

# Expanding Your ISP (with INEX!)



**i n e x**  
*internet neutral exchange*

**Barry O'Donovan**

**INEX Operations**

[barry.odonovan@inex.ie](mailto:barry.odonovan@inex.ie)



*i n t e r n e t n e u t r a l e x c h a n g e*

- Introduce INEX
- Look at IP Transit vs IXP
- Where INEX fits into your network
- INEX and Critical Infrastructure
- Requirements for Joining INEX
- BGP
- RIPE, AS numbers and IP Space

# INEX – An Introduction



*i n t e r n e t n e u t r a l e x c h a n g e*

- Company limited by guarantee
  - Formed 1996
  - Neutral, not for profit
  - Owned by the members (currently 63)

# INEX – An Introduction



i n t e r n e t n e u t r a l e x c h a n g e

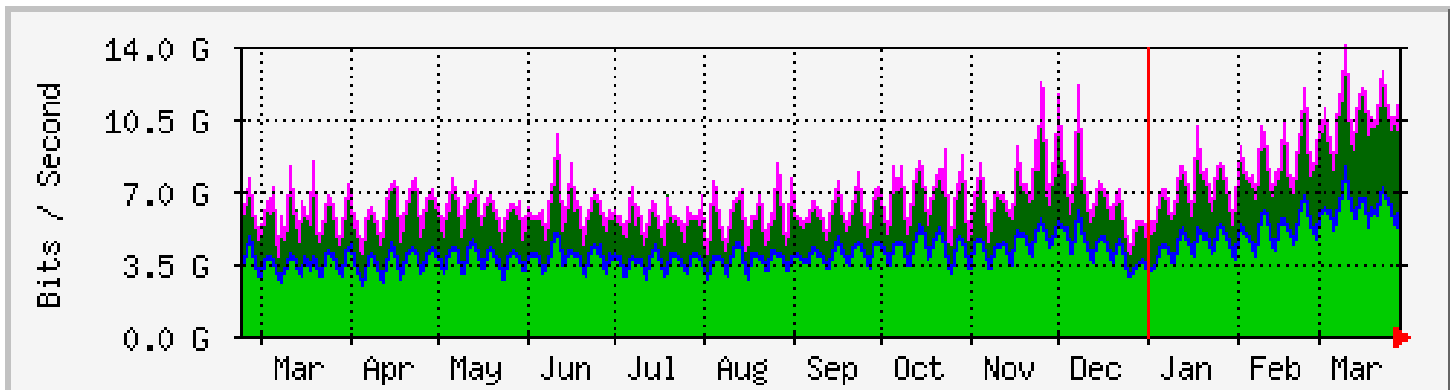
- Company limited by guarantee
  - Formed 1996
  - Neutral, not for profit
  - Owned by the members (currently 63)
- Mandate includes:
  - Provide robust IP exchange facilities
  - *Keep Irish IP traffic in Ireland - Ireland's IP hub*



# INEX – An Introduction

i n e x  
i n t e r n e t n e u t r a l e x c h a n g e

- Company limited by guarantee
  - Formed 1996
  - Neutral, not for profit
  - Owned by the members (currently 63)
- Mandate includes:
  - Provide robust IP exchange facilities
  - *Keep Irish IP traffic in Ireland - Ireland's IP hub*



# A Look at IP Transit



**i n e x**  
*i n t e r n e t n e u t r a l e x c h a n g e*

## A Look at IP Transit



*i n t e r n e t n e u t r a l e x c h a n g e*

- Commercial relationship
  - Smaller network typically pays the larger

## A Look at IP Transit



*i n t e r n e t n e u t r a l e x c h a n g e*

- Commercial relationship
  - Smaller network typically pays the larger
- Little control of how traffic is routed



## A Look at IP Transit



*i n e x*  
*i n t e r n e t n e u t r a l e x c h a n g e*

- Commercial relationship
  - Smaller network typically pays the larger
- Little control of how traffic is routed
- Often bounced to London or Amsterdam

