

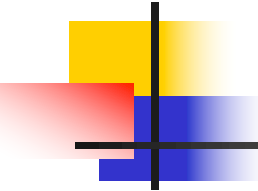
Internet Routing Table Analysis Update

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ThaiNOG 7

23rd May 2025

Bangkok



Motivation

- 1998: No one was publishing any Internet routing table analysis
 - Only CIDR-Report reporting on top 20 contributors to routing table, and top 20 bad aggregators
- With support of APNIC, my weekly report started from 23rd February 1999:
 - Routing table size
 - CIDR-Report style reporting on a per-RIR basis
 - ...and many other interesting features
- Started recording global IPv6 table in September 2010

IPv4 Routing Report 22nd May 2025

BGP routing table entries examined:	984301
Prefixes after maximum aggregation (per Origin AS):	379574
Deaggregation factor:	2.59
Unique aggregates announced (without unneeded subnets):	480205
Number of IPv4 prefixes with a valid ROA:	540873
Number of IPv4 prefixes with an invalid ROA:	1311
Number of IPv4 prefixes with no ROA:	442117
Total ASes present in the Internet Routing Table:	76870
Prefixes per ASN:	12.80
Origin-only ASes present in the Internet Routing Table:	65804
Origin ASes announcing only one prefix:	26936
Transit ASes present in the Internet Routing Table:	11066
Transit-only ASes present in the Internet Routing Table:	547
Average AS path length visible in the Internet Routing Table:	5.2
Max AS path length visible:	106
Max AS path prepend of ASN (37447)	98
Prefixes from unregistered ASNs in the Routing Table:	1009
Number of instances of unregistered ASNs:	1020
Special use prefixes present in the Routing Table:	1
Prefixes being announced from unallocated address space:	456
Number of addresses announced to Internet:	3110498432
Equivalent to 185 /8s, 102 /16s and 112 /24s	
Total number of prefixes smaller than registry allocations:	321821

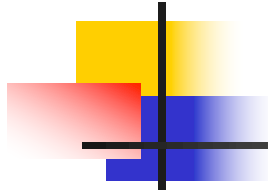
APNIC Region

Prefixes being announced by APNIC Region ASes:	259087
Total APNIC prefixes after maximum aggregation:	77830
APNIC Deaggregation factor:	3.33
Prefixes being announced from the APNIC address blocks:	250192
Unique aggregates announced from the APNIC address blocks:	103192
APNIC Region origin ASes present in the Internet Routing Table:	14639
APNIC Prefixes per ASN:	17.09
APNIC Region origin ASes announcing only one prefix:	4444
APNIC Region transit ASes present in the Internet Routing Table:	1951
Average APNIC Region AS path length visible:	5.5
Max APNIC Region AS path length visible:	36
Number of APNIC region 32-bit ASNs visible in the Routing Table:	10131
Number of APNIC addresses announced to Internet:	749443328
Equivalent to 44 /8s, 171 /16s and 153 /24s	
APNIC AS Blocks	4608-4864, 7467-7722, 9216-10239, 17408-18431
(pre-ERX allocations)	23552-24575, 37888-38911, 45056-46079, 55296-56319, 58368-59391, 63488-64098, 64297-64395, 131072-155961
APNIC Address Blocks	1/8, 14/8, 27/8, 36/8, 39/8, 42/8, 43/8, 49/8, 58/8 to 61/8, 101/8, 103/8, 106/8, 110/8 to 126/8, 133/8, 175/8, 180/8, 182/8, 183/8, 202/8, 203/8, 210/8, 211/8, 218/8 to 223/8

Global per AS IPv4 prefix count summary

ASN	No of nets	/20 equiv	Max Agg	Description
16509	13428	40825	5084	AMAZON-02, US
8151	12136	3251	582	UNINET, MX
9808	11101	8757	101	CHINAMOBILE-CN China Mobile Communications Group
12479	7708	1714	148	UNI2-AS, ES
7545	6171	844	649	TPG-INTERNET-AP TPG Telecom Limited, AU
39891	4797	293	62	ALJAWWALSTC-AS, SA
4538	4784	4192	76	ERX-CERNET-BKB China Education and Research Netw
11492	4735	314	586	CABLEONE, US
9498	4383	534	305	BBIL-AP BHARTI Airtel Ltd., IN
20940	3965	3395	127	AKAMAI-ASN1, NL
7552	3902	1332	26	VIETEL-AS-AP Viettel Group, VN
7155	3864	286	85	VIASAT-SP-BACKBONE, US
9009	3799	330	2010	M247, RO
7713	3696	1044	66	TELKOMNET-AS-AP PT Telekomunikasi Indonesia, ID
6327	3622	1320	81	SHAW, CA
10620	3499	480	1018	Telmex Colombia S.A., CO
22773	3349	3032	168	ASN-CXA-ALL-CCI-22773-RDC, US
174	3347	8745	876	COGENT-174, US
45899	3284	1869	102	VNPT-AS-VN VNPT Corp, VN
749	3230	54783	2481	DNIC-AS-00749, US

AfriNIC APNIC ARIN LACNIC RIPE NCC



What about IPv6 ?

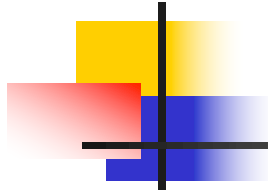
IPv6 Routing Report 22nd May 2025 (Singapore)

BGP routing table entries examined:	215934
Number of IPv6 prefixes with a valid ROA:	133623
Number of IPv6 prefixes with an invalid ROA:	810
Number of IPv6 prefixes with no ROA:	81501
Total ASNs present in the IPv6 Routing Table:	34412
Average AS path length:	4.7
Longest AS path:	32
Total Origin ASNs present in the IPv6 Routing Table:	34069
Paths with bogon ASNs present in the IPv6 Routing Table:	4

Global IPv6 per AS prefix count summary (Singapore)

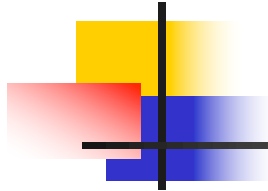
ASN	No of Nets	Description
9808	6622	CHINAMOBILE-CN China Mobile Communications Group Co., Ltd., CN
16509	5085	AMAZON-02, US
7552	3546	VIETEL-AS-AP Viettel Group, VN
18403	3489	FPT-AS-AP FPT Telecom Company, VN
45609	3305	BHARTI-MOBILITY-AS-AP Bharti Airtel Ltd. AS for GPRS Service, IN
11172	2856	Alestra, S. de R.L. de C.V., MX
13335	2308	CLOUDFLARENET, US
39891	1806	ALJAWWALSTC-AS, SA
20115	1771	CHARTER-20115, US
24547	1731	CMNET-V4HEBEI-AS-AP Hebei Mobile Communication Company Limited
12479	1612	UNI2-AS, ES
28573	1579	Claro NXT Telecomunicacoes Ltda, BR
36183	1551	AKAMAI-AS, US
17622	1512	CNCGROUP-GZ China Unicom Guangzhou network, CN
56041	1499	CMNET-ZHEJIANG-AP China Mobile communications corporation, CN
32098	1437	TRANSTELCO-INC, US
38266	1437	VIL-AS-AP Vodafone Idea Ltd, IN
56046	1403	CMNET-JIANGSU-AP China Mobile communications corporation, CN
45271	1342	VIL-AS-AP Vodafone Idea Ltd, IN
6167	1333	CELLCO-PART, US

AfriNIC APNIC ARIN LACNIC RIPE NCC



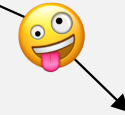
Non-routable ASNs for IPv4

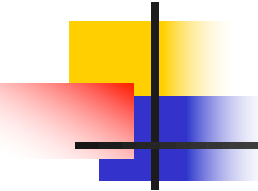
Network	Path	
N*> 37.25.82.0/24	6461 41313 6821 6821 6821 6821 6821 6821 6821 6821 65571	Documentation ASN
N*> 37.25.83.0/24	6461 41313 6821 6821 6821 6821 6821 6821 6821 6821 65572	
V*> 46.221.6.0/24	6762 15924 65989	IANA Reserved ASN
N*> 64.76.168.0/24	2914 3356 19583 650950000 650950004	
N*> 67.55.182.0/23	6461 174 5056 65778	Private ASN
N*> 70.39.15.0/24	6461 174 5056 65777	
V*> 84.44.80.0/24	6762 15924 65593	Valid ROA – IANA reserved ASN
N*> 102.207.142.0/24	6762 30844 30844 30844 327693 329505 65539	
N*> 164.115.251.0/24	4651 38450 38450 38450 66666 66666	
N*> 167.248.149.0/24	6461 174 26479 397872 {64511}	
V*> 170.82.113.0/24	6762 27947 4200000178 264836	
N*> 178.91.40.0/23	6762 12389 9198 65547	
V*> 181.232.136.0/24	6762 61568 271355 271355 271355 2371355 271355 271355 271355 271355 271355	
V*> 181.232.138.0/24	6762 61568 271355 271355 271355 2371355 271355 271355 271355 271355 271355	
V*> 181.232.139.0/24	6762 61568 271355 271355 271355 2371355 271355 271355 271355 271355 271355	
N*> 185.37.99.0/24	6762 8781 42298 65540	
N*> 185.155.170.0/24	2914 174 6206 42241111	
N*> 194.84.46.0/24	6762 31133 2854 65577	
N*> 196.219.246.0/24	6762 8452 65550	
N*> 200.6.141.0/24	7195 13786 61832 264329 2632632	
V*> 202.189.174.0/24	9790 132231 4290106469 132231	



Non-routable ASNs for IPv6

Network	Path	Documentation ASN
V*> 2620:131:3009::/48	6939 6453 4755 58419 58419 58419 58419 58419 58419 58419 58419 58419 58419	
N*> 2801:17:2800::/48	6762 13489 65650	
N*> 2801:80:3ea2::/48	6762 16735 52925 272432 4222010001	
N*> 2801:116:1::/48	6762 13489 271827 65850 271827	
V*> 2803:1f90::/32	6762 27947 4200000464 273081	
V*> 2804:5290::/32	6939 61568 267669 267669 267669 267669 267669 267669 267669 267669 267669 267669 267669 267669 267669 268526	
N*> 2804:88a0:fffe::/48	37468 263432 272783 65536	
N*> 2a0c:a641::/32	6762 8781 42298 65540	





Deprecated AS Set

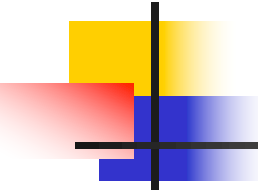
- Use of BGP AS Set is not recommended
 - RFC6472/BCP172 (December 2011)
- There are still some in both IPv4 and IPv6 BGP tables
 - IPv4 has 216 entries
 - IPv6 has 26 entries

