

# Dynamic RouteFlow

## Creating L3 topo in OpenFlow network within seconds

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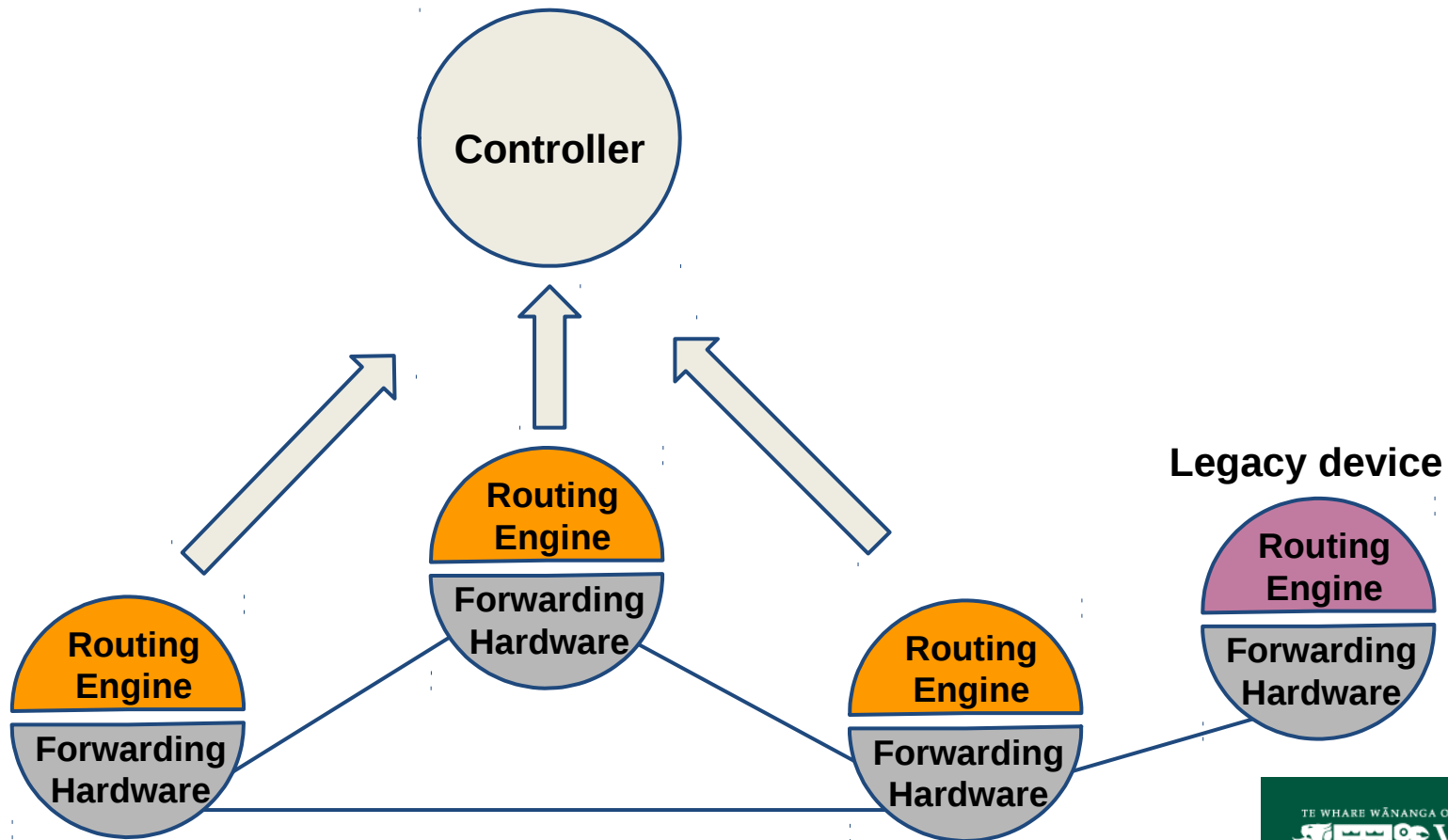
RouteFlow architecture  
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Evaluation of the extension

