

EcoDNS –

RIPE Green Hackathon @ Amsterdam

Décembre 2024



Why study DNS?

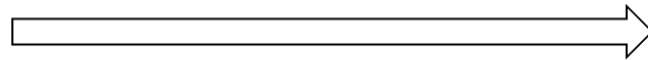


- As known to us - No prior studies focussing on measuring the energy impact of DNS infrastructure & protocol
- Why such a study is getting important now?
 - Encrypted DNS traffic \approx 23%
 - Cost of transition from UDP to encrypted communication does increase energy consumption²
 - Corporate Social Responsibility – We would like to improve our understanding of the environmental impact of our “core business” technology - the DNS

Objective



Measure



Reduce

Before the Hackathon



- **Knew about different tools to study energy consumption**
- **Team of 3 people**
- **Infrastructure**
 - **Generate different DNS traffic types**
 - **DNS resolver**
 - **Using the wattmeter to collect the energy consumption results in graph style**

Team



During the Hackathon

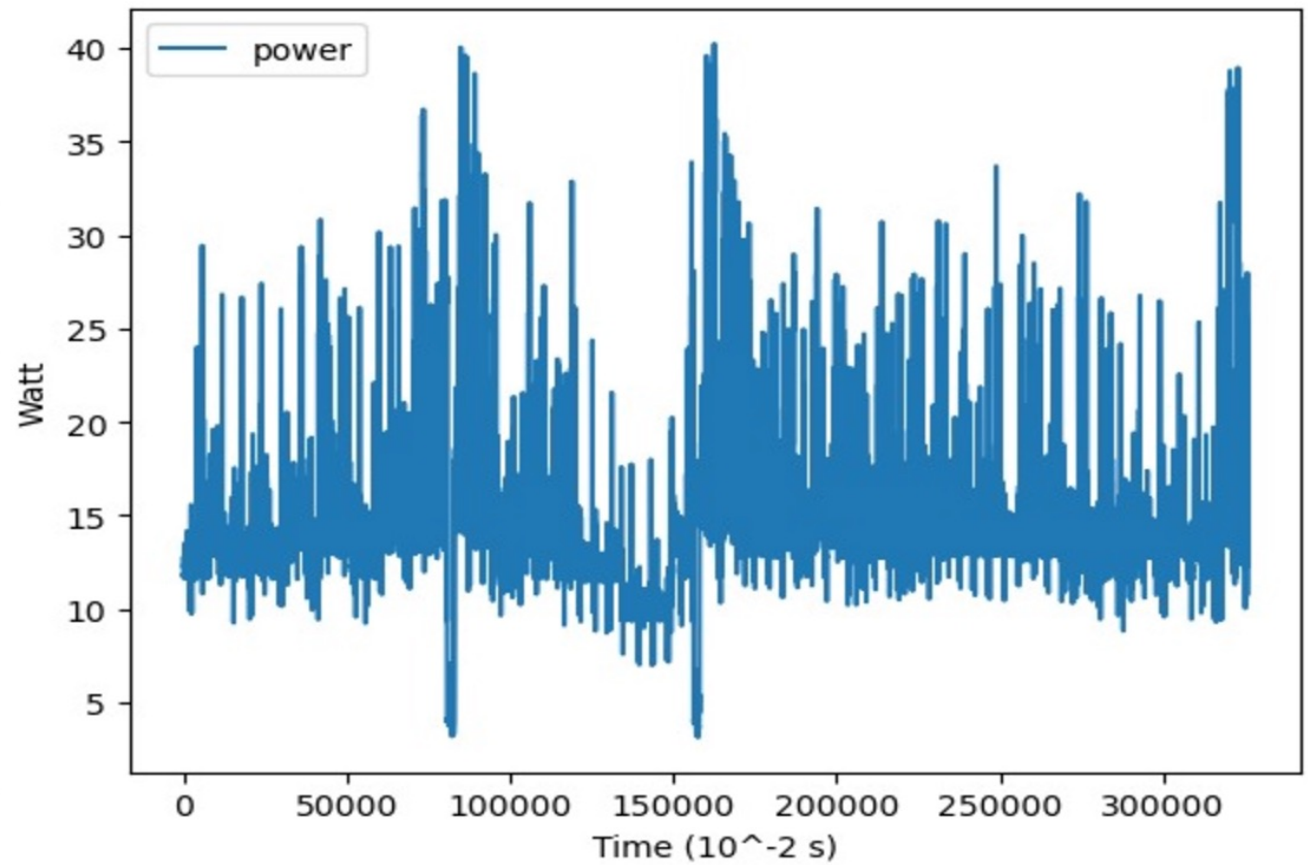


- **Team of 6 with everyone contributing**
- **Infrastructure**
 - **Implemented a Network infrastructure with different VPN connections to set up the test network**
 - **Debugged different Open-source tools (Scaphandre, Ecofloc, Nethogs)**
 - **Documented in Github**
 - **Created an Ansible playbook for easy installation of the test infrastructure for research purpose**

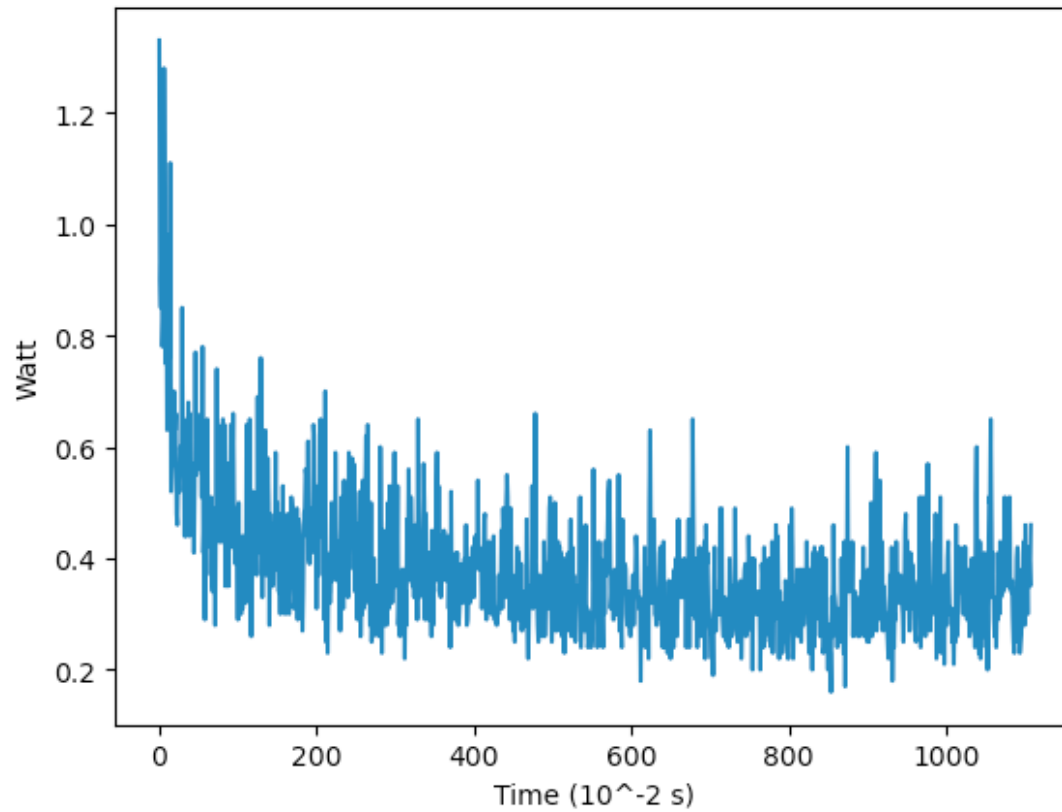
Yoctopuce (Wattmeter)



Total power consumption of the laptop
In watts



Ecofloc (Per HW energy consumption - CPU)

