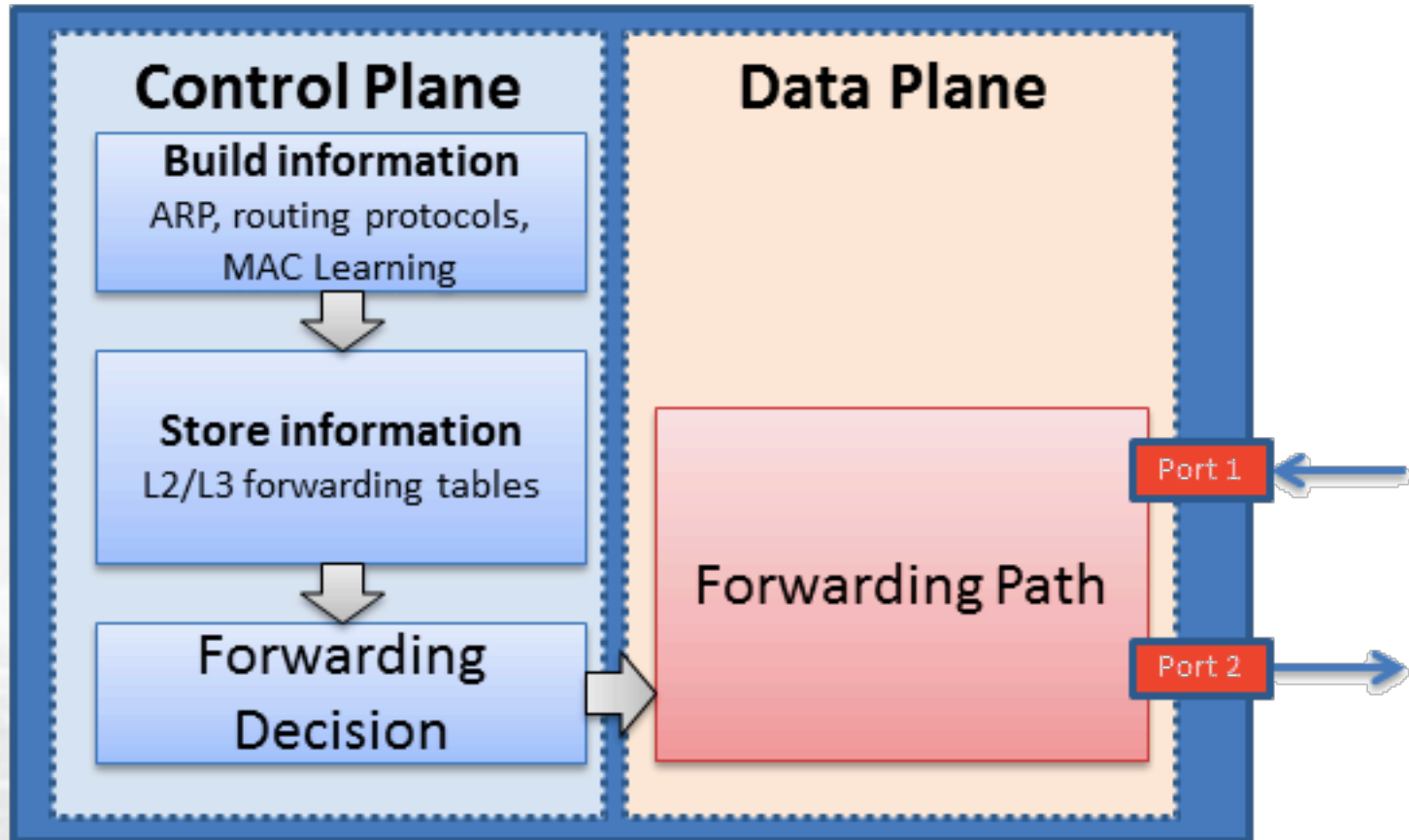


A Brief Introduction to OpenFlow

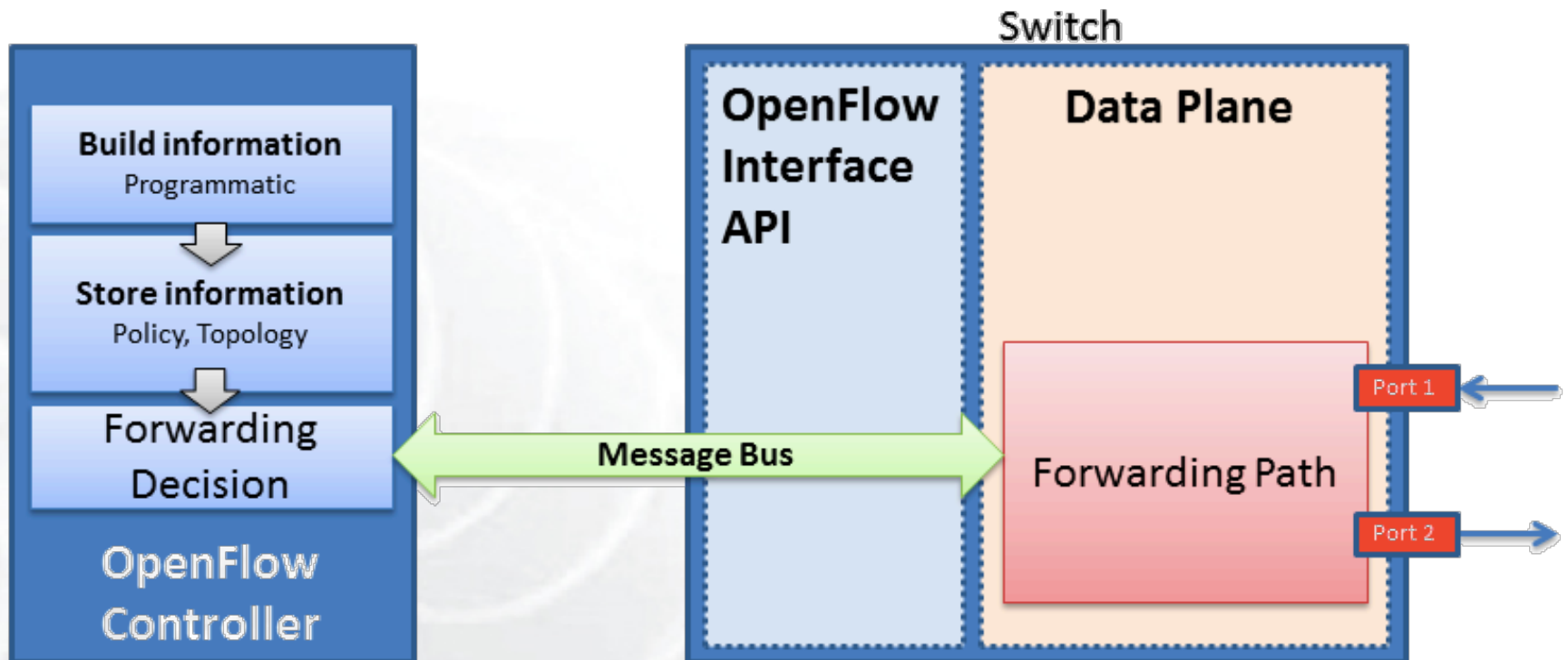
(Adapted from GENI OpenFlow Tutorial)

Switch



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Externally controlled Switch

