

PRAGMA³¹ STUDENT HACKATHON

LIGHTNING GREEN

HIGH PERFORMANCE COMPUTING AND NETWORKING CENTER

DEPARTMENT OF COMPUTER ENGINEERING

KASETSART UNIVERSITY



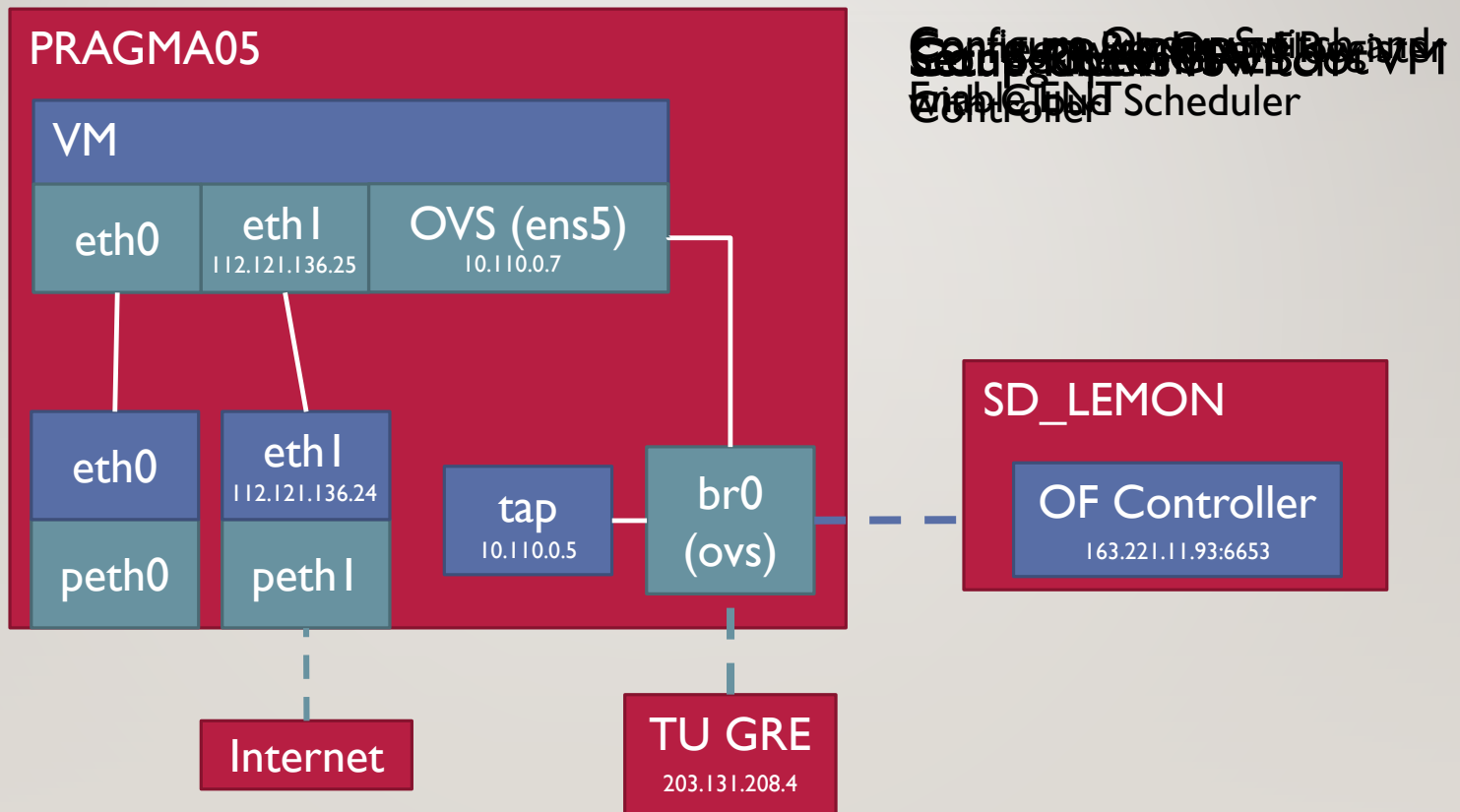
2 MOTIVATION / INSPIRATION

- Why you want to do this work?
 - Interested in network technology
- What is going to be better with your work done?
 - Add new switch to network
 - Get to learn and try PRAGMA, SDN, Open vSwitch, etc.

