

OSHI - Open Source Hybrid IP/SDN networking (and its emulation on Mininet and on distributed SDN testbeds)

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DREAMER Project

<http://netgroup.uniroma2.it/DREAMER>

Distributed **RE**silient sdn **A**rchitecture **ME**eting carrier grade **R**equirements

▪ Partners:



▪ Main goal:

- Design a “carrier grade” IP backbone based on OpenFlow/SDN and experiment with its prototype on GÉANT SDN testbed

The DREAMER Project is one of the beneficiary projects of the GÉANT Open Call research initiative running from October 2013 to March 2015, see www.geant.net

Objectives of this work

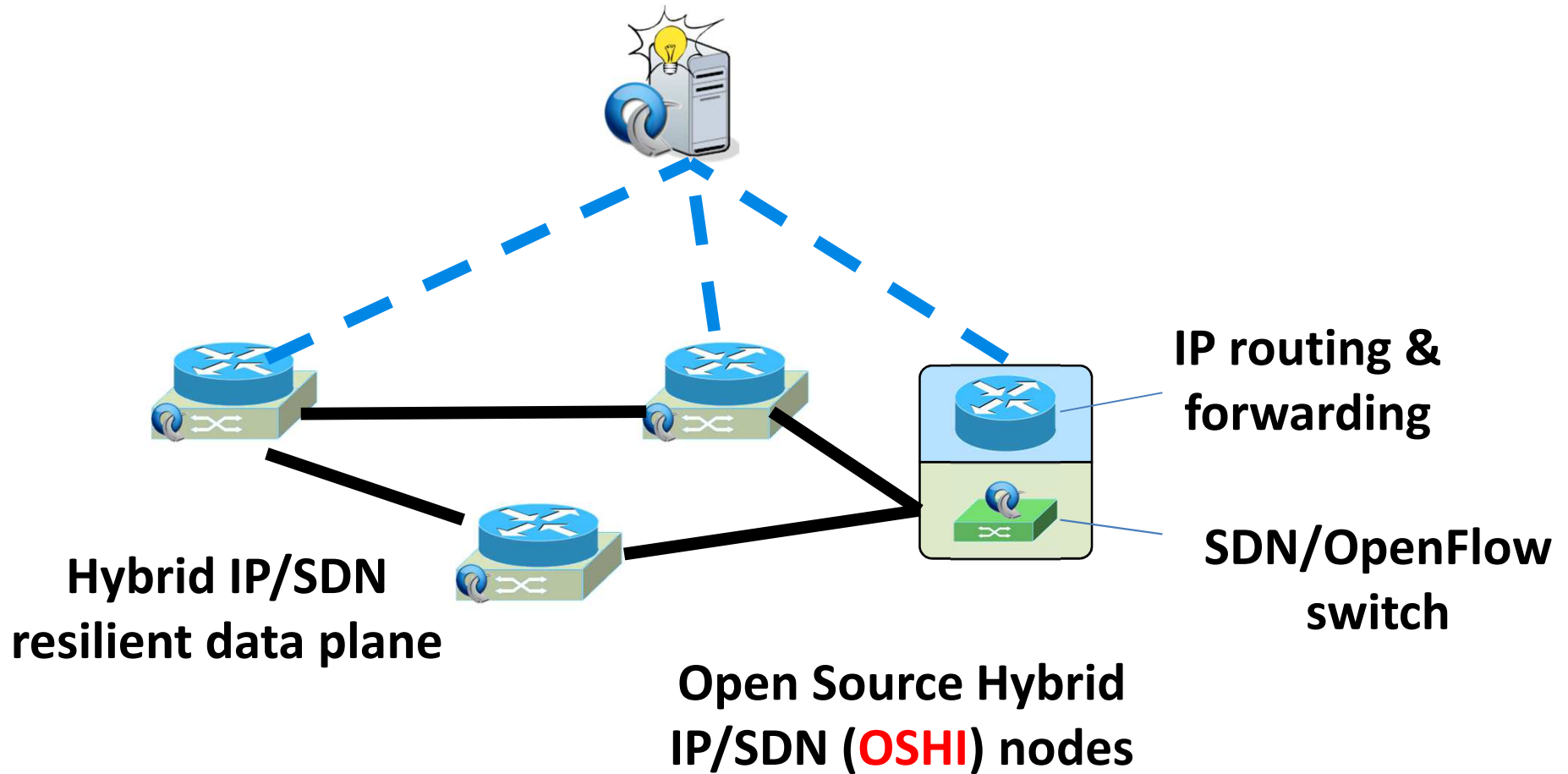
- **Introduce the Software Defined Networking paradigm in IP backbones**
 - replicating the services of IP/MPLS networks
 - ... and their non-functional properties (“carrier grade”)
- **Do it in an open way !!**
 - Open source components
 - Simple tools for setting up and performing experiments

