INEX

https://www.inex.ie/

@ComePeerWithMe

Barry O'Donovan
barry.odonovan@inex.ie
@barryo79

Who Am I?

- Cork / Galway but married into Dublin :-(
- NUI, Galway (UCG!), UCD
- 2nd Generation ISP Network Engineer in Ireland: ADSL
- Consult via Open Solutions
- Operations at INEX (nearly 10 years)
- Lead developer of IXP Manager
- Formed Island Bridge Networks in 2014 with Nick
  - Core ISP Managed Services

What is an IXP?

- An Internet exchange point (IX or IXP) is a physical infrastructure through which Internet service providers (ISPs) and Content Delivery Networks (CDNs) exchange Internet traffic between their networks (autonomous systems).

- IXPs reduce the portion of an ISP's traffic which must be delivered via their upstream transit providers, thereby **reducing the average per-bit delivery cost** of their service. Furthermore, the increased number of paths learned through the IXP **improves routing efficiency and fault-tolerance**. In addition to that, IXPs exhibit the characteristics of what economists call **the network effect**.

https://en.wikipedia.org/wiki/Internet_exchange_point

inex

INEX

- Member owned association, not for profit
- Island of Ireland Exchange
- Six PoPs around Dublin, two infrastructures
  - LAN1 recently upgraded to Extreme x670's and x460's
  - LAN2 is Brocade TI24X and Netirons, upgrade planned for 2016
  - 3 x Telecity, 2 x Interxion, 1 x Vodafone

Matthew Bloch
@matthewbloch

Follow

Telecity send a marketing email with the subject line "need data centre diversity?" Assuming body reads "enjoy it while you can!"

RETWEETS
7

FAVORITES
4

2:28 PM - 12 Feb 2015

INEX

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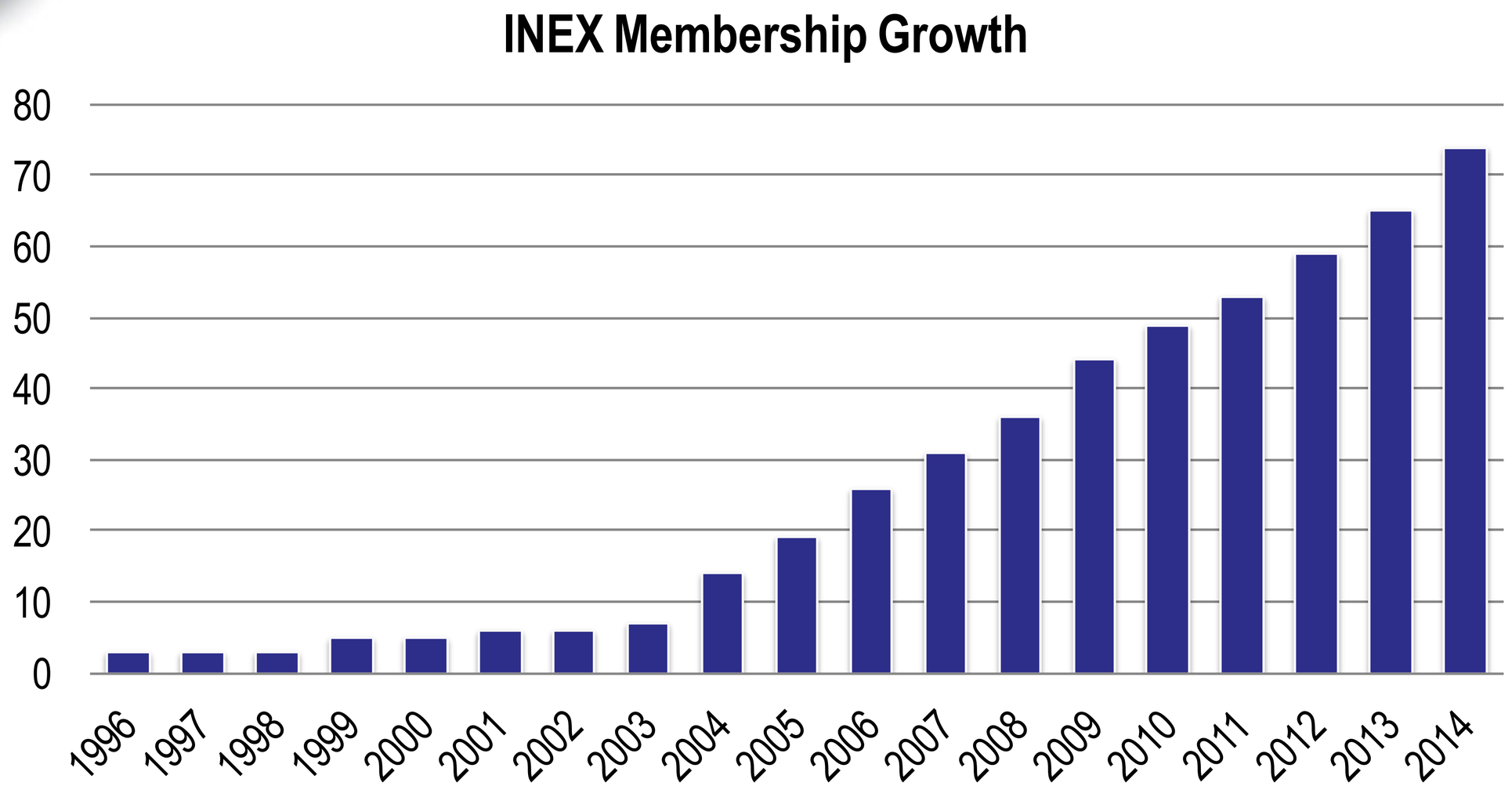
- Six PoPs around Dublin, two infrastructures
  - LAN1 recently upgraded to Extreme x670's and x460's
  - LAN2 is Brocade TI24X and Netirons, upgrade planned for 2016
  - 3 x Telecity, 2 x Interxion, 1 x Vodafone
- Dark fibre rings connecting all PoPs
- 77 full trafficking members, 4 pro-bono

Go Big, Or Go Home

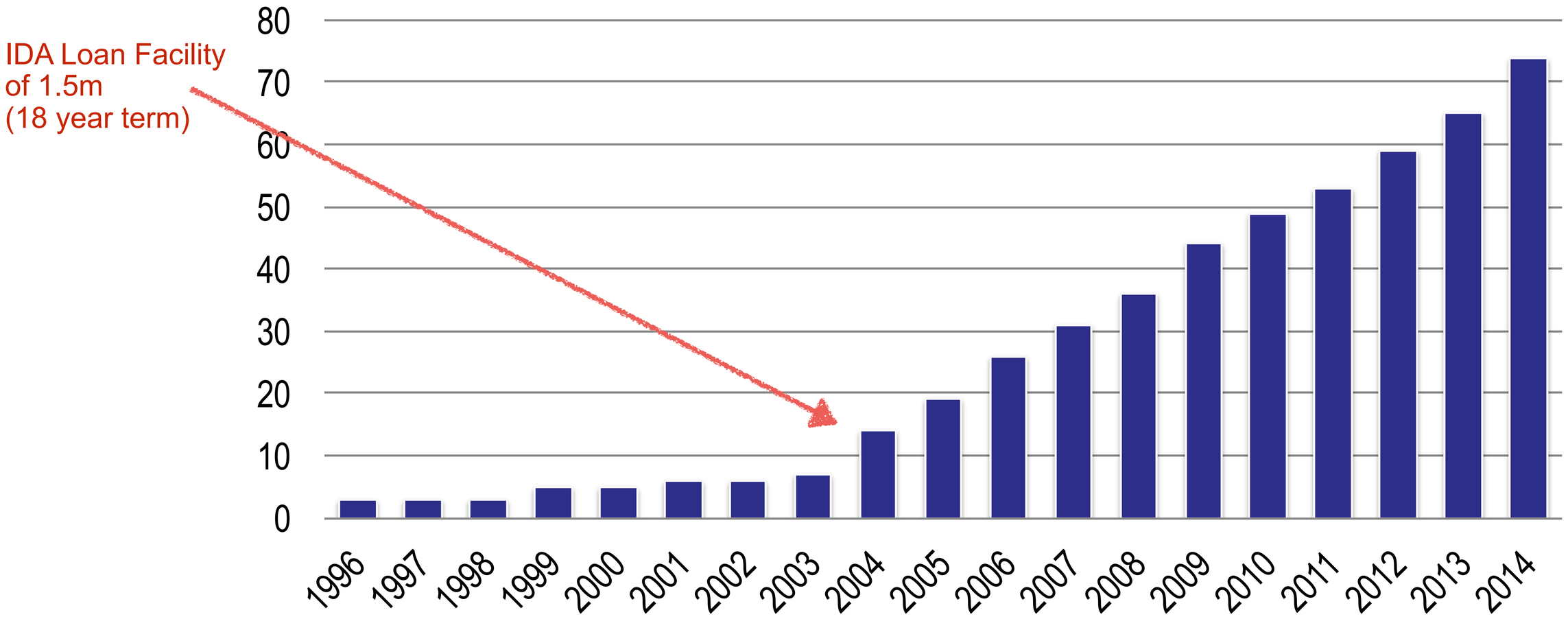
inex internet neutral exchange



Go Big, Or Go Home

inex internet neutral exchange

INEX Membership Growth



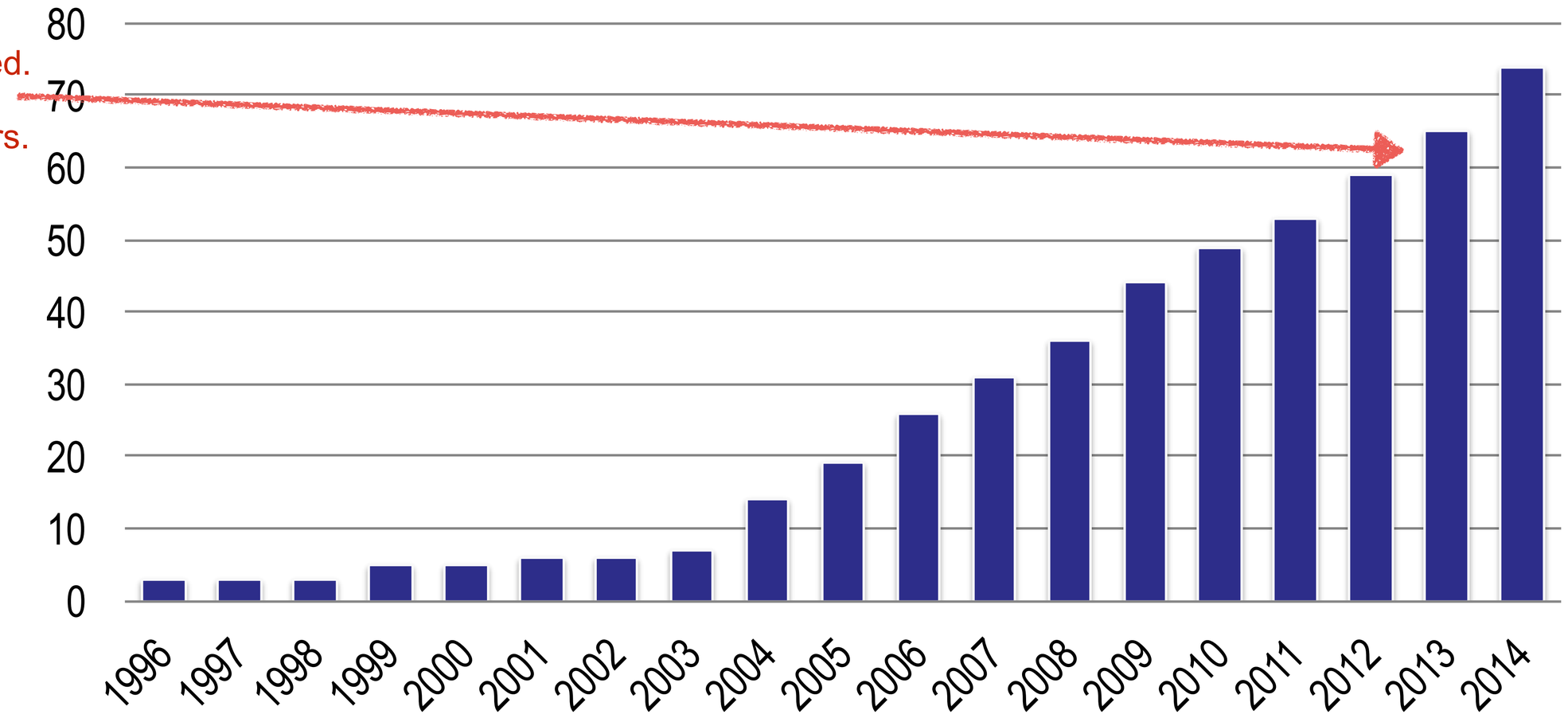
Go Big, Or Go Home

inex internet neutral exchange

INEX Membership Growth

Only €550m used.

Repaid in 7 years.



