Open Source MANO

(RE)INTRODUCING OPEN SOURCE MANO

Francisco-Javier Ramón Salguero (Telefónica)
ETSI OSM Chair

NFV WORLD CONGRESS

ETSI

Management and Orchestration are **key functions** for NFV, but…

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… THERE ARE MANY INTERPRETATIONS OF THE MANO STACK

- What does it take to onboard VNF "X" in this MANO environment?
- Would VNF "X" work as expected?
- How could I operate the Network Service in practice?
- How can I integrate it with the rest of my network and OSS/BSS?

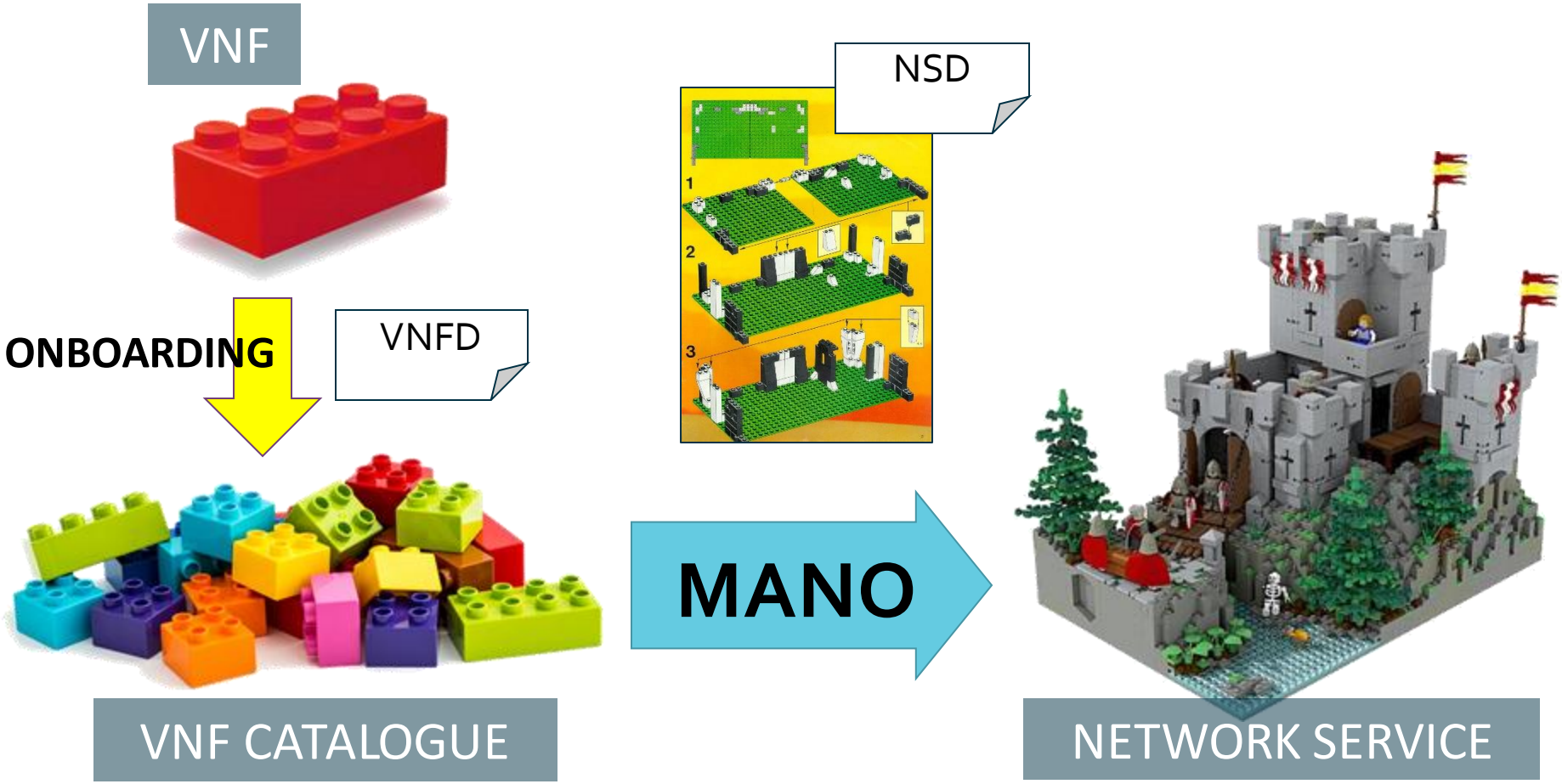
… INDUSTRY FRAGMENTATION and ENTRY BARRIERS do not help to real deployments!

NEED TO ACCELERATE CONVERGENCE ON A TELCO-READY MANO SOLUTION

- Drive NFV Ecosystem and Adoption

NFV requires **replaceable components** that can be **safely & automatically assembled**…

Open Source MANO



… but current modelling is **not yet there!**

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HARD ONBOARDING

Basic NSD

Ad hoc integration often needed

BASIC AND HAND-MADE NETWORK SERVICE

OSM aims to deliver a **production-quality MANO stack…**

Open Source MANO

- Capable of consuming **openly published IM/DM**
- **Available for everyone**, to minimize uncertainties
- **Suitable for all VNFs**, capturing real production complexity
- **Operationally significant**: including Service Orchestration too!
- **VIM-independent**

ALIGNED TO NFV ISG INFORMATION MODELS

- … but capable of providing **prompt and constructive feedback** whenever needed

ENABLING AN ECO-SYSTEM OF IM-COMPLIANT VNF VENDORS

- Ready to be offered to cloud and service providers
- No need of integration per- customer & MANO vendor basis

… which minimizes entry barriers for VNF developers…

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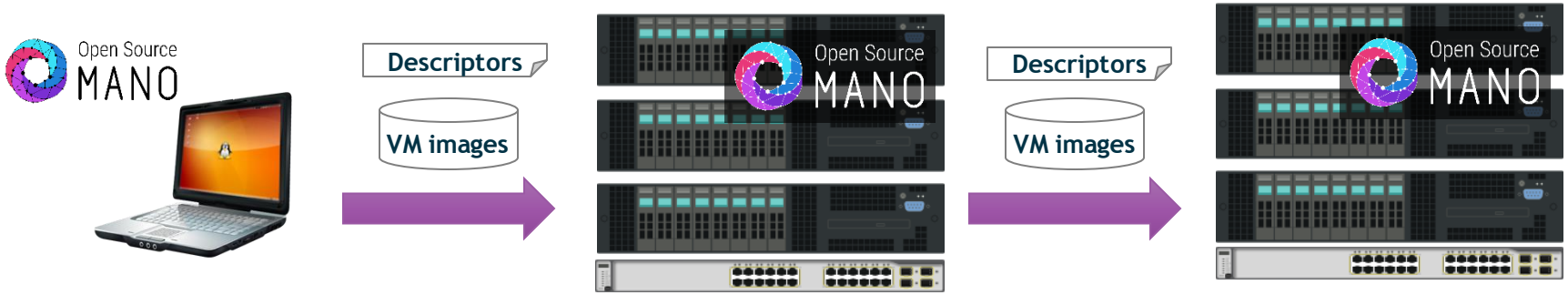
LOCAL DEVELOPMENT &TESTING

TEST POOL FOR DEVELOPERS

SERVICE PROVIDER



- Open Development Env
- Functional tests
- Low cost
- Integration from the beginning

- Real servers and switches
- Performance tests (EPA can be enforced)
- Cost-effective shared infrastructure
- Move the value to VNF services

- Production/pre-production environment
- Real network scenarios
- Final service configuration
- Fast deployment
- Low final integration cost

SAME **IMAGES** AND **DESCRIPTORS** ACROSS ALL THE CHAIN!