Outline

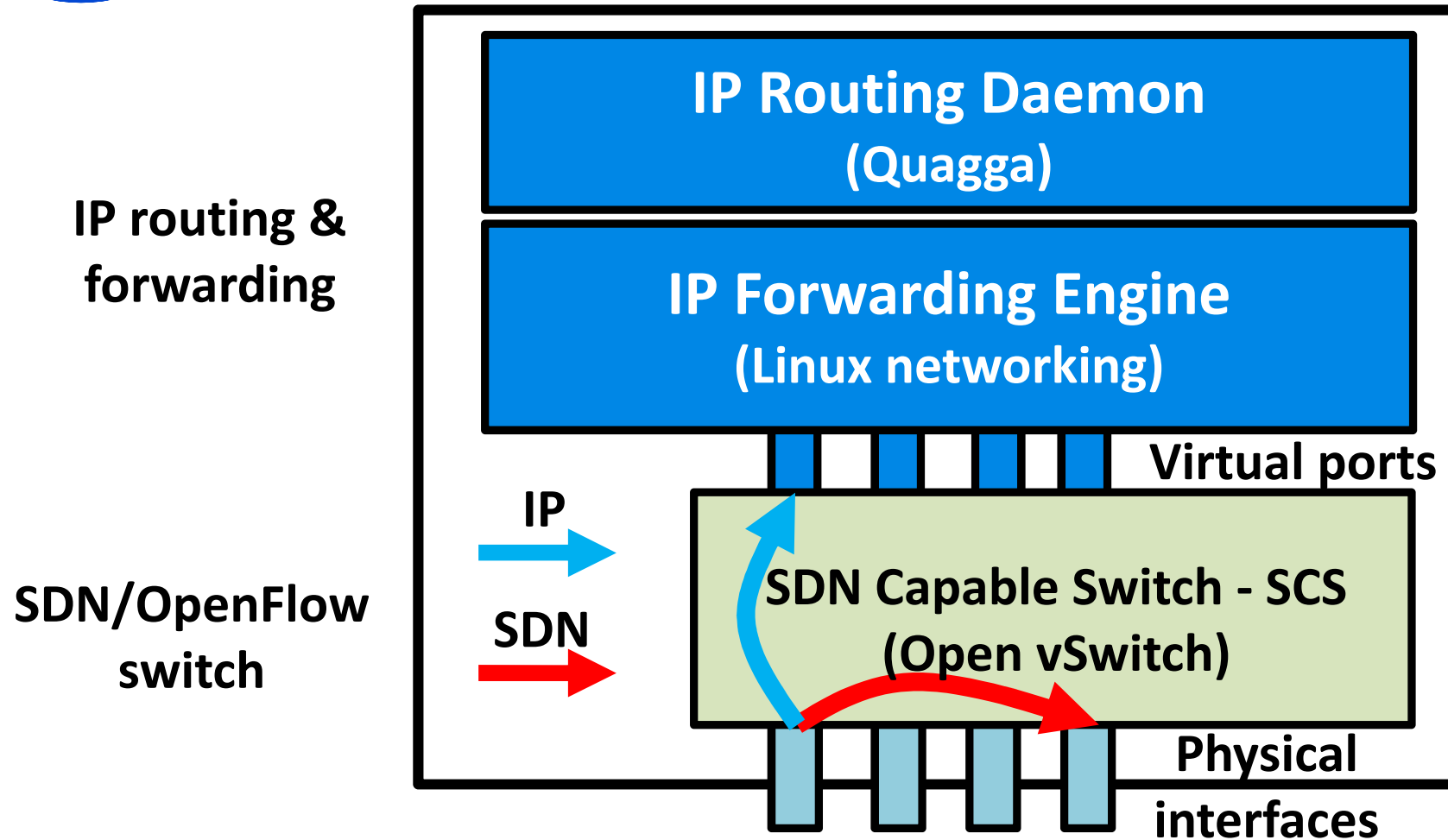
1. **Open Source Hybrid IP/SDN (OSHI) data plane**
2. **An example service: Ethernet VLL**
3. **OSHI emulation tools (and short video demo)**
4. **Performance evaluation**

Open Source Hybrid IP/SDN (OSHI)

