BGP Routing Table Report

View of the routing table between 2006 - 2016

Objective

Analyse changes in global routing table between 2006 to 2016

Analysis is along:

1. Top 5 well connected ASNs
2. Growth of ASNs
3. Growth of Prefixes
4. Changes in across multihomed networks

Ranking the top connected networks

Networks with the highest adjacencies (IPv4)

Year	2006	2007	2008	2009	2010	2011
Rank 1	AS701 (2442)	AS701 (2720)	AS701 (2293)	AS3356 (2656)	AS174 (2931)	AS174 (3381)
Rank 2	AS7018 (2073)	AS7018 (2104)	AS7018 (2217)	AS174 (2476)	AS3356 (2908)	AS3356 (3205)
Rank 3	AS1239 (1765)	AS174 (1854)	AS174 (2192)	AS7018 (2294)	AS7018 (2394)	AS7018 (2446)
Rank 4	AS174 (1612)	AS1239 (1723)	AS3356 (2184)	AS701 (2090)	AS701 (1981)	AS701 (1929)
Rank 5	AS3356 (1373)	AS3356 (1746)	AS1239 (1631)	AS1239 (1449)	AS6939 (1563)	AS6939 (1871)

** Data belongs to Dec of each year*

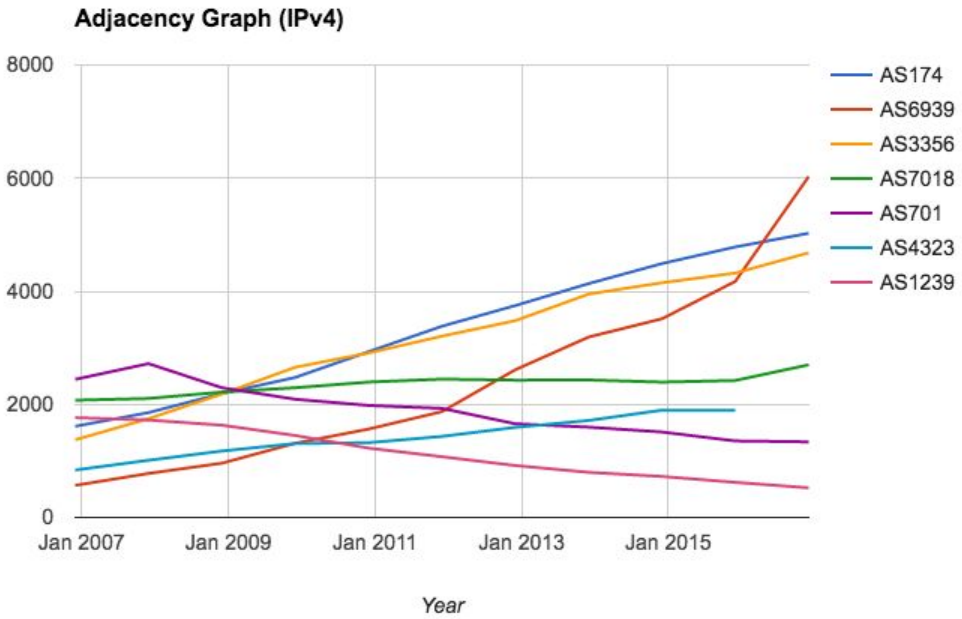
Networks with the highest adjacencies (IPv4) (cont.)

Year	2012	2013	2014	2015	2016
Rank 1	AS174 (3747)	AS174 (4135)	AS174 (4489)	AS174 (4783)	AS6939 (6029)
Rank 2	AS3356 (3480)	AS3356 (3950)	AS3356 (4150)	AS3356 (4321)	AS174 (5025)
Rank 3	AS6939 (2612)	AS6939 (3190)	AS6939 (3513)	AS6939 (4173)	AS3356 (4680)
Rank 4	AS7018 (2428)	AS7018 (2431)	AS7018 (2393)	AS7018 (2422)	AS3549 (2699)
Rank 5	AS701 (1656)	AS4323 (1715)	AS4323 (1897)	AS4323 (1895)	AS7018 (2396)

** Data belongs to Dec of each year*

Year on year IPv4 peering change across the top ASNs

Year on Year peering changes between 2006 - 2016



Networks with the highest adjacencies (IPv6)

