



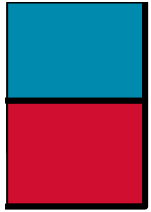
# **Internet Routing Table Analysis Update**

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**APNIC Routing SIG, APNIC OPM,**

**Taipei, 30<sup>th</sup> August 2001**



# Routing Table Analysis

- **Lot's of people doing this now** 😊

<http://www.aso.icann.org/rirs/stats>

And more...

- **What I'm doing now**

**CIDR Report**

**new bits and update**

**APNIC Routing Table Report**

**new bits and update**



# CIDR Report

- **Attempts to report on aggregation efforts**

**Only one view – not absolute, it's just a guide!**

**Current view taken from MAE-East**

- **Information**

**E-mail <[cidr-report@cisco.com](mailto:cidr-report@cisco.com)>**

**Webpage**

**[www.employees.org/~tbates/cidr-report.html](http://www.employees.org/~tbates/cidr-report.html)**



# CIDR Report Enhancements

- **RIR regional top 30**  
shows regional efforts
- **Software being optimised**  
written when routing table was 20k prefixes  
P needs to scale to 100k and beyond  
Now uses ASN cache rather than hitting the whois DBs  
Address lookups use cache and previous day info
- **Web page improved**  
lists regional info  
lists all registered AutNums



# CIDR Report Plans

- **More Views**
- **Further optimisation of the code**  
Runtime already much reduced
- **Better analysis**  
aggregation versus “traffic engineering”



# CIDR Report – 7<sup>th</sup> August

Sorting by  
Net Gain

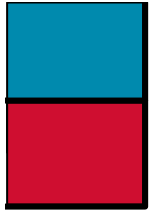
ASnum	NetsNow	NetsCIDR	NetGain	% Gain	Description
AS1221	1254	965	289	23.0%	Telstra Pty Ltd
AS4755	205	115	90	43.9%	Videsh Sanchar Nigam Ltd. Autonom
AS703	294	243	51	17.3%	UUNET Technologies, Inc.
AS17561	113	62	51	45.1%	Internet service provision to Wes
AS7586	108	60	48	44.4%	Paradox Digital Pty Ltd
AS17557	97	59	38	39.2%	Pakistan Telecom
AS4786	127	99	28	22.0%	NetConnect Communications Pty Ltd
AS4740	168	142	26	15.5%	OzEmail ISP
AS7545	136	111	25	18.4%	TPG Internet Pty Ltd
AS2697	40	17	23	57.5%	National Centre for Software Tech
AS7633	40	19	21	52.5%	Software Technology Parks of Indi
AS2907	172	152	20	11.6%	SINET Japan
AS2764	366	346	20	5.5%	connect.com.au pty ltd
AS7604	32	14	18	56.2%	Highway 1
AS7474	182	164	18	9.9%	Optus Communications Pty Ltd
AS17433	26	8	18	69.2%	PhilWeb.Com, Inc.
AS7657	68	51	17	25.0%	The Internet Group Limited
AS17635	17	2	15	88.2%	Emerge Technologies Pty Ltd
AS4763	81	68	13	16.0%	Telstra New Zealand
AS4621	45	32	13	28.9%	UNINET-TH
AS17484	20	8	12	60.0%	Hypermax Internet Pty Ltd
AS4732	56	45	11	19.6%	DDI CORPORATION
AS17447	16	5	11	68.8%	Net4India
AS4775	31	21	10	32.3%	Telecom Carrier / ISP Plus +
AS4752	21	11	10	47.6%	Geko Pty Limited
AS4961	15	6	9	60.0%	Daewoo Heavy Industries LTD.
AS4862	37	29	8	21.6%	Global One Communications
AS4766	46	38	8	17.4%	Korea Internet Exchange for "96 W
AS4618	28	20	8	28.6%	Internet Thailand Company Limited
AS10097	28	20	8	28.6%	flow communications level 2 541 k



