Pratyastha: An Efficient Elastic Distributed SDN Control Plane

Anand Krishnamurthy, Shoban P. Chandrabose and Aaron Gember-Jackobson
### Motivation

**SDN Control Plane**

- **Operator goals:**
  1. Better Performance – Minimizing flow setup latency
  2. Lower Operating Cost – Efficient controller resource allocation
Challenges faced by operators
Challenges faced by operators

- Static switch assignment

  ![Diagram showing load shifts and controllers](image)

  - Overload or Inefficient Resource Utilization

- State Storage and Access

  ![Diagram showing state storage and access](image)

  - Increases flow setup latency
<table>
<thead>
<tr>
<th>Motivation</th>
<th>Architecture</th>
<th>Evaluation</th>
<th>Summary</th>
</tr>
</thead>
</table>

Pratyaastha - Architecture

*Joint optimization of Inter-controller communication and Resource consumption*
Pratyaastha - Architecture

Application state

- AS1
- AS2
- AS3
- AS4

Flow arrival rate

VM configurations

Controller assignment algorithm

AI – Hill Climbing with simulated annealing
Pratyaastha - Architecture

Application state
- AS1
- AS2
- AS3
- AS4

Controller assignment algorithm
AI – Hill Climbing with simulated annealing

Flow arrival rate

Scaling and Migration
- P1
- P2
- P3
- P4

VM configurations
Evaluation

Topology and traffic from a private datacenter

33% and 42% decrease in cost when compared with ‘Local CPU + Mem’ and ‘CPU only’ respectively

44% decrease in flow-setup latency
Summary

Praytaastha: An Efficient Elastic Distributed SDN Control Plane

- Novel assignment of application state partitions and switches to controller instances
- Minimizes flow setup latency
- Minimizes controller operating costs