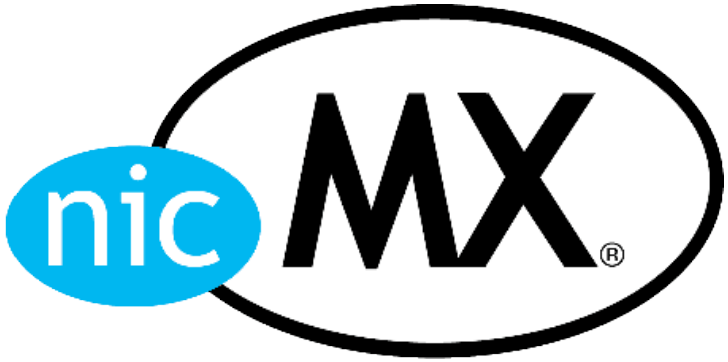


Network
Information
Center
México

Dot MX
Anycast
DNS
system and results
on traffic analysis

Index

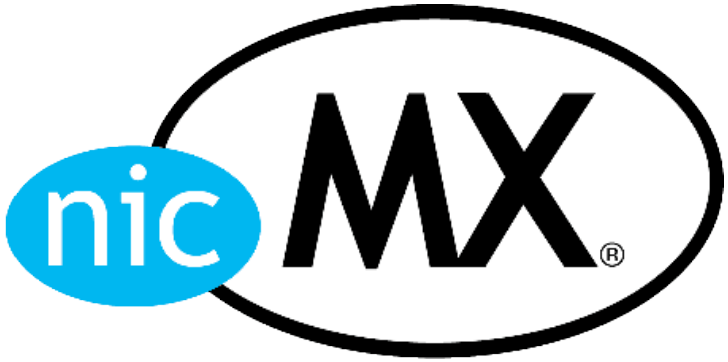
About NIC México

- 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 trough:
  - 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.



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DNS Infrastructure

In the beginning …

- Sponsored secondaries with other organizations.

NS	IP Address	Geographic Location
ns.nic.mx (**NIC México**)	200.23.1.1	Monterrey, Sótano del CETEC
dns1.avantel.net.mx (**ISP**)	200.33.213.66	Monterrey, Avantel Datacenter
mex1-m-213.uninet.net.mx (**ISP**)	200.33.146.213	DF, Telmex laboratory
ns.unam.mx (**University**)	132.248.253.1	DF, DGSCA, UNAM

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)

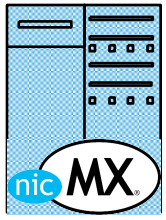
On 5 physical global nodes:

Monterrey, MX
Triara

Monterrey, MX
Avantel

México City, MX
Alestra

San Jose, US
Verio



San Francisco, US
ISC

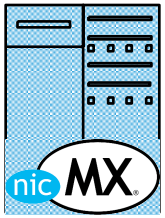
IPv4 Anycast version 2

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.

