Increasing the resilience of the Netherlands' digital infrastructure together

ISC2NL Cyber Resilience Event
Amersfoort, the Netherlands
May 28, 2019

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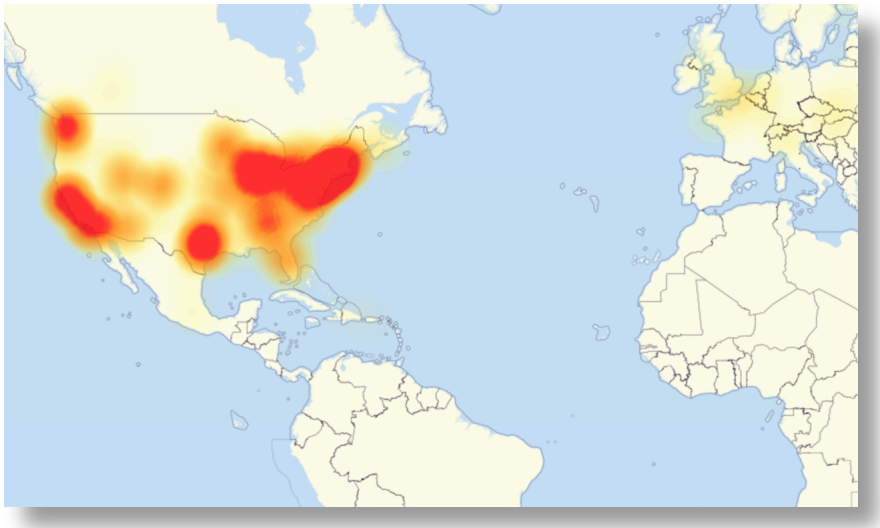
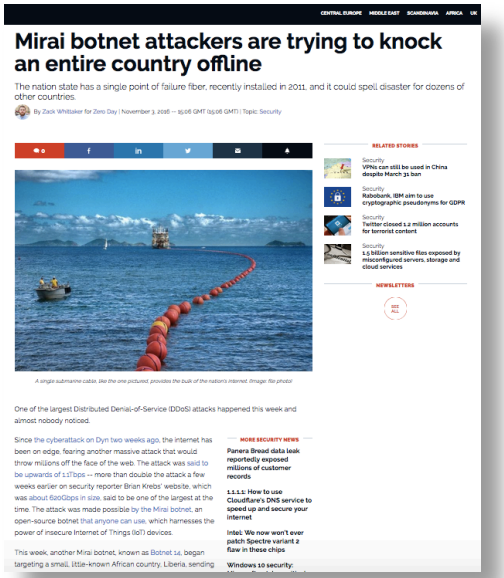
DDoS examples



Other targets: OVH (hosting provider), Krebs On Security (website), Deutsche Telecom (ISP)



Mirai botnet attackers are trying to knock an entire country offline

The nation state has a single point of failure fiber, recently installed in 2011, and it could spell disaster for dozens of other countries.

One of the largest Distributed Denial-of-Service (DDoS) attacks happened this week and almost nobody noticed.

Na banken nu ook Belastingdienst en DigiD slachtoffer DDoS-aanvallen

MA 29 JANUARI, 10:50 AANGEPAST MA 29 JANUARI, 17:37 BINNENLAND, ECONOMIE

De golf van DDoS-aanvallen op Nederlandse instellingen houdt aan. Vandaag is de Belastingdienst tweemaal getroffen, en sinds 15.45 uur heeft ook DigiD last van een DDoS-aanval waardoor de site slecht bereikbaar is.

Volgens een woordvoerder van DigiD "gebeurt een aanval wel vaker, maar dit is wel zwaar". Er wordt hard gewerkt aan een oplossing. Hoelang dat nog gaat duren, kan de woordvoerder niet zeggen.