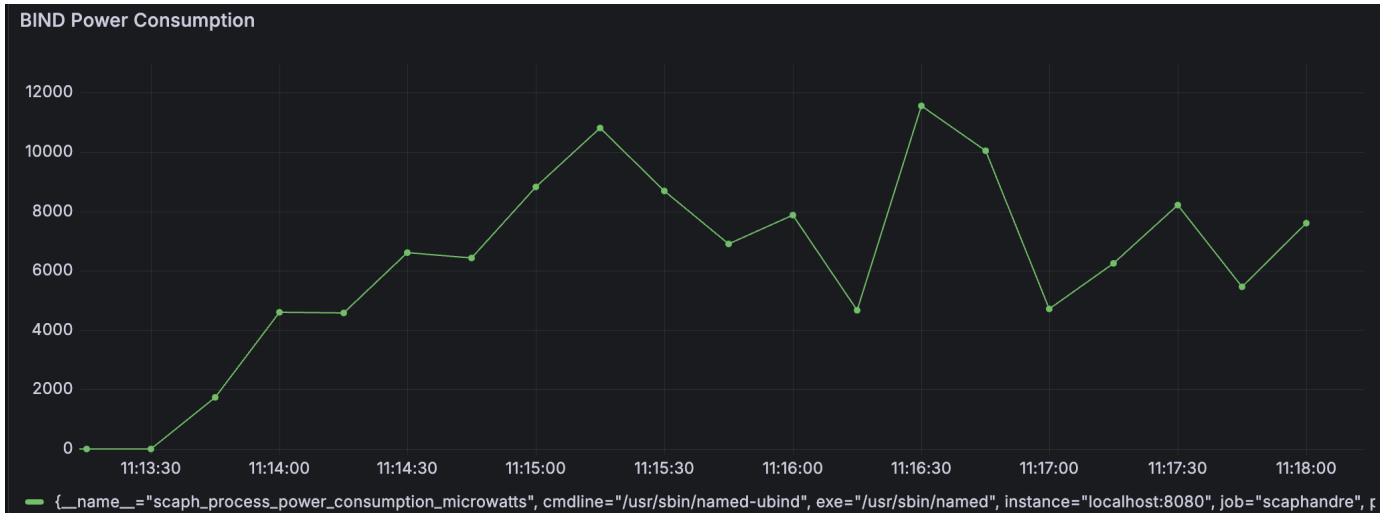


Scaphandre (Per process energy consumption)

Total power consumption of a single process (BIND) with normal DNS queries (UDP)

