NLNET**LABS**

ANNUAL REPORT 2018

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Welcome,

We are happy and proud to present our annual report of our activities in 2018, a rewarding year in achieving our mission and objectives. It has been a dynamic year, with new colleagues, new open-source projects and repositioned applied network research. In short, we can say that all our activities have been focused on the realisation of open source development, open standards, research and community outreach for the stability, security and privacy of Internet infrastructure and end-users.

The development of our Unbound and NSD software products was directed to increase the resilience of the Internet infrastructure and the privacy of end-users. Other DNS software applications and libraries developed and maintained by NLnet Labs saw regular updates, fixes and releases.

A new activity in our organisation is the development of software for routing security. In recent years, our researchers have contributed to research into routing stability and security, but this year we started implementing software for use in operational environments to improve the security and reliability of the routing infrastructure. This new work fits very well with our other activities and strengthens our profile as a research and development organisation that contributes to the core of the Internet.

We have positioned our research to be more complementary to our software and standardisation activities. The ambition to connect academic research with operational practice is, as always, important and has demonstrated its relevance for the community.

The new activities and ambitions can only be realised with talented professionals. We are delighted that in the past year we have been able to attract respected research and software engineers who further complement our expertise and skills.

Financially, the organisation is doing well. In recent years, we have focused on the sustainability, and with it the continuity, of NLnet Labs with various funding flows based on gifts, subsidies and sponsored software feature development. This model works well for us.

In conclusion, NLnet Labs has an impact on the global Internet. Our contributions are widely recognised: we provide software that is used in essential parts of the Internet, work together in standards organisations to improve protocols, and share knowledge with the community through presentations, papers and expertise groups.

Enjoy reading our report!

BENNO OVEREINDER
managing director NLnet Labs

About NLnet Labs

NLnet Labs is a not-for-profit foundation, founded in 1999. Our mission is to develop open source software and open standards for the benefit of the Internet, and to perform applied research on Internet protocols. We focus our efforts particularly on the Domain Name System and inter-domain routing. NLnet Labs work supports the robustness, security and reliability of the Internet and safeguards the privacy of its users.

To accomplish our mission, we collaborate with key players in the Internet around the world. Organisations we work with include the Internet Engineering Task Force (IETF), the Regional Internet Registries (RIRs), the Internet Corporation for Assigned Names and Numbers (ICANN), leading Top Level Domain (TLD) operators, the International Standards Organisation (ISO), the Internet Society (ISOC), as well as a wide variety of other members in the field, ranging from individual researchers to major industry actors.

NLnet Labs plays a leading role in promoting technologies that stimulate trust, security, privacy, scalability and the global nature of the Internet. Our peers see us as a major stakeholder in the creation and use of open standards and open software. We are leading experts on core Internet technologies, specifically the DNS and routing.

We are a lightweight organisation with a team of around twelve people, consisting of almost exclusively developers and researchers, while having almost no overhead. We attract talented people who want to make a difference in the well-being of the Internet, with a profound belief in open source and open standards.

We create powerful and professional tools that are used throughout the Internet industry, ranging from DNS root servers at the core of the Internet to small embedded devices running a secure recursive resolver. Our software is used for signing and validation operations in both routing and DNS security applications.

Our researchers pioneer new technologies, help craft future standards and build prototypes of technologies that promise to improve the Internet. We increase understanding of the Internet by studying its fundamental building blocks. By actively participating in both worlds, we bridge the gap between academia and industry.

Our expertise and advice is widely recognised by policy-making bodies, including regulators and governments. We advise on public policy decisions that affect the security and privacy of Internet users across the globe, as well as the stability of the Internet itself.

While users may not see it on the outside, we proudly say:
THE INTERNET RUNS ON NLNET LABS!

Organisation Positioning

In 2018, one of our key efforts was to make our projects either financially self-sustaining, or capable of being funded by one of the other projects we maintain. This way, we ensure that we remain in a financially healthy situation while still having the opportunity to do groundbreaking work for the good of the Internet.

A related effort over 2018 was to reposition our organisation and to present both ourselves and our products more clearly to the outside world. While NLnet Labs is widely known within the open source and open standards community, our products and services were not always strongly linked to the organisation. This is important because it enables us to showcase the maturity of our product portfolio and creates a stronger link between the products and the organisation.

