



bgp.he.net

July 2017 – JPIX
Tokyo Japan

Walt Wollny, Director Interconnection Strategy
Hurricane Electric AS6939

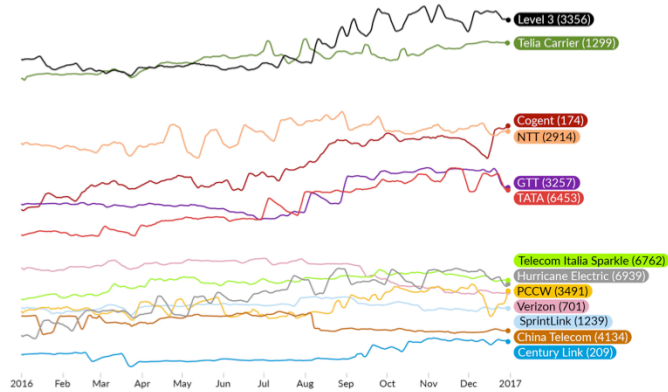
Who is Walt Wollny?

- ❑ **Hurricane Electric AS6939 – 3 years**
 - ❑ Director Interconnection Strategy – supporting the network to reach to over 39 countries and over 156 Internet Exchanges.
Focus on Global connectivity.
- ❑ **Amazon AS16509 – 4 years**
 - ❑ Developed IP Transit and Peering on five continents.
 - ❑ Primary focus on Japan, Singapore, Hong Kong, India, Taiwan, Philippines, Australia.
 - ❑ Over 62 new CDN sites.
- ❑ **Microsoft AS8075 – 13 years**
 - ❑ Developed IP Transit and Peering on four continents.
 - ❑ Primary focus on US, UE and South America.



Hurricane Electric #8 in 2017 up from #13 in 2016 in the Global IPv4 rankings!

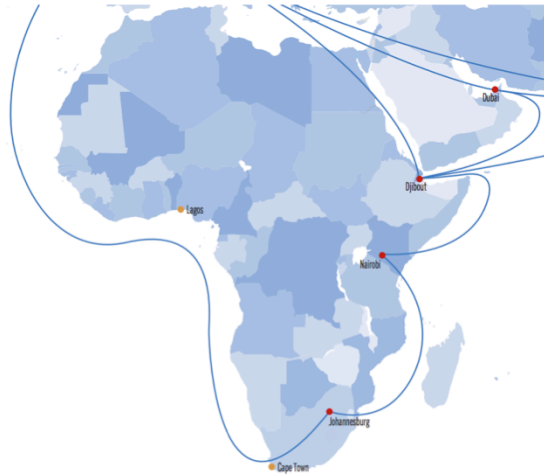
Baker's Dozen for 2016



Hurricane Electric - Massive Peering!



Hurricane Electric Network Update



Hurricane Electric - Massive Peering!



Hurricane Electric is expanding in 2017 into some of the following locations:

Nairobi, Kenya

Djibouti

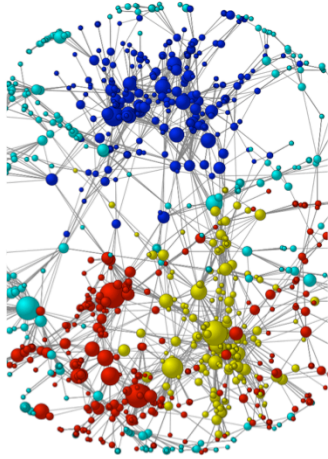
Dubai, UAE

Also the following:

Oslo, Norway

Montgomery, Alabama, USA

INTERNET



A network of
“networks” (where
“networks = ASNs”)



Key points before we begin

- Network ASN must be visible
- If it is not visible there will be no routing data
- Participate with public collectors via route-views
- BGP is the key so best path selection is used
- Data is independent of HE's production network
- Data is updated every 24 hours

- If you manage network that is not adequately represented, contact us and we will work with you to get your data incorporated. support@he.net

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It is important to remember that bgp.he.net uses data from public sources and other places to gather the data presented on the website.

BGP best path selection is used for the one direction. If you want to understand it more please look at the following link

<https://tools.ietf.org/html/rfc4271>

Also remember this is just one direction you would need to do traceroute or MRT to understand the return paths.

Home Page



HURRICANE ELECTRIC
INTERNET SERVICES

BGP Toolkit Home

Quick Links

- [BGP Toolkit Home](#)
- [BGP Prefix Report](#)
- [BGP Peer Report](#)
- [Exchange Report](#)
- [Bogon Routes](#)
- [World Report](#)
- [Multi Origin Routes](#)
- [DNS Report](#)
- [Top Host Report](#)
- [Internet Statistics](#)
- [Looking Glass](#)
- [Network Tools App](#)
- [Free IPv6 Tunnel](#)
- [IPv6 Certification](#)
- [IPv6 Progress](#)
- [Going Native](#)
- [Contact Us](#)

Home

Welcome to the Hurricane Electric BGP Toolkit.

