networking-vpp: An OpenStack ml2 driver for VPP

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FD.io Program | April 21st, 2020

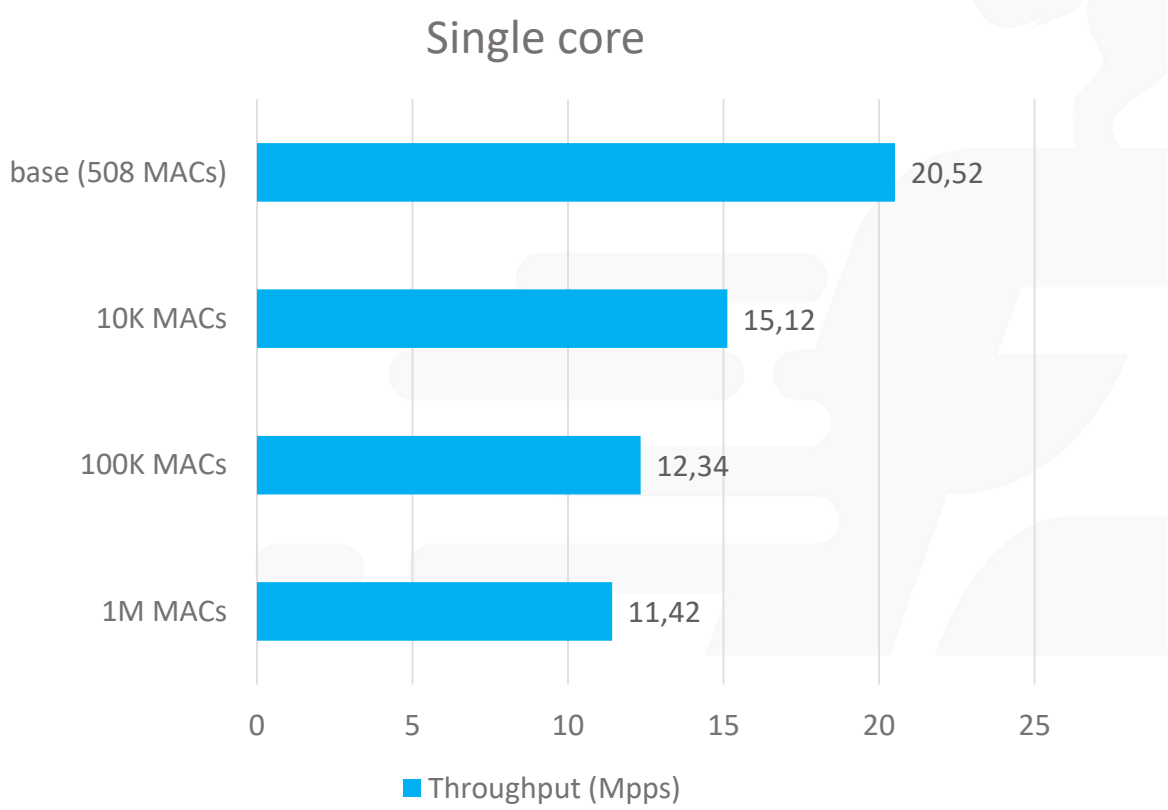
Agenda

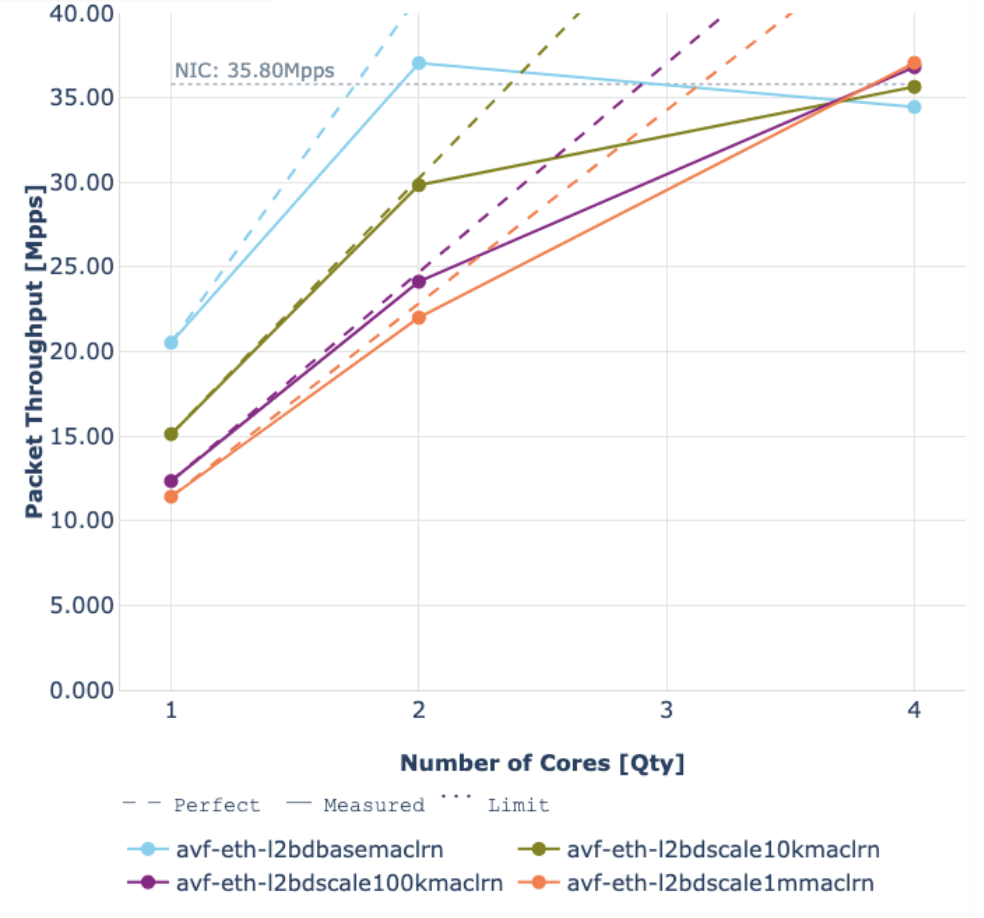
- What is networking-vpp?
- Design principles
- Overall architecture
- Current feature set
- FDS/networking-vpp and OPNFV
- Thank You - OPNFV, Functest and Fuel (and Apex)
- Roadmap for 20.05
- Questions

What is networking-vpp

- FD.io / VPP is a **fast software dataplane** that can be used to speed up communications for any kind of VM or VNF.
- VPP can speed-up both East-West and North-South communications
- Networking-vpp is a project aiming at providing a **simple, robust, production grade** integration of VPP in OpenStack using ml2 interface
- Goal is to make VPP a **first class citizen component in OpenStack** for NFV and Cloud applications

