

The Internet Routing Table Using RouteViews

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RouteViews

A collaborative router looking glass to share BGP views among network operators and researchers.

RouteViews was founded at the University of Oregon's Advanced Network Technology Center (ANTC) in 1995. Data archives began in 1997 and amount to 50TBs (compressed) today.

The group is currently led by the Network Startup Resource Center (NSRC) group engineering team at the University of Oregon.

RouteViews collaborates with the Center for Applied Internet Data Analysis (CAIDA) working with NSF grants that support *Designing a Global Measurement Infrastructure to Improve Internet Security*, GMI3S ([OAC-2131987](#)), and an *Integrated Library for Advancing Network Data Science*, ILANDS ([CNS-2120399](#)).

RouteViews is supported with financial and in-kind donations by multiple additional organizations:

<https://www.routeviews.org/routeviews/index.php/supporters/>

NSRC

NSRC supports the growth of global Internet infrastructure by providing engineering assistance, collaborative technical workshops, training, and other resources to university, research & education networks worldwide. NSRC is partially funded by the IRNC program of the NSF ([OAC-2029309](#)) and Google with other contributions from public and private organizations.

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The University of Oregon is a public research institution in Eugene, Oregon, USA founded in 1876. UO is renowned for its research prowess and commitment to teaching. Both NSRC and RouteViews are based at the UO.

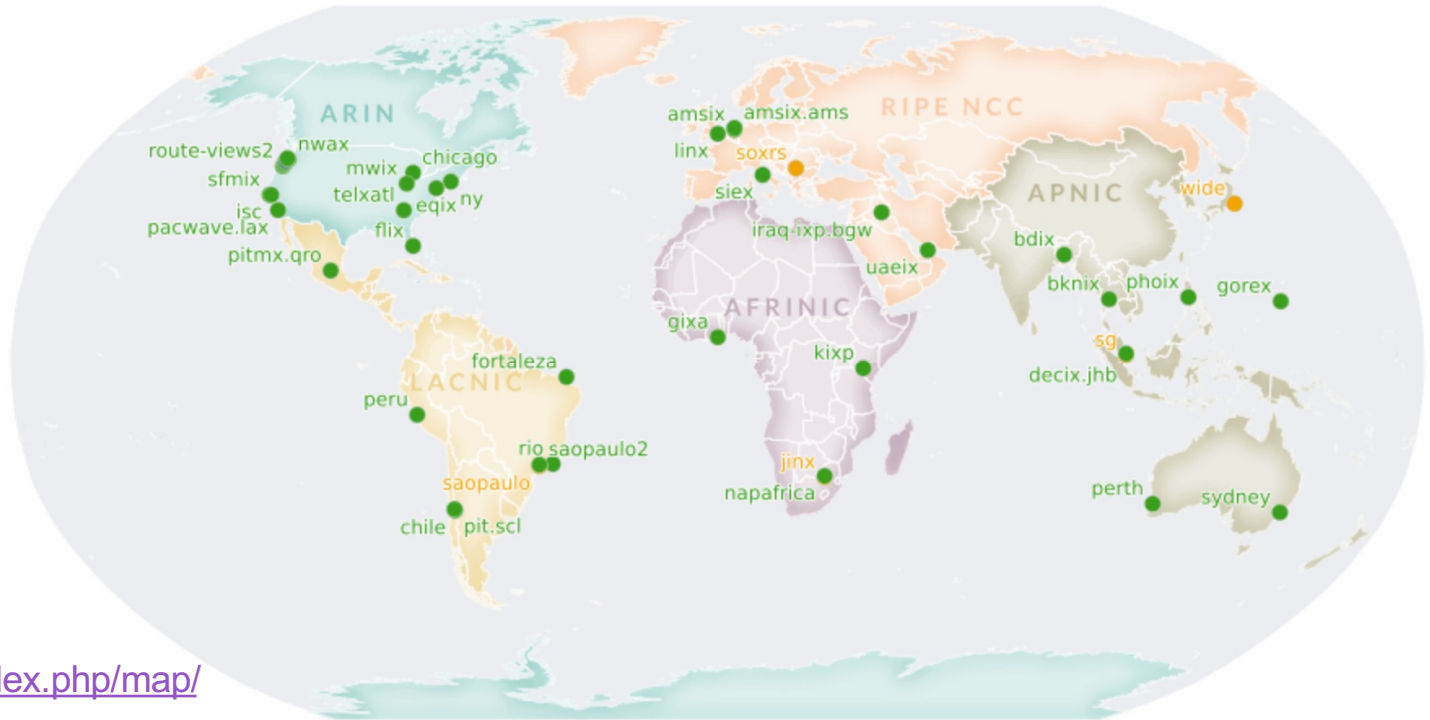
Why RouteViews?

It's YOUR Internet

- Originally conceived in 1995 as a tool for Internet operators to look at the BGP table from different backbones and locations around the world to troubleshoot and to assess:
 - Reachability, hijacks, bugs, peer visibility, mass withdrawals, and RPKI status
- Operators who find it a valuable tool also peer to contribute to the value
- The data-set of BGP information archived by RouteViews since 1997 has become an invaluable research resource
 - RouteViews data has been used in over 1000 research papers.
 - <http://www.routeviews.org/routeviews/index.php/papers/>

RouteViews Collector Map

<http://www.routeviews.org/routeviews/index.php/map/>

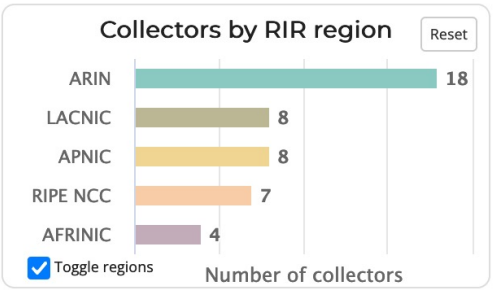
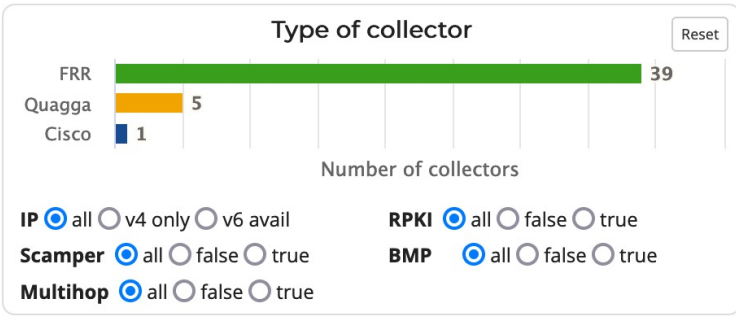


Map filter **Peers by region** Peer count RIB count

Search collectors by name or IP Maintain filters during search

45
of 45 collectors
visible

Installed date
From:
To:



Interactive map created by UO InfoGraphics Lab
 Powered by CARTO | HighCharts | Leaflet

RouteViews

Routing Table Analysis

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 in February 1999
 - <https://thyme.apnic.net>
 - Started recording global IPv6 table in September 2010
- With NSRC support, started recording the global R&E table in May 2021
 - <https://bgp.nsrc.org/REN>
- Weekly reports from these record:
 - Routing table size
 - CIDR-Report style reporting on a per-RIR basis
 - ...and many other interesting features



IPv4 Routing Report 19th June 2024

BGP routing table entries examined:	952989
Prefixes after maximum aggregation (per Origin AS):	362728
Deaggregation factor:	2.63
Unique aggregates announced (without unneeded subnets):	465034
Total ASes present in the Internet Routing Table:	75930
Prefixes per ASN:	12.55
Origin-only ASes present in the Internet Routing Table:	65056
Origin ASes announcing only one prefix:	26733
Transit ASes present in the Internet Routing Table:	10874
Transit-only ASes present in the Internet Routing Table:	548
Average AS path length visible in the Internet Routing Table:	4.4
Max AS path length visible:	60
Max AS path prepend of ASN (53153)	57
Prefixes from unregistered ASNs in the Routing Table:	1004
Number of instances of unregistered ASNs:	1006
Special use prefixes present in the Routing Table:	1
Prefixes being announced from unallocated address space:	626
Number of addresses announced to Internet:	3024891008
Equivalent to 180 /8s, 76 /16s and 44 /24s	
Total number of prefixes smaller than registry allocations:	312009

APNIC Region

Prefixes being announced by APNIC Region ASes:	255208
Total APNIC prefixes after maximum aggregation:	74266
APNIC Deaggregation factor:	3.44
Prefixes being announced from the APNIC address blocks:	247303
Unique aggregates announced from the APNIC address blocks:	101201
APNIC Region origin ASes present in the Internet Routing Table:	14219
APNIC Prefixes per ASN:	17.39
APNIC Region origin ASes announcing only one prefix:	4322
APNIC Region transit ASes present in the Internet Routing Table:	1917
Average APNIC Region AS path length visible:	4.6
Max APNIC Region AS path length visible:	55
Number of APNIC region 32-bit ASNs visible in the Routing Table:	9613
Number of APNIC addresses announced to Internet:	761643136
Equivalent to 45 /8s, 101 /16s and 192 /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, 131072-153913
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
8151	11874	3302	494	UNINET, MX
16509	10060	11428	3568	AMAZON-02, US
9808	9856	8745	76	CHINAMOBILE-CN China Mobile Communicati
12479	7718	1708	145	UNI2-AS, ES
7545	5643	777	673	TPG-INTERNET-AP TPG Telecom Limited, AU
4538	4929	4192	74	ERX-CERNET-BKB China Education and Rese
39891	4758	286	60	ALJAWWALSTC-AS, SA
11492	4640	308	549	CABLEONE, US
18403	4196	347	23	FPT Telecom Company, VN
7155	4166	287	88	VIASAT-SP-BACKBONE, US
7552	3946	1331	21	Viettel Group, VN
20940	3836	3396	135	AKAMAI-ASN1, NL
9498	3779	510	262	BBIL-AP BHARTI Airtel Ltd., IN
6327	3594	1320	79	SHAW, CA
7713	3593	1043	63	Telekomunikasi Indonesia (PT), ID
9009	3582	305	1807	M247, RO
10620	3518	492	938	Telmex Colombia S.A., CO
174	3475	8783	871	COGENT-174, US
22773	3459	3037	215	ASN-CXA-ALL-CCI-22773-RDC, US
45899	3279	1857	105	VNPT Corp, VN

AfriNIC APNIC ARIN LACNIC RIPE NCC



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What about IPv6 ?

