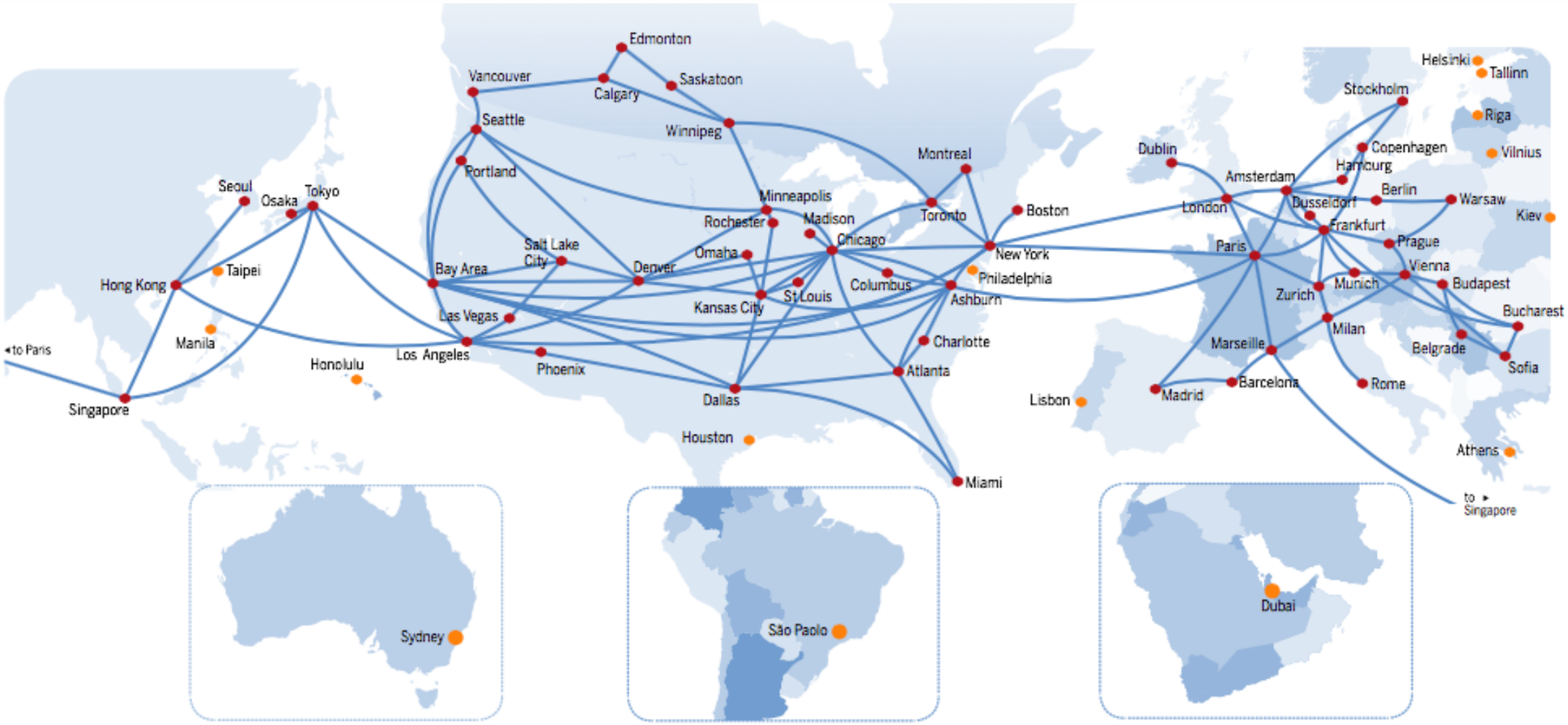
HE's Observations on Internet Exchange Point Management

Tim Denton
Hurricane Electric
ENOG-10

Background



Hurricane Electric (HE) participates in more than 100 Internet exchanges around the world. I'm here to present our experiences and my reflections on how exchange point operators can attract members and promote peering.

Things that Help us Most

List participants on your website including their AS numbers, switch-fabric IPv4 and IPv6 addresses, and peering contact information.

