2010 Chilean Earthquake: .CL DNS impact

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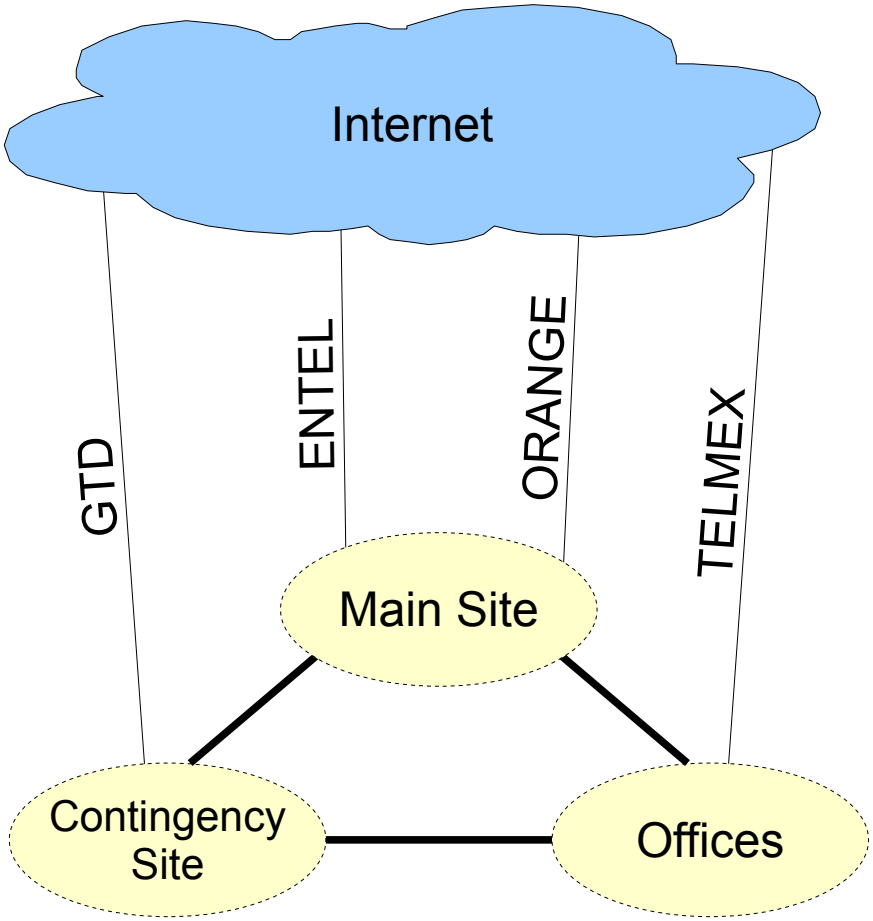
Background

- Chile has no IXP per-se
- Government has rules to enforce peering between ISPs on their own COLOs
- ...so, we need to peer with everyone separately.
- Chile has 2 fiber “entries” to the country (PAN-AM, SAC-1 and SAC/SAM)
- .CL has a big presence in the region. Almost every domain name is under .CL (~90%)

