.nl: for confidence online

Cristian Hesselman

SIDN is the operator of the .nl TLD

- Objective: increase society's confidence in the Internet

- Provide secure and fault-tolerant registry services for .nl

  - Anycasted DNS services with DNSSEC support

  - Registration and domain protection services

- Increase the value of the Internet in the Netherlands and elsewhere

  - Enable safe and novel uses (SIDN Fonds, IRMA)

  - Increase security and trustworthiness of the infrastructure (SIDN Labs)

- Not-for-profit organization of ~100 FTE, based in Arnhem

TRUSTED INTERNET

.nl = the Netherlands
17M inhabitants
6.2M domain names
3.4M DNSSEC-signed
2.5B DNS queries/day
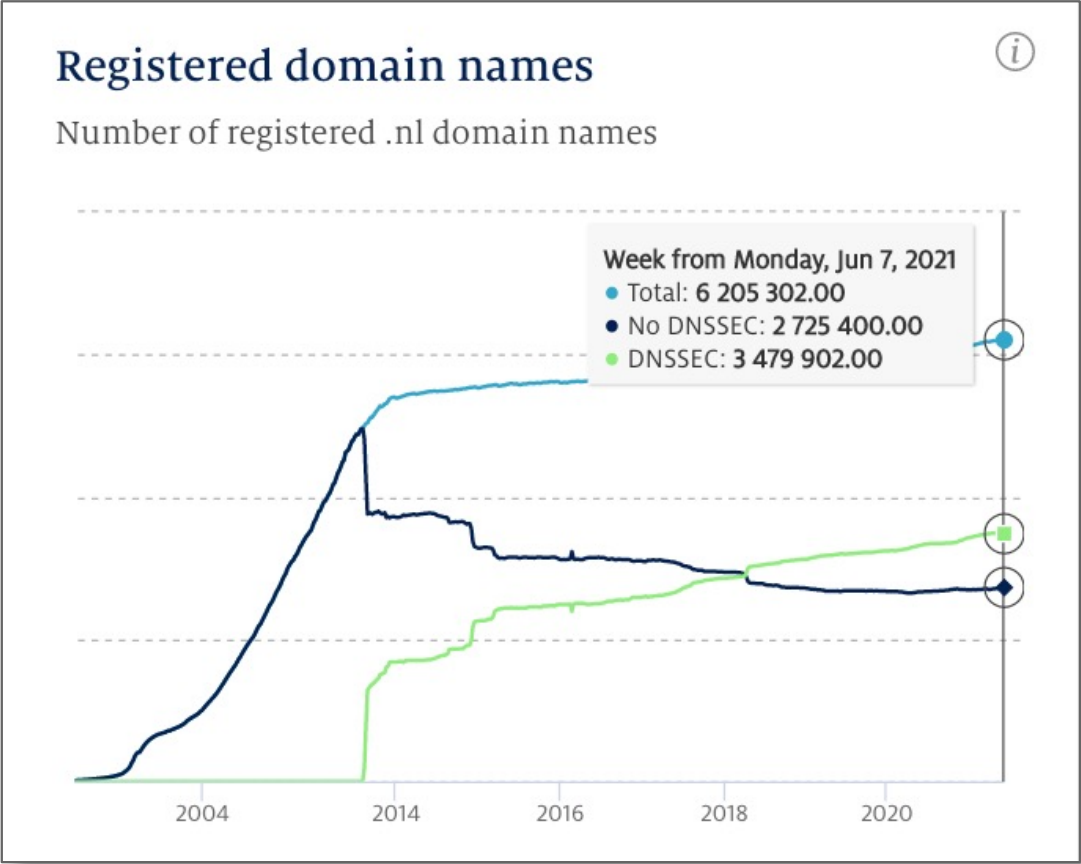8.6B NTP queries/day