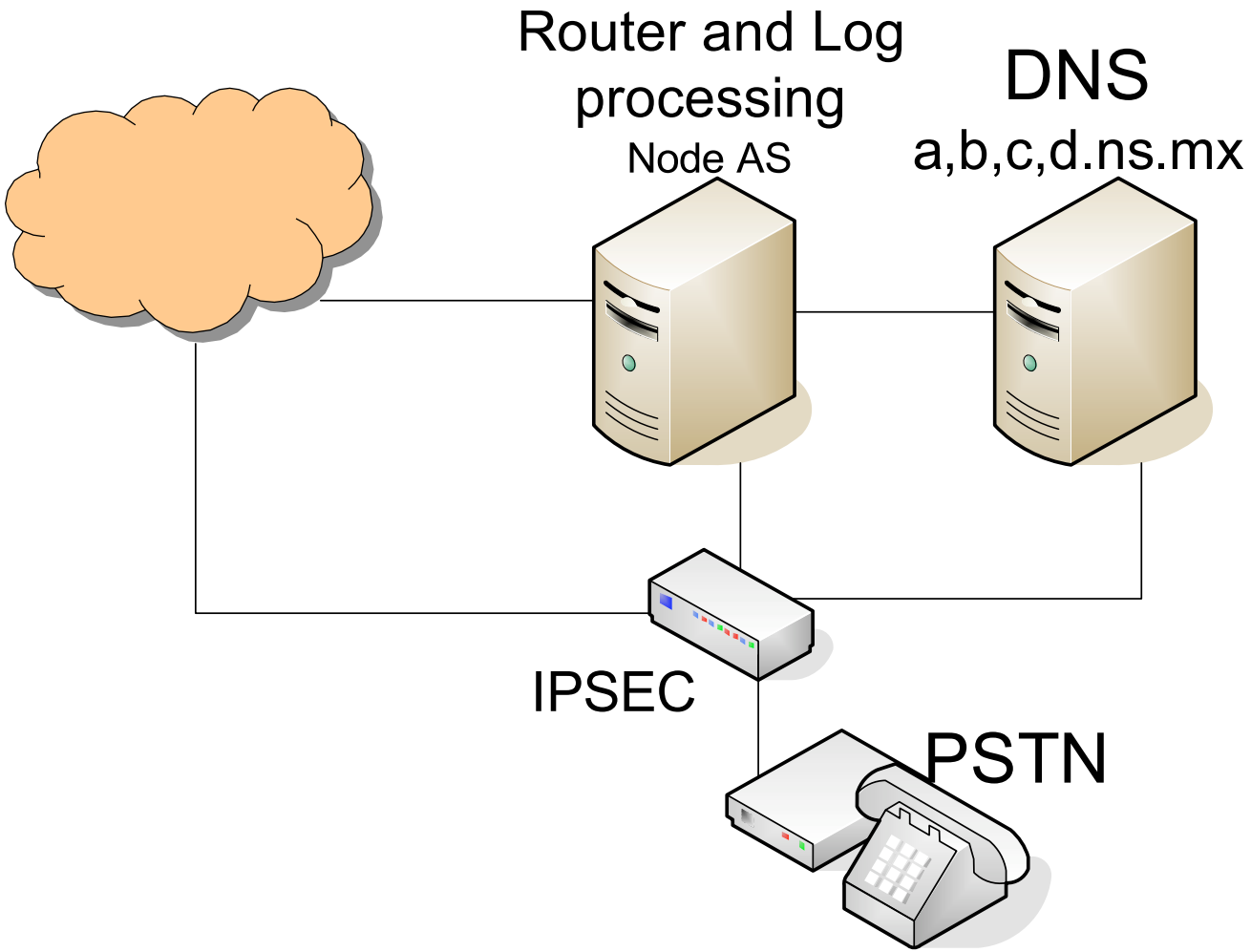
Other features

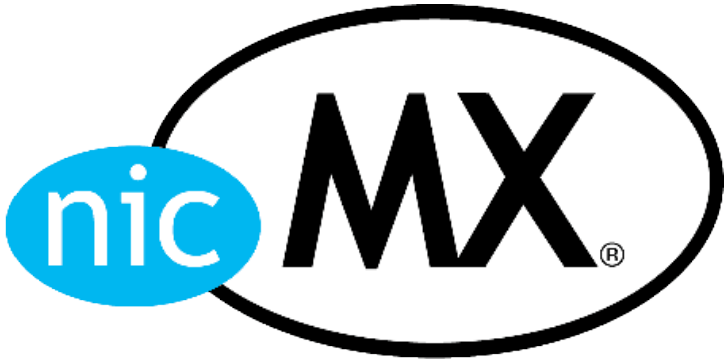
- Full control of DNS system.
- Easy to include one more server to the pool, there is no need to request IANA updates.
- **Redundant remote access on all servers: SSH, KVM over Internet and analog PSTN modem.**
- Memory file system for zone storage.

