



What is an IXP?

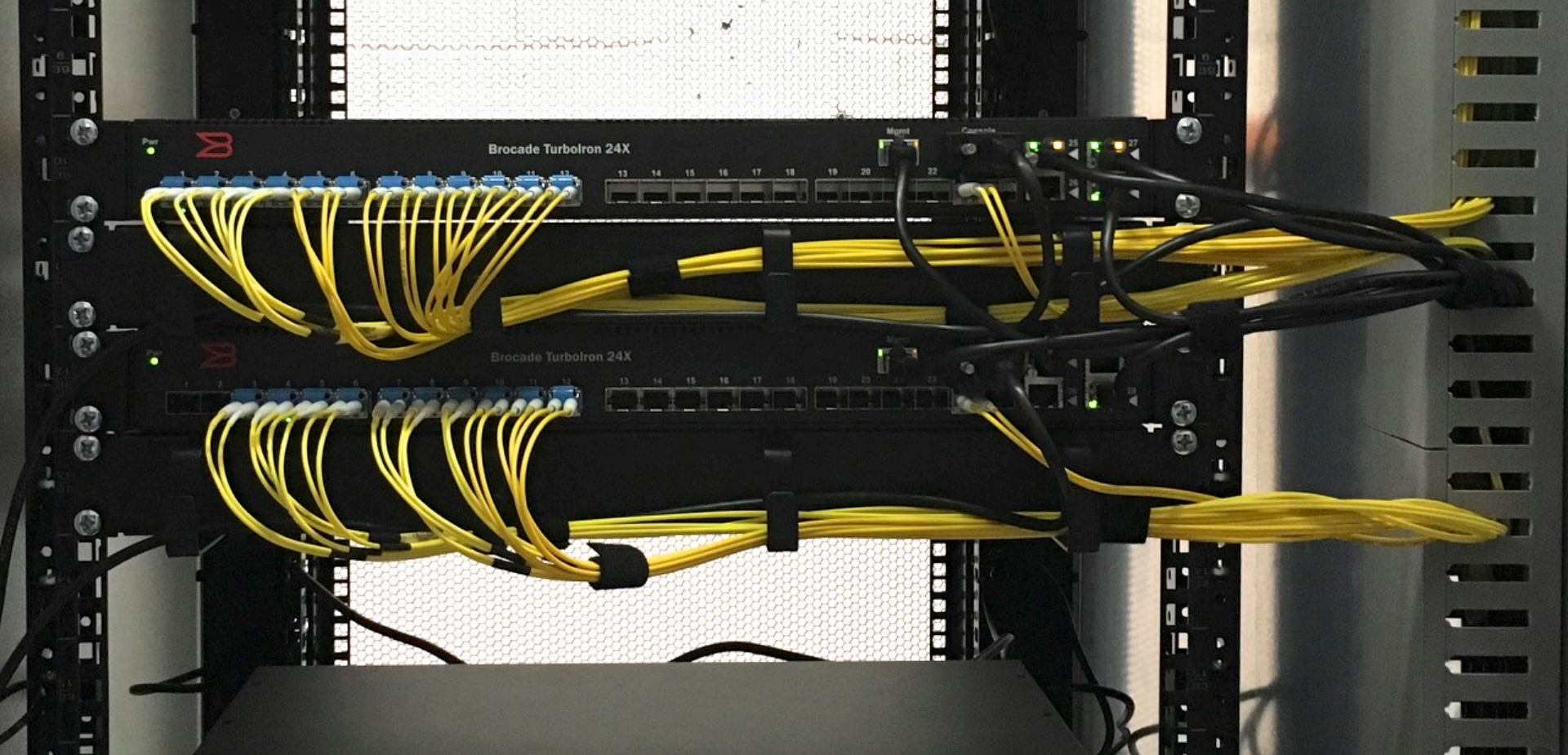
Beirut, March 2017

Nick Hilliard

Chief Technical Officer

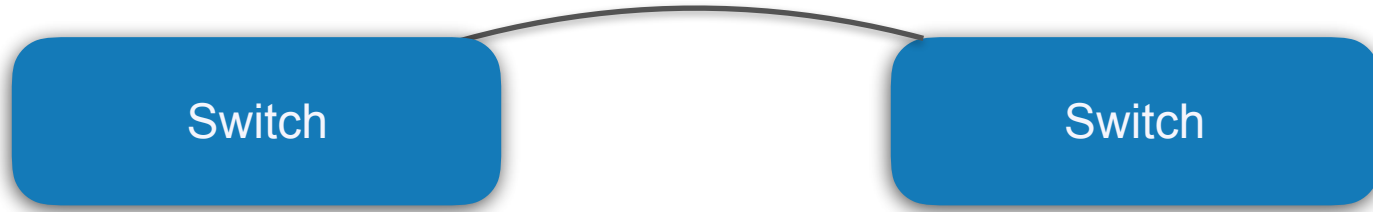
Internet Neutral Exchange Association
Company Limited by Guarantee

