IXP Manager

Sponsors' Report

For Year End 2017

This is the public version. The only differences to the sponsors' version is that we have removed bank statements and summarised the income / expenditure tables.

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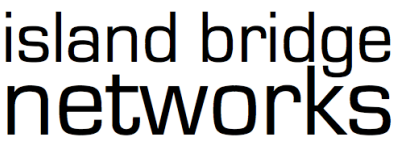

Executive Summary

In early 2016, INEX realised that to fully develop IXP Manager into what the organisation hoped it could be, a more sustainable funding model and a full time developer were required. A call for sponsorship[1] was published in several industry forums and we were delighted with the response: three platinum sponsors and two bronze sponsors, which met 91% of the projected year one requirements.

These sponsors are:

Name	
Internet Society	
Netflix	
SwissIX	
NIX (University of Oslo)	
GRNET	
Total	**€60,240**

The *Call for Sponsorship* document outlined how we would structure the program, the budget required, project oversight, project management and development plans.

This document, the 2017 Sponsor's Report, provides a detailed list of activities undertaken in the last year, and shows full compliance with the project's development plans.

To summarise, we have met the following milestones in the last year:

- Known numbers of IXPs using IXP Manager has grown from 26 to 45 known installations. We feel that this is the best possible positive indicator from your sponsorship and we are proud of this increase[2].
  Some of the newer users have allowed us to drop pins in our users' map in Asia (China and Thailand), Canada and several more in Africa and Europe.
- A full time developer was hired in December 2016. The financial period covered by this document includes some expenditure incurred in 2016 in addition to all expenditure to date in 2017.
- Official release of version 4 (tagged as version 4.5) and a further point release, v4.6.
- We expect two more releases before year end 2017.
- A new dedicated website: https://www.ixpmanager.org/.
- A new automated documentation framework: http://docs.ixpmanager.org/.
- New router management and configuration generator.

[1] https://www.ixpmanager.org/sponsorship.php
[2] https://www.ixpmanager.org/users.php

- Patch panel management, LoA generation.
- Layer2/MAC address management.
- Release of Grapher, a new graphing generation and management mechanism.
- Bespoke looking glass for route collectors and route servers.
- Continued migration of code from the end of life Zend Framework to Laravel, a modern popular PHP application framework.
- Continued outreach through presentations and mailing lists.
- A new logo.

Sponsorship Expenditure

The intellectual property rights and copyright to IXP Manager are owned by INEX (Internet Neutral Exchange Association Company Limited by Guarantee), a not-for-profit industry-owned company registered in Dublin, Ireland. INEX owns and operates Internet Exchanges in Dublin and Cork.

As we detailed in the call for sponsorship document, project development for IXP Manager is handled by Island Bridge Networks Limited, a company registered in Dublin, Ireland. The directors and sole owners of this company are Barry O'Donovan, the IXP Manager lead developer / project manager and Nick Hilliard. Both Barry and Nick separately contract to INEX in operational roles.

Development of IXP Manager is handled on a non-profit basis by Island Bridge Networks Ltd. All rights to the IXP Manager code developed under this sponsorship arrangement are transferred by Island Bridge Networks Ltd to INEX.

This arrangement is structured in this way because INEX is an Internet Exchange Association and has no in-house software development expertise. Due to its constitutional neutrality and not-for-profit corporate structure, it is an appropriate organisation for holding the intellectual property and copyright ownership of this open source project.

Under the sponsorship arrangement as originally proposed - Island Bridge Networks Ltd:

- Recruited and hired a suitable PHP developer.
- Provides office space and a suitable working environment for the developer.
- Handles all employee arrangements including: contracts, pay, tax, insurance, other financial, tax and legal obligations, annual leave, etc.
- Maintains a dedicated bank account for all financial matters relating to this project (statements included at end of this document).
- Invoiced all supporting organisations on an pre-agreed basis.

