

# ROLLING OUT IPV6

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# ROLLING OUT IPV6

- **Getting your IPv6 Prefix**
- **Setup BGP with v6**
  - Announcing your v6 prefix
  - Filters
- **Subnetting v6**
  - How ARIN suggests you do it
  - How I suggest you do it!
- **OSPFv3**
  - Setting up
  - Routing traffic
- **IPv6 Address Configurations**
  - Assign v6 Prefixes
  - DHCPv6
  - PPPoE and v6 Prefixes

# DENNIS BURGESS

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# GETTING STARTED

- **Get your /32-/36 From ARIN**
  - Contact ARIN, [www.arin.net](http://www.arin.net)
  - Assumes you have v4 resources from ARIN
  - Request your v6 block
  - Pay for it
  - Get your v6 block!

# GETTING STARTED

- **Get your /32-/36 From ARIN**
  - Contact ARIN, [www.arin.net](http://www.arin.net)
  - Assumes you have v4 resources from ARIN
  - Request your v6 block
  - Pay for it
    - You will pay \$500 per year for a /32-/36
  - **Get your v6 block!**

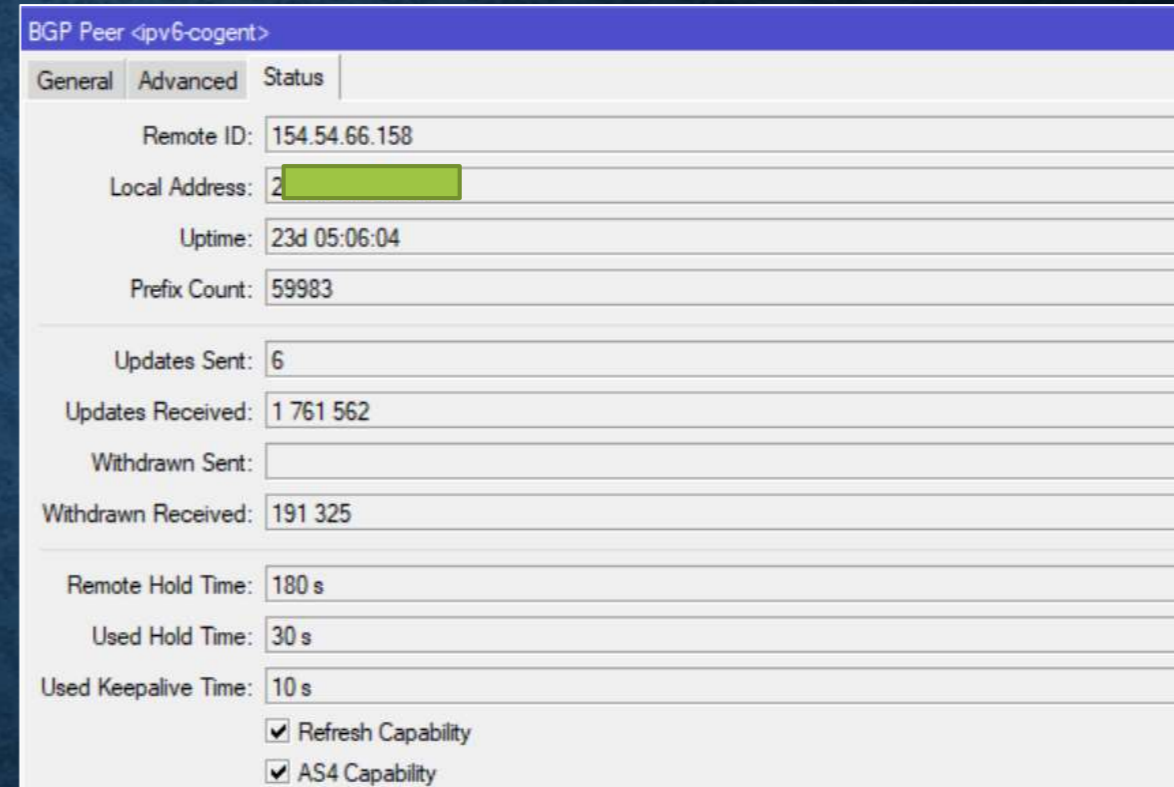
# BGP WITH IPV6

- **Same as BGP with IPv4**
  - IPv6 addresses instead of v4 addresses
  - Address family will be IPv6 vs IPv4
    - **BGP Best Practices**
      - Be sure to configure in-out filters
      - Specify the source IP
      - Change the hold/Keepalive Times