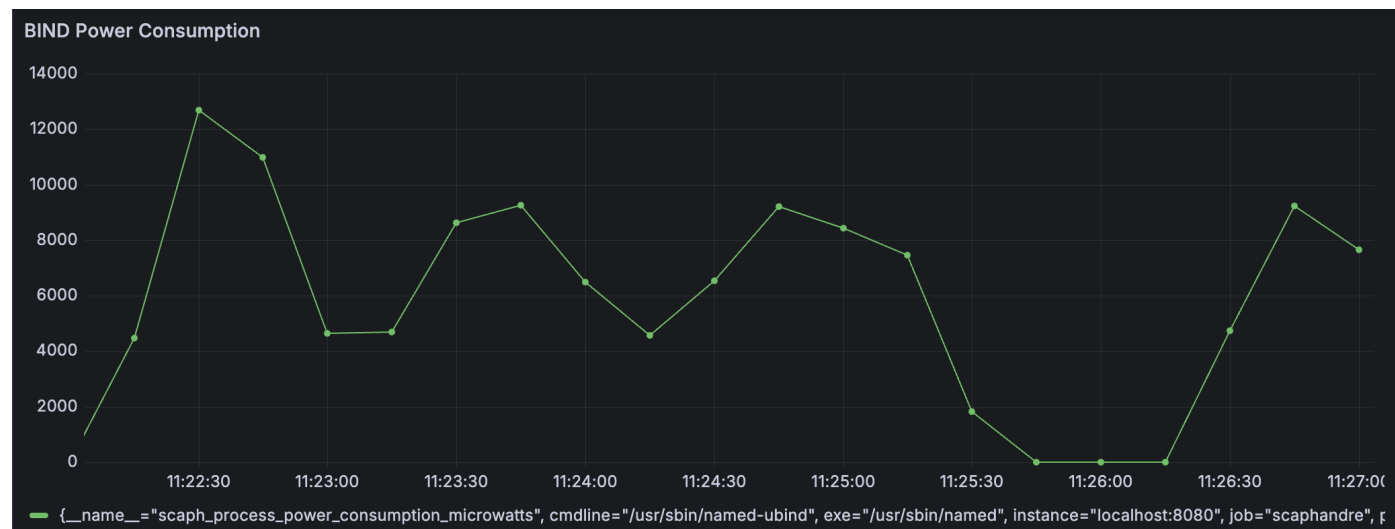


CPU power consumption using 'dig'

