ETSI OSM-TFS Integration
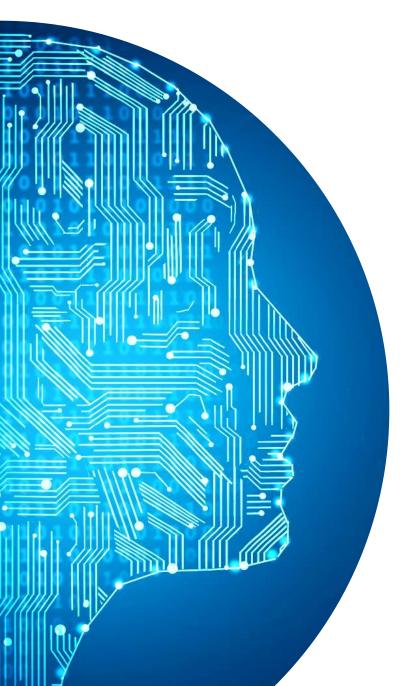
New WIM-related features and future OSM+TFS integration plans

Lluis Gifre, Ricard Vilalta (CTTC)

16/06/2022

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Agenda

- ETSI TeraFlowSDN (TFS) OSG

- Contributions from ETSI TeraFlowSDN OSG

- Experimental Demonstrations

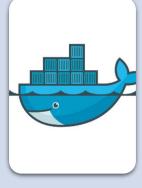- OSM-TFS Long-term Testbed Proposal

ETSI TeraFlowSDN (TFS) OSG

Do we need YET another Transport SDN controller?

Cloud-native SDN controller for supporting future networks beyond 5G.	Hosted by ETSI and based on results of the European Union-funded TeraFlow 5G PPP research project.	Micro-services architecture provides key benefits: Scalability, Self-healing, Integrity	'Toolbox' for ETSI groups working on network transformation.	Supports use cases such as autonomous networks, inter-domain, and cybersecurity.	Enables the alignment of multi-SDO goals and helping to accelerate standardization cycles.	ETSI TeraFlowSDN to serve as reference implementation for Telecom Infra Project	The source code of TeraFlowSDN is publicly available under the Apache Software Licence.

ETSI TeraFlowSDN: A growing community

- Members
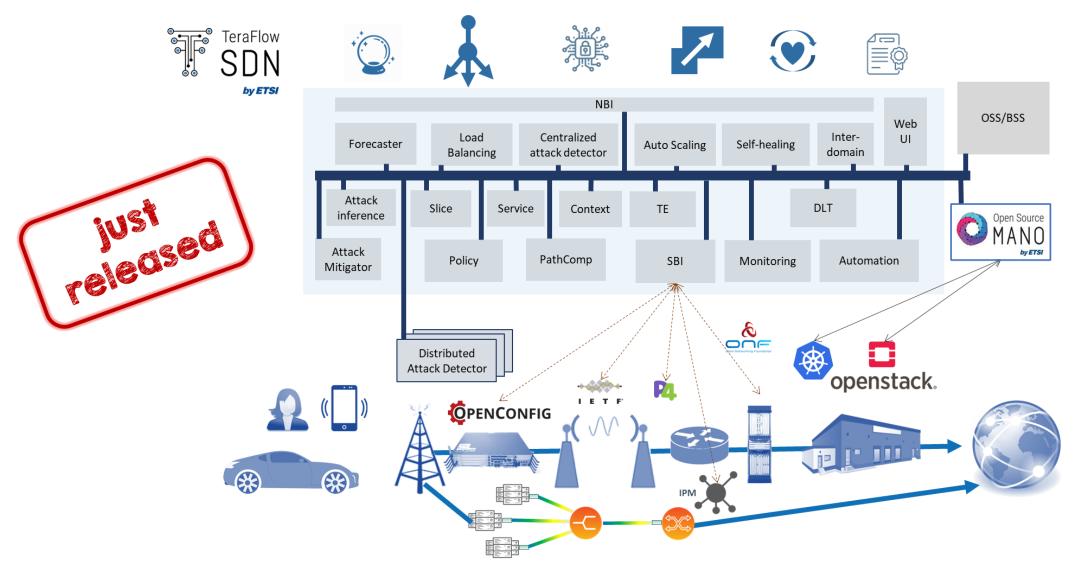

- Participants (Non-ETSI members)
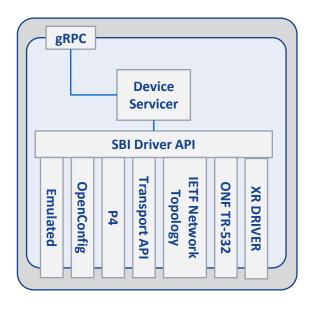
TFS Release 2 Architecture