The year one projected budget against actual expenditure is as follows:

	Budgeted	Projected Y/E 2017
Total	**€65,325**	**€56,448**

Some notes on the table above:

- We hired Yann Robin, the developer, in mid-December 2016. This incurred some expenditure in 2016 such as recruitment costs, logo costs and a couple of weeks salary. The figures presented above include these but otherwise relate to the calendar year 2017 projected to December 31st 2017.
- In our original budget, we did not include a recruitment fee but we did state: "*a recruitment fee may also be necessary if it proves impossible to find a suitable PHP developer. However we will endeavour to do this through local PHP user groups and the networking community*". In the end, we used a recruitment website. During the hiring process, offers were made to two other developers but they declined the position.

- Yann did not travel this year but it is intended that he will travel in 2018.
- We were able to defray cloud service costs as Island Bridge Networks had a spare Dropbox license and we were able to get by without adding Yann to our Zendesk account. If circumstances change, this expenditure may be necessary in future.
- Island Bridge Networks offers all employees home broadband. This was accidentally omitted from the original budget.

Income versus Expenditure

Through the generosity of our sponsors, we have raised a total of €60,240 in our first year of sponsorship. When we exclude capital expenditure and other one off costs, we expect the year two budget to be approximately €61,000.

If our current sponsors maintain funding, if we take into account an expected funding reduction from ISOC, and carry over the year one excess, we expect funding to break even for year two.

We will, however, continue to try to attract more sponsorship to reduce the burden on our existing sponsors and to ensure a wider base of sponsors should we lose any. Additionally, we will also try and attract sponsorship from more Internet Exchanges using IXP Manager as it is critical for us to have user buy in.

Year One Achievements

We set out the following specific year one achievements as well as a longer term three-year view.

Note that we have only benefitted from an estimated 7.5 months of productive working time from Yann, our developer, as he started mid-December but took two-weeks unpaid leave during the Christmas period and then required time to immerse himself fully into the project. We estimate that this represents approximately 70% FTE from mid-December 2016 to mid-October 2017.

We have also postponed some of the immediate goals to achieve other more pressing and topical issues (detailed after the initial list below).

- Installation and upgrade improvements.
  DONE: Improvements made to our Vagrant installation and documentation. Additionally, a script has been created and released which fully installs IXP Manager on a clean Ubuntu installation. We will continue to work on making IXP Manager easier to install and upgrade.

- Dedicated web site.
  DONE: see https://www.ixpmanager.org/

- New logo.
  DONE: visible on the project website and all documentation, including the cover page of this document.

- Complete and release IXP Manager version 4.
  DONE: Released in May 2017 as v4.5.

- Write well-structured and detailed documentation.
  DONE: see: http://docs.ixpmanager.org/ (and ongoing).

- Layer 2 ACLs – most IXPs are moving towards static L2 ACLs rather than dynamic port security. We want IXP Manager to provide database management, a user-interface for updating them—including member facing for router changes—and zero touch provisioning to our switches.
  DONE: Layer 2 ACLs were released as part of v4.5.

- Augment reseller functionality to also allow for trunk ports ("p-tags") which also requires graphing updates, peer to peer updates and database schema considerations. We note that a small part of this work was funded by a separate bounty project requested and kindly funded by DE-CIX.
  PARTLY-DONE: Graphing updates complete.

- Patch panel / cross connect management.
  DONE: Released as the headline feature of v4.5 and Yann's first major contribution to the project. This was a milestone project for us and is a significant piece of work, both in scope and utility for Internet Exchanges. Details and screen shots are available on the documentation web site:
  http://docs.ixpmanager.org/features/patch-panels/

- Add REST API endpoints for members (e.g. access to their port and peer to peer graphs programmatically).
  DONE: (and ongoing).

- Use the new developer to provide front line support on the mailing list to get him/her fully immersed in the project, its users and their user experience issues.
  DONE: (and ongoing).

From the broader three year outlook we also achieved:

- Better integration with tools such as Smokeping.
- Built-in looking glass for route collectors and route servers.
- Multiple security audit analysis fixes

The above represents approximately 75% of our Y1 planned goals on the basis of approximately 70% of a developer FTE (full-time equivalent). We believe that this is an excellent achievement and demonstrates strong compliance with the project sponsorship goals.

