OPEN SOURCE MANO

INTRODUCING OPEN SOURCE MANO

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ETSI OSM Chair
NFV promises to go from traditional network management...

**Day 0**
- PNF installation
- Initial configuration to make PNF reachable (user, pwd, network, etc.)

**Day 1**
- License activation
- Injection of configuration
- Neighbor configuration
- Network configuration

**Day 2**
- Service provisioning
- Business provisioning
... to native NFV management, with highly efficient automation and operation

Day 0
- VNF deployment
- NS deployment (complex topology)

Day 1
- License activation
- VNF configuration
- Neighbor configuration

Day 2
- Service provisioning
- Business provisioning
Leveraging replaceable components that can be safely & automatically assembled...
NICE BUT...
Which one would you choose?

**Enterprise (NCC-1701)**

- Designed in the 60’s...
- Faster than x8 light speed
- Much bigger than a football pitch, comfortable for 10s crew members
- Public was interested for decades
- You can wear comfortable clothes
- Never flew for real

**Apollo XI**

- Designed in the 60’s...
- Much slower than light speed (0.0037%)  
- Maybe bigger than an open kitchen, terribly uncomfortable for 3 people
- Public was interested just a few days
- Need to wear awkward outfits
- Can bring you to the Moon and return safely!
Reality is not always pretty at first glance; it is pretty mostly because it works!

Enterprise (NCC-1701)

Best if you like wearing pajamas and be on TV

Best if you want to go to the Moon for real!

Apollo XI
... OK, SO WHAT’S OUT THERE THEN?
Operating a real Virtualised Network looks more like this, with multiple sites and technologies...

