T3.2: Developing and Piloting a DDoS Clearing House for Europe

CONCORDIA Final Review

May 23, 2023

Thijs van den Hout (SIDN Labs)

Partners: SIDN, SURF, University of Twente, Telecom Italia, FORTH, University of Zürich

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

DDoS Attacks Remain Relevant

Sweden, May 2023

REUTERS | Reuters

Swedish parliament website hit by DDoS attack

Reuters
3 May 2023 · 1-min read

STOCKHOLM (Reuters) -Sweden's parliament has been hit by a so called distributed de
of-service (DDoS) attack that has disrupted access to its web page, it said on Wednesd

The web page was partially down on Tuesday and appeared slow on Wednesday.

"The analysis shows that it is a denial-of-service attack," a parliament spokesperson said.

"R

February 2023

Cloudflare blocks record-breaking 71 million RPS DDoS attack

By Sergiu Gatlan — February 13, 2023 — 02:50 PM — 2

The Netherlands, September 2020

House of Representatives of The Netherlands, Oct 2020

Tweede Kamer
DER STATEN-GENERAAL

Akamai Mitigates Record DDoS Attack in Asia-Pacific (900 Gbps)

Craig Sparling
March 08, 2023
Share

Following last summer's record-setting attacks on Europe, the distributed denial-of-service (DDoS) threat landscape continues to morph and intensify.

March 2023

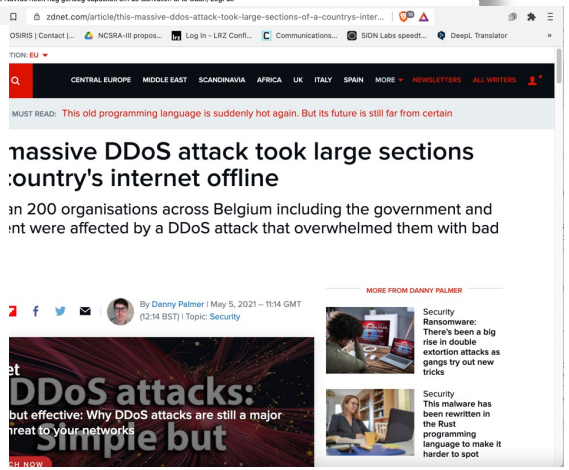
Door Lennart 't Hart

12 sep 2022 om 20:29
Update: 6 maanden geleden

213 reacties

DigiD was maandagavond urenlang beperkt beschikbaar vanwege een storing. De website werd geteisterd door ddos-aanvallen. Veel gebruikers

