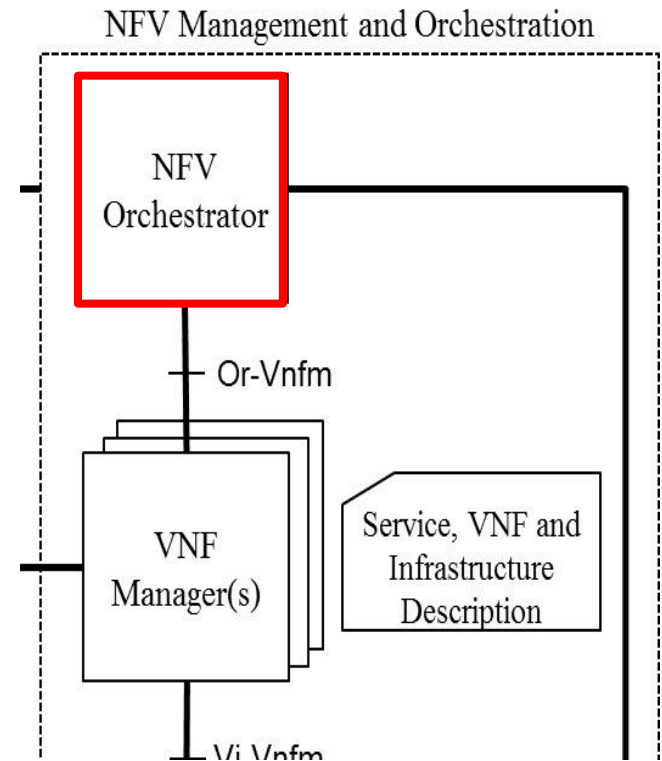
- The VNF Manager, also part of the ‘MANO Stack’, covers lifecycle management for Virtual Network Functions (VNFs), either directly or through their own Element Management System (EMS).



- VNF Managers can be generic (current trend), or vendor-specific ones.

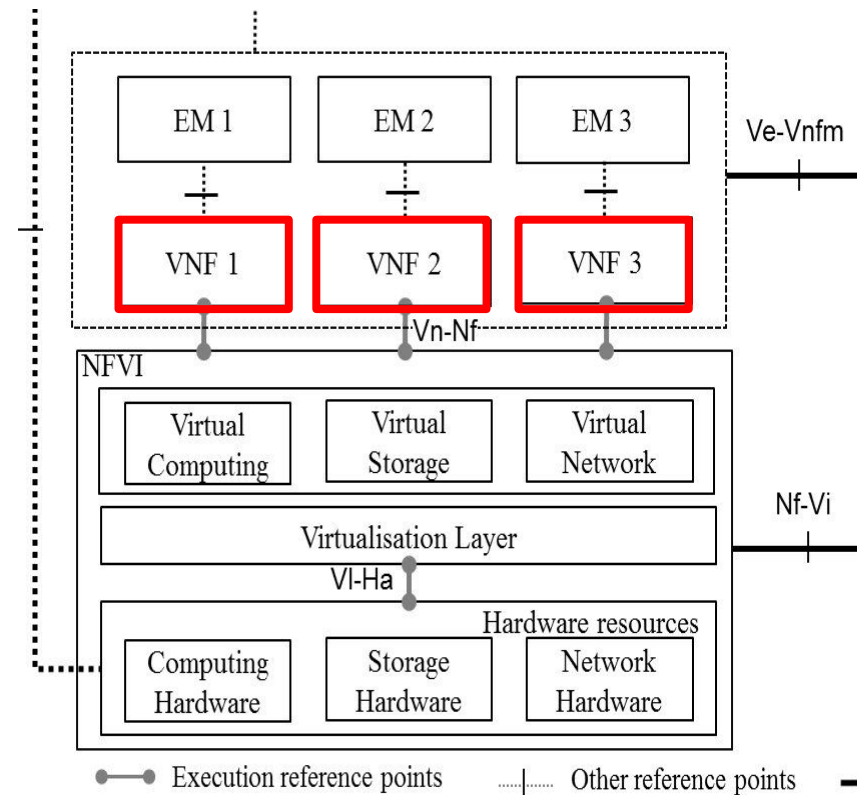
# MANO: NFV Orchestrator (NFV-O)

- The NFV Orchestrator, the higher entity in the 'MANO Stack', covers general resource orchestration and services lifecycle, which comprise multiple VNFs and define their roles (traffic paths, scaling decisions, and other service-related requirements)
- It can interact with a generic VNF Manager, or vendor-specific ones.



# Virtual Network Functions (VNF)

- Finally, the VNFs, which are supported by the underlying NFVI, and managed by their own EM (internal manager) and the VNF Manager (external, 'context-aware' manager)
- They should be able to provide any networking function and interact with other VNFs.



# VNF Descriptor files (VNFD)

One of the most important aspects of achieving a unified VNF catalogue, is having a standard way of describing VNFs.

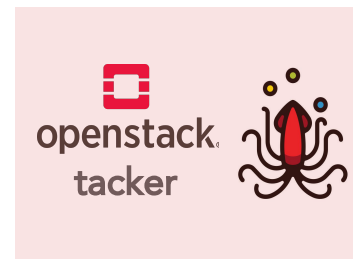
- MANO solutions should give the possibility to describe VNFs through 'descriptor files'
- The industry's goal is a unified and standard descriptor file format across different platforms.
- Both NS (comprised of VNFs) and VNFs should be described in a simple way.

```
vnfd:vnfd-catalog:
  vnfd:vnfd:
  - vnfd:connection-point:
    - vnfd:name: eth0
      vnfd:type: VPORT
    vnfd:description: Generated by OSM pacakage generator
    vnfd:id: ubuntuvmf_vnfd
    vnfd:mgmt-interface:
      vnfd:cp: eth0
    vnfd:name: ubuntuvmf_vnfd
    vnfd:service-function-chain: UNAWARE
    vnfd:short-name: ubuntuvmf_vnfd
    vnfd:vdu:
    - vnfd:cloud-init-file: cloud_init
      vnfd:count: '1'
      vnfd:description: ubuntuvmf_vnfd-VM
      vnfd:guest-epa:
        vnfd:cpu-pinning-policy: ANY
      vnfd:id: ubuntuvmf_vnfd-VM
      vnfd:image: ubuntu_admin
      vnfd:interface:
      - nw-vnfd:floating-ip-needed: 'false'
        vnfd:external-connection-point-ref: eth0
```