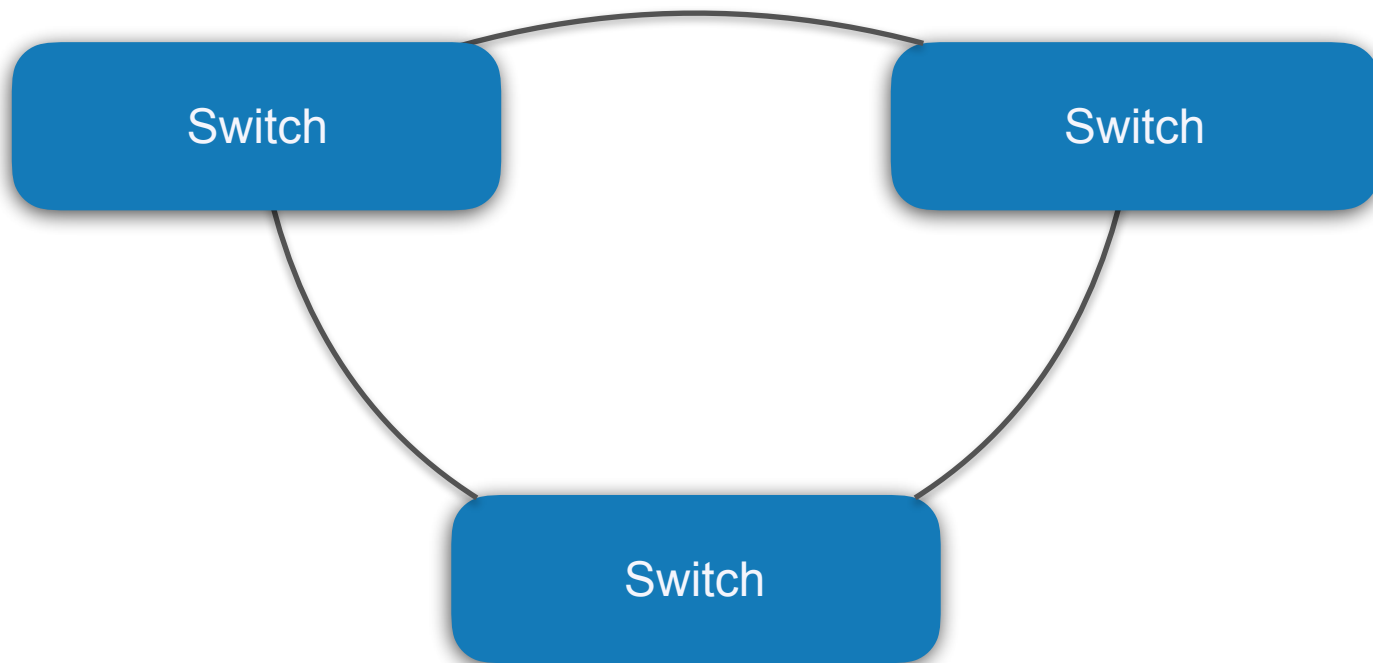


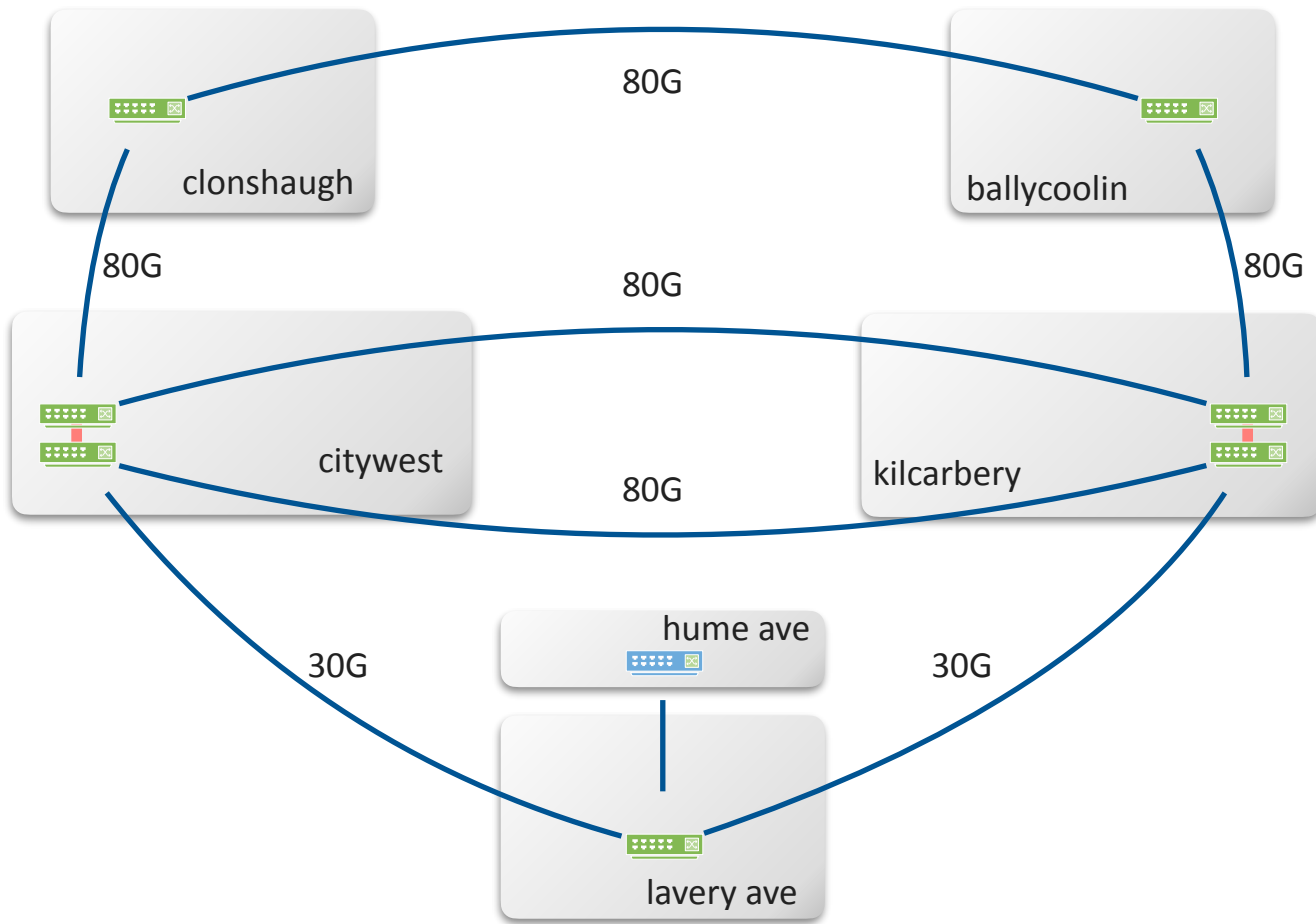


Just a Switching Platform

Switch







What is an IXP?

IXPs - the IX-F Definition

- An Internet Exchange Point (IXP) is a network facility that enables the interconnection and exchange of Internet traffic between more than two independent Autonomous Systems.
- An IXP provides interconnection only for Autonomous Systems.
- An IXP does not require the Internet traffic passing between any pair of participating Autonomous Systems to pass through any third Autonomous System, nor does it alter or otherwise interfere with such traffic.

What is an IXP?