January 2018

https://en.wikipedia.org/wiki/2016_Dyn_cyberattack
https://www.zdnet.com/article/mirai-botnet-attack-briefly-knocked-an-entire-country-offline/

A few DDoS trends

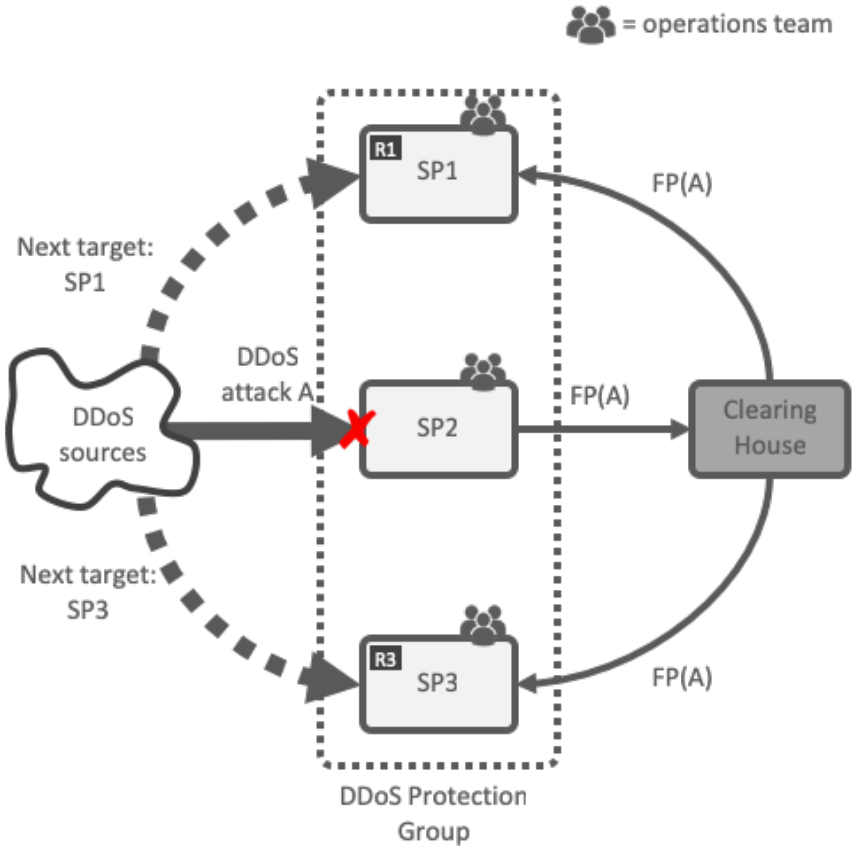
- Volume at 1+ Tbps, likely going up (Dyn 1.2 Tbps, GitHub 1.3 Tbps)
- Many widely distributed sources (Mirai 600K, Hajime 400K)
- High propagate rates (e.g., Mirai from 42K to 71K bots in 1 hour)
- Complex traffic (e.g., bot churn, volumetric/TCP state exhaustion)
- Easier to launch through booters/stressers (Mirai)
- Reflection attacks possible (e.g., Mirai and Reaper botnets)

➔ Our society increasingly depends on network services!

- Antonakakis, T. April, M. Bailey, M. Bernhard, E. Bursztein, J. Cochran, Z., Durumeric, J. A. Halderman, L. Invernizzi, M. Kallitsis, D. Kumar, C. Lever, Z. Ma, J. Mason, D. Menscher, C. Seaman, N. Sullivan, K. Thomas, and Y. Zhou, "Understanding the Mirai Botnet", 26th USENIX Security Symposium, 2017
- S. Herwig, K. Harvey, G. Hughey, R. Roberts, and D. Levin, "Measurement and Analysis of Hajime, a Peer-to-peer IoT Botnet", Network and Distributed Systems Security (NDSS) Symposium 2019, San Diego, CA, USA, February 2019

