

# DNS-OARC and Name Collisions: an Introduction

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**WPNC, London**  
**March 2014**



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Domain Name System Operations Analysis and Research Center

# DNS-OARC Introduction



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# What is DNS-OARC ?

*The Domain Name System Operations Analysis and Research Center (DNS-OARC) is a non-profit, membership organization that seeks to improve the security, stability, and understanding of the Internet's DNS infrastructure.*

*DNS-OARC's mission is:*

- to build relationships among its community of members and facilitate an environment where information can be shared confidentially*
- to enable knowledge transfer by organizing workshops*
- to promote research with operational relevance through data collection and analysis*
- to increase awareness of the DNS's significance*
- to offer useful, publicly available tools and services*



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# OARC's Functions

- Facilitate co-ordination of DNS operations community
- Ongoing data gathering
- Operate community info-sharing resources
  - Mailing lists, jabber, website, trust vetting
- Maintain/host DNS software tools
- Outreach via external and shared meetings



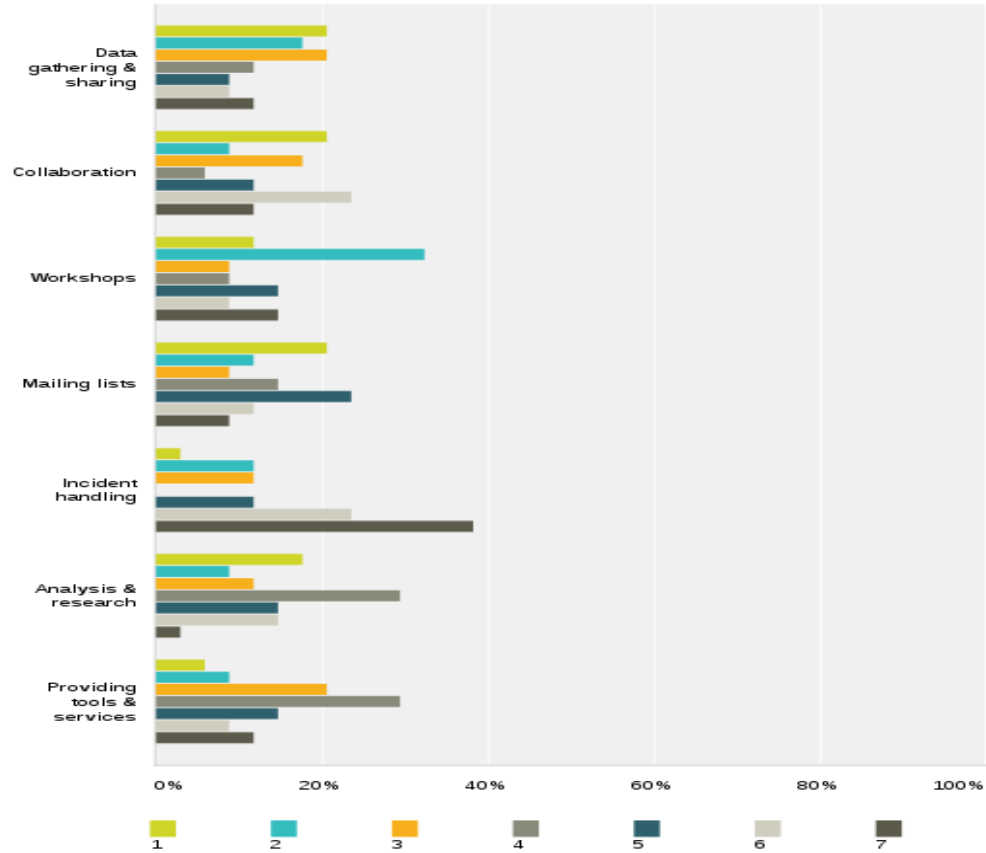
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# OARC Functions & Services