IXPs and IP connectivity

- Generally speaking, three types of IP connectivity:
- Private Network Interconnections (PI or PNI)
- Internet eXchange Point (IXP)
- Regular IP Transit (IPT)

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 - latency
 - available bandwidth
 - “control” - more recently we also consider mitigation against DDoS.

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Quality Improvement

What is an IXP?

IXPs

- Less Expensive
- Limited routes
- Member & community
- Greater control
- Greater QoS
- Traffic remains local
- Lower latency
- No congestion
- Greater reliability
- Enhanced security

IP Transit

- More expensive
- Near or 100% routes
- You're just a customer
- Limited or no control
- Main problems:
- Latency
- Routing
- Congestion



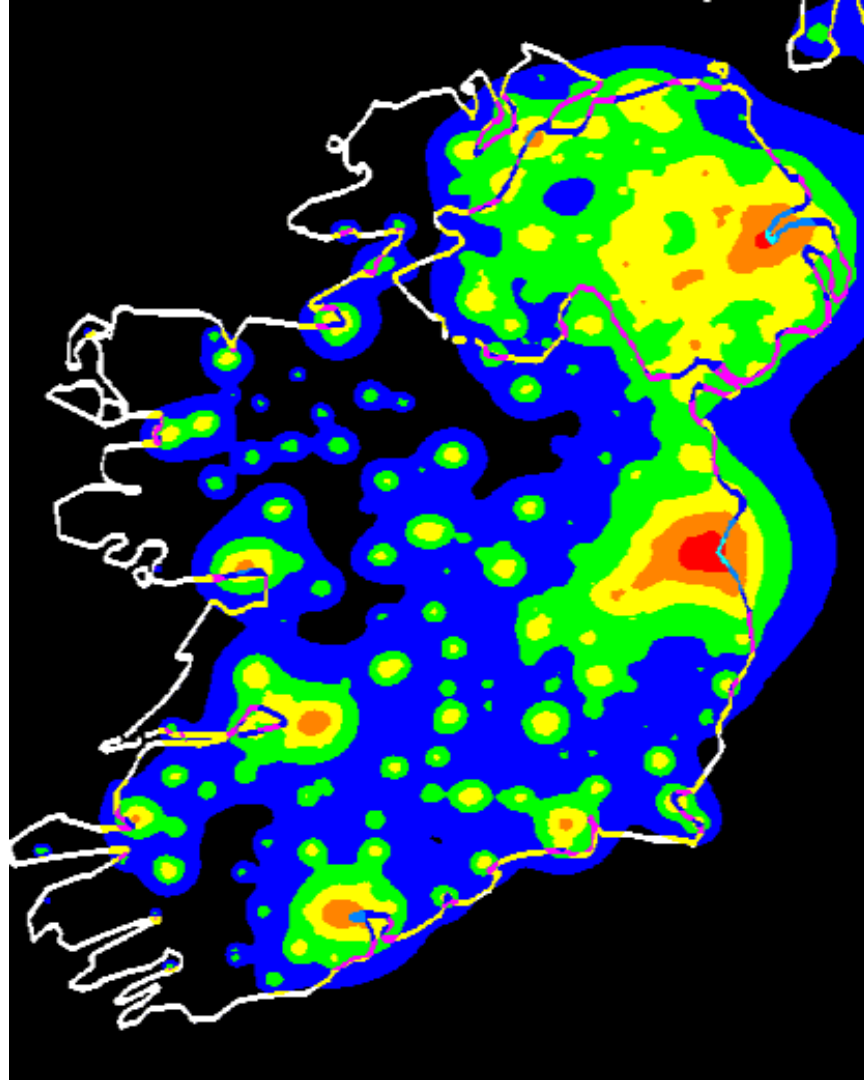
Population

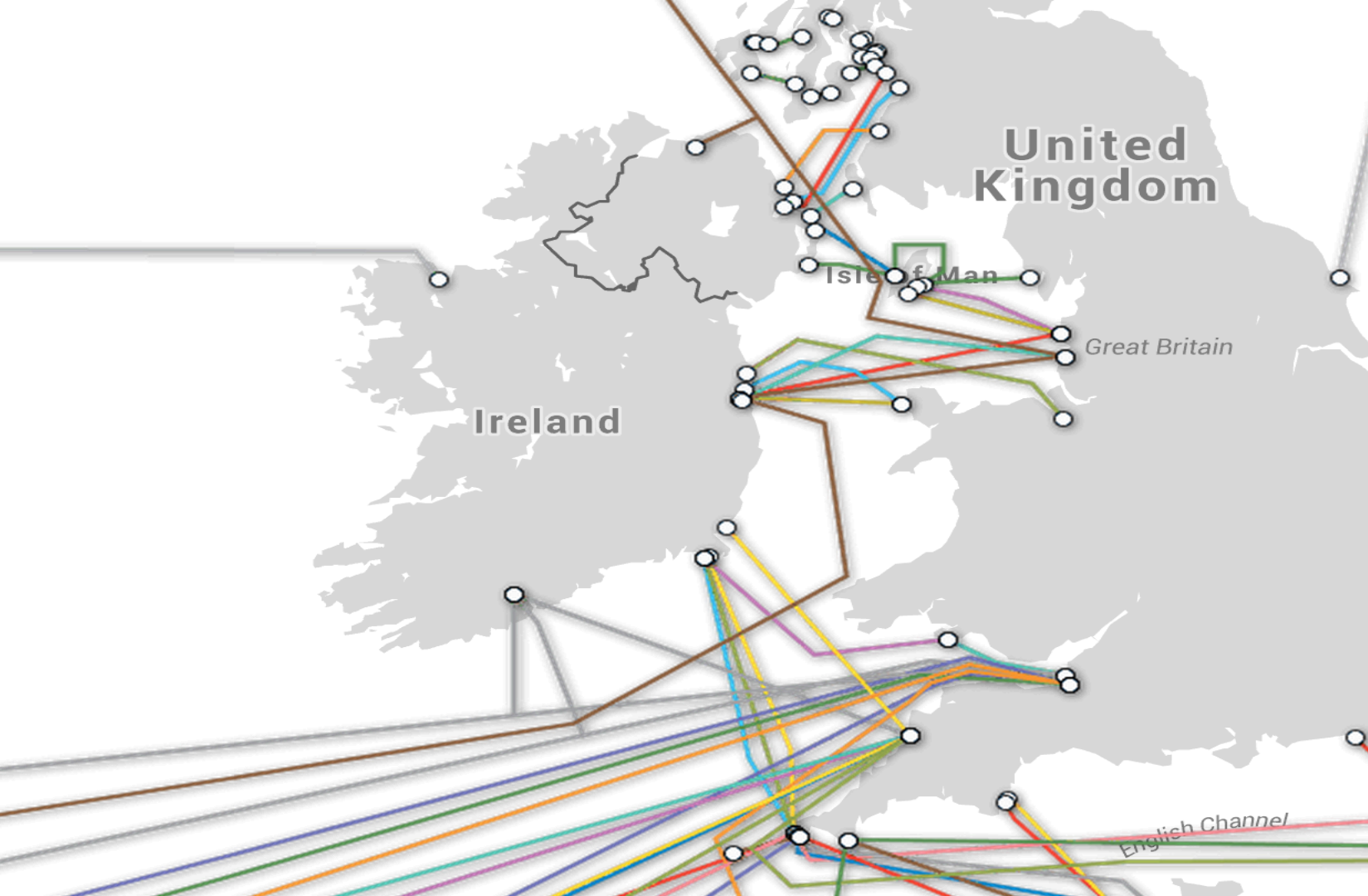
Northern Ireland: 1.8m

Republic of Ireland: 4.6m

Total: 6.5m

Land Area: 85,000 Km²





UK spy base GCHQ tapped Irish internet cables

Snowden documents reveal how British intelligence target Irish internet traffic



What is an IXP?

Why did Ireland need an exchange?

- Internet connectivity was extremely expensive
- Cost of IP Transit was \$250,000 per megabit per month
- Speed of access was cripplingly low