How it all began

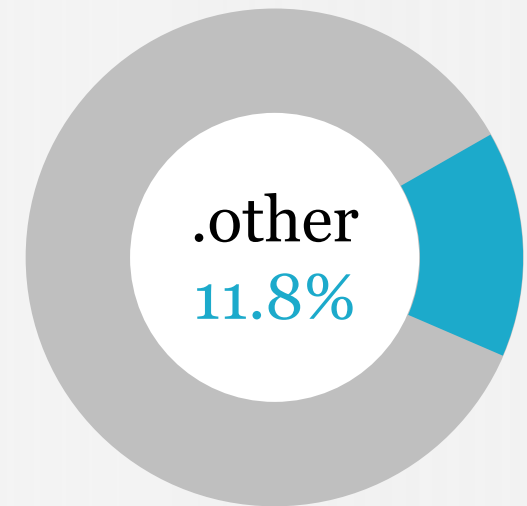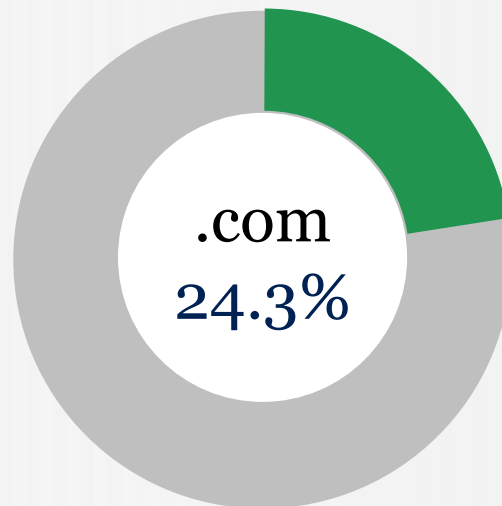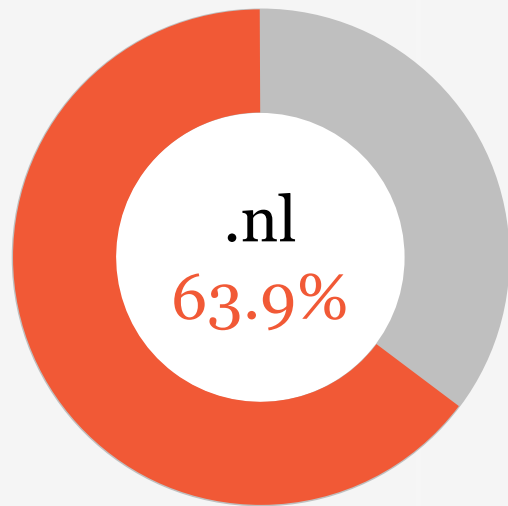Piet Beertema, "godfather" of the .nl top-level domain