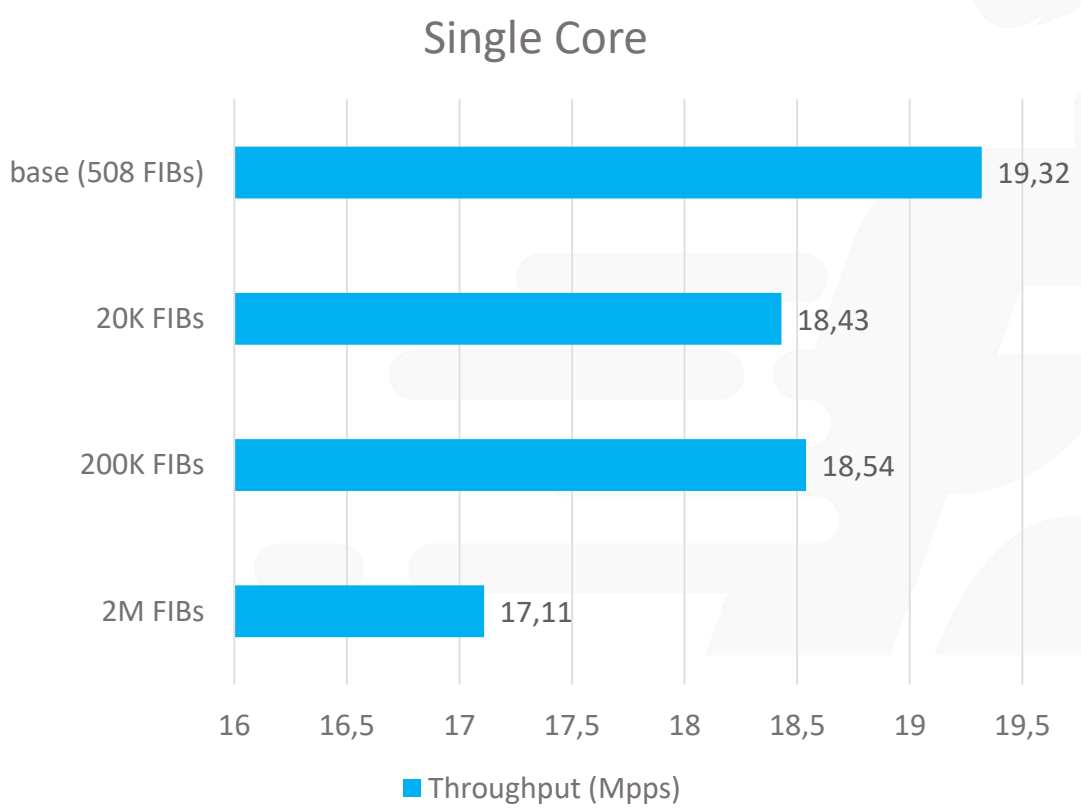
VPP L2 Switching

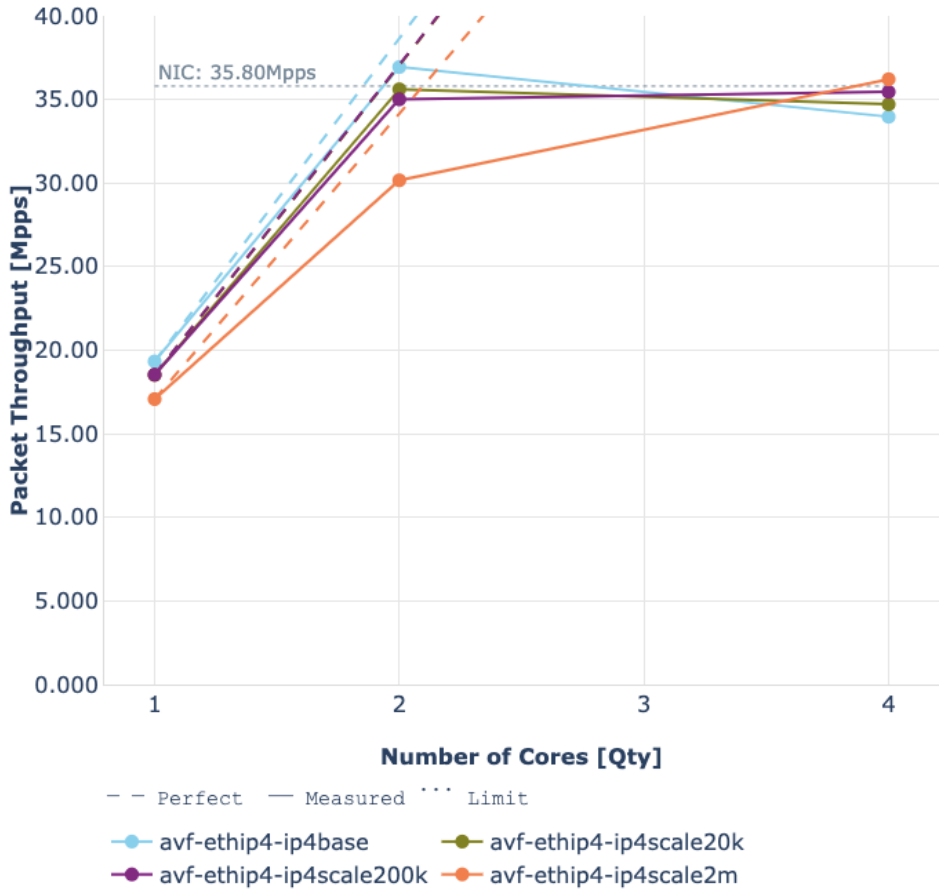




Intel CascadeLake@2.3GHz (Xeon 6252N), HyperThead on, TurboBoost off

VPP L3 Routing





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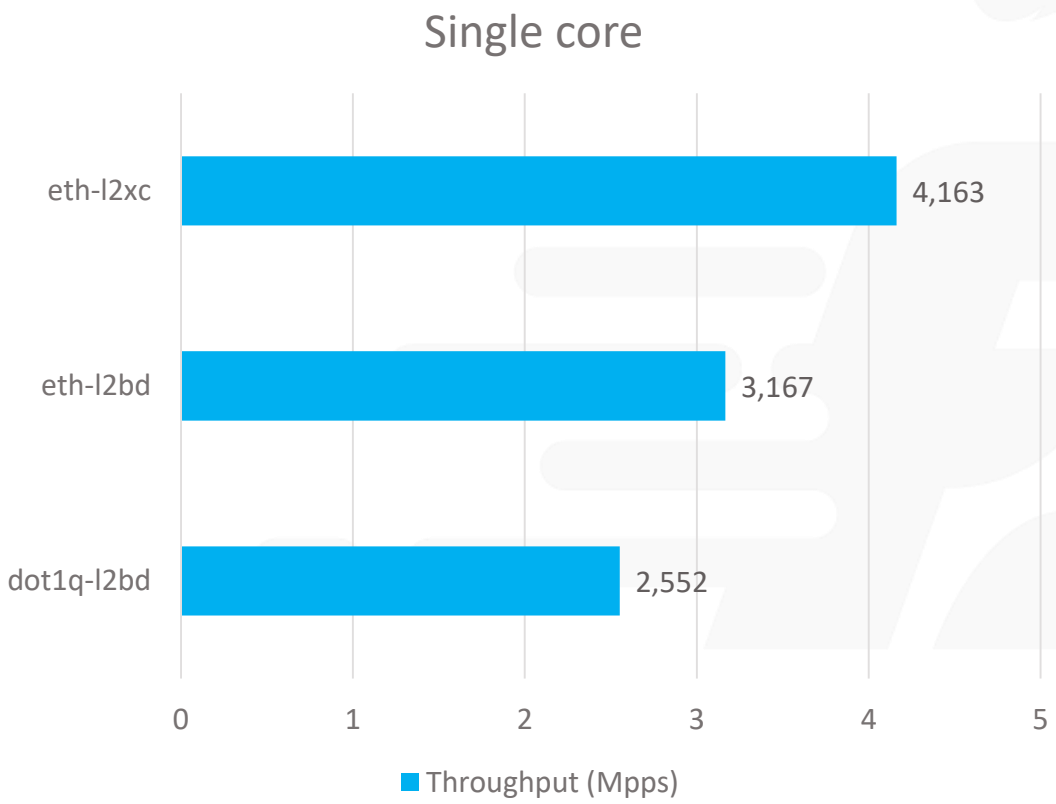
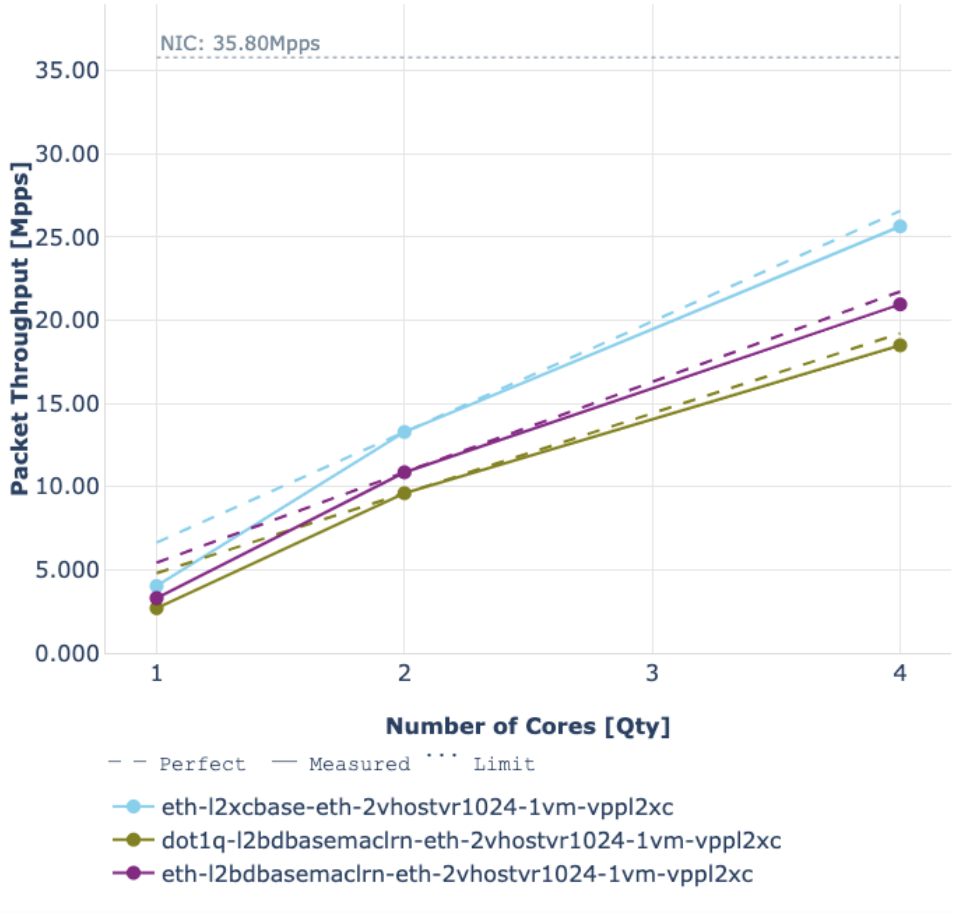
VPP vhostuser (Phy-Virtual-Phy aka PVP)





