EUC-X The IX Federation, and the IX-F database

9th TREX Workshop. 2nd June 2017

Tampere, Finland



Euro-IX - What do we do?

- Two fora per year
- Maintain and develop the website, database and tools
- Annual European IXP Report
- Mentor-IX programme
- Fellowship programme

GOLO-IX

• Benchmarking Club (BMC)







> Talk to us and each other

- Mailing lists
- Newsletter Subscribe here:
 - euro-ix.net/news-and-events/newsletter/
- Working Groups
- Social Media
 - @euroix • Twitter
 - Facebook fb.me/maineuroix
 - YouTube

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youtube.com/channel/UCFyucVRAAMzxyJlsxnGwsjw





82 affiliated IXPs:

- Peering LANs
- 26 IXPs from the rest of the world
- Newest Members: CAS-IX **Beirut-IX**





56 IXPs in the Euro-IX Region 49 Countries, operating over 100





- Arista
- Brocade
- •Ciena
- Coriant
- ECI Telecom
- Equinix I Telecity
- Extreme Networks



- Huawei
- Interxion
- Juniper Networks
- •MRV
- Nokia
- Telehouse



Internet Exchange Federation







Internet Exchange Federation

- MOU signed by APIX, Euro-IX and LAC-IX to form the IX-F in November 2012 – <u>www.ix-f.net</u>
- Af-IX later signed the MoU to join the IX-F
- Collaboration between the IX Associations
- Current work:
- Global IXP DB
- Global IXP BCPs
- Automate Data Collection from IXPs
- Plans to collaborate with other external Databases

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internet Exchange Federation

• Af-IX

Nishal Goburdhan – JINX (South Africa) Kyle Spencer – UIXP (Uganda)

• APIX

Katsuyasu Toyama - JPNAP (Japan) Gavin Tweedie - Megaport (Australia)

• Euro-IX

Ondrej Filip – NIX.cz (Czech Republic) John Souter - LINX (United Kingdom)

LAC-IX Ariel Graizer - NAP CABase (Argentina) Milton Kashiwakura - PTT.br (Brazil)







IXP Database



XP Database – Org Profile

Organization Profile

Internet Neutral Exchange Association

General	Introduction	Contacts	<u>IXPs</u>	<u>Users</u>	
			Loca	ation:	Irelan
P	inex•		Esta	blished:	1996-
			Affili	iation:	Mem
			Boa	rd Contact:	
			Ema	il:	<u>barry.</u>
			Web	site:	<u>https:</u>
Edit					

GOLO-IX

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-09-01	
ber	
.rhodes@inex.ie	
://www.inex.ie/	







Organization Profile

«

Amsterdam Internet Exchange B.V.

Introduction	Contacts	<u>IXPs</u>	<u>Users</u>			
Bay Area						
AMS-IX Caribbean						
<u>Chicago</u>						
AMS-IX Hong Kong						
AMS-IX India						
AMS-IX New York						
am Internet Excha	nge					
	Introduction Bay Area Caribbean Chicago Hong Kong India New York am Internet Excha	Introduction Contacts Bay Area	Introduction Contacts Introduction Contacts Bay Area Bay Area Caribbean Chicago Hong Kong India New York am Internet Exchange			





COUNTRY
United States of America
Netherlands Antilles
United States of America
China
India
United States of America
Netherlands





XP Database – IXP Pofile

IXP Profile

Internet Neutral Exchange Association

F	Profile	<u>Network</u>	Switches	Services	Pricing	<u>Tree</u>	A
	Auto	mation Link	htt	ps://www.ine	cie/noncms	/php/eur	o-ix
	AS #		COMPANY				
	<u>34218</u>		3 Ireland				
	<u>29644</u>		Airspeed Tele	com			
	42227		Airwire				
	<u>20940</u>		Akamai Techn	ologies			
	<u>16509</u>		Amazon				
	<u>61194</u>		Another 9				
	<u>49567</u>		Aptus Broadb	and			
	<u>5580</u>		Atrato IP Netv	vorks			
	<u>47680</u>		BBnet				
	Traffic						

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SNs Users		A	Automations	
-members.php			ASN Link	\checkmark
IP	/6		Traffic Link	\bigotimes
N				0
••••••••••••••••••••••••••••••••••••••				
Ý				
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ASN Database