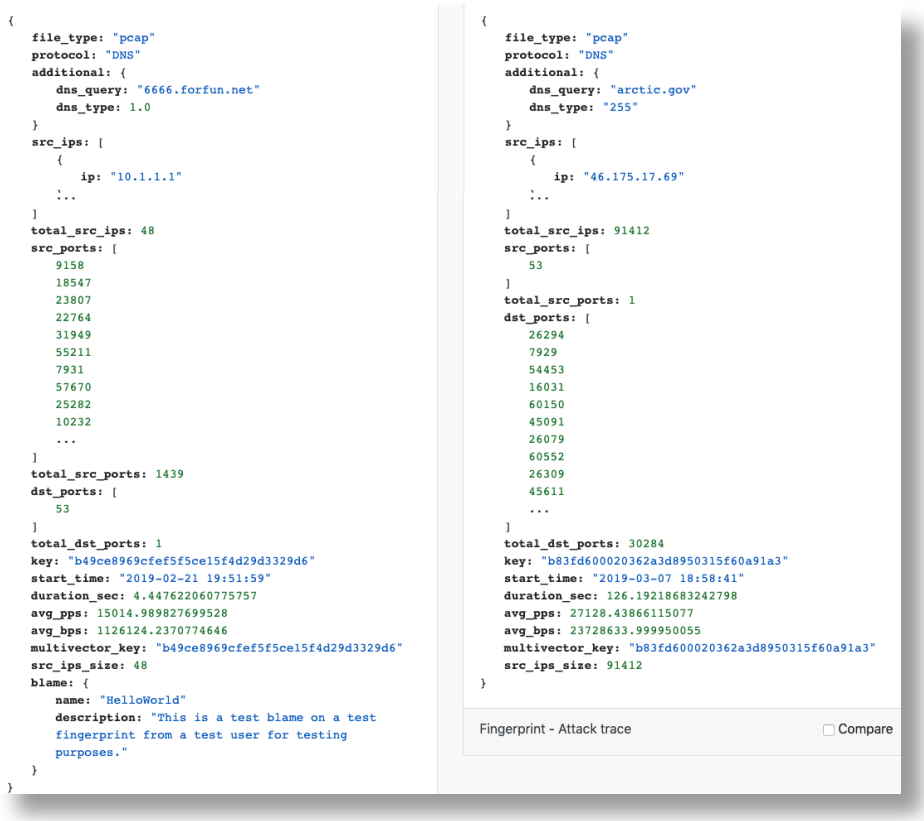
New: DDoS information sharing in NL

- Continuous and automatic sharing of “DDoS fingerprints” buys providers time (proactive)
- Extends DDoS protection services that critical service providers use and does not replace them
- Improves attribution, allowing for better prosecution and increased deterrent effects
- Open to all critical providers in the Netherlands (Internet, financial, energy, water, etc.)