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Networking-vpp: Design Principles

- Main design goals are : **simplicity, robustness, scalability**
- Efficient management communications
  - All communication is asynchronous
  - All communication is REST based
- Robustness
  - Built for failure – if a cloud runs long enough, *everything* will happen eventually
  - All modules are unit and system tested
- Code is small and easy to understand (no spaghetti/legacy code)

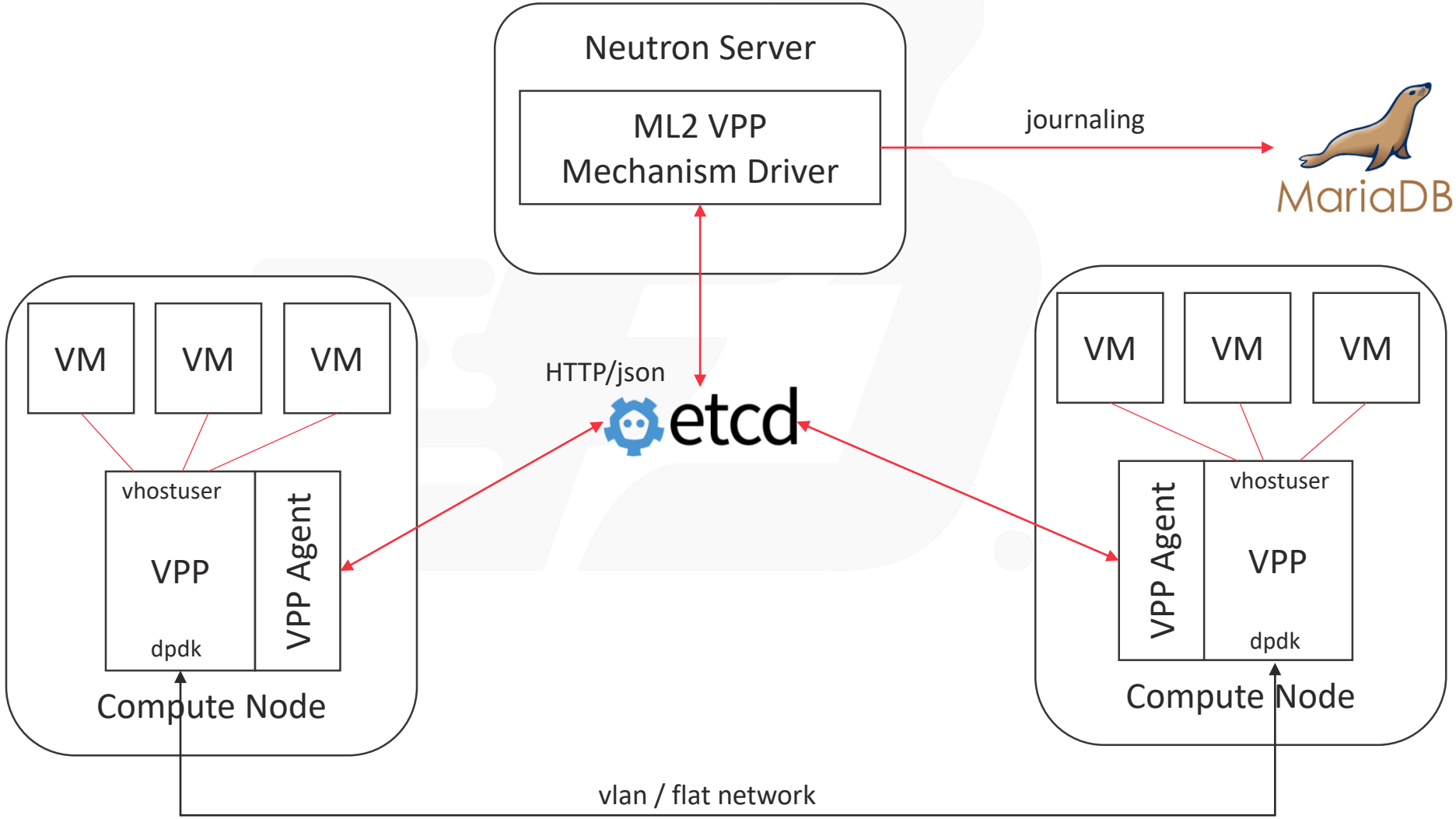
Networking-vpp, what is your problem?