First active country-code domain outside the US in 1986

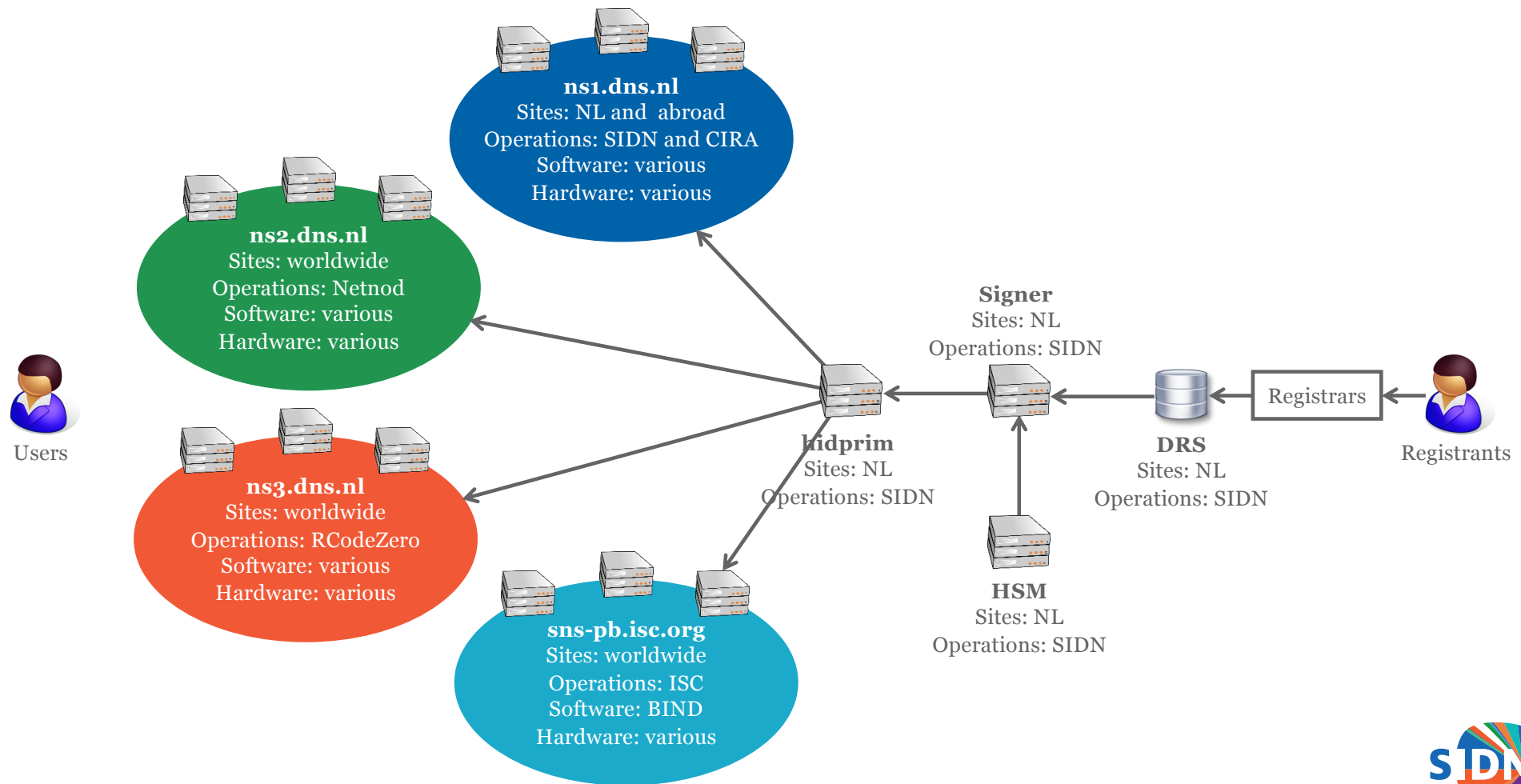Co-founder of SIDN (*Stichting Internet Domeinregistratie Nederland*) in 1996

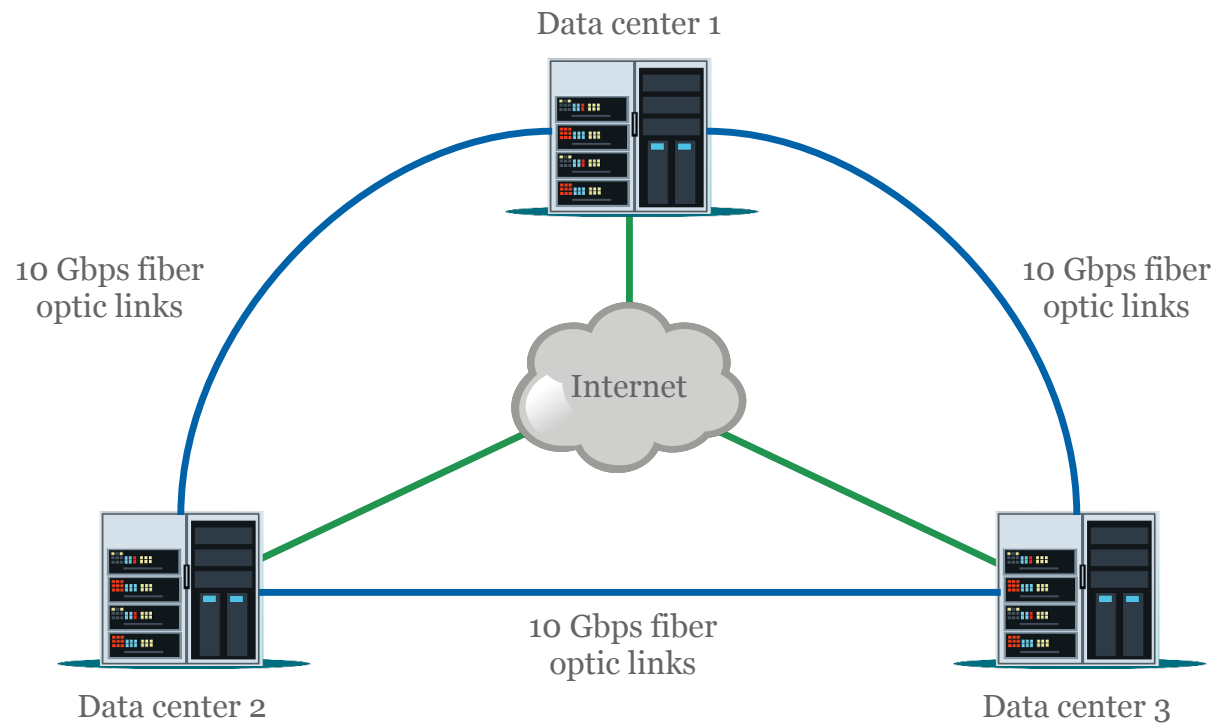# Number of .nl domain names (stats.sidnlabs.nl)

