

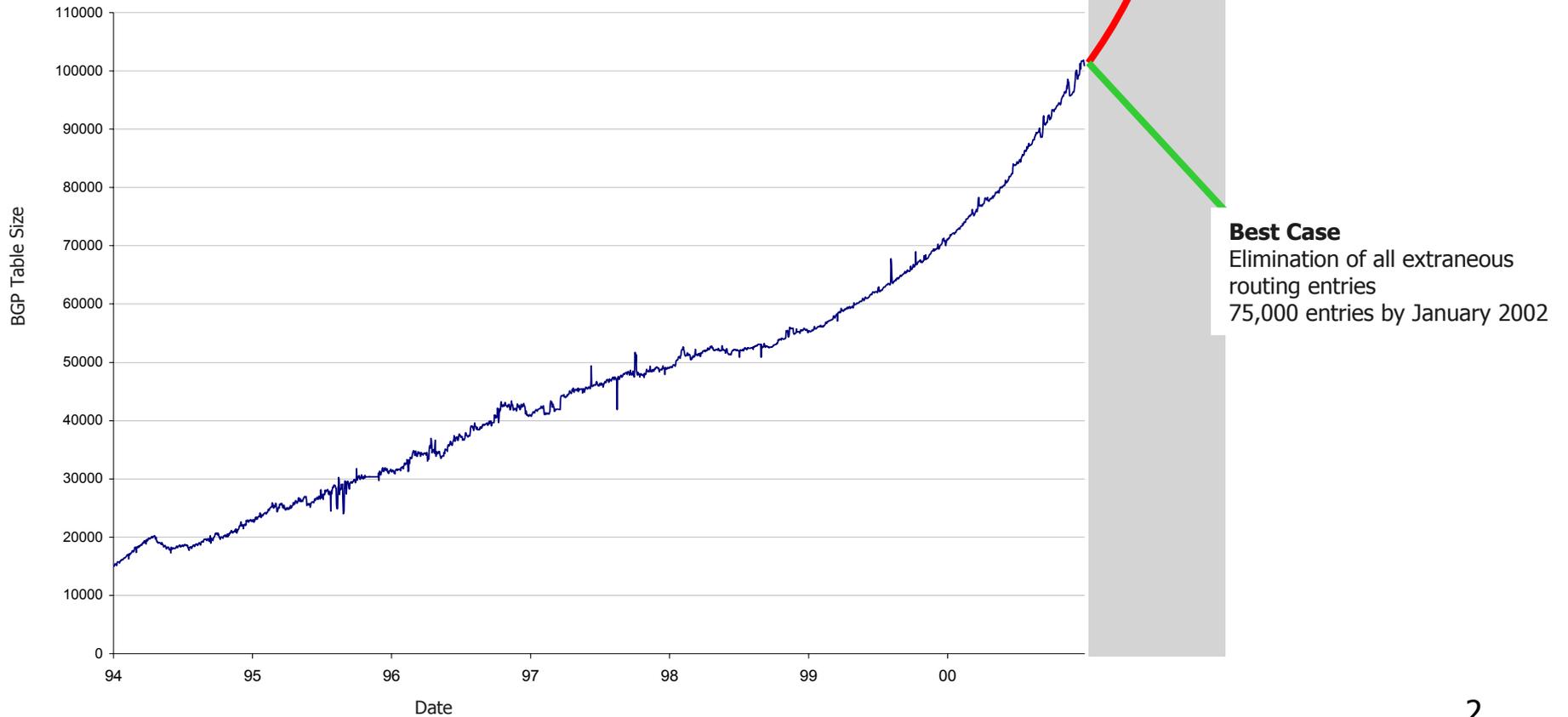
BGP Status

The Internet BGP Table over the
past 18 months