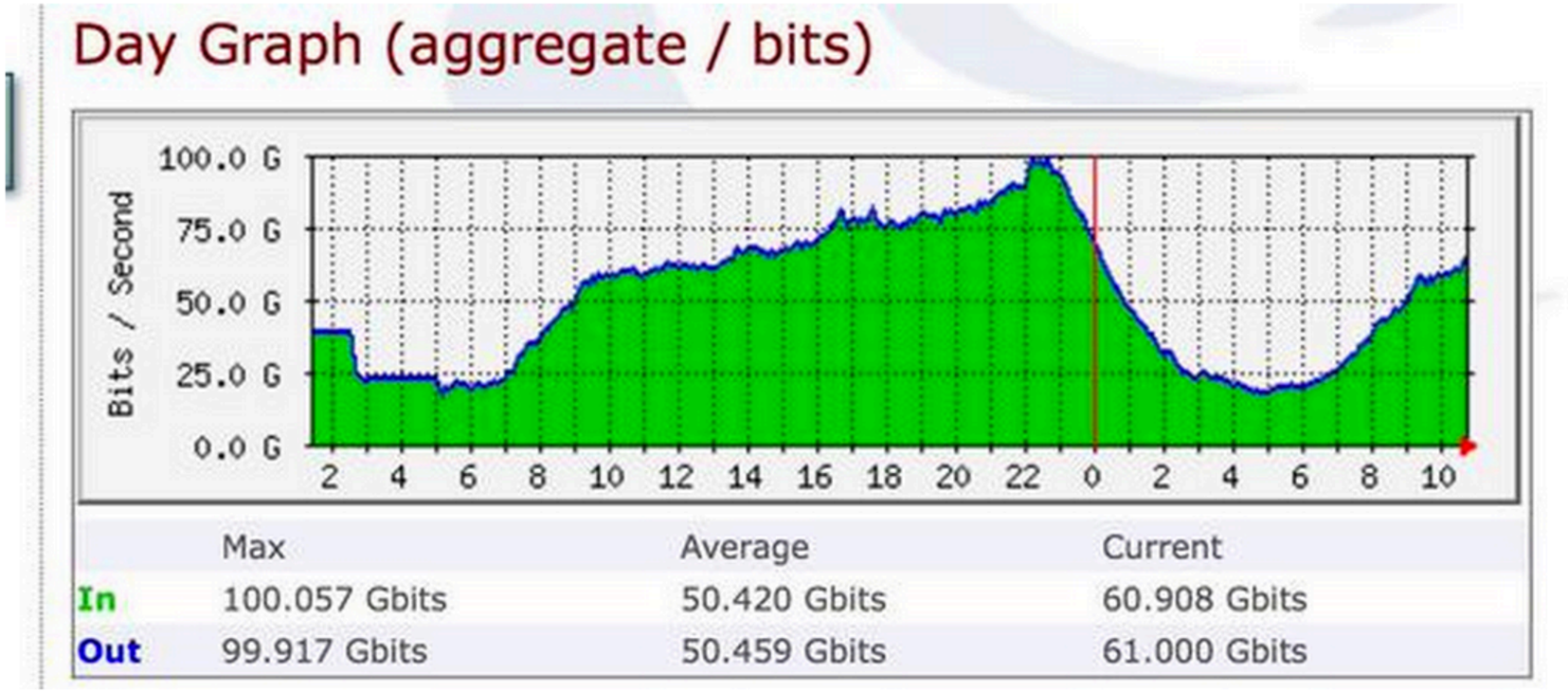
The INEX Team

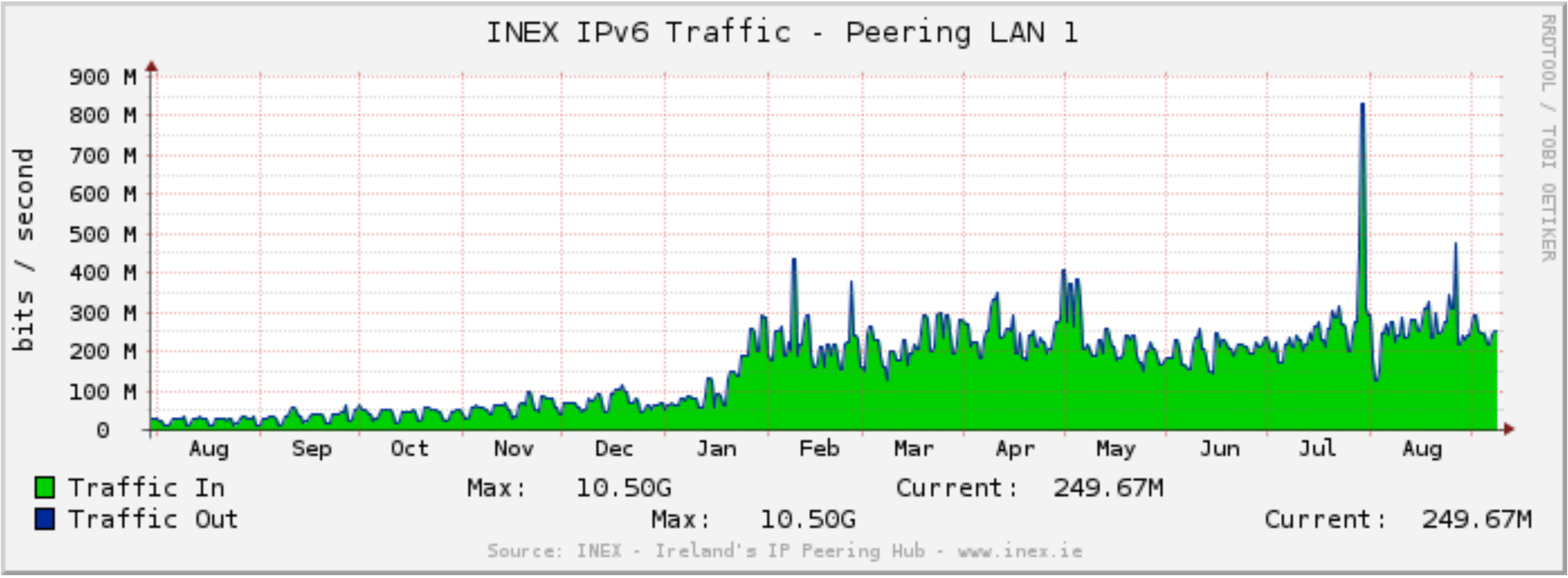
- Controlled by a committee of the members
  - Two year term, term limits for chairman
- Delegates day-to-day operations to the *management team:*
  - Barry Rhodes – CEO
  - Eileen Gallagher – Marketing and Membership Development
  - Nick Hilliard (CTO) – Operations
  - Barry O'Donovan – Operations
  - **cough* we're hiring -> need another person in operations*
  - Louisa Holmes – Administration / billing
  - All part time.

INEX
@ComePeerWithMe

Following

Well, we think this probably wins as the most interesting way an IXP has joined the 100Gbit traffic club. #peering




INEX IPv6 Traffic - Peering LAN 1
RRDTOOL / TOBI OETIKER
bits / second
900 M
800 M
700 M
600 M
500 M
400 M
300 M
200 M
100 M
0
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Traffic In
Max: 10.50G
Current: 249.67M
Traffic Out
Max: 10.50G
Current: 249.67M
Source: INEX - Ireland's IP Peering Hub - www.inex.ie

LAN IPs

- LAN1: 193.242.111.0/25 2001:7f8:18::/64
- LAN2: 194.88.240.0/25 2001:7f8:18:12::/64

LAN IPs

- LAN1: 193.242.111.0/25 2001:7f8:18::/64
- LAN2: 194.88.240.0/25 2001:7f8:18:12::/64

```
barryo@noc:~$ mtr -r -c 1 8.8.8.8
Start: Tue Sep  8 12:00:10 2015
HOST: noc                          Loss%   Snt   Last   Avg  Best  Wrst StDev
  1.|-- rtr01.vl311.net.cablesurf  0.0%     1    8.4   8.4   8.4   8.4   0.0
  2.|-- ge-0-0-2.rtr02.net.cables  0.0%     1    8.8   8.8   8.8   8.8   0.0
  3.|-- inex.google.com            0.0%     1    6.0   6.0   6.0   6.0   0.0
  4.|-- 209.85.250.215             0.0%     1    6.0   6.0   6.0   6.0   0.0
  5.|-- google-public-dns-a.googl  0.0%     1    5.8   5.8   5.8   5.8   0.0
```

LAN IPs

- LAN1: 193.242.111.0/25 2001:7f8:18::/64
- LAN2: 194.88.240.0/25 2001:7f8:18:12::/64

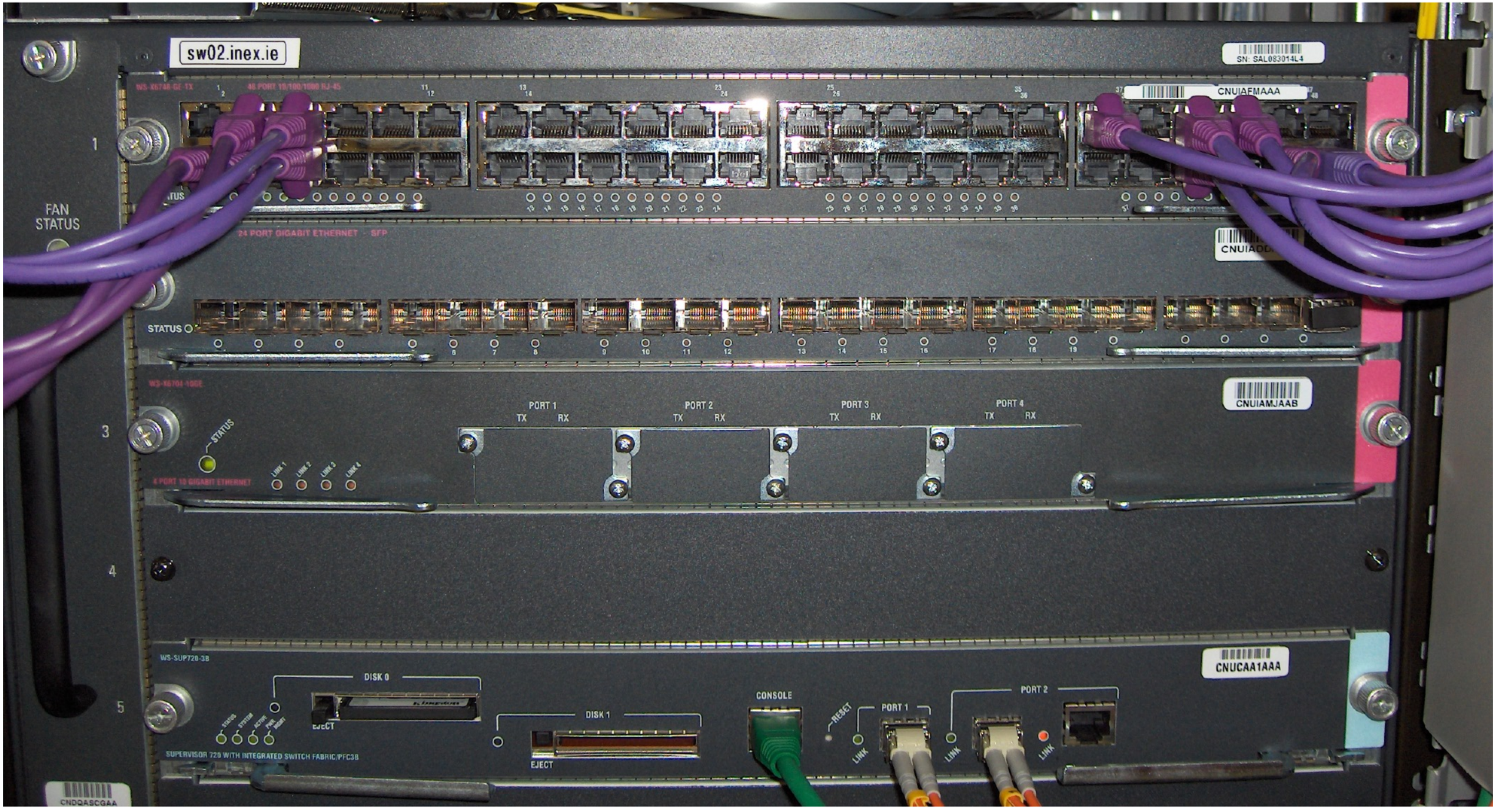
```
barryo@noc:~$ mtr -r -c 1 -n 8.8.8.8
Start: Tue Sep  8 12:00:20 2015
HOST: noc                         Loss%   Snt   Last   Avg  Best  Wrst StDev
  1.|-- 83.220.203.98              0.0%     1    8.5   8.5   8.5   8.5   0.0
  2.|-- 83.220.203.191             0.0%     1    8.8   8.8   8.8   8.8   0.0
  3.|-- 193.242.111.57             0.0%     1    6.3   6.3   6.3   6.3   0.0
  4.|-- 209.85.250.215             0.0%     1    6.3   6.3   6.3   6.3   0.0
  5.|-- 8.8.8.8                    0.0%     1    5.9   5.9   5.9   5.9   0.0
```

