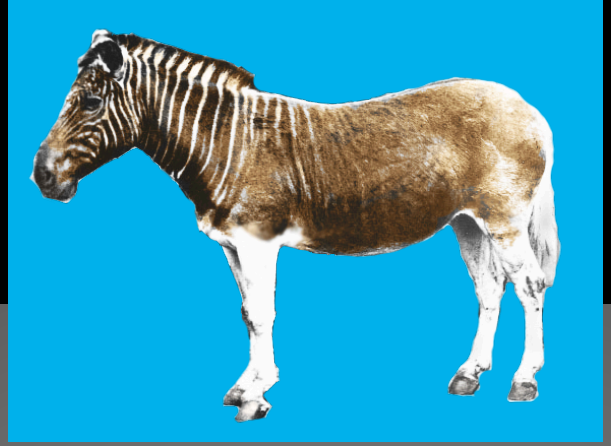

QUAGGA – TRIANGLE NETWORK ENGINEERS

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@seanx820

WHAT IS QUAGGA?

- Routing Software Suite (Application)
- Support for
  - OSPFv2 & OSPFv3
  - RIP & RIPng
  - BGP
  - ISIS
- Open Source (written in C)
- Modal cli
- FREE!

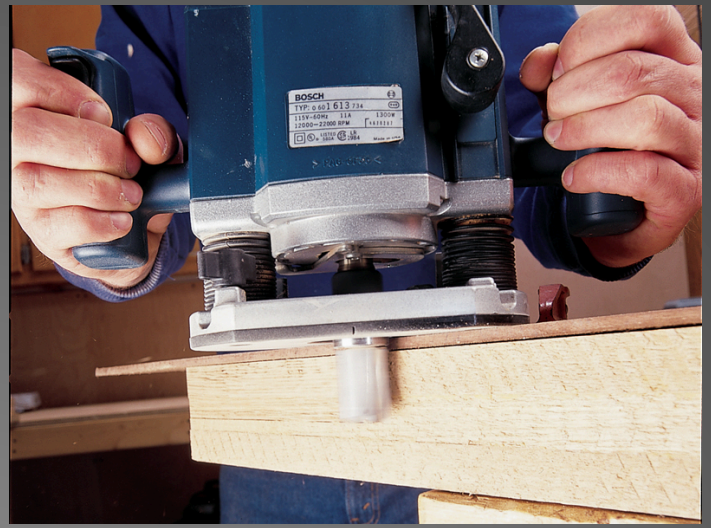


Figure A: Routing

WHO USES QUAGGA?

- Cumulus Networks
- Midokura (Overlay Technology called Midonet)
- 6wind
- Vyatta (prior to Purchase by Brocade), fork now VyOS
- Naval Research Library
(http://www.nrl.navy.mil/itd/ncs/products/ospf-manet)
- NIST (http://www-x.antd.nist.gov/bgpsrx/)

Sponsored by:
- Google
- Cumulus Networks
- NetDEF

More Info: http://www.opensourcerouting.org/

WHY DOES QUAGGA EXIST?

- Educational Sector:

to learn and test new ideas

- Large Corporation:

to add their own "special" sauce (no more vendors who deny features!)

- Equipment Vendors:

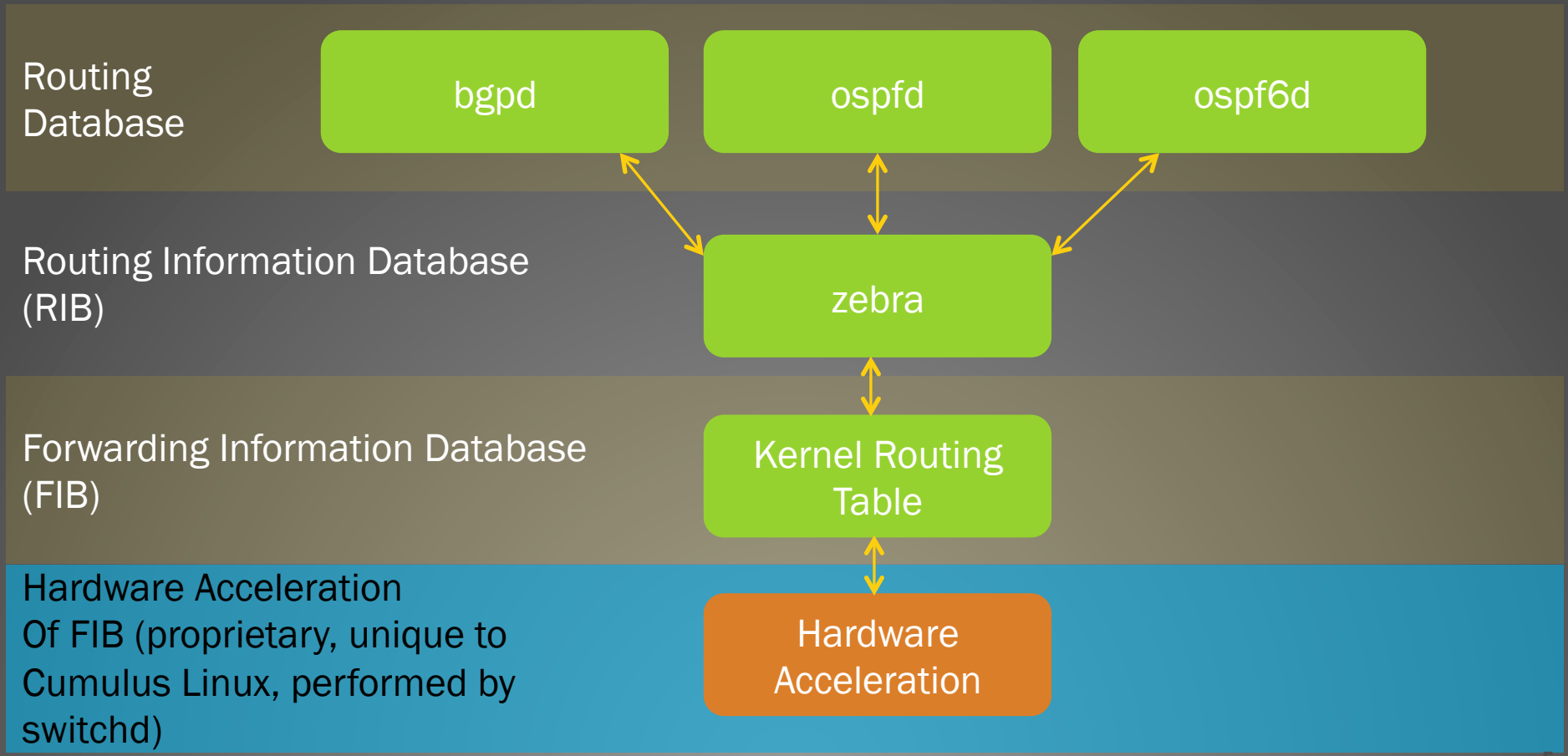
Lower the bar to enter the routing market and speed up innovations

- End Users:

lower cost and increase available choices

Information from: http://www.opensourcerouting.org/about-us/

QUAGGA ARCHITECTURE



HOW TO INSTALL

Latest Accepted Release

```
sean@sean:~$ sudo apt-get update
```

after update finishes search for quagga->

```
sean@sean:~$ apt-cache search quagga
quagga - BGP/OSPF/RIP routing daemon
```

Package is simply called quagga

```
sean@sean:~$ sudo apt-get install quagga
```

Cumulus Release

See next slide

HOW TO INSTALL

Cumulus Release

```
sean@sean:~$ sudo wget http://repo.cumulusnetworks.com/pool/
CumulusLinux-2.5/main/quagga_0.99.23.1-1+cl2.5+2_amd64.deb
```

Once Downloaded use the dpkg command

```
sean@sean:~$ sudo dpkg -i quagga_0.99.23.1-1+cl2.5+2_amd64.deb
```

The above was installed with Ubuntu 14.10 Vanilla Installation, if there are missing packages browse the Cumulus Networks online repository and dpkg –i the dependent packages:

http://repo.cumulusnetworks.com/pool/CumulusLinux-2.5/main/

TWEAKING QUAGGA

Singular configuration file (rather than separated out into bgpd.conf, ospfd.conf, etc)

service integrated-vtysh-config

```
sean@sean:~$ sudo vtysh
Hello, this is Quagga (version 0.99.23).
Copyright 1996-2005 Kunihiro Ishiguro, et al.

sean# conf terminal
sean(config)# service integrated-vtysh-config
sean(config)# end
sean# wr
Building Configuration...
Integrated configuration saved to /etc/quagga/Quagga.conf
[OK]
sean#
```