.nl usage in the Netherlands

.nl
63.9%

.com
24.3%

.other
11.8%

SIDN LABS

Heterogeneous and fault-tolerant DNS infrastructure

ns1.dns.nl
Sites: NL and abroad
Operations: SIDN and CIRA
Software: various
Hardware: various

ns2.dns.nl
Sites: worldwide
Operations: Netnod
Software: various
Hardware: various

ns3.dns.nl
Sites: worldwide
Operations: RCodeZero
Software: various
Hardware: various

sns-pb.isc.org
Sites: worldwide
Operations: ISC
Software: BIND
Hardware: various

hidprim
Sites: NL
Operations: SIDN

Signer
Sites: NL
Operations: SIDN

HSM
Sites: NL
Operations: SIDN

DRS
Sites: NL
Operations: SIDN

Registrars

Users

Registrants

ns2.dns.nl (Netnod)

Registration infrastructure (DRS, RDAP, WHOIS, …)

Data center 1

Internet

10 Gbps fiber optic links

10 Gbps fiber optic links

10 Gbps fiber optic links

Data center 2

Data center 3

99.96% availability
Full-automatic failover

Other security areas

- System monitoring and patching (with NCSC-NL and others)

- Secure software development

- Infrastructure penetration testing

- Large-scale and collaborative DDoS mitigation drills (Dutch Anti-DDoS Coalition)

- Security Operations Center (ISO 27001)

- Proactive and collaborative abuse mitigation (phishing, malware, fake shops, etc.)

A more flexible DNS infrastructure (in progress) [1][2]

- Virtual machines at cloud providers

- Vultr, Packet (Equinix), Heficed

- Control over VMs and operating systems

- Complements "as a service" and owned infra

- BIRD-based BGP sessions to cloud providers
 - Path pre-pending
  - BGP communities

Anycast2020 sites
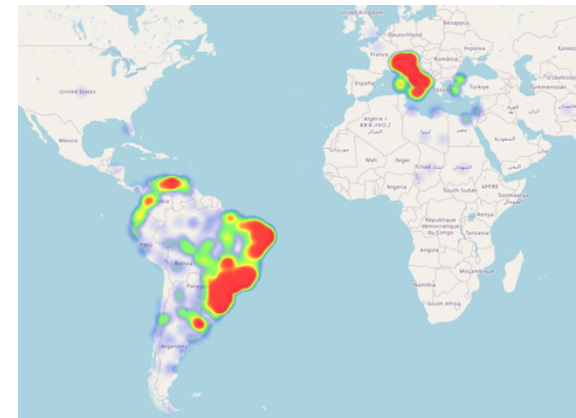
BGP tuning based on catchments

I Reveal My Attributes (IRMA)

- Solution for decentralized identity management

- Increases users' data autonomy

- Reduces big tech user profiling

- Enables security verification through open source

- Development at SIDN (from University of Nijmegen)

