



GPF12 - NY, USA, APRIL 2017

# IXP Manager

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Internet Neutral Exchange Association  
Company Limited by Guarantee



## BARRY O'DONOVAN



*New York, 2001*

- NetDevOps
- INEX for ~10 years
- Lead developer for IXP Manager
- @barryo79
- @ComePeerWithMe (INEX)



## INEX

- Peering point for the island of Ireland, member owned association, not for profit, founded in 1996
- ~100 members (inc. ~98% of eyeballs)
- >150Gbps of IP data exchanged at peek
- Dual infrastructure, 6 PoPs, own dark fibre
- Opened INEX Cork in 2016
- Just launched 100Gb ports on Arista switches (IXP Manager / Salt / Napalm automation)
- Home of IXP Manager

## What This Presentation Will Cover

- What is IXP Manager
- Growing Pains
- Three New Features
  - Bird's Eye
  - Patch Panel / X-Connect Management
  - IX-F Member Export (JSON)



# IXP Manager - A Full Stack Management System for IXPs

- **Admin and Member Portal**
  - Web based user interface
  - Web based API endpoints
  - Command line utilities
- **End to End Provisioning System**
  - **New:** Salt/Napalm automation now implemented at INEX via IXP Manager
  - Has always configured everything else
- **Teaches and Implements Best Practice**
  - INEX formed in 1996. We've accumulated a lot of experience!

# IXP Manager - Distinguished Features

- Templated route server configuration generation
  - Includes: strict IRRDB prefix filtering, next hop hijack prevention, analysis tool etc.
- Templated route collector and AS112 router configuration
- Graphing (including new Grapher backend, mrtg/SNMP and sflow)
  - IXP, peering LAN, v4/v6, member ports / LAGs / aggregates
  - Bps / pps / discards / errors / broadcasts inc. email reporting
- Nagios / Smokeping / DNS / quarantine
- Layer2 address table (static and dynamic)
- And many more...

# Why Build IXP Manager?

- Key requirements for an IXP:

## **Security - Efficiency - Reliability**

- Human error cannot be eradicated
  - We have observed that the probability of a DFZ leak is equal between the smallest inexperienced operators and the largest networks connected.
- IXP Manager has three specific goals:
  - Zero touch provisioning and configuration
  - Do more with less staff and resources
  - Provide **excellent** service to our members



IXP MANAGER

**Success Is Not Consequence Free**





## Success Is Not Consequence Free

- More users means:
  - Greater demand for mailing list interaction
  - More requests for workshops and presentations
  - Greater pressure on addressing bug reports
  - Large demand for new features - great and small
- Feature requests are an interesting case:
  - Rarely come with offers to help by way of code or money
  - Not always on INEX's own wish list
  - Often not appropriate (create's manual overhead, not best practice, hacky)

# The Need for Sponsorship

- We recognised the time/resource issue in late 2015
- Wrote a request for sponsorship document<sup>1</sup> and distributed it Feb 2016. Included:
  - Proposed budget and how the money would be spent
  - Primary objective was a full time PHP developer
  - Management process and audit plans (euro-ix audit committee)
  - Detailed plan for the first 12 months development
  - Outlook plan for three years
  - Budget: €65,000 per annum
  - Project management / code review provided by IBN<sup>2</sup> - not for profit basis

1. <https://www.ixpmanager.org/media/2016/2016-02-Funding-Model-1.4.pdf>

2. Island Bridge Networks - <https://www.islandbridgenetworks.ie/>

## SPONSORSHIP

### Our Sponsors



**NETFLIX**

**swissix**  
SWISS INTERNET EXCHANGE



Also: NIX (Norwegian Internet Exchange)



IXP MANAGER

## The Wider Ecosystem: Hackathons, Bird's Eye and Looking Glasses



RIPE IXP Tools Hackathon, October 2016, Madrid, Spain (before RIPE73)