… and includes the **operational aspects** required for E2E service orchestration

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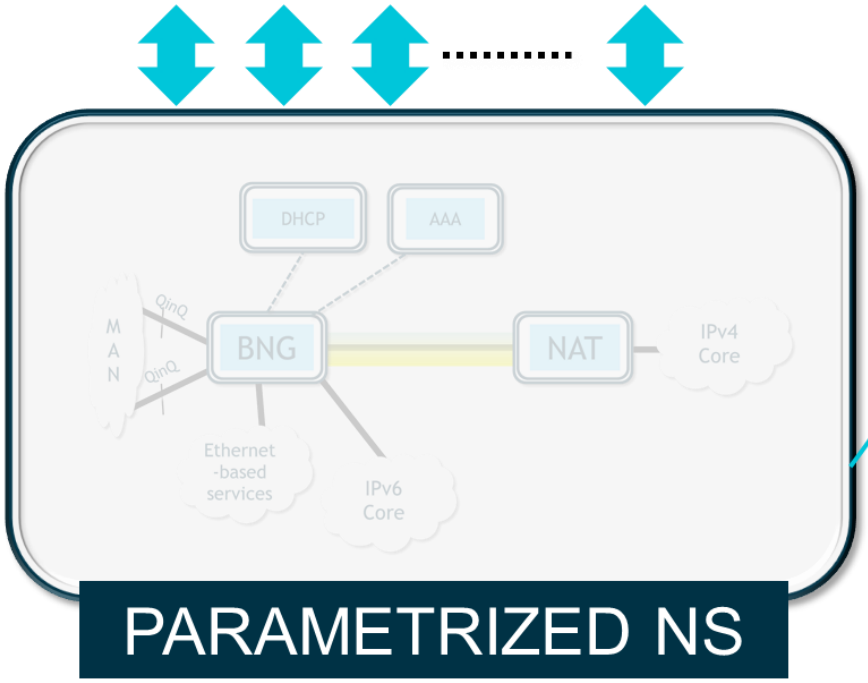
HIGH-LEVEL PRIMITIVES

E.g.:
- Add subscriber
- Add service profile
- Update subscriber profile
- Add service access to subscriber

…



PARAMETRIZED NS

PARTICULARIZATION

IP pools = x1
QoS1 definition = x2
QoS2 definition = x3
…

OSM scope covers all that is required to deliver a **production-quality MANO stack**

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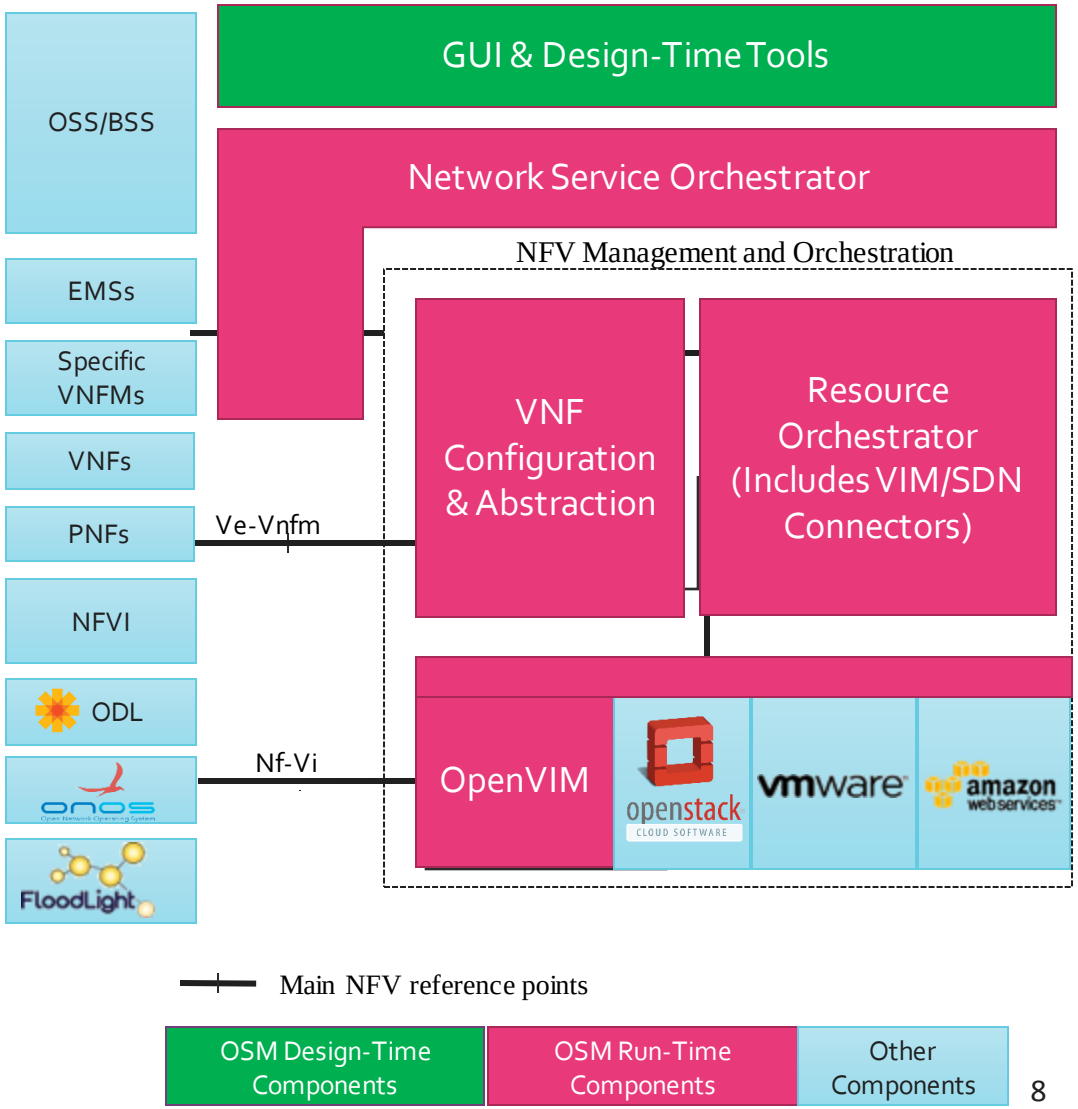
RUN-TIME SCOPE

- Automated E2E Service Orchestration
- Superset of ETSI NFV MANO
- Plugin model for integrating multiple SDN controllers
- Plugin model for integrating multiple VIMs
- Integrated Generic VNFM with support for integrating Specific VNFMs
- Support for Physical Network Function integration
- Greenfield and brownfield deployments

DESIGN-TIME SCOPE

- Network Service Definition
- Model-Driven Environment with Data Models aligned with ETSI NFV
- VNF Package Generation
- GUI



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BUT… WHY OSM?

