INEX

LAC-IX
Monitoring and Measurement

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Barry O'Donovan - barry.odonovan@inex.ie
@ComePeerWithMe / @barryo79

INEX

- Peering point for the island of Ireland, member owned association, not for profit, founded in 1996
- ~115 members (inc. >95% of eyeballs)
- >600Gbps of IP data exchanged at peek
- Dual infrastructure, 7 PoPs, own dark fibre
- Opened INEX Cork in 2016
- IXP Manager / Salt / Napalm automation
- Home of IXP Manager

- Member portal (IXP Manager)
- Fully resilient route servers on each peering LAN
- Route collectors (mandatory)
- AS112 service
- Private VLAN service (>=2 members)
- 1Gb ports on UTP / SMF
- 10 / 100Gb ports of SMF
- Evaluating 400Gb ports - no demand currently

IXP Manager

- An INEX project
- Full-stack management system for IXPs
- FOSS - GPL v2 license
- Complete route server automation
- In use at >170 IXPs worldwide

https://www.ixpmanager.org/

Connected Edge Capacity

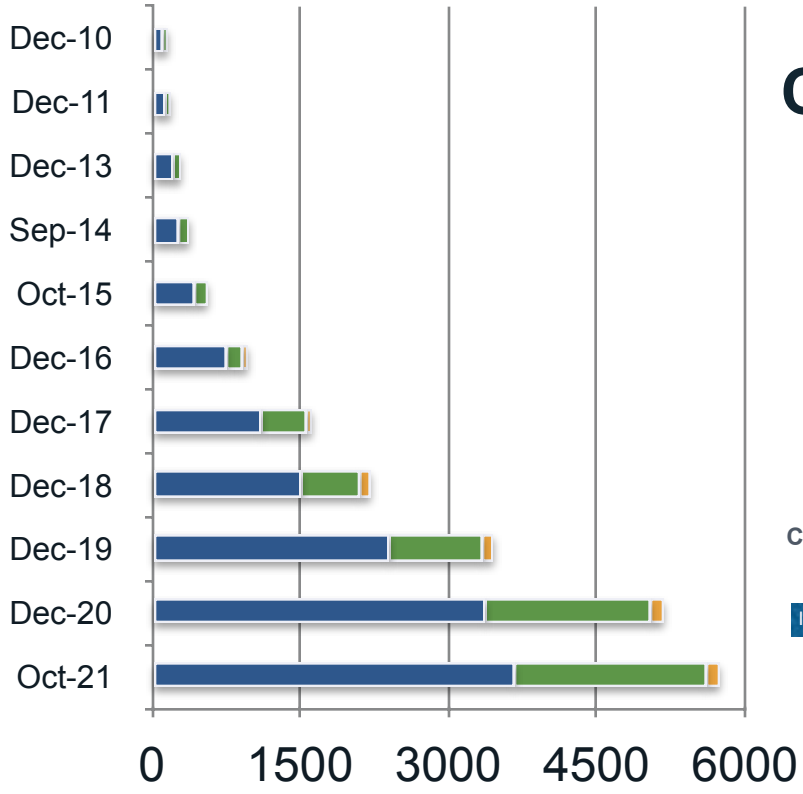
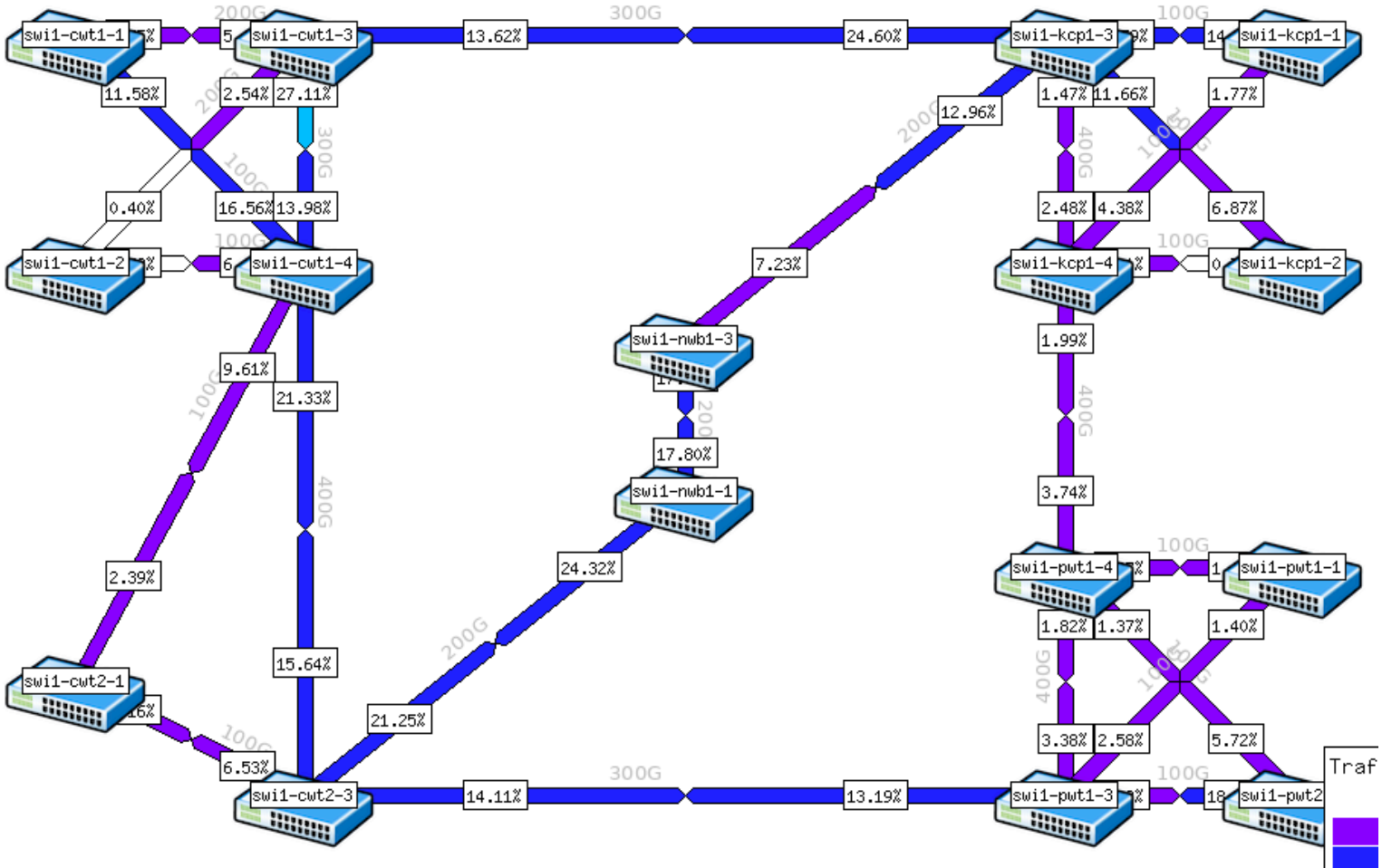


