



IXP Manager Sponsorship Program

Sponsors' Report

For Year End 2021

Barry O'Donovan on behalf of The IXP Manager Sponsorship Program



island bridge
networks

Diamon Sponsors



Platinum Sponsors



Gold Sponsors



Silver Sponsors



Bronze Sponsors



Executive Summary

IXP Manager has now completed the fifth year of the IXP Manager Sponsorship Program¹. You can read the past sponsorship reports on the website.

The 2021 sponsorship funding was made up of:

Name	Value
Amazon	€15,000
APNIC	€24,810
CIRA *	-
Facebook *	-
GRIX	€2,000
InterLAN	€1,000
Internet Society (ISOC) *	-
INX	€5,000
LONAP	€6,806
NAMEX	€2,000
STHIX	€5,000
Total	€61,616

* As you'll read within this document, our full-time developer moved on after five years and we did not replace him in 2021. As such, the program's funds are healthy and we decided to recruit a new developer before proactively seeking sponsorship renewals.

Full details of the structure of the program, project oversight and project management can all be found on the project's website² and these are in line with the original *Call for Sponsorship* document from 2016 (also on the website).

This document, the 2021 Sponsors' Report, provides a summary of activities undertaken in 2021, and shows full compliance with the program's objectives.

¹ <https://www.ixpmanager.org/sponsorship>

² <https://www.ixpmanager.org/sponsorship/terms>

To summarise, we have met the following milestones in 2021:

- Known numbers of IXPs using IXP Manager has grown from 147 to 182 installations. Over the four years of the sponsorship program, there has been more than a eight-fold increase in this metric. We feel that this is the best possible positive indicator from your sponsorship and we are incredibly proud of this growth³.
- A full-time developer was hired in December 2016 and remained with the project for five years until August 2021⁴.
- Official releases of versions v5.8, a milestone release v6.0, v6.1 and v6.2 (including additional bugfix and security releases of these).
- Continued additions to the official documentation at <http://docs.ixpmanager.org/>.
- Continued outreach through presentations, workshops and mailing lists (albeit much reduced to the Covid-19 global pandemic).
- Created additional tutorial videos for the installation and use of IXP Manager.

The year-end 2021 financial position of the IXP Manager project fund is:

2021 Opening Reserves	€ 32,222
2021 Sponsorship Income	€ 61,616
2021 Expenditure	€ (32,400)
2021 Closing Balance	€ 61,438

As part of our commitment to transparency and to fulfil the financial reporting requirements to our sponsors, we have an external chartered accountant prepare an independent report on the accounts each year. You can find the 2021 accountant's report on the sponsorship reports section of the website⁵.

³ <https://www.ixpmanager.org/community/world-map>

⁴ <https://www.ixpmanager.org/about/news/a-word-of-thanks-to-yann-robin>

⁵ <https://www.ixpmanager.org/sponsorship/reports>

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, the IXP Manager Sponsorship Program is run by Island Bridge Networks Limited (“IBNL”), 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, INEX’s CTO. Both Barry and Nick contract to INEX in operational and other roles.

Development of IXP Manager through the sponsorship program is handled on a not-for-profit basis by IBNL. All rights to the IXP Manager code developed under this sponsorship arrangement are transferred by IBNL to INEX (i.e. IBNL is a signee of the Contributor License Agreement⁶).

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 and as implemented - IBNL:

- 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.
- Invoices all supporting organisations on a pre-agreed basis.
- Reports on the project at Euro-IX Forums in whatever format the Euro-IX Forum Program Committee deems to be appropriate. We also make a number of presentations to other conferences and meetings⁷.

⁶ <https://docs.ixpmanager.org/dev/cla/>

⁷ <https://www.ixpmanager.org/support/talks>

The year four summary expenditure is as follows:

	Budgeted	Y/E 2021
Developer Costs	€55,375	€28,407
Hardware (budget = €3,600 less 2017-19 spend):	€525	€0
Software Licences	€900	€551
Travel (2 x Euro-IX)	€1,200	€0
Rent (plus supplies and sundries)	€3,600	€2,572
Insurance	€150	€0
Other Costs	€0	€259
Home Broadband	€0	€211
Accountant's Report	€0	€400
Total	€61,750	€32,400

Some notes on the table above:

