Internet Routing Table Analysis Update

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Internet Routing Table Analysis

- **New:**
  - **Count unique prefixes**
  - **Prefixes after maximum aggregation**
  - **IP addresses in use**
  - **Origin only ASes**
  - **Transit only ASes**
- **Full Stats on APNIC web page**

  http://www.apnic.net/stats/bgp

New Features

- **Unique Prefixes**

  Eliminate all subnets of prefixes appearing in routing table

  e.g. 158.43.0.0/16 is announced, all subnets are dropped/ignored

  Represents the smallest the Internet Routing Table can be without losing address space

    If used can lead to suboptimal routing, or routing which relies on more detailed routing information existing outside of the viewing AS

New Features (continued)

- **Prefixes after maximum aggregation**

  Eliminate all subnets of prefixes appearing in routing table and originated by the same AS

  e.g. 158.43.0.0/16 is announced from AS1849, all subnets which also are originated by AS1849 are dropped/ignored

  Represents aggregation effort by the AS (but obviously can not account for traffic engineering)

  Represents the smallest the Internet Routing table can be without losing *any* detailed reachability information

New Features (continued)

- **IP Addresses in use**

  Fixed error in previous analysis which overcounted address space

- **Origin only ASes**

  Counts ASes which only originate prefixes and are not involved in the transit path from this view

- **Transit only ASes**

  Counts Ases which are only in the transit path and are not originating any prefixes from this view

Global summary

Routing Report 11 January, 2002	
BGP routing table entries examined	107232
Prefixes after maximum aggregation	**71370**
Unique aggregates announced to Internet	**52095**
Total ASes present in the Internet Routing Table	12279
Origin-only ASes present in the Internet Routing Table	10671
Origin ASes announcing only one prefix	4614
Transit ASes present in the Internet Routing Table	1608
Transit-only ASes present in the Internet Routing Table	49
Average AS path length visible in the Internet Routing Table	5.3
Max AS path length visible	16
Illegal AS announcements present in the Routing Table	1
Non-routable prefixes present in the Routing Table	0
Prefixes being announced from the IANA Reserved Address blocks	15
Number of addresses announced to Internet	1160328160
Equivalent to 69 /8s, 41 /16s and 51 /24s	
Percentage of available address space announced	31.3
Percentage of allocated address space announced	59.2
Percentage of available address space allocated	52.8
Total number of prefixes smaller than registry allocations	71690

Comments

- **Routing Report**
  - **Maximum aggregation 71370**
  - **Unique aggregates 52095**
- **CIDR Report**
  - **Maximum aggregation ????**

APNIC region summary

APNIC region Report 11 January, 2002

Prefixes being announced by APNIC Region ASes	17007
Total APNIC prefixes after maximum aggregation	10409
Prefixes being announced from the APNIC address blocks	15624
Unique aggregates announced from the APNIC address blocks	9751
APNIC Region origin ASes present in the Internet Routing Table	1420
APNIC Region origin ASes announcing only one prefix	459
APNIC Region transit ASes present in the Internet Routing Table	246
Average APNIC Region AS path length visible	5.3
Max APNIC Region AS path length visible	14
Number of APNIC addresses announced to Internet	78420544
Equivalent to 4 /8s, 172 /16s and 154 /24s	
Percentage of available APNIC address space announced	58.0

APNIC AS Blocks	4608 - 4864, 7467 - 7722, 9216 - 10239
	17408 - 18431, 23552 – 24575
APNIC Address Blocks	61/8, 202/7, 210/7, 218/7 and 220/8

ARIN region summary

ARIN region Report 11 January, 2002

Prefixes being announced by ARIN Region ASes	72362
Total ARIN prefixes after maximum aggregation	47060
Prefixes being announced from the ARIN address blocks	51977
Unique aggregates announced from the ARIN address blocks	17055
ARIN Region origin ASes present in the Internet Routing Table	7277
ARIN Region origin ASes announcing only one prefix	2255
ARIN Region transit ASes present in the Internet Routing Table	720
Average ARIN Region AS path length visible	5.2
Max ARIN Region AS path length visible	16
Number of ARIN addresses announced to Internet	182787360
Equivalent to 10 /8s, 229 /16s and 29 /24s	
Percentage of available ARIN address space announced	68.1

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
ARIN Address Blocks	24/8, 63/8, 64/6, 68/8, 199/8, 200/8, 204/6, 208/7 and 216/8

RIPE NCC summary

RIPE NCC region Report 11 January, 2002

Prefixes being announced by RIPE Region ASes	17863
Total RIPE prefixes after maximum aggregation	13901
Prefixes being announced from the RIPE address blocks	14594
Unique aggregates announced from the RIPE address blocks	9712
RIPE Region origin ASes present in the Internet Routing Table	3532
RIPE Region origin ASes announcing only one prefix	1900
RIPE Region transit ASes present in the Internet Routing Table	633
Average RIPE Region AS path length visible	5.8
Max RIPE Region AS path length visible	15
Number of RIPE addresses announced to Internet	105485824
Equivalent to 6 /8s, 73 /16s and 150 /24s	
Percentage of available RIPE address space announced	69.9

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

APNIC Region per AS prefix count summary

ASN	No of nets	/20 equiv	Max Agg	Description
1221	1345	1241	993	Telstra Pty Ltd
4538	424	1082	14	China Education and Research
2764	400	378	374	connect.com.au pty ltd
703	396	337	303	UUNET Technologies, Inc.
2907	393	1923	362	SINET Japan
4755	335	114	93	Videsh Sanchar Nigam Ltd. Aut
7474	313	285	204	Optus Communications Pty Ltd
4134	268	1858	100	Data Communications Bureau
4766	198	1380	145	Korea Internet Exchange for "
17557	174	13	85	Pakistan Telecom
9443	172	45	68	Primus Telecommunications
9583	158	32	5	Satyam Infoway Ltd.,
4740	145	34	119	OzEmail ISP
9768	145	381	88	Korea Telecom
1659	144	924	34	Taiwan Academic Network (TANe
7657	124	21	84	The Internet Group Limited
17676	121	1920	7	XTAGE CORPORATION
4780	117	186	40	Digital United Inc.
4713	115	894	102	NTT Communications Corporatio
9800	113	193	22	CHINA UNICOM