## A Look at IP Transit



*i n t e r n e t n e u t r a l e x c h a n g e*

- Commercial relationship
  - Smaller network typically pays the larger
- Little control of how traffic is routed
- Often bounced to London or Amsterdam
- May cross multiple networks
  - Multiple failure points

# A Look at Internet Exchange Points (IXPs)



*i n e x*  
*i n t e r n e t n e u t r a l e x c h a n g e*

# A Look at Internet Exchange Points (IXPs)



*i n t e r n e t n e u t r a l e x c h a n g e*

- Typically mutual organisations
  - Commercial varieties exist

## A Look at Internet Exchange Points (IXPs)



*i n t e r n e t n e u t r a l e x c h a n g e*

- Typically mutual organisations
  - Commercial varieties exist
- Members interconnect directly
  - Reduced cost – ‘peers’
  - Lower latency

## A Look at Internet Exchange Points (IXPs)



i n t e r n e t n e u t r a l e x c h a n g e

- Typically mutual organisations
  - Commercial varieties exist
- Members interconnect directly
  - Reduced cost – ‘peers’
  - Lower latency
- Looking at INEX specifically:
  - Ireland’s IP hub
  - Vital part of Irish national communications infrastructure



## INEX for Irish WISPs

*i n t e r n e t n e u t r a l e x c h a n g e*

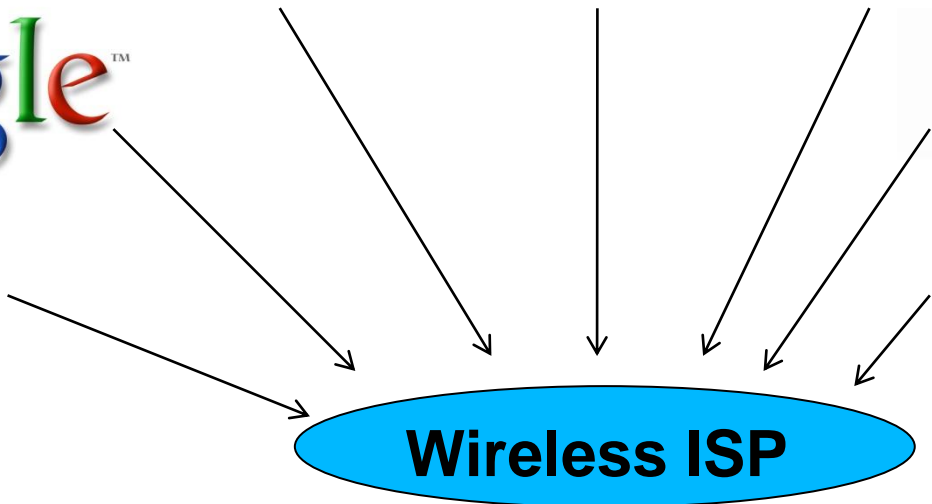
**ISP's have an asymmetric profile – mostly in**