<http://netgroup.uniroma2.it/OSHI>

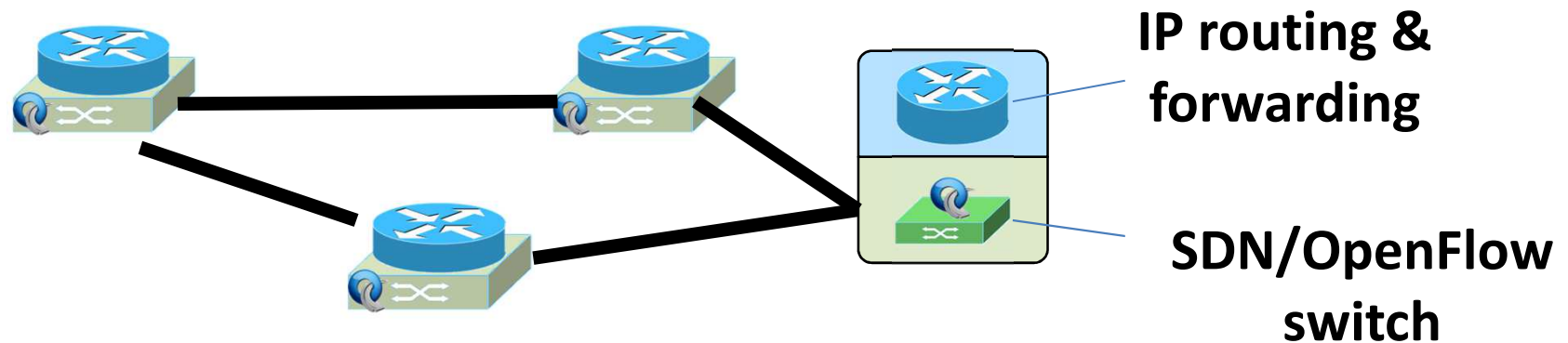


OSHI Node architecture



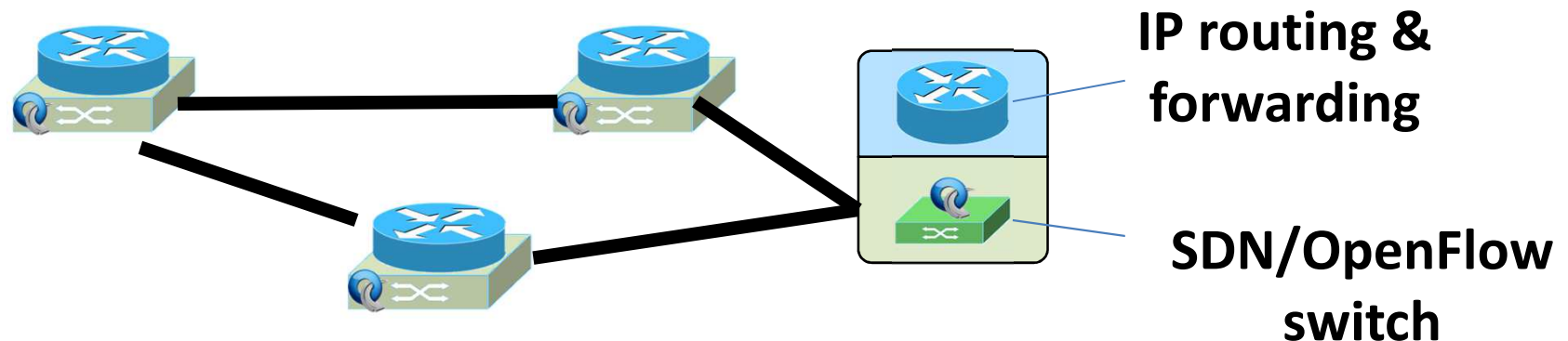
Hybrid IP/SDN data plane

1. Coexistence mechanisms for IP traffic and SDN traffic
2. Ingress classification functions / tunneling mechanisms



Hybrid IP/SDN data plane

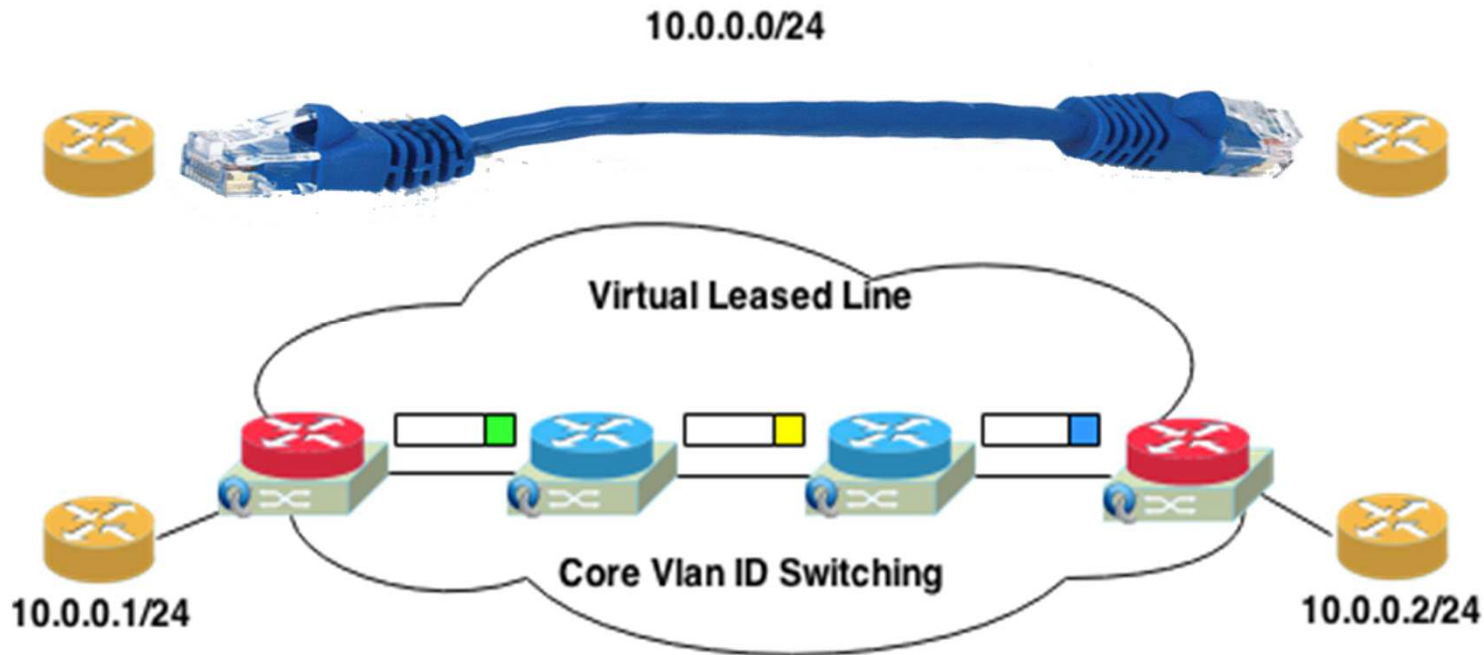
1. Coexistence mechanisms for IP traffic and SDN traffic
2. Ingress classification functions / tunneling mechanisms



