



euro-IX

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# IXP Projects

# ➤ Why do we need IXPs?

- IXPs enable local traffic to stay local
- This increases efficiency of internet traffic and allows settlement-free peering rather than paying for transit, i.e. reduce cost
- Allows and encourages content to be accessed locally
- Reduces dependency on critical nation infrastructure
- Local content business has a higher chance of success
- Can increase knowledge sharing and experience (via IXP meetings and mailing lists)

# Why do we need IXPs?

Traceroute  
Kujtesa -> Artmotion

Before

Tracing route to 84.22.48.99 over a maximum of 30 hops

```
1  1 ms  1 ms  1 ms 192.168.1.1
2 132 ms 102 ms 23 ms 10.255.31.254
3 146 ms 100 ms 102 ms 10.20.30.254
4  24 ms  22 ms  21 ms 82.114.64.185
5  25 ms  62 ms  19 ms 79.101.105.229 [Telekom Srbija]
6  23 ms  19 ms  18 ms 212.200.227.225
7  24 ms  19 ms 109 ms 212.200.232.90
8 218 ms  22 ms  24 ms 212.200.17.45
9 103 ms 104 ms 102 ms 79.101.96.130
10 122 ms 102 ms 103 ms 84.22.63.109
11 126 ms 102 ms 106 ms 84.22.63.25
12 114 ms 100 ms 103 ms 84.22.32.198
13 118 ms 102 ms 102 ms 84.22.48.99
```

Trace complete.

After

Tracing route to 84.22.48.99 over a maximum of 30 hops

```
1  1 ms  1 ms  1 ms 192.168.1.1
2  40 ms  84 ms  22 ms 10.255.31.254
3  44 ms  17 ms  10 ms 10.20.30.254
4  12 ms  23 ms  24 ms 82.114.64.185 [Kujtesa]
5  22 ms  16 ms  12 ms 192.168.100.12 [KOSIX]
6  31 ms  24 ms  12 ms 84.22.32.198 [Artmotion]
7  27 ms  11 ms  21 ms 84.22.48.99
```

Trace complete.

### Improvement:

- Drop from 13 to 7 hops
- Average 3-packet delay drop from 75ms to 22ms

# ➤ Why do we need IXPs?

Kujtesa -> Artmotion

## Before

Pinging 84.22.48.99 with 32 bytes of data:  
Reply from 84.22.48.99: bytes=32 time=131ms TTL=245  
Reply from 84.22.48.99: bytes=32 time=143ms TTL=245  
Reply from 84.22.48.99: bytes=32 time=181ms TTL=245  
Reply from 84.22.48.99: bytes=32 time=199ms TTL=245

Ping statistics for 84.22.48.99:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
Minimum = 131ms, Maximum = 199ms, **Average = 163ms**

## After

Pinging 84.22.48.99 with 32 bytes of data:  
Reply from 84.22.48.99: bytes=32 time=16ms TTL=249  
Reply from 84.22.48.99: bytes=32 time=14ms TTL=249  
Reply from 84.22.48.99: bytes=32 time=14ms TTL=249  
Reply from 84.22.48.99: bytes=32 time=13ms TTL=249

Ping statistics for 84.22.48.99:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
Minimum = 13ms, Maximum = 16ms, **Average = 14ms**

### Improvement :

Average RTT drop from 163 ms to 14 ms



# IXP Bogon List

# ➤ IXP Bogon List

IXP Bogon list Project with Team Cymru -  
<http://www.team-cymru.org/IXP/index.html>

Why is this important for networks?

