CONCORDIA

Cyber security cOmpeteNCe fOr Research anD InnovAtion

Developing a DDoS Clearing House for Europe

CONCORDIA Review #4

Feb 17, 2022

Cristian Hesselman (SIDN Labs)

Partners: SIDN, University of Twente, Telecom Italia, FORTH, University of Zurich, SURF, University of Lancaster, CODE, Siemens

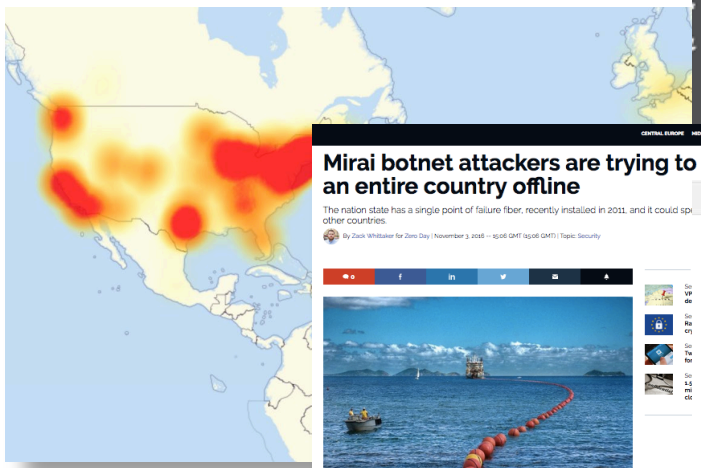
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 830927.

Overview

- CONCORDIA T3.2 progress
- Dutch anti-DDoS Coalition progress
- DDoS Clearing House distributed testbed

High-impact DDoS Examples

Mirai botnet, 2016



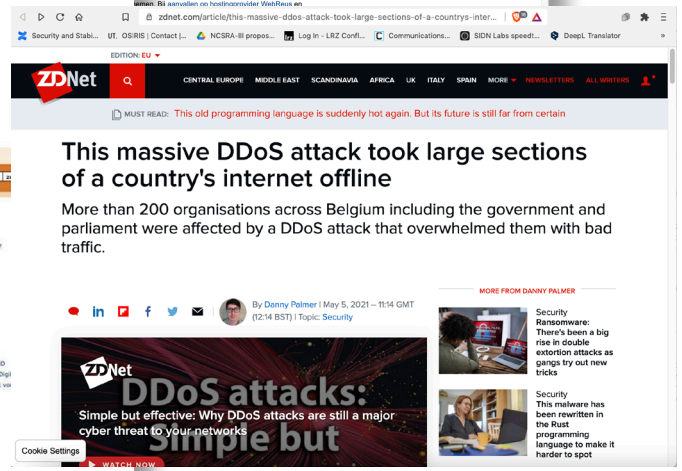
Liberia, 2016

Estonia, 2007

The Netherlands, September 2020

House of Representatives of The Netherlands, Oct 2020

The Netherlands, January 2018



Belgium, May 2021

Problem

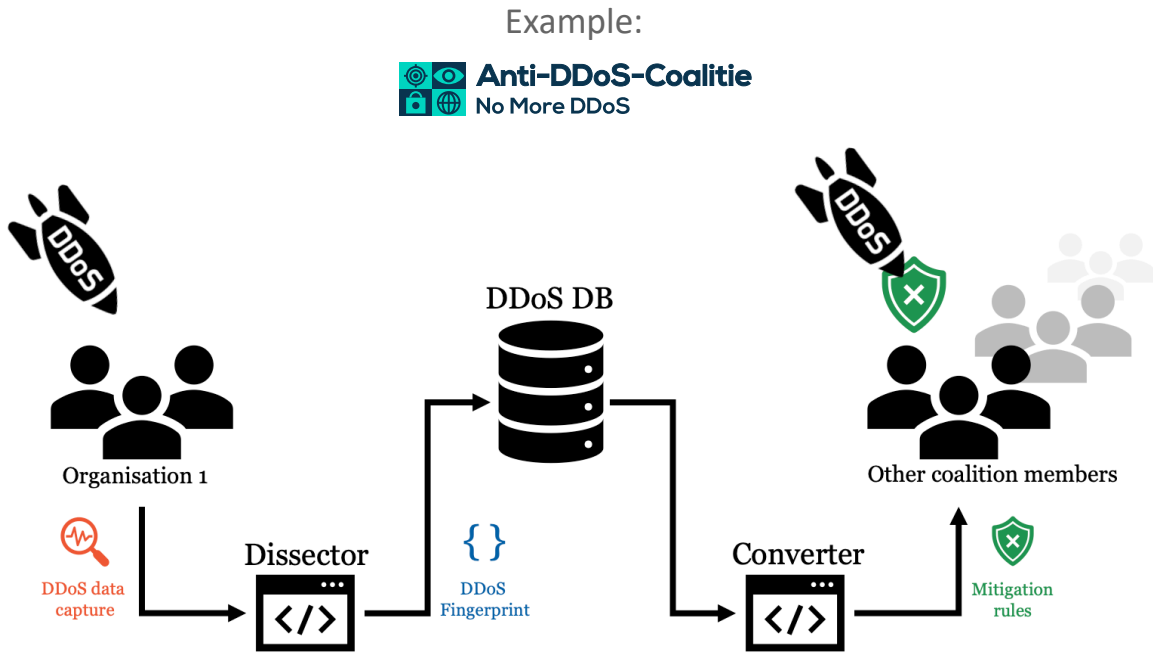
- Mature DDoS mitigation services (e.g., scrubbing), routinely handling large numbers of DDoS attacks

