PIX-IE : Programmable Internet eXchange in Edo

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1. Motivation

▪ Flexible traffic control on IXs with SDN technologies

▪ Limitations of current IXs and Inter-domain networking
→ traffic engineering based on IP Prefix with BGP
→ there are no intelligences on IX
→ require security functions against large scale cyber attacks

2. PIX-IE

PIX-IE provides following functions on the IX network;

▪ **Security**
- Filtering DoS/DDoS traffic on ingress ports of attacks, before the traffic is forwarded to a victim network
- use case: DoS/DDoS filtering

▪ **Multilayer Path Exchange**
- connecting multilayer paths among ASs such as MPLS or VLAN
- use case : inter-cloud, inter-VPN

▪ **Flexible Traffic Control**
- control traffic based on a type of application
- use case : application based load balancing

Figure 1. shows a design of the PIX-IE. The IX is comprised with the controller and SDN switches. OpenFlow is a candidate of the SDN technology. The PIX-IE has to coordinate to avoid any conflicts in rules. In addition the controller should fairly assign the SDN resources to ASs (e.g. Flow Table, Bandwidth) .

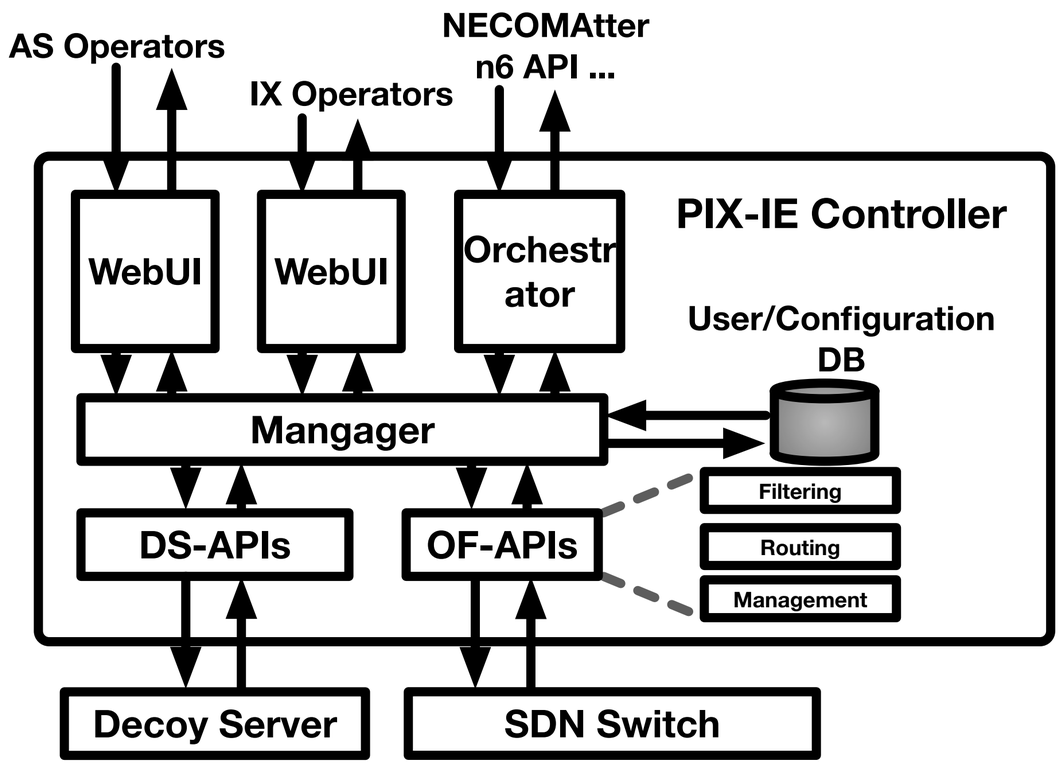
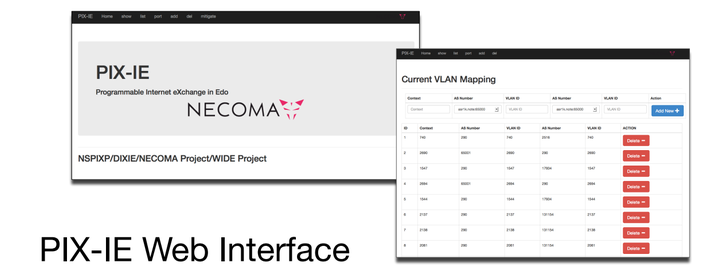


