



# Internet Routing Table Analysis Update

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SANOG IV

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# Motivation

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- 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 reporting report started early 1999:
  - Routing table size
  - CIDR-Report style reporting on a per-RIR basis
  - ...and many other interesting features

## Routing Report      28 July 2004

BGP routing table entries examined	142886
Prefixes after maximum aggregation	85675
Unique aggregates announced to Internet	68792
Total ASes present in the Internet Routing Table	17668
Origin-only ASes present in the Internet Routing Table	15327
Origin ASes announcing only one prefix	7175
Transit ASes present in the Internet Routing Table	2341
Transit-only ASes present in the Internet Routing Table	76
Average AS path length visible in the Internet Routing Table	4.8
Max AS path length visible	26
Prefixes from unregistered ASNs in the Routing Table	3
Special use prefixes present in the Routing Table	0
Prefixes being announced from unallocated address space	19
Number of addresses announced to Internet	1305241632
Equivalent to 77 /8s, 204 /16s and 104 /24s	
Percentage of available address space announced	35.2
Percentage of allocated address space announced	57.8
Percentage of available address space allocated	60.9
Total number of prefixes smaller than registry allocations	65576

## APNIC Region

Prefixes being announced by APNIC Region ASes	27352
Total APNIC prefixes after maximum aggregation	13963
Prefixes being announced from the APNIC address blocks	25592
Unique aggregates announced from the APNIC address blocks	14060
APNIC Region origin ASes present in the Internet Routing Table	2086
APNIC Region origin ASes announcing only one prefix	623
APNIC Region transit ASes present in the Internet Routing Table	328
Average APNIC Region AS path length visible	4.9
Max APNIC Region AS path length visible	16
Number of APNIC addresses announced to Internet	153754624
Equivalent to 9 /8s, 42 /16s and 28 /24s	
Percentage of available APNIC address space announced	70.2

APNIC AS Blocks	4608 - 4864, 7467 - 7722, 9216 - 10239 17408 - 18431, 23552 - 24575
APNIC Address Blocks	58/7, 60/7, 202/7, 210/7, 218/7, 220/7 and 222/8

## ARIN Region

Prefixes being announced by ARIN Region ASes	81759
Total ARIN prefixes after maximum aggregation	50096
Prefixes being announced from the ARIN address blocks	63503
Unique aggregates announced from the ARIN address blocks	22078
ARIN Region origin ASes present in the Internet Routing Table	9338
ARIN Region origin ASes announcing only one prefix	3352
ARIN Region transit ASes present in the Internet Routing Table	925
Average ARIN Region AS path length visible	4.6
Max ARIN Region AS path length visible	18
Number of ARIN addresses announced to Internet	228019488
Equivalent to 13 /8s, 151 /16s and 77 /24s	
Percentage of available ARIN address space announced	75.5

ARIN AS Blocks	1 - 1876, 1902 - 2042, 2044 - 2046, 2048 - 2106
	2138 - 2584, 2615 - 2772, 2823 - 2829, 2880 - 3153
	3354 - 4607, 4865 - 5119, 5632 - 6655, 6912 - 7466
	7723 - 8191, 10240 - 12287, 13312 - 15359
	16384 - 17407, 18432 - 20479, 21504 - 23551
	25600 - 26591, 26624 - 27647, 29695 - 30719
	31744 - 33791
ARIN Address Blocks	24/8, 63/8, 64/6, 68/7, 70/8, 198/7, 204/6, 208/7 and 216/8

## RIPE NCC Region

Prefixes being announced by RIPE Region ASes	26412
Total RIPE prefixes after maximum aggregation	18688
Prefixes being announced from the RIPE address blocks	23208
Unique aggregates announced from the RIPE address blocks	15435
RIPE Region origin ASes present in the Internet Routing Table	5691
RIPE Region origin ASes announcing only one prefix	3066
RIPE Region transit ASes present in the Internet Routing Table	975
Average RIPE Region AS path length visible	5.4
Max RIPE Region AS path length visible	26
Number of RIPE addresses announced to Internet	167645760
Equivalent to 9 /8s, 254 /16s and 18 /24s	
Percentage of available RIPE address space announced	58.8

RIPE AS Blocks      1877 - 1901, 2043, 2047, 2107 - 2136, 2585 - 2614  
                         2773 - 2822, 2830 - 2879, 3154 - 3353, 5377 - 5631  
                         6656 - 6911, 8192 - 9215, 12288 - 13311  
                         15360 - 16383, 20480 - 21503, 24576 - 25599,  
                         28672 - 29695, 30720 - 31743, 33792 - 34815

RIPE Address Blocks 62/8, 80/5, 88/8, 188/8, 193/8, 194/7,  
                         212/7 and 217/8