LAN IPs

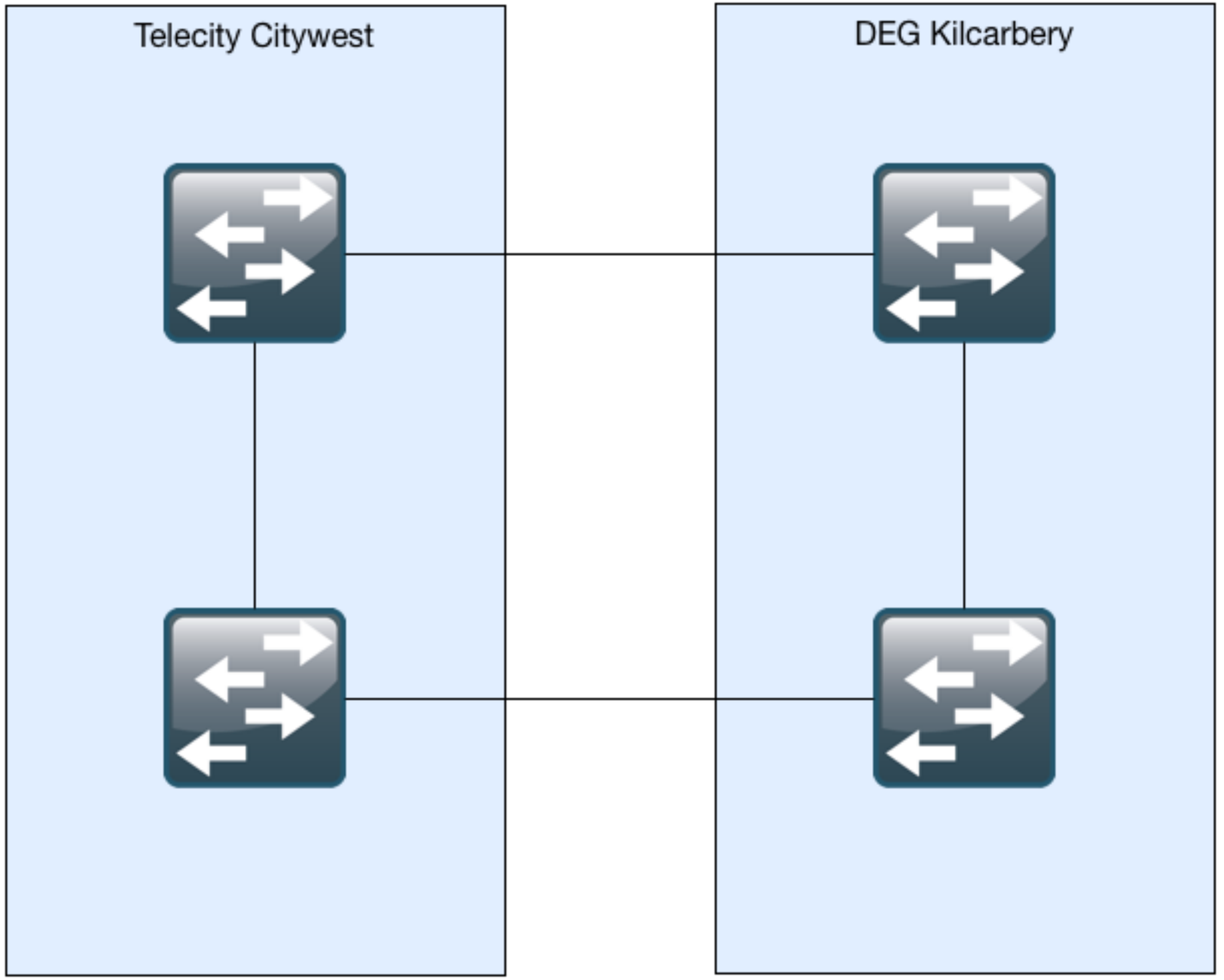
- LAN1: 193.242.111.0/25 2001:7f8:18::/64
- LAN2: 194.88.240.0/25 2001:7f8:18:12::/64

```
HOST: samaria.inex.ie                Loss%   Snt   Last   Avg  Best  Wrst StDev
  1.|-- 2001:7f8:18:100::1            0.0%     1    1.8   1.8   1.8   1.8   0.0
  2.|-- 2001:7f8:18::57               0.0%     1    1.9   1.9   1.9   1.9   0.0
  3.|-- 2001:4860::1:0:70c5           0.0%     1    2.4   2.4   2.4   2.4   0.0
  4.|-- 2001:4860::8:0:5bb9           0.0%     1   11.1  11.1  11.1  11.1   0.0
  5.|-- 2001:4860::8:0:51a0           0.0%     1   16.8  16.8  16.8  16.8   0.0
  6.|-- 2001:4860::8:0:519e           0.0%     1   19.9  19.9  19.9  19.9   0.0
  7.|-- 2001:4860::2:0:8652           0.0%     1   20.0  20.0  20.0  20.0   0.0
  8.|-- ???                          100.0     1    0.0   0.0   0.0   0.0   0.0
  9.|-- 2001:4860:4860::8888          0.0%     1   20.0  20.0  20.0  20.0   0.0
```

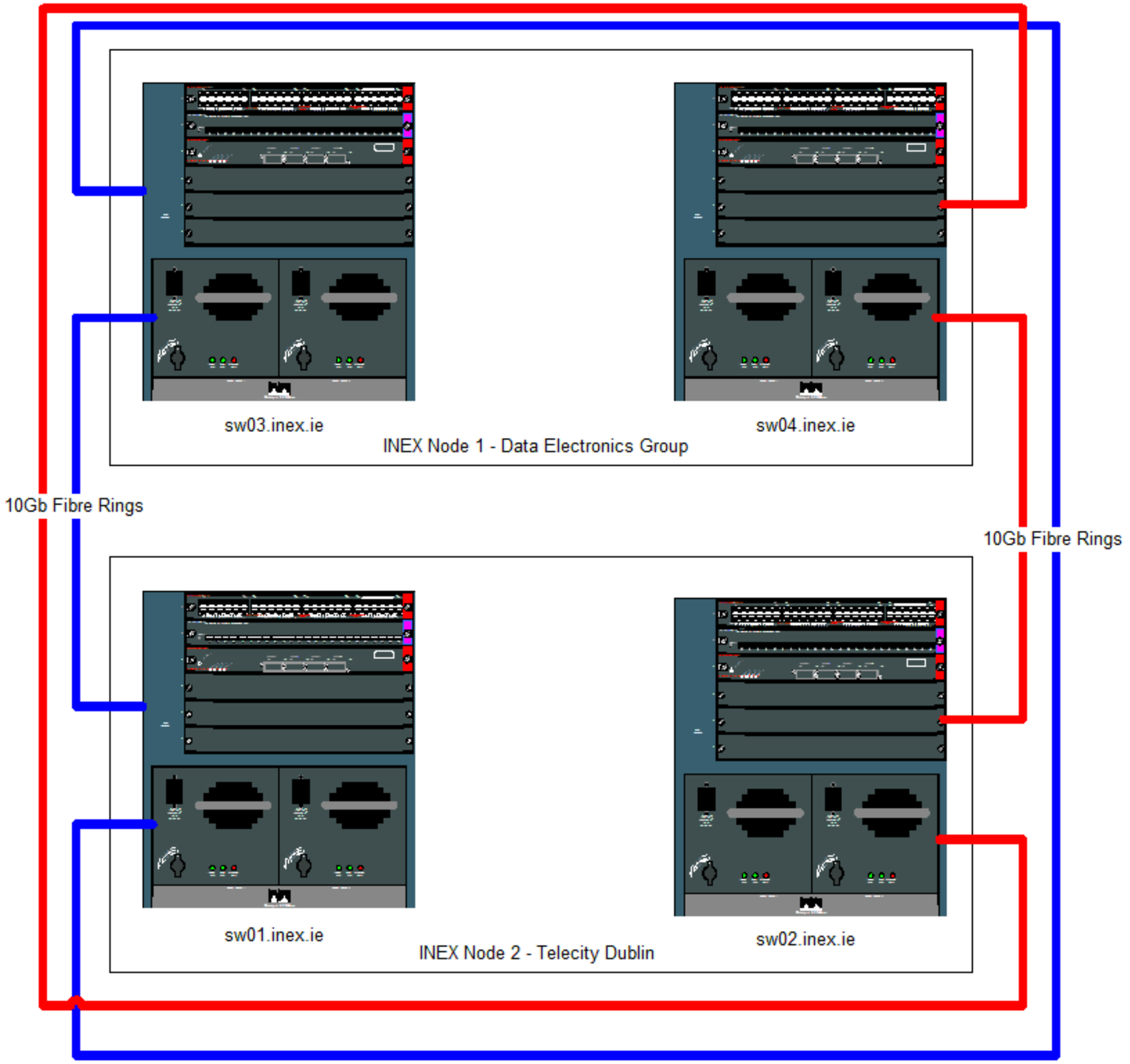
Network Evolution
Mid 00's to Present


sw02.inex.ie
SN: SAL083014L4
CNUIAFMAAA
WS-X6748-GE-TX
48 PORT 10/100/1000 RJ-45
24 PORT GIGABIT ETHERNET - SFP
CNUIAMJAAB
WS-X6704-10GE
4 PORT 10 GIGABIT ETHERNET
PORT 1
PORT 2
PORT 3
PORT 4
TX
RX
STATUS
LINK 1
LINK 2
LINK 3
LINK 4
FAN STATUS
WS-SUP720-3B
CNUCAA1AAA
DISK 0
DISK 1
EJECT
CONSOLE
RESET
LINK
SUPERVISOR 720 WITH INTEGRATED SWITCH FABRIC/PFC3B
CNDQASCGAA