- IXP addresses should not be reachable from customers & connections not associated with the IXP
- Team Cymru gives users a tool to deny services to these prefixes altogether, saving networks from unnecessary risks
- All IXPs in the IXP database have an option to send their prefixes to the IXP Bogon list automatically by ticking a box



# IXP Member List Schema



# ➤ IXP Member list Schema

IXP Member list JSON Schema -

<https://github.com/euro-ix/json-schemas>

Most IXPs allow members to fetch data in various formats

- Having the correct IXP data is important
  - IXP Location(s) – where can you connect to the IXP
  - IXP contact details – how to contact the IXP
  - ASNs connected to the IXP & IPs assigned
  - Switch and Route Server info

...and more

# ➤ IXP Member list Schema

IXP Member list JSON Schema -  
<https://github.com/euro-ix/json-schemas>

- The IXP community is working on a portable JSON output format for member lists
- What does this mean for you?
  - Standard collection of IXP data, in one single format (currently JSON)
  - Help you automate your IXP related work
  - Get up to date IXP information automatically!

Thanks to Nick Hilliard (INEX) and Elisa Jasinska (Netflix)



IXP BCOPs

# IXP BCOPs

IXP BCOPs - <https://www.euro-ix.net/euro-ix-bcp>

- what's included:
  - Physical requirements
  - Device configuration
  - Member peering LANs
  - IXP Management
  - IXP Services
  - IXP Website



# IXP Database

# IXP Database Project

- There are many IXP Databases...

Navigation Search Public Exchange Points

Exchange Name City

IP Block Country Continental Region

Media Type Select Value

Search

Search Records

List of Public Exchange Points

Exchange Name	Long Name	City/Region	Country	Continental Region	Media Type	Participants	
ASIX	Alpes Adria Internet eIXchange	Klagenfurt	AT	Europe	Ethernet	4	
ACTIX	ACT Internet Exchange	Canberra	ACT	AU	Australia	Ethernet	11
ADN-IX		Valence	FR	Europe	Ethernet	0	
AlbertaIX	AlbertaIX	Calgary	CA	North America	Ethernet	4	
AMPATH	AMPATH - Florida International University/CISRA	Miami	US	North America	Multiple	0	
AMS-IX	Amsterdam Internet Exchange	Amsterdam	NL	Europe	Ethernet	1229	
AMS-IX Caribbean	Amsterdam Internet Exchange Caribbean	Curacao	CW	South America	Ethernet	11	
AMS-IX Hong Kong	Amsterdam Internet Exchange Hong Kong	Hong Kong	HK	Asia Pacific	Ethernet	27	
AMS-IX NY	AMS-IX New York	New York	US	North America	Ethernet	14	
Angola-IXP / ANG-IXP	Angola Internet Exchange point	Luanda	AO	Africa	Ethernet	3	
ASX	Auckland Peering Exchange	Auckland	NZ	Asia Pacific	Ethernet	56	
ArmitX	Armenian Internet Exchange	Yerevan	AM	Europe	Ethernet	0	
ASIX6	Academia Sinica Internet Exchange 6	Taipei	TW	Asia Pacific	Multiple	1	
ASSOCIO	mpis ASSOCIO	Tokyo, Nation wide	jp	Asia Pacific	Multiple	0	
AZIX	Arizona Internet Exchange	Phoenix, Arizona	US	North America	Ethernet	10	
B-IX	Balkan Internet Exchange	Sofia	BG	Europe	Ethernet	13	

www.datacentermap.com/ixps.html

Map Database Search Request quote Research About Login / Signup

Internet Exchange Points  
= IXPs

On the map below you can see an overview of internet exchange points (IXPs) around the world. Zoom in and click on a city marker to see the internet exchange points available in the city.

Map Satellite

TRUSTED SERVER HOSTING SINCE 1994

Managed Hosting Hybrid Hosting

How to Safely Avoid Overcooling Your Data Center and Save Money Today

Peering Research Related Reports & White Papers

- Multi-Tenant Datacenter: North American Providers - 2013
- To Build or Not To Build - Part I: Should Service Providers Build Or Lease Their Datacenters?

