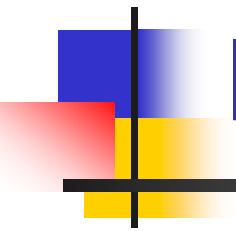
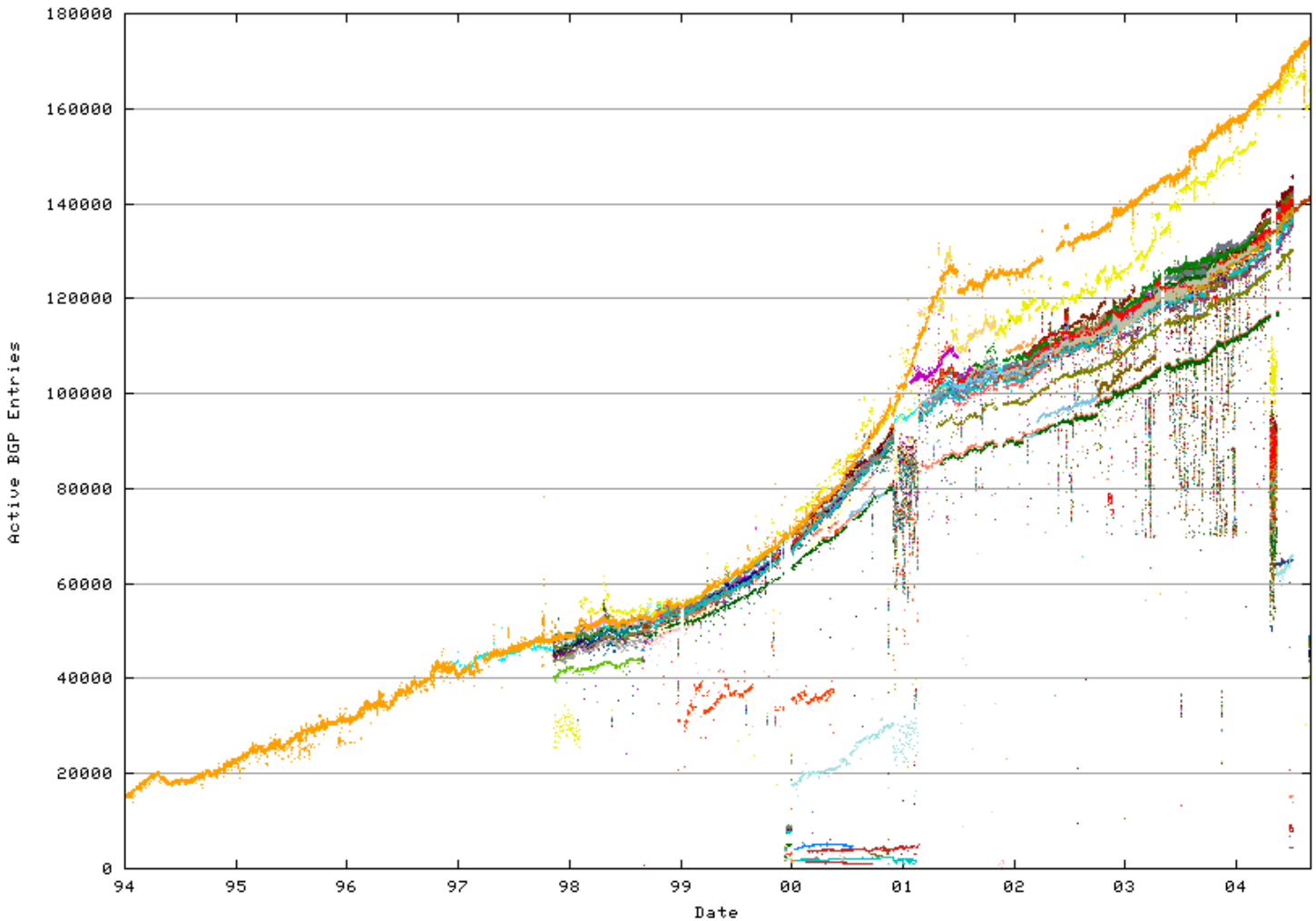


Routing Table Status Report

Geoff Huston
August 2004

APNIC

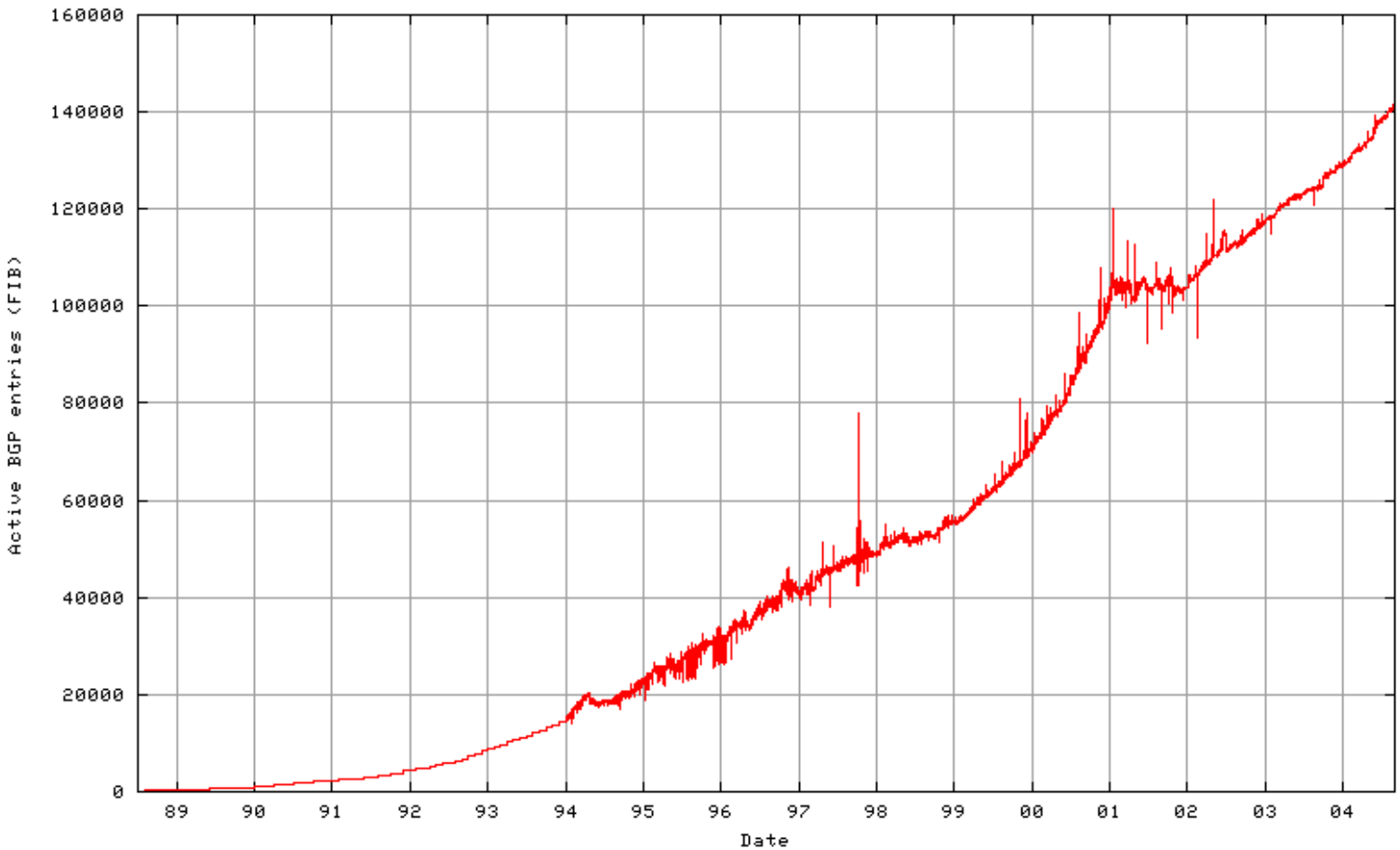
IPv4 Routing Table Size



Data assembled from a variety of sources, Including Surfnet, Telstra, KPN and Route Views. Each colour represents a time series for a single AS.