# Introduction to RouteFlow

- IP routing & forwarding for OpenFlow networks
- Migration tool to convert legacy IP to SDN
- Network aggregating/multiplexing

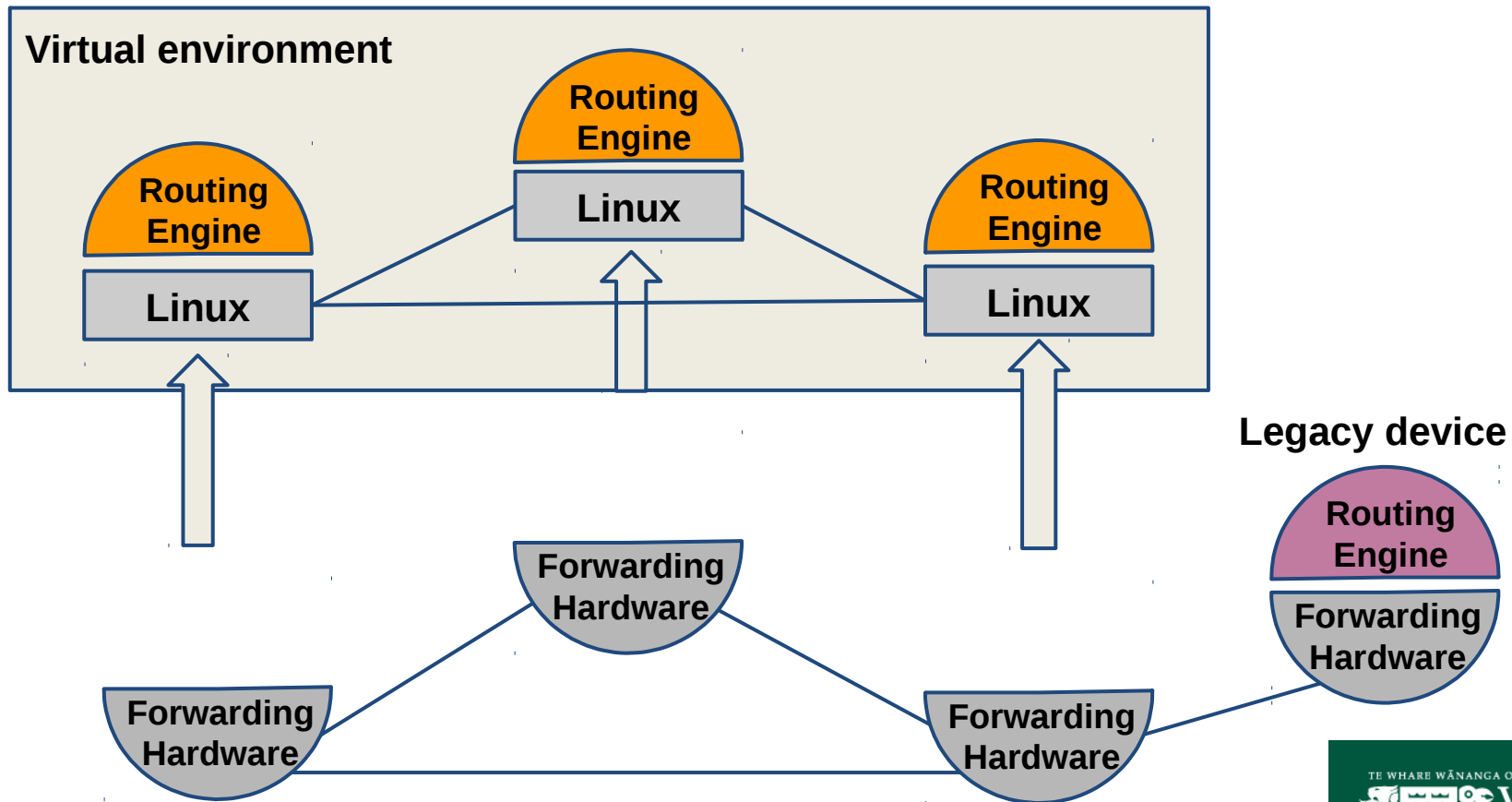
# Introduction to RouteFow

**SDN approach:** Move intelligence to single controller



# Introduction to RouteFlow

**RouteFlow approach:** Move REs to a virtual centralized environment

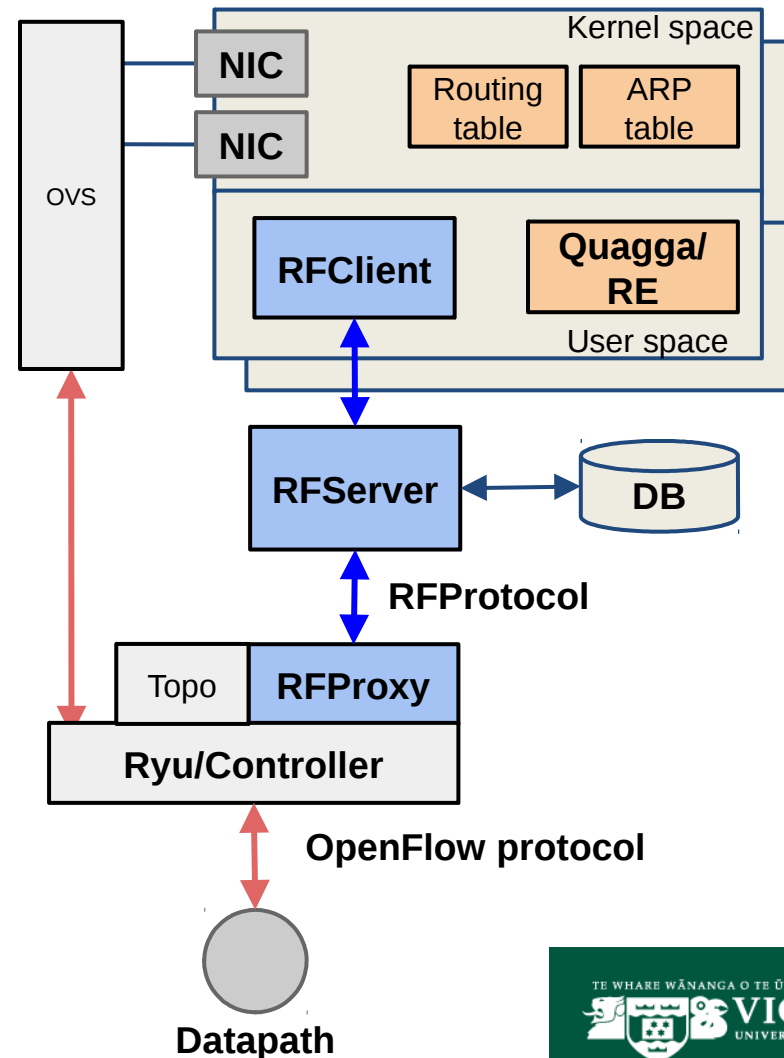


# RouteFlow architecture

**RFClient:** Lightweight daemon, listen to updates on kernel's ARP & FIB table & inform RFServer through RFProtocol

**RFServer:** Core system logic, maintain system state, mapping state and compute routes

**RFProxy:** Translate RouteFlow routes into OpenFlow ones



# Static map configuration

## What's wrong with static map?

- Defined by users in CSV & loaded once when RF server starts
  - Cannot be changed without restarting
- ⇒ Users cannot add more switches or links to the network
- ⇒ Failure events (i.e. port down) in physical topo are not replicated to VMs

