IPv6 Address Planning Basics

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Objectives

- Compare different sizes of IPv6 blocks

- Describe the details of the hierarchy of IPv6 block size

- Identify the 3 separate blocks of IPv6 needed for an organization

Objectives Cont'd

- Build an IPv6 address plan for your organization

- Identify elements of ARIN and NRPM policy that may have an effect on your IPv6 allocation.

- Recognize common mistakes made in IPv6 plans and requests.

Compare with what you know
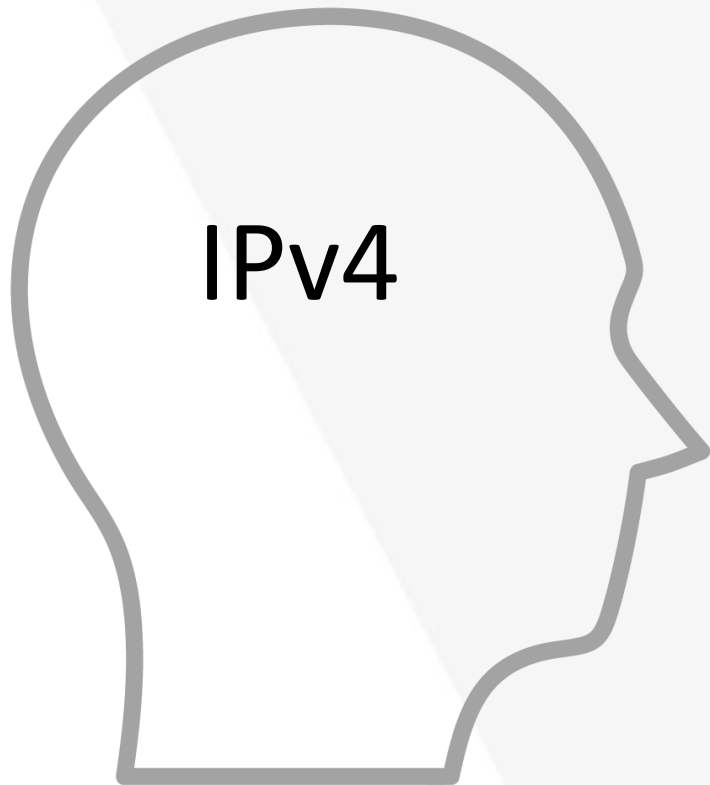
Changing your mindset

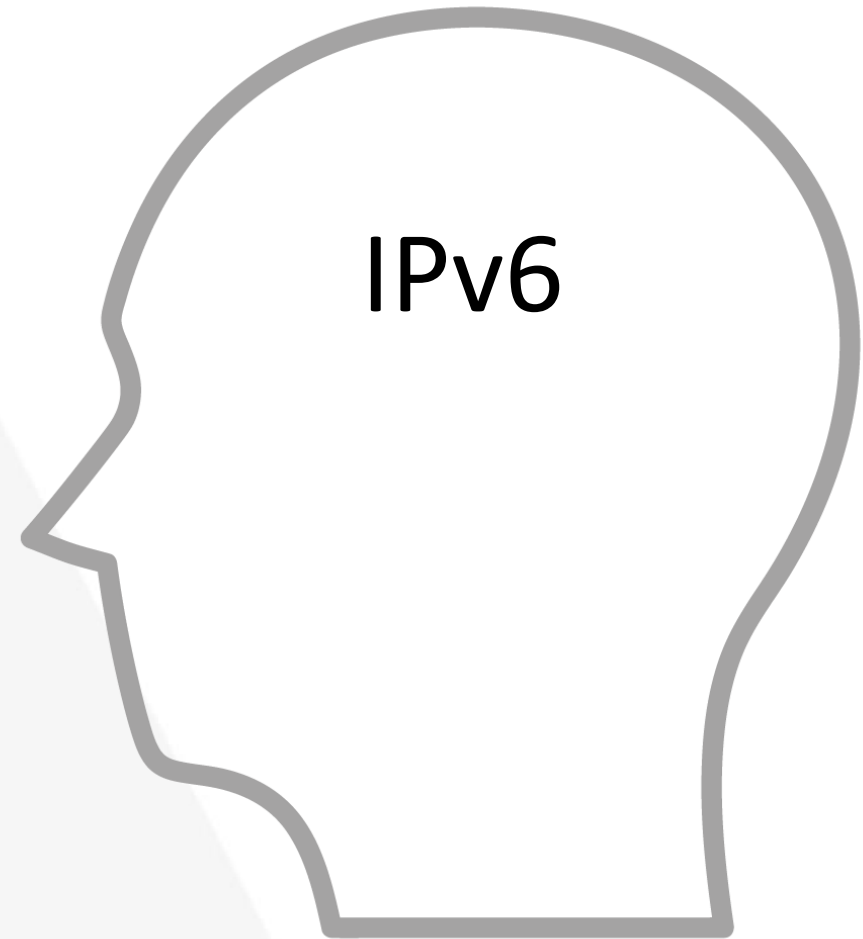**IPv4:**

Thinking about IP addresses

IPv6:

Thinking about subnets

IPv4

- ISP with a /16 (256 /24s)
- Customer with a /24
- That /24 has 256 unique IPv4 addresses to assign to devices/users

- Last 64-bits used for device auto-configuration
- Each user has 65,536 /64 subnets, each of which can hold a near-infinite number of devices/users

IPv6

The Building Blocks of IPv6

Examples of most common blocks of IPv6

Typical Sizes

/32

/48

/64

Sizes

/32

/48

/64

- The block assigned to most end users or customer sites
- 65,536 /64 subnets

Sizes

/32

/48

/64

- Giving so much to each customer?
- Thinking in subnets
  - Each /64 subnet can hold 2^64 addresses

Sizes

/32

/48

/64

- Minimum to an ISP
- 65,536 /48s

ANY QUESTIONS **?**

Q&A

Building an Address Plan

Building an address plan?