The major point here is that there is no single view of routing. Each AS view is based on local conditions, which include some local information and also local filtering policies about external views.

IPv4 Routing Table Size

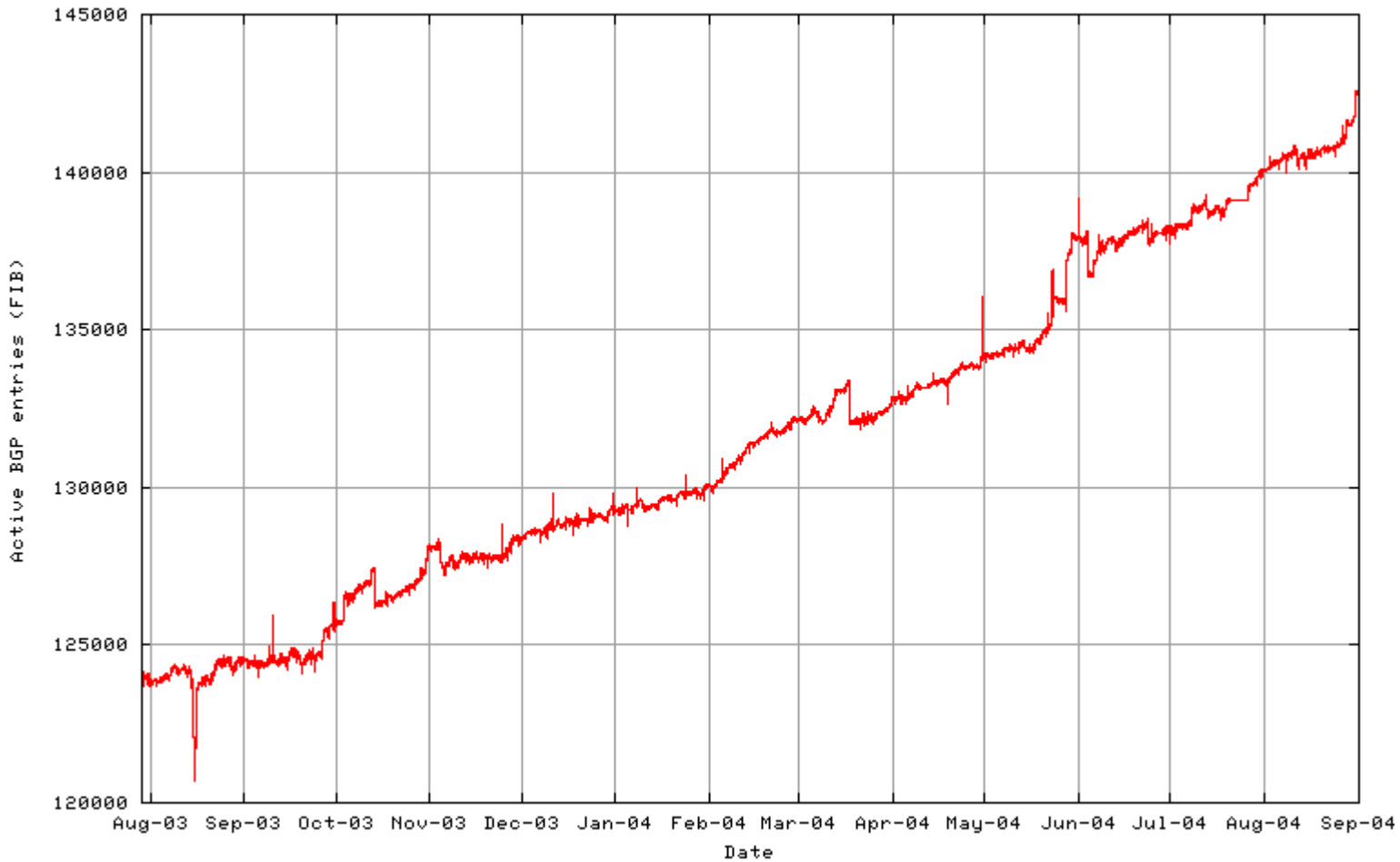


To provide a clearer view, a single transit view has been generated.

This view shows a number of distinct phases of routing table growth:

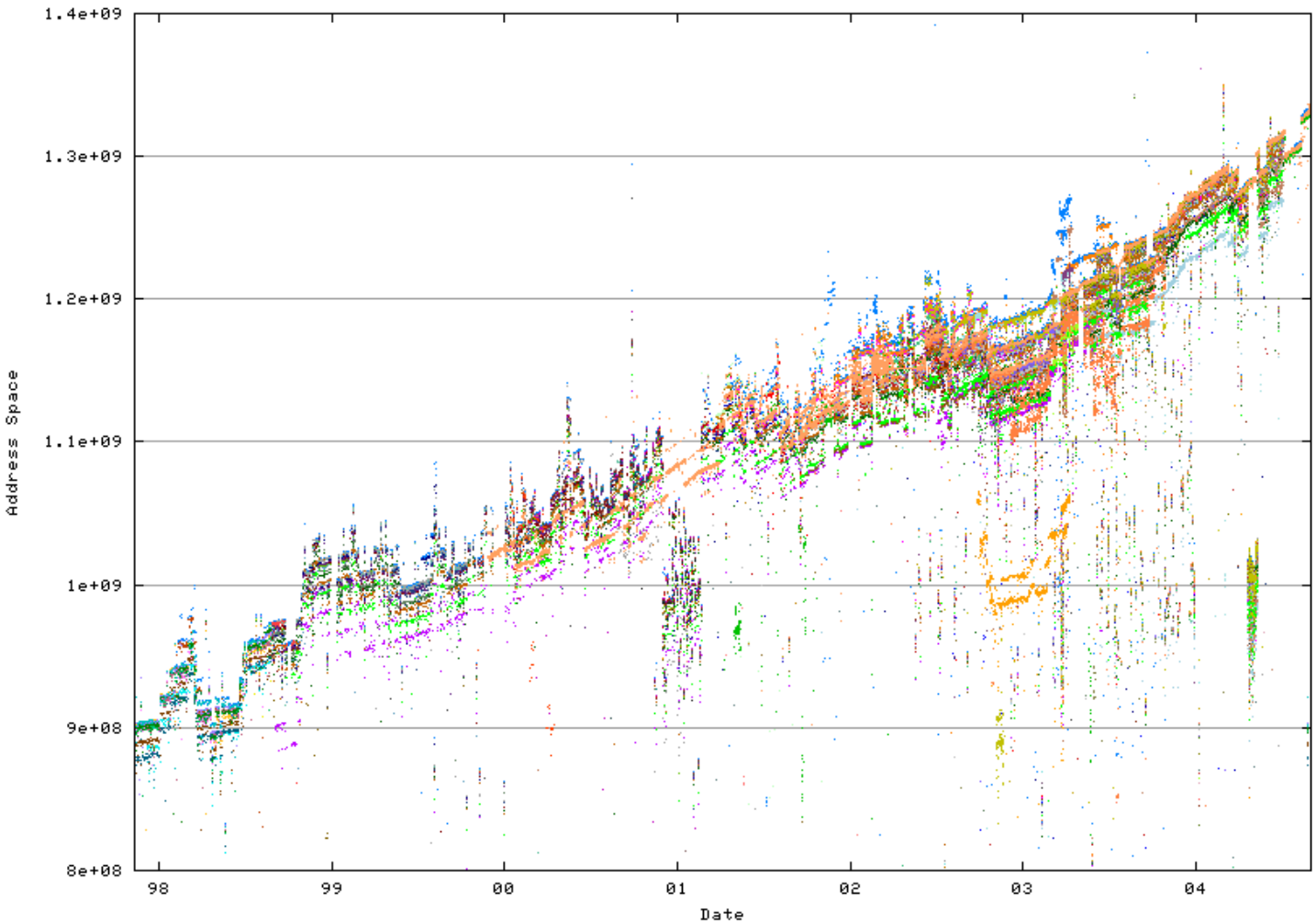
1 – the growth of the Class C's 88 – 94
2 – the introduction of CIDR into the routing environment in 1994
3 – the Internet boom on 1999, and its crash in 2001
4 – the post-crash growth since 2002