https://www.sidn.nl/en/theme/online-identity
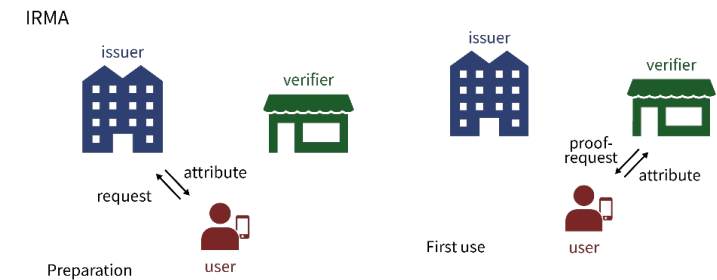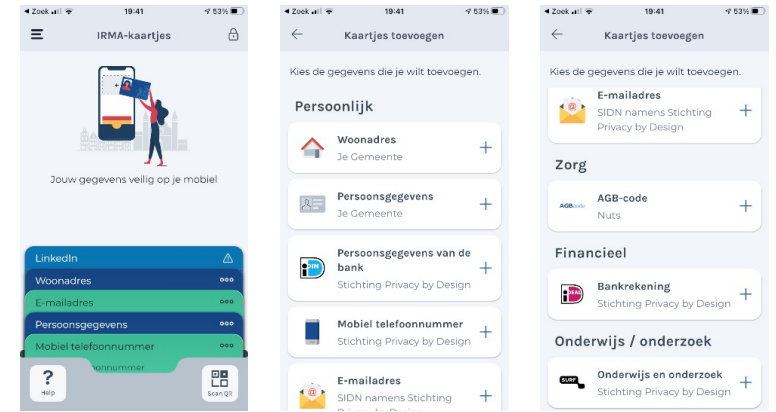
SIDN Labs = research team

- Goal: increase trustworthiness (security, stability, resilience, and transparency) of our society's internet infrastructure, for .nl and the Netherlands in particular.

- Strategies:

  - Applied technical research (measurements, design, prototyping, evaluation)

  - Make results publicly available and useful for various target groups

  - Work with universities, infrastructure operators, and other labs

- Three research areas: network security (DNS, NTP, BGP), domain name & IoT security, trusted future internet infrastructures.
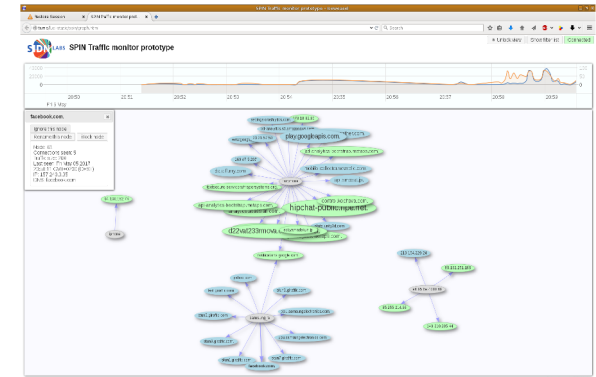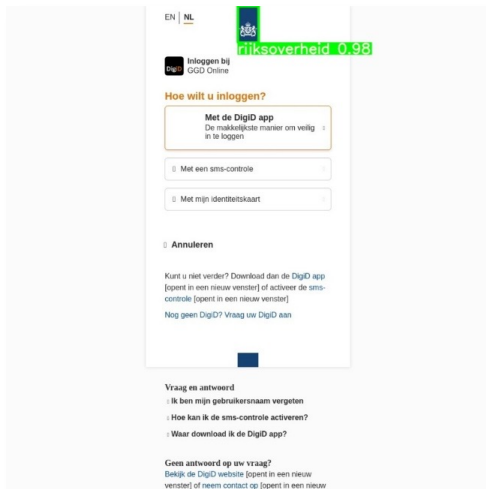
Example projects
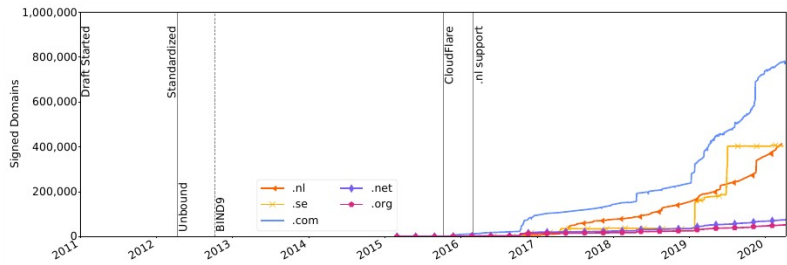
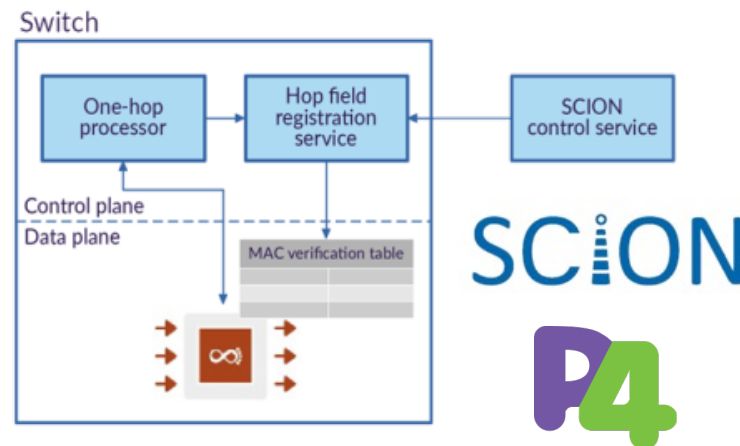Measuring the deployment of newly standardized DNSSEC algorithms [3]