- Local IXP would relieve international links
- Local traffic routed via London / Amsterdam
- Greater security / resilience for local traffic

What is an IXP?

First Attempt: DINX

- Neutrality not mandated in its Constitution
- No neutral colocation
- Two members decided to hijack the process
- IXP didn't grow beyond two members

What is an IXP?

Second Attempt: INEX

- HEAnet – Ireland's NREN
- EUnet Ireland (acquired by BT Ireland)
- Indigo (acquired by Eircom - NPT)
- Telecom Internet (acquired by Eircom - NPT)

What is an IXP?

INEX - Governance Structure

- Neutrality enshrined in Company Memo & Arts
- No member is more privileged than any other
- Not for profit “Company Limited by Guarantee”.
- Open to anyone agreeing to and meeting the MoU
 - MoU has policy and technical requirements
 - Publicly available on the INEX web site - www.inex.ie
- Owned by the members (currently ~91 full members, 18 associate members)

What is an IXP?

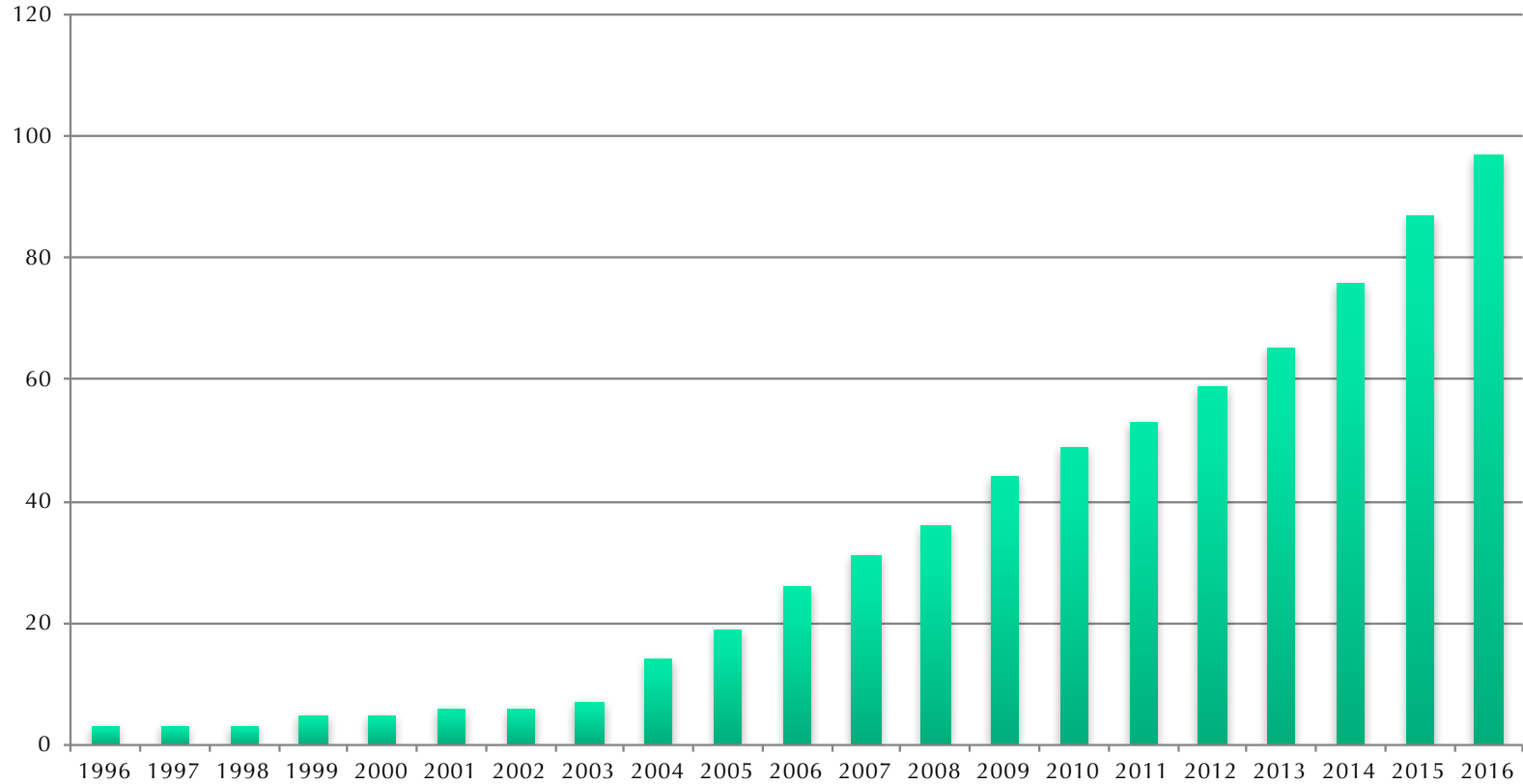
INEX - Governance Aims

- Provide high-speed, reliable and resilient IP traffic exchange facilities
- Allow national and international members to route traffic more efficiently
- Keep Irish IP traffic in Ireland
- Only an IXP - no feature creep into other areas

What is an IXP?