2003 / 2004



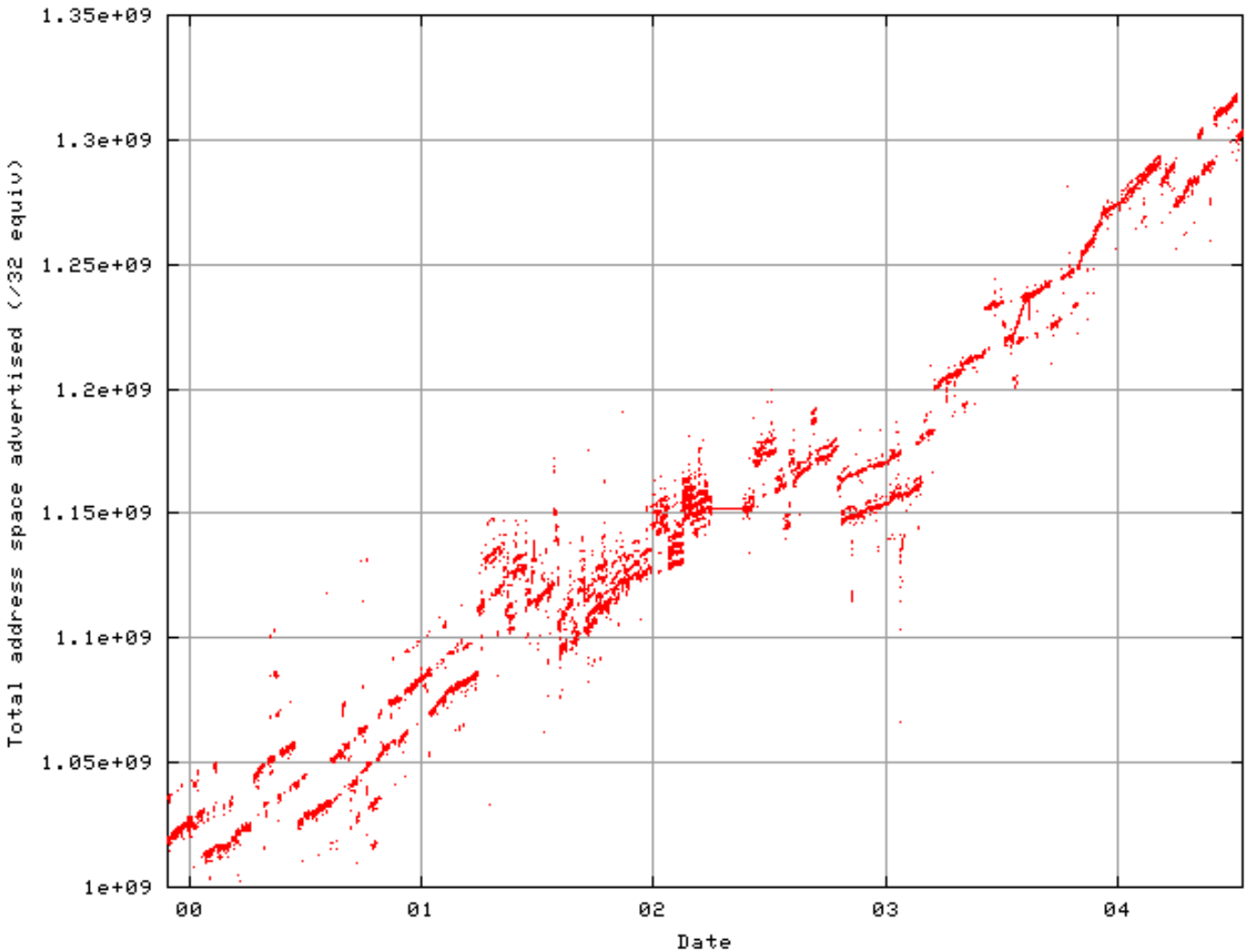
Routing table growth in the last 12 months shows an increasing growth trend, although the rate of growth remains close to linear (or constant) growth rates. This figure indicates that the current table growth rate is some 18,000 entries per year. This data is based on hourly snapshots of the routing table, and the noise in the figures is based downward spikes of lost routing information and upward spikes of transient routing information, possibly due to leakage of local more specific routes. The discontinuities show points of large scale aggregation or dis-aggregation.

IPv4 Address Span



This figure shows the total amount of address space spanned by the routing table. This is a view derived from the Route-Views archive, where each AS has a single colour. The snapshots are at two-hourly intervals, and span from early 2000 until the present. The strong banding in the figure is spaced 16.7M units apart, or the size of a /8 advertisement There appear to be 3 /8 advertisements that are dynamic. Not every AS sees the same address range, and this is long term systemic, rather than temporary. This is probably due to routing policy interaction, coupled with some cases of prefix length filtering of routing information. The rate of growth declined sharply across 2002 and the first half of 2003, resuming its 2000 growth levels in 2004.

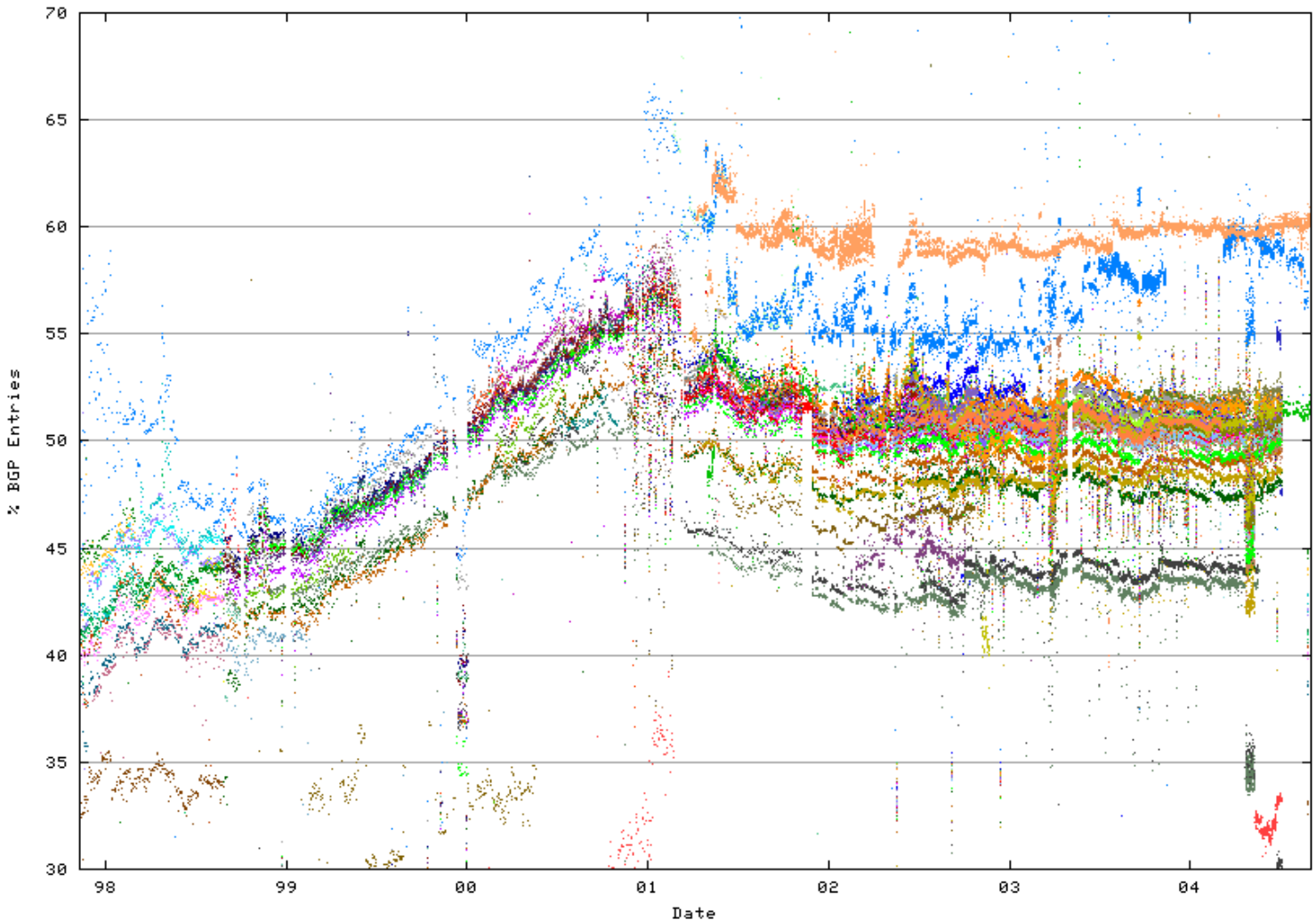
IPv4 Address Span



This is the same data for a single AS. It is evident thjast the number of unstable /8 advertisements has dropped from 3 to 1 over this period. It is also apparent that the rate of growth in 2004 is slightly higher than that of 2000.