You are visiting from **220.86.114.11**



Announced as **220.80.0.0/13**



Your ISP is **AS4766** (Korea Telecom)



Updated 16 Mar 2017 14:01 PST © 2017 Hurricane Electric


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Visiting from: this is your devices ip address
Announced: subnet that your device is on
Your ISP AS4766

http://bgp.he.net/AS12779#_asinfo

AS Info | Graph v4 | Graph v6 | Prefixes v4 | Prefixes v6 | Peers v4 | Peers v6 | Whois | IRR | IX

Company Website:	http://www.itgate.it
Company Looking Glass:	http://www.ncc.itgate.net/lg
Country of Origin:	Italy 
Internet Exchanges:	7
Prefixes Originated (all):	15
Prefixes Originated (v4):	13
Prefixes Originated (v6):	2
Prefixes Announced (all):	159
Prefixes Announced (v4):	142
Prefixes Announced (v6):	17
BGP Peers Observed (all):	1,447
BGP Peers Observed (v4):	1,410
BGP Peers Observed (v6):	977
IPs Originated (v4):	45,056
AS Paths Observed (v4):	81,552
AS Paths Observed (v6):	14,809
Average AS Path Length (all):	4.077
Average AS Path Length (v4):	4.135
Average AS Path Length (v6):	3.760



Like You and 1.7K others like this.

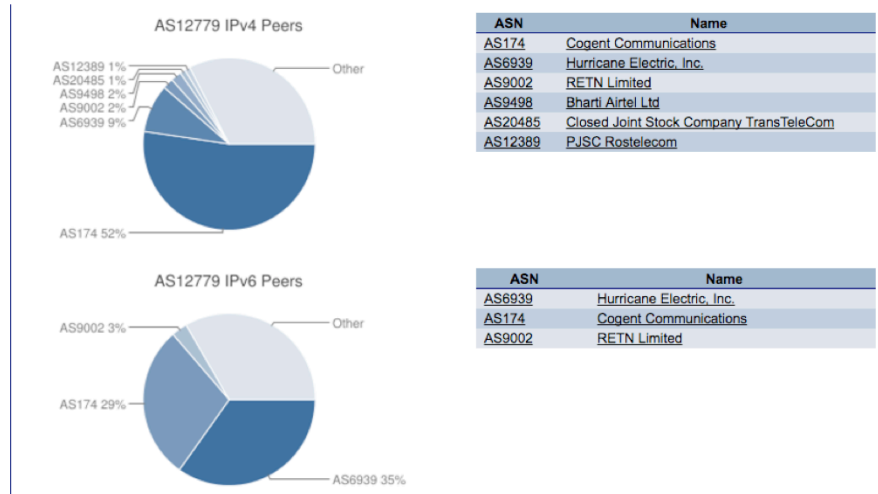
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In the search bar we typed in AS12779

This was used as it is an interesting example and as you can see it shows a summary of the IPS including all the internet exchanges and prefixes

http://bgp.he.net/AS12779#_asinfo



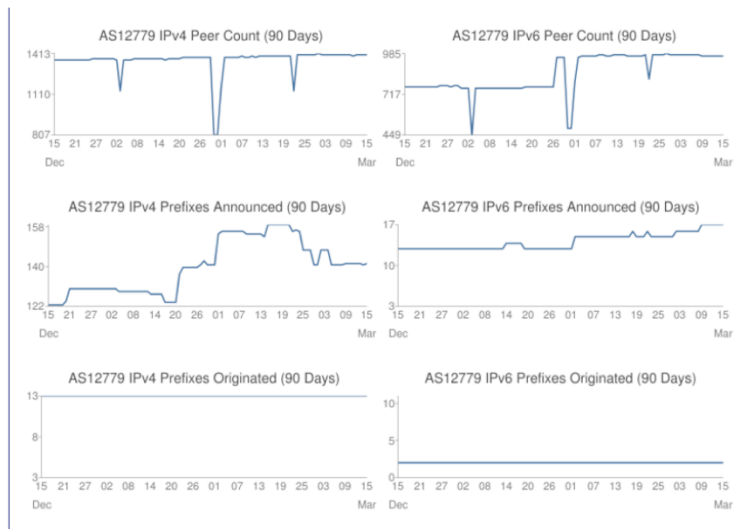
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You can see from this slide that there is a probable transit relationship with Cogent. More details will be examined on slide 12 showing the ipv4 graph.

It is key to note that there is no way to tell if there is any commercial relationship between AS12779 and any of the connected ASNs. We can only infer.

http://bgp.he.net/AS12779#_asinfo



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This is an interesting page and should be looked at closely.

As we can see there is some growth in both IPv4/v6 peers as we can see the two graphs growing up and to the left.

