Mantoo - a set of management tools for controlling SDN experiments

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Open Source Hybrid IP/SDN (OSHI)

http://netgroup.uniroma2.it/OSHI

Hybrid IP/SDN resilient data plane

Open Source Hybrid IP/SDN (OSHI) nodes

IP routing & forwarding

SDN/OpenFlow switch
Services

- IP Virtual Leased Line
- Ethernet Pseudo-Wire
- Virtual Ethernet Switch
Planning and executing SDN experiments

Experimental Topology
Mantoo (Management tools)

Mininet emulation

Designer & Deployer

Distributed testbeds

VM servers

Physical OF switches

Physical OFELIA testbed
OSHI Home page
http://netgroup.uniroma2.it/OSHI
– Code on GitHub
– A ready-to-go Virtual Machine which replicates the DEMO
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Additional material
OSHI Node architecture

- Virtual ports
- Physical interfaces
- IP Forwarding Engine (Linux networking)
- IP Routing Daemon (Quagga)
- IP routing & forwarding
- SDN/OpenFlow switch

SDN Capable Switch - SCS (Open vSwitch)

Physical interfaces

Virtual ports
1. Coexistence of IP traffic and SDN traffic
2. Ingress classification functions / tunneling mechanisms

First prototype: VLAN tags - released
Final prototype: MPLS tags – ongoing dev.
Virtual Leased Line Pusher

2. An example service (VLL)
Design & deployment workflow

Graphical Topology and Service Designer

Networkx (automatic topology generator)

Topology representation file (JSON)

Topology to testbed mapping

Topology Deployer

Topology Parser

OFELIA Deployer

Mininet Deployer

Measurement Tools

- OFELIA Setup scripts
- OFELIA config scripts

Management Console
How to map an arbitrary topology on a set of VM servers and links, with minimal configuration effort?
### 3. Emulation tools

#### 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
On top of the OSHI platform...

Distributed Clusters of ONOS controllers for Control Plane scalability & resilience

SDN based Data Path Protection / Restoration

SDN based Segment routing
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

3. Emulation tools

xentop on the XEN server

the “POLLER” client queries info

REMOTE PC

XEN1

VM1 VM2 VM3

getVMInfo(VM3)

iperf -c

iperf -s
OSH vs. Plain Router
(no tunnels in both cases)

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

% CPU Load vs. Packet Rate

- OSHI IP
- ROUTER IP

Packet Rate (p/s)

500 1000 1500 2000 2500 3000 3500 4000 4500 5000
Tunneling comparisons

OpenVPN tunnels vs. VXLAN tunnels vs. No tunnels

4. Performance evaluation

- Percentage CPU usage
- Packet Rate (p/s)
- OSHI IP
- OpenVPN
- VXLAN
- VLAN
- No Tun.
Details on ongoing work

• Designing a full Ethernet “pseudo-wire” service... using MPLS for tunneling rather than VLAN
• Design a Virtual Ethernet Switch service

• 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)