Improving bridge(4) or Toward a Unified L2 Framework

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Who We Are

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- Working at IIJ (Internet Initiative Japan)
 ISP company in Japan
- Developing Internet access routers
- Kernel and networking developers

Motivation

- We have several software switches
 - L3capable bridge(4), openvswitch, etc.



3

Motivation

- They have much in common
 - architecture
 - data plane and internal port are separated
 - configuration
 - add/delete data plane and port, forwarding rules...
 - processing
 - rule lookup, forwarding frames by the rule...





Framework Overview

• The framework consists of several components





Device

Framework Overview

Configuration

- add/delete data plane and port, forwarding rules...
- Flexible forwarding plane
 - 1. Extract a key from a packet
 - 2. Lookup a rule with the key
 - 3. Forward the packet by the rule
- Others
 - STP and LLDP handling
 - Timer event handling
 - expire rule, etc..

Adding forwarding rules

 Both brconfig(8) and vswitchd(8) add forwarding rules via the framework APIs



7

Adding forwarding rules

 Both brconfig(8) and vswitchd(8) add forwading rules that used the framework APIs



Dataplane abstraction function

```
static void
dp input(struct ifnet *ifp, struct mbuf *m) {
    struct brdp softc *sc = &ifp->if softc;
    struct flow key key;
    struct flow *flow;
    (sc->brdp flow extract)(sc, m, &key);
    m = (sc->brdp_upcall controller)(sc, m, &key);
    if (m == NULL)
        return;
    flow = (sc->brdp_flow_lookup)(sc, &key);
    (sc->brdp forward)(sc, m, flow);
```

Normal packet processing

static void

dp_input(struct ifnet *ifp, struct mbuf *m) {
 struct brdp_softc *sc = &ifp->if_softc;

1.Extract a key from the packet

(sc->brdp_flow_extract)(sc, m, &key);

m = (sc->brdp_upcall_controller)(sc, m, &key);
if (m == NULL)

return;

```
flow = (sc->brdp_flow_lookup)(sc, &key);
(sc->brdp_forward)(sc, m, flow);
```

Normal packet processing



Normal packet processing



STP and LLDP



Summary

- We have proposed a framework for software switches
 - They have similar components
 - architecture
 - configuration
 - forwarding processing
- We have a plan to support hardware switches

Thank you!

Any questions or comments?

Backup

Extend to hardware switch

• Overview of extended framework



Device specific operation



What is improving bridge(4)?

- bridge(4) has many many problems
- So we redesign bridge(4)
- Improving bridge(4) has internal-port that receive and send self packets



What is openvswitch module?

• We implement inkernel datapath that is component on Open vSwitch

