BGP and ECMP/BFD in leaf & spine Openstack architecture

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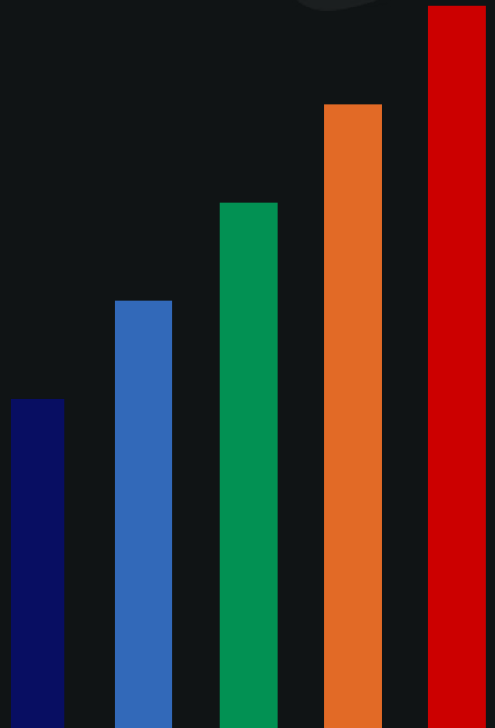
Summary



Traditional network deployments

Networks changes
New needs

BGP
ECMP
BFD

OVN-BGP
Conclusion

Worteks

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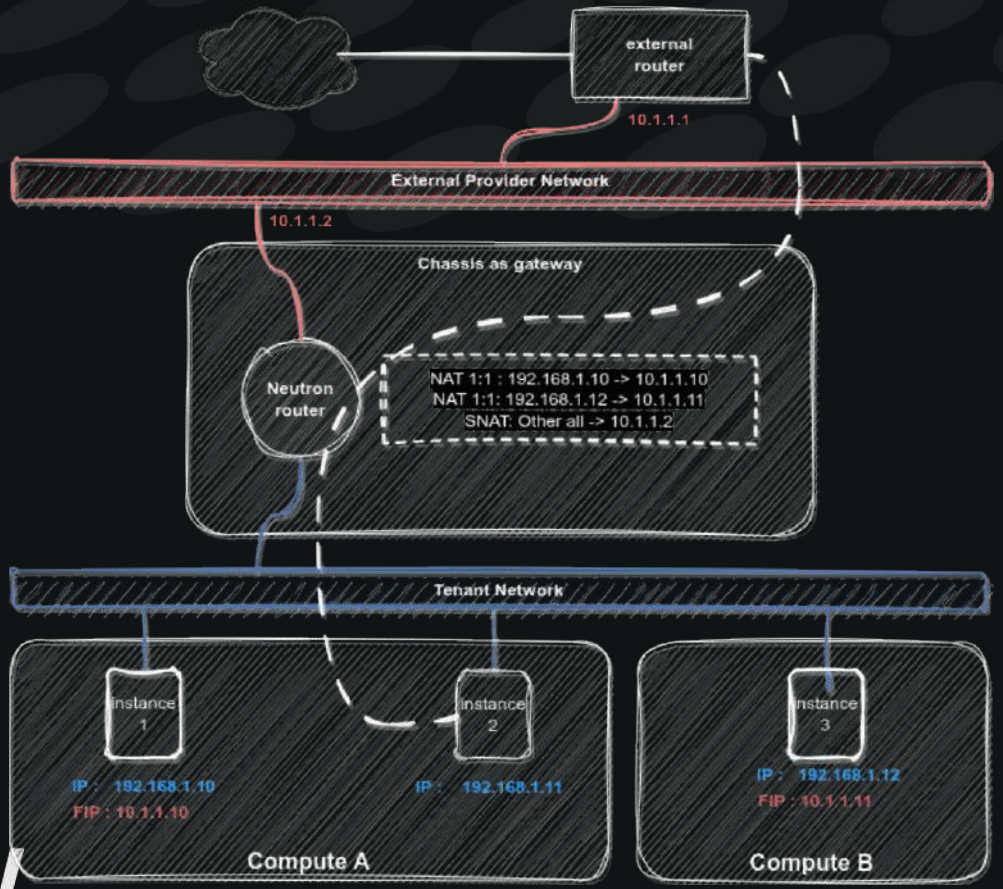
BGP and ECMP/BFD in leaf & spine Openstack architecture

Traditionnal network deployment of OpenStack



- Massive use of NAT : instances are not directly routed in the data center
- Floating IP required to expose external workloads
- Differentiated instance traffic between FIP and no FIP
- Increasing usage of provider networks to bypass restrictions
- Strong isolation of tenant networks
- Overlapping subnets between tenants

Consequence: OpenStack operates as an independant nation, difficult to integrate into the physical datacenter.