## LACNIC Region

Prefixes being announced by LACNIC Region ASes	6153
Total LACNIC prefixes after maximum aggregation	2248
Prefixes being announced from the LACNIC address blocks	5797
Unique aggregates announced from the LACNIC address blocks	3511
LACNIC Region origin ASes present in the Internet Routing Table	386
LACNIC Region origin ASes announcing only one prefix	113
LACNIC Region transit ASes present in the Internet Routing Table	74
Average LACNIC Region AS path length visible	5.1
Max LACNIC Region AS path length visible	16
Number of LACNIC addresses announced to Internet	15368960
Equivalent to 0 /8s, 234 /16s and 131 /24s	
Percentage of available LACNIC address space announced	45.8

LACNIC AS Blocks           26592 - 26623, 27648 - 28671

LACNIC Address Blocks   200/7

## **"Emerging Afrinic" Region**

Prefixes being announced by AfrinIC Region ASes	1207
Total AfrinIC prefixes after maximum aggregation	680
Prefixes being announced from the AfrinIC address blocks	817
Unique aggregates announced from the AfrinIC address blocks	645
AfrinIC Region origin ASes present in the Internet Routing Table	91
AfrinIC Region origin ASes announcing only one prefix	21
AfrinIC Region transit ASes present in the Internet Routing Table	13
Average AfrinIC Region AS path length visible	4.8
Max AfrinIC Region AS path length visible	16
Number of AfrinIC addresses announced to Internet	1903616
Equivalent to 0 /8s, 29 /16s and 12 /24s	
Percentage of available AfrinIC address space announced	11.3
AfrinIC AS Blocks	<none>
AfrinIC Address Blocks	196/8



## Global per AS prefix count summary

ASN	No of nets	/20 equiv	Max Agg	Description
7018	1422	6872	991	AT&T
701	1262	8440	930	UUNET Technologies, Inc.
6347	952	390	100	SAVVIS Communications Corpora
1239	942	2875	627	Sprint
3356	888	10929	671	Level 3 Communications, LLC
1221	817	1056	589	Telstra Pty Ltd
4134	810	4064	148	Data Communications Bureau
4323	755	571	213	Time Warner Communications, I
18566	734	192	8	Covad Communications
6197	727	479	303	BellSouth Network Solutions,
702	646	2036	537	UUNET - Commercial IP service
209	614	3427	499	Qwest
721	568	20736	259	DLA Systems Automation Center
20115	566	376	291	Charter Communications
7843	512	673	127	Adelphia Corp.
852	511	1142	399	Telus Advanced Communications
4766	500	2895	265	Korea Internet Exchange for "
9583	490	39	109	Satyam Infoway Ltd.,
7132	486	7897	368	Southwestern Bell Internet Se
6198	450	395	204	BellSouth Network Solutions,

## Global Aggregation Savings Summary

ASN	No of Nets	Net Savings	Description
6347	952	852	SAVVIS Communications Corpora
18566	734	726	Covad Communications
4134	810	662	Data Communications Bureau
4323	755	542	Time Warner Communications, I
6197	727	424	BellSouth Network Solutions,
7843	512	385	Adelphia Corp.
9583	490	381	Satyam Infoway Ltd.,
22909	397	363	Comcast Cable Corporation
5668	381	363	Century Telephone
4755	392	341	Videsh Sanchar Nigam Ltd. Aut
6467	370	337	E.Spire Communications, Inc.
701	1262	332	UUNET Technologies, Inc.
27364	349	330	Armstrong Cable Services
22773	389	329	Cox Communications, Inc. Atla
1239	942	315	Sprint
721	568	309	DLA Systems Automation Center
17676	341	308	XTAGE CORPORATION
11172	352	298	Servicios Alestra S.A de C.V
9929	329	298	China Netcom Corp.
4355	391	290	EarthLink, Inc.

## List of Unregistered AS's

Bad AS	Designation	Network	Transit AS	Description
1877	UNALLOCATED	192.108.199.0/24	1876	Southern Methodist U
63330	RESERVED	213.8.224.0/23	5486	EuroNet Digital Comm
63330	RESERVED	213.8.226.0/23	5486	EuroNet Digital Comm

- 1877 has come and gone from the Internet since this report started!

## Number of prefixes announced by prefix length

/1:0	/2:0	/3:0	/4:0	/5:0	/6:0
/7:0	/8:18	/9:3	/10:6	/11:15	/12:61
/13:127	/14:301	/15:530	/16:7917	/17:2127	/18:3710
/19:9568	/20:10079	/21:7418	/22:10402	/23:11891	/24:78113
/25:213	/26:189	/27:100	/28:34	/29:9	/30:49
/31:0	/32:6				

July 2004 ↑

July 2003 ↓

## Number of prefixes announced by prefix length

/1:0	/2:0	/3:0	/4:0	/5:0	/6:0
/7:0	/8:17	/9:5	/10:8	/11:13	/12:54
/13:97	/14:260	/15:477	/16:7424	/17:1737	/18:3068
/19:8644	/20:8662	/21:6320	/22:9278	/23:10843	/24:69954
/25:177	/26:293	/27:183	/28:27	/29:10	/30:17
/31:0	/32:26				

