1. Motivation and Problem Statement

- Common SDN techniques program switches individually.
- But network applications need to produce global policy.
- Policy transformation moves, merges, and splits rules across a topology of switches, while preserving the global network behavior.

2. Correctness - Rewriting System

Achieve policy transformation by composing a collection of simple, local rewriting axioms.

Single-Switch policy:
- Join
- Reorder
- Shadow
- Global

C chained-Switch policy:
- Pattern: action
  - Push action ahead
  - Pull action back

We have proved the rewriting system for single-switch policy is sound and complete.

3. Efficiency: Rule Placement

Goal: minimize total number of rules.

Action Composition

$\alpha \cdot \beta$ denotes cumulative action for applying action $\alpha$ after $\beta$. We only consider restricted case of action set \{drop, forward\}.

Example

- Topology
  - 2-hop chain
- Global Policy, Pattern
  - 2 header fields
  - Global Policy, Action
  - forward and drop

4. Ongoing Work

- Rewriting axioms over complicated topologies, e.g. tree and DAG.
- Use axioms to analyze and optimize an existent rule placement.
- Rule placement algorithm for general global policy and topologies.
- Evaluate algorithm performance using real data, Firewall ACL etc.