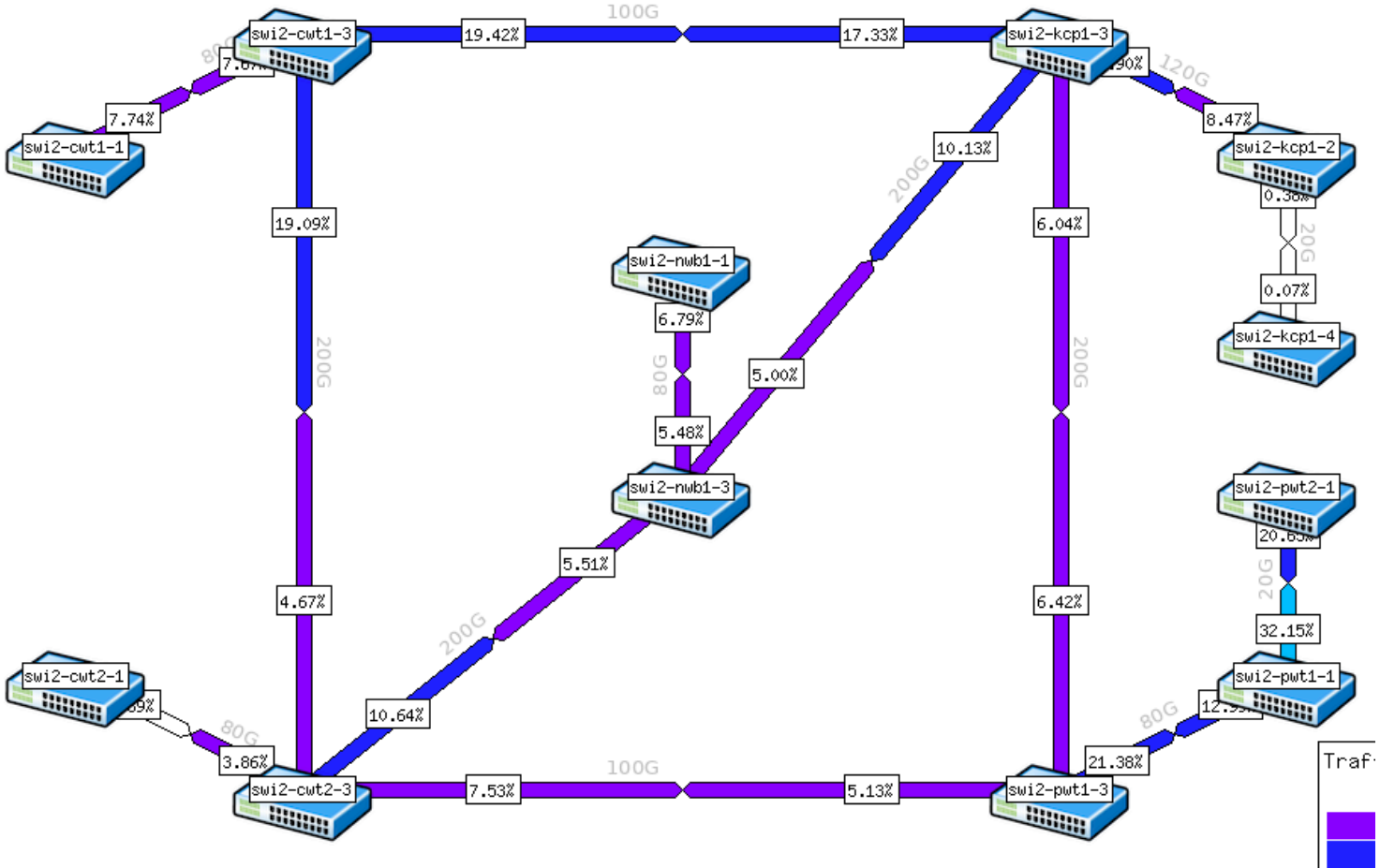
Chart Descriptions

INEX LAN1 | INEX LAN2 | INEX Cork

INEX LAN1


swi1-cwt1-1
swi1-cwt1-3
swi1-cwt1-2
swi1-cwt1-4
swi1-cwt2-1
swi1-cwt2-3
swi1-nwb1-3
swi1-nwb1-1
swi1-kcp1-3
swi1-kcp1-1
swi1-kcp1-4
swi1-kcp1-2
swi1-pwt1-4
swi1-pwt1-1
swi1-pwt1-3
swi1-pwt2
200G
300G
100G
400G
13.62%
24.60%
11.58%
2.54%
27.11%
0.40%
16.56%
13.98%
12.96%
1.47%
11.66%
1.77%
2.48%
4.38%
6.87%
7.23%
1.99%
9.61%
21.33%
17.80%
3.74%
2.39%
24.32%
1.82%
1.37%
1.40%
15.64%
21.25%
3.38%
2.58%
5.72%
6.53%
14.11%
13.19%
Traf

