

Python for Networking Devices

Elisa Jasinska
elisa@bigwaveit.org

About Me

- Elisa Jasinska
- Automating large-scale networks for almost 10 years
- Past AMS-IX, LLNW, MSFT, NFLX
- Now freelance systems architect and software engineer @bigwaveit
- Github/Twitter @fooelisa
- For fun @symatenka





Network Engineering

- Ethernet, VLANs, ACLs, BGP, OSPF, ISIS, MPLS, EVPN, VXLAN, etc.
- Manage and maintain network infrastructure, switches, routers, firewalls, optical etc.



Network Engineering

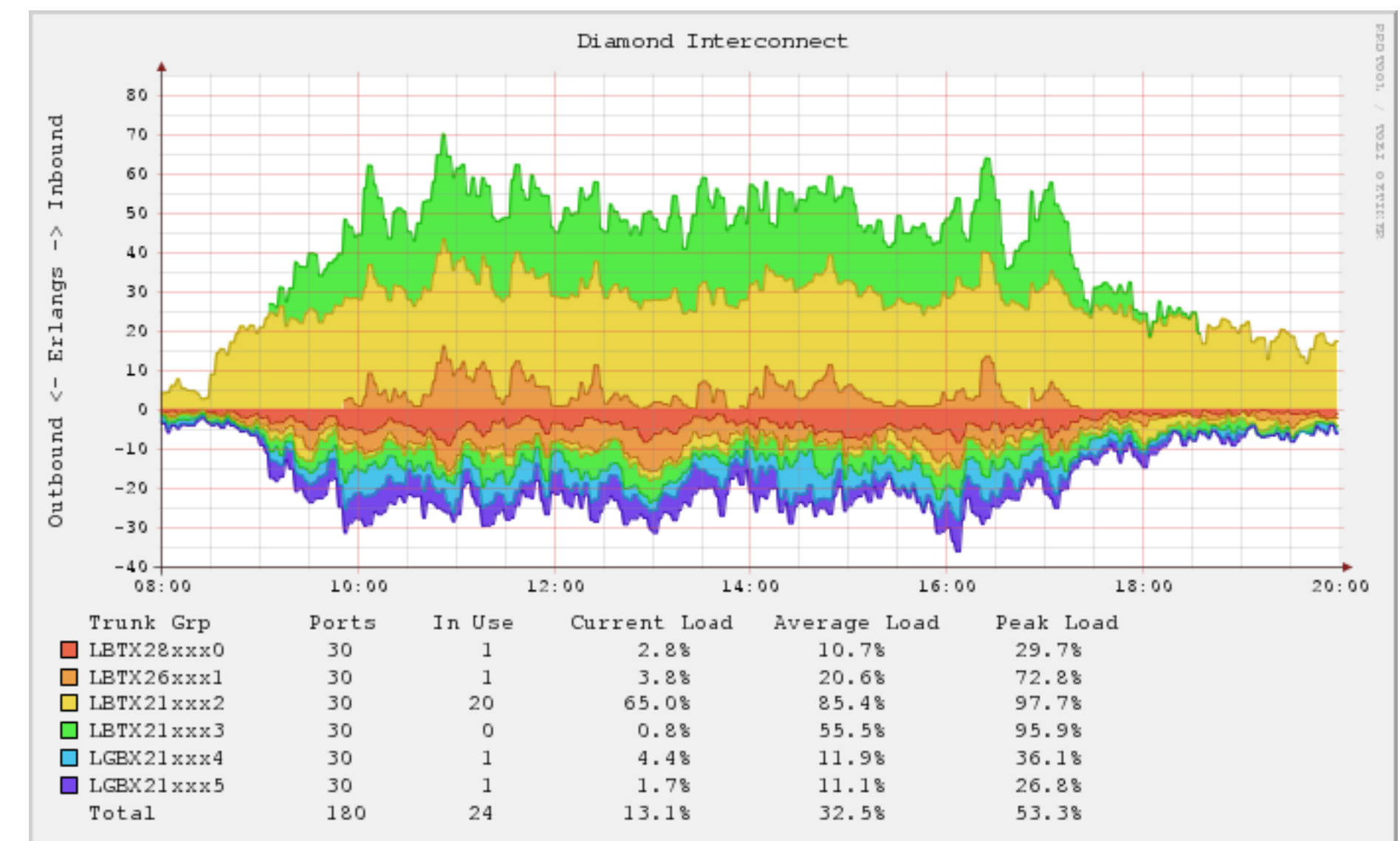
- Lots of Manual Changes
- Mostly done via CLI
- Relying on Skilled Engineers
- Close to the Hardware
- Equipment either Bleeding Edge ...or End-of-life

Glamorous!