Make sure we can find your exchange in public directories.

Why List Participants?

Both current and prospective participants need this information to add peering sessions, increase peered traffic, and grow revenue.

Network operators continuously evaluate additional IXPs for potential expansion. To make this determination they need participant AS numbers and, ideally, to see what prefixes those peers advertise to a route-server at the exchange.

Example: Seattle IX (SIX) Members Page
https://www.seattleix.net/participants.htm

SEATTLE INTERNET EXCHANGE

Participants

There are 199 autonomous systems / 215 routers connected to the SIX. The voting membership count is 196.

This table is also available in these formats: [CSV | JSON | PCH | TSV]

Some data is from PeeringDB.com and is updated hourly. Please keep your record there current.

The prefix counts from the route servers may be a minute or two old. For each route server, the order of the counts is: 1500 MTU IPv4, 15

Corrections to webmaster_a_t_seattleix.net.

Organization	ASN	Addresses	Options	Policy	Prefixes: PeeringDB rs2:v4,v6,v4j,v6j rs3:v4,v6,v4j,v6j	Speed Mbit/sec	Sv
AARNet Pty Ltd	7575	206.81.80.112/23 2001:504:16::1d97/64 206.81.82.112/23_MTU9k 2001:504:16:1::1d97/64_MTU9k	IPv6 MTU9k	Selective	600 497,70,0,0 497,70,0,0	10000	SI
Access Communications Co-operative Limited	21804	206.81.81.24/23 2001:504:16::552c/64	IPv6	Open	50 39,1,0,0 39,1,0,0	10000	SI
Ace Data Centers	11798	206.81.80.247/23 2001:504:16::2e16/64	IPv6	Open	700		SI
Adhost	11274	206.81.80.59/23 2001:504:16::2c0a/64	IPv6	Open	30 23,1,0,0 23,1,0,0	1000	SI
Adobe Systems	15224	206.81.81.13/23 2001:504:16::3b78/64	IPv6	Selective	20 3,0,0,0 3,0,0,0	10000	SI
AEBC Internet Corporation	25668	206.81.80.103/23 2001:504:16::6444/64	IPv6	Open	300 47,0,0,0 47,0,0,0	10000	Ci
Afilias	12041	206.81.80.153/23 2001:504:16::2f09/64	IPv6	Open	200		Ec
Akamai Technologies, Inc.	20940	206.81.80.113/23 2001:504:16::51cc/64	IPv6	Open	50 19,1,0,0 19,1,0,0	80000	SI

Machine-Readable Format

Since 2007 there has been a global standard for publishing this information in a machine-readable format:

http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/ICCP/CISP(2007)9&docLanguage=En.

More recently RIPE has begun work on a competing European standard:

https://ripe70.ripe.net/presentations/96-inex-ripe-connectwg-amsterdam-2015-05-13.pdf

Get Your Exchange Listed Publicly

PCH

PeeringDB

WIKIPEDIA
The Free Encyclopedia

TeleGeography

Get Your Exchange Listed Publicly

You put extensive effort into starting and running your exchange:

You talked to network operators and recruited the participation.

You negotiated with data center operators for space to install exchange switches.

You obtained, deployed, and maintain hardware for the exchange.