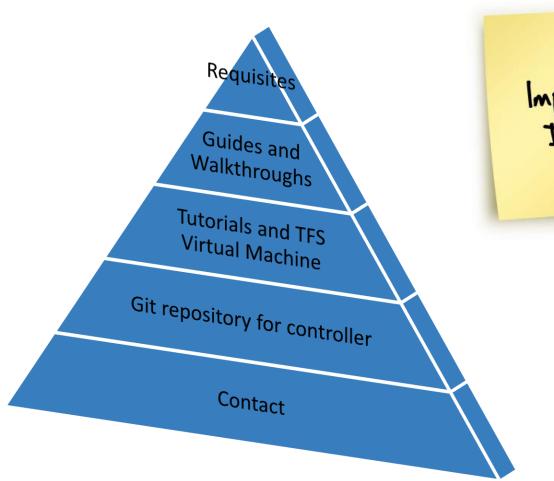# Controlled and managed network elements/domains

- The TeraFlowSDN controller uses its **North-Bound Interface** (NBI) component to receive:

  - **Layer 2 Virtual Private Network** (L2VPN) requests and convert them to necessary connectivity services.

  - **Transport Network Slices** via the Slice and Service components.

- The **Service** component is responsible for selecting, configuring, and deploying the requested connectivity service through the **South-Bound Interface** (SBI).

- The **SBI** component interacts with the network equipment through pluggable drivers.

  - A **Driver API** has been defined to facilitate the addition of new network protocols and data models to the SBI component. Validated drivers include:
    - OpenConfig-based routers.
    - Optical SDN controllers through the Open Networking Foundation (ONF) Transport API (TAPI).
    - Microwave network elements through the IETF Network Topology YANG model.
    - Point-to-Multipoint integration of Infinera XR optical transceivers.
    - Support for P4 routers that includes (i) loading a P4 pipeline on a given P4 switch; (ii) getting runtime information (i.e., flow tables) from the P4 switch; and (iii) pushing runtime entries into the P4 switch pipeline, thus allowing total usage of P4 switches.