Month	2006	2007	2008	2009	2010	2011
Rank 1	AS3257 (144)	AS3257 (179)	AS6939 (335)	AS6939 (659)	AS6939 (1106)	AS6939 (1576)
Rank 2	AS2914 (115)	AS2914 (162)	AS3257 (200)	AS13030 (330)	AS3257 (423)	AS3356 (507)
Rank 3	AS30071 (83)	AS6939 (160)	AS2914 (191)	AS3257 (274)	AS13030 (357)	AS174 (505)
Rank 4	AS6175 (75)	AS30071 (117)	AS3549 (123)	AS2914 (210)	AS2914 (281)	AS13030 (461)
Rank 5	AS2497 (65)	AS6175 (94)	AS30071 (110)	AS3549 (148)	AS3549 (225)	AS3257 (412)

** Data belongs to Dec of each year*

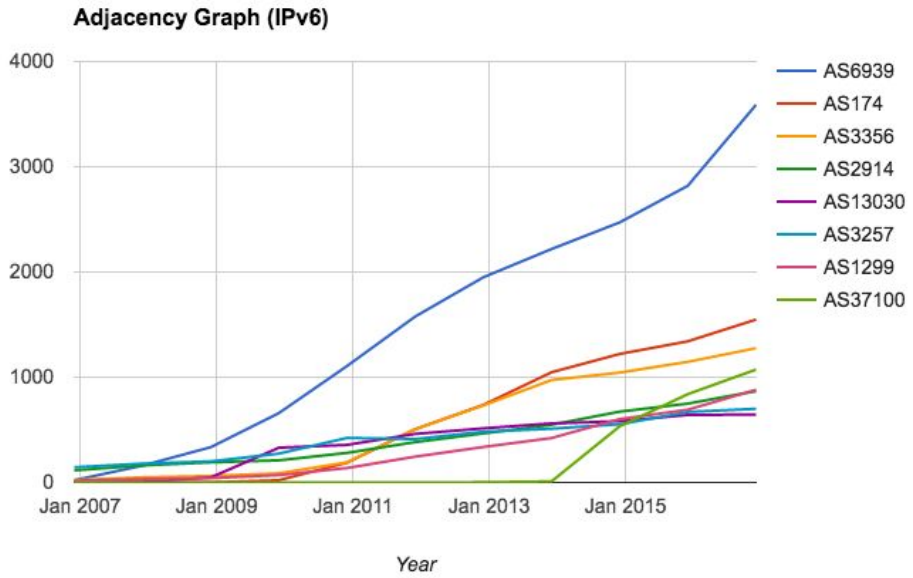
Networks with the highest adjacencies (IPv6)

Month	2012	2013	2014	2015	2016
Rank 1	AS6939 (1950)	AS6939 (2218)	AS6939 (2471)	AS6939 (2819)	AS6939 (3589)
Rank 2	AS174 (737)	AS174 (1047)	AS174 (1221)	AS174 (1341)	AS174 (1548)
Rank 3	AS3356 (732)	AS3356 (973)	AS3356 (1044)	AS3356 (1146)	AS3356 (1276)
Rank 4	AS13030 (514)	AS13030 (561)	AS2914 (673)	AS37100 (839)	AS37100 (1073)
Rank 5	AS3257 (466)	AS2914 (548)	AS1299 (602)	AS2914 (749)	AS1299 (881)

** Data belongs to Dec of each year*

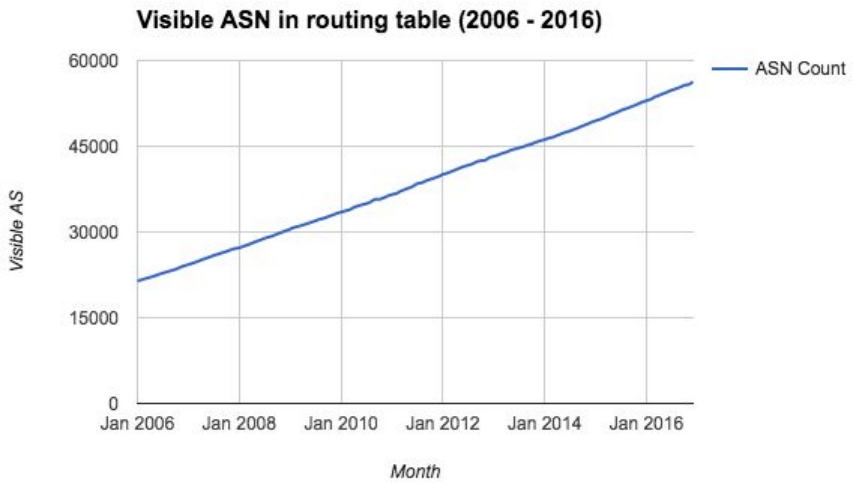
Year on year IPv6 peering changes across the top ASNs