Related News

- Alcatel first connected customer at DE-CX New York
- DE-CX New York signs on Akamai as its first customer
- Microsoft Adds Private Azure Links at 37 European Data Centers
- Akamai becomes First DE-CX New York Customer
- TeletyGroup adds Microsoft Azure to Cloud-IX ecosystem

Latest Facilities

- Caronet XB, Charlotte

www.telegeography.com/research-services/internet-exchange-points-directory/

TeleGeography AUTHORITY IN TELECOM DATA

RESEARCH SERVICES CUSTOM RESEARCH TELECOM MAPS TELECOM RESOURCES

HOME > RESEARCH SERVICES > Internet Exchange Points Directory

## Internet Exchange Points Directory

The data provided in our Internet Exchange Points Directory is now accessible via our free interactive Internet Exchange Map. The map provides information for active Internet exchanges and buildings. Select an Internet exchange from the list provided to view the buildings in which that exchange is present. Or, select a building from the map projection to access data about the building, including its street address and a list of Internet exchanges present there.

The Internet Exchange Map is based on data compiled by TeleGeography, and is updated regularly to ensure that it is as accurate and as up-to-date as possible. Click here for more information about the map, or try it out at www.internetexchangemap.com.

Related Services

Interactive Internet Exch  
An interactive, regularly updated directory of internet exchanges worldwide.

Colocation Database  
Commonsense online

www.prefix.pch.net/applications/ixpdir/

PCH Packet Clearing House

Log In search pch.net

Home About Purpose Technology Resources Calendar Sponsors Contact

EDUCATION RESEARCH POLICY

Help

- Show inactive IXPs
- Hide inactive IXPs
- Show summary views
- Submit a change
- Featurebug report

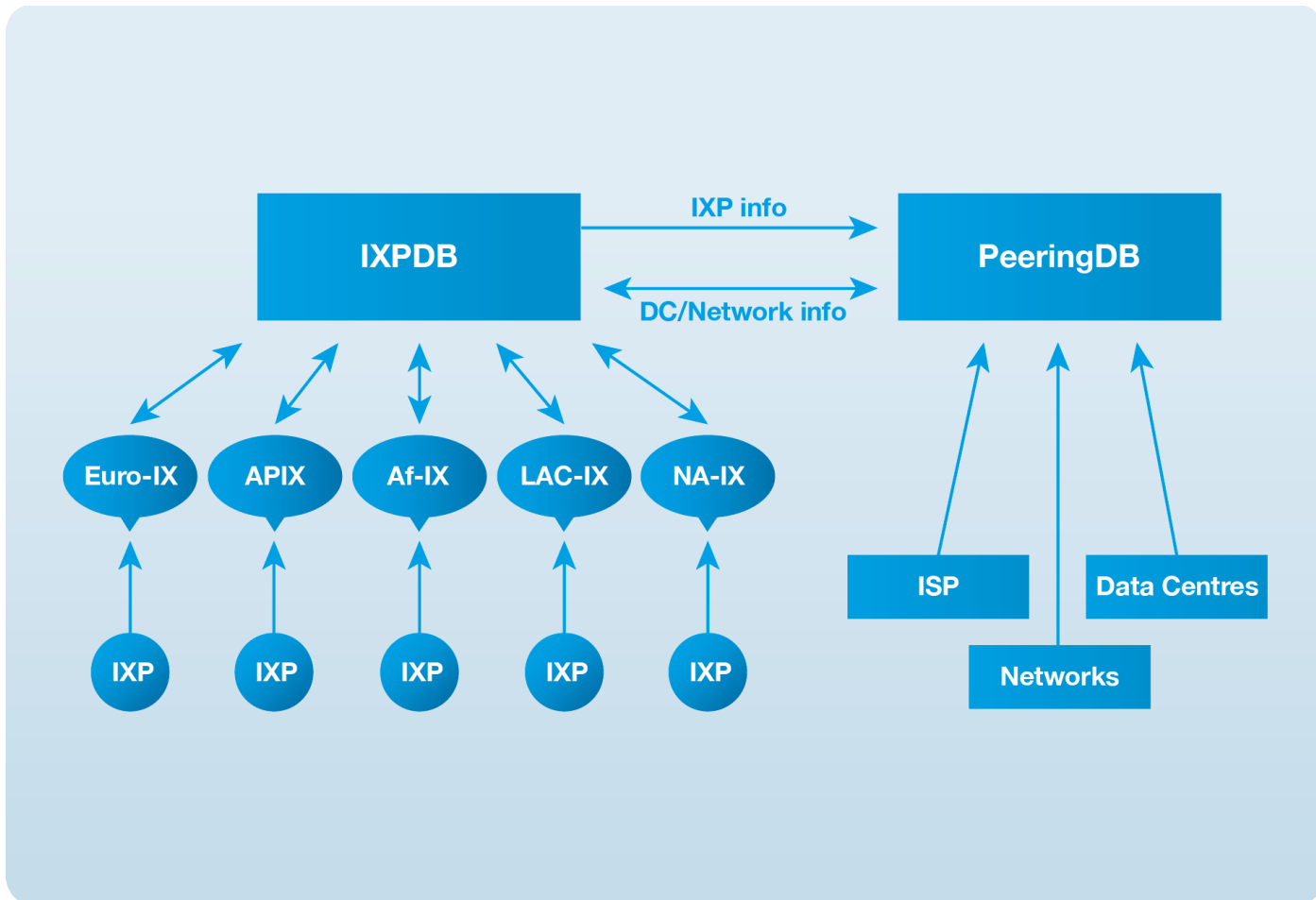
Region	Country	City	Internet Exchange Name	Participants	Traffic	Prefixes	Established	URL
Asia/Pacific	Albania	Katun	National Internet Exchange of Afghanistan				May 2011	
Africa	Algeria	Algiers	Algeria Internet Exchange				2013	
	Angola	Luanda	Angola Internet Exchange	10	13M		2008	
		Luanda	Foro de Interconexão Internet Angola					
Latin America	Argentina (10)	Buenos Aires	NAP CABASE Buenos Aires	12	100M		2010	
		Buenos Aires	NAP CABASE Buenos Aires	78	7.04G	100	Aug 2006	
		Cordoba	NAP CABASE Cordoba	9	100M		Aug 2012	