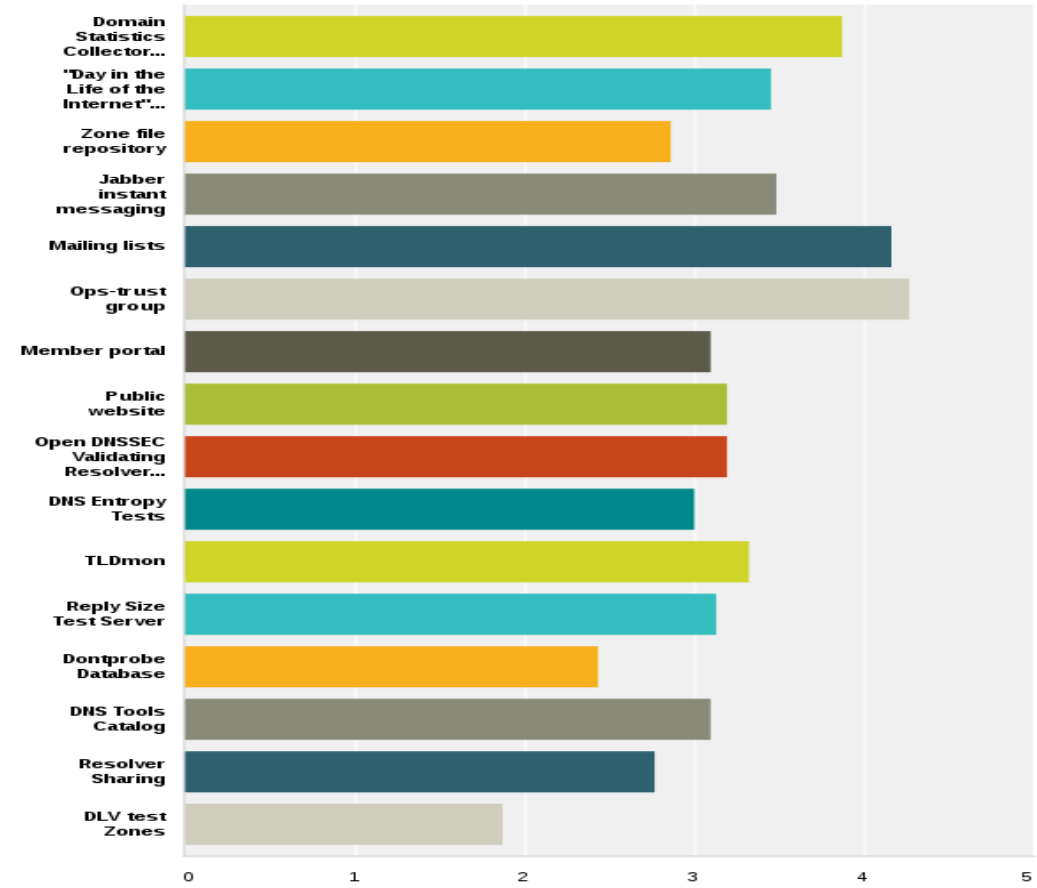
Please rank the following OARC functions in terms of importance to you: (1=most, 7=least)

Answered: 34 Skipped: 11



Please rate the following OARC services in terms of importance to you:

Answered: 31 Skipped: 14



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# OARC Members

Afilias (.org, .info)

Dyn

Google

ICANN

Nominet (.uk)

RIPE NCC

AFNIC (.fr)

APNIC

Akamai

ARIN

Cisco

DENIC (.de)

EurID (.eu)

Neustar (.biz)

SIDN (.nl)

.CLUB

.SE

ARI Registry Services

Artemis (.secure)

CentralNic

CIRA (.ca)

CloudShield

CNNIC (.cn)

CORE

CZ.NIC

Demand Media

DK Hostmaster

DNSpod

Donuts

dotBERLIN

IEDR (.ie)

Internet Identity

JAS Advisors

JPRS (.jp)

KISA/KRNIC

Mark Monitor

Minds+Machines

NIC Chile (.cl)

NIC-Mexico (.mx)

Nominum

Norid (.no)

NZRS

Registro.BR

RTFM

SWITCH (.ch)

tcinet.ru

XYZ

Comcast

ISC

Microsoft

Verisign (.com)

AFRINIC

CAIDA

Cogent

Dotua

Eesti Internet

LACNIC

Measurement Factory

NASA Ames

Netnod (.se)

NLnet Labs

NTT

OTTIX

PowerDNS

Public Interest Registry (.org)

Secure64

Team Cymru

University of Maryland

USC/ISI

WIDE



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# OARC Governance

- Independent legal entity
- Diverse member base
  - direct participation agreements
- Financially self-supporting
- Self-governing, neutral
- Board reflecting member interests
- *501(c)3* non-profit public benefit corporation



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# OARC Board

- John Crain, ICANN, RSAC Director
- Ondrej Filip, CZ.NIC, Chairman
- Chris Griffiths, Dyn, Director
- Matt Pounsett, Afilias, Treasurer
- Antoin Verschuren, SIDN, Director
- Duane Wessels, Verisign, Director



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# DNS-OARC Staff Resources

- President, Secretary (Keith Mitchell)
- Systems Engineer (William Sotomayor)
- Events contractor (Denesh Bhabuta)
- Under contract from ISC:
  - Finance/Admin functions
  - Infrastructure services
- Hiring 2014:
  - Program Development
  - Administration
  - Website re-Design
  - Software Engineer

*(not all roles are full-time)*



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# 2013 Donors – Thank You !