- You have a controller and you tell it to do something
- It talks to a device to get the job done
  - Did the message even get sent, or did the controller crash first? Does the controller believe it sent the message when it restarts?
  - Did the message get sent and the controller crash before it got a reply?
  - Did it get a reply but crash before it processed it?
  - If the message was sent and you got a reply, did the device get programmed?
  - If the message was sent and you *didn't* get a reply, did the device get programmed?

Networking-vpp, what is your problem?

- If you give a device a list of jobs to do, it's *really hard* to make sure it gets them all and acts on them
- If you give a device a *description of the state you want it to get to*, the task can be made *much* easier

Networking-vpp: overall architecture



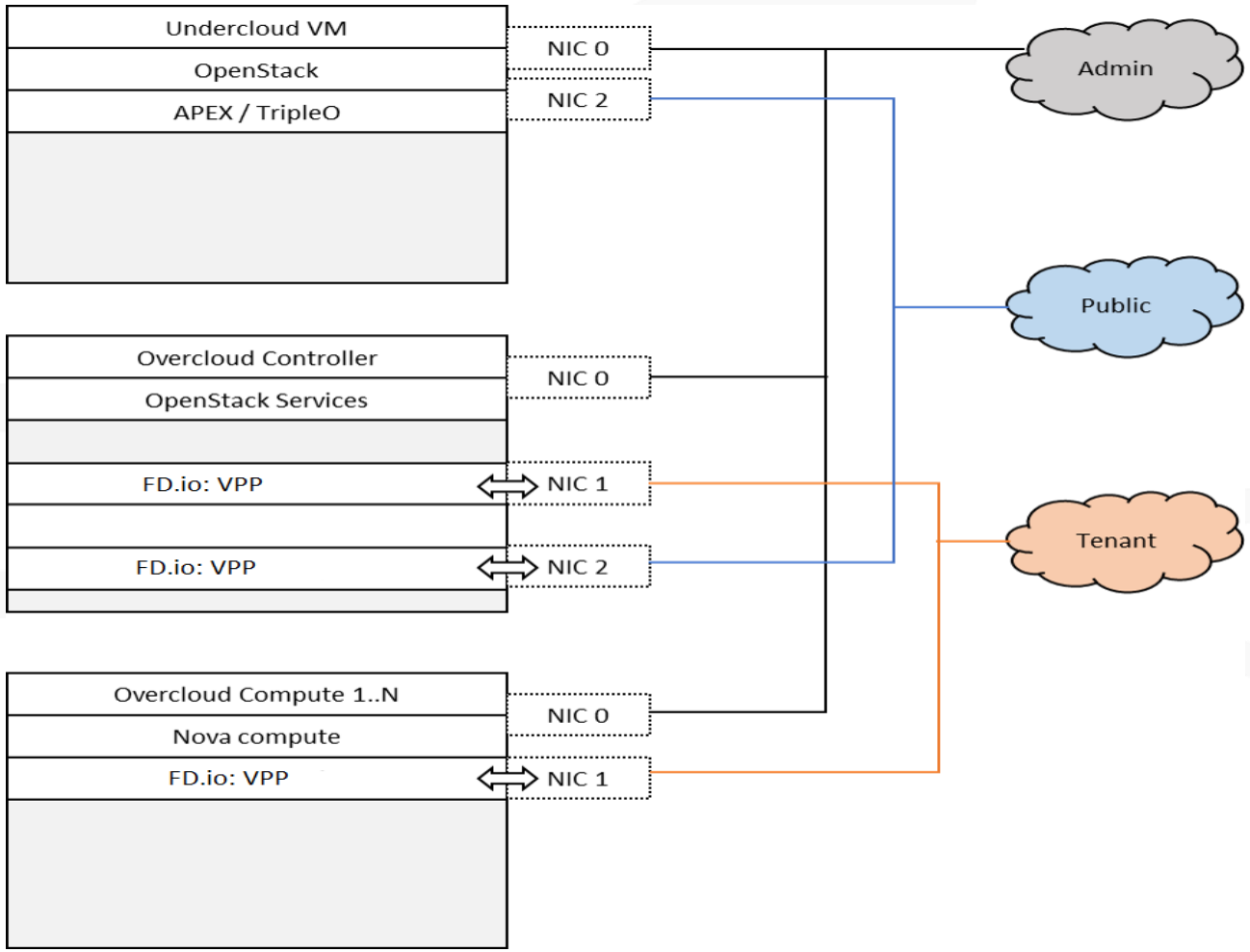
Networking-vpp: current feature set

- Network types
  - VLAN: supported since version 16.09
  - VXLAN-GPE: supported since version 17.04
- Port types
  - VM connectivity done using fast *vhostuser* interfaces
  - TAP interfaces for services such as DHCP
  - GSO support for increased endpoint performance
- Security
  - Security-groups based on VPP stateful ACLs
  - Port Security can be disabled for true fastpath
  - Role Based Access Control and secure TLS connections for etcd
- Layer 3 Networking
  - North-South Floating IP, SNAT
  - East-West Internal Gateway
- Robustness
  - If Neutron commits to it, *it will happen*
  - Component state resync in case of failure: recovers from restart of Neutron, the agent and VPP
  - LACP bonding for uplinks, ECMP for L3
- TaaS
  - Supported since version 18.10
  - ERSPAN support since version 19.08.1
- Python3
  - Support since version 19.01