IPv6 Routing Report 19th June 2024 (Singapore)

BGP routing table entries examined:	196998
Number of IPv6 prefixes with a valid ROA:	116722
Number of IPv6 prefixes with an invalid ROA:	548
Number of IPv6 prefixes with no ROA:	79728
Total ASNs present in the IPv6 Routing Table:	32905
Average AS path length:	4.8
Longest AS path:	27
Total Origin ASNs present in the IPv6 Routing Table:	32597
Paths with bogon ASNs present in the IPv6 Routing Table:	3



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Global IPv6 per AS prefix count summary (Singapore)

ASN	No of Nets	Description
11172	7021	Alestra, S. de R.L. de C.V., MX
9808	5009	CHINAMOBILE-CN China Mobile Communications Group Co., Ltd.,
16509	4877	AMAZON-02, US
18403	3955	FPT-AS-AP FPT Telecom Company, VN
7552	2946	VIETEL-AS-AP Viettel Group, VN
45609	2748	BHARTI-MOBILITY-AS-AP Bharti Airtel Ltd. AS for GPRS Service
24547	2035	CMNET-V4HEBEI-AS-AP Hebei Mobile Communication Company Limit
45271	1812	ICLNET-AS-AP Idea Cellular Limited, IN
13335	1593	CLOUDFLARENET, US
17622	1534	CNCGROUP-GZ China Unicom Guangzhou network, CN
38266	1530	VIL-AS-AP Vodafone Idea Ltd, IN
28573	1460	Claro NXT Telecomunicacoes Ltda, BR
39891	1365	ALJAWWALSTC-AS, SA
17072	1318	TOTAL PLAY TELECOMUNICACIONES SA DE CV, MX
36183	1309	AKAMAI-AS, US
12479	1299	UNI2-AS, ES
6167	1219	CELLCO-PART, US
22773	1187	ASN-CXA-ALL-CCI-22773-RDC, US
56046	1162	CMNET-JIANGSU-AP China Mobile communications corporation, CN
32098	1151	TRANSTELCO-INC, US

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Number of IPv4 prefixes announced by prefix length

/1:0	/2:0	/3:0	/4:0	/5:0	/6:0	/7:0	/8:16
/9:14	/10:37	/11:93	/12:297	/13:573	/14:1169	/15:2059	/16:13258
/17:8259	/18:13755	/19:24701	/20:44343	/21:51877	/22:111710	/23:99733	/24:580361
/25:734	/26:0	/27:0	/28:0	/29:0	/30:0	/31:0	/32:0

19th June 2024↑

19th June 2023↓

/1:0	/2:0	/3:0	/4:0	/5:0	/6:0	/7:0	/8:16
/9:14	/10:39	/11:103	/12:301	/13:582	/14:1199	/15:2064	/16:13465
/17:8247	/18:13851	/19:25183	/20:44097	/21:51538	/22:110043	/23:98558	/24:556042
/25:746	/26:0	/27:0	/28:0	/29:0	/30:0	/31:0	/32:0



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Number of IPv6 prefixes announced by prefix length

/16:1	/17:0	/18:0	/19:1	/20:14	/21:3	/22:6	/23:8
/24:31	/25:11	/26:16	/27:22	/28:209	/29:4604	/30:626	/31:335
/32:24504	/33:3599	/34:3198	/35:1107	/36:6942	/37:1060	/38:2016	/39:1582
/40:18446	/41:1097	/42:2254	/43:1107	/44:18752	/45:2590	/46:4103	/47:5996
/48:93279	/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							

19th June 2024↑

19th June 2023↓

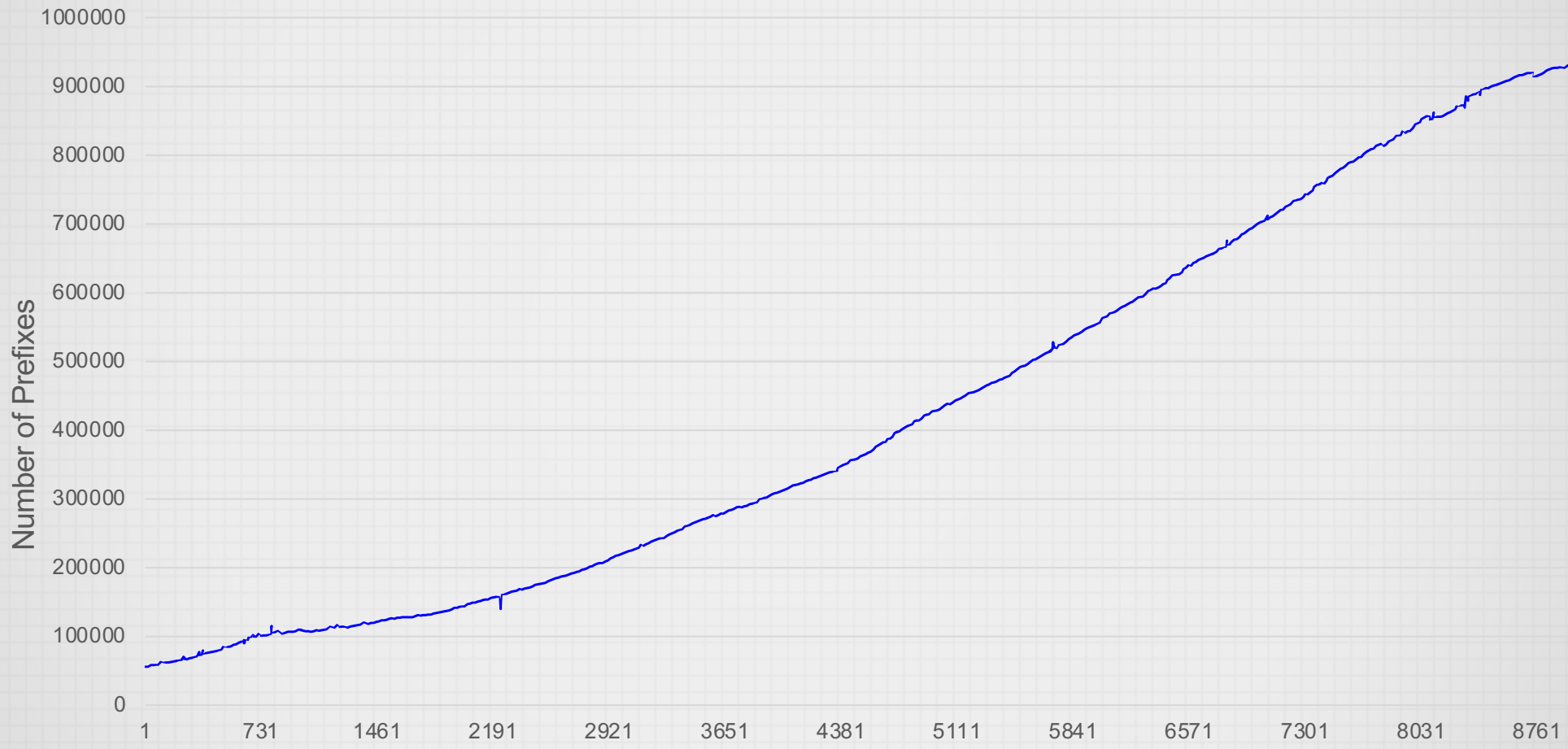
/16:1	/17:0	/18:0	/19:1	/20:14	/21:3	/22:7	/23:7
/24:30	/25:8	/26:16	/27:20	/28:200	/29:4358	/30:603	/31:304
/32:23041	/33:3129	/34:2640	/35:1042	/36:6286	/37:971	/38:1702	/39:1495
/40:14152	/41:942	/42:3443	/43:1071	/44:15565	/45:1933	/46:3449	/47:3949
/48:86507	/49:0	/50:0	/51:0	/52:0	/53:0	/54:0	/55:0
/56:0	/57:0	/58:0	/59:0	/60:0	/61:0	/62:0	/63:0
/64:0							



