AS112-bis.

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AS112–IPv6

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Cut to the chase

• Lots of stupid DNS
• IPv6 brings new kinds of stupid DNS
• Time to re-work AS112 and delegate some IPv6 reverses to AS112
This is my problem

• Negative Answers cost more
  – There are lots of Negative-Answer questions
Negatives cost more?

• NXDOMAIN on average is 2-3x longer than OK
• DNSSEC makes this worse
  – Additional RRSET/NSEC sections in reply
  – Answer now approaching 1kb per query.
• How bad can this get?
  – Depends how much IPv6, and
  – what kind(s) of stupid questions get asked
    • dunnit?
Negatives cost more!
This is my problem

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  – There are lots of Negative-Answer questions
  – Like IPv6 address types not expected to be seen in the global DNS but which are being looked up
This is my problem

• Negative Answers cost more
  – There are lots of Negative-Answer questions
  – Like IPv6 address types not expected to be seen in the global DNS but which are being looked up

• What kind of negative-answer demanding Questions are there?
Too many to count ..........
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• Un-delegated in reverse,
  – but otherwise global unicast
Too many to count ........

• Un-delegated in reverse,
  – but otherwise global unicast
• Link Local
• Site Local
• Multicast
  – Link and site-local multicast
• Unique Local Address (ULA)
• Tunnelled
  – 6RD, 6to4, Teredo
Too many to count (ok 6)

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What we get in IPv4 right now AS112 is designed to mitigate

New in IPv6
A typical day in 2011

transport
  v4: 369,917,141
  v6: 6,605,575

v6/v4 ratio: 0.0178

PTR: 341,620,046
valid PTR: 341,271,155
invalid PTR: 322,778
odd PTR: 25,827
null PTR: 286

valid PTR: 341,271,155
in-addr: 317,287,473
ip6.arpa: 23,983,682

ip6/in-addr ratio: 0.0756

1.78% of query carried in V6

7.56% of query about V6
A typical day in 2011

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  v4: 369,917,141
  v6: 6,605,575

v6/v4 ratio: 0.0178

PTR: 341,620,046

5% NXDOMAIN = Negative Answer Required

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in-addr: 317,287,473
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ip6/in-addr ratio: 0.0756

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7.56% of query about V6
7.56%? What’s the problem?

• Risk management is about **planning for the worst case**
  – In **this** case, the worst case is “IPv6 succeeds”

• The volume of queries seen in IPv4 therefore become the volume of queries seen in IPv6
  – Plus, all the new stupid queries
  – Most of which are NXDOMAIN

• So, how many stupid queries do I see?
Drilling down into stupid queries
ULA query growth, 2009-2011

Unique Local Address queries/Day

- **2009**: 200,000
- **2010**: 400,000
- **2011**: 1,200,000
Scoped address query growth 2008-2011

link-local and site-local queries/day

- 2009
- 2010
- 2011
Tunnels compared to global-unicast 2009-2011

![Bar chart showing the comparison of tunnels to global-unicast from 2009 to 2011. The chart includes data for teredo, 6to4, and global-unicast.]
Tunnels compared to global-unicast 2009-2011

LOG scale

- teredo
- 6to4
- global-unicast
Tunnels a problem?

- We added 2.0.0.2.ip6.arpa to DNS
  - Ugly but solved problem
- Its harder to add Teredo
  - More random tunnel binding (per session)
  - Inherently unscaleable
- In any case, these queries are mostly about FAILING tunnels:
  - The Teredo doesn’t reflect actual usage seen at applications-level logs, tests
Mapped IPv4 addresses queries 2009-2011

Unspecified address queries/day

- 2009: 4,400,000
- 2010: 5,000,000
- 2011: 3,400,000
Can we stop now?
Its Log scale. 100x more silly Questions

- silly questions
- global unicast

<table>
<thead>
<tr>
<th>Year</th>
<th>Silly Questions</th>
<th>Global Unicast</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
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</tbody>
</table>
Its Log scale. 100x more silly Questions

![Bar chart showing silly questions and global unicast from 2009 to 2011 with a log scale on the y-axis.](chart.png)
What does a Draft look like?

• “Dear IAB. Please instruct IANA to delegate the following reverse zone in ip6.arpa to AS112”
  • e.f.ip6.arpa
  • f.f.ip6.arpa
  • 0.0.0.0.ip6.arpa
  • :
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- (Plus about 5 pages of boilerplate)
- draft-michaelson-as112-ipv6-00
Not another ‘V6 is doomed’ pack

• Remember this only scales to disaster if IPV6 succeeds
  – The Teredo problem goes if tunnels go
• Skepticism aside, this has potential to become a large problem, high in the DNS server tree
  – For the life of dual-stack, if not beyond
• We dodged this in IPv4 by taking action (AS112)
• This pack is arguing we just extend it to IPv6
Input to 00 Draft so far

- Inadequate References to cited RFCs
Input to 00 Draft so far

• Inadequate References to cited RFCs
• True. Needs edits for an 01 spin to fix some broken references.
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- Also mis-labels some sub-classes and requests the wrong delegations in the DNS
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- True. Needs edits for an 01 spin to fix some broken references.
- Also mis-labels some sub-classes and requests the wrong delegations in the DNS
- All of which should be fixed in an 01 draft
Input to 00 Draft so far

• Delegate multicast to a competent authority
Input to 00 Draft so far

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  - Not a problem for this draft: can always override the AS112 delegation if there is a competent delegation to be made.
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• ...Assumes AS112 has some management mechanism to update delegation/conf
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  – Not a problem for this draft: can always override the AS112 delegation if there is a competent delegation to be made.

• ...Assumes AS112 has some management mechanism to update delegation/conf

• ...Which is the subject of another draft by other people
Input to 00 Draft so far

• We should fix broken S/W which ignores RFC direction to ‘not do this’
Input to 00 Draft so far

• We should fix broken S/W which ignores RFC direction to ‘not do this’

• Yes.. But we have to be realistic: Broken DNS behavior persists in the global Internet for a very long time
Input to 00 Draft so far

• AS112 should have a V6 prefix assigned
Input to 00 Draft so far

• AS112 should have a V6 prefix assigned
• Yes. Let's do this in a distinct instruction to have the delegation done from IANA held space for IPv6
Can we stop now?

• There is at least 1, if not 2 decimal orders of magnitude more ‘silly’ DNS queries than useful ones in IPv6.

• This problem will not go away without work
  – Code fixes to reduce unneeded DNS requests
  – Local delegations in bind-9, but do people use them?
  – AS112 set-aside is looking compelling..