Year on Year peering changes between 2006 - 2016

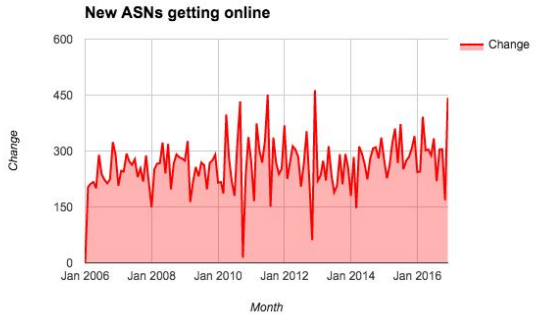


Growth of ASNs between 2006 - 2016

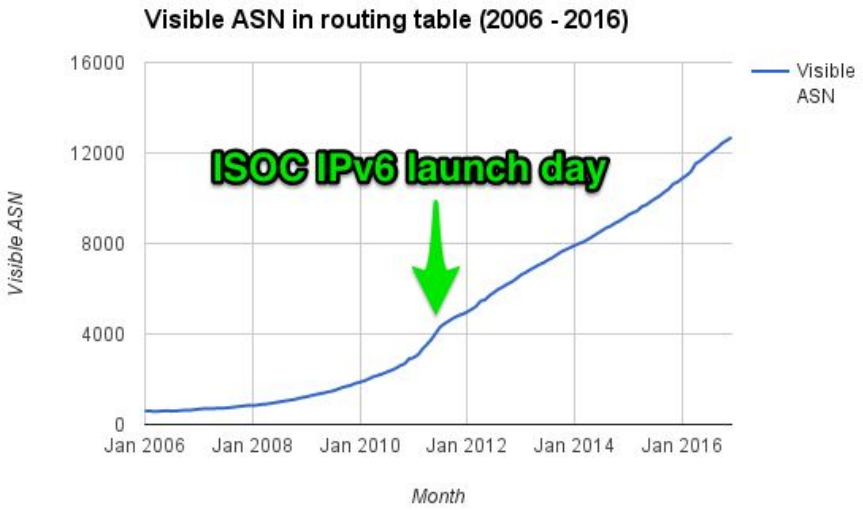
Year on Year growth of ASNs (IPv4)



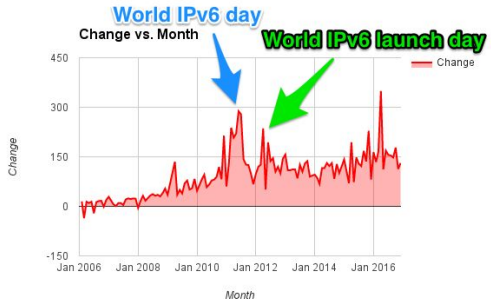
- Visible ASNs in Jan 2006: 21441
- Visible ASNs in Dec 2016: 56271
- Average change of 14.76% (every year) for an 11 year period



Year on Year growth of ASNs (IPv6)

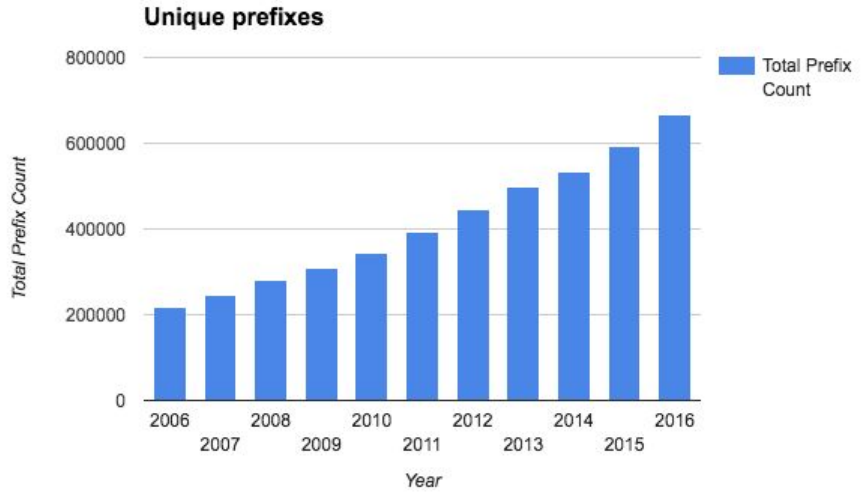


- Visible ASNs in Jan 2006: 590
- Visible ASNs in Dec 2016: 12691
- Average change of 186.45% (every year) for a 11 year period



