Tracking the Internet's BGP Table

Geoff Huston

Telstra

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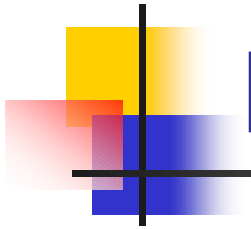
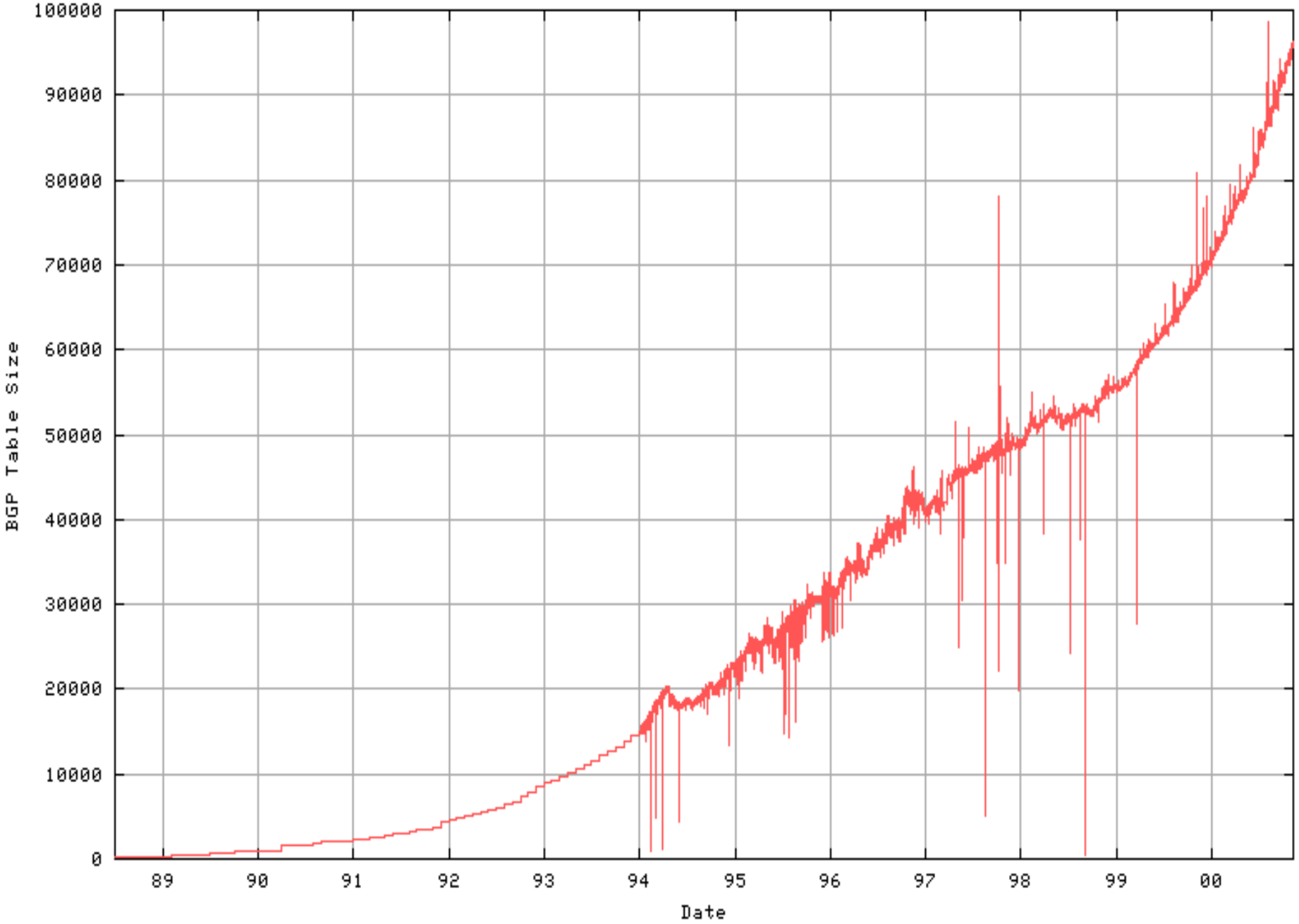


