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Internet Peering

George Petrica,
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What is Internet Peering ?

"…peering is a voluntary interconnection of administratively separate Internet networks for the purpose of exchanging traffic between the "down-stream" users of each network." **Source:** WIkipedia

Peering Options/Sources

- Transit customers (customers)

- Peering partners (peers)

- Internet Exchange Points (IXPs)

How to measure the Peering

- Peering traffic vs Transit ratio

- Cost savings from Transit

- as-path-length ("…the average number of steps along the shortest paths for all possible pairs of network nodes." **Source:** WIkipedia)

- Peers (Quantity & Quality)

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BENEFITS OF PEERING

Cost savings:

Peering allows networks to exchange traffic without having to pay for it, which can be a cost-effective alternative to using IP Transit services.

Improved network performance:

Peering can result in lower latency and improved network performance, as traffic between the two networks can be exchanged directly, rather than having to pass through multiple intermediaries.

Increased network resilience:

Peering can improve network resilience by providing multiple paths for traffic to travel between the two networks. If one path fails, traffic can automatically be routed via another path.

Improved customer experience:

Peering can improve the customer experience by reducing network congestion and improving network performance, resulting in faster and more reliable access to online services and applications.

Increased network control:

Peering allows networks to have more control over how their traffic is routed and delivered, which can be beneficial for networks with specific requirements or preferences for how their traffic is handled.

Peering Ranking

- # customers
- # peers (direct / indirect)
- # IXPs

Sources

- **RIPE NCC – [RIPE stat](#)**

  ❏ as-path-length (22 collectors)

- **CAIDA – [AS Rank](#)**

  ❏ # customers per ASN

  ❏ #direct peers per ASN

- **Hurricane Electric – [BGP Peer Report](#)**

  ❏ TOP 1000/100/50/20 adjacency– most well connected ASNs (**direct peers + indirect peers+ customers + transit providers**)

  ❏ IXPs per ASN

Top 1000 Ranking

- Source: **Hurricane Electric – [BGP Peer Report](#)**

Top 10

❑ [RIPE NCC – RIS collectors](#)

❑ [Route-views project](#)

❑ Others...

Adjacencies	Adjacency History	Prefixes	Prefix History	IPv4 Addresses Originated

IPv4 Adjacencies

ASN	Name	Count
AS6939	Hurricane Electric LLC	9,727
AS49544	i3D.net B.V	8,380
AS36236	NetActuate, Inc	7,058
AS174	Cogent Communications	6,716
AS3356	Level 3 Parent, LLC	6,575
AS24482	SG.GS	6,394
AS199524	G-Core Labs S.A.	6,376
AS1828	Unitas Global LLC	5,497
AS39120	Convergenze S.p.A.	5,447
AS35280	F5 Networks SARL	5,192

AS IPv4 Adjacency Count Chart

Top 1000 Ranking

- Source: **NetIX internal tool**

HE.net TOP 1000

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# ▲	ASn	Name	Code	Adjacencies v4	Routes V4	Adjacencies v6	Routes V6
1	AS6939	Hurricane Electric LLC	US	9501	148259	6904	55727
2	AS49544	i3D.net B.V	NL	8944	305	5887	62
3	AS24482	SG.GS	SG	7896	1864	5619	358
4	AS36236	NetActuate, Inc	US	6786	485	4663	186
5	AS174	Cogent Communications	US	6717	196964	2638	22127
6	AS3356	Level 3 Parent, LLC	US	6595	235644	2329	33396
7	AS199524	G-Core Labs S.A.	LU	6225	379	4489	129
8	AS39120	Convergenze S.p.A.	IT	5733	85	3898	6
9	AS1828	Unitas Global LLC	US	5597	3646	4333	223
10	AS35280	F5 Networks SARL	FR	5392	1898	4179	277
11	AS1031	Peer 1 Internet Service LLC	US	5207	1705	1507	647
12	AS37721	Virtual Technologies & Solutions	BF	4760	265	2319	8
13	AS16552	Tiggee LLC	US	3920	58	3006	71
14	AS6057	Administracion Nacional de Telecomunicaciones	UY	3549	920	3080	149
15	AS60501	Sirius Technology SRL	IT	3336	32	1469	8
16	AS58511	Anycast Global Backbone	AU	3142	1063	2143	136
17	AS51185	Onecom Global Communications LTD	GB	3133	22	1614	15