- **BUT no sharing of DDoS data and expertise across organizations**
  - Lowers response time and learning because of limited victim-specific view
  - Reduces innovation of mitigation processes and systems at ecosystem level
  - DDoS data “stuck” in systems of (US-based) DDoS mitigation providers

- Increases probability of societal disruptions, especially through critical (cyberphysical) systems (cf. WP2)

DDoS Clearing House Concept

- Continuous and automatic sharing of **DDoS fingerprints**, buys providers time (proactive)
- **Extends DDoS protection services** that service providers use and does not replace them
- Generic concept: across sectors, Member States, business units, etc.



DDoS Fingerprint Example

fingerprint a38e5062b69fd7b8c5194fa7698398a7


```
{
  attack_vectors: [
    {
      service: "HTTP"
      protocol: "TCP"
      source_port: 80
      fraction_of_attack: 1.0
      destination_ports: "random"
      TCP_flags: {
        ...A....: 0.989
      }
      nr_flows: 5077
      nr_packets: 20308000
      nr_megabytes: 30599
      time_start: "2022-01-23 01:28:00"
      time_end: "2022-01-23 01:29:56"
      duration_seconds: 116
      source_ips: [
        "[redacted]"
        "[redacted]"
        "[redacted]"
        "[redacted]"
      ]
    }
  ]
  target: "Anonymous"
  tags: [
    "TCP"
    "TCP ACK flag attack"
  ]
  key: "a38e5062b69fd7b8c5194fa7698398a7"
  time_start: "2022-01-23 01:28:00"
  duration_seconds: 116
  total_flows: 5077
  total_megabytes: 30599
  total_packets: 20308000
  total_ips: 4
  avg_bps: 2110318068
  avg_pps: 175068
  avg_Bpp: 1506
  submitter: "thijs"
  submit_timestamp: "2022-01-25T13:50:13.818348"
  shareable: False
}
```

Key innovations

- Bridge **multidisciplinary gap** to deployment, more than tech!

- **Opensource design** that we make available through a “cookbook”
  - Technology, legal, organizational, lessons learned based on pilots
  - Enable federations of organizations to set up their own DDoS clearing house
  - Main use case is the Dutch Anti-DDoS Coalition (NL-ADC)

- Operates across **heterogeneous networks** and offers **rich** set of services

https://github.com/ddos-clearing-house

Key achievements M19-M36

- Selected for EC Innovation Radar
- Developed DDoS Clearing House testbed (MS7)
- Further improved Clearing House components
- Completed technical preparations for the pilots
- Refined DDoS clearing house innovations
- 14 presentations, 2 blogs, 1 video blog

Y4 outlook

- Scale up testbed to pilots in the Netherlands and Italy
- Proposal for fingerprint standardization (DOTS WG, IETF)
- Explore whether we can use the testbed as a cyberrange (with T3.3)
- MISP-DDoS-DB interworking
- Closing workshop in Sep/Oct

DDoS Clearing House: use-inspired research

CONCORDIA
Cyber security cOmpeteNCe fOr Research anD InnovAtion

Anti-DDoS-Coalitie
No More DDoS

https://www.nomoreddos.org/en/

- DDoS clearing house **R&D**
- Clearing house distributed testbed
- Technical evaluation through pilots in the Netherlands and Italy
- DDoS clearing house cookbook

- **Using** CONCORDIA's results
- Sharing of operational experience
- Large-scale multi-party DDoS drills
- DDoS clearing house operations
- Operational ADC organization

CONCORDIA is funded by the European Union's Horizon 2020 Research and Innovation program under Grant Agreement No 830927. Project website: https://www.concordia-h2020.eu/

Dutch Anti-DDoS Coalition (NL-ADC)

Betaalvereniging Nederland

SURF

CONCORDIA partner

VNO NCW

SIDN

CONCORDIA partner

NBIP NaWas

UNIVERSITY OF TWENTE.

