



GPF12 - NY, USA, APRIL 2017

IXP Manager

Barry O'Donovan

@ComePeerWithMe / @barryo79

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 peak
- 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 document¹ 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 IBN² - 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



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”*

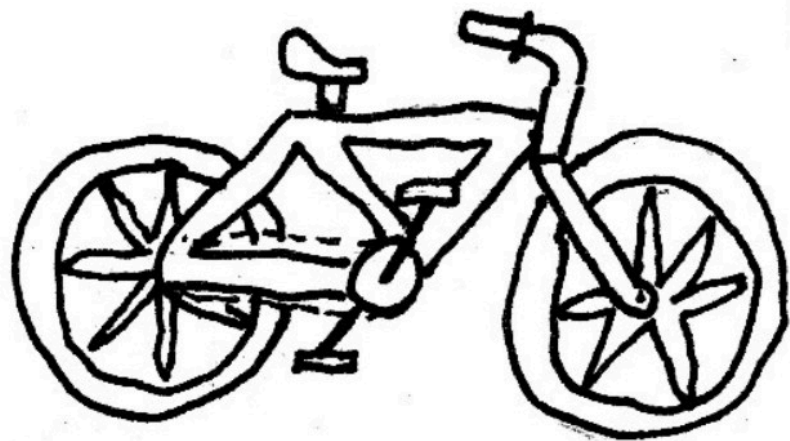
Bird's Eye: References

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

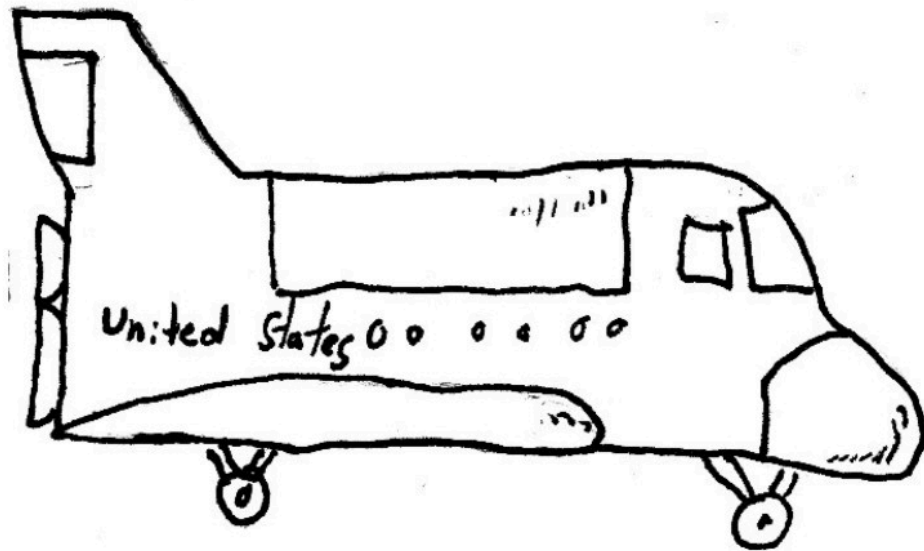


IXP MANAGER

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	TCIE32076 - Digiweb - swi2-tcy1-1:e2
Port 3	TCIE11471 - notused - office1	TCIE - Eircom - swi1-tcy1-2:e9	TCIE45755 - Amazon	TCIE32891 - Google - swi1-tcy1-2:e5
Port 4	TCIE11472 - office2	FREE RESERVED FOR INEX INTERNAL USE	TCIEXXXXX - Eunetworks metro CWT i-KCP1	TCIE52113 - BT Ireland #2 - swi1-tcy1-2:e12
Port 5	TCIExxxx - 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	FREE swi1-tcy1-2:e7			
Port 8	FREE 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			

Teleticity 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	TCIE10155 - Strencom - swi1-tcy1-2:e2	TCIE14045 - BT Ireland - swi1-tcy1-2:e10	TCIE45779 - BT Ireland	TCIE32076 - Digiweb - swi2-tcy1-1:e2
Port 3	TCIE11411 - notused - office1	TCIE - Eircom - swi1-tcy1-2:e9	TCIE45755 - AWS - AWS / Amazon	TCIE32891 - Google - swi1-tcy1-2:e5
Port 4	TCIE11412 - office2	FREE RESERVED FOR INEX INTERNAL USE	TCIEXXXXX - Eunetworks metro CWT i-FCP1	TCIE52113 - BT Ireland #2 - swi1-tcy1-2:e12
Port 5	TCIExxxx - 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	FREE swi1-tcy1-2:e7			
Port 8	FREE swi1-tcy1-2:e8 [Was: TCIE22963 - Net1]			
Port 9	TCIE30323 - Questzones (via Digiweb) - swi1-tcy1-2:e9			
Port 10	TCIE19416 - Fastcom Router - /0/1 - 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?

barry.odonovan@inex.ie

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

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

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

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