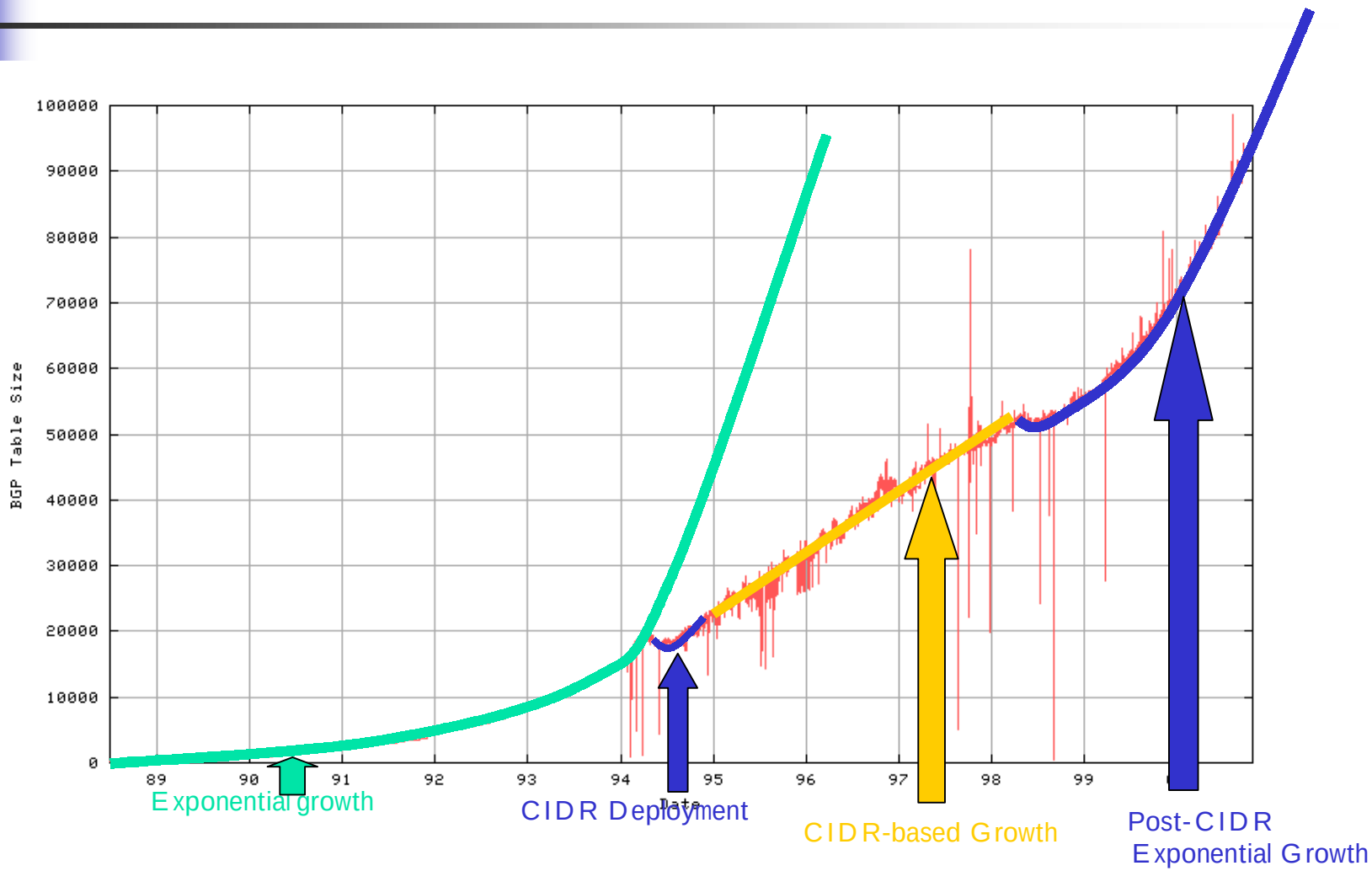
Methodology

- The BGP table monitor uses a router at the boundary of AS1221 which has a default-free BGP routing table
- Capture the output from “show ip bgp” every hour
- Perform analysis of the data

  (and then discard the raw dump!)
- Update reports at http://www.telstra.net/ops/bgp

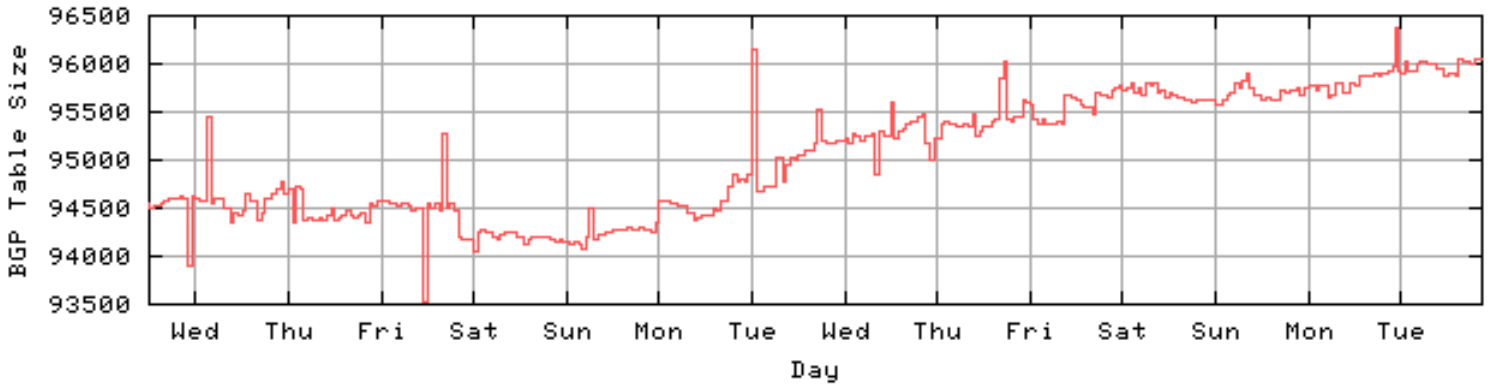

BGP Table Size
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
89
90
91
92
93
94
95
96
97
98
99
00
Date