CONCORDIA partner

Logius
Ministerie van Binnenlandse Zaken en Koninkrijksrelaties

amsix

DeNederlandscheBank
EUROSYSTEEM

vodafone ziggo

POLITIE

Nationaal Cyber Security Centrum
Ministerie van Veiligheid en Justitie

Agentschap Telecom
Ministerie van Economische Zaken en Klimaat

Belastingdienst

NLIX
The Interconnect Exchange

kpn

DINL
Stichting Digitale Infrastructuur Nederland

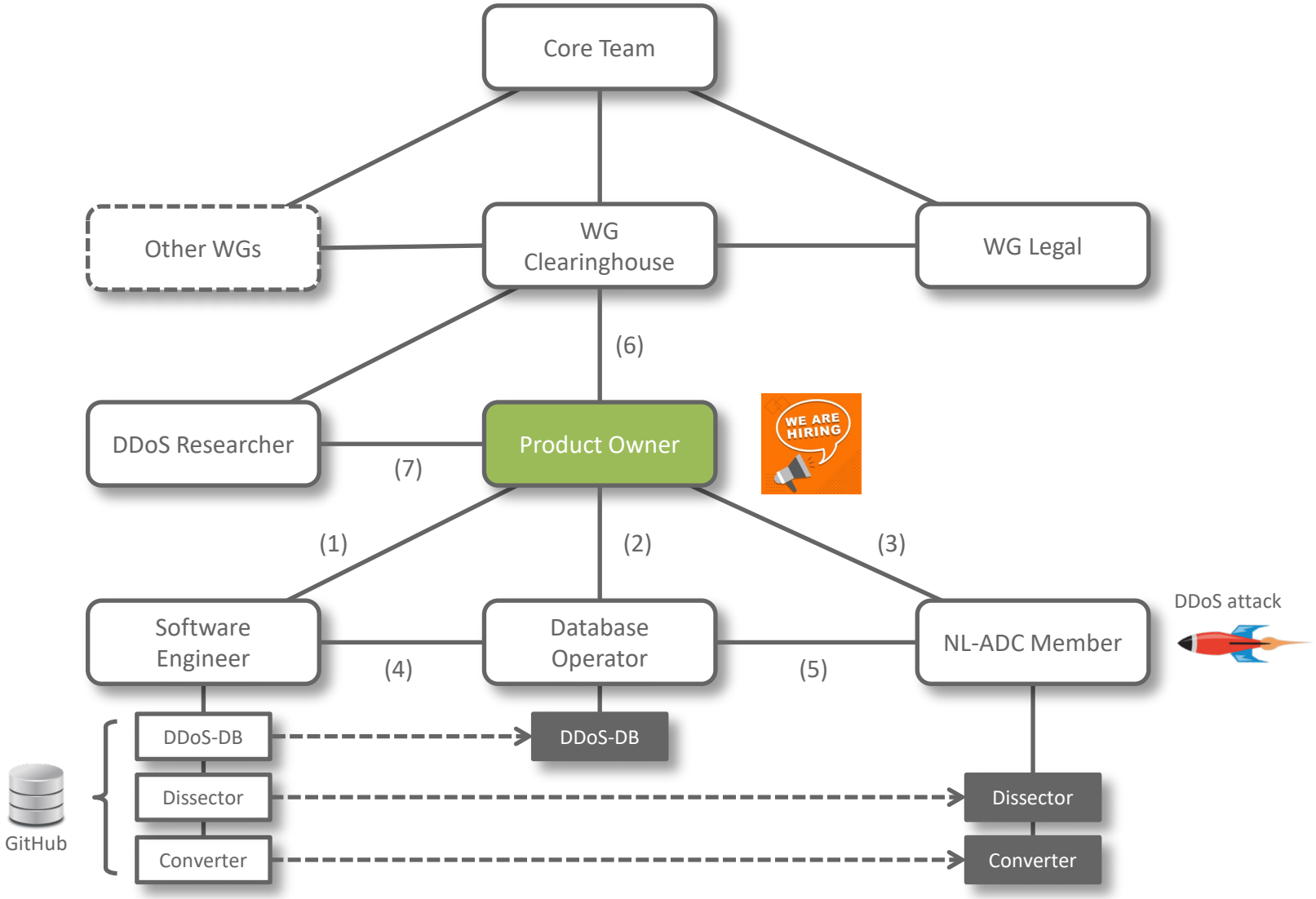
NL-ADC Overview

- Objective: further improve the resilience of Dutch critical services
- Strategies: sharing of DDoS measurements (clearing house), large scale collaborative drills, sharing expertise
- Organization: structure of WGs, clearing house operator and software developer, “core team” governing the initiative

Key achievements M19-M36

- Signed consortium agreement
- 200K from Dutch gov’t to bring clearing house to production
- 114K membership fees per year
- Agreed on path to take DDoS-DB in production for the NL-ADC

DDoS Clearing House's Product Owner