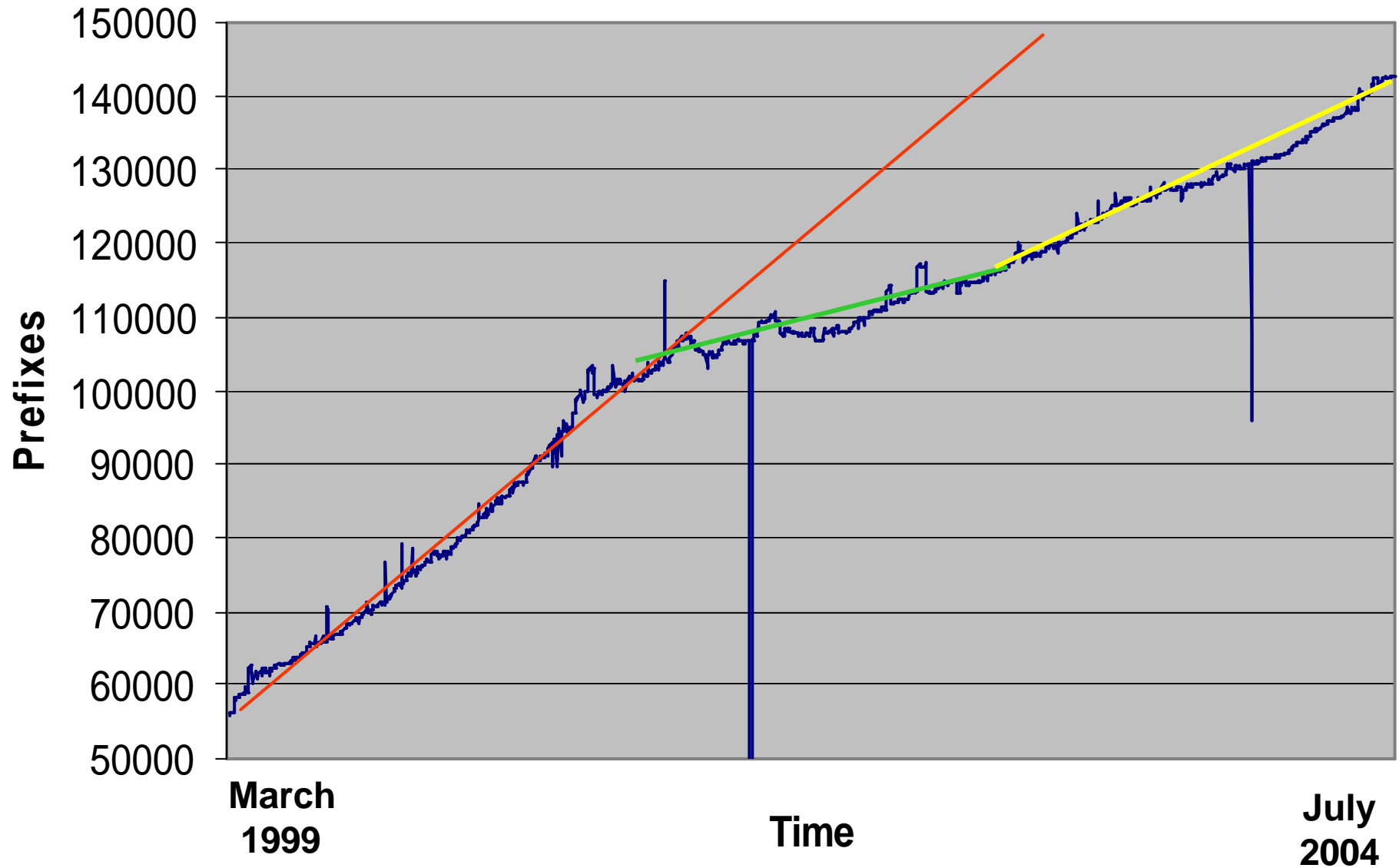
## Advertised IANA Reserved Addresses

Network	Origin AS	Description
132.0.0.0/10	721	DLA Systems Automation Center
137.0.0.0/13	721	DLA Systems Automation Center
156.154.16.0/22	7786	Lockheed Martin IMS
158.0.0.0/13	721	DLA Systems Automation Center
164.234.0.0/18	721	DLA Systems Automation Center
164.234.0.0/16	721	DLA Systems Automation Center
192.43.230.0/24	4738	South Australian Academic Res
192.44.0.0/19	702	UUNET - Commercial IP service
192.70.164.0/24	25689	National Research Council of
192.83.16.0/20	5515	Sonera Solution Autonomous Sy
192.83.32.0/19	5515	Sonera Solution Autonomous Sy
192.83.96.0/22	5515	Sonera Solution Autonomous Sy
192.83.100.0/24	5515	Sonera Solution Autonomous Sy
192.84.205.0/24	719	LANLINK autonomous system
192.119.135.0/24	270	NASA
192.135.50.0/24	7018	AT&T
192.136.79.0/24	719	LANLINK autonomous system
192.172.0.0/19	721	DLA Systems Automation Center
192.172.11.0/24	721	DLA Systems Automation Center