# CIDR Report – 7<sup>th</sup> August

Sorting by  
% Gain

ASnum	NetsNow	NetsCIDR	NetGain	% Gain	Description
AS17635	17	2	15	88.2%	Emerge Technologies Pty Ltd
AS7592	4	1	3	75.0%	Dragon Net/The Hoath Family Trust
AS7578	4	1	3	75.0%	iBasis HK
AS7565	4	1	3	75.0%	Pacific Regent International Limi
AS4863	4	1	3	75.0%	MECO Enterprises Inc.
AS17662	4	1	3	75.0%	NetStar Networks Systems Integrat
AS17491	4	1	3	75.0%	PAKFREE Pvt. Ltd.
AS10170	4	1	3	75.0%	The Bank of Korea
AS17433	26	8	18	69.2%	PhilWeb.Com, Inc.
AS17447	16	5	11	68.8%	Net4India
AS7705	6	2	4	66.7%	Wanbao Telecom (HK) Co., Ltd.
AS17658	6	2	4	66.7%	PrimaNet - PT. Khasanah Timur Ind
AS17632	11	4	7	63.6%	Iserv India Solutions Pvt Ltd
AS10022	11	4	7	63.6%	Internet access for Datacom Syste
AS4961	15	6	9	60.0%	Daewoo Heavy Industries LTD.
AS17721	5	2	3	60.0%	Dishaonline is an ISP based in So
AS17484	20	8	12	60.0%	Hypermax Internet Pty Ltd
AS17479	5	2	3	60.0%	Chiang Mai University
AS10239	10	4	6	60.0%	Comsat Max ISP
AS2697	40	17	23	57.5%	National Centre for Software Tech
AS7674	7	3	4	57.1%	Nippon Telegraph and Telephone Co
AS10192	7	3	4	57.1%	Woosong Information College
AS7604	32	14	18	56.2%	Highway 1
AS7633	40	19	21	52.5%	Software Technology Parks of Indi
AS7581	10	5	5	50.0%	POWERNET INTERNET GROUP
AS7468	4	2	2	50.0%	Cyber Express Communication Ltd.
AS4660	2	1	1	50.0%	Hansol Telecom Inc.
AS4624	6	3	3	50.0%	InterServe Communication (H.K.) L
AS4623	6	3	3	50.0%	Chevalier (Internet) Limited auto
AS17797	2	1	1	50.0%	Pickknowl Internet Services



# Routing Report

- **Now in it's third year**

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

**Last 6 months have been “interesting”**

- **New features**

**Improve intelligence of autnum lookup**

**Check former B-space for unregistered but announced /16s**

**Count prefixes smaller than registry allocations**

**0-127**

**smaller than /8**

**128-191**

**smaller than /16**

**192-223**

**smaller than /24**

**24, 61-81, 193-218**

**smaller than /20**





# 8<sup>th</sup> August summary

## Global summary

BGP routing table entries examined	106773
Origin ASes present in the Internet Routing Table	11377
Origin ASes announcing only one prefix	4151
Transit ASes present in the Internet Routing Table	1486
Average AS path length visible in the Internet Routing Table	5.3
Max AS path length visible	17
Illegal AS announcements present in the Routing Table	49
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	1219922472
Equivalent to 72 /8s, 182 /16s and 138 /24s	
Percentage of available address space announced	32.9
Percentage of allocated address space announced	63.4
Percentage of available address space allocated	51.9
Total number of prefixes smaller than registry allocations	73036



# 8<sup>th</sup> August summary

## APNIC region summary

Prefixes being announced by APNIC Region ASes	15933
Prefixes being announced from the APNIC address blocks	14282
APNIC Region origin ASes present in the Internet Routing Table	1339
APNIC Region origin ASes announcing only one prefix	450
APNIC Region transit ASes present in the Internet Routing Table	216
Average APNIC Region AS path length visible	5.1
Max APNIC Region AS path length visible	16
Number of APNIC addresses announced to Internet	75887853
Equivalent to 4 /8s, 133 /16s and 244 /24s	
Percentage of available APNIC address space announced	74.6
APNIC AS Blocks	4608 - 4864, 7467 - 7722, 9216 - 10239, 17408 - 18431
APNIC Address Blocks	61/8, 202/7, 210/7 and 218/8



# 8<sup>th</sup> August summary

## ARIN region summary

Prefixes being announced by ARIN Region ASes	73364
Prefixes being announced from the ARIN address blocks	53181
ARIN Region origin ASes present in the Internet Routing Table	6845
ARIN Region origin ASes announcing only one prefix	2019
ARIN Region transit ASes present in the Internet Routing Table	696
Average ARIN Region AS path length visible	5.2
Max ARIN Region AS path length visible	17
Number of ARIN addresses announced to Internet	202962510
Equivalent to 12 /8s, 24 /16s and 246 /24s	
Percentage of available ARIN address space announced	75.6

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 - 22527

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

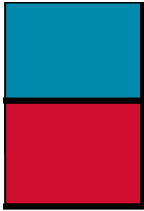


# 8<sup>th</sup> August summary

## RIPE NCC region summary

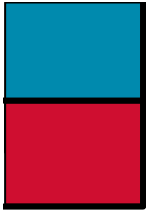
Prefixes being announced by RIPE Region ASes	17473
Prefixes being announced from the RIPE address blocks	13624
RIPE Region origin ASes present in the Internet Routing Table	3200
RIPE Region origin ASes announcing only one prefix	1682
RIPE Region transit ASes present in the Internet Routing Table	575
Average RIPE Region AS path length visible	5.8
Max RIPE Region AS path length visible	15
Number of RIPE addresses announced to Internet	104840781
Equivalent to 6 /8s, 63 /16s and 190 /24s	
Percentage of available RIPE address space announced	69.4
RIPE AS Blocks	1877 - 1901, 2042, 2047, 2107 - 2136, 2585 - 2614 2773 - 2822, 2830 - 2879, 3154 - 3353, 5377 - 5631 6656 - 6911, 8192 - 9215, 12288 - 13311, 15360 - 16383, 20480 - 21503
RIPE Address Blocks	62/8, 80/7, 193/8, 194/7, 212/7 and 217/8