# The NFV MANO Landscape

- Given that the VIM is already well covered by OpenStack distributions and proprietary solutions (e.g. vCD), in practice, **the “NFV MANO” part focuses on the VNF Manager and NFV Orchestrator.**
- Among the most popular open source platforms for NFV MANO, we have:



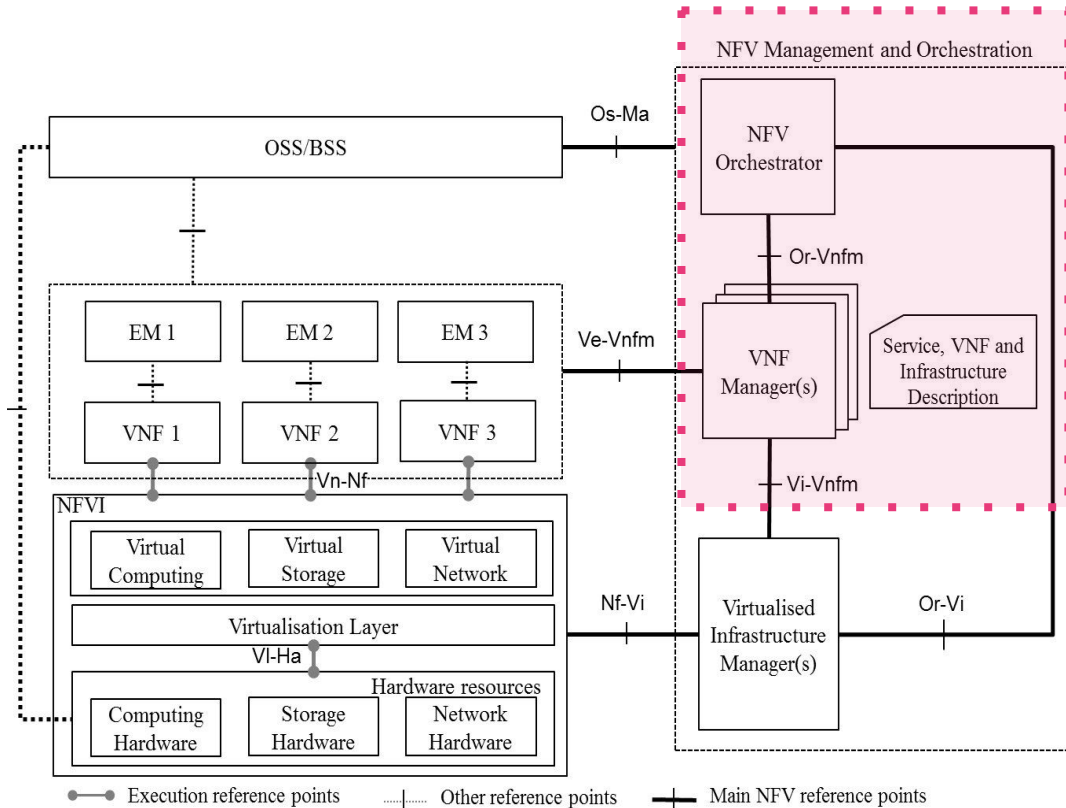


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# Introduction to OSM Release Four