# Dynamic Map Extension

- To make RF more operational and suitable for production use
- Goal: Capability to change/expand/shrink the topology without (or with minimal) loss of traffic
  - Add more switches or links
  - Add more VMs to virtual topology
  - Map existing VMs to new switches



# Other improvements

- Replicate port events (up/down) in physical network to the virtual one
- Add JSON RPC ⇒ Allow interaction with the system
  - ◆ View/Add/Update/Delete map state & configs
- RFCClient fixes
  - ◆ Support static routes & ARP entries
- CLI for admins

# Evaluation

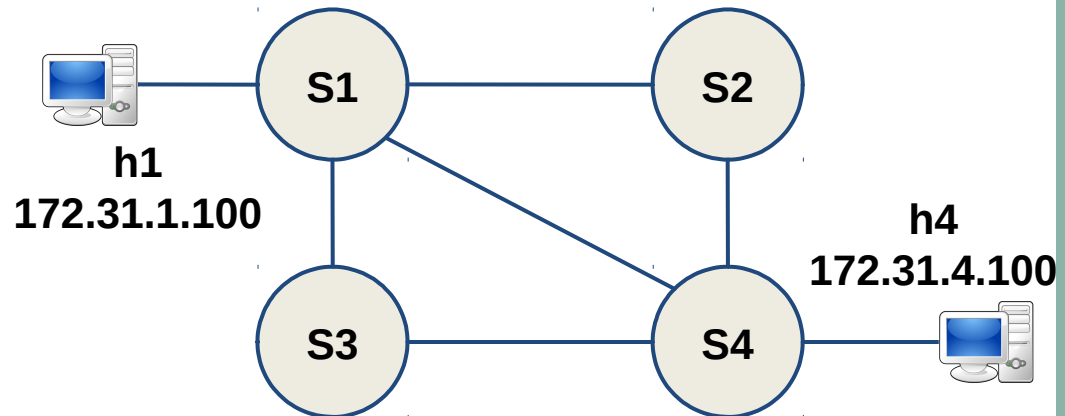
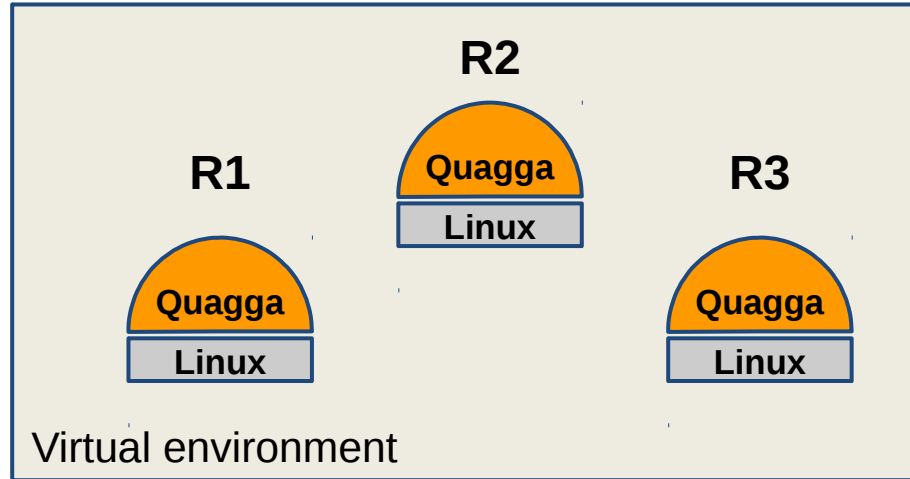
## Test environment:

3 Quagga routers running OSPF on 3 LXC

4 switches & two hosts with Mininet

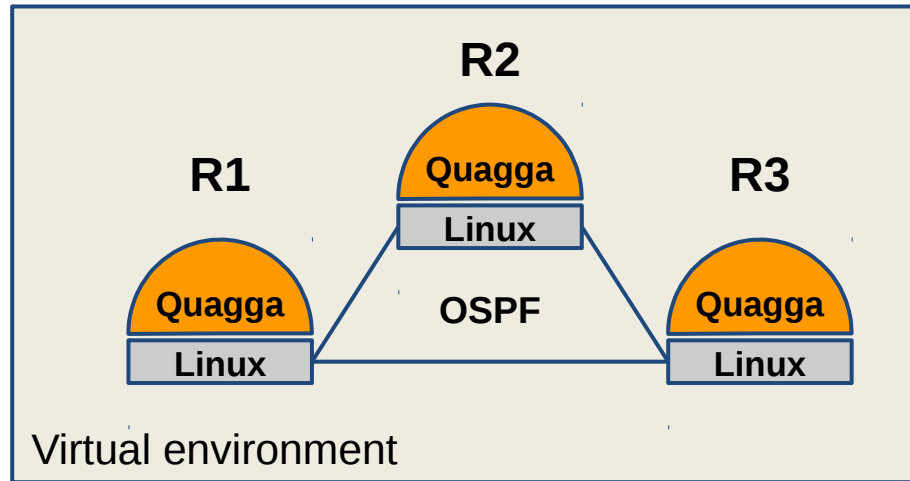
RouteFlow running on the same VM with LXC

No mapping config yet, h1 & h4 cannot ping each other



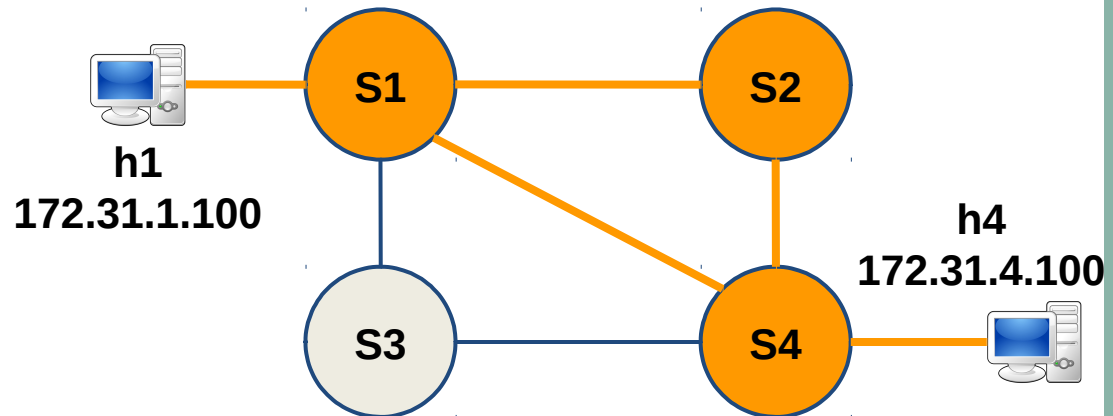
# Evaluation - Forming the topo

Run a python script that invokes RPC calls to add map configs to RouteFlow to form the topo



## Result:

>Takes a few seconds to install control plane rules to the SWs  
>After R1, R2 & R3 learn OSPF, h1 is able to ping h4



# Evaluation - Forming the topo

## Control Plan rules

cookie=0x0, duration=18.263s, table=0, n\_packets=0, n\_bytes=0,  
priority=32800,tcp,dl\_dst=00:a1:a1:a1:a1:a2,nw\_dst=12.0.0.1,tp\_src=**179**  
**actions=CONTROLLER:65509**

cookie=0x0, duration=18.245s, table=0, n\_packets=1, n\_bytes=1588,  
priority=32800,ip,nw\_proto=**89** **actions=CONTROLLER:65509**

## Data Plan rules

cookie=0x0, duration=475.962s, table=0, n\_packets=454, n\_bytes=44492,  
priority=16720,ip,in\_port=3,dl\_dst=00:a1:a1:a1:a1:a3,nw\_dst=**172.31.1.100**  
**actions=set\_field:00:a1:a1:a1:a1:a1-**