Unannounced Developments

We have two as yet unannounced / unreleased development subprojects that are broadly completed but awaiting code review, documentation and minor tidy-up:

1. **Core bundles:** Most IXPs have more than one switch and IXP Manager has previously not included functionality for managing the links between these switches. Yann has developed code to support this infrastructure in the database. The feature allows IXPs to create Layer 2 and/or Layer 3 internal infrastructures and the functionality allows IXPs to implement advanced network automation, internal graphing support, monitoring and alerting support, in addition to automated generation of IXP network diagrams and weather maps.

2. **IXP Automation:** IXP Manager can use this information generate the necessary data representations for an IXP to create a complete configuration of the switching layer. Candidate automation implementations will be provided under the open source GPLv2 license by INEX to integrate IXP Manager with NAPALM and the SaltStack automation system, initially targeting Arista and Cumulus platforms.

This functionality will be released in production versions of IXP Manager by the end of 2017.

Publicity

IXP Manager has been or is scheduled to be headlined at the following conference presentations between October 2016 and October 2017:

- IXP Manager Workshop, Euro-IX 28, Luxembourg, April 2016
- "IXP Flow Telemetry via IXP Manager", RIPE73, Madrid, October 2016
- "IXP Flow Telemetry via IXP Manager", Euro-IX 29, Krakow, November 2016
- ISOC IXP Workshop, Skopje, Macedonia, November 2016
- Operations Update, INEX Members, Dublin, March 2017
- "Introduction to IXPs", IXP formation meeting, Beirut, March 2017
- "Cross Connect / Patch Panel Management", Euro-IX 30, Spain, April 2017
- "IXP Manager Update", GPF 12.0, New York, USA, April 2017
- "Automation with IXP Manager", NLNOG 2017, Amsterdam, September 2017
- "Automation with IXP Manager", INEX Members, Dublin, September 2017
- "Automation with IXP Manager", Euro-IX 31, Bratislava, October 2017
- "Automation with IXP Manager", RIPE75, Dubai, October 2017

Development Goals – Year Two

As well as continuing work on automation and completing all remaining action points from year one, the following sets out what we aim to achieve in year two:

Completion of Migration to Laravel Framework

Under the hood, IXP Manager v4 still depends on an PHP framework called Zend Framework V1, which was declared end-of-life in 2016. An architectural decision was made to migrate the application to the Laravel framework in order to ensure IXP Manager's long term development viability.

All code written under the IXP Manager sponsorship program has been Laravel compatible, and work continues to migrate the rest of the application. However a substantial quantity of older Zend Framework code still remains.

We plan to continue this migration and, once completed, release this as IXP Manager version 5.

End User Facing Portal

While IXP Manager has gained an large amount of IXP operator functionality, the end-user / end-network areas have remained relatively unchanged in several years.

We intend to completely redesign and refresh this area with a more structured UI and UX plan which is to include:

- Restructuring of the user authentication mechanism to make the user experience simpler.

- Better layout of useful tools including the route server prefix analysis tool and the looking glass.
- A status report showing any issues which is to include:
    - error counters on peering ports;
    - route collector / server / AS112 service BGP sessions down; and
    - advertised prefix count vs max prefix setting thresholds.
- A more intuitive view of graphs.
- Ability to update all aspects of customer information including billing details, peering, NOC details, port MAC addresses, etc.
- Integration of IXP member news, Twitter feeds, Blog or LinkedIn news feeds, etc.

Authentication Redesign

Authentication is currently handled by Zend Framework. We need to:

- Move this to Laravel.
- Remove the username and instead key uniquely from email address.
- Allow end users to be associated to more than one network (many engineers are contractors, and work for more than one network).
- Allow OAuth authentication against services such as Google, Facebook, Twitter, LinkedIn and GitHub.
- Build a OAuth service to work with PeeringDB.
- Add two factor authentication.