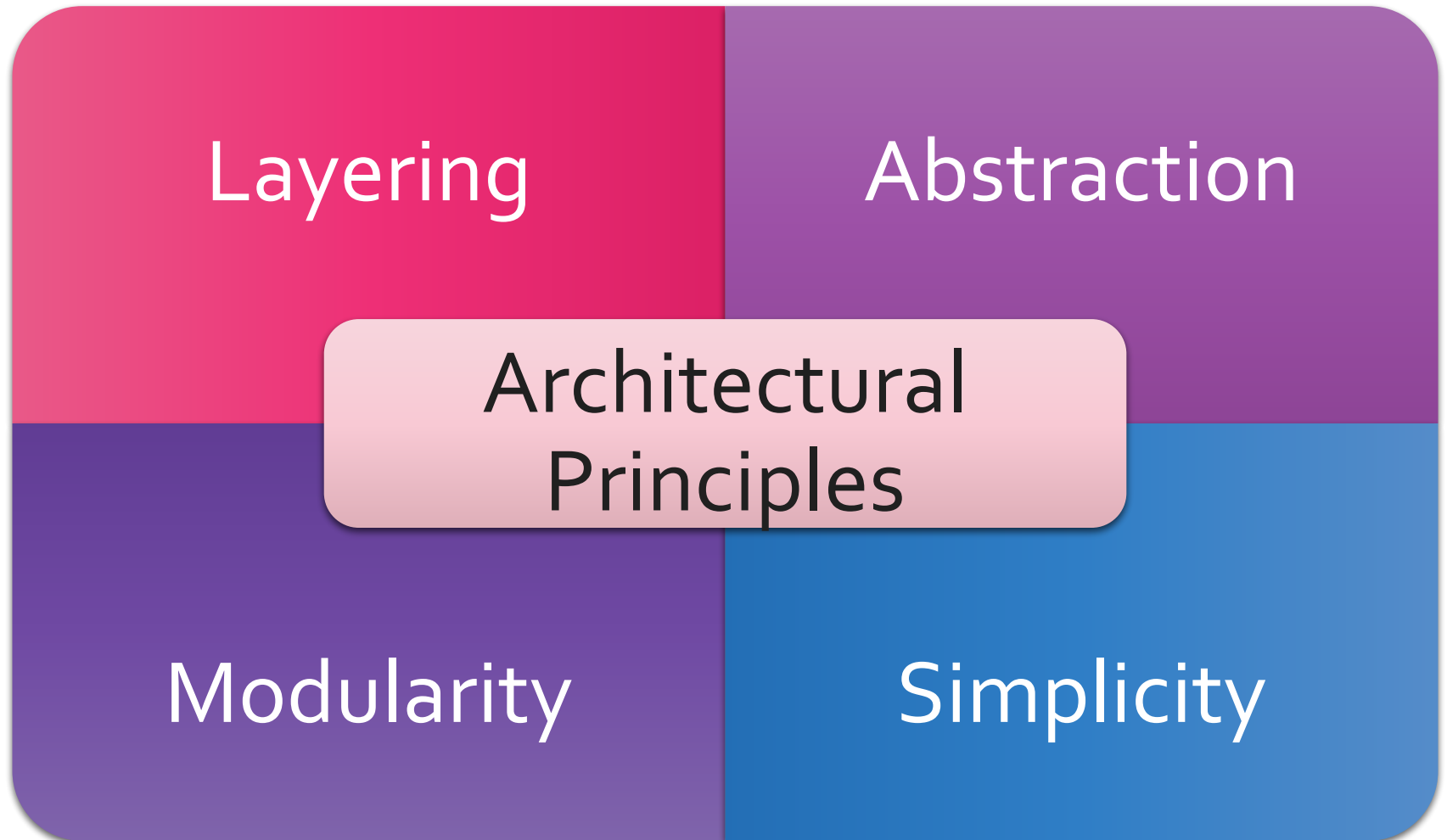


# The Open Source MANO Project

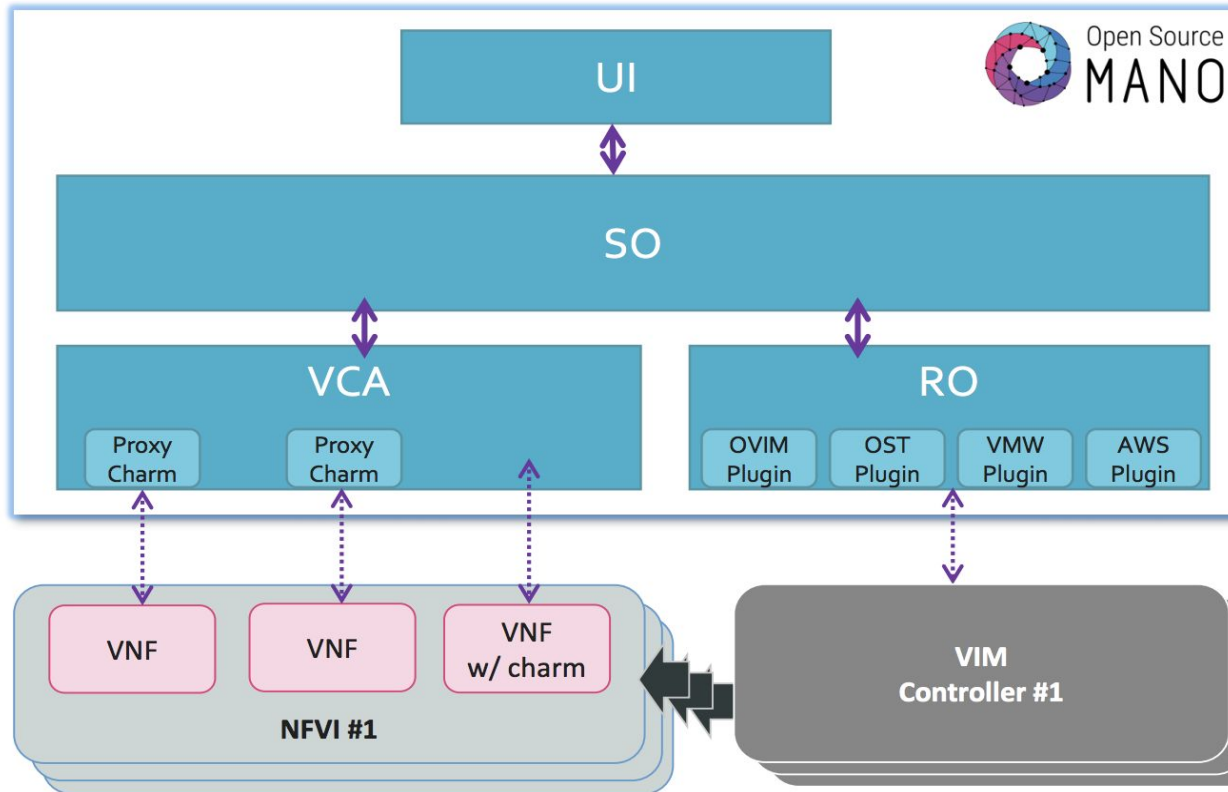


**We are here!**  
Open Source MANO is an ETSI-hosted project to develop an Open Source NFV Management and Orchestration (MANO) software stack aligned with ETSI NFV.