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<u>Stats</u>	Search	Recent	<u>Common</u>					
	IXP PARTICIPANTS							
		8715						
		1513						
		335						
		1883						
		2195						
		14641						

IPV6	UNIQUE ASNS
EURO-IX	
5488	4478
APIX	
447	929
AF-IX	
64	296
LAC-IX	
1258	1385
NORTH AMERICA	
538	1086
GLOBAL	
7795	7755



XP Database – ASN Database

ASN Database

Stats Sea	arch Recent Common		
AS#	COMPANY	PRESENT AT	IPV6
<u>6939</u>	HE	<u>80</u> (Y
<u>20940</u>	<u>Akamai</u>	IXPs	D
<u>15169</u>	Google	AMS-IX AMS_IX Boy Area	D
<u>3856</u>	Packet Clearing House	AMS-IX Bay Area AMS-IX Chicago	D
<u>42</u>	WoodyNet	AMS-IX Hong Kong AMS-IX New York BBIX - Tokyo	D
<u>8075</u>	Microsoft	BCIX BIX BG	D
22822	Limelight Networks, Inc.	BiX Big APE	D
<u>10310</u>	<u>Yahoo Inc. (B)</u>	CATNIX CoreSite - Any2 Denver / RMIX Denver	D
<u>13335</u>	CloudFlare	CoreSite - Any2 Los Angeles DE-CIX Frankfurt	D
<u>16509</u>	Amazon	DE-CIX Hamburg DE-CIX Marseille	D
<u>26415</u>	VeriSign Netherlands BV	DE-CIX Munich DE-CIX New York	D
<u>15133</u>	Edgecast	DIX - Lyngby ECIX Berlin	D





XP Database – ASN Database

ASN Data	oase		
Stats Search	Recent Commo	<u>n</u>	
Search			
ASN, IXP or Org	ganization		
Advanced Filters			
	•	Nothing selected	
	•	Nothing selected	
Filter <u>Toggle</u>	Advanced Filters		







XP Database – Peering Matrix

Peering Matrix

CSV Download

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			05	
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ked AS at doin this	the	ee ns	thic	
stallist GNS the of AS	GNS the	otAS	Bilt	MSIN
10 Az 0/0	And C	010	AL	All
AMS-IX	79.77	0	<u>796</u>	<u>2</u>
AMS-IX Caribbean	30.77	0	<u>2</u>	<u>13</u>
ARMIX	0.00	0	0	0
Angonix	50.00	0	0	0
BBIX - Tokyo	62.50	0	<u>2</u>	1
BCIX	70.89	0	<u>37</u>	<u>1</u>
BIX.BG	58.33	0	<u>22</u>	<u>1</u>
BNIX	53.33	0	<u>19</u>	0
BiX	42.86	0	<u>17</u>	0
CATNIX	37.50	0	<u>11</u>	1
CIX	37.50	0	<u>4</u>	<u>1</u>
CIXP	75.00	0	<u>19</u>	0
DE-CIX Frankfurt	72.48	0	<u>385</u>	1
DIX - Lyngby	59.09	0	<u>22</u>	1
ECIX Berlin	83.67	0	<u>24</u>	1
Equinix Paris	83.38	0	<u>131</u>	1
Equinix Zurich	98.95	0	<u>69</u>	<u>1</u>
FICIX - Helsinki	56.67	0	<u>9</u>	0
FVG-IX	75.00	0	<u>3</u>	0
France-IX Paris	89.80	0	<u>113</u>	1