INEX - Organisational Structure

- 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 (out-sourced)
 - Barry O'Donovan – Operations (out-sourced)
 - Louisa Holmes – Administration / billing
 - Roisin King, Denis Nolan joined in 2016
- All part time



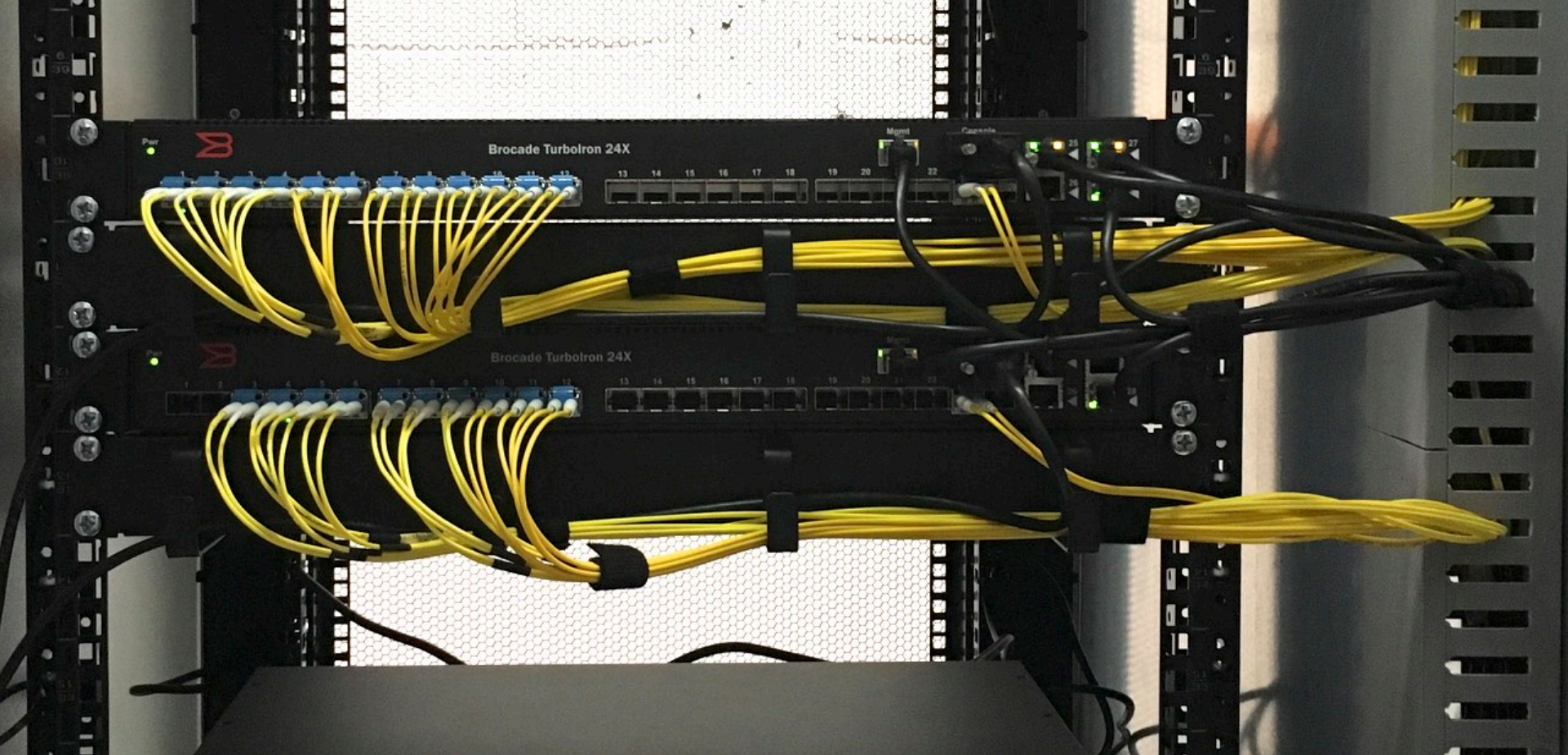
Membership Growth - 1996–2016



Sample of INEX Members



IXP Technicalities



Not “Just” a Switching Platform





What is an IXP?