The image shows two screenshots of a network management interface for configuring a BGP Peer. The top screenshot shows the 'General' tab for a peer named 'ipv6-cogent'. The configuration includes: Name: ipv6-cogent, Instance: default, Remote Address: [redacted], Remote Port: [dropdown], Remote AS: 174, TCP MD5 Key: [dropdown], Nexthop Choice: force self, with checkboxes for Multihop and Route Reflect. Timers are set to Hold Time: 30s, Keepalive Time: 10s, and TTL: default. Max Prefix Limit and Max Prefix Restart Time are also present. In and Out filters are set to in-ipv6-cogent and out-ipv6-cogent respectively. AllowAS In has checkboxes for Remove Private AS and AS Override. Default Originate is set to never, with checkboxes for Passive and Use BFD. The bottom screenshot shows the 'Advanced' tab for the same peer. It features 'Address Families' with checkboxes for ip, ipv6 (checked), I2vpn, vpn4, and I2vpn-cisco. The 'Update Source' is set to [redacted], and 'Cisco VPLS NLRI Length Format' is set to auto bits.

# BGP WITH IPV6

- **Same as BGP with IPv4**
  - **BGP Peer Established**
    - Add a IP from your prefix on your router
    - Verify you can get to google, Netflix, towercoverage.com etc.
    - Drop a /64 on an interface and make sure you can surf with IPv6



The screenshot shows a web interface for configuring a BGP peer named 'ipv6-cogent'. It has three tabs: 'General', 'Advanced', and 'Status'. The 'General' tab is active, displaying the following fields:

Remote ID:	154.54.66.158
Local Address:	2 [redacted]
Uptime:	23d 05:06:04
Prefix Count:	59983
Updates Sent:	6
Updates Received:	1 761 562
Withdrawn Sent:	
Withdrawn Received:	191 325
Remote Hold Time:	180 s
Used Hold Time:	30 s
Used Keepalive Time:	10 s
	<input checked="" type="checkbox"/> Refresh Capability
	<input checked="" type="checkbox"/> AS4 Capability

# SUBNETTING

- **Minimum Prefix Size = /64**
  - This is the min size for stateless autoconfiguration to work.
  - Therefore the minimum prefix that you should give customers is /64.
    - Note: this is without DHCP, with DHCP you can go much smaller, but 99% of the installations I have done has not used DHCPv6 to assign IPs on local LANs, they simply use the SLACC (autoconfigure)
- **I DO NOT RECOMMEND GIVING THEM THE MINIMUM ALLOCATION REQUIRED.**



# SUBNETTING

- **ARINs Recommended Subnetting**

- /48 to every customer
  - This simply can be a larger pool of IPv6 addresses that you put in your DHCPv6 server, then issue /48 Prefixes to each customer.
  - They wish to assign the first three hex numbers as the customer, something they would be able to remember.
  - Think: 2442:A300:AAAA::/48 that's it.
    - That gives each Subscriber: 65,536 potential LAN segments

# SUBNETTING

- **ARINs Recommended Subnetting**
  - Note that there are plenty of other resources on how to subnet
- **Another registry states /48s to /56s are fine.**

# SUBNETTING

- **My Recommended Subnetting**

- /56- /60 to every customer

- Yes this is much smaller

- /60 gives 16 x /64s

- /56 gives 256 x /64s

- **IT IS UP TO YOU**

- How many LAN segments do you think the average home needs?

- You can always router a /48 to businesses if they request it? Or even a home!



# OSPFV3

- **Setting up OSPFv3**

- No more Networks to worry about.
- **Just add the interfaces**
- By Default ALL interface should be passive
  - Best Practice
- Still need to setup your routerID
  - Can be the same as IPv4 OSPF RouterID!!

The screenshot shows the 'New OSPFv3' configuration window with the following settings:

- Area: backbone
- Interface: all
- Cost: 10
- Priority: 1
- Network Type: point to point
- Instance ID: 0
- Passive
- Use BFD

# OSPFV3

- **Setting up OSPFv3**
  - That's it! SUPER SIMPLE
    - OSPFv3 forms relationships via the FE80 (link-local) Address
    - You can assign /126s if you wish, but its not a requirement.