3 UNIQUE FEATURES THAT MATTER

1) OSM community is really **LARGE AND DIVERSE**, with 65+ members today

Open Source MANO

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

(*) Names & brands may be claimed as the property of others

… while it is open to fellow travellers, with REALLY LOW BARRIERS FOR PARTICIPATION

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ETSI MEMBERS

- Sign Member Agreement & CCLA
- Free participation

NON-ETSI MEMBERS

- Sign Participant Agreement & CCLA
- Fees per F2F meeting (same as in ETSI NFV)

Individual developers and end users

- Just create an individual account

MORE INFO AT: osm.etsi.org

2) OSM embraces the **complexity required for deployments in field…**

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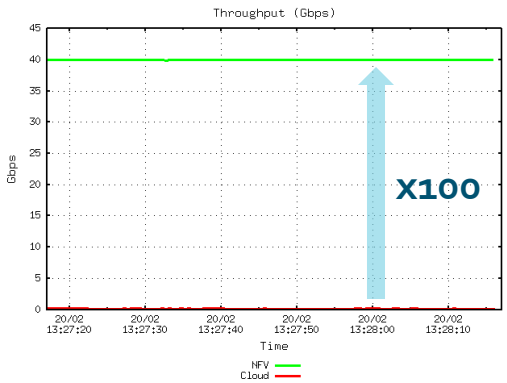
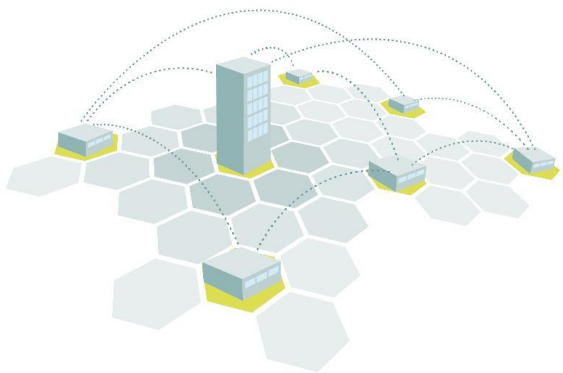
1. EPA support



2. Multi-VIM & Multi-SDN

openstack CLOUD SOFTWARE
vmware
WIND
amazon web services
OPEN DAYLIGHT
onos Open Network Operating System

3. Multi-site



4. Ready for green & brownfield

… with a clear focus on INTEROPERABILITY

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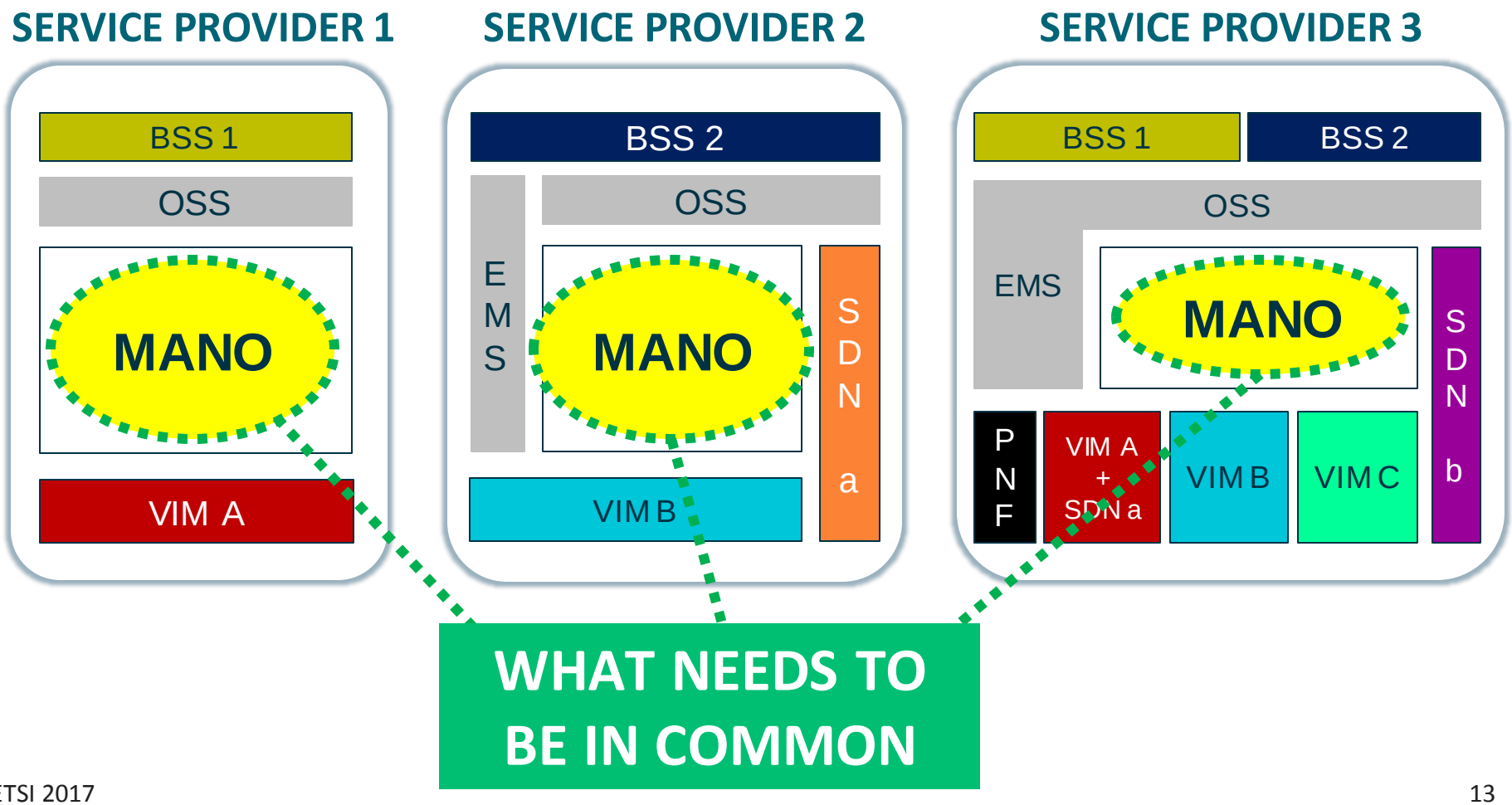
Key is INTEROPERABILITY, allowing architectural alternatives and competition