**i n e x**  
i n t e r n e t n e u t r a l e x c h a n g e

# INEX for Irish WISPs

ISP's have an asymmetric profile – mostly in



**Wireless ISP**

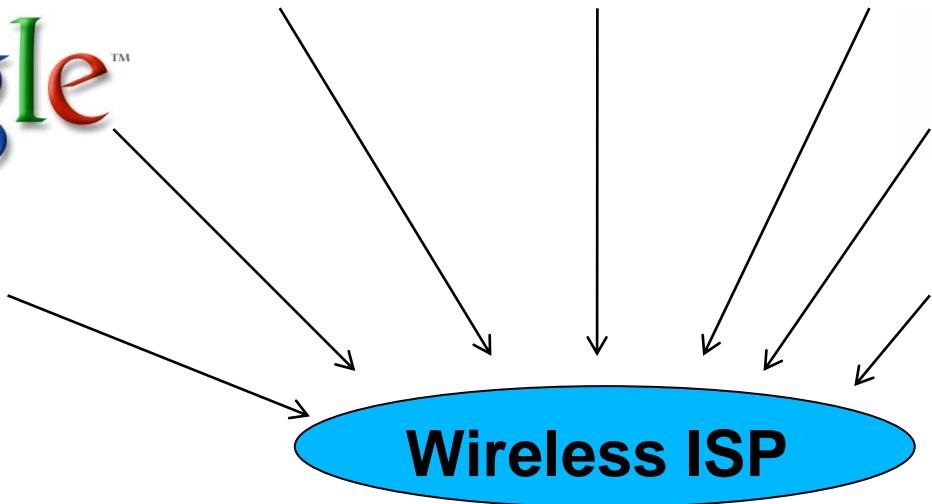




**inex**  
internet neutral exchange

# INEX for Irish WISPs

ISP's have an asymmetric profile – mostly in



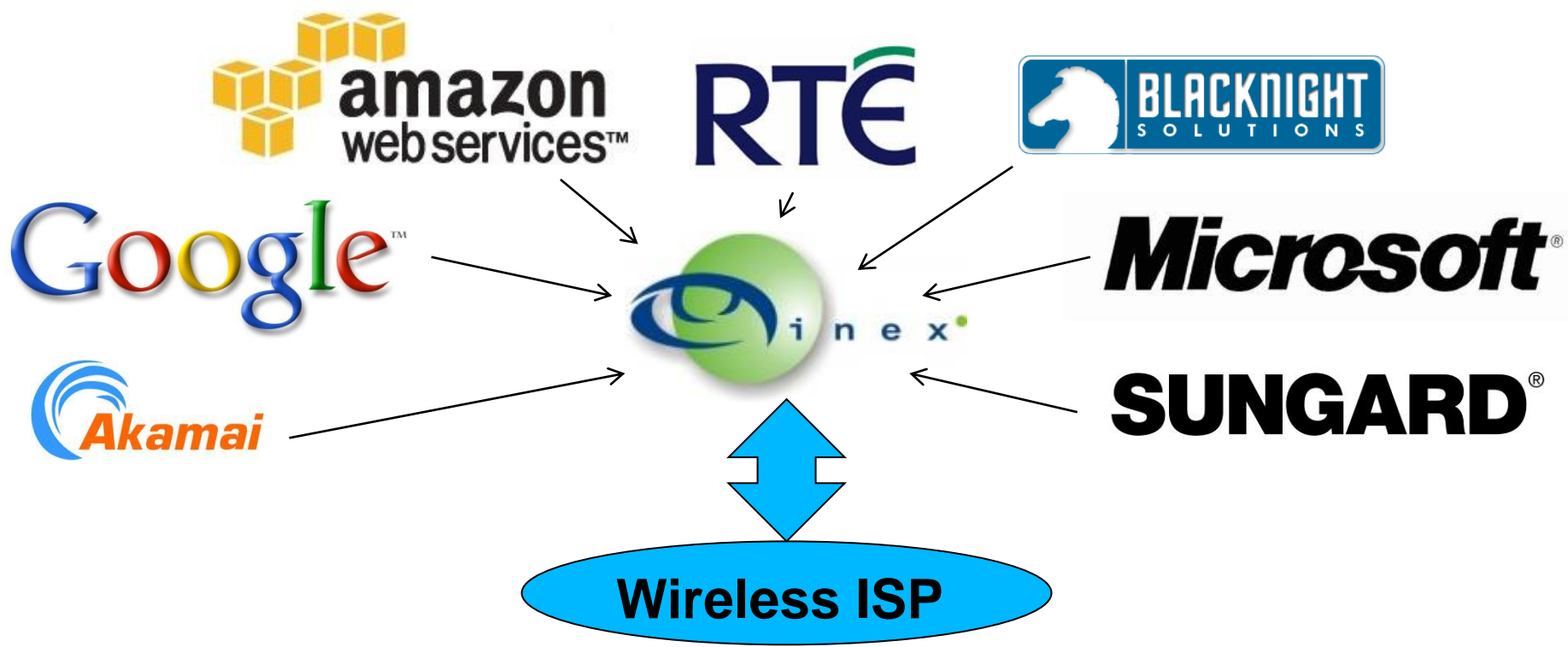
<https://www.inex.ie/about/memberlist>



i n e x  
i n t e r n e t n e u t r a l e x c h a n g e

# INEX for Irish WISPs

ISP's have an asymmetric profile – mostly in



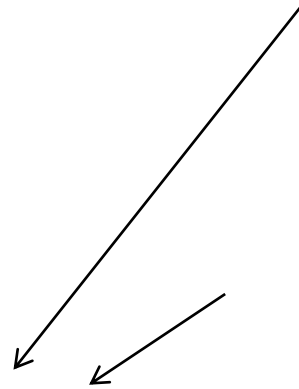
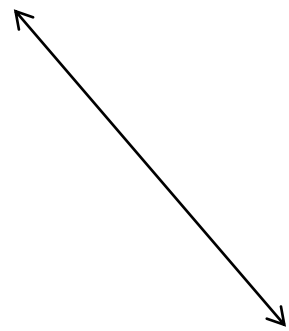
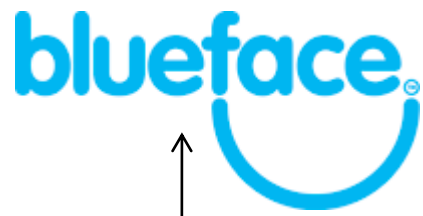
<https://www.inex.ie/about/memberlist>



**i n e x**  
i n t e r n e t n e u t r a l e x c h a n g e

# INEX for Irish WISPs

**Other ISPs**



**Wireless ISP**



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

## Additional Benefits of IXPs



*i n t e r n e t n e u t r a l e x c h a n g e*

- Low Latency

## Additional Benefits of IXPs



*i n t e r n e t n e u t r a l e x c h a n g e*

- Low Latency
- Irish Traffic Stays in Ireland

## Additional Benefits of IXPs



*i n t e r n e t n e u t r a l e x c h a n g e*

- Low Latency
- Irish Traffic Stays in Ireland
- Access to other members' NOCs