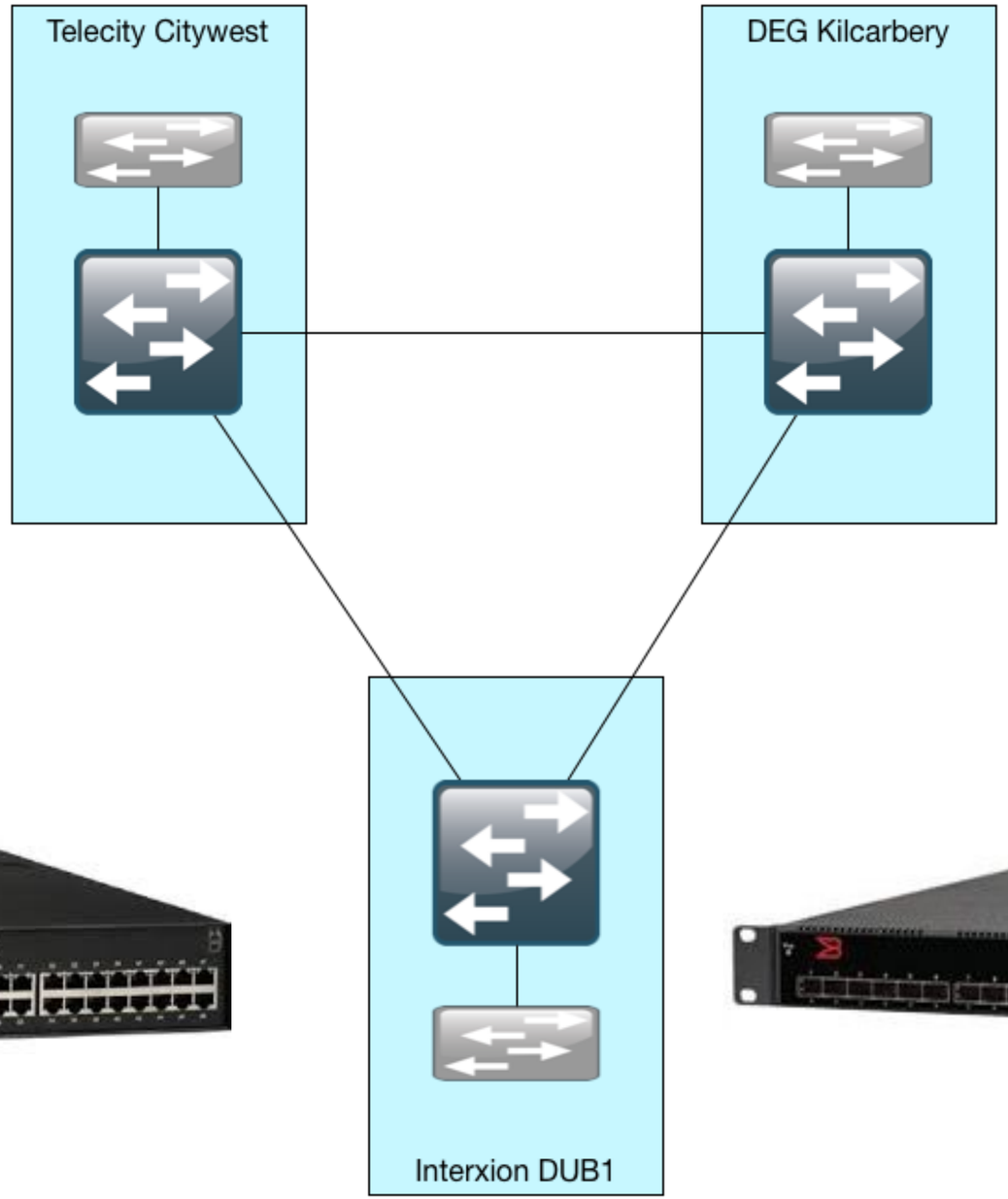
2004



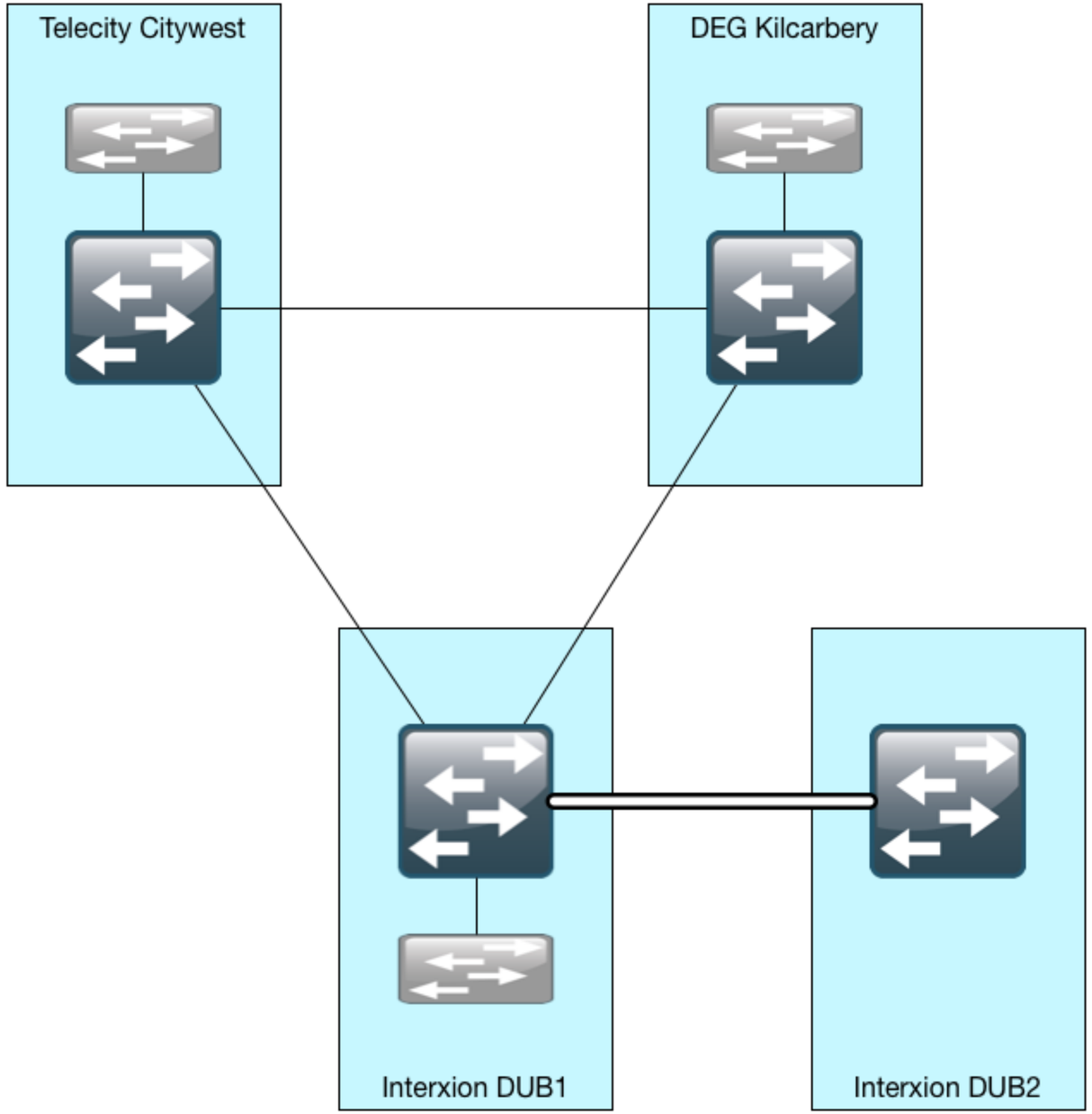
2008


sw03.inex.ie
sw04.inex.ie
INEX Node 1 - Data Electronics Group
10Gb Fibre Rings
10Gb Fibre Rings
sw01.inex.ie
sw02.inex.ie
INEX Node 2 - Telecity Dublin

2009 - New PoPs, 2009-2010 New Kit



2009 - New PoPs, 2009-2010 New Kit



LAN1 Forklift Upgrade

INEX is upgrading LAN1 - on Extreme Networks kit

Summit X670 for network core; Summit X460 for network edge

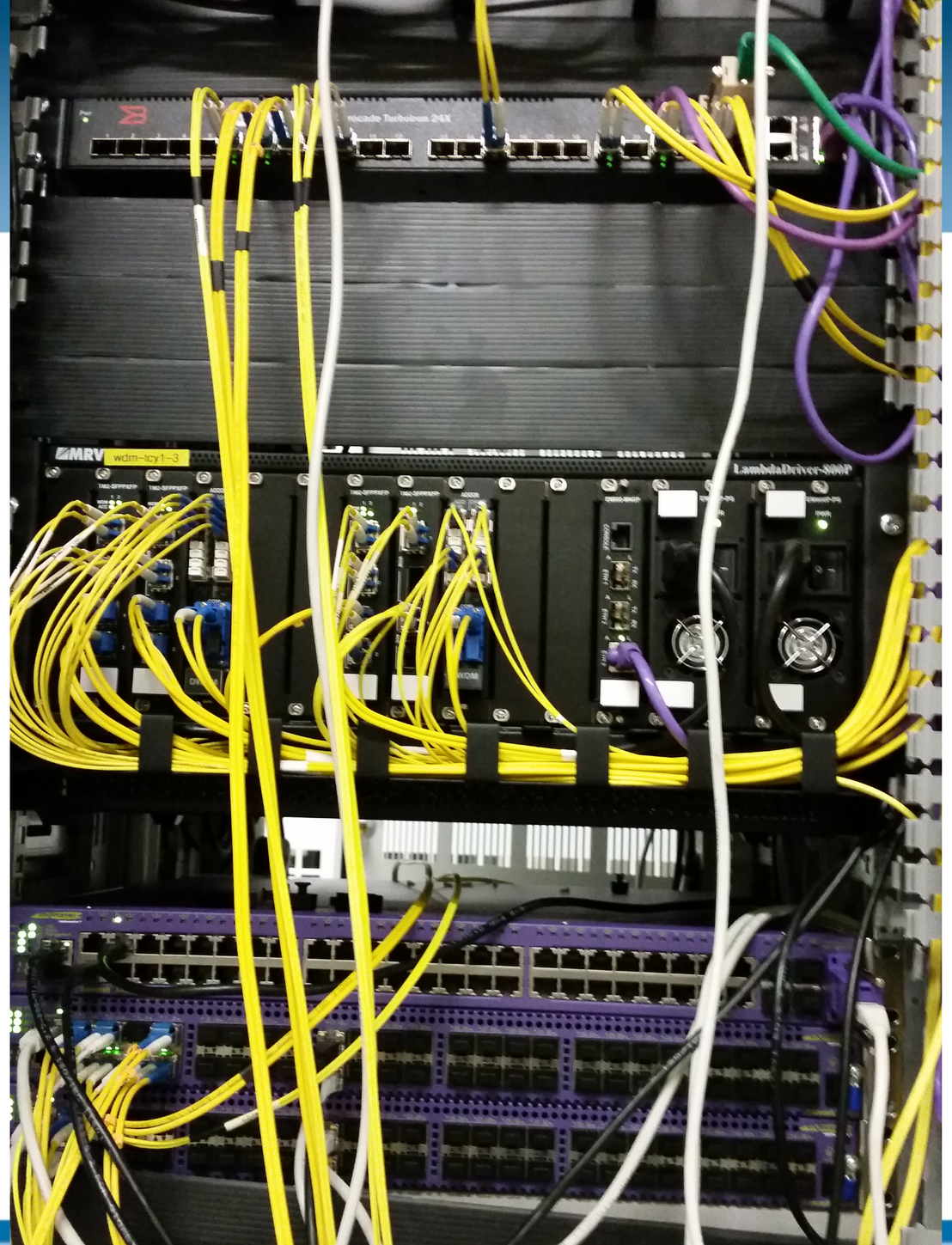
Lab tested at Agile Networks' new HQ in April, with successful PoC

INEX Members Meeting - Dec 2014
Operations Update

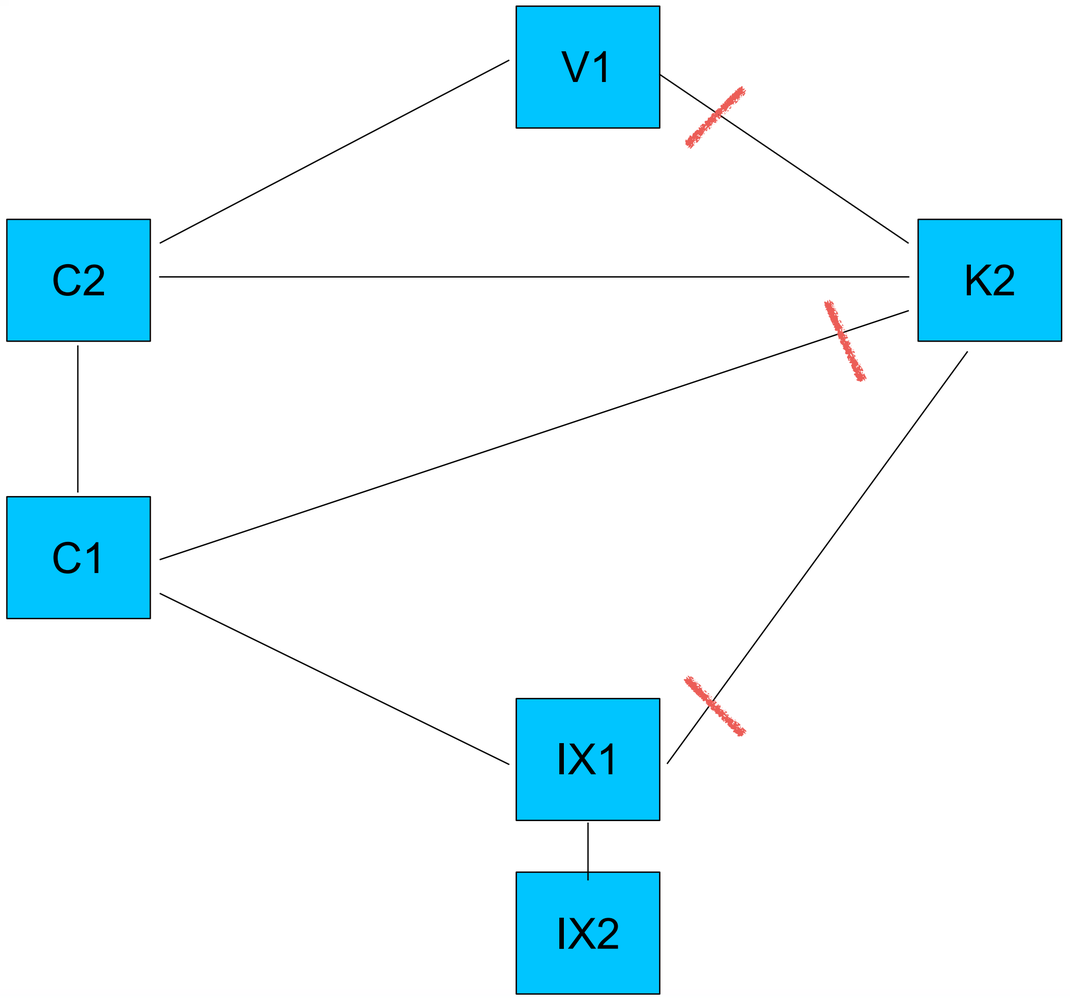
INEX Members Meeting - Dec 2014
Operations Update

Lab work includes template configs for:

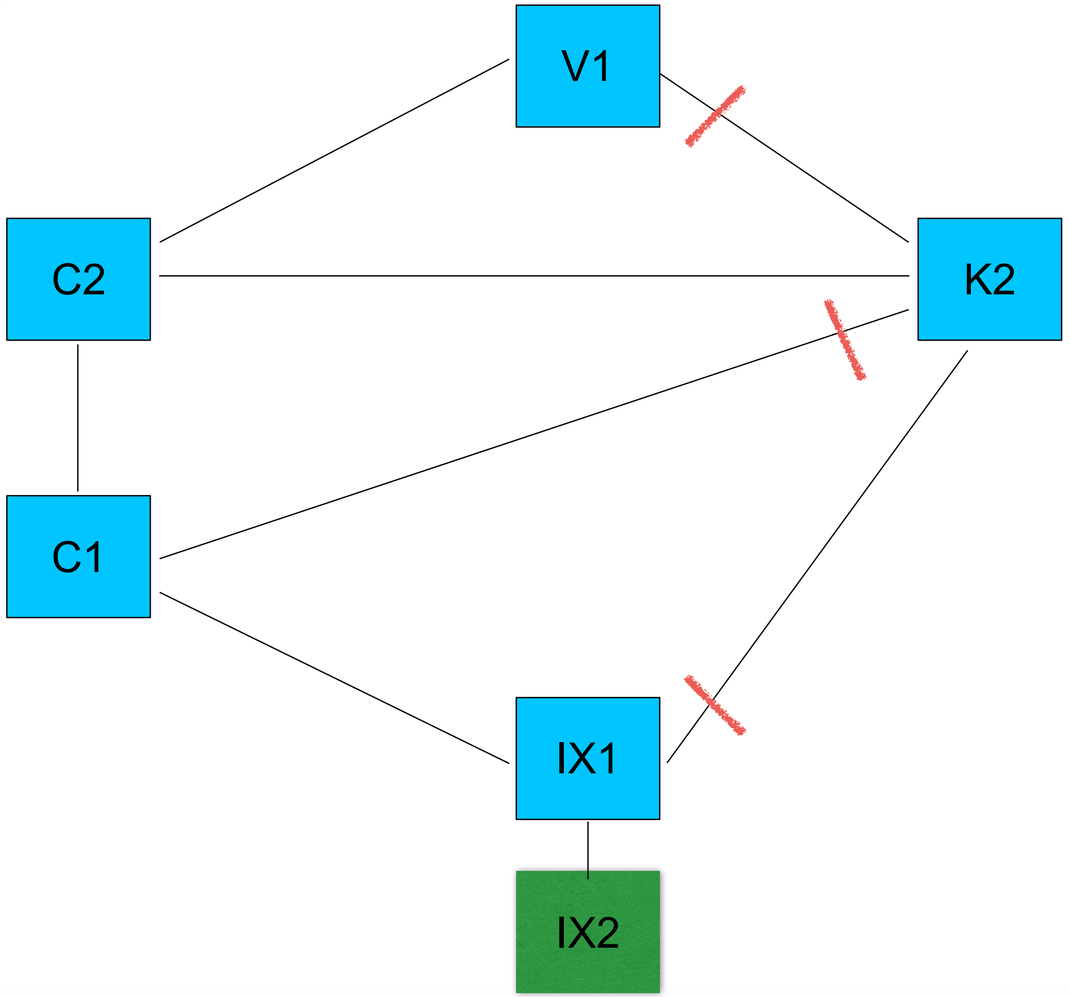
- Mgmt access & TACACS+
- NTP / Syslog / SNMP
- VLANs
- STP
- Sflow
- LLDP / EDP
- LAGs / LACP
- Port mirroring
- Storm control
- L2 ACLs
- Port security
- UTP Auto-neg / hard coding