Current prototype:

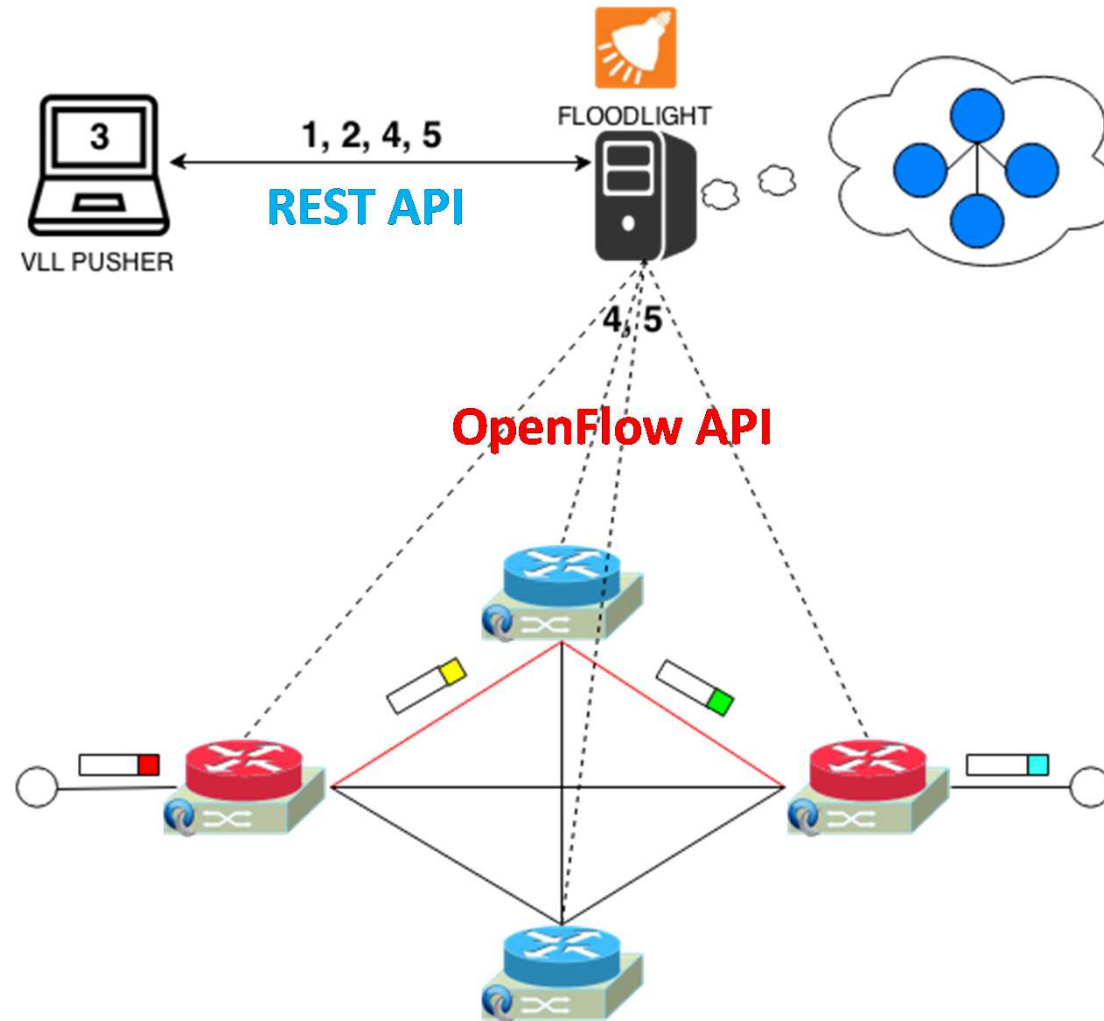
VLAN tags for coexistence, classification & tunneling mechanisms