Peering Ranking

- **# customers**
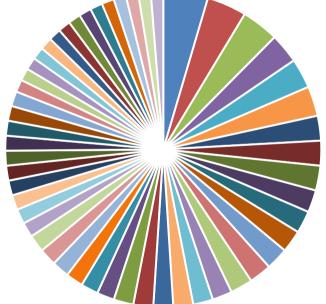
- **# peers**

- **# IXPs**

How to measure the Peering

- Peering traffic vs Transit ratio

- Cost savings from Transit

- **as-path-length ("...the average number of steps along the shortest paths for all possible pairs of network nodes." Source: WIkipedia)**

- **Peers (Quantity & Quality)**

IXP Peering

TOP	IXPs	AVG IXPs	No_IXP
1000	677	0.68	49
100	422	4.22	3
50	386	7.72	3
20	383	19.15	1

Top 10 IXPs / Top 20 ASNs

- DE-CIX Frankfurt
- AMS-IX
- LINX LON1
- France-IX Paris
- Any2West
- IX.br (PTT.br) S√£o Paulo
- Equinix Ashburn
- DE-CIX New York
- Equinix Singapore
- Equinix San Jose
- NYIIX New York
- SIX Seattle
- NAPAfrica IX Johannesburg
- DE-CIX Madrid
- MegaIX Sydney
- Netnod Stockholm GREEN -- MTU1500
- Equinix Hong Kong
- TorIX
- Netnod Stockholm BLUE -- MTU1500
- Equinix Sydney
- HKIX
- NL-ix
- Equinix Paris
- JPIX TOKYO
- MIX-IT
- FL-IX
- France-IX Marseille
- Equinix Chicago
- Equinix Dallas
- BBIX Tokyo
- BBIX Singapore
- DE-CIX Marseille
- BBIX Hong Kong
- IX Australia (Sydney NSW)
- MSK-IX Moscow
- Equinix S√£o Paulo
- DE-CIX Mumbai
- Equinix New York
- Equinix Miami
- SwissIX
- Equinix Warsaw
- NIX.CZ
- ESPANIX Madrid Lower LAN
- NetIX
- SGIX
- DATAIX
- DE-CIX Dallas
- UAE-IX
- DE-CIX Lisbon
- EdgeIX - Sydney
- PIT Santiago - PIT Chile
- LINX LON2

IXP	Top 20 ASNs
DE-CIX Frankfurt	18
AMS-IX	16
LINX LON1	15
France-IX Paris	12
Any2West	12
IX.br (PTT.br) S√£o Paulo	12
Equinix Ashburn	10
DE-CIX New York	10
Equinix Singapore	10
Equinix San Jose	9
NYIIX New York	9
SIX Seattle	9
NAPAfrica IX Johannesburg	9
DE-CIX Madrid	9
MegaIX Sydney	9
Netnod Stockholm GREEN -- MTU1500	8
Equinix Hong Kong	8
TorIX	8
Netnod Stockholm BLUE -- MTU1500	8
Equinix Sydney	8
HKIX	8
NL-ix	7
Equinix Paris	7
JPIX TOKYO	7
MIX-IT	7
FL-IX	7
France-IX Marseille	7

IXP	Top 20 ASNs
Equinix Chicago	6
Equinix Dallas	6
BBIX Tokyo	6
BBIX Singapore	6
DE-CIX Marseille	6
BBIX Hong Kong	6
IX Australia (Sydney NSW)	6
MSK-IX Moscow	6
Equinix S√£o Paulo	6
DE-CIX Mumbai	6
Equinix New York	5
Equinix Miami	5
SwissIX	5
Equinix Warsaw	5
NIX.CZ	5
ESPANIX Madrid Lower LAN	5
NetIX	5
SGIX	5
DATAIX	5
DE-CIX Dallas	5
UAE-IX	5
DE-CIX Lisbon	5
EdgeIX - Sydney	5
PIT Santiago - PIT Chile	5
LINX LON2	5