## Additional Benefits of IXPs



*i n t e r n e t n e u t r a l e x c h a n g e*

- Low Latency
- Irish Traffic Stays in Ireland
- Access to other members' NOCs
- Uncongested links

## Additional Benefits of IXPs



*i n t e r n e t n e u t r a l e x c h a n g e*

- Low Latency
- Irish Traffic Stays in Ireland
- Access to other members' NOCs
- Uncongested links
- Guaranteed QoS



## Additional Benefits of IXPs



i n t e r n e t n e u t r a l e x c h a n g e

- Low Latency
- Irish Traffic Stays in Ireland
- Access to other members' NOCs
- Uncongested links
- Guaranteed QoS
- Thus better service to your customers

## Additional Benefits of IXPs



i n t e r n e t n e u t r a l e x c h a n g e

- Low Latency
- Irish Traffic Stays in Ireland
- Access to other members' NOCs
- Uncongested links
- Guaranteed QoS
- Thus better service to your customers
- Social and networking platform
  - Quarterly meetings
  - Technical mailing list
  - IRC channel



*i n e x*  
*i n t e r n e t n e u t r a l e x c h a n g e*

- DNS – Domain Name System
  - IEDR – resolves .ie (and others)



*i n t e r n e t n e u t r a l e x c h a n g e*

- DNS – Domain Name System
  - IEDR – resolves .ie (and others)
  - Verisign
    - J Root
    - .com and .net