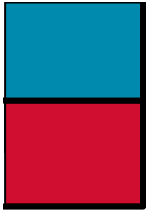
## APNIC Region per AS prefix count summary

ASN	No of nets	/19 equiv	Description
1221	1607	1316	Telstra Pty Ltd
2764	436	361	connect.com.au pty ltd
703	399	365	UUNET Technologies, Inc.
2907	366	1783	SINET Japan
4755	291	162	Videsh Sanchar Nigam Ltd. Aut
4134	238	1698	Data Communications Bureau
7474	236	292	Optus Communications Pty Ltd
4740	208	26	OzEmail ISP
7539	207	175	TANet2, sponsored by NSC, TAI
4766	177	1336	Korea Internet Exchange for "
7545	151	25	TPG Internet Pty Ltd
9443	143	39	Primus Telecommunications
4786	130	17	NetConnect Communications Pty
4812	130	306	China Telecom (Group)
4763	120	69	Telstra New Zealand
17561	116	167	Internet service provision to
4713	115	886	NTT Communications Corporatio
7586	113	17	Paradox Digital Pty Ltd
9583	113	61	Satyam Infoway Ltd.,
7657	110	22	The Internet Group Limited



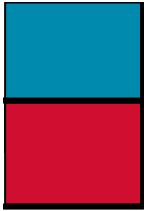
## ARIN Region per AS prefix count summary

ASN	No of nets	/19 equiv	Description
701	2312	8109	UUNET Technologies, Inc.
7018	988	7068	AT&T
1	891	8689	BBN Planet
3908	885	628	Supernet, Inc.
7046	871	1031	UUNET Technologies, Inc.
2551	805	657	ICG NetAhead, Inc
1239	684	3217	Sprint
2914	512	2298	Verio, Inc.
690	495	92	Merit Network
4293	481	98	Cable & Wireless USA
209	471	2136	Qwest
3561	427	2398	Cable & Wireless USA
2149	395	328	Performance Systems, Inc.
2548	392	1009	Business Internet, Inc.
18994	377	10	Global Crossing
3549	360	818	Global Crossing
4323	348	318	Time Warner Communications, I
11371	340	100	Rhythms NetConnections
3967	337	456	Exodus Communication
15290	335	357	AT&T Canada IES



## RIPE NCC Region per AS prefix count summary

ASN	No of nets	/19 equiv	Description
702	693	1747	UUNET Technologies, Inc.
3301	430	918	TeliaNet Sweden
15870	407	12	Global Center Frankfurt
1257	280	521	SWIPnet Swedish IP Network
1270	236	865	UUNET Germany
3215	233	497	France Telecom / &Equant
680	229	2069	DFN-IP service G-WiN
15878	203	8	Global Center Paris
786	184	1890	The JANET IP Service
3320	181	1940	Deutsche Telekom AG
719	180	291	LANLINK autonomous system
5515	175	654	Sonera Finland Autonomous Sys
8708	152	15	Romania Data Systems S.A.
5400	138	67	Concert European Core Network
3303	133	576	Swisscom Ltd
2856	128	776	BTnet UK Regional network
5549	122	66	Nextra Deutschland GmbH + Co.
517	119	271	KPNQwest Germany GmbH
8503	114	3	PCNET - PCNET DATA Network
5511	111	170	France Telecom



## Global per AS prefix count summary

ASN	No of nets	/19 equiv	Description
701	2312	8109	UUNET Technologies, Inc.
1221	1607	1316	Telstra Pty Ltd
7018	988	7068	AT&T
1	891	8689	BBN Planet
3908	885	628	Supernet, Inc.
7046	871	1031	UUNET Technologies, Inc.
2551	805	657	ICG NetAhead, Inc
702	693	1747	UUNET Technologies, Inc.
1239	684	3217	Sprint
2914	512	2298	Verio, Inc.
690	495	92	Merit Network
4293	481	98	Cable & Wireless USA
209	471	2136	Qwest
2764	436	361	connect.com.au pty ltd
3301	430	918	TeliaNet Sweden
3561	427	2398	Cable & Wireless USA
15870	407	12	Global Center Frankfurt
703	399	365	UUNET Technologies, Inc.
2149	395	328	Performance Systems, Inc.
2548	392	1009	Business Internet, Inc.