If we take a look into in both IPv4/v6 graphs we can see a sharp downward spike right around Feb

Route propagation is to the following networks:

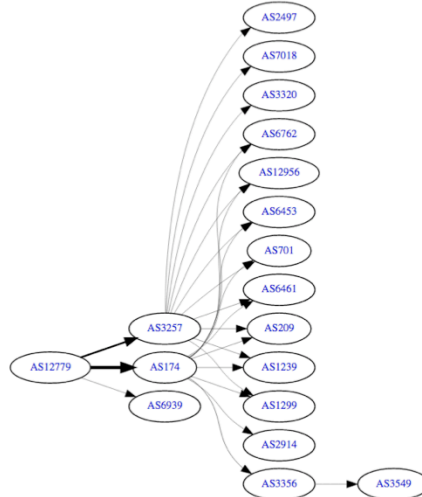
Company	ASN	Company	ASN	Company	ASN
Hurricane	6939	TiNet	3257	Sparkle	6762
Qwest	209	Dtag	3320	Cogent	174
UUnet	701	Level3	3356	AT&T	7018
UUnet Europe	702	GBLX	3549	Comcast	7922
Cable and Wireless	1273	Savvis	3561	Telefonica	12956
Sprint	1239	Orange	5511	Abovenet	6461
Telia	1299	TATA	6453	IJJ	2497



http://bgp.he.net/AS12779#_graph4

AS Info | Graph v4 | Graph v6 | Prefixes v4 | Prefixes v6 | Peers v4

AS12779 IPv4 Route Propagation

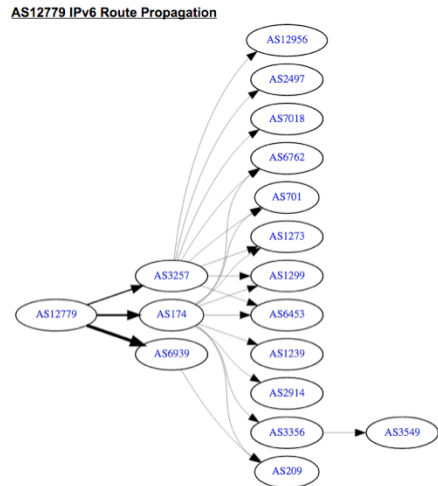


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This view shows that there is a ipv4 transit relationship between AS12799 and AS174 as well as AS3257 as they both are propagating routes to the rest of the world.

http://bgp.he.net/AS12779#_graph6























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This view shows that there is a ipv6 transit relationship between AS12799 and AS174, AS3257 as well as AS6939 as they both are propagating routes to the rest of the world.

What is also shown on this page is that AS6939 looks to be preferred for IPv6 transit.

http://bgp.he.net/AS12779#_prefixes

Prefix		Description	
5.104.26.0/23		ATCALL SRL	
5.104.28.0/22		ATCALL SRL	
77.74.16.0/21		MOVIMATICA Srl	
89.31.200.0/21		IT.Gate S.p.A.	
93.191.240.0/21		Eurologon Srl	
176.221.48.0/21		Critical Case s.r.l	
185.59.80.0/22		IT.Gate S.p.A.	
185.73.136.0/22		FENICE SRL	
192.88.99.0/24		Internet Assigned Numbers Authority	
195.238.235.0/24		A.D.B. Analisi Dati Borsa S.p.A.	
212.110.32.0/19		IT.Gate S.p.A.	
213.212.128.0/18		IT.Gate S.p.A.	
213.254.0.0/19		IT.Gate S.p.A.	



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ROA - Route Origin Authorization is a technique which helps in validating a given route against its origin AS. ROA helps to verify whether a given ASN is authorized to announce a prefix or not. It helps in dealing with accidental or intentional route hijacks. Routers can be configured to give priority to routes where ROA check has been successful. HE's BGP tool shows a "green key" next to prefixes where ROA is present and is being validated against the announcement. In case if a origin AS is not matching origin AS in ROA, tool shows a red key. No key appears in case ROA is not present.











This is the same details for the next slide

http://bgp.he.net/AS12779#_prefixes6

Prefix	Description
2001:1418::/32	 IT.Gate S.p.A. 
2002::/16	6to4



http://bgp.he.net/AS12779#_peers











Rank	Description		IPv6	Peer
1	Cogent Communications		X	AS174
2	Hurricane Electric, Inc.		X	AS6939
3	RETN Limited		X	AS9002
4	Bharti Airtel Ltd		X	AS9498
5	Closed Joint Stock Company TransTeleCom		X	AS20485
6	PJSC Rostelecom		X	AS12389
7	PJSC "Vimpelcom"		X	AS3216
8	PJSC MegaFon		X	AS31133
9	Reliance Globalcom Limited		X	AS15412
10	COLT Technology Services Group Limited		X	AS8220

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This shows the ASNs that have a direct connection to AS12779. It does not show if there is any paid peering arrangements.

http://bgp.he.net/AS12779#_peers6

Rank	Description	IPv4	Peer
1	Hurricane Electric, Inc. 	X	AS6939
2	Cogent Communications 	X	AS174
3	RETN Limited 	X	AS9002
4	Bharti Airtel Ltd 	X	AS9498
5	Interoute Communications Limited 	X	AS8928
6	IP-Only Networks AB 	X	AS12552
7	COLT Technology Services Group Limited 	X	AS8220
8	PJSC MegaFon 	X	AS31133
9	Eweka Internet Services B.V. 	X	AS12989
10	NORDUnet 	X	AS2603