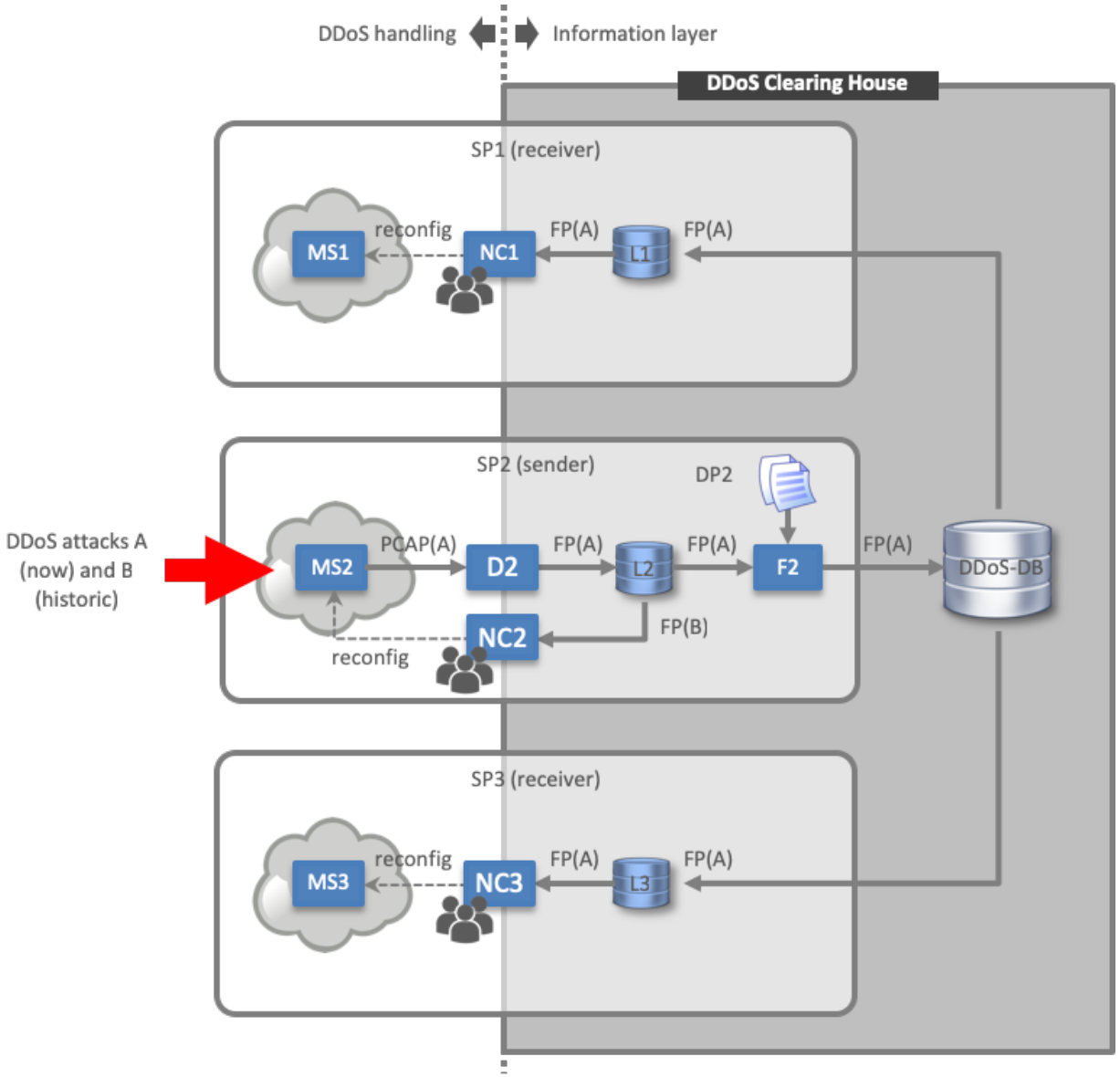


DDoS fingerprints = summary of DDoS traffic

- Domain names used, source IP addresses, protocol, packet length, no victim IP addresses
- Optional extensions: PCAPs, device-specific packet filter rules that ops teams used, suspected type of DDoS attack (e.g., Mirai or Hajime-powered), contact details of ops team
- Created from network measurements (e.g., PCAP, Netflow, IPFIX, sFlow, Logfile)



Clearing house overall architecture (DRAFT)



DDoS clearing house NL partners

- Embraced by a coalition of 25 players from industry (ISPs, xSPs, IXPs, banks, not-for-profit DPS) and gov't (ministries and agencies)

- Including various existing collaborative anti-DDoS initiatives, such as the Dutch Continuity Board (DCB), NoMoreDDoS, NBIP-NaWas

- Working groups:
  - Clearing house
  - Cross-industry information sharing
  - Outreach
  - Ground rules and incident response
  - Exercises

- Facilitated by Dutch National Cyber Security Centre (NCSC-NL)

Status

- Technical track
  - Operational version of DDoS-DB based on open source prototype developed by the University of Twente
  - Closed user group: KPN, THTC, NBIP, NCSC-NL, SIDN, UT, NL-ix, VodafoneZiggo, Dutch Payment Association

- Legal track: data sharing agreement
  - Draft developed by legal experts of SIDN and KPN
  - Covers topics like governance, liability, and audits
  - Focus on simplicity, scalability (NL/EU), and various devops phases

Next steps

- Pilot in the Netherlands (short-term)
  - Approach: start small and iteratively scale up to more partners
  - First share pre-generated fingerprints, then on-the-fly generated prints

- DDoS clearing house for Europe
  - Part of CONCORDIA project (www.concordia-h2020.eu)
  - Development of a clearing house "cookbook"
  - Second pilot in Italy

- Envisioned long-term growth paths
  - Netherlands → Europe → global
  - Extend to "non-critical" service providers

Q&A

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The development of the Dutch national DDoS clearing house is a joint effort of NBIP-NaWas, KPN, THTC, NCSC-NL, Dutch Payment Association, VodafoneZiggo, NL-ix, SIDN, SURFnet, and the University of Twente (WG clearing house). SIDN, SURFnet, and the University of Twente were partly funded by the European Union's Horizon 2020 Research and Innovation program under Grant Agreement No 830927.