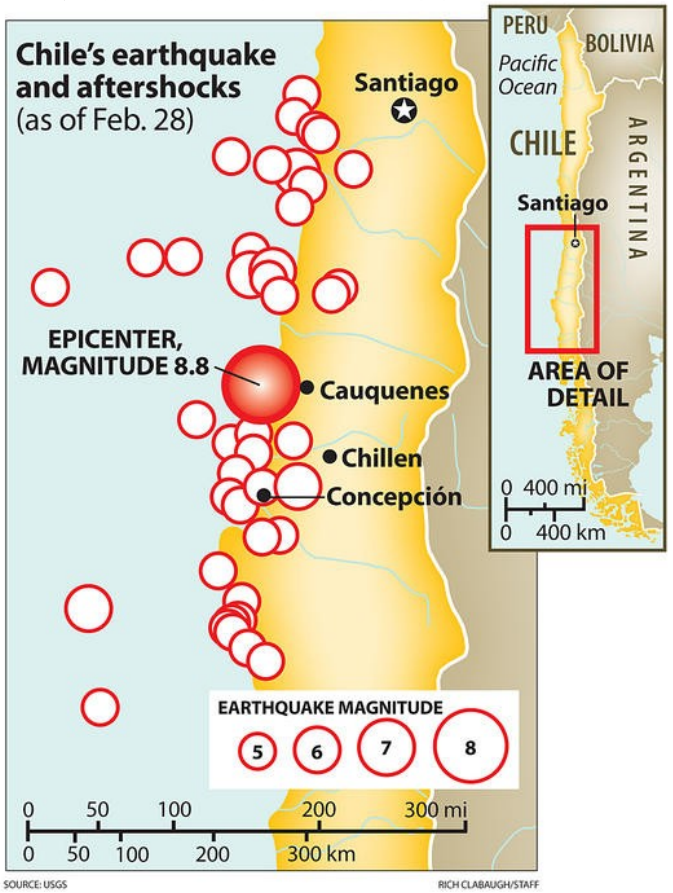
NIC Chile's infrastructure

- 3 sites:
  - Main site (UPS + power generator)
  - Offices (UPS only)
  - Contingency site (UPS + power generator)
- All production servers with 2 mirrors, one on same site, the other on contingency site.
- All network equipment duplicated.

