Introduction to OpenFlow

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Outline

- Background
  - Motivation
- OpenFlow overview
  - OpenFlow Concept
  - OpenFlow protocol
  - OpenFlow Messages
- How OpenFlow works?
- Conclusion

Background

- Internet is closed for Innovations
- We like to do new experiments
  - Mobility management
  - New naming/address schemes
  - Network access control
  - ……

What is OpenFlow?

- Put an open platform in hands of researchers/students to test new ideas at scale through production networks.
- An open development environment for all researchers
- Give access to flow tables in switches
  - lookup tables, access control list, etc..
  - Control packet forwarding in routers and switches.

OpenFlow Architecture

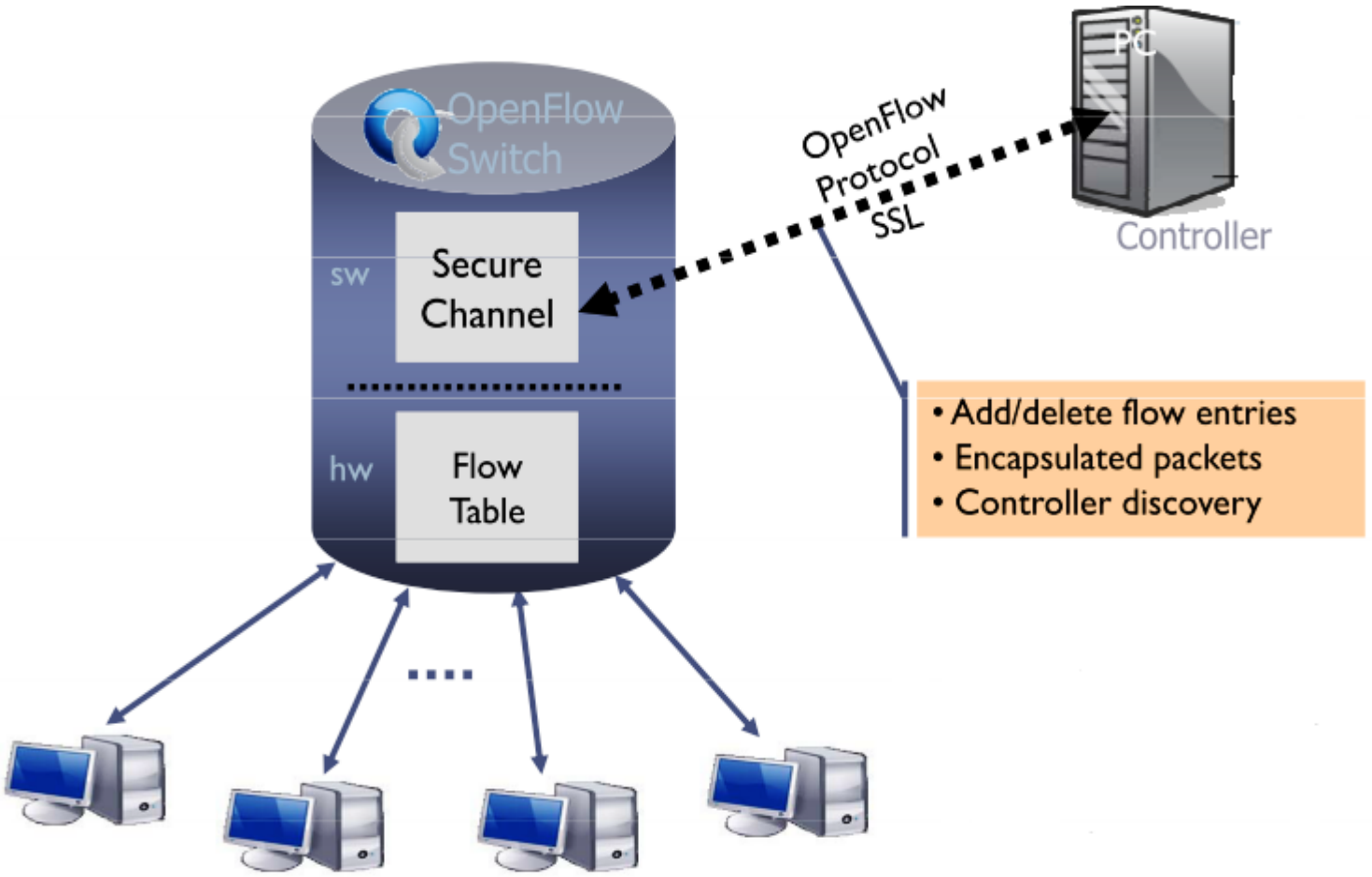
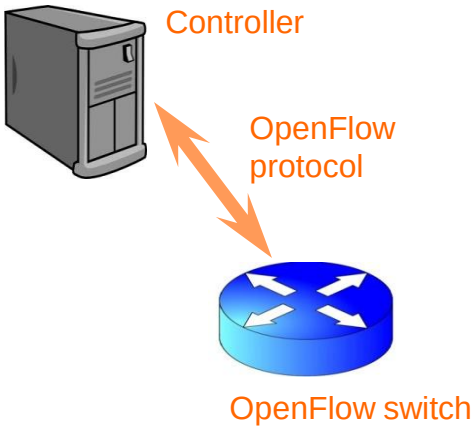