Network changes affecting Openstack

Evolution of data center architectures:

- Data Centers are adopting spine-leaf architecture
- With these changes, dynamic routing drives datacenter.
- Proprietary solutions already integrate directly into this model.

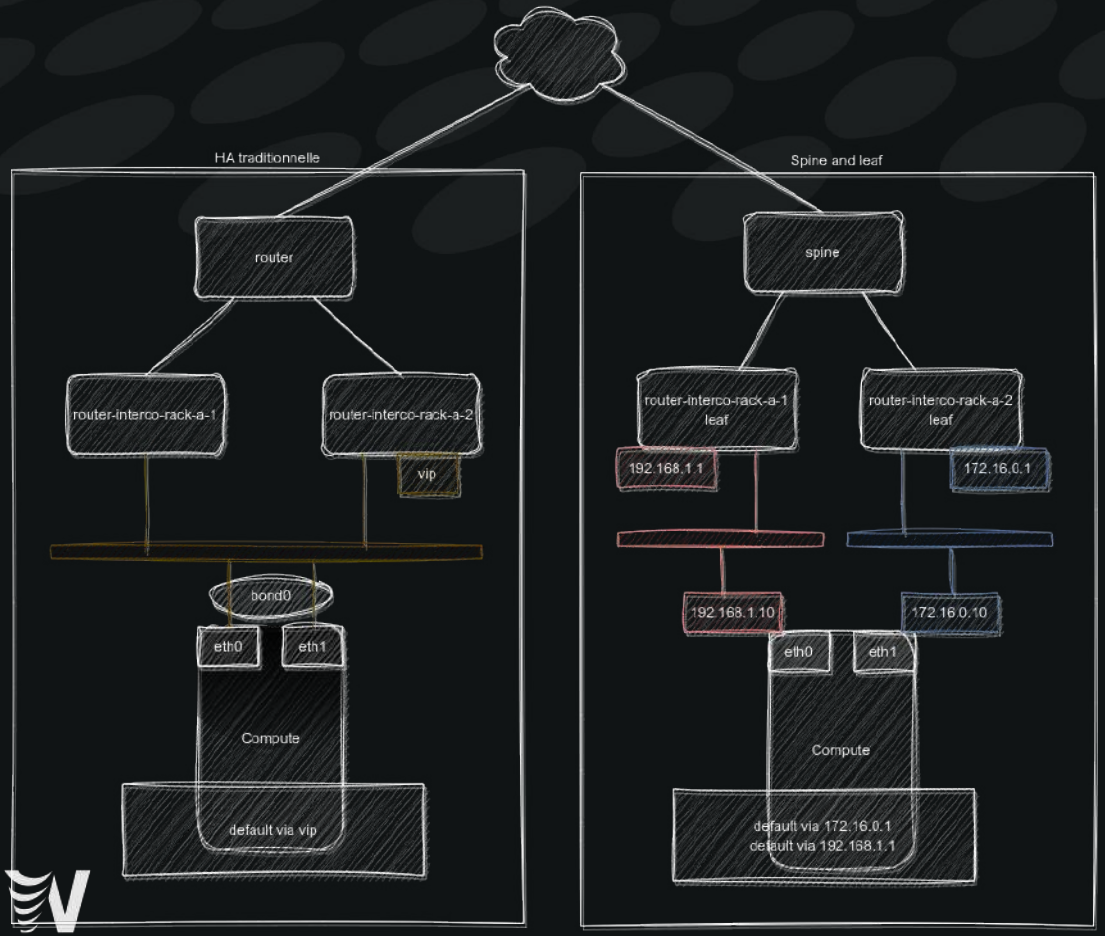
The central question:

How can we get OpenStack integrated into these new network topologies ?