- The budgeted costs figure reflects the original call for sponsorship numbers from 2016 which included a year 2 and year 3 estimate. **These estimates have held up remarkably well into the fourth year.** We are now on the fifth year and our developer moved on two-thirds of the way into the year.
- The developer costs are significantly down as they are reduced by an additional €5,400 which was a redundancy contingency kept by Island Bridge Networks Ltd. Under Irish employment law, employees are entitled to a statutory redundancy payment based on number of years worked. IBNL maintained an annual contingency fund for this purpose. As the developer resigned and moved on (i.e. was not made redundant), this contingency has been released back into the project.
- The original budget separated *Software Licences* and *Cloud Services*. These have been merged above.
- IBNL offers all employees home broadband. This was omitted from the original budget.
- Rent is costed to the project as 1/n of IBNL's rent bill where n is the number of employees. This is pro-rated to when the developer moved on. Insurance (which covers employee liability and all risks for the developer's laptop) is also charged at 1/n of IBNL's cost – no charge was made for 2021.
- IBNL has not charged other incurred expenses such as staff parties, other office costs, entertainment, etc. to date.
- IBNL has not apportioned any costs for the administrative overhead of the project's management.

Income versus Expenditure

Through the generosity of our patrons and sponsors, we have raised a total of €61,616 in our fifth year of sponsorship. In 2016, our year 3 estimated costs (when we exclude capital expenditure and other one-off costs), was €61,750. Despite representing estimates from over five years ago, this has still come in under budget when pro-rated for the developer's two-third year – 61.1% of the budgeted costs vs. 66.7%

The accumulated reserves of the project at year end 2021 now stand at:

- Accumulated reserves as at January 1st 2021: €32,222
- Surplus for financial year ending December 31st 2021: €29,216
- **Total accumulated reserves at December 31st 2021: €61,438**

These accumulated reserves will be used to:

- Offset any sponsorship shortfalls for 2022;
- Extend the project lifetime into a sixth year; and
- Cover additional travel costs to deliver workshops and presentations and create increased project visibility (and thus sponsorship payback).

Publicity

Ordinarily we would do a number of in-person IXP Manager related talks at appropriate events in any year. Due to the global pandemic in 2020 and 2021, travel was curtailed and only two talks were delivered – details on the website⁸.

The time was put into other endeavours including a new and comprehensive six-part video tutorial on IXP Manager and route servers. There was no cost to the Sponsorship Program for this. See:

<https://www.ixpmanager.org/support/tutorials>

New Website

In June 2020, we knew of nearly one hundred internet exchange points (IXPs) around the world who were Powering Peering using IXP Manager. In recognition of this upcoming milestone, we developed and launched a new website which provides a better insight to the world's favourite IXP platform.

Our new website reflects the professionalism and maturity of the platform itself and the essential internet services it helps enable. It serves as the online headquarters of the project

⁸ <https://www.ixpmanager.org/support/talks>

where visitors can get the latest news, explore our community of users and find help through our plentiful support channels.

In particular, we wanted to better recognise our sponsors and patrons and give them the credit they deserve. The sponsors' section lists all our current and past sponsors, explains the current sponsorship structure and provides an archive for all the related reports.

We also wanted to recognise the wider community who contribute to the project with code, documentation and opening and working on feature and support requests. In all, 110 individuals, at time of launch, had worked with the project through GitHub and we welcome all those that have made at least five contributions to our new team page.

One section we're incredibly proud of is the community statistics page. In our 2020 report, as at April 2021, those statistics reflected the international adoption of the platform:



There are at least **164** IXPs Powering Peering using IXP Manager around the world to connect **6,801** networks of which **4,188** are unique. The edge peering capacity of these networks is **104Tb** over **8,920** connected ports. We aggregate traffic statistics from 100 IXP Manager platforms which show us that the peak traffic exchanged is **27.23 Tbps**.

Port Breakdown



As we write the 2021 report in October 2022, you can see the significant growth in these figures in the following graphic. **Notably, in 18 months, the number of connected networks has grown from 6,801 to 9,207 – a 35% increase!**



There are at least **189** IXPs Powering Peering using IXP Manager around the world to connect **9,207** networks of which **5,547** are unique. The edge peering capacity of these networks is **290Tb** over **19,228** connected ports. We aggregate traffic statistics from 123 IXP Manager platforms which show us that the peak traffic exchanged is **60.51 Tbps**.

Port Breakdown



General Development Update

A complete list of releases and related features for 2021 are available on the project's GitHub page: <https://github.com/inex/IXP-Manager/releases>.

V5.8.0 – June 2021

This release has various small fixes and improvements and is intended to be the last significant release for the v5 branch. All future development effort, new features and fixes will be committed to the soon-to-be-released v6 branch. All IX's running < v5.8.0 were advised to upgrade as this will also be the staging point for upgrading to v6.

This release contained a number of small fixes, improvements and bug fixes.