TWEAKING QUAGGA

Paging problem (END bug)

To fix the vtysh (END) problem, follow these two steps:

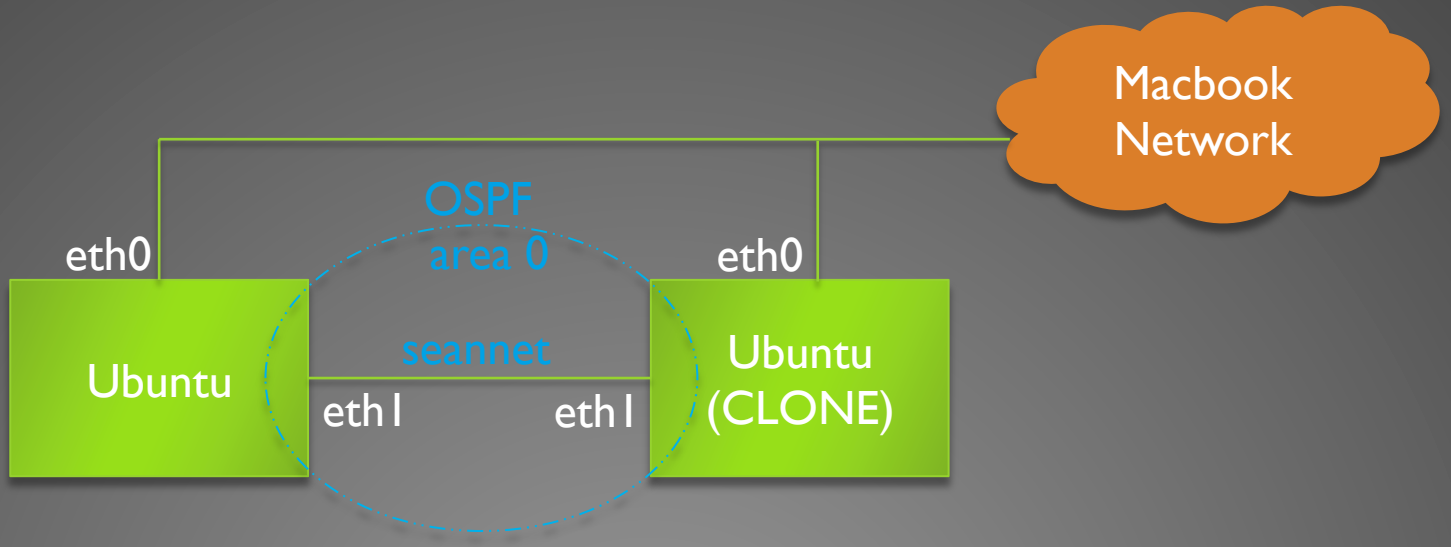
- Add the text "export VTYSH_PAGER=more" in the /etc/bash.bashrc file
- Add the text "VTYSH_PAGER=more" in the /etc/environment file