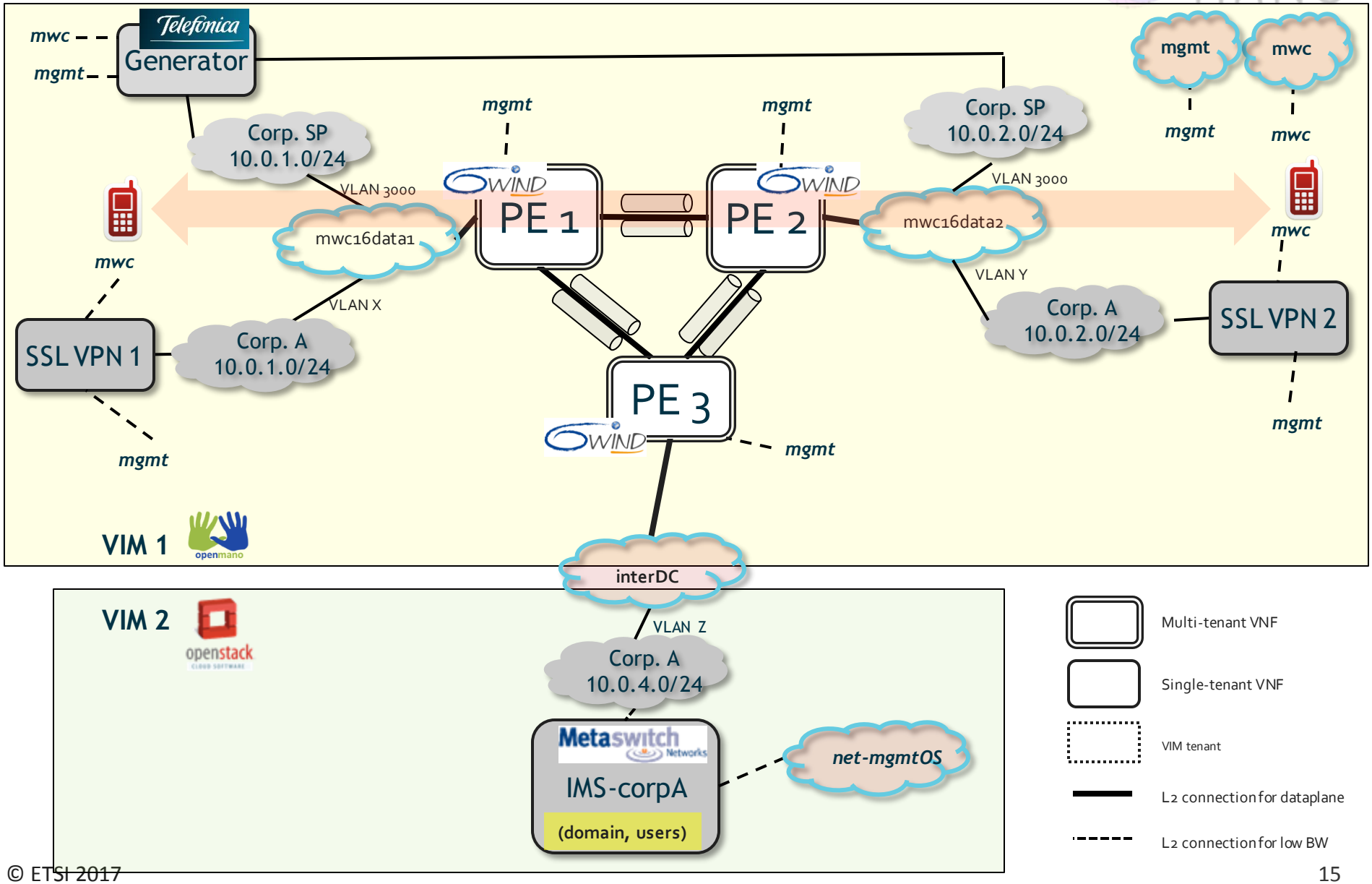
3) OSM did not start from scratch…

- **OpenMANO** as seed *Resource Orchestrator*
- **Riftware** as seed *Service Orchestrator*
- **Juju** as external reference for *VNF Config and Mgmt*

- **CODE SEEDS** helped to:
  - Avoid over-engineering due to excess of abstraction
  - Get traction at service provider level
  - Improve influence (via credibility) in other forums

- While seed code represented an initial starting point, **all components have been subject to evolution** (or even replacement) per release

… being able to demonstrate the full concept as early as MWC'2016…



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AND WE HAVE ACCOMPLISHED A LOT SINCE THEN…

OSM has delivered **3 RELEASES**, aiming PRODUCTION READINESS FOR 2017

Open Source MANO

MWC demo
(Feb)

Kick-off
(Apr)

Release ONE
(Oct)

Release TWO
(Apr)

Production Readiness

2016

2017

Release ZERO
(May)

1st ETSI NFV Plugtest
(Jan)

Release THREE target
(Oct-Nov)

OSM has delivered **3 RELEASES**, aiming PRODUCTION READINESS FOR 2017

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MOBILE WORLD CONGRESS

MWC demo
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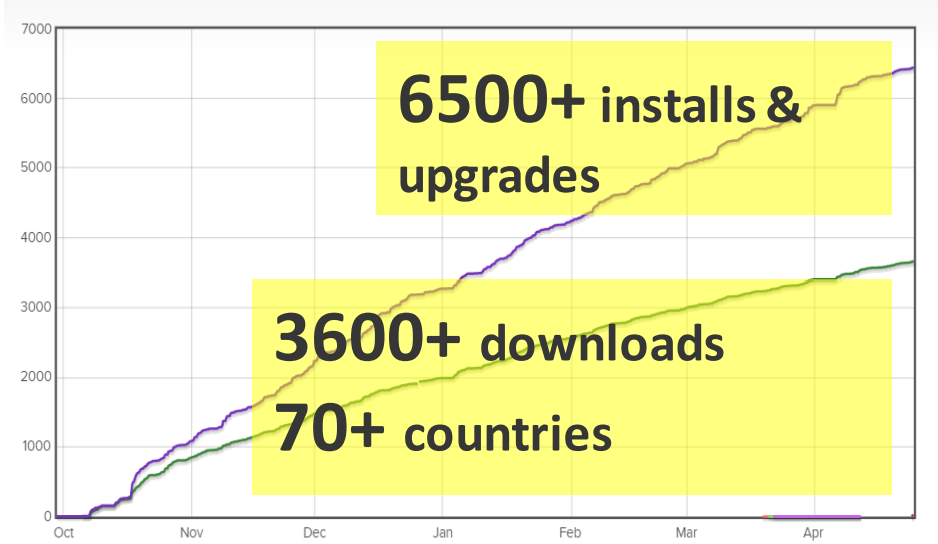
Open Source MANO
Release Zero



6500+ installs & upgrades

3600+ downloads

70+ countries

1st **NFV Plugtests** were an excellent reality check for OSM

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- **Objective:** 1 OSM descriptor for all VIMs
  - All OSM's VIM plugins were used in the tests: OpenStack, VMware, OpenVIM
  - A wide range of Openstack platforms were tested successfully:
    - From Kilo- to Newton-based
    - Deployment on specific segments: regions, availability zones.
    - Access to VMs through both provider external network and tenant network connected to the public/external network
- A total of **32 test sessions** in 8 days, **all completed successfully**:
  - Addition/removal of VNF and NS packages into the Catalog
  - Instantiation and termination of NS instances.
  - Update operations on running NS instances (start/stop VNF instance)

www.etsi.org/nfvplugtest

OSM MANAGED TO INTEROPERATE WITH ALL VIMs AND VNFs PARTICIPATING IN THE PLUGTEST

… being extremely useful to accelerate the maturation of OSM SW

Open Source MANO

22 BUGS COLLECTED AND FIXED

Some examples:

- Race condition in GUI preventing concurrency in catalog manager (bug 195).
- Timeout issues (with some VIMs and/or large NS) (bug 187)
  - New ideas to improve SO-RO IF to remove this
- More detailed feedback to facilitate troubleshooting significantly
  - Not major developments required
  - A number of suggestions are on their way as part of the new release cycle

IOP MATRIX
(note that all VNFs and VIMs were assigned at least once)

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- **OSM passed successfully all scheduled tests**
  - All VNFs, all VIMs
  - Most time spent on creation and debugging of descriptors