Topologies and combinations of technologies are provided as examples.
... that require the configuration & coordination of an even larger set of elements...
... and unless we are ready to respect the layering, management gets really complicated

```
NS#1
  VNF 1
  VNF 2
  VNF 3

NFV Orchestration

NFVI
  Hypervisor
  Hardware

VIM
  Cloud Management System
  SDN Controller

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... and unless we are ready to respect the layering, management gets really complicated.
... and unless we are ready to respect the layering, management gets really complicated.
And modelling is not helping either...

- Inadequate VNF Modelling
- Hard Onboarding
- Uneven VNF Catalogue

Basic NSD

Ad hoc integration often needed

Basic and Hand-Made Network Service
SO, WHAT ARE YOU DOING ABOUT IT?

A.K.A. “how you are planning to take me the moon?”
Strategy for a smart maturation

**FOCUS ON WHAT WE HAVE IN COMMON**

<table>
<thead>
<tr>
<th>SERVICE PROVIDER 1</th>
<th>SERVICE PROVIDER 2</th>
<th>SERVICE PROVIDER 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSS 1</td>
<td>OSS</td>
<td>MANO</td>
</tr>
<tr>
<td>BSS 2</td>
<td>OSS</td>
<td>MANO</td>
</tr>
<tr>
<td>EMS</td>
<td>SDN a</td>
<td>VIM A</td>
</tr>
<tr>
<td>VIM B</td>
<td></td>
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<td>SDN</td>
<td>VIM a</td>
<td>VIM B</td>
</tr>
<tr>
<td>SDN b</td>
<td></td>
<td>VIM C</td>
</tr>
</tbody>
</table>

Key is **INTEROPERABILITY**, not full architecture

**MULTIPLE VIMs & SDNs ARE HERE TO STAY** (public clouds too!)

**LEVERAGE ON ETSI NFV WORK**

**READY FOR GREENFIELD AND BROWNFIELD**

**PERFORMANCE MATTERS FOR THE BUSINESS CASE**

**OPEN SOURCE AS TOOL TO FACILITATE CONVERGENCE**
3 reasons to go to open source

1. To accelerate the availability of a reference standard

2. To build a wide and competitive market of producers and consumers

3. To answer the BUY vs. MAKE question
Some requirements to make Open Source MANO fit for purpose

• OPEN TO PLAYERS OF ALL SIZES
  • Need of a diverse community
  • Adding expertise & demand

• SUSTAINABLE AND RELIABLE
  • The leaner, the better

• OPEN TO NEW TECHNOLOGIES
  • Key for future-proof

• AND READY TO DELIVER!

Focus on the core, leave the rest to INTEROP
So, what does OSM provide in practice?
OSM provides a production-quality MANO stack...

• 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

LOCAL DEVELOPMENT & TESTING
- Open Development Env
- Functional tests
- Low cost
- Integration from the beginning

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

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

SAME IMAGES AND VNF PACKAGE ACROSS ALL THE CHAIN!
... with a rich IM that embeds all the operational procedures and requirements...
... so that they can run across different types of VIMs, Infrastructures, and OSS

Key is INTEROPERABILITY, allowing architectural alternatives and competition

WHAT NEEDS TO BE IN COMMON
OSM scope covers all that is required to deliver a production-quality MANO stack.

**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 VNFNM 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
OSM community is really LARGE AND DIVERSE, with 95 members today.

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

(*) Names & brands may be claimed as the property of others
... and open to fellow travellers, with \textbf{REALLY LOW BARRIERS FOR PARTICIPATION}

<table>
<thead>
<tr>
<th>ETSI MEMBERS</th>
<th>NON-ETSI MEMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sign Member Agreement &amp; CCLA</td>
<td>• Sign Participant Agreement &amp; CCLA</td>
</tr>
<tr>
<td>• Free participation</td>
<td>• Fees per F2F meeting (same as in ETSI NFV)</td>
</tr>
</tbody>
</table>

**Individual developers and end users**

• Just create an individual account

MORE INFO AT: \texttt{osm.etsi.org}
OK, BUT HOW CLOSE IS OSM TO TAKE ME TO THE MOON?
OSM is about to deliver its 5th RELEASE, after reaching PRODUCTION READINESS.
OSM is about to deliver its 5th RELEASE, after reaching PRODUCTION READINESS.

- 6000+ downloads
- 70+ countries
- 10K+ installs & upgrades

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Release TWO & THREE brought a really comprehensive set of capabilities (1/2)

Multi-VIM

Multi-SDN

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.
Release TWO & THREE brought a really comprehensive set of capabilities (2/2)

Role-Based Access Control

Monitoring (experimental)
Plugin Model, NFVI to VDU correlation, App metrics, normalization

Explicit port ordering & Device Role Tagging

Anti-affinity rules for VNF resiliency

Full Interop with VIO 4

VIM emulator (OpenStack-like)

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

Soon available at: osm.etsi.org
OSM’s CI/CD enjoys a Network of Remote Labs to test interop with different VIMs and NFVIs.
And, well... we won the **Network Transformation Award 2017 for BEST OPEN SOURCE DEVELOPMENT**
AREN'T YOU DONE YET?

IS THE SOFTWARE FINISHED?
SOFTWARE IS NEVER FINISHED.

DID YOU FIX ALL OF THE BUGS?

THERE'S NO WAY TO KNOW.