- Verisign
  - \$50k one-off donation
  - Keith/William time, Root-Ops jabber servers
- ICANN
  - 1 x Dell r815, 3 x Dell r820 analysis servers
  - Workshop underwriting
- Donuts, Demand Media
  - 2 x Dell r810 analysis servers
- Farsight
  - 4 x Sun X4500 storage servers
- 2014
  - We have a number of offers of other-site hosted server clouds, under discussion..



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# 2013 Achievements

- Created Strategic Development Plan
- Increased staff from 0.6 to ~2FTE
- Governance Rationalization
- Revenue growth from \$270k to \$470k
- Major infrastructure overhaul
- Significant cash and hardware donations
- Workshop improvements, sponsor program



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# OARC Development Plan

- Output from Member Survey, Board Retreat, to re-boot DNS-OARC:
  - [https://www.dns-oarc.net/files/workshop-201305/Strategy-2013\\_report.pdf](https://www.dns-oarc.net/files/workshop-201305/Strategy-2013_report.pdf)
- Objectives on 3+ year timescale:
  - Governance reforms for more focused operations
  - Grow OARC to a more sustainable and stable “Ideal OARC” level of ~5FTE, \$1M revenue
  - Workshop improvements, sponsorship
  - Re-develop systems, infrastructure, processes, websites
  - Solicit funding for new projects and services of value to members



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# DNS-OARC Data Sharing



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# DNS Data Gathering

- Generally involves sensors running on, or adjacent to servers, e.g.
  - Domain Statistics Collector (DSC) - continuous traffic analysis and summary, no payload
  - “Day in the Life of the Internet” (DITL) - full query payload via *dnscap* for 48 hours at least once a year
- Also:
  - Zone File Repository (ZFR) – aggregate archive of TLD zone file contents
  - Capturing data from various user-driven test tools



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# OARC's Data Sharing Policy

- Governed by Participation Agreement, which applies to all paying Members and non-paying Participants
- Obligations on OARC and participants to preserve privacy of shared data
- OARC-held raw data may not be copied off of OARC's servers
  - Yes, we know this is very “pre-cloud retro” but we are stuck with it
- OARC provides significant storage and compute resources to allow members to analyze data in-situ
- Analysis **results** may be copied off of OARC servers for internal use and/or publication, subject to approval
- Members and researchers encouraged to share and publish their findings



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# OARC's DITL Dataset

- Since 2006, at least once per year to provide “Internet Science” baseline
- Also during key DNS events such as DNSSEC signing of root, IPv6 enabling, potentially during incidents
- Gathered from most Root, many TLD, and some resolver operators
- Full query traffic to authoritative servers
- ~80Tb Dataset
  - OARC has been doing “big data” for nearly a decade..
  - less challenging with modern hardware than when we first did this !
  - <https://www.dns-oarc.net/oarc/data/ditl>