Our single point of entry: https://tfs.etsi.org

Requisites

Guides and Walkthroughs

Tutorials and TFS Virtual Machine

Git repository for controller
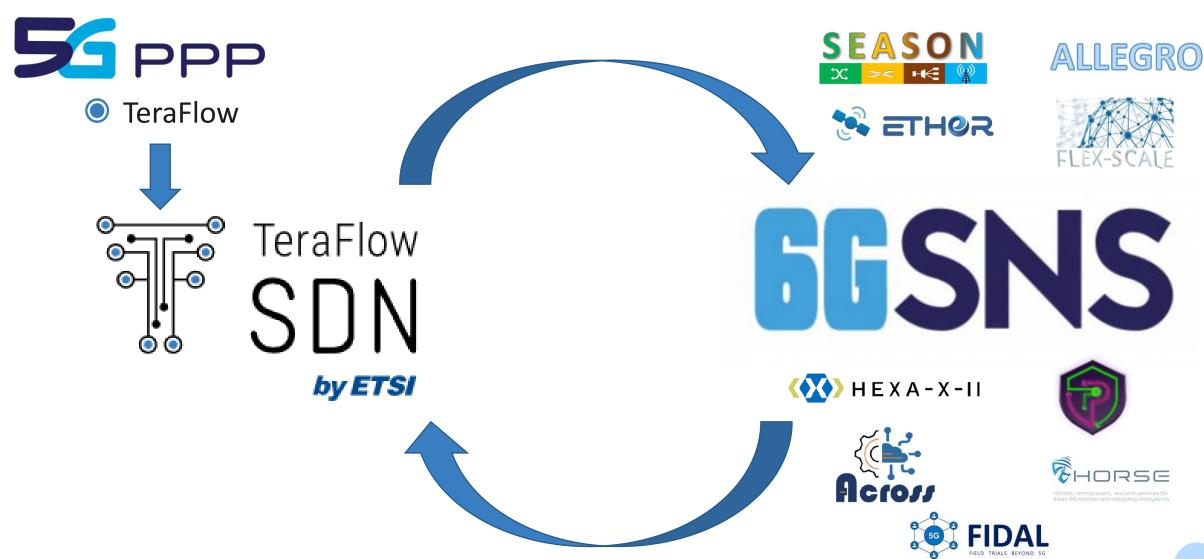
Contact

Important Dates

Come and join us

Hackfest #2: 20-21 June 2023, Madrid (Spain). Collocated with IEEE NetSoft
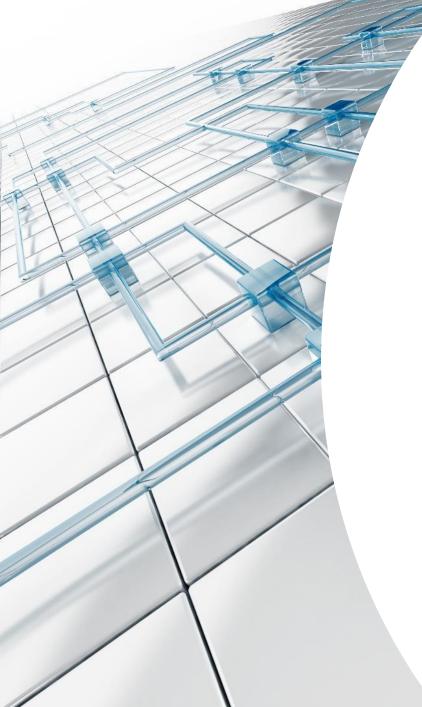
Hackfest #3: 16-17 October, Castelldefels (Spain)

TFS Ecosystem day: 18 October, Castelldefels (Spain)

Bridges to Research – Building the TFS ecosystem

9

Contributions from ETSI TeraFlowSDN OSG

End-2-End Workflow extensions and Bug Fixes

Open Source MANO

Change	Subject	Project	Branch
#12683	Feature 10954 to automatically select WIMs for inter-datacenter networks	osm/LCM	master
#13226	Feature 10937: Transport API (TAPI) WIM connector for RO	osm/RO	master
#11712	Fix bug 1886 to hide WIM password properly in command wim-show	osm/osmclient	v10.0
#12511	Fix 2152 to hide WIM password properly in command wim-show	osm/osmclient	v12.0
#12512	Fix 2153 to hide WIM password properly in command wim-show	osm/osmclient	master
#11731	Fix 1899 to select correct WIM connector class and prevent exceptions with missing parameters	osm/RO	v10.0
#12523	Fix 2154 to select correct WIM connector class and prevent exceptions with missing parameters	osm/RO	v12.0
#12525	Fix 2156 to select correct WIM connector class and prevent exceptions with missing parameters	osm/RO	master
#11732	Fix bug 1902 to resolve issues with IETF L2VPN WIM connector	osm/RO	v10.0
#12524	Fix 2155 to resolve issues with IETF L2VPN WIM connector	osm/RO	v12.0
#12526	Fix 2157 to resolve issues with IETF L2VPN WIM connector	osm/RO	master
#11730	Fix 1901 to encrypt correct WIM account password field and check WIM accounts	osm/NBI	v10.0
#12509	Fix 2150 to encrypt correct WIM account password field and check WIM accounts	osm/NBI	v12.0
#12510	Fix 2151 to encrypt correct WIM account password field and check WIM accounts	osm/NBI	master