Phases of Growth

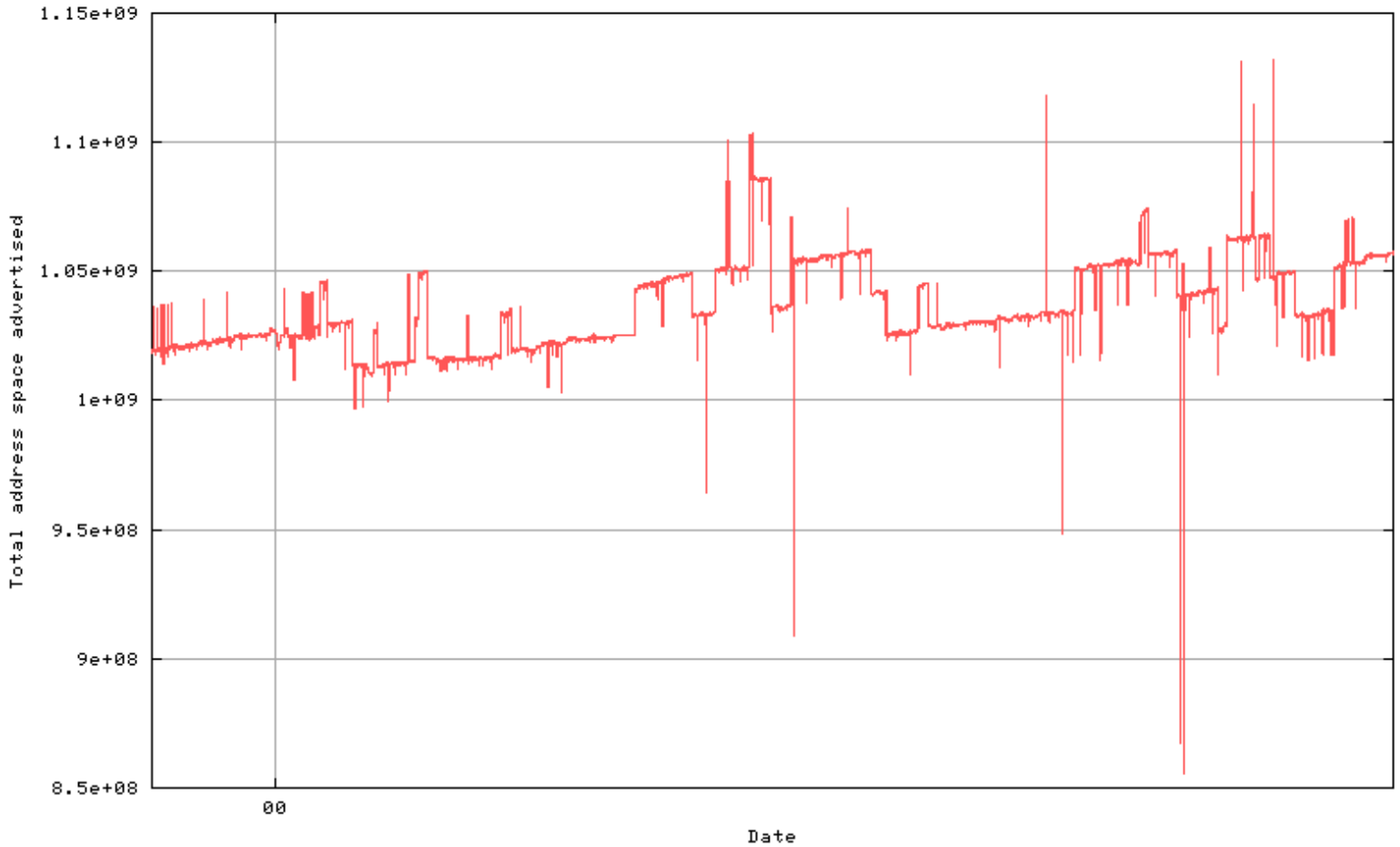


Growth Characteristics

- Short term route fluctuation is an absolute value (not a % of total routes) of 1,000 – 2,000 routes