Y4 outlook and beyond CONCORDIA

- Transition to production
  - Hire product owner using Dutch gov't subsidy
  - Move s/w engineering from T3.2 to NL-ADC
- DDoS fingerprint experiment at next NL-ADC DDoS drill
  - A-B testing with different blue teams
  - Collaborate with UT for methodological support
- Further improving clearing house with NBIP, UT, other NL-ADC partners

DDoS Clearing House Testbed

CONCORDIA Review #4

Feb 17, 2022

Thijs van den Hout (SIDN Labs)

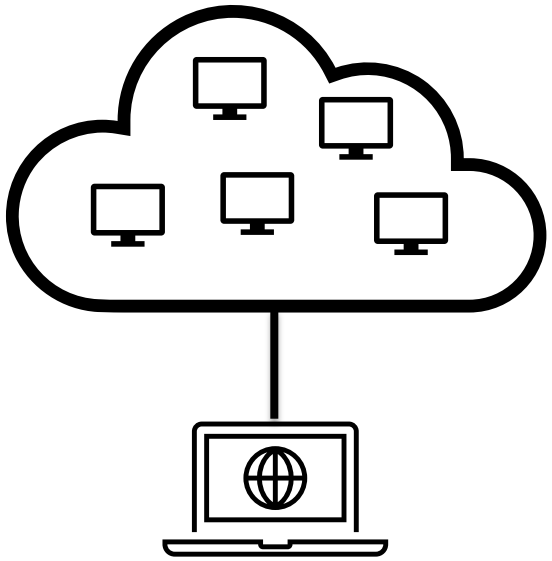
Partners: SIDN, University of Twente, Telecom Italia, FORTH, University of Zurich, SURF, University of Lancaster, CODE

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 830927.

Clearing House testbed

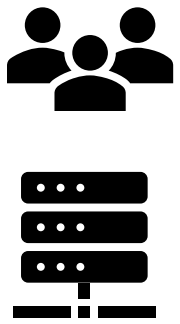
- Goal: pilots in the Netherlands & Italy
- Obstacle: production systems and legal agreements
- Intermediate step: representative environment in which to test the technical developments of the Clearing House