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Global IPv4 Routing Table



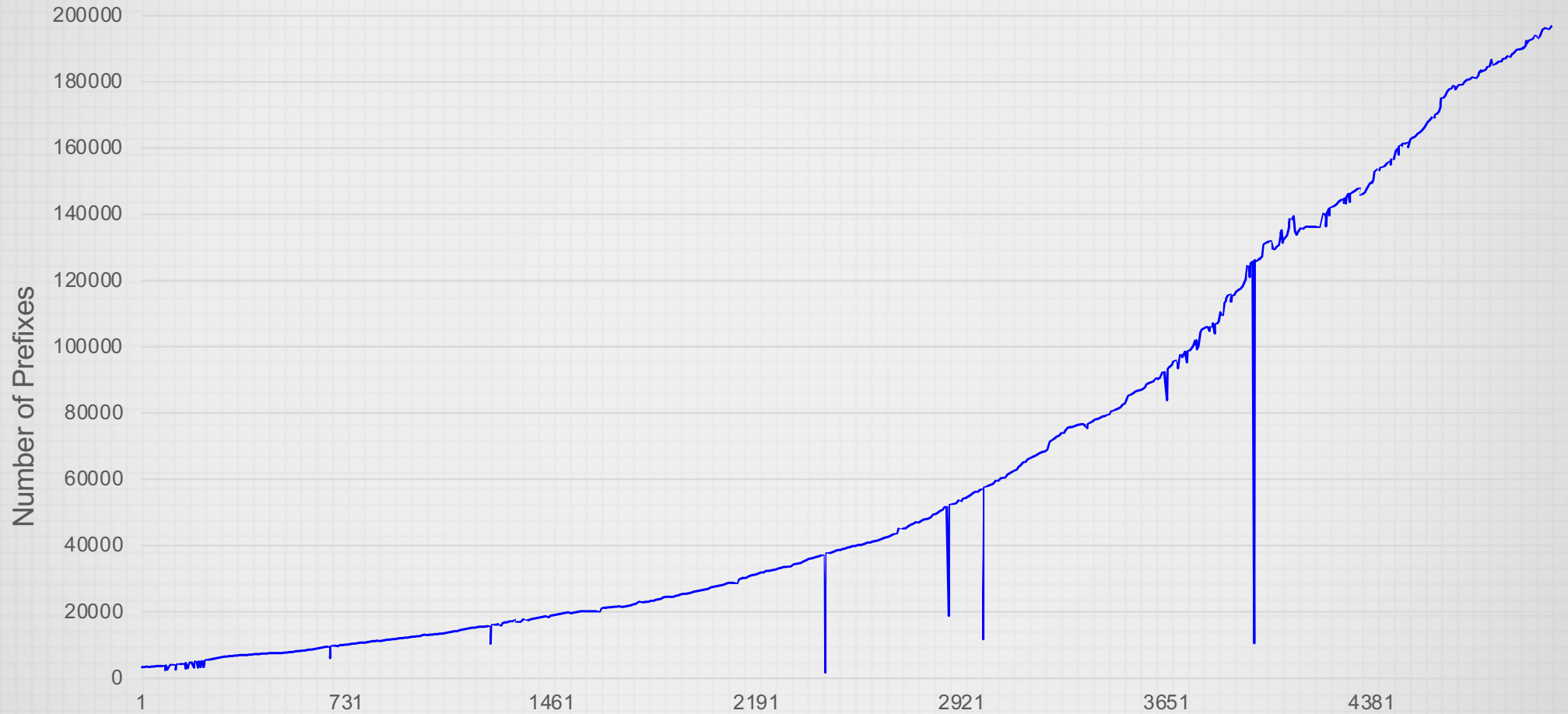
Days since 23rd February 1999



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Global IPv6 Routing Table



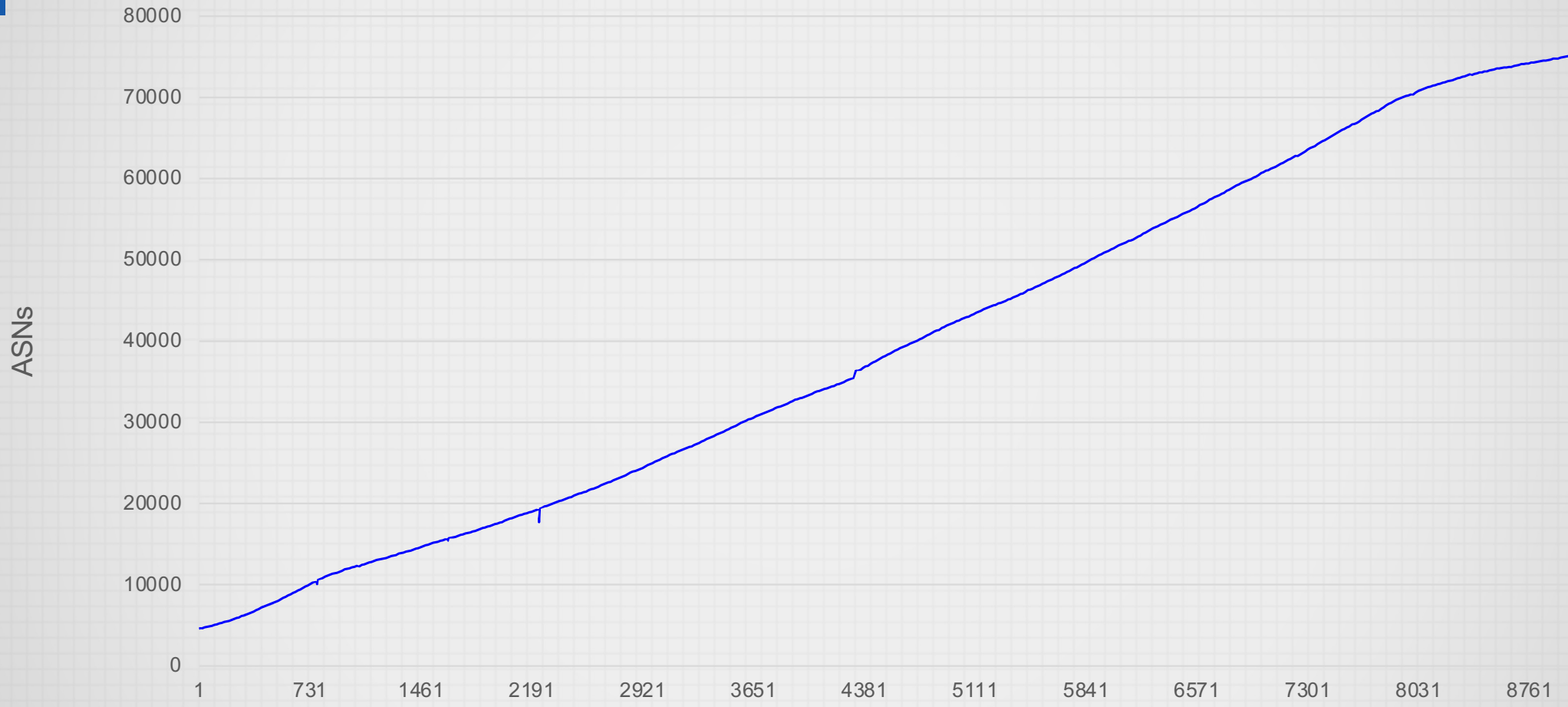
Days since 11th September 2010



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IPv4 AS Growth



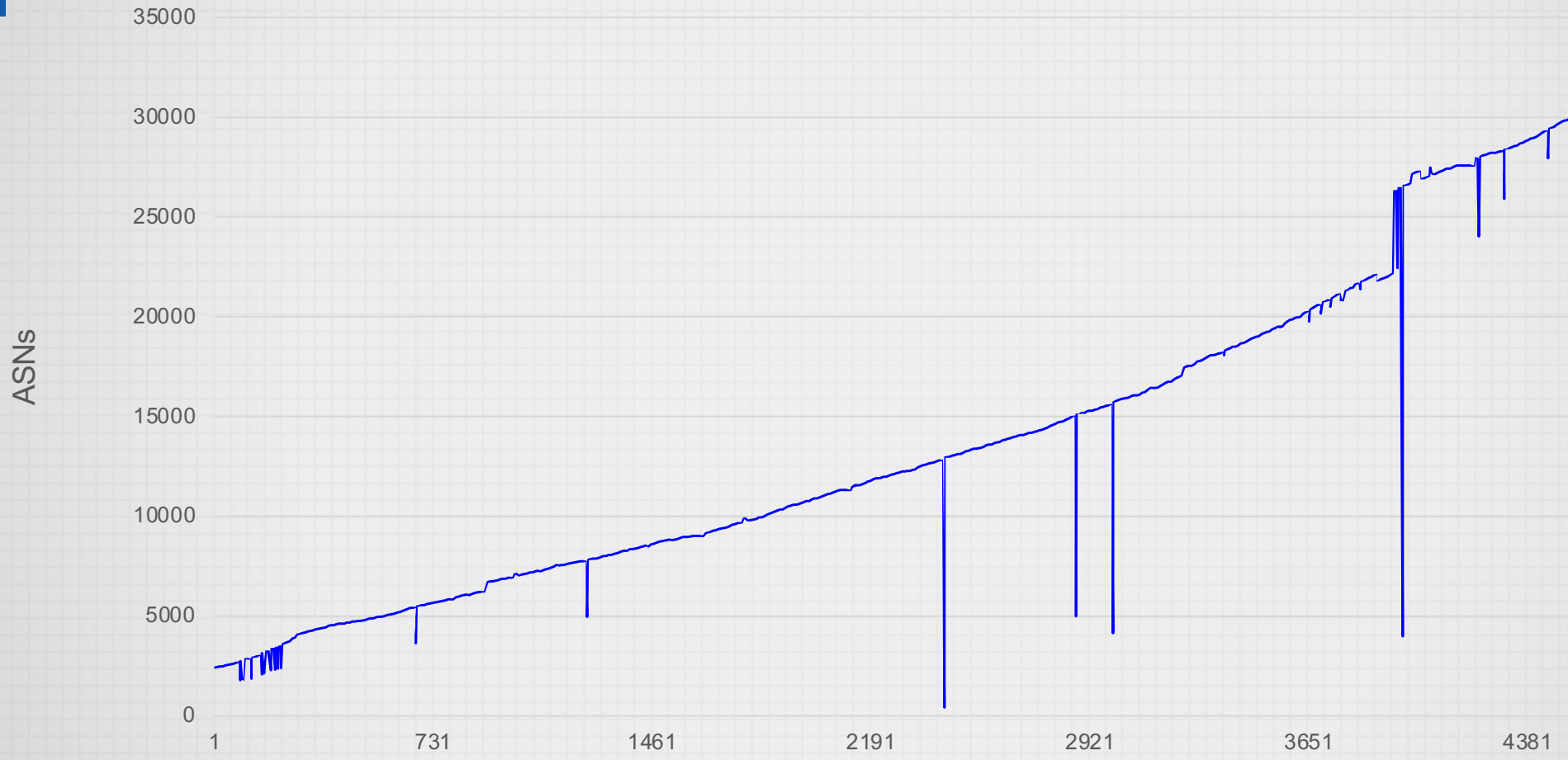
Days since 23rd February 1999



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IPv6 AS Growth



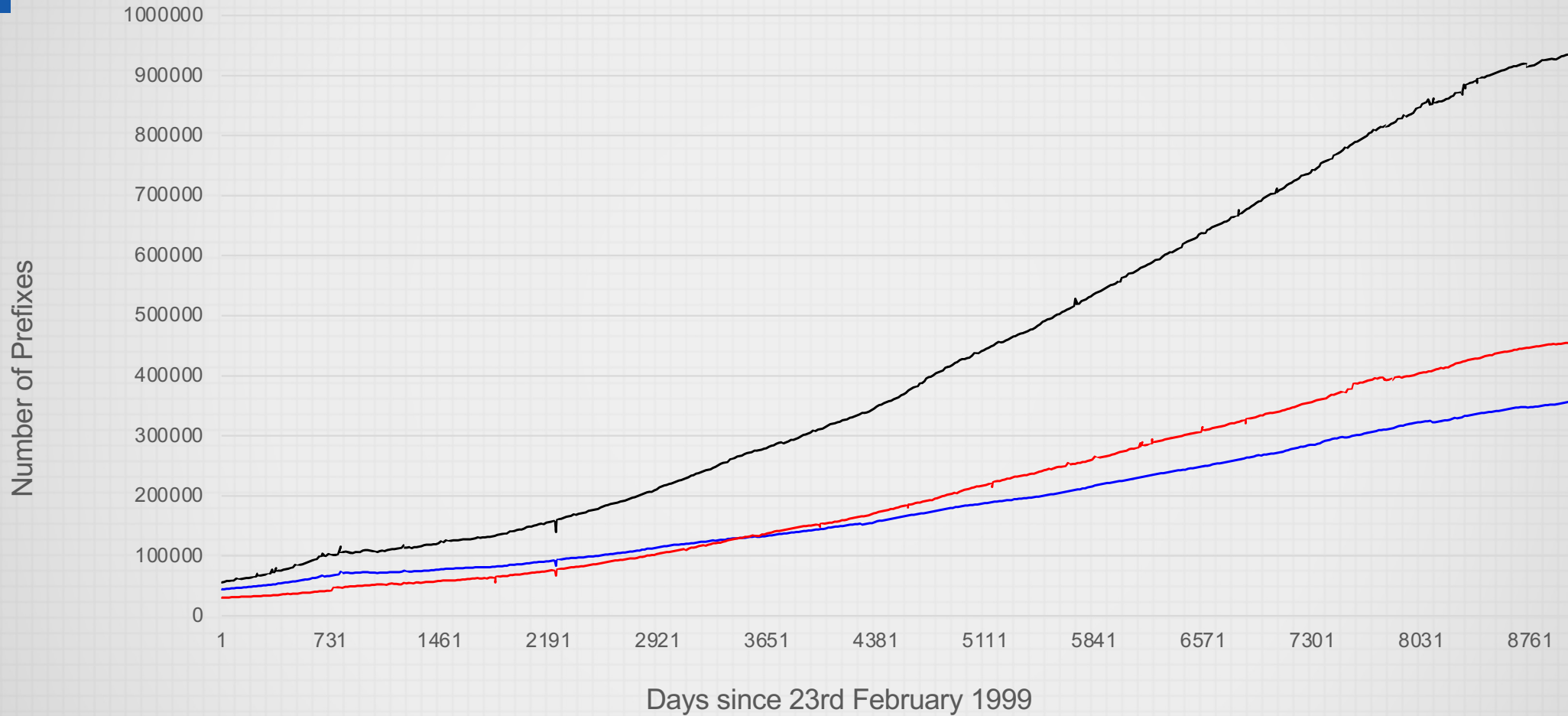
Days since 11th September 2010



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IPv4 Max Aggregation vs Unique Prefixes