New customer requirements

- New needs have emerged, particularly with the rise in Vmware migration.
  - Expose self service networks directly to the datacenter networks
  - Remove NAT and Floating IP
  - Use dynamic routing to comunicate with the datacenter infrastructure.
- Key points that comes up during architectural design with customers:
  - Real time adaptation
  - Routing Resilience
  - Traffic balancing
  - Cloud team independance on network creation

The Goal : Openstack must be part of the network



How can Openstack can become a player in the datacenter network

- Openstack must participate in datacenter routing
- We have to move away from Isolated model with NAT

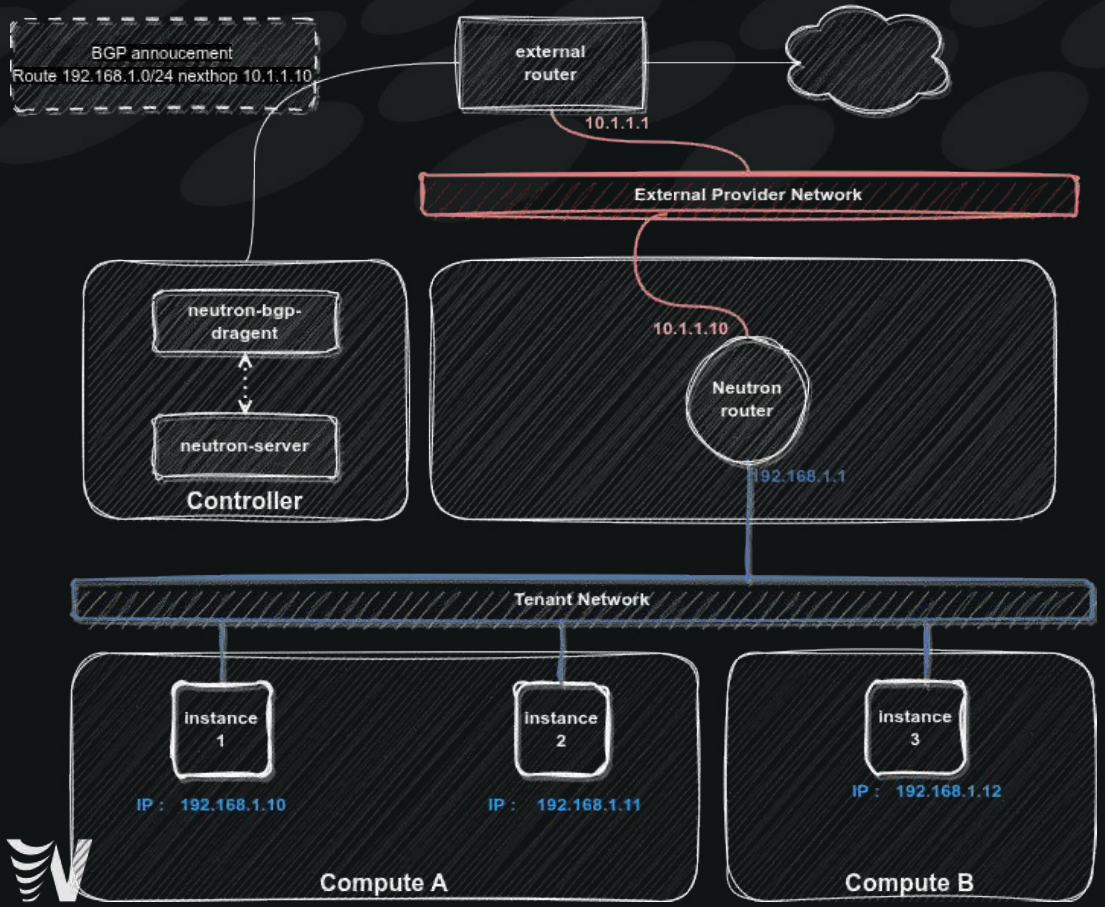
Spine-Leaf : A requirement for scalability

- Each spine is connected to all leafs
- Lowering latency and hop count
- Easie horizontal scalability
- Removing spanning tree using L3 routing

For Openstack this means

- Dynamic Routing
- Router resilience
- Native Load Balancing (ECMP)

Dynamic Routing with Openstack



BGP features are available in OpenStack

Neutron offers several extensions for integrating dynamic routing

- **Neutron-dr-agent**
- **ovn-bgp-agent**
- bagpipe (MPLS)
- networking-bgpvpn (BPG IP VPN)

What did we test for now:

- neutron-dr-agent
- A bit of OVN-BGP

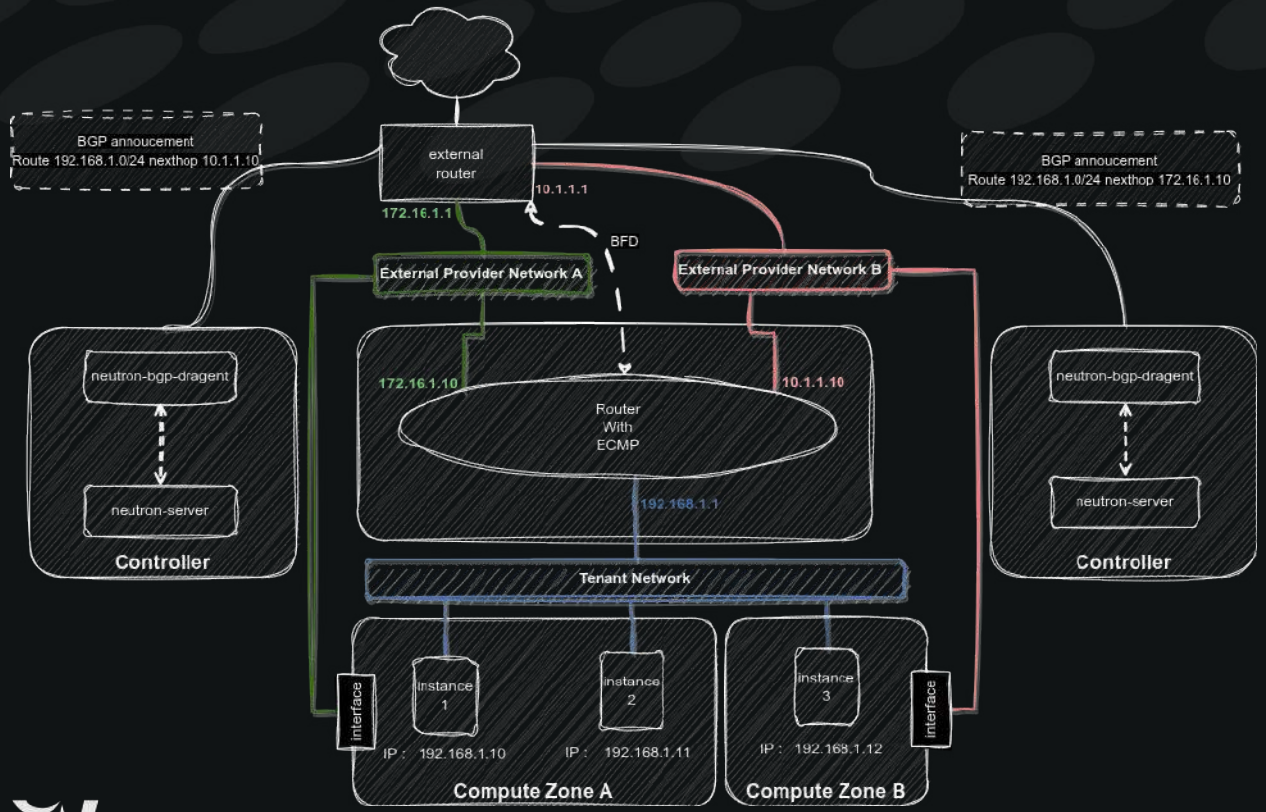
Neutron-dr-agent enables

- Exposing tenant networks to the external network
- Cloud team autonomy
- Starting to move away from the Openstack isalation
- The use of adress scopes is a requirements as subnet overlapping is no longer possible

Limits of this first step:

- We only have bgp advertisement we don’t adress resilience or trafic balancing

Improving performance and resilience



BGP alone is not sufficient and needs friends.