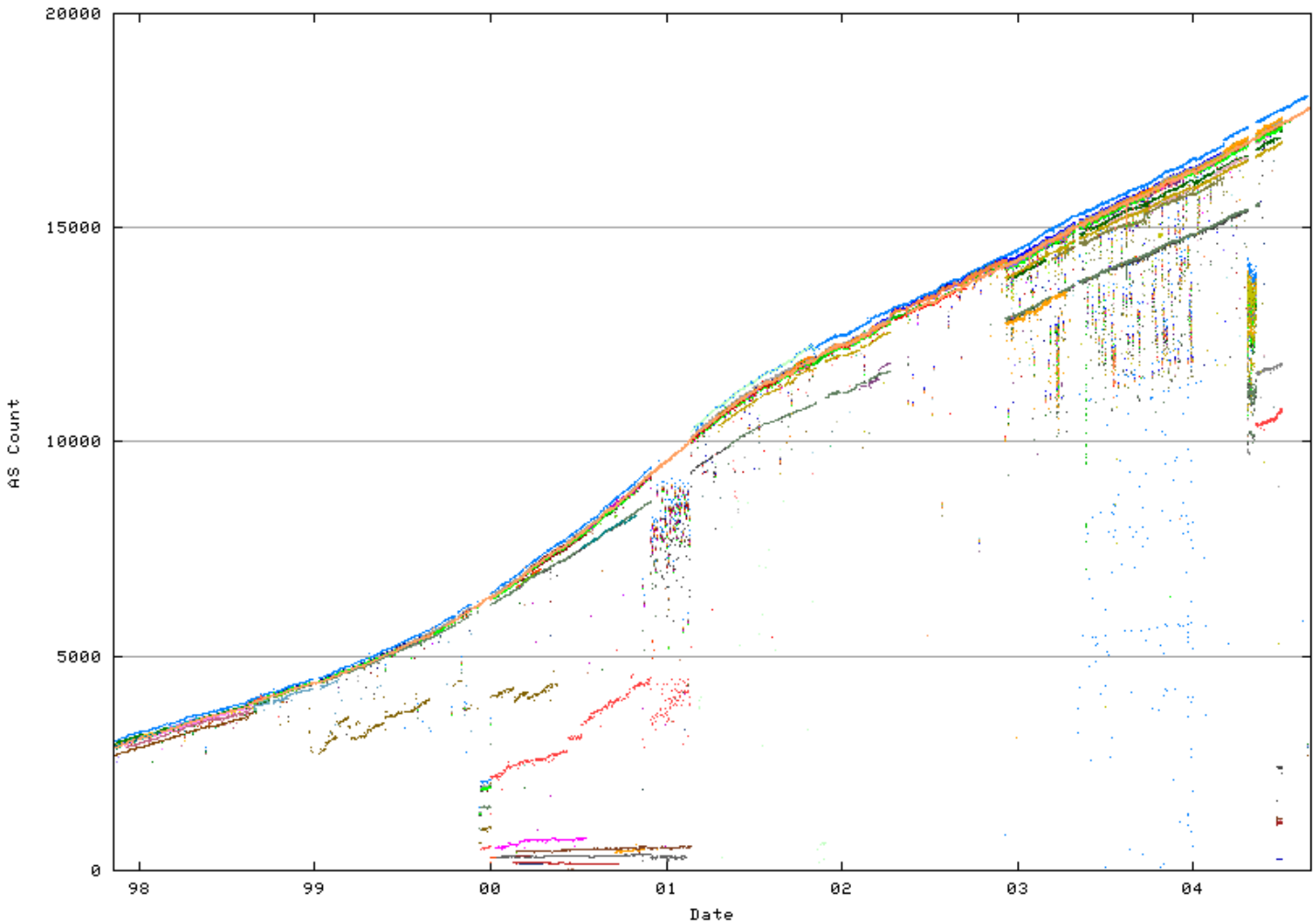
When comparing this to the steeply rising number of routing advertisements in 2000 it is likely that the periods of growth in the routing table correspond to periods of dis-aggregation of address blocks. This implies that the large growth periods of the routing table may be closely linked to periods of growth in policy diversity within the ISP sector, coupled with denser levels of interconnectivity.

IPv4 More Specific Advertisements



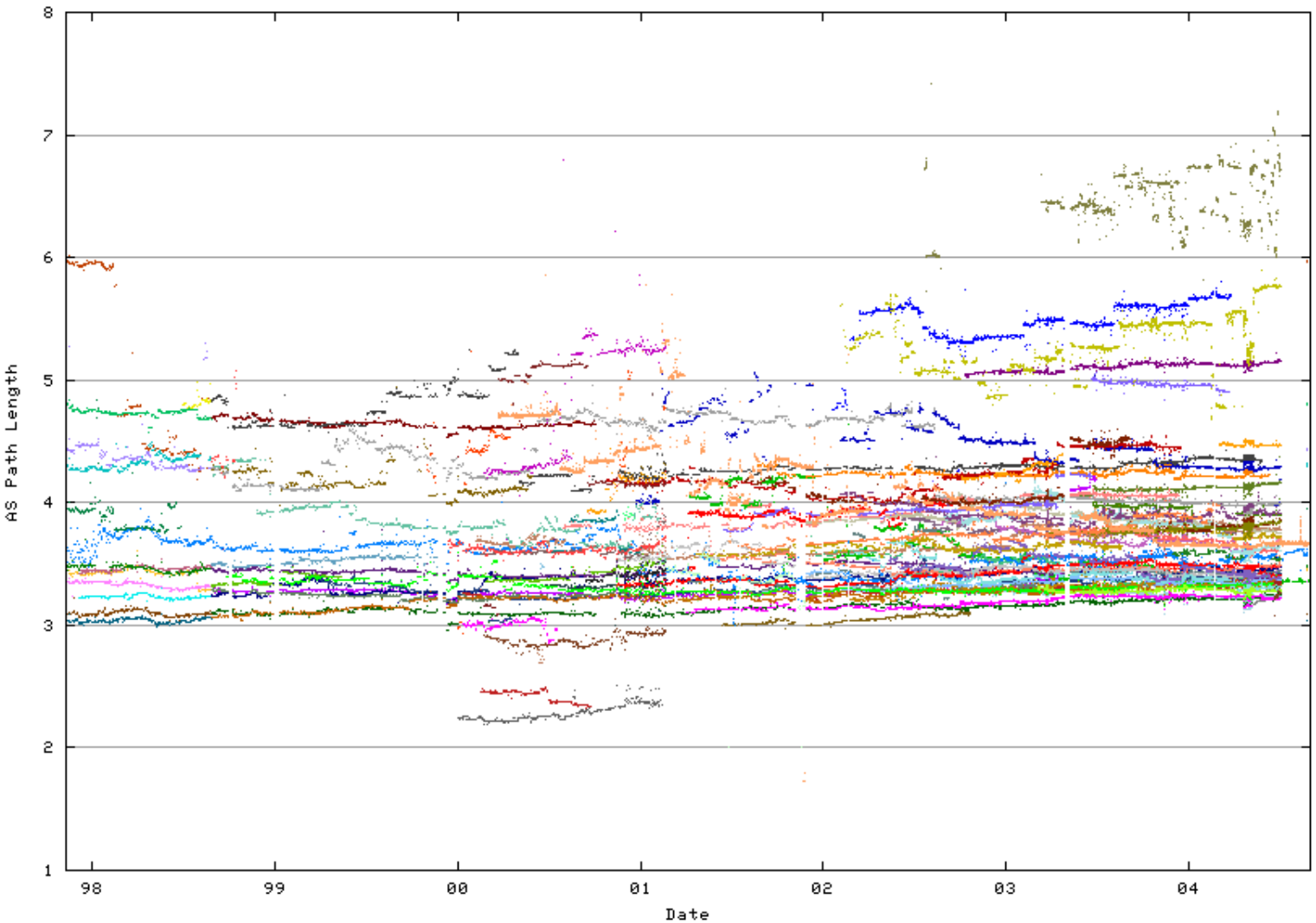
This shows the percentage of routing entries for each AS which are more specific of an existing aggregate advertisement. This shows that the level of fragmentation of aggregate address blocks is not getting any worse. At the start of 2001 the mean fragmentation level was 53% of all advertisements. This has dropped to 51% at present, and has remained stable for three years. The common fragmentation is to break an allocation into component /24 advertisements and advertise the fragment and the aggregate. This may be due to traffic engineering of incoming traffic using selective advertisement of more specific prefixes.