## ● DNS – Domain Name System

- IEDR – resolves .ie (and others)
- Verisign
  - J Root
  - .com and .net
- Packet Clearing House - 38 ccTLDs (.dk, .fr, .us)



## ● DNS – Domain Name System

- IEDR – resolves .ie (and others)
- Verisign
  - J Root
  - .com and .net
- Packet Clearing House - 38 ccTLDs (.dk, .fr, .us)
- Your DNS servers recurse to these



- DNS – Domain Name System
  - IEDR – resolves .ie (and others)
  - Verisign
    - J Root
    - .com and .net
  - Packet Clearing House - 38 ccTLDs (.dk, .fr, .us)
  - Your DNS servers recurse to these
- AS112 service

# Joining INEX - Requirements



*i n t e r n e t n e u t r a l e x c h a n g e*

- Portable IP Address Space
  - PI Assignment
  - RIR Membership



# Joining INEX - Requirements



- Portable IP Address Space
  - PI Assignment
  - RIR Membership
- Autonomous System number (ASN)

# Joining INEX - Requirements



*i n t e r n e t n e u t r a l e x c h a n g e*

- Portable IP Address Space
  - PI Assignment
  - RIR Membership
- Autonomous System number (ASN)
- Signed Membership Application Form

## Joining INEX - Requirements



*i n t e r n e t n e u t r a l e x c h a n g e*

- Portable IP Address Space
  - PI Assignment
  - RIR Membership
- Autonomous System number (ASN)
- Signed Membership Application Form
- Connectivity to an INEX PoP

# Joining INEX - Requirements



- Portable IP Address Space
  - PI Assignment
  - RIR Membership
- Autonomous System number (ASN)
- Signed Membership Application Form
- Connectivity to an INEX PoP
  - Telecity, Citywest
  - Data Electronics Group (DEG), Kilcarbery
  - InterXion DUB1, Park West
  - InterXion DUB2, Park West

## Joining INEX – Introductory Offer



*i n t e r n e t   n e u t r a l   e x c h a n g e*

- Annual Membership Fee
  - €2,000
- 10Mb port free of charge
  - Provisioned at 100Mb for three months

# BGP – Border Gateway Protocol



**i n e x**  
*i n t e r n e t n e u t r a l e x c h a n g e*

# BGP – Border Gateway Protocol



*i n t e r n e t n e u t r a l e x c h a n g e*

- Routing protocol of the internet

# BGP – Border Gateway Protocol



*i n t e r n e t n e u t r a l e x c h a n g e*

- Routing protocol of the internet
- Required as you grow
  - Multiple edge routers, Multiple upstreams



# BGP – Border Gateway Protocol



i n t e r n e t n e u t r a l e x c h a n g e

- Routing protocol of the internet
- Required as you grow
  - Multiple edge routers, Multiple upstreams
- Decides on the *best path* via upstreams
  - Generally based on AS path length
  - i.e. “how many networks from here to there”

# BGP – Border Gateway Protocol



i n t e r n e t n e u t r a l e x c h a n g e

- Routing protocol of the internet
- Required as you grow
  - Multiple edge routers, Multiple upstreams
- Decides on the *best path* via upstreams
  - Generally based on AS path length
  - i.e. “how many networks from here to there”
- For INEX, your peers will be *the next network*

# BGP – Border Gateway Protocol



i n t e r n e t n e u t r a l e x c h a n g e

- Routing protocol of the internet
- Required as you grow
  - Multiple edge routers, Multiple upstreams
- Decides on the *best path* via upstreams
  - Generally based on AS path length
  - i.e. “how many networks from here to there”
- For INEX, your peers will be *the next network*
- For configuration, you need:
  - An AS number
  - IP space to advertise
  - Same as INEX!

