

# Extending Neutron with a Programmable Big Switch abstraction

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# Neutron API abstractions

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Virtual Network

Port

Virtual Router

Floating IP

Subnet

Programmable Big Switch



10000 miles view

**NOKIA** Bell Labs



Programmable Big Switch

10000 miles view

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Switch  
(software w/ ports)

Big  
(physically distributed, logically one)

**Programmable**  
(packet processing + control channel)



# Wait, but why?

Complex packet processing in

- VMs → **Not efficient / complex orchestration**
- Dedicated boxes → **Doesn't fit well with virtual infrastructure**
- Neutron subprojects → **No future use cases, admin-level mgmt**
- Via Neutron internals → **Ties app to Neutron implementation**

Expose the power of networking infrastructure

# Use cases

- Service Function Chaining
- Network Function Virtualization
  - User plane part of traditional telco gateways
  - 5G user plane network elements
- Traffic Shaping
- Firewall, Load Balancer, Parental Control, Health Check, Traffic Monitor/Probe, ...
- [not invented yet]



# Levels of programmability

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Level 0: no control → Virtual Network

Level 1: routing table → Distributed Virtual Router  
(but connecting ports)

Level 2: OpenFlow  
fixed functionality, continuous control

Level 3: P4  
custom functionality, custom control

User Application

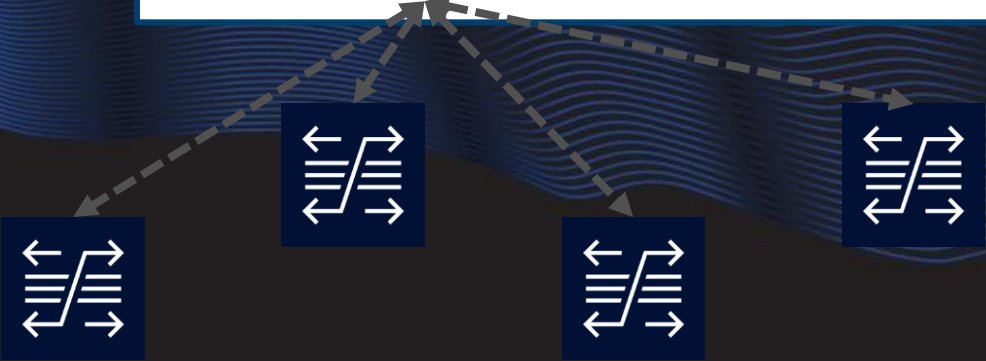
1. Create Big Switch

Neutron

Big Switch Controller

3. Establish Control Channel

2. Created





# Potential impact on OpenStack

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“Userspace” applications instead of  
several Neutron subprojects

FWaaS, LBaaS, SFCaaS, (VPNaaS), ...

Networking-OVN is a good implementation candidate

NOTE: Distributed Virtual Routing is not really affected

# References

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- M. Casado, T. Koponen, R. Ramanathan, and S. Shenker, “Virtualizing the network forwarding plane,” in PRESTO, ACM, 2010.
- Nanxi Kang, Zhenming Liu, Jennifer Rexford, and David Walker. “Optimizing the "one big switch" abstraction in software-defined networks,” in Proceedings of the ninth ACM conference on Emerging networking experiments and technologies (CoNEXT '13), ACM, 2013
- C. Monsanto, J. Reich, N. Foster, J. Rexford, and D. Walker, “Composing software defined networks,” in NSDI, Apr 2013
- <https://github.com/OPENNETWORKINGLAB/flowvisor/wiki> FlowVisor



The background of the image is a dark, almost black, space filled with a complex, glowing blue wireframe structure. This structure consists of numerous thin, parallel lines that are slightly offset from each other, creating a 3D effect of depth and movement. The lines form a series of undulating, wave-like patterns that flow from the left side towards the right. In the center-right portion of the image, there is a more dense and intricate section of the wireframe, resembling a cylindrical or conical shape with a grid-like pattern of intersecting lines. The overall aesthetic is futuristic and technological.

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