# OSM Architectural Principles

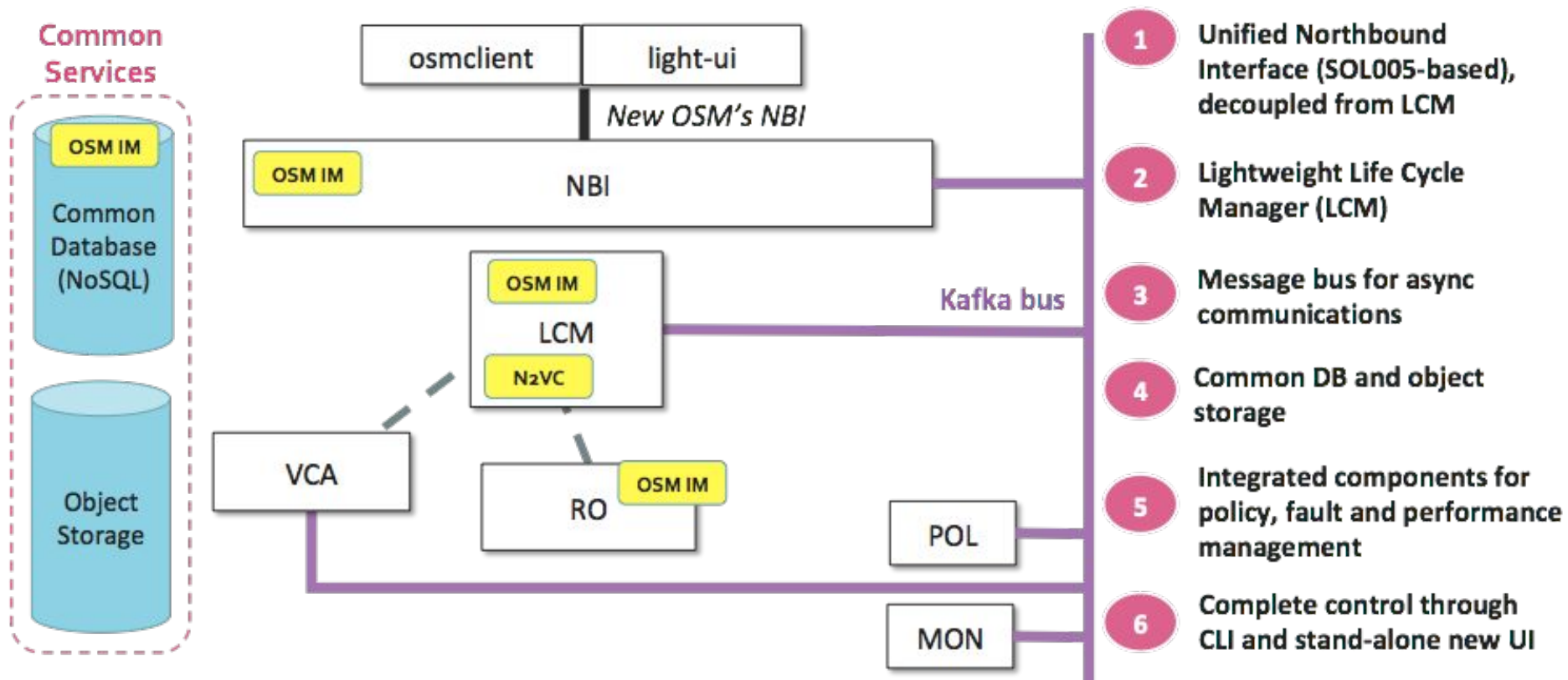


# Release 3 architecture (OLD)



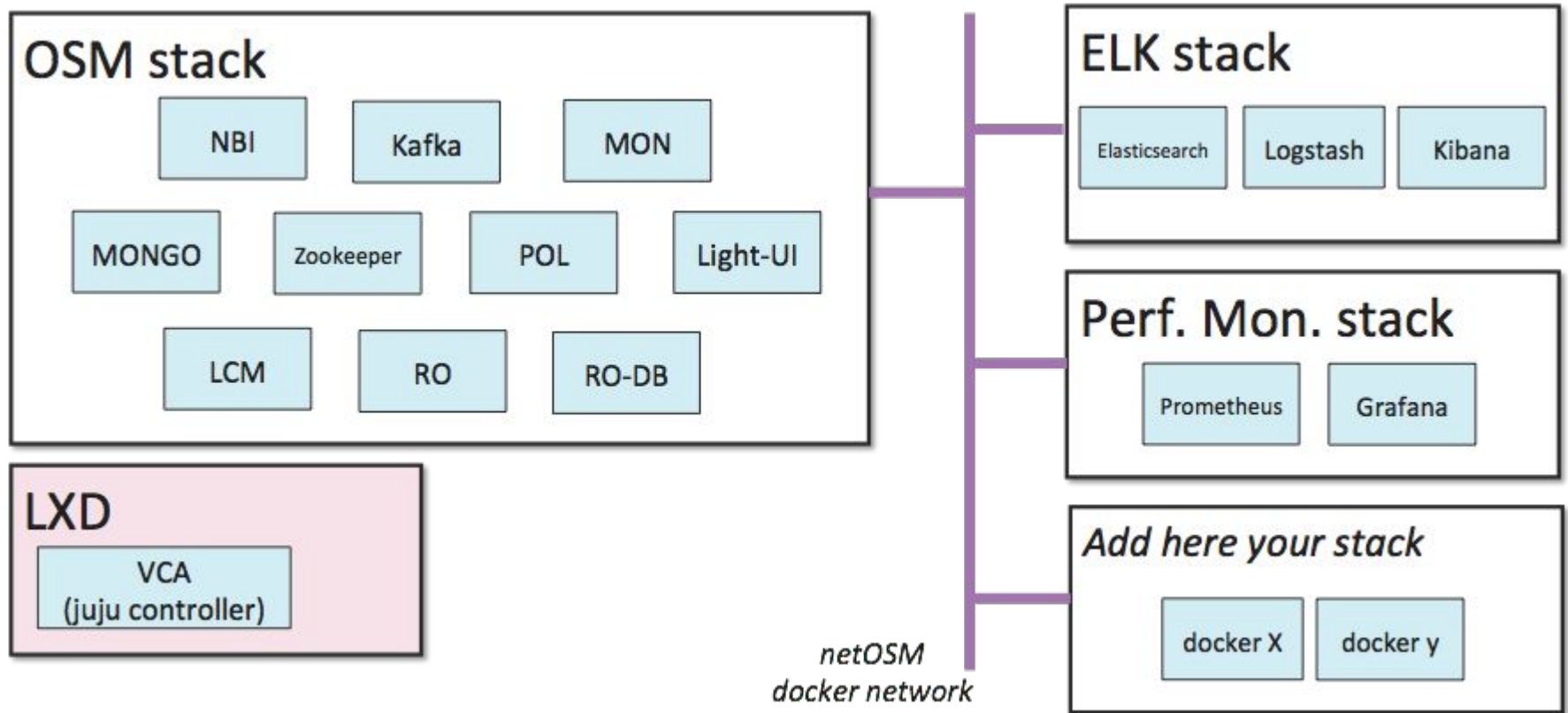
UI: User interface  
SO: Service Orchestrator  
VCA: VNF Configuration & Abstraction  
RO: Resource Orchestrator