Provide well-managed and secure time services [4]

Making the IoT more secure and transparent and measure its evolution [5]

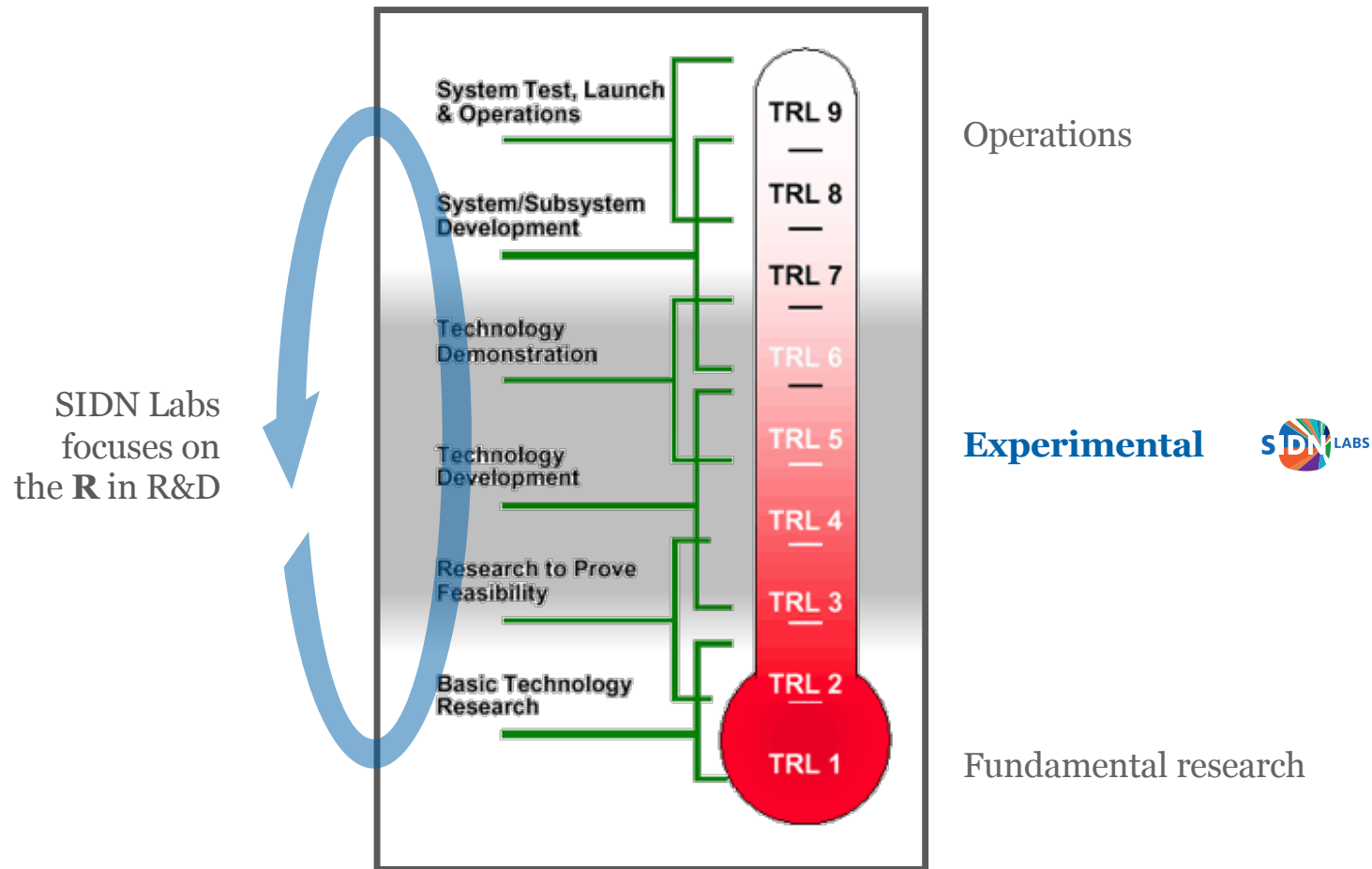Logo detection technology to identify malicious .nl websites [6]