ARIN Region per AS prefix count summary

ASN	No of nets	/20 equiv	Max Agg	Description
701	2138	8777	1527	UUNET Technologies, Inc.
7018	1153	7487	896	AT&T
1	874	8393	647	BBN Planet
3908	799	1638	474	Supernet, Inc.
3967	785	361	339	Exodus Communication
1239	782	3172	605	Sprint
8010	715	62	11	PublicNet Communications, Inc
7046	681	820	437	UUNET Technologies, Inc.
4323	586	380	202	Time Warner Communications, I
852	582	979	384	Telus Advanced Communications
690	547	77	323	Merit Network
209	507	1860	295	Qwest
705	487	437	303	UUNET Technologies, Inc.
2914	460	2211	431	Verio, Inc.
7132	416	481	161	Southwestern Bell Internet Se
3549	400	830	200	Global Crossing
2149	392	214	328	Performance Systems, Inc.
3561	371	2220	318	Cable & Wireless USA
4151	363	704	16	USDA
577	353	588	221	Bell Advanced Communications

RIPE NCC Region per AS prefix count summary

ASN	No of nets	/20 equiv	Max Agg	Description
702	1084	2635	859	UUNET Technologies, Inc.
3301	400	924	353	TeliaNet Sweden
1257	253	489	247	SWIPnet Swedish IP Network
680	233	2149	231	DFN-IP service G-WiN
3215	232	562	151	France Telecom / &Equant
5515	216	705	176	Sonera Finland Autonomous Sys
3320	201	1961	169	Deutsche Telekom AG
786	182	1874	182	The JANET IP Service
719	164	289	118	LANLINK autonomous system
8708	152	20	139	Romania Data Systems S.A.
5400	148	60	85	Concert European Core Network
5549	143	78	65	Nextra Deutschland GmbH + Co.
2856	136	777	125	BTnet UK Regional network
3303	126	575	124	Swisscom Ltd
3269	115	663	70	TELECOM ITALIA
12302	112	7	36	MobiFon S.A.
8297	111	37	63	Teleglobe Autonomous System i
517	108	230	106	KPNQwest Germany GmbH
1290	97	412	72	PSINet UK Ltd.
5511	95	192	79	France Telecom

Global per AS prefix count summary

ASN	No of nets	/20 equiv	Max Agg	Description
701	2138	8777	1527	UUNET Technologies, Inc.
1221	1345	1241	993	Telstra Pty Ltd
7018	1153	7487	896	AT&T
702	1084	2635	859	UUNET Technologies, Inc.
1	874	8393	647	BBN Planet
3908	799	1638	474	Supernet, Inc.
3967	785	361	339	Exodus Communication
1239	782	3172	605	Sprint
8010	715	62	11	PublicNet Communications, Inc
7046	681	820	437	UUNET Technologies, Inc.
4323	586	380	202	Time Warner Communications, I
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690	547	77	323	Merit Network
209	507	1860	295	Qwest
705	487	437	303	UUNET Technologies, Inc.
2914	460	2211	431	Verio, Inc.
4538	424	1082	14	China Education and Research
7132	416	481	161	Southwestern Bell Internet Se
2764	400	378	374	connect.com.au pty ltd
3301	400	924	353	TeliaNet Sweden

Global Aggregation Savings Summary

ASN	No of Nets	Net Savings	Description
8010	715	704	PublicNet Communications, Inc
3967	785	446	Exodus Communication
4538	424	410	China Education and Research
4323	586	384	Time Warner Communications, I
1221	1345	352	Telstra Pty Ltd
4151	363	347	USDA
3908	799	325	Supernet, Inc.
11371	278	271	Rhythms NetConnections
7018	1153	257	AT&T
7132	416	255	Southwestern Bell Internet Se
7046	681	244	UUNET Technologies, Inc.
4755	335	242	Videsh Sanchar Nigam Ltd. Aut
6347	323	240	SAVVIS Communications Corpora
1	874	227	BBN Planet
702	1084	225	UUNET Technologies, Inc.
690	547	224	Merit Network
7029	244	222	Alltel Information Services,
209	507	212	Qwest
3549	400	200	Global Crossing
4355	229	199	EarthLink, Inc.

List of Illegal AS's

Bad AS	Designation	Network	Transit AS	Description
5757	UNALLOCATED	207.19.224.0/24	701	UUNET Technologies,