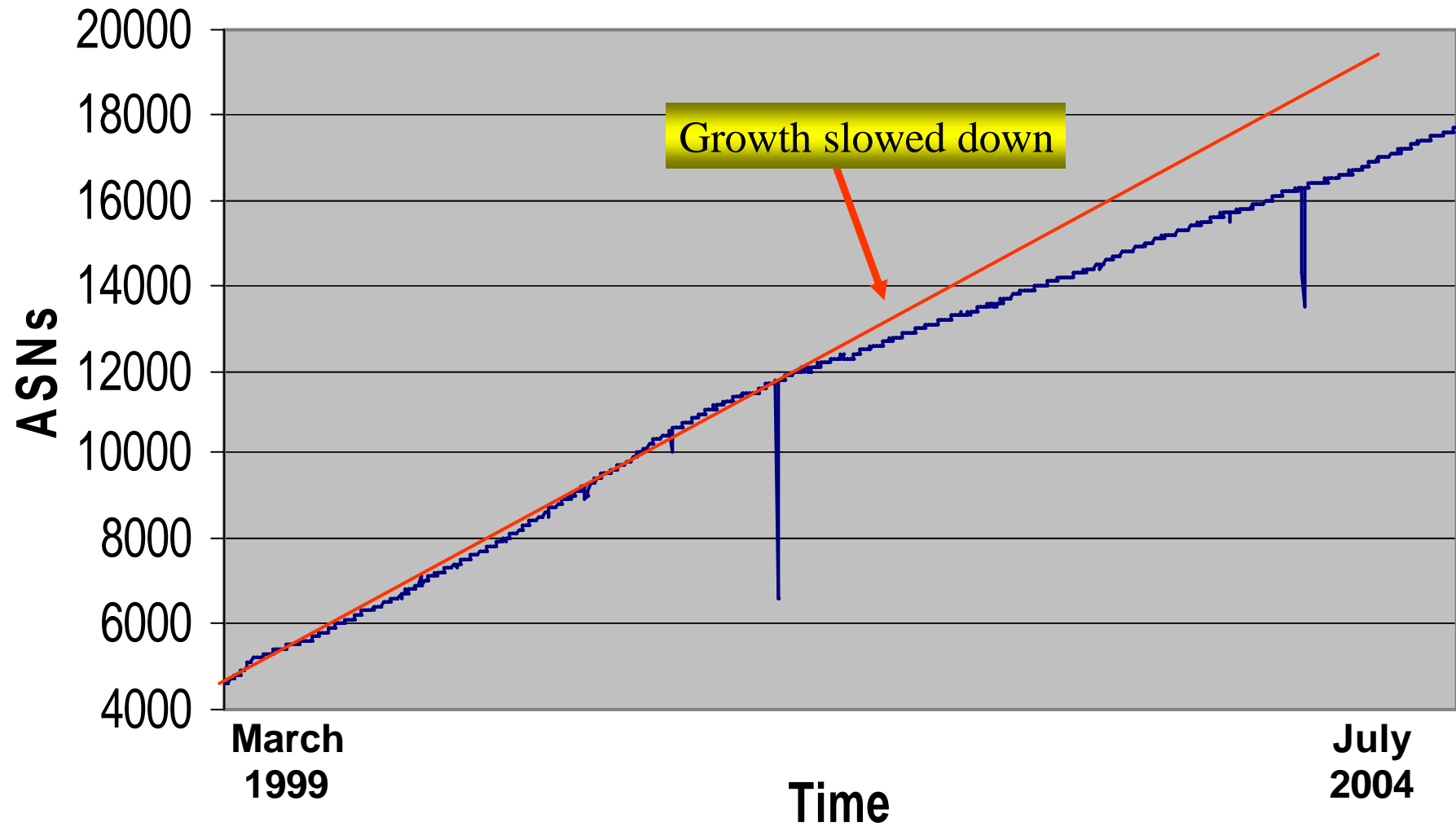
## Prefixes Smaller than Registry Allocations

ASN	No of nets	Total ann.	Description
6347	731	952	SAVVIS Communications Corpora
18566	717	734	Covad Communications
6197	558	727	BellSouth Network Solutions,
7018	546	1422	AT&T
3356	502	888	Level 3 Communications, LLC
702	398	646	UUNET - Commercial IP service
1239	371	942	Sprint
701	367	1262	UUNET Technologies, Inc.
9583	337	490	Satyam Infoway Ltd.,
27364	336	349	Armstrong Cable Services
5668	333	381	Century Telephone
6198	332	450	BellSouth Network Solutions,
4766	317	500	Korea Internet Exchange for "
20115	300	566	Charter Communications
6467	269	370	E.Spire Communications, Inc.
9929	260	329	China Netcom Corp.
14824	254	278	NewSouth Communications Corp.
3320	248	300	Deutsche Telekom AG
13609	248	291	Choice One Communications Inc
25844	245	245	Skadden, Arps, Slate, Meagher

