Dot MX
Anycast
DNS
system and results on traffic analysis
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About NIC México

- ccTLD operator of .mx (México).
- National Internet Registry (México).
- .mx registrations are possible under the following SLDs only:
  - Com.mx (open)
  - Edu.mx (restrictions apply)
  - Gob.mx (restrictions apply)
  - Net.mx (restrictions apply)
  - Org.mx (restrictions apply)
  - Test.mx (restrictions apply)
About NIC México

- .mx registrations are possible through:
  - NIC México registrar.
  - Other registrars using API-MX.
- Almost all systems are developed and operated in house.
- IT infrastructure is developed and operated in house.
- 185,453 domains under .mx to date.
In the beginning ...

- Sponsored secondaries with other organizations.

<table>
<thead>
<tr>
<th>NS</th>
<th>IP Address</th>
<th>Geographic Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>ns.nic.mx (NIC México)</td>
<td>200.23.1.1</td>
<td>Monterrey, Sótano del CETEC</td>
</tr>
<tr>
<td>dns1.avantel.net.mx (ISP)</td>
<td>200.33.213.66</td>
<td>Monterrey, Avantel Datacenter</td>
</tr>
<tr>
<td>mex1-m-213.uninet.net.mx (ISP)</td>
<td>200.33.146.213</td>
<td>DF, Telmex laboratory</td>
</tr>
<tr>
<td>ns.unam.mx (University)</td>
<td>132.248.253.1</td>
<td>DF, DGSCA, UNAM</td>
</tr>
</tbody>
</table>
In the beginning ...

IPv4 version 1 (only on one NS RR), all DNS servers operated by NIC Mexico, 2002

- IN NS ns.nic.mx
- IN NS yacateuctli.nic.mx
  - Yacateuctli is an aztec god and patron of merchants who travel long distances.

Dynamic updates, January 2004

IPv4 anycast version 2 (all four NS RR), July 2005

- IN NS a.ns.mx
- IN NS b.ns.mx
- IN NS c.ns.mx
- IN NS d.ns.mx
IPv4 Anycast .MX version 2
IPv4 Anycast version 2 main objectives

- Redundancy of DNS infrastructure.
- High uptimes.
- Avoid monoculture.
- Give the majority of our DNS customers better response times (in 2005, USA and Mexico).
IPv4 Anycast version 2

DNS servers for .MX, SLD’s and IR for the NIR at July 2005

IPv4 Anycast in all the servers with 4 NS:

- a.ns.mx (200.23.1.1)
- b.ns.mx (200.23.179.1)
- c.ns.mx (192.100.224.1)
- d.ns.mx (207.248.64.1)

On 5 physical global nodes:

- Monterrey, MX
  - Triara
- Monterrey, MX
  - Avantel
- México City, MX
  - Alestra
- San Jose, US
  - Verio
- San Francisco, US
  - ISC
IPv4 Anycast version 2

DNS servers for .MX, SLD’s and IR for the NIR at July 2005

IPv4 Anycast in all the servers with 4 NS:

- a.ns.mx (200.23.1.1)
- b.ns.mx (200.23.179.1)
- c.ns.mx (192.100.224.1)
- d.ns.mx (207.248.64.1)

Plus 1 local node:

New York, US
ISC
IPv4 Anycast version 2 details

- Each NS listed in the root zone resides on a /24.

- A /23 for a.ns.mx, c.ns.mx and d.ns.mx is announced from one location. The local node announces /24 prefixes for a.ns.mx, c.ns.mx and d.ns.mx only.

- Each node can announce any of the four prefixes of the four NS listed in the root zone.

- Each node announces two or three prefixes only. Different physical nodes are “seen” from one point on the Internet. Example, Verio node announces prefixes for a.ns.mx and d.ns.mx in the normal operation state.

- In case of problems on a node, the off prefixes can be manually turned on to preserve anycasting and diversity.
Avoid monoculture

- **Operating Systems**: FreeBSD 4, Linux 2.6, OpenBSD 3, Solaris 9.

- **Hardware architectures**: AMD64, Intel x86, Sparc.

- **DNS implementations**: BIND 8, BIND 9, ANS.

- **Firewalls**: IPFW2, IPF, PF, IPtables.

- **BGP implementations**: Quagga, OpenBGP, Cisco IOS.

- **Carriers** covering ~90% of Mexico’s Internet: Alestra, Avantel and Telmex plus Verio and ISC.
Other features

- Full control of DNS system.
- Easy to include one more server to the pool, there is no need to request IANA updates.
- Redundant remote access on all servers: SSH, KVM over Internet and analog PSTN modem.
- Memory file system for zone storage.
Blocking and unblocking of attackers

- Monitoring the number of queries based on source IP.
- Automatic blocking on firewall.
- Exponentially growing time of blocking on attackers: 5, 10, 20, 40, 60 minutes.
- A memory of 3 hours of misbehavior.
Typical Node

Router and Log processing
Node AS

DNS
a,b,c,d.ns.mx

IPSEC

PSTN
DNS queries on .mx servers

- A lot of unnecessary traffic.

- One of objective of our DNS infrastructure is to put servers near the origination of the queries.

- Traffic analysis is done with captures taken at the same time on all servers.

- The following statistics were taken in October, 2006.
Porcentaje por tipo de peticiones

- A: 29%
- A6: 0%
- AAAA: 10%
- ANY: 1%
- CNAME: 1%
- MX: 46%
- NS: 1%
- PTR: 1%
- SOA: 1%
- SRV: 6%
- TXT: 1%
Queries por entidad

- a.ns.mx: 26%
- b.ns.mx: 26%
- c.ns.mx: 24%
- d.ns.mx: 24%
By region,
Present and future projects,
Present and future,

- IPv6 support on the Registry applications (done)
- Secondary for other ccTLD’s in IPv4 Anycast (IPv4 anycast)
- ENUM (private trial)
- DNSsec (test bed)
- Nodes in Europe and Asia-Pacific ... soon
- EPP ... soon
- IPv6 transport ... soon
- IRIS ... later
- IDN’s ... not for some time
Thank you