

Precise Timing Analysis of Open vSwitch for Hard Real-Time Applications

Lavanya Piramanayagam, Smruti Padhy, Monowar Hasan, Sibin Mohan



PROBLEM STATEMENT AND OBJECTIVES

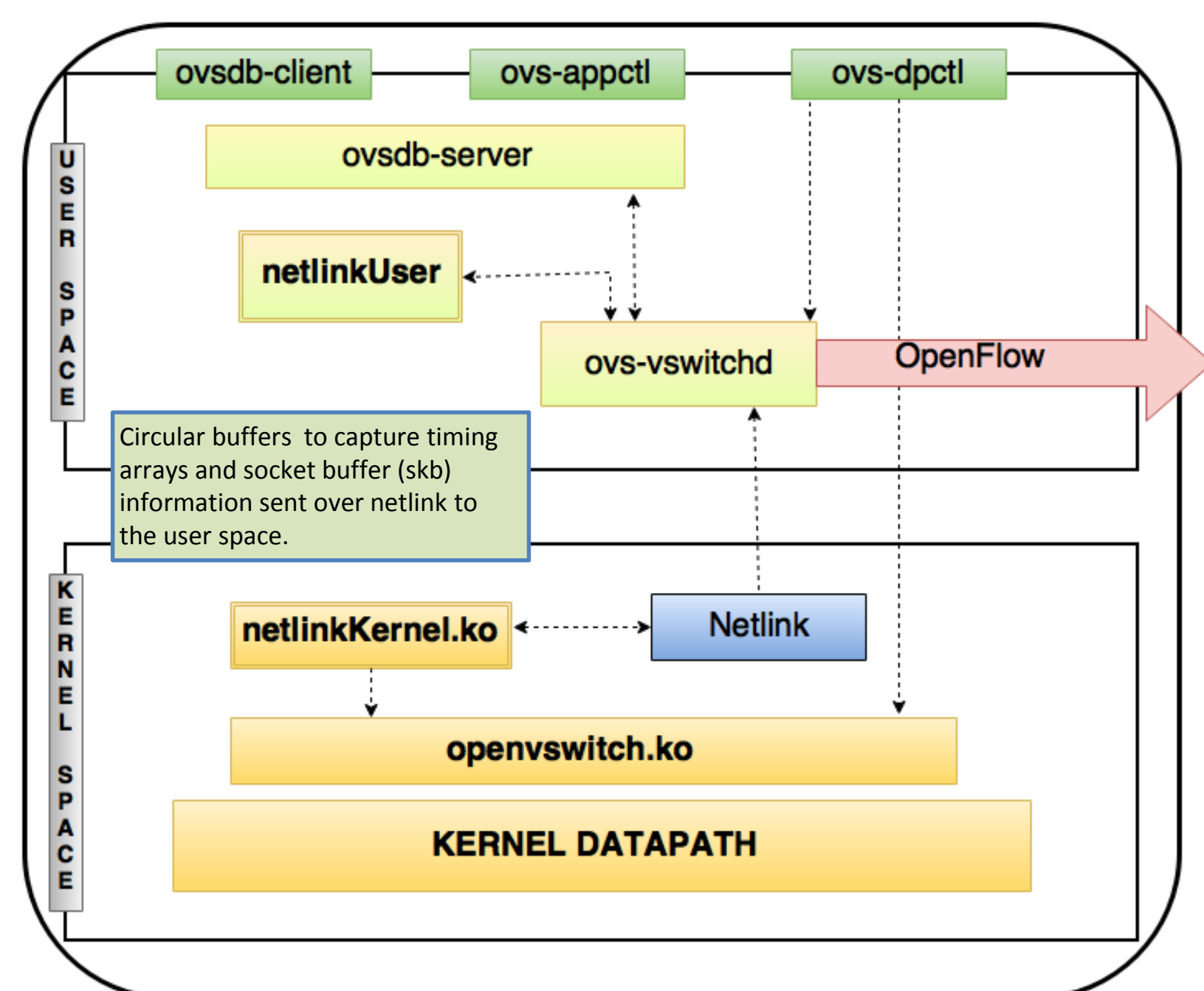
Hard real-time applications require precise timing information to guarantee QoS (*viz.* end-to-end delay) requirements. The goal of this work is to support real-time communication on SDN-enabled networks.

This work aims to build a dynamically *pluggable kernel module* that monitors the timings of packets as they move from the *ingress* to the *egress* port.