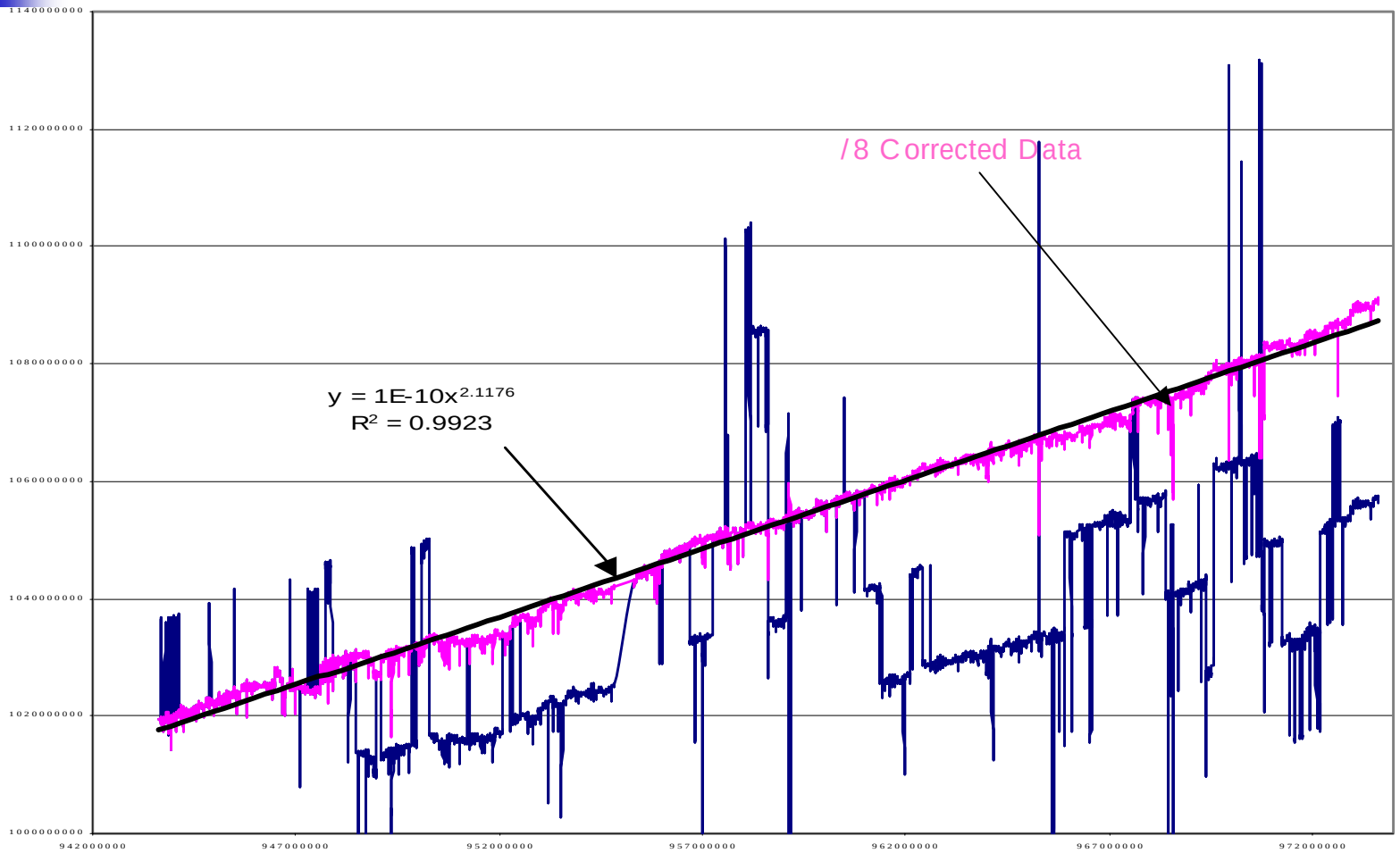
Routed Address Space



Fluctuation is due to announcement / withdrawals of /8 prefixes

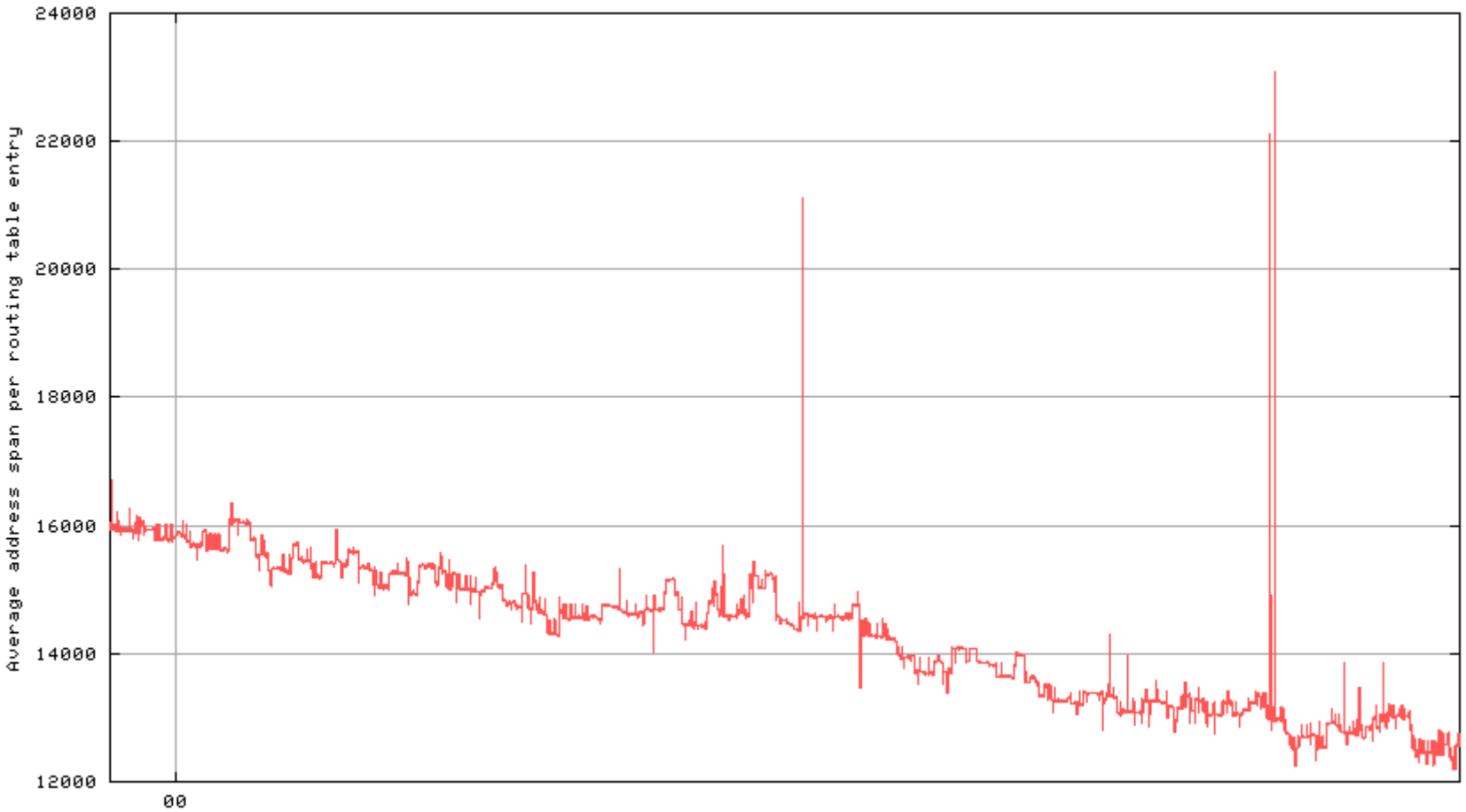
11 months of data does not provide clear longer growth characteristic

Routed Address Space (/8 Corrected)