Experimenting with secure future networks and programmable networks [7][8]

Developing a new Internet security and autonomy paradigm [9]

€1.9M

SIDN Labs and Technology Readiness Levels

System Test, Launch & Operations — TRL 9 — Operations

System/Subsystem Development — TRL 8 — TRL 7

Technology Demonstration — TRL 6

SIDN Labs focuses on the **R** in R&D

Technology Development — TRL 5 — **Experimental** — SIDN LABS — TRL 4

Research to Prove Feasibility — TRL 3

Basic Technology Research — TRL 2 — TRL 1 — Fundamental research

SIDN LABS
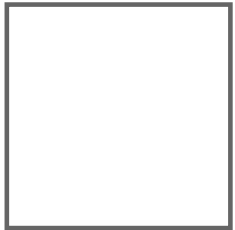
https://en.wikipedia.org/wiki/Technology_readiness_level
O'Reilly, C. A., & Tushman, M. L. (2013). Organizational ambidexterity: Past, present, and future. Academy of Management Perspectives, 27(4), 324-338

Examples of our research partners

SIDN Labs team

SIDN Labs
Vacancy
Research Engineer

SIDN Labs
Thymen Wabeke
Research engineer

SIDN Labs
Moritz Müller
Research engineer

SIDN Labs
Marisca van der Donk
Managementassistente

SIDN Labs
Marco Davids
Research engineer

SIDN Labs
Maarten Wullink
Research engineer

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Thijs van den Hout
Research Engineer

SIDN Labs
Ralph Koning
Research Engineer

SIDN Labs
Jelte Jansen
Research engineer

SIDN Labs
Giovane Moura
Data Scientist

SIDN Labs
Elmer Lastdrager
Research engineer

SIDN Labs
Christian Scholten
Afstudeerder (UT)

SIDN Labs
Caspar Schutijser
Research engineer

SIDN Labs
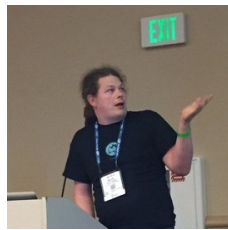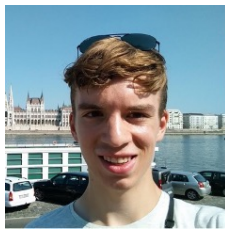**Cristian Hesselman**
Directeur SIDN Labs

- Technical experts, divers in seniority and nationality

- Help SIDN teams, write open-source software, analyze large amounts of data, conduct experiments, write articles, collaborate with universities

- M.Sc students help us advance specific areas

Check out or blogs for more!

1. https://www.sidnlabs.nl/en/news-and-blogs/inside-line-on-our-anycast-testbed

2. https://www.sidnlabs.nl/en/news-and-blogs/anycast-performance-monitoring-with-anteater

3. https://www.sidnlabs.nl/en/news-and-blogs/dnssec-the-long-and-bumpy-road-of-algorithm-deployment

4. https://www.sidnlabs.nl/en/news-and-blogs/all-good-things-take-time

5. https://www.sidnlabs.nl/en/news-and-blogs/increasing-the-transparency-of-the-iot-with-the-spin-pcap-reader

6. https://www.sidnlabs.nl/en/news-and-blogs/using-logo-detection-technology-to-identify-malicious-nl-websites

7. https://www.sidnlabs.nl/en/news-and-blogs/a-practical-demo-of-scion-a-new-internet-architecture

8. https://www.sidnlabs.nl/en/news-and-blogs/future-internet-at-terabit-speeds-scion-in-p4

9. https://www.sidnlabs.nl/en/news-and-blogs/three-more-things-you-need-to-know-about-the-responsible-internet

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