Software Defined Networking

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In this course, you will learn about software defined networking and how it is changing the way communications networks are managed, maintained, and secured.

This Module: The Control Plane

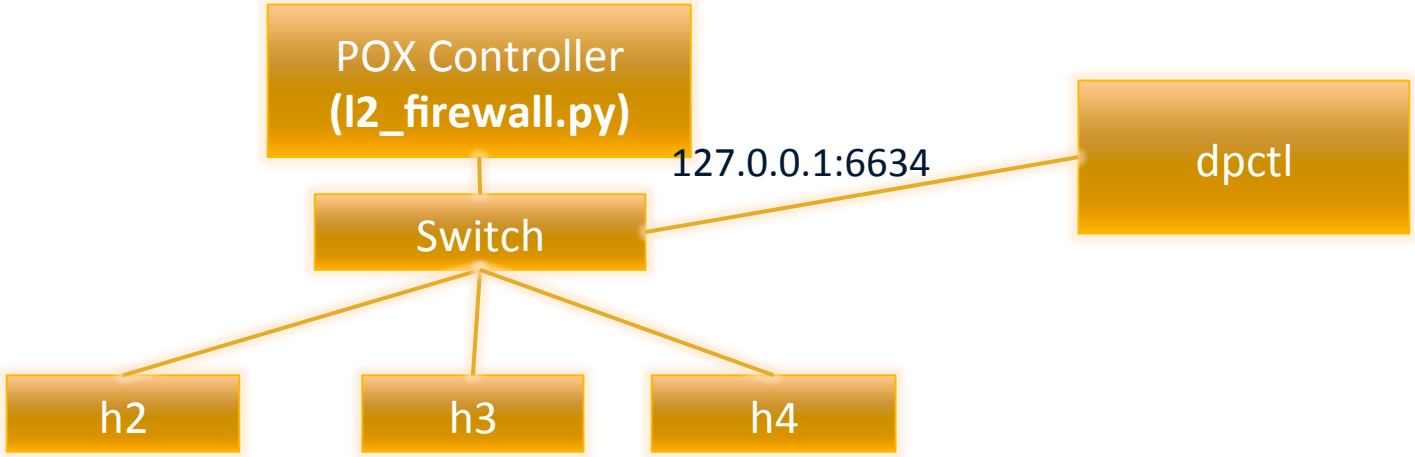
- Three Lessons
  - Control Plane Basics (OpenFlow 1.0 and Beyond)
  - SDN Controllers
  - **Using SDN Controllers to Customize Control**
    - **Part 2: Simple Firewall**
- Programming Assignment (and Quiz)
- Quiz

Customizing Control with Flow Rules

Switching

Switch Port	MAC src	MAC dst	Eth type	VLAN ID	IP Src	IP Dst	IP Prot	TCP sport	TCP dport	Action
*	*	00:1f:..	*	*	*	*	*	*	*	port6

Example Topology: Now with Firewall



- `$ sudo mn --topo single,3 --mac --switch ovsk --controller remote`
- `dpctl` to communicate with switches
  - Switches listen on port 6634
  - Can inspect flow table entries, modify flows, etc.

POX Learning Switch Algorithm

- Use source address and switch port to update address/port table
- **Check source MAC address against firewall rules**
- Is transparent = False and either Ethertype is LLDP or the packet's destination address is a Bridge Filtered address? If yes, DROP
- Is destination multicast? If so, FLOOD.
- Is port for destination address in our address/port table? If not, FLOOD.
- Is output port the same as input port? If yes, DROP
- Install flow table entry in the switch so that this flow goes out the appropriate port. Send the packet out appropriate port.

Simple Additions to Controller

- Hash table for storing (key,value) pairs
  - Table maps (switch, src MAC) to True/False
- Controller will decide to **drop** traffic
  - If there is a firewall entry that maps to “False”
  - If there is no firewall entry
- Controller will decide to **forward** traffic
  - If there is a firewall entry that maps to “True”

Performance: Cache Decisions at Switch

- Important to limit data traffic to the controller
- When control decides to forward or drop, the switch's flow table is modified
- Decision is cached at switch until the flow table entry expires

Summary

- Customizing control is easy in SDN!
- Exploration of alternate control program
  - Turned switch into a firewall in < 40 lines of code
- Demonstrated of the performance benefits of caching forwarding decisions at switch