V6.0.0 – July 2021

V6.0.0 was a milestone release for us and represented many months of hard work. One of the biggest changes in v6 relates to a significant framework change - Doctrine ORM has been completely removed and replaced with Laravel's Eloquent.

This work is thanks to Yann Robin, the full-time developer, who had done all the heavy-lifting on rewriting all database-related code within the project over the months leading to the release. Using Eloquent, which is a key component of Laravel and integrates fully with the framework, should allow us to develop new features with greater ease and speed.

This release also introduces two new major features: core bundle management (inter-switch links) and database change logging.

Core Bundle Management

A core bundle is a link between the IXP's own switches. These are often referred to as trunks, interswitch links (ISLs), core links, etc. IXP Manager introduced a number of features to support these in this release:

- Creation and management of core bundles.
- Graphing of core bundles.
- Wizard to enable the creation of complex core bundles.
- Enables automation of switch configuration. INEX has published a number of templates:
 - Arista EOS: interface configuration and BGP configuration suitable for VXLAN and ECMP.
 - Cumulus: interface configurations with FRR (for BGP).
- Integration with weather map software (e.g. the configuration for these weathermaps) are dynamically generated.
- Nagios checks for core bundle monitoring and alerting.

Database Change Logging

In IXP Manager v6, we changed the database access layer to Laravel's Eloquent. As part of this work, we added a new listener for any UI based changes to database objects.

You will now find [View logs] buttons throughout IXP Manager and these will link to the appropriate entries in the Logs controller (which you can find in the left hand menu under IXP Utilities).

V6.1.0 – September 2021

We've known for some time that the generation time for router configurations was sub-optimal and looking at that has been on the to-do list. A regression in v6.0.0 in the move to Eloquent also caused an increased latency in the process.

This release resolves that issue and provides a significant speed increase for generating router configuration - especially where you have members which huge prefix lists.

Through the use of serialising IRRDB prefixes at the time of fetching them from IRRDB databases, we've gotten the speed / usage down as follows:

Iteration	Generation Time	Memory Usage (Real)
V6.0.0	99.5 secs	1,362 MB (1,551 MB)
1st Pass – Query Optimisation	32.0 secs	501 MB (576MB)
2nd Pass – Add Caching	1.3 secs	210 MB (212 MB)

V6.2.0 – November 2021

This release provides a large amount of improvements and bug fixes accumulated since v6.1 was released. Most of these relate to the bigger changes in v6.0 and have been found and reported as more IXPs upgraded. Thanks to all how contributed via those reports.

It also introduced two new features:

Partial Port Speeds

This release provides a long sought-after feature to allow for a differentiation between the declared port speed (where the IXP provides sub-rate connectivity) and that configured on the switch which may not match.

Per-Facility Aggregate Graphs

This release included support for per-facility graphs which are the aggregate of all peering ports excluding core/trunk ports in a given location.

Versions in Use

One excellent metric of active use and maintenance of IXP Manager is the number of installs of each version. Our new website discussed above, were possible, also gathers this information during its daily polls:

Version	# Installs	
	Apr 2021	Oct 2022
6.2.0		64
6.1.0		4
6.0.0		9
5.8.0		10
5.7.0	71	23
5.6.0	15	5
5.5.0	13	12
5.3.0	1	5
5.2.0	4	2
5.1.0	2	2
4.9.3	3	2
4.9.2	1	1
4.8.999	2	2
4.8.0	6	1
4.7.3	4	3
4.5.0	1	1
3.8.0	2	2
3.7.5	2	2
3.7.3	2	2
3.7.2	1	1

As you can see, the vast majority – 72% – are using a version released during 2021. This is slightly down from 2020 where that number was 77%. **However**, this remains exceptionally impressive as a new major version, v6, was released in 2021 and many IXPs would be hesitant to upgrade until it had been released and stable for some time.

Closing Remarks

A vision shared by many of those involved in IXP Manager – INEX, the core developers, the contributors – is that as a technology it will enable the creation of IXPs wherever they are required which in turn will create a stronger, open, more robust and better connected internet. And not only is it hoped that IXP Manager will help start these new IXPs but that it will also enable these IXPs to launch from the best place possible: secure by default, proven configurations and designs, implementing best practice.

Our hope is also to gather and foster an 'IXP Manager community' - a place where the 189+ IXPs that use IXP Manager can come and help each other, learn from each other and share their stories.

Today, IXP Manager is in use by at least 189 IXPs around the world - with more being added every month. This is something that gives all of the team, our community sponsors, the developers and contributors immense pride. It is also quite sobering - it reminds us all to keep all the community in mind when developing and prioritising new features. And it focuses our attention on maintaining the excellent reliability and security standards that have been set over the past two decades.