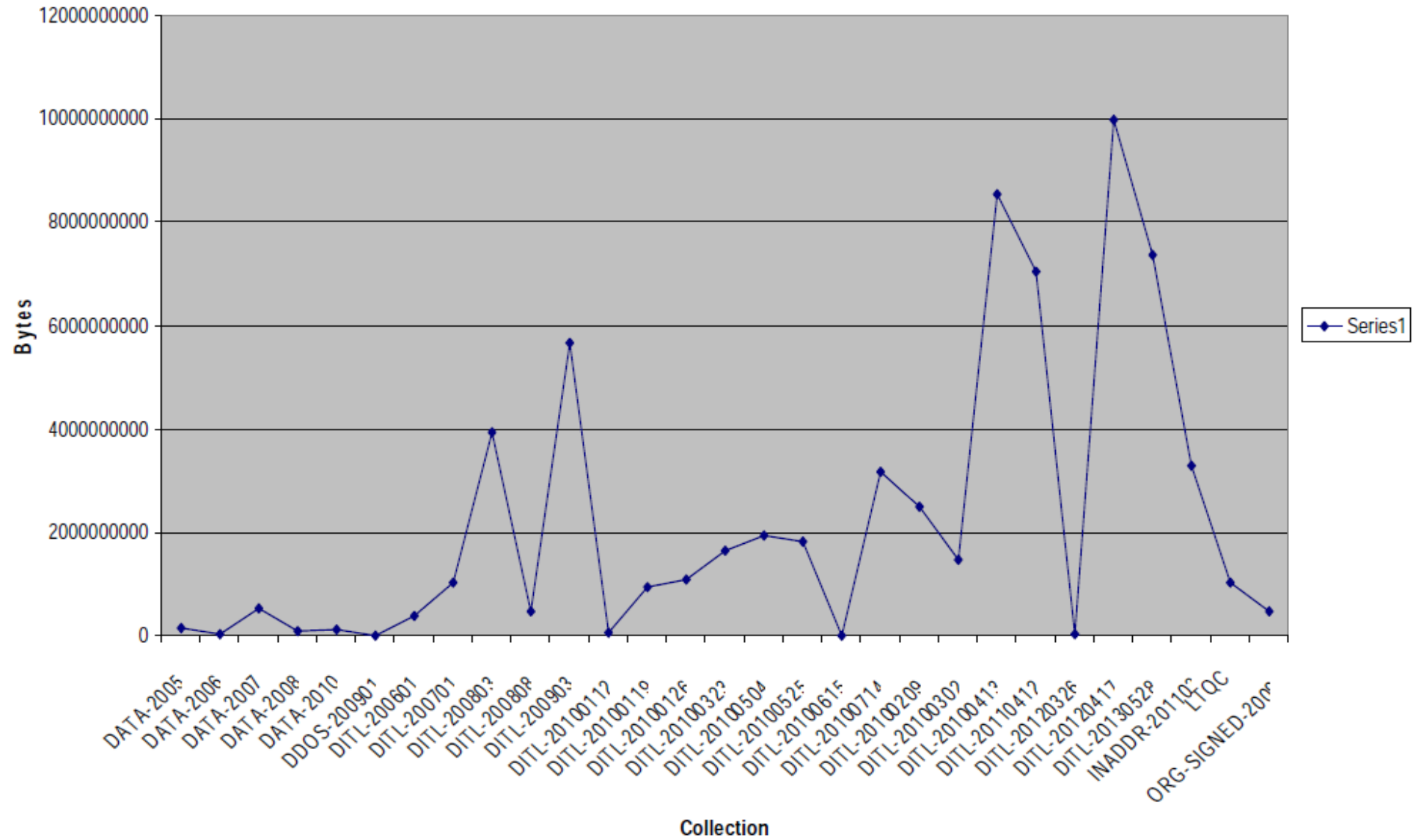


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# DNS-OARC Data Collection Sizes



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# Dataset Summary

- 76TB used out of 84TB capacity
- Additional interim capacity being brought on-line for DITL 2014 from donated X4500 hardware
- Procuring 80TB *StoragePod* for future requirements

Year	Gb
DITL-200601	372
DITL-200701	989
DITL-200808	452
DITL-20100112	46
DITL-20100119	898
DITL-20100126	1031
DITL-20100323	1562
DITL-20100504	1454
DITL-20100525	2313
DITL-20100615	1
DITL-20100714	3011
DITL-20120326	23