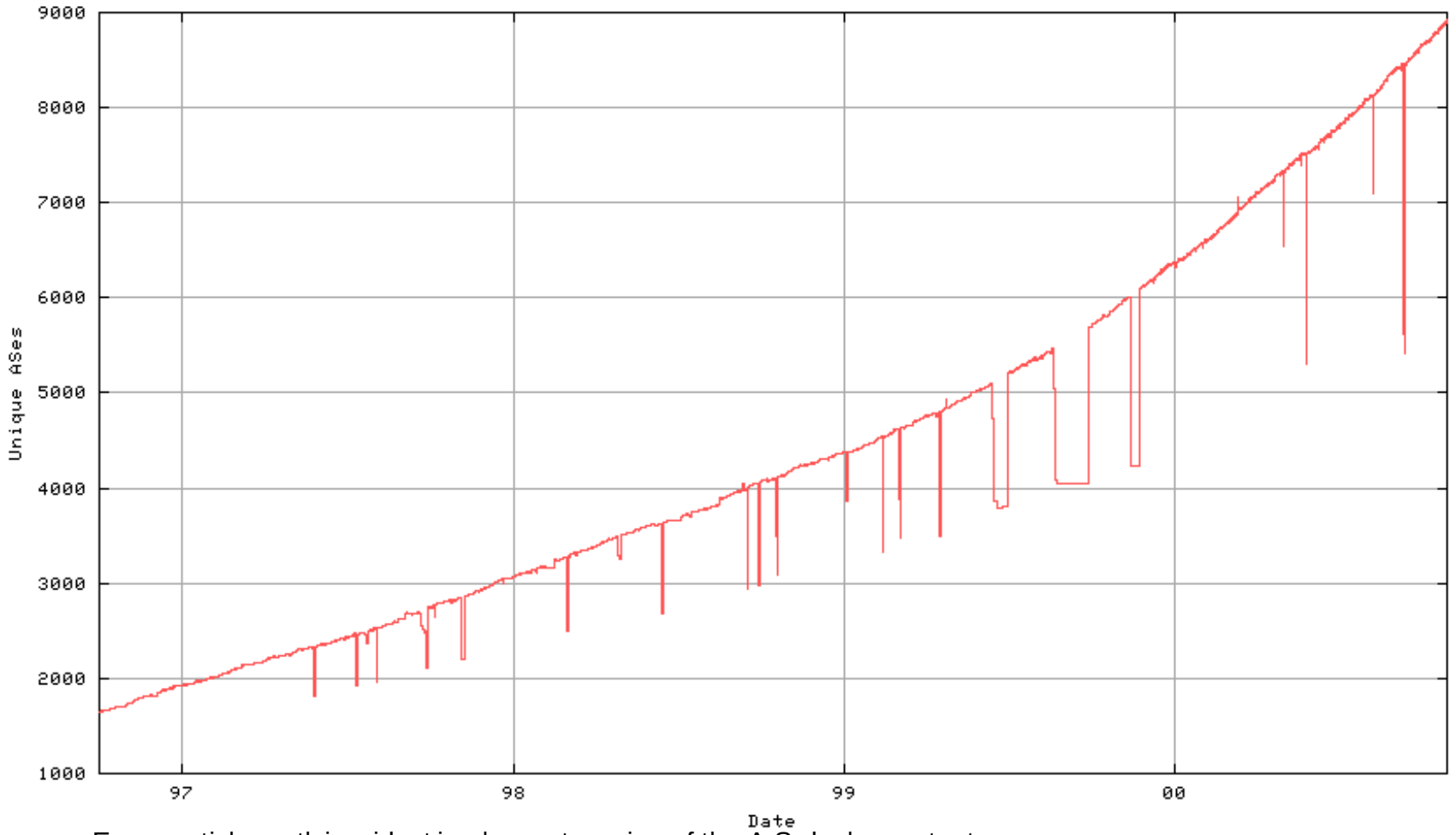
Annual compound growth rate is 107% p.a.