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http://bgp.he.net/AS12779#_whois

```
as-block:      AS12557 - AS13223
descr:         RIPE NCC ASN block
remarks:       These AS Numbers are assigned to network operators in the RIPE NCC service
region:
mnt-by:        RIPE-NCC-HM-MNT
created:       2010-05-11T11:45:03Z
last-modified: 2014-02-24T13:15:16Z
source:        RIPE

aut-num:       AS12779
as-name:       ITGATE
```

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Whois shows the “who is” data for the given ASN or prefix and it is taken from appropriate RIR which has allocated the ASN. It helps in identifying contact details for the given resource.

http://bgp.he.net/AS12779#_irr

RIPE

```
aut-num:      AS12779
as-name:      ITGATE
remarks:      +-----+
remarks:      We do not use RPSL to generate routers configurations and our
remarks:      complete routing policy would be too much verbose anyway, so
remarks:      this object does not precisely reflect the actual policy in
remarks:      use in our network.
remarks:      The following import and export attributes define only an
remarks:      upper bound of what we accept or announce from neighbors and
remarks:      should not be interpreted literally.
remarks:      We document the ASN and prefixes announced to peers in the
remarks:      AS12779:AS-CUSTOMERS and AS12779:AS-CUSTOMERS-V6 as-sets
remarks:      and we generate prefix and/or as-path filters for our peers
remarks:      and customers using the data published in the RIPE routing
remarks:      registry as much as feasible.
remarks:      +-----+
import:       from AS-ANY accept ANY;
export:       { to AS-ANY announce AS12779:AS-CUSTOMERS; } refine { to AS12779:AS-
DOWNSTREAMS announce ANY; }
```








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IRR or Internet Routing Registry tab shows the data for a given ASN from IRR records. By default HE's BGP tool pulls data for a given ASN from all popular IRRs (RADB, RIPE, and other private registries). It also has direct links to AS sets appearing in the ASN.

http://bgp.he.net/AS12779#_ix

AS Info Graph v4 Graph v6 Prefixes v4 Prefixes v6 Peers v4 Peers v6 Whois IRR IX

Exchange	CC	City	IPv4	IPv6
AMS-IX		NL Amsterdam	80.249.209.17	2001:7f8:1::a501:2779:1
DE-CIX Frankfurt		DE Frankfurt	80.81.194.186	2001:7f8::31eb:0:1
France-IX		FR Paris	37.49.236.177	2001:7f8:54::177
LINX Juniper LAN		GB London	195.66.226.31	2001:7f8:4::31eb:1
Lyonix		FR Lyon	77.95.71.201	2001:7f8:47:47::c9
MIX-IT		IT Milan	217.29.66.65	2001:7f8:b:100:1d1:a5d1:2779:65
TOP-IX		IT Turin	194.116.96.4	2001:7f8:23:ffff::3

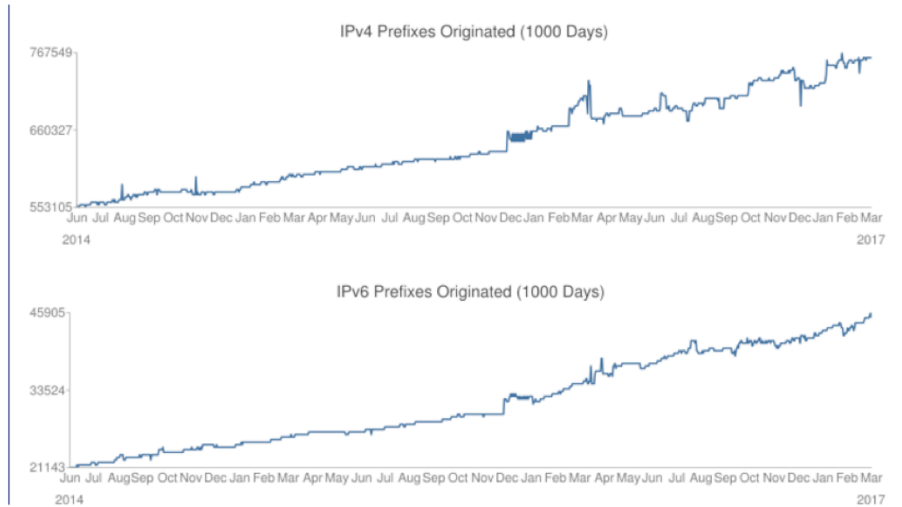
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This show all the IXs that AS12779 is connected.

However if AS12779 is connected to an IX that is not in the peeringdb.com it will not show up.