		OpenStack Newton	OpenStack Newton	OpenStack Kilo	OpenVIM	OpenStack+ODL	OpenStack+ODL	OpenStack Mitaka		OpenStack Mitaka w/ regions	OpenStack Mitaka w/ regions	
		VIM 1	VIM 2	VIM 3	VIM 4	VIM 5	VIM 6	VIM 7	VIM 8	VIM 9	VIM 10	
FW	VNF 1		Ok						Ok			2
LB	VNF 2							Ok				1
Probe	VNF 3		Ok	Ok					Ok			3
IMS	VNF 4		Ok									1
FW	VNF 5								Ok	Ok		2
Enterprise Messaging	VNF 6								Ok	Ok		2
Probe	VNF 7		Ok	Ok					Ok (minor issue with LCM update)	Ok	Ok	5
PCRF	VNF 8					Ok						1
FW	VNF 9							Ok				1
Probe/LB	VNF 10						Ok		Ok			2
DPI	VNF 11						Ok					1
SBC	VNF 12	Ok			Ok					Ok		3
Tester	VNF 13					Ok			Ok	Ok		3
Tester	VNF 14							Ok		Ok		2
Probe	VNF 15		Ok						Ok	Ok		3
		1	5	2	1	2	2	3	8	7	1	**32**

- *Blank = combinations not tested during the Plugtest (likely to work)*

Feedback to ETSI NFV after Release ONE was really well received…

In/Out	Title	Date	Comments
Out (to ETSI)	VNFD Implementation Challenges (NFVIFA(15)0001351)	2015 (pre-OSM)	Findings based on implementation of ETSI-NFV ISG Phase 1 models. Partially incorporated in phase 2 models
Out (to ETSI)	OSM Release ONE Feedback on Phase 2 VNFD and NSD (NFVIFA(16)0001511r1)	Dec 13th 2016	Overview of clarifications, defects (sightings) and feature requests related to the VNFD and NSD

~100 comments to the current specs, around these areas:

- Enhanced Platform Awareness
- Lifecycle management in NSD and VNF
- VNFD connection points and L2/L3 addresses
- VNFFGD
- Deployment flavours
- Nested services
- Local Affinity Rules vs. Local Affinity Groups

… while OSM has been continuously **open to feedback** to make OSM better

Open Source MANO

- **3600+** downloads & **6500** installs/upgrades just of Rel ONE!

- This huge amount of activity brings a **wealth of useful feedback** from user community (e.g. via OSM_TECH ML)
  - Early bug detection
  - Usability improvements
  - Feature priorities
  - Focus on most relevant use cases

- **All-in-one installer** and **small footprint** are being essential
  - OSM community keeps pushing to make **installer even easier** and **code even leaner**!

Release TWO brings already a really comprehensive set of capabilities

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Multi-VIM

openstack CLOUD SOFTWARE · openvim · vmware · amazon web services

Multi-SDN

OPEN DAYLIGHT · FloodLight · onos Open Network Operating System

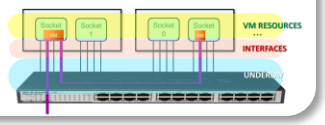
Open Source MANO

Release TWO

Available at:
osm.etsi.org

SDN assist for underlay chaining with EPA

Enables EPA deployments E2E for VIMs with no underlay support

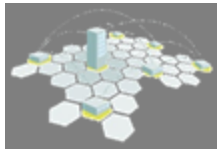


One-click installer
(multiple formats)

