SET YOUR EXCHANGE TO fullauto
Agenda

- Introductions
- Definitions
- Philosophies
- Principles
- Examples
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- 20+ years in networking
- Co-founder of IX-Denver
- OIX Chair
- 8 patents in NetTech
- Co-founder and CEO at FullCtl

Matt “Grizz” Griswold

- 20+ years in software development
- Co-founder of UIX / ChIX
- PeeringDB Director
- PeeringDB Maintainer
- Co-Founder and CTO at FullCtl
What does “fullauto” even mean?

`FullAuto == fully automated`

Maybe a bit cheeky

Still - why wouldn’t you want to fully automate your internet exchange?
But what does “fully automated” mean?

“Fully” not very concrete...

Automation vs Orchestration...

Observability???
What we mean...

SoT synchronization
Route server management
Switch port management
Member management
Traffic graphs
Self-serve
Cool story - but why?

Automation sounds like a lot of work...

If it ain’t broke...

CLI: ‘Never gonna give you up’
Hey, CLI,

I just wanna tell you how I'm feeling
Gotta make you understand
Never gonna give you up
Never gonna let you down
Never gonna run around and desert you
Never gonna make you cry
Never gonna say goodbyyyyyyyyyyyyyyyyyyyyyyyyyye...
Full Auto Philosophy

Machines > Humans

Humans > Machines
I’m convinced; full auto, let’s go!
So... How?
Principles

KISS
Leverage existing OSS
Do not reinvent the wheel
Modular
Redundant
Basic Architecture

SoTs

Orchestration

Output

Input

Automation

Functions

Observability
Zoom in: Sources of Truth

SoTs
Zoom in: Sources of Truth
Zoom in: Sources of Truth

- IPAM
- DCIM
- NMS
- AAA
- PeeringDB
- IX Operator Portal
- IX User Portal
- Time Series DBs
NetBox vs IXPManager

- General Purpose
- Extensible w/ plugins/apps
- 93% Python
- 288 Contributors
- 14,800 “stars”
- 405 watching
- 2,400 forks

- Specialized Use-Case
- “Full stack web application”
- 94% PHP
- 24 Contributors
- 351 “stars”
- 41 watching
- 155 forks
Data Schema

General Purpose has downsides

So, we’re working on an IX specific data schema for NetBox / Nautobot…

- Coming Soon: BCOP
Time Series DB(s)

- MRTG & RRDTool are great, but...
- sFlow
- Light levels
- Graphing everything!
Orchestration vs Automation

Change management
Version control
Template integration

Task execution
Zoom in: User experience

SoTs → Output

Input →
Zoom in: User experience

SoTs

Input

Output

- MAC addr
- as-set
- Max prefix
- Use RS?
- Bounce
- RPKI OV
- Graceful Shutdown
Zoom in: User experience

SoTs

Input

Output

- Status
- Alerting
- Traffic
- Utilization
- BGP Stats
- Weathermap
- Light Level
- Maintenance
Example: IX-Denver
How we did it

- Identify the moving pieces
- Identify the Sources of Truth
- How do we replace this?
- How do we make this modernized and easily portable?
Pieces

- Customer portal
- Circuit / panel / cross connect DB
  - LOA Generation
- Ansible repo
- Graphs
- Website memberlist
- Route servers
CUSTOMER PORTAL

- IXP-Manager -> ixCtl
- Import data...
- IXP-Manager was the only SoT (which makes it nice and easy)
CIRCUITS AND PANELS

- IXP-Manager to NetBox
- Actual representation of how panels are done
- Leverage plugins
CIRCUITS AND PANELS - BEFORE

Patch Panel Port / Cross Connect - PP:303.04:009:C :: 1/2 (Fibre, duplex port: 1)

**Description:** PP:314.04:001:B ports 1/2

**Our Reference:** PPP-00663

**Patch Panel:** PP:303.04:009:C

**Patch Panel Port:** 1/2 (Fibre, duplex port: 1)

**Member:** Force Broadband

**State:** Connected

**Ticket Reference:**

**Assigned At:** 2021-05-09

**Connected At:** 2021-05-09

**Internal Use:** No

**Chargeable:** No

**Owned By:** Customer

**Rack:** 910 MMR

**Facility:** 910 Telecom

**Created:**

**Updated:** 2022-03-12 23:37:52
CIRCUITS AND PANELS - AFTER
ANSIBLE REPO

- IXP-Manager inventory plugin -> DeviceCtl inventory plugin
- Works with other tooling using DeviceCtl

To be continued … (otm referee)
ORCHESTRATION

- Ansible + Referee
- Git = CI/CD, change management
- FullCtl DB is 100% versioned
  - NetBox, Nautobot not...
  - DeviceCtl abstraction adds it
GRAPHS

- IXP-Manager generated MRTG Config -> DeviceCtl
- Leverage the FullCtl IX Schema to generate MRTG config
- Load all existing graph data from MRTG (takes about 30 seconds to import 15 years)
GRAPHS

The graph shows the bps IN and bps OUT for 7 days from May 26 to June 01. It indicates a peak of 14G for IN traffic and 3360M for OUT traffic.

Et-0/0/50
GRAPHHS

- Coming soon – prometheus and grafana
WEATHERMAP

- Php dir, fed by script
- VM with PHP, etc.

= 

- Containerize, feed from our universal schema
ROUTE SERVERS

- ARS -> ARS 🎉
- Took base config, dropped into ixCtl Management
- Porting from IXP-Manager not much more difficult
SOURCES OF TRUTH

- IXP-Manager
- Replacing with: ixCtl, DeviceCtl, PeerCtl, NetBox
- Ansible repo
- ARouteServer git repo
INTERFACING WITH SOT

- Ansible for Automation
- ARS

Mostly replaced with our FullCtl IX Schema
FullCtl IX SCHEMA

- Similar to the IX-F/Euro-IX schema, but with added fields
- More useful for automation
- More stricter
- More better

https://ix.fullctl.com/apidocs/swagger
FullCtl IX SCHEMA

```json
{
  "data": [
    {
      "id": 9,
      "mbh_id": 2147483647,
      "is": 0,
      "ixf_member_type": "peer",
      "ixf_state": "active",
      "num": 2147483647,
      "name": "string",
      "display_name": "string",
      "sport": "string",
      "gaddis": "string",
      "num": "string",
      "primary": "string",
      "is_mora_override": "string",
      "is_in_mora": true,
      "isp": 2147483647,
      "mb": "string",
      "prefx": "string",
      "prefx5": "string",
      "prefix": 2147483642,
      "gclay": "string"
    }
  ]
}```
IX-F SCHEMA

- Replaced internally, not externally (PDB)
- IX-F not used in PDB because IXP-Manager didn’t match IRL
- Once we switched and it was modeled correctly, we updated PDB with ixCtl IX-F schema
DASHBOARDS

- Speaking of using OSS - grafana dashboards?
- Time series DB...
SELF SERVICE

- MAC, as-set, max-prefix, etc...
- Update PDB
- Bounce port
- Light levels
- Traffic
- BGP culling (graceful)
https://github.com/fullctl
Extras...
Architecture detail...
More???

TODO: Ensure the end-state is well described...

- NetBox/Nautobot plugins?
- Our tools?