- **Source: Hurricane Electric – BGP Peer Report**

IXP Peering

ASN	Top 1000	IXP Rank	IXPs
6939	1	1	291
49544	2	16	90
24482	3	25	69
36236	4	42	45
174	5	952	0
3356	6	745	3
199524	7	12	104
39120	8	194	14
1828	9	29	64
35280	10	35	54
1031	11	578	5
37721	12	82	28
16552	13	96	25
6057	14	195	14
60501	15	196	14
58511	16	71	31
51185	17	214	13
9498	18	239	12
53427	19	427	7
57695	20	746	3
47787	21	147	17
271253	22	174	15
61832	23	215	13
14840	24	128	19
57463	25	78	29

ASN	Top 1000	IXP Rank	IXPs
29049	26	747	3
42473	27	39	48
25091	28	37	51
3257	29	428	7
6461	30	49	42
15830	31	64	36
41047	32	275	11
41327	33	79	29
263009	34	240	12
267613	35	90	26
23106	36	500	6
39351	37	83	28
7018	38	953	0
36351	39	33	55
5394	40	429	7
1299	41	954	0
35598	42	159	16
13237	43	175	15
9002	44	80	29
1239	45	59	38
264479	46	579	5
61573	47	241	12
52468	48	216	13
56665	49	176	15
264409	50	501	6

- many customers
- many peers
- No need of IXPs

- customers
- peers
- Many IXPs

ASN	Top 1000	IXP Rank	IXPs
6939	1	1	291
13335	140	2	283
42	135	3	236
3856	403	4	236
15169	304	5	216
8075	387	6	195
20940	261	7	191
32934	301	8	182
16509	321	9	135
54113	328	10	122
2906	316	11	109
199524	7	12	104
15133	326	13	98
10310	335	14	95
22822	458	15	94
49544	2	16	90
6507	382	17	90
46489	462	18	86
55256	338	19	85
21859	281	20	83
8674	451	21	82
112	670	22	80
57976	362	23	73
26415	475	24	72
24482	3	25	69

ASN	Top 1000	IXP Rank	IXPs
33438	341	26	69
714	361	27	67
19551	277	28	66
1828	9	29	64
32590	369	30	64
136907	354	31	62
54994	336	32	56
36351	39	33	55
3303	137	34	55
35280	10	35	54
16276	365	36	53
25091	28	37	51
137409	65	38	51
42473	27	39	48
9009	123	40	46
25152	433	41	46
36236	4	42	45
8220	64	43	45
20473	201	44	45
30081	425	45	44
32787	176	46	43
44444	453	47	43
14340	975	48	43
6461	30	49	42
4455	51	50	42

Customers

ASN	Top1000 Rank	#Customers	Customers Rank
6939	1	2175	6
49544	2	31	376
24482	3	37	346
36236	4	97	223
174	5	6609	1
3356	6	6488	2
199524	7	28	385
39120	8	14	513
1828	9	87	241
35280	10	61	278
1031	11	22	425
37721	12	10	568
16552	13	0	866
6057	14	26	398
60501	15	7	631
58511	16	50	309
51185	17	0	867
9498	18	970	15
53427	19	4	688
57695	20	42	328
47787	21	20	443
271253	22	123	182
61832	23	237	70
14840	24	290	56
57463	25	0	868

ASN	Top1000 Rank	#Customers	Customers Rank
29049	26	42	325
42473	27	25	410
25091	28	61	280
3257	29	2301	5
6461	30	2151	7
15830	31	229	75
41047	32	1	811
41327	33	128	174
263009	34	105	206
267613	35	141	158
23106	36	171	129
39351	37	10	567
7018	38	2379	3
36351	39	15	498
5394	40	5	678
1299	41	2329	4
35598	42	204	92
13237	43	201	97
9002	44	1028	12
1239	45	1034	11
264479	46	3	728
61573	47	14	512
52468	48	305	55
56665	49	12	538
264409	50	56	292

ASN	Top1000 Rank	#Customers	Customers Rank
174	5	6609	1
3356	6	6488	2
7018	38	2379	3
1299	41	2329	4
3257	29	2301	5
6939	1	2175	6
6461	30	2151	7
2914	111	1519	8
701	138	1255	9
12389	141	1132	10
1239	45	1034	11
9002	44	1028	12
8220	64	1028	13
209	187	996	14
9498	18	970	15
46887	188	942	16
286	108	883	17
3216	63	815	18
3549	203	801	19
4755	214	755	20
4826	113	729	21
20485	106	694	22
32787	176	652	23
3491	238	629	24
31133	107	616	25