Network Service scaling

Full Day 0 & Day 1 operations

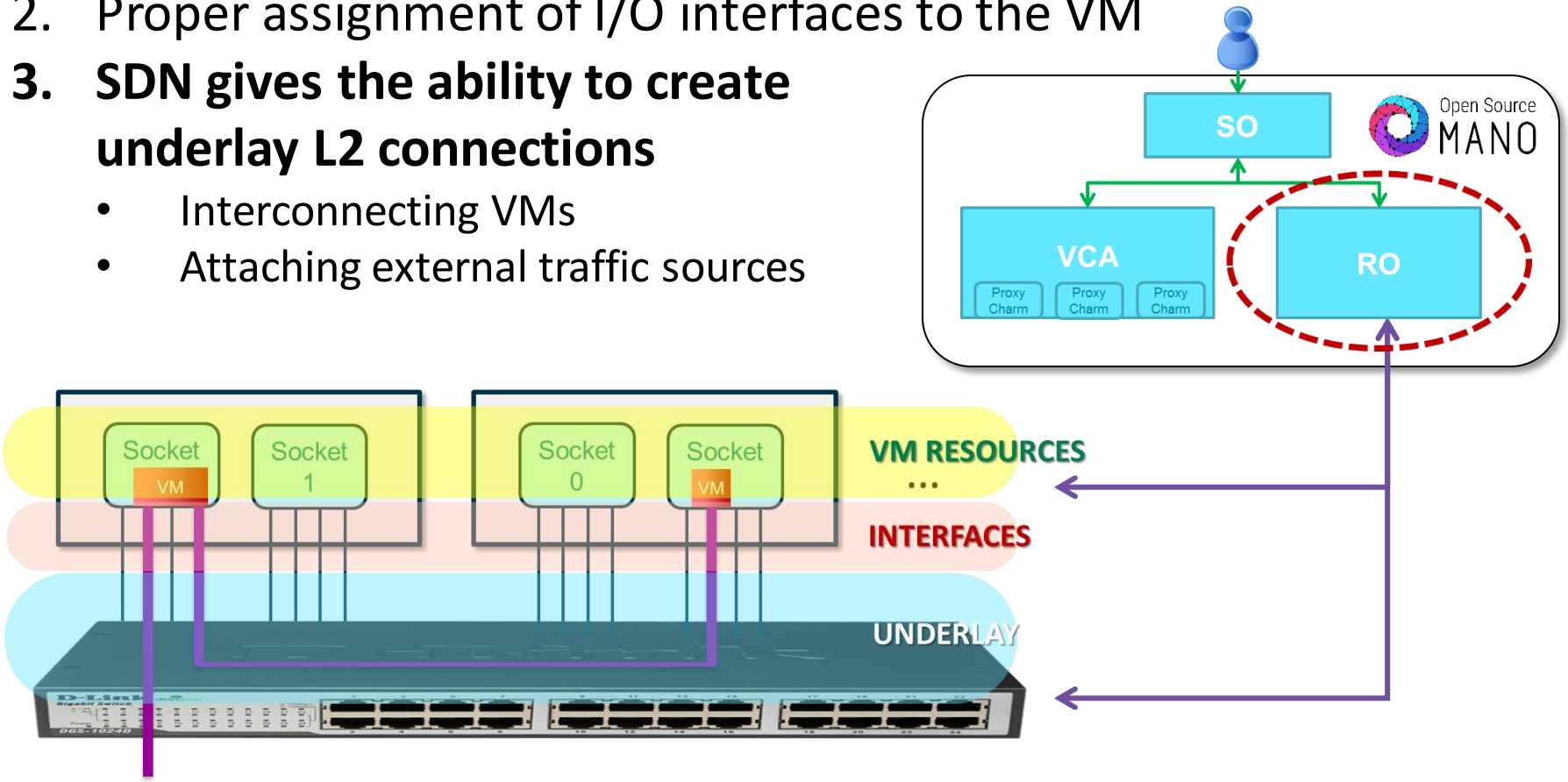
Multi-site Network Services



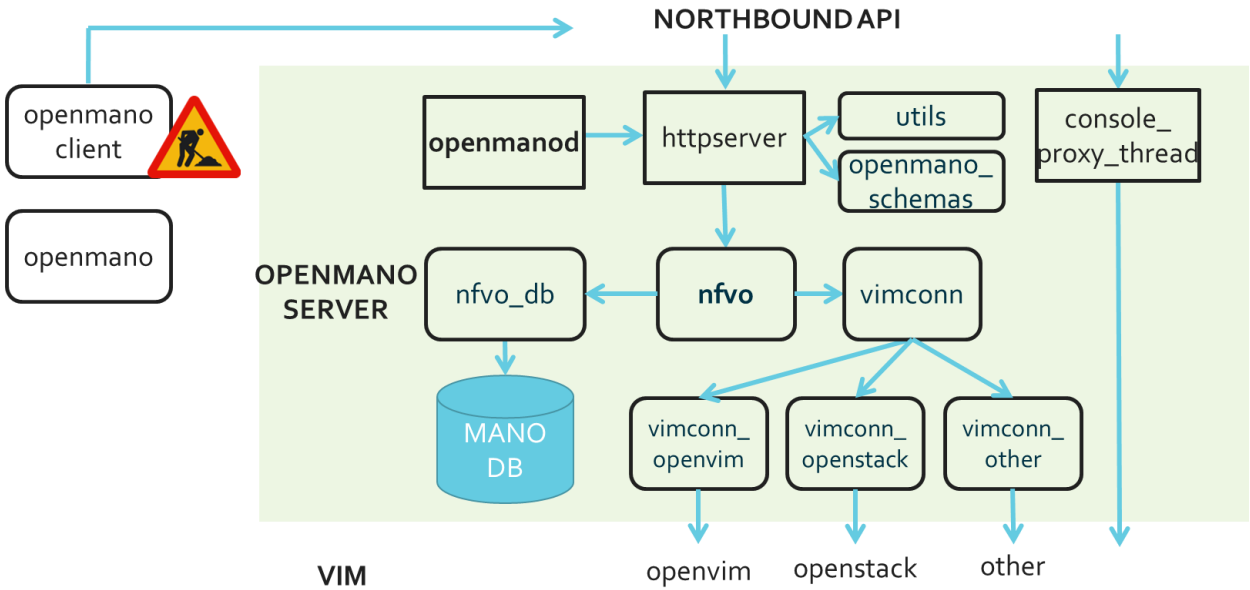
… and many improvements in interoperability, stability, security, etc.

EPA support combined with SDN Assist enables chaining of high performance VNFs

1. Accurate assignment of resources at VM level
2. Proper assignment of I/O interfaces to the VM
3. **SDN gives the ability to create underlay L2 connections**
   - Interconnecting VMs
   - Attaching external traffic sources

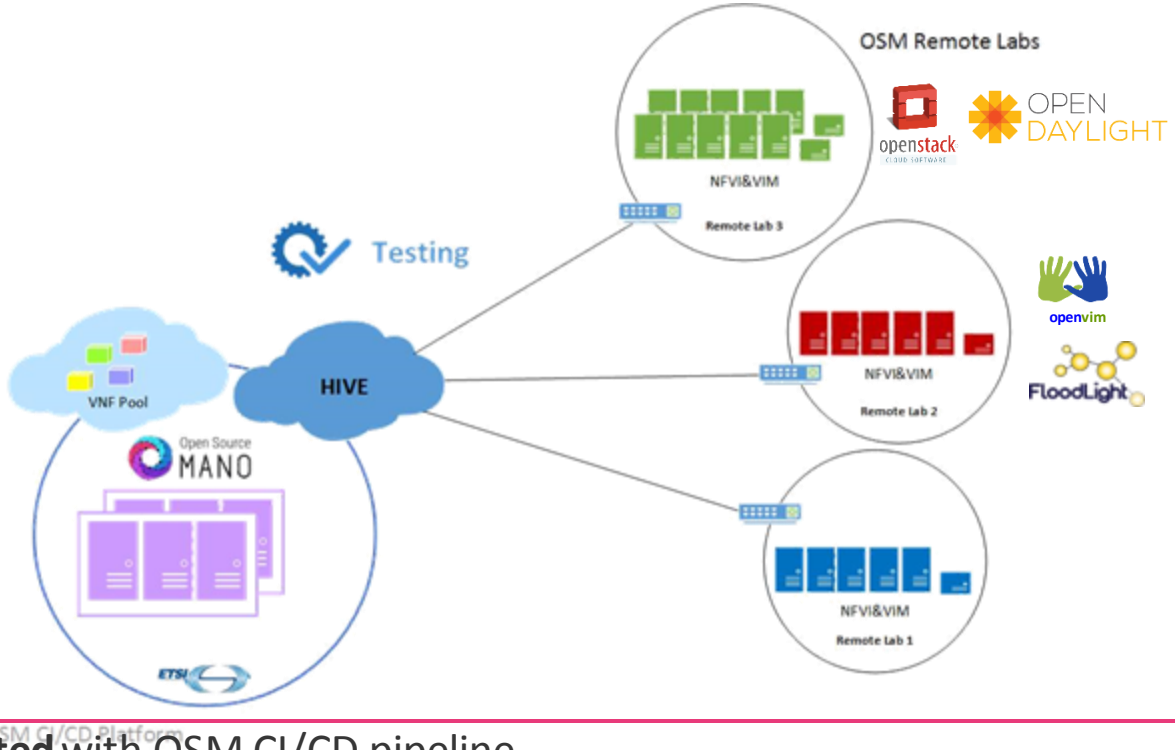


The **plugin model** facilitates interop with different clouds and controllers



CMS PLUGINS	SDN PLUGINS
• OpenStack (several flavours) • OpenVIM • VMware (vCD) • AWS • Add your plugin here	• ODL • ONOS • FloodLight • Add your plugin here

OSM's Network of Remote Labs enables continuous & automated testing with different VIMs and NFVIs



- Fully **integrated** with OSM CI/CD pipeline
- Bring **realistic conditions** to OSM testing, as continuous proof of interop
- **Minimise barriers** for community engagement
- **Securely connected** over ETSI's HIVE (Hub for Inter-operability and Validation)
- **POWERFUL TOOL TO ENSURE AND EXTEND INTER-OPERABILITY**

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AS ALWAYS, AFTER AN ACHIEVEMENT THERE ARE NEW CHALLENGES AHEAD

Next OSM Milestones

Some key areas for Release THREE

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Production-readiness

- Platform resiliency
- Extend Day 2 operations
- SA & telemetry
- Etc.

Efficient SW evolution

- Keep effective IM control by TSC
- Focus on E2E features
- Timely decisions and designs
- Avoid bottlenecks

Testing to play a central role

- Mean to test interoperability
- Automation as goal

Keep promoting contributions and giving them credit

- Leverage on huge OSM community size to progress (even) faster!
- Engage current & new community members
- Recognize big and new contributors
- Minimize barriers to participation

Keep growing base of users

- Facilitate VNF onboarding (and give it visibility)
- Consider new use cases and PoCs
- Improve user experience, particularly related to installation and first use
- Public cloud support should help

Keep explaining what we do (& track the impact)

Production-Ready & Go To Market

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Release THREE goal: PRODUCTION-READY

- Focus on **E2E features** and **telco-grade MVP**
  - **EUAG input** has been key to initiate this process
  - **Use cases** during the release cycle might shape it too
- Facilitate external visibility with **OSM's Ecosystem Map**
  - **Visibility for go-to-market** (think of coming RFx)
  - **Enable the ecosystem** for:
    - Evolution & integration (e.g. system integrators)
    - Interoperability (e.g. VNFs)
    - Use & operation (e.g. service providers)

SOME DIRECTIONS
(for Release THREE and beyond)

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- Architectural support of **Service Assurance**
- Security – **RBAC & Authentication** between modules
- **Improved UI/CLI feedback** to facilitate troubleshooting
- Towards full VNF and NS **dynamicity and scaling**
- **New types of VIMs and SDNC** (leveraging on plugin model):
- **Nested Network Services**
- Generalized approach to **service chaining**

CONTINUOUS IMPROVEMENTS IN USABILITY AND MODELLING ARE FORESEEN!