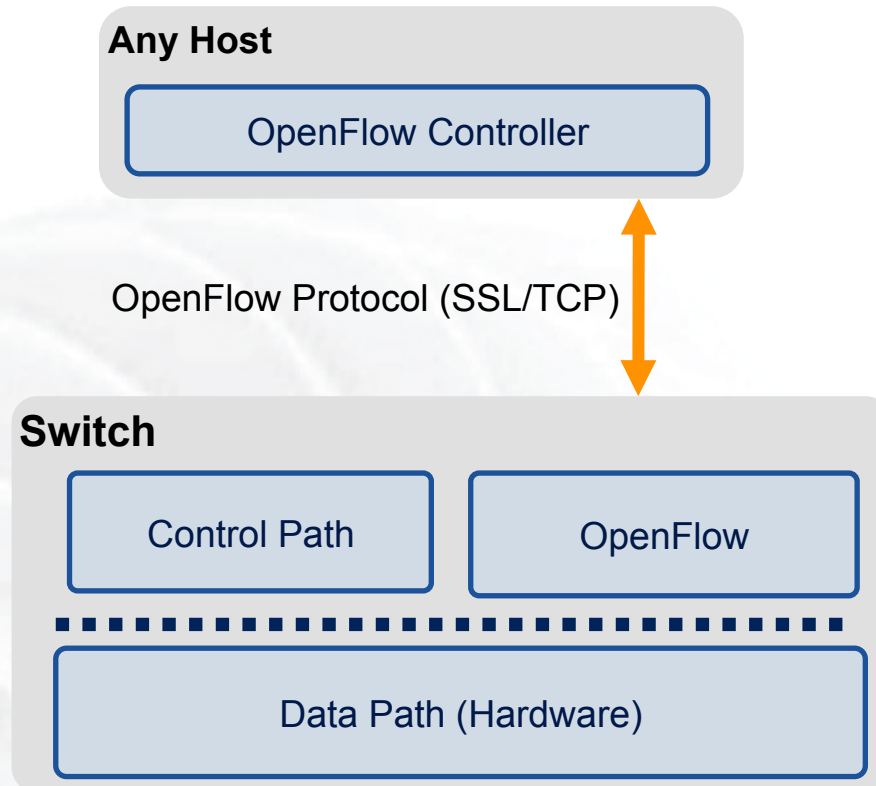


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- Control how packets are forwarded
- Implementable on COTS hardware
- Make deployed networks programmable
 - not just configurable
- Makes innovation easier

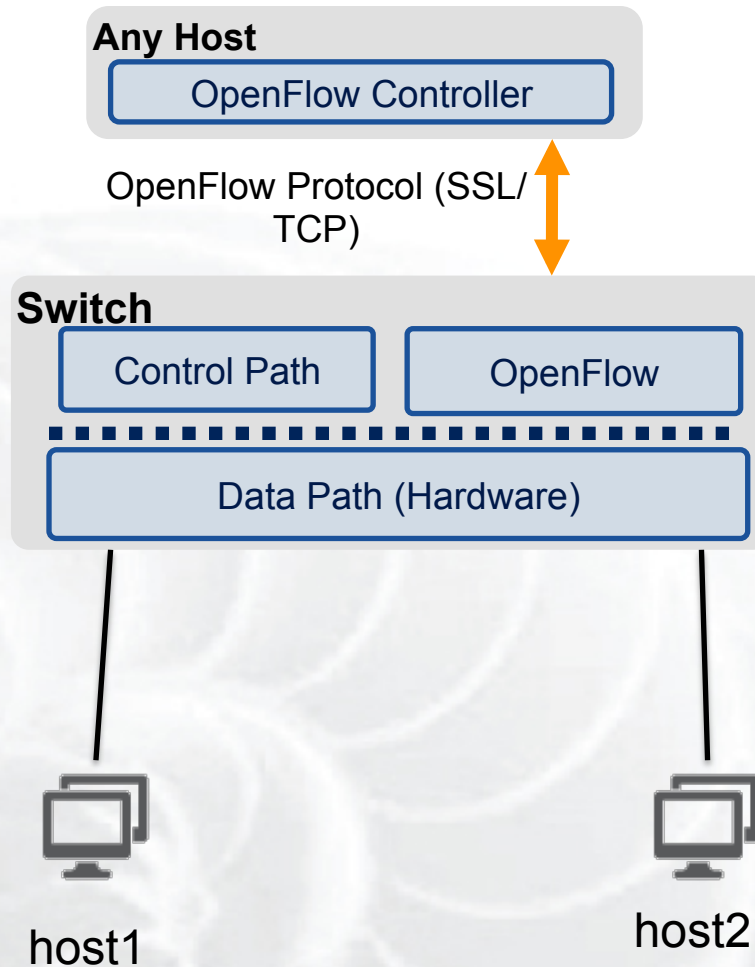


- **Open source controller frameworks**
 - NoX/**PoX**
 - Open Daylight
 - FloodLight (BigSwitch)
 - Trema (NEC)
 - Maestro
 - Ryu
- **Production controllers**
 - Mostly customized solutions based on Open Source frameworks
 - ProgrammableFlow - NEC