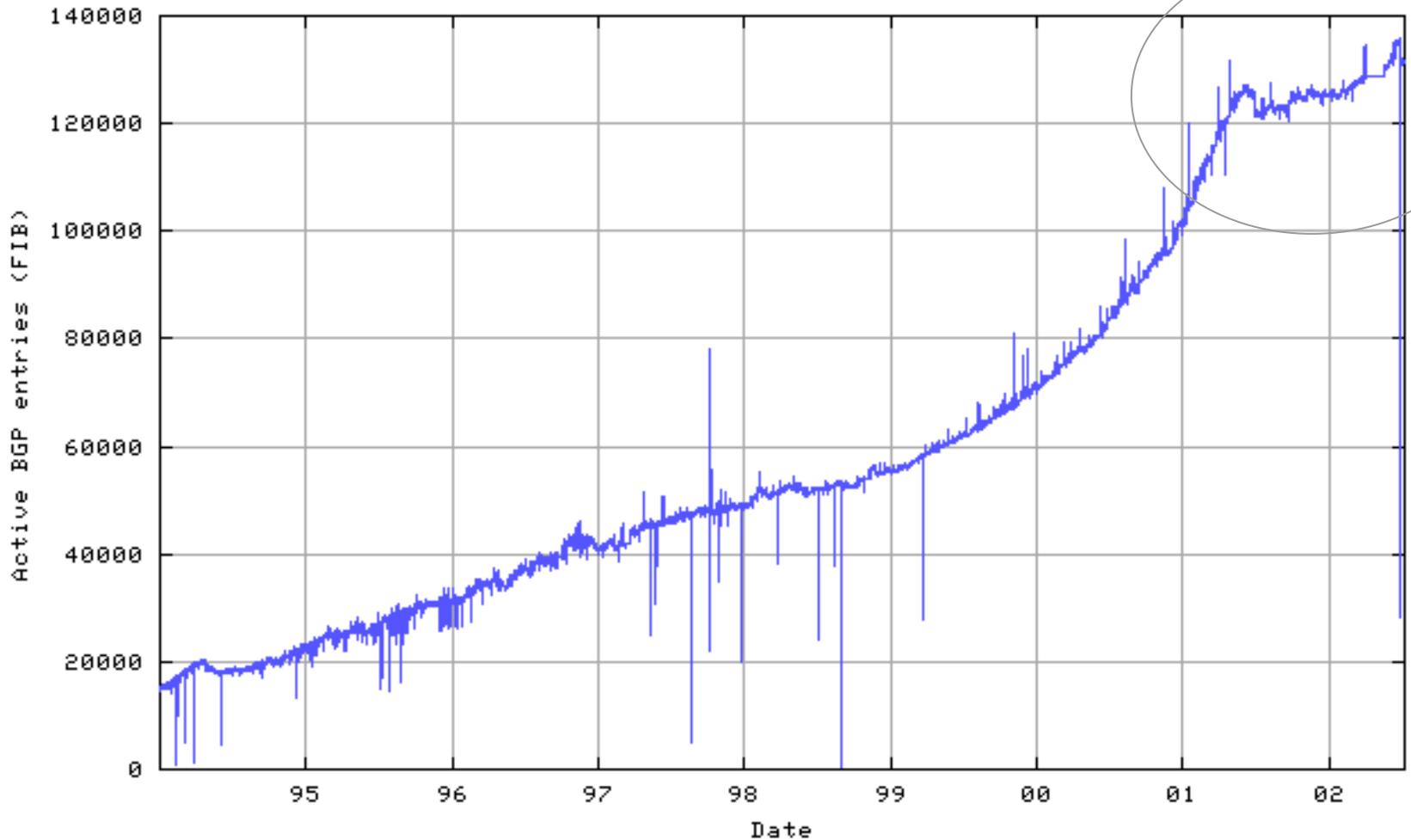
Geoff Huston

July 2002

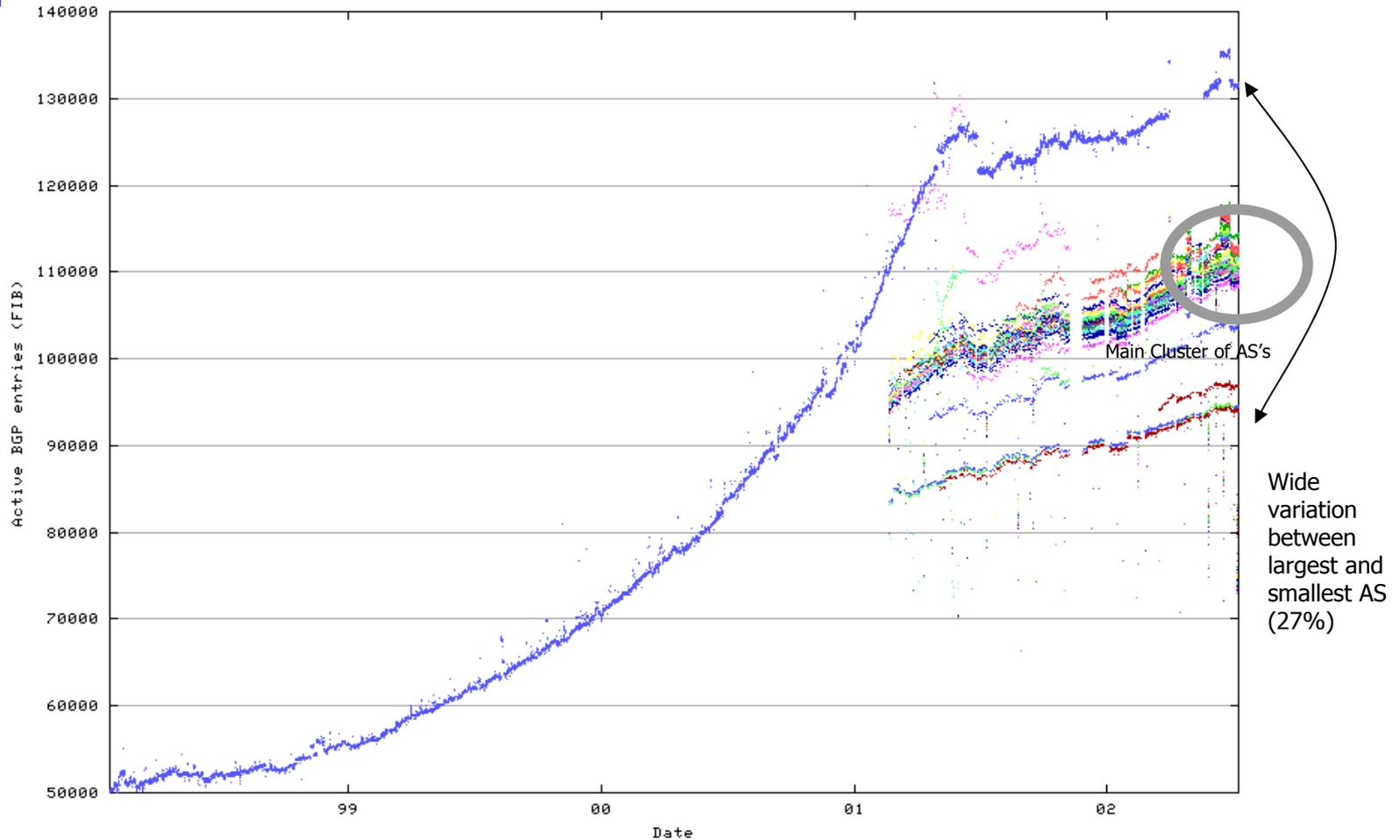
The Prediction Space



