NLnet Labs' Strategic Plan

by Benno Overeinder, reviewed by the NLnet Labs' board on 25 October 2015

This the NLnet Labs' 2016 version of its strategic plan.

With this plan we intend to communicate who we are and where we are going, it serves the NLnet Labs Board and Staff but also the parties that support our mission and want to contribute financially.

This is a rolling plan and will be reviewed every 1 to 2 years.

1 The Fundaments

Stichting NLnet Labs (NLnet Labs for short) is a not for profit foundation founded in 1999 in the Netherlands. Its statutes define its objectives: to develop Open Source software and open standards for the benefit of the Internet.[1].

In this chapter we describe our fundaments in terms of objectives, mission, and guiding principles. Our objectives are at the basis of our mission and our guiding principles. Our vision on where we want to be is, in turn, based on that mission and those principles.

The fundaments are the basis for the strategic directions described in chapter 2.

1.1 Mission

NLnet Labs' mission is:
To provide globally recognized innovations and expertise for those technologies that turn a network of networks into an Open Internet for All.

Why?

The Internet is a global system with an impact on our society as profound as the impact of the printing press and the industrial revolution. Its success and societal relevance finds its root in a cultural and technological approach called Openness.

The foundation believes that the Openness of the network, as enabled by technology and policy, thrives human wellbeing and prosperity. By contributing technology and expertise in the form of Open Source Software and Open Standards, we contribute to wellbeing and prosperity for all.

NLnet Labs statutory goals are:

[…] to (further) develop and distribute on a non-profit basis Open Source Software (being software whose source code is freely available to third parties) and Open Standards (being standards developed based on a publicly accessible procedure and that may be used freely by all) for the Internet, and furthermore do all that is directly or indirectly connected thereto or conducive thereto, all this in the broadest sense.

The foundation attempts to realise its object by activities including, but not limited to, the following:

a. enabling talented software developers to develop, expand, maintain and make available Open Source Software and Open Standards for the Internet;
b. entering into collaborations of whatever kind with other developers in the area of developing projects as referred to in (a);
c. promoting a wide circulation of the developed standards or software;
d. making developers available to third parties for the development of (Open Standards for) specific Internet applications.

http://www.nlnetlabs.nl/labs/about/Statuten-20070322-eng.pdf

1 http://www.nlnetlabs.nl/labs/about/Statuten-20070322-eng.pdf for the English translation.

1.2 Guiding Principles for setting direction

The objectives of the NLnet Labs foundation are captured in its charter:

> *"[...] the foundation's object is to (further) develop and distribute on a non-profit basis Open Source Software (being software whose source code is freely available to third parties) and Open Standards (being standards developed based on a publicly accessible procedure and that may be used freely by all) for the Internet, and furthermore do all that is directly or indirectly connected thereto or conducive thereto, all this in the broadest sense."*

In addition to the chartered objectives, NLnet Labs takes into account the following guiding principles for setting direction (some of which are recognized from the mission statement):

1. Technological focus on an Open Internet: we focus on those technologies that are needed to turn a collection of individual networks into one Internet. Those technologies are not directly targeted to the users of one network but enhance quality, security, scalability, openness, transparency and the trust in the Internet for all of its users.
2. Applied research and development: we provide products, knowledge and results that need to be deployable or applicable on the *Internet of today*; the work takes place on the edge between academic research and industrial deployment.
3. Global commons: the work we do is targeted towards the benefit of the public. Not necessarily places where economic benefit can be gained by working on the technology.
4. Long breath: some technologies will take years to catch on; we also invest time and effort in those topics where persistence and zeal are needed.
5. Research and open-ended innovation: there is time and space for ideas to mature.
6. Technology has societal impact: standardization and governance aspects are relevant for the successful impact.

1.3 The Internet Environment

The Internet has caused a paradigm shift equal to the shift caused by the invention of the printing press and the steam engine.