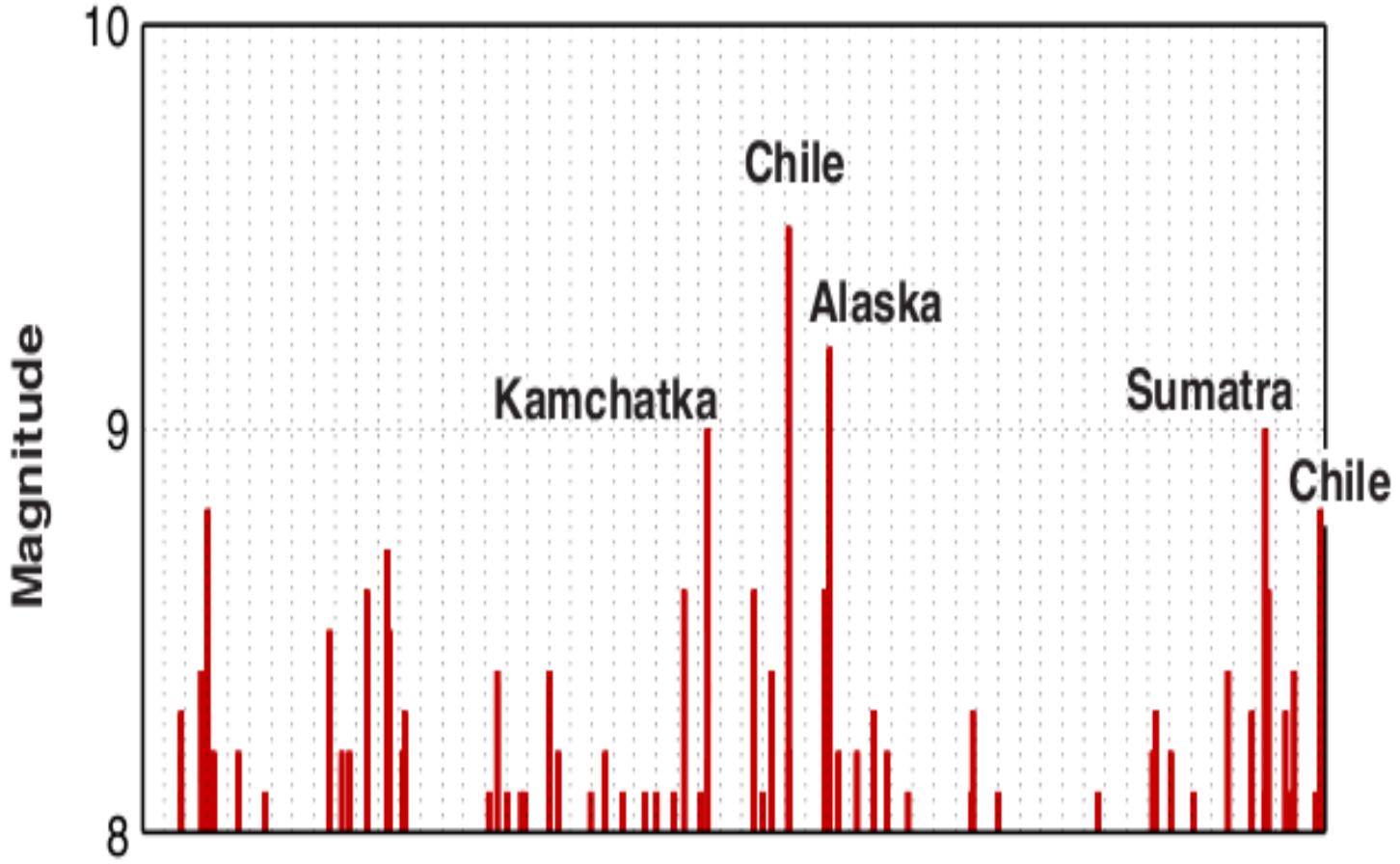


What happened?

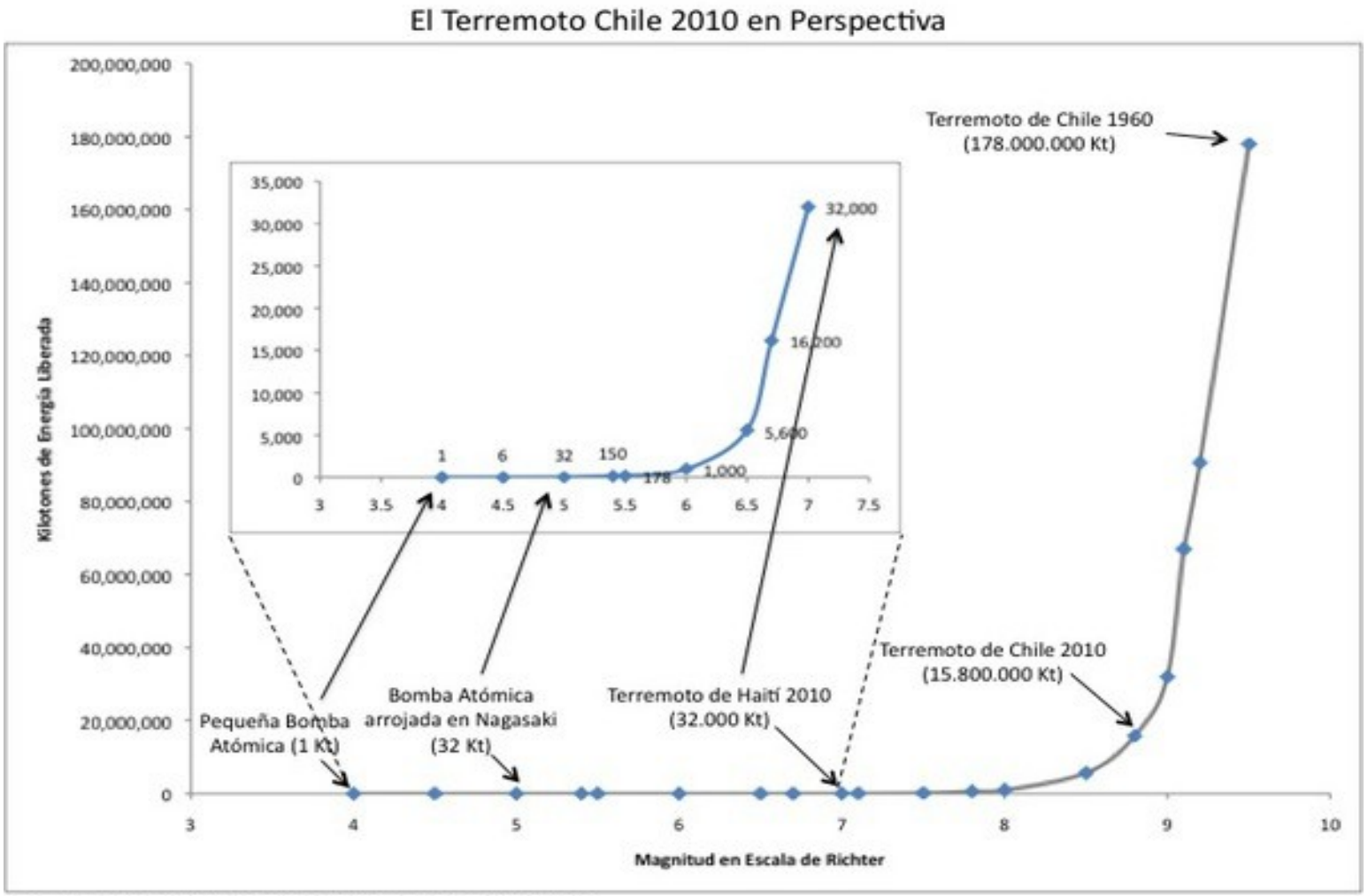
- On Feb 27th, 3:34 AM CLT a major earthquake (magnitude 8.8) lasted around 90 seconds with epicenter in Region del Maule.
- About 30 minutes after the shock consecutive tsunami waves hit coastal towns.
- Fact: 6th chilean earthquake to enter top-20 magnitude registered so far