I CAN'T MANAGE YOU IF YOU DON'T LEARN TO LIE.

OKAY, THE SOFTWARE WILL BE PERFECT IN 2.3 DAYS.
OSM is continuously open to feedback to make the system better

- **6K+ downloads & 10K+ installs/upgrades** just of Rel ONE+TWO!

- 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, leaner, and more robust!*

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OSM is really committed to optimize code efficiency continuously...

<table>
<thead>
<tr>
<th>Version</th>
<th>Min. RAM (GB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed code (2016-Q1)</td>
<td>24</td>
</tr>
<tr>
<td>Release ZERO (2016-Q2)</td>
<td>24</td>
</tr>
<tr>
<td>Release ONE (2016-Q4)</td>
<td>16</td>
</tr>
<tr>
<td>Release TWO (2017-Q2)</td>
<td>12</td>
</tr>
<tr>
<td>Release THREE (2017-Q4)</td>
<td>8</td>
</tr>
<tr>
<td>Release FOUR target (2018-Q2)</td>
<td>2</td>
</tr>
</tbody>
</table>
... bearing in mind that perspective sometimes helps

Min. RAM (GB)

- Star Trek's ENTERPRISE (2017-Q4): 336 GB
- Seed code (2016-Q1): 24 GB
- Release ZERO (2016-Q2): 24 GB
- Release ONE (2016-Q4): 16 GB
- Release TWO (2017-Q2): 12 GB
- Release THREE (2017-Q4): 8 GB
- Release FOUR target (2018-Q2): 2 GB

Min. RAM (GB) x168
OSM was again present in the latest NFV Plugtests (2\textsuperscript{nd}), in touch with reality

- 2 commercial OSM-based distros

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Solution</th>
<th>Location</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atos</td>
<td>SONATA</td>
<td>Spain</td>
<td>Open Source NFVO + Generic VNFM</td>
</tr>
<tr>
<td>Cisco</td>
<td>Tail-f NFVO</td>
<td>Sweden</td>
<td>NFVO and Elastic Services Controller</td>
</tr>
<tr>
<td>EnterpriseWeb</td>
<td>EnterpriseWeb</td>
<td>USA/Canada</td>
<td>Microservice-based NFVO and Generic VNFM</td>
</tr>
<tr>
<td>Ericsson</td>
<td>Cloud Manager</td>
<td>New Jersey, USA</td>
<td>NFVO and Generic VNFM</td>
</tr>
<tr>
<td>Fraunhofer FOKUS</td>
<td>Open Baton</td>
<td>Germany</td>
<td>Open Baton NFVO and Generic VNFM</td>
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<tr>
<td>HPE</td>
<td>NFV Director</td>
<td>France/Spain</td>
<td>HPE NFV Orchestration solution</td>
</tr>
<tr>
<td>Luxoft</td>
<td>SDL</td>
<td>Romania</td>
<td>NFVO and Generic VNFM</td>
</tr>
<tr>
<td>RIFT.io</td>
<td>RIFT.ware</td>
<td>USA</td>
<td>OSM based MANO Orchestration (NFVO and Generic VNFM)</td>
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<tr>
<td>Whitenstack</td>
<td>WhiteNFV</td>
<td>USA</td>
<td>OSM Rel THREE distribution (NFVO and Generic VNFM)</td>
</tr>
<tr>
<td>ZTE</td>
<td>CloudStudio</td>
<td>China</td>
<td>NFVO and Generic VNFM</td>
</tr>
</tbody>
</table>

- No other commercial distros were based on open source projects

- Leveraging on community experience:
  - Wealth of VNFs with available OSM descriptors/packages
  - Interop guaranteed upfront with participant NFVI+VIM

- Some new Rel FOUR functionality was conceived there:
  - Policy Manager, VNF alarms framework, etc.
While it has organized its 1\textsuperscript{st} and 2\textsuperscript{nd} Hackfests to enable the ecosystem too

• **1\textsuperscript{st} OSM Hackfest** (Sophia Antipolis, France)
  • Co-located with 2\textsuperscript{nd} NFV Plugtests @ ETSI premises
  • VNF on-boarding, covering Day 0/1/2 operations
  • Full descriptor development to leverage the full suite of capabilities offered by OSM
    • Service and resource orchestration
    • VNF configuration with charm development

• **2\textsuperscript{nd} OSM Hackfest** (Madrid, Spain)
  • Co-located with Zero Touch Carrier Automation Congress @ Intel premises
  • 2\textsuperscript{nd} edition of hands-on activities, to meet the demand that was unattended
  • Max room capacity was reached weeks before... ... so we’ll need to think of a 3\textsuperscript{rd} edition? 😊
Key directions for Release FOUR and beyond

Platform deployment
- Redundancy
- Self-healing
- Distributed modes

Service Assurance & Monitoring
- Incorporate to IM control
- Focus on E2E enablement

User experience
- Feedback and diagnosis
- Explore external viewing tools

Testing to keep playing a central role

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

Keep explaining what we do (& track the impact)
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 THREE – **GIVE IT A TRY!**

• OSM Release THREE White Paper

• Tutorials and examples from **1st OSM Hackfest**
  • [https://osm.etsi.org/wikipub/index.php/1st_OSM_Hackfest](https://osm.etsi.org/wikipub/index.php/1st_OSM_Hackfest)
If you want to explore further:

osm.etsi.org
osm.etsi.org/wikipub
The short history of OSM

- **MWC demo** (Feb)
- **Kick-off** (Apr)
- **Release ONE** (Oct)
- **Release TWO** (Apr)
- **Release THREE** (Oct)
- **2nd ETSI NFV Plugtest** (Jan)
- **Release FOUR** (Apr-May)

- **Release ZERO** (May)
- **1st ETSI NFV Plugtest** (Jan)
- **Production Readiness**
## Feedback to ETSI NFV after Release ONE

### VNFD Implementation Challenges

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

~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