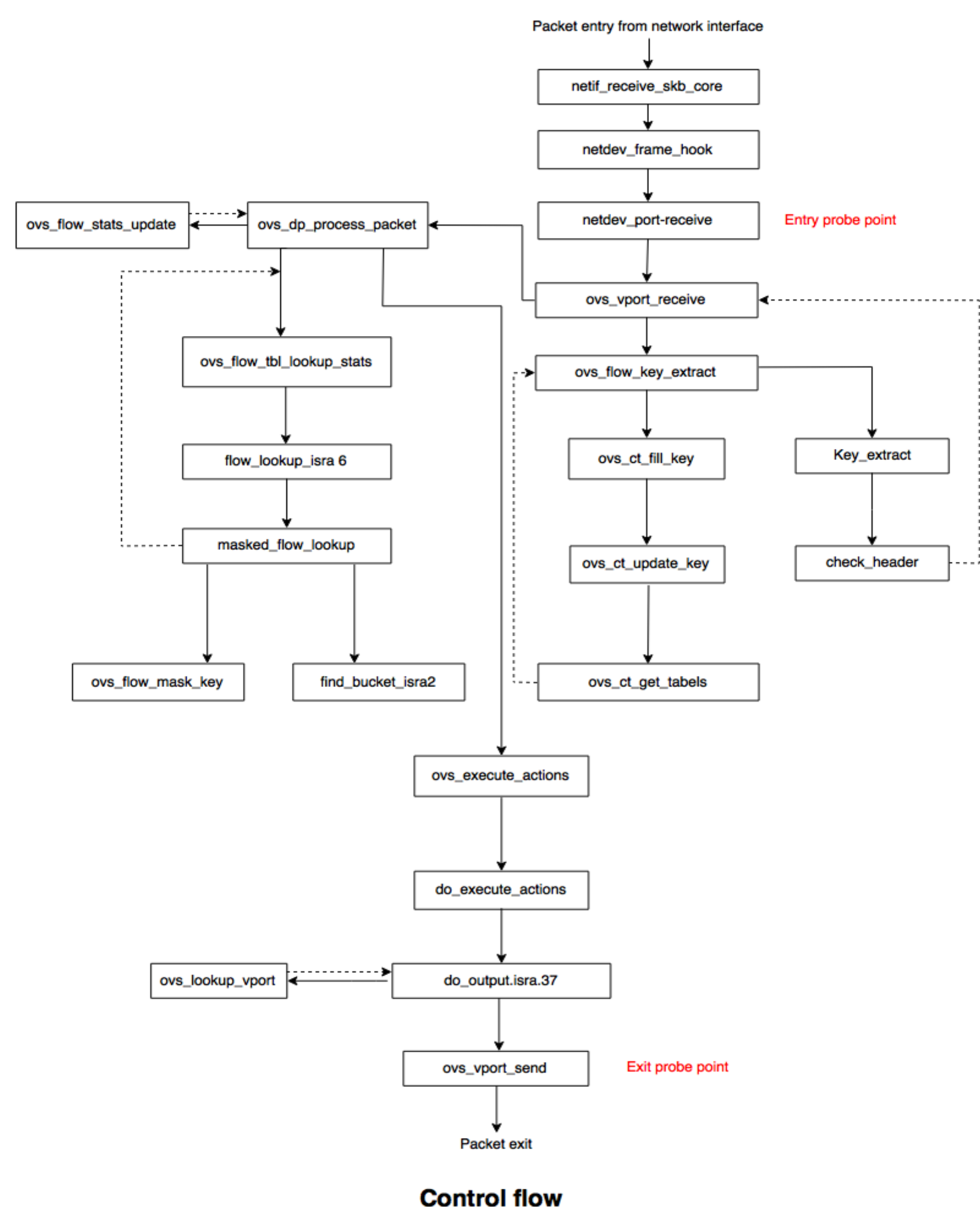
CHALLENGES

- Building a loadable kernel module that is fully integrated with the standard Open vSwitch (OVS).
- Establishing a communication link between the user and kernel space and extract timing information.
- Retrofitting a *high resolution* Linux timer, placing probe points and examining their compatibility as well as effectiveness.