By 2016 the Internet Economy is expected to amount to $4.2 trillion or 5.4 percent of the GDP across the G20 countries, while 3.5 Billion people will be using the Internet.[2] This market is expected to grow only for the Internet of Things (IoT) with an anticipated $7 trillion market in 2020.[3]

At the same time the Internet ecosystem is in constant flux, new technologies flourish while at the same time older technologies tend to get ossified. Changes are not only technological, the Internet today has a different impact on our life and society than it had a decade ago. Risks of ossification is that security and problems get harder to solve which in turn may cause distrust of the general public in the Open Internet. The economical, political and regulatory environments has changed enormously and are likely to change in the coming decade too. Society continues to come to grips with tradeoffs between sovereign public policy objectives and a global open network. The use of the Internet for less benevolent purposes such a theft and cyber warfare may also deteriorate trust.

Factors that play a role in shaping the next decade are the (imminent) outrun of IPv4 and whether there is significant uptake of IPv6 technology; different economic and regulatory regimes in those regions where Internet use is growing most; the rise of middle boxes; and the dynamics of the domain name industry and how domain names are used in the Internet of Things. Besides, (short

2 Paraphrased from "The Trillion Dollar Question", a paper by the International Digital Economy Alliance which based these numbers on: Boston Consulting Group, *The Internet Economy in the G-20: The $4.2 Trillion Growth Opportunity, March 2012* and McKinsey Global Institute, *Internet Mattters: The Net's sweeping impact on growth, jobs, and prosperity,* May 2011.

3 Worldwide and Regional Internet of Things 2014-2020 Forecast, IDC.

term) commercial interests have the tendency to ignore the principles that allow for permission-less innovation.

NLnet Labs is uniquely positioned to assess these sorts of treats and provide technical leadership in dealing with aspects of these problems.

1.4 Where are we going

NLnet Labs mid term

In 3 to 5 years from now:

- We continued to be a leading change agent for technologies[4] that enhance and stimulate trust, security, privacy, and the global nature of the Open Internet. We are recognized as an impactful stakeholder in the creation and use of Open Standards, Open Software, and the Open Internet in general.
- We are leading experts on Internet system technology and architecture that are being utilized with a focus on the technologies in the *waist of the hourglass*: DNS, IP, and Routing. These are the technologies that benefit the users of the Internet at large; which provides security, stability, scalability, reliability, and trust; and technologies that are crucial for further growth and maintaining the openness of the Internet.
- By creating powerful and professional tools and methods we have driven down the costs and risks of the deployment of technology that doesn't immediately bring individual benefit but increases the stability and security of the Internet as a whole. By doing so we continue to make a difference in the adaptation of security technology and methodology that enhances trust in the global open Internet. We indiscriminately provide support to the Internet community for our software and tools.
- We have in-depth knowledge about the security and stability aspects of global DNS and Routing. Our software is generally known, used, and appreciated in the related communities. The value of these tools is recognized through sponsorships.
- We are a lightweight organization with small overhead and a staff size between 5 and 10 highly skilled persons.
- We are closely affiliated with Open Netlabs BV, a wholly owned subsidiary, that provides commercial services on NLnet Labs products and provides part of NLnet Labs' funding.
- Our alumni, both students and staff, are found throughout the Internet industry.

1.5 Beyond the mid term horizon

In the long term NLnet Labs will continue to position itself as the neutral technical expertise center for those technologies that bind a multitude of networks into one Open Internet. It will do so by finding pragmatic approaches to bridge between theory and practical deployment by contributing to the development of Internet protocols, technology, and expertise. But also, when needed and from a perspective informed from our technical work, to inform, educate, or assist during the development of global, regional, or national policies that impact or are impacted by the open Internet.

The specialism and expertise of NLnet Labs are a starting-point for which avenues are pursued. Exploration of new emerging areas relevant to the future of the Internet that fuel potential collaborations with other parties are inherent to the role NLnet Labs plays in the field.

Subjects that are typically in focus are changes in naming, addresses, and routing (*e.g.* named data networking); Openness and Innovation in an ossified and heavily consolidated environment,

4 Technologies is a broad term encapsulating software, protocols, architecture, and practices. Our focus is less on hardware aspects.

or '*Openness through Overlay*'. The latter term meaning Internet users working around limitations imposed by regulation or ossification, business incentives, by building overlay networks and possibly causing paradigm shifts.