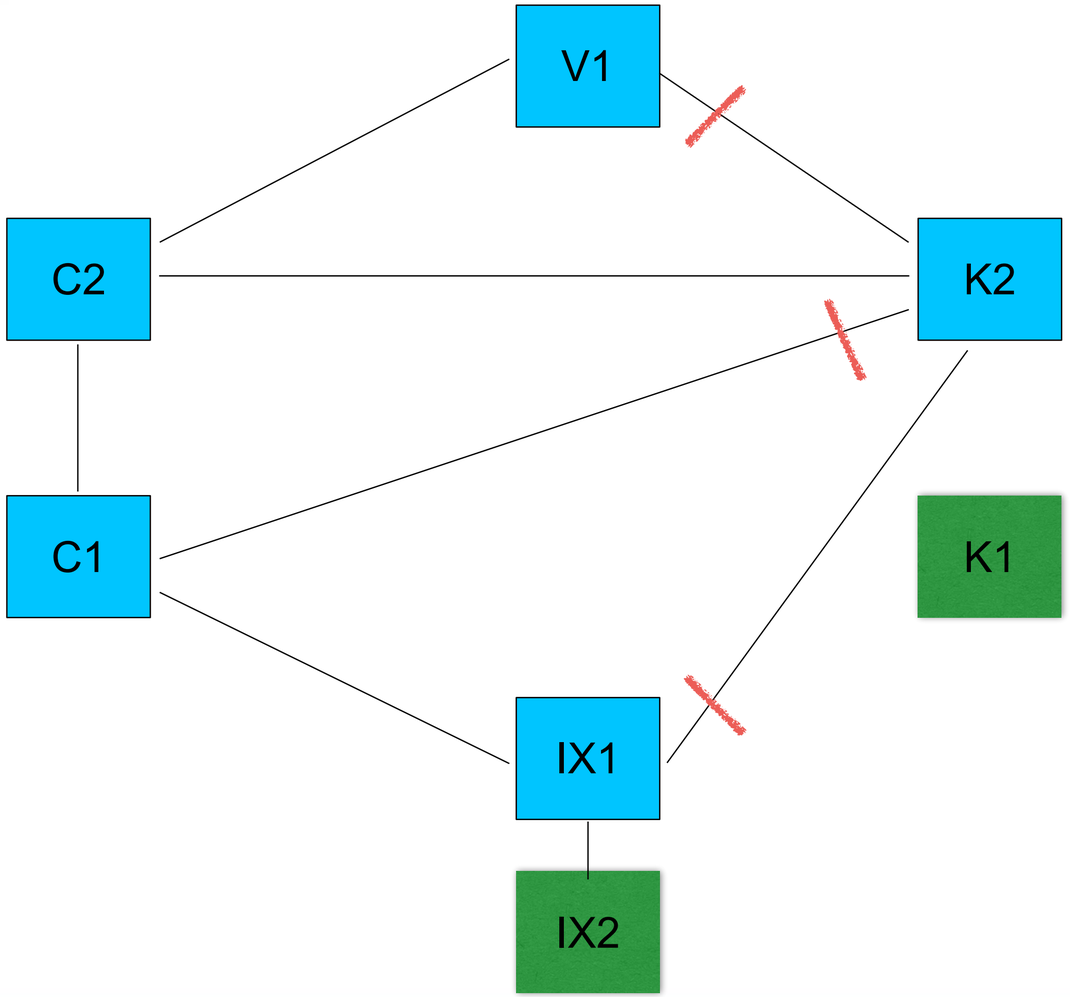
LAN1 Core TI24X Topology Before Upgrade



LAN1 Core Upgrade



Example Insertion of x670 into KCP



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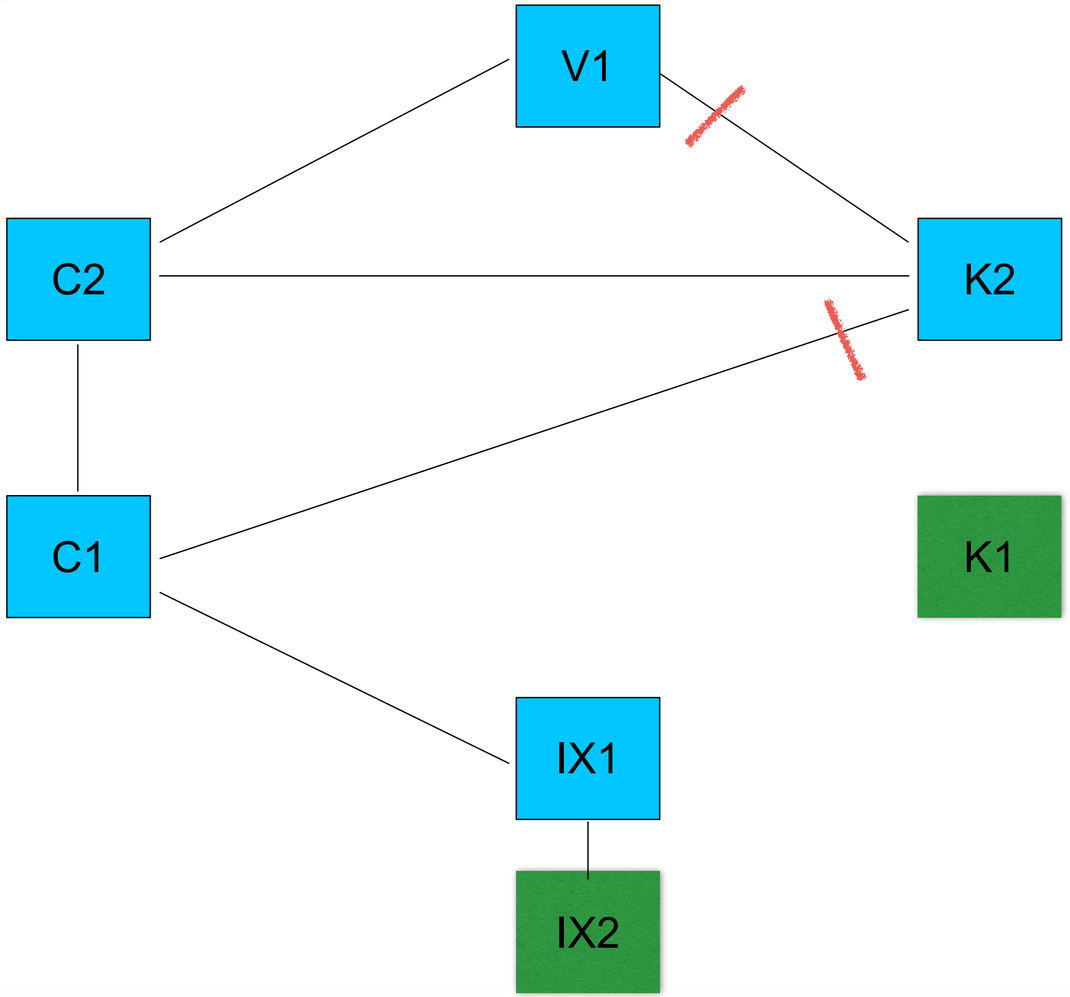

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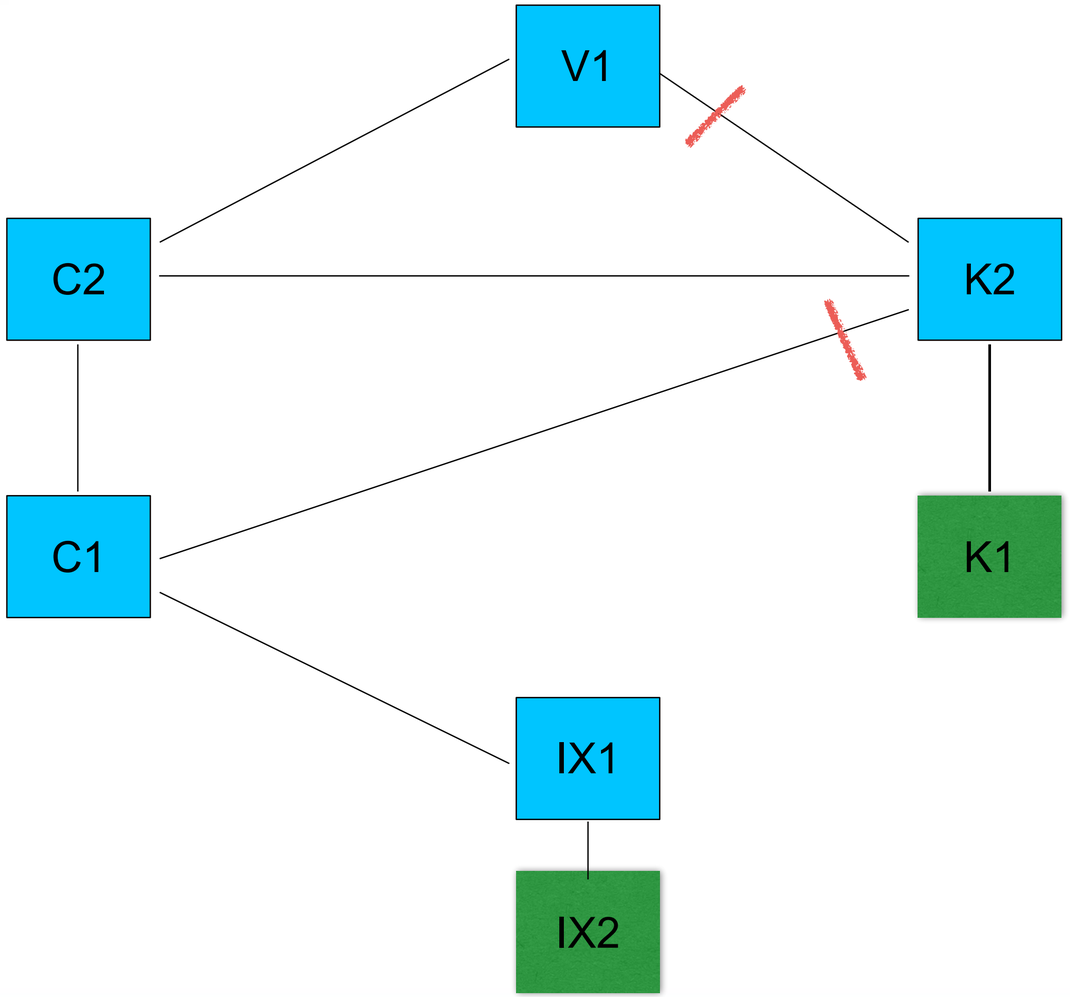