WHAT WE WANT TO PRESERVE

- Keep the pace of delivery
  - OSM participants want to do things for real!
- Keep following OSM's architectural principles
  - Layering, modularity, abstraction, simplicity
- OSM is opinionated, avoiding "all things to all people"
- Preserve and improve the current WoW
  - Current WoW gives a lot of freedom to evolve project's organization as OSM Community requires
- Meritocracy and technical competence are tied with empowerment
  - All OSM MDLs are in control of their module and fully understand E2E implications

If you want to learn more…

- **OSM Release TWO – GIVE IT A TRY!**
  - Follow instructions at: https://osm.etsi.org/wikipub/index.php/OSM_Release_TWO

Open Source MANO
Release TWO

Available at:
osm.etsi.org

- **OSM Release TWO White Paper**
  - https://osm.etsi.org/images/OSM-Whitepaper-TechContent-ReleaseTWO-FINAL.pdf


Open Source MANO

An ETSI OSM Community White Paper

OSM RELEASE TWO

A TECHNICAL OVERVIEW

April 2017

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BACKUP SLIDES

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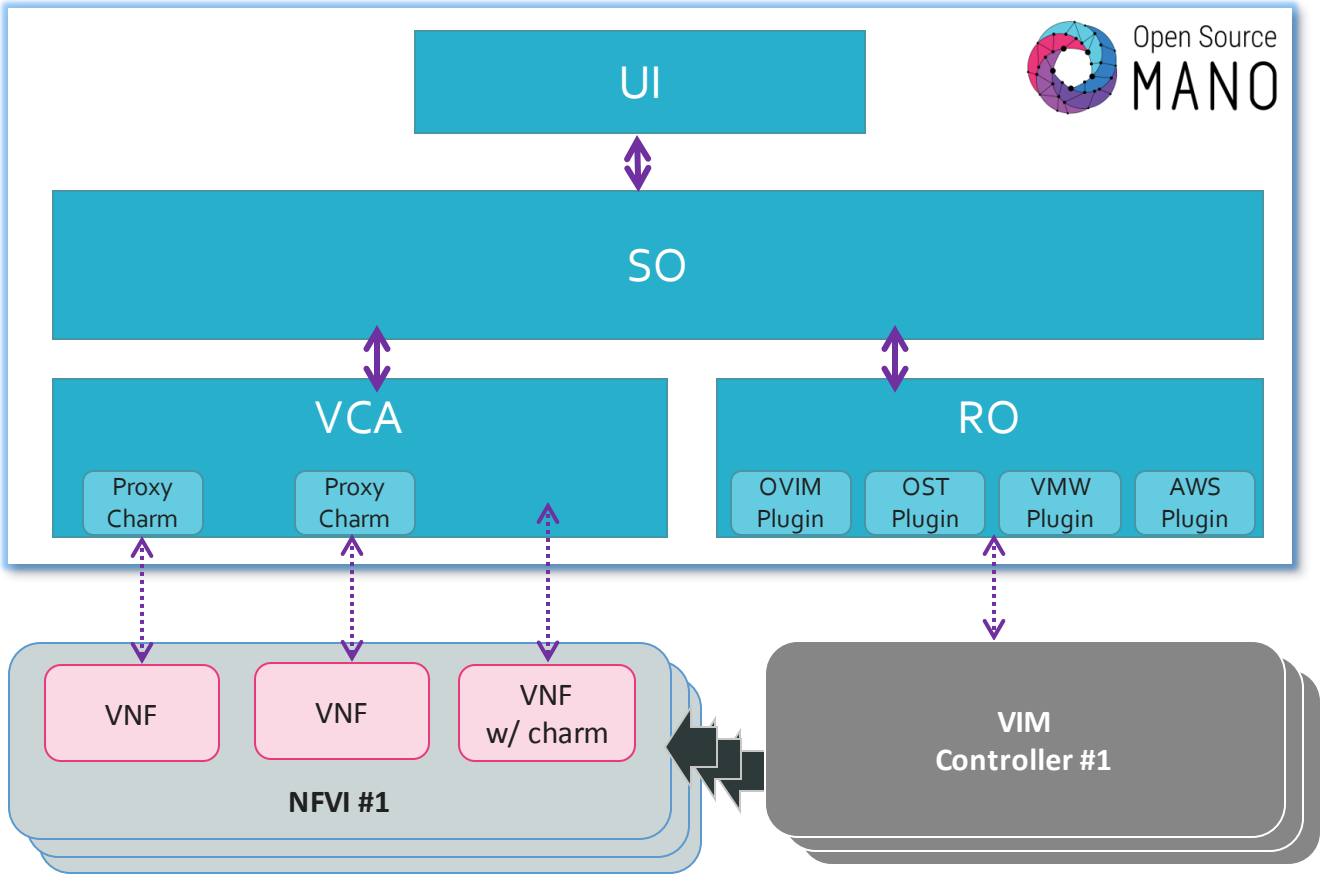
OSM ARCHITECTURE

Architectural Principles for OSM

- **LAYERING**
  - Require clear delineation between the layers and modules.
  - Should be broadly aligned with ETSI-NFV
- **ABSTRACTION**
  - Moving up/down the layers should offer clear differentiation in the levels of abstraction/detail presented.
- **MODULARITY**
  - Even within layers, clear modularity enabled with a plugin model preferred to facilitate module replacements as OSM community develops.
- **SIMPLICITY**
  - Solution must have the minimal complexity necessary to be successful and no more.