IPv4 Prefixes using Deprecated AS_SET

Net Originated	AS Path
5.1.48.0/21	6939 12389 15493 {8998}
5.10.23.0/24	2516 1299 60610 {12703}
8.41.202.0/24	1828 13789 13789 13789 13789 13789 13789 13789 13789 13789 30372 {40179}
15.0.64.0/18	2516 1299 7018 33 13979 {8035}
15.8.64.0/18	2516 1299 7018 33 13979 {8034}
15.36.64.0/18	2687 25888 {21326}
15.44.64.0/18	2687 25888 {21326}
20.137.160.0/20	2516 3356 206 {4237}
37.52.0.0/14	2516 1299 6849 {6877}
37.221.128.0/19	2516 3257 3255 {62384}
38.57.120.0/22	2516 6762 262248 {272061}
38.188.104.0/22	2516 3257 37468 61832 273656 {273656}
38.188.104.0/23	2516 3257 37468 61832 273656 {273656}
41.91.244.0/23	2516 6762 8452 24863 37069 37069 {37069}
41.178.56.0/22	2516 1299 5511 24863 {328587}
41.178.56.0/24	2516 1299 5511 24863 {328587}
...	
209.27.48.0/22	2516 174 11233 {55246}
209.137.136.0/21	2516 1299 4459 4459 4459 4459 4459 {32699}
209.137.141.0/24	2516 3356 4459 {32699}
212.108.128.0/19	2516 3356 9121 9121 9121 9121 9121 9121 9121 9121 9121 9121 47883 {202254}
213.186.96.0/19	2516 1299 6849 {6877}
216.110.102.0/24	2516 6762 23520 14813 14813 14813 14813 {11139}
216.126.96.0/20	2516 577 22573 {6058}
216.126.104.0/22	2516 577 22573 {6058}
216.126.116.0/24	2516 577 22573 {6058}
216.221.208.0/22	2516 3356 26585 26585 {26585}
216.221.212.0/22	2516 3356 26585 26585 {26585}
216.221.220.0/22	2516 3356 26585 26585 {26585}
216.241.10.0/24	2516 6762 262589 52468 18747 {52411}
216.255.240.0/20	2516 3356 30444 {400908}
217.65.248.0/21	2516 174 3255 {59671}
217.116.48.0/20	6939 12389 15493 {15493}

IPv6 Prefixes using Deprecated AS_SET

Net Originated	AS Path
2001:510::/32	6453 376 {36786}
2001:678:6d0::/48	3216 212748 {212748}
2001:4220::/32	2914 6762 8452 24835 {36935}
2402:4640::/33	4788 38044 {23736}
2402:4640:8000::/33	4788 38044 {23736}
2402:7500::/32	9505 9924 9924 9924 9924 9924 {24158}
2402:8100::/32	3491 55644 {36040,38266,45271}
2602:ff4d::/36	174 20412 {36040}
2604:d440::/32	2914 8151 396966 {19244}
2605:ab80::/32	3356 46792 {46792}
2606:e300::/32	1299 20055 18825 {18825}
2607:f280::/32	174 14615 {36040,398053}
2607:f390::/32	174 32440 {2055,17244,40189}
2607:f7a8:600::/39	3257 46887 {397488}
2607:f7a8:800::/39	3257 46887 {395749}
2607:f7a8:c00::/39	3257 46887 {21687}
2607:f8f0::/32	1299 271 271 {4476,11105,16462,36391,393249}
2800:486::/32	701 14080 {10620}
2803:fd80::/32	5511 52468 18747 {52581}
2a00:6480::/32	3320 35548 35548 35548 35548 {29018}
2a01:4a40::/29	3257 44814 {214378}
2a01:73c0::/32	1299 12849 12849 12849 12849 12849 12849 12849 12849 21450 {21450}
2a02:6680::/32	3257 8551 8551 8551 8551 16116 {211612}
2a03:6b00::/32	3356 8529 48832 {36040,141180}
2a05:f940::/29	1299 24785 39647 {16131}
2a0a:39c0::/32	3257 62240 {62240}



Unassigned resources

- Use of unassigned address space is rampant
 - Currently 456 unassigned prefixes in IPv4 routing table
- Use of unassigned ASNs is also a big problem
 - Currently 374 unassigned ASNs in use
- Many are transited by well-known / reputable operators
 - Why??

List of Unregistered ASNs

The complete list in use:

940	1017	1277	1636	1782	3503	4846	4879	6081	6485	6565	7064	7363	7916	9538	9879	10425	11011	11044	11091	11223
11276	11457	11490	11575	11610	11618	11636	11819	11835	12140	12169	12240	13339	13342	13492	13762	13980	14076	14167		
14350	14461	14605	14902	14908	15178	15200	15220	15235	15249	15804	16546	16615	16666	16929	18462	18591	18805	19062		
19081	19176	19359	19396	19427	19507	19533	19629	19708	19926	20090	20210	20227	20263	20271	21649	21695	21861	21884		
21942	21986	22271	22272	22484	22538	22539	22542	22733	22736	22774	22830	23021	23119	23190	23194	23262	23288	23357		
23411	23448	23476	23512	23658	23985	25600	25641	25647	25750	25779	25800	25831	25920	26016	26018	26122	26171	26250		
26295	26345	26443	26483	26582	26643	26712	26758	26898	26961	26971	27247	27289	27335	27361	27470	27593	28330	29763		
29820	29829	30004	30168	30218	30248	30381	30384	30426	30442	30457	30550	30699	31781	32068	32187	32247	32302	32510		
32534	32596	32772	32856	32916	33051	33123	33417	33484	33625	33684	36102	36139	36264	36283	36304	36357	36465	36528		
36679	36774	36893	36900	36911	36928	37155	37320	37434	37442	37475	37476	37537	37586	37703	38055	38221	39991	40077		
40186	40255	40356	40600	40654	40687	40726	40751	40804	40891	40920	46086	46123	46167	46211	46224	46226	46228	46472		
46511	46639	46673	46772	46815	46876	46913	46916	47044	52760	52845	53367	53419	53552	53657	53715	53737	53771	53775		
53854	53886	53929	53947	54215	54231	54278	54338	54424	54472	54591	54739	54754	54779	55203	56043	56212	62641	62770		
62801	62820	62964	63277	63387	63401	63433	64011	64339	65539	65540	65547	65550	65577	65593	65777	65778	65989	66666		
132387	134526	135632	135882	136137	138024	138030	138321	138561	148976	150811	152139	202528	215208	227171	255546					
262318	262509	262640	262745	262774	262992	264493	265039	265441	268652	269275	269596	270291	271135	273565	297889					
327869	327878	327933	328007	328144	328226	328248	328485	328766	328932	329008	393266	393305	393310	393377	393446					
393451	393476	393515	393808	394108	394115	394156	394187	394293	394402	394519	394634	394721	394754	394936	394939					
395195	395270	395293	395312	395350	395376	395377	395406	395438	395527	395531	395557	395697	396015	396078	396281					
396314	396324	396330	396426	396831	396894	397015	397157	397409	398120	398213	398294	398398	398829	399382	399618					
399875	399953	400273	400274	40																

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14350	14461	14605	14902	14908	15178	15200	15220	15235	15249	15804	16546	16615	16666	16929	18462	18591	18805	19062		
19081	19176	19359	19396	19427	19507	19533	19629	19708	19926	20090	20210	20227	20263	20271	21649	21695	21861	21884		
21942	21986	22271	22272	22484	22538	22539	22542	22733	22736	22774	22830	23021	23119	23190	23194	23262	23288	23357		
23411	23448	23476	23512	23658	23985	25600	25641	25647	25750	25779	25800	25831	25920	26016	26018	26122	26171	26250		
26295	26345	26443	26483	26582	26643	26712	26758	26898	26961	26971	27247	27289	27335	27361	27470	27593	28330	29763		
29820	29829	30004	30168	30218	30248	30381	30384	30426	30442	30457	30550	30699	31781	32068	32187	32247	32302	32510		
32534	32596	32772	32856	32916	33051	33123	33417	33484	33625	33684	36102	36139	36264	36283	36304	36357	36465	36528		
36679	36774	36893	36900	36911	36928	37155	37320	37434	37442	37475	37476	37537	37586	37703	38055	38221	39991	40077		
40186	40255	40356	40600	40654	40687	40726	40751	40804	40891	40920	46086	46123	46167	46211	46224	46226	46228	46472		
46511	46639	46673	46772	46815	46876	46913	46916	47044	52760	52845	53367	53419	53552	53657	53715	53737	53771	53775		
53854	53886	53929	53947	54215	54231	54278	54338	54424	54472	54591	54739	54754	54779	55203	56043	56212	62641	62770		
62801	62820	62964	63277	63387	63401	63433	64011	64339	65539	65540	65547	65550	65577	65593	65777	65778	65989	66666		
132387	134526	135632	135882	136137	138024	138030	138321	138561	148976	150811	152139	202528	215208	227171	255546					
262318	262509	262640	262745	262774	262992	264493	265039	265441	268652	269275	269596	270291	271135	273565	297889					
327869	327878	327933	328007	328144	328226	328248	328485	328766	328932	329008	393266	393305	393310	393377	393446					
393451	393476	393515	393808	394108	394115	394156	394187	394293	394402	394519	394634	394721	394754	394936	394939					
395195	395270	395293	395312	395350	395376	395377	395406	395438	395527	395531	395557	395697	396015	396078	396281					
396314	396324	396330	396426	396831	396894	397015	397157	397409	398120	398213	398294	398398	398829	399382	399618					
399875	399953	400273	400274	40																

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11276	11457	11490	11575	11610	11618	11636	11819	11835	12140	12169	12240	13339	13342	13492	13762	13980	14076	14167		
14350	14461	14605	14902	14908	15178	15200	15220	15235	15249	15804	16546	16615	16666	16929	18462	18591	18805	19062		
19081	19176	19359	19396	19427	19507	19533	19629	19708	19926	20090	20210	20227	20263	20271	21649	21695	21861	21884		
21942	21986	22271	22272	22484	22538	22539	22542	22733	22736	22774	22830	23021	23119	23190	23194	23262	23288	23357		
23411	23448	23476	23512	23658	23985	25600	25641	25647	25750	25779	25800	25831	25920	26016	26018	26122	26171	26250		
26295	26345	26443	26483	26582	26643	26712	26758	26898	26961	26971	27247	27289	27335	27361	27470	27593	28330	29763		
29820	29829	30004	30168	30218	30248	30381	30384	30426	30442	30457	30550	30699	31781	32068	32187	32247	32302	32510		
32534	32596	32772	32856	32916	33051	33123	33417	33484	33625	33684	36102	36139	36264	36283	36304	36357	36465	36528		
36679	36774	36893	36900	36911	36928	37155	37320	37434	37442	37475	37476	37537	37586	37703	38055	38221	39991	40077		
40186	40255	40356	40600	40654	40687	40726	40751	40804	40891	40920	46086	46123	46167	46211	46224	46226	46228	46472		
46511	46639	46673	46772	46815	46876	46913	46916	47044	52760	52845	53367	53419	53552	53657	53715	53737	53771	53775		
53854	53886	53929	53947	54215	54231	54278	54338	54424	54472	54591	54739	54754	54779	55203	56043	56212	62641	62770		
62801	62820	62964	63277	63387	63401	63433	64011	64339	65539	65540	65547	65550	65577	65593	65777	65778	65989	66666		
132387	134526	135632	135882	136137	138024	138030	138321	138561	148976	150811	152139	202528	215208	227171	255546					
262318	262509	262640	262745	262774	262992	264493	265039	265441	268652	269275	269596	270291	271135	273565	297889					
327869	327878	327933	328007	328144	328226	328248	328485	328766	328932	329008	393266	393305	393310	393377	393446					
393451	393476	393515	393808	394108	394115	394156	394187	394293	394402	394519	394634	394721	394754	394936	394939					
395195	395270	395293	395312	395350	395376	395377	395406	395438	395527	395531	395557	395697	396015	396078	396281					
396314	396324	396330	396426	396831	396894	397015	397157	397409	398120	398213	398294	398398	398829	399382	399618					
399875	399953	400273	400274	40																

