SUSTAINABILITY

Hackathon RIPE 86
20-21 May 2023
@Ahoy Rotterdam

Project/Team name:

- Green DNS
- Greenish DNS
- Greener DNS
- NXDOMAIN
- NODATA
- NXTEAM
- NXTEAMNAME
- Green Machine
- Sustainable DNS
- Future DNS
- DNS cleanup
- Sustainabiliteam

Links / Existing Documents:

Abstract and index
https://pad.chalec.org/p/a129ripe-86-hackathonpaper
Hackhathon presentation:
https://pad.chalec.org/p/a129ripe-86-hackathonnotes23894

References:

- Green Networking Metrics https://datatracker.ietf.org/doc/html/draft-cx-green-metrics (references on networking/routing impact)
  - ***using the terms "green", "sustainable", and "carbon footprint reduction" interchangeably***
- Green Qubits: https://github.com/Lizaterdag/QIH-2022/blob/main/Qubits_for_the_Kids.pdf
  - definition: "***The sustainability of a system is influenced by : the ecological footprint and social impacts like social and environmental justice"***
- Repository https://github.com/becha42/ClimateJustice

- Climate cost of AI https://labs.ripe.net/author/wim-vanderbauwhede/the-climate-cost-of-the-ai-revolution/
- Carbon.txt https://github.com/thegreenwebfoundation/carbon.txt
- Theoritical number of packets for a DNS query (in French): https://gitlab.rd.nic.fr/jcsa/2022/-/blob/main/presentation.pdf
- Measurement and Modeling the Power Consumption of Router Interface: https://sci-hub.st/https://doi.org/10.1109/ICACT.2014.6779082
- Website carbon calculator: https://www.websitecarbon.com/ (methodology: https://sustainablewebdesign.org/calculating-digital-emissions/)
- Energy-aware DNS server allocating: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8191410/
- Reducing DNS lookups: https://10web.io/blog/reduce-dns-lookups/ - not just less traffic, it's also favorable for the operator for better performance and SEO

- TELCOS
- **A Telco Sustainability Reality Check: December 2022**
  - https://go.abiresearch.com/lp-telco-sustainability-reality-check
  - human-centered decision-making will continue to evaluate the challenges and opportunities of addressing the climate crisis, working together with technology to drive reductions of global carbon emissions, water use, and waste.
- **“Ranking of ten leading telecom operators for sustainability.”**
  - Sustainability Index by ABI Research (Q1 2022)
  - https://www.abiresearch.com/press/deutsche-telekom-telefonica-vodafone-and-kpn-are-leaders-in-abi-researchs-telco-operators-sustainability-index/
- **“How five of the world’s biggest telecom operators deal with their greenhouse gas emissions” (February 2023)**
  - * AT&T, Verizon, NTT, China Mobile and Deutsche Telekom.
  - https://telecoms.com/opinion/how-five-of-the-worlds-biggest-operators-deal-with-their-greenhouse-gas-emissions/
- **Carbon reporting regulations are rising. Small businesses need to keep up.**
  - https://app.wedonthavetime.org/posts/5fa28ad9-11b7-47e9-9926-913ff1f915ab

REGULATIONS

- **EU Commission proposed to cut greenhouse gas (GHG) emissions by at least 55% by 2030 … & becoming climate neutral by 2050**
  - https://climate.ec.europa.eu/eu-action/european-green-deal/2030-climate-target-plan_en

- **ITU in 2020: “reduce ICT GHG emissions by 45% by 2030”**
  - https://www.itu.int/en/mediacentre/Pages/PR04-2020-ICT-industry-to-reduce-greenhouse-gas-emissions-by-45-percent-by-2030.aspx & ***https://www.itu.int/rec/T-REC-L/en***
- **International Energy Agency: “align ICT with climate-based targets”**
  - https://www.iea.org/reports/data-centres-and-data-transmission-networks
- **European Green Digital Coalition: “net-zero no later than 2040”**
  - https://digital-strategy.ec.europa.eu/en/policies/european-green-digital-coalition

Problems:

- https://en.wikipedia.org/wiki/Jevons_paradox

Sustainability definition:

- 3 components: environmental, social, economical
- In 1987, the United Nations Brundtland Commission defined sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their own needs.” (https://www.un.org/en/academic-impact/sustainability)

Caching: 90-95% queries in cache (@joe)
consider trade-offs

How can we reduce DNS queries by 10% in 1 year?
users: ad blocker
DNS ops: ??
registrants: longer TTL
How does it interact with privacy and security (DNSSEC, QNAME minimisation, DoT, DoH, DoQ...)

Possible outcomes / results

- Coming up with Recommendations (bold or modest) for operators, developers, customers of operators (sales) , end-users
  - radical: replace DNS with something more sustainable
  - św developers / sustainability by design
  - hw manufacturers (laptops & phones)

    - OS makers! (google, apple, microsoft, IBM)
    - root-name-server operators!! (ncc, netnod, + dns-oarc)
        - Kurt Kaiser said: "80% of rootnameserver queries is rubbish, and it could be cut out" (get back to him...)
    -
- Contributing to existing documents (e.g. adding DNS info to "green metrics" draft)
- Academic Paper
- Contribute to BCOP (Best Current Operational Practices) documents!
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Where to publish the paper

- https://events.ccc.de/category/call-for-papers/

Wrap-up / Stand-up (day 1):
Publication of a paper to inform about sustainability regarding DNS, raising awareness, spreading the word.
Needs: collection of data, visualisation (memes? being funny and memorable).
Tools: communication, an open mind, sharing knowledge and receiving input, curiosity and creativity are our tools to tackle this question.
Necessary tools for this are for example: examine prior work ; tools to measure the number of redundant and unnecessary DNS queries, their size, origin... that could be eliminated ; tools to classify the origin of the query to aid in the integration of our data
Examination of current practices and their impact in DNS traffic, getting together to talk about collected data,on this and develop best practices together which should periodically be reexamined.
Define "unnecessary DNS traffic" and it's subjectivity. Tools to detect it should have ways to define what it is for the current user.

Cooperation with other teams:
- dnssec <-> what is the difference between the traffic with dissect or without
- "team dns today" what is the difference between the traffic with ADDBLOCKER or without
    - James Rice said something what they came up with could be useful to "us" (SustainabiliTeam)
- team "Dapper" <->
- team's "Amazing" (whatever) result was REDUCING the size of measurement results data
    - by how much? what's the benefit?
    - or -- who can use this, to increase the impact??

How can we make domain name system sustainability?

Let's analyse Today DNS Queries on Internet
- By 13 Root servers
- By protocols
- DNS Softwares

https://www.icann.org/en/system/files/files/rssac-002-20nov14-en.pdf
https://root-servers.org/rssac002/

impact of dns query?
- more consumption of energy ---->

factors that grow up DNS Queries?
- third party tools : advertising
- dns measurement
- security implementation : new protocols = more packets
- security issues : ddos

dns measurement & sustainability : impact
- more data >>> +storage
- high available technical environnement

Somes actions to reduce dns query :
- reduce dns lookup
- ad-blockers
- implement dns resolverless
- use cache

Considerations of sustainability on DNS :

- Environnemental :
    - reduce DNS Queries carbon footprint

- Social :
    -

- Economie :