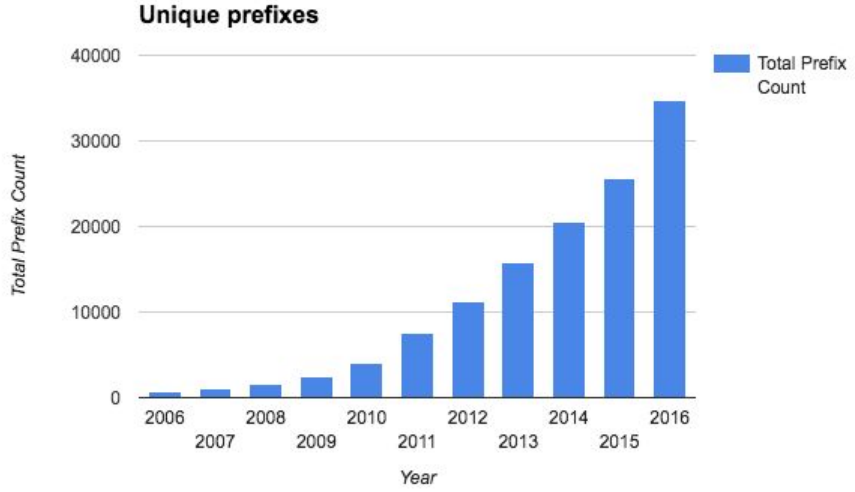
Growth of IPv4 Prefixes

Growth of unique IPv4 prefixes visible in the routing table between 2006 to 2016

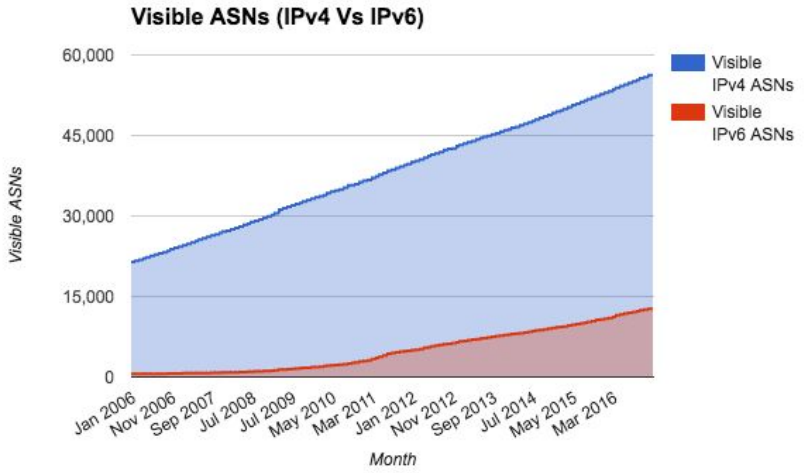


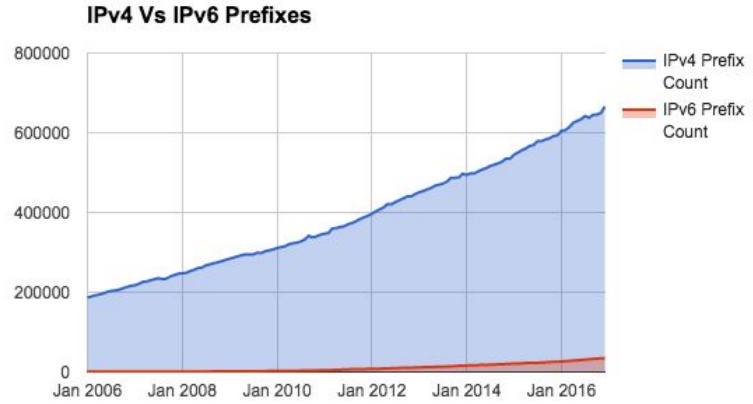
Growth of IPv6 Prefixes

Growth of unique IPv6 prefixes visible in the routing table between 2006 to 2016



IPv4 vs. IPv6 ASN Comparison



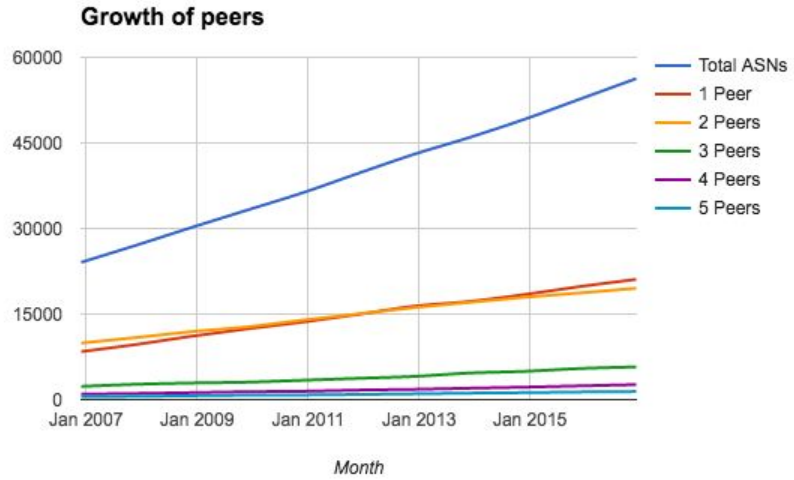


Growth of multi-homing

Comparison of growth of adjacencies

Month	1 Peer	2 Peers	3 Peers	4 Peers	5 Peers	Total Visible ASNs
Dec 2006	8424	9920	2319	970	498	24076
Dec 2007	9680	10894	2698	1080	575	27088
Dec 2008	11128	11931	2920	1226	680	30221
Dec 2009	12423	12767	3066	1389	781	33253
Dec 2010	13606	13948	3398	1467	814	36289
Dec 2011	14947	15028	3737	1675	913	39693
Dec 2012	16384	16134	4071	1804	1021	43022
Dec 2013	17205	17052	4670	2004	1146	45966
Dec 2014	18437	17951	4962	2187	1227	49184
Dec 2015	19839	18713	5461	2418	1347	52724
Dec 2016	21082	19520	5734	2636	1419	56271

Comparison of growth of adjacencies



Adjacencies of networks in Middle East

Year	2006	2007	2008	2009	2010	2011
AS8529 Omantel	4	6	6	6	9	12
AS50010 Ooredoo	Not Visible	Not Visible	Not Visible	Not Visible	1	2
AS8966 Etisalat	29	28	30	53	47	43
AS15802 DU	4	7	11	8	8	8
AS39386 STC	21	29	35	38	52	53
AS35753 ITC	2	10	6	18	21	22

** Data belongs to Dec of each year*

Adjacencies of networks in Middle East

Year	2012	2013	2014	2015	2016
AS8529 Omantel	16	20	26	32	59