Design of Feature 10954: https://osm.etsi.org/pad/p/feature10954
Design of Feature 10937: https://osm.etsi.org/pad/p/feature10937
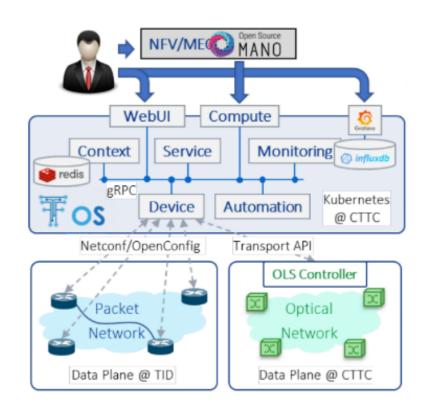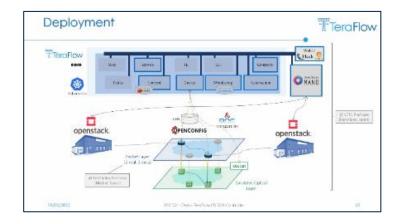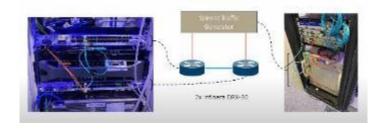
Experimental Demonstrations
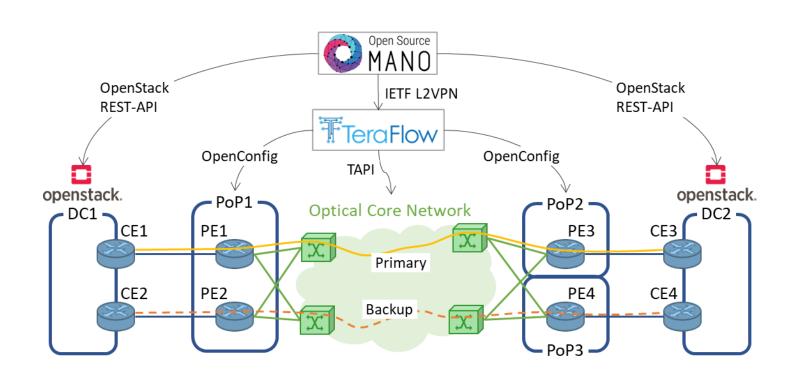
ETSI OSM and ETSI TFS integration

Demonstration of Zero-touch Device and L3-VPN Service Management using the TeraFlow Cloud-native SDN Controller, Ll. Gifre, C. Natalino, S. Gonzalez-Diaz, F. Soldatos, S. Barguil, C. Aslanoglou, F. J. Moreno-Muro, A. N. Quispe Cornelio, L. Cepeda, R. Martinez, C. Manso, V. Apostolopoulos, S. Petteri Valiviita, O. Gonzalez de Dios, J. Rodriguez, R. Casellas, P. Monti, G. P. Katsikas, R. Muñoz, and R. Vilalta

Transport Network Slicing with SLA Using TFS

Feature for OSM
(under discussion)

Extend IETF L2VPN WIM connector with high availability capacities.

Experimental Demonstration of Transport Network Slicing with SLA Using the TeraFlowSDN Controller, Ll. Gifre, D. King, A. Farrel, R. Casellas, R. Martinez, J.-P. Fernández-Palacios, O. González-de-Dios, J.-J. Pedreno-Manresa, A. Autenrieth, R. Muñoz, R. Vilalta
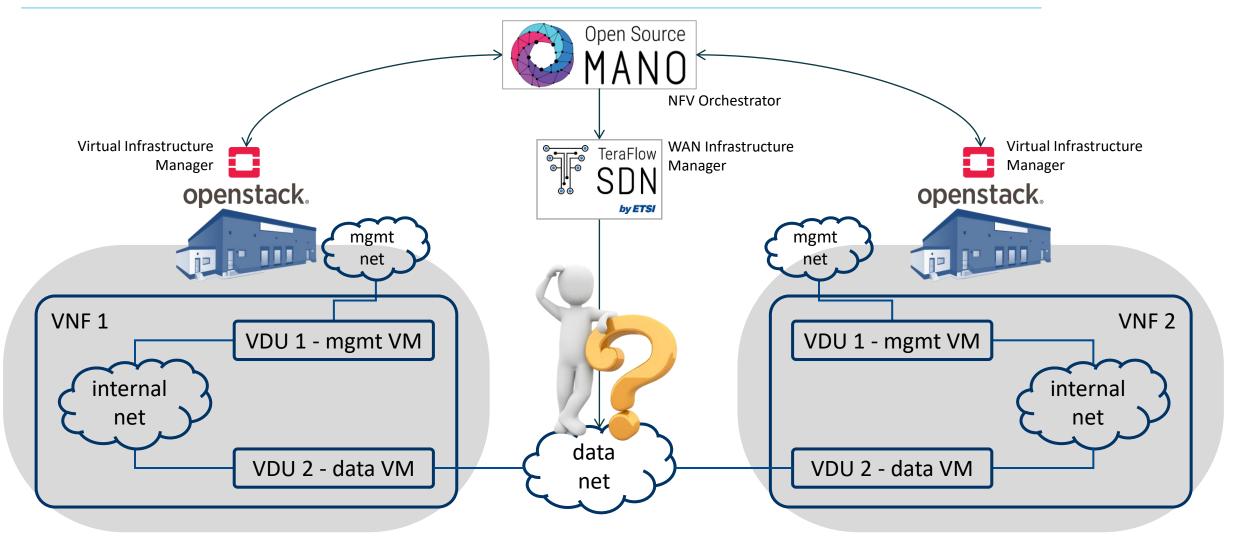
OSM-TFS Long-term Testbed Proposal