Figure 1: OpenFlow Architecute [1]

OpenFlow Protocol

- Support three message types
  - Controller-to-switch messages
    - Configuring the switch
    - Exchanging switch capabilities
    - Managing the Flow table
  - Symmetric messages
    - Send in either direction
    - Diagnose problems in switch controller connection
  - Asynchronous messages
    - From switch to the controller
    - Announce change in network state, swtich state etc.



OpenFlow Controller

- Openflow controller is a centralized entity for the entire OpenFlow network.
- NOX [4] is an open source OpenFlow controller.
  - simplified platform for writing network control software in C++/ Python.
- Researchers can write a software and plugin to NOX for testing their idea.

Packet processing in OpenFlow Network

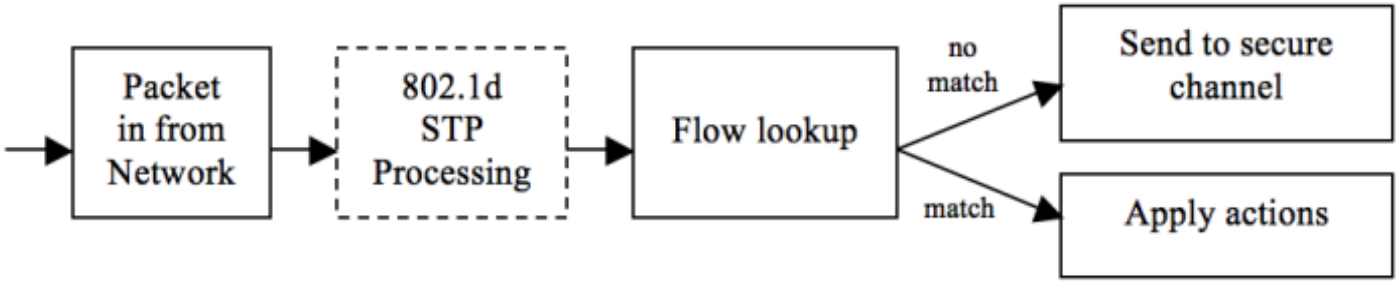


Figure 2: Processing of a packet in Openflow network [1]