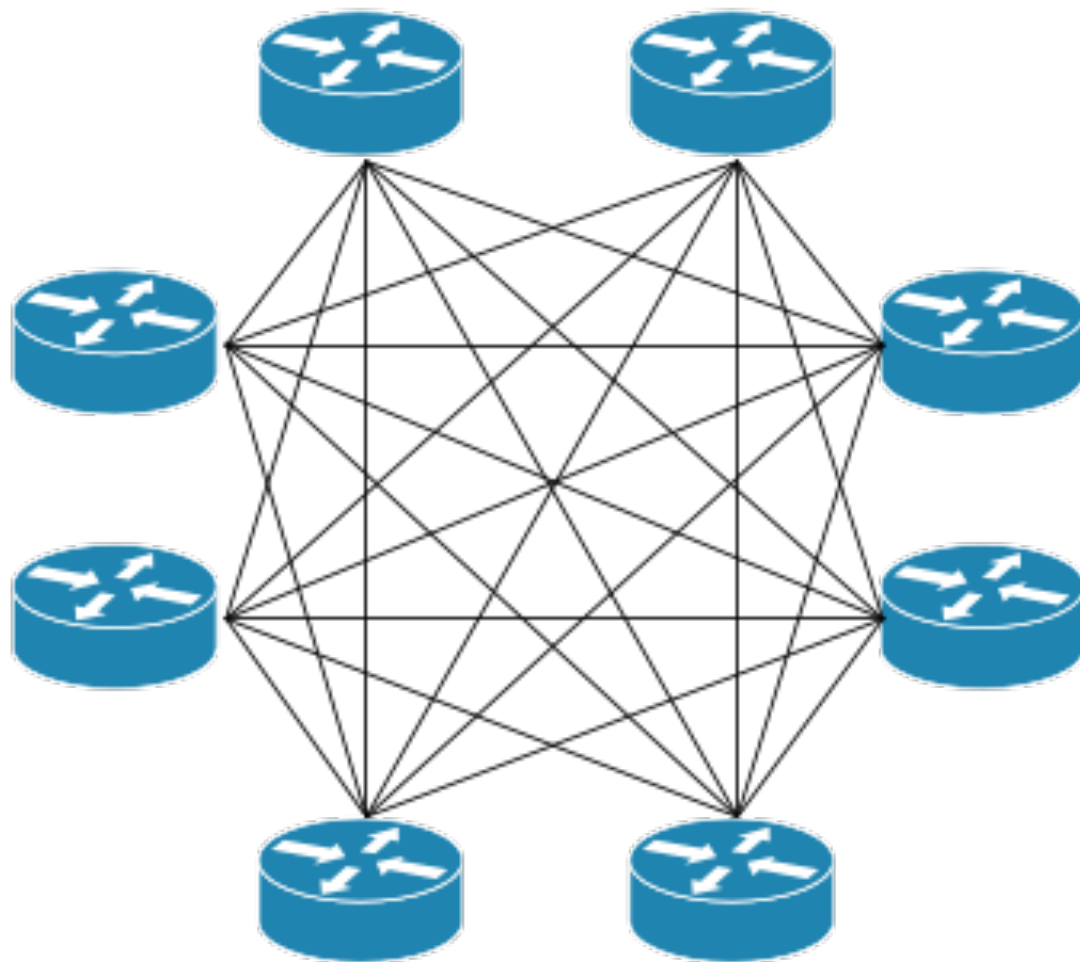
INEX - Pro Bono Connections

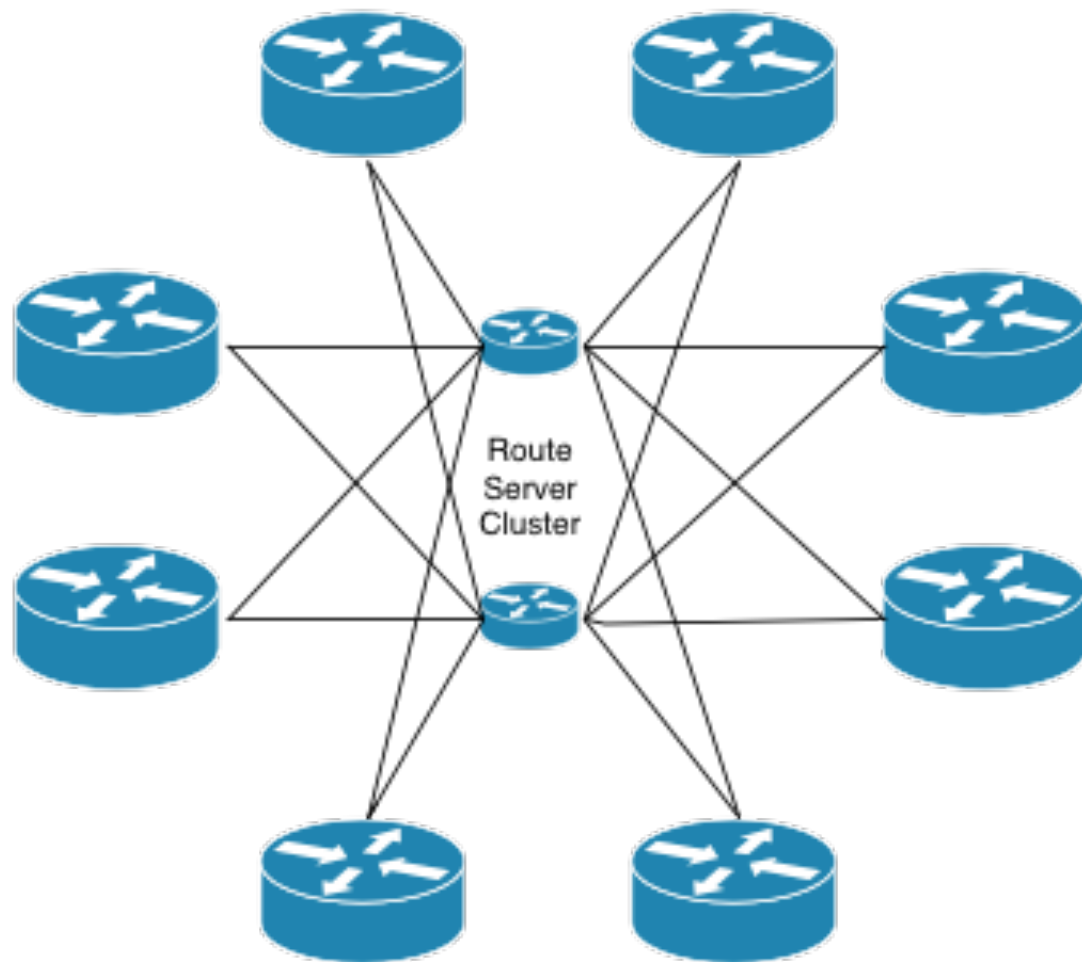
- Verisign 'J' DNS root server (.com/.net)
- PCH 'D', 'E' DNS root server, Top-Level Domains
- AS112
- RIPE 'K' DNS root (INEX Cork)
- RIPE Atlas anchors (Dublin and Cork)

What is an IXP?

INEX - Routing Assistance Systems

- Route collector - <http://rc1-lan1-ipv4.inex.ie/lg/>
- Resilient route servers
- Without route servers, full mesh peering at an exchange is $n*(n-1)$ sessions
 - 72 members means potentially 8,190 BGP sessions.







IXP Manager is a full stack management system for Internet eXchange Points (IXPs) which includes an administration and customer portal; provides end to end provisioning; and both teaches and implements best practice.