<http://bgp.he.net/report/prefixes>



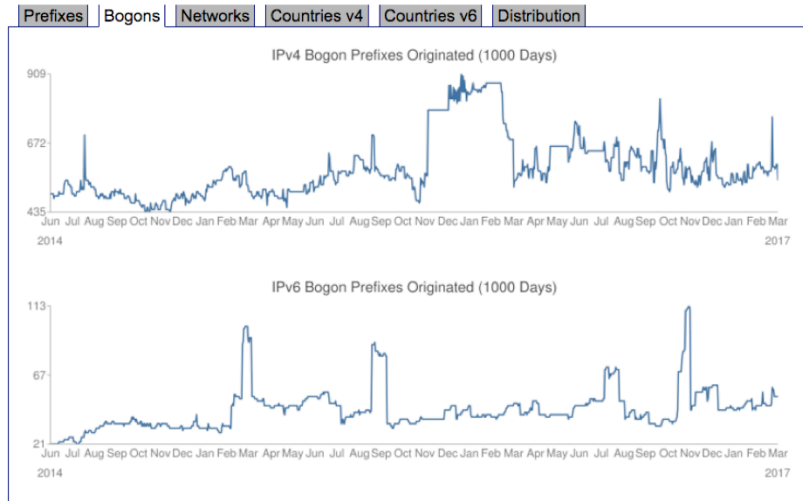
Hurricane Electric - Massive Peering!



This simply shows the growth of the subnets being advertised over time.

It does not show disaggregation of subnets. there is now an active feature request but no release date has been provided.

http://bgp.he.net/report/prefixes#_bogons

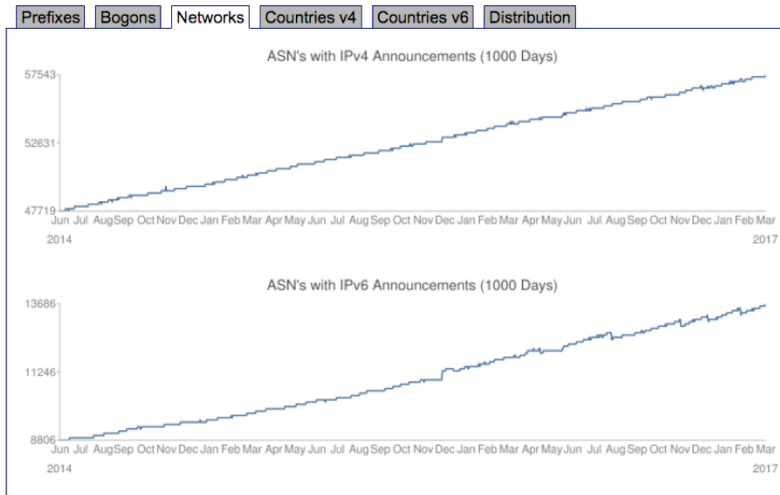


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The areas of unallocated address space are called the bogon space. A network should never advertise bogon space.

http://bgp.he.net/report/prefixes#_networks



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This simply shows the growth of ASNs over time.

A unique ASN is allocated to each AS for use in BGP routing. AS numbers are important because the ASN uniquely identifies each network on the Internet.

[https://en.wikipedia.org/wiki/Autonomous_system_\(Internet\)#Types](https://en.wikipedia.org/wiki/Autonomous_system_(Internet)#Types)

http://bgp.he.net/report/prefixes#_countriesv4

Prefixes Bogons Networks Countries v4 Countries v6 Distribution

IPv4 Announcements by Country

Country	Prefixes	ASNs	Prefixes / ASN
United States 	197,599	18,321	10
China 	54,086	501	107
Brazil 	50,280	4,256	11
India 	35,863	1,430	25
Russian Federation 	28,352	4,799	5
Canada 	23,783	1,296	18
Australia 	20,121	1,537	13
Korea, Republic of 	19,251	740	26

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If you want to learn more about each country and what provider and subnets are visible this is a great starting place! Selecting the report will launch more details on the country

http://bgp.he.net/report/prefixes#_countriesv6

[Prefixes](#) [Bogons](#) [Networks](#) [Countries v4](#) [Countries v6](#) [Distribution](#)

IPv6 Announcements by Country

Country	Prefixes	ASNs	Prefixes / ASN
United States 	14,048	2,804	5
Brazil 	4,228	1,776	2
United Kingdom 	2,095	706	2
Germany 	1,901	894	2
Canada 	1,404	322	4
India 	1,360	224	6
Netherlands 	1,263	489	2
Russian Federation 	1,175	722	1
Australia 	997	345	2



http://bgp.he.net/report/prefixes#_distribution

Prefixes Bogons Networks Countries v4 Countries v6 Distribution

IPv4 Announced Prefix Count by CIDR and Growth over 1000 Days

CIDR:	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Count:	20	13	38	103	290	556	1,111	1,963	14,176	9,519	16,021	30,381	46,060	52,333	94,124	78,325	415,822
Change:	4	1	8	15	28	59	90	181	689	1,682	3,127	3,425	6,939	10,383	30,063	26,247	124,859
Percent:	25%	8%	26%	17%	10%	11%	8%	10%	5%	21%	24%	12%	17%	24%	46%	50%	42%