Number of prefixes announced by prefix length

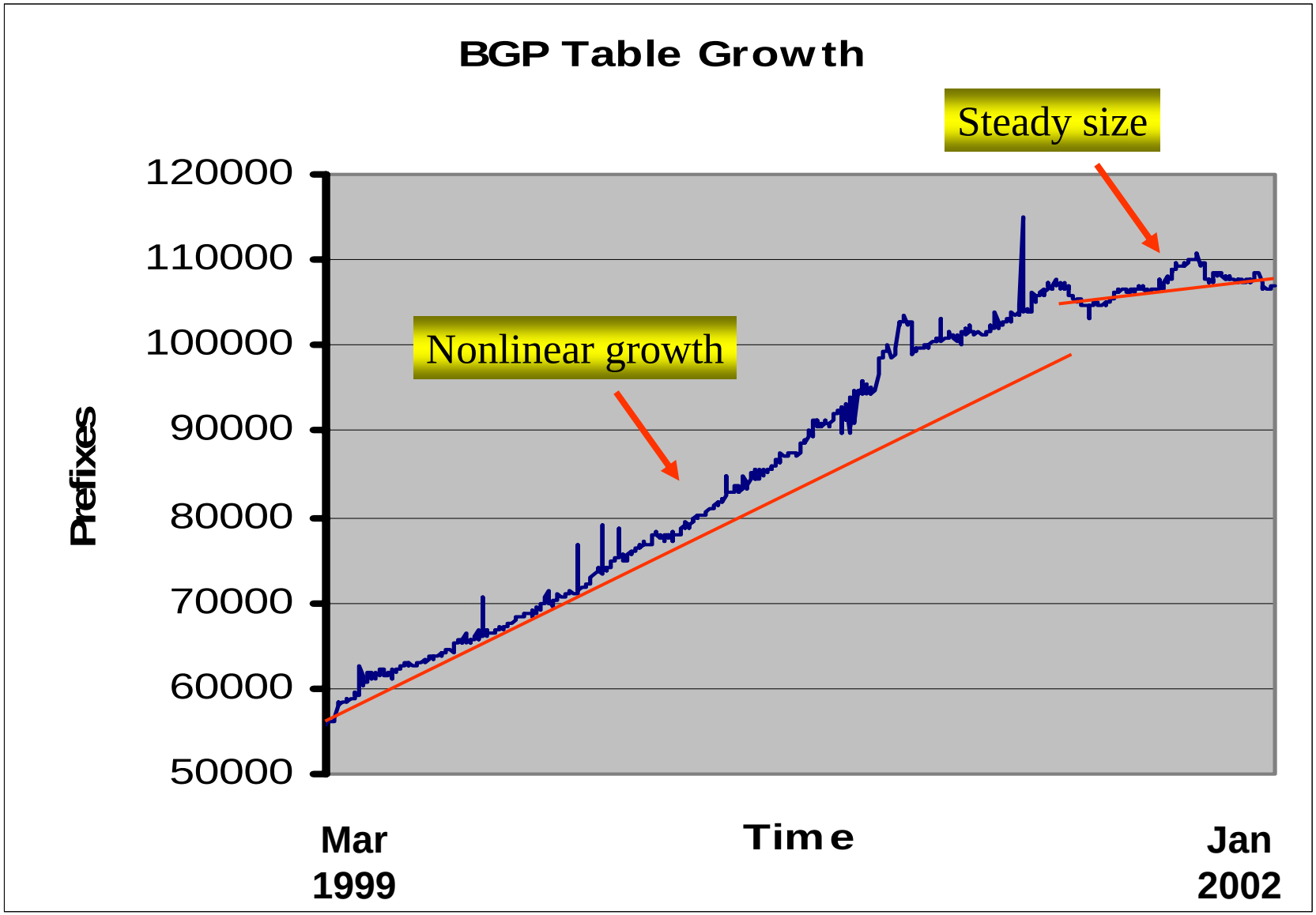
/1:0	/2:0	/3:0	/4:0	/5:0	/6:0
/7:0	/8:18	/9:6	/10:7	/11:12	/12:38
/13:92	/14:230	/15:392	/16:7125	/17:1398	/18:2462
/19:7229	/20:6518	/21:4800	/22:7180	/23:8925	/24:60019
/25:209	/26:217	/27:122	/28:77	/29:69	/30:63
/31:0	/32:24				