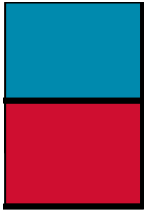
# 8<sup>th</sup> August summary

## List of Illegal AS's

Bad AS	Designation	Network	Transit AS	Description
2027	UNALLOCATED	150.185.0.0/16	10530	Interpacket Group,
5757	UNALLOCATED	207.19.224.0/24	701	UUNET Technologies,
6971	UNALLOCATED	64.42.0.0/18	2516	Kokusai Denshin Denw
65460	PRIVATE	192.231.11.0/24	7018	AT&T
65501	PRIVATE	64.243.116.0/24	16890	K&G Network Services
65515	PRIVATE	212.110.142.0/24	5593	CRIS-AS

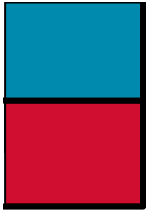
**Registries are aware of the 2027, 5757 and 6971 bogus announcements and will fix databases &c in due course**

**Private ASes remain a daily feature**



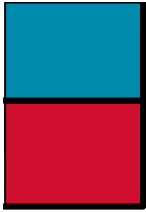
## Advertised IANA Reserved Addresses

Network	Origin AS	Description
82.104.0.0/16	3269	TELECOM ITALIA
82.104.128.0/17	3269	TELECOM ITALIA
82.105.0.0/16	3269	TELECOM ITALIA
82.105.128.0/17	3269	TELECOM ITALIA
128.65.0.0/16	3463	ACES Research Inc
132.0.0.0/10	568	DISO-UNRRA
134.137.0.0/16	7170	AT&T Government Markets
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
172.32.1.0/25	1221	Telstra Pty Ltd
201.115.100.0/24	7018	AT&T



## Number of prefixes announced by prefix length

/1:0	/2:0	/3:0	/4:0	/5:0	/6:0
/7:0	/8:18	/9:5	/10:6	/11:11	/12:32
/13:84	/14:220	/15:362	/16:6916	/17:1201	/18:2278
/19:6793	/20:5587	/21:4616	/22:6873	/23:8702	/24:60724
/25:329	/26:395	/27:416	/28:421	/29:351	/30:335
/31:2	/32:96				



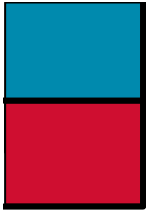
## Advertised IANA Reserved Addresses

Network	Origin AS	Description
82.104.0.0/16	3269	TELECOM ITALIA
82.104.128.0/17	3269	TELECOM ITALIA
82.105.0.0/16	3269	TELECOM ITALIA
82.105.128.0/17	3269	TELECOM ITALIA
128.65.0.0/16	3463	ACES Research Inc
132.0.0.0/10	568	DISO-UNRRA
134.137.0.0/16	7170	AT&T Government Markets
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
172.32.1.0/25	1221	Telstra Pty Ltd
201.115.100.0/24	7018	AT&T



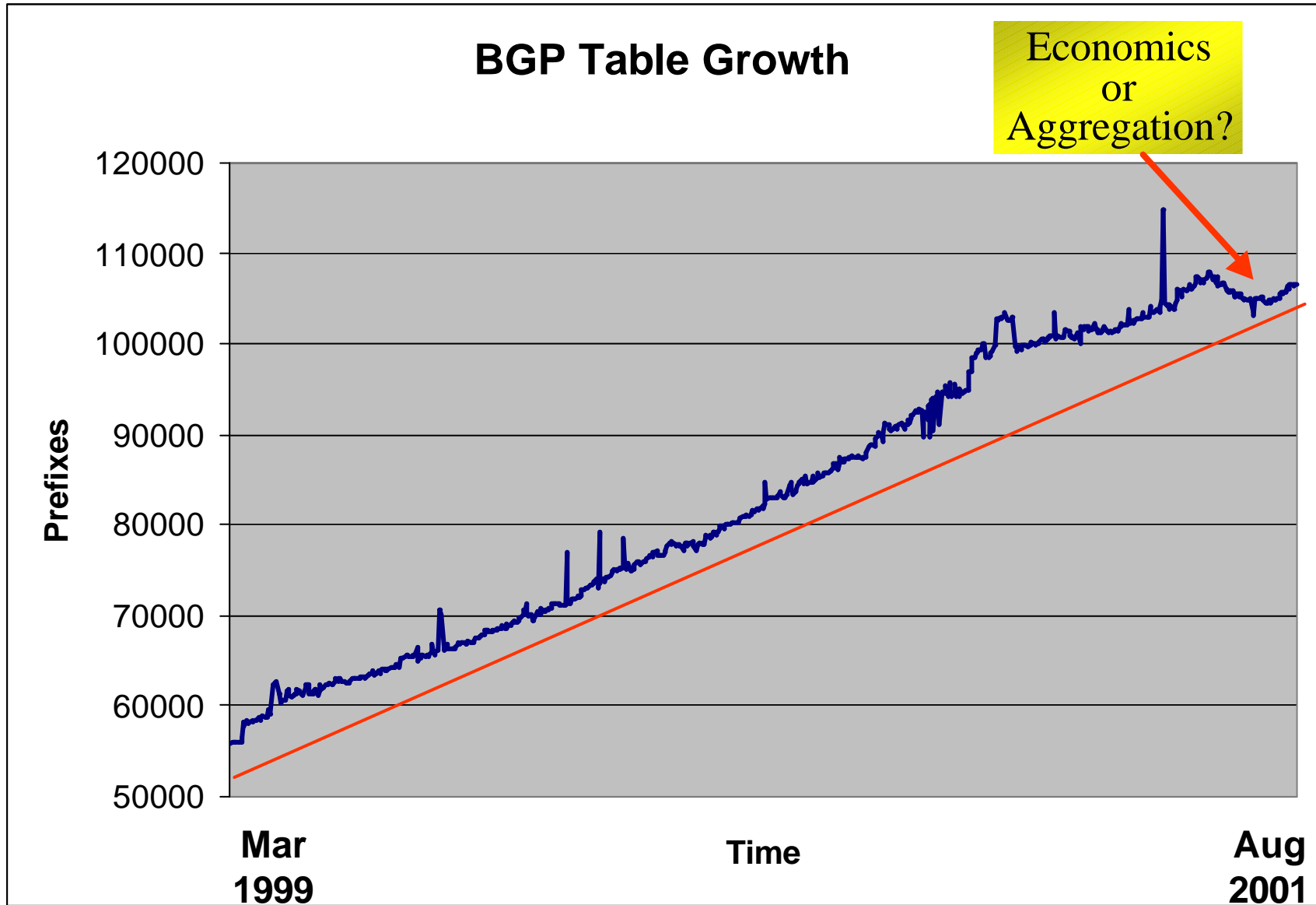
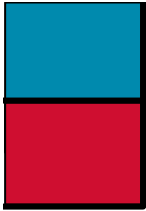
## Advertised Prefixes Smaller than "Registry Allocations"