Remote cloud-hosted Traffic simulator



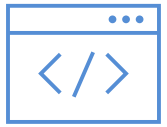
Coalition

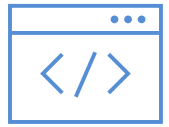
Member 1



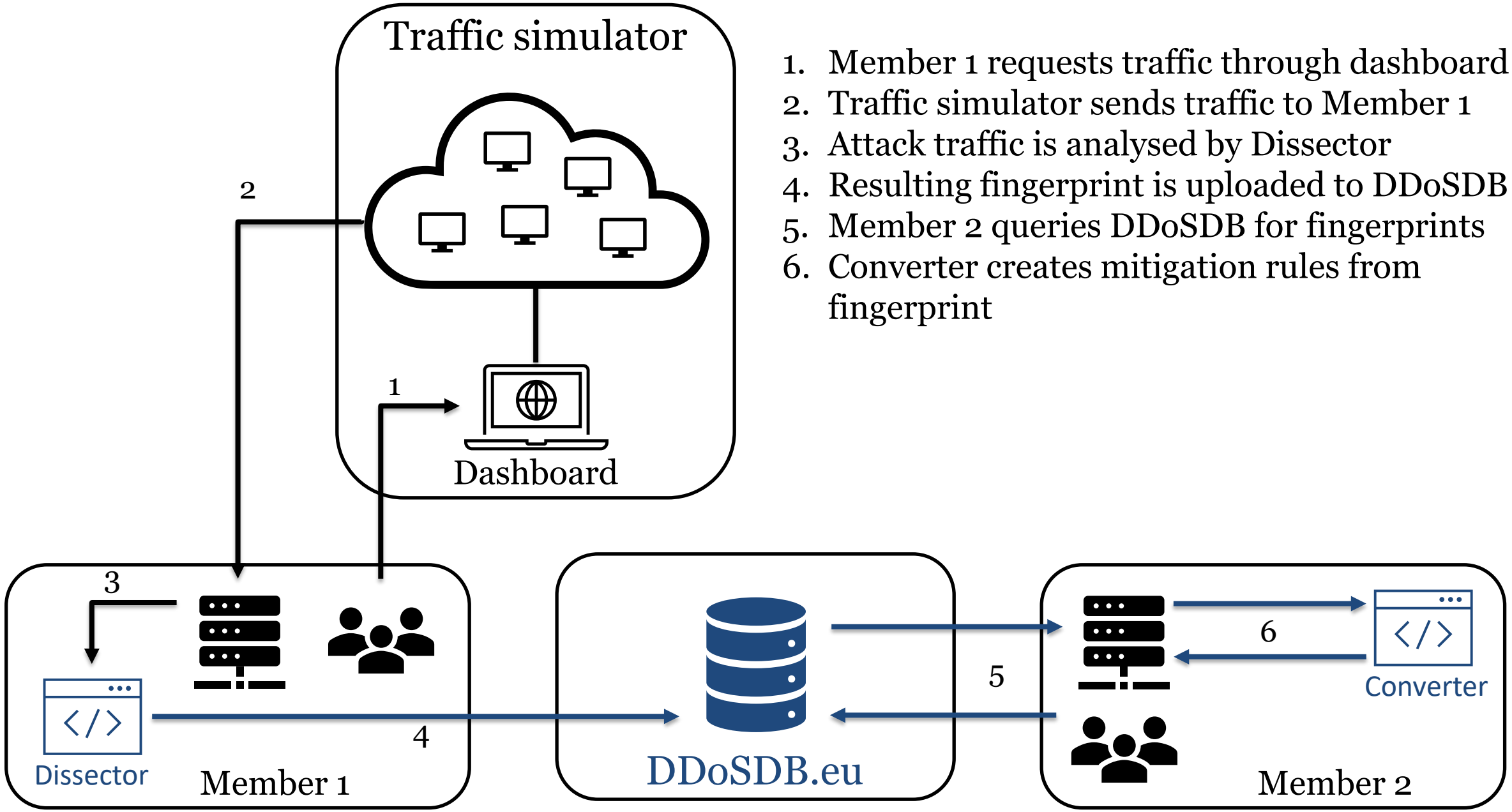
Member 2

DDoS Clearing House



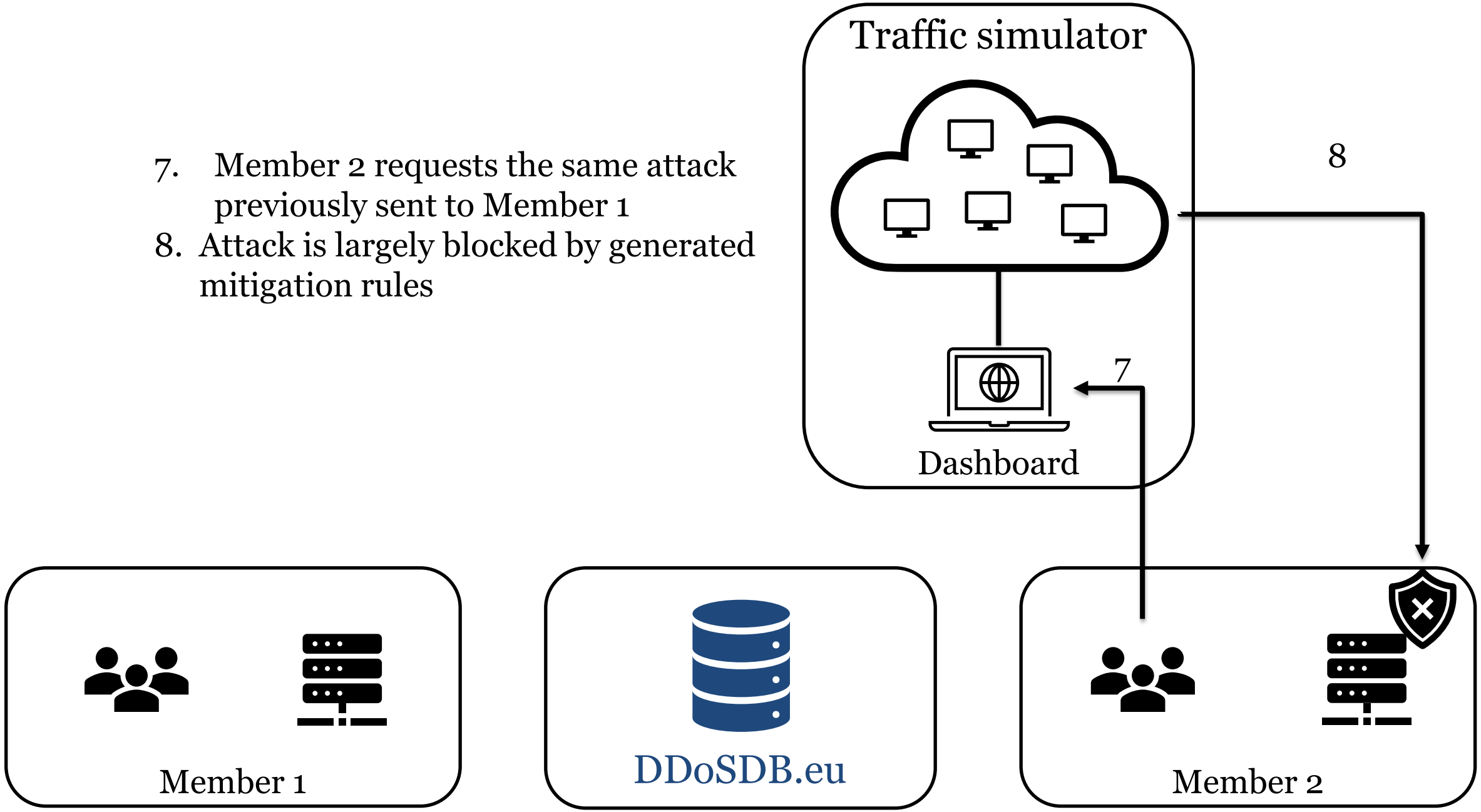


DDoS DB



1. Member 1 requests traffic through dashboard
2. Traffic simulator sends traffic to Member 1
3. Attack traffic is analysed by Dissector
4. Resulting fingerprint is uploaded to DDoSDB
5. Member 2 queries DDoSDB for fingerprints
6. Converter creates mitigation rules from fingerprint

7. Member 2 requests the same attack previously sent to Member 1
8. Attack is largely blocked by generated mitigation rules



Further reading

https://www.sidnlabs.nl/en/news-and-blogs/developing-and-running-a-testbed-for-the-ddos-clearing-house

https://www.sidnlabs.nl/en/news-and-blogs/new-ddos-classifiers-for-the-ddos-clearing-house

https://www.sidnlabs.nl/en/news-and-blogs/work-in-progress-the-concordia-platform-for-threat-intelligence