OSM-TFS Long-term Testbed Architecture

Network Emulation

https://containerlab.dev/

https://www.gns3.com/

… and many more: https://www.brianlinkletter.com/2023/02/network-emulators-and-network-simulators-2023/

ContainerLab

https://containerlab.dev/

- Many containerized Network Operating Systems.

- Experts need to run them on demand in user-defined topologies.

- Container orchestration tools (e.g., docker-compose) does not fit well with this purpose.

  - Unable to create connections defining the topology.
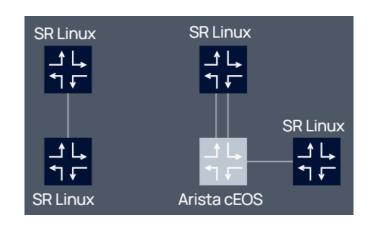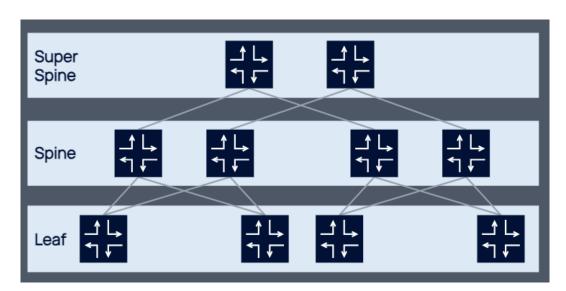
- ContainerLab:

  - CLI for orchetsrtaion and managing container-based networking labs

  - Starts containers, builds virtual wiring between them.

  - Manage labs lifecycle.

  - Support for many network device kinds (https://containerlab.dev/manual/kinds/)
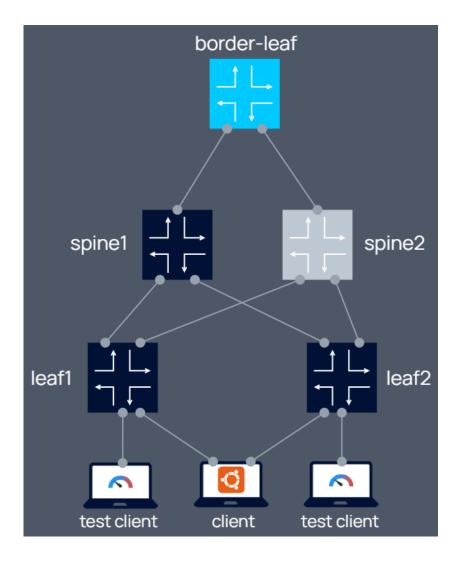
  - Many examples (https://containerlab.dev/lab-examples/lab-examples/)

ContainerLab - Examples

https://containerlab.dev/

ContainerLab – Quick Start (I)

https://containerlab.dev/

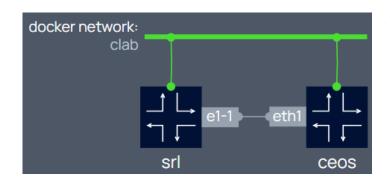**Download and install the latest release (may require sudo)**
```
bash -c "$(curl -sL https://get.containerlab.dev)"
```

Topology definition


```
name: srlceos01
topology:
  nodes:
    srl:
      kind: srl
      image: ghcr.io/nokia/srlinux
    ceos:
      kind: ceos
      image: ceos:4.25.0F
  links:
    - endpoints: ["srl:e1-1", "ceos:eth1"]
```

Additional Details:

https://containerlab.dev/quickstart/

ContainerLab – Quick Start (II)

https://containerlab.dev/

Check that container images are available

```
$ docker images | grep -E "srlinux|ceos"
REPOSITORY              TAG        IMAGE ID       CREATED        SIZE
ghcr.io/nokia/srlinux   latest     79019d14cfc7   3 months ago   1.32GB
ceos                    4.25.0F    15a5f97fe8e8   3 months ago   1.76GB
```