Earthquake magnitude

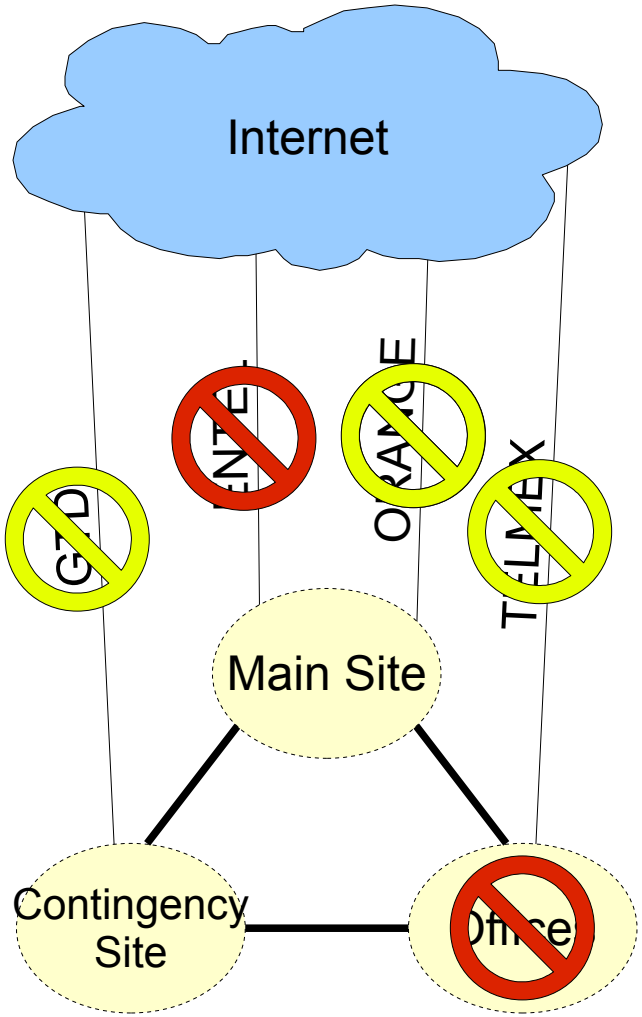


Earthquake magnitude



Fuente: elaboración propia, en base a datos del USGS

Non-DNS Infrastructure impact



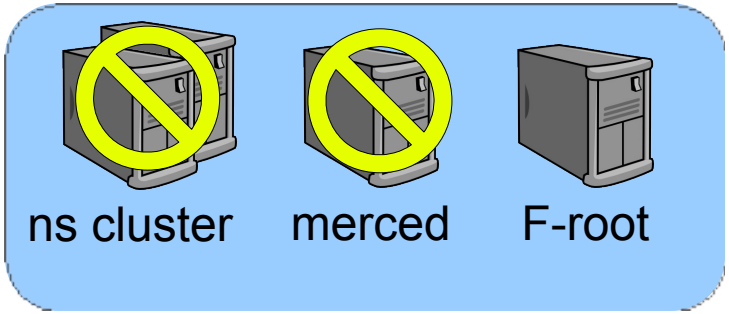
- 3:34 Earthquake, links degraded, one switch power off (ORANGE link down). Sites operating with local auxiliary power.
- 3:59 Web site operation verified using BB network by engineering team.
- 4:04 ENTEL link down.
- 4:30 Engineering team inspection at offices
- 6:06 UPS down at Office site.
- 9:14 ENTEL link up.
- 10:00 Eng. team inspection at Main site
- 11:06 ORANGE link up degraded
- 11:08 Offices energy return, TELMEX link normal
- 12:48 GTD link normal
- 14:30 Contingency site inspection by engineering team.
- 21:30 Zone generation completely normalized
- 24:00 ORANGE link normal