Ethernet Virtual Leased Line

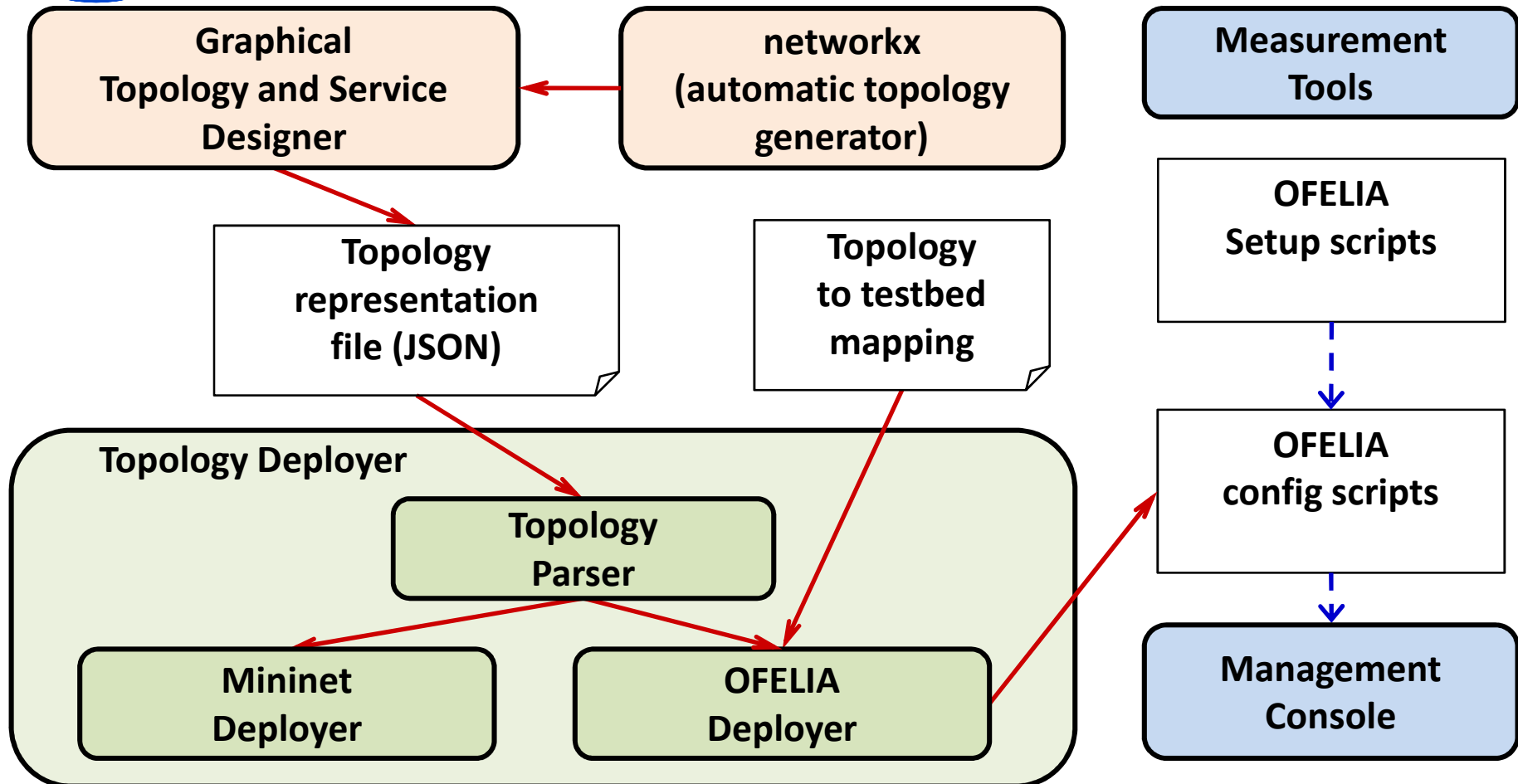


- VLL is provided through a SDN Based Path (SBP)
 - we use VLAN tags switching (in current prototype)