Some tweets

NLnet Labs
@NLnetLabs
Follow

NSD 4.1.24 is released today. This version has a fix for a bug in resigning zones with different NSEC3 salt. New feature is nsd-control over a command pipe, without using TLS.
Read release notes at

News - NSD 4.1.24 released
Lenient NSEC3PARAM and nsd-control over a named socket.
nlnetlabs.nl

6:13 AM - 13 Aug 2018

10 Retweets 11 Likes

1   10   11

NLnet Labs
@NLnetLabs
Follow

Unbound 1.8.0 is available! This release has a number of bug fixes, a (long) list of features added, *and* some defaults changed. We think this justifies a minor version increase to 1.8.0. Read our news post for all details

News - Unbound 1.8.0 released
bug fixes, features added and some defaults changed
nlnetlabs.nl

6:20 AM - 10 Sep 2018

38 Retweets 38 Likes

        38   38

NLnet Labs
@NLnetLabs
Follow

Two years ago we introduced QNAME minimisation in #Unbound. The implementation has proven to be so reliable that in version 1.7.2 we are enabling it by default. #privacy #dnsprivacy Some background: indico.dns-oarc.net/event/22/contr…

4:23 AM - 11 Jun 2018

20 Retweets 29 Likes

1   20   29

Routinator 3000
@routinator3000
Follow

"3… 2… 1… and lift off of Routinator 0.1.0 'Godspeed!' Embarking on new adventures as #RPKI routing security is hoisted to new heights!" #notreallyspacetravel #butstillverycool #rustlang
nlnetlabs.nl/news/2018/Nov/…

6:09 AM - 1 Nov 2018 from French Guiana

6 Retweets 13 Likes

Organisation Positioning

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Ralph Dolmans presents our NSD and Unbound logos at the Internetdagarna in Stockholm, November 2018

STRONGER BRANDING

Feedback we received in the past was that to many of our users, it was not clear that NLnet Labs is the organisation behind our key products.
In 2018, designer Richard de Ruijter helped us develop clear and clean branding for our most used open source products NSD and Unbound, as well as our new routing security tools named Krill and Routinator.
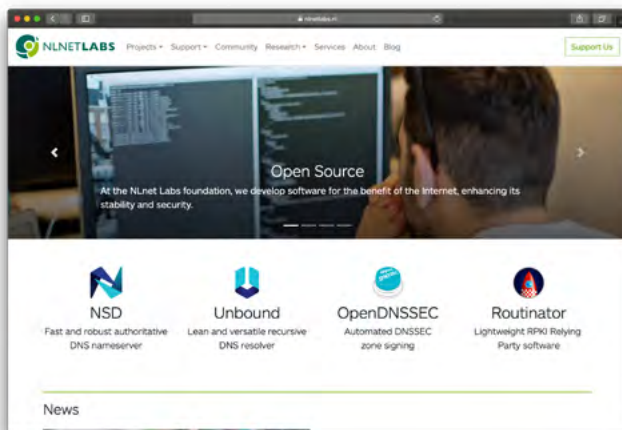
NEW WEBSITE

The NLnet Labs website was completely redesigned in 2018.
In keeping with our beliefs, the new website is built on a modern open source framework and can be managed fully automatically using the same tools we use to manage our open source software. This makes it easy for all team members to contribute to the website, and allows us to announce the latest releases of our open source products in just a few simple steps.

Our most popular products feature prominently on the front page, providing easy access to information and downloads for users. An added benefit is that it clearly links these products to the NLnet Labs organisation.

RESEARCH MORE PROMINENT

On our new website, we have also positioned our research activities more prominently. We introduced a new research vision on the website and redesigned and updated the information page about the projects we participate in and the academic institutions we collaborate with.
More information on our research activities can be found under "Research" further down this report.

Software Development

9

7

2018 was a busy year for NLnet Labs' software developers. We released nine updates to Unbound, and seven for NSD. Work is well underway on a major re-engineering effort on the OpenDNSSEC project, with the goal of radically improving signer performance and supporting fast updates and incremental zone transfers.

The DNS libraries we collaborate on with the community also received a lot of attention, with four releases of getdns/Stubby and eight releases of Net::DNS.
Our own DNS library LDNS saw a steady stream of contributions, and was joined toward the end of the year by a new sister: a DNS "crate" for the Rust programming language.

Finally, in 2018 a new project was launched in the area of inter-domain routing: an RPKI toolset to help secure the Border Gateway Protocol (BGP).

DNS(SEC)
Software Projects

UNBOUND
In 2018, we made Unbound even more secure, robust and privacy friendly.
New features introduced in Unbound in 2018 include authority zones, aggressive use of DNSSEC-validated cache, root key sentinel support, DNS over TLS authentication for forward zones, and new upstream server selection configuration options.

Authority zones make it possible to transfer an authoritative zone into Unbound. This can, for example, be used to load a copy of the root zone (RFC 7706). Having the root zone loaded in a resolver improves round-trip times and enhances privacy.