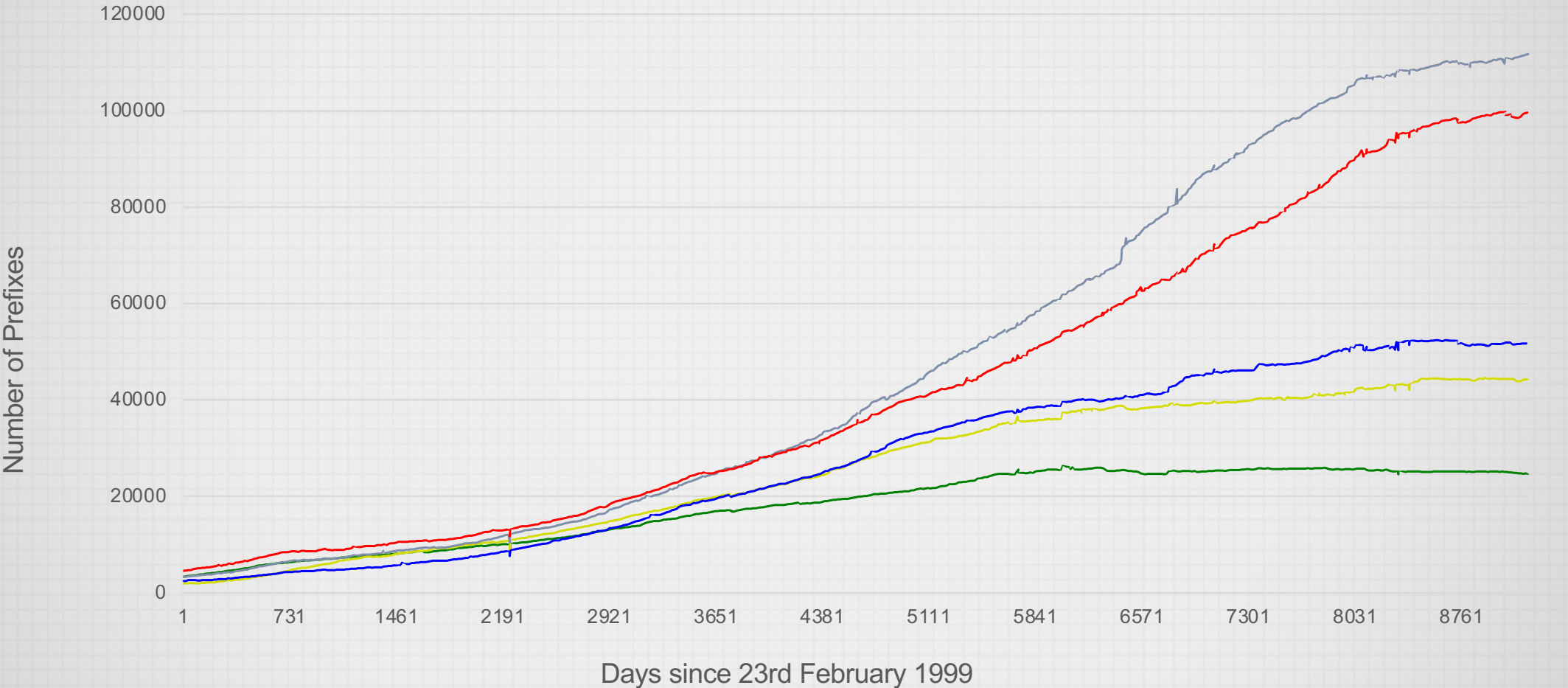
— Max Aggregation — Unique Prefixes — Global BGP Table



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IPv4 Prefix sizes announced



— /19 — /20 — /21 — /22 — /23



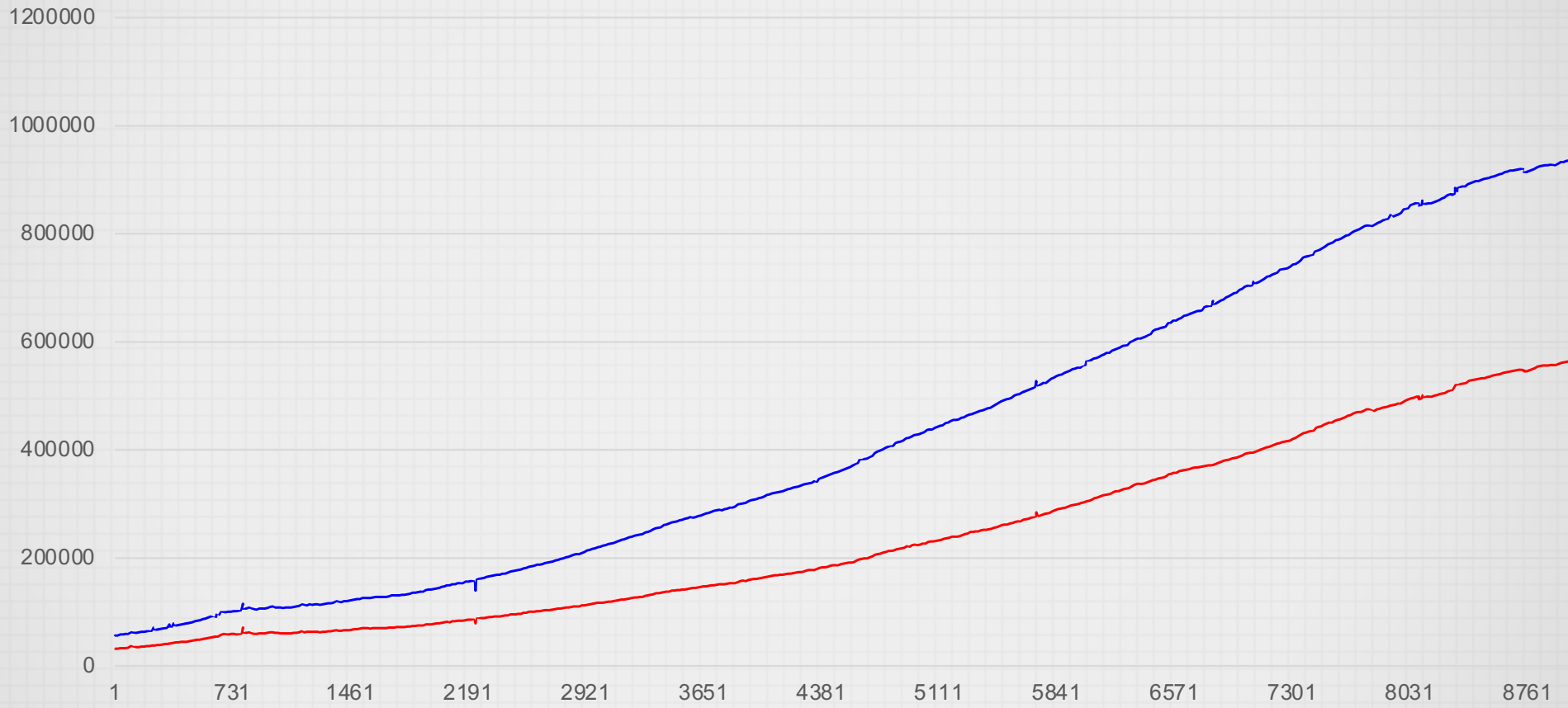
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IPv4 /24s announced