# IXP Database

What do we want..

- A single canonical place for IXP data
- IXP data maintained by IXPs ensures greater accuracy
- Useful for the IXP members to see IXP data in context
- We want it to be open and pluggable so others can use it
- Develop new tools..

# IXP Database





# IXP Database

IXPDB API server written using Python / Django, which can:

- get / create / update / delete IXP and Organisation objects
- all interaction is JSON
- all non-sensitive information will be publically available
- IXPs will be able to create, update and delete IXPs from the databases.

# ➤ IXP Database

- We have a proof of concept client to interact with this database in Python including unit test code at:  
<https://github.com/euro-ix/ixf-client-py>
- The PHP version of this with unit tests also available at:  
<https://github.com/euro-ix/ixf-client-php>



# Tools

# Euro-IX Tools

- IXP Service Matrix - [euro-ix.net/tools/ixp\\_matrix](https://euro-ix.net/tools/ixp_matrix)
- Peering Matrix - [euro-ix.net/tools/peering\\_matrix](https://euro-ix.net/tools/peering_matrix)
- ASN Search [euro-ix.net/tools/asn\\_search](https://euro-ix.net/tools/asn_search)
- ASN Filter - [euro-ix.net/tools/asn\\_filter](https://euro-ix.net/tools/asn_filter)
- Newest ASN entries - [euro-ix.net/tools/asn\\_newest](https://euro-ix.net/tools/asn_newest)
- Most common ASNs - [euro-ix.net/tools/asn\\_common](https://euro-ix.net/tools/asn_common)

# ASN Search Tool

Enter an ASN, IXP or organisation name:

Query

Search

*Note: The ASN information contained within this database is a combination of both affiliated and non-affiliated IXP content. While the affiliated IXP content is highly accurate, the non-affiliated IXP content is updated on a best effort basis and is nonetheless considered to be quite accurate.*