SYSTEM STRUCTURE AND CONTROL FLOW



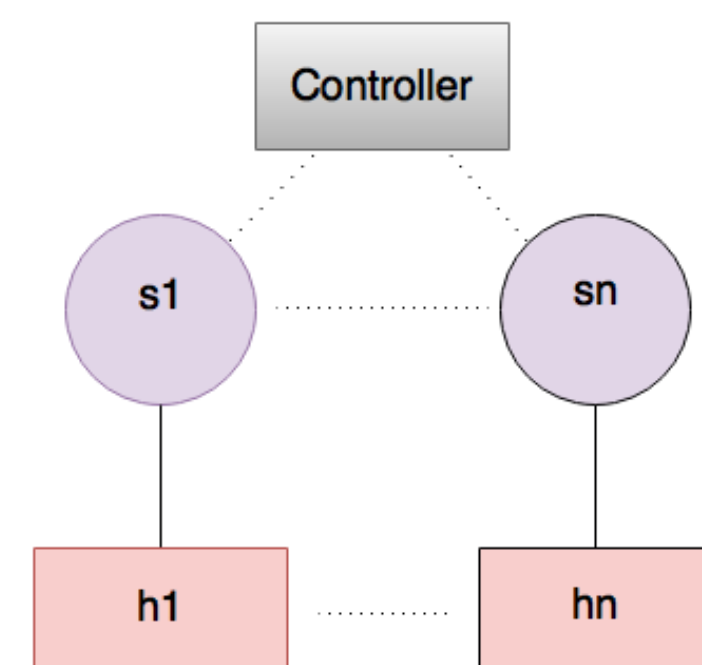
Switch Architecture Implemented



