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IPv6 Address Planning Considerations for the Enterprise Rocky Mountain 2011 IPv6 Summit

Paul Zawacki – Internal Global Routing Architect Oracle Global IT – Strategic Network Architecture



- I know I need to get started, but how?
- What kind of addressing do I need, and how much?
- That's so much space, where do I begin?
- 128 bit addressing is intimidating to my team!

• Assumptions in this presentation: Ability to secure adequately sized address block Your mileage will vary



Begin With a Structured Approach - Design Goals and Requirements

The obvious –

Reduce possibility of readdressing Maximize potential for route aggregation, reduce fragmentation Eliminate overlapping private ranges with M&A

- New considerations or opportunities Reduce or eliminate most custom addressing design work Maximize potential for design replication and automation Simplify ease of understanding and readability Uncouple IPv6 from IPv4 addressing
- Challenge what worked and what didn't in the past!



Begin With a Structured Approach - Design Goals and Requirements

• Often hear, "What's the business case for IPv6?"

Usual Response -Outside market opportunity Customers can't reach me

What about new opportunities? Enough internal benefit alone?





Begin With a Structured Approach - Design Goals and Requirements

- One IPv4 challenge significant custom design work
- Regions, sites, applications, subnets, all custom sized
- If you guessed too high Wasted space, a luxury you may not have May be difficult to reclaim later on
- If you guess too low Subjected to painful and expensive readdressing exercise Fragmentation in plan, difficult to follow Route aggregation issues



• How can this be simplified?

2001:0008:8533:0000:0000:8222:0370:7334 	0001 - 0.4-0 - 05 - 0 - 0000 - 0000 - 0 - 0 - 0 -
1 1	2001:0db8:85a3:0000:0000:8a2e:0370:7334
1 1	
<pre> </pre>	128
<pre>//// /// /// /// /// /// /// /// /// /</pre>	124
<pre>//// /// /// /// /// /// /// //// ///</pre>	120
	116
1111 1111 1111 1111 1101 1111 1111 1111 1111 1101 1111 1111 1111 1111 1101 1111 1111 1111 1111 1101 1111 1111 1111 1111 1101 1111 1111 1111 1111 1111 1111 1111 1111 1111 1112 1111 1111 1111 1111 1112 1111 1111 1111 1111 1113 1111 1111 1111 1111 1113 1111 1111 1111 1111 1113 1111 1111 1111 1114 1114 1111 1111 1111 1114 1114 1111 1111 1114 1114 1114 1111 1111 1114 1114 1114 1111 1114 1114 1114 1114 1111 1114 1114 1114 1114	112
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1 1	
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1 1	
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1111 1111 1111 1110 1111 1111 1111 1111 172 1111 1111 1111 1111 68 1111 1111 1111 64 1111 1111 11160 1111 1111 1160 1111 1111 156 1111 1111 52 1111 1111 148 1111 1111 44 1111 1111 36 1111 11132	
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52 52 48 40 36 32	
68 60 56 52 48 48 36 32	
64 56 52 48 44 	68
60 56 52 48 44 	64
56 52 48 44 	60
52 48 44 	56
48 44 	52
44 40 36 32	48
40 36 32	44
36 32	40
32	36
	32



• How can this be simplified?

1) Use standard /64 prefixes Debate this on next slide

2001:0db8:85a3:0000:0000:8a2e:0370:7334
64
60
56
52
48
44
1111 1111 140
1111 1111 36
1111 11132
1111 11132



- How can this be simplified?
- 1) Use standard /64 prefixes Debate this on next slide
- 2) Disregard most significant bits Identical for every prefix

2001:0db8:85a3:0000:0000:8a2e:0370:7334
1 1111 1111
64
60
56
52
48
44
1 1 4 0
1.36
32



 How can this be simplified? 1) Use standard /64 prefixes Debate this on next slide 2) Disregard most significant bits Identical for every prefix 3) Standardize regional blocks, sites, prefixes on major bits!

2001:0db8:85a3:00	00:0000:8a2e:0370:7334
	1
i i	
i i	
i i	i
i i	i
i i	i
i i	i
i i	i
i i	i
1 1	1
1 1	1
1 1	1
1 1	1
1 1	1
1 1	1
1 1	1
1 1	1
	64
1 1	
1 1	
48	
1	
1	
1	
32	



To Cheat or Not on /64 Prefixes

 It appears to be very wasteful Can we use /126s for PTP Links? What do you gain? Can you still aggregate routes? 	
 Is space conservation still a primary design objective? 	
 It is the standard May break some things like SLAAC Cheating greatly complicates the math! 	
Judge for yourself Your mileage may vary	

2001:0db8:85a3:0000:0000:8a2e:0370:7334
i i i
i i i
i i i
64
48
1
32

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What Kind of Addresses Do I Need?

- Easy to obtain a /48 from your Service Provider May subject you to readdressing later on
- Consider Global Unicast Provider Independent (PI)
 May help to preserve your design options
- Might hedge your bets with some of each
- What about private addressing?
 Is it still necessary?
 Recommend avoiding it





Math Examples

Examples of various allocation and standardized site sizes

Standard Site Size	/48 Sites	/52 Sites	/56 Sites	/60 Sites
/48 Company Allocation	1 site w/	16 sites w/	256 sites w/	4,096 sites w/
	65,536 x /64's	4,096 x /64's each	256 x /64's each	16 x /64's each
/40 Company Allocation	256 sites w/	4,096 sites w/	65,536 sites w/	1,048,576 sites w/
	65,536 x /64's each	4,096 x /64's each	256 x /64's each	16 x /64's each
/32 Company Allocation	65,536 sites w/	1,048,576 sites w/	16,777,216 sites w/	268,435,456 sites w/
	65,536 x /64's each	4,096 x /64's each	256 x /64's each	16 x /64's each



Lessons in Address Planning

- Do not underestimate: Time to secure address space Time to build consensus Organizational challenges, resources, and priorities Training required
- Consider the human factor, keep it simple!





- Challenge your preconceived ideas from IPv4
- Look for new opportunities
- Standardize wherever possible
- Keep the math simple for success!
- Get started

Go Oracle in the 34th America's Cup San Francisco!