Unique ASNs



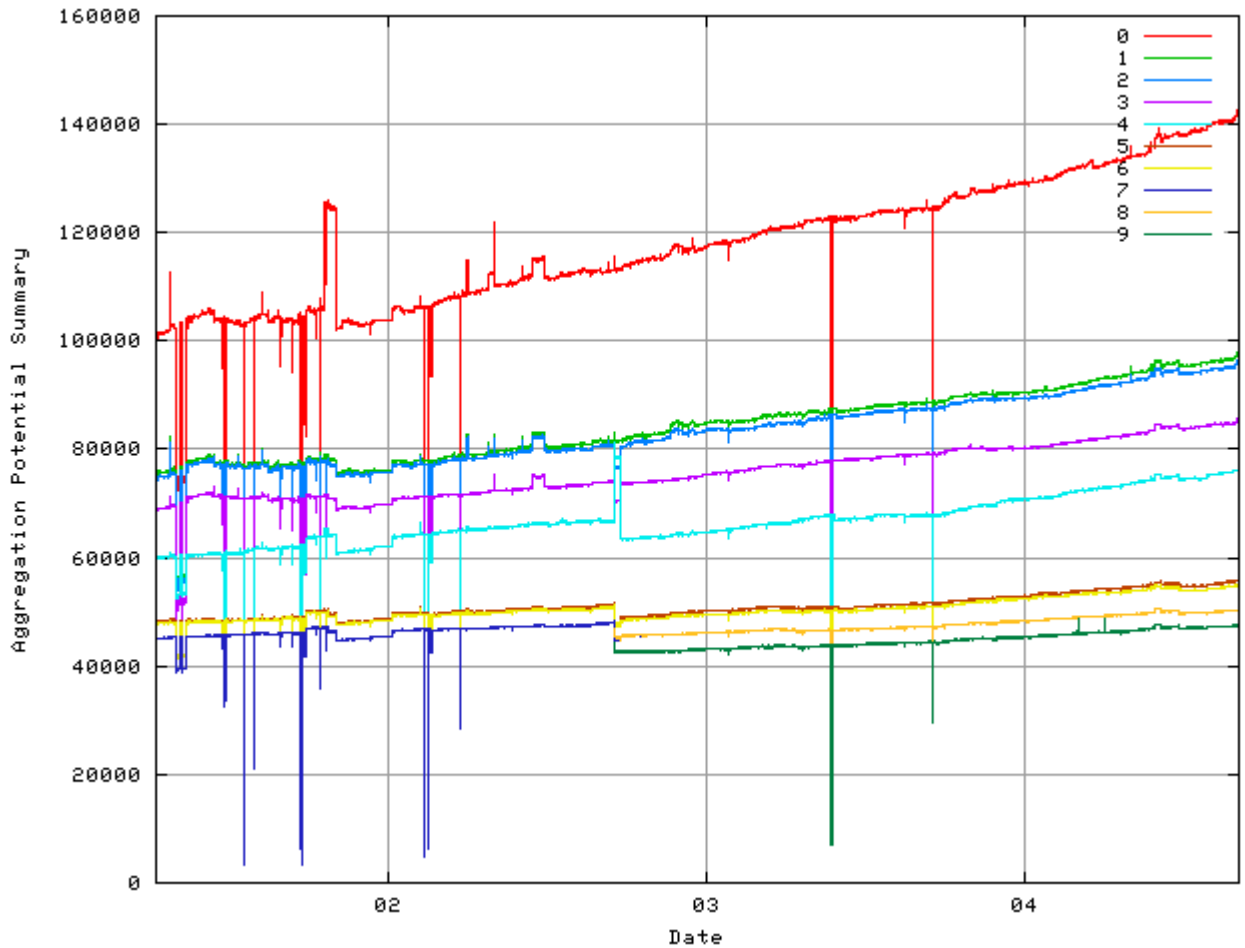
Since early 2001 the number of ASNs in the routing table has been growing at a constant rate, closely matching a linear growth model. New ASNs track the growth of new service providers.

Average AS Path Length

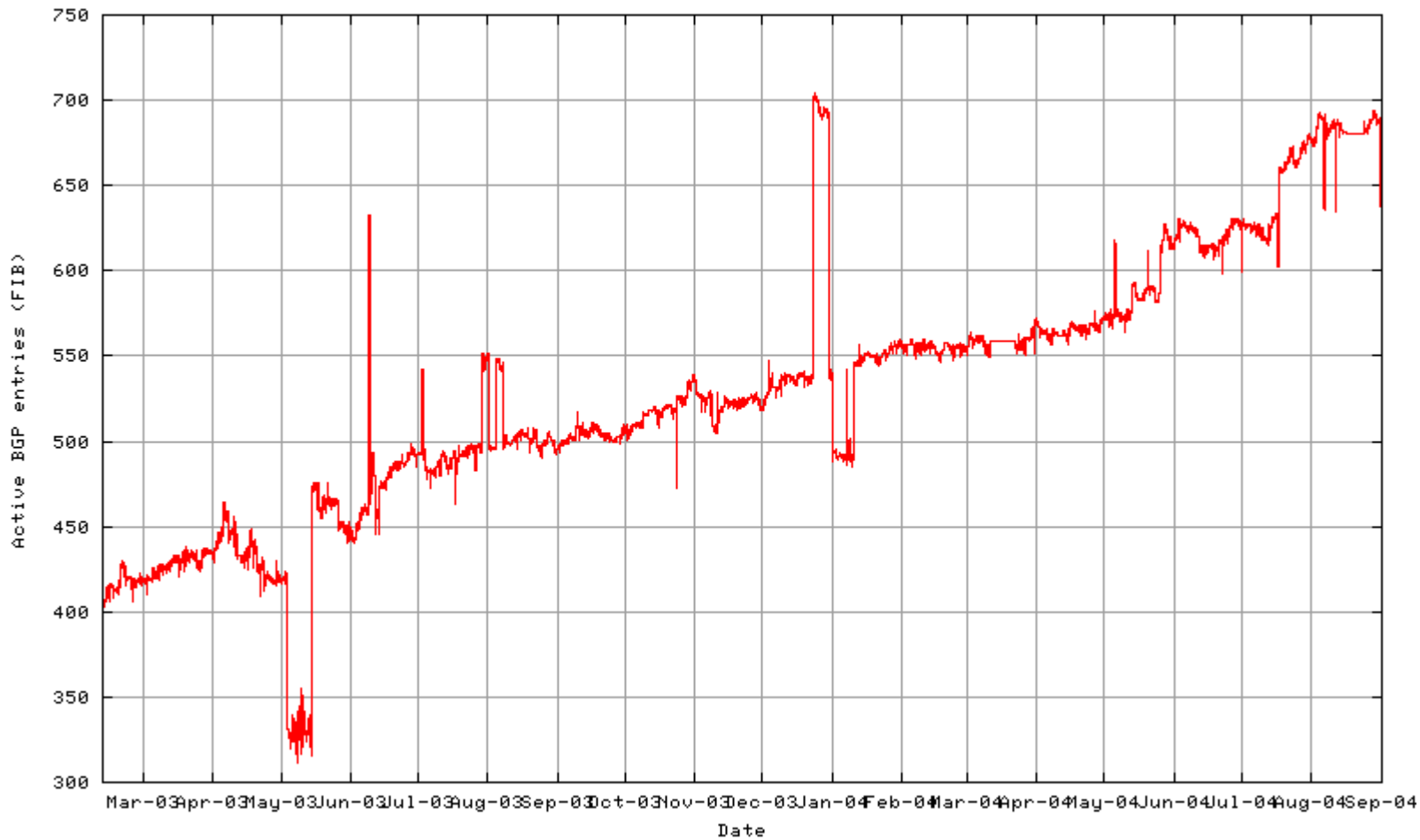


A constantly increasing number of ASNs can be related to average AS path length. The relatively constant AS path length for all AS paths implies that the density of AS interconnection is increasing at a rate proportional to the number of ASNs being added.