List of Unregistered Origin ASNs

Far too many to list. See <https://thyme.apnic.net/current/data-badAS>:

Bad AS	Designation	Net Originated	Transit AS	Transit AS Name
22542	UNALLOCATED	8.7.205.0/24	3356	LEVEL3, US
33123	UNALLOCATED	8.10.69.0/24	174	COGENT-174, US
12169	UNALLOCATED	8.15.207.0/24	32787	PROLEXIC-TECHNOLOGIES-DDOS-MITIGATION-NETWORK, US
46639	UNALLOCATED	8.17.66.0/24	701	UUNET, US
53775	UNALLOCATED	8.20.88.0/24	7029	WINDSTREAM, US
393266	UNALLOCATED	8.23.52.0/24	46887	CROWNCastle-AS46887, US
396894	UNALLOCATED	8.28.201.0/24	46887	CROWNCastle-AS46887, US
394936	UNALLOCATED	8.33.224.0/24	22442	HOU-PHONOSCOPE, US
54338	UNALLOCATED	8.33.241.0/24	3356	LEVEL3, US
46639	UNALLOCATED	8.38.73.0/24	3356	LEVEL3, US
395195	UNALLOCATED	8.38.115.0/24	33132	CROWNCastle-AS33132, US
400273	UNALLOCATED	8.41.137.0/24	3356	LEVEL3, US
1782	UNALLOCATED	8.42.19.0/24	3356	LEVEL3, US
22542	UNALLOCATED	8.42.195.0/24	3356	LEVEL3, US
395438	UNALLOCATED	8.42.206.0/24	3356	LEVEL3, US
46639	UNALLOCATED	8.42.219.0/24	3356	LEVEL3, US
54739	UNALLOCATED	8.44.198.0/23	13335	CLOUDFLARENET, US
397015	UNALLOCATED	8.44.246.0/24	12025	IMDC-AS12025, US
399953	UNALLOCATED	12.9.122.0/24	7018	ATT-INTERNET4, US
13342	UNALLOCATED	12.17.5.0/24	174	COGENT-174, US
26345	UNALLOCATED	12.21.93.0/24	40264	TWC-40264-WI-MN-UPPERMI-C3, US
396831	UNALLOCATED	12.23.198.0/24	33491	COMCAST-33491, US
21861	UNALLOCATED	12.37.59.0/24	7018	ATT-INTERNET4, US
33684	UNALLOCATED	12.37.144.0/24	6461	ZAYO-6461, US
33684	UNALLOCATED	12.68.34.0/24	7018	ATT-INTERNET4, US
31781	UNALLOCATED	12.71.107.0/24	7018	ATT-INTERNET4, US

List of Unassigned IPv4 addresses

Far too many to list (over 450!!). See <https://thyme.apnic.net/current/data-add-IANA:>

Unassigned Network	ASN Information		AS Name
14.192.20.0/22	Origin:	26658	HENGTONG-IDC-LLC, US
14.192.20.0/22	Transit:	6939	HURRICANE, US
23.140.216.0/24	Origin:	27176	DATAWAGON, US
23.140.216.0/24	Transit:	20278	NEXEON, US
23.141.0.0/24	Origin:	395350	RESERVED, ZZ
23.141.0.0/24	Transit:	11426	TWC-11426-CAROLINAS, US
23.146.16.0/24	Origin:	396281	RESERVED, ZZ
23.146.16.0/24	Transit:	53610	METRO-COMMUNICATIONS-COMPANY, US
23.146.19.0/24	Origin:	396281	RESERVED, ZZ
23.146.19.0/24	Transit:	53610	METRO-COMMUNICATIONS-COMPANY, US
23.147.240.0/24	Origin:	32302	RESERVED, ZZ
23.147.240.0/24	Transit:	32787	PROLEXIC-TECHNOLOGIES-DDOS-MITIGATION-NETWORK, US
23.152.48.0/24	Origin:	46167	RESERVED, ZZ
23.152.48.0/24	Transit:	7018	ATT-INTERNET4, US
23.155.208.0/24	Origin:	396169	AS-GHCIL-01, US
23.155.208.0/24	Transit:	35985	ONERINGNET-ATL-1, US
23.159.56.0/24	Origin:	174	COGENT-174, US
23.159.56.0/24	Transit:	2516	KDDI KDDI CORPORATION, JP
23.161.8.0/24	Origin:	142433	DATAWAVE-AS-AP DATAWAVE GLOBAL LLC, CN
23.161.8.0/24	Transit:	983	AKARI-NETWORKS, US
23.170.224.0/24	Origin:	30168	RESERVED, ZZ
23.170.224.0/24	Transit:	397095	SETSONLLC, US
23.171.200.0/24	Origin:	397409	RESERVED, ZZ
23.171.200.0/24	Transit:	6939	HURRICANE, US
23.175.136.0/24	Origin:	12129	123NET, US
23.175.136.0/24	Transit:	3257	GTT-BACKBONE GTT, US

Number of IPv4 prefixes announced by prefix length

/1:0	/2:0	/3:0	/4:0	/5:0	/6:0	/7:0	/8:16
/9:16	/10:41	/11:92	/12:299	/13:581	/14:1214	/15:2144	/16:13990
/17:8324	/18:13775	/19:24812	/20:44675	/21:52119	/22:112180	/23:102143	/24:607084
/25:796	/26:0	/27:0	/28:0	/29:0	/30:0	/31:0	/32:0

22nd May 2025 ↑

22nd May 2024 ↓

/1:0	/2:0	/3:0	/4:0	/5:0	/6:0	/7:0	/8:16
/9:14	/10:37	/11:93	/12:298	/13:577	/14:1170	/15:2055	/16:13281
/17:8266	/18:13749	/19:24753	/20:44304	/21:51758	/22:111473	/23:99350	/24:579710
/25:729	/26:0	/27:0	/28:0	/29:0	/30:0	/31:0	/32:0

Number of IPv6 prefixes announced by prefix length

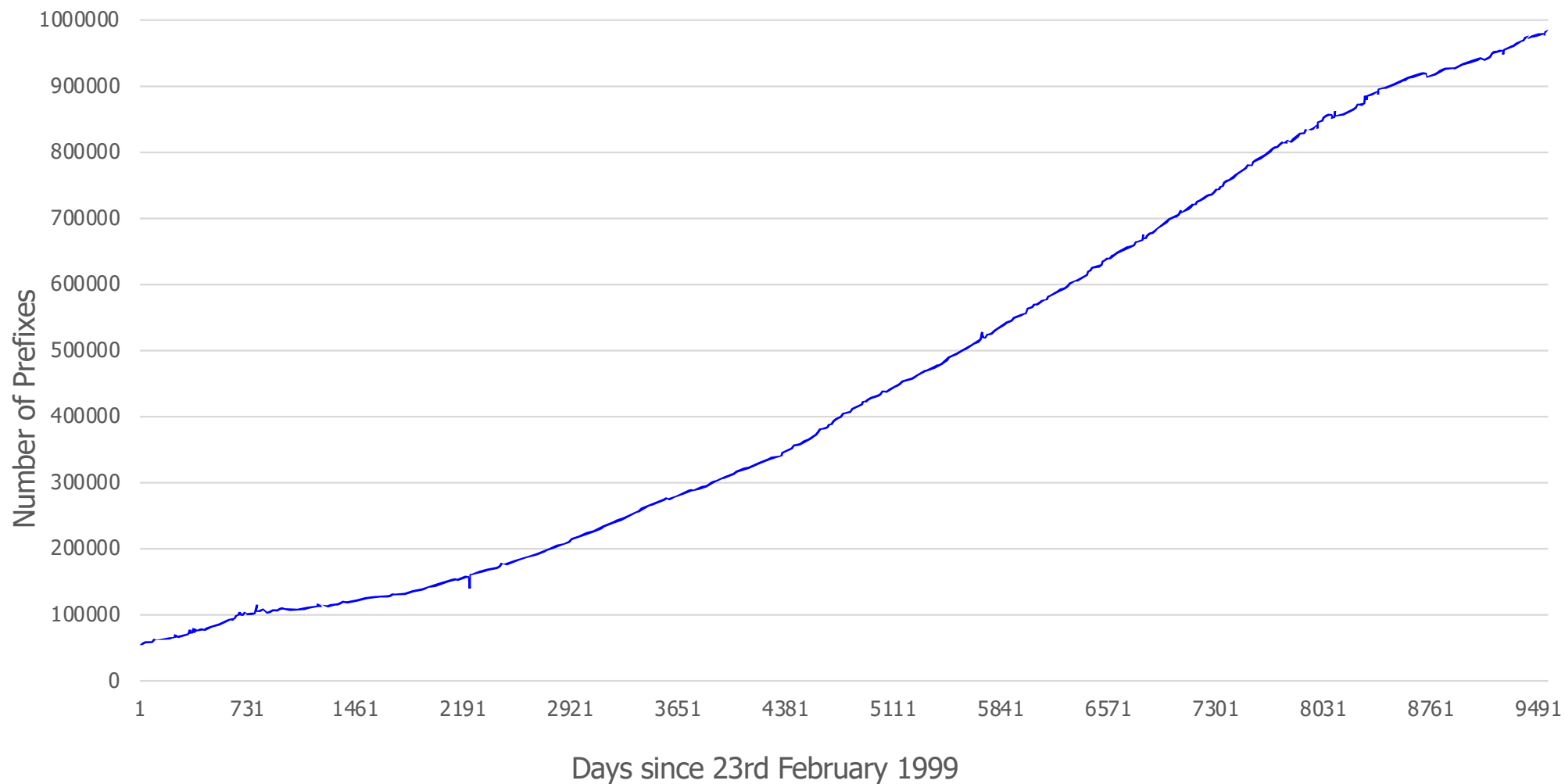
/16:1	/17:0	/18:0	/19:1	/20:13	/21:3	/22:6	/23:6
/24:37	/25:11	/26:20	/27:19	/28:150	/29:5302	/30:726	/31:328
/32:25393	/33:3953	/34:3640	/35:1371	/36:7587	/37:1104	/38:2249	/39:1698
/40:20793	/41:1358	/42:2792	/43:1188	/44:20103	/45:2774	/46:4737	/47:6431
/48:100355	/49:4	/50:0	/51:0	/52:1	/53:0	/54:0	/55:0
/56:3	/57:0	/58:0	/59:0	/60:1	/61:0	/62:0	/63:0
/64:14							