Control flow

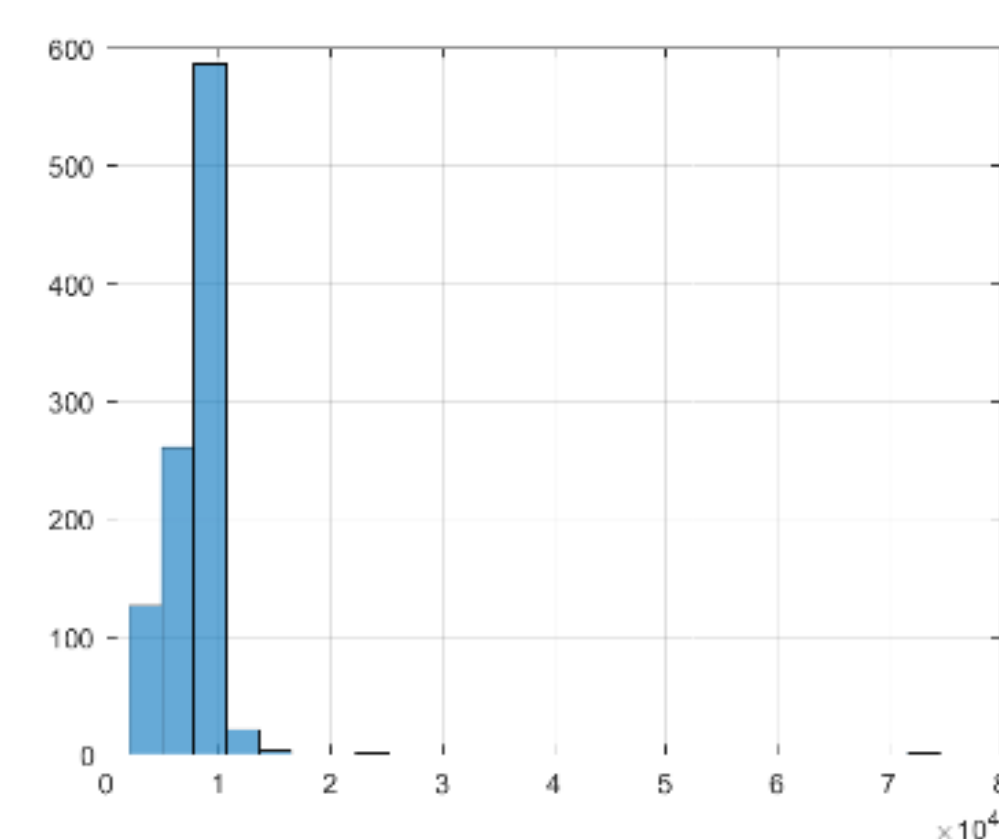
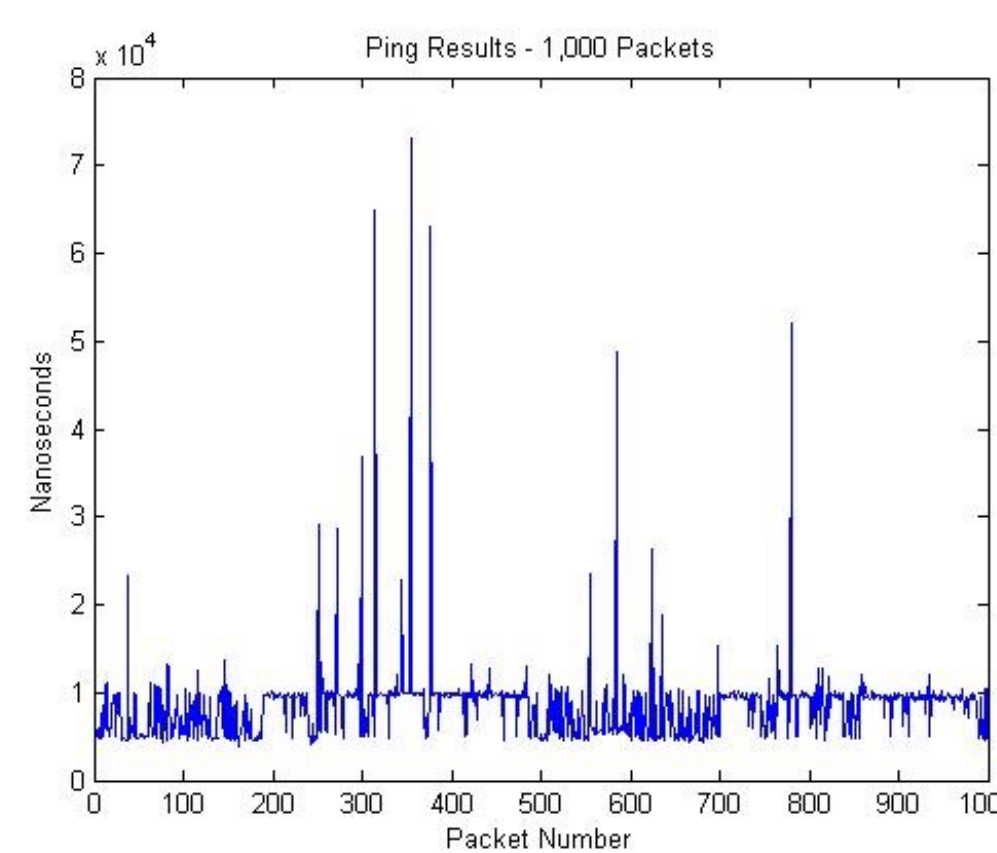
EXPERIMENTS