Further privacy, security and performance enhancements are provided by aggressive use of the DNSSEC-validated cache (read more about this feature on our blog). We also enabled query name minimisation by default, and now support TLS authentication for upstream resolvers.

Based on user feedback at industry events, new configuration options were added that allow tuning of Unbound's upstream server selection to better meet industry needs. Other enhancements to Unbound include a redis cache backend the code for which was generously contributed by Infoblox.

We fixed one critical security flaw in early 2018, a DNSSEC downgrade attack, published as CVE-2017-15105 (read more about this issue on our blog).

Finally, with the addition of support for Ed448, Unbound now supports all modern DNSSEC algorithms, if compiled against OpenSSL 1.1.1 or newer. This means we will see incremental uptake of these new algorithms across the Internet as OS distributions get upgraded.

NSD
NSD saw a number of minor bug fixes in memory handling and NSEC3 processing over 2018. A more serious issue that was resolved was a potential timing attack on secure transfer (TSIG) processing, with thanks to Ondřej Surý for reporting this.

Major new features in NSD include the ability to refuse ANY queries (to help prevent DNS amplification attacks), improvements to TCP performance on various operating systems and dnstap support (for integration with DNS monitoring and statistics applications). We will continue to improve the performance of NSD in 2019 to keep up with the expectations and requirements of the industry.

DNS(SEC)
Software Projects

OPENDNSSEC
Development work on the OpenDNSSEC project in 2018 concentrated on major improvements to the signer to handle fast updates and increase responsiveness.
The goal of the fast updates code is for OpenDNSSEC to be able to create a signed zone file containing all changes submitted to it within a short interval.
This functionality involved major design changes and re-engineering, as up until this change, the signer had been engineered to different efficiency criteria.

The changes to internal data structures in the signer made in 2018 form a solid basis for future releases with improved performance planned for 2019.

While user uptake of OpenDNSSEC 2.1 remained relatively low in 2018, feedback from users that did deploy this release was positive, and OpenDNSSEC performed stably in production. Error reports from 2.1 users led to only two bug fixes, which will be included in a release in 2019.

In 2018, OpenDNSSEC 1.4 remained the de-facto long-term support (LTS) release, although we now strongly encourage users to migrate to 2.1 as the preferred version.

DNSSEC-TRIGGER
This lightweight experimental daemon helps users secure their system with DNSSEC validation in challenging environments (untrusted WiFi networks, captive portal environments, ...).
In 2018 two updates were released. The first update migrated a significant part of the tool's functionality that had previously been implemented in scripts to the main code of the daemon. The second release fixed an infinite loop that could occur in certain circumstances.

SOFTHSM V2
In 2018, NLnet Labs also contributed to SoftHSM v2, a spin-off of the OpenDNSSEC project.
Together with partners SURFnet and Swedish technology provider KnowIT, we worked on creating an abstraction layer to support different token implementations under the outer SoftHSM API.
This will pave the way for supporting partially hardware-based cryptography to be made available under SoftHSM in the future.

DNS(SEC) Libraries

LDNS
There were no LDNS releases in 2018, but there has been a steady stream of contributions and bugfixes which have been addressed in the source repository. We expect to release a new version of LDNS in 2019. In parallel, we continued discussions about a successor to LDNS that is based on the completely re-architected functionality in the getdns library and in Unbound.
This work will continue in 2019.

GETDNS AND STUBBY
The getdns project brings a modern DNS API to applications with a number of language bindings, and Stubby, which is based on getdns, provides a local privacy-aware DNS resolver on UNIX-like systems. A binary port of Stubby for Windows is also distributed by the project. Over 2018, getdns saw security improvements that allow it to validate the certificate of DNS-over-TLS services using DNSSEC/DANE validation. Just like Unbound, with the advent of OpenSSL 1.1.1, getdns now supports the modern Ed25519 and Ed448 cryptographic algorithms for DNSSEC validation, as well as TLS 1.3.

Finally, getdns gained experimental support for DNS-over-HTTPS during the hackathon at IETF 101 held in March 2018 in London.

NET::DNS(::SEC)
NLnet Labs is a long time contributor and maintainer of the Net::DNS::(SEC) library that supports DNS functionality in the Perl scripting language. Over 2018, the most major change that NLnet Labs contributed was an overhaul of the interfacing with the underlying cryptographic library used for DNSSEC. As a result, Net::DNS::SEC is now compatible with more underlying cryptographic libraries: LibreSSL & BoringSSL besides just OpenSSL. It now also supports new algorithms included in recent versions of OpenSSL: Ed25519 and Ed448.