NIC Chile's DNS infrastructure

- More than 50 secondaries .CL servers; 3 Anycast clouds (>30 Netnod, 4 SNS@ISC, 8 NIC Chile), 1 cluster (NIC Chile), 2 unicast (AFNIC, NETNOD).
- 6 servers active in Chile: 4 in Santiago, 1 in Concepción, 1 in Valparaiso
- Local mirror of F-ROOT in Main site in Santiago

Impact on DNS infrastructure

- International nodes unaffected directly. (Only without XFR)
- February 27
  - 3:34 Earthquake, epicenter near Concepción. blanco, merced, minimal traffic.
  - 3:40 valparaiso minimal traffic
  - 3:45 tucapel minimal traffic, blanco, valparaiso ok
  - 4:04 ns minimal traffic.
  - 6:06 miraflores down.
  - 9:14 ns, merced ok.
  - 11:00 tucapel down.
  - 11:08 miraflores up.
- March 1
  - 11:10 tucapel up, minimal traffic.
  - 11:40 tucapel ok.

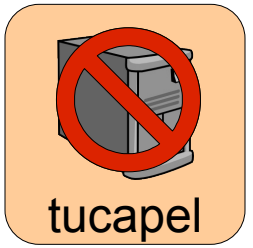


Main Site

Contingency site

Office site

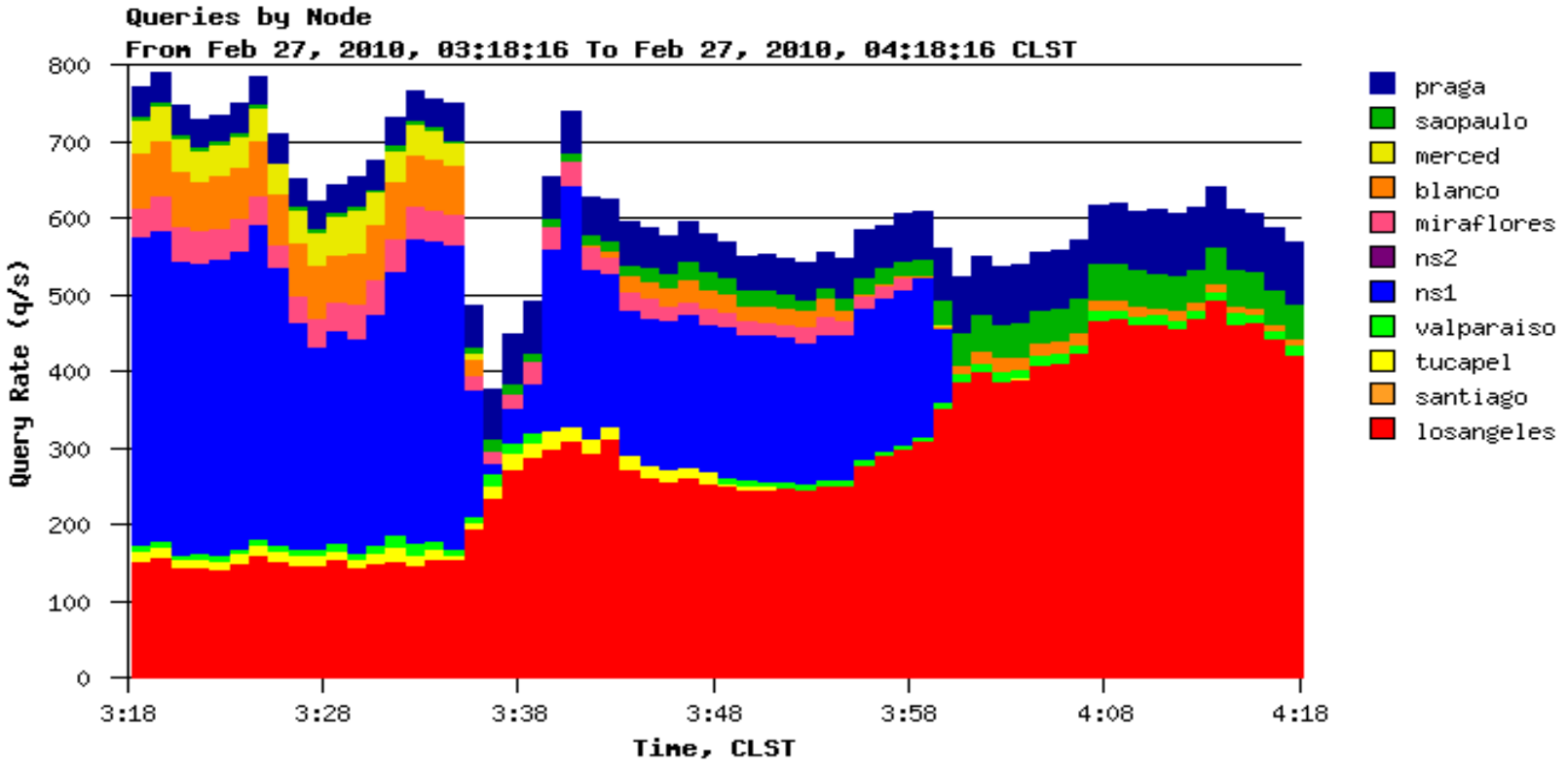
Valparaíso



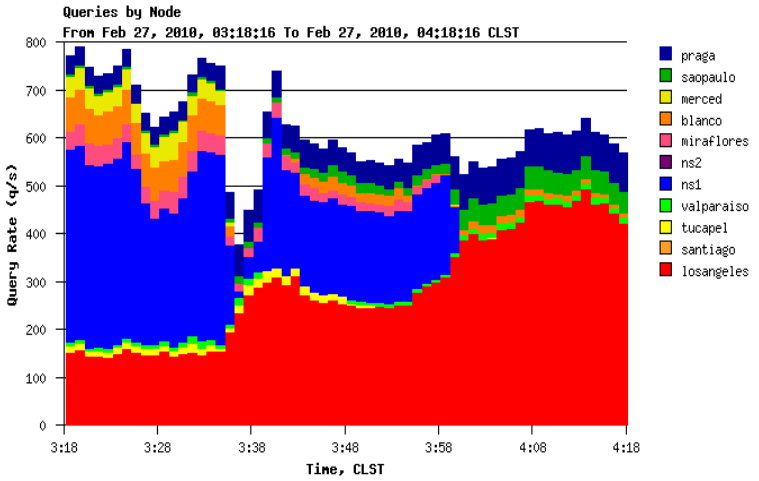
Concepción

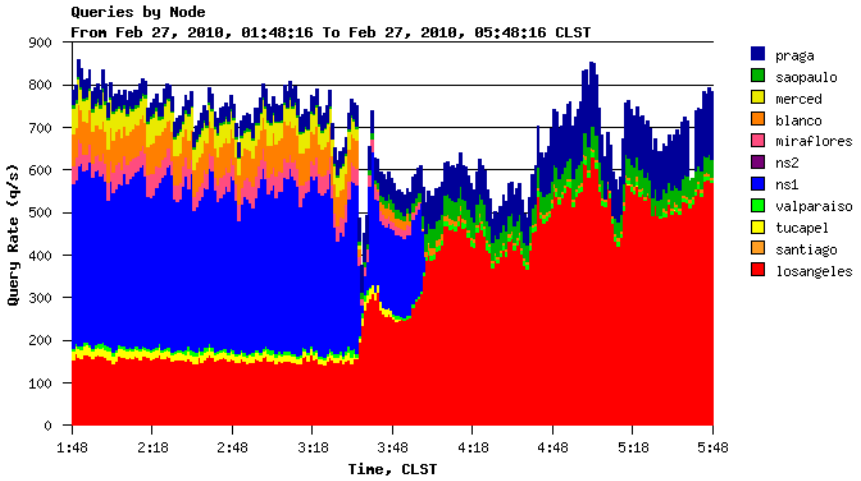
Traffic impact (ns.nic.cl and a.nic.cl)