Number of Prefixes



Days since 23rd February 1999

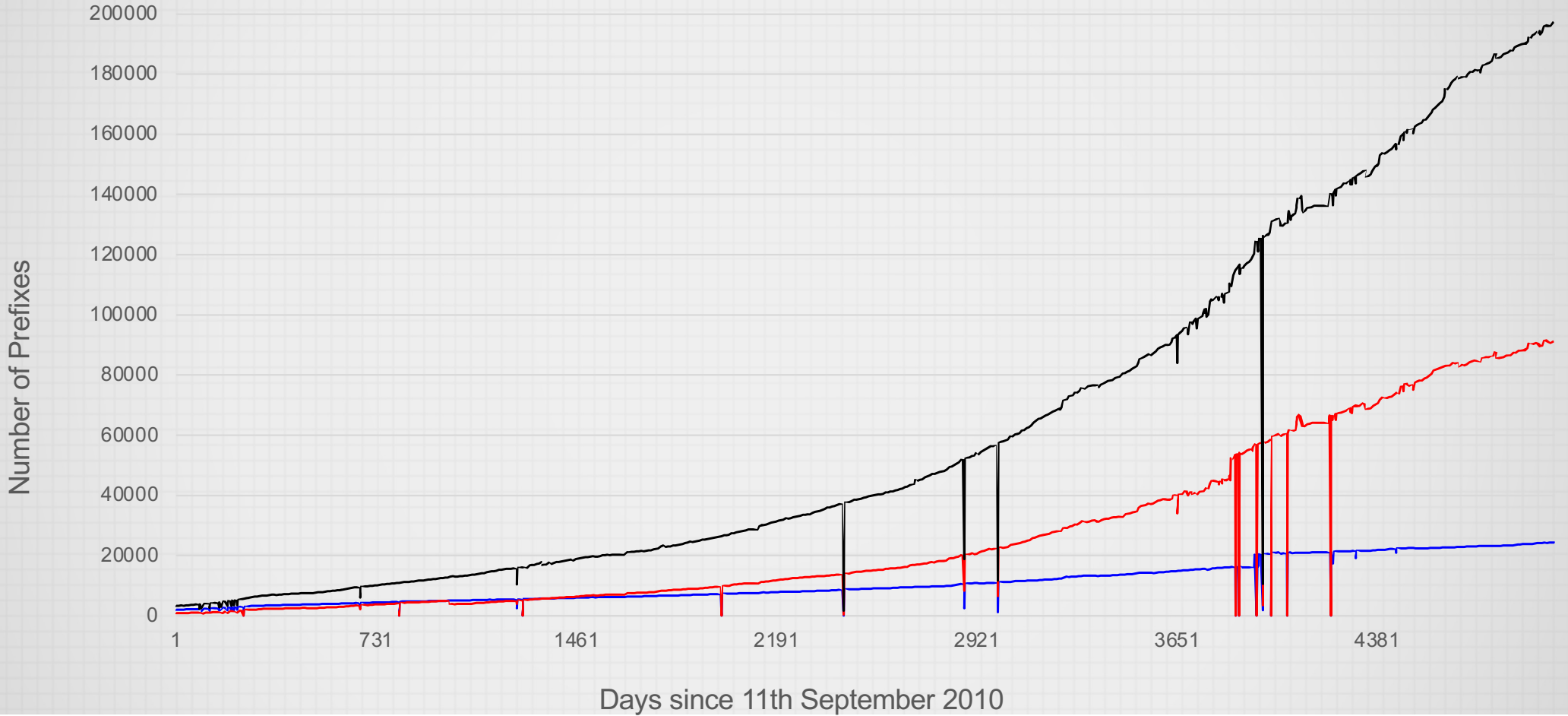
— /24s — Global BGP Table



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IPv6 /32s vs /48s



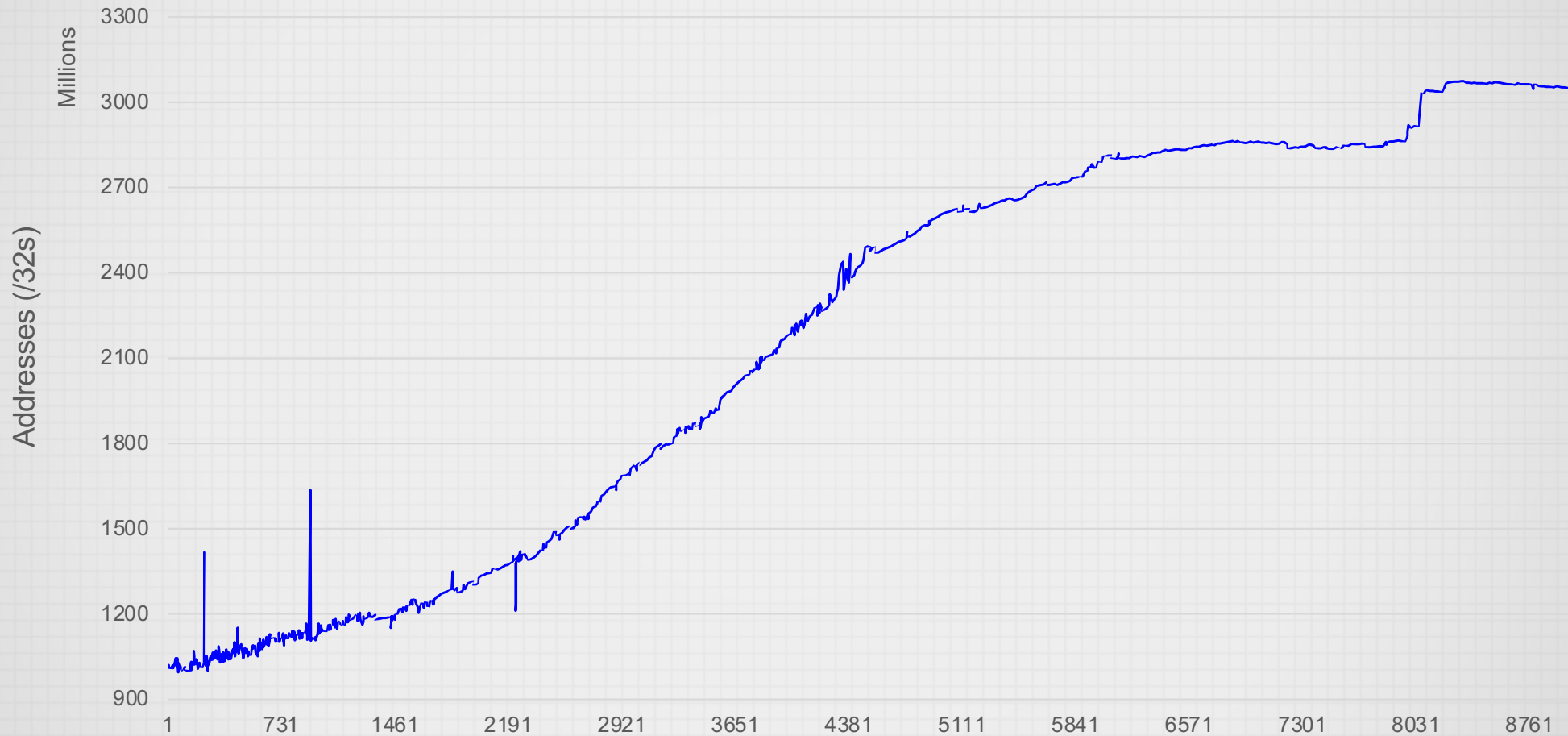
— /32s — /48s — IPv6 Table



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IPv4 Address Space announced



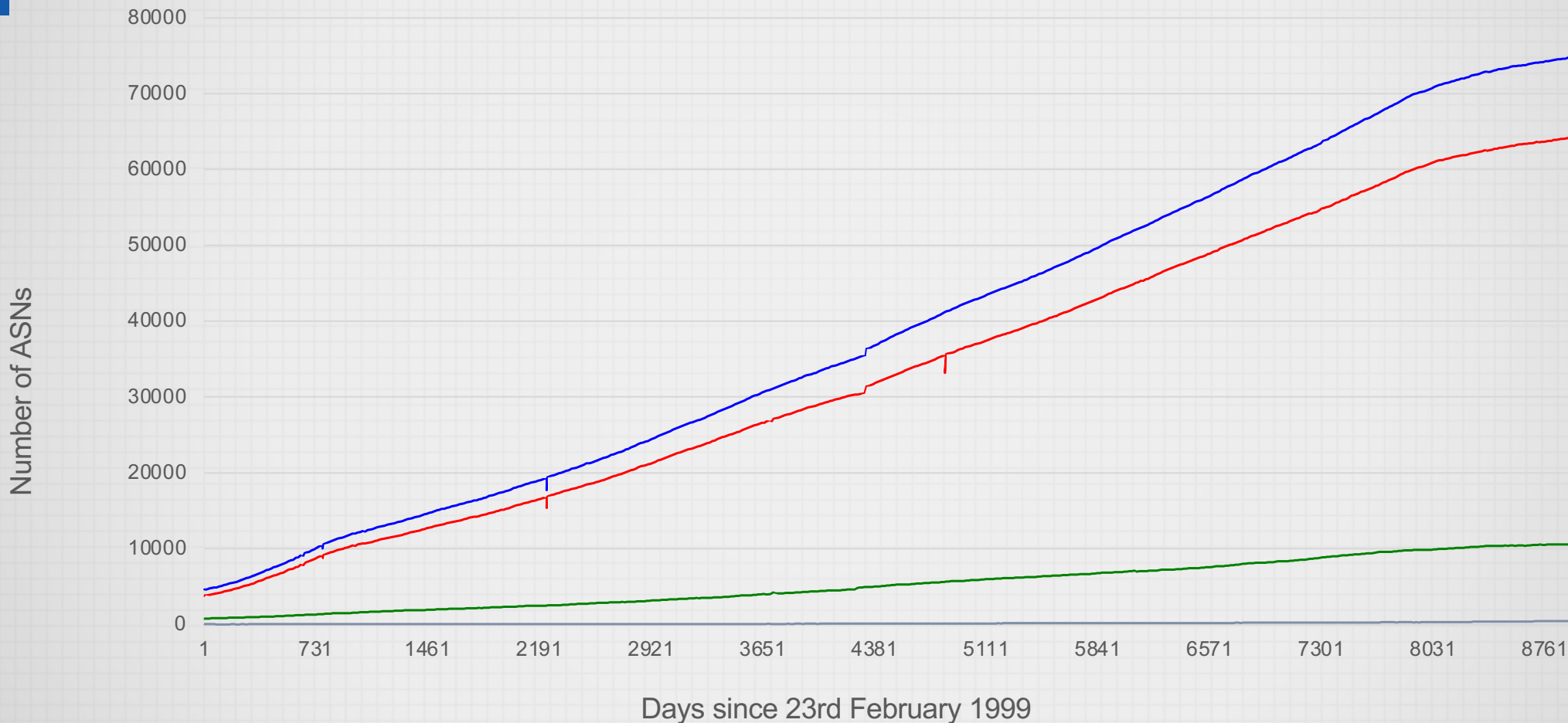
Days since 23rd February 1999



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IPv4 AS Announcements

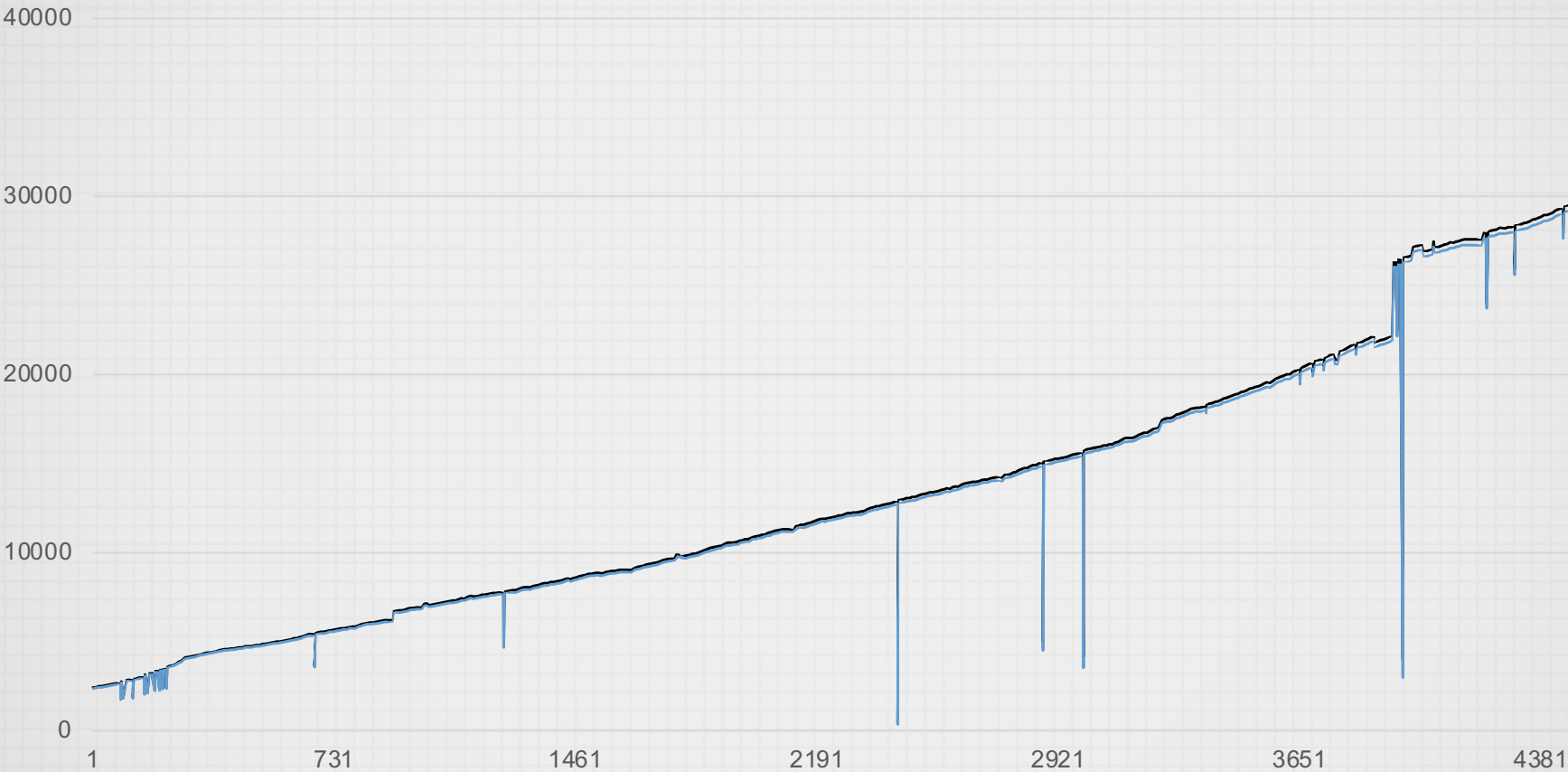


— Total ASNs — Origin-only ASNs — ASN providing Transit & Origin — Transit-only ASNs

IPv6 AS Announcements



Number of ASNs



Days since 11th September 2010

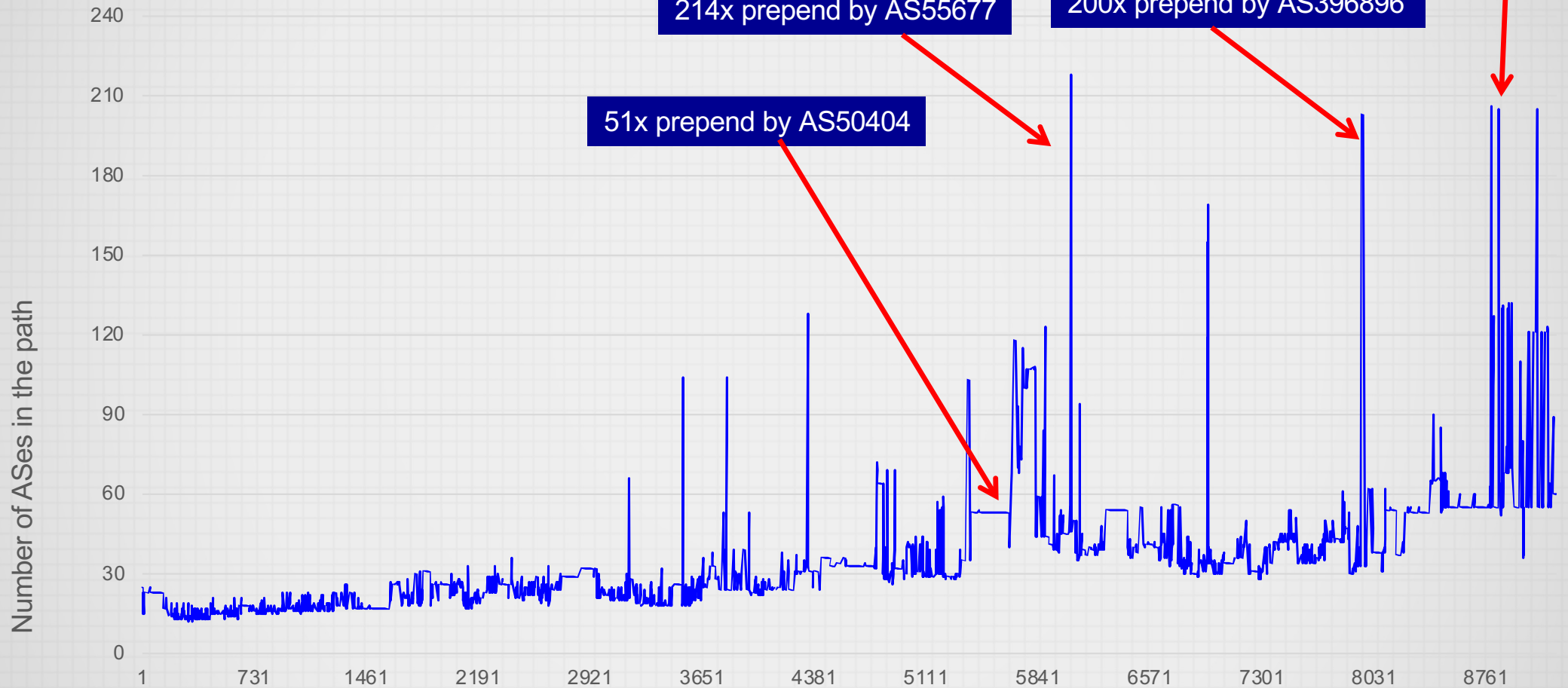
— Total ASNs — Origin-only ASNs



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Maximum AS Path Length



Days since 23rd February 1999



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Looking at Deaggregation in IPv4