DOMAIN CRATE
The NLnet Labs DNS(SEC) library family welcomed a new member in 2018: the domain crate, which brings DNS functionality to the Rust programming language. This will enable future NLnet Labs DNS projects to also be written in Rust, and helps the fast-growing Rust community to access DNS functionality.

Routing Software
- A New Pillar

While NLnet Labs has always had a mission to provide value in the area of inter-domain routing, this was mainly centred around various research projects for most of its existence. This changed substantially in 2018 when we announced our plans to develop a comprehensive toolset for Resource Public Key Infrastructure (RPKI), a technology aimed at making the Border Gateway Protocol (BGP) more secure.

RPKI is based on open standards and works by providing network operators a way to perform Route Origin Validation. Using the system, the legitimate holder of a block of IP addresses can make an authoritative statement about which Autonomous System (AS) is authorised to originate their IP prefix in BGP. In turn, other network operators can download and validate these statements and make routing decisions based on them.

Initial research into the viability of this project began when concerns were raised in the routing community that there was a lack of diversity in the tooling around RPKI. This resulted in meticulous market research by NLnet Labs, as well as the development of a business plan to map out the problem space, requirements, potential users and cost. From the outset it was imperative that we make the RPKI project self-sustaining, meaning that partners in the industry would fund both the initial development and the long-term maintenance of the toolset.

This approach is in line with the new reality and ambitions of the organisation, where every project we undertake is capable of standing on its own feet, or can be funded by one of the other projects we maintain. This way, we ensure that we remain in a financially healthy situation while still having the opportunity to do groundbreaking work for the good of the Internet.
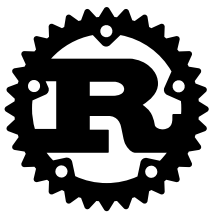
After several months of negotiations and funding rounds, we could announce in the summer that NIC.br, the National Internet Registry of Brazil, as well as the Mozilla Open Source Support Fund, the RIPE NCC Community Projects fund and the Dutch National Cyber Security Centre all committed to funding the development of our RPKI toolset. Additional infrastructure for testing and deployment is offered by DigitalOcean, Juniper, Nokia and Cisco.

NLnet Labs develops two RPKI tools: Krill, which is an RPKI Certificate Authority and Routinator, our RPKI Relying Party software. Both projects are exclusively developed in the Rust programming language. A modern programming language with a focus on reliability and performance.

Our developers will first create a technology preview version of the toolset, bringing it from a prototype to a production grade toolset that is on par with the quality that is expected from NLnet Labs with projects such as NSD and Unbound. It also opens the door for additional research in the area of inter-domain routing. Lastly, we contribute to the development of open standards in the area of routing security, with several ongoing drafts in the IETF.

Routing Software Projects
/ Krill

With Krill, operators can generate and publish RPKI cryptographic material to authorise their BGP announcements. Up until now, operators were largely dependent on the hosted RPKI systems that each of the five Regional Internet Registries (RIRs) provide. Krill lets organisations run RPKI on their own systems as a child of one or more RIRs. It can also run under a different parent, such as a National Internet Registry (NIR), and, in turn, act as a parent for other organisations.

The implementation will support running the CA both upwards and downwards. Upwards means that operators can have multiple parents, such as ARIN, RIPE NCC, etc., simultaneously and transparently. Downwards means that the CA can delegate to child organisations or customers who, in turn, run their own CA. This makes Krill ideal for National Internet Registries and Enterprises.

A publication server is included in Krill, but can also be run as an independent component. This means organisations can host published certificates and ROAs themselves, or let a third party, such as a Content Delivery Network, do it on their behalf.

KRILL IS INTENDED FOR:
- Organisations which do not want to rely on the web interface of the hosted systems that the RIRs offer, but require RPKI management that is integrated with their own systems

- Organisations that need to be able to delegate RPKI to their customers or different business units, so that that they can run their own CA and manage ROAs themselves

- Organisations that manage address space from multiple RIRs. Using Krill, they can manage all ROAs for all resources seamlessly within one system

- Organisations who want to be operationally independent from their parent RIR, such as NIRs or Enterprises

Development started in the summer of 2018. We expect Krill to be ready for production by the end of 2019. NIC.br, the National Internet Registry of Brazil, has already committed to taking the software package into production as soon as it is ready. Several other organisations have expressed a strong interest in adopting Krill as an RPKI management solution.

Routing Software Projects /ROUTINATOR

ROUTINATOR

Routinator is Relying Party software, also known as an RPKI Validator. Operators can use it to download and validate the global RPKI data set and feed the result into their routers, or use it elsewhere in the BGP decision making process.