# Release 4 architecture & additions



# Release 4 architecture & additions

Microservice architecture to enable extensibility



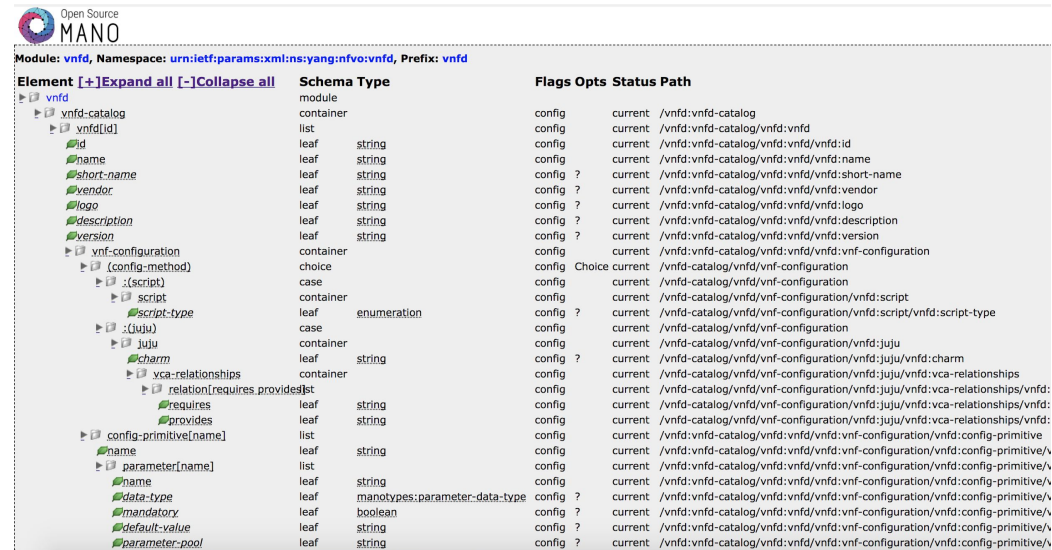
# Why is OSM Awesome?

## It has a rich and open information model

- Agnostic to VIM, SDN platform, VNF and OSS connectors/specifics.
- It allows for a uniform NFV orchestration, abstracted from the environment
- Aligned with ETSI-NFV Information Model

Visit:

[https://osm.etsi.org/wikipub/index.php/OSM\\_Info\\_rmation\\_Model](https://osm.etsi.org/wikipub/index.php/OSM_Info_rmation_Model)



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Module: vnf: Namespace: urn:ietf:params:xml:ns:yang:vnf:vnfd, Prefix: vnf:

Element	Schema Type	Flags	Opts	Status	Path
vnf	module				
vnf-catalog	container	config		current	/vnfd:vnf-catalog
vnfd[id]	list	config		current	/vnfd:vnf-catalog/vnfd:vnfd
id	leaf	config		current	/vnfd:vnf-catalog/vnfd:vnfd:id
name	leaf	config		current	/vnfd:vnf-catalog/vnfd:vnfd:name
short-name	leaf	config	?	current	/vnfd:vnf-catalog/vnfd:vnfd:short-name
vendor	leaf	config	?	current	/vnfd:vnf-catalog/vnfd:vnfd:vendor
logo	leaf	config	?	current	/vnfd:vnf-catalog/vnfd:vnfd:logo
description	leaf	config	?	current	/vnfd:vnf-catalog/vnfd:vnfd:description
version	leaf	config	?	current	/vnfd:vnf-catalog/vnfd:vnfd:version
vnf-configuration	container	config		current	/vnfd:vnf-catalog/vnfd:vnfd:vnf-configuration
(config-method)	choice	config	Choice	current	/vnfd-catalog/vnfd/vnf-configuration
(script)	case	config		current	/vnfd-catalog/vnfd/vnf-configuration
script	container	config		current	/vnfd-catalog/vnfd/vnf-configuration/vnfd:script
script-type	leaf	config	?	current	/vnfd-catalog/vnfd/vnf-configuration/vnfd:script/vnfd:script-type
(juju)	case	config		current	/vnfd-catalog/vnfd/vnf-configuration
juju	container	config		current	/vnfd-catalog/vnfd/vnf-configuration/vnfd:juju
charm	leaf	config	?	current	/vnfd-catalog/vnfd/vnf-configuration/vnfd:juju/vnfd:charm
vca-relationships	container	config		current	/vnfd-catalog/vnfd/vnf-configuration/vnfd:juju/vnfd:vca-relationships
requires	leaf	config		current	/vnfd-catalog/vnfd/vnf-configuration/vnfd:juju/vnfd:vca-relationships/vnfd:
provides	leaf	config		current	/vnfd-catalog/vnfd/vnf-configuration/vnfd:juju/vnfd:vca-relationships/vnfd:
config-primitive[name]	list	config		current	/vnfd:vnf-catalog/vnfd:vnfd:vnf-configuration/vnfd:config-primitive
name	leaf	config		current	/vnfd:vnf-catalog/vnfd:vnfd:vnf-configuration/vnfd:config-primitive/vnfd:
parameter[name]	list	config		current	/vnfd:vnf-catalog/vnfd:vnfd:vnf-configuration/vnfd:config-primitive/vnfd:
name	leaf	config		current	/vnfd:vnf-catalog/vnfd:vnfd:vnf-configuration/vnfd:config-primitive/vnfd:
data-type	leaf	config	?	current	/vnfd:vnf-catalog/vnfd:vnfd:vnf-configuration/vnfd:config-primitive/vnfd:
mandatory	leaf	config	?	current	/vnfd:vnf-catalog/vnfd:vnfd:vnf-configuration/vnfd:config-primitive/vnfd:
default-value	leaf	config	?	current	/vnfd:vnf-catalog/vnfd:vnfd:vnf-configuration/vnfd:config-primitive/vnfd:
parameter-pool	leaf	config	?	current	/vnfd:vnf-catalog/vnfd:vnfd:vnf-configuration/vnfd:config-primitive/vnfd:



# Why is OSM Awesome?

**It has a large and diverse community!**  
More than 100 members and growing



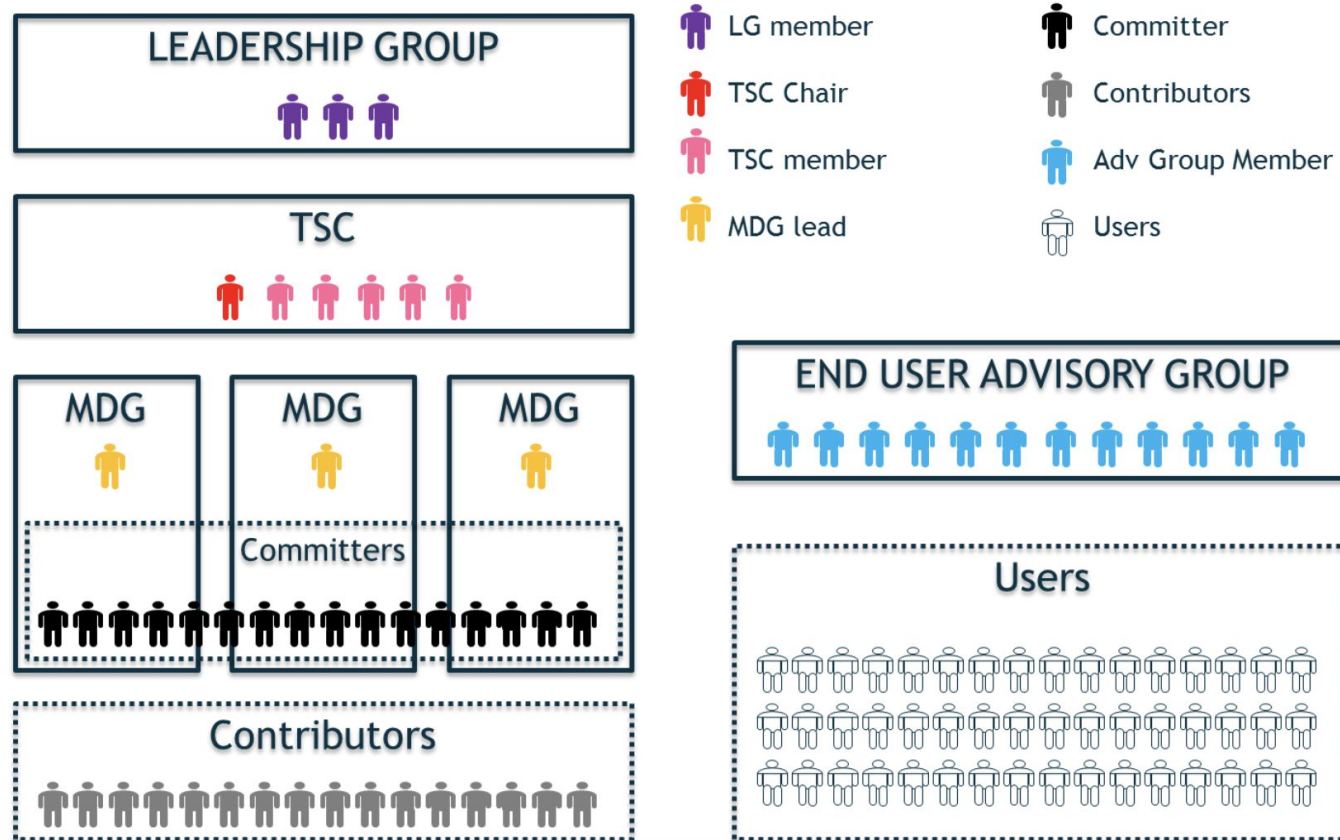
- 11 Global Service Providers
- Leading IT/Cloud players
- VNF providers

Logos shown on the map include: Sprint, Bell, BT, telenor, amazon web services, verizon, PT, Telefonica, SK telecom, kt, CableLabs.