Figure 1. Design of SDN-IX Controller

3. Demonstration in INTEROP Tokyo

We demonstrated the PIX-IE in INTEROP Tokyo 2014 (Jun. 2014) . That is one of the biggest business shows in computer networking. Figure 2. shows the overview of the demonstration. In the demos, we deployed a prototype of PIX-IE on the network and provided flexible path exchange functions on the network. Totally, we have successfully exchanged 70 paths on the PIX-IE.



PIX-IE Web Interface

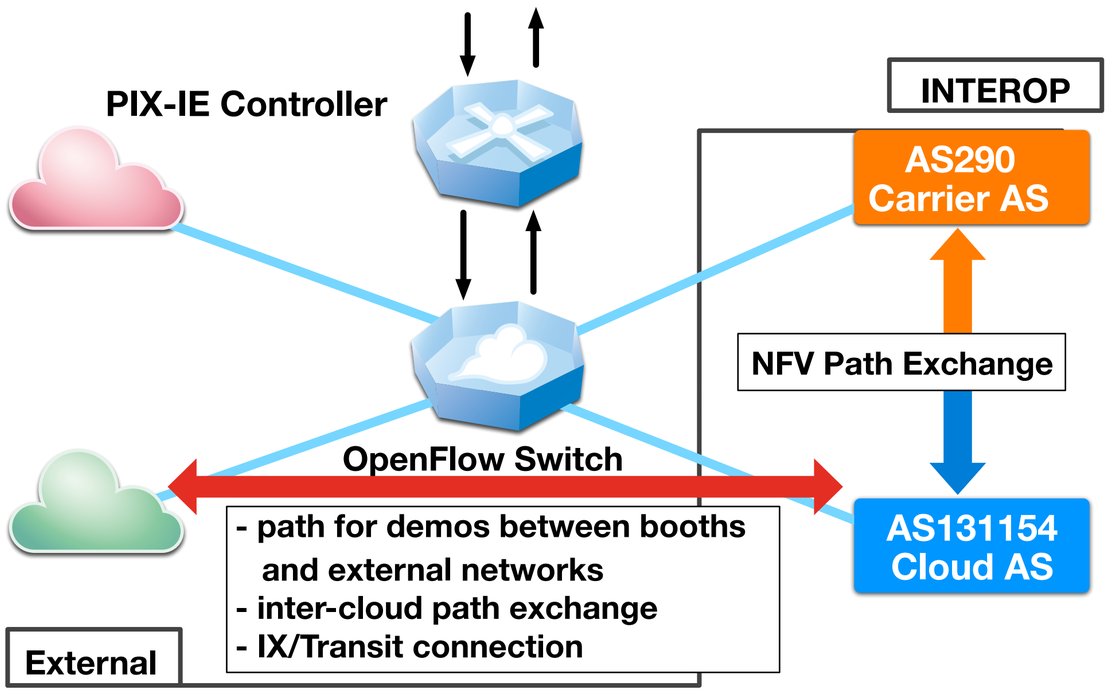


Figure 2. Overview of the demo in INTEROP

4. Future Work

- Implement security functions
- Demonstrate the PIX-IE with security functions on INTEROP Tokyo2015
- Deploy and evaluate the PIX-IE on NSPIXP and improve the features
- Publish papers and journals on this research