With so many addresses, now we can plan

Address planning

Make the address work for you

2001:0DB8:<mark>0234:AB00</mark>:0123:4567:8901:ABCD

0 = Northeast hub
1 = Southeast Hub
2 = Central Hub
3... Future hubs

Site within that hub or region

Designate the subnets within a site

Where do we start?

- If you provide access to others, think like an ISP.
  - Government
  - Universities
  - etc.

Poll:
End User or ISP

End User

ISP

End User

- Start with the number of sites in your network (offices, datacenters, etc) to determine overall block size

Number of Sites	Block Size
1	/48
2-12	/44
13-192	/40
193-3,072	/36
3,073-49,152	/32

End User

- If you have regional aggregation points, determine # of sites in largest region
- Each regional aggregation point gets that block size
- From there, sites within each region get a /48 each
- If you don't have regional aggregation points, just assign a /48 per site within your network

End User

- Generally "set it and forget it"
  - Each site's /48 has 65,536 /64 subnets
  - Each /64 subnet can hold 2^64 addresses
  - Minimum of 25% extra /48s for future site growth

Joe's Trucking Company

- 5 regional networks
- Gets a /44.
  - Equals 16 /48s
- Each site gets a /48
  - 11 left

Number of Sites	Block Size
1	/48
2-12	/44
13-192	/40
193-3,072	/36
3,073-49,152	/32

Joe's Trucking Company

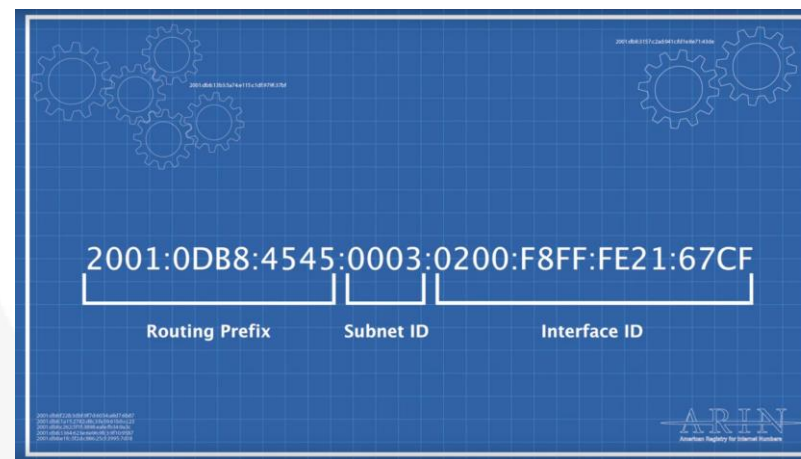- When at 12 regional networks will qualify for more.
  - Don't wait until at Capacity

From the video before the webinar:

- Knowing which regional network just by looking at the address.

2001:0DB8:4545:0003:0200:F8FF:FE21:67CF

Routing Prefix   Subnet ID   Interface ID

End User

ISP

- Number Resource Policy Manual (NRPM) dictates how we operate.
  - Designed by our community
- ISP allocation qualification
  - What are my 3 numbers?

a) Decide what block size you will assign to customers (/48 is typical)

b) Determine # of "serving sites"

c) Determine # of customers served by the largest site

Block Size for Largest Site

Number of Customers	Site's Block Size
1	/48
2-12	/44
13-192	/40
193-3,072	/36
3,073-49,152	/32
49,153-786,432	/28
786,433-12,582,912	/24

ISP Example

GHC Wireless

a) Decides to give /48 to each customer

b) Currently has 15 wireless towers

c) Largest wireless tower serves 507 customers

ISP Example

- Number of customers at largest serving site: 507

Number of Customers	Site's Block Size
1	/48
2-12	/44
13-192	/40
193-3,072	/36
3,073-49,152	/32
49,153-786,432	/28
786,433-12,582,912	/24

- 15 towers/serving sites
- Overall block size = /28
- Plenty of room for growth!

/36 to each site	
Total # of sites	**Overall Block Size to Request**
1-12	/32
13-192	/28
193-3,072	/24
3,073-49,152	/20
49,153-786,432	/16

QUIZ! End User

Now you try!

End user "Quiz" Answer

Awesome Co needs IPv6 for internal routing only.

They have 13 offices.

As an end user, what size block should they need?

Number of Sites	Block Size
1	/48
2-12	/44
13-192	/40
193-3,072	/36
3,073-49,152	/32

QUIZ! ISP

Now you try!

- Gander Wireless:
  - /48 to each customer
  - 16 sites
  - 123 at largest site

Number of Customers	Site's Block Size
1	/48
2-12	/44
13-192	/40

/40 to each site

Total # Sites	Your Overall Block Size
1 to 192 sites	/32
193 to 3,072 sites	/28
3,073 to 49,152 sites	/24

ANY QUESTIONS ?

Q&A