

Enhancing Cloud Efficiency

Software-defined Networking (SDN)

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Agenda

- SDN: a more flexible network solution for cloud
- Demo: use SDN controller to manage Open vSwitch

SDN [5]

SDN: decouple network control and forwarding functions, enabling the network control to become directly programmable.

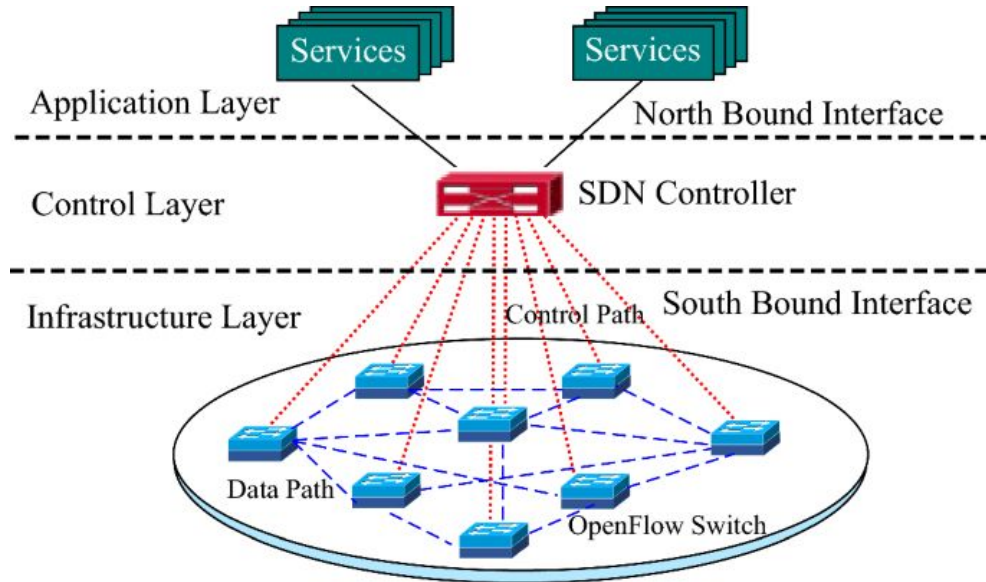


Figure: SDN Architecture [6]

How Cloud Benefits from SDN?

Open vSwitch [7]: a widely used soft switch running within the hypervisor.

Benefits:

- Simplified Network Management
- Improved Network Flexibility and Agility
- Fine-Grained Traffic Control
- Enhanced Network Automation
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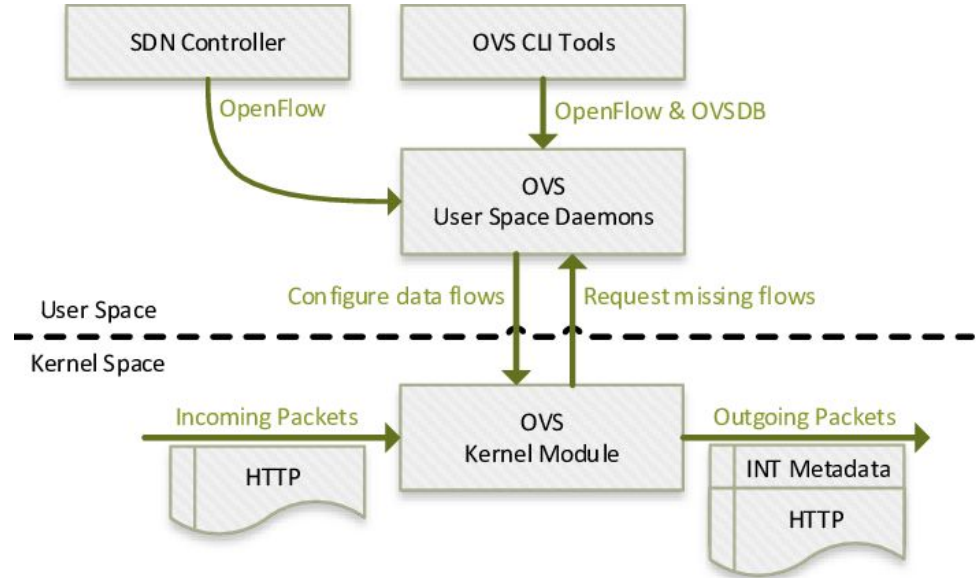