  - Python3 only since version 20.01
- API versioning
  - Supported from version 20.01 onwards
  - Check against installed API signature at agent startup
  - Only whitelisted APIs allowed during runtime

FDS/networking-vpp and OPNFV

- Networking-vpp is part of OPNFV/FastDataStacks - https://wiki.opnfv.org/display/fds
- Networking-vpp is included in *os-nosdn-fdio-[noha|ha]* scenario
- Initial engagement (2016):
  - Work to integrate with Apex installer started from Colorado 1.0
  - Was in Colorado 3.0 that we managed to pass release criteria tests and the os-nosdn-fdio-noha scenario made it into OPNFV

OPNFV FDS/ os-nosdn-fdio-[noha|ha] overall architecture (Apex/Fuel)



Timeline

- **Apex/RH**
  - Colorado – 12/2016
    - passed release criteria tests
    - only non-HA scenario (os-nosdn-fdio-noha)
  - Danube – 04/2017
    - HA scenario (os-nosdn-fdio-ha)
  - Euphrates – 10/2017
    - Bugfix release
  - Fraser – 05/2018
    - L3 integration
  - Gambia – N/A -> **Last available release**
- **Fuel**
  - Hunter – 05/2019
    - L3 integration
    - non-HA scenario
  - Iruya – 01/2020
    - Python3
  - Jerma – sometimes in 2020

Thank You - OPNFV, Functest, Fuel (and Apex)

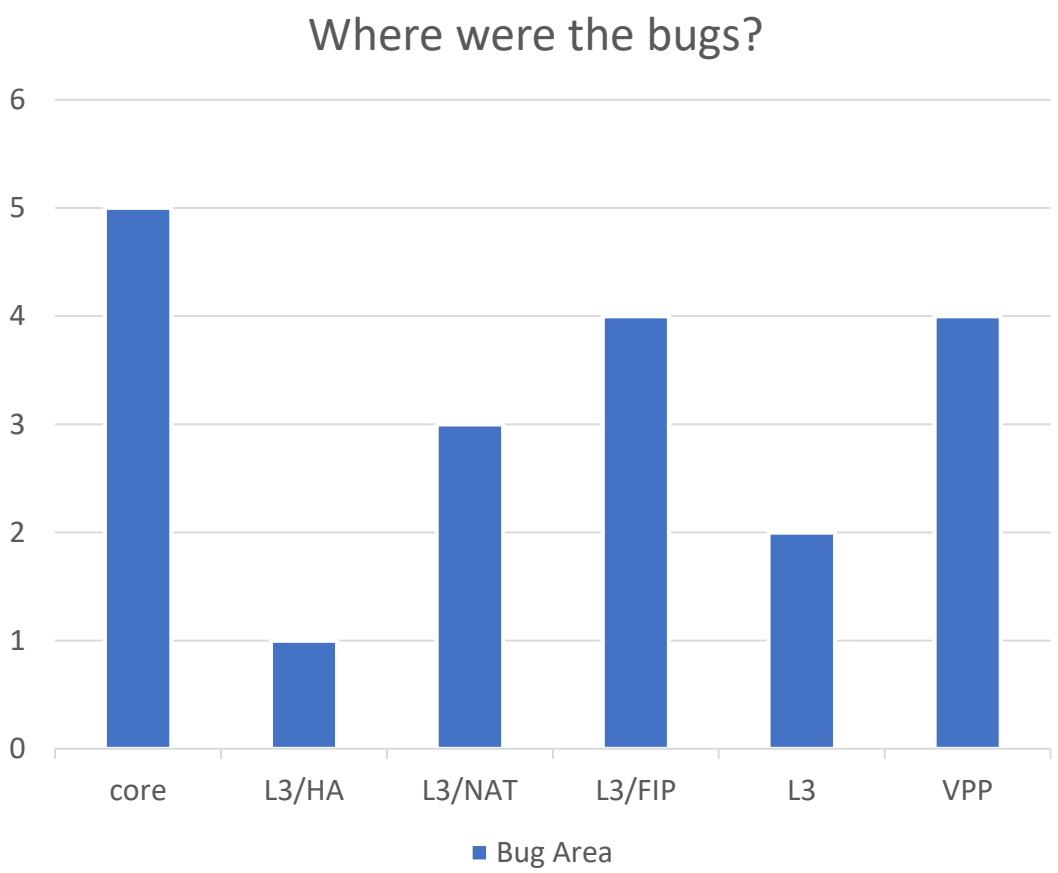
- Truly symbiotic relationship
- OPNFV gives us
  - A production like environment for testing in addition to devstack based testing
  - Access to early upstream releases / an early warning system
  - Ability to catch lots of issues during OPNFV release testing
    - Manual as well as Functest
    - Eg., Nova live migration, Trunk Port, L3, NAT and so on
- We contributed by finding & reporting issues across different projects – Apex, Fuel, Functest, snaps, domino, orchestra, cloudify_ims
  - Eg., SNAPS-185, FUNCTEST-970, APEX-468 etc