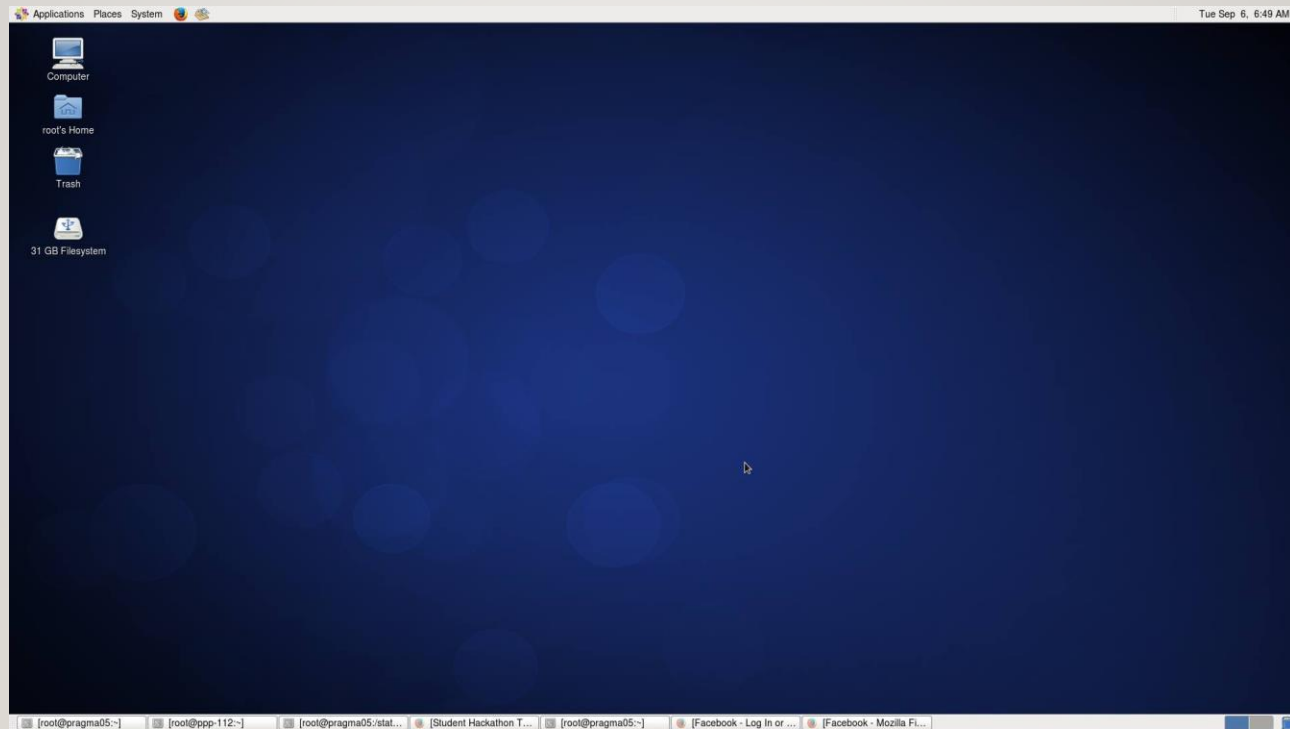
3 STEP OF THE ASSIGNED TASK

- Install Rocks cluster frontend
- Register host with PRAGMA Cloud Scheduler
- Install pragma_boot
- Install and configure Open vSwitch and GRE Link

4 ARCHITECTURE



5 INSTALL ROCKS CLUSTER FRONTEND



6 REGISTER HOST WITH PRAGMA CLOUD SCHEDULER



[Add Image](#)

Status ● [Available](#)

Sort Order [0](#) [Edit](#)

Resource Details

Name **Lightning Green** [Rename](#) | [Delete](#)

Location *(no location set)* [Edit](#)

Resource Type *(no resource type set)* [Edit](#)

Schedule *Default* [Move](#)

Contact *(no contact information)*

Description *PRAGMA Student Hackathon from Kasetsart University* [Edit](#)

Notes *(no notes)* [Edit](#)