Logos shown in the bottom rounded rectangle include: Cwind, ADVA, altran, AMPLIPAE, ADSACOM, ARCTOS LABS, ASTELLIA, AtoS, Arinet, big switch NETWORK, BROCADE, CANONICAL, CASE, cenX, citrix, conit, COMARCH, comptel, CLANE NETWORKS, CTC, DATAART, DELL EMC, Dialogic, EMPIRIX, EURECOM, F3K, FONDAZIONE BRUNO KESSLER, Fraunhofer, i2cat, iconectiv, idea, indra, Infoblox, intel, Iricent, ixia, keynetix, KING'S College LONDON, LAYER123, MANTICA, MAVENIR, MC5G, MeadowCom, metaswitch, mycomosi, solarwinds n-able, Netcracker, NetNumber, netrounds, NETSCOUT, NEXTWORKS, NFWare, PacketFront Software, PADERBORN UNIVERSITY, PENZA, PROCERA, RADCOM, radware, redhat, RIFT.io, sandvine, SEVEN PRINCIPLES, SIGMA, SIGSCALE, SPIRENT, Tech Mahindra, technicolor, Telcaria, TNO, ubiwhere, Universidad Carlos III de Madrid, Universidad del País Vasco, Europa Horitzo, VIAYI, virtuosys, vmware, whitestack, WIND, wipro, FLOW, and others.

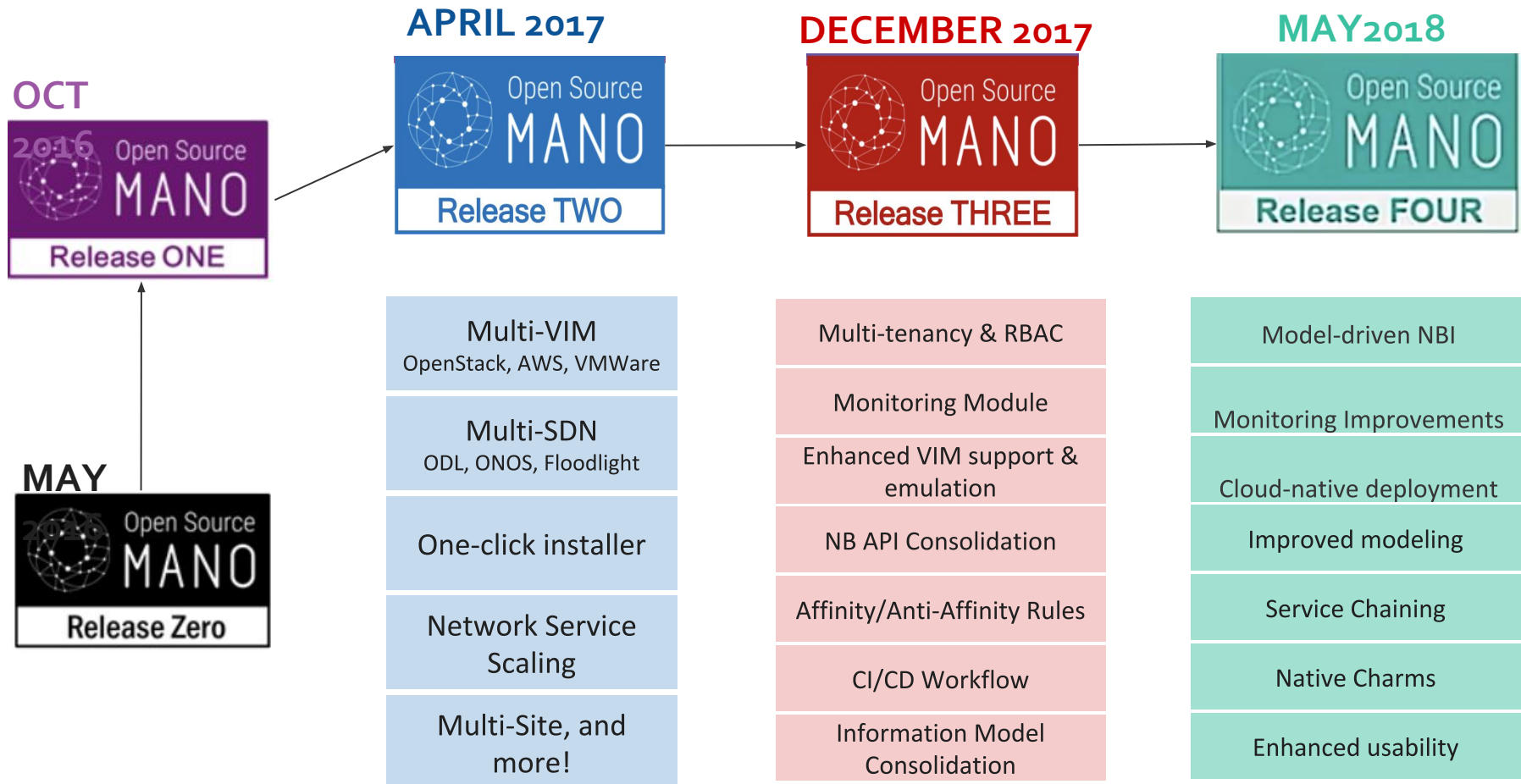
# Why is OSM Awesome?