The Netherlands, September 2022



Belgium, May 2021

Problem Statement

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

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

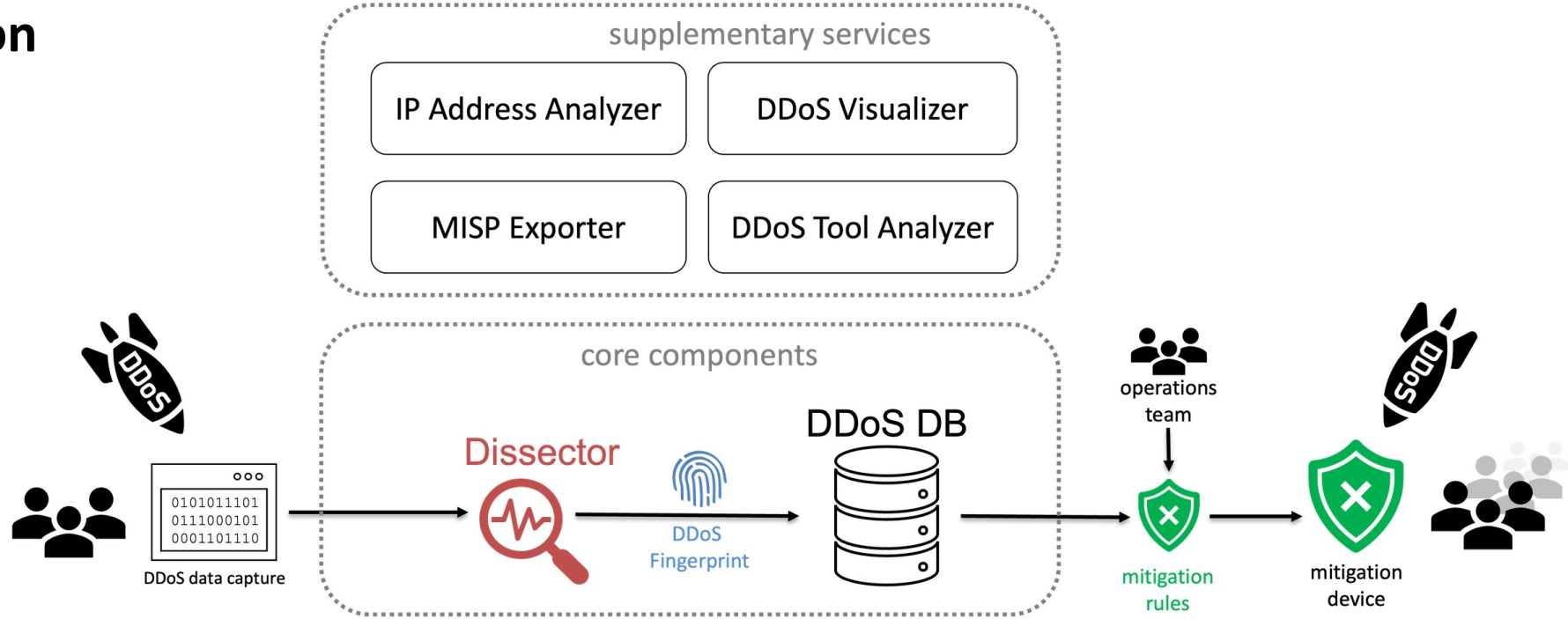
- Increases probability of societal disruptions, especially through critical (cyberphysical) systems (cf. WP2)

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

- Anti-DDoS Coalition: across sectors, Member States, business units, etc.



DDoS Fingerprint

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 the **multidisciplinary** gap to **deployment**
  - DDoS Clearing House
  - Anti-DDoS coalitions
  - Validation of both in practice
- DDoS **cyber range**
- **Open-source** design: proven in pilots, documented in a *cookbook*
- Operates across **heterogeneous networks**, offers extensible services
- ⭐ EC Innovation radar 2021
- ⭐ Key CONCORDIA results