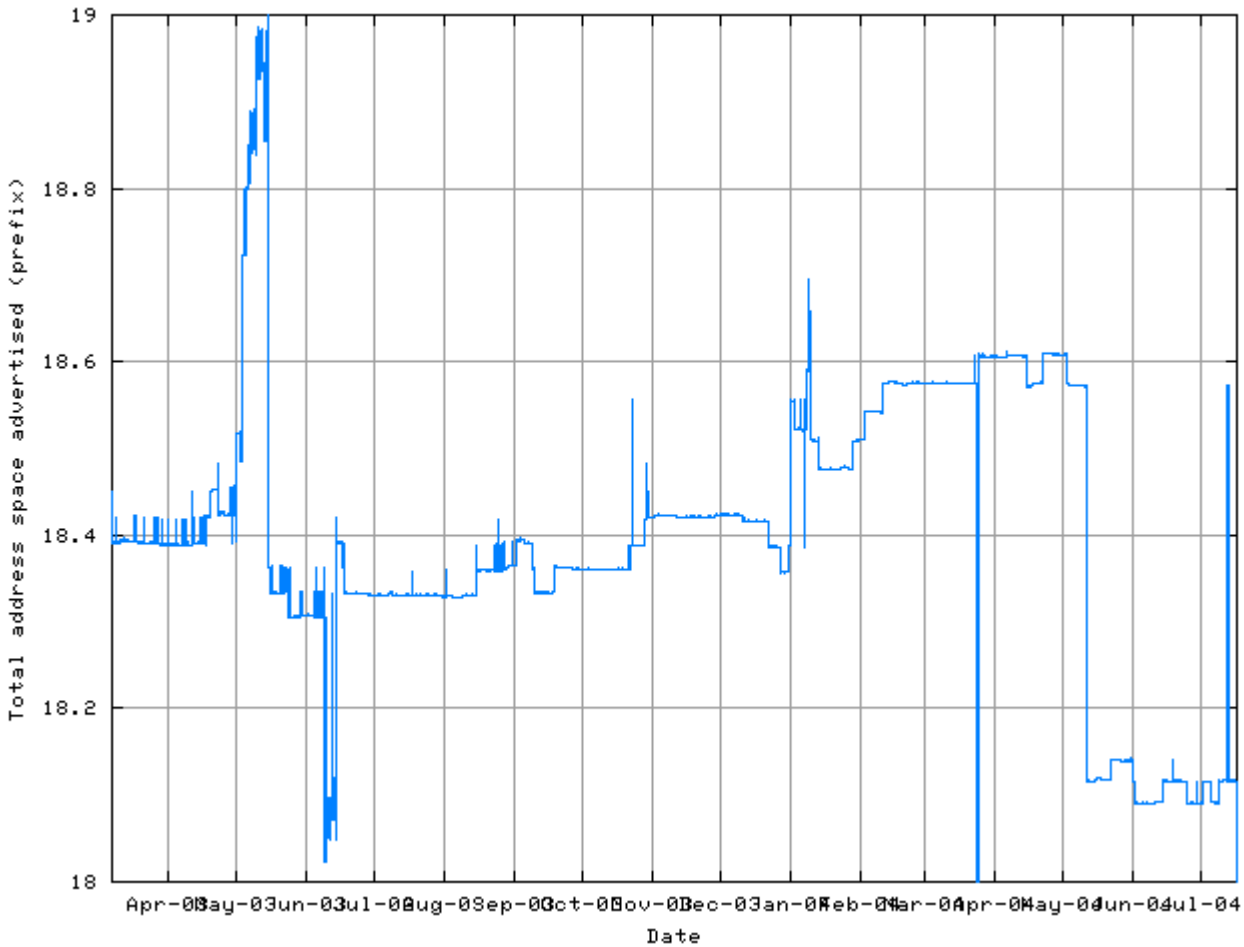
IPv4 Aggregation Potential



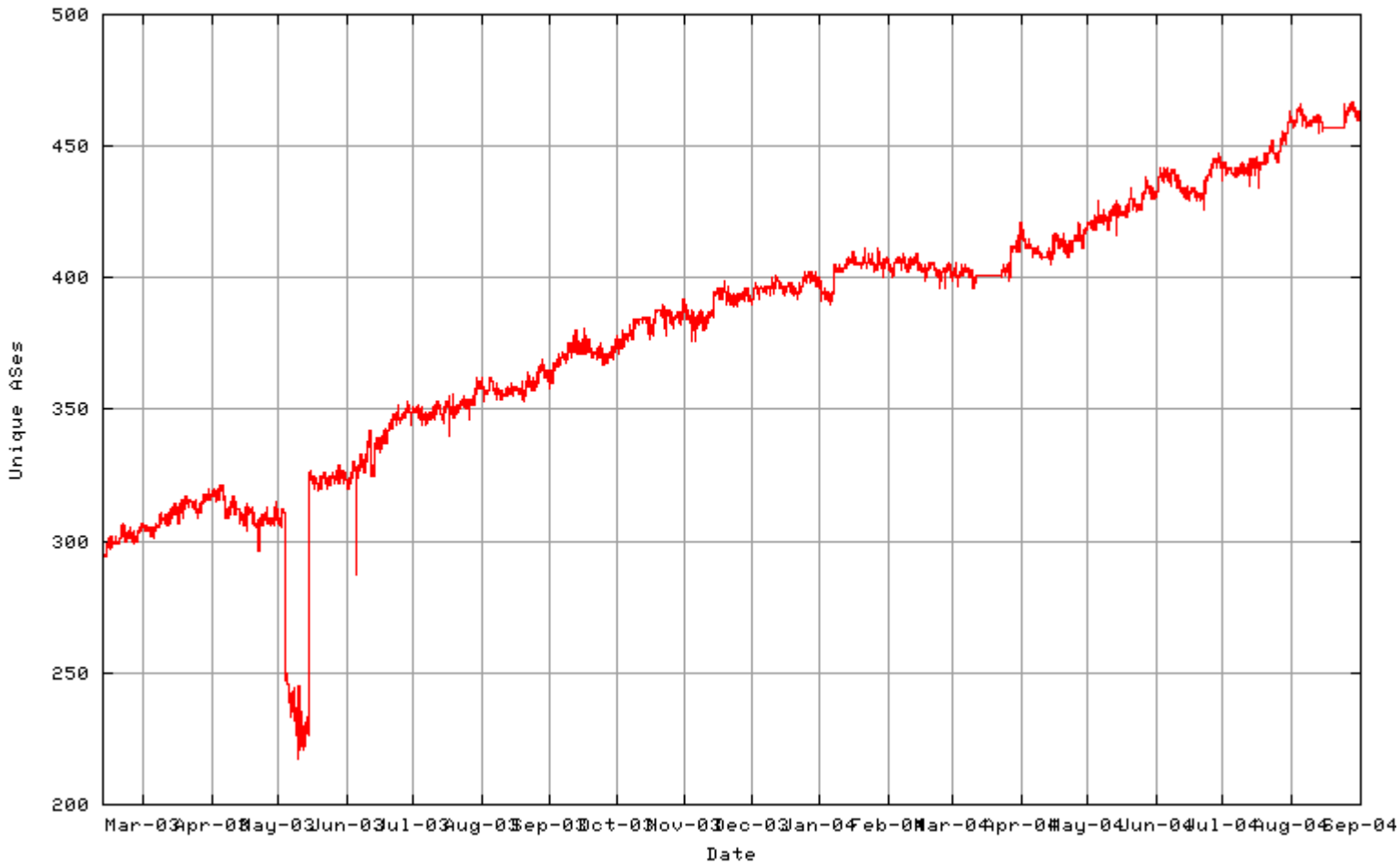
IPv6 Routing Table



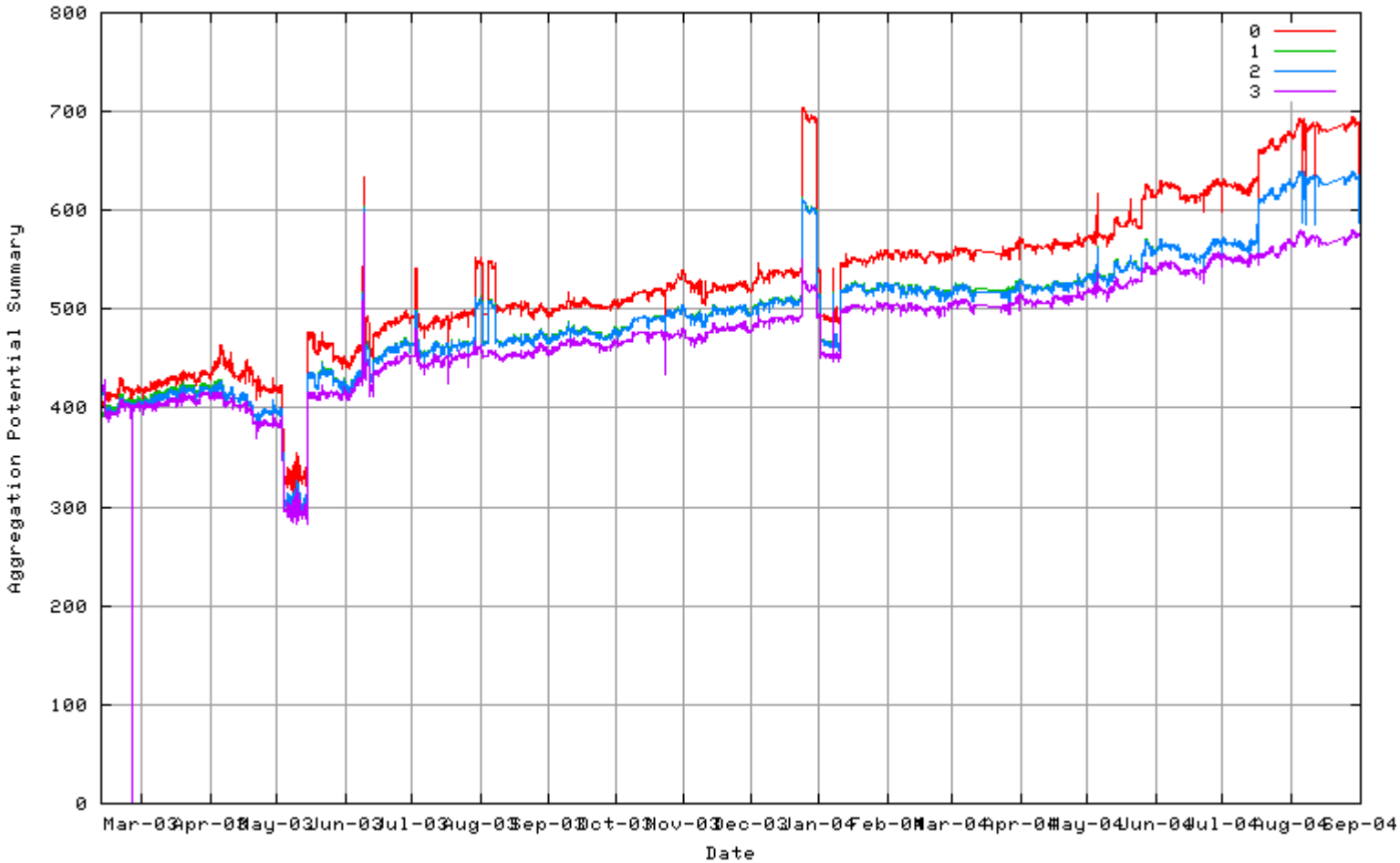