38 Existing Users

GitHub

@ixpmanager





- Full-stack IXP Management System, including switch configuration



NETFLIX





IXP CUSTOMER ACTIONS

[Customers](#)[Interfaces](#)[Patch Panel](#)[Users](#)[Contacts](#)[Colocated Equipment](#)[Meetings](#)

IXP ADMIN ACTIONS

[Infrastructures](#)[Locations](#)[Cabinets](#)[Switches](#)[IP Addressing](#)[MAC Addresses](#)[Vendors](#)[Console Server](#)[Connections](#)[VLANs](#)[IRRDB Configuration](#)[Route Server Prefixes](#)

AS112 Reverse DNS [AS112]

PROBONO MEMBER

[Overview](#)[Details](#)[Ports](#)[Users](#)[Contacts](#)[Logins](#)[Notes](#)[RS Prefixes »](#)[P2P »](#)

Connection 1

Infrastructure #1



Switch: swi1-nwb1-1

Speed: 1000 Mbps

Location: Equinix NWBP

Switch Port: Ethernet11

Media: 1000BaseTFD

Colo Cabinet ID: INEX-NWBP-1

Peering VLAN #1:

IPv6 Address: 2001:7f8:18::6/64

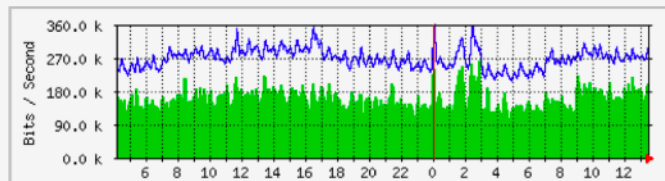
IPv4 Address: 185.6.36.6/23

Multicast Enabled: No

Route Server Client: Yes

AS112 Client: No

Day Graph for swi1-nwb1-1 / Ethernet11



	Max	Average	Current
In	287.864 Kbits	158.504 Kbits	196.008 Kbits
Out	435.880 Kbits	267.277 Kbits	277.064 Kbits

Connection 2

Infrastructure #2



Switch: swi2-deg1-3

Speed: 1000 Mbps

Switch Port: GigabitEthernet17

Duplex: full

Day Graph for swi2-deg1-3 / GigabitEthernet17



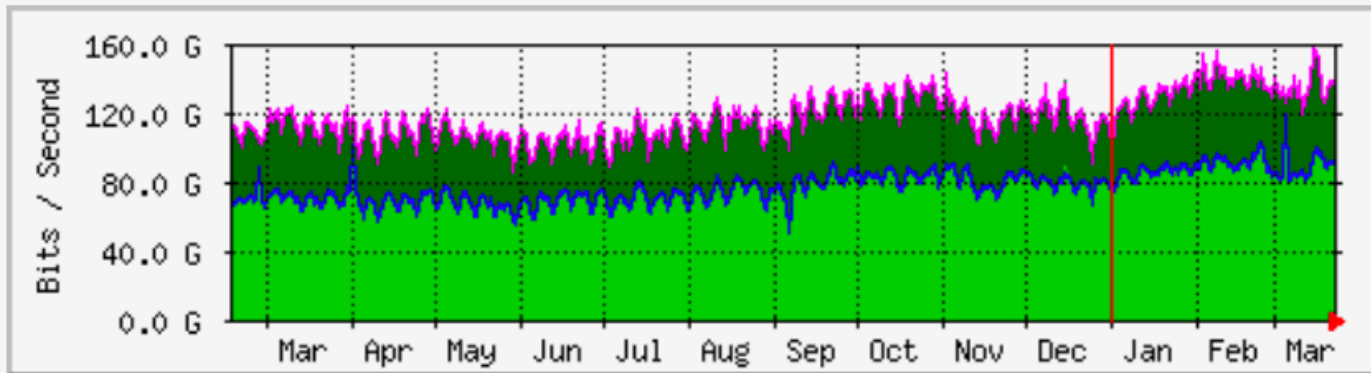
THANK YOU

Any Questions?