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





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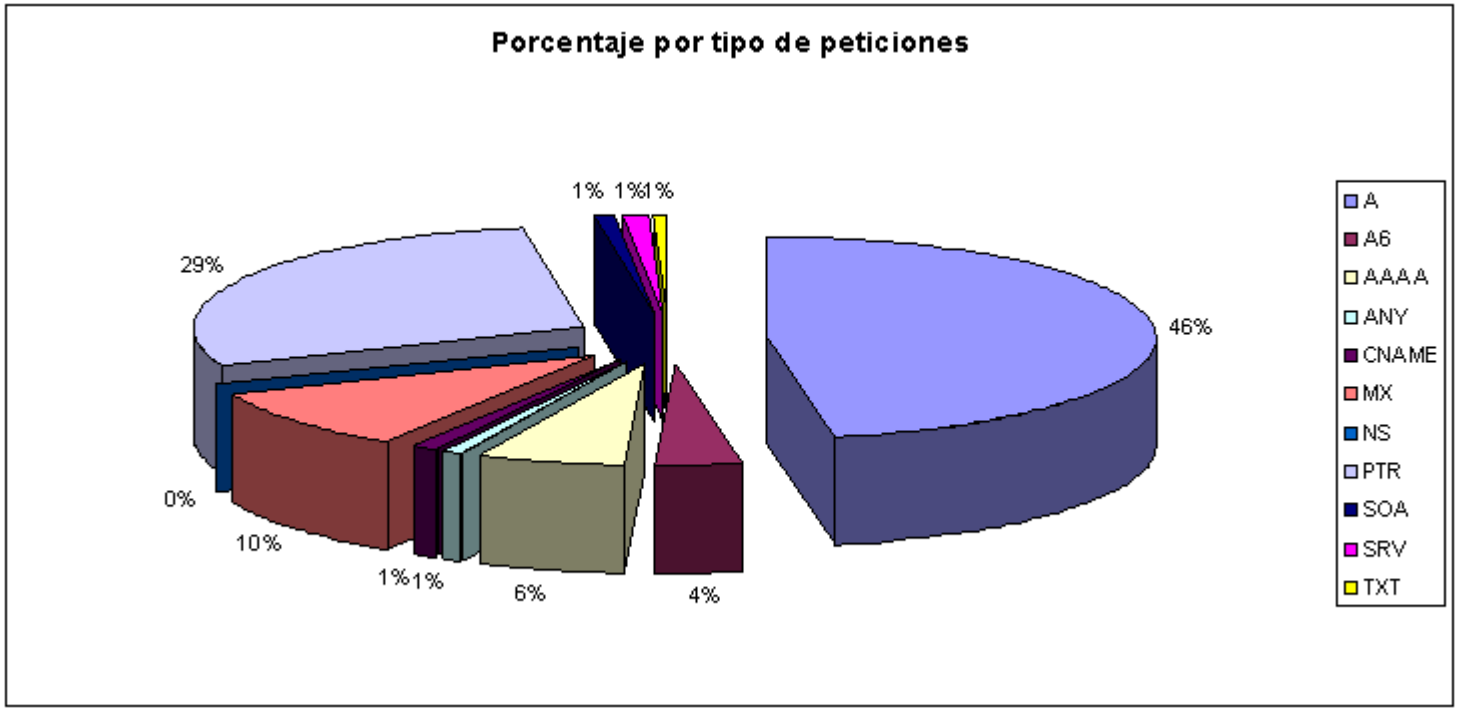
Traffic Analysis