One of the main selection criterion for projects is whether our contribution has the potential to impact the deployment of certain technologies, whether our participation serves public interest and changes the needle towards an open and innovative Internet environment available to all.

2 What and How

2.1 Approach

The methodology by which we proceed is of strategic nature. So, before we describe *what* technology areas we consider strategic we describe the general approaches on *how* we work accomplishing progress towards fulfillment of our mission.

2.1.1 Code at the core

Software as strategic instrument

NLnet Labs has demonstrated that it most effectively impacts the improvement of trust, security, privacy, stability, and resiliency of the global Internet by writing high quality, usable, and maintained open-source software, or code for short.

Such software can only be developed when having deep understanding of technologies and communities, which in turn helps us do develop a fairly unique view on the Internet eco-system that helps us broaden our network beyond the technical communities. The need for globally interoperable code leads to competence in standardization activities. The interactions with the technical and non-technical communities inform us what code serves the Open Internet best and our experience with code helps us promote the Open Internet in various communities.

2.1.2 Improving usability and lowering TCO

A number of technologies that are needed to improve scalability and trust in the Internet have proven difficult to implement (IPv6, DNSSEC, BCP38). NLnet Labs believes[5] that lowering the barrier to the global adaptation of security innovations can be done by

- making innovations simple to deploy and operate;
- demonstrating relative advantage;
- making the innovation compatible with the existing environment;
- making the innovation try-able;
- and making the result of innovation observable.

The capex, opex and risks of introducing a new innovation need to be in balance with the return of the investment. By improving the usability of our existing software we are likely to expand its impact. We will invest in improving ease-of-use by supplying management tools and GUIs where it serves our mission.

In order to reduce continuity risks for those who deploy our software we commit to support of the software to the general public.

Training, support in deployment, targeted support, tech consultancy on the products is explicitly outside of the scope of NLnet Labs. A wholly owned commercial subsidiary called OpenNet Labs B.V. will be taking responsibility for the commercial aspects of NLnet Labs created software.

5 This is founded on the observation that diffusion of Internet technology follows the same patterns as other innovations. See e.g. https://ripe66.ripe.net/archives/video/7/

2.1.3 Evangineering the Open Internet

The technical work in the areas above have an impact on how the open Internet evolves. That evolution impacts and is impacted by the way the public uses the Internet. A good technical understanding should be informed by those issues. At the same time the public, its policy makers in particular, should be well informed about the properties of the Open Internet and the technology that enables or disables it.

NLnet Labs responsibly bridges the technology-policy gap wherever it has applicable expertise.

2.1.4 Growing the talent pool

Exposure to the development of open-source and open-standards and an understanding of the cultural aspects that come with the Internet's technology and governance structure helps to establish the evangineering aspects in the long term. NLnet Labs trains students through internships and welcomes, and sometimes encourages, talents to join the organization, absorb all possible knowledge, gain experience and move on.

2.2 Research Topics and Areas of Innovation

2.2.1 DNS and DNSSEC

In addition to improving usability of our existing code we invest in extending functionality to allow for easier provisioning at the server side as well as increasing the utility of DNSSEC at the client side of the DNS architecture.

The impact of work in this area is that it allows the DNS to evolve towards being a component in brokering global trust, which in turn impacts the ability to innovate and trust the Internet as a whole. DNSSEC and DANE also plays an important role in improving privacy of end-users on the Internet by protecting data from eavesdropping.

These two tracks of server and client side are further detailed below.

2.2.1.a Provisioning or Server Side

The DNS serves a purpose: making available domain based resource information to the global Internet. Historically this information has been centered around rendez-vous type of information like the addresses of machines, the location of mail servers for domains, and other generic service discovery. With the introduction of DNSSEC it becomes more attractive to put public keys in the DNS so that security credentials for domain-based resources can be exchanged.

At the server side we will be looking at tools that allow bundling of DNSSEC capabilities with the applications. For instance, configuration and provisioning public key cryptography for technologies like DANE (offering alternative certificate exchange mechanisms for encrypted transport) and DKIM (offering authentication mechanisms that help to cope with spam).