OpenFlow Table Entry

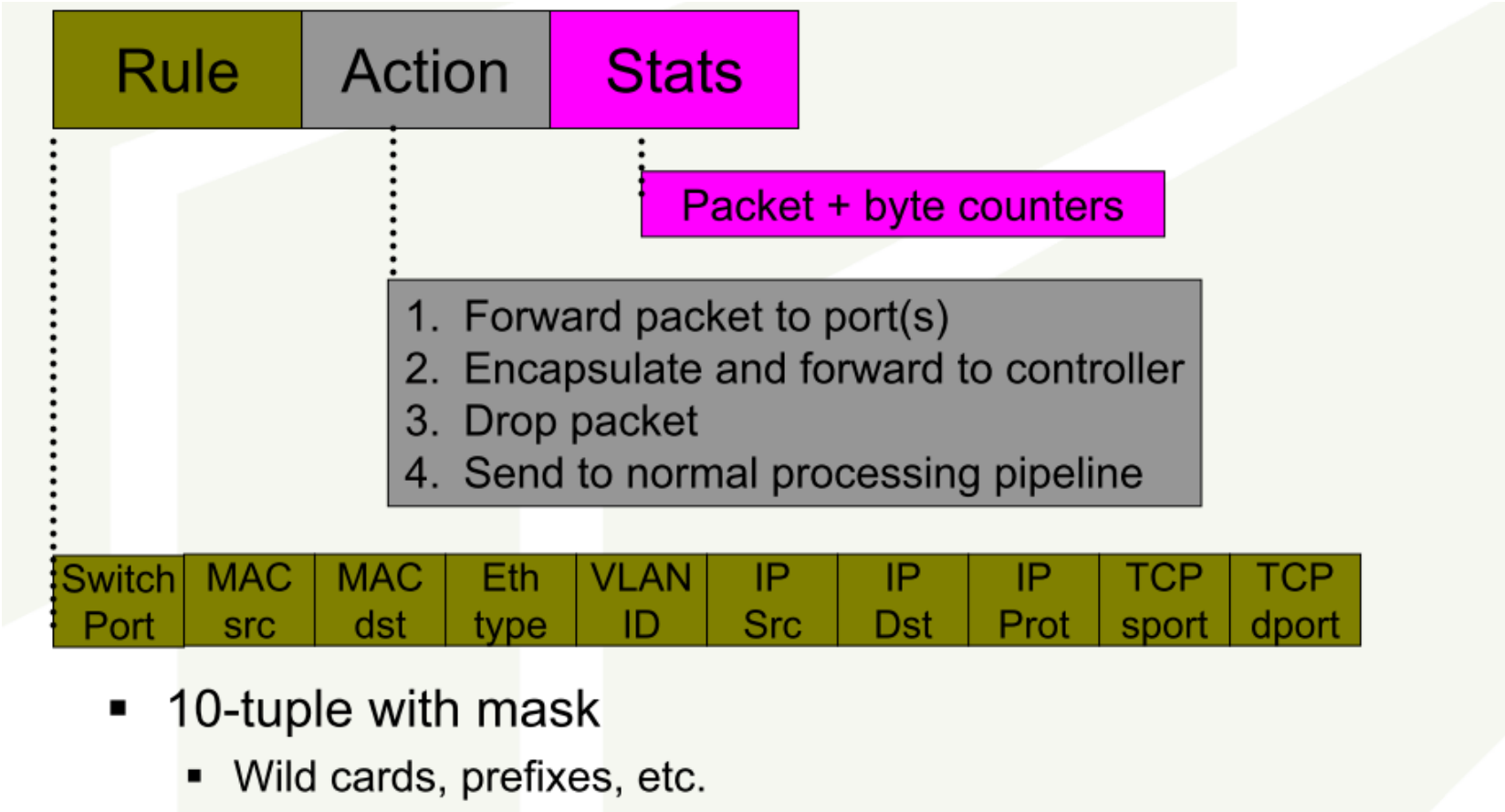


Figure 3: OpenFlow Table Entry [2]