Average size of a routing entry



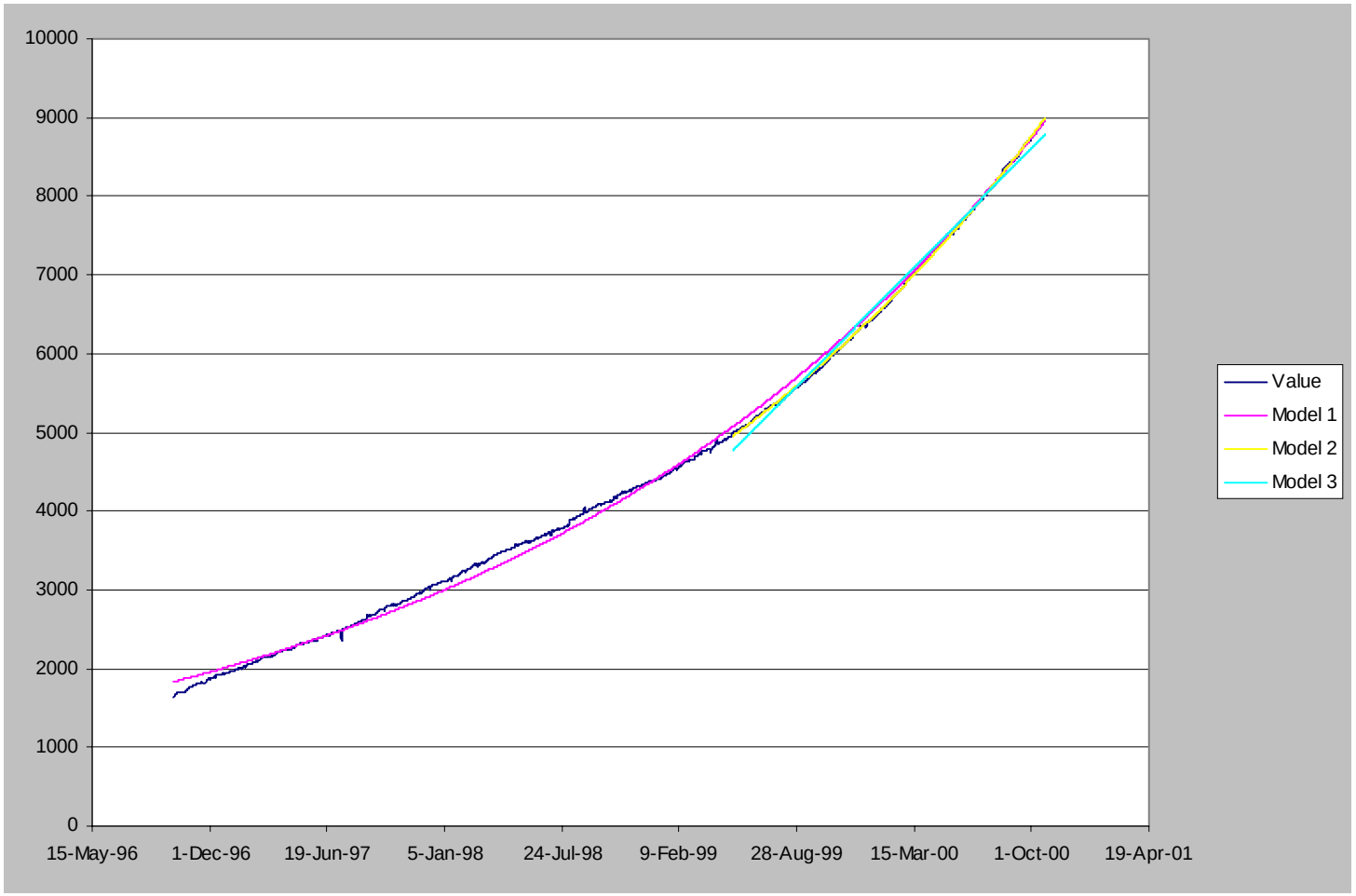
The BGP routing tale is growing at a faster rate than the rate of growth of announced address space

Number of AS's in the table



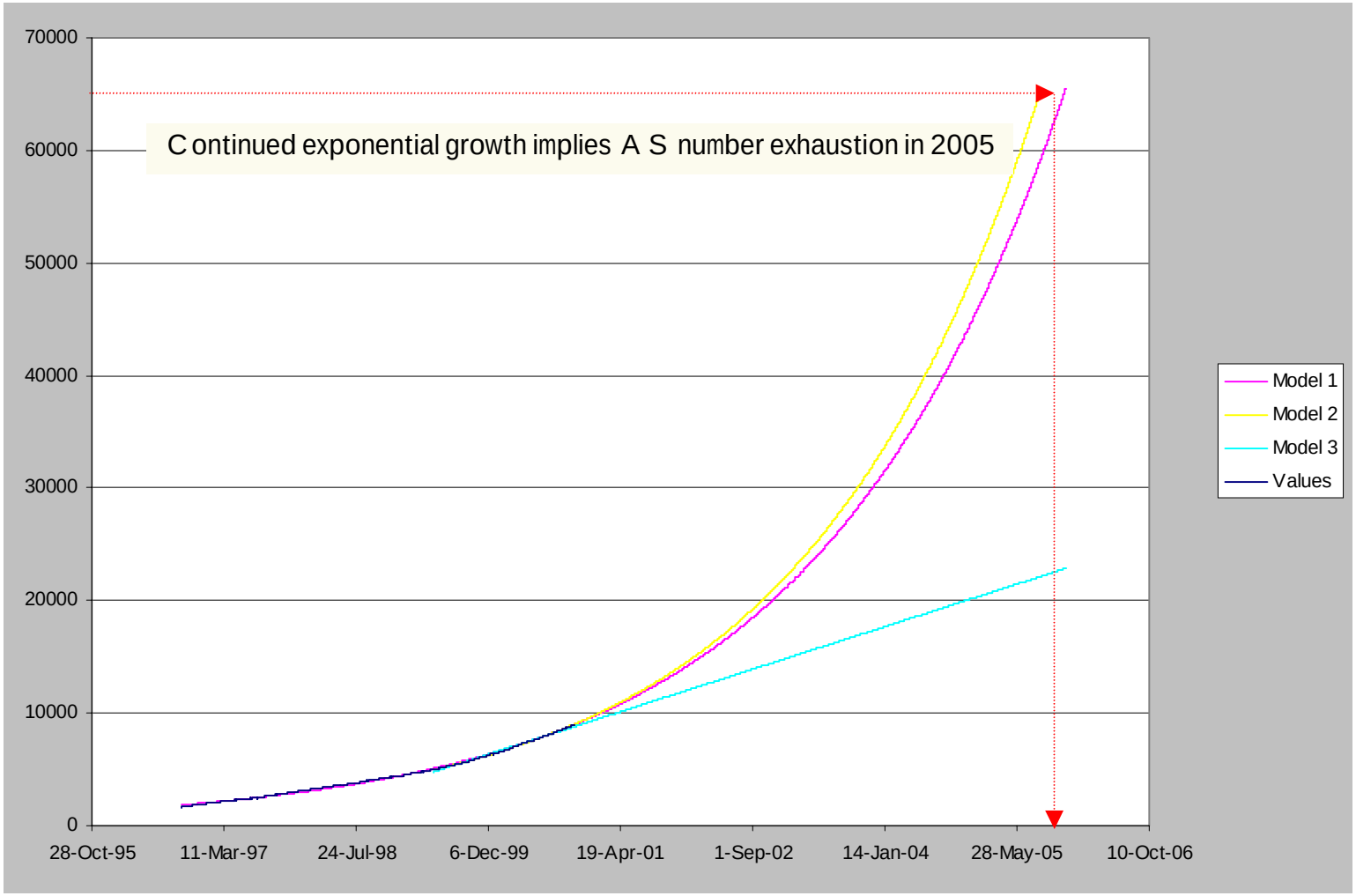
Exponential growth is evident in a longer term view of the AS deployment rate