Resource Administrator *PRAGMA 31 students* [Edit](#)

[Allow Subscriptions to this Calendar](#)

Additional Attributes [Edit](#)

Pragma_boot path: /opt/pragma_boot Pragma_boot version: 2 Python path: /usr/bin/python Temporary directory: /tmp Username: root

Deployment type: Rocks KVM ENT-enabled: yes Site hostname: pragma05.cs.tu.ac.th Latitude: 13.846419 Longitude: 100.568660

7 INSTALL PRAGMA BOOT

```
[root@pragma05 ~]# cat /var/log/pragma_boot/centos7-20160905-21:39.log
2016-09-05 21:39:15,907 - pragma.drivers.kvm_rocks - DEBUG - Loaded driver pragma.drivers.kvm_rocks
2016-09-05 21:39:15,908 - pragma.util - DEBUG - Executing command: '/opt/rocks/bin/rocks list host interface'
2016-09-05 21:39:16,577 - pragma.drivers.kvm_rocks - INFO - Loading network information from /opt/pragma_boot/etc/kvm
_rocks.conf
2016-09-05 21:39:16,578 - pragma.drivers.kvm_rocks - INFO - Requesting 0 CPUs
2016-09-05 21:39:16,578 - pragma.util - DEBUG - Executing command: '/opt/rocks/bin/rocks list host vm-container'
2016-09-05 21:39:17,316 - pragma.util - DEBUG - Executing command: '/opt/rocks/bin/rocks list host vm status=true'
2016-09-05 21:39:18,147 - pragma.drivers.kvm_rocks - INFO - Found available public IP 112.121.136.25 -> ppp-112.121.1
36.25.revip.proen.co.th
2016-09-05 21:39:18,148 - pragma.drivers.kvm_rocks - DEBUG - Executing rocks command '/opt/rocks/bin/rocks add cluste
r 112.121.136.25 0 cpus-per-compute=1 mem-per-compute=2048 fe-name=ppp-112 cluster-naming=true vlan=22 container-host
s=""'
2016-09-05 21:39:18,148 - pragma.util - DEBUG - Executing command: '/opt/rocks/bin/rocks add cluster 112.121.136.25 0
cpus-per-compute=1 mem-per-compute=2048 fe-name=ppp-112 cluster-naming=true vlan=22 container-hosts=""'
2016-09-05 21:39:30,684 - pragma.util - DEBUG - Executing command: '/opt/rocks/bin/rocks list host vm'
2016-09-05 21:39:31,517 - pragma.drivers.kvm_rocks - INFO - Allocated cluster ppp-112 with compute nodes:
2016-09-05 21:39:31,518 - pragma.util - DEBUG - Executing command: 'rocks list host interface'
2016-09-05 21:39:32,149 - pragma.repository.processor.xmlprocessor - DEBUG - Writing vc-out file to /state/partition1
/temp/pragma-DvRQLN4741-2016-09-05/vc-out.xml
2016-09-05 21:39:32,149 - pragma.util - DEBUG - Executing command: '/opt/rocks/bin/rocks list host vm showdisks=true'
2016-09-05 21:39:32,971 - pragma.util - DEBUG - Executing command: 'cp --sparse=always /state/partition1/vm-images/ce
ntos7/centos7-fe.img /state/partition1/kvm/disks/ppp-112.vda'
2016-09-05 21:41:29,373 - pragma.drivers.kvm_rocks.image_manager - INFO - Making mount dir /state/partition1/temp/pr
agma-DvRQLN4741-2016-09-05/mnt-ppp-112.vda
2016-09-05 21:41:29,373 - pragma.util - DEBUG - Executing command: 'guestmount -a /state/partition1/kvm/disks/ppp-112
.vda -i /state/partition1/temp/pragma-DvRQLN4741-2016-09-05/mnt-ppp-112.vda'
2016-09-05 21:41:58,289 - pragma.drivers.kvm_rocks.image_manager - DEBUG - Checking for file(s) /state/partition1/tem
p/pragma-DvRQLN4741-2016-09-05/mnt-ppp-112.vda/etc/udev/rules.d/70-persistent-net.rules
2016-09-05 21:41:58,296 - pragma.drivers.kvm_rocks.image_manager - DEBUG - Checking for file(s) /state/partition1/tem
p/pragma-DvRQLN4741-2016-09-05/mnt-ppp-112.vda/etc/sysconfig/network-scripts/ifcfg-eth*
2016-09-05 21:41:58,310 - pragma.drivers.kvm_rocks.image_manager - INFO - Moving /state/partition1/temp/pragma-DvRQLN
4741-2016-09-05/mnt-ppp-112.vda/etc/sysconfig/network-scripts/ifcfg-eth0 to /state/partition1/temp/pragma-DvRQLN4741-
2016-09-05/mnt-ppp-112.vda/etc/sysconfig/network-scripts/old-ifcfg-eth0
2016-09-05 21:41:58,312 - pragma.drivers.kvm_rocks.image_manager - INFO - Moving /state/partition1/temp/pragma-DvRQLN
4741-2016-09-05/mnt-ppp-112.vda/etc/sysconfig/network-scripts/ifcfg-eth1 to /state/partition1/temp/pragma-DvRQLN4741-
2016-09-05/mnt-ppp-112.vda/etc/sysconfig/network-scripts/old-ifcfg-eth1
2016-09-05 21:41:58,314 - pragma.drivers.kvm_rocks.image_manager - INFO - Copying /state/partition1/temp/pragma-DvRQL
N4741-2016-09-05/vc-out.xml to /state/partition1/temp/pragma-DvRQLN4741-2016-09-05/mnt-ppp-112.vda/root/vc-out.xml
2016-09-05 21:41:58,323 - pragma.util - DEBUG - Executing command: 'umount /state/partition1/temp/pragma-DvRQLN4741-2
016-09-05/mnt-ppp-112.vda'
2016-09-05 21:41:58,336 - pragma.util - DEBUG - Executing command: '/opt/rocks/bin/rocks set host boot ppp-112 action
=cs'
2016-09-05 21:41:59,309 - pragma.util - DEBUG - Executing command: '/opt/rocks/bin/rocks start host vm ppp-112'
[root@pragma05 ~]# ssh 112.121.136.25
Last login: Mon Sep 5 16:22:52 2016 from 112.121.136.24
[root@ppp-112 ~]#
```