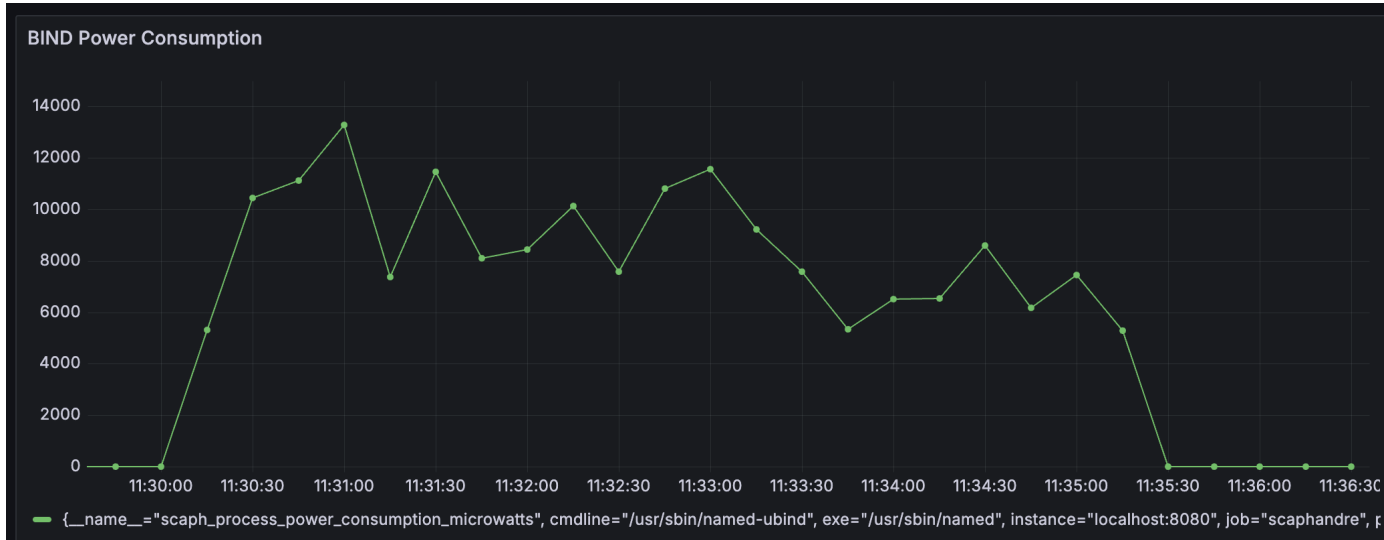


Querying different domains for 5 minutes

Querying afnic.fr for 5 minutes

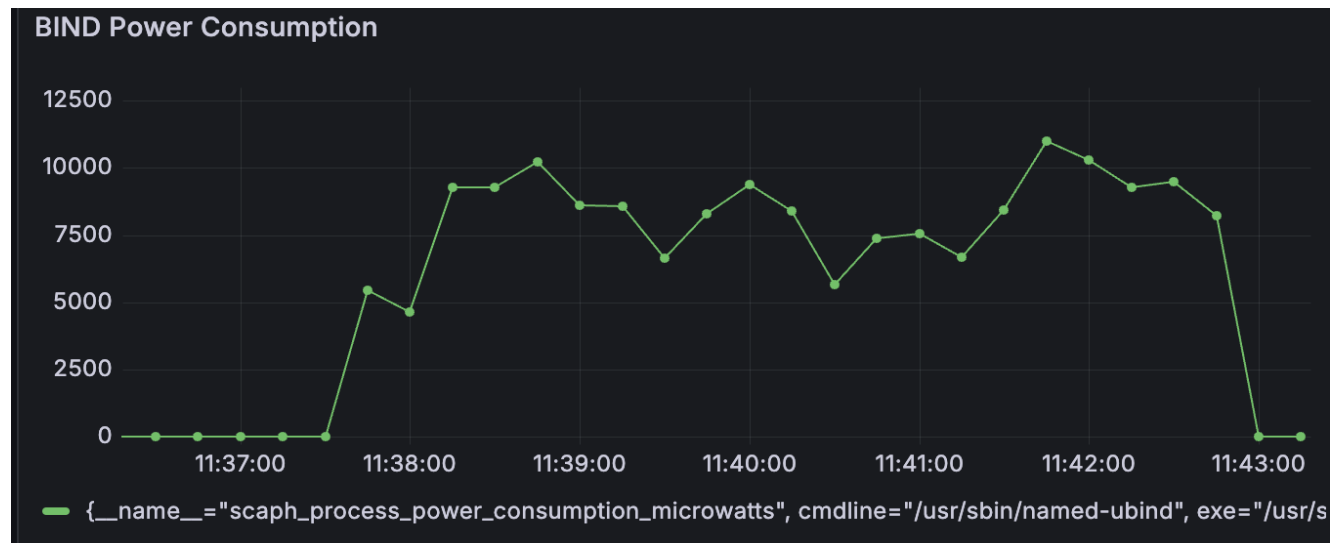


CPU power consumption using 'dog'



Querying different domains for 5 minutes

Querying afnic.fr for 5 minutes



Nethogs (per process bandwidth consumption)



- Nethogs dumps data to a file.
- Nethogs-parser is run every second to parse the file out to a csv formatted file.
- Csv-Prometheus-exporter reads the csv file every second and exports the data to Prometheus.
- Prometheus feeds the data to Grafana, the visual analysis tool.

Ansible playbook



```
TASK [bind9 : Install bind9] *****
changed: [resolver_localhost]

TASK [bind9 : Start bind9] *****
changed: [resolver_localhost]

TASK [gcc : Install gcc] *****
changed: [resolver_localhost]

TASK [make : Install make] *****
changed: [resolver_localhost]

TASK [venv : install venv] *****
changed: [resolver_localhost]

TASK [ecofloc : clone ecofloc] *****
changed: [resolver_localhost]

TASK [ecofloc : install msr-tools] *****
changed: [resolver_localhost]

TASK [ecofloc : Install perf] *****
changed: [resolver_localhost]

TASK [ecofloc : Install build-essential] *****
changed: [resolver_localhost]

TASK [ecofloc : install ecofloc] *****
changed: [resolver_localhost]

TASK [nethogs : Install nethogs] *****
changed: [resolver_localhost]

TASK [nethogs : Install goLang] *****
changed: [resolver_localhost]

TASK [nethogs : Install nethogs parser] *****
changed: [resolver_localhost]

TASK [nethogs : Build nethogs-parser] *****
changed: [resolver_localhost]

TASK [nethogs : Copy nethogs-parser.sh] *****
changed: [resolver_localhost]

TASK [nethogs : run nethogs] *****
changed: [resolver_localhost]

TASK [nethogs : Run nethogs-parser.sh] *****
changed: [resolver_localhost]
```

Dissemination (Creative commons, Open Source)



- Documentation: <https://github.com/AFNIC/EcoDNS/tree/main>
- Code: <https://github.com/AFNIC/EcoDNS/tree/main/Src>