

# HE's Observations on Internet Exchange Point Management



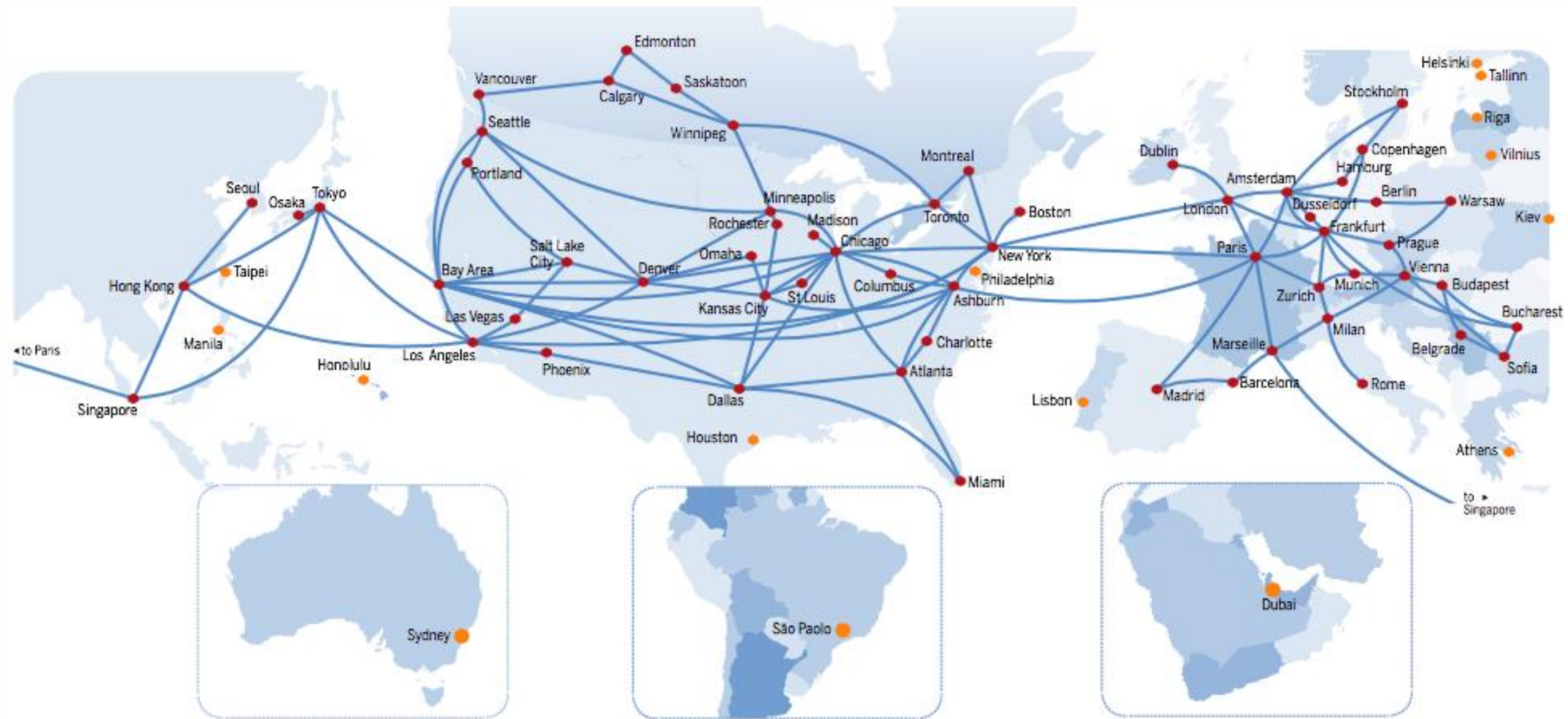
HURRICANE ELECTRIC  
**INTERNET SERVICES**

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ENOG

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# 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:**

## **1. List participants**

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 advertize to a route-server at the exchange.

There are at least 2 ways to do this: locally and globally.