A Simple Secure Micro Service for Querying Bird

## Bird's Eye: Rationale

- Scratch an itch that IXP's (and other networks) have
- API access allows: analysis, monitoring, tools
- We did look around - nothing met requirements of:
  - Bent to fit our needs in less time than creating
  - Fitted my skillset for *bending*
  - *Secure, trustworthy.*

## Bird's Eye: Security

- Natural rate limiting: cache every response
  - Secondary rate limited for variable queries
- Strict parameter parsing and checking
- Bundled *birdc* wrapper script for safe sudo
- *birdc* only executed in restricted mode (show only)

## Bird's Eye: Capabilities

- `api/status`
- `api/protocols/bgp`
  - `api/protocols/$protocol_name`
- `api/routes/protocol/$protocol_name`
- `api/route/$ip|prefix[/table/$table]`

```
{  
  - api: {  
    from_cache: true,  
    ttl_mins: "1",  
    version: "1.0.0"  
  },  
  - status: {  
    version: "1.5.0",  
    router_id: "185.1.69.126",  
    server_time: "2016-10-23T14:23:50+00:00",  
    last_reboot: "2016-04-12T15:00:34+00:00",  
    last_reconfig: "2016-10-23T14:12:01+00:00",  
    message: "Daemon is up and running"  
  }  
}
```



## Bird's Eye: IXP Manager

- Looking Glass: <https://www.inex.ie/ixp/lg>
  - We have 30 instances of Bird (rc, rs, as112)
- Monitoring - Generate Nagios Configuration for:
  - Status of all Bird daemons
  - Route collector sessions
  - Route server sessions
- Implementation by interface / contract - *“as a service”*

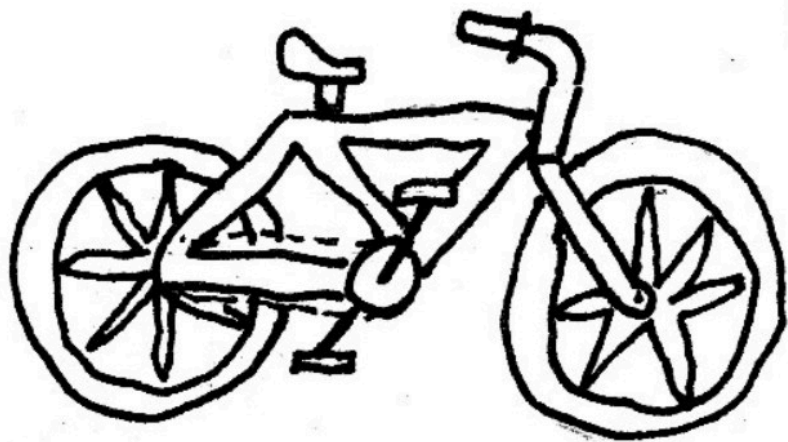
## Bird's Eye: References

- GitHub: <https://github.com/inex/birdseye> [MIT]
- Live/Production: <https://www.inex.ie/ixp/lg>
- Alternative from ECIX:
  - <https://github.com/ecix/birdseye>