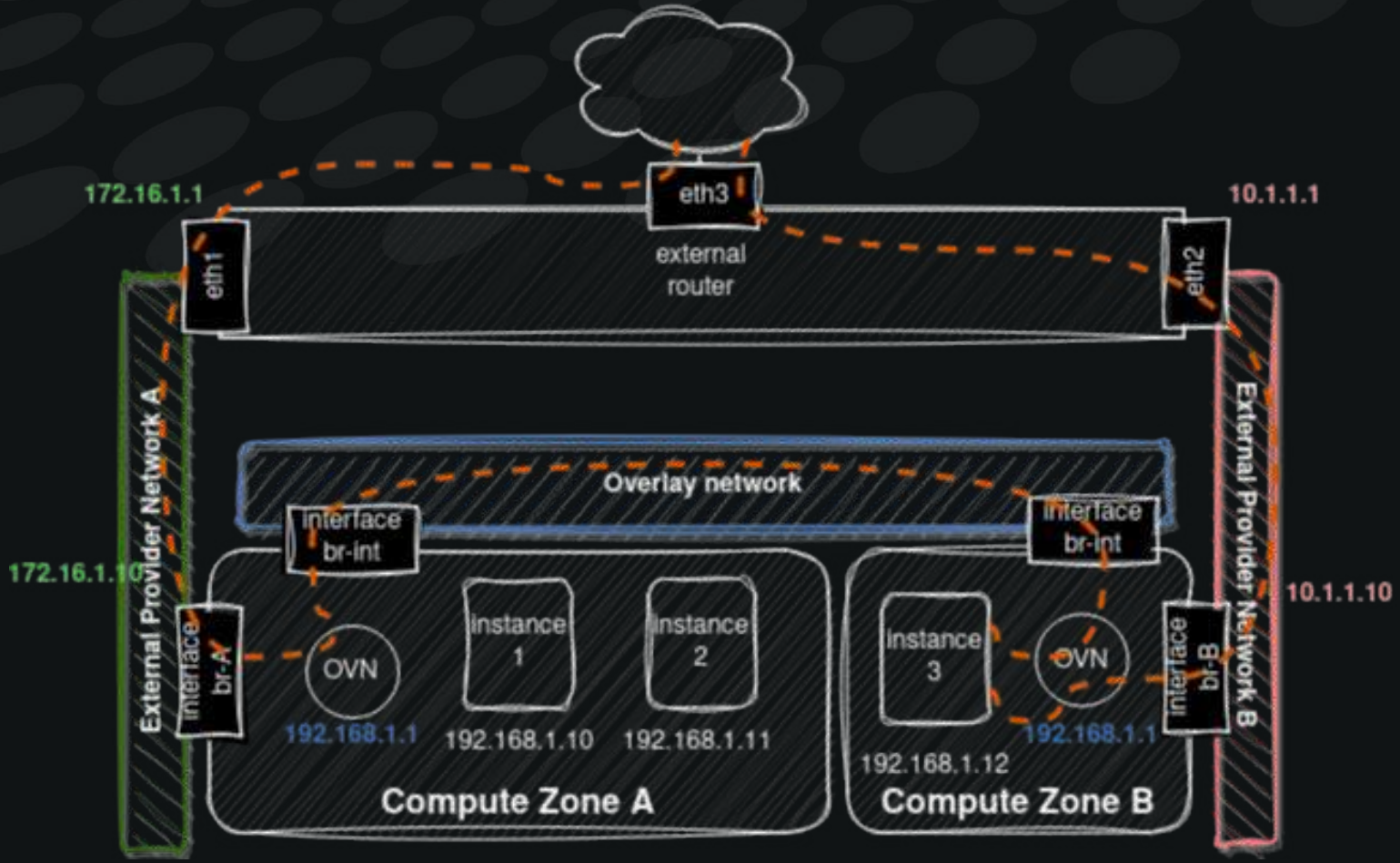
Here comes BFD (Bidirectional Forwarding Detection)

- Real time monitoring
- Ultra-fast failure detection
- Automatic switchover in case of failure

