OFf: Bugspray for Openflow

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Motivation

- Debugging SDN applications is hard
- "Runs as designed" may be insufficient
- Deployment must cope with a wide range of operating conditions
- How can we answer the following question:

Will my SDN app run as designed when deployed in a live setting?

Our solution: OFf (built atop fs-sdn [1])

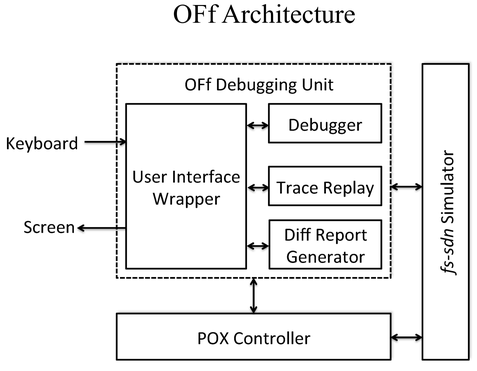
Design Goals

- A debugging and test environment for SDN developers
- Default debugging options (step, break, etc.)
- Comprehensive testing for SDN apps
- Tie unwanted network behavior to controller
- Simple, light-weight, no hardware support
- Facilitate transition to live environments

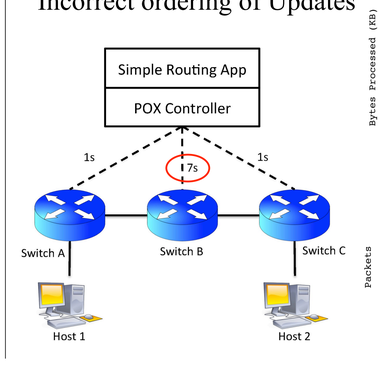
OFf Commands

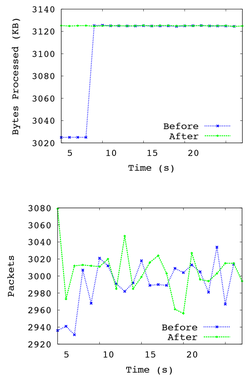
- Longlist and shortlist source code
- Pretty print expressions
- Hide/unhide frames
- Interactive interpreter
- Track, watch, or unwatch variables
- Edit source files during debugging
- Enable or disable break points on the fly
- Sticky mode to visualize code

OFf Architecture

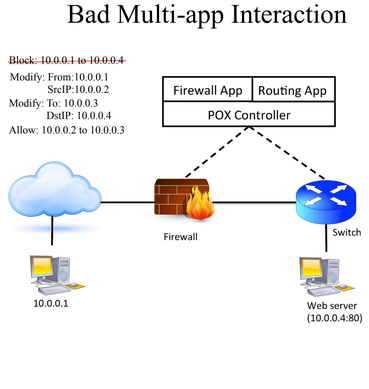


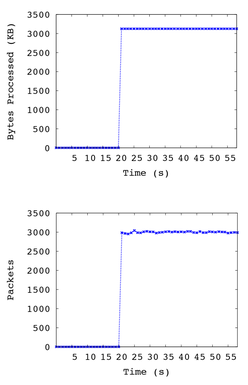
Scenario 1
Incorrect ordering of Updates



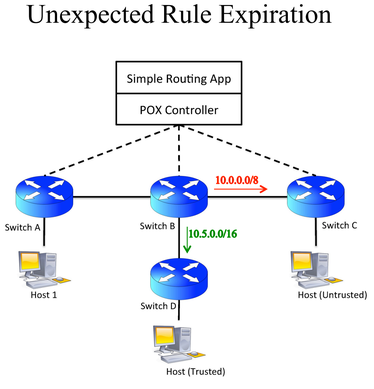


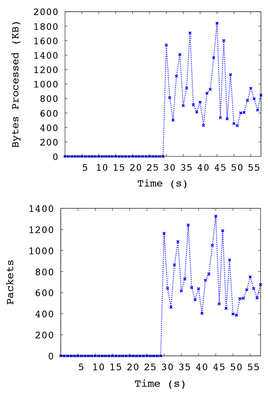
Scenario 2
Bad Multi-app Interaction





Scenario 3
Unexpected Rule Expiration





OFf Additional Features

- Trace packet through the network
  - *Holistic* view of flows, controller and switches
  - No additional hardware
- Replay packets
  - No OFP modification
- Detect configuration changes
  - In topology, performance, rules/actions

OFf in Action

- We demonstrate OFf in three scenarios:
  - Incorrect ordering of updates
  - Bad multi-app interaction
  - Unexpected rule expirations
- **Goal**: Identify logical bugs in the source code that lead to transient outages and losses

Timeline

- Future work: Multiple platform and controller support
- Source code available at: https://github.com/52-41-4d/fs-master

References

[1] M. Gupta, J. Sommers, P. Barford. "Fast, Accurate Simulation for SDN Prototyping", In Proceedings of ACM HotSDN, Hong Kong, August, 2013.