AF-IX		
IXP Participants	IPv6 active	Unique ASNs
275	43	223
North America		
IXP Participants	IPv6 active	Unique ASNs
2161	390	1005
LAC-IX		
IXP Participants	IPv6 active	Unique ASNs
1105	490	763
APIX		
IXP Participants	IPv6 active	Unique ASNs
1469	350	872
Euro-IX		
IXP Participants	IPv6 active	Unique ASNs
7881	4183	4188
Global		
IXP Participants	IPv6 active	Unique ASNs
12891	5456	7394

# ASN Filter

## ASNs that peer at:

NAP INCA (Peru)  
6NGIX (Korea, Republic of)  
AAIX (Austria)  
ACT-IX - Canberra (Australia)  
ADN-IX (France)  
AIXP (Tanzania, United Republic of)  
ALB-IX (Albania)  
AlbertalX (Canada)  
AMPATH (United States of America )  
AMS-IX (Netherlands)  
AMS-IX Caribbean (Netherlands Antilles)  
AMS-IX East Africa (Kenya)  
AMS-IX Hong Kong (China)  
AMS-IX New York (United States of America )  
ANG-IXP (Angola)

- List all
- Only
- And other IXPs
- And at ⇒
- But not at ⇒
- And other IXPs, but not at ⇒

NAP INCA (Peru)  
6NGIX (Korea, Republic of)  
AAIX (Austria)  
ACT-IX - Canberra (Australia)  
ADN-IX (France)  
AIXP (Tanzania, United Republic of)  
ALB-IX (Albania)  
AlbertalX (Canada)  
AMPATH (United States of America )  
AMS-IX (Netherlands)  
AMS-IX Caribbean (Netherlands Antilles)  
AMS-IX East Africa (Kenya)  
AMS-IX Hong Kong (China)  
AMS-IX New York (United States of America )  
ANG-IXP (Angola)

