Creating a

Network Reputation Database

"A list of bad actors on the internet & everything we know about them."

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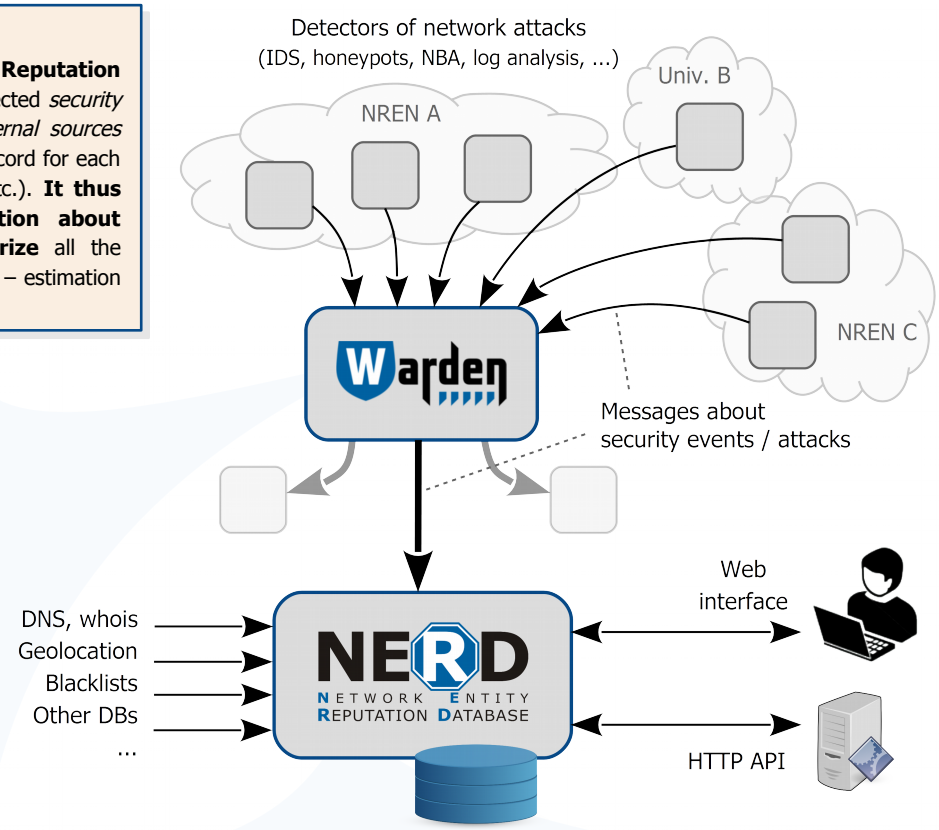
Summary

We are working on a system called **"Network Entity Reputation Database" (NERD)**. It receives messages about detected *security events*, combines them with data from various *external sources* (e.g. blacklists), and stores all that information as a record for each reported *entity* (i.e. IP address, network, domain, etc.). **It thus keeps all available security-related information about network entities** at one place. It also **summarize** all the information about an entity into its ***reputation score*** – estimation of the level of threat the entity poses.



Warden – alert sharing

- Detectors of malicious traffic deployed in different networks (senders) report their results to the central hub (Warden server).
- The hub distributes the messages to all subscribed receviers.
- Reciprocity – anyone sending data to Warden is allowed to receive all data sent by others.
- Common data format – IDEA [1]
- Developed and operated by CESNET.
  - Currently >20 senders
  - 1.5 million alerts per day
- We are looking for more participants ...
- **Join the sharing community now!**
  - Share data from your detectors
  - Get data from all others
  - Get access to NERD

Reputation database (NERD)

- Keeps all known security-related information about network entities – IP addresses, networks, domains and others.
- Main data source – **alerts from Warden** (or other similar systems, e.g. MISP [2])
  - Information about all detected malicious activities related to an entity.
- Data from various **other sources** added
  - Blacklists, other databases, geolocation, ... (see left)
- Summary of all the information – ***reputation score***.
  - Ranking of entites by level of threat they pose.
  - Formally – probability of future attacks combined with their expected severity. (Predicted by machine learning.)

An IP address record contains:

- Time added, last updated
- All reported **events**
- Hostname (rev. DNS)
- Country, city
- ASN, abuse contact
- List of blacklists the address is present on
- Amplifier (open DNS, NTP, ...)
- TOR exit node
- VirusTotal
- Shodan info (e.g. open ports)
- Static / dynamic address (guessed)
- Device type (guessed)
- *... many other information ...*

(some with history and/or probability)

- **Reputation score** (summary of all above)
- Manually added notes

Access:

- Via a **web interface** or **HTTP-based API**.
- **CSIRT teams** and **security researchers** can request access to NERD.
- Anyone sending data to **Warden** gets full access automatically → start sharing!
- Limited access for public

Use-cases:

- "NERD, what do you know about IP x.y.z.a?"
  - "It is a known spammer."
  - "It often tries to break into SSH by guessing passwords".
  - "It was scanning ports a week ago, no report since then."
  - "It is a botnet C&C server according to blacklist 'X'."
  - "Unknown – probably benign."
- "NERD, give me a list of all malicious IP addresses in my network (x.y.z.0/22)."
- "NERD, give me all open DNS resolvers known to be used in DNS amplification attacks."
- *... and many more ...*

Useful for:

- Incident handling
- Block lists
- Security research
- Statistics, visualization
- ...

More information

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References:

[1] IDEA – Intrusion Detection Extensible Alert. https://idea.cesnet.cz/
[2] MISP – Malware Information Sharing Platform. http://www.misp-project.org/