# Getting IP Space and an ASN



*i n t e r n e t n e u t r a l e x c h a n g e*

## Getting IP Space and an ASN



*i n t e r n e t n e u t r a l e x c h a n g e*

- There are three options:
  - Request resources through a LIR
    - Cost to LIR: €50 / resource => €150



i n t e r n e t   n e u t r a l   e x c h a n g e

- There are three options:
  - Request resources through a LIR
    - Cost to LIR: €50 / resource => €150
  - Become a Direct Assignment User of RIPE
    - €2,000 set up plus €1,300 per annum



i n e x  
i n t e r n e t   n e u t r a l   e x c h a n g e

- There are three options:
  - Request resources through a LIR
    - Cost to LIR: €50 / resource => €150
  - Become a Direct Assignment User of RIPE
    - €2,000 set up plus €1,300 per annum
  - Become a LIR of RIPE (our RIR)
    - €2,000 set up plus €1,300 per annum



- There are three options:
  - Request resources through a LIR
    - Cost to LIR: €50 / resource => €150
  - Become a Direct Assignment User of RIPE
    - €2,000 set up plus €1,300 per annum
  - Become a LIR of RIPE (our RIR)
    - €2,000 set up plus €1,300 per annum

**YOU NEED TO BECOME A LIR!**  
**Why? Let me explain...**



# IPv4 Depletion



*i n t e r n e t n e u t r a l e x c h a n g e*

- IANA IPv4 free pool exhausted Feb'11

# IPv4 Depletion



*i n t e r n e t n e u t r a l e x c h a n g e*

- IANA IPv4 free pool exhausted Feb'11
- RIPE has 4 + 1 /8's in reserve

# IPv4 Depletion



*i n t e r n e t n e u t r a l e x c h a n g e*

- IANA IPv4 free pool exhausted Feb'11
- RIPE has 4 + 1 /8's in reserve
- When down to the remaining /8:
  - New LIRs will be allocated a /22 instead of a /21

## IPv4 Depletion



*i n t e r n e t n e u t r a l e x c h a n g e*

- IANA IPv4 free pool exhausted Feb'11
- RIPE has 4 + 1 /8's in reserve
- When down to the remaining /8:
  - New LIRs will be allocated a /22 instead of a /21

**BUT ONLY IF THEY ALREADY HAVE AN IPv6 ALLOCATION**



## IPv4 Depletion

- IANA IPv4 free pool exhausted Feb'11
- RIPE has 4 + 1 /8's in reserve
- When down to the remaining /8:
  - New LIRs will be allocated a /22 instead of a /21

**BUT ONLY IF THEY ALREADY HAVE AN IPv6 ALLOCATION**

- Moral: Act now and ensure a double allocation!



## IPv4 Depletion

- IANA IPv4 free pool exhausted Feb'11
- RIPE has 4 + 1 /8's in reserve
- When down to the remaining /8:
  - New LIRs will be allocated a /22 instead of a /21

**BUT ONLY IF THEY ALREADY HAVE AN IPv6 ALLOCATION**

- Moral: Act now and ensure a double allocation!
- IPv4 addresses - a tradable commodity
  - Nortel in bankruptcy – sold IPs at \$11.25 each
  - IPv4 blocks now including on some balance sheets



i n t e r n e t n e u t r a l e x c h a n g e

## IPv4 Depletion

- IANA IPv4 free pool exhausted Feb'11
- RIPE has 4 + 1 /8's in reserve
- When down to the remaining /8:
  - New LIRs will be allocated a /22 instead of a /21

**BUT ONLY IF THEY ALREADY HAVE AN IPv6 ALLOCATION**

- Moral: Act now and ensure a double allocation!
- IPv4 addresses - a tradable commodity
  - Nortel in bankruptcy – sold IPs at \$11.25 each
  - IPv4 blocks now including on some balance sheets

**FOR AN ISP – A CRITICAL REQUIREMENT**

# IPv6 – *Do Something! Anything!*



*i n t e r n e t n e u t r a l e x c h a n g e*



IPv6 – *Do Something! Anything!*



*i n e x*  
*i n t e r n e t n e u t r a l e x c h a n g e*

- World IPv6 Day – June 6 2011

## IPv6 – *Do Something! Anything!*



*i n t e r n e t n e u t r a l e x c h a n g e*

- World IPv6 Day – June 6 2011
- Do something! Anything!