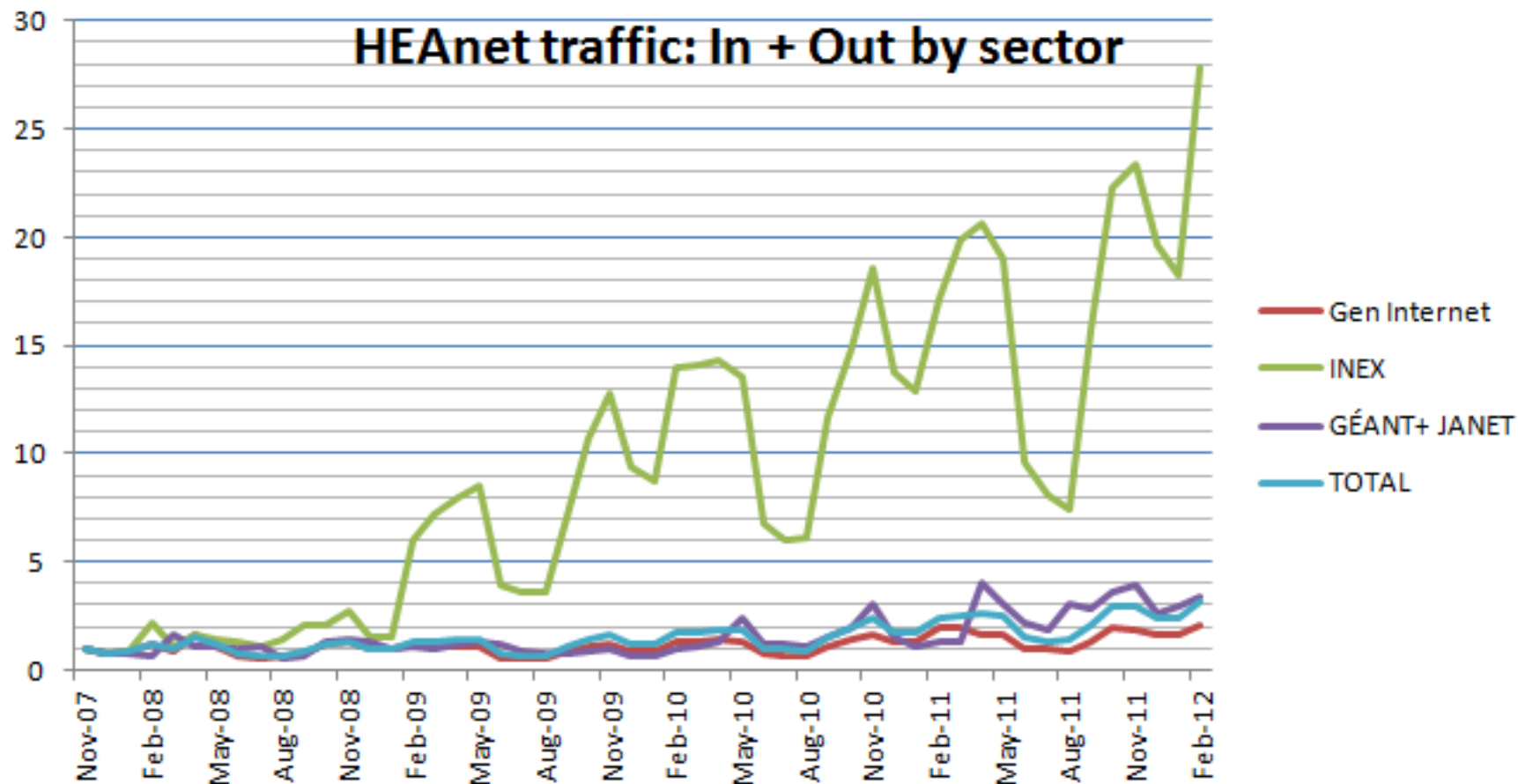
IXP Traffic

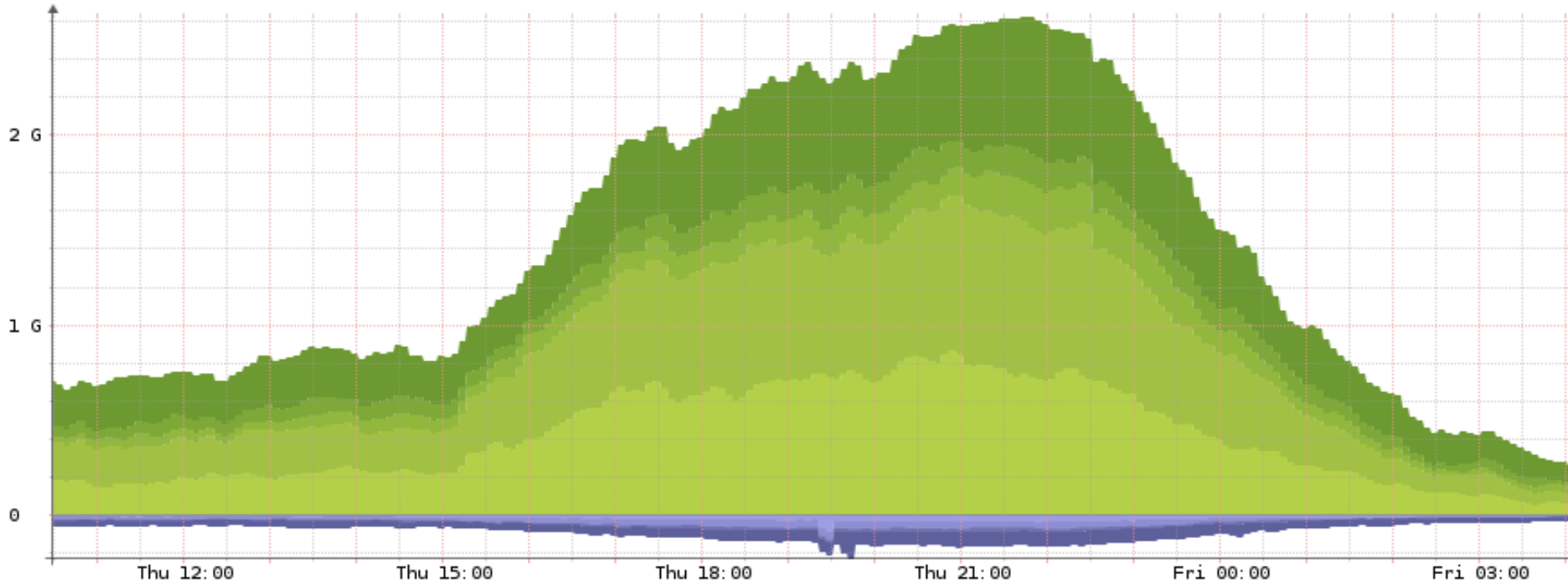


	Max	Average	Current
In	155.720 Gbits	76.845 Gbits	92.786 Gbits
Out	156.002 Gbits	76.828 Gbits	93.125 Gbits

HEAnet traffic: In + Out by sector

Value relative to Nov 2007

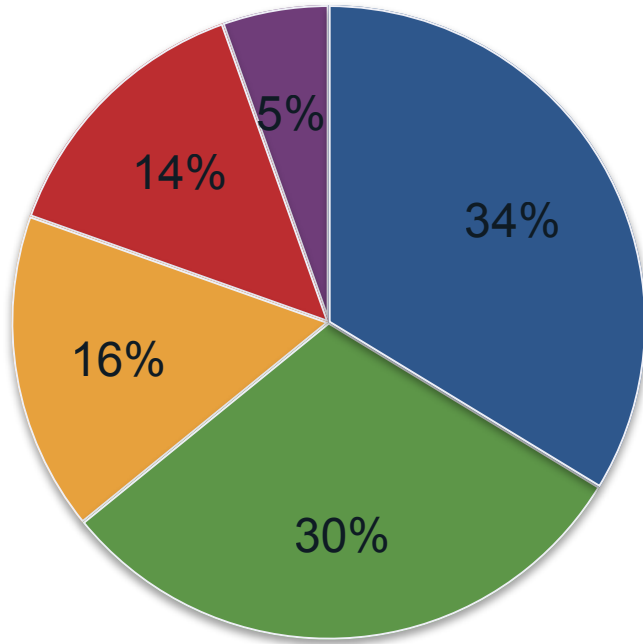




Regional Wireless ISP in Ireland

OBLIGATORY INFOGRAPHIC

What Routers do People Use?



● Cisco ● Juniper ● PC / VMware ● Mikrotik
● Others