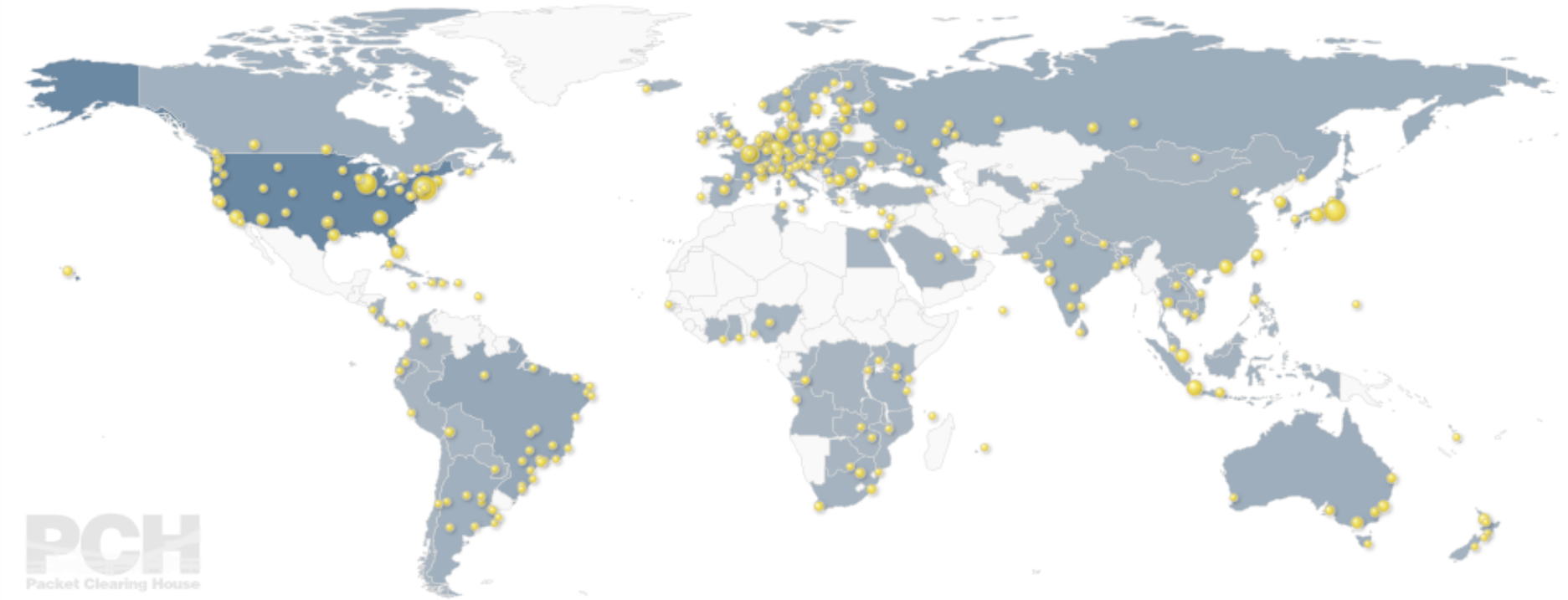
You catalyze ongoing communication between your participants.

Taking the last step, publicizing your exchange, maximizes its value both to current participants and to those who could benefit from it.

Packet Clearing House

https://
www.pch.net/ixpdir

Email ixps@pch.net or talk with any PCH staffer you may encounter at a network operations meeting to get your exchange added.



Filters

+ New filter

Region	Country	City	IXP Name	Prefixes	Established	Status	URL
Africa	Cote d'Ivoire	Abidjan	Côte d'Ivoire Internet Exchange Point		3 Oct 2013	Active	
	Nigeria	Abuja	IXPN - Abuja		28 Jul 2011	Active	
	Ghana	Accra	Ghana Internet Exchange		18 Oct 2005	Active	
Oceania	Australia	Adelaide	PIPE Networks Adelaide		2003	Active	
			South Australia Internet Exchange		27 Feb 2013	Active	
Asia	India	Ahmedabad	National Internet Exchange of India		2008	Active	
North America	United States of America	Albuquerque	New Mexico Internet Exchange		2008	Active	
Europe	France	Alsace	EuroGIX		4 Mar 2002	Active	

PeeringDB

Search Public Exchange Points

Exchange Name		**City**	
IP Block		**Country**	
Media Type	Select Value	**Continental Region**	Select Value