ASN	Top1000 Rank	#Customers	Customers Rank
3320	241	612	26
6453	256	603	27
13335	140	587	28
6762	265	578	29
16735	228	523	30
4766	274	518	31
22773	291	505	32
20473	201	465	33
4637	255	463	34
7713	83	458	35
12741	195	446	36
9049	273	410	37
4230	268	400	38
8359	259	396	39
16265	356	383	40
9318	269	357	41
3786	327	357	42
8708	220	352	43
54004	422	345	44
201054	332	343	45
1221	485	342	46
7545	349	339	47
7029	347	328	48
6830	310	324	49
50607	432	319	50

Peers

ASN	Top1000 Rank	#Peers	Peers Rank
6939	1	7479	2
49544	2	6712	3
24482	3	7983	1
36236	4	345	263
174	5	79	841
3356	6	80	840
199524	7	6087	4
39120	8	5799	5
1828	9	5700	6
35280	10	5025	7
1031	11	1646	63
37721	12	4603	8
16552	13	1752	54
6057	14	168	479
60501	15	3419	9
58511	16	3254	10
51185	17	3177	11
9498	18	268	315
53427	19	24	931
57695	20	3045	13
47787	21	2823	16
271253	22	2283	26
61832	23	154	542
14840	24	192	403
57463	25	0	992

ASN	Top1000 Rank	#Peers	Peers Rank
29049	26	177	450
42473	27	2724	19
25091	28	2767	17
3257	29	494	212
6461	30	349	260
15830	31	2506	20
41047	32	2737	18
41327	33	2490	21
263009	34	140	615
267613	35	2310	24
23106	36	2281	27
39351	37	2463	22
7018	38	42	885
36351	39	2416	23
5394	40	192	406
1299	41	52	868
35598	42	2188	32
13237	43	2212	30
9002	44	815	161
1239	45	1359	90
264479	46	2266	28
61573	47	38	893
52468	48	78	842
56665	49	190	411
264409	50	65	857

ASN	Top1000 Rank	#Peers	Peers Rank
24482	3	7983	1
6939	1	7479	2
49544	2	6712	3
199524	7	6087	4
39120	8	5799	5
1828	9	5700	6
35280	10	5025	7
37721	12	4603	8
60501	15	3419	9
58511	16	3254	10
51185	17	3177	11
137409	65	3083	12
57695	20	3045	13
61568	95	3002	14
34927	59	2869	15
47787	21	2823	16
25091	28	2767	17
41047	32	2737	18
42473	27	2724	19
15830	31	2506	20
41327	33	2490	21
39351	37	2463	22
36351	39	2416	23
267613	35	2310	24
132337	52	2303	25

ASN	Top1000 Rank	#Peers	Peers Rank
271253	22	2283	26
23106	36	2281	27
264479	46	2266	28
7713	83	2247	29
13237	43	2212	30
63927	58	2194	31
35598	42	2188	32
34224	56	2187	33
4455	51	2130	34
17639	67	2105	35
38880	69	2086	36
18106	62	2079	37
52873	54	2078	38
12779	66	2048	39
61955	74	2030	40
28634	68	1974	41
263508	73	1965	42
263152	70	1962	43
53070	75	1947	44
34549	82	1931	45
37468	60	1894	46
60503	79	1866	47
28186	72	1855	48
29075	81	1852	49
8298	90	1801	50

11.

AS-PATH-LENGTH

ASN	Top1000 Rank	ASP Rank	AVG ASP
6939	1	4	2.07
49544	2	21	2.63
24482	3	10	2.41
36236	4	746	3.39
174	5	41	2.68
3356	6	111	2.77
199524	7	383	3.00
39120	8	384	3.00
1828	9	385	3.00
35280	10	386	3.00
1031	11	387	3.00
37721	12	388	3.00
16552	13	389	3.00
6057	14	415	3.01
60501	15	429	3.02
58511	16	161	2.82
51185	17	26	2.64
9498	18	19	2.62
53427	19	268	2.90
57695	20	968	4.30
47787	21	427	3.02
271253	22	779	3.44
61832	23	250	2.88
14840	24	480	3.06
57463	25	961	4.06