Virtual Leased Line Pusher



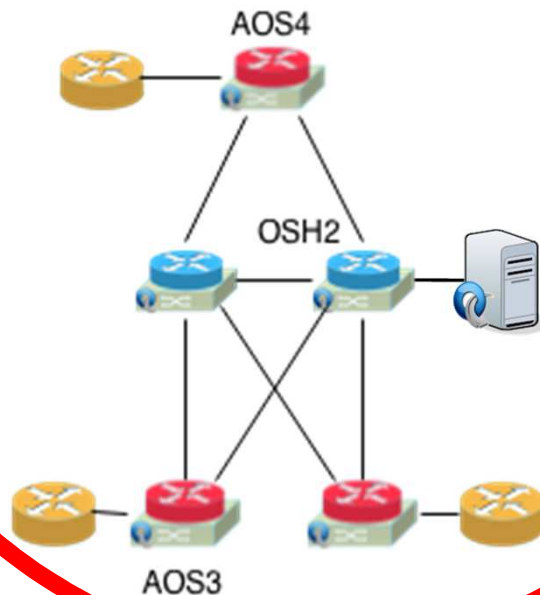
Design & deployment workflow



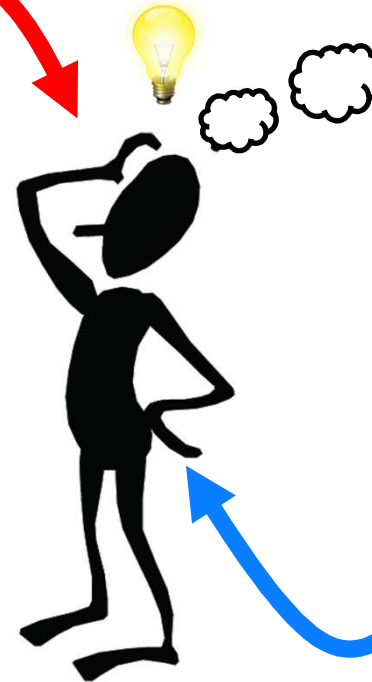
Emulation on OCF testbeds

(OCF : OFELIA Control Framework)

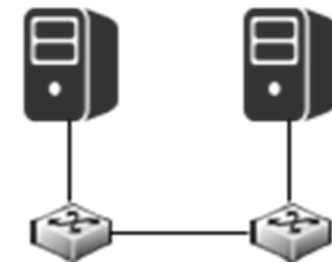
Overlay Experimental
Topology



VMs and
Tunneling



VM servers



Physical
OF switches



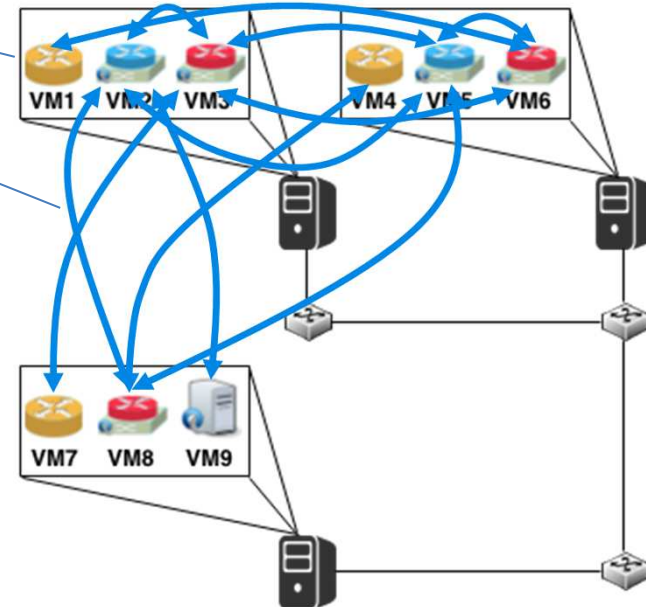
Physical OFELIA
testbed

How to map an arbitrary topology on a set of VM servers and links, with minimal configuration effort ?

Emulation on the OCF testbeds (2)

(OCF : OFELIA Control Framework)

Overlay Nodes → VMs
 Overlay Links → Ethernet over UDP tunnels



Our toolset:

- VXLAN (or OpenVPN) for making tunnels
- Bash and Python scripts to automate VMs setup
- DSH for distributed setup and maintenance



Short demo

1. Topology and Service Designer
2. Topology Deployer (on OFELIA)
3. Virtual Leased Lines operation

Demo Video is available at:

<https://www.dropbox.com/s/5ahmuiqlcr3wnue/oshi-v5.wmv>

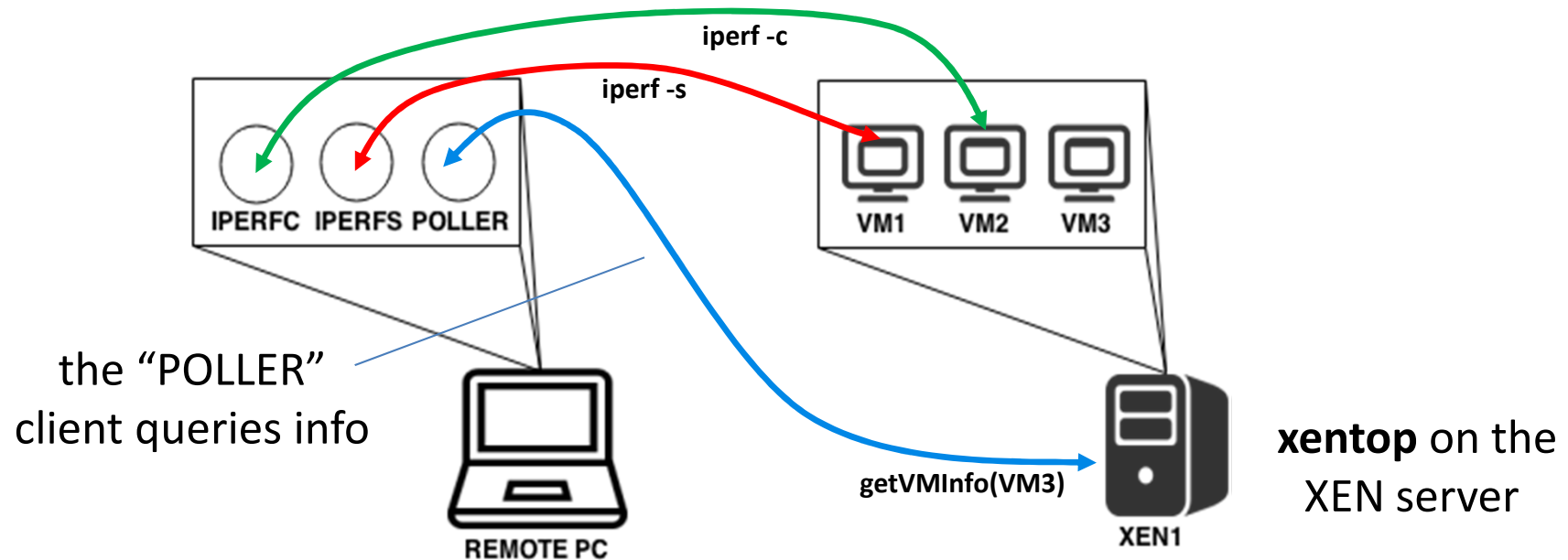
You may want to download the oshi-v5.wmv file locally,
save it in the same folder of the .pptx file,
then you may click on the link below while in pptx presentation mode

Enjoy watching !

[OSHI-video-demo-v5.wmv](#)

Performance evaluation Measurements tools

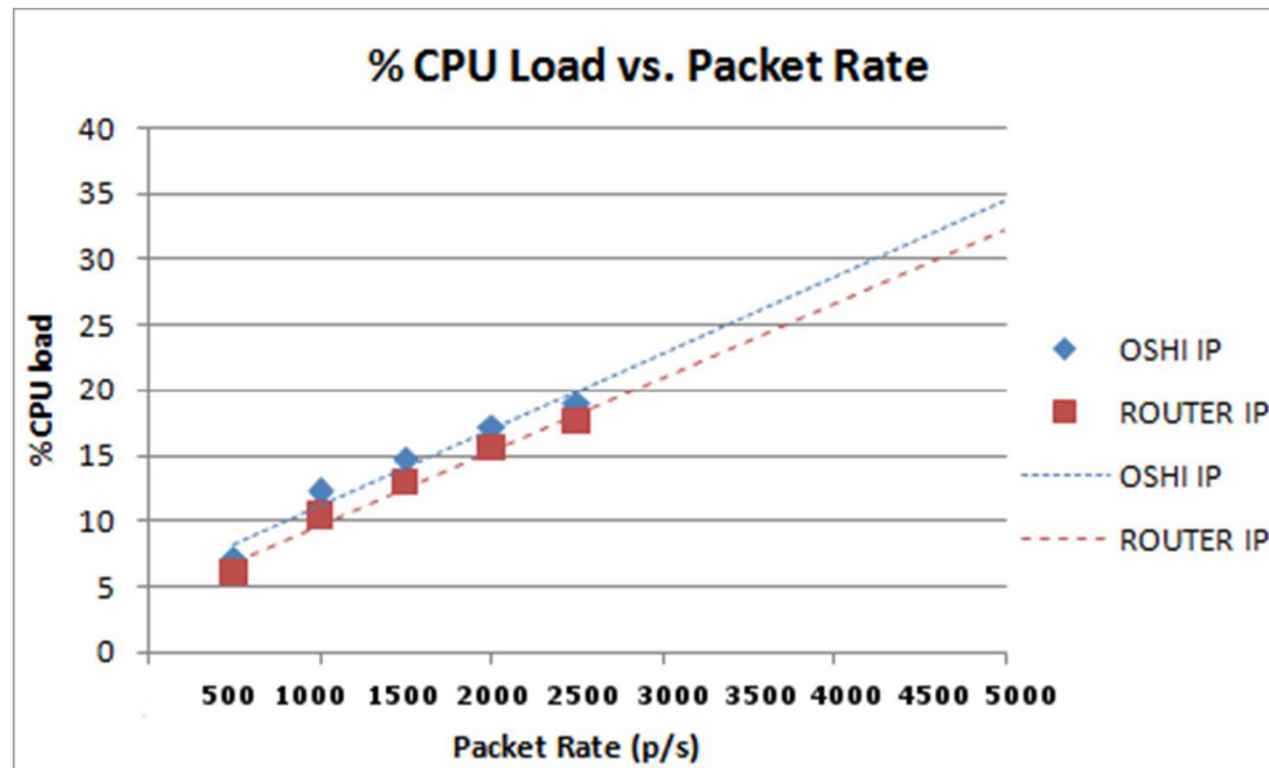
- iperf tool for traffic sources/sinks
- A client-server measurement tool to gather CPU load info of VMs