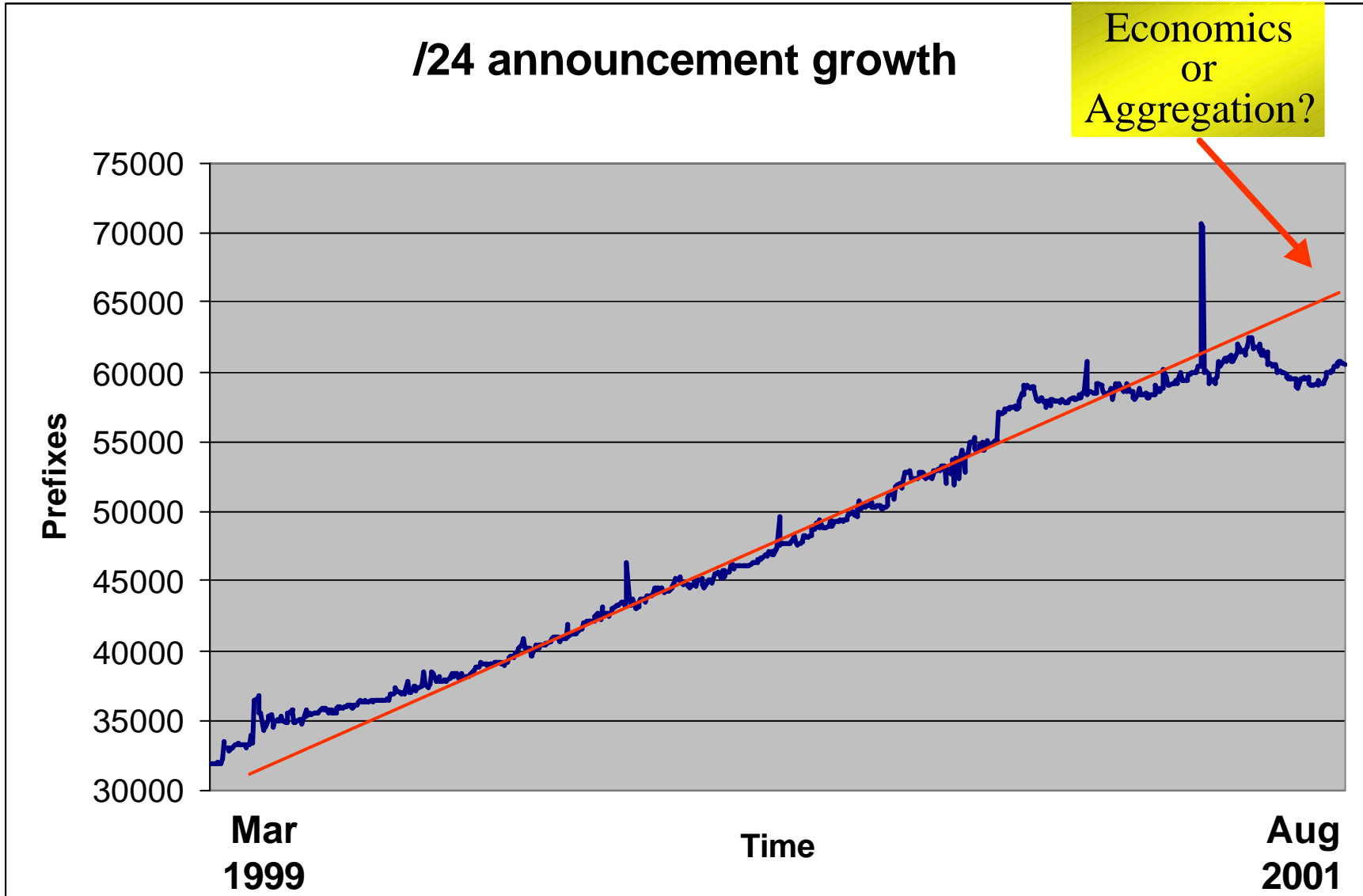
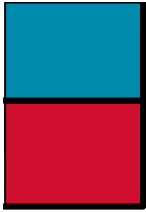
ASN	No of nets	Total Ann.	Description
1221	1458	1607	Telstra Pty Ltd
701	1456	2312	UUNET Technologies, Inc.
3908	738	885	Supernet, Inc.
7046	701	871	UUNET Technologies, Inc.
2551	697	805	ICG NetAhead, Inc
7018	500	988	AT&T
690	491	495	Merit Network
4293	464	481	Cable & Wireless USA
702	444	693	UUNET Technologies, Inc.
1	418	891	BBN Planet
15870	403	407	Global Center Frankfurt
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209	339	471	Qwest
703	329	399	UUNET Technologies, Inc.
11371	327	340	Rhythms NetConnections
4323	299	348	Time Warner Communications, I
18993	299	303	Global Crossing
2548	282	392	Business Internet, Inc.