AS Number Trend Models

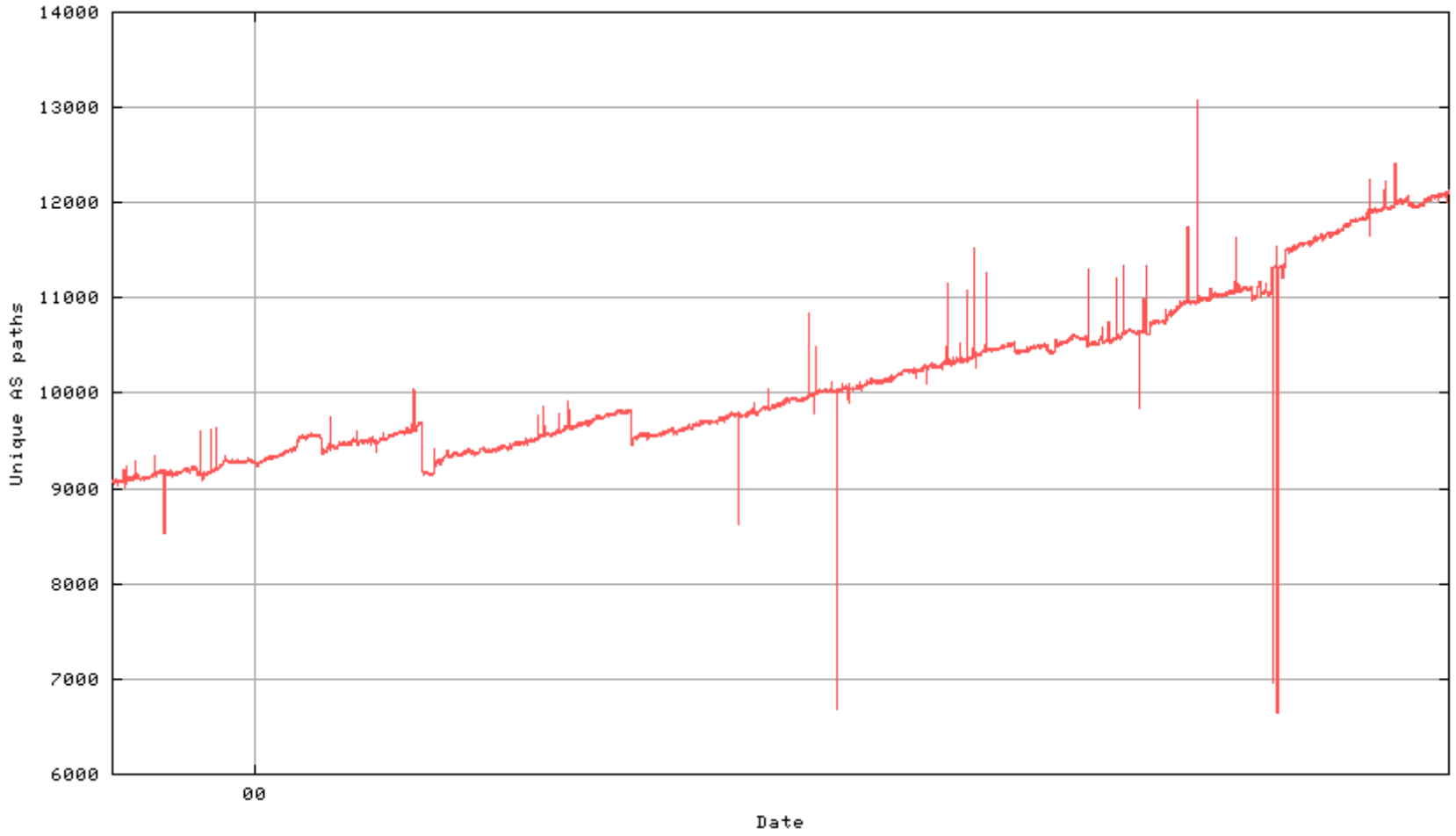


Best fit model is an exponential model using 12 months of data

AS Number Use - Extrapolation



Number of distinct AS Paths

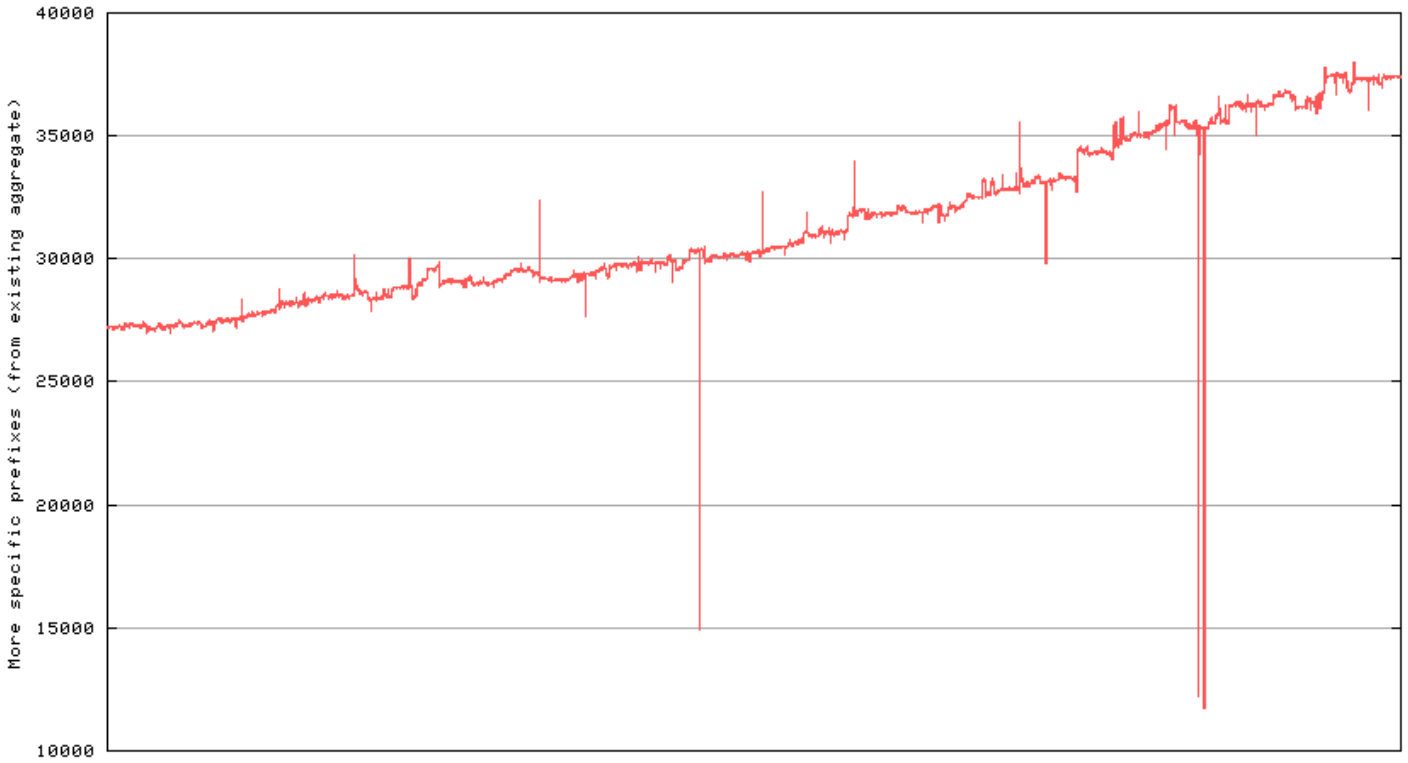


Observations for 99/00

- Linear rise in routed address space
  - 5M x /32 / month
- Exponential rise in number of AS's
  - 3.5% growth / month (151% / year)
- Exponential rise in number of route advertisements
  - 3% growth / month (140% / year)
- Exponential rise in the number of routed addresses
  - 0.6% growth / month (107% / year)

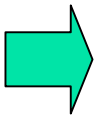
Multi-homing on the rise?

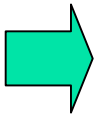
- Track rate of CIDR “holes” – currently 35% of all route advertisements are routing ‘holes”



T his graph tracks the number of address prefix advertisements which are part of an advertised larger address prefix

Prefix Growth – Aug 00 to Oct 00





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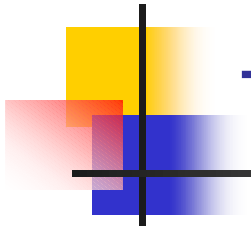
/16   6553 ->   6670   absolute growth =   117, relative =    1.79%
/17    889 ->    936   absolute growth =    47, relative =    5.29%
/18   1763 ->   1884   absolute growth =   121, relative =    6.86%
/19   5704 ->   5984   absolute growth =   280, relative =    4.91%
/20   3423 ->   3854   absolute growth =   431, relative =   12.59%
/21   3621 ->   3856   absolute growth =   235, relative =    6.49%
/22   5415 ->   5870   absolute growth =   455, relative =    8.40%