22nd May 2025 ↑

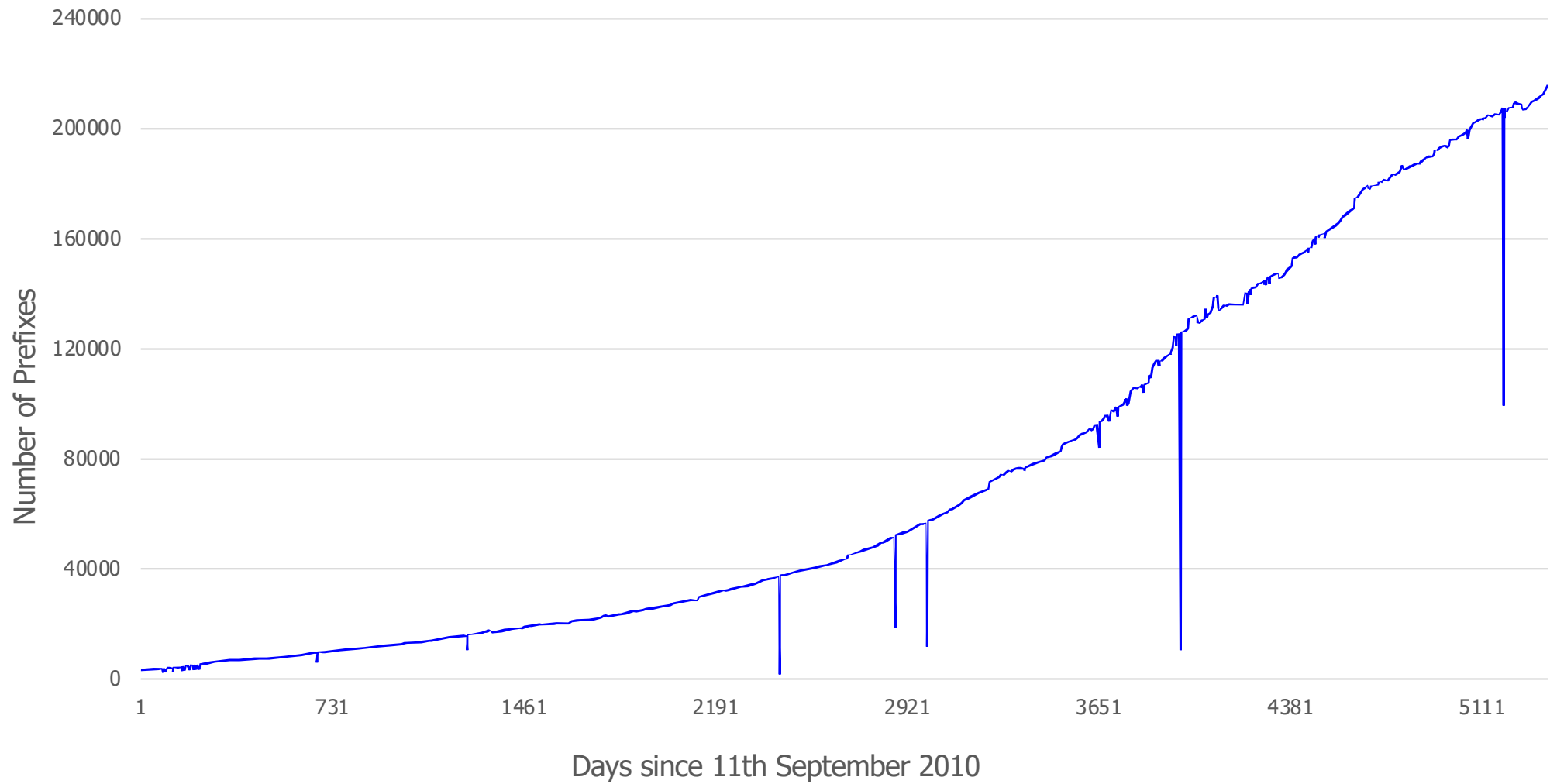
22nd May 2024 ↓

/16:1	/17:0	/18:0	/19:1	/20:14	/21:3	/22:6	/23:8
/24:32	/25:11	/26:14	/27:22	/28:207	/29:4495	/30:619	/31:336
/32:24297	/33:3563	/34:3176	/35:1103	/36:6723	/37:1029	/38:2001	/39:1337
/40:16272	/41:1089	/42:2429	/43:1093	/44:18542	/45:2531	/46:3928	/47:5877
/48:93690	/49:4	/50:0	/51:0	/52:1	/53:0	/54:0	/55:0
/56:1	/57:0	/58:0	/59:0	/60:0	/61:0	/62:0	/63:0
/64:0							