OpenFlow switching mechanism

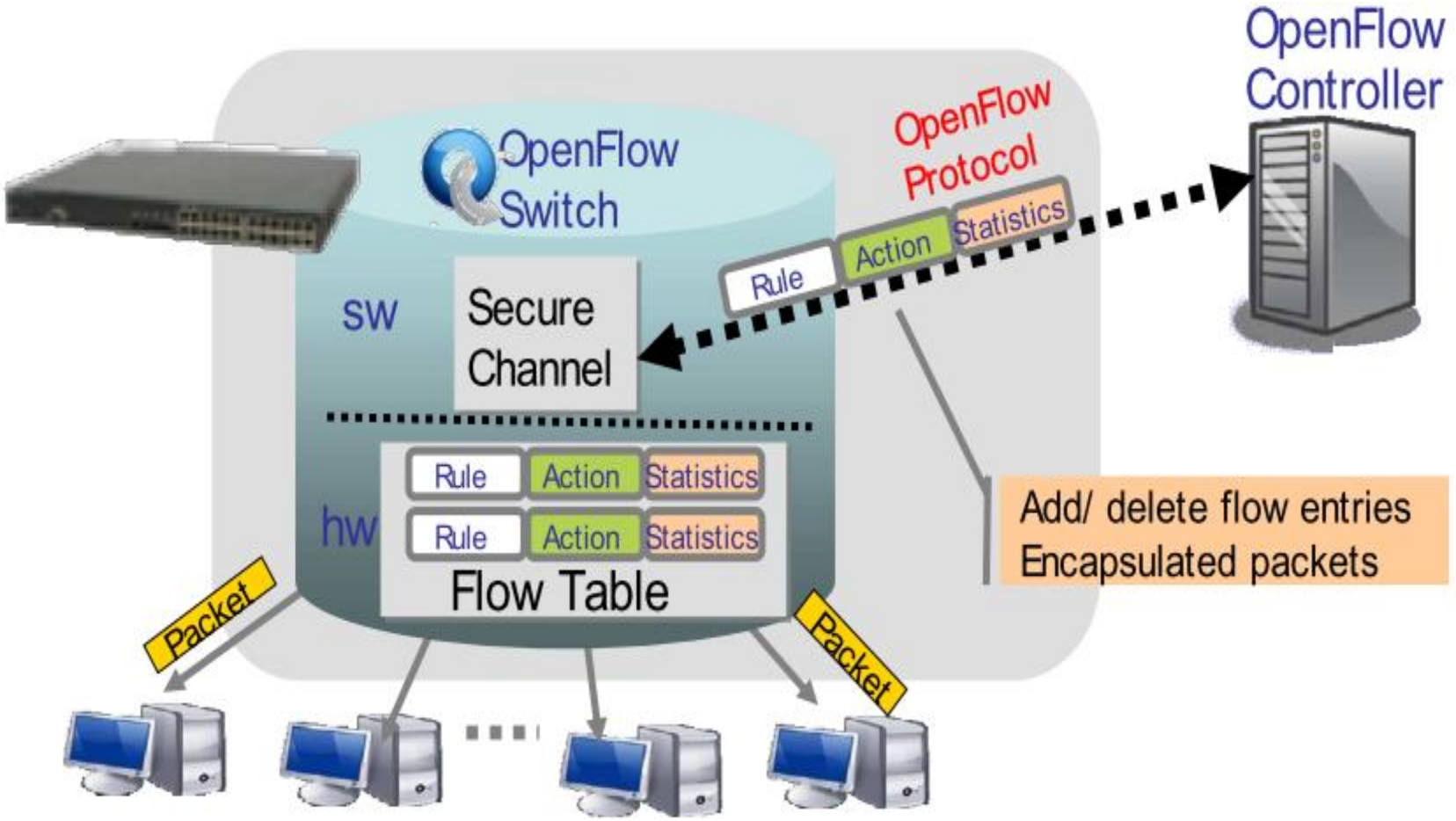


Figure 4: Switching of packets in OpenFlow network [3]

Conclusion

- Test environment for future Internet technologies
  - Setup experiments at the flow level
  - Setup experiments at the packet level

Reading Material

- OpenFlow switch specification; URL: www.openflowswitch.org/documents/openflow-spec-v0.8.9.pdf
- N McKeown; '*OpenFlow: Enabling Innovation in Campus Networks*'; URL: http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.141.2269
- Labsetup of Openflow network; URL: http://www.openflowswitch.org/foswiki/bin/view/OpenFlow/Deployment/HOWTO/LabSetup#4_Controller_Setup
- NOX controller; URL: http://noxrepo.org/noxwiki/index.php/Main_Page

References

1. Nick McKeown;“*Clean state design for Internet*”; URL: www.openflowswitch.org/documents/FOpenFlow.ppt&ei=K3xITN3cHIqOjAfo7Li0Dg&usg=AFQjCNGBQJM8FlhrVJAF7iy_BcehOKkqqw&sig2=WFzjw1dzcG_Hwy3lxSMAZg
2. Peter Sjodin, Markus Heidell, Georgia Kontesidou, Kyriakos Zarifis, “Network virtualization based on flows”
3. HIDEyuki Shimonishi; ‘*Virtualized Network Infrastructure using Openflow*’;
4. NOX; URL: http://noxrepo.org/wp/