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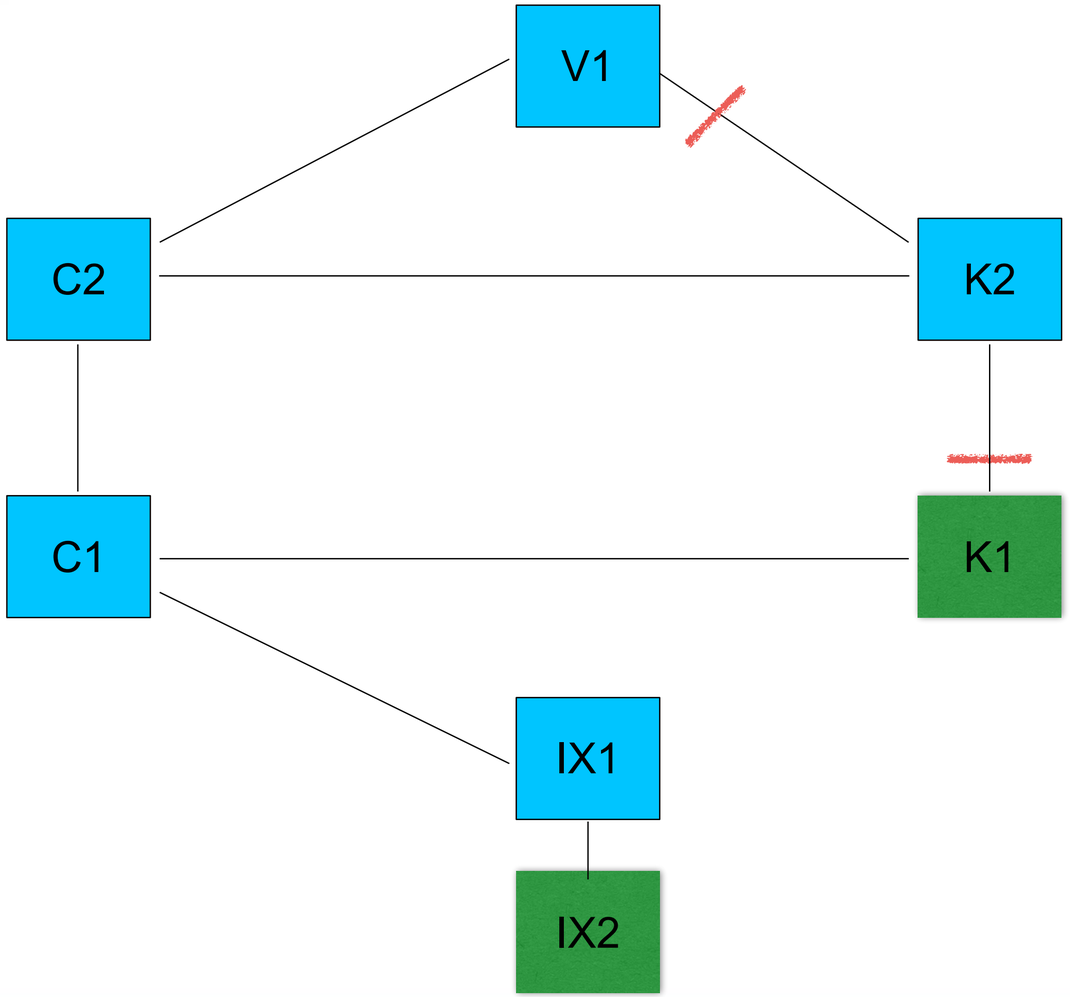

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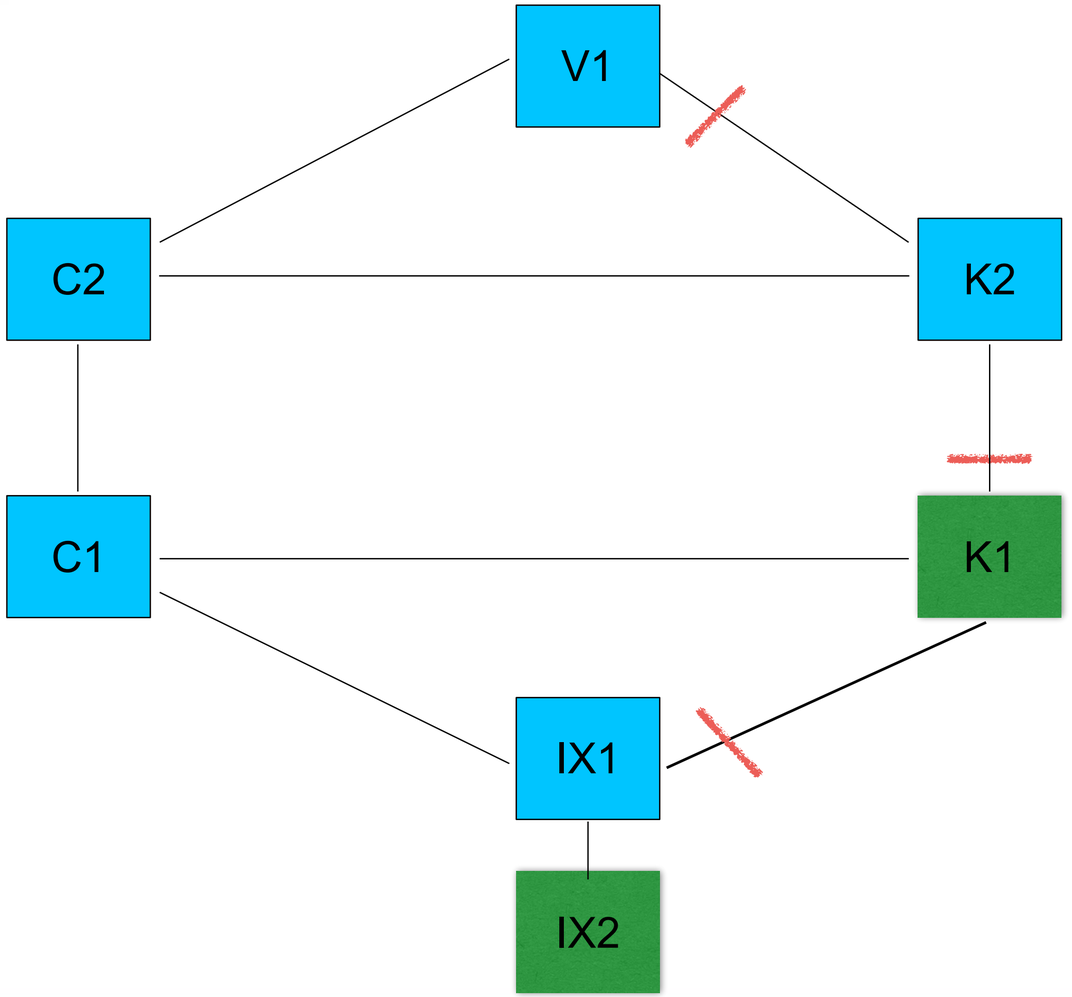
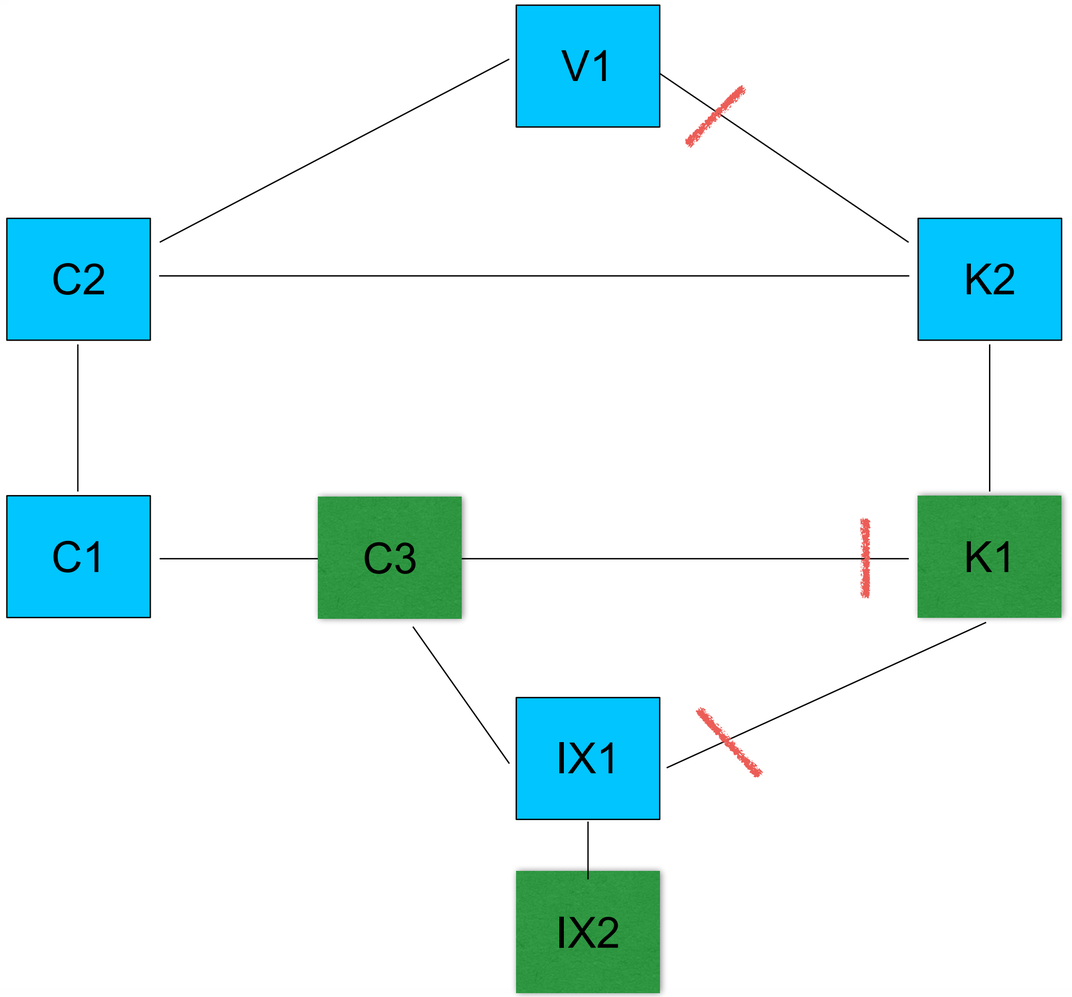
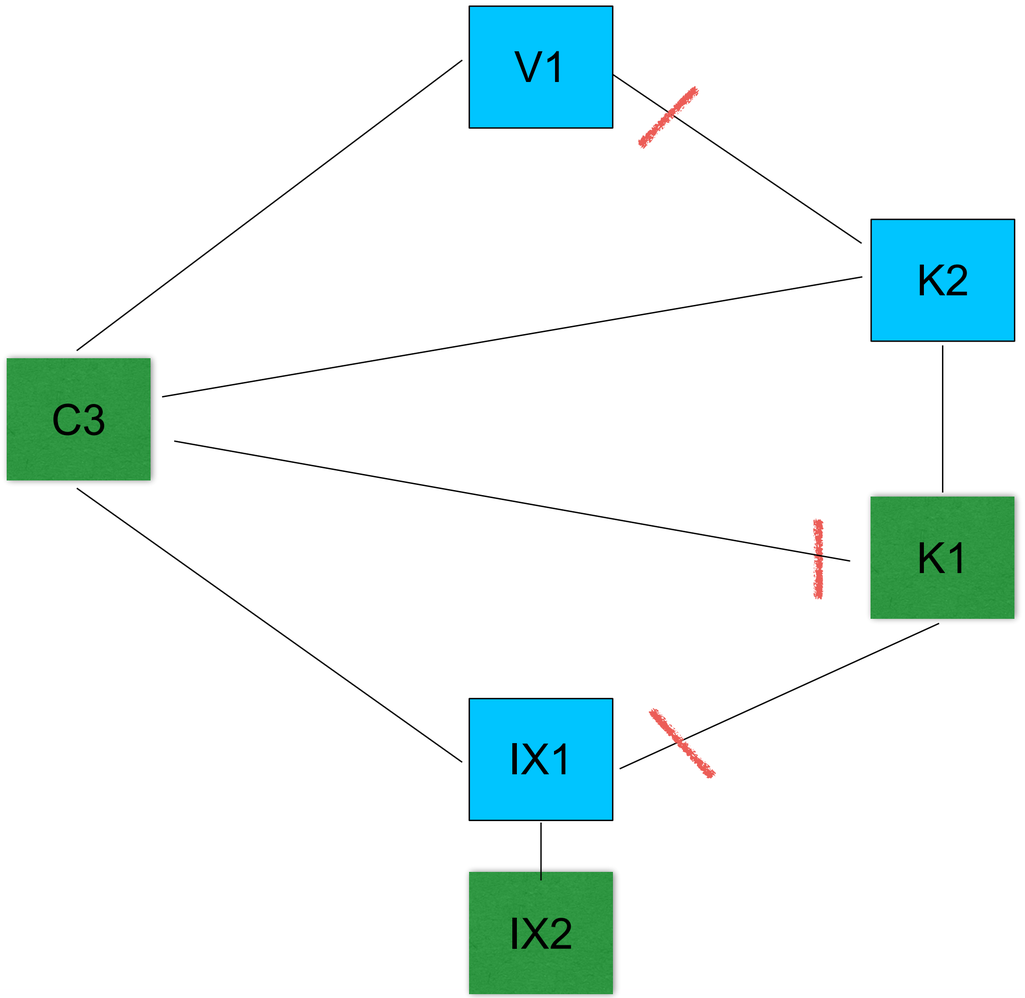