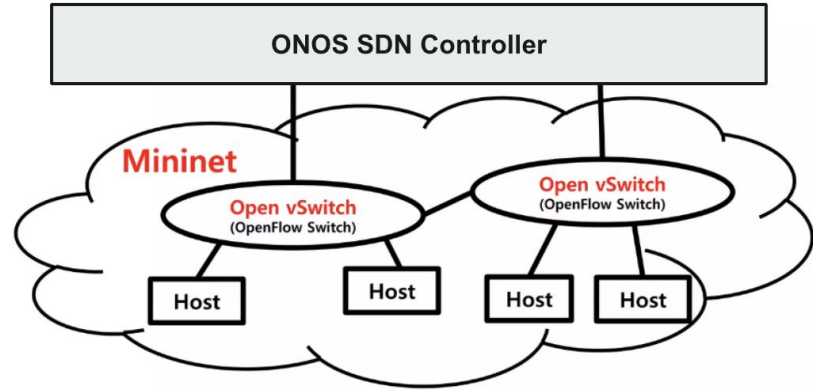
Figure: Open vSwitch basic architecture [8]

Demo: Using SDN controller to manage Open vSwitch

Demo environment introduction

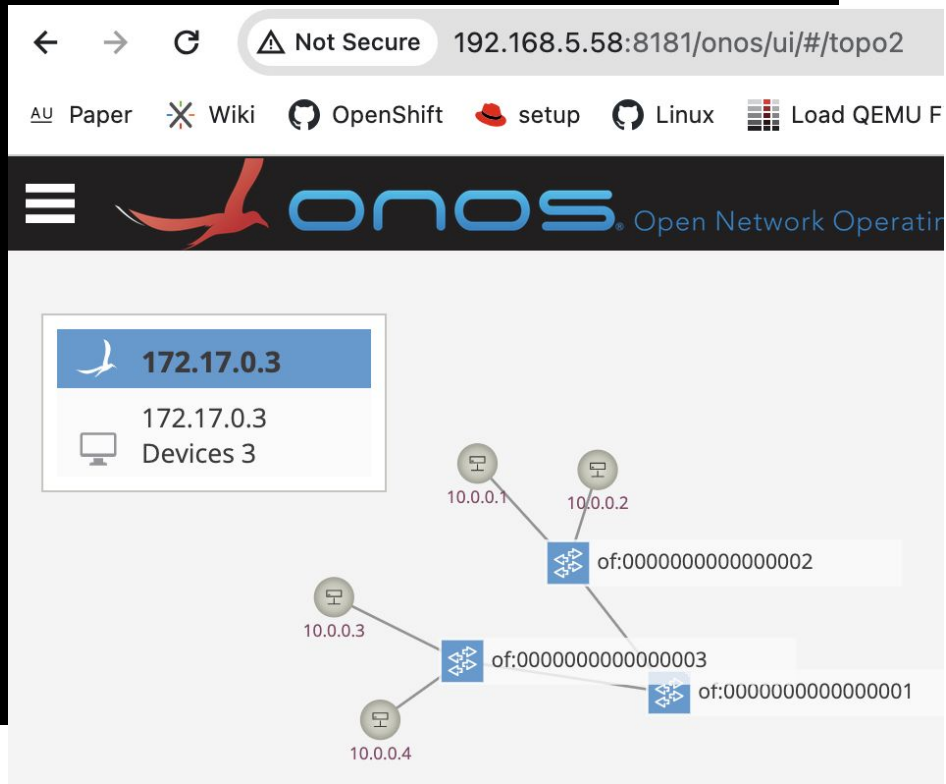
- **ONOS**: SDN Controller
- **Mininet**: a tool to simulate an Open vSwitch-based network topology.