# BGP Routing Table

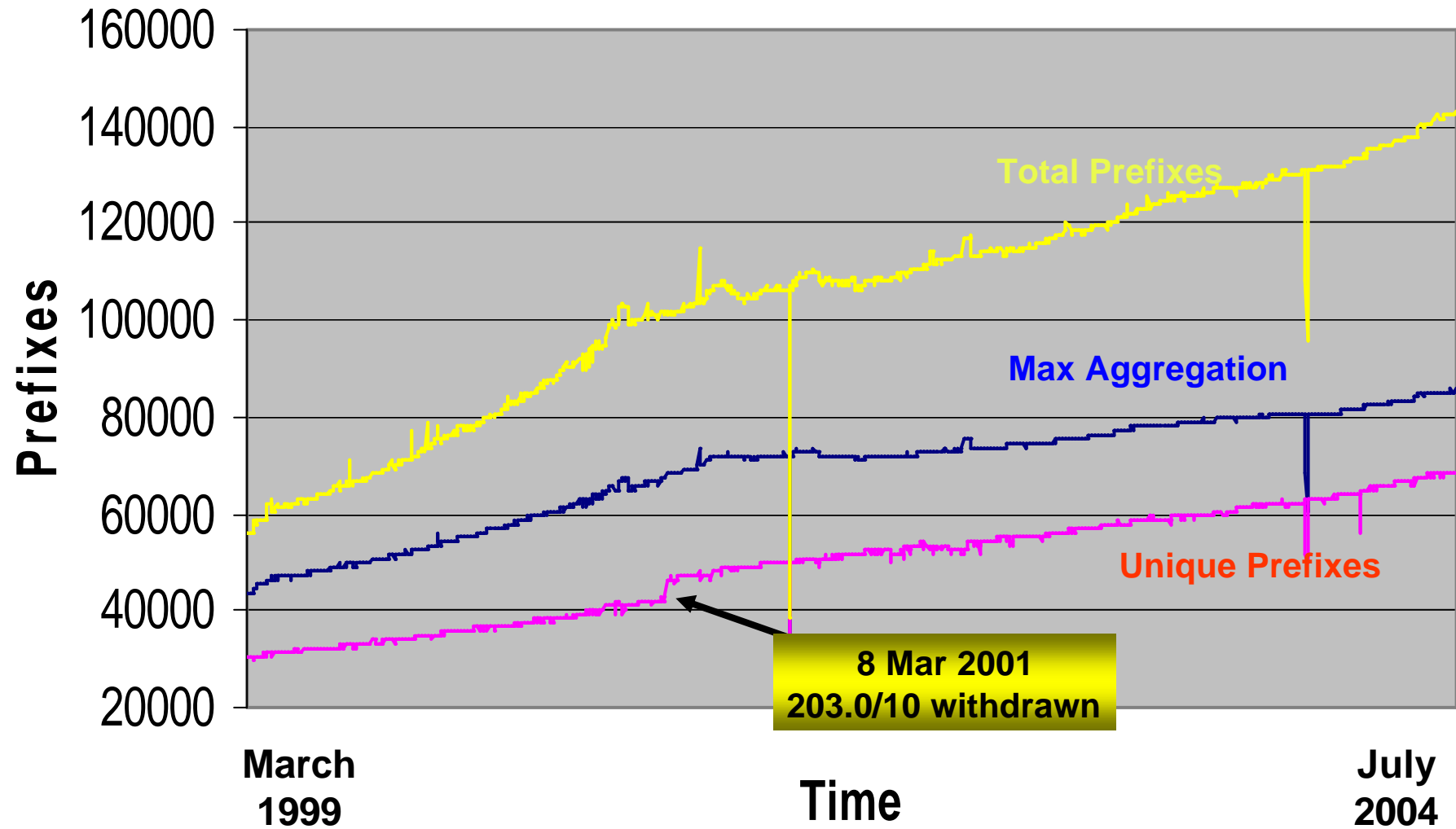


# AS Growth

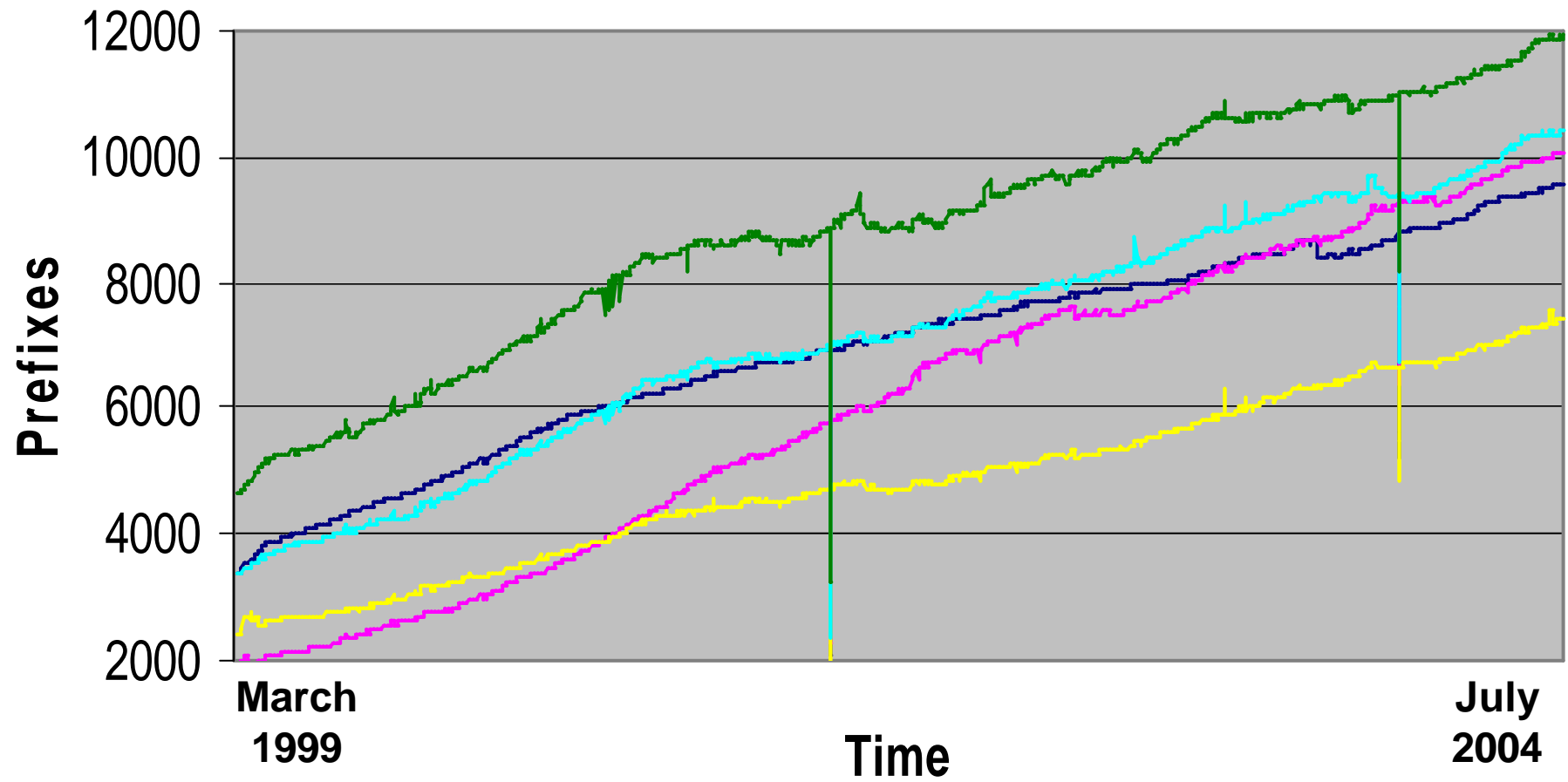




# Max Aggregation vs