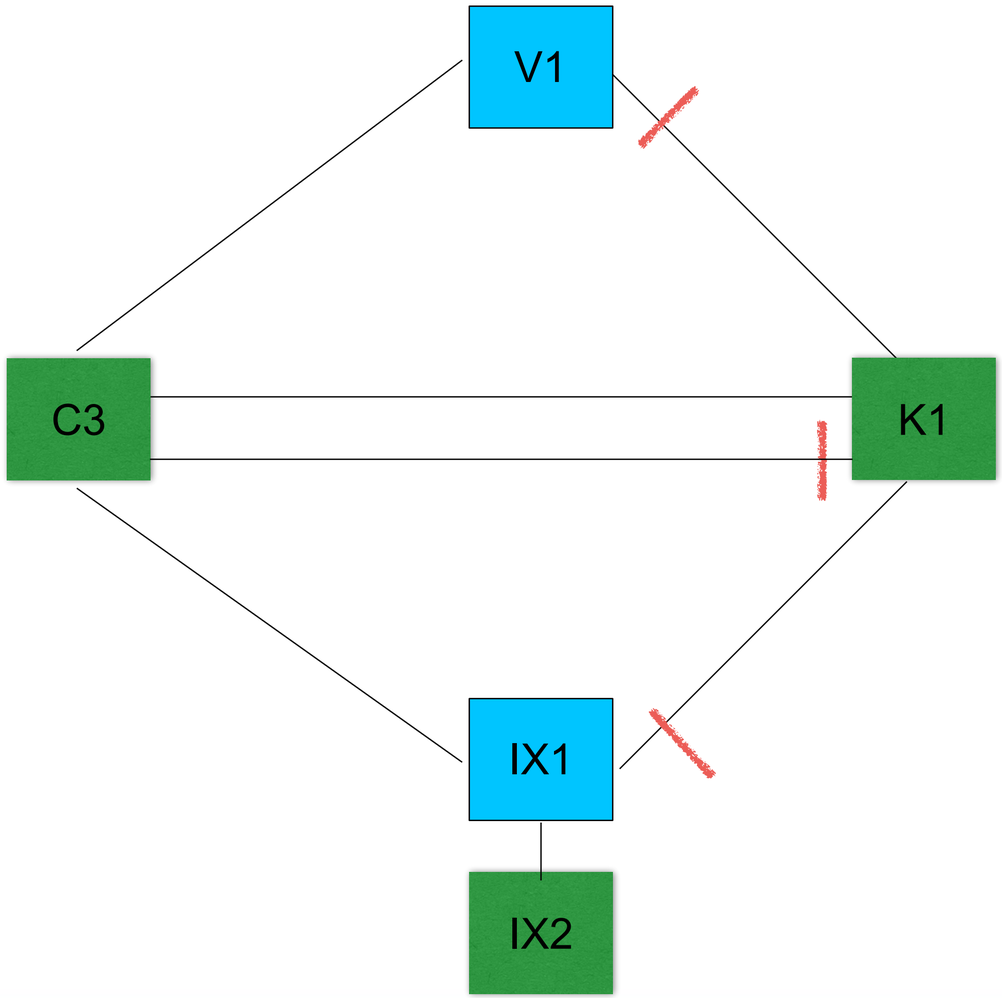
Shim In TCY Citywest



Jan 15th:



Jan 22nd:



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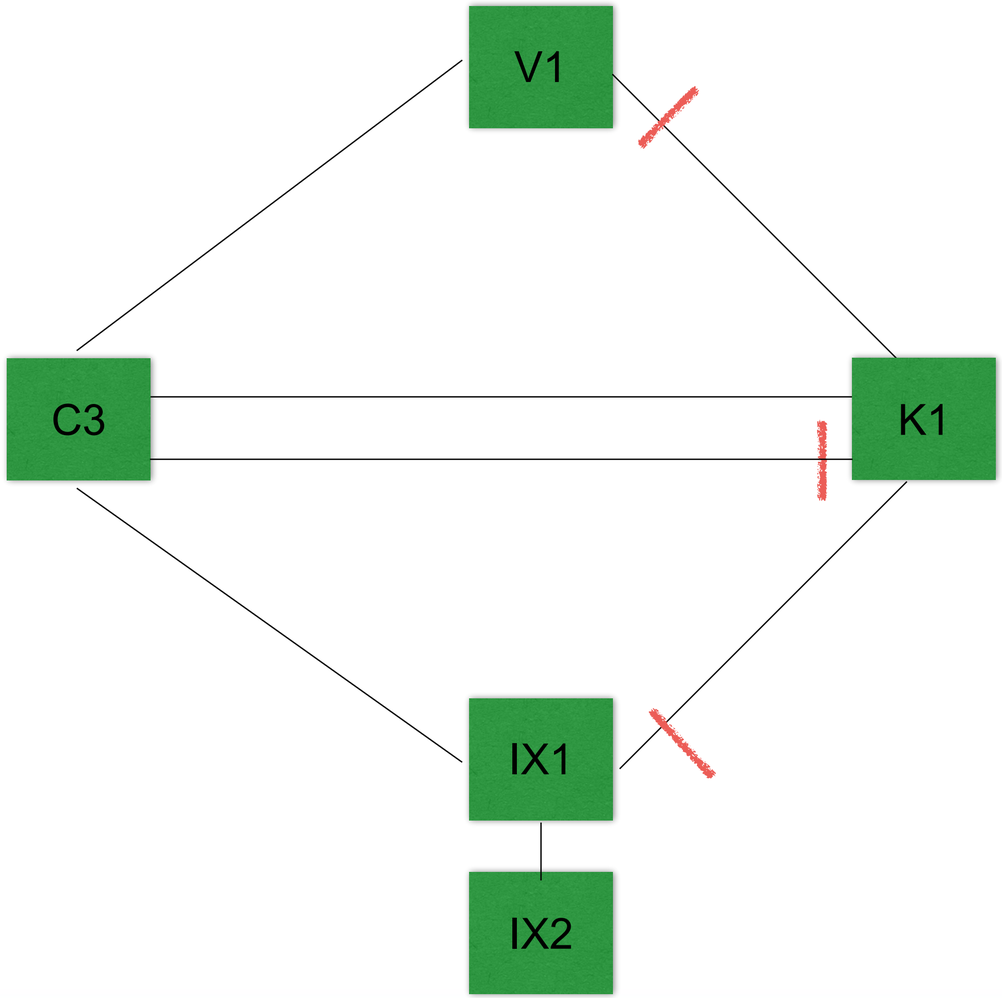
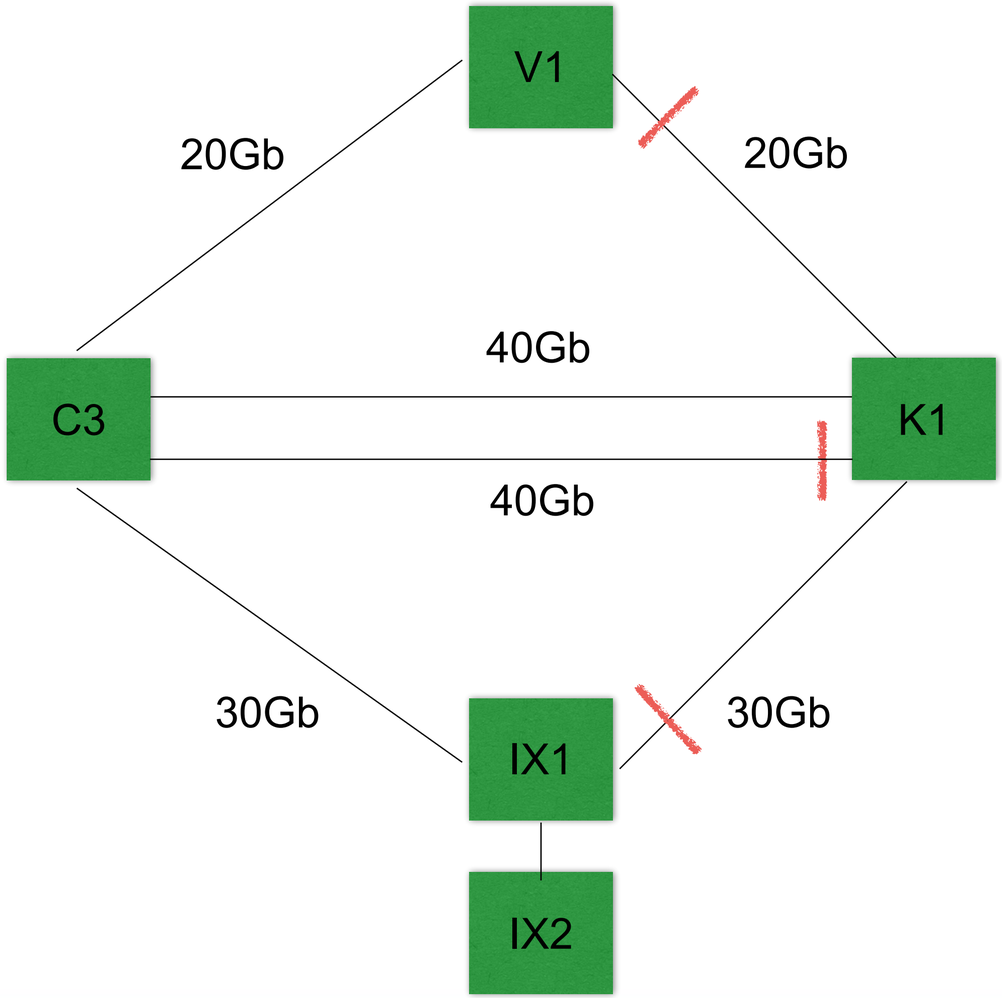
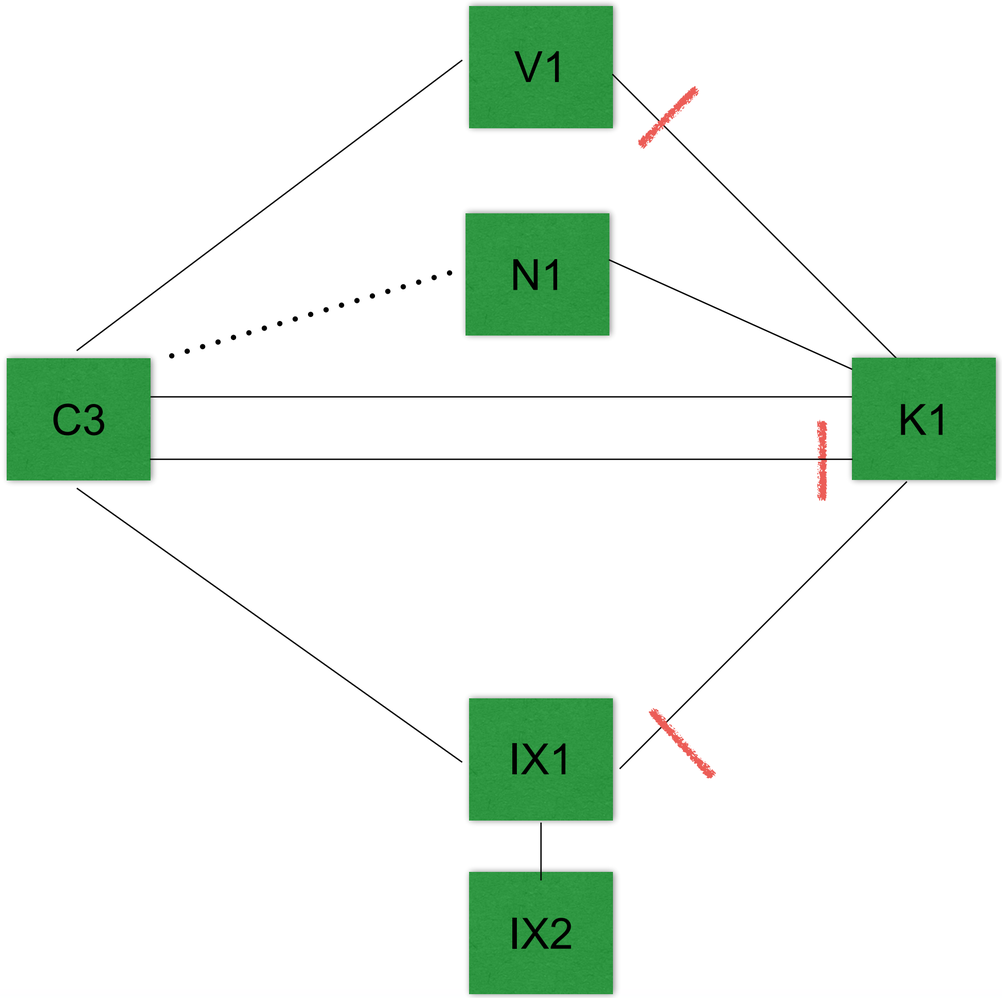