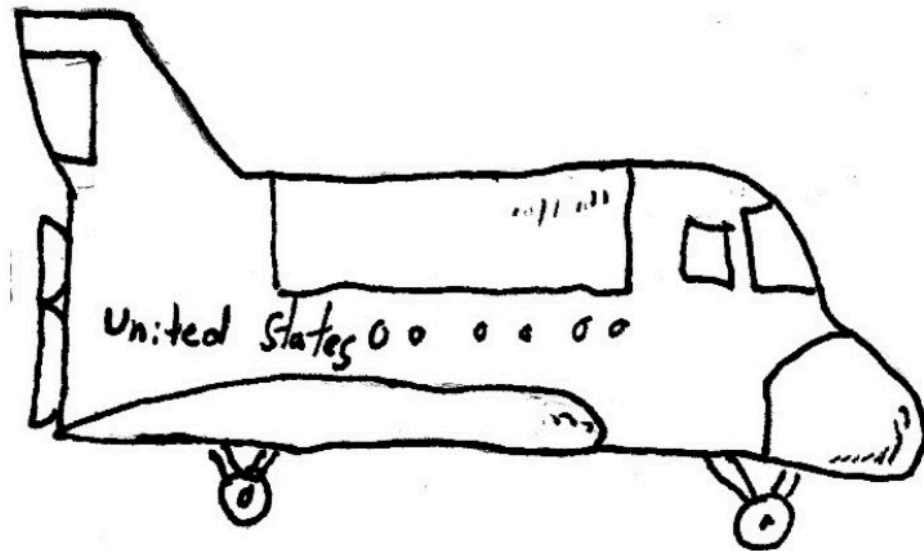


IXP MANAGER

**Cross Connect / Patch Panel Management**



Good Bike



Bad Bike

Parkinson's Law of Triviality / Bike-Shedding / Over-Engineering





## Telecity Cabinet IEDBZ3S8.1.1

Type:	UTP	Single Mode Fibre	Single Mode Fibre	Single Mode Fibre
Type		Protect	Worker	Worker
Name	IEDBZ3.S8.CAB1.PP4A - PP:0104:13203727	IEDBZ3S8.1.1.1 - PP:0104:13201546	IEDBZ3S8.1.1.2 - PP:0104:13201545	IEDBZ3S8.1.1.3 - PP:0104:13201544
Port 1	TCIE50101 - Conway BB - 20140304 - swi1-tcy1-2:e1	TCIE15668 - DEG ring west	TCIE46484 - C&W Clonsh. IEDBM1.8.1.63.3/4	TCIE42366 - euNetworks swi1-tcy1-3:e8
Port 2	TCIE10455 - Strencom - swi1-tcy1-2:e2	TCIE14045 - BT Ireland - swi1-tcy1-2:e10	TCIE45779 - BT Ireland / 3 Ireland	TCIE32076 - Digiweb - swi2-tcy1-1:e2
Port 3	TCIE11471 - notused - office1	TCIE - Eircom - swi1-tcy1-2:e9	TCIE45755 - AWS - US / Amazon	TCIE32891 - Google - swi1-tcy1-2:e5
Port 4	TCIE11472 - office2	<b>FREE RESERVED FOR INEX INTERNAL USE</b>	TCIEXXXXX - Eunetworks metro CWTi-KCP1	TCIE52113 - BT Ireland #2 - swi1-tcy1-2:e12
Port 5	TCIExxxxx - notused - swi1-tcy1-2:e5	TCIE54921 - Convergence - swi1-tcy1-1:e5	TCIE - Fort Tech - swi1-tcy1-1:e6	TCIE43622 - euNetworks swi2-tcy1-2:e9
Port 6	TCIE - Welltel - swi1-tcy1-2:e6 (was: TCIE15873 - Bytel)	TCIE44446 - Colt - swi1-tcy1-2:2	TCIE53977 - HEAnet #2 - swi1-tcy1-2:e2	TCIE83776 - Vodafone 20170209 - swi1-tcy1-1:e3
Port 7	<b>FREE</b> swi1-tcy1-2:e7			
Port 8	<b>FREE</b> swi1-tcy1-2:e8. [Was: TCIE22963 - Net1]			
Port 9	TCIE30323 - QuestZones (via Digiweb) - swi1-tcy1-2:e9			
Port 10	TCIE19436 - Fastcom Router - f0/1 - colo			

## Telecity Cabinet IEDBZ3S8.1.1

[Edit](#)
[Cross-Connect MMR Termination Points](#)

