

# 30 Years of Operating a Root Name Server

Challenges Now and Then



# A long journey begins ...

- On July 28, 1991, the DNS records

```
.           IN NS      nic.nordu.net.  
nic.nordu.net.  IN A      192.36.148.17
```

were introduced in the root zone making nic.nordu.net "number 9", the first root server outside the USA.

- This summer, that will be 30 years ago ...

... for us both!

- The 30 years isn't the scary number ...
- ... it's the 29.5 years that I've been part of it ...

# What was it like in 1991?

THE (singular!) Root Name Server in Europe was a workstation on a desk in an empty office.

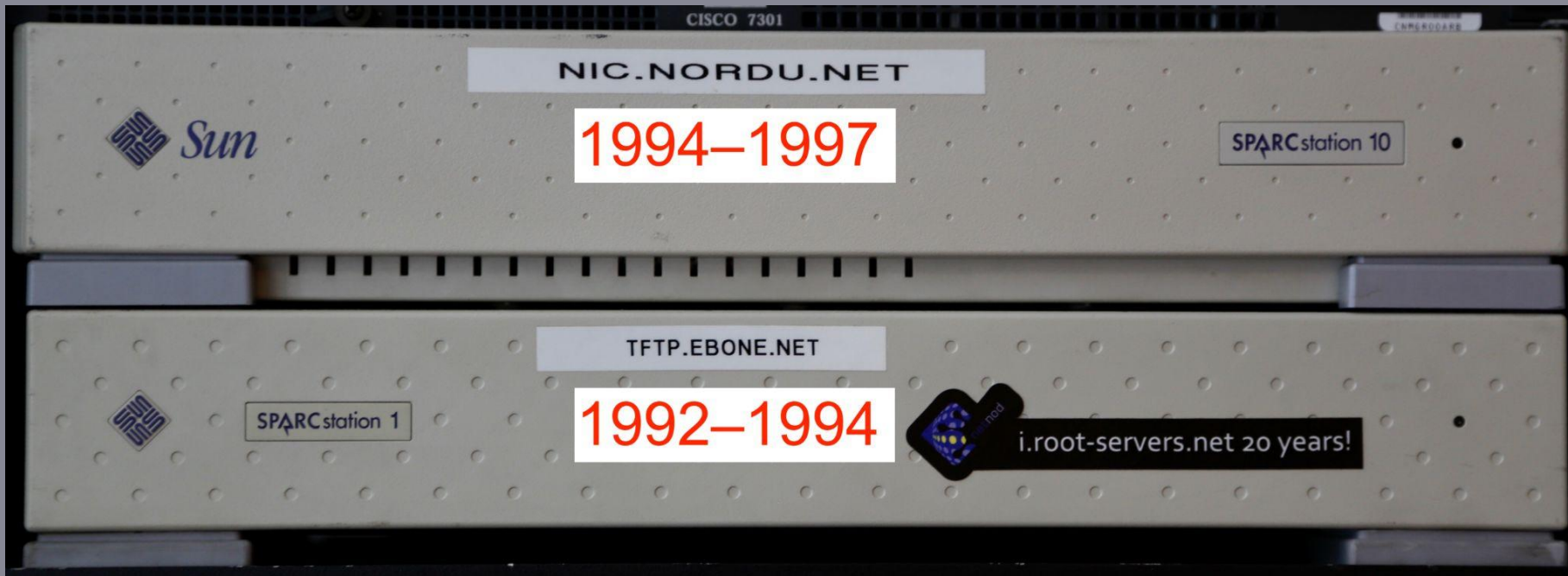
## July 1991

- Sun 3/50
- Motorola 68020 (15.7 MHz)
- 4 MB of RAM
- 10Base2 Ethernet
- SunOS 3.5

## Later 1991

- Sun 4/65 (SPARCstation 1+)
- LSI L64801 (25 MHz)
- 40 MB of RAM
- 10Base2 Ethernet
- SunOS 4.0.3

# The Netnod museum



# Challenges in 1992

- Getting the zone files!
  - Major packet loss to the USA. (30 % was not unusual, I remember seeing > 50 %.)
  - Had to use FTP. DNS zone transfer wasn't sufficiently reliable.
- Zone content mix
  - Cache and authoritative data were "in the same pool"
  - Served several "levels" (e.g., root + COM/NET/ORG/SE/...) from the same server.
  - Zone boundaries were not enforced. You could put any data in any zone.
  - Lots of human errors and "lack of clarity in thought processes ..."

# The 1990s: politics

- The Internet picks up speed ... and business!
- Politics enters the field.
  - Acceptable Use Policies (AUP) haunt the net.
  - Distribution of root servers becomes an issue.
- 1995: root servers were renamed
  - No EDNS, 512-byte limit on UDP packets.
  - Priming query limited to 9 servers.
  - New scheme took advantage of DNS message compression.
  - Room for 4 more!

# The turn of the century

- 1998: Jon Postel dies.
  - Result: all root-server operator meet for the first time ever.
  - All agree: IANA is the source of data, and we need to coordinate.
  - Root-ops was formed.
- 1998: ICANN is created
  - RSSAC is one of the initial ACs.
- The Y2K bug ...
  - Test runs.
  - Staff on site during "THE night".



# Challenges in this millennium

Internet and the root service has gradually turned into infrastructure → higher demands on ...

- Service stability
- Policy stability
- Financial stability

# How Netnod Tries To Meet These Challenges

# Service stability

- Provisioning
  - Dual systems for critical parts.
  - VPN-based transport.
  - Machine-generated configurations.
- Statistics
  - RSSAC002
- Root Zone Scalability Study (2009)
- RZERC

# Service stability

## Reachability

- Anycast
  - Thousands of peering relationships.
  - Extensive use of route servers.
  - Extensive use of peering-db.
  - Dialogues with site hosts.
  - Machine generated (peering) configurations.
- RPKI
- Drawing from experience of operating IXs.

# Policy stability

- Global DNS policy affects the root more than other services.
- ICANN (IANA/PTI/CSC, **RSSAC**, RZERC, SSAC, **RSS GWG**)
- ITU – EU – IETF – RIPE – CENTR
- Everyone wants to have a say.
- We have to be everywhere!

# Financial stability

- Operating a root server requires neutrality and independence (see RSSAC042).
- No a-priori source of income.
- The Netnod way:
  - Provide commercial DNS service (primarily for TLDs) from other parts of the same platform.
  - The multitude of customers alleviates the possible problem with undue influence that comes with a single source of money.

# Deployment challenges

- Finding dependable, knowledgeable, and stable hosts.
- Logistics and shipping.
  - "Customs. Bl--dy customs ..." 😊
- Making the service cheaper → more sites.

# Provisioning challenges

- Zone propagation.
  - Several release points, several distribution masters, 70+ servers.
  - Timely
  - In sync
- Status: monitoring and reporting.
- Statistics: collecting and reporting.
- Slow admin links ...



# Political challenges

- To ensure that all decisions that may impact the operations of the root service are based on facts and not on misconceptions.
  - We try to provide the Internet community across the public and private sectors with a clear picture of how the root server system works, and to make it clear that its purpose is technical infrastructure and nothing else.
  - Thankfully many others do the same.

# netnod.se

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