- Mininet topology with Ryu as SDN controller

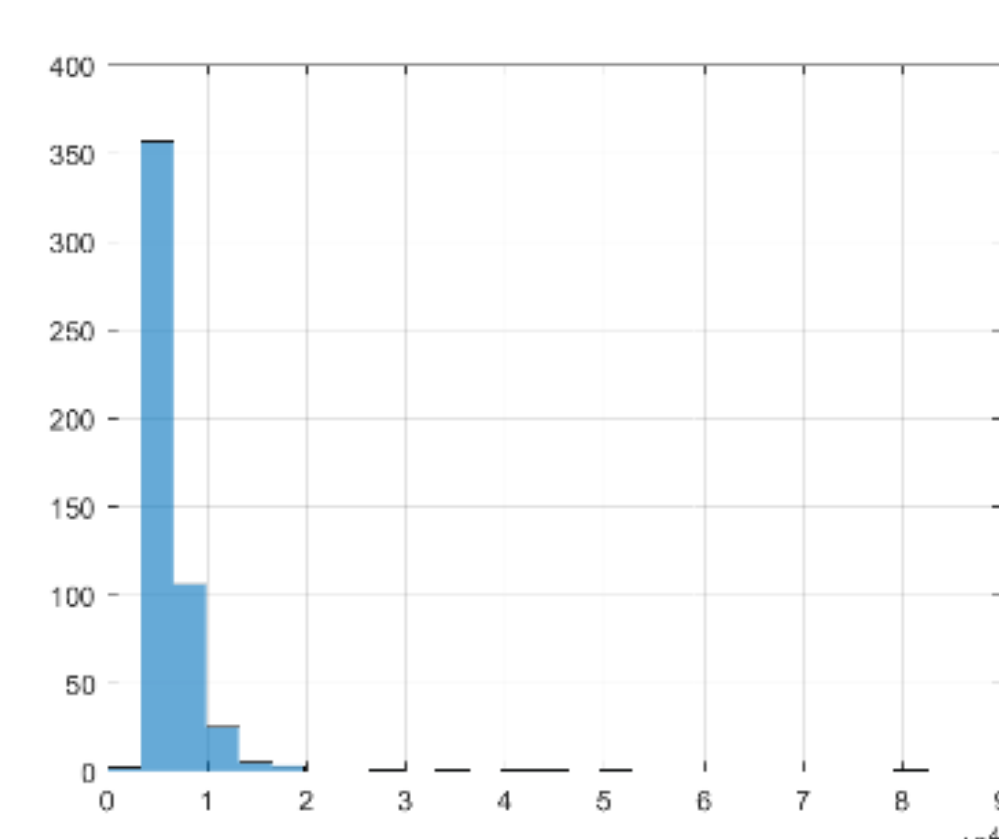
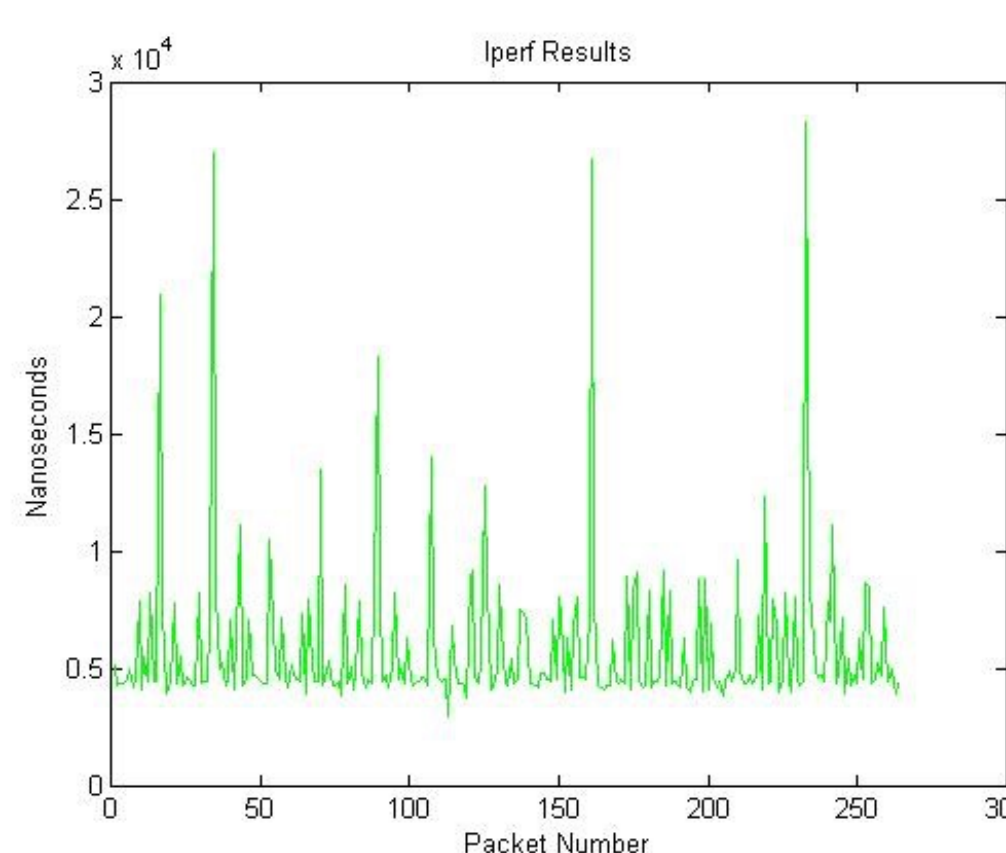


- Analyze the impact of:
 - ✓ Topology changes
 - ✓ Flow variations
 - ✓ Different size and number of packets

RESULTS



Timing variations in ping



Timing variations in iperf

CONCLUSION & FUTURE WORK

- A kernel module is designed to measure end-to-end timing for SDN enabled real-time applications.
- This work will be extended leveraging the multicore support:
 - ✓ Utilize Linux CPU affinity to remove measurement noise
 - ✓ Separate real-time application, Linux processes and packet flows in different cores