Unique Prefixes

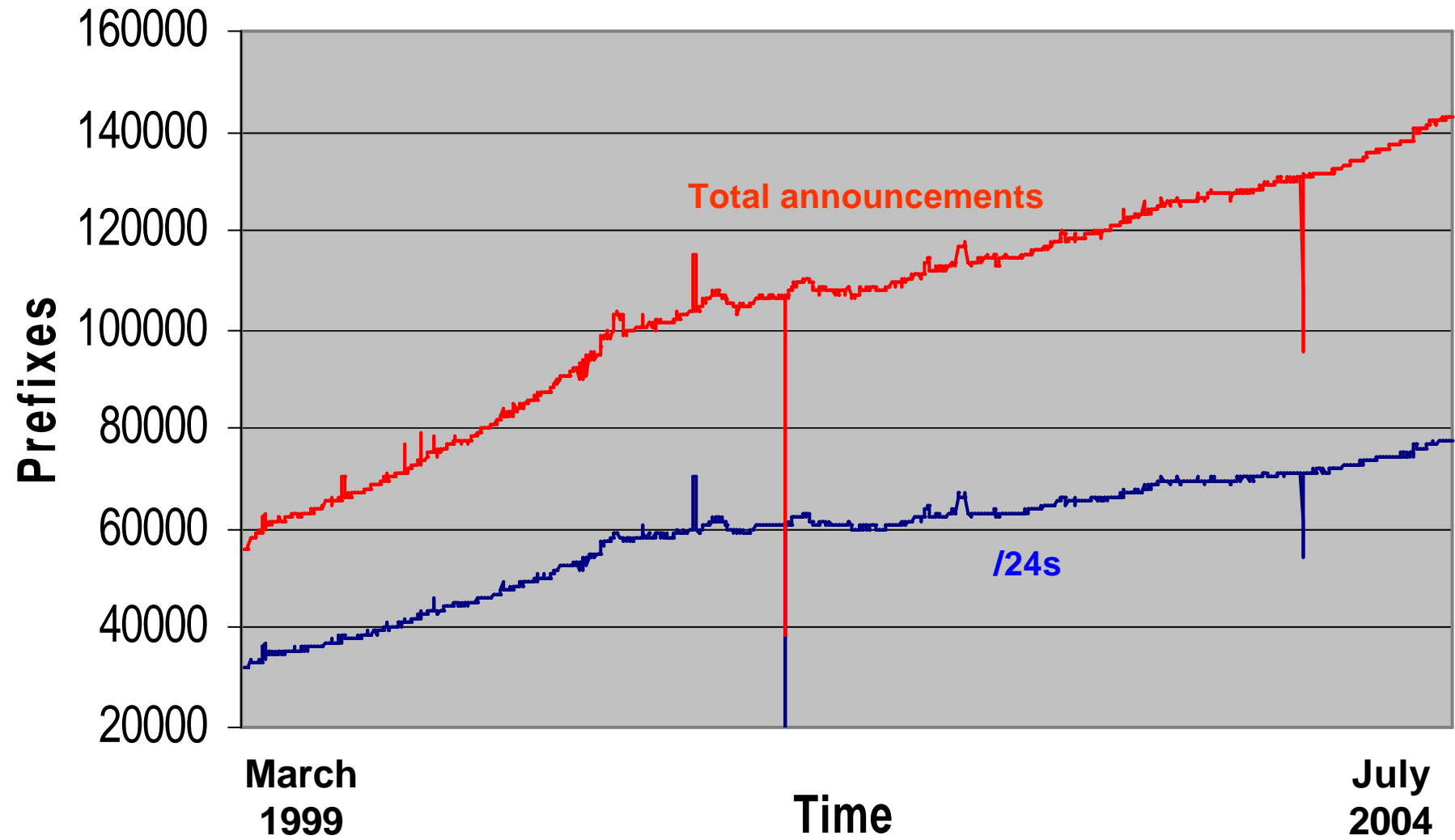


# Prefixes sizes announced

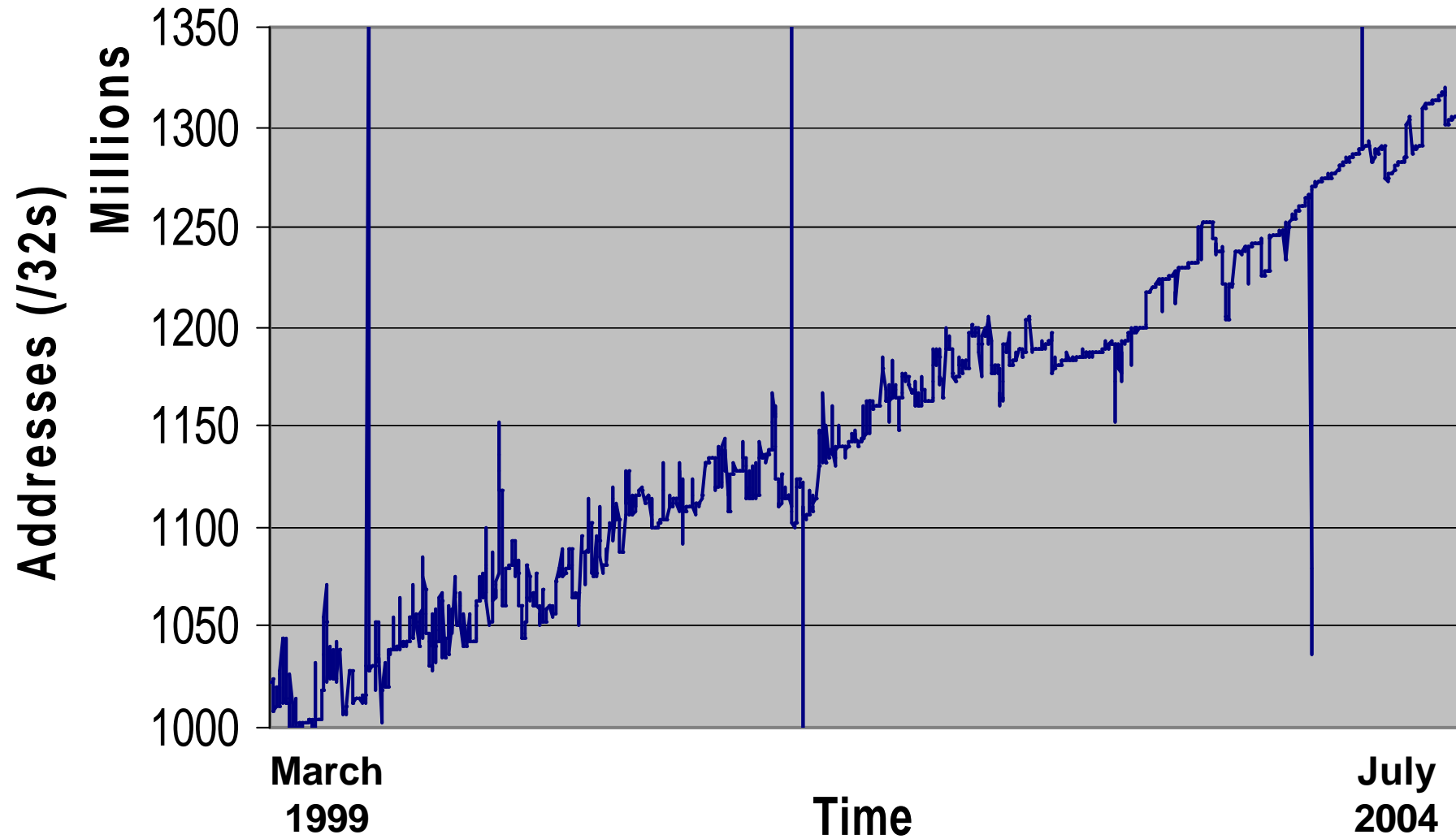