IPv6 Announced Prefix Count by CIDR and Growth over 1000 Days

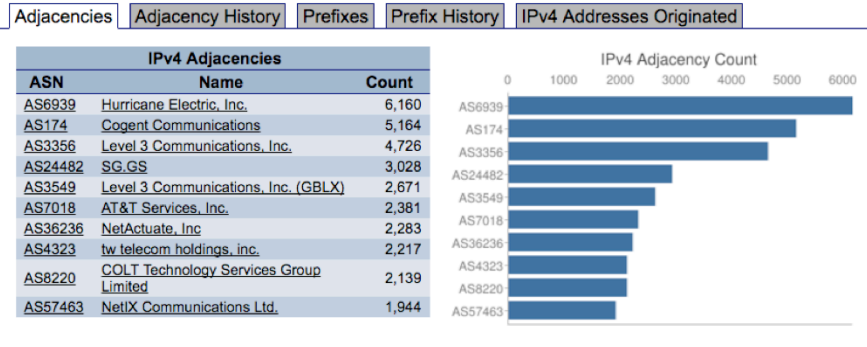
CIDR:	16	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Count:	14	2	9	3	4	4	20	5	89	16	78	1,611	136	110	9,208
Change:	3	0	3	0	0	0	5	1	75	2	19	1,173	57	55	3,091
Percent:	27%	0%	50%	0%	0%	0%	33%	25%	535%	14%	32%	267%	72%	100%	50%

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Prefix distribution shows distribution of /8s to /24s visible in the routing table (IPv4) and /16 to /32 (IPv6). It shows count of announcement with each of those masks and changes in last 1000 days.

<http://bgp.he.net/report/peers>



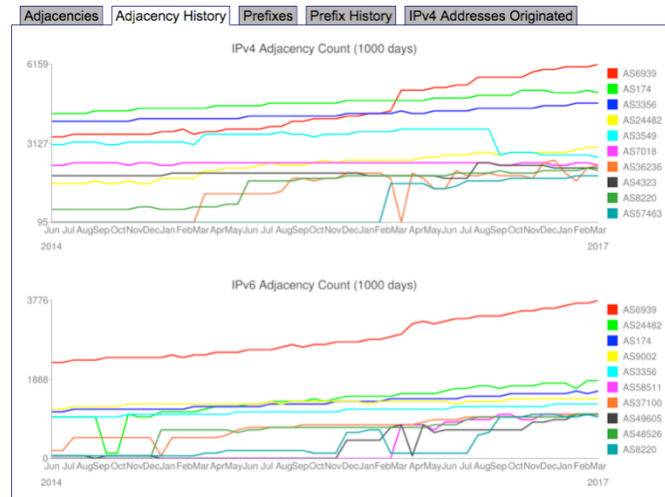
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This shows you the top 10 most connected networks.

Internet peering is the relationship whereby two networks reciprocally provide access to each other's customers.

http://bgp.he.net/report/peers#_adjacencyhistory



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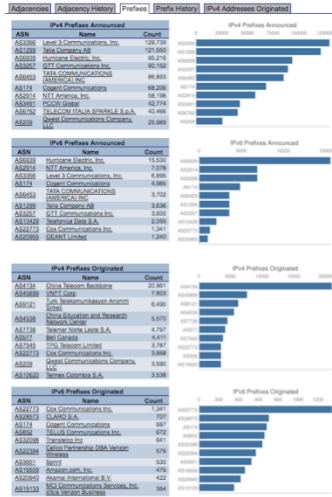


This is a graphical representation of ipv4/6 connectivity over time.

It is important to note that this is for unique networks not all peering sessions.

So for example if you had 6 sessions with AS6939 it would count as one.

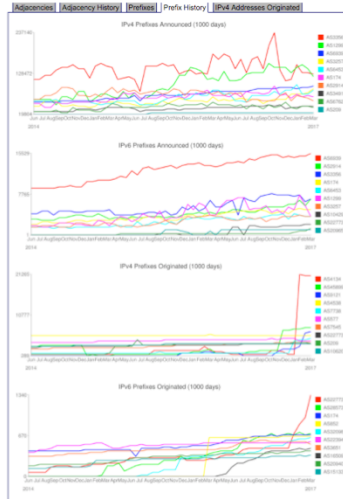
http://bgp.he.net/report/peers#_prefixes



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http://bgp.he.net/report/peers#_prefixhistory