AS50010 Ooredoo	3	5	6	16	25
AS8966 Etisalat	40	47	48	57	72
AS15802 DU	14	24	32	35	47
AS39386 STC	58	53	50	57	69
AS35753 ITC	29	31	36	40	49

** Data belongs to Dec of each year*

How do I get my ASN in the list?

How to make the internet better?

- Follow & promote an open peering policy
- Peer at Internet Exchange Points (IXPs)
- Start an IXP in your home region if not there already
- Use peeringDB to list yourself & search for others
- Share your routing table to public route collectors - Oregon routeviews, RIPE RIS, PCH collector etc.

Conclusions

- Peering is good! *Remember somewhere up the transit path there's peering*
- More peerings = more entry & exit points in backbone gives tremendous flexibility, fewer points of failure, capacity to deal with high amounts of traffic and lot more!
- IPv6 deployment by global networks needs to accelerate. Remember each IPv6 route origination carries 2^80 addresses at least
- IPv6 deployments need to be pushed all the way to the network edge to eyeballs to ensure a scalable future of the internet

Considerations for the study

- There can be large content networks which have a very high amount of peering but not visible since neither side dumps data in public route collectors
- Announcements smaller than /24 in IPv4 and /48 in IPv6 are ignored
- This study measures adjacencies which includes all three i.e peers, upstream & downstream

Thankyou!

Questions / Peering?

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