Routinator connects to the Trust Anchors of the five Regional Internet Registries (RIRs) — APNIC, AFRINIC, ARIN, LACNIC and RIPE NCC — downloads all of the cryptographic material in their repositories and validates the signatures. It can feed the validated information to hardware routers supporting Route Origin Validation such as Juniper, Cisco and Nokia, as well as serving software solutions like BIRD and OpenBGPD. Alternatively, Routinator can output the validated data in a number of useful formats, such as CSV, JSON and RPSL.

Routinator had its first release on 1 November 2018 and is already seeing active use in production environments at major operators such as KPN and AT&T, as well as a variety of Internet Exchanges, including AMS-IX, DECIX and France-IX.

NLnet Labs actively collaborates with other developers of RPKI Relying Party software, such as the RIPE NCC and Cloudflare, to ensure cross-compatibility and data integrity.

RPKI ANALYTICS

To help the Internet community understand the uptake, effects and quality of RPKI deployment, we have written an analytics tool offering insight and assistance with troubleshooting.

Research

Over its history, the Internet has grown incredibly, reaching billions of people around the world. At its core, the Internet relies on a set of interconnected protocols specified, for the majority, in open standards. At NLnet Labs we both contribute to these standards, and implement them in our open source projects. Yet what happens if the community decides to change one of these standards? Or what if a new standard is introduced? This is where NLnet Labs' research activities come into play.

RESEARCH VISION

NLnet Labs redefined its research vision in 2018 to better align with the overall vision and goals of the organisation. At the core of this vision is the impact our research should have on the Internet. By actively studying existing and new protocols, and by participating in large scale studies of the Internet's core infrastructure, we aim to help technologists, operators and policy makers improve the security, privacy and stability of the Internet. Read more about our renewed research vision on our website.

RESEARCH HIGHLIGHTS

LIGHTEST

NLnet Labs is one of the partners in this project, which is funded by the European Commission's Horizon 2020 programme. NLnet Labs contributes its knowledge of Internet standardisation and DNS(SEC) to the project. Over 2018, NLnet Labs contributed to ten deliverables and reviewed three further deliverables.

OPENINTEL

In 2018, NLnet Labs joined the OpenINTEL project. The project's goal is to serve as the "longterm memory" of the DNS and performs daily measurements of over 60% of the global DNS name space. OpenINTEL is built on core NLnet Labs products (LDNS and Unbound). Other project partners are the University of Twente, SURFnet and SIDN. A key highlight of 2018 was OpenINTEL receiving the Dutch National Research Data Prize, which recognises novel large-scale datasets that promise to lead to new insights in their scientific research field

Research

DNS ROOT KSK ROLLOVER
Since early 2017, NLnet Labs participates in the Root Canary project, whose goal is to monitor the DNSSEC Root Key Signing Key (KSK) rollover. This rollover, which was postponed from 2017 to 2018, took place in October 2018. This event coincided with the RIPE and DNS-OARC meetings in Amsterdam.

As a consequence, many key organisations involved in the roll over had staff members in Amsterdam, and NLnet Labs served as host for these organisations during the actual rollover.
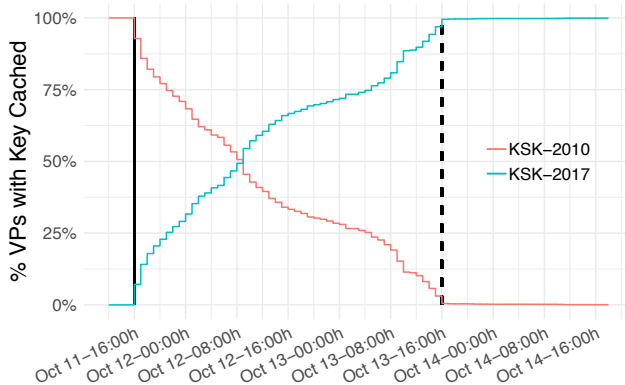
The Root Canary measurements are based on NLnet Labs' DNSThought platform, which in turn uses the RIPE Atlas measurement platform. These measurements played an important role during the rollover. One of the measurements checked how DNS resolvers worldwide picked up the new DNSSEC keyset for the root.
This graph was constantly displayed on a big screen in the NLnet Labs office and helped the Root KSK rollover team track the progress of the rollover. To keep the larger DNS and Internet community updated about the progress, this graph also featured prominently on the front page of the NLnet Labs website over the course of the rollover, and has since shown up in numerous presentations about the event.

