Integrating Openstack with Tungsten Fabric

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OpenStack @ CERN

- Platform to build and manage clouds
- Control compute, network and storage resources
### Exploring Tungsten Fabric

- **CERN’s network architecture**
  - Flat but segmented network, with multiple broadcast domains
  - Limited network isolation
  - Limited IP mobility

- **Overlay networks**

- **Load Balancer as a Service**
  - DNS based load balancing
  - Need for L4/L7 load balancers
  - Ruled out Octavia load balancing solution

![Diagram showing network nodes and virtual machines](image-url)
Tungsten Fabric in a nutshell

- Software Defined Networking (SDN) solution
- TungstenFabric aka. OpenContrail
- Network isolation (VxLAN, MPLSoGRE, MPLSoUDP)
- Virtual Network translates to a VRF
- Security and network policies
- Advanced features (load balancer, floating IPs, etc.)
- OpenStack and Kubernetes as orchestrators
Forwarding Plane - vRouter

- **vRouter Agent**
  - Receives routes from control plane
  - Installs forwarding state into the forwarding plane
  - Reports analytics state
  - Proxies DHCP, ARP and DNS

- **vRouter Kernel Module**
  - Encap/decap packets
  - Deliver packets to correct destination
Tungsten Fabric Deployment @ CERN

- New SDN region in OpenStack
- Containerized control plane
- Helm for control plane deployment (OpenStack and Tungsten)
- 3 compute nodes
- QFX10k as SDN gateway
  - Auto-configured QFX10k by using tungsten’s device manager
  - BGP peering between QFX10k and Tungsten Fabric controller
  - VxLAN tunnels between QFX10k and compute nodes

**First service:** Load Balancing as a Service (LBaaS)
LBaaS Feature

- Integrates seamlessly with OpenStack
- HAPProxy is spawned in a network namespace
- Offers a failover mechanism
- SSL Termination
- Choice of load balancing algorithm
- Health checks etc.
- L7 policies
DEMO TIME
Step 1: Create a Load Balancer

$ openstack loadbalancer create --name mylb --vip-network-id public

Triggers creation of a Neutron port

HAPrxy instances deployed in Active / Passive mode, different hypervisors
Step 2: Create a Listener

$ openstack loadbalancer listener create --name mylistener \
   --protocol HTTP --protocol-port 80 mylb

Protocols supported

TCP, HTTP, HTTPS, TERMINATED_HTTPS, UDP
Step 3: Create a Pool

$ openstack loadbalancer pool create --name mypool
  --lb-algorithm ROUND_ROBIN   --listener mylistener --protocol HTTP

Available LB Algorithms: ROUND_ROBIN, SOURCE_IP, LEAST_CONNECTIONS

Session Persistence using cookies
Step 4 (optional): Create a Health Monitor

$ openstack loadbalancer healthmonitor create --name tcp-monitor \ 
  --delay 7 --timeout 5 --max-retries 3 --type TCP mypool

Available Types: PING, HTTP, HTTPS, TLS HELLO, TCP, UDP-CONNECT
Step 5: Add Members

$ openstack loadbalancer member create  --address 137.138.53.95 \  --weight 2 --protocol-port 80 mypool

$ openstack loadbalancer member create  --address 188.185.80.141 \  --weight 1 --protocol-port 80 mypool

Weights can be assigned

Enable/Disable

$ openstack loadbalancer member set mypool <member-id> --disable
Conclusion & Next Steps

- SDN Region up and running, LBaaS as the first available service
- Contributing upstream
- Deploy control plane in multiple AZs
- Disaster recovery?

- Ongoing Work
  - Integration of Virtual IPs with LanDB for DNS
  - Developing Tungsten provider driver for Octavia

- Coming Next
  - Full SDN Solution: Floating IPs, Overlay Networks, Security Groups, FWaaS, ...
Thank You!
## Evaluation

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<td>Floating IPs</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Distributed Routing</td>
<td>Only with DVR</td>
<td>Yes</td>
<td>Yes</td>
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<td>Tunneling Protocols</td>
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<td>vxlan / GRE / geneve</td>
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<td>tcpdump</td>
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<td>Physical Switch Integr.</td>
<td>L2 / L3</td>
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Meet Tungsten Fabric