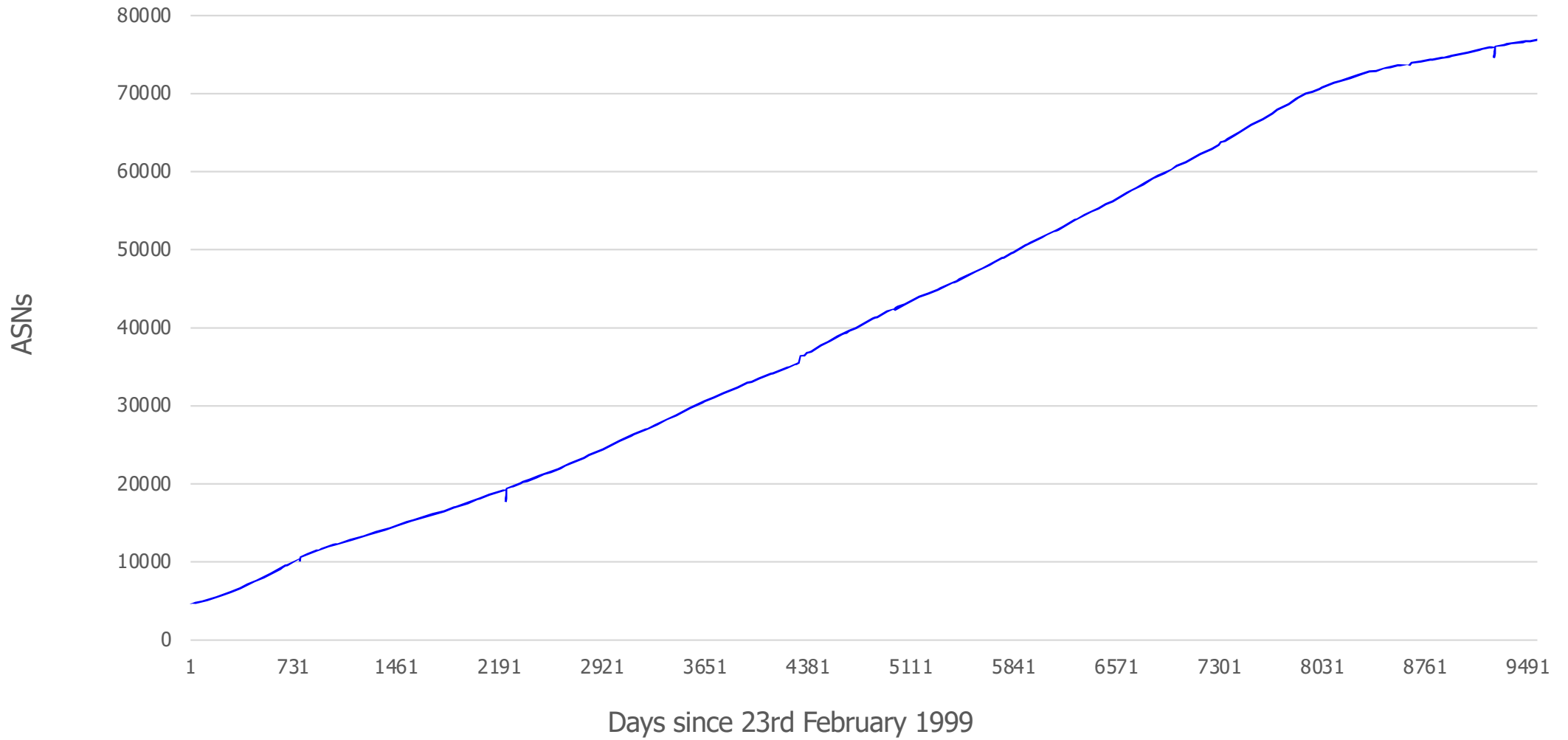
Global IPv4 Routing Table



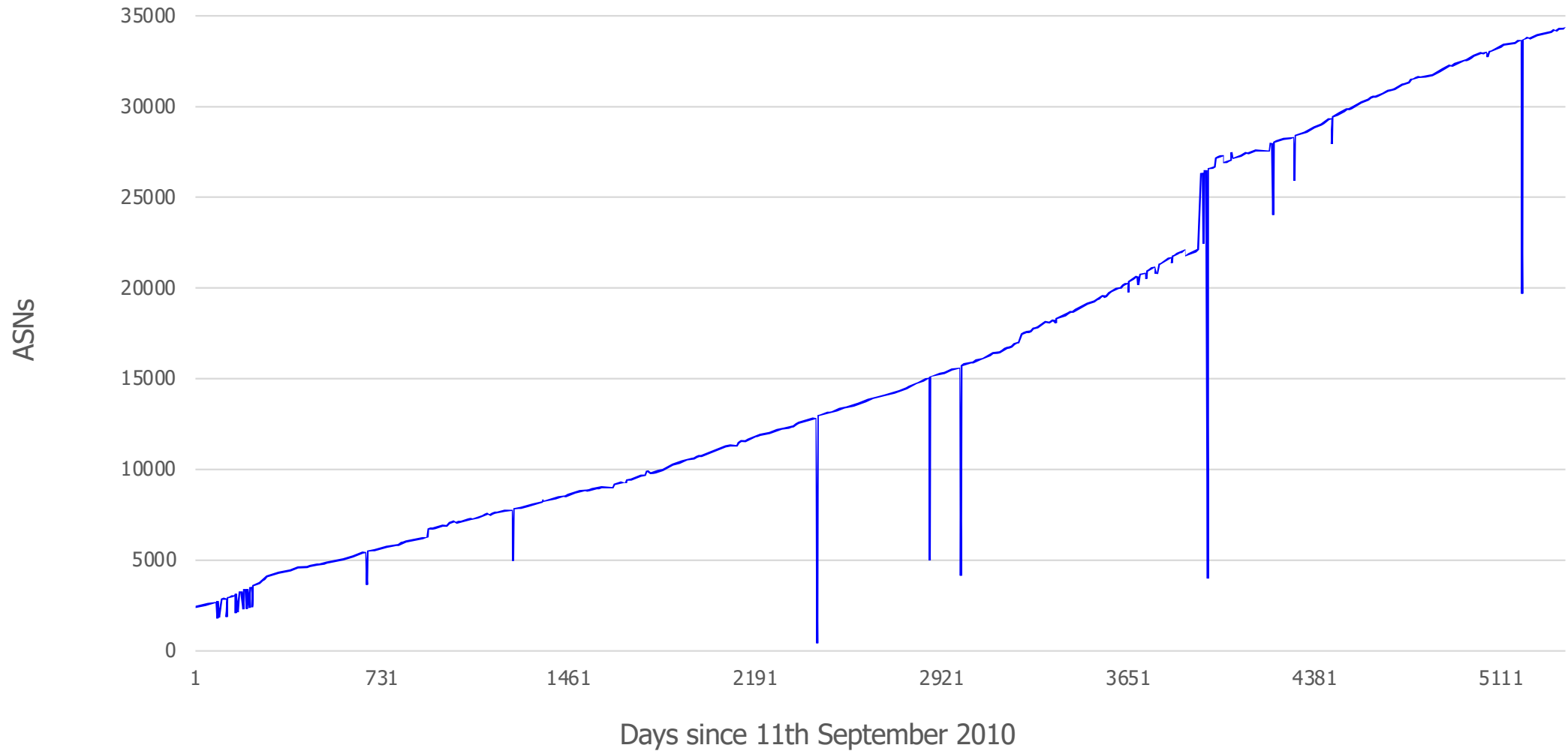
Global IPv6 Routing Table



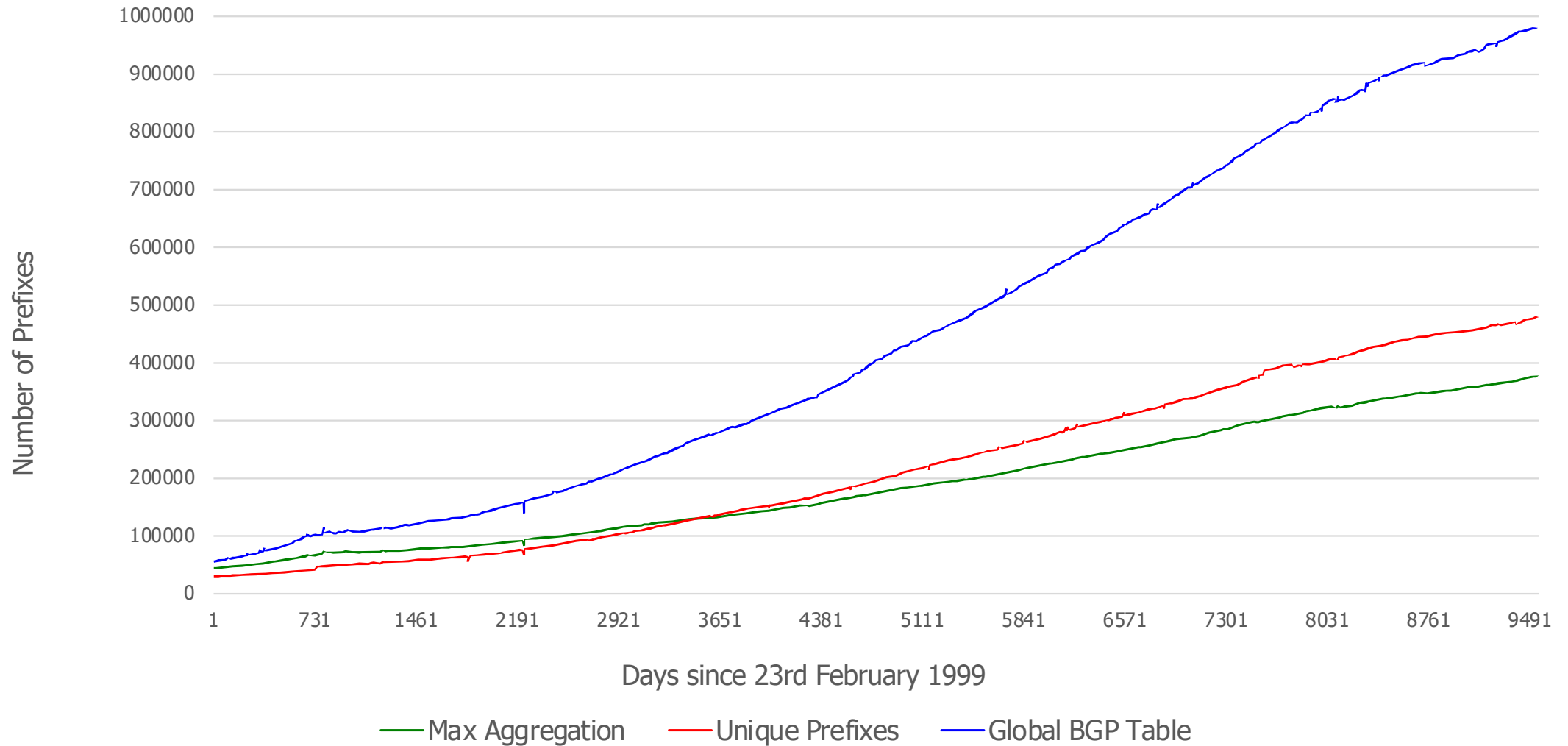
IPv4 AS Growth



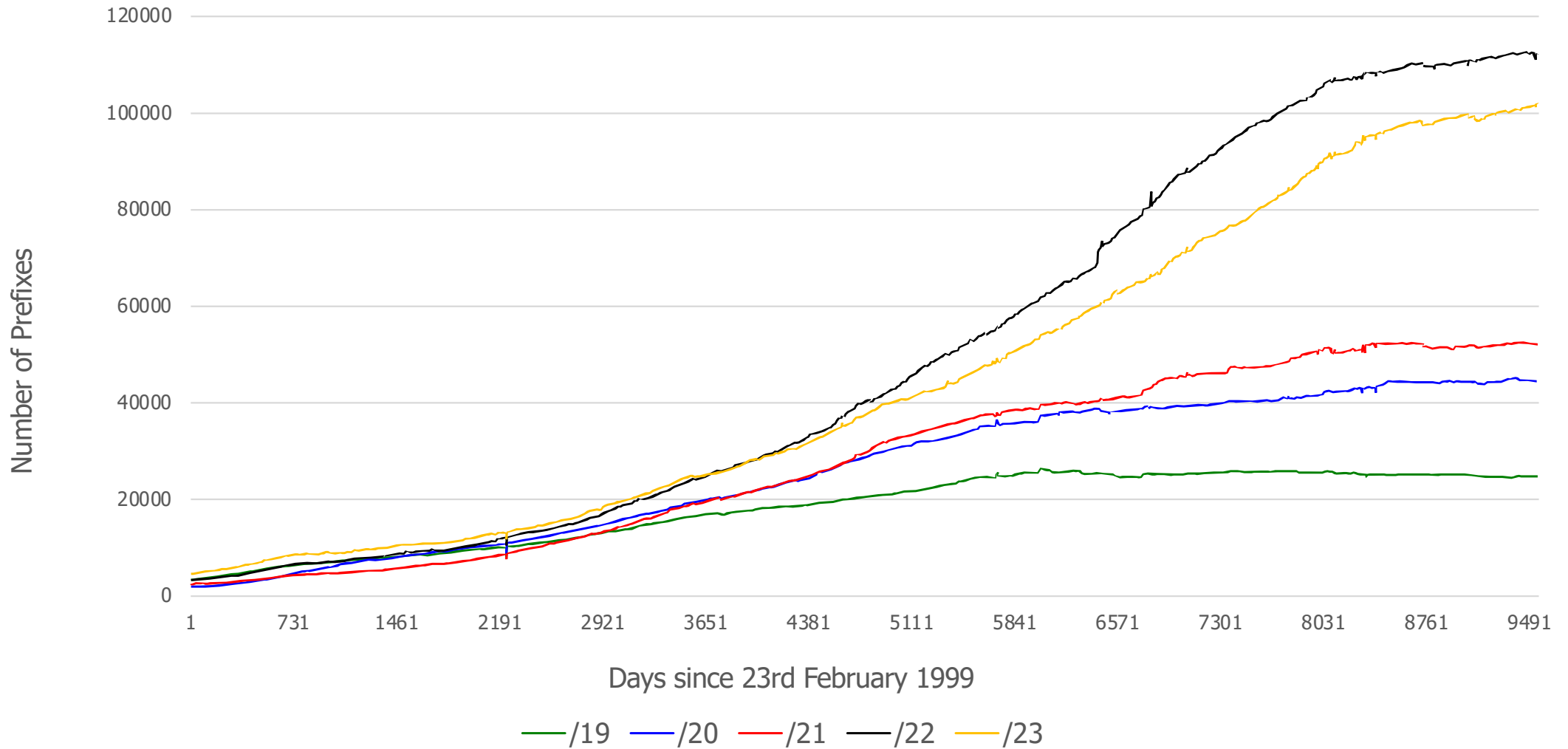
IPv6 AS Growth



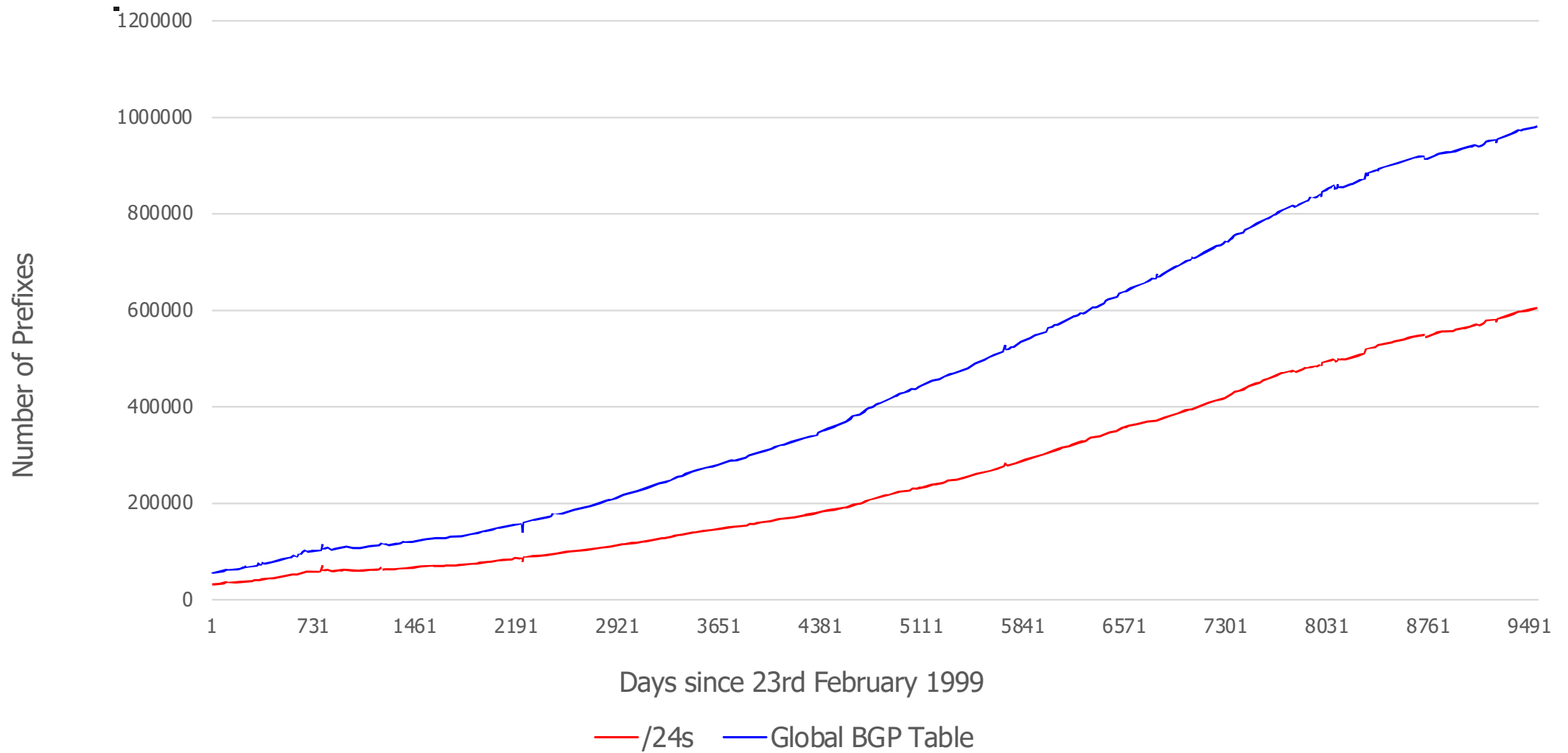
IPv4 Max Aggregation vs Unique Prefixes



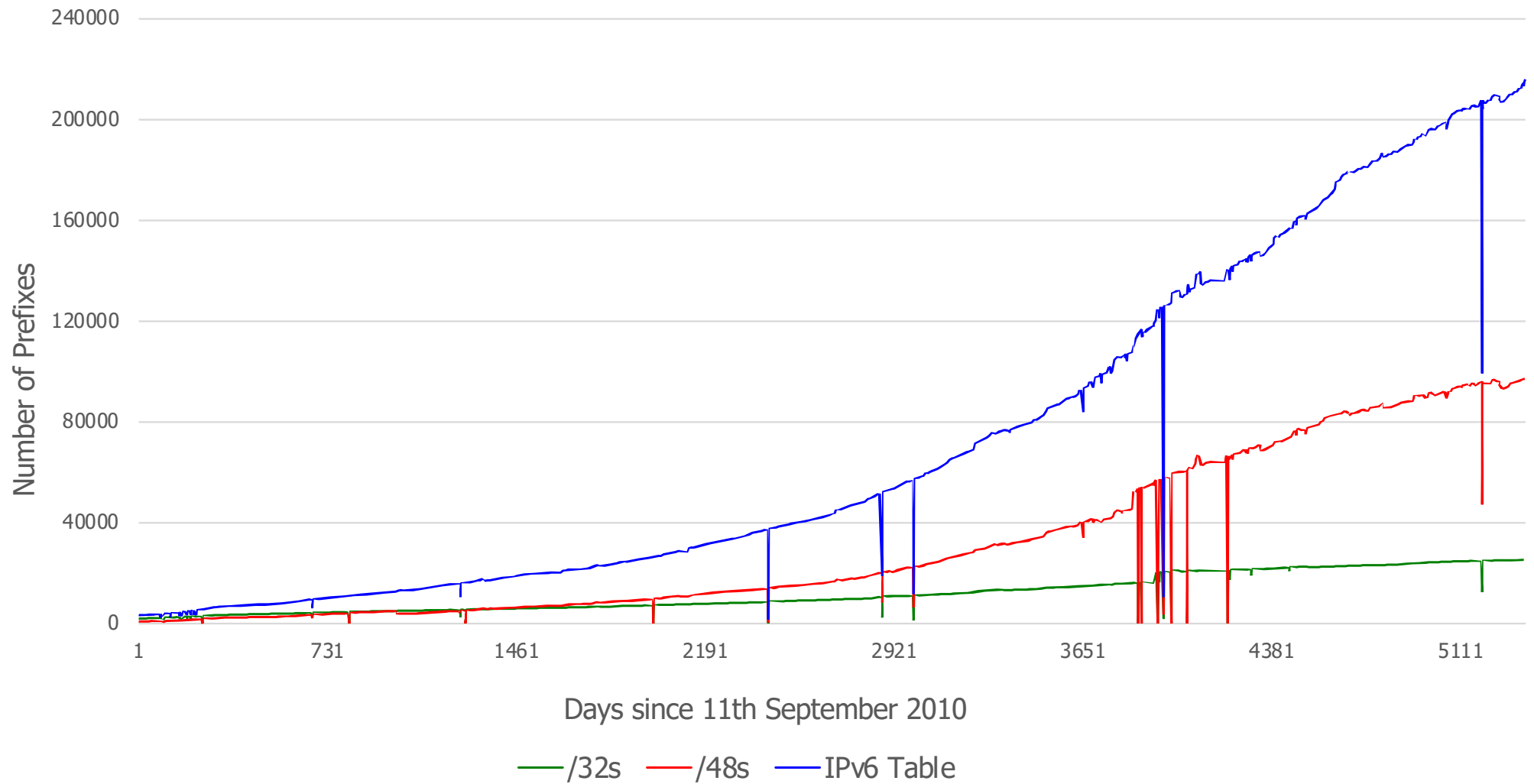
IPv4 Prefix sizes announced



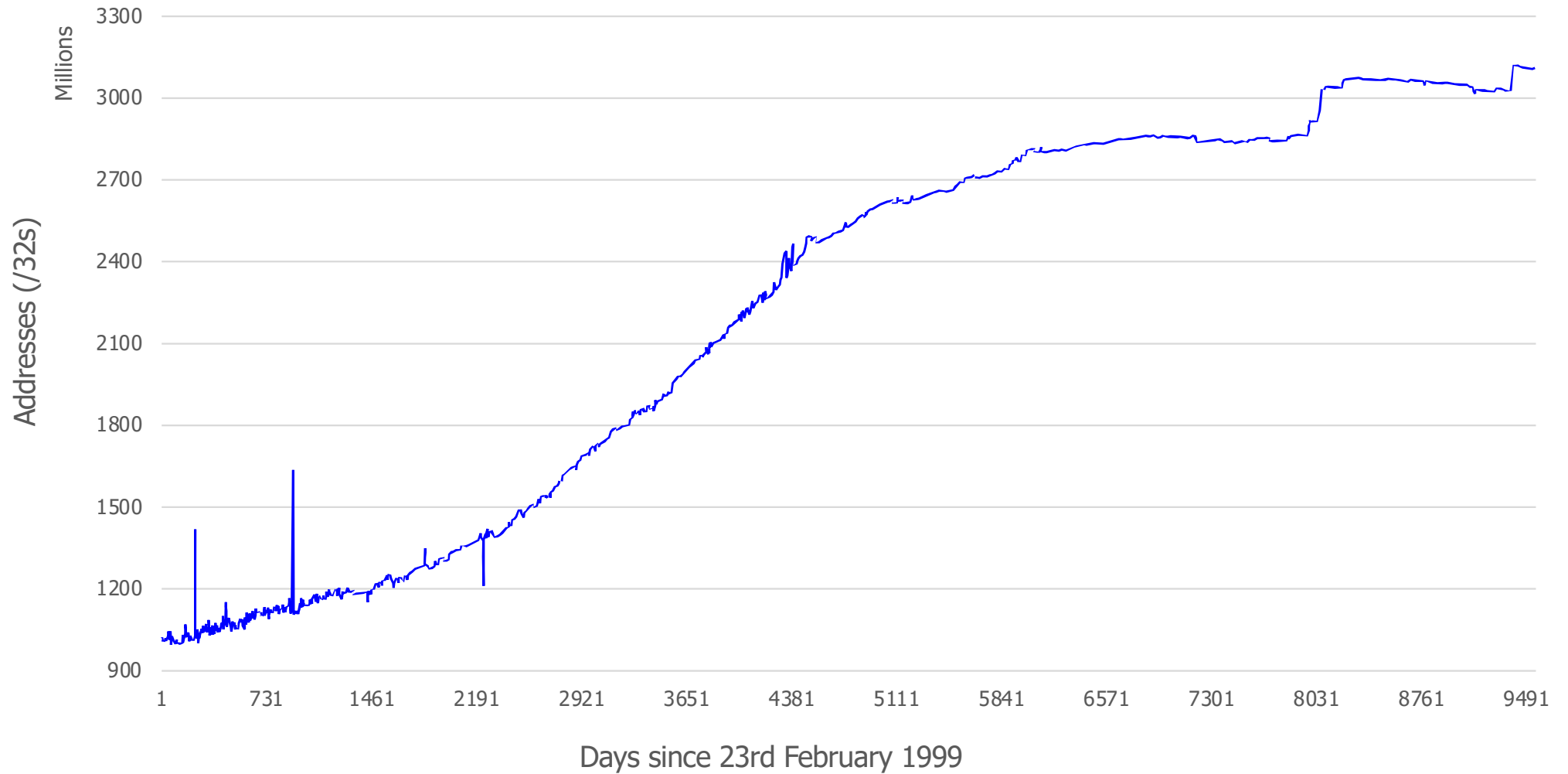
IPv4 /24s announced



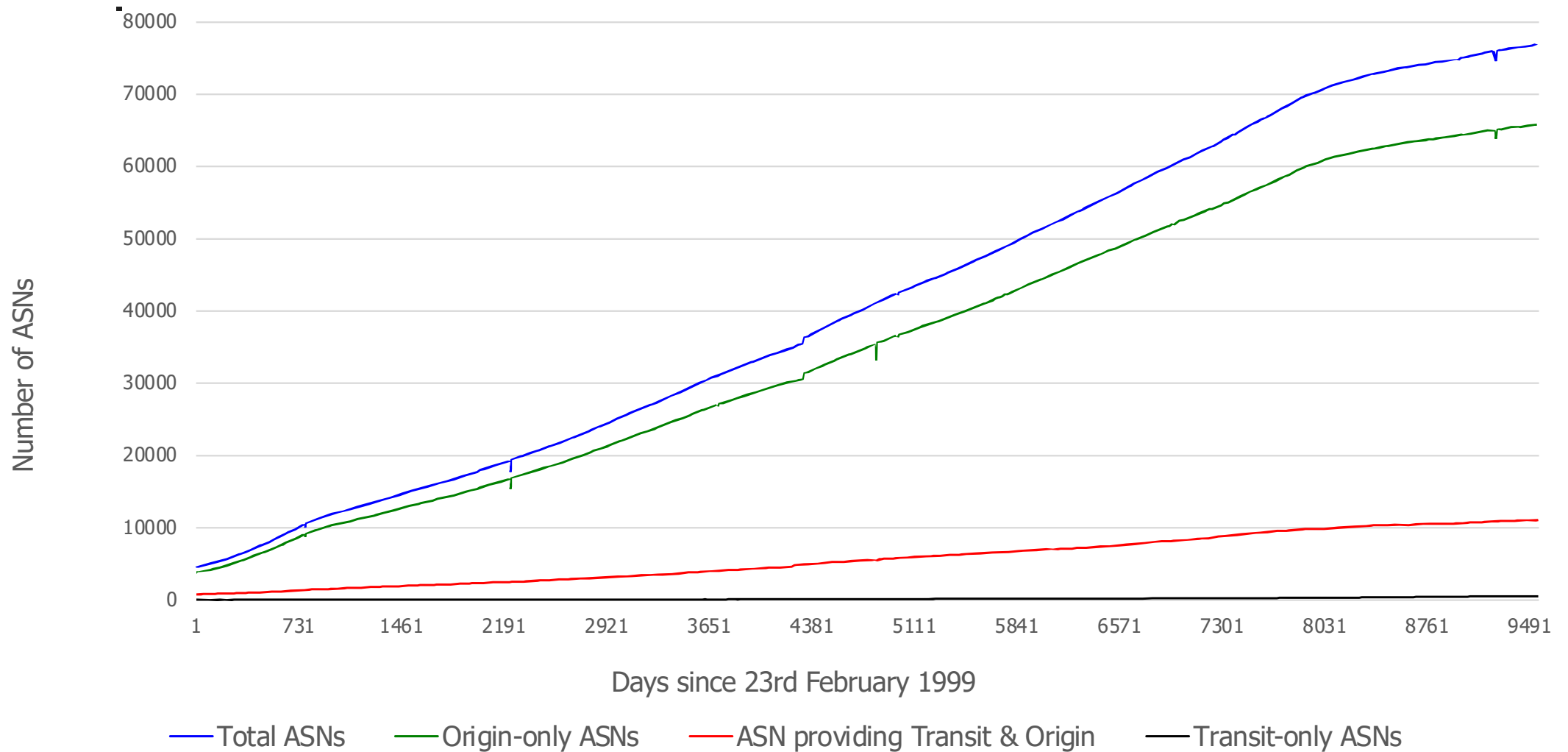
IPv6 /32s vs /48s



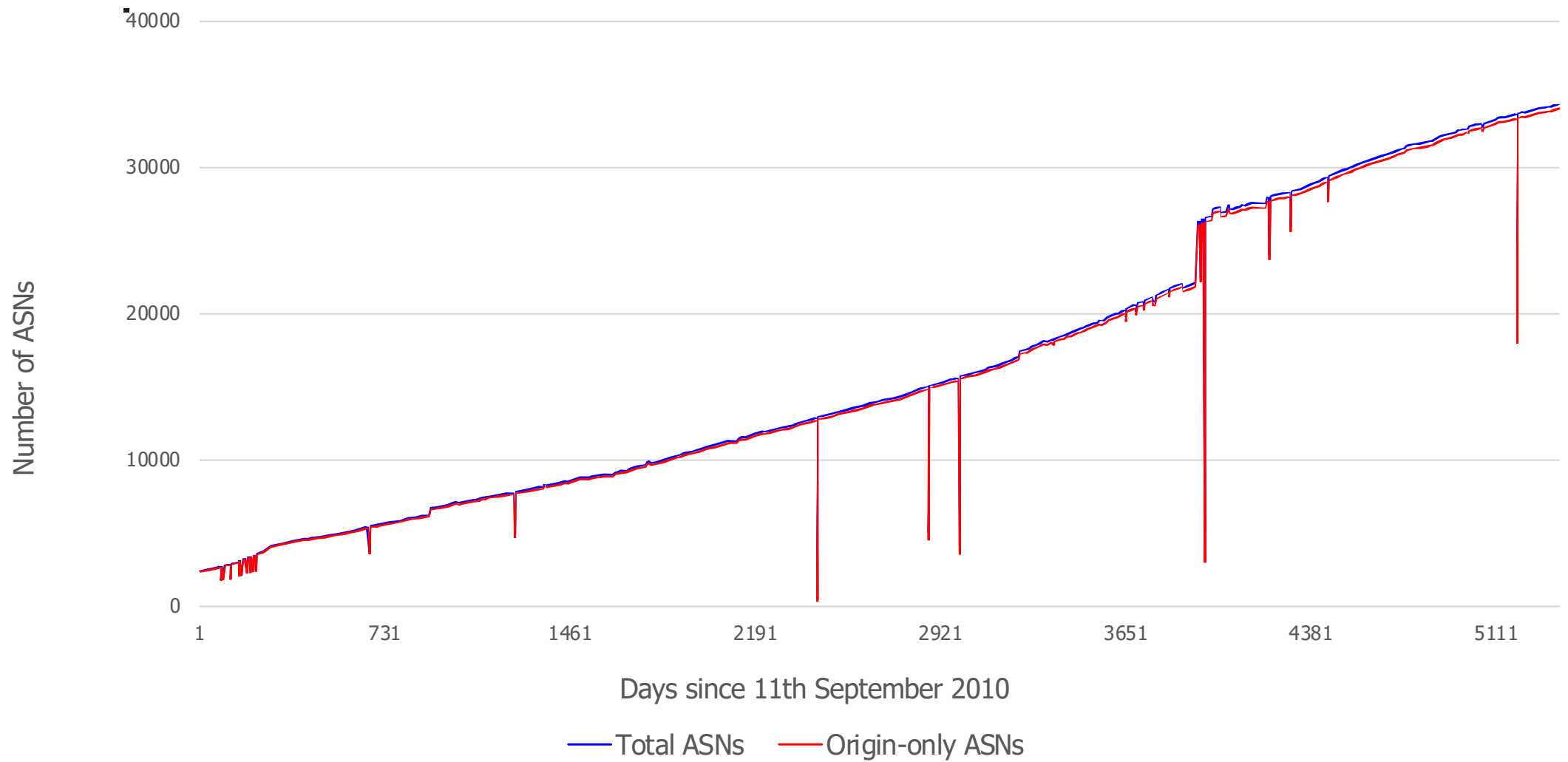
IPv4 Address Space announced



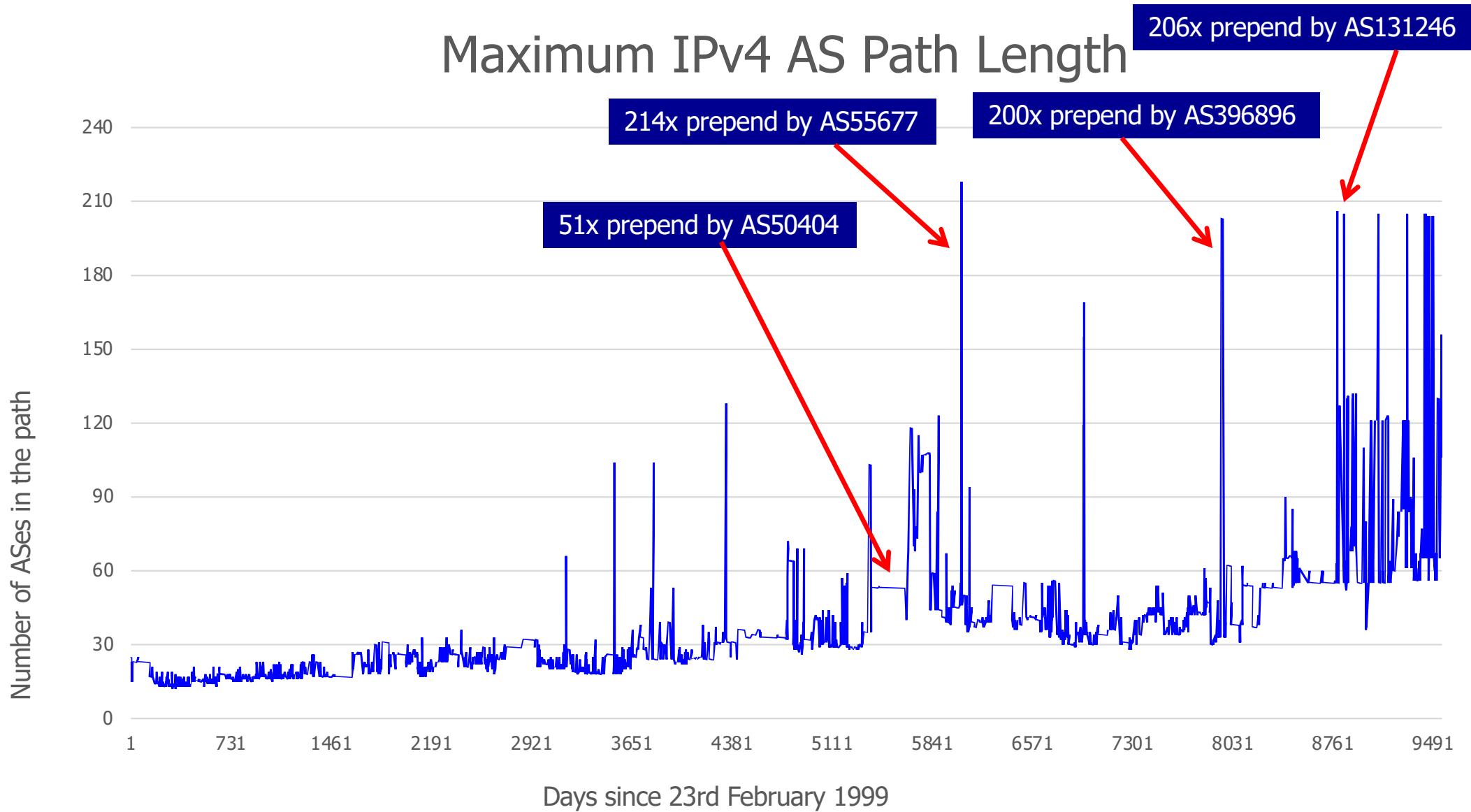
IPv4 AS Announcements



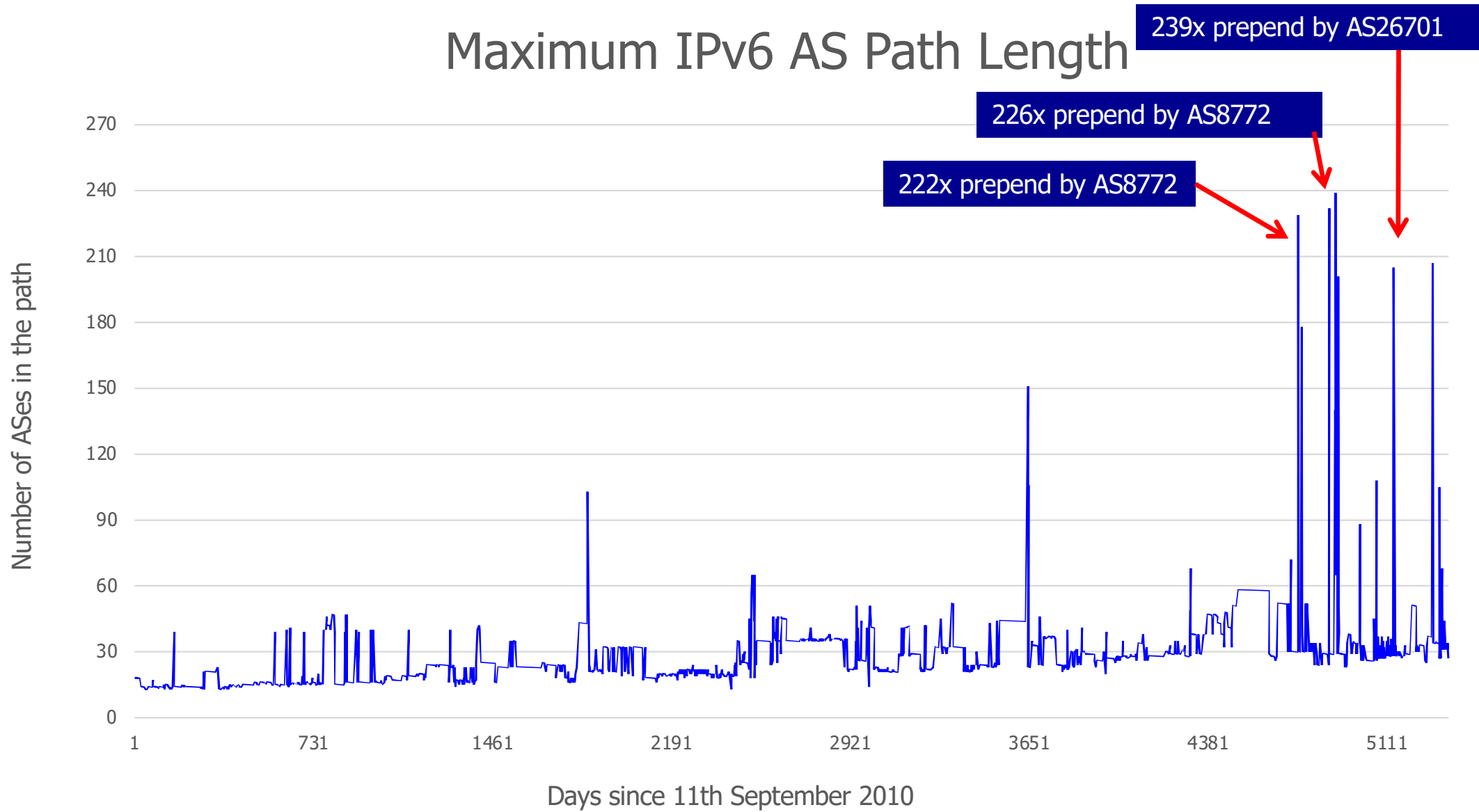
IPv6 AS Announcements

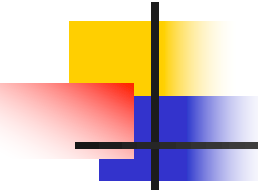


Maximum IPv4 AS Path Length



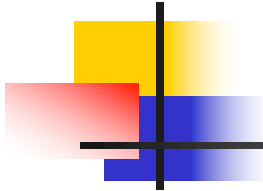
Maximum IPv6 AS Path Length





Looking at Deaggregation in IPv4

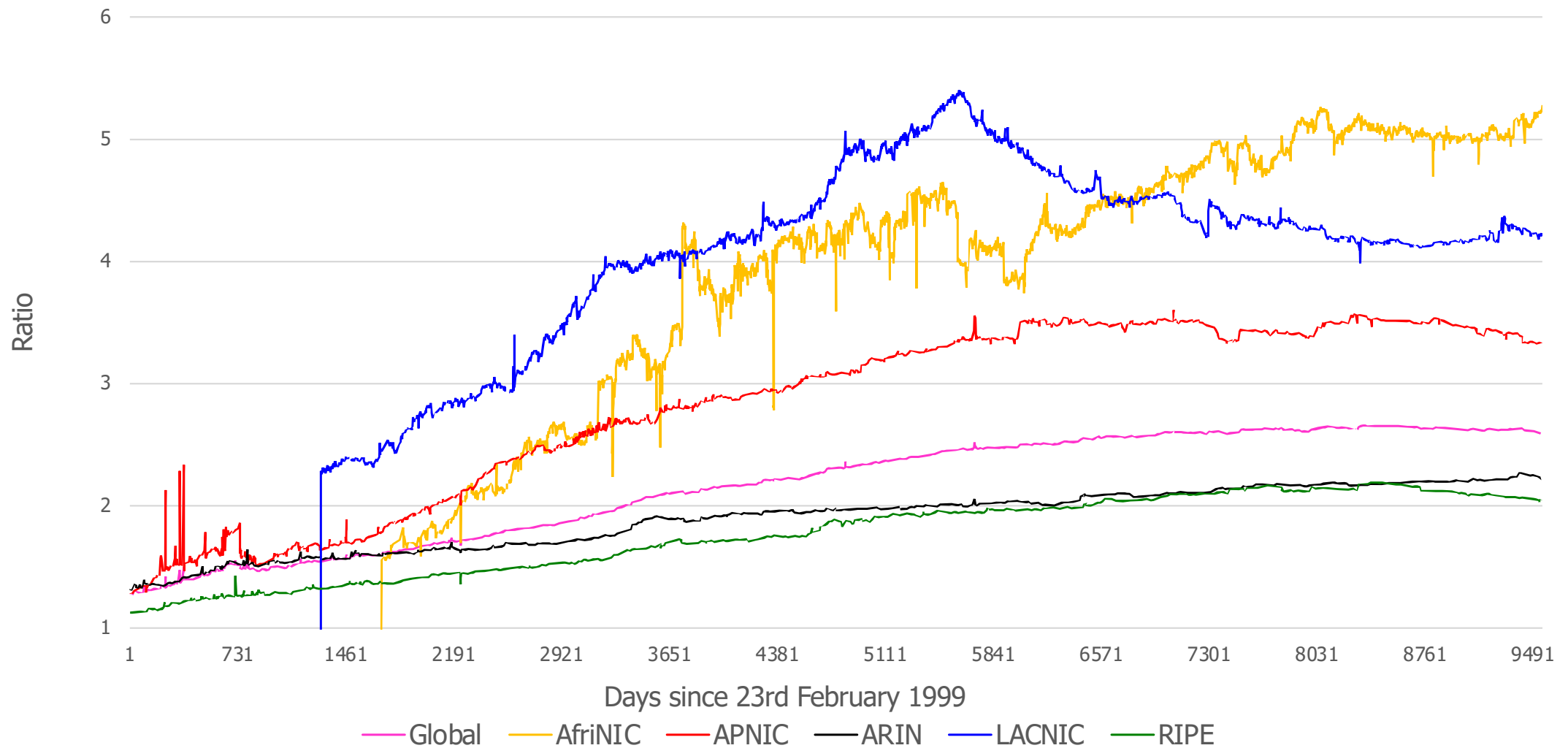
- Routing Report
 - One summary takes BGP table and aggregates prefixes by origin AS
 - Called “Max Aggregation” in report
 - Global and per RIR basis: <https://thyme.apnic.net/current/>
 - Per ISO-3166 code basis: <https://bgp.nsrc.org/REN/OIX/iso-3166>
- Calculates **Deaggregation** Factor:
 - Measure of Routing Table size/Aggregated Size
 - Global value has been increasing slowly and steadily since “records began”



May 2025

- **Total Prefixes**
- Global BGP Table
 - 984k prefixes
- North America
 - 291k prefixes
- Europe & Middle East
 - 274k prefixes
- Asia & Pacific
 - 259k prefixes
- Latin America & Caribbean
 - 124k prefixes
- Africa
 - 35k prefixes
- **Deaggregation Factor**