It is well organized for producing production-ready upstream code



# Why is OSM Awesome?

## It prioritizes features for production readiness



# Why is OSM Awesome?

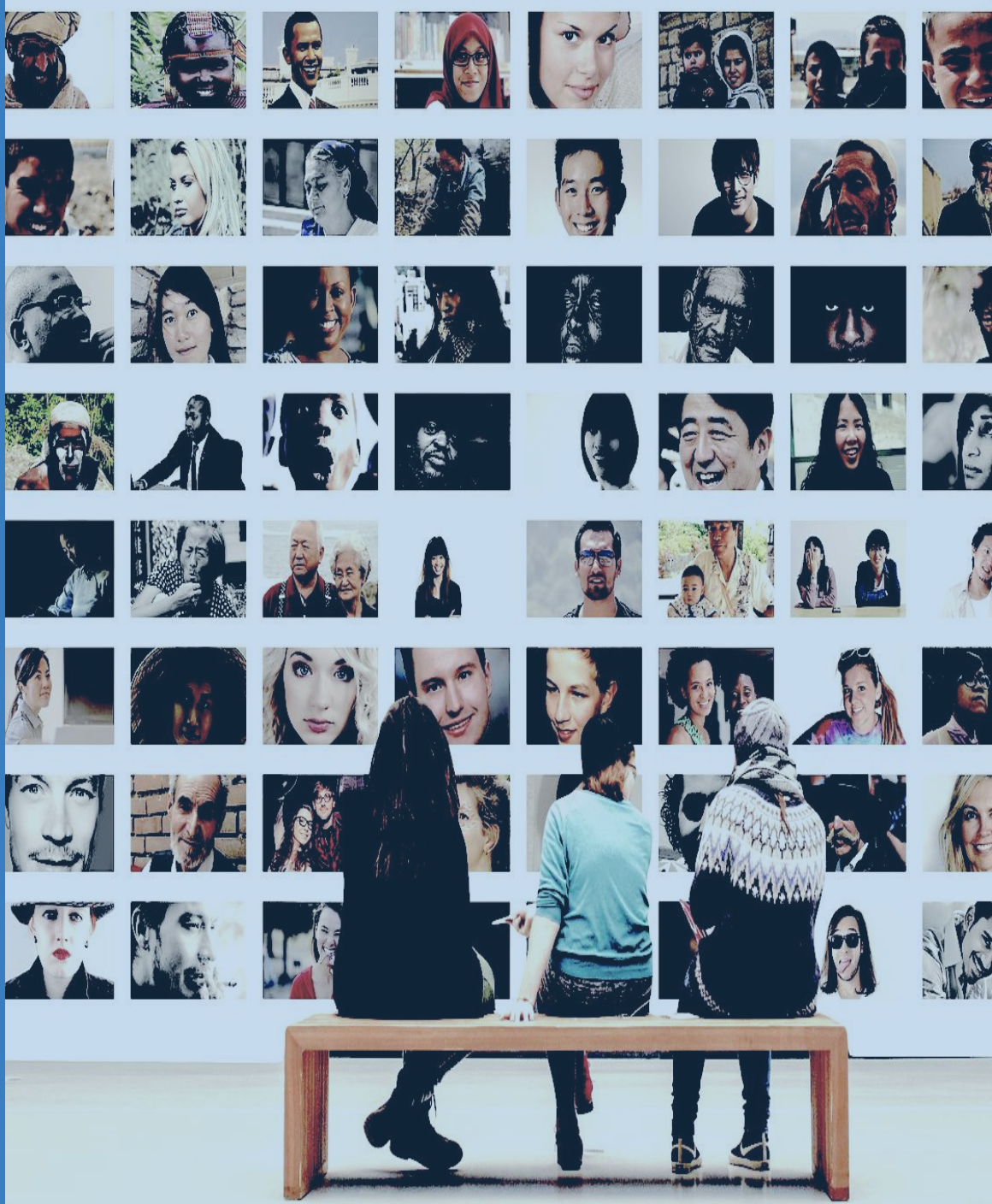
## ...and will keep expanding its features towards Release FIVE and production deployments:

- Improved interface towards VNFs
- Further evolution of Performance and Fault Management capabilities
- Management of VNFs of new generation
  - Docker containers + Kubernetes management
  - Hybrid NFs (Virtual + Physical)
- Support of future 5G deployments
  - Network Slicing likely to require NS Nesting, Management of shared resources



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Contributing  
to the  
Community



# Joining the OSM Community

- Join [here](https://osm.etsi.org/about/how-to-join) as a company or individual contributor!  
<https://osm.etsi.org/about/how-to-join>

## HOW TO GET INVOLVED IN OSM

There are two paths to get involved in OSM as an organisation: as an ETSI Member, or as an OSM Participant.

Check first if your organization is already involved by consulting the list of [OSM Members](#) and [Participants](#).

### Get involved as an ETSI Member

To take part in the development of OSM and participate to the meetings, ETSI Members need to sign the [OSM Membership Agreement and CCLA](#). In doing this, they agree to the OSM operating rules which in some cases are different from those in ETSI's Technical Working Procedures. [Check if your company is an ETSI Member](#).

### Get involved as an OSM Participant

Organizations who are not members of ETSI may also participate in OSM, attend meetings and help to develop OSM by making technical contributions. They are not applicable for leadership (LG) positions and must pay a participation fee to attend OSM meetings. To get involved as a Participant, please sign the [OSM Participant Agreement and the CCLA](#).

## Developers and Users

Individual developers and end users are welcome to contribute code and feedback to OSM, they just need to [create an individual contributor or user account](#).

# OSM Community Activities

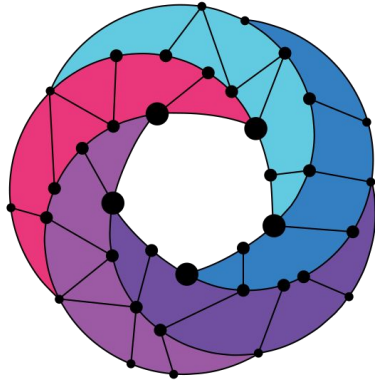
- Weekly Conference Calls
  - Technical, leadership, DevOps, and more!
- Face to Face Meetings
  - Plenaries and Mid-Release meetings (every 3 months)
  - Next location: Castelldefels, Spain (Feb 2019)
- OSM Hackfest
  - Fifth edition taking place on February 2019 at Spain, expecting to keep **co-locating** with OSM Face-to-Face meetings.

# Ways to contribute to OSM



- **Try OSM** and give feedback to the community.
- Join as a developer to **make contributions to the code**.
- Join the community to **contribute to design discussions**.
- **Start building your own distribution** of OSM as an integrator.
- **Host an OSM meeting** to contribute to the community's growth and diversity.





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[osm.etsi.org](http://osm.etsi.org)  
[osm.etsi.org/wikipub](http://osm.etsi.org/wikipub)