Filter

# Peering Matrix

IXP	Total listed ASNs at IXP	ASNs that don't peer at other IXPs	% of ASNs that don't peer at other IXPs	ASNs that peer at other IXPs	% of ASNs that peer at other IXP	ADN-IX	ALB-IX	AMS-IX	AMS-IX Caribbean	AMS-IX East Africa	AMS-IX Hong Kong	AMS-IX New York	ANGONIX	ARMIX	BBIX - Fukuoka	BBIX - Nagoya	BBIX - Okinawa	BBIX - Osaka	BBIX - Tokyo	BBIX - Tokyo	BCIX	BIX	BIX	BIX.BG	BNIX	CATNIX	CIX	CIXP	CoreSite - Any Los	CyruSOne	DE-CIX Frankfurt	DE-CIX Hamburg	DE-CIX Munich	DE-CIX New York	DIX - Baileirup	DIX - Skanderborg	
<a href="#">AMS-IX</a>	<a href="#">679</a>	<a href="#">114</a>	<a href="#">17</a>	<a href="#">565</a>	<a href="#">83</a>	0	0	<a href="#">679</a>	<a href="#">1</a>	0	0	0	0	0	0	0	0	0	<a href="#">2</a>	0	<a href="#">26</a>	<a href="#">15</a>	0	<a href="#">13</a>	<a href="#">20</a>	<a href="#">7</a>	0	<a href="#">19</a>	<a href="#">31</a>	0	<a href="#">305</a>	<a href="#">12</a>	<a href="#">7</a>	<a href="#">1</a>	0	0	
<a href="#">AMS-IX Caribbean</a>	<a href="#">7</a>	<a href="#">2</a>	<a href="#">29</a>	<a href="#">5</a>	<a href="#">71</a>	0	0	<a href="#">1</a>	<a href="#">7</a>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<a href="#">1</a>	<a href="#">1</a>	0	0	0	0	0	0	0	0	0	0	0
<a href="#">ARMIX</a>	<a href="#">8</a>	<a href="#">6</a>	<a href="#">75</a>	<a href="#">2</a>	<a href="#">25</a>	0	0	0	0	0	0	0	0	<a href="#">8</a>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<a href="#">1</a>	0	0	0	0	0
<a href="#">BBIX - Tokyo</a>	<a href="#">8</a>	<a href="#">1</a>	<a href="#">13</a>	<a href="#">7</a>	<a href="#">87</a>	0	0	<a href="#">2</a>	0	0	0	0	0	0	0	0	0	0	<a href="#">8</a>	0	<a href="#">2</a>	<a href="#">1</a>	0	<a href="#">2</a>	0	0	0	0	<a href="#">3</a>	0	<a href="#">2</a>	<a href="#">1</a>	<a href="#">2</a>	<a href="#">1</a>	0	0	
<a href="#">BCIX</a>	<a href="#">62</a>	<a href="#">22</a>	<a href="#">35</a>	<a href="#">40</a>	<a href="#">65</a>	0	0	<a href="#">26</a>	0	0	0	0	0	0	0	0	0	0	<a href="#">2</a>	0	<a href="#">62</a>	<a href="#">3</a>	0	<a href="#">5</a>	<a href="#">3</a>	<a href="#">1</a>	0	<a href="#">1</a>	<a href="#">8</a>	0	<a href="#">31</a>	<a href="#">8</a>	<a href="#">7</a>	<a href="#">1</a>	0	0	
<a href="#">BIX</a>	<a href="#">51</a>	<a href="#">33</a>	<a href="#">65</a>	<a href="#">18</a>	<a href="#">35</a>	0	0	<a href="#">15</a>	0	0	0	0	0	0	0	0	0	0	<a href="#">1</a>	0	<a href="#">3</a>	<a href="#">51</a>	0	<a href="#">2</a>	<a href="#">4</a>	0	0	<a href="#">3</a>	<a href="#">4</a>	0	<a href="#">16</a>	<a href="#">1</a>	<a href="#">2</a>	<a href="#">1</a>	0	0	
<a href="#">BIX.BG</a>	<a href="#">54</a>	<a href="#">25</a>	<a href="#">46</a>	<a href="#">29</a>	<a href="#">54</a>	0	0	<a href="#">13</a>	0	0	0	0	0	0	0	0	0	0	<a href="#">2</a>	0	<a href="#">5</a>	<a href="#">2</a>	0	<a href="#">54</a>	0	0	0	<a href="#">5</a>	0	<a href="#">16</a>	<a href="#">2</a>	<a href="#">3</a>	<a href="#">1</a>	0	0		
<a href="#">BNIX</a>	<a href="#">45</a>	<a href="#">17</a>	<a href="#">38</a>	<a href="#">28</a>	<a href="#">62</a>	0	0	<a href="#">20</a>	0	0	0	0	0	0	0	0	0	0	0	0	<a href="#">3</a>	<a href="#">4</a>	0	0	<a href="#">45</a>	<a href="#">2</a>	0	<a href="#">3</a>	<a href="#">3</a>	0	<a href="#">17</a>	0	0	0	0		
<a href="#">CATNIX</a>	<a href="#">29</a>	<a href="#">15</a>	<a href="#">52</a>	<a href="#">14</a>	<a href="#">48</a>	0	0	<a href="#">7</a>	<a href="#">1</a>	0	0	0	0	0	0	0	0	0	0	0	<a href="#">1</a>	0	0	0	<a href="#">2</a>	<a href="#">29</a>	<a href="#">1</a>	0	<a href="#">1</a>	0	<a href="#">4</a>	0	0	0	0		
<a href="#">CIX</a>	<a href="#">29</a>	<a href="#">20</a>	<a href="#">69</a>	<a href="#">9</a>	<a href="#">31</a>	0	0	0	<a href="#">1</a>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<a href="#">1</a>	<a href="#">29</a>	0	0	0	<a href="#">3</a>	0	0	0	0		
<a href="#">CIXP</a>	<a href="#">37</a>	<a href="#">8</a>	<a href="#">22</a>	<a href="#">29</a>	<a href="#">78</a>	0	0	<a href="#">19</a>	0	0	0	0	0	0	0	0	0	0	0	0	<a href="#">1</a>	<a href="#">3</a>	0	0	<a href="#">3</a>	0	0	<a href="#">37</a>	<a href="#">1</a>	0	<a href="#">13</a>	<a href="#">1</a>	0	0	0		
<a href="#">CoreSite - Any2 Los Angeles</a>	<a href="#">147</a>	<a href="#">59</a>	<a href="#">40</a>	<a href="#">88</a>	<a href="#">60</a>	0	0	<a href="#">31</a>	0	0	0	0	0	0	0	0	0	0	<a href="#">3</a>	0	<a href="#">8</a>	<a href="#">4</a>	0	<a href="#">5</a>	<a href="#">3</a>	<a href="#">1</a>	0	<a href="#">1</a>	<a href="#">147</a>	0	<a href="#">28</a>	<a href="#">2</a>	<a href="#">3</a>	<a href="#">1</a>	0	0	
<a href="#">DE-CIX Frankfurt</a>	<a href="#">585</a>	<a href="#">111</a>	<a href="#">19</a>	<a href="#">474</a>	<a href="#">81</a>	0	0	<a href="#">305</a>	0	0	0	0	0	<a href="#">1</a>	0	0	0	0	<a href="#">2</a>	0	<a href="#">31</a>	<a href="#">16</a>	0	<a href="#">16</a>	<a href="#">17</a>	<a href="#">4</a>	<a href="#">3</a>	<a href="#">13</a>	<a href="#">28</a>	0	<a href="#">585</a>	<a href="#">19</a>	<a href="#">16</a>	<a href="#">1</a>	0	0	