The overall trust in the provisioning of DNS records itself is an important component of this and while NLnet Labs will contribute to tools and technology to increase the trust in the DNS provisioning itself, the governance of global DNS provisioning is probably a more important aspect (see section 2.1.3).

2.2.1.b Client Side Availability

In order for the DNS to be used as a global repository for security informations the application will need to get first hand information about the status of DNSSEC validation. The current state of DNSSEC deployment is at the recursive name server. The challenge of moving the DNSSEC validation information from the recursive name server to the client is called the 'last mile' challenge.

NLnet Labs will be concentrating on solving issues that prevent the 'the last mile' thereby making DNSSEC available to the applications. Issues that need solving are:

1. availability of programatic interfaces so that applications get access to DNSSEC

information

2. availability of libraries in several environments to assist the development of DNSSEC solutions and implementation of APIs
3. difficulties in actual deployments, such as the roaming of users in the presence of various middle boxes

These actives involve developments, measurements and experiments, and protocol development to understand and address the ossified nature of some of the Internet's environments.

2.2.2 Routing

Security and Stability of the routing fabric are other components for trust in the Internet.

We will develop tools that ease the exchange and validation of route information which in turn can be used to perform origin and path validation.

In addition we building the understanding on what are the features that allow for a stability in the routing system.

2.2.3 Evolution at the waist

IP evolution is a broad term for the evolution that takes place around the waist of the Internet hourglass, it is an area of our interest because the developments in this area are a logical extension to our current work.

Work in this area is done to maintain a solid understanding on how the Internet is likely to evolve and the approach taken is to identify concrete projects and collaborations and perform short term (of the order of several months) projects.

Our interest in this area is characterized by questions like:

- Will new routing paradigms like Software Defined Networking make a transition to global inter-AS network routing?
- What are the consequences on a slow IPv6 uptake, what are the deployment incentives that can be triggered, and what are the effects of carrier-grade NATs on the Open Internet?
- Are there viable new transport mechanisms (think multipath TCP, UDP, QUICK optimizations or alternatives)?
- Which innovations can improve the current inter-AS network routing stability, and provide a consistent and correct expression of routing policies of the ASes?

2.3 Financial Continuity

NLnet Labs is a not-for-profit foundation under Dutch law.

Traditionally it has relied on a subsidy from one private party: The NLnet Foundation. Unfortunately the NLnet Foundation was not able to continue its support as of end 2015.

More recently SIDN has funded half of the revenues needed for NLnet Labs' exploitation. From 2016 onwards NLnet Labs diversifies its income by identifying and engaging with more parties to provide a continued commitment to fund its work and by cooperating with a wholly owned subsidiary that pursues commercial opportunities based on NLnet Labs software and services (e.g. commercial support, training, etc). Both these pursuits are detailed below.

2.3.1 Subsidy Sources

In order to diversify its funding

NLnet Labs seek multiple parties

- that subsidize NLnet Labs general activities based because they share our vision and want

to contribute to our mission;

- that subsidize NLnet Labs because they want us to continue to develop and support, for the general community, specific types of software. For instance, entities that want to support our DNS development efforts, NSD, Unbound,or OpenDNSSEC in particular;
- that subsidize and collaborate in general areas;
- that subsidize very specific developments or fund specific types of research;

In all cases the subsidy is applied towards outcomes that benefit the Internet at large.

NLnet Labs is looking for a small (between 5 and 20) number of benefactors that is able to provide multi-year support in order to provide continuity without the overhead of fundraising.

2.3.2 Wholly owned subsidiary

NLnet Labs also owns a commercial subsidiary of which all profits contribute to NLnet Labs mission. The subsidiary is the logical place for users of NLnet Labs software to seek commercial support and services. One can think of commercial support, specific consultancy, or proprietary extensions to NLnet Labs software.

The commercial subsidiary is independently managed and organizationally separated from NLnet Labs.

3 Implementation

This strategic plan is implemented through an annual planning and reporting cycle. The annual plans made available to immediate stakeholders or interested parties after motivated request. Annual reports are available on our website. NLnet Labs works with a budget and planning cycle that is aligned with the calender year.

For specific projects the board may earmark project funds or project reserves so that multi-year commitment for the development and delivery of a certain project can be secured.