Yeti DNS Project Status

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Outline

- Yeti DNS Project Review
- Yeti DNS Findings
  - Experiment findings
  - Operational issues
  - Preliminary result from Yeti data
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- *Yeti DNS Project Review*
- Yeti DNS Findings
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What Is Yeti?

- The Yeti DNS Project is a live root DNS server system testbed for advanced root services and some trials on IPv6-only operation, DNSSEC key rollover, renumbering issues, scalability issue, and so on.

- The goal of this parallel root system is to discover the limits of DNS root name services and deliver useful technical output.

https://yeti-dns.org/

Source: 2016-10-15 DNS-OARC meeting presented by Shane Kerr
Why: Problem Space of Yeti(1)

Conflict between DNS Centralization Vs. Network Autonomy

• External Dependency
  • Local services rely on external root services
  • Require external management and support

• Surveillance risk
  • Information leakage cause by the DNS Root lookup
  • RFC7626: DNS Privacy Considerations, by S. Bortzmeyer
Why: Problem Space of Yeti(1)

Why: Problem Space of Yeti(2)

• Can IPv6-only DNS survive?
  • Some DNS servers which support both A & AAAA (IPv4 & IPv6) records still do not respond to IPv6 queries
  • IPv6 introduces larger MTU (1280 bytes), but a different fragmentation model

• Is it ready for KSK Rollover, or not?
  • Not all resolver is compliant to RFC5011
  • Larger packets will introduce risks during ksk/zsk rollover

• And, Renumbering issue

https://github.com/BII-Lab/Yeti-Project/blob/master/doc/Yeti_PS.md

Source: 2015-11-15 Yeti DNS Workshop @ Yokohama presented by Davey Song
Architecture Design for Yeti

Current Model:
- IANA
- Unique IANA name space and KSK
- Vetting the root zone changes
- Sign and distribute the root zone file

Yeti Model:
- IANA
- Unique IANA name space and KSK
- Sign and distribute the root zone file
- DM coordination protocol
- Group A of root server
- Group B of root server

Source: 2015-11-15 Yeti DNS Workshop @ Yokohama presented by Davey Song
Three DMs setup and coordination

**Timing setting**

<table>
<thead>
<tr>
<th>DM</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>BII</td>
<td>hour + 00</td>
</tr>
<tr>
<td>WIDE</td>
<td>hour + 20</td>
</tr>
<tr>
<td>TISF</td>
<td>hour + 40</td>
</tr>
</tbody>
</table>

**Synchronizing**

- WIDE DM REPO
- TISF DM REPO
- BII DM REPO

**Time of Fetching the zone**

KSK, ZSK, server list, IANA serial number

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Source: 2015-11-15 Yeti DNS Workshop @ Yokohama presented by Davey Song

https://github.com/Bii-Lab/Yeti-Project/blob/master/doc/Yeti-DM-Setup.md
https://github.com/Bii-Lab/Yeti-Project/blob/master/doc/Yeti-DM-Sync.md
Yeti DNS Project founded with 3 DM/Root servers

- May 8, 2015
  - yeti-as59715.net
  - ns-yeti.bondis.org

- Jul 2015
  - yeti-ns.ix.ru
  - dahu1.yeti.eu.org

- Aug 2015
  - yeti-dns01.dnsworkshop.org
  - yetivo6.ernet.in
  - yeti.bofh.priv.at

- Oct 2015
  - yeti-aquaray.com
  - yeti-ns.switch.ch
  - yeti-ns.conit.co

- Nov 2015
  - yeti-ns.lab.nic.cl
  - yeti-dns02.dnsworkshop.org

- Feb 2016
  - MZSK experiment
    - February 17, 2016
  - Add 8 additional server
  
- March 2016
  - Yeti experiments
  - New Root servers

- June 30, 2015
  - First Yeti KSK rollover

- July 12, 2016
  - Second Yeti KSK rollover

- May 8, 2016
  - BZSK experiment
    - 2048 bit ZSK
    - May 8, 2016
Yeti Root Operators
Major Events and Activities in Yeti Testbed

Yeti experiments
New Root servers

Yeti DNS Project
founded with 3 DM/Root servers
May 8, 2015

First Yeti
KSK rollover
June 30, 2015

Yeti experiments
New Root servers

Second Yeti
KSK rollover
July 12, 2016

Development Authority Server of Yeti Root zone
Resolver, traffic, Data
Current Need: Traffic

- DNS caching is really efficient
- <100 queries/second
- Please help!
  - Set up a Yeti resolver
    [http://veti-dns.org/join.html](http://veti-dns.org/join.html)
  - Use dnsdist with a Yeti resolver
    [http://veti-dns.org/.../Mirroring-traffic-using-dnsdist.html](http://veti-dns.org/.../Mirroring-traffic-using-dnsdist.html)
  - Try the ymmv query mirror (alpha code)
    [https://github.com/shane-kerr/ymmv](https://github.com/shane-kerr/ymmv)

Source: 2016-07-17 IEPG meeting presented by Shane Kerr
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Experiments and findings

- Yeti is for research!
Yeti Operation Issues

- Yeti Root naming
  - Like bii.dns-lab.net, yeti-ns.wide.ad.jp, yeti-ns.tisf.net

- Root Glue issues (Resolved!)
  - Current root servers answer for the root-servers.net zone, but Yeti root server does not (independent domain). Without this setup, BIND 9 does not include glue in answers to priming queries.
  - Resolved! With a patch for BIND9
Yeti Operation Issues

• A Bug in Knot 2.0 (Resolved!)
  • Knot 2 compress even the root. It is useless since it is a zero-length label, only one byte. Knot 1.6 used for K-root do not do that
  • https://gitlab.labs.nic.cz/labs/knot/issues/398
Yeti Operation Issues

- Dnscap process crashed
  - Dnscap bug dropping some IPv6 packets
  - Disk is full(logs, pcaps) , Resolved!