— /19s — /20s — /21s — /22s — /23s

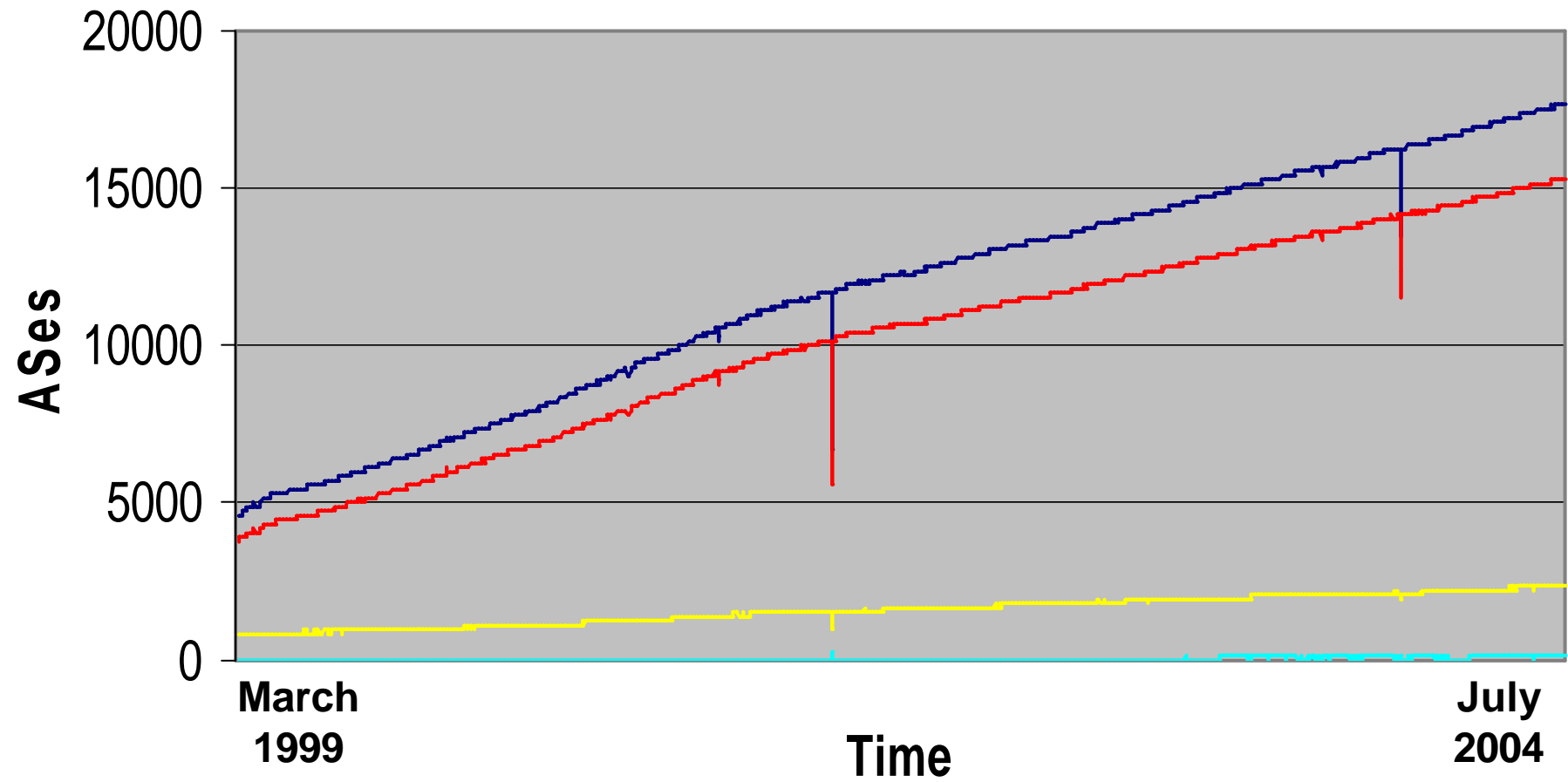
# /24s announced



# Address Space announced



# AS Announcements



— Total — Origin Only — Transit — Transit Only

# Internet Routing Table Analysis Update



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Questions?