8 CONFIGURE OPEN VSWITCH AND GRE LINK

```
[root@pragma05 ~]# ovs-vsctl show
3da05176-b2ee-47a2-ac63-9412681102b8
  Bridge "br0"
    Controller "tcp:163.221.11.93:6653"
      is_connected: true
    fail_mode: secure
    Port gre-naist
      Interface gre-naist
        type: gre
        options: {remote_ip="203.131.208.4"}
    Port "br0"
      Interface "br0"
        type: internal
    Port "vnet1"
      Interface "vnet1"
    Port "tap0"
      Interface "tap0"
        type: internal
    ovs_version: "2.4.1"
[root@pragma05 ~]# █
```


9 TEST PINGING TO THE CONTROLLER

```
[root@pragma05 ~]# ping 163.221.11.93
PING 163.221.11.93 (163.221.11.93) 56(84) bytes of data.
64 bytes from 163.221.11.93: icmp_seq=1 ttl=44 time=141 ms
64 bytes from 163.221.11.93: icmp_seq=2 ttl=44 time=144 ms
64 bytes from 163.221.11.93: icmp_seq=3 ttl=44 time=141 ms
^C
--- 163.221.11.93 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2428ms
rtt min/avg/max/mdev = 141.719/142.663/144.449/1.336 ms
[root@pragma05 ~]# ping 112.121.136.24
PING 112.121.136.24 (112.121.136.24) 56(84) bytes of data.
64 bytes from 112.121.136.24: icmp_seq=1 ttl=64 time=0.082 ms
64 bytes from 112.121.136.24: icmp_seq=2 ttl=64 time=0.070 ms
64 bytes from 112.121.136.24: icmp_seq=3 ttl=64 time=0.145 ms
^C
--- 112.121.136.24 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2334ms
rtt min/avg/max/mdev = 0.070/0.099/0.145/0.032 ms
[root@pragma05 ~]# █
```