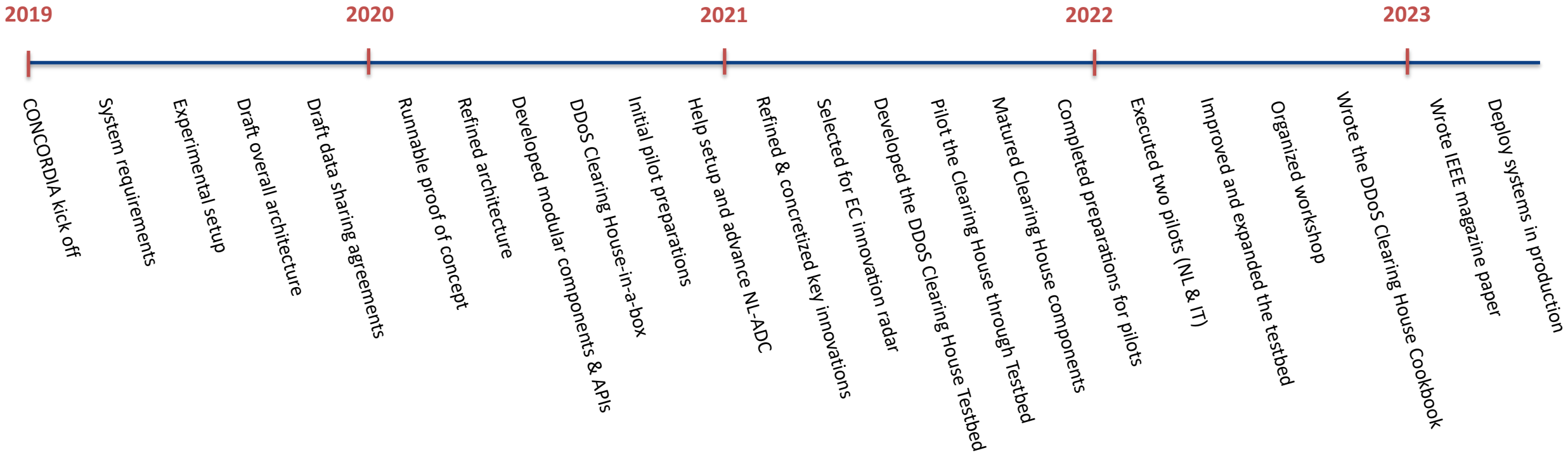
`github.com/ddos-clearing-house`

Dutch Anti-DDoS Coalition

- 18 cross-sectoral critical infrastructure operators in NL
- Sharing DDoS data through Clearing House
- Large-scale DDoS drills (Red/blue team)
- Sharing DDoS expertise and knowledge
- Small-scale DDoS exercises (Cyber range)

nomoreddos.org

CONCORDIA T3.2 Timeline



Two Coalitions – Two and a Half Pilots

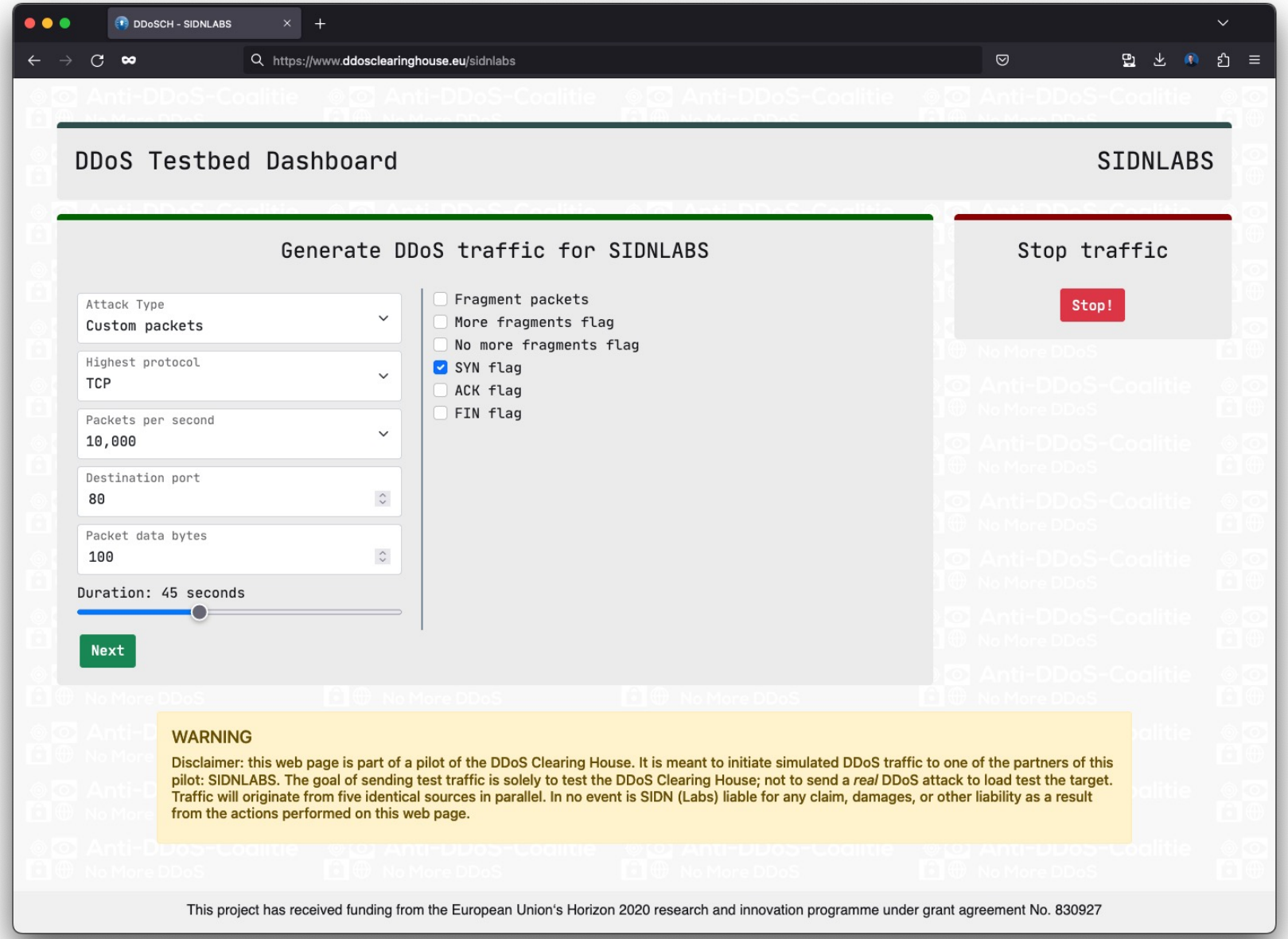
1. Dutch Anti-DDoS Coalition (TRL 8)
   - Shared 270 DDoS fingerprints through DDoS-DB
   - External collaboration
   - Iteratively improve the platform