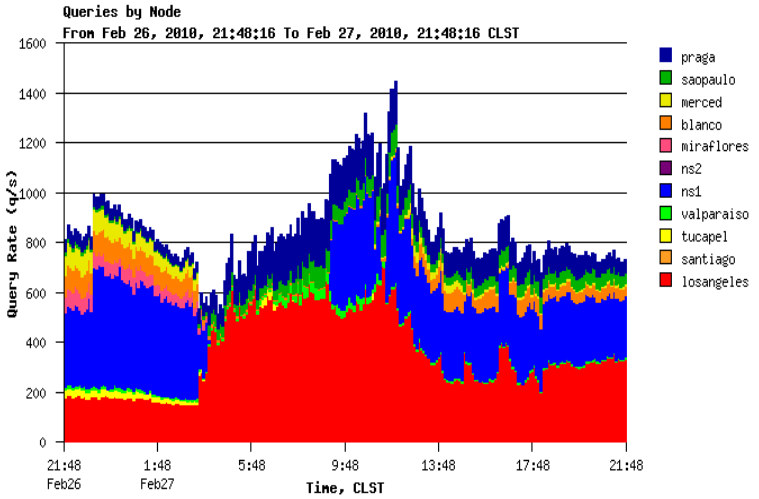
- DNS Servers losangeles (Los Angeles CA, USA), praga (Praga, Czech Republic) and saopaulo (Sao Paulo, Brazil), answer by servers degraded

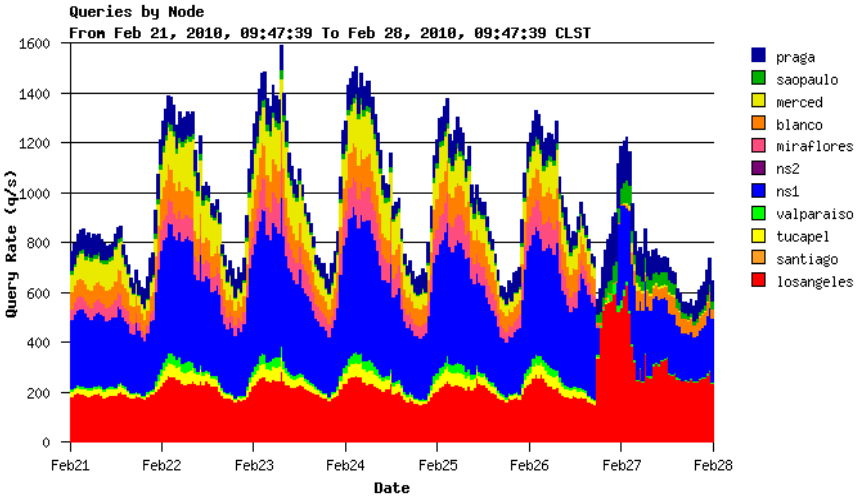


Traffic impact (different time scale)









Earthquake 2010 Chile impact

Some of the detected problems

- NTP Servers and Resolvers located in office site (only UPS, no power generator)
- Some servers had both power supplies connected to the same electrical circuit; short power cable on a switch was a serious problem.
- No written plan on how to proceed with a complete communications blackout
- ISPs and their upstream providers haven´t told us what really happened with them.
- Chilean IXP architecture and their routing methods prooved to be not resilient.
- One of the main Data Centers in Chile had serious problems, no official information released yet.

Check discussions in http://www.niclabs.cl/terremoto

Conclusions

- DNS servers network around the world guaranteed uninterrupted domain name resolution service for .CL.
- Local F-ROOT mirror allowed national Internet to operate even with all international links down.
- Our sites responded as expected.
- Zone generation was normal each half hour, but between 4:00 and 21:30, some of the generated zones were not published
- We are analyzing the events, to improve response for future emergencies.
- One of the main problems was communications within the team while electrical power, cellphones and land lines were down.