10 SETTING UP INTERFACES ON VIRTUAL CLUSTER

```
[root@ppp-112 ~]# ifconfig ens5 10.112.0.7 netmask 255.255.0.0
[root@ppp-112 ~]# ifconfig -a
ens5: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.112.0.7 netmask 255.255.0.0 broadcast 10.112.255.255
    inet6 fe80::1888:79ff:fe00:2 prefixlen 64 scopeid 0x20<link>
    ether 1a:88:79:00:00:02 txqueuelen 1000 (Ethernet)
    RX packets 77 bytes 19334 (18.8 KiB)
    RX errors 0 dropped 8 overruns 0 frame 0
    TX packets 110 bytes 18580 (18.1 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.1.1.1 netmask 255.255.0.0 broadcast 10.1.255.255
    inet6 fe80::1888:79ff:fe00:0 prefixlen 64 scopeid 0x20<link>
    ether 1a:88:79:00:00:00 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 9 bytes 662 (662.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 112.121.136.25 netmask 255.255.255.0 broadcast 112.121.136.255
    inet6 fe80::1888:79ff:fe00:1 prefixlen 64 scopeid 0x20<link>
    ether 1a:88:79:00:00:01 txqueuelen 1000 (Ethernet)
    RX packets 4446 bytes 287746 (281.0 KiB)
    RX errors 0 dropped 1 overruns 0 frame 0
    TX packets 228 bytes 34205 (33.4 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

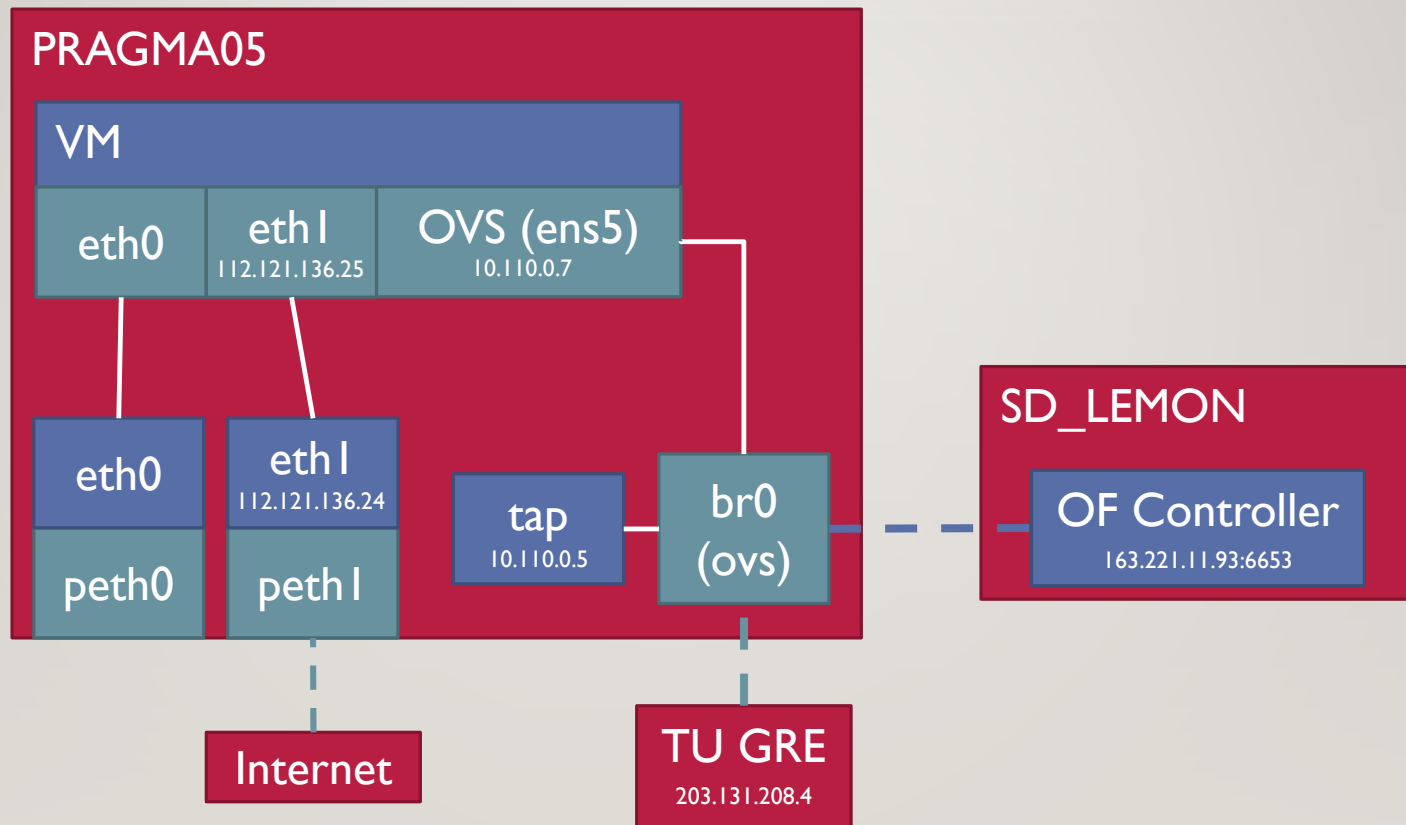
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 0 (Local Loopback)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

[root@ppp-112 ~]# █
```