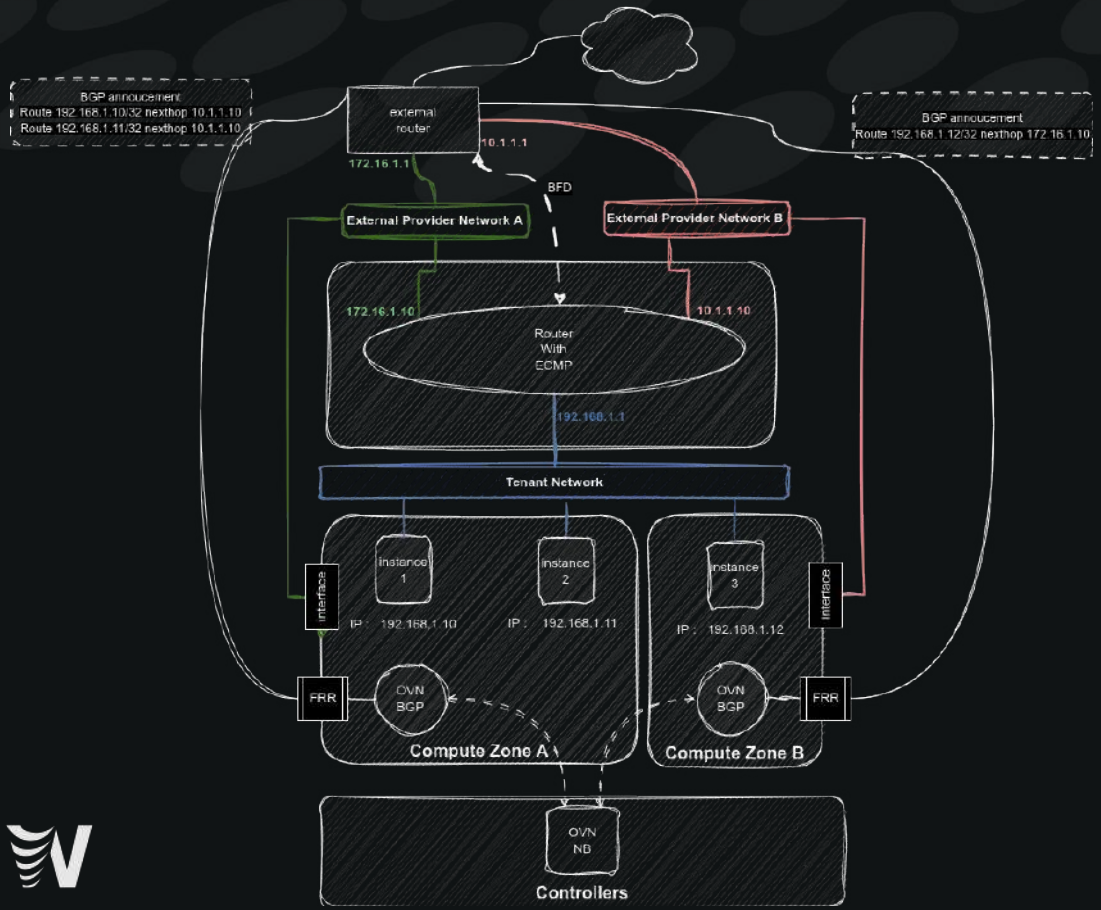
Here comes ECMP (Equal Cost Multipath Routing)

- Multiple active default routes
- Traffic balancing between equal paths
- Performance scaling

Where are my network packets going?



OVN-BGP : Natural evolution of dynamic routing



What is OVN-BGP ?

- Shares the goals of neutron-dr-agent
- Native BGP integration in OVN

Multiple operating modes

Different model cohexist depending on architecture

- **Underlay** : Exposing Ips using kernel routing
- **VRF** : Adds EVPN support
- Others : OVN, etc

Implementation :

- OVN-BGP relies on FRR to handle the BGP protocol

Orientation :

- OVN-BGP aims to replace or complement Neutron Dynamic Routing, with deeper integration into the OpenStack architecture.

One key question remains:

Which solution should be favored for production environments now, OVN-BGP or Neutron BGP?

OVN-BGP vs Neutron Dynamic Routing

	OVN-BGP	Neutron Dynamic Routing
BGP implementation	More complete (FRR usage)	BGP simple advertisement only
Integration	Native with OVN	Indépendante du SDN
Maturity	Younger stack	Widely used in production
Documentation	limited	Important
customer/production feedback	Few feedbacks	Lot of feedback
Isolation	Depends on exposing driver	Proven and stable
Known issues	Some critical bugs	Stable
Neutron AZ support	In progress	No support
Maintenance/Lifecycle	Depends on OVN and FRR lifecycle	Depends only on Neutron

The choice will depend on the level of network maturity and production constraints.

To conclude …

First concrete results at Worteks

- Implementation of OpenStack dynamic routing bricks
- Exploring available options: Neutron Dynamic Routing (DR-Agent), OVN-BGP

Alignment with customer needs

- Objective: Integrate OpenStack into modern architectures
- Stop NAT and floating IPs
- Native exposure of tenant networks in the DC

Solution maturity

- Neutron Dynamic Routing
  - Production-ready since Newton
  - Limited BGP Features but stable
- OVN-BGP
  - more comprehensive and more native
  - Available from Bobcat
  - Few bugs remaining

Questions ?

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