- Global Average
 - 2.59
- North America
 - 2.22
- Europe & Middle East
 - 2.04
- Asia & Pacific
 - 3.33
- Latin America & Caribbean
 - 4.21
- Africa
 - 5.32

Deaggregation: RIR Regions vs Global



Asia Pacific Aggregation Savings Summary

ASN	No of Nets	Savings	Description
9808	11101	11000	CHINAMOBILE-CN China Mobile Communications Grou
7545	6171	5522	TPG-INTERNET-AP TPG Telecom Limited, AU
4538	4784	4708	ERX-CERNET-BKB China Education and Research Net
9498	4383	4078	BBIL-AP BHARTI Airtel Ltd., IN
7552	3902	3876	VIETEL-AS-AP Viettel Group, VN
7713	3696	3630	TELKOMNET-AS-AP PT Telekomunikasi Indonesia, ID
45899	3284	3182	VNPT-AS-VN VNPT Corp, VN
24560	2869	2333	AIRTELBROADBAND-AS-AP Bharti Airtel Ltd., Telem
45090	2208	2122	TENCENT-NET-AP Shenzhen Tencent Computer System
4755	2172	1979	TATACOMM-AS TATA Communications formerly VSNL
9829	1921	1889	BSNL-NIB National Internet Backbone, IN
23969	1822	1806	TOT-NET TOT Public Company Limited, TH
4766	2370	1742	KIXS-AS-KR Korea Telecom, KR
56046	1902	1721	CMNET-JIANGSU-AP China Mobile communications
56041	1636	1560	CMNET-ZHEJIANG-AP China Mobile communications
45609	1853	1529	BHARTI-MOBILITY-AS-AP Bharti Airtel Ltd. AS for
56047	1494	1441	CMNET-HUNAN-AP China Mobile communications corp
9583	1919	1370	SIFY-AS-IN Sify Limited, IN
17557	1247	1212	PKTELECOM-AS-PK Pakistan Telecommunication Comp
17488	1269	1136	HATHWAY-NET-AP Hathway IP Over Cable Internet,

<https://thyme.apnic.net/current/data-CIDRnet-APNIC>

Thailand Aggregation Savings Summary

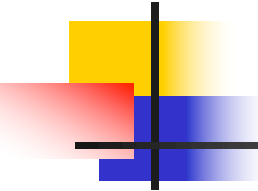
ASN	No of nets	/20 equiv	MaxAgg	Description
23969	1822	314	16	TOT-NET TOT Public Company Limited, TH