ASN	Top1000 Rank	ASP Rank	AVG ASP
29049	26	159	2.81
42473	27	879	3.67
25091	28	46	2.69
3257	29	225	2.87
6461	30	101	2.76
15830	31	451	3.04
41047	32	354	2.98
41327	33	38	2.67
263009	34	956	4.02
267613	35	98	2.76
23106	36	656	3.23
39351	37	43	2.68
7018	38	558	3.14
36351	39	12	2.46
5394	40	303	2.93
1299	41	59	2.71
35598	42	505	3.09
13237	43	44	2.68
9002	44	152	2.81
1239	45	20	2.63
264479	46	934	3.94
61573	47	524	3.11
52468	48	905	3.77
56665	49	23	2.64
264409	50	762	3.41

ASN	Top1000 Rank	ASP Rank	AVG ASP
286	108	1	2.00
47734	222	2	2.00
7717	882	3	2.00
6939	1	4	2.07
50058	491	5	2.14
50263	675	6	2.15
3856	403	7	2.15
15169	304	8	2.22
8075	387	9	2.24
24482	3	10	2.41
16276	365	11	2.42
36351	39	12	2.46
62955	487	13	2.46
20562	142	14	2.50
50384	483	15	2.50
714	361	16	2.54
57344	346	17	2.60
196844	563	18	2.62
9498	18	19	2.62
1239	45	20	2.63
49544	2	21	2.63
23764	289	22	2.63
56665	49	23	2.64
29075	81	24	2.64
39063	564	25	2.64

ASN	Top1000 Rank	ASP Rank	AVG ASP
51185	17	26	2.64
7713	83	27	2.65
37468	60	28	2.65
37100	116	29	2.65
58453	264	30	2.65
3303	137	31	2.66
24940	503	32	2.66
4455	51	33	2.66
1764	177	34	2.66
4651	495	35	2.66
8529	118	36	2.66
20804	306	37	2.67
41327	33	38	2.67
25160	101	39	2.67
13030	205	40	2.68
174	5	41	2.68
9050	112	42	2.68
39351	37	43	2.68
13237	43	44	2.68
25198	565	45	2.69
25091	28	46	2.69
38880	69	47	2.69
208722	813	48	2.69
45489	102	49	2.69
8220	64	50	2.69

12.

Summary

ASN	Top 1000	IXP Rank	Peers Rank	Customers Rank	ASP Rank
6939	1	1	2	6	4
49544	2	16	3	376	21
24482	3	25	1	346	10
36236	4	42	263	223	746
174	5	952	841	1	41
3356	6	745	840	2	111
199524	7	12	4	385	383
39120	8	194	5	513	384
1828	9	29	6	241	385
35280	10	35	7	278	386
1031	11	578	63	425	387
37721	12	82	8	568	388
16552	13	96	54	866	389
6057	14	195	479	398	415
60501	15	196	9	631	429
58511	16	71	10	309	161
51185	17	214	11	867	26
9498	18	239	315	15	19
53427	19	427	931	688	268
57695	20	746	13	328	968
47787	21	147	16	443	427
271253	22	174	26	182	779
61832	23	215	542	70	250
14840	24	128	403	56	480
57463	25	78	992	868	961

ASN	Top 1000	IXP Rank	Peers Rank	Customers Rank	ASP Rank
29049	26	747	450	325	159
42473	27	39	19	410	879
25091	28	37	17	280	46
3257	29	428	212	5	225
6461	30	49	260	7	101
15830	31	64	20	75	451
41047	32	275	18	811	354
41327	33	79	21	174	38
263009	34	240	615	206	956
267613	35	90	24	158	98
23106	36	500	27	129	656
39351	37	83	22	567	43
7018	38	953	885	3	558
36351	39	33	23	498	12
5394	40	429	406	678	303
1299	41	954	868	4	59
35598	42	159	32	92	505
13237	43	175	30	97	44
9002	44	80	161	12	152
1239	45	59	90	11	20
264479	46	579	28	728	934
61573	47	241	893	512	524
52468	48	216	842	55	905
56665	49	176	411	538	23
264409	50	501	857	292	762

Your AS Rank will improve the more you peer !

NETIX

13.

- Source: RIPE NCC – **RIPE stat**
- Source: CAIDA – **AS Rank**
- Source: Hurricane Electric – **BGP Peer Report**

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