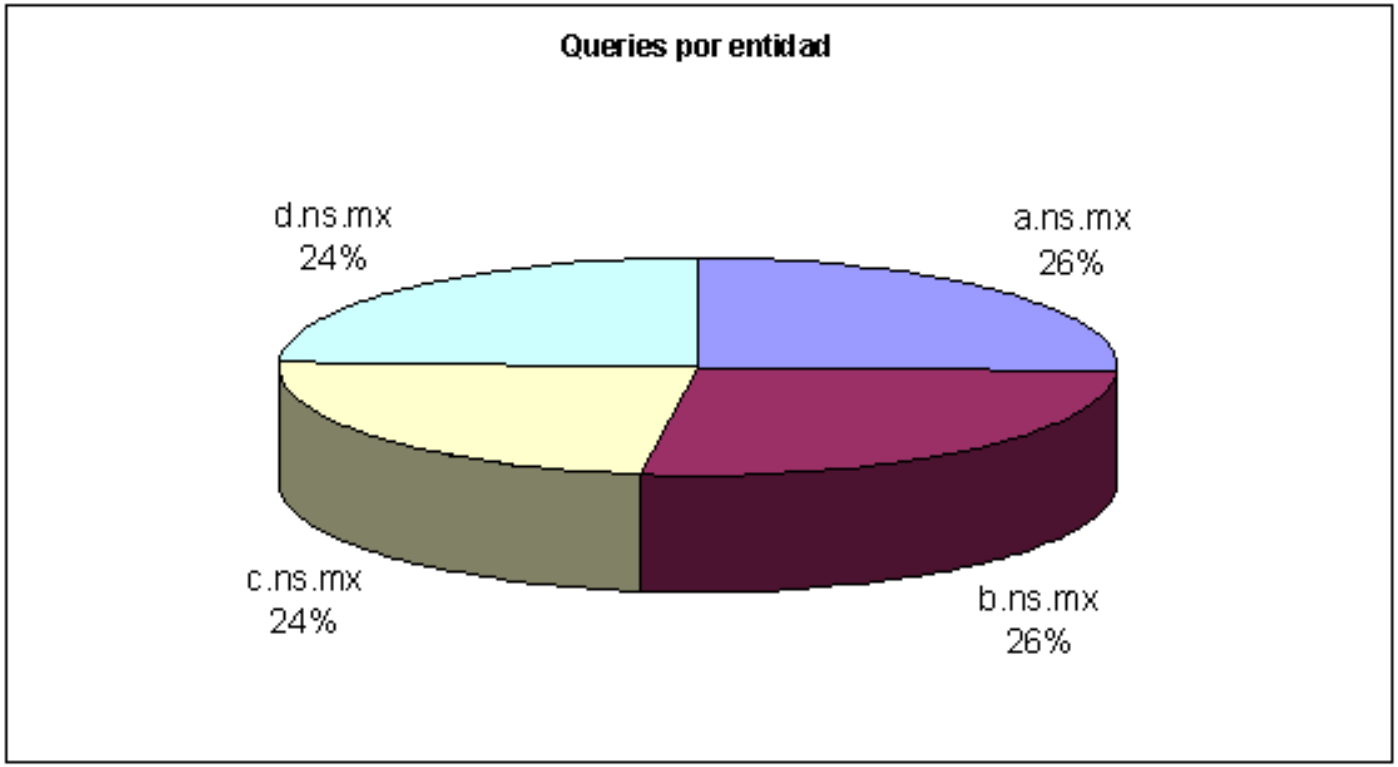
DNS queries on .mx servers

- **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.

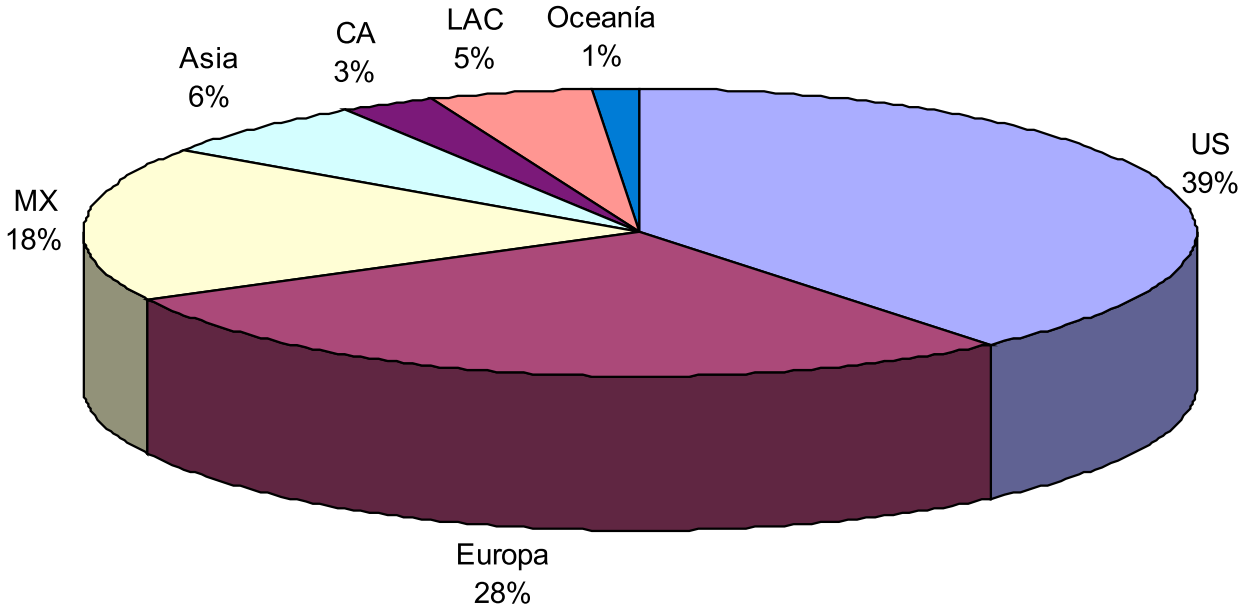
By RRtype,


Porcentaje por tipo de peticiones
1%
1%
1%
29%
46%
0%
10%
1%
1%
6%
4%
A
A6
AAAA
ANY
CNAME
MX
NS
PTR
SOA
SRV
TXT

By NS,



By region,


Queries por región
Asia
6%
CA
3%
LAC
5%
Oceanía
1%
US
39%
MX
18%
Europa
28%

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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