Instance	Area	Router ID	Gateway
▶ default	backbone	10.188.1...	fe80::e68d:8cff fe19:...
▶ default	backbone	10.251.3.1	
▶ default	backbone	10.251.0...	fe80::260:e0ff fe55:9...
▶ default	backbone	10.188.1...	fe80::e68d:8cff fe19:...
▶ default	backbone	10.188.1...	fe80::e68d:8cff fe19:...
▶ default	backbone	10.251.2...	fe80::e68d:8cff fe19:...
▶ default	backbone	139.60.2...	fe80::e68d:8cff fe19:...
▶ default	backbone	10.222.1...	fe80::e68d:8cff fe19:...
▶ default	backbone	10.50.1.17	fe80::e68d:8cff fe19:...
▶ default	backbone	10.188.1...	fe80::e68d:8cff fe19:...
▶ default	backbone	10.188.1...	fe80::260:e0ff fe55:9...
▶ default	backbone	10.50.1.50	fe80::e68d:8cff fe19:...
▶ default	backbone	10.188.1...	fe80::e68d:8cff fe19:...

# IPV6 ADDRESS CONFIGURATIONS

- **SLACC (Auto-config)**
- **DHCPv6**
- **PPPoE**
- **CPE Configuration**
  - Routed CPE + Customer Router

# IPV6 ADDRESS CONFIGURATIONS

- **SLACC (Auto-config)**
  - Assign a /64 with a IP on it.
  - Check the advertise option
  - This tells this server it is advertising this prefix out to other IPv6 Clients
  - Clients with IPv6 enabled will then request a prefix, this router will respond with the prefix and the SLACC autoconfigure will occur.



IPv6 Address <2602:fea0:1ff00::1/64>

Address: 2602:fea0:1ff00::1/64

From Pool: [ ] ▼

Interface: ether3 [ ] ▼

EUI64

Advertise

No DAD

# IPV6 ADDRESS CONFIGURATIONS

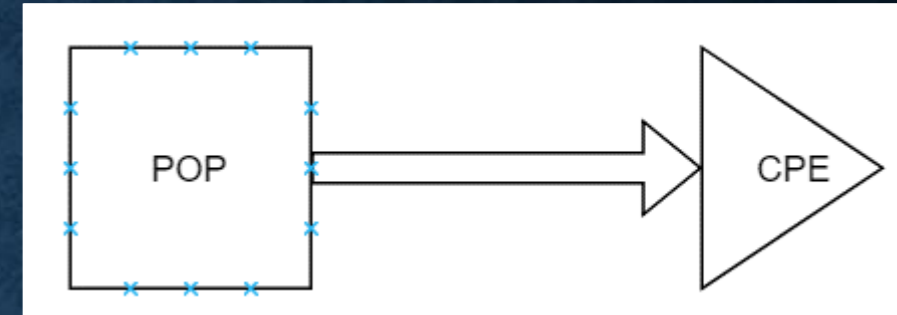
## • DHCPv6 – POP Location

### • Create a IPv6 Pool

- We created a pool with a /56, but the prefix we will hand out is a /60

### • Create IPv6 DHCPv6 Server

- Specify what interface, options as well as lease time and IPv6 Pool



IPv6 Pool <2602fea0::/48>

Name:

Prefix:

Prefix Length:

DHCPv6 Server <server1>

Name:

Interface:

Address Pool6:

Lease Time:

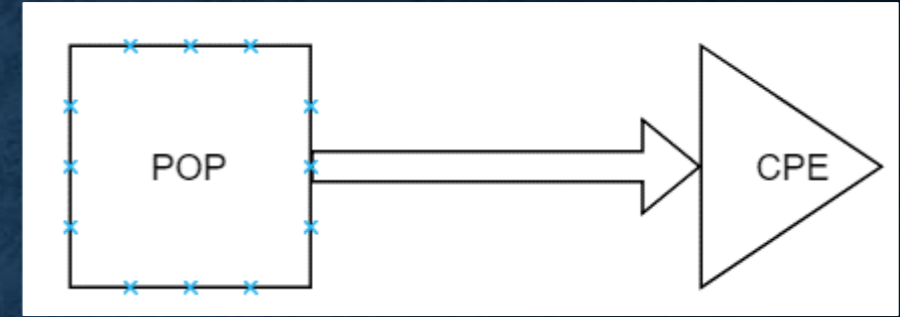
DHCP Options:



# IPV6 ADDRESS CONFIGURATIONS

## • Examples

- POP location - /48
- CPE - /60
  - DHCPv6 Server n POP Location
  - DHCPv6 Client on CPE
    - Add IPv6 Pool
    - Select Prefix
    - Place on Upstream Interface



The screenshot shows the 'New DHCPv6 Client' configuration window. The 'Advanced' tab is selected. The configuration includes:

- Interface:** bridge1
- Request:**  info,  address,  prefix
- Pool Name:** IPv6
- Pool Prefix Length:** 64
- Prefix Hint:** (empty)
- Use Peer DNS
- Add Default Route

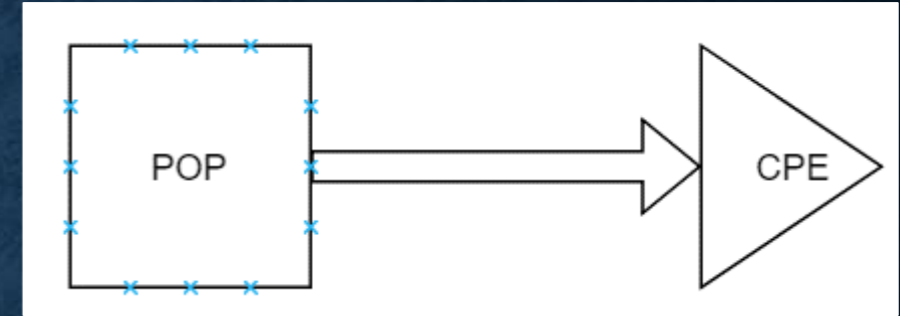
# IPV6 ADDRESS CONFIGURATIONS

- **Examples**

- POP location - /48

- CPE - /60

- This creates the IPv6 Pool



IPv6 Pool <IPv6>	
Name:	IPv6
Prefix:	2602:fea0::/60
Prefix Length:	64
Expire Time:	2d 23:59:19

# IPV6 ADDRESS CONFIGURATIONS

- **Examples**

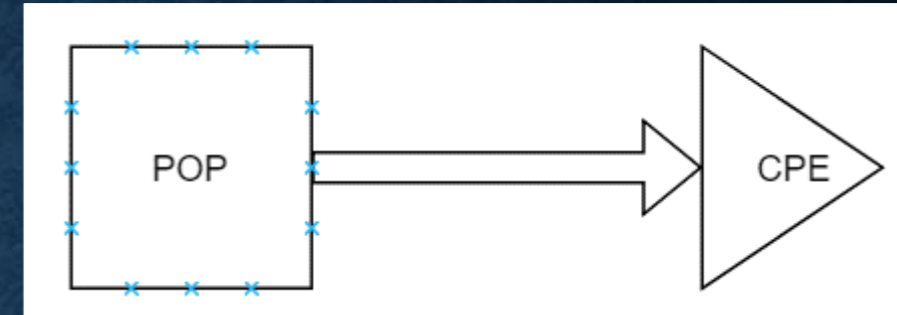
- POP location - /48

- CPE - /60

- DHCPv6 Client on CPE

- Add IPv6 Address from Pool

- Place on Interface



The screenshot shows a configuration window titled 'New IPv6 Address'. It contains the following fields and options:

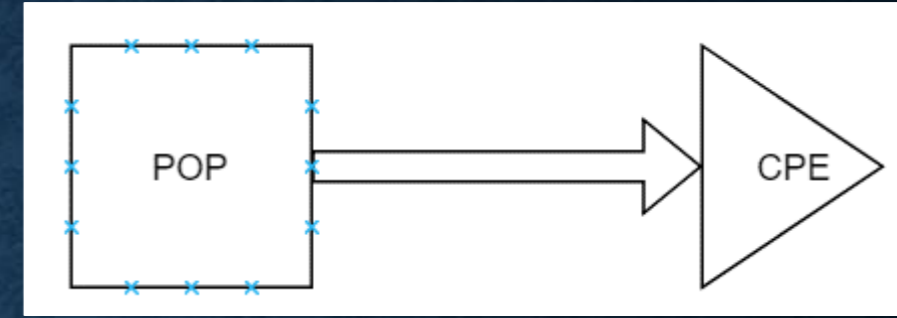
- Address:** A text field containing the value `::1/64`.
- From Pool:** A dropdown menu with 'IPv6' selected.
- Interface:** A dropdown menu with 'ether3' selected.
- Options:** Three checkboxes are visible: 'EUI64' (unchecked), 'Advertise' (checked), and 'No DAD' (unchecked).