# Seattle IX (SIX) Members Page

<https://www.seattleix.net/participants.htm>



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## 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, 1500 MTU IPv6

Corrections to [webmaster\\_a\\_t\\_seattleix.net](mailto:webmaster_a_t_seattleix.net).

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

# JSON API

Many exchanges are starting to publish a list of their members in JSON format at a URL. This API allows anyone to automate collection of a current member list.

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

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

Open-source tools, like IXP-Manager, do it for you:

<https://github.com/inex/IXP-Manager>

## 2. Get Your Exchange Listed Publicly



## **2. 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.

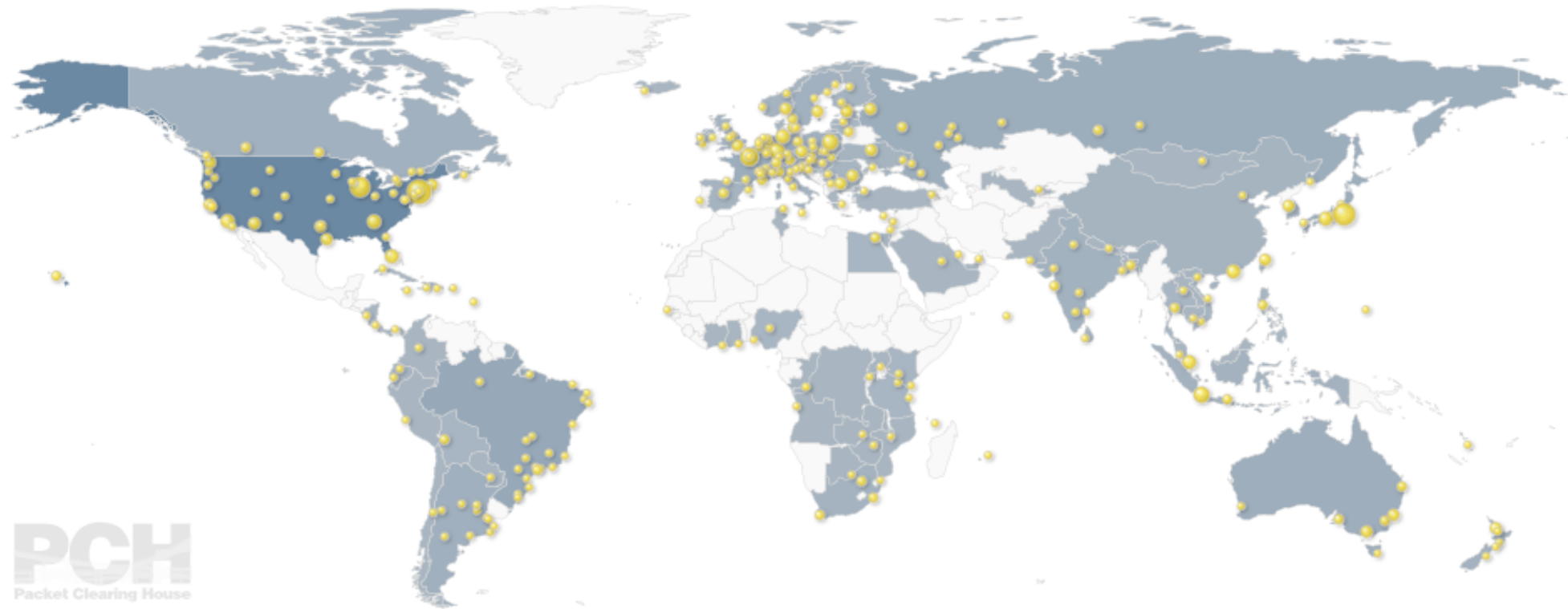
Taking the last step, publicizing your exchange, maximizes its value both to current participants and to those who could benefit from it.