IPv6 Address Span



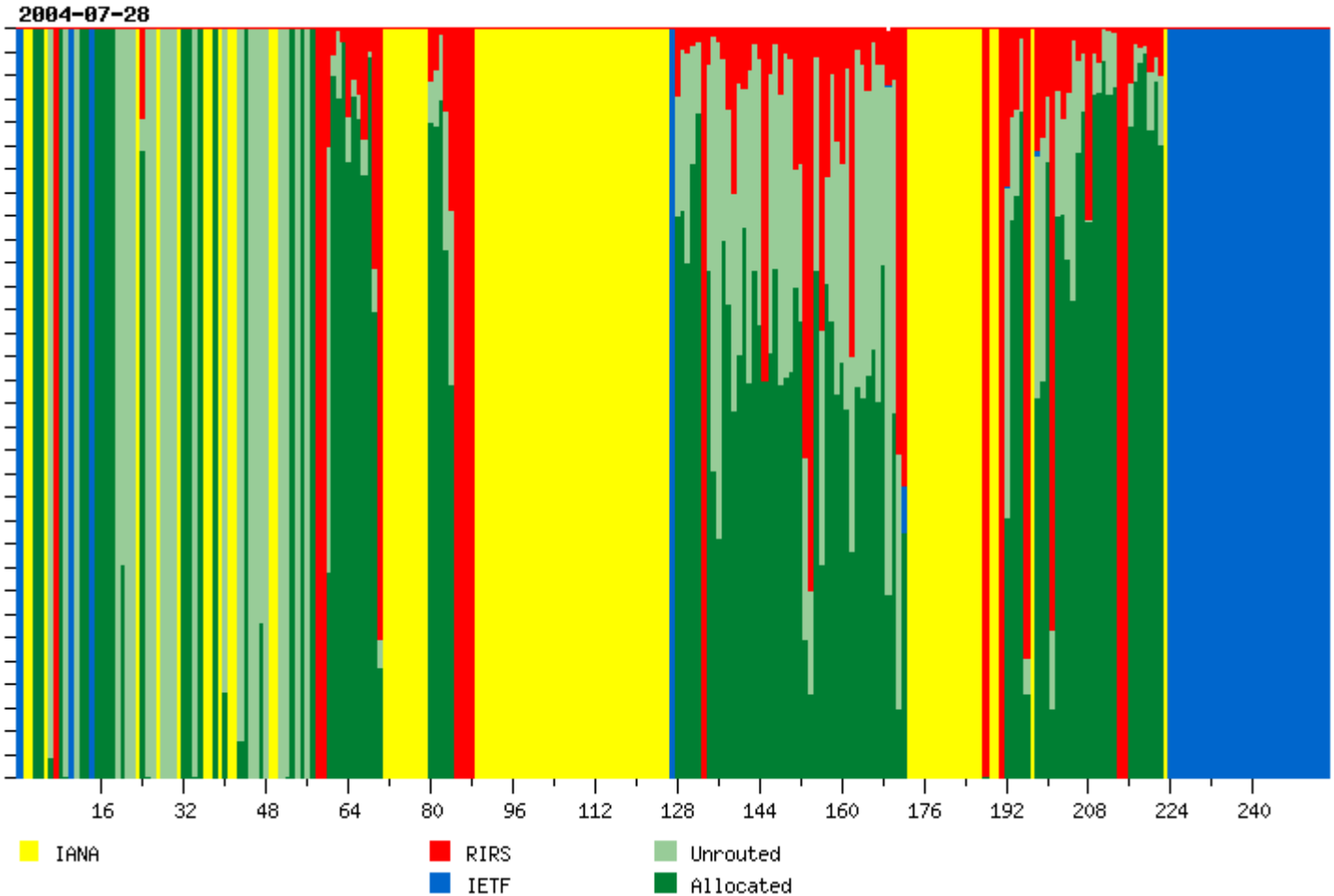
IPv6 Unique ASNs



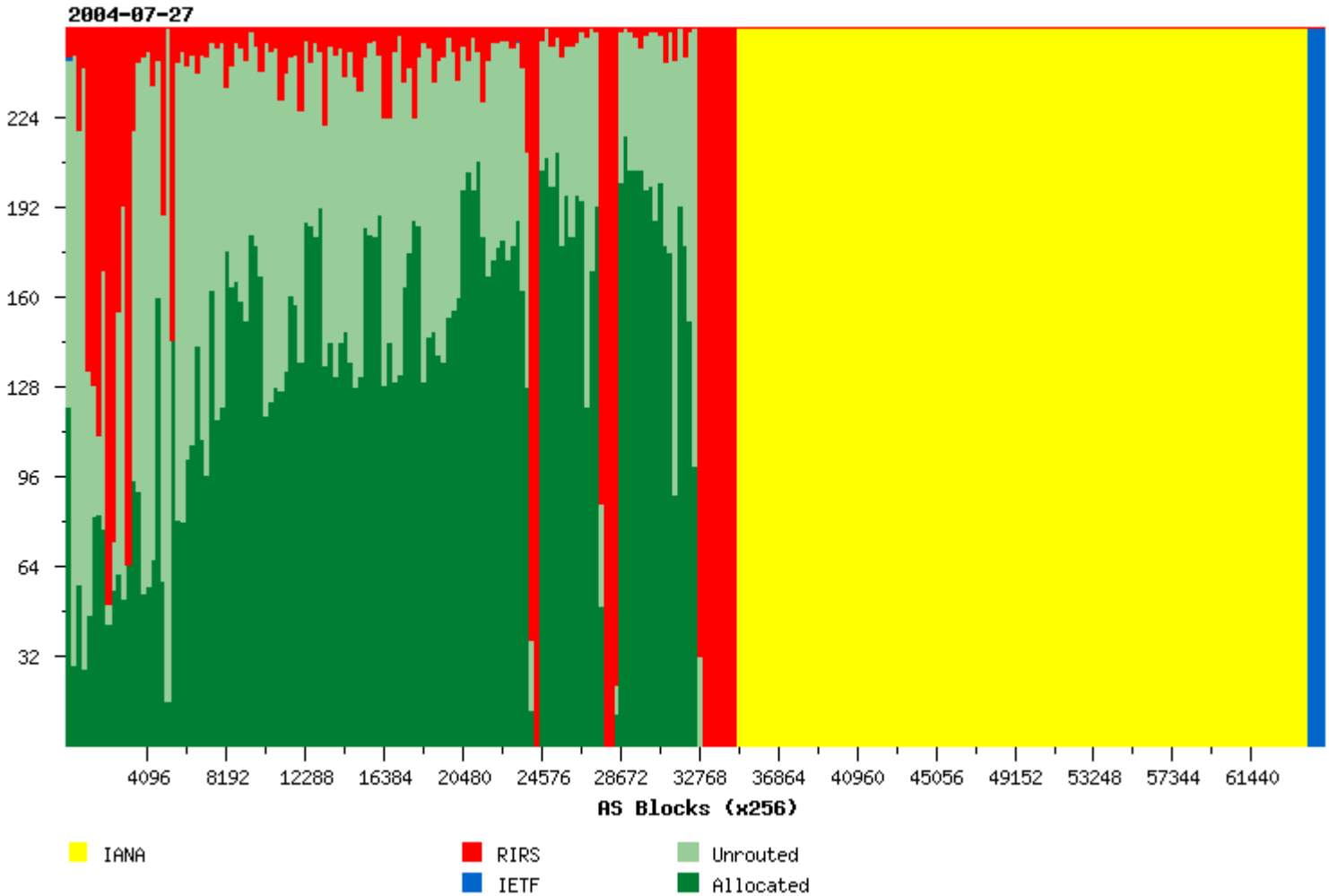
IPv6 Aggregation Potential