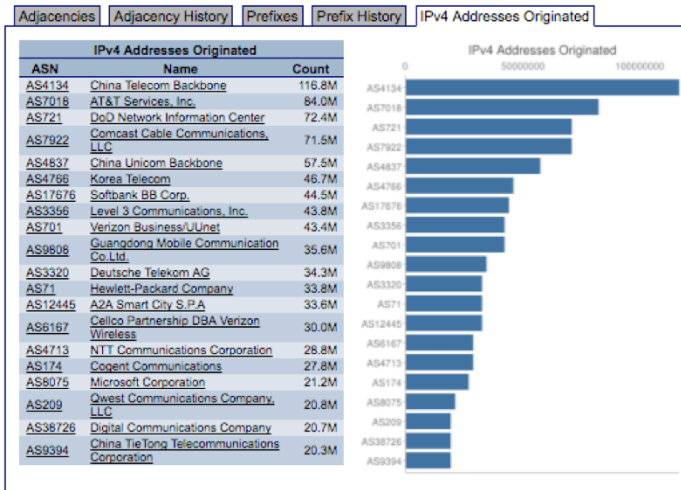


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This is a graphical representation of ipv4/6 prefixes over time.

http://bgp.he.net/report/peers#_ipv4addresses



Hurricane Electric - Massive Peering!



This is a graphical representation of ipv4/6 addresses.

<http://bgp.he.net/report/exchanges>

Internet Exchanges Exchange Participants

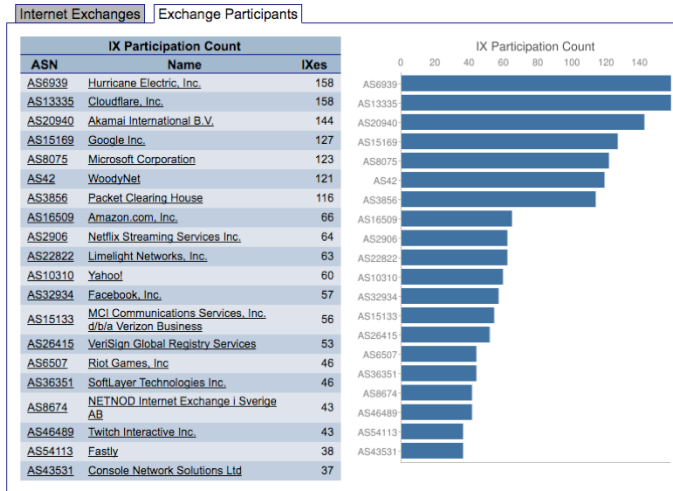
Internet Exchange	Members ↓	Data	CC	City	Website
PTT São Paulo	 1,016	✘	BR	Sao Paulo	ptt.br
AMS-IX	 851	✔	NL	Amsterdam	www.ams-ix.net
DE-CIX Frankfurt	 730	✔	DE	Frankfurt	www.de-cix.net
LINX Juniper LAN	 724	✔	GB	London	www.linx.net
Data IX	 461	✔	RU	St.Petersburg	www.dataix.ru
MSK-IX Moscow	 422	✔	RU	Moscow	www.msk-ix.ru
NL-IX	 382	✔	NL	Amsterdam	www.nl-ix.net
LINX Extreme LAN	 336	✔	GB	London	www.linx.net
Equinix Paris	 336	✔	FR	Paris	www.equinix-ix.fr
Equinix Ashburn	 278	✘	US	Ashburn	ix.equinix.com

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This this of exchanges is generated from peeringdb.com and several other sources.

http://bgp.he.net/report/exchanges#_participants

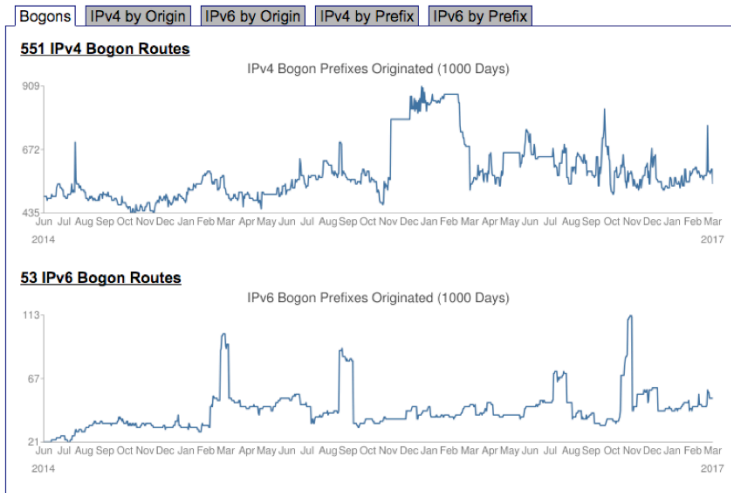


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The exchange most connected networks

http://bgp.he.net/report/bogons#_bogons



Hurricane Electric - Massive Peering!



