Improving Passive DNS collection

with D4 Project

Team CIRCL
https://www.d4-project.org/

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D4 project

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Problem statement

- CIRCL (and other CSIRTs) have their own passive DNS[1] collection mechanisms
- Current **collection models** are affected with DoH[2] and centralised DNS services
- DNS answers collection is a tedious process
- **Sharing Passive DNS stream** between organisation is challenging due to privacy

[1] https://www.circl.lu/services/passive-dns/

[2] DNS over HTTPS

Potential Strategy

- Improve **Passive DNS collection diversity** by being closer to the source and limit impact of DoH (e.g. at the OS resolver level)
- Increasing diversity and **mixing models** before sharing/storing Passive DNS records
- Simplify process and tools to install for **Passive DNS collection by relying on D4 sensors** instead of custom mechanisms
- Provide a distributed infrastructure for mixing streams and filtering out the sharing to the validated partners

First release

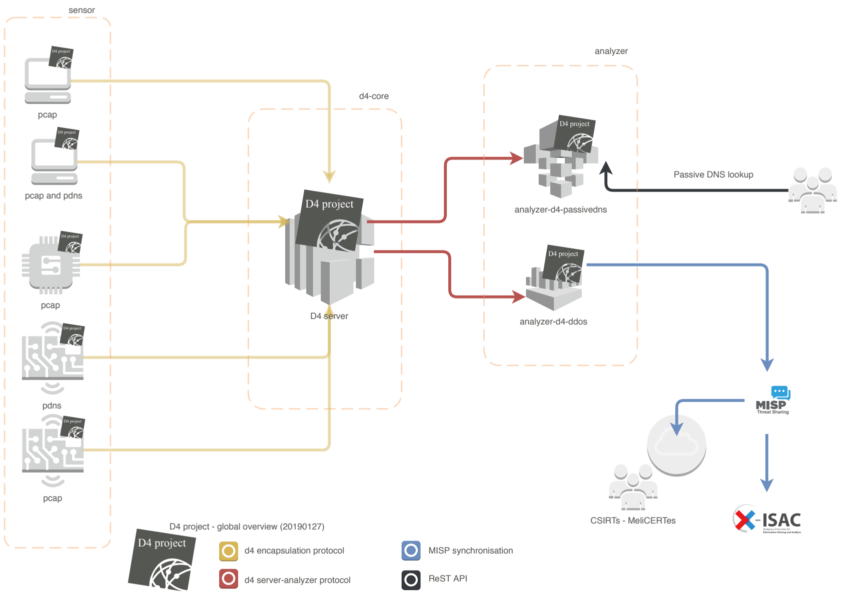
- analyzer-d4-passivedns[3] is an analyzer for a D4 network sensor. The analyser can process data produced by D4 sensors (in passivedns CSV format[4])
- Ingest these into a **Passive DNS server** which can be queried later to search for the Passive DNS records
- The lookup server (using on redis-compatible backend) is a Passive DNS REST server compliant to the Common Output Format[5]

[3] `https://github.com/D4-project/analyzer-d4-passivedns`

[4] `https://github.com/gamelinux/passivedns`

[5] `https://tools.ietf.org/html/draft-dulaunoy-dnsop-passive-dns-cof-04`

D4 Overview


sensor
D4 project
pcap
D4 project
pcap and pdns
D4 project
pcap
D4 project
pdns
D4 project
pcap
d4-core
D4 project
D4 server
analyzer
D4 project
analyzer-d4-passivedns
Passive DNS lookup
D4 project
analyzer-d4-ddos
MISP
Threat Sharing
CSIRTs - MeliCERTes
X-ISAC
D4 project - global overview (20190127)
D4 project
d4 encapsulation protocol
d4 server-analyzer protocol
MISP synchronisation
ReST API

Common Output Format

- **Consistent naming of fields across Passive DNS software** based on the most common Passive DNS implementations
- Minimal set of fields to be supported
- Minimal set of optional fields to be supported
- Way to add "additional" fields via a simple registry mechanism (IANA-like)
- Simple and easily parsable format
- A gentle reminder regarding privacy aspects of Passive DNS

Sample output www.terena.org

```
{"count": 868, "time_first": 1298398002, "rrtype": "A", "rrname": "www.terena.org", "rdata": "192.87.30.6", "time_last": 1383124252}
{"count": 89, "time_first": 1383729690, "rrtype": "CNAME", "rrname": "www.terena.org", "rdata": "godzilla.terena.org", "time_last": 1391517643}
{"count": 110, "time_first": 1298398002, "rrtype": "AAAA", "rrname": "www.terena.org", "rdata": "2001:610:148:dead::6", "time_last": 136670845}
```

Mandatory fields

- **rrname** : name of the queried resource records
  - JSON String
- **rrtype** : resource record type
  - JSON String (interpreted type of resource type if known)
- **rdata** : resource records of the query(ied) resource(s)
  - JSON String or an array of string if more than one unique triple
- **time_first** : first time that the resource record triple (rrname, rrtype, rdata) was seen
- **time_last** : last time that the resource record triple (rrname, rrtype, rdata) was seen
  - JSON Number (epoch value) UTC TZ

Optional fields

- **count** : how many authoritative DNS answers were received by the Passive DNS collector
  - JSON Number
- **bailiwick** : closest enclosing zone delegated to a nameserver served in the zone of the resource records
  - JSON String

Additionals fields

- **sensor_id** : Passive DNS sensor information
    - JSON String
- **zone_time_first** : specific first/last time seen when imported from a master file
- **zone_time_last**
    - JSON Number
- Additional fields can be requested via `https://github.com/adulau/pdns-qof/wiki/Additional-Fields`

Future

- **Mixing models for passive DNS stream** (for privacy) in next version of D4 core server
- Interconnecting private D4 sensor networks with other D4 sensor networks (sharing to partners filtered stream)
- Previewing dataset collected in D4 sensor network and providing **open data stream** (if contributor agrees to share under specific conditions)

Get in touch if you want to join/support the project, host a passive DNS sensor or contribute

- Collaboration can include research partnership, sharing of collected streams or improving the software.
- Contact: info@circl.lu
- https://github.com/D4-Project - https://twitter.com/d4_project