## IPv6 – *Do Something! Anything!*



*i n t e r n e t n e u t r a l e x c h a n g e*

- World IPv6 Day – June 6 2011
- Do something! Anything!
  - Get an IPv6 address block (or tunnel – SixXS)

## IPv6 – *Do Something! Anything!*



i n t e r n e t n e u t r a l e x c h a n g e

- World IPv6 Day – June 6 2011
- Do something! Anything!
  - Get an IPv6 address block (or tunnel – SixXS)
  - Migrate your mail server

## IPv6 – *Do Something! Anything!*



i n t e r n e t n e u t r a l e x c h a n g e

- World IPv6 Day – June 6 2011
- Do something! Anything!
  - Get an IPv6 address block (or tunnel – SixXS)
  - Migrate your mail server
  - Get IPv6 BGP peerings

## IPv6 – *Do Something! Anything!*



i n t e r n e t n e u t r a l e x c h a n g e

- World IPv6 Day – June 6 2011
- Do something! Anything!
  - Get an IPv6 address block (or tunnel – SixXS)
  - Migrate your mail server
  - Get IPv6 BGP peerings
  - IPv6 Enable your core kit

## IPv6 – *Do Something! Anything!*



i n t e r n e t n e u t r a l e x c h a n g e

- World IPv6 Day – June 6 2011
- Do something! Anything!
  - Get an IPv6 address block (or tunnel – SixXS)
  - Migrate your mail server
  - Get IPv6 BGP peerings
  - IPv6 Enable your core kit
  - Migrate your DNS server

## IPv6 – *Do Something! Anything!*



i n t e r n e t n e u t r a l e x c h a n g e

- World IPv6 Day – June 6 2011
- Do something! Anything!
  - Get an IPv6 address block (or tunnel – SixXS)
  - Migrate your mail server
  - Get IPv6 BGP peerings
  - IPv6 Enable your core kit
  - Migrate your DNS server
  - **Use IPv6 – SixXS tunnel even**



# IPv6 – *Do Something! Anything!*



i n t e r n e t n e u t r a l e x c h a n g e

- World IPv6 Day – June 6 2011
- Do something! Anything!
  - Get an IPv6 address block (or tunnel – SixXS)
  - Migrate your mail server
  - Get IPv6 BGP peerings
  - IPv6 Enable your core kit
  - Migrate your DNS server
  - **Use IPv6 – SixXS tunnel even**
  - Get certified: <http://ipv6.he.net/certification/>

# IPv6 – *Do Something! Anything!*



*i n t e r n e t n e u t r a l e x c h a n g e*

- World IPv6 Day – June 6 2011
- Do something! Anything!
  - Get an IPv6 address block (or tunnel – SixXS)
  - Migrate your mail server
  - Get IPv6 BGP peerings
  - IPv6 Enable your core kit
  - Migrate your DNS server
  - **Use IPv6 – SixXS tunnel even**
  - Get certified: <http://ipv6.he.net/certification/>
- **Get IPv6 Ready! <http://www.ipv6ready.ie/>**

# IPv6 – *Do Something! Anything!*



i n e x  
i n t e r n e t n e u t r a l e x c h a n g e



● **Get IPv6 Ready! <http://www.ipv6ready.ie/>**

## Contact Details



*i n t e r n e t n e u t r a l e x c h a n g e*

- **Barry O'Donovan**

- [barry.odonovan@inex.ie](mailto:barry.odonovan@inex.ie)

- **Membership Enquiries**

- Eileen Gallagher

- [eileen@inex.ie](mailto:eileen@inex.ie)



[www.inex.ie](http://www.inex.ie)



[www.ipv6ready.ie](http://www.ipv6ready.ie)