# IXP Service Matrix

IXP	↑ Location	Asn	Rs Asn	# Of Customers	# I Pv6 Ready	% I Pv6 Ready	# Of Sites	Last Month Traffic (Gb/S)	Public Stats	Non Profit	Priv. Peering	Ipv6 Lan Type	Ipv6 Registry	Multicast	Vlan Services	Out Of Band Access	24x7 Service	24x7 Access
<a href="#">ADN-IX</a>	Valence		N/A	0	0	0	0	-	-	-					-	-	-	-
<a href="#">ALB-IX</a>	Tirana		N/A	0	0	0	0	-	-	-					-	-	Y	-
<a href="#">AMS-IX Traffic</a>	Amsterdam	1200	6777	679	539	79.4	12	2927	Y	Y	Y	ISP Peering LAN	RIPE	No	Y	-	Y	Y
<a href="#">AMS-IX Caribbean Traffic</a>	Willemstad, Curacao	28017	N/A	7	0	0.0	1	0	Y	Y	Y				Y	-	Y	Y
<a href="#">AMS-IX East Africa Traffic</a>	Mombasa	327740	N/A	0	0	0	1	0	Y	Y	Y				Y	-	Y	Y
<a href="#">AMS-IX Hong Kong Traffic</a>	Hong Kong	58516	N/A	0	0	0	1	0	Y	Y	Y				Y	-	Y	Y
<a href="#">AMS-IX New York Traffic</a>	New York	62981	N/A	0	0	0	4	0	Y	Y	Y				Y	-	Y	Y
<a href="#">ANGONIX</a>	Luanda		N/A	0	0	0	0	0	-	-	-				-	-	-	-
<a href="#">ARMIX</a>	Yerevan	51225	N/A	8	8	100.0	1	0	-	Y	-				-	-	Y	Y
<a href="#">BBIX - Fukuoka</a>	Fukuoka		N/A	0	0	0	0	0	-	-	-				-	-	-	-





# Twinning Program

# **Twining Program**

Supporting Exchange Points with the following:

- Tools
- Framework for management and business development
- Assistance following IXP BCOPs
- Design and engineering help as needed
- Marketing support
- Implementing additional services

# ➤ **Twining is Winning**

- Netnod, twins with 3 IXPs – KINIX, KIXP and MOZ-IX
- DE-CIX, twins with 2 IXPs – NPIX and TIX
- LINX, twins with 1 IXP - ZIXP
- INEX with support from ISOC recently helped build The Gambia IXP -> twining, first stages of help:
  - Obtain IP addresses and ASN
  - IXP and BGP training
- France-IX and LyonIX working with ISOC on AXIS project, provide training in Francophone countries

# ➤ **Twinning is Winning**

## **Benefits:**

- Expose engineers to problems they may not find in their own environment
- Marketing and commercial kudos
- Use of standard documentation and training material
- Encourage IXPs to follow IXP BCOPs
- Make the internet faster and reliable in twins market
- Feel good factor, helping out because you can!



# IXP Traffic

# ➤ Traffic during FIFA World Cup

- Collaboration with RIPE NCC - <https://labs.ripe.net/Members/emileaben/>

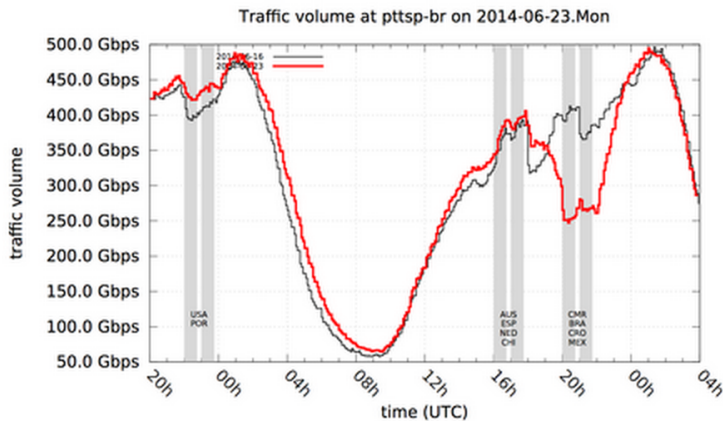


Figure 6: Traffic at the PTT.BR IXP in Sao Paulo, Brazil on 16 and 23 June 2014

**LONAP**  
@lonap

Follow

Yesterday we did see a traffic spike during the World Cup game but it was 1.1Gbit off the alltime peak caused by an Apple software release.

11:18 PM - 9 Jul 2014

5 RETWEETS 1 FAVORITE

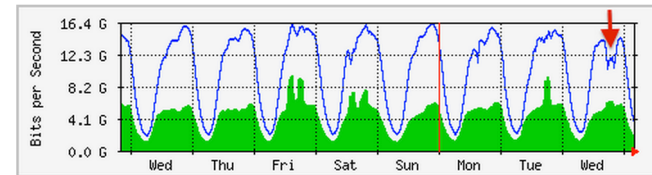


Figure 22: Weekly traffic at CABASE NAP in Buenos Aires. The difference between IN (green) and OUT (blue) traffic is traffic handed off to any of the other 11 NAPs that CABASE serves. The red arrow indicates the Netherlands-Argentina game.

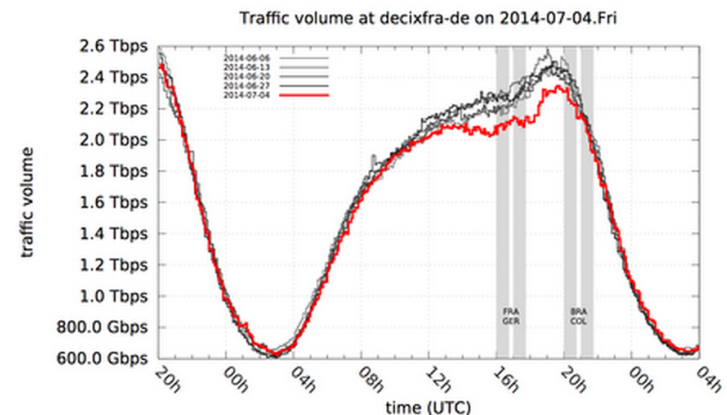


Figure 13: Traffic at DE-CIX in Frankfurt, Germany on 4 July 2014 (and the weeks before)

# ➤ The Internet Revealed – IXP Movie



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➤ Questions?

**I ♥ IXP<sub>s</sub>**

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# Thank you!

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