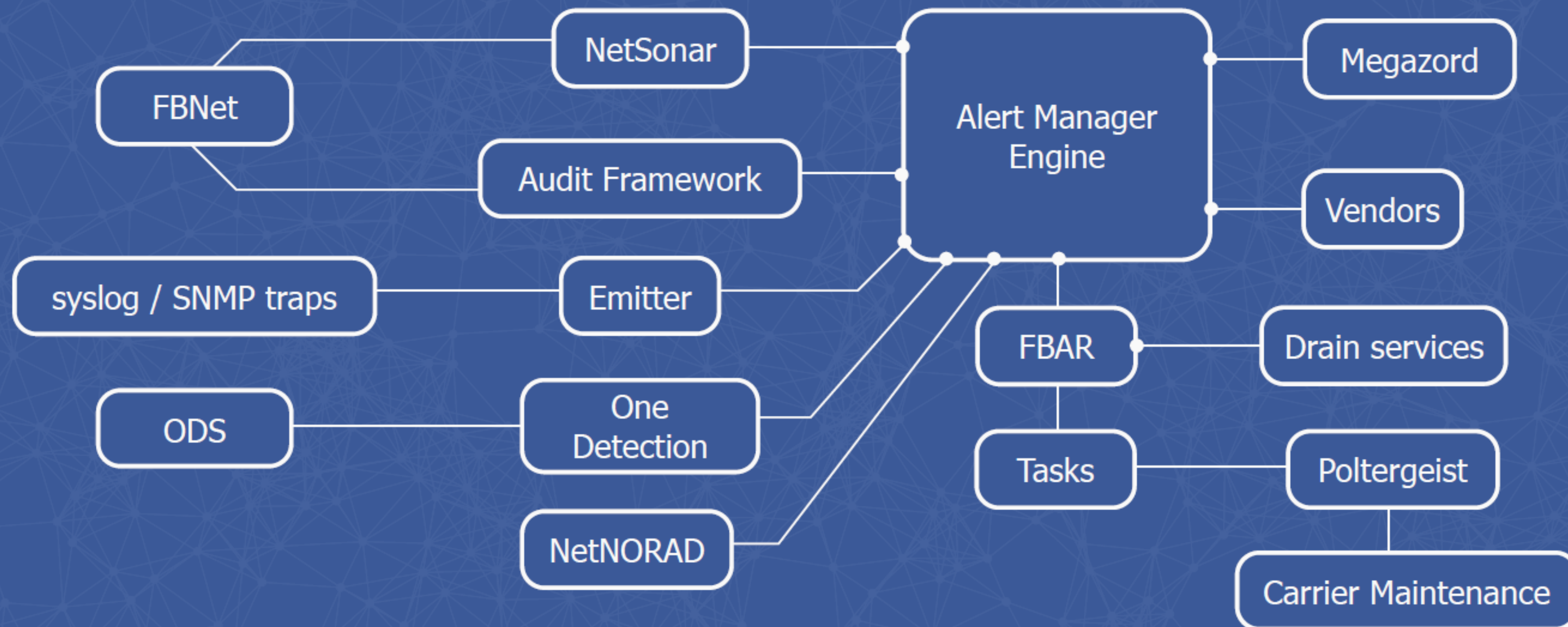


Automation for Networks

- Monitoring Network State
- Alerting
- Telemetry (SNMP, NetFlow, sFlow)
- Troubleshooting
- Device Provisioning
- Service Provisioning



Facebook Defined Networking



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Router OS

- Juniper - JunOS
- Arista - EOS
- Cisco - IOS, IOS-XR, NXOS
- etc

Network Device Access

- CLI
 - line by line configuration -> not transactional
- First Telnet
- Now SSH

Router Configurations

```
1  hostname ios-xrv-unittest-changed
2
3  interface MgmtEth0/0/CPU0/0
4      ipv4 address 192.168.56.202 255.255.255.0
5
6  interface GigabitEthernet0/0/0/0
7      ipv4 address 192.168.78.12 255.255.255.0
8
9  router bgp 65000
10     vrf test
11         neighbor 1.1.1.2
12         remote-as 1
13
14     vrf test2
15         neighbor 2.2.2.3
16         remote-as 2
17
18     ssh server v2
19     xml agent tty
20
21     lldp
22
23     end
```

```
44  interfaces {
45      ge-0/0/0 {
46          unit 0 {
47              family inet {
48                  address 192.168.56.203/24;
49              }
50          }
51      }
52      ge-0/0/1 {
53          unit 0 {
54              family inet {
55                  address 192.168.77.11/24;
56              }
57          }
58      }
59      ge-0/0/1 {
60          unit 0;
61      }
62  }
63  protocols {
64      lldp {
65          interface all;
66      }
67  }
```


Netconf

- Underlying SSH transport
- Transactions
- Structured Data
- Error Reporting

Retrieve Data - Arista

```
eos.edge1>show arp
```

Address	Age (min)	Hardware Addr	Interface
10.220.88.1	0	001f.9e92.16fb	Vlan1, Ethernet1
10.220.88.21	0	1c6a.7aaf.576c	Vlan1, not learned
10.220.88.28	0	5254.00ee.446c	Vlan1, not learned
10.220.88.29	0	5254.0098.69b6	Vlan1, not learned
10.220.88.30	0	5254.0092.13bb	Vlan1, not learned
10.220.88.38	0	0001.00ff.0001	Vlan1, not learned

Retrieve Data - Juniper

```
root@qfx.edge1> show arp
```

MAC Address	Address	Name	Interface	Flags
00:1f:9e:92:16:fb	10.220.88.1	10.220.88.1	vlan.0	none
00:19:e8:45:ce:80	10.220.88.22	10.220.88.22	vlan.0	none
f0:ad:4e:01:d9:33	10.220.88.100	10.220.88.100	vlan.0	none

```
Total entries: 3
```

Generic Access Libraries

- Pexpect
<https://github.com/pexpect/pexpect>
- Paramiko
<https://github.com/paramiko/paramiko>
- Ncclient
<https://github.com/ncclient/ncclient>

Network Vendor Libraries

- Arista's pyeapi
<https://github.com/arista-eosplus/pyeapi>
- Cisco IOS-XR pyiosxr
<https://github.com/fooelisa/pyiosxr>
- Juniper's py-junos-eznc
<https://github.com/Juniper/py-junos-eznc>

Multivendor Libraries

- Netmiko
<https://github.com/ktbyers/netmiko>
- NAPALM
<https://github.com/napalm-automation/napalm>

Vendor Differences

When Cisco asks you to remove the comments from your config to make it load



<https://honestnetworker.wordpress.com/2015/07/20/when-cisco-asks-you-to-remove-the-comments-from-your-config-to-make-it-load/>

Thanks!

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