7470	720	533	57	TRUEINTERNET-AS-AP TRUE INTERNET Co.,Ltd.
45458	599	46	128	SBN-AWN-AS-02-AP SBN-ISPAWN-ISP and SBN-N
4750	509	62	292	CSLOXINFO-AS-AP CS LOXINFO PUBLIC COMPANY
133481	483	74	45	AIS-FIBRE-AS-AP AIS Fibre, TH
4618	319	56	7	INET-TH-AS Internet Thailand Company Limi
131293	280	23	64	TOT-LLI-AS-AP TOT Public Company Limited,
131445	233	33	49	AIS3G-2100-AS-AP Advance Wireless Network
17552	185	349	21	TRUEONLINE-AS-AP True Online, TH
132280	180	37	18	SYMPHONY-AP-TH Symphony Communication Tha
9931	175	71	36	CAT-AP The Communication Authoity of Thai
23884	149	10	31	PROENNET-AS Proen Corp Public Company Lim
9335	144	11	37	CAT-CLOUD-AP CAT Telecom Public Company L
38794	133	23	50	UIH-BBB-AS-AP UIH, TH
4621	132	45	10	UNINET-AS-AP UNINET-, TH
132061	114	13	10	REALMOVE-AS-AP Realmove Company Limited,
4274	108	16	3	ERX-AU-NET Assumption University, TH
132618	94	10	18	REALFUTURE-AS-AP Real Future Company Limi
9891	93	12	65	CSLOX-IDC-AS-AP CS LOXINFO Public Company
7693	91	63	12	COMNET-TH KSC Commercial Internet Co. Ltd

<https://bgp.nsrc.org/REN/OIX/iso-3166/TH-ASnet>

Thailand Address Span Summary

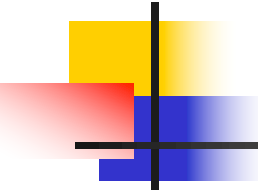
ASN	No of nets	/20 equiv	Description
7470	720	533	TRUEINTERNET-AS-AP TRUE INTERNET Co.,Ltd., TH
17552	185	349	TRUEONLINE-AS-AP True Online, TH
23969	1822	314	TOT-NET TOT Public Company Limited, TH
45758	41	262	TTBP-AS-AP Triple T Broadband Public Company Limi
45430	60	93	SBN-AWN-IIG-AS-AP SBN-IIGAWN-IIG transit provider
133481	483	74	AIS-FIBRE-AS-AP AIS Fibre, TH
9931	175	71	CAT-AP The Communication Authoity of Thailand, CA
7693	91	63	COMNET-TH KSC Commercial Internet Co. Ltd., TH