2. Italian Anti-DDoS Coalition (TRL 7)
   - Telecom Italia + university of Torino
   - Internal and external collaboration
   - Share fingerprints via MISP

2½. Testbed (TRL 6)
   - pilot with simulated data

Improved Testbed as Cyber Range

- DDoS sample traffic
- Test the Clearing House cycle
- Target yourself and low traffic volumes = fewer agreements
- Use as cyber range



Workshop on Collaborative DDoS Mitigation

- 35 guests (10 CONCORDIANs)
- CONCORDIA introduction
- Four Tech Talks
- Panel discussion

Takeaways:

- *Exchange DDoS metadata at multiple levels*
- *Operational measures are just as important as technology*
- *On-premises, hybrid, or cloud-based mitigation?*

concordia.sidnlabs.nl

Photos by Mattijs Jonker

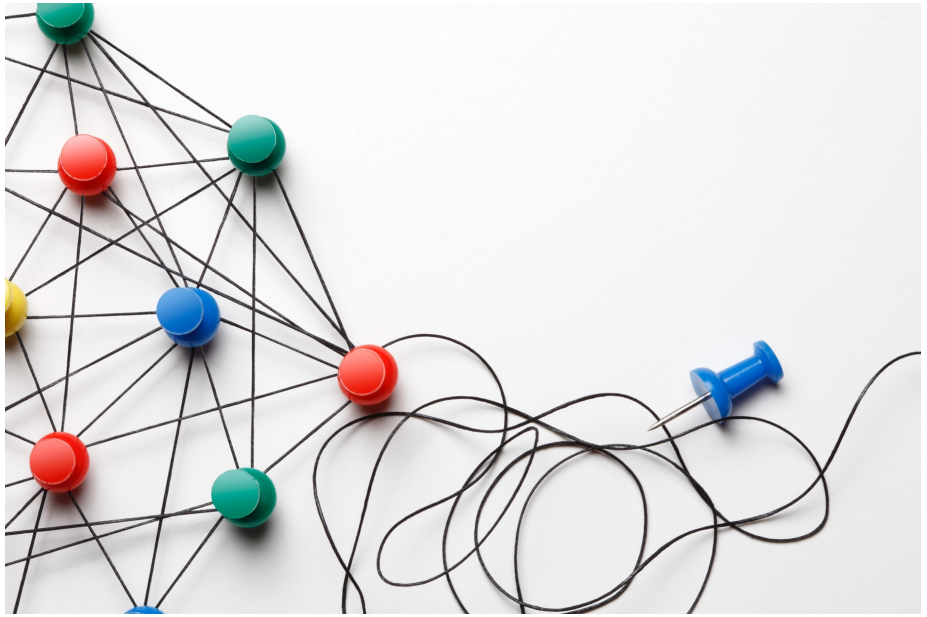
D3.6: DDoS Clearing House Cookbook

- Documentation of the DDoS Clearing House
- Template agreements / contracts
- Description of pilots
- Notes on implementation
- Lessons learned
- IEEE Communications Magazine submission