Start the lab deployment

```
$ mkdir ~/clab-quickstart
$ cd ~/clab-quickstart
$ cp -a /etc/containerlab/lab-examples/srlceos01/* .
$ containerlab deploy --topo srlceos01.clab.yml
…
```

#	Name	Container ID	Image	Kind	Group	State	IPv4 Address	IPv6 Address
1	clab-srlceos01-ceos	2e2e04a42cea	ceos:4.25.0F	ceos		running	172.20.20.3/24	2001:172:20:20::3/80
2	clab-srlceos01-srl	1b9568fcdb01	ghcr.io/nokia/srlinux	srl		running	172.20.20.4/24	2001:172:20:20::4/80

Additional Details:

https://containerlab.dev/quickstart/

ContainerLab – Quick Start (III)

CONTAINERlab

https://containerlab.dev/

Connecting to the nodes
```
$ docker exec -it clab-srlceos01-srl1 sr_cli
$ docker exec -it clab-srlceos01-srl1 bash

$ ssh admin@172.20.20.3
admin@172.20.20.3's password:
Using configuration file(s): []
Welcome to the srlinux CLI.
Type 'help' (and press <ENTER>) if you need any help using this.
--{ running }--[   ]--
A:srl1#

# Creates /etc/hosts entries so you can use names
$ ssh admin@clab-srlceos01-srl
```
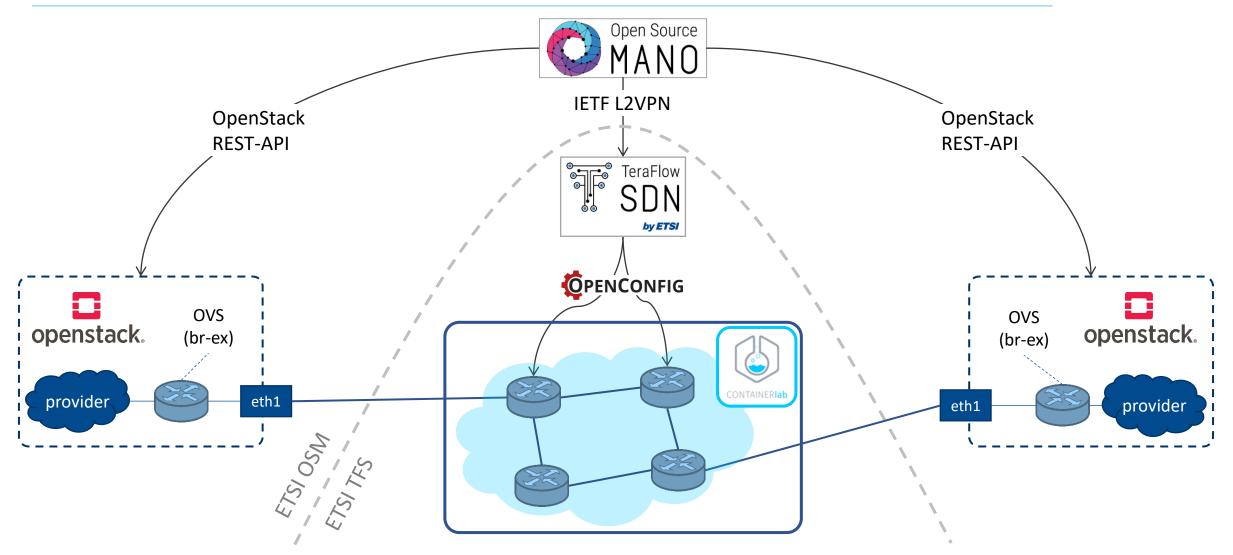
Destroying a lab
```
$ containerlab destroy --topo srlceos01.clab.yml
```

Additional Details:
https://containerlab.dev/quickstart/

OSM-TFS Long-Term Testbed – Deployment Proposal

Plans after Summer Break

- 1. Extend automated tests for TeraFlowSDN

  - Automate end-to-end integration tests in CI/CD pipeline

  - Add missing unitary tests

- 2. Migrate CI/CD pipeline to ETSI HIVE

- 3. Automate deployment of ContainerLab in automated tests

- 4. Plan Long-Term Testbed activity

Open Source
MANO
by ETSI

Thank You!

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