/23   7298 ->   7788   absolute growth =   490, relative =    6.71%
/24  49169 ->  52449   absolute growth =  3280, relative =    6.67%
/25    208 ->    436   absolute growth =   228, relative =  109.62%
/26    334 ->    606   absolute growth =   272, relative =   81.44%
/27    469 ->    667   absolute growth =   198, relative =   42.22%
/28    357 ->    452   absolute growth =    95, relative =   26.61%
/29    579 ->    764   absolute growth =   185, relative =   31.95%
/30    746 ->   1026   absolute growth =   280, relative =   37.53%
```

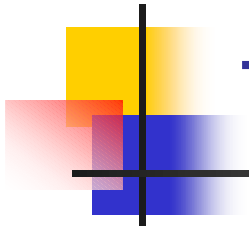
T he largest significant relative growth in recent times is /20, tracking the allocation policy change in the RIRs

While the absolute number is low, the largest relative growth is in /25 prefixes, and /25 to /30 represent the greatest area of prefix growth in relative terms



Tentative Conclusions

- BGP table size will continue to rise exponentially
- AS number deployment growth will exhaust 64K AS number space in 2005 if current growth trends continue
- Multi-homing at the edge of the Internet is on the increase
- The interconnectivity mesh is getting denser
  - The number of AS paths is increasing faster than the number of AS's



Tentative Conclusions (Cont)

- Inter-AS Traffic Engineering is being undertaken through routing discrete prefixes along different paths (the routing mallet!)
- RIR allocation policy (/19, /20) is driving the per-prefix length growth
- More noise (/25 and greater) in the table, but the absolute level of noise is low (so far)