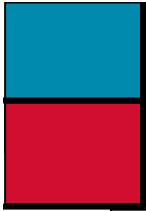
## Number of /24s announced by per /8

9:3	12:395	13:10	15:1	17:6	20:2
24:660	26:1	32:31	38:7	43:1	44:2
53:2	55:1	57:13	61:57	62:140	63:1901
64:1320	65:553	66:401	80:32	128:42	129:91
130:21	131:45	132:12	133:1	134:169	135:10
136:19	137:127	138:215	139:45	140:142	141:159
142:64	143:41	144:144	145:11	146:147	147:138
148:205	149:94	150:35	151:213	152:420	153:31
154:24	155:77	156:79	157:114	158:73	159:64
160:47	161:146	162:64	163:159	164:141	165:91
166:184	167:135	168:117	169:36	170:269	171:2
192:5400	193:1909	194:2060	195:825	196:409	198:3738
199:3397	200:2371	201:1	202:2727	203:4603	204:3549
205:2375	206:2963	207:2889	208:3084	209:3070	210:520
211:128	212:789	213:451	214:9	215:13	216:3049
217:391	218:2				

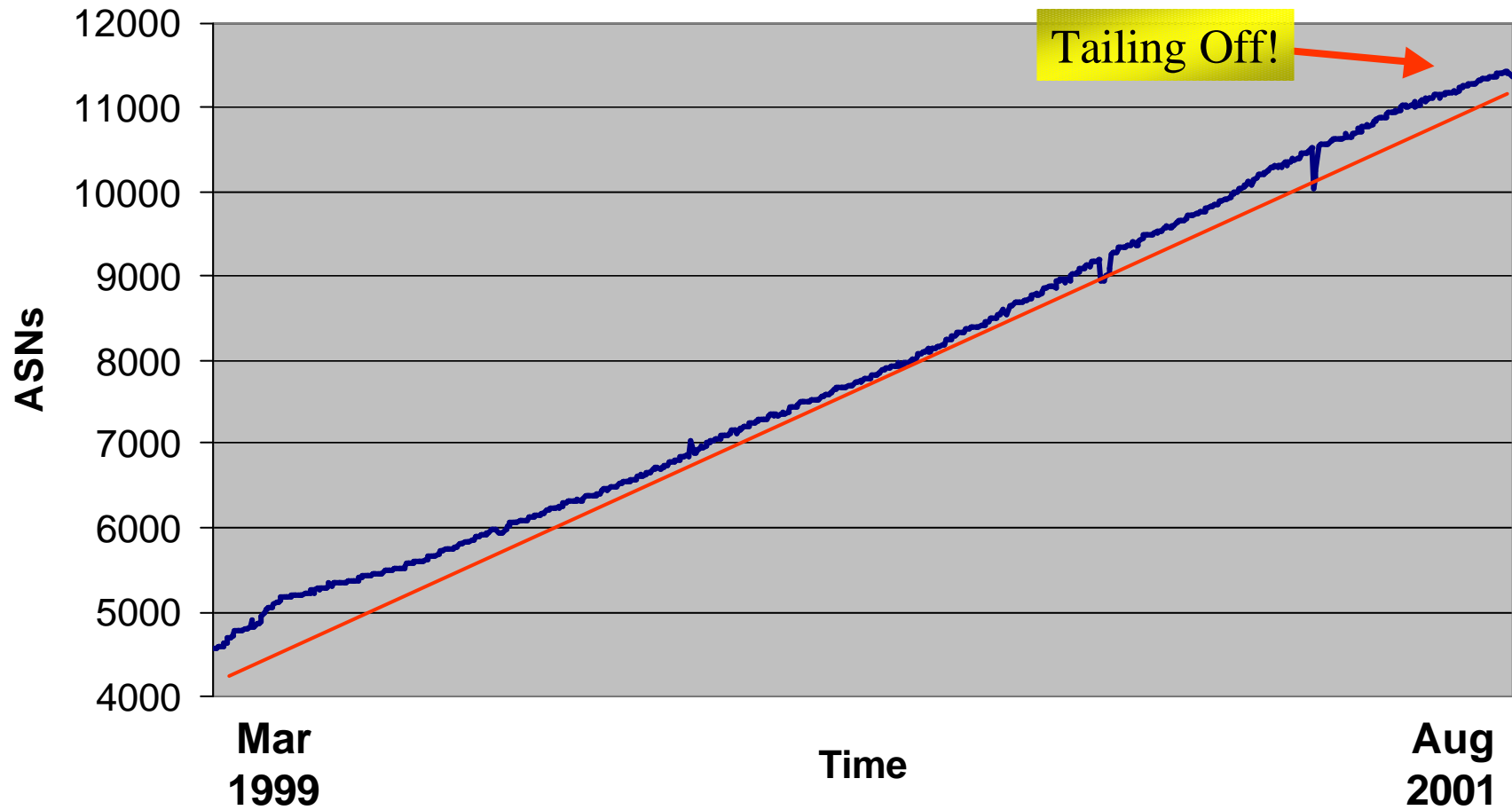


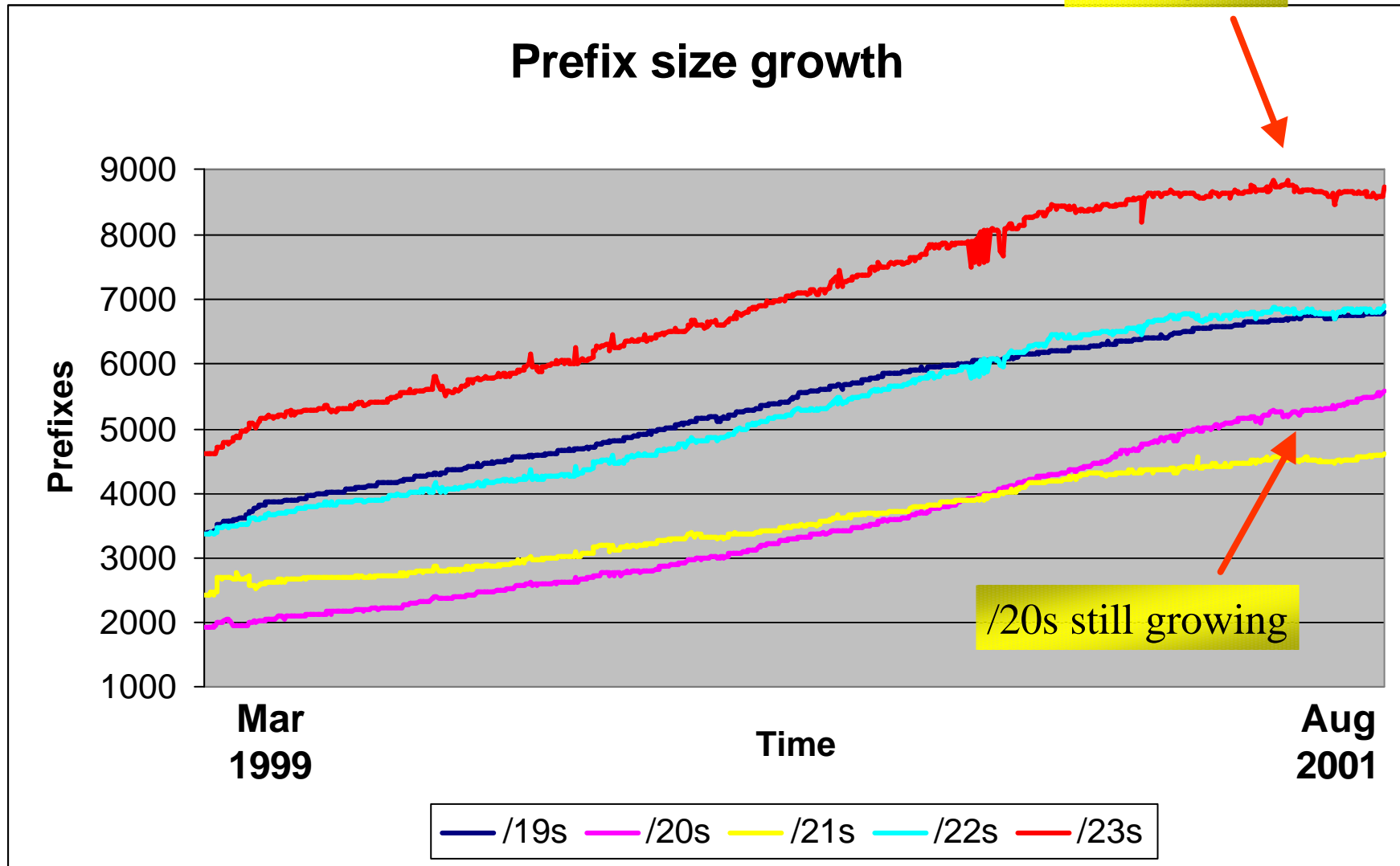
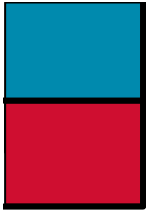