https://www.sidnlabs.nl/en/news-and-blogs/new-version-of-the-ddos-clearing-house-core-components

https://www.sidnlabs.nl/en/news-and-blogs/dutch-anti-ddos-coalition-lessons-learned-and-the-way-forward

https://www.sidnlabs.nl/en/news-and-blogs/setting-up-a-national-ddos-clearing-house

https://www.sidnlabs.nl/en/news-and-blogs/increasing-the-netherlands-ddos-resilience-together

Contact

Research Institute CODE
Carl-Wery-Straße 22
81739 Munich
Germany

contact@concordia-h2020.eu

Follow us

www.concordia-h2020.eu

www.twitter.com/concordiah2020

www.facebook.com/concordia.eu

www.linkedin.com/in/concordia-h2020

www.youtube.com/concordiah2020

Dutch Anti-DDoS Coalition:
https://www.nomoreddos.org/en/

Clearing house on GitHub:
https://github.com/ddos-clearing-house/

Cristian Hesselman
cristian.hesselman@sidn.nl
@hesselma
+31 6 25 07 87 33

Thijs van den Hout
thijs.vandenhout@sidn.nl
@thijsvandenhout

This work was funded by the European Union's Horizon 2020 Research and Innovation program under Grant Agreement No 830927. Project website: https://www.concordia-h2020.eu/