NLnet Labs' measurement activities will continue to play a role in analysing the Root KSK rollover event. DNSThought was expanded to support the so-called KSK Sentinel, which allows external observers to check which trust anchors DNS resolvers use. In 2019, NLnet Labs will participate in an international study that will evaluate the DNS Root KSK rollover and provide recommendations for future rollovers.

FURTHER READING
Read more about all the research projects NLnet Labs participates in on our website.

Community Outreach

STANDARDISATION

NLnet Labs is an active participant in the Internet standardisation efforts of the IETF. In 2018, we contributed to multiple Internet drafts that improve DNS security and privacy, that provide guidance on implementing time in Internet protocols and that advance routing security.
Next to contributing to drafts, NLnet Labs is also an enthusiastic participant in IETF hackathons where the goal is to achieve the second half of the IETF's adagium of "rough consensus and running code".

Our further long-term commitment to open Internet standardisation is reflected in Benno Overeinder being appointed as one of the co-chairs of the IETF DNS Operations Working Group.
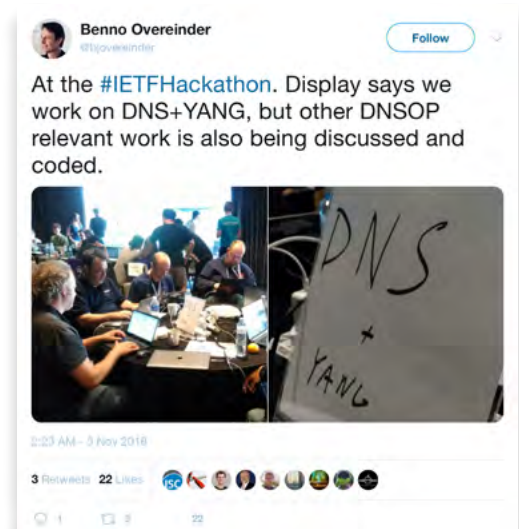
DNS FLAG DAY

NLnet Labs is a supporter of DNS Flag Day. This initiative that brings together leading organisations in open source DNS development and DNS operations, aims to encourage deployment of a more robust implementation of the DNS protocol. Scheduled to take place in early 2019, on DNS Flag Day all open source DNS implementers will remove workarounds for broken EDNS implementations, and large operators will deploy software in production that does the same. NLnet Labs also plans to measure the impact of DNS Flag Day using the DNSThought platform.

INTERNET.NL

NLnet Labs is a member of the Dutch Internet Standards Platform (Platform Internetstandaarden). Through this initiative various partners from the Internet community and the Dutch government collaborate to raise awareness about and increase the usage of modern Internet Standards, such as IPv6, DNSSEC, RPKI, TLS, SPF, DMARC and DKIM.

The website Internet.nl, launched in 2015, is used to educate and entice consumers and businesses to adopt modern Internet standards. NLnet Labs is responsible for the development and maintenance of Internet.nl. In 2018, the project was open sourced. As a result, similar projects have sprung up in Australia, Luxemburg and Portugal, which all use the internet.nl project as a starting point.

Community Outreach

MANRS OBSERVATORY

Mutually Agreed Norms for Routing Security (MANRS) is a global initiative, supported by the Internet Society, that provides crucial guidelines to reduce the most common routing threats. In 2018, NLnet Labs created a toolset that offers a commitment rating for participating organisations. The toolset performs tests automatically and periodically, stores the results in a database and exposes them in a RESTful API which is visualised in the MANRS Observatory.
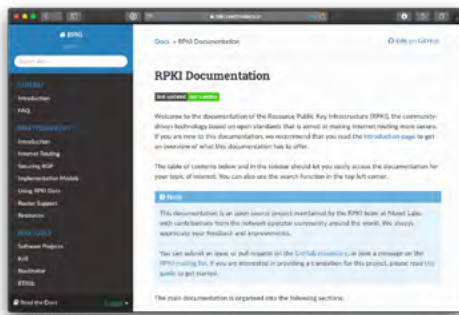
RPKI DOCUMENTATION PROJECT

Toward the end of 2018, NLnet Labs took the initiative to create a comprehensive documentation project for the RPKI ecosystem. Available through the popular "Read The Docs" platform, this project brings together in-depth information about how RPKI works as well as documentation for tools from different open source organisations. The project has already received community contributions, for example from the developers of the RTRlib toolchain, as well as documentation for operational guidance.

PRESENTATIONS

NLnet Labs regularly presents in national and international conferences and meetings. Over 2018, we were present at all IETF, ICANN, RIPE and DNS OARC meetings, at FOSDEM, NLUUG, NLNOG, the NL IGF, the Nordic Domain Days, Holland Strikes Back, and various national events. A full overview and slide decks for our presentations can be found on our website.