Type	UTP	Single Mode Fibre	Single Mode Fibre	Single Mode Fibre
Type		Protect	Worker	Worker
Name	IEDBZ3.S8.CAB1.PP4A - PP:0104:13203727	IEDBZ3S8.1.1.1 - PP:0104:13201546	IEDBZ3S8.1.1.2 - PP:0104:13201545	IEDBZ3S8.1.1.3 - PP:0104:13201544
Port 1	TCIE50101 - Conway B3 - 20140304 - sw1-tcy1-2:e1	TCIE15668 - DEG ring west	TCIE46484 - C&W Clonsh. IEDBM1.8.1.63.3/4	TCIE42366 - euNetworks swi1-tcy1-3:e8
Port 2	TCIE10555 - Strencom - swi1-tcy1-2:e2	TCIE14045 - BT Ireland - swi1-tcy1-2:e10	TCIE45779 - BT Ireland - swi1-tcy1-2:e10	TCIE32076 - Digiweb - swi2-tcy1-1:e2
Port 3	TCIE11411 - notused - office1	TCIE - Eircom - swi1-tcy1-2:e9	TCIE45755 - AWS - swi1-tcy1-2:e9	TCIE32891 - Google - swi1-tcy1-2:e5
Port 4	TCIE11412 - office2	<b>FREE RESERVED FOR INEX INTERNAL USE</b>		TCIE52113 - BT Ireland #2 - swi1-tcy1-2:e12
Port 5	TCIExxxxx - notused - swi1-tcy1-2:e5	TCIE54921 - Convergence - swi1-tcy1-1:e5	TCIE - Fort Tech - swi1-tcy1-1:e6	TCIE43622 - euNetworks swi2-tcy1-2:e9
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Port 7	<b>FREE</b> swi1-tcy1-2:e7			
Port 8	<b>FREE</b> swi1-tcy1-2:e8 [Was: TCIE22963 - Net1]			
Port 9	TCIE30323 - Quest Diagnostics (via Digiweb) - swi1-tcy1-2:e9			
Port 10	TCIE19416 - Fastcom Router - 10/1 - colo			

## **Cross Connect / Patch Panel Management**

- All highlighted elements (previous slides) fully supported
- “Lifecycle Events”:
  - Allocate -> Awaiting Cross Connect
  - Connected
  - Cease Request
  - Ceased (and archived)

## Cross Connect / Patch Panel Management

- Public / private notes
- Email generation / templates
- PDF LoA generation
- Public / private file attachments
- Extensive use / support for markdown
- “Smart” dropdown list population
- Mostly feature complete - “eat our own dog food”

**After releasing the code and documentation...**

**...along comes...**

9simon commented 11 days ago



We have sometimes larger circuits to connect something and it goes over multiple patch-panels. An example for such a circuit would be like:

switch1 Port3 wants to connect to router1 port10, which is located on a different floor/room.

switch1 Port3 -> Patched to -> Rack A01, KEV5 Fiber 7 -> connects via a trunk cable to an other patch panel -> Rack X01 KEV 1 Fiber 7 -> Patched to -> X01 KEV2 Fiber 3 -> connects via trunk cable to another patchpanel on another floor -> X11 KEV1 Fiber 3 -> Patched to -> router1 port10

So it would be great to have the following:

- Front and backside of the ports / connectors of a patch panel
- Assignment of a patch panel port to another patchpanel port
- 1:1 linking of whole patch panel backside or frontside ports to another patch panel (or ranges of ports)



## X-CONNECT MANAGEMENT



Request represents minimum 4 weeks work.



**IXP MANAGER**

**IX-F Member List Export (JSON)**

## Problem

- There is no real **accurate, up to date and complete** database which can answer questions such as:
  - At what IXPs do AS65500 peer?
  - Do they peer with the route servers?
  - What is their peering IP address(es)?

### Solution

- Each IXP individually has **all this data - accurate and current - *about itself***.
- IX-F (formally euro-ix) has traditionally maintained the most comprehensive database of IXPs [1]
- IX-F Member Export is an attempt to create a directory and even centralise this

[1] <https://db.ix-f.net/api/ixp>

## **New Site and Directory - <http://ml.ix-f.net/>**

- Better documentation - raison d'être
- Directory (which is also exportable as JSON)
- Test / validates JSON exports
- Ask your IXPs to implement this!

THANK YOU

## Any Questions?

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[@comepeerwithme](#) / [@barryo79](#)

<https://www.inex.ie/>

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

<http://docs.ixpmanager.org/>