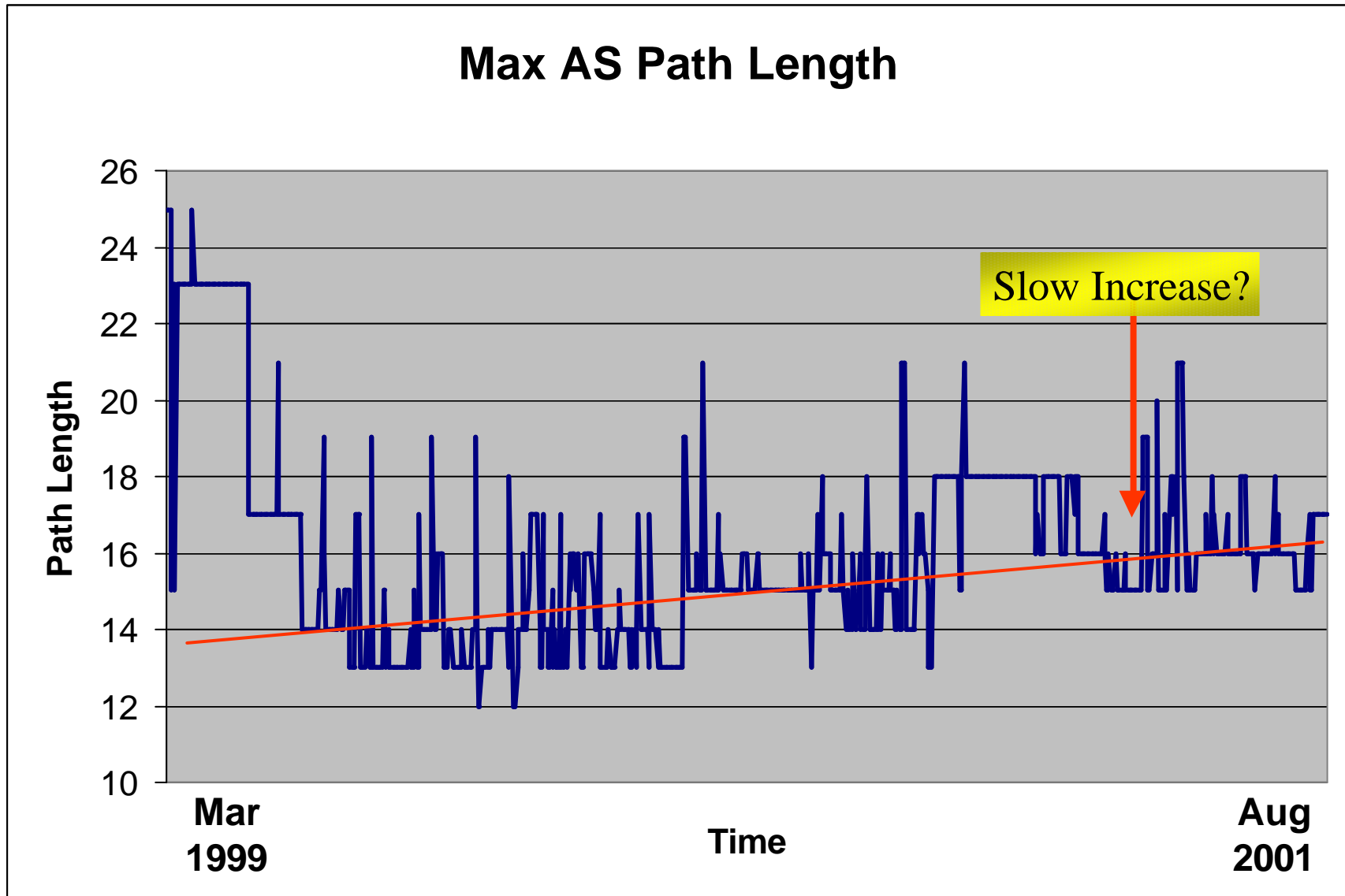
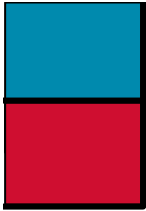


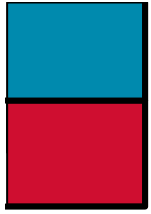


## AS Announcement Growth









# Final Slide...

- **Comments?**
- **Discussion**
- **Input?**