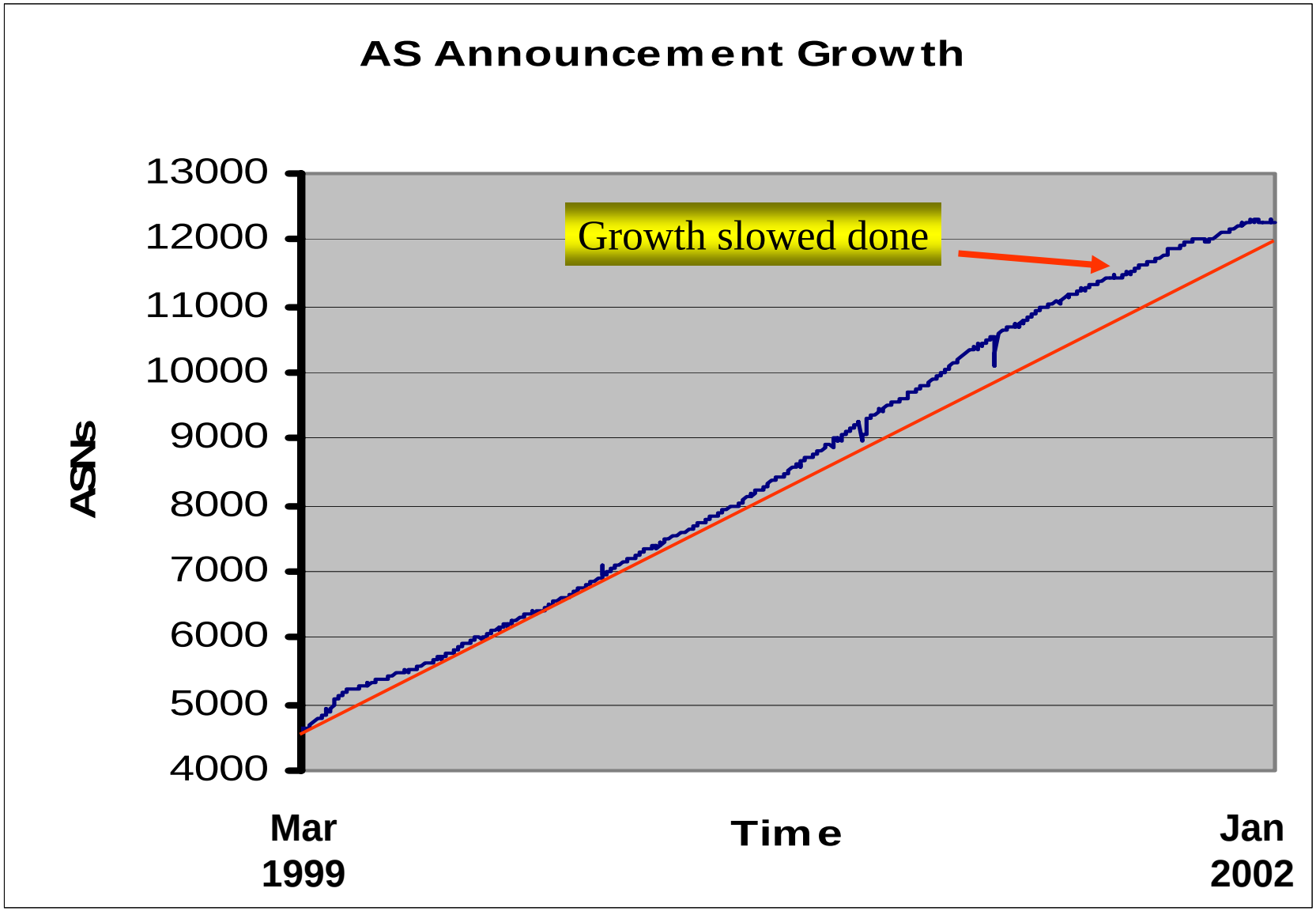
Advertised IANA Reserved Addresses

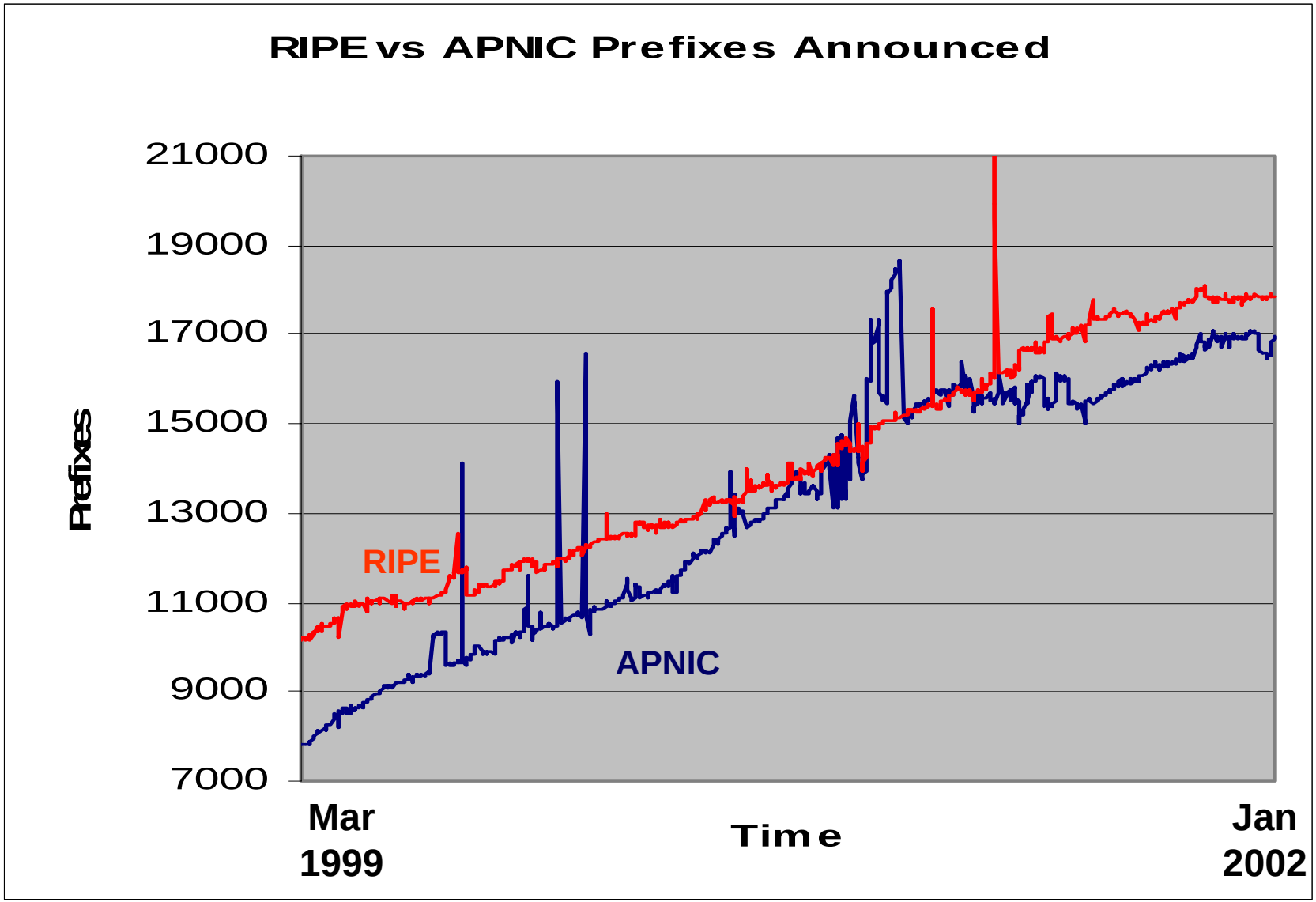
Network	Origin AS	Description
39.0.0.0/8	4554	Exchange Point Blocks
132.0.0.0/10	568	DISO-UNRRA
134.137.0.0/16	400	Headquarters Standard Systems
135.0.0.0/13	10455	Lucent Technologies
137.0.0.0/13	568	DISO-UNRRA
138.94.0.0/16	1	BBN Planet
144.7.0.0/16	701	UUNET Technologies, Inc.
153.34.0.0/15	701	UUNET Technologies, Inc.
153.36.0.0/14	701	UUNET Technologies, Inc.
154.150.0.0/16	6494	IDCI
158.0.0.0/13	568	DISO-UNRRA
164.233.0.0/16	6020	DISA NETWORK SERVICES
164.235.0.0/16	6025	US DOD NIC Unregistered
191.9.200.0/24	1290	PSINet UK Ltd.
201.115.100.0/24	7018	AT&T