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# OARC Compute Resources

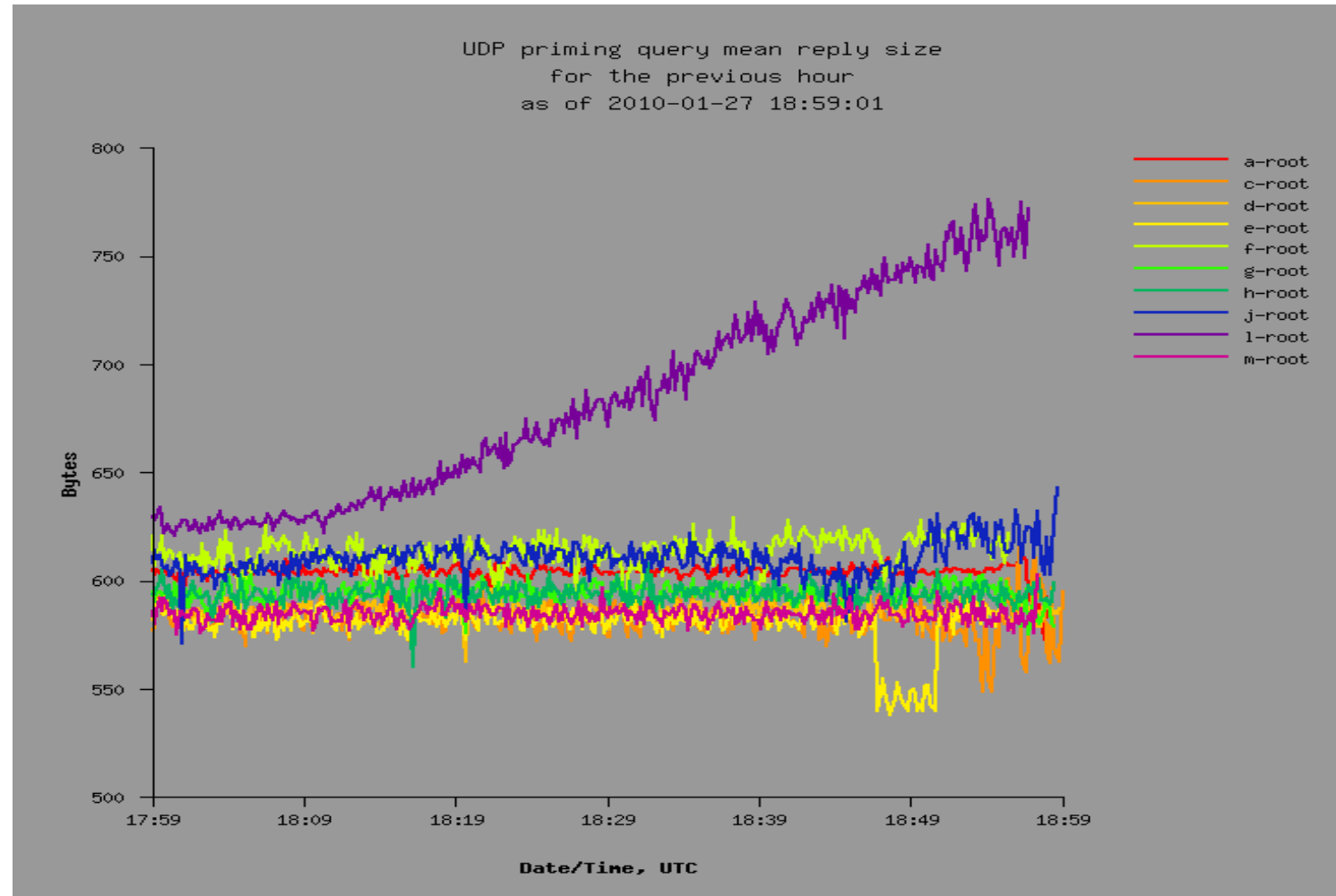
- Storage:
  - *fs2, fs3, fs4*: IXsystems SATA-based FreeBSD 9.2
- Analysis:
  - *an1, an3*: 64-bit FreeBSD 9.2, using Dell R810 with 144GB of RAM, with 4 X7560 @ 2.27GHz CPUs
  - *an2, an4*: 64-bit Debian Linux 7.1, using Dell R820 with 64GB of RAM, with 2 E5-4603 0 @ 2.00GHz CPUs
- Storage servers export data to analysis servers via NFS
- Member access to analysis servers via ssh



