OVN:
The Open Virtual Network for Open vSwitch

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The Case for Network Virtualization

• Network provisioning needs to be self-service.
• Virtual network needs to be abstracted from physical.
• Virtual network needs same features as physical.
Why Start OVN?

- Virtual networking for OVS, done from scratch using experience built up in the OVS project
- Natural evolution of the project--OVS had only provided the components to build a distributed switch
- Cloud management systems agnostic
What is OVN?

- Open source L2/L3 network virtualization for Open vSwitch (OVS):
  - Logical switches
  - L2/L3/L4 ACLs (Security Groups)
  - Logical routers
  - Multiple tunnel overlays (Geneve, STT, and VXLAN)
  - TOR-based and software-based logical-physical gateways

- Works on same platforms as OVS:
  - Linux (KVM and Xen)
  - Containers (Docker)
  - DPDK
    - Hyper-V

- Integration with:
  - OpenStack Neutron
  - Docker
    - Other CMSes

The “Toaster Oven” Release
The Particulars

- Developed by the same community as Open vSwitch
- Vendor-neutral
- Design and implementation all occur in public
- Developed under the Apache license
Goals

• Production-quality
• Straightforward design
• Scale to 1000s of hypervisors (each with many VMs/containers)
• Improved performance and stability over existing OpenStack OVS plugin
How is OVN Different?
Architecture

• Configuration coordinated through databases
• Logical flows, don’t worry about physical topology
• Local controller converts logical flow state into physical flow state
• Desired state clearly separated from run-time state
• Based on the architecture we wanted based on seeing a number of others using OVS
OpenStack Security Groups (Legacy)

- Required extra Linux bridge and veth pair per VM
- Uses iptables
Security Groups (OVN ACLs)

- Uses kernel conntrack module directly from OVS
- Design benefits
  - No complicated pipeline
  - Faster* -- Fewer hops and veth ports

* http://blog.russellbryant.net/2015/10/22/openstack-security-groups-using-ovn-acls/
OVN L3 Design

• Native support for IPv4 and IPv6
• Distributed
• ARP/ND suppression
• Flow caching improves performance
  • Without OVN: multiple per-packet routing layers
  • With OVN: cache sets dest mac, decrements TTL
• No use of Neutron L3 agent
Gateways

• Based on “vtep” OVSDB schema included with OVS
  • Hardware: Arista, Brocade, Cumulus, Dell, HP, Juniper, Lenovo
  • Software: Implement “vtep” schema in software, via DPDK
    • Will become a reference for building OVS DPDK applications
• Later: move beyond the capabilities of the “vtep” schema to support fail-over, scale-out, and more stateful services
Physical Workload Integration

OVN Cluster

API (OVSDB)

VTEP (Top of Rack Switch)

PH1

PH2

HV1

Tunnels (VXLAN)

VM1

VM2

VM3

Physical Workloads

Logical Network

VM1

VM2

VM3

PH1

PH2
Rolling Upgrades

- OVSDB schema is versioned
- Changes to schema will be carefully managed to be backwards compatible
- Allows rolling upgrades
  - Update databases first
  - Roll through upgrades to ovn-controller
- Same strategy OVS itself has been using
Status
Upcoming Work in OVN

- NAT for OVS (patches available)
- Native DHCP support (patches available)
- Service Function Chaining (design in progress)
- Basic load balancing (required for Kubernetes)
Resources

• Architecture described in detail in ovn-architecture (5)
• Available in the “master” branch of the main OVS repo:
  – https://github.com/openvswitch/ovs
  – http://openvswitch.org/support/dist-docs/
• Neutron plugin in its own repo:
  – https://git.openstack.org/openstack/networking-ovn.git
• Neutron integration docs, including devstack instructions:
  – http://docs.openstack.org/developer/networking-ovn/
How you can help

• Try it! Test it! Write Code!
• Report bugs and try it at scale
• Core OVN is being developed on ovs-dev mailing list:
  – #openvswitch on Freenode
• Neutron plugin for OVN is being developed here:
  – [http://git.openstack.org/openstack/networking-ovn.git](http://git.openstack.org/openstack/networking-ovn.git)
  – openstack-dev mailing list
  – #openstack-neutron-ovn on Freenode
Thank you!

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