OSHI vs. Plain Router

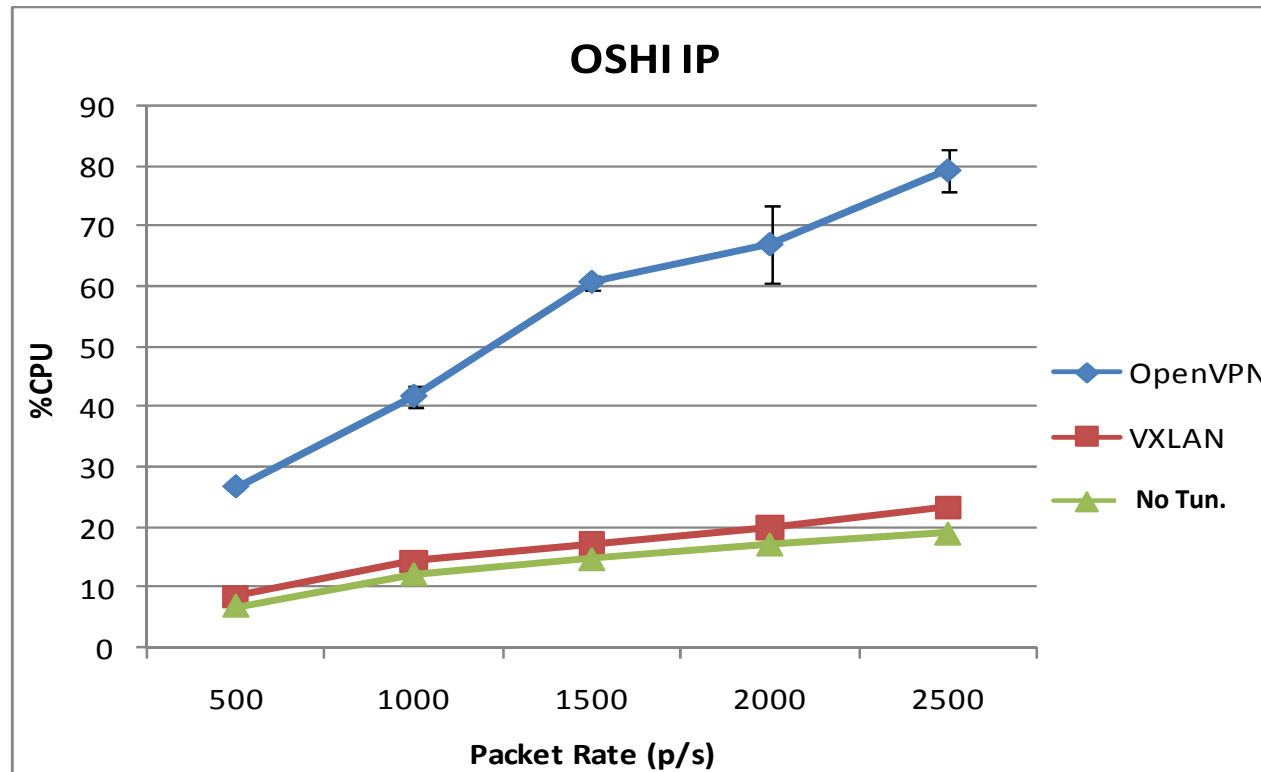
(no tunnels in both cases)

No tunnels, comparison between routing with OSHI and a plain router



Tunneling comparisons

OpenVPN tunnels vs. VXLAN tunnels vs. No tunnels



References

- DREAMER project home page:
<http://netgroup.uniroma2.it/DREAMER>
- Home page of OSHI
<http://netgroup.uniroma2.it/OSHI>
 - Code from GitHub see Software download section

Conclusions

- **We designed and implemented an Open Source Hybrid IP/SDN solution (OSHI) ... it works well !**
- **The VXLAN tunneling solution is very effective to map overlay topology over distributed testbeds**
- **The proposed deployment workflow is a key element to ease innovation in IP/SDN networks**

Next steps (work in progress)

- Designing a full Ethernet “pseudo-wire” service... using MPLS for tunneling rather than VLAN
- Using ONOS controller clusters to replace Floodlight
- Designing a solution with multiple controller clusters, each one controlling a portion of a wide area SDN based IP/SDN backbone

Thank you! (questions)





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