- Deaggregation 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/>
 - For R&E networks worldwide
 - <https://bgp.nsrc.org/REN/>
 - For ISO-3166 economies
 - <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”



June 2024

Total Prefixes

- Global BGP Table
 - 953k prefixes
- North America
 - 277k prefixes
- Europe & Middle East
 - 266k prefixes
- Asia & Pacific
 - 255k prefixes
- Latin America & Caribbean
 - 122k prefixes
- Africa
 - 32k prefixes

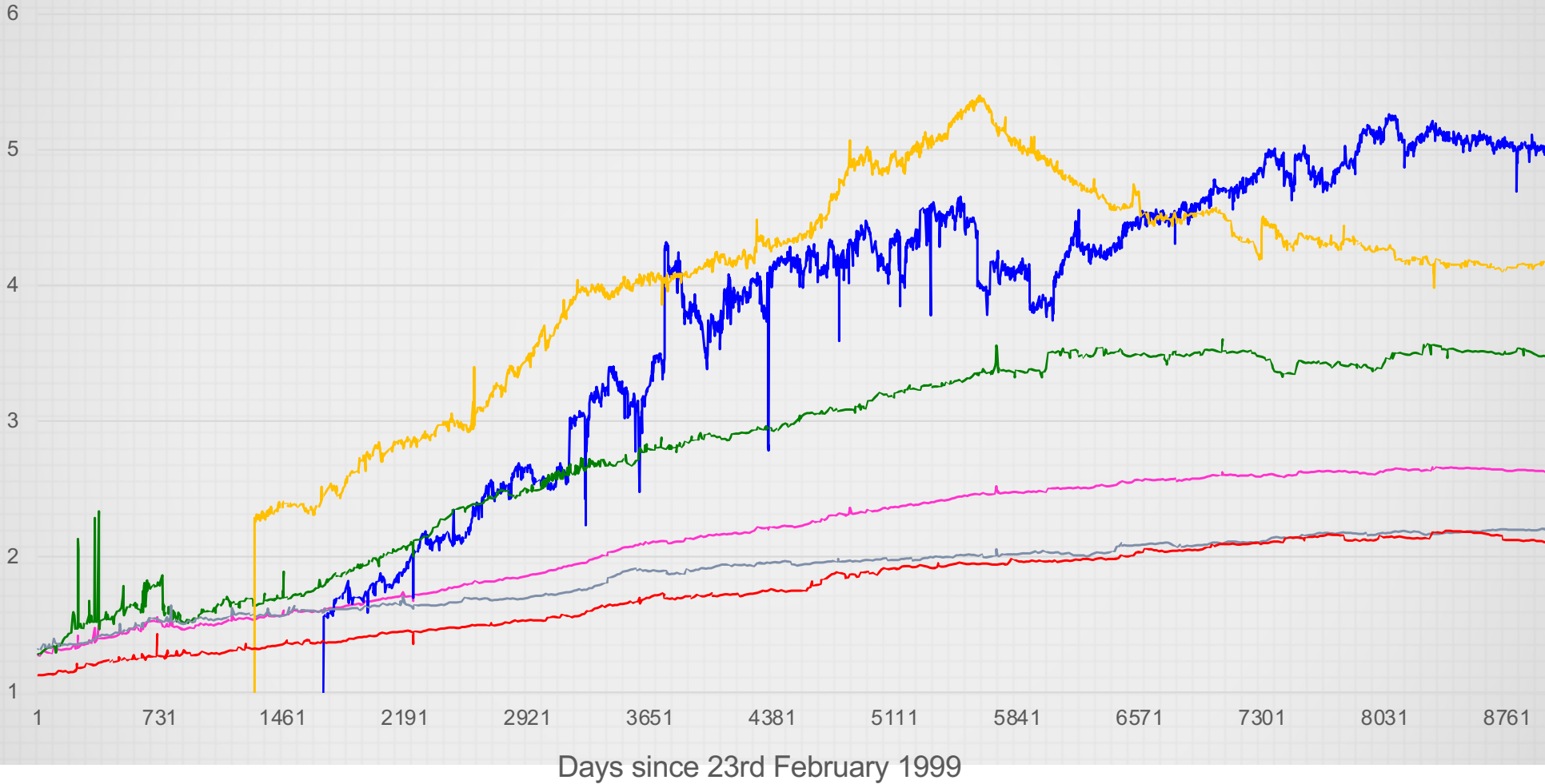
Deaggregation Factor

- Global Average
 - 2.63
- North America
 - 2.21
- Europe & Middle East
 - 2.09
- Asia & Pacific
 - 3.44
- Latin America & Caribbean
 - 4.22
- Africa
 - 5.09



Deaggregation: RIR Regions vs Global

Ratio



— Global — AfriNIC — APNIC — ARIN — LACNIC — RIPE

Asia Pacific Aggregation Savings Summary

ASN	No of Nets	Savings	Description
9808	9856	9780	CHINAMOBILE-CN China Mobile Communications Grou
7545	5643	4970	TPG-INTERNET-AP TPG Telecom Limited, AU
4538	4929	4855	ERX-CERNET-BKB China Education and Research Net
18403	4196	4173	FPT-AS-AP FPT Telecom Company, VN
7552	3946	3925	VIETEL-AS-AP Viettel Group, VN
7713	3593	3530	TELKOMNET-AS-AP PT Telekomunikasi Indonesia, ID
9498	3779	3517	BBIL-AP BHARTI Airtel Ltd., IN
45899	3279	3174	VNPT-AS-VN VNPT Corp, VN
24560	2823	2423	AIRTELBROADBAND-AS-AP Bharti Airtel Ltd., Telem
45090	2186	2107	TENCENT-NET-AP Shenzhen Tencent Computer System
4755	2200	2002	TATACOMM-AS TATA Communications formerly VSNL i
9829	1975	1939	BSNL-NIB National Internet Backbone, IN
23969	1944	1928	TOT-NET TOT Public Company Limited, TH
4766	2290	1712	KIXS-AS-KR Korea Telecom, KR
45609	1910	1596	BHARTI-MOBILITY-AS-AP Bharti Airtel Ltd. AS for
56047	1516	1468	CMNET-HUNAN-AP China Mobile communications corp
56046	1549	1445	CMNET-JIANGSU-AP China Mobile communications co
56041	1510	1439	CMNET-ZHEJIANG-AP China Mobile communications c
9583	1842	1304	SIFY-AS-IN Sify Limited, IN
17557	1269	1238	PKTELECOM-AS-PK Pakistan Telecommunication Comp

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

Papua New Guinea Aggregation Savings Summary

ASN	No of Nets	Savings	Description
58460	47	34	DIGICELPNG-AS-AP Digicel PNG Ltd, PG
55792	44	41	DATEC-PNG-AS-AP Datec-PNG, PG
38009	23	21	TELIKOM-PNG-AS-AP Telikom PNG Satellite Tier 1
139898	16	12	DCL-AS-AP Digitec Communications Limited, PG
17828	7	1	PNGDATACOLIMITED-AS-PG PNG DATACO LTD, PG
134151	6	5	STC-AS-AP Steamships Ltd, PG
63945	6	4	DIGITECPNG-AS-AP Digitec PNG Limited, PG
136587	4	1	PNGDATACOLIMITED-AS-AP PNG DATACO LIMITED, PG
136239	4	2	CLICKPACIFICLTD-AS-AP CLICK PACIFIC LTD, PG
133137	4	3	BEMOBILEPNG-AS-AP Bemobile LTD, PG
45924	3	1	GLOBAL-AS-AP Global Technologies Limited, PG
152477	2	1	LBL-AS-AP LOTIC Bige Limited, PG
151398	2	1	CCPL-AS-AP Credit Corporation PNG Limited, PG
138519	2	1	EXCITE-AS-AP Excite Limited, PG
136940	2	1	COMSATLTD-AS-AP ComSat Ltd, PG

New Caledonia Aggregation Savings Summary

ASN	No of Nets	Savings	Description
18200	16	9	OPT-NC-AS-AP Office des Postes et Telecommunica
17480	8	1	CANL CANL, NC
45345	5	1	NAUTILE-NC-AS-AP Nautile, NC
45461	4	1	TELENET-AS-AP TeleNet, NC
136402	3	2	NTL-NC-AS-AP Nautile SARL, NC
134405	3	1	DATASERVICESPACIFIC-AS-AP Data Services Pacific

Fiji Aggregation Savings Summary

ASN	No of Nets	Savings	Description
4638	93	80	IS-FJ-AS Telecom Fiji Limited, FJ
38442	25	21	VODAFONEFIJI-AS-FJ Vodafone Fiji Limited, FJ
45355	10	2	DIGICELPACIFIC-1-AP Digicel Fiji Limited, FJ
141470	7	6	GOVNET-AS-AP ITC Services, FJ
45349	6	3	TFL-AS-AP Telecom Fiji Ltd, FJ
9241	5	3	FINTEL-FJ Fiji International Telecommunications

Solomon Islands Aggregation Savings Summary

ASN	No of Nets	Savings	Description
45891	23	21	SBT-AS-AP Solomon Telekom Co Ltd, SB
132468	9	3	SATSOL-NET-SB SATSOL LIMITED, SB
132462	4	3	BEMOBILESI-AS-AP Bemobile Solomon Islands Ltd,
139609	2	1	SISCC-AS-AP Solomon Islands Submarine Cable Com

Vanuatu Aggregation Savings Summary

ASN	No of Nets	Savings	Description
9249	33	29	VUTELECOM-AS01-VU-AP Telecom Vanuatu Limited, V
43357	12	4	OWL Owl Limited, VU
45935	11	7	WNL-AS-AP Wantok Network Limited, VU
132254	2	1	PRIMADC-AS-AP PRIMA DC LIMITED, VU

Federated States of Micronesia Aggregation Savings Summary

ASN	No of Nets	Savings	Description
45193	5	2	AS45193 FSM Telecommunications Corporation, FM
38875	5	2	AS38875 FSM Telecommunications Corporation, FM
139759	4	2	FMTELECOM-AS-AP FSM Telecommunications Corporat
58524	4	2	AS58524 FSM Telecommunications Corporation, FM

