UCSDCSE
Computer Science and Engineering

An Elastic Distributed SDN Controller

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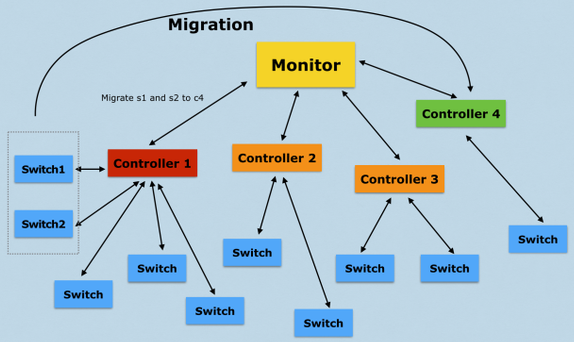
Problem & Idea

Distributed SDN (distributed control plane) can provide with scalability and reliability

However, current mapping between a controller and a switch is statically configured

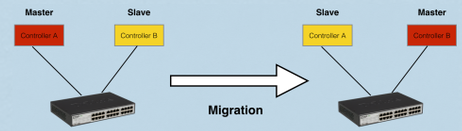
- **PROBLEM:** This can not adapt to traffic load variation
  - Controllers are not balanced, e.g. some are overloaded while others are idle
- **IDEA:** Real time monitoring & dynamic load balancing -> migration[1]
  - Monitoring logic: decide when to trigger the migration
  - Migration logic: migrate a switch from a heavily loaded controller to a lightly loaded one
- **Requirement:** No packet will get lost during the migration process

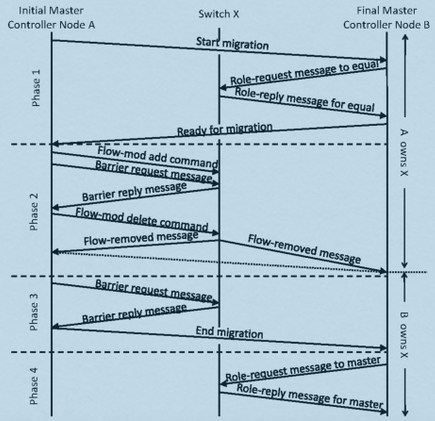


1. Dixit, Advait, et al. "Towards an elastic distributed SDN controller." *ACM SIGCOMM Computer Communication Review*. Vol. 43. No. 4. ACM, 2013.

Protocol

- **OpenFlow controller can be three different modes: Master, Equal, Slave.**
- **Migration of a switch is the process of changing its controllers' mode.**

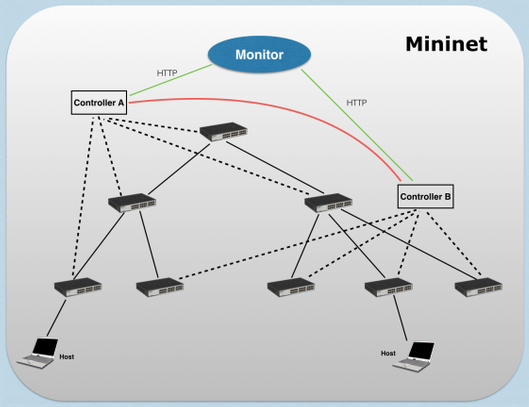




Protocol detail

- Phase 1: Change controller B from **Slave** to **Equal**
- Phase 2: Insert and remove a dummy flow
- Phase 3: Controller A finishes all the pending requests
- Phase 4: Controller B request to become **Master**

Implementation

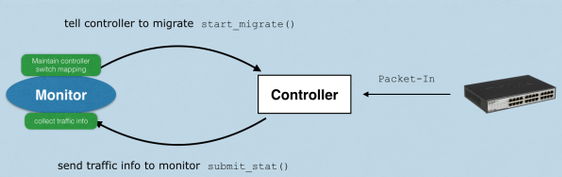


We implement the system on top of Mininet

- The network consists of 8 virtual switches, each linked to two hosts. There are two controllers in the system, each "connected" to 4 switches
- Monitor uses HTTP request to talk to controllers, controllers also use HTTP request to talk to each other
- Monitor only sends request to controllers, controllers will coordinate themselves to finish migration

Monitor maintain status and trigger events

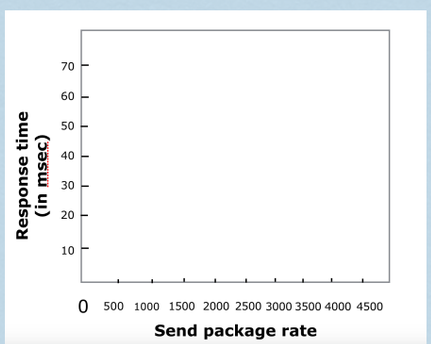
- Controller periodically send traffic information to monitor
- Monitor collect and compare traffic information, and decide whether to trigger a migration event or not

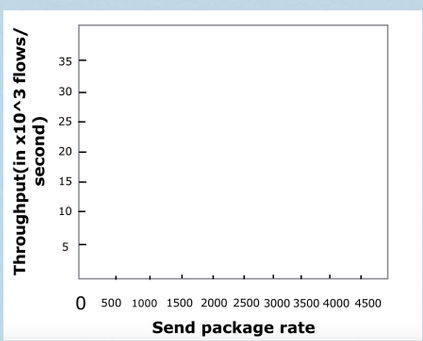


Evaluation

We test the Response Time and the Throughput of controllers

- We use `ping` to generate network traffic with different package rate
- We compare the differences in response time and throughputs of controllers before and after migration





We haven't finished evaluation yet, we will have the result soon.