**>eth\_src,set\_field:86:42:0d:21:e9:3e->eth\_dst,output:1**

cookie=0x0, duration=455.637s, table=0, n\_packets=454, n\_bytes=44492,  
priority=16640,ip,in\_port=1,dl\_dst=00:a1:a1:a1:a1:a1,nw\_dst=172.31.4.0/24  
**actions=set\_field:00:a1:a1:a1:a1:a3-**

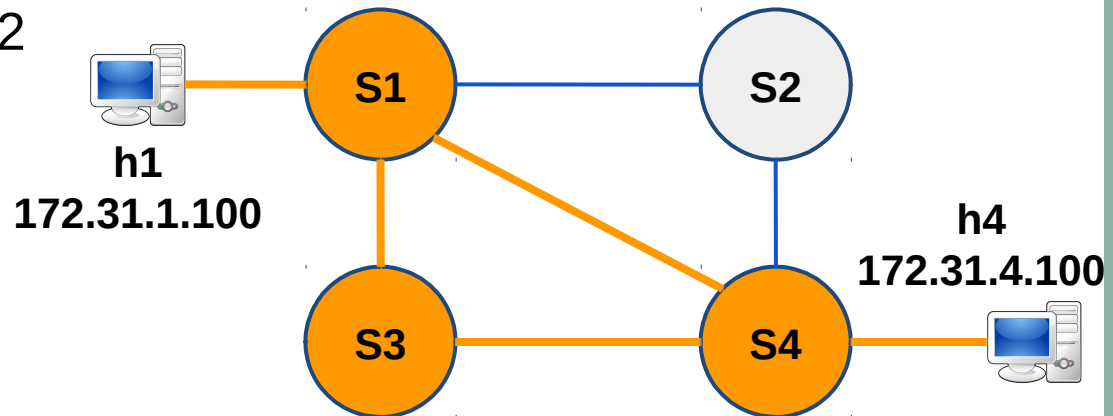
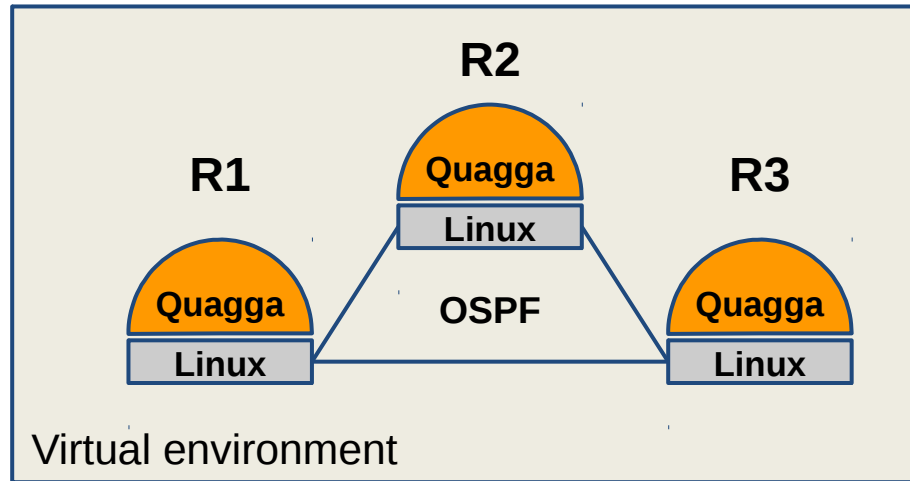
**>eth\_src,set\_field:00:a3:a3:a3:a3:a3->eth\_dst,output:3**

# Evaluation - Moving RE to a new SW

Move R2 to newly added switch S3 with a few RPC calls

Result:

>Takes a few seconds to move all routes in R2 to S3



# Thank you!

## Question?

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Github: <https://github.com/trungdtbk>