|| TEST PING TO GRE LINKS

```
[root@ppp-112 ~]# ping 10.112.0.1
PING 10.112.0.1 (10.112.0.1) 56(84) bytes of data.
64 bytes from 10.112.0.1: icmp_seq=1 ttl=64 time=318 ms
64 bytes from 10.112.0.1: icmp_seq=2 ttl=64 time=155 ms
64 bytes from 10.112.0.1: icmp_seq=3 ttl=64 time=155 ms
^C
--- 10.112.0.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 155.170/209.707/318.615/77.010 ms
[root@ppp-112 ~]# ping 10.112.0.3
PING 10.112.0.3 (10.112.0.3) 56(84) bytes of data.
64 bytes from 10.112.0.3: icmp_seq=1 ttl=64 time=609 ms
64 bytes from 10.112.0.3: icmp_seq=2 ttl=64 time=6.94 ms
64 bytes from 10.112.0.3: icmp_seq=3 ttl=64 time=6.57 ms
^C
--- 10.112.0.3 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 6.576/207.558/609.152/283.969 ms
[root@ppp-112 ~]# ping 10.112.0.5
PING 10.112.0.5 (10.112.0.5) 56(84) bytes of data.
64 bytes from 10.112.0.5: icmp_seq=1 ttl=64 time=3.79 ms
64 bytes from 10.112.0.5: icmp_seq=2 ttl=64 time=1.13 ms
64 bytes from 10.112.0.5: icmp_seq=3 ttl=64 time=1.24 ms
^C
--- 10.112.0.5 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 1.139/2.059/3.792/1.226 ms
[root@ppp-112 ~]# ping 10.112.0.7
PING 10.112.0.7 (10.112.0.7) 56(84) bytes of data.
64 bytes from 10.112.0.7: icmp_seq=1 ttl=64 time=0.091 ms
64 bytes from 10.112.0.7: icmp_seq=2 ttl=64 time=0.200 ms
64 bytes from 10.112.0.7: icmp_seq=3 ttl=64 time=0.192 ms
^C
--- 10.112.0.7 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1999ms
rtt min/avg/max/mdev = 0.091/0.161/0.200/0.049 ms
[root@ppp-112 ~]# █
```

12 ARCHITECTURE



I3 WHAT WE HAVE LEARNT

- Open vSwitch
- GRE Link
- The PRAGMA Architecture
- In-depth computer networking

14 WHAT WE HAVE LEARNT

- The most challenging part
 - Connect the front-end to Controller (SD-LEMON)
 - Configuring GRE Link
- The easiest part
 - Install Rocks cluster in front-end

15 IMPRESSIONS

- What we have done well?
 - Foods and Venue
 - Comprehensive documentation
- What we need to improve?
 - Certain parts of the document are not clear or misleading

If the status shows “active” stop the virtual frontend with:

```
rocks stop host vm YOUR-FE
```

Add interfaces to your virtual cluster nodes. For a virtual frontend (named YOUR-VF):

```
rocks add host interface YOUR-VF ovs subnet=openflow mac=`rocks report vm next`  
rocks sync config YOUR-VF
```

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Q&A

TIME FOR QUESTIONS