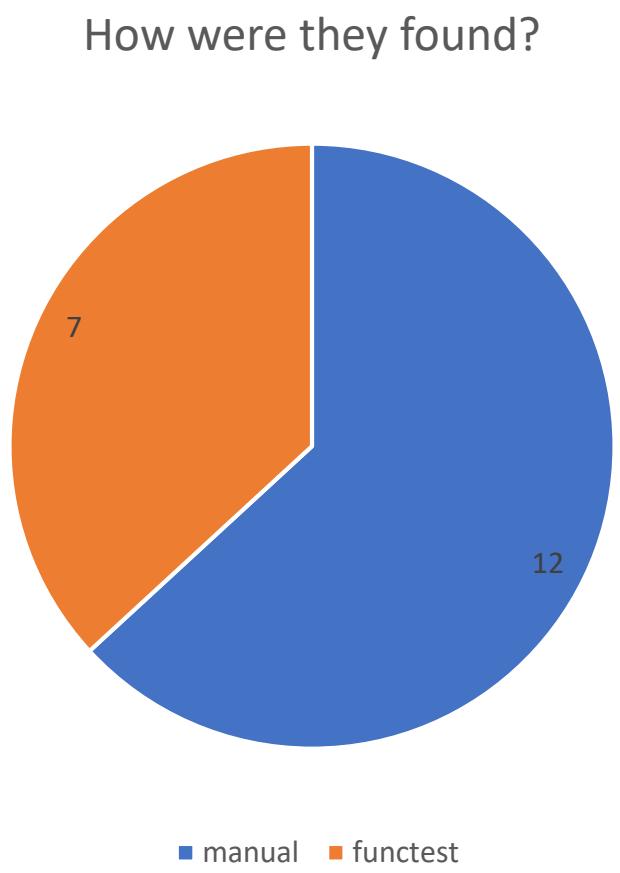
An example – Fraser release

- networking-vpp = 15 bugs found
- VPP = 4 bugs found
- Apex = 11 bugs found
- Misc = 7 bugs found

NOTE: Functest helped catch close to 40% of bugs in VPP/networking-vpp

Bugs found in Fraser : networking-vpp + VPP Analysis





Latest status – Iruya (Jan 2020)

- Installer = Fuel only
- VPP/networking-vpp version = 20.01
- OpenStack version = Stein
- Ubuntu Bionic
- **Completely Python3 (Python 3.6)**

Networking-vpp: Roadmap / next steps

Next version will be networking-vpp 20.05

- https://launchpad.net/networking-vpp

- Bulk API calls
  - Speed up reconfiguration after restart
  - Support for bulk programming of ACLs using VPP async APIs
- Network APIs for new network types
  - Provide interface to easily add new overlay types
- TaaS/ERSPAN
  - Push changes upstream: ERSPAN APIs for OpenStack
- Testing, testing, testing
  - Support HA scenario for Fuel

Questions