[https://  
www.pch.net/ixpdir](https://www.pch.net/ixpdir)

Email [ixps@pch.net](mailto: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	<a href="#">Côte d'Ivoire Internet Exchange Point</a>		3 Oct 2013	Active	<a href="#">↗</a>
	Nigeria	Abuja	<a href="#">IXPN - Abuja</a>		28 Jul 2011	Active	<a href="#">↗</a>
	Ghana	Accra	<a href="#">Ghana Internet Exchange</a>		18 Oct 2005	Active	<a href="#">↗</a>
Oceania	Australia	Adelaide	<a href="#">PIPE Networks Adelaide</a>		2003	Active	<a href="#">↗</a>
			<a href="#">South Australia Internet Exchange</a>		27 Feb 2013	Active	<a href="#">↗</a>
Asia	India	Ahmedabad	<a href="#">National Internet Exchange of India</a>		2008	Active	<a href="#">↗</a>
North America	United States of America	Albuquerque	<a href="#">New Mexico Internet Exchange</a>		2008	Active	<a href="#">↗</a>
Europe	France	Alsace	<a href="#">EuroGIX</a>		4 Mar 2002	Active	<a href="#">↗</a>



Search Public Exchange Points			
Exchange Name	<input type="text"/>	City	<input type="text"/>
IP Block	<input type="text"/>	Country	<input type="text"/>
Media Type	<input type="text" value="Select Value"/>	Continental Region	<input type="text" value="Select Value"/>
<input type="button" value="Search"/>			

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



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 that have one or more IXPs or are members of the global Internet Exchange Federation. More details about members of an **Internet exchange point** can be found at **PeeringDB**, which is "a freely available web-based database of networks that are interested in peering with each other". PeeringDB has become the default location for Internet peering data.<sup>[1]</sup> In co-operation with the **Network Startup Resource Center** there is also a webpage with an **RSS** feed about the latest developments in the world of Internet exchange points.<sup>[2]</sup>

### Contents [hide]

- 1 Introduction
- 2 Active Internet exchanges
- 3 Inactive Internet exchanges
- 4 See also
- 5 References
- 6 External links

## 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.<sup>[3]</sup>

## Active Internet exchanges [edit]

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

Region <span>↕</span>	Country, City/Region <span>↕</span>	Name <span>↕</span>
<a href="#">Africa</a>	<span><span></span></span> <a href="#">Angola</a> , <a href="#">Luanda</a>	Angola Internet Exchange (Angola-IXP, ANG-IX)
<a href="#">Africa</a>	<span><span></span></span> <a href="#">Angola</a> , <a href="#">Luanda</a>	Angola Internet Exchange (Angonix)
		Benin Internet Exchange Point (BENIN-IXP)

[https://  
wikipedia.org/wiki/  
List\\_of\\_Internet\\_exchange  
\\_points](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.