http://www.brianlinkletter.com/quagga-vtysh-shell-end-problem/

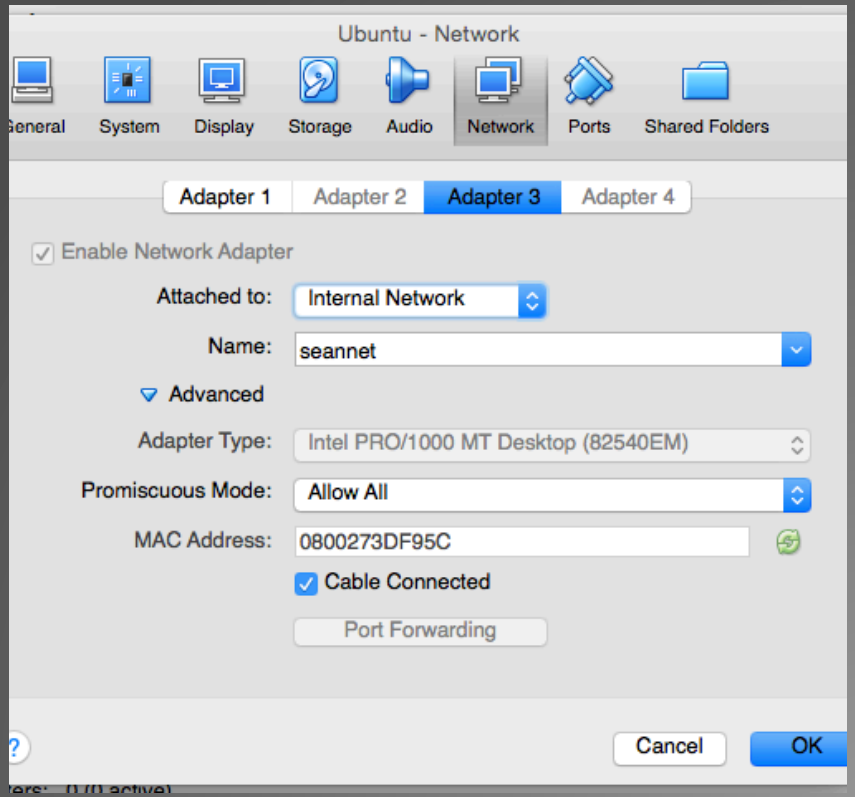
LOOKING AT THE ROUTE TABLE

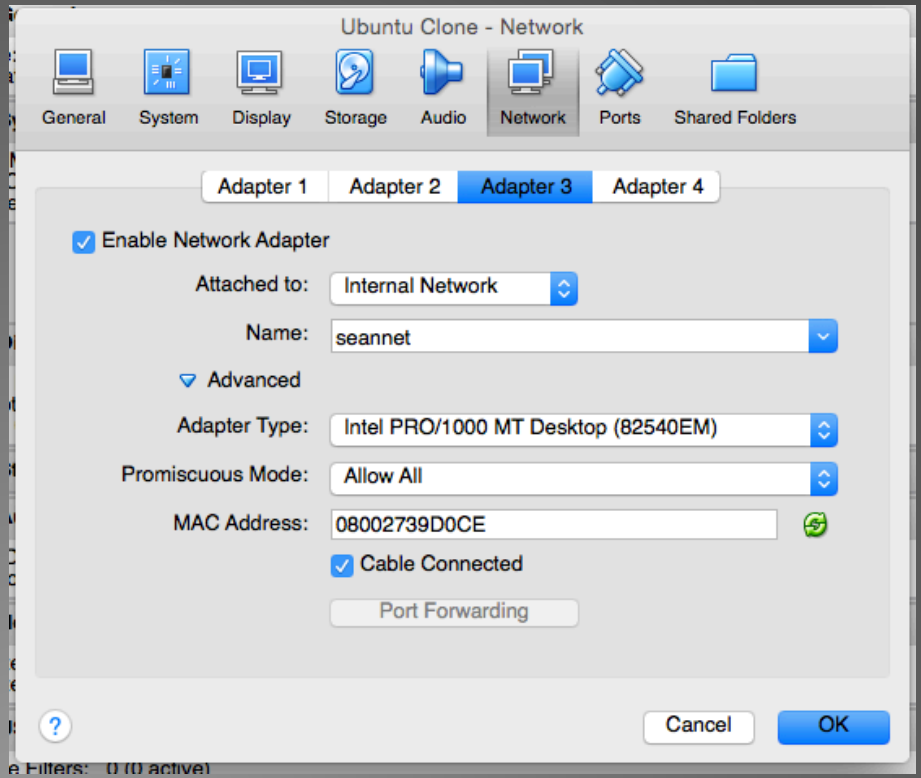
```
sean# show ip route
Codes:  K - kernel route, C - connected, S - static, R - RIP,
        O - OSPF, I - IS-IS, B - BGP, A - Babel, T - Table,
        > - selected route, * - FIB route

K>* 0.0.0.0/0 via 10.0.2.2, eth0
C>* 10.0.2.0/24 is directly connected, eth0
sean#
```

SMALL DEMO OF USE-CASE (EDUCATION)



NETWORK SETTINGS - VBOX





ONE PERSONAL MODIFICATION TO UBUNTU

- I perfer to use /etc/network/interfaces (ifupdown) vs network-manager

```
sean@sean:~$ sudo apt-get remove network-manager
```

Had to remove b/c network-manager kept stealing my network-configuration and messing up my demo! (i.e. removing my eth1 config)
You could use it, but would need to configure in network-manager (GUI) not /etc/network/interfaces

CONFIGURE /ETC/NETWORK/INTERFACES

Ubuntu 14.10 VM #1

```
auto eth1
iface eth1 inet static
address 172.16.0.1
netmask 255.255.255.0
```