ddosclearinghouse.eu/cookbook

Connecting the Threat Intelligence Platform

- CONCORDIA Threat Intelligence Platform
  - T3.1 Incident Clearing House
  - T3.2 DDoS Clearing House
  - MISP
- MISP DDoS Fingerprint object
- DDoS-DB – MISP connection
- Demo video: https://www.youtube.com/watch?v=TJfOMzXh1ik



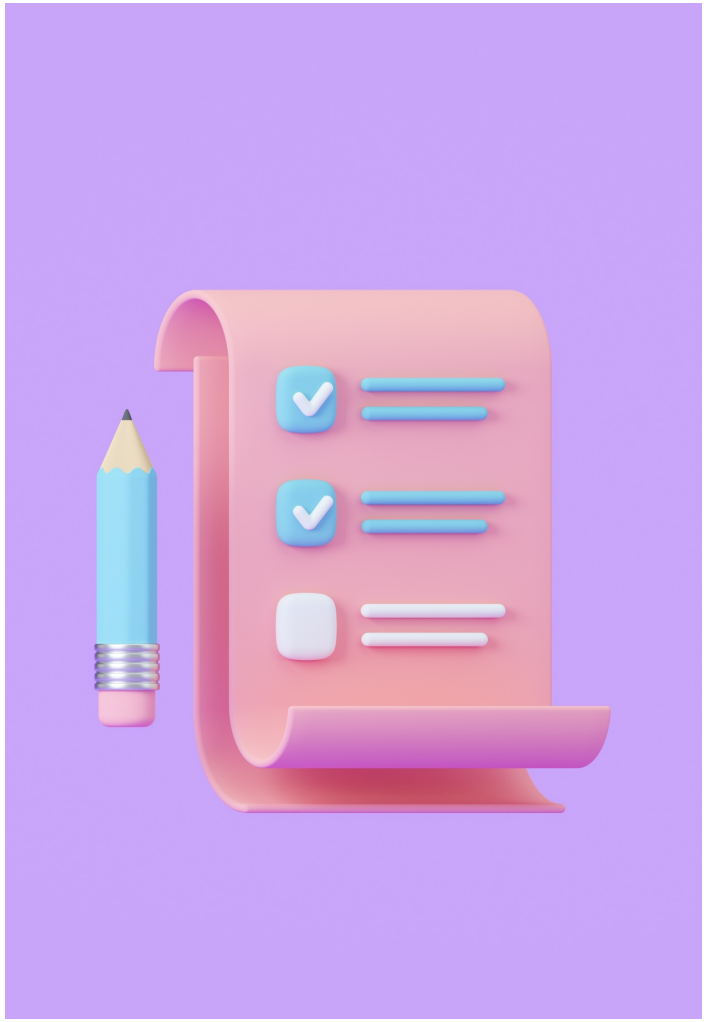
Looking Ahead: Beyond CONCORDIA

- Production-level services for Dutch ADC
  - DDoS Clearing House (at NBIP)
  - Testbed for purple team exercises (at Tax & Customs Admin)
  - Contracts currently being finalized
  - Further development at TU Delft

- Dissemination of our work
  - Paper in IEEE Communications Magazine
  - Workshop on Collaborative DDoS Mitigation
  - Interest from IXP community
  - Potentially in MANRS+

T3.2 Summary

- Developed DDoS Clearing House
- Helped shape the concept and implementation of anti-DDoS coalitions (ADC)
- Piloted the system in two ADCs and a simulated platform
- Tackled organizational and legal requirements for deployment
- Developed Testbed & Cyber Range
- Contributions moved to industry, deployment in production
- Active dissemination (cookbook, paper, workshop)



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/

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

Cristian Hesselman
cristian.hesselman@sidn.nl
@hesselma

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/