XP Database – IXP Service Matrix

IXP Service Matrix

CSV Download

IXP	Location	ASN	RS ASN	# of customers	# IPv6 ready	% IPv6 ready	# of Sites
AMS-IX Bay Area	San Francisco			23	17	73.91	0
AMS-IX Caribbean	Willemstad, Curacao	<u>28017</u>		14	6	42.86	1
AMS-IX Chicago	Chicago			21	17	80.95	0
AMS-IX Hong Kong	Hong Kong	<u>58516</u>		32	25	78.12	1
AMS-IX India	Mumbai					0.0	0
AMS-IX New York	New York	<u>62981</u>		18	17	94.44	4
ARMIX	Yerevan	<u>51225</u>		10	8	80.00	1
Angonix	Luanda	<u>327788</u>		2	2	100.00	0
Aracaju (SE)	Aracaju					0.0	0
BBIX - Hong Kong	Hong Kong					0.0	0
BBIX - Tokyo	Tokyo	23640		8	1	12.50	7
BCIX	Berlin	<u>16374</u>		83	72	86.75	6
BIX Bergen	Bergen	<u>0</u>		4	2	50.00	0
BIX.BG	Sofia	<u>15669</u>		77	36	46.75	8
BNIX	Brussels	<u>5406</u>		45	14	31.11	3
Belo Horizonte (MG)	Belo Horizonte			29	13	44.83	0
Belm (BEL)	Belém			15	6	40.00	1
BiX	Budapest	<u>5507</u>		49	37	75.51	3
Braslia (DF)	Brasilia			32	21	65.62	0
CATNIX	Barcelona	<u>49638</u>		35	22	62.86	3
CHN-IX	Beijing					0.0	0
CIX	Zagreb	<u>51702</u>		32	11	34.38	2
CIXP	Geneva	<u>57859</u>		36	7	19.44	3





XP Database – where are we?

- Database schema is in place for IXPs to record their
- IXP API is live <u>https://db.ix-f.net/api/ixp</u>



information about themselves and the operators they serve



XP Database – What's next?

- Extend and internationalise the admin interface for all IXPAs (APIX, LAC-IX and AF-IX)
- Create bespoke maintained APIs •
- Future revisions to the database schema to capture more data





IXP Member List JSON Schema





- Contains both IXP data & IXP participant data
 - ASN (member list), locations, switch, RS, etc etc
- Open, consistent & an atomic design
- Currently 24 IXP independent implementations

(API includes data from euro-ix portal entered manually or via .csv)

- Open source implementation in IXP Manager
- Further information about the Member Lists can be found here: http://ml.ix-f.net
- Source available on GitHub; https://github.com/euro-ix/json-schemas

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XP Database – use case

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Why not just use the IXPs own data?

- This gives you a single API for many IXPs
- Get the same format for all IXPs, its standard wohoo!
- Data is fed from the IXP IXPs have accurate data, they own it.
- Portable, supportable and scaleable!







"who am I not peering with at LONAP?"

- differences



 You have a script which load direct adjacencies into an array • You need a complete and canonical list of peers to compare







Using the IXP API https://db.ix-f.net/api/ixp





```
"ixp_info": {
  "status": "active",
  "updated": "2014-02-17T10:07:51Z",
  "name": "London Network Access Point",
  "created": "2011-08-16T13:26:26Z",
  "shortname": "LONAP",
  "ixp_id": "IX-F#18"
},
"timestamp": "2015-09-16T08:17:31.116Z",
"version": "2014110401",
"member_list": [
 {
    "asnum": 20915,
    "name": "100 Percent"
  },
    "url": "http://www.2connectbahrain.com/",
    "asnum": 51406,
    "name": "2Connect"
  Ъ.
    "url": "http://www.34sp.com",
    "asnum": 41357,
    "name": "34SP.com Ltd"
    "url": "http://4d-dc.com/",
    "asnum": 31463,
    "name": "4D Data Centres"
  },
    "url": "http://www.afilias.info",
    "asnum": 12041,
    "name": "Afilias"
  },
    "url": "http://www.akamai.com",
    "asnum": 20940,
    "name": "Akamai Technologies"
  },
    "url": "http://www.alentus.com",
    "asnum": 21321,
    "name": "Alentus UK Ltd"
 },
```









