IPv6 Address Planning and Strategy

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Introduction

- Too much address space how to subnet?
- How much is enough to future proof?
- It's difficult to subnet and adds up a lot of operational cost.
- Is it fine to be wasteful in IPv6? IPv4 historically wasn't limited when first launched.
- What to do with routing? How to aggregate or summarize?

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Be Wasteful

- The idea of having 18446744073709551616 address space in /64 and using only 2 is wasteful by all means.

- But if you have /32 Prefix than you have 4.3 billion of above stated addresses to play with.

- Conservative designing in IPv6 is just like spending $200 to find a way to save $2 (JD)

- Think out of the IPv4 box.

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Considerations

- Don't think in IPv4 terms but consider the IPv4 address management and planning.
- Evaluate if IPv4 address management was good enough if yes follow the same foot steps otherwise start from scratch.
- Do you have a routing and security plan for IPv4?
- How do you manage your IPv4 management? IPv6 can only be managed through a good IPAM application.
- Routing will remain the same in terms. Nothing new in it only some syntax changes.

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IPv6 Address Distribution

- /32 – LIR (local Internet Registry) usually an Internet Service Provider.

- /48 – Organization usually large enterprises.

- Now its up to the LIR/ISP and Organization to further allocate as per requirement.

- /56 – End Sites

- /64 – Host

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For Medium and Small Enterprises

- Usually in a small and medium enterprises there aren't any particular IPv4 address plans which they rolled out.

- Solution: Map IPv4 to IPv6 if they can.
  - 192.168.1.0/24 → 2001:db8:0:1::0/64
  - 202.163.96.0/24 → 2001:db8:0:96::0/64

- This doesn't scale well but easy for the operations to manage.

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Cybernet IPv6 Cloud

- Location base subnets
- Our network locations are as follows:
  - 3 Regional HQs
  - Every Regional HQ has 5 and more Cities.
  - Every City has 5 and more POPs.
- We have allocated /36 for each regional HQ.
- One /36 is reserved for infrastructure only.
- One /36 for critical services and official use
- Tested RFC 6164 (/127) for inter-router p2p links
- One /64 reserved for loopback addresses.

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Enterprise Assignments

- No commercial user for IPv6 services to date.
- We provide /56 for each enterprise.
- No requirement so far for /48
- Reserves /64 for point to point connectivity but only assign /127. No issues.
- BGP is mandatory.

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Cybernet Local Network

- Cybernet is part of Lakson Group of Companies and provided services to all enterprises.
- Around 15 companies with different user base and bandwidth requirements.
- Those who only require only internet, assign /64 with SLAAC.
- Those who require IPs for infrastructure we provide multiple /64 as per requirement. No /56.
- Cybernet LAN is on SLAAC with multiple/64 on the basis of floor and/or department.

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Upstream Connectivity

- We have native IPv6 connectivity with one of our upstream.

- Backup link configured over tunnel with HE in case of any connectivity failure with upstream.

- We strongly discourage our customers to create tunnels.

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IP Address Management

- Its impossible to do IPv6 management without any IPAM solution.

- If you are still using MS Excel than FYI it doesn't support HEX.

- We were using PHP-IP for IPv4 management for years but it doesn't support IPv6

- We have parallel IPAM for IPv6 i.e. IPPLan.

- Its simple, easy to manage and OpenSource.

- There are other management tools available.

Lessons Learned

- We have learned couple of lessons after atleast 2 years of deployment.
  - IPv4 and IPv6 are two different protocols and require attention differently.
  - Address planning should be done way before configuring the first interface on a production router.
  - Security should be catered separately for IPv6
  - You cannot block ICMPv6
  - IPv6 address also has a,b,c,d,e,f and its legitimate. Remember its Hexadecimal.

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Summary

- IPv6 address management and planning cannot be generalized. It should be taken on case to case basis.

- We have tried VLAN ID, IPv4 3 octet and interface ID for the ease of search but it doesn't scale.

- Don't play with link-local addresses.

- Infrastructure protection should be considered before hand because IPv4 policies are for IPv4 only.

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Conclusion

- Do whatever best suits you rather following any BCP but stick to your address plan rather doing it haphazardly. Was there any BCP for IPv4 address management?

- Large address space allocation will make you future proof in designing network.

- Its fine to subnet at nibble boundaries.

- Learn to subnet in HEX as well ☺

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