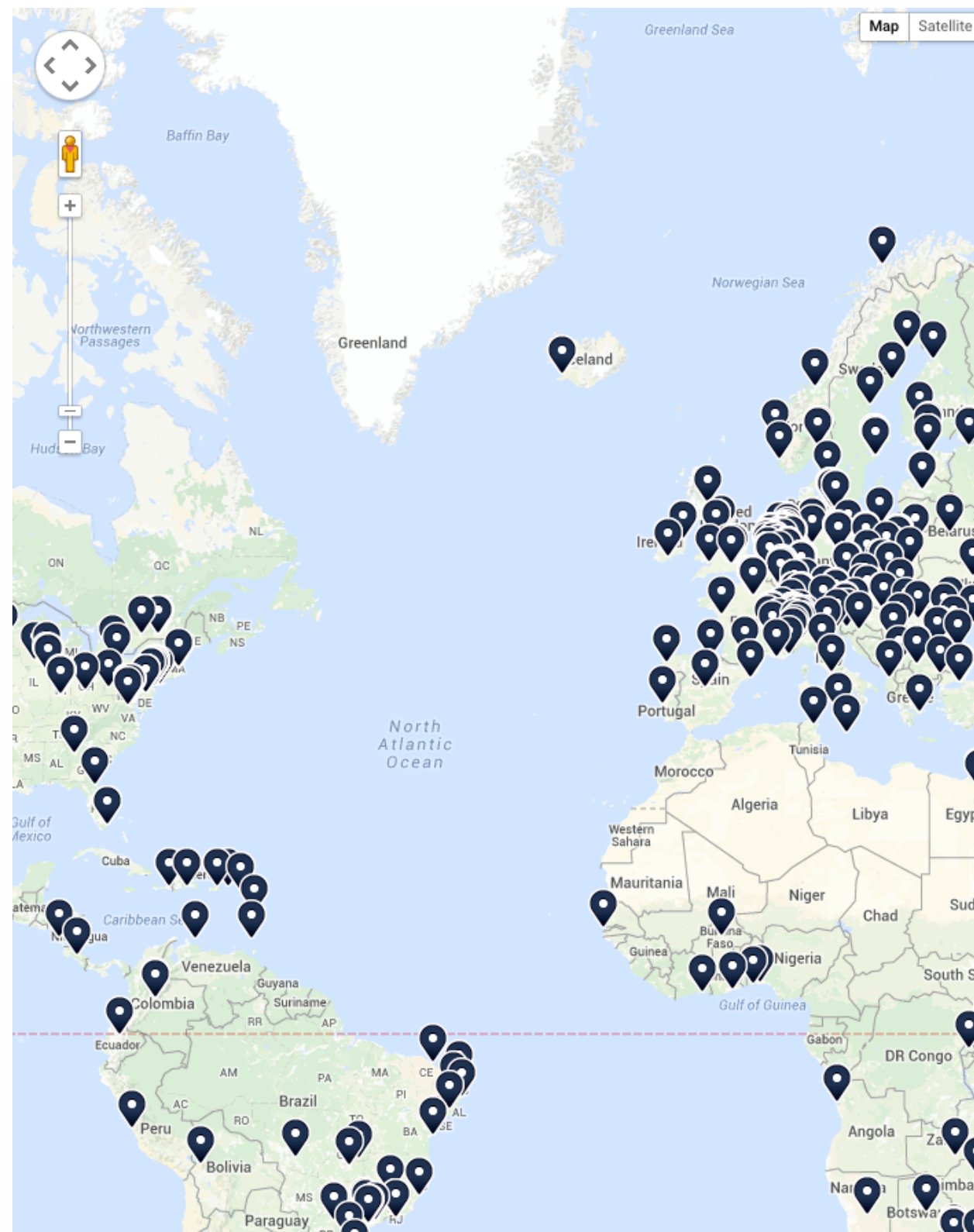




# TeleGeography

<http://www.internetexchangeangemap.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 compiled by TeleGeography and is updated on a regular basis.

To learn more about TeleGeography or this map, please visit [www.telegeography.com](http://www.telegeography.com).



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### 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)
- Balkan-IX (Bacau, Romania)
- Balkan-IX (Bucharest, Romania)
- Balkan-IX (Cluj Napoca, Romania)
- Balkan-IX (Constanta, Romania)

# **3. Maintain boundaries and don't be greedy**

1. 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.

2. Don't charge usage-based fees on exchange traffic. Don't penalize the thing you want more of, and you want traffic to grow. More traffic is more profit for everybody.

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

## **4. Ask for advice and assistance**

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:

1. Reduce average per-bit delivery cost (APBDC)
2. Increase supply of bandwidth to keep up with growing demand
3. Improve quality: reduce loss, latency, out-of-order delivery and jitter
4. Meet and connect new potential customers



# Evaluation Criteria

1. Correlation of Netflow analysis of current traffic sources and destination ASes with the ASes participating in the exchange
2. Number of networks present in the data center where the exchange is hosted and those nearby or easily reachable
3. Reasonably priced dark fiber cross-connects within the data center
4. Availability of dark fiber between the exchange facility and our customers and other data centers
5. Cost of long-haul circuits from the nearest existing Hurricane Electric points of presence (POPs) to the exchange's location

# Do not limit 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 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 are essential

Updates of equipment are constant.

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?