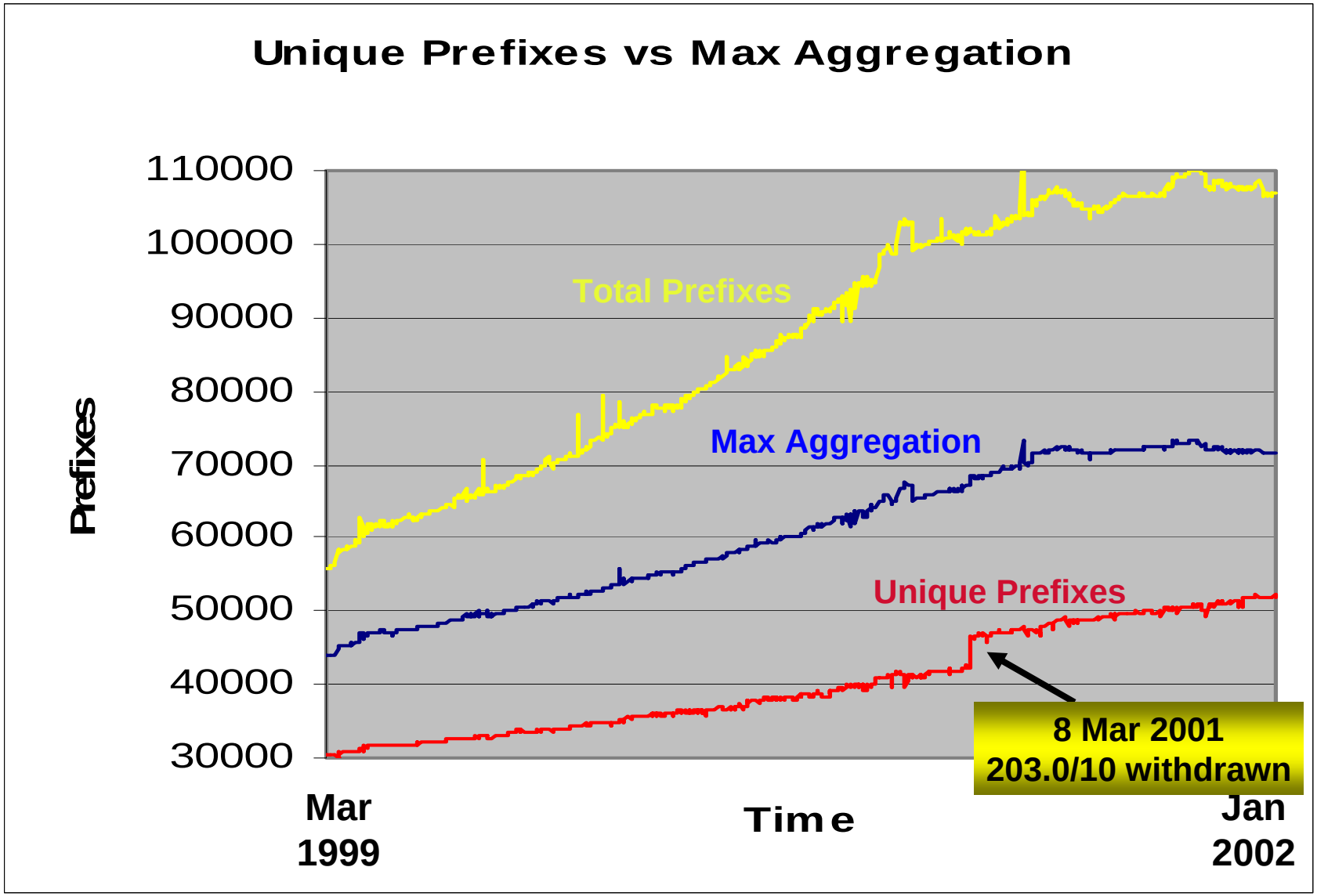
Number of /24s announced by per /8

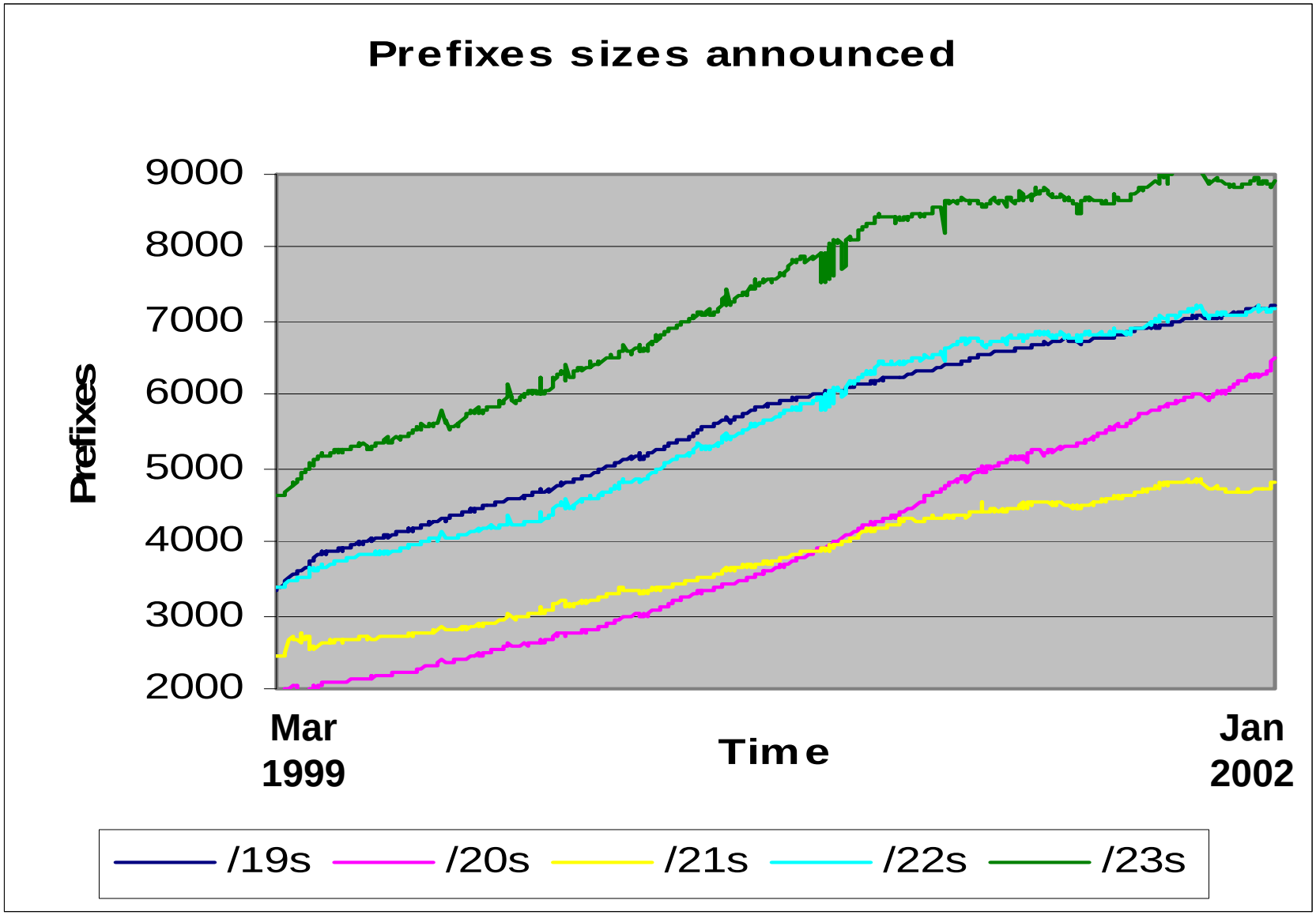
4:3	9:1	12:450	13:10	15:2	17:5
20:1	24:776	25:1	32:74	38:13	40:4
43:1	44:2	52:1	57:14	61:226	62:161
63:1899	**64:1498**	65:973	66:752	67:23	68:15
80:136	128:62	129:118	130:23	131:41	132:14
133:2	134:104	135:10	136:45	137:101	138:62
139:30	140:70	141:57	142:49	143:41	144:57
145:12	146:201	147:94	148:161	149:88	150:38
151:43	152:386	153:34	154:7	155:83	156:81
157:118	158:72	159:79	160:26	161:54	162:118
163:122	164:118	165:112	166:219	167:162	168:113
169:47	170:280	171:2	191:1	***192:5326***	**193:2053**
194:2045	195:858	196:430	***198:3698***	***199:3282***	**200:2396**
201:1	**202:2880**	***203:4494***	***204:3254***	**205:2155**	**206:2590**
207:2687	**208:2604**	**209:2964**	210:534	211:152	212:878
213:533	214:9	215:17	**216:2958**	217:411	218:12