- Zone transfer failed
  - Multiple IPv6 address (EUI-64 address)
  - zone transfer delayed (Bundy)
  - IPv6 fragment lost
Other Operation Issues

- DNS software problem
  - process crashed
  - process hang
- DNS configure issue
  - wrong DM address
- Hardware problem
  - power failure
  - server down
- network problem
  - IPv6 networking unreachable
  - firewall rules
Preliminary analysis of Yeti data

• Use Entrada to analysis Yeti traffic data
  ✓  http://entrada.sidnlabs.nl/

• Preliminary findings
  ✓ The packet size and impact
  ✓ Information about Resolvers
Length of Priming Response

Response length of NS query

Bytes
0 500 1000 1500 2000 2500

Date
2015/6/1 2015/7/1 2015/8/1 2015/9/1 2015/10/1 2015/11/1 2015/12/1 2016/1/1 2016/2/1 2016/3/1 2016/4/1 2016/5/1 2016/6/1 2016/7/1 2016/8/1 2016/9/1

1920 Bytes
Length of DNSKEY response

First KSK Rollover

MZSK

BZSK

KSK Rollover

2049 Bytes
Yeti Resolvers

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>::/128</td>
<td>2391</td>
</tr>
<tr>
<td>::/64</td>
<td>1509</td>
</tr>
<tr>
<td>::/32</td>
<td>716</td>
</tr>
</tbody>
</table>

25.9% 51.1% 19.6% 1.5% 0.7%
## The Active IPv6 Prefix

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Organization</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>240c::/28</td>
<td>BII</td>
<td>CN</td>
</tr>
<tr>
<td>2001:6d0:6d06::/48</td>
<td>MSK-IX</td>
<td>RU</td>
</tr>
<tr>
<td>2001:1488::/32</td>
<td>CZ.NIC</td>
<td>CZ</td>
</tr>
<tr>
<td>2001:620::/32</td>
<td>SWITCH</td>
<td>CH</td>
</tr>
<tr>
<td>2001:470::/32</td>
<td>Hurricane Electric, Inc.</td>
<td>US</td>
</tr>
<tr>
<td>2001:0DA8:0202::/48</td>
<td>BUPT6–CERNET2</td>
<td>CN</td>
</tr>
<tr>
<td>2001:19f0:6c00::/38</td>
<td>Choopa, LLC</td>
<td>US</td>
</tr>
<tr>
<td>2001:da8:205::/48</td>
<td>BJTU6–CERNET2</td>
<td>CN</td>
</tr>
<tr>
<td>2001:62a::/31</td>
<td>Vienna University Computer Center</td>
<td>AT</td>
</tr>
<tr>
<td>2a02:2478::/32</td>
<td>Profitbricks GmbH</td>
<td>DE</td>
</tr>
<tr>
<td>2001:1398:4::/48</td>
<td>NIC Chile</td>
<td>CL</td>
</tr>
<tr>
<td>2001:4490:dc4c::/46</td>
<td>NIB (National Internet Backbone)</td>
<td>IN</td>
</tr>
<tr>
<td>2a02:aa8:0:2000::/52</td>
<td>T-Systems–Eltec</td>
<td>ES</td>
</tr>
<tr>
<td>2a01:cb04::/30</td>
<td>Orange S.A.</td>
<td>FR</td>
</tr>
<tr>
<td>2a03:b240::/32</td>
<td>Netskin GmbH</td>
<td>CH</td>
</tr>
<tr>
<td>2801:1a0::/42</td>
<td>Universidad de Ibagué</td>
<td>CO</td>
</tr>
<tr>
<td>2a00:1cc8::/40</td>
<td>ICT Valle Umbra s.r.l.</td>
<td>IT</td>
</tr>
<tr>
<td>2a02:cdc0::/29</td>
<td>ORG–CdSB1–RIPE</td>
<td>IT</td>
</tr>
<tr>
<td>2001:620::/32</td>
<td>SWITCH</td>
<td>CH</td>
</tr>
</tbody>
</table>
Preliminary Observation

• Packet size grows steadily
• Retry and TCP-fallback observed
• No IPv4 and IPv6 data comparison
• Some Data is corrupted and messy
• More than half of resolvers come from Europe
• Our Root server operator contribute most traffic
Conclusion

- Results are finally appearing
- Don’t forget to send us queries!

More information

Yeti DNS project: [www.yeti-dns.org](http://www.yeti-dns.org)