COMMUNITY SERVICE

We fulfilled the following community positions in 2018:

ORGANISATION	ROLE	PERSON
IETF DNSOP WG	Co-chair	Benno Overeinder
RIPE	PC chair	Benno Overeinder
Forum Standaardisatie	Member	Benno Overeinder
ICANN	RSSAC Caucus member	Benno Overeinder
ICANN	SSAC member	Jaap Akkerhuis
ICANN	Various advisory roles	Jaap Akkerhuis
ISO	ISO 3166 MA member	Jaap Akkerhuis
Internet Society	Member advisor council member	Jaap Akkerhuis
DNS-OARC	PC member	Ralph Dolmans

Team

NLnet Labs strives to achieve its goals with minimal management overhead. The organisation values diversity, aiming to employ staff members from a wide range of nationalities, cultures and backgrounds. Our goal is to be as open and inclusive as possible, with the love for open source and open standards binding us together. Almost all of the staff is comprised of software developers and research engineers The foundation strives to maintain a compact team, with a healthy mix of experience ranging from junior to senior and people who focus on software development or research. Other responsibilities such as management, product development, finance and auditing, staffing and recruiting, as well as sales and marketing are shared by two people.

DEVELOPMENTS IN 2018

In 2018, two staff members said goodbye. We thank Yuri Schaeffer and Hoda Rohani for their contributions to our projects and wish them good luck in their new endeavours. Two new staff members joined NLnet Labs in 2018:

- **TIM BRUIJNZEELS** joined in July 2018, bringing over a decade of experience in RPKI development to our organisation. Tim is lead developer of Krill, our open source RPKI Certificate Authority. He also regularly presents on RPKI and plays an active role in RPKI standardisation in the IETF SIDR Operations Working Group

- **ROLAND VAN RIJSWIJK-DEIJ** joined in November 2018. He brings more than 10 years of experience in DNS and DNSSEC to NLnet Labs and will serve as NLnet Labs' Principal Scientist. In this role, Roland will initiate new research projects (including attracting funding), collaborate with industry and academia and present research results to the Internet community. Next to his position at NLnet Labs, he continues his part-time position as assistant professor in network security at the University of Twente.

OUTLOOK

For 2019, NLnet Labs is looking for a modest expansion, and is hoping to add a maximum of three team members in software development and research engineer roles. Looking further forward, our goal is to maintain a stable team size, in keeping with our philosophy of a lightweight team with minimal management overhead. We specifically keep one position open for a junior role, as we want to keep space for fresh ideas.

Funding

INCOME FROM SUPPORT AND DEVELOPMENT
A key goal for 2018 was to increase the turnover from support contracts and paid software development. Being a non-profit foundation, NLnet Labs is obliged to follow strict tax regulations and is not allowed to offer taxable services. Therefore, support and development contracts are offered through Open Netlabs B.V. This company is a wholly owned, taxable subsidiary of the NLnet Labs Foundation serving the non-profit public benefit goals of its parent, as well as being guided and managed according its charter.

Open Netlabs B.V. offers support contracts with a service level for our production-grade software packages, such as NSD and Unbound. In addition to receiving support and early access to security patches, the financial contribution also supports our mission to provide free and open software for all. Lastly, Open Netlabs provides training and software development in the area of Internet security standards, as well as consulting services such as installation and integration support, optimisation and auditing.

In 2018, Open Netlabs generated income from both support contracts and contracted software development. We are thankful that this contributes to letting us build free, open source software in a sustainable way. We would like to specifically thank NIC.br, the Mozilla Open Source Support programme, the RIPE NCC Community Projects Fund, the Dutch National Cyber Security Centre, as well as Cisco, Juniper, Nokia and DigitalOcean for their investment in the development of our RPKI toolset.

GRANTS AND SUBSIDIES
Since 2012 NLnet Labs has received a generous subsidy from SIDN. This pledge was renewed in 2017 for another five years. We are also grateful for the substantial, long term grants that Infoblox, Verisign and Internetstiftelsen have donated.

Last but not least, we have also received numerous donations from both organisations and individuals. Our gratitude goes out to Manu Bretelle, Andre Nathan, Peter Philipp, Lynn Grant, Henrik Kramshøj and Tim Wicinski for their generosity. We couldn't fulfil our mission without your support!