Search

List of Public Exchange Points

Exchange Name	Long Name	City/Region	Country	Continental Region	Media Type	Participants
AAIX	Alpes Adria Internet eXchange	Klagenfurt	AT	Europe	Ethernet	11
ACTIX	ACT Internet Exchange	Canberra, ACT	AU	Australia	Ethernet	11
ADN-IX	The Ardèche and Drôme Internet eXchange Point	Valence	FR	Europe	Ethernet	0
AKL-IX	Auckland Internet Exchange	Auckland/NZ	NZ	Australia	Ethernet	33
AlbertaIX	AlbertaIX	Calgary	CA	North America	Ethernet	3
ALBtelecom sh.a	ALBtelecom Albania	Tirana	01	Europe	Multiple	0
ALBtelecom1 sh.a	ALBtelecom Albania	Tirana	AL	Europe	Multiple	0
AlsardFiber	Alsard Fiber	Sulaymanieh	IQ	Middle East	Multiple	0
AMPATH	AMPATH - Florida International University/CIARA	Miami	US	North America	Multiple	0
AMS-IX	Amsterdam Internet Exchange	Amsterdam	NL	Europe	Ethernet	1391
AMS-IX BAY	AMS-IX Bay Area	San Francisco, San Jose	US	North America	Ethernet	30
AMS-IX Caribbean	Amsterdam Internet Exchange Caribbean	Curacao	CW	South America	Ethernet	15
AMS-IX Chicago	AMS-IX Chicago	Chicago	US	North America	Ethernet	13
AMS-IX Hong Kong	Amsterdam Internet Exchange Hong Kong	Hong Kong	HK	Asia Pacific	Ethernet	33
AMS-IX NY	AMS-IX New York	New York	US	North America	Ethernet	32
Angola-IXP / ANG-IX	Angola Internet Exchange point	Luanda	AO	Africa	Ethernet	6
angonix	Angola Internet Exchange Point	Luanda	AO	Africa	Ethernet	3

https://
www.peeringdb.com

Entries are created by network operators, not exchange operators.

Encourage all your members to register and list themselves as being connected to your exchange - they will need to make the request to list your exchange.

https://wikipedia.org/wiki/List_of_Internet_exchange_points

Edit IXP list article to include information about your exchange.

Monitor in case your entry is edited by others

Consider creating a stand-alone Wikipedia article about your exchange.

WIKIPEDIA
The Free Encyclopedia

List of Internet exchange points

From Wikipedia, the free encyclopedia

This is a **list of Internet exchange points** (IXPs). Some of the entries represent IXPs and some represent organizations th
one or more IXPs or are members of the global Internet Exchange Federation. More details about members of an Internet e
point can be found at PeeringDB, which is "a freely available web-based database of networks that are interested in peering
PeeringDB has become the default location for Internet peering data.[1] In co-operation with the Network Startup Resource
there is also a webpage with an RSS feed about the latest developments in the world of Internet exchange points.[2]

Contents [hide]

Introduction [edit]

The columns used in the lists below include the following information:

- **Region**: The official Regional Internet registry (RIR) regions.
- **Country**: Uses ISO 3166-1 alpha-3 to display the country flag.
- **City**: A reference to a city article within Wikipedia.
- **Name**: Longname (Shortname). Entries flagged with an asterisk (*) do not appear in PeeringDB.
- **IX-F region**: IX-F region with which the IXP is associated.[3]

Active Internet exchanges [edit]

