About Me

- CTO at Akanda Inc
- OpenStack Technical Committee
- Core Reviewer for Neutron
- Neutron PTL during Havana/Icehouse

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@gtwmm
IPV6
GOOGLE IPV6 TRAFFIC
HTTPS://WWW.GOOGLE.COM/INTL/EN/IPV6/STATISTICS.HTML
United States of America

IPv6 Adoption %

Select with your mouse to zoom-in on graph

Source: Akamai State of the Internet Report
DID YOU KNOW?

SCALE WIFI

This page shows your IPv6 and/or IPv4 address
You are connecting with an IPv6 Address of:

2607:ff38:3:811c:984a:3880:a29:7dc1

IPv4 only Test          Normal Test          IPv6 only Test

If the IPv6 only test shows "The page cannot be displayed" (Internet Explorer), "Server not found" (Firefox), any error or search page then you do not have working IPv6 connectivity. "Normal Test" shows which protocol your browser prefers when you have both IPv4 and IPv6 connectivity. This page should work even on computers with IPv6 only connectivity.

You can access this page with any of these easy to remember url's:

ip4.me (defaults to IPv4 only test)
ip6.me
whatismyipv6.com
whatismyipv6address.com
Differences from v4

- Huge Address Space —128-bit
  340,282,366,920,938,463,463,374,607,431,768,211,456
- End-to-end Connectivity
- Configuration
- Routing
- ICMP + Multicast
Auto Configuration

- Link Local Addressing
- SLAAC
  - Based on EUI-64 Address
  - Prefix Announced via RA
  - Requires a /64 available for each tenant
Auto Configuration (con’t)

- DHCPv6
  - Stateless
    - RA + DHCP for extra information
  - Stateful
    - Nearly the same as v4 DHCP today
Changes for Routing

- Fixed Header Size
- No checksum
  - Lower/Upper layers provide
  - No packet fragmentation
- Router Advertisements
ICMPv6

- Neighbor Discovery
- Router Advertisements
- Some messages require multicast
  - ie ff02::1
- Path MTU Discovery
Challenges

- New Hardware Deployment
- Software Updates
- Application Updates for
  - IP, DNS, etc
- Addresses not really human friendly
  - 2607:f295:6050::101:ca75
  - fe80::893:33f1:b5c7:67ee
  - fe80::feed:cafe
IPV6 IS A MUST
OPENSTACK NEUTRON
OpenStack

- Large ecosystem of projects
- Common Projects:
  - Compute, Identity, Networking, Storage projects
- Released every 6 months
OpenStack
OpenStack

GUI, CLI, API Libs

Compute API: KVM
Network API: ML2 Plugin
Storage API: Ceph
What is Neutron?

- Unified API
- Small Core
- Pluggable Architecture
- Extensible
Neutron
IPv6 in Neutron

- IPv6 IPAM
- Security Groups, L2 Pre-Pop
- Early support starting in Grizzly
- Enhanced support in Juno
IPv6 Tenant Benefits

- No NAT
- No Floating IP Required

$ ssh 2607:f298:6050:eb8f::a1f:ea75:ca75
JUNO
REleased October 2014
Configuration

- SLAAC
  - via radvd
- DHCPv6
  - stateless
  - stateful
  - via dnsmasq
Routing

- L3 Agent
- Provider Support
- RA within project
- Static External Gateway
- Provider Network
IPv6 Security

- End to end connectivity
  - NAT as a security blanket
- DHCP Spoofing
- RA Spoofing
MANAGEMENT LAYER
IPv6 Readiness

- API Layer
- DB Layer
- Client Libraries
- Messaging
- Overlay Tunnels*
Linux Tunnels

- Kernel 3.9+
- iproute(2)
- Works

```bash
# ip link add vtep1 type vxlan id 2 local 2607:f298:6050::feed
remote 2607:f298:6050::beef
```
Open vSwitch Tunnels

This command will silently fail:

```
# ovs-vsctl add-port br1 tun1 -- set interface tun1 type=vxlan
options:remote_ip=2607:f298:6050::face
```

However, in the logs you’ll get this error:

```
2015-02-21T05:44:38.213Z|00031|socket_util|
ERR|"2607:f298:6050::face" is not a valid IP address
```
Kilo

- v4 and v6 DHCP Options
- Multiple Prefixes per Subnet
- Support External Prefix Delegation
- Link Local Default External Gateway
Linux Routing RA+Forwarding

- net.ipv6.conf.eth0.accept_ra=1
- net.ipv6.conf.all.forwarding=1
Linux Routing RA+Forwarding

- `net.ipv6.conf.eth0.accept_ra=2`
- `net.ipv6.conf.all.forwarding=1`
CHALLENGES
Metadata Service

- Cloud Init
  - Default EC2 address is IPv4: 169.254.169.254
- Config Drive is your friend
IPv6 Privacy Extension

- SLAAC address is identifiable
- Generate and use temporary address for a limited time
- Incompatible with Spoofing Prevention
- Do we care? private network, shared network, public network
Routing

- Prefix Delegation
  - Your routers and Neutron need to know this information
- Static Routing
- Dynamic Routing
  - OSPFv3
  - BGP
AKANDA
What is Akanda?

- Open Source (Apache 2)
- Dynamic Routing via Service VMs
- Drop in replacement for Neutron L3, DHCP, Metadata Agents
- In Production Now
- Created by DreamHost
Neutron

- Neutron-server
- Database
- Message Queue
- L2 Agent
- L3 Agent
- DHCP Agent
- Adv Services
Neutron+Akanda

- neutron-server
- Database
- Message Queue
- L2 Agent
- Akanda
QUESTIONS?