OUTLOOK
Looking toward 2019 and further, the financial outlook is excellent. We expect further funding support for the development of our RPKI toolset. In addition, we intend to expand grants-based funding from organisations that support open source development (e.g. the Mozilla Open Source Programme and the Comcast Innovation Fund) to other NLnet Labs products, such as Unbound and NSD. In terms of research projects, we intend to submit proposals to one or more of the new Next Generation Internet (NGI) calls from the European Commission. Looking to the long term future, our goal is to fully support the operational running cost of the organisation with support and development contracts, and to shift the use of grants and subsidies exclusively to fund research and risk-bearing innovation.

Financial Results
NLnet Labs

Income

	2017 ACTUAL (K€)	2018 ACTUAL (K€)	2018 BUDGET (K€)
SIDN Subsidy	250	225	225
Other donations	206	304	204
Consultancy and other income	243	135	136
Research and projects	109	125	200
Income from interest	11	9	12
TOTAL	**819**	**798**	**777**

Expenditure

	2017 ACTUAL (K€)	2018 ACTUAL (K€)	2018 BUDGET (K€)
Staff	631	576	670
Housing	55	55	44
Travel	38	39	46
Depreciation	3	1	
Project costs	59	49	35
Other costs	39	44	59
Sub Total	825	764	854
Negative Result Open Netlabs B.V.	-46	-44	
Project reservations	40	78	-77
TOTAL	**819**	**798**	**777**

Balance Sheet (K€)

ASSETS		LIABILITIES	
Inventory	2	General Reserve	756
Open Netlabs B.V. Stock & loans	354	Special Purpose Reserves	563
Receivables	343	Current Liabilities and Accruals	138
Bank and cash	758		
TOTAL	**1457**		**1457**

Governance

Stichting NLnet Labs was founded on 29 December 1999 by Stichting NLnet.
Its board consists of four to seven members with staggered terms.
The board's composition and most recent rotation schedule is shown below.

NLnet Labs Board in 2018

NAME	ROLE	END OF TERM
Cristian Hesselman	Chair	June 30, 2021
Frances Brazier	Secretary	October 12, 2018
Marieke Huisman	Secretary	August 30, 2021
Ted Lindgreen	Member	March 31, 2019
Sjoera Nas	Member	September 30, 2020
Andrei Robachevsky	Member	June 30, 2019
Jochem de Ruig	Treasurer	June 30, 2021

Four board meetings took place in the year 2018. Benno Overeinder participated in the board meetings in his role as director of NLnet Labs and as director of Open Netlabs BV.

Board members do not receive any compensation for their board work. Expenses may be reimbursed if necessary (€1.470 in 2018). The table below shows the additional functions held by board members and director of Stichting NLnet Labs.

Additional Functions

Held By NLnet Lab Board Members and Directors in 2018

NAME	FUNCTION(S)
Cristian Hesselman	Head of SIDN Labs Member ICANN SSAC Associate Professor University of Twente
Frances Brazier	Full Professor TU Delft
Marieke Huisman	Full Professor University of Twente
Sjoera Nas	Autoriteit Persoonsgegevens Advisory Board SIDN Fonds
Benno Overeinder	See the Community Service section for an overview
Andrei Robachevsky	Technology Programma Manager Internet Society Member EU MSP Standardisation
Jochem de Ruig	Organic wine entrepreneur at Wilde Wijnen

Looking Ahead
To 2019

The year 2019 will be a very special year for NLnet Labs, as it marks our 20 year anniversary! We will, of course, not let this anniversary pass without a celebration with the team.

For 2019, we will continue to support and extend our DNS(SEC) portfolio. We plan to start work on DNS-over-HTTPS support in Unbound, to ensure diversity in implementations of this new protocol. We plan to find external funding for this endeavour. For NSD, we plan to make further speed improvements, especially in startup times and for modern 10–40 Gb/s interfaces. OpenDNSSEC will play a role in a research project we intend to submit to the EU NGI call, to build a robust key management strategy for high value domains (such as TLDs). Finally, for our DNS library portfolio, we aim to make a head start with the long-awaited LDNS2, and will expand the functionality of our newest DNS addition, the domain crate for Rust.

Next year also promises to be an exciting year for our new inter-domain routing software portfolio. We have a host of new features lined up for the Routinator, and aim to have a first working technology preview of Krill ready by the summer. Our ambition is to release a first full production-ready version of Krill by the end of 2019.

Finally, 2019 will also see a much stronger focus on research. Projects we have lined up include participation in a large international study into the DNSSEC Root KSK rollover, and longitudinal studies of the RPKI ecosystem. We will also play a role in chairing and teaching at the TMA PhD summer school in Paris and in October our principal scientist will be one of the chairs of the prestigious ACM Internet Measurement Conference, which will be held at the Royal Tropical Institute in our hometown: Amsterdam!

We look forward to collaborating with all of you in the Internet community!

Credits