French Polynesia Aggregation Savings Summary

ASN	No of Nets	Savings	Description
9471	207	187	ONATI-AS-AP ONATI, PF
56017	21	18	VITI-AS-PF VITI, PF
138179	13	6	PMT-AS-AP PACIFIC MOBILE TELECOM, PF
55943	12	7	ONATI-AS-AP ONATI, PF

Palau Aggregation Savings Summary

ASN	No of Nets	Savings	Description
17893	5	3	PALAU-AS-AP Palau National Communications Corp.
133897	2	1	PEACCDPT-AS-AP Palau Equipment Co. Inc., PW
58932	2	1	PMCI-AS-AP Palau Mobile Communications Inc., PW

Samoa Aggregation Savings Summary

ASN	No of Nets	Savings	Description
17993	38	35	VODAFONESAMOA-AS-AP Vodafone Samoa Limited, WS
38800	6	1	DIGICELSAMOA-WS-AS-AP Digicel Samoa Ltd, WS
38227	3	1	CSLSAMOA-WS-AS-AP Computer Services Limited CSL

Tonga Aggregation Savings Summary

ASN	No of Nets	Savings	Description
132831	8	3	EZINET-AS-AP EziNET Limited, TO
38201	8	1	KALIANET-PUBLIC-AS-AP Tonga Communications Inte
38198	4	3	DIGICELNET-TO Digicel Tonga Ltd, TO

Guam Aggregation Savings Summary

ASN	No of Nets	Savings	Description
3605	22	13	ERX-KUENTOS-AS Guam Cablevision, LLC., GU
9246	11	3	GTA-AP Teleguam Holdings, LLC, GU
395400	4	2	UNIVERSITY-GUAM, GU

Nauru Aggregation Savings Summary

ASN	No of Nets	Savings	Description
55722	4	3	CENPAC-AS-AP Cenpac Net Inc, NR
141368	3	2	ICT-NR-AS-AP ICT, NR

Tokelau Aggregation Savings Summary

ASN	No of Nets	Savings	Description
198147	2	1	TK2, TK
57382	2	1	TK1, TK

American Samoa Aggregation Savings Summary

ASN	No of Nets	Savings	Description
23657	41	36	BLUESKY-AS-AP Blue Sky Communications, AS
9751	19	6	ASTCA-AS-AP AMERICAN SAMOA TELECOMMUNICATIONS A

Kiribati Aggregation Savings Summary

ASN	No of Nets	Savings	Description
134783	12	9	ATHKL-AS-AP Amalgamated Telecom Holdings Kiriba
132486	3	2	OCEANLINKLTD-AS-AP OCEAN LINK LTD, KI

Wallis & Fotuna Aggregation Savings Summary

ASN	No of Nets	Savings	Description
45879	14	11	OWF-AS-AP Orange Wallis & Futuna, WF

Northern Marianas Aggregation Savings Summary

ASN	No of Nets	Savings	Description
7131	82	66	PTIPACIFICAINC-AS-AP PTI Pacifica Inc., MP

Cook Islands Aggregation Savings Summary

ASN	No of Nets	Savings	Description
10131	34	33	CKTELECOM-CK-AP Telecom Cook Islands, CK

Niue Aggregation Savings Summary

ASN	No of Nets	Savings	Description
55885	5	4	ISP-NU No. 1 Commercial Center, NU

Tuvalu Aggregation Savings Summary

ASN	No of Nets	Savings	Description
23917	6	1	TUVALU-TELECOM-AS-AP Tuvalu Telecom, TV

Collector Deployment

Locations

- At Internet Exchange Points
 - Or DataCentres hosting major interconnections
- Goal is to maximise opportunities for Autonomous Networks to peer with the RouteViews collector
- There are also multi-hop collectors hosted at the University of Oregon

Collector

- One interface on the IXP peering LAN
 - Peering with operators who wish to supply a BGP feed to the RouteViews collector
- One interface for management and backhaul
 - Managing the collector
 - Sending the collected BGP table & BGP updates for archival at the University of Oregon

Collector Data

Multi-Threaded Routing Toolkit (MRT)

- <https://tools.ietf.org/html/rfc6396>
- MRT provides a standard for parsing or dumping routing information to a binary file.
- RouteViews Dumps consist of BGP RIBs and UPDATES
 - RIBs are archived every 2 hours
 - UPDATES are archived every 15 minutes

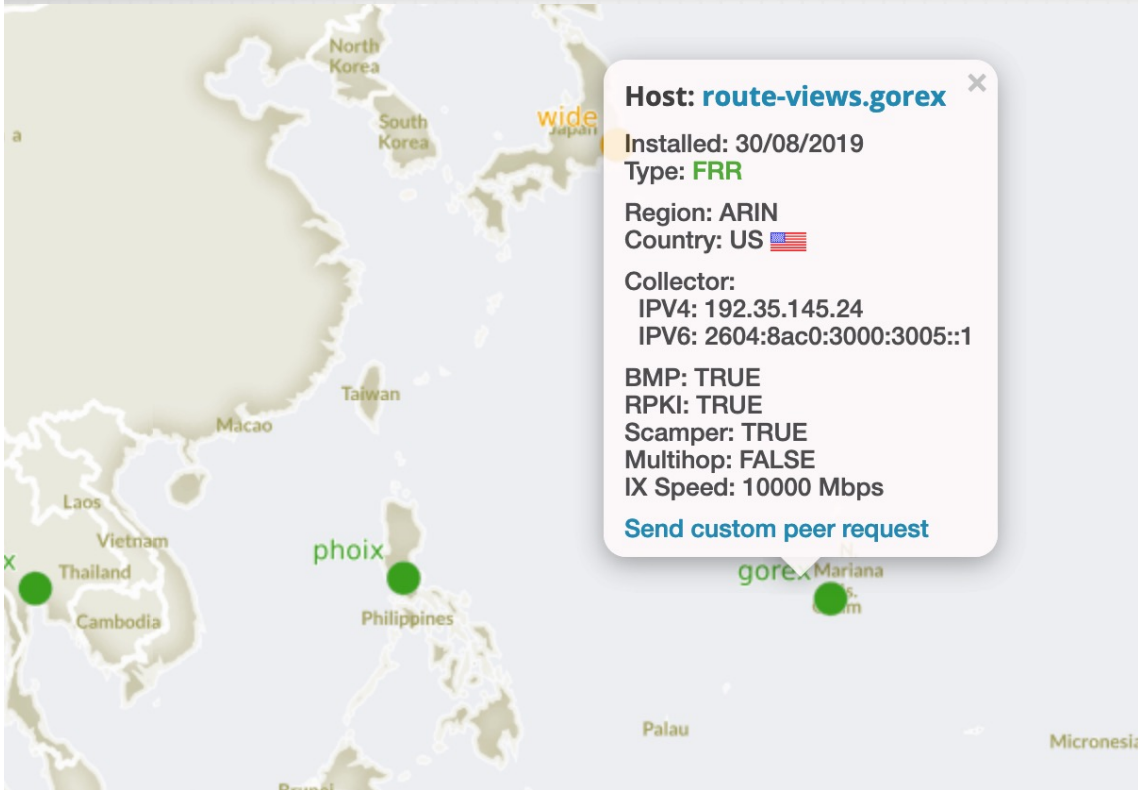
Data Access

- MRT files are bziped and rsynced back to <http://archive.routeviews.org/> on above schedule
- They can be accessed via http, ftp and rsync
- Map view tool is interactive

Direct BGP Monitoring Protocol Feed (BMP)

- New Model, development under way to make this scale
- BMP upstream from collectors, not FROM peers

Collector Data



Index of /route-views.gorex/bgpdata

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
Parent Directory		-	
2019.08/	2019-08-27 17:06	-	
2019.09/	2019-08-27 17:06	-	
2019.10/	2019-09-29 09:01	-	
2019.11/	2019-10-29 09:01	-	
2019.12/	2019-11-29 09:01	-	
2020.01/	2019-12-29 09:01	-	
2020.02/	2020-01-29 09:01	-	
2020.03/	2020-02-29 09:01	-	
2020.04/	2020-03-29 09:01	-	
2020.05/	2020-04-29 09:01	-	
2020.06/	2020-05-29 09:01	-	

<http://archive.routeviews.org/route-views.gorex/bgpdata/>

Operations

Access

- BGP is the backbone of the Global Routing Infrastructure.
- To ensure its stability, it needs to be constantly monitored.
- RouteViews provides:
 - Command-Line/Looking Glass
 - Prefix Visibility, Verify Convergence, Path Stability
 - Comparing Local/Regional/Global Views
 - Troubleshooting Reachability
 - Access to historical BGP data, i.e. “When did this happen??”

Operations

Looking Glass

- Looking Glass front-end as an alternative access is being tested
- This will likely replace the telnet access in the near future

ROUTE VIEWS 6447 Looking Glass

TYPE OF QUERY	ADDITIONAL PARAMETERS	NODE
<input checked="" type="radio"/> bgp		RouteViews (Uni of Oregon) ✓ route-views
<input type="radio"/> bgp regexp		Accra (GIXA) route-views.gixa
<input type="radio"/> rpki table		Amsterdam (AMS-IX) route-views.amsix
<input type="radio"/> rpki prefix		Asburn (Equinix) route-views.eqix
<input type="radio"/> rpki ASN		Atlanta (TELX) route-views.telxatl
<input type="radio"/> ping		Bangkok (BKNIX) route-views.bknix
<input type="radio"/> traceroute		Belgrade (SOXRS) route-views.soxrs
IPv4		Chicago (Equinix) route-views.chicago
		Dhaka (BDIX) route-views.bdix
		Dubai (UAEIX) route-views.uaeix

Submit Reset

Disclaimer: All commands are logged for possible analysis and statistics please disconnect now.

Use Cases

New(er) Collector Features

BMP

- BMP data will feed tools like BGPStream and ARTEMIS.
- Or write your own Kafka consumer for raw BMP data.
- Limited access during trial period.
- Wider availability to follow on completion of trials.

RPKI

- RPKI data is accessible directly from the collectors.
- We also are establishing an archive of RPKI ROA data.
- Working on back-filling that data set from the RIR/CAs.