Route Server Prefix Analysis Tool

The route server prefix analysis tool is an invaluable service which helps members to identify prefixes which are blocked by the strict prefix filtering mechanism of the route servers.

Currently this takes a view from a single route server via a script that runs a couple of times a day. We want to introduce large BGP community tagging on the route servers to:

- provide a view of all route servers on all LANs;
- highlight why prefixes are filtered (RFC1918, no route object, IPv4 prefix < /24, IPv6 prefix < /48, etc);
- integrate this functionality into the Birds Eye looking glass rather than a standalone tool.

Advanced P2P Functionality

IXP Manager's peer to peer graphing feature is one of its most popular end-user features. We would like to advance this functionality to use a time-series database backend and present more useful, real-time information to our members.

This includes tasks and features such as:

- Selection of an appropriate time series database from candidates which include Carbon (of Graphite), InfluxDB and OpenTSDB. The initial goal will be to support the

scale requirements of a medium-sized IXP, and the mechanism will be programmed to be able to easily support other backends. The existing RRD based backend will be maintained.
- Addition of functionality to provide more structured data rather than just unordered peer to peer graphs: top ten peers, combined graphs, unusual traffic, etc.
- Attempt to automate the selection of sample rates for ports with low traffic rates to more accurately represent their traffic.
- use of peer to peer information to calculate and graph overall peering traffic rather than just rely on port statistics.

This action item is carried over from the previous year one goals.

Installation and Upgrade Ease

We plan to continue work on simplifying the installation and upgrade procedure through the use of a web-based installation wizard to ask relevant questions and handle most of the tasks automatically.

Some progress towards this has already been made through the use of Vagrant for setting up fully functional development boxes with just three commands, and a fully automated installation script to install IXP Manager on a bare bones Ubuntu distribution.

Development Outlook

Outside of the immediate year two goals mentioned above, we have plans that we would like to achieve over a longer timeline, which include:

- Continued integration of IX-F Member Schema targeting export to IX-F IXP database and PeeringDB.
- Completion of Helpdesk integration.
- Intelligent stream-lined provisioning of new ports and upgrades. This is less about automation and more about the end-user request and fulfilment experience.
- Continue to work on collateral such as recorded tutorial videos, in-person workshops, continuation and improvement of IXP Manager documentation.
- Develop on-demand provisioning via queuing mechanisms. This means, for example, rather than having to wait for a batch job to run at designated times to have new route server sessions provisioned, they can be provisioned on demand.
- Further development *My Peering Manager* to include route server session management, for example allowing members to opt in / out of peering with certain other members on the route servers without having to rely on community tagging.
- Embark on projects such as more intelligent monitoring of customer peering sessions via services such as RIPE Atlas.
- Customer audit – automated review of a customer's services and highlight issues such as port errors; inactive BGP sessions with route collector / route server / AS112, etc.; ports spiking at high utilisation rates; missing sessions with peers with open policies, etc.
- Internationalisation and localisation of the customer facing areas. While English may be the predominant language in the networking industry, end users of IXP Manager should be able to interact in their own language.

Accounting Ledger and Bank Statements

What follows is the accounting ledger for year to date with projected values to year end 2017.

The following notes accompany the ledger:

- All documents, invoices and bank statements relating to this are available to the sponsors on request. Island Bridge Networks Limited maintains a dedicated bank account for this project and can share all documents via Dropbox.
- All office expenditure figures which mention “20%” relate to the fact that Yann is 1 of 5 people based in Island Bridge Networks’ offices. This percentage will decrease if Island Bridge Networks hires additional staff.
- In Ireland, all employers are obliged to remit Emloyers’ Pay-Related Social Insurance to the Irish tax authorities. Employer’s PRSI is levied at varying rates (8.5% and 10.75% for PRSI Class A employees), is levied on top of the employee’s gross salary, and is separate to Employee’s PRSI. Further information about Employer’s PRSI can be found on the web site of the Department of Employment Affairs and Social Protection.

Omitted from public version, available to sponsors.