# IPV6 ADDRESS CONFIGURATIONS

- **Examples**

- POP location - /48

- CPE - /60



	Address	/	From Pool	Interface
G	📶 2602fea0::1/64		IPv6	ether4
G	📶 2602fea0:0:1::1/64		IPv6	ether3
G	📶 2602fea0:0:2::1/64		IPv6	bridge1

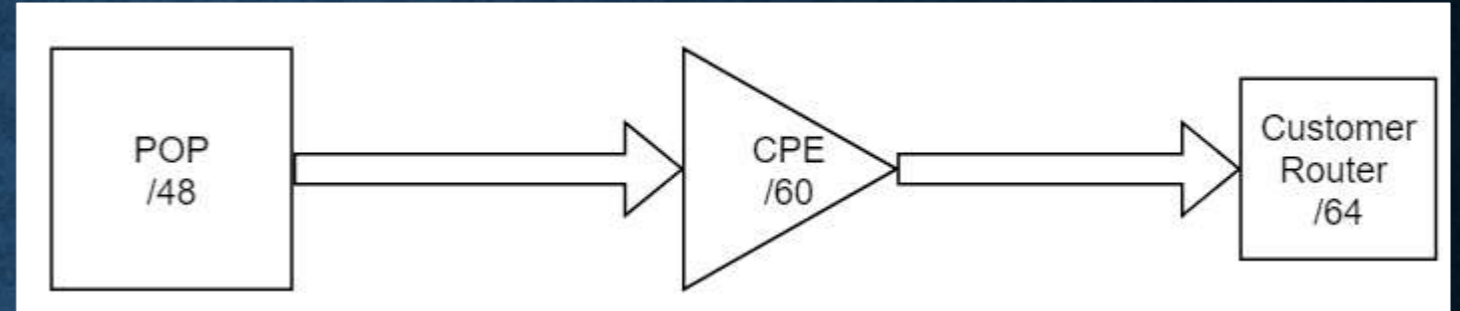
- Lets say we want to create a Guest network.

- We use another interface and put in the ::1/64 and it will auto assign.

# IPV6 ADDRESS CONFIGURATIONS

- **Examples**

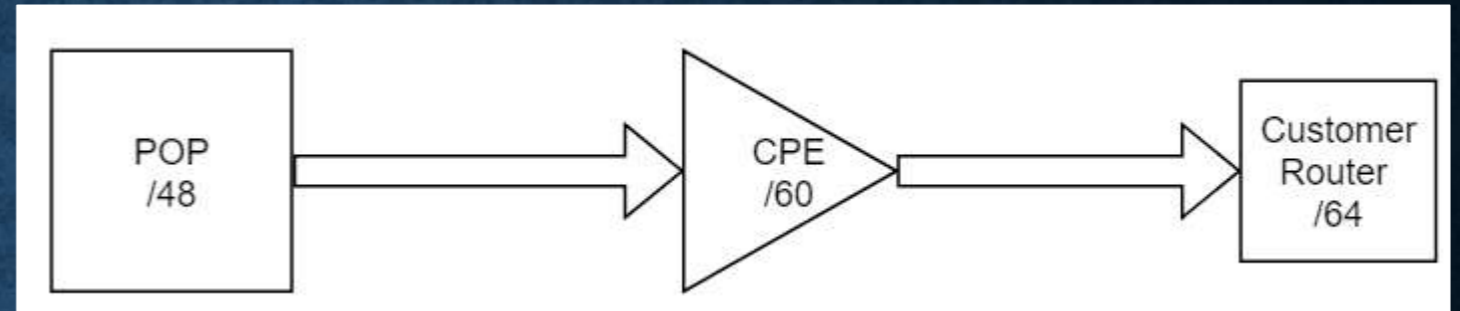
- POP location - /48
- CPE - /60
- Customer Router - /64



# IPV6 ADDRESS CONFIGURATIONS

## • Examples

- POP location - /48
- CPE - /60



- Setup the CPE the same as the previous example
  - We commonly place a /64 on the CPE LAN interface but we also turn on DHCPv6
  - This enables us to hand a /64 to the customer router
  - Does not help with guest networks etc
  - Does offer v6 Prefix to requesting devices
- Customer Router - /64

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