My Clone ☺

```
auto eth1
iface eth1 inet static
address 172.16.0.2
netmask 255.255.255.0
```

```
sean@sean:~$ ping 172.16.0.2
PING 172.16.0.2 (172.16.0.2) 56(84) bytes of data.64 bytes
from 172.16.0.2: icmp_seq=1 ttl=64 time=0.883 ms
64 bytes from 172.16.0.2: icmp_seq=2 ttl=64 time=0.297 ms
64 bytes from 172.16.0.2: icmp_seq=3 ttl=64 time=0.314 ms
```

QUAGGA.CONF

Ubuntu

```
interface eth1
 ip ospf area 0.0.0.0
 ip ospf network point-to-point
 link-detect
!
interface lo
 link-detect
!
router ospf
  ospf router-id 1.1.1.1
```

Clone

```
interface eth1
 ip ospf area 0.0.0.0
 ip ospf network point-to-point
 link-detect
!
interface lo
 link-detect
!
router ospf
  ospf router-id 2.2.2.2
```

CHECK CONNECTIVITY

Ubuntu

```
sean# show ip ospf int
eth1 is up
<output removed for brevity>
```

Clone

```
sean# show ip ospf int
eth1 is up
<output removed for brevity>
```

```
root@sean:~# vtysh

Hello, this is Quagga (version 0.99.23.1).
Copyright 1996-2005 Kunihiro Ishiguro, et al.

sean# show ip ospf neigh

Neighbor ID     Pri State           Dead Time Address         Interface            RXmtL RqstL DBsmL
2.2.2.2           1 Full/DROther      37.822s 172.16.0.2      eth1:172.16.0.1          0     0     0

sean#
```

DEBUG?

log file /var/log/quagga/test.log

```
sean(config)# debug ospf
 <1-65535>  Instance ID
event      OSPF event information
ism        OSPF Interface State Machine
lsa        OSPF Link State Advertisement
nsm        OSPF Neighbor State Machine
nssa       OSPF nssa information
packet     OSPF packets
zebra      OSPF Zebra information
```

DEBUG CONTINUED

```
root@sean:~# tail /var/log/quagga/test.log
2015/02/23 16:41:30 OSPF: ip_off 02015/02/23 16:41:30 OSPF: ip_ttl 1
2015/02/23 16:41:30 OSPF: ip_p 89
2015/02/23 16:41:30 OSPF: ip_sum 0xf7902015/02/23 16:41:30 OSPF: ip_src
172.16.0.22015/02/23 16:41:30 OSPF: ip_dst 224.0.0.5
2015/02/23 16:41:30 OSPF: Hello received from [2.2.2.2] via [eth1:172.16.0.1]
2015/02/23 16:41:30 OSPF:  src [172.16.0.2],2015/02/23 16:41:30 OSPF:  dst
[224.0.0.5]
2015/02/23 16:41:30 OSPF: Packet 2.2.2.2 [Hello:RECV]: Options *|-|-|-|-|-|E|*
```

WHAT CAN'T QUAGGA DO?

- Layer 1
  - MTU
  - Link-speed
  - Auto-negotiation
- Layer 2
  - Spanning-Tree
  - vlan assignments

What about IP addressing?

- You can assign ip address in Quagga however Cumulus Networks recommends only assigning them in /etc/network/interfaces so other applications can use that flat file like our own ifupdown2. Also possible risk of 'dual' assignment

WHAT HAS CUMULUS DONE?

- Scalability enhancements for bgp and ospf
- multi-instance ospf
- non-modal interactions for automation (cl-ospf,cl-bgp, etc)'
- json output
- #1 contributors to quagga codebase at this time
- Much more! (see http://git.savannah.gnu.org/cgit/quagga.git/log/)

Same engineers that developed routing protocols at companies like Cisco were let lose on the open source Quagga suite to bring it up to enterprise quality.

LEARNING MORE

Quagga Official Documentation

http://www.nongnu.org/quagga/docs/docs-info.html

Cumulus Documentation

http://docs.cumulusnetworks.com/display/CL25/Layer+3+Features

Nice writeup: Overview of Quagga:
http://www.academia.edu/5754254/Introduction_to_the_Quagga_Routing_Suite

IRC Channels:

irc.freenode.net#quagga

irc.freenode.net#cumulusnetworks