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# DITL in Action



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# OARC and Name Collisions

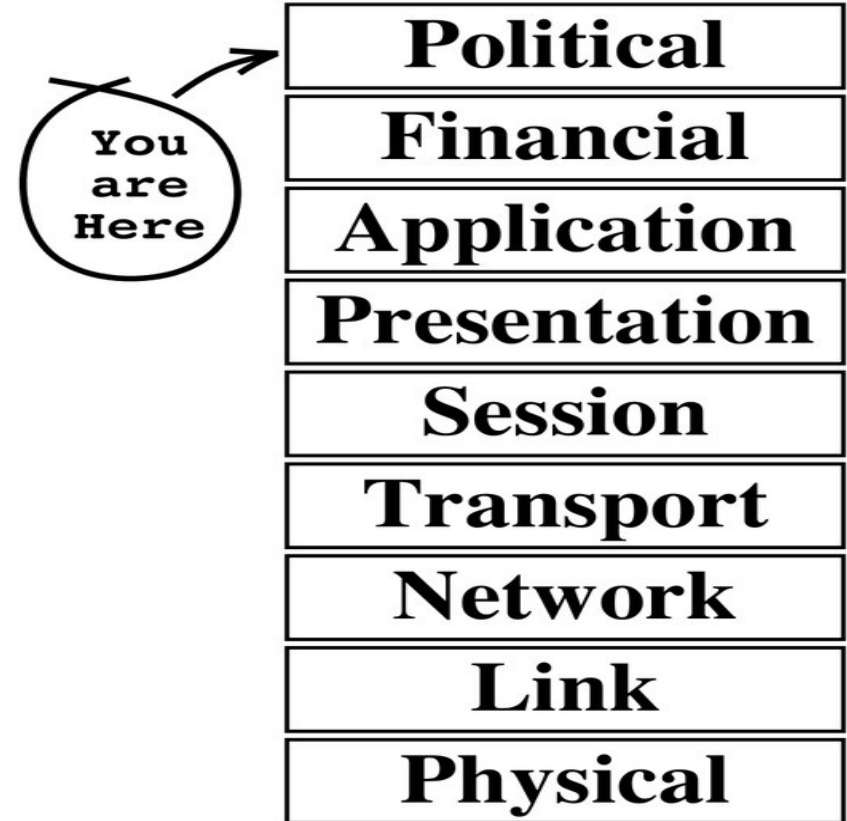


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# Evidence-Informed Policy

- Decisions to make changes at the top level of the DNS are ultimately commercial/political ones
- Many vested high-stakes commercial interests involved..
- ..but cannot be made in an operational vacuum
- Could there be adverse security/stability impacts ?
- How best to inform policy makers with hard evidence ?



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# DNS Security *Collides* with Policy

- ICANN approving new TLDs on a competitive bidding process
- Various domains such as “.corp”, “.home” applied for in process
- Unfortunately various entities already make non-standard use of “pseudo TLDs” in their **internal** networks
  - some of these are same as new TLDs being applied for
  - worse, some of these have “internal-use-only” SSL website-security certificates already issued for them !
- Could creating these domains on the wider Internet “collide” with their internal usage ?
- Worse, could it lead to website impersonation and hi-jacking ??



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# OARC's Data-set to the Rescue

- Rather than debate endlessly, it's been possible to analyze data already gathered to decide the extent of queries for potential new TLDs on the live Internet
- OARC's DITL dataset from 2006-2013 available for this:
  - not the perfect resource for such research, but much better than nothing at all
  - triggered donations of some extra CPU-power 😊
- <https://www.dns-oarc.net/node/332>



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# ICANN Collisions DITL Query Analysis

- <https://www.icann.org/en/about/staff/security/ssr/name-collision-02aug13-en.pdf>

Rank	Proposed TLD	As TLD	As SLD	At all other levels	Total
1	home	595,024	24,117	3,723	622,865
2	corp	122,794	31,084	39,985	193,864
3	site	13,013	212	412	13,637
4	global	10,838	8,895	13,838	33,571

- Summary:
  - **Not safe** to delegate “.corp” or “.home” new TLDs
  - Mostly safe to delegate 80% of rest
  - 20% need further study, safeguards
- <http://www.icann.org/en/news/public-comment/name-collision-26feb14-en.htm>
  - Other speakers better qualified to say more on this than me...



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# Some OARC Take-Homes

- There is no substitute for gathering live data from the Internet
- The DNS is pervasive enough its use for data gathering can make it part of the solution, not just the problem
- Operators have live data network data, but don't always have the skills/insight/time to analyze it
- Researchers can greatly help understand this data, but don't always find it easy to obtain, or to interpret operational impact
- Analysis of data is a highly valuable input to informed policy-making and infrastructure protection
- Working together we can answer important protocol, implementation, security and policy questions



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# Workshops and Meetings

- These are:
  - Twice a year, of 2 days duration
  - Combined with other Internet meetings (RIPE, IETF, NANOG, ICANN)
  - Some member-only content, mostly open to all
  - Sponsor-funded
- May 10-11 2014: Warsaw, PL (*RIPE68*)
- Oct 12-13 2014: Los Angeles, US (*ICANN51*)
- May 16-17 2015: Amsterdam, NL (*RIPE70, SIDN*)
- Oct 03-04 2015: Montreal, CA (*NANOG65*)



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# Further Information

- Web: <https://www.dns-oarc.net>
- Workshops: <https://indico.dns-oarc.net>
- E-mail: [admin@dns-oarc.net](mailto:admin@dns-oarc.net)
- Social: <https://www.linkedin.com/groups/DNSOARC-3193714>
- IM: <xmpp:keith@jabber.dns-oarc.net>
- Phone: +1 650 423 1344 (EST)



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