INEX LAN2


swi2-cwt1-3
swi2-kcp1-3
swi2-cwt1-1
swi2-kcp1-2
swi2-kcp1-4
swi2-nwb1-1
swi2-nwb1-3
swi2-pwt2-1
swi2-pwt1-1
swi2-pwt1-3
swi2-cwt2-1
swi2-cwt2-3
100G
120G
200G
80G
20G
19.42%
17.33%
7.74%
8.47%
10.13%
19.09%
6.04%
0.38%
0.07%
6.79%
5.00%
5.48%
5.51%
4.67%
6.42%
20.65%
32.15%
10.64%
3.86%
7.53%
5.13%
21.38%

INEX

- Company limited by guarantee - member owned, run on a cost recovery basis
- Board of directors of up to 8 member representatives, voted by the members
- Lean organisation:
  - CEO
  - Looking to recruit someone for sales and marketing
  - Office administrator / bookkeeping
  - Outsourced operations team

Measurement

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Measurement - Mostly via IXP Manager

- Port utilisation - core, member, aggregates; bits, pkts, errors, discards, non-unicast
  - Reports: utilisation tables, weekly emails for errors, utilisation and profile changes
- Peer to peer graphs (sflow)
- Latency via Smokeping of all IP endpoints
- Non-IXP Manager tools:
  - LibreNMS (switch and server CPU, memory, fans, PSUs, etc.)

Monitoring

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Monitoring - Mostly via IXP Manager

Automation is critical here - IXP Manager provides Nagios configuration for:

- Member ipv4/6 reachability (ping / ping-busy)
- BGP sessions with route collectors / route servers / AS112
- Bird daemon status (we have 32!)
- Switches including:
  - Chassis (fans, PSUs, temperature, CPU, memory, load)
    - https://github.com/barryo/nagios-plugins
  - Core bundles (inter-switch links)
  - SSH, ping, etc.

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Monitoring - Non-IXP Manager

Relatively static/stable management and infrastructure systems via Nagios:

- Physical servers, WDM chassises, PDUs, management switches
- Virtual hosts (chassis, disks, time, processes, ssh, bacula daemon, ping)
- Services: mail, web, SSL, DNS, etc.

Automation

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Automation at INEX - via IXP Manager

- Route servers at INEX automated from the beginning. (LAN1 IPv4 has ~0.5m lines)
- Route collectors
- AS112 routers
- Graphing (MRTG)
- sflow (discovery / static configuration of MAC addresses and updates automatically)
- Nagios (switches, member reachability and BGP sessions)
- Weathermaps / core bundles
- DNS ARPA entries
- IRRDB entries for members peering on route servers
- IX-F Member Export
- Peering matrices
- RIR Object updates
- Smokping
- TACACS
- DB has been used for Apache Auth, mail systems, etc.

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Automation at INEX - Switches

Using IXP Manager as the *source of truth*, we configure switches using:

- Arista - SaltStack + Napalm
- Cumulus - SaltStack

See: https://www.ixpmanager.org/support/talks

SaltStack takes its *pillar* information from IXP Manager APIs.

War Stories?

Recommendations

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Recommendations

- Automate where possible:
  - Repetitive tasks lead to PEBCAK / omissions and suck joy from the job;
  - Don’t get too comfortable - some monitoring requires manual effort.
- Resiliency / fault-tolerant design better than 24/7 availability of engineers.
- Monitoring SNR - very hard but try to tune this so notifications are important.
- Have well publicised NOC contact details.
  - E.g. my email signature includes https://www.inex.ie/support;
  - Our auto-reply on our support email includes escalation details;
  - Send out maintenance reminders 1-2 hours before start.

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Recommendations

- An IXP also has the community of all member NOCs watching the service
  - Perhaps there's an opportunity to leverage some members' 24/7 NOCs
- Consider other forms of external monitoring. Who monitors Nagios?
- War game scenarios
  - Take seriously and include vendor contracts, remote hands, availability of engineers
  - Document results as procedures to follow next time
- When dealing with issues, use all the tools available to you
  - Review all elements of the IX - symptoms can manifest on different switches!
- We haven't solved the monitoring problem!

THANK YOU

Any Questions?

Barry O'Donovan
barry.odonovan@inex.ie
@barryo79
https://www.barryodonovan.com/

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