Use Cases – Multihop Collector

Operations

```
route-views2.routeviews.org$ sh bgp sum
```

```
IPv4 Unicast Summary (VRF default):  
BGP router identifier 128.223.51.102, local AS number 6447 vrf-id 0  
BGP table version 2376140  
RIB entries 1842070, using 169 MiB of memory  
Peers 32, using 644 KiB of memory
```

32 peers, multi-hop

Lots of full tables

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd	PfxSnt	Desc
12.0.1.63	4	7018	278377	377	2376140	0	0	06:14:18	938553	0	ATT
37.139.139.17	4	57866	281167	751	2376140	0	0	06:14:18	941733	0	Fusix
45.61.0.85	4	22652	430462	754	2376140	0	0	05:30:45	943602	0	FIBRENOIRE
62.115.128.137	4	1299	1145666	377	2376140	0	0	06:14:18	919817	0	Telia
64.71.137.241	4	6939	222621	376	2376140	0	0	06:14:18	961672	0	Hurricane Electric
77.39.192.30	4	20912	199676	2247	2376140	0	0	06:14:18	942334	0	PANSERVICE
87.121.64.4	4	57463	124693	375	2376140	0	0	06:13:35	483102	0	NETIXLTD
89.149.178.10	4	3257	301777	377	2376140	0	0	06:14:18	939075	0	Tiscali
91.218.184.60	4	49788	280255	376	2376140	0	0	06:14:18	943183	0	NEXTHOPNO
94.156.252.18	4	34224	365615	376	2376140	0	0	06:14:17	965856	0	NETERRA
105.16.0.247	4	37100	304500	746	2376140	0	0	06:11:16	942394	0	SEACOM
129.250.1.71	4	2914	267752	751	2376140	0	0	06:14:18	939523	0	NTT-A
137.164.16.84	4	2152	219827	376	2376140	0	0	06:14:18	941035	0	CENIC
140.192.8.16	4	20130	247609	751	2376140	0	0	06:14:18	964417	0	DEPAULEDU
144.228.241.130	4	1239	4442	377	2376140	0	0	06:14:17	45863	0	Sprint
147.28.7.1	4	3130	421	376	2376140	0	0	06:14:18	14	0	RGnet, LLC
147.28.7.2	4	3130	262297	377	2376140	0	0	06:14:18	918899	0	RGnet, LLC
162.251.163.2	4	53767	40301	751	2376140	0	0	06:14:18	166509	0	ICASTCENTER

Use Cases – GOREX Collector

Operations

```
route-views.gorex.routeviews.org> sh bgp sum
```

```
IPv4 Unicast Summary (VRF default):  
BGP router identifier 192.35.145.24, local AS number 6447 vrf-id 0  
BGP table version 11044739  
RIB entries 217010, using 20 MiB of memory  
Peers 3, using 60 KiB of memory
```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd	PfxSnt	Desc
103.115.193.252	4	65534	2475264	55835	11044739	0	0	2d18h41m	96738	0	MARIIX RS
103.115.193.253	4	65534	2524970	223296	11044739	0	0	2d18h33m	96740	0	MARIIX RS
192.35.145.24	4	35889	179378	111711	11044739	0	0	05w3d18h	2067	0	GOREX RS

```
Total number of neighbors 3
```

```
IPv6 Unicast Summary (VRF default):  
BGP router identifier 192.35.145.24, local AS number 6447 vrf-id 0  
BGP table version 4952098  
RIB entries 128967, using 12 MiB of memory  
Peers 3, using 60 KiB of memory
```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd	PfxSnt	Desc
2001:de9:4000::fc	4	65534	1598486	55836	4952098	0	0	2d18h41m	61256	0	MARIIX RS
2001:de9:4000::fd	4	65534	1749575	223310	4952098	0	0	2d18h33m	61256	0	MARIIX RS
2604:8ac0:3000:3005::1	4	35889	122006	111711	4952098	0	0	05w3d18h	220	0	GOREX RS

```
Total number of neighbors 3
```

MARIIX & GOREX

3 peers

Use Cases

Operations

```
route-views7.routeviews.org# sh ip bgp 45.181.4.0/24
BGP routing table entry for 45.181.4.0/24, version 54948963
Paths: (8 available, best #2, table default)
  Not advertised to any peer
...
924 835 16735 53062 262698 269289
  185.121.168.42 from 185.121.168.42 (10.20.30.40)
    Origin IGP, valid, external, best (Older Path), rpki validation-state: not found
    Community: 835:11103 924:90 924:601 924:690 16735:111 16735:7000 16735:7203 16735:53062 24115:16735 24115:24115 24115:65023
53062:10020 53062:10021 53062:30004 53062:30007 53062:30009 53062:30011 53062:30013 53062:30045 53062:30049 53062:30058 53062:30091
53062:30092 53062:30105 53062:30114 53062:30115 53062:30117 53062:30122 53062:30130 53062:30136 53062:30152 53062:30156 53062:30161
53062:30168 53062:30182 53062:30183 53062:30184 53062:30185 53062:30186 53062:30187 53062:30188 53062:30191 53062:30198 53062:30200
53062:30203 53062:30208 53062:30217 53062:30222 53062:30228 53062:30232 53062:30235 53062:30239 53062:30244 53062:30250 53062:30255
53062:30263 53062:30274 53062:30278 53062:30287 53062:30291 53062:30296 53062:30301 53062:30305 53062:30317 53062:30328 53062:30344
53062:30355 53062:30357 53062:30369
  Large Community: 924:1:90 924:600:90 924:601:101 24115:1000:2 24115:1001:1 24115:1002:1 24115:1003:26 24115:1004:16735
53062:11:3692 53062:12:81 53062:13:48
  Last update: Thu Jun 20 04:03:53 2024
  37989 18106 263444 262316 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289
269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289
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269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289 269289
203.123.48.6 from 203.123.48.6 (203.123.48.6)
  Origin IGP, valid, external, rpki validation-state: not found
  Community: 13538:2000
  Last update: Sun Jun 16 10:17:30 2024
```

What is AS269289 trying to achieve by prepending 101 times??

What is AS53062 trying to achieve with all these communities??

Use Cases

Invalid ROAs

```
route-views7.routeviews.org$ sh ip bgp rpki invalid
BGP table version is 22488840, local router ID is 128.223.51.113, vrf id 0
Default local pref 100, local AS 6447
Status codes:  s suppressed, d damped, h history, * valid, > best, = multipath,
                i internal, r RIB-failure, S Stale, R Removed
Nexthop codes: @NNN nexthop's vrf id, < announce-nh-self
Origin codes:  i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
```

	Network	Next Hop	Metric	LocPrf	Weight	Path
I*	1.6.168.0/24	203.123.48.6	0	37989	56300	132132 4657 6453 4755 9583 ?
I*=		178.132.82.72	0	57344	6453	4755 9583 ?
I*		103.26.26.1	0	150369	17676	6453 4755 9583 ?
I*		103.26.26.4	0	150369	17676	6453 4755 9583 ?
I*>		178.132.82.71	0	57344	6453	4755 9583 ?
I*	1.6.169.0/24	203.123.48.6	0	37989	56300	132132 4657 6453 4755 9583 i
I*=		178.132.82.72	0	57344	6453	4755 9583 i
I*		103.26.26.1	0	150369	17676	6453 4755 9583 i
I*		103.26.26.4	0	150369	17676	6453 4755 9583 i
I*>		178.132.82.71	0	57344	6453	4755 9583 i
...						

RouteViews Impact

Geoff Huston wrote in his report, “BGP in 2022 – the routing table”:

“I should take a moment to mention the [RouteViews Project](#). It was originally intended to offer a multi-perspective real-time view of the inter-domain routing system, allowing network operators to examine the current visibility of route objects from various points in the inter-domain topology.

*What makes RouteViews so unique is that it archives these routing tables every two hours and has done so for more than two decades. It also archives every BGP update message. **This vast collection of data is a valuable research data source in its own right**, and here we are just taking a tiny slice of this data set to look at longer-term routing growth trends.*

The folk at the RouteViews Project, with support from the University of Oregon and the US National Science Foundation, should be commended for their efforts here. This is a very unique data set if you are interested in the evolution of the Internet over the years.”

RouteViews Impact

Aftab Siddiqui

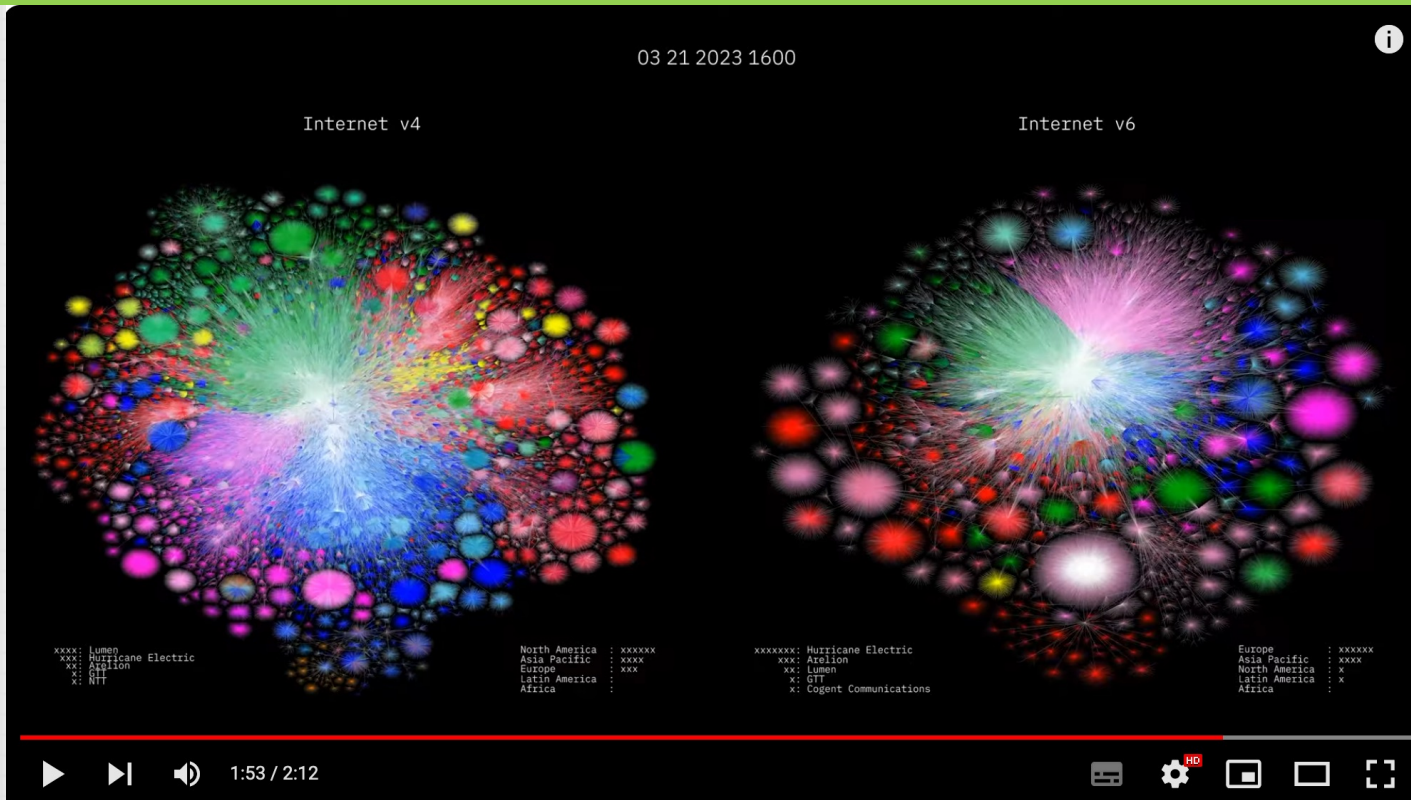
*"The MANRS Observatory relies heavily on BGPStream and GRIP for the detection of BGP related incidents such as BGP Leaks and BGP mis-origination. It is also very critical to verify that any incident highlighted by these services can be verified independently and to do that **we require raw BGP data which is made available by 2 sources: RIPE RIS and RouteViews.** Diversity of data sources is once again very important to verify any such incidents. NSRC, which manages the RouteViews project, ensures that the routing data they provide is accurate and they have promptly addressed any issues or concerns raised by the MANRS team, whether it is related to changes in the MRT format causing problems in data parsing or helping with BMP data. **Actively maintaining RouteViews provides community service by NSRC.**"*

MANRS has gained a lot of good reputation in the community due to the support and expertise provided by its partners such as NSRC. NSRC included MANRS Action explanation and implementation guidelines in their training courses for network operators and R&E networks, in their technical video content, and has been promoting various MANRS programs to respective communities specifically in Asia Pacific and Africa where the MANRS participation is low as compared to other regions."

RouteViews Impact

Barrett Lyon:

<https://www.youtube.com/watch?v=vo5gIK9czIE>





THANK YOU

Questions?