In this demo, Mininet is running on the host directly while ONOS is a container running on the same host.



Demo (1)

```
jing@fedora:~$ sudo mn --topo tree,2,2 --mac --switch ovs,protocols=OpenFlow14 --controller remote,ip=172.17.0.3
[sudo] password for jing:
*** Creating network
*** Adding controller
Connecting to remote controller at 172.17.0.3:6653
*** Adding hosts:
h1 h2 h3 h4
*** Adding switches:
s1 s2 s3
*** Adding links:
(s1, s2) (s1, s3) (s2, h1) (s2, h2) (s3, h3) (s3, h4)
*** Configuring hosts
h1 h2 h3 h4
*** Starting controller
c0
*** Starting 3 switches
s1 s2 s3 ...
*** Starting CLI:
mininet>
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2 h3 h4
h2 -> h1 h3 h4
h3 -> h1 h2 h4
h4 -> h1 h2 h3
*** Results: 0% dropped (12/12 received)
```



Demo (2)

The ONOS REST API allows users to perform a variety of tasks, including: Obtain information, Configure devices, Create or delete bridges, Attach or remove ports from bridges, Create peer patches, Set up GRE tunnels, List ports of a specific device, Create new devices, Update device attributes, Delete devices, List infrastructure links, Update link attributes

```
jing@fedora:~$ curl -X GET -u onos:rocks http://127.0.0.1:8181/onos/v1/devices
{"devices":[{"id":"of:0000000000000001","type":"SWITCH","available":false,"role":"MASTER","mfr":"Nicira, Inc.,"hw":"Open vSwitch","sw":"3.3.0","serial":"None","driver":"default","chassisId":"1","lastUpdate":"1718440720198","humanReadableLastUpdate":"disconnected 5m49s ago","annotations":{"channelId":"172.17.0.1:60598","datapathDescription":"s1","managementAddress":"172.17.0.1","protocol":"OF_14"}},{id":"of:0000000000000002","type":"SWITCH","available":false,"role":"MASTER","mfr":"Nicira, Inc.,"hw":"Open vSwitch","sw":"3.3.0","serial":"None","driver":"default","chassisId":"2","lastUpdate":"1718440720268","humanReadableLastUpdate":"disconnected 5m49s ago","annotations":{"channelId":"172.17.0.1:60622","datapathDescription":"s2","managementAddress":"172.17.0.1","protocol":"OF_14"}]}]jing@fedora:~$
jing@fedora:~$
jing@fedora:~$ curl -X DELETE -u onos:rocks http://127.0.0.1:8181/onos/v1/devices/of:0000000000000001
{"id":"of:0000000000000001","type":"SWITCH","available":false,"role":"MASTER","mfr":"Nicira, Inc.,"hw":"Open vSwitch","sw":"3.3.0","serial":"None","driver":"default","chassisId":"1","lastUpdate":"1718440720198","humanReadableLastUpdate":"disconnected 5m55s ago","annotations":{"channelId":"172.17.0.1:60598","datapathDescription":"s1","managementAddress":"172.17.0.1","protocol":"OF_14"}}jing@fedora:~$ curl -X DELETE -u onos:rocks http://127.0.0.1:8181/onos/v1/devices/of:0000000000000002
{"id":"of:0000000000000002","type":"SWITCH","available":false,"role":"MASTER","mfr":"Nicira, Inc.,"hw":"Open vSwitch","sw":"3.3.0","serial":"None","driver":"default","chassisId":"2","lastUpdate":"1718440720268","humanReadableLastUpdate":"disconnected 5m58s ago","annotations":{"channelId":"172.17.0.1:60622","datapathDescription":"s2","managementAddress":"172.17.0.1","protocol":"OF_14"}}jing@fedora:~$
jing@fedora:~$ curl -X GET -u onos:rocks http://127.0.0.1:8181/onos/v1/devices
{"devices":[]}jing@fedora:~$
jing@fedora:~$
```

Thank you!