OSM Architecture – Release TWO



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

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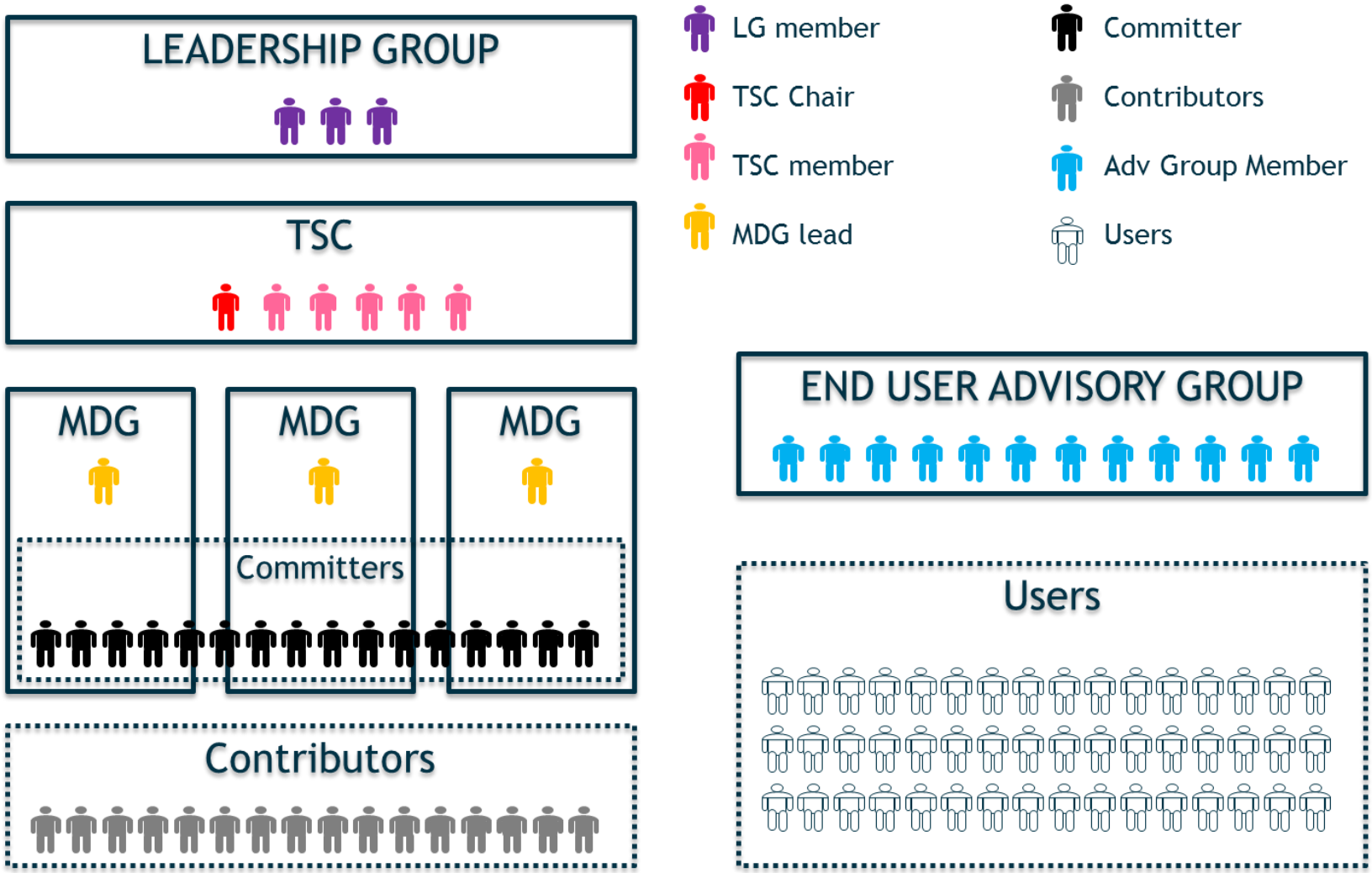
OUR WAY OF WORK

OSM has an organization oriented to the production of upstream code…



… which favours efficient decision taking

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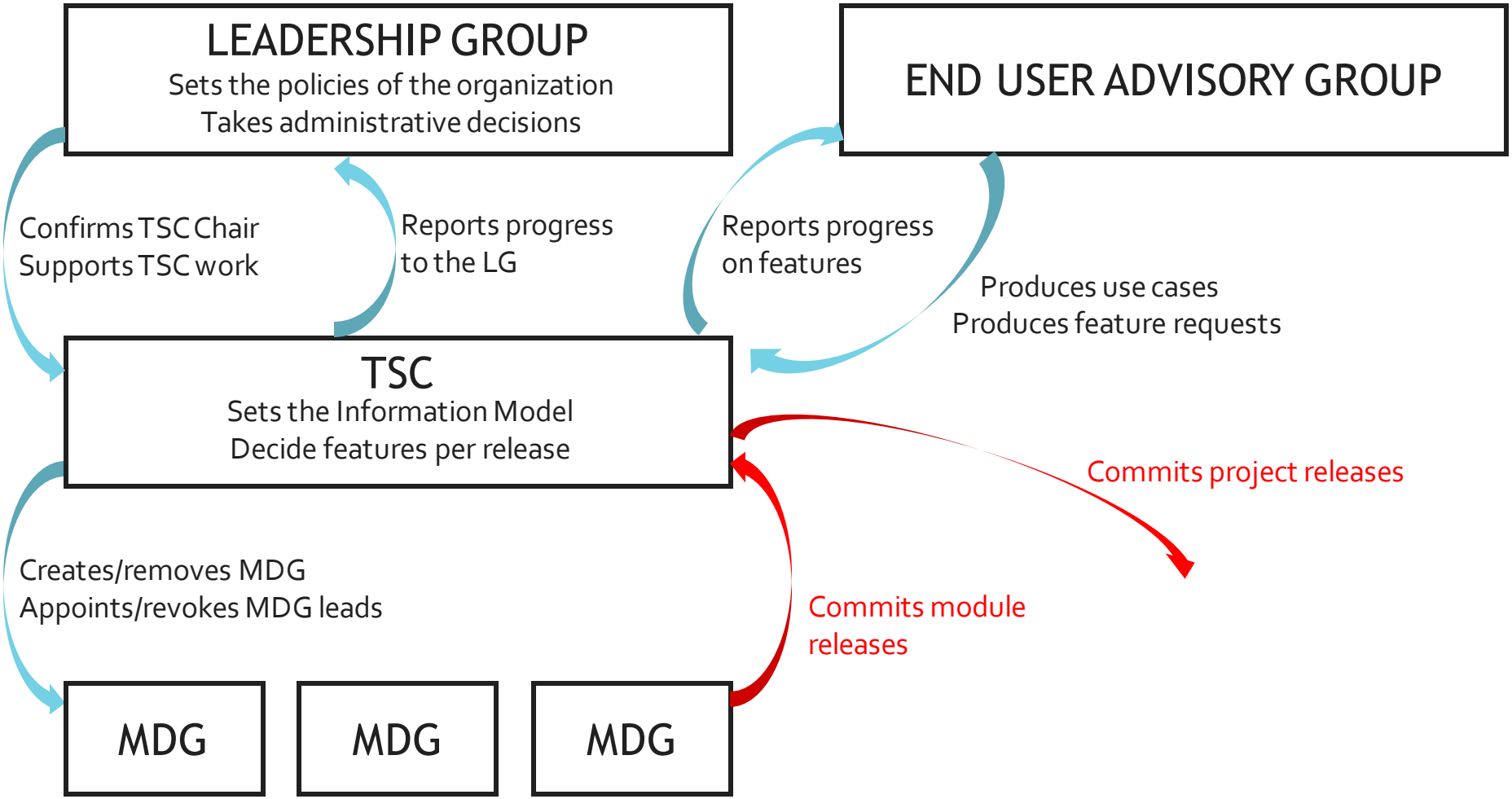

OSM STRUCTURE DURING **RELEASE TWO**

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Leadership Group (LG)
Chair: FJ Ramón Salguero (Telefónica)
Vice-Chair: Andy Reid (BT)
Vice-Chair: Pål Grønsund (Telenor)

End User Advisory Group (EUAG)
Chair: Andy Reid (BT)

Technical Steering Committee (TSC)
Chair: Adrian Hoban (Intel)
Member: Gerardo García de Blas (Telefónica)
Member: Mark Shuttleworth (Canonical)
Member: Matt Harper (Rift.io)
Member: Vanessa Little (VMware)

Marketing TF
Convenor: Chris Buerger (Intel)

VNF Config & Abstraction TF (VCA)
Convenor: Marco Ceppi (Canonical)

Interoperability Testing TF
Convenor: Noel Charath (RIFT.io)

User Interface MDG (UI)
MDG Lead: Kiran Kashalkar (RIFT.io)

Nw Service Orchestration MDG (NSO)
MDG Lead: Rajesh Velandy (RIFT.io)

Resource Orchestration MDG (RO)
MDG Lead: Alfonso Tierno Sepúlveda (Telefónica)

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More information at:

osm.etsi.org
osm.etsi.org/wikipub