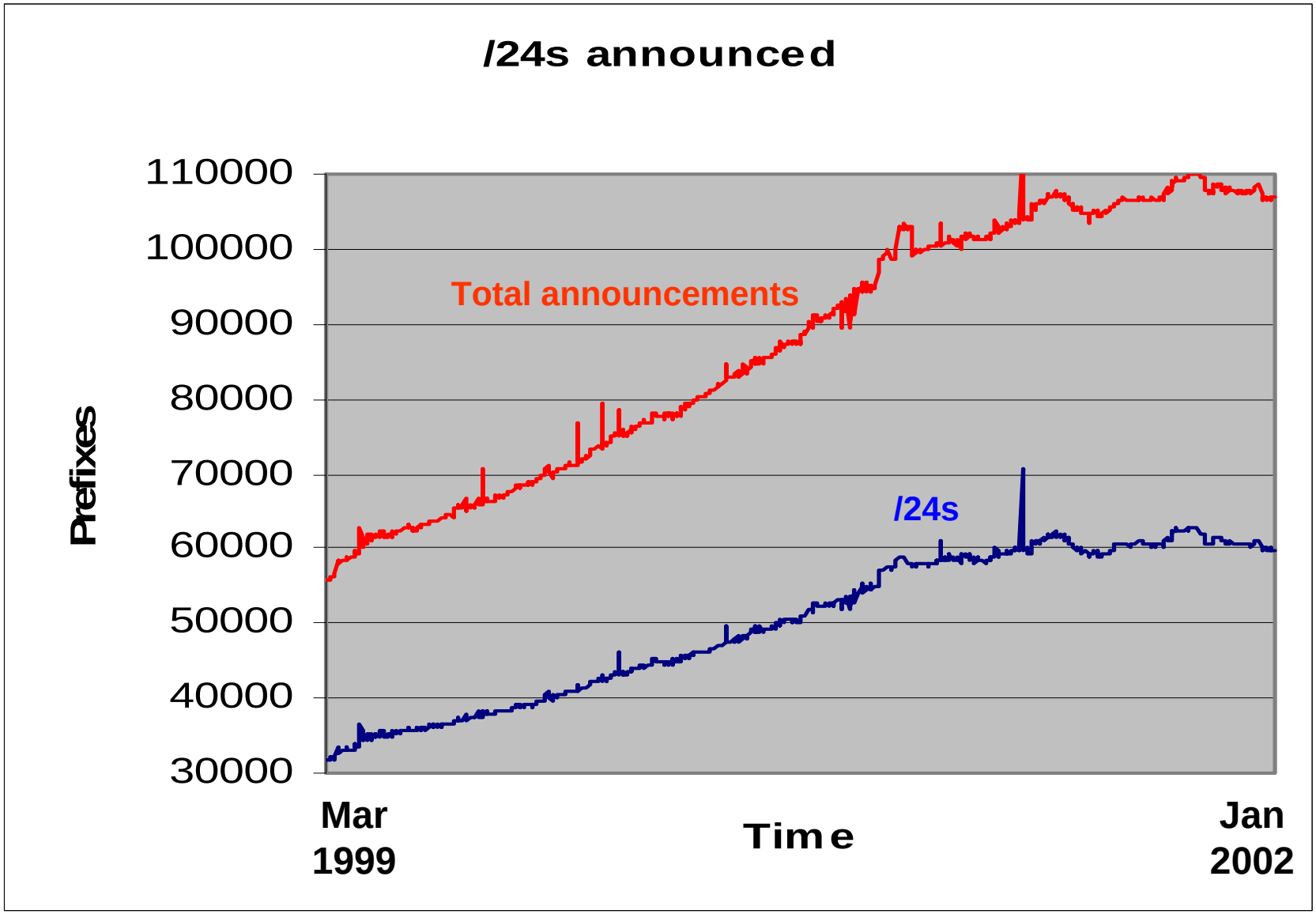


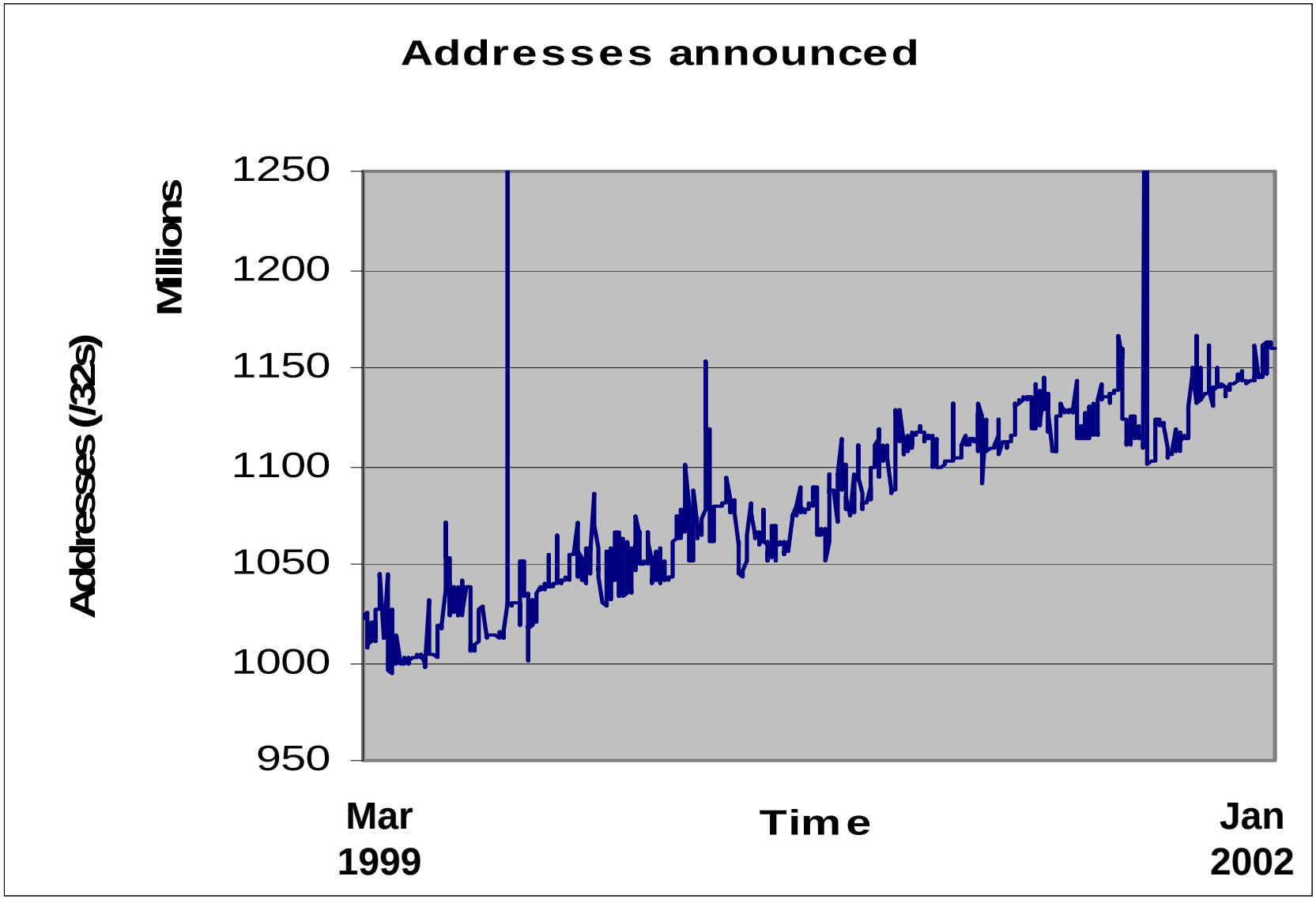