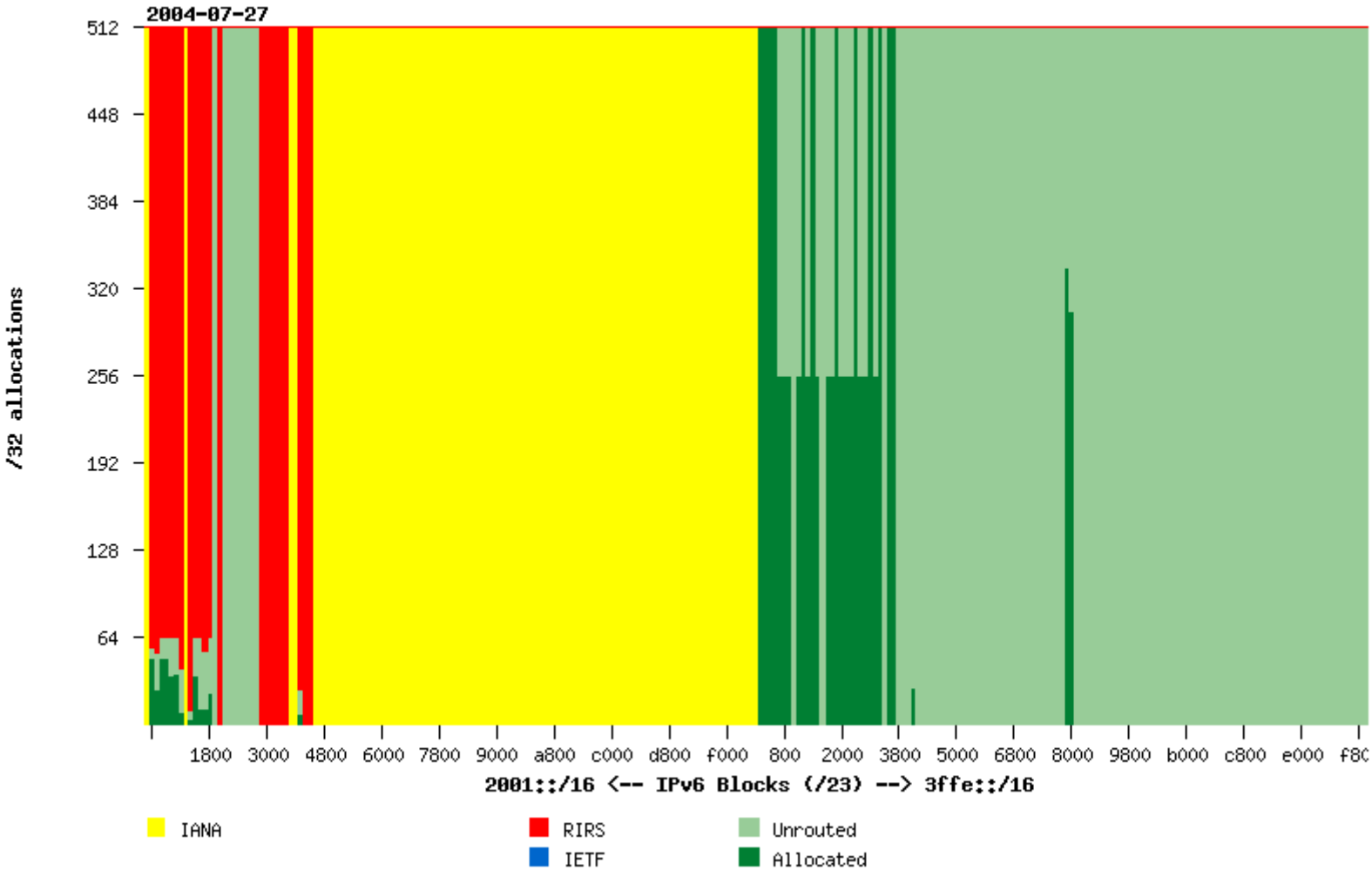
Current Snapshots – IPv4



Current Snapshots – ASNs



Current Snapshots – IPv6



How did we get here?