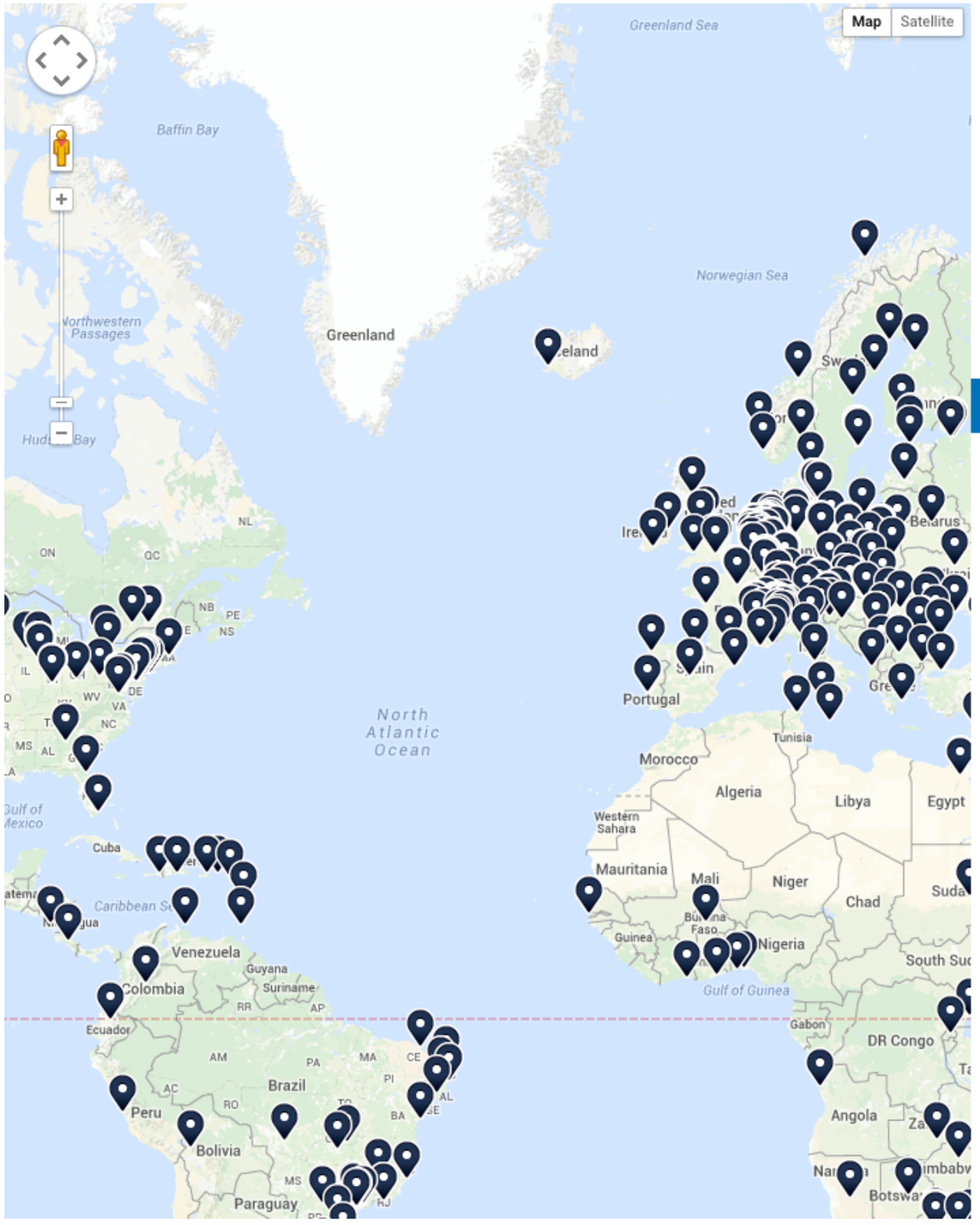
The IXPs in the list that follows have a working webpage, are listed in PeeringDB, or both.

Region	Country, City/Region	Name
Africa	Angola, Luanda	Angola Internet Exchange (Angola-IXP, ANG-IX)
Africa	Angola, Luanda	Angola Internet Exchange (Angonix)
Africa	Benin,	Benin Internet Exchange Point (BENIN-

TeleGeography

http://www.internetexchangemap.com

No action needed: TeleGeography will pick up your information automatically if you are listed in the PCH IXP directory.



TeleGeography

Internet Exchange Map

The Internet Exchange Map is a free resource from TeleGeography. Data contained in this map was complied by TeleGeography and is updated on a regular basis.

To learn more about TeleGeography or this map, please visit www.telegeography.com.