Core Links



NWBP

NWBP

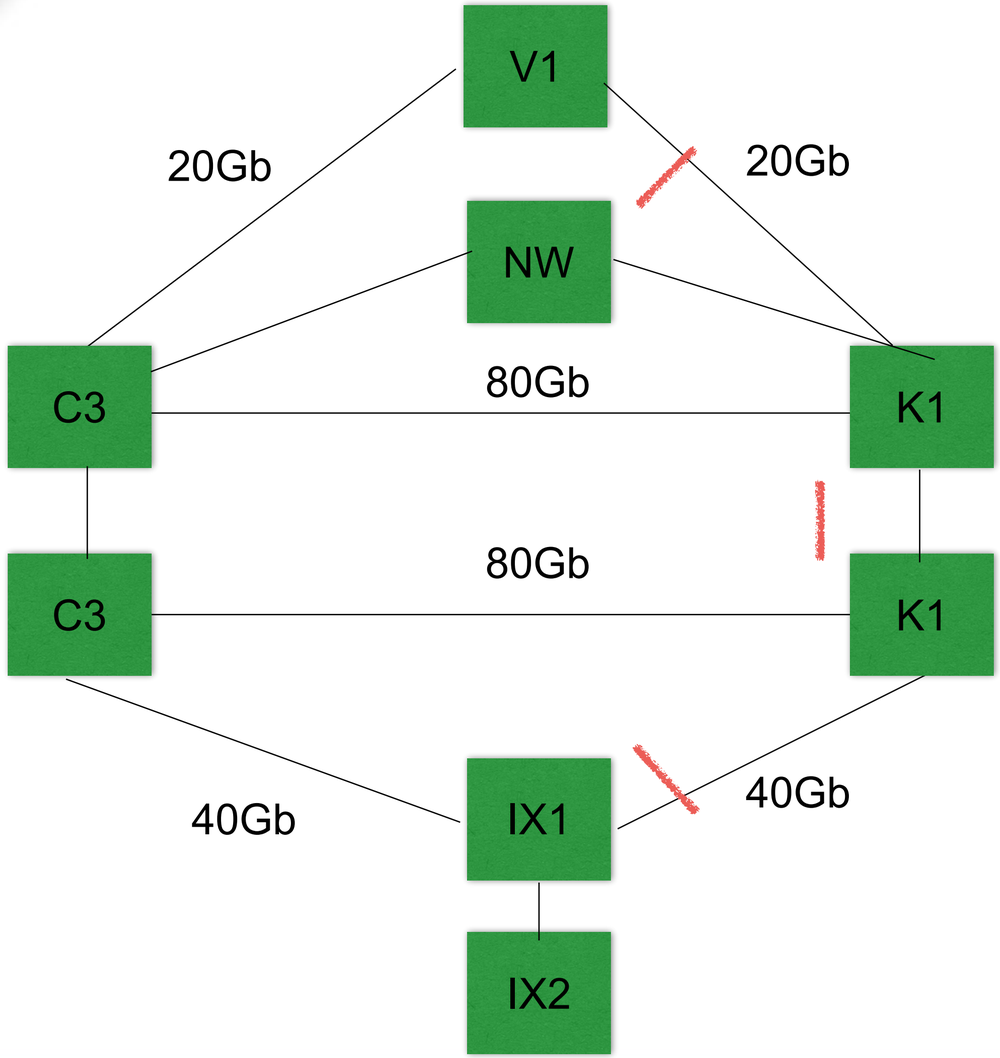


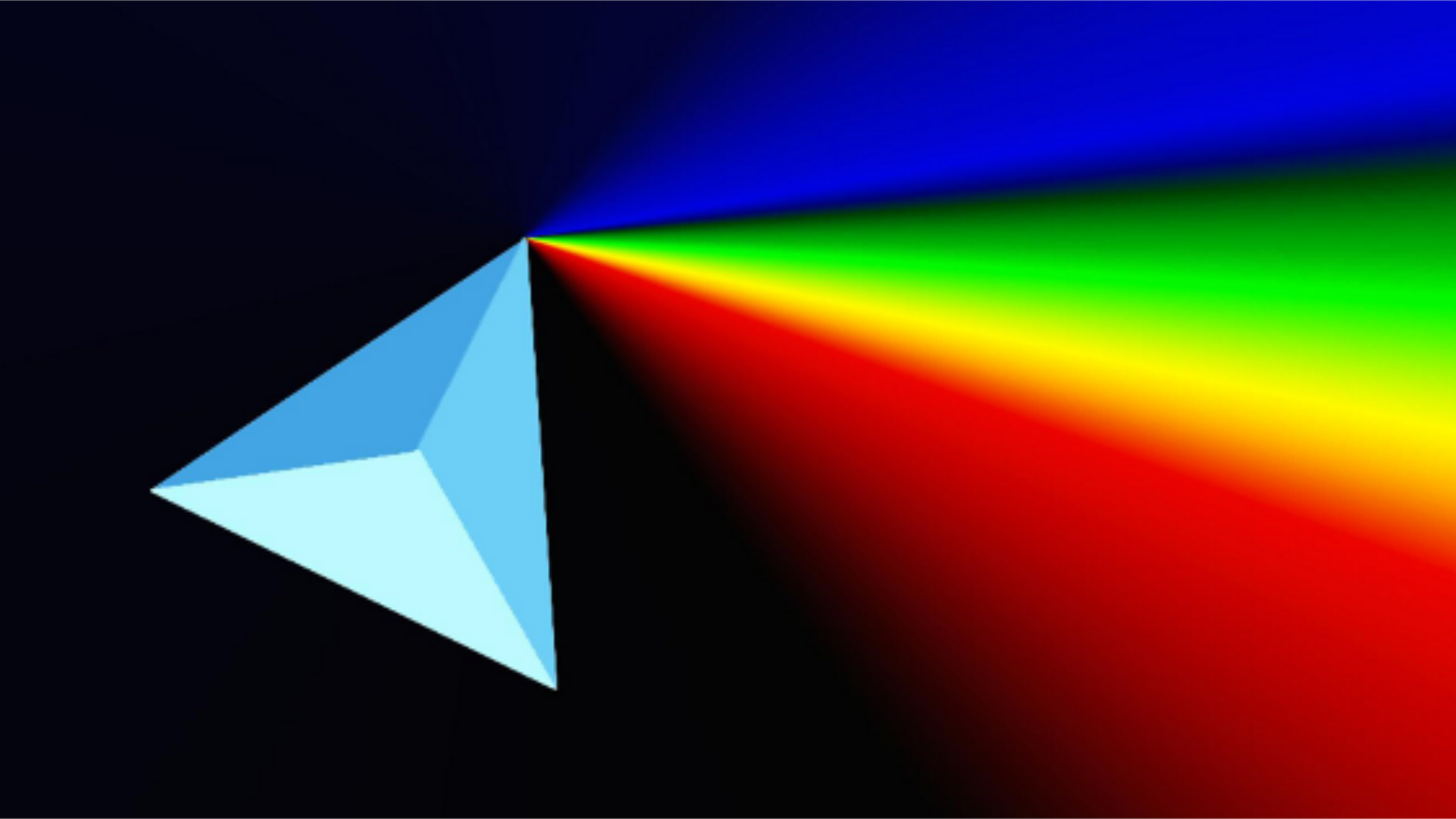
Argh! STP!

Alternatives:

- VPLS
- TRILL
- EVPN
- VXLAN

In Progress



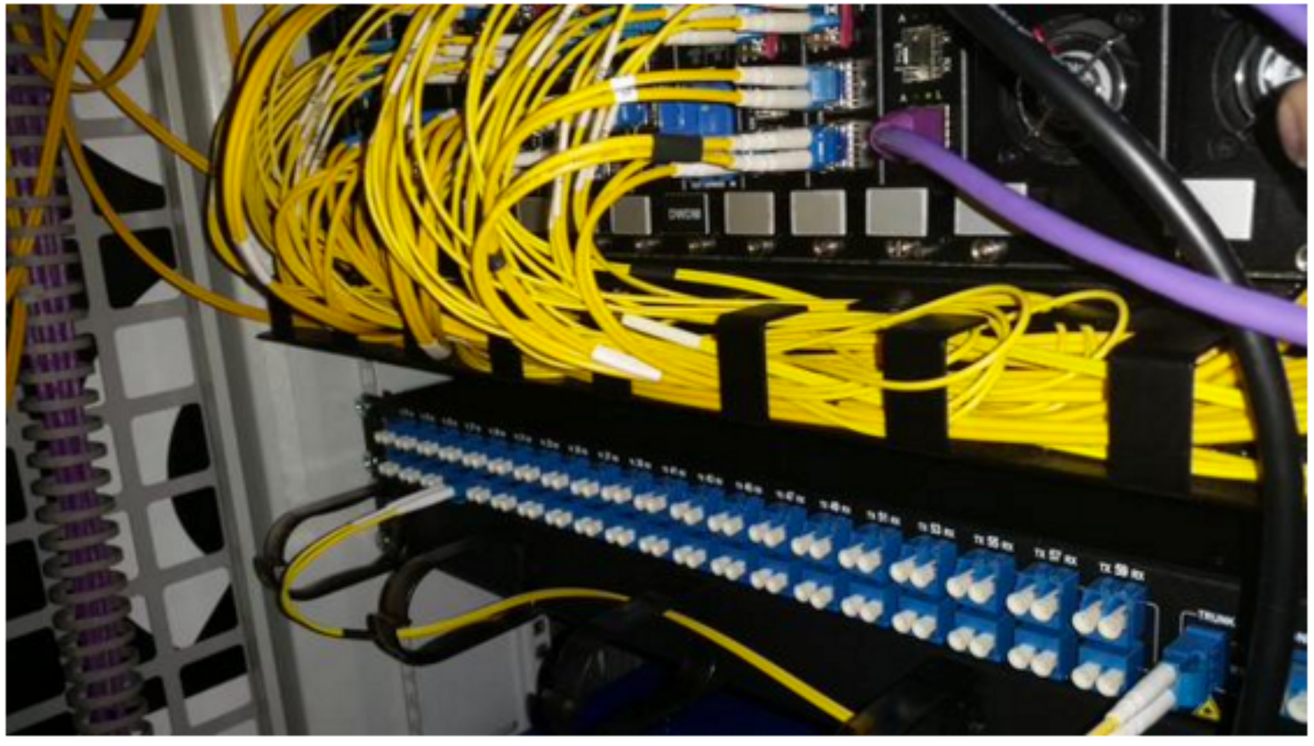


NETWORK OPERATION
NETWORK OPERATION
CF 0
ISM
PVDM1
PVDM0
TM-301
transmode
Fan status
OK
Alarm
Console
USB
RS232
ICN1
ICN2
ICN3
ICN4
PWR
STS
-48V RTN
GND
strap

MRV
TM2-SFPPXFP
ADDD8
ADD
DROP
28
WDM
ACC
COM
EM800-MNGP
EM800P-PS
PWR
CONSOLE
ETH1
ETH2
TX
RX

Barry O'Donovan
@barryo79

At the start of tonight's MUX upgrade in @ComePeerWithMe - from 80Gb to 400Gb potential inter-core-PoP capacity #ixp



IXP Manager

Full stack management system for IXPs

- Administrative & Member Portal
- End to end provisioning system
- Teaches, implements and ensures best practice
- Fully loaded with IXP specific tools and features
- F/LAMP Stack plus Laravel / Doctrine ORM / ZF1

https://github.com/inex/IXP-Manager

Configures everything but the port. For now…

Example of Auto Provisioning

- When a interface is added to IXP Manager, you get:
  - Route Collector BGP session auto-provisioned
  - Route Server BGP session auto-provisioned
  - MRTG auto-provisioned
  - Peer to peer graphs auto-provisioned
  - Nagios monitoring of member's interface
  - Smokeping target for member's interface
  - AS112 BGP session
  - ARPA DNS for IXP assigned address
  - RIR AS-SET / ASN objects

Route Servers

- An IXP is just a shared L2 domain
  - Think of it as a **big switch**
- IXP participants arrange bilateral BGP peerings
  - Exchange their routes
  - Exchange traffic
- Sessions required: n(n-1)
  - 10 participants: 90
  - 80 participants: …

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  - 80 participants: 6320

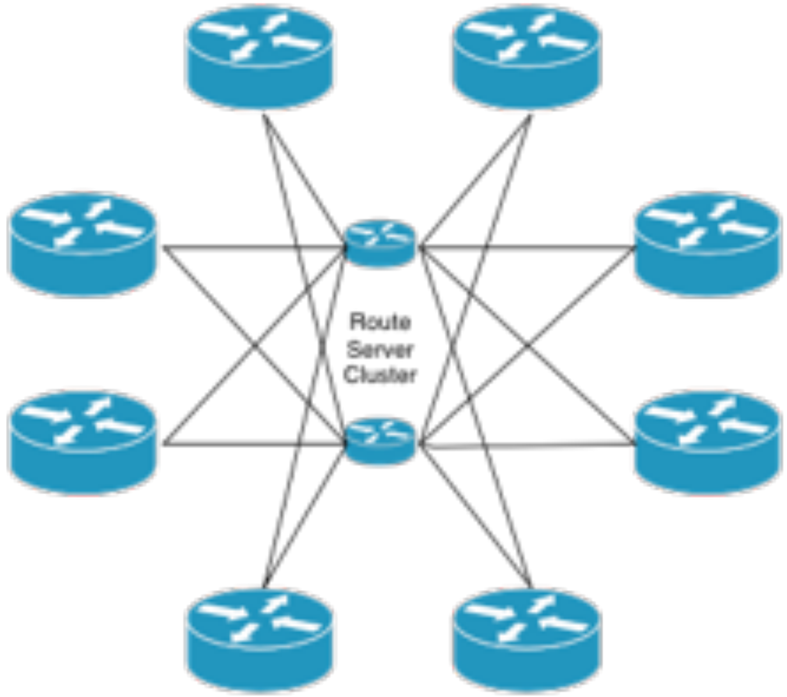
Route Servers

Peering on IXP without Route Servers

Route Servers

inex
internet neutral exchange

Peering on IXP without Route Servers



Peering on IXP with Route Servers

Route Servers

- Route servers **do NOT route traffic**
- Preserves:
  - AS-PATH (no bgp enforce-first-as)
  - MED
  - Communities
- Uses per-client RIBs (memory, processor intensive)
- **Critical infrastructure: must be stable, robust, secure, free from PEKAC**
- **IXP Manager contains INEX's broad experience with route servers**
- **INEX:** two resilient route servers, zero human touch

Other Projects / Outreach

- Euro-IX JSON Export Schema - https://github.com/euro-ix/json-schemas
- RTBH - RFC 6666
- IXP Manager - 22 IXPs using this now! Workshops @ Euro-IX.
- Twinned with Gambia (Euro-IX / ISOC project)
- Serbian IXP Workshop (ISOC)
- Montenegro IXP Workshop (ISOC)
- National Time Service
- NEW: Maintenance Notifications Schema

INEX Community

- Four members' meetings per annum
  - Three are half day conference style
  - The summer one is a social
- Usually sponsored by a member / associate member
- Updates from the CEO, sales / marketing, technical team
- Invited guest speakers / member presentations
- 5 Minutes of Fame slot
- Attendance varies from 50 – 100
- Mailing lists, IRC channel
- Twitter: @ComePeerWithMe

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Free Beer!

INEX - Some of Our Members

inex
internet neutral exchange

Thank You!

Barry O'Donovan
barry.odonovan@inex.ie
@barryo79