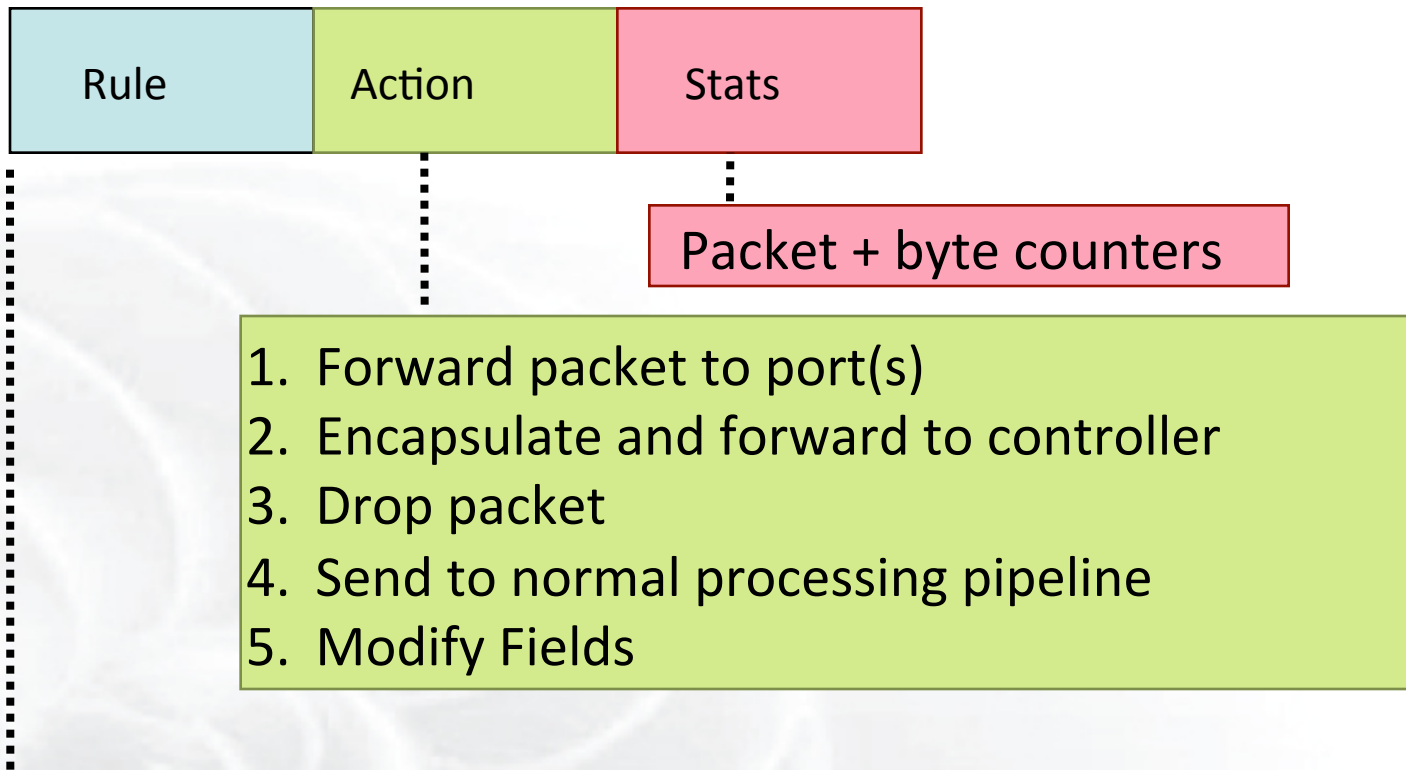
- The controller is responsible for populating forwarding table of the switch
- In a table miss the switch asks the controller

OpenFlow in action



- Host1 sends a packet
- If there are no rules about handling this packet
 - Forward packet to the controller
 - Controller installs a flow
- Subsequent packets do not go through the controller

OpenFlow Basics (1.0)



1. Forward packet to port(s)
2. Encapsulate and forward to controller
3. Drop packet
4. Send to normal processing pipeline
5. Modify Fields

Packet + byte counters

Switch Port	VLAN ID	VLAN PCP	MAC src	MAC dst	Eth type	IP Src	IP Dst	IP Prot	IP ToS	TCP sport	TCP dport
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+ mask what fields to match

OVS is a virtual switch running on a xen VM in GENI

- The interfaces of the node are the ports of the switch
 - Configure an ethernet bridge
 - add all dataplane ports to the switch
- Can be an OpenFlow switch
 - Need to specify the controller