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Feedback github

Search

Internet Exchanges

6NGIX (Seoul, Korea, Rep.)
AAIX (Klagenfurt, Austria)
ADN-IX (Valence, France)
AIXP (Arusha, Tanzania)
AIXP (Port-au-Prince, Haiti)
ALB-IX (Tirane, Albania)
AMPATH (Miami, United States)
AMS-IX (Amsterdam, Netherlands)
AMS-IX Bay Area (San Francisco, United States)
AMS-IX Caribbean (Willemstad, Netherlands Antilles)
AMS-IX Chicago (Chicago, United States)
AMS-IX Hong Kong (Hong Kong, China)
AMS-IX New York (New York, United States)
ANG-IXP (Luanda, Angola)
APE (Auckland, New Zealand)
APIX (Hong Kong, China)
AZIX (Phoenix, United States)
B-IX (Bucharest, Romania)
B-IX (Sofia, Bulgaria)
B-IX (Svilengrad, Bulgaria)
Balcan-IX (Bacau, Romania)
Balcan-IX (Bucharest, Romania)
Balcan-IX (Cluj Napoca, Romania)
Balcan-IX (Constanta, Romania)

Other Suggestions

Be the Ethernet switch fabric your participants expect and need, and nothing more. ISPs operate Layer 3 networks, which run on top of a Layer 2 substrate, in this case your Internet exchange. Maintaining a clear boundary separation and division of responsibilities allows everyone to do the job that they expect to do, minimizes costs, and preempts unpleasant surprises.

Don’t charge usage based fees on exchange traffic, and try not to charge more for faster ports. Don’t penalize the thing you want more of, and you want traffic to grow! More traffic is more profit for everybody!

Don’t try to force every participant to peer with every other participant. This will scare larger networks away, and hinder growth.

Other Suggestions

Remember there are 500 other exchange points out there, and among them are a diversity of examples of both success and failure, and many potential solutions to every problem. Their operators are your friends and colleagues, don't be afraid to ask them for advice and assistance.

A global not-for-profit organization, Packet Clearing House, was formed in 1994 by the Internet industry specifically to support the growth of Internet Exchange Points and other critical Internet infrastructure. PCH has provided training, logistics, and equipment to hundreds of exchange points over more than twenty years and is there to support you at no cost.

What does Hurricane Electric look for in an exchange?

Benefits

When Hurricane Electric connects to a new exchange, we are trying to achieve these goals:

Reduce average per-bit delivery cost (APBDC)

Increase supply of bandwidth to keep up with growing demand

Improve quality: reduce loss, latency, out-of-order delivery and jitter

Meet and connect new potential customers

Evaluation Criteria

Correlation of Netflow analysis of current traffic sources and destination ASes with the ASes participating in the exchange

Number of networks present in the data center where the exchange is hosted and those nearby or easily reachable

Reasonably priced dark fiber cross-connects within the data center

Availability of dark fiber between the exchange facility and our customers and other data centers

Cost of long-haul circuits from the nearest existing Hurricane Electric points of presence (POPs) to the exchange’s location

Limitations on Participation

Internet Service Providers with a naive conception of Internet economics sometimes try to preclude competition through barriers to new market entry.

An example of this is the occasional misguided requirement that only network operators licensed as ISPs by the local regulator may participate in the exchange.

This is self defeating because it precludes the participation of both the content providers that customers want to reach and the international participants that local ISPs must pay to reach through transit.

This restriction limits the growth of the exchange, further reducing its attractiveness to new participants in a cycle of unfortunate unintended consequences.

Logistics

Can a global shipping company (ex. FedEx, UPS, or DHL) perform door-to-door delivery in the country and charge all customs duties and taxes to the shipper?

Customs should be professional, transparent, and streamlined to facilitate business. Duties and taxes should be remitted directly to the government by the shipping company, and if there are any “special services fees,” we don’t want to hear about it.

Irregular and opaque customs processes hinder business and particularly curtail growth of the Internet and telecom sector, which is so dependent on frequent equipment upgrades.

Conclusions

Listing your members on your website and on public directories is simple, helps your exchange grow, and supports your members.

Large networks rely on public membership information when making decisions about where to put equipment.

Imposing fees and license requirements to join your exchange will stifle its growth.

Certain telecommunications regulations and non-standard customs processes in your country may further discourage foreign networks from joining.

Thank You!

Questions?