This is a graphical representation of ipv4/6 bogons over time.

http://bgp.he.net/report/bogons#_bogonsv4asn

[Bogons](#) | [IPv4 by Origin](#) | [IPv6 by Origin](#) | [IPv4 by Prefix](#) | [IPv6 by Prefix](#)

ASN	Name	Prefixes
AS81	MCNC	192.154.32.0/19 -> unallocated 192.154.64.0/19 -> unallocated
AS112	DNS-OARC	192.31.196.0/24 -> unallocated
AS209	Qwest Communications Company, LLC	209.193.112.0/20 -> unallocated
AS680	Verein zur Foerderung eines Deutschen Forschungsnetzes e.V.	192.124.252.0/22 -> unallocated
AS701	Verizon Business/UUnet	198.168.0.0/16 -> unallocated 208.67.132.0/22 -> unallocated 209.135.171.0/24 -> unallocated 209.135.175.0/24 -> unallocated
AS702	Verizon Business/UUnet Europe	192.101.72.0/24 -> unallocated
AS721	DoD Network Information Center	192.188.208.0/20 -> unallocated 198.97.72.0/21 -> unallocated 198.97.96.0/19 -> unallocated 198.97.240.0/20 -> unallocated 199.121.0.0/16 -> unallocated 199.123.16.0/20 -> unallocated
AS812	Rogers Communications Canada Inc.	198.62.196.0/24 -> unallocated

Hurricane Electric - Massive Peering!




You do not want to be announcing bogons

<http://bgp.he.net/AS81>

AS Info | Graph v4 | Graph v6 | Prefixes v4 | Prefixes v6 | Peers v4 | Peers v6 | Whois | IRR

AS81 announces bogons.

Company Website: <http://www.mcnc.org>

Country of Origin: United States 


Prefixes Originated (all): 65
Prefixes Originated (v4): 63
Prefixes Originated (v6): 2


Prefixes Announced (all): 112
Prefixes Announced (v4): 105
Prefixes Announced (v6): 7

BGP Peers Observed (all): 30
BGP Peers Observed (v4): 30
BGP Peers Observed (v6): 9

IPs Originated (v4): 3,507,200
AS Paths Observed (v4): 1,544
AS Paths Observed (v6): 420

Average AS Path Length (all): 4.086
Average AS Path Length (v4): 4.117
Average AS Path Length (v6): 3.974



 Like Do the first of your friends to like this.

Hurricane Electric - Massive Peering!












When AS81 removes the bogon announces red bar will no longer be there.

<http://bgp.he.net/report/world>

Countries


Countries with ASNs: 240

Description		CC	ASNs	Report
United States		US	26,270	Report
Russian Federation		RU	6,267	Report
Brazil		BR	4,668	Report
United Kingdom		GB	2,661	Report
Poland		PL	2,406	Report
Germany		DE	2,295	Report
Australia		AU	2,267	Report
Ukraine		UA	2,244	Report
Canada		CA	1,973	Report



<http://bgp.he.net/country/PH>

Country Info

 **Networks: Philippines**

ASN	Name	Adjacencies v4	Routes v4 ↓	Adjacencies v6	Routes v6
AS9299	Philippine Long Distance Telephone Company	154	1,042	12	5
AS4775	Globe Telecoms	154	503	29	3
AS9658	Eastern Telecoms Phils., Inc.	71	493	10	3
AS6648	Bayan Telecommunications, Inc.	111	290	8	5
AS55303	60 Market Square,P.O. Box 364	17	274	1	10
AS23930	IP-Converge Data Center, Inc.	41	224	7	1
AS132199	Globe Telecom Inc.	1	210	0	0
AS17639	ComClark Network & Technology Corp.	40	202	8	4
AS23944	SKYBroadband SKYCable Corporation	26	153	0	0
AS10139	Smart Broadband, Inc.	1	147	1	1

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What you can see here is the report of the Philippines

Take the time to click on AS132199 and you can see that that ASN is connected to AS4775.

Question. What ASN on this page is single attached to AS9299?

http://bgp.he.net/report/multi-origin-routes#_ipv4multioriginroutes

IPv4 Multi Origin Routes

IPv6 Multi Origin Routes

Prefix	Description	Origin ASNs
69.36.157.0/24	VeriSign Infrastructure & Operations	AS36616 , AS36617 , AS36618 , AS36619 , AS36620 , AS36621 , AS36622 , AS36623 , AS36624 , AS36625 , AS36626 , AS36628 , AS36630 , AS36631 , AS36632
192.42.176.0/24	VeriSign Global Registry Services	AS36616 , AS36617 , AS36618 , AS36619 , AS36620 , AS36621 , AS36622 , AS36623 , AS36624 , AS36625 , AS36626 , AS36628 , AS36630 , AS36631 , AS36632
192.82.134.0/24	VeriSign Global Registry Services	AS36616 , AS36617 , AS36618 , AS36619 , AS36620 , AS36621 , AS36622 , AS36623 , AS36624 , AS36625 , AS36626 , AS36628 , AS36630 , AS36631 , AS36632

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Multi-origin routes are the cases where a given prefix is being announced by different ASNs. This can be done for various administrative reasons. First column shows prefix and third column shows the ASNs which are originating that prefix. Table is a formed by aggregated data and it may be reflecting case where an AS is announcing pool in one region & other ASN is announcing it in other region.

Key closing points

- Your view depends on where you stand
- Routers propagate the best path only
- It is important to understand the full view thus you must understand the reverse path.

- Participate with public collectors via route-views to help improve our data





Thanks!

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