4750	509	62	CSLOXINFO-AS-AP CS LOXINFO PUBLIC COMPANY LIMITED
4618	319	56	INET-TH-AS Internet Thailand Company Limited, TH
45458	599	46	SBN-AWN-AS-02-AP SBN-ISPAWN-ISP and SBN-NIXAWN-NI
4621	132	45	UNINET-AS-AP UNINET-, TH
132280	180	37	SYMPHONY-AP-TH Symphony Communication Thailand PC
24378	74	34	ENGTAC-AS-TH-AP Total Access Communication PLC.,
131445	233	33	AIS3G-2100-AS-AP Advance Wireless Network, TH
9587	75	33	DTACNETWORK-TH-AP 26th Floor 3333 Moo 14 Chai Bui
23974	22	24	MOE-AS-AP Ministry of education, TH
131293	280	23	TOT-LLI-AS-AP TOT Public Company Limited, TH
38794	133	23	UIH-BBB-AS-AP UIH, TH
7616	41	18	JASTEL-NETWORK-IDC JasTel Network, TH

<https://bgp.nsrc.org/REN/OIX/iso-3166/TH-AS20net>



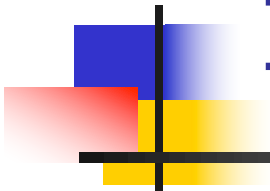
IPv4 Observations

- Routing table continues to grow
 - Linear growth from 2015 to 2020 has tailed off
 - Even though total address space announced has started to reduce over last 2 years
- /24 announcements continue to grow
 - Clearly many operators are deaggregating down to the smallest prefix size considered routable
 - Do operators still filter prefix sizes smaller than /24?
 - (A few /25s through /32s are visible)
- Overall global deaggregation ratio growth has slowed
 - Significant improvements in Latin America



IPv6 Observations

- Routing table growth has continued into 2024
 - How to interpret this?
- /48 announcements continue to grow rapidly
 - Operators seem to believe that IPv6 /48 needs to be treated like IPv4 /24 🤔😞
- Noticeable increases:
 - According to RIR allocation boundaries
 - Along nibble boundaries



Internet Routing Table Analysis Update

Questions?