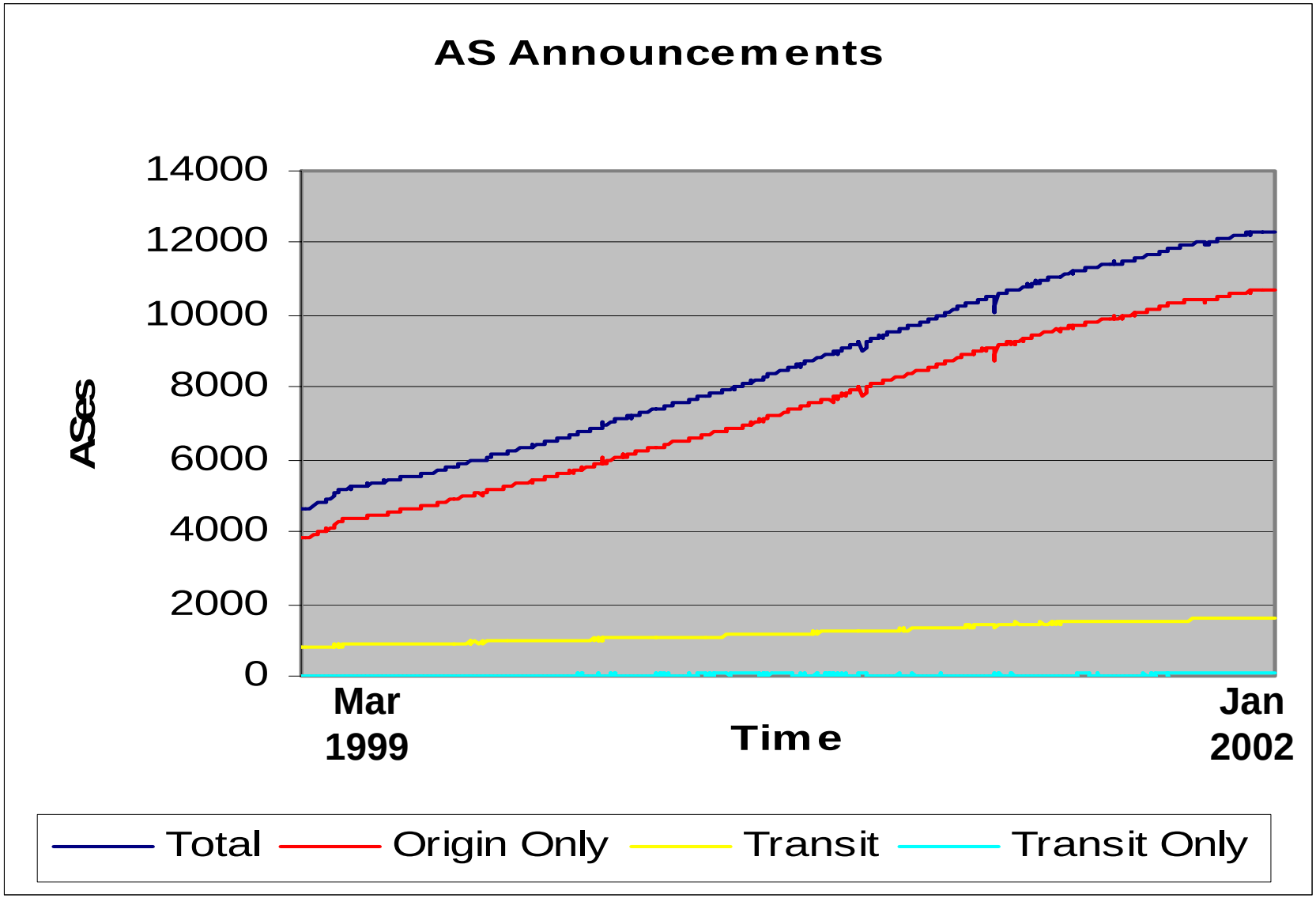


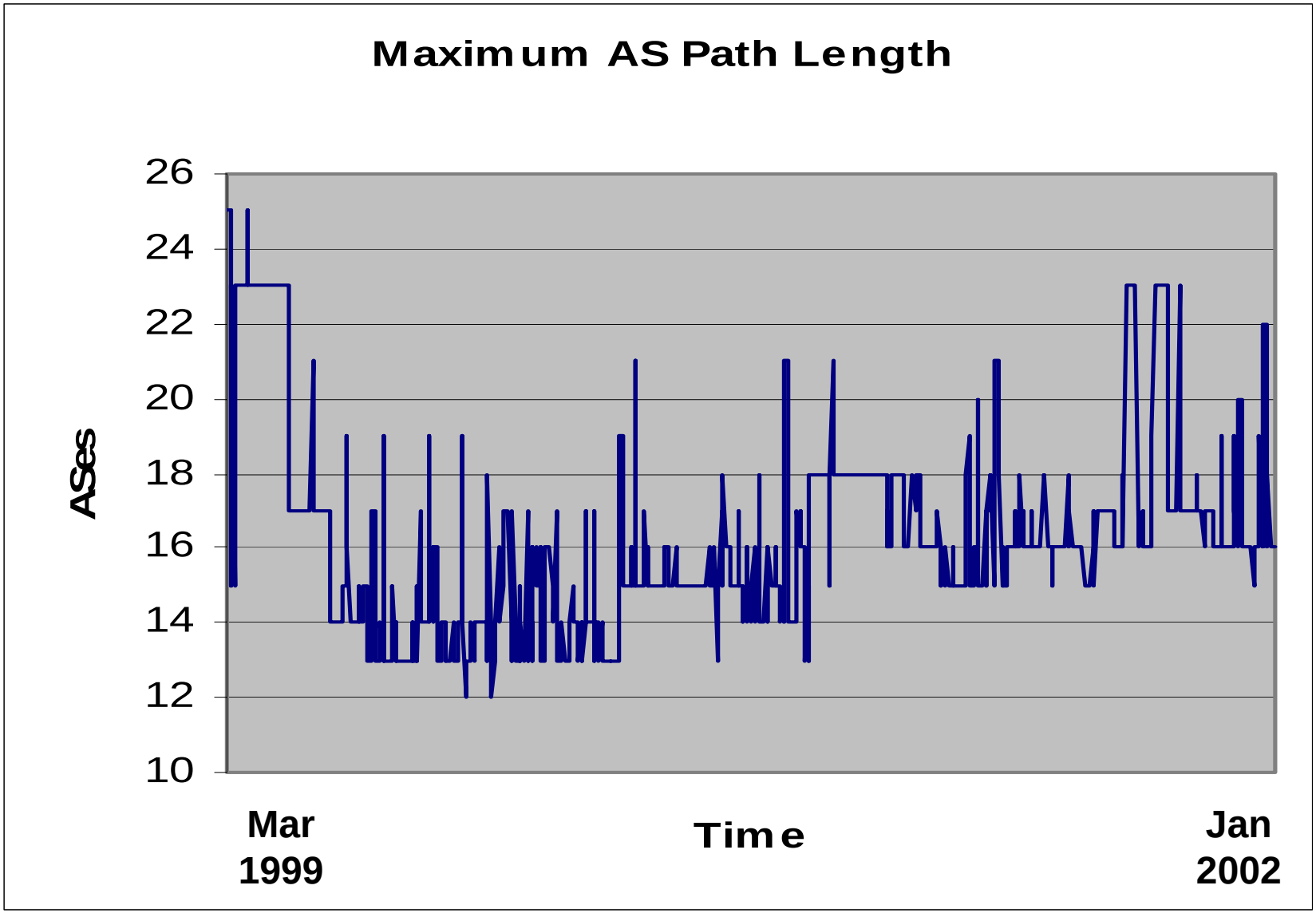












Final Slide...

- **Any comments/discussion?**