EUIO-IX



	enti	gma:De	esktop a	nayş		
	enig	gma:De	esktop a	ndy \$ j	python	ixp
	Get	some	peering	with	6871	(Plu
	Get	some	peering	with	8689	(Pow
	Get	some	peering	with	8676	(PRT
-	Get	some	peering	with	28792	(Pu
ľ	Get	some	peering	with	31402	(Ra
	Get	some	peering	with	35662	(Re
c	Get	some	peering	with	5552	(Red
đ	Get	some	peering	with	5503	(RM
	Get	some	peering	with	51409	(Se
c	Get	some	peering	with	50056	(Ad
d	Get	some	peering	with	29550	(Si
	Get	some	peering	with	48961	(Wa
	Get	some	peering	with	20738	(We
g,	Get	some	peering	with	44444	(We
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erGroup (Power Internet Ltd))
 Systems)
blic Internet Limited)
ink Interactive (Blue Square Limited))
dstation)
stone Communications Ltd)
Education Plc)
ctorsix)
vantage Interactive Ltd)
mply Transit Ltd.)
rwicknet Ltd)
bfusion)
bsense Hosted R&D Ltd. (UK))
finity)
n Internet)
```



ArouteServer

- The Euro-IX ML JSON Schema defines a portable output format to export the list of members connected to an IXP
- These can fetch the list of clients and their attributes (AS-SETs, max-prefix limits)
- automatically build the clients.yml file used by ARouteServer to generate route server's configuration
- The client command you use is:



<u>Create clients.yml file from Euro-IX member list JSON file using</u>

arouteserver clients-from-euroix --url <URL> <ixp_id> -o <output_file>



- The JSON file contains information about more than one IXP for every IX e.g., AMS-IX has 'AMS-IX', 'AMS-IX Caribbean', 'AMS-IX Hong Kong' and more.
- To filter only those clients which are connected to the IXP of interest an identifier (ixp_id) is needed.
- When executed without the ixp_id argument, the command prints the list of IXPs and VLANs reported in the JSON file; the ID can be found on this list:



<pre>\$ arouteserver d</pre>	client	ts-from-euroixurl	L
IXP ID 1, short	name	'AMS-IX'	
- VLAN ID 502,	name	'GRX', IPv4 prefix	1
- VLAN ID 504,	name	'MDX', IPv4 prefix	1
- VLAN ID 600,	name	'PI'	
- VLAN ID 501,	name	'ISP', IPv4 prefix	1
IXP ID 3, short	name	'AMS-IX Caribbean'	
- VLAN ID 600,	name	'PI'	
- VLAN ID 501,	name	'ISP', IPv4 prefix	1
IXP ID 2, short	name	'AMS-IX Hong Kong'	
- VLAN ID 501,	name	'ISP', IPv4 prefix	1

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https://my.ams-ix.net/api/v1/members.json 93.105.101.0/25, IPv6 prefix 2001:7f8:86:1::/64 95.60.82.128/26 03.247.139.0/25, IPv6 prefix 2001:13c7:6004::/64 03.247.139.0/25, IPv6 prefix 2001:13c7:6004::/64 03.247.139.0/25, IPv6 prefix 2001:13c7:6004::/64



• An example from LONAP:

```
$ arouteserver clients-from-euroix --url https://portal.lonap.net/apiv1/member-list/list 1
  clients:
  - asn: 42
    cfg:
      filtering:
        irrdb:
          as sets:
          - AS-PCH
        max_prefix:
          limit_ipv4: 100
    description: Packet Clearing House AS42
    ip: 5.57.80.238
  - asn: 42
    cfg:
      filtering:
        irrdb:
          as sets:
          - AS-PCH
        max_prefix:
          limit_ipv6: 100
    description: Packet Clearing House AS42
    ip: 2001:7f8:17::2a:1
  - asn: 714
    cfg:
      filtering:
        irrdb:
          as_sets:
          - AS-APPLE
        max_prefix:
          limit_ipv4: 1000
    description: Apple Europe Ltd
    ip: 5.57.81.57
  . . .
GOLO-IX
```



- Thanks to Pier Carlo Chiodi for his work on this subject.
- More of his work is on GitHub: https://arouteserver.readthedocs.io/en/latest/USAGE.html#crea te-clients-yml-file-from-euro-ix-member-list-json-file





XP Database

euro-IX

In search of accurate information

- Peering networks can go to two sources of data to guarantee accuracy
- Tools and portal available on the Euro-IX website, future development for APIX, LAC-IX and AF-IX
- IXPAs have regional reach to local IXPs
- The data is complementary to database services that the RIR/NIRs & PeeringDB provide



XP Database Funding

- Funding so far has been from Euro-IX
- We need funds to continue development
- Next stage includes:

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- Interface to database for all IXPAs
- Fetch data center data from external databases
- Enhance the data set e.g. add IP Addressing from IXPs
- Outreach and training for IXPs

Please contact <u>bijal@euro-ix.net</u> if you are interested in supporting this work!



How you can help

- Use the data
- Suggest enhancements to the data
- Use the data some more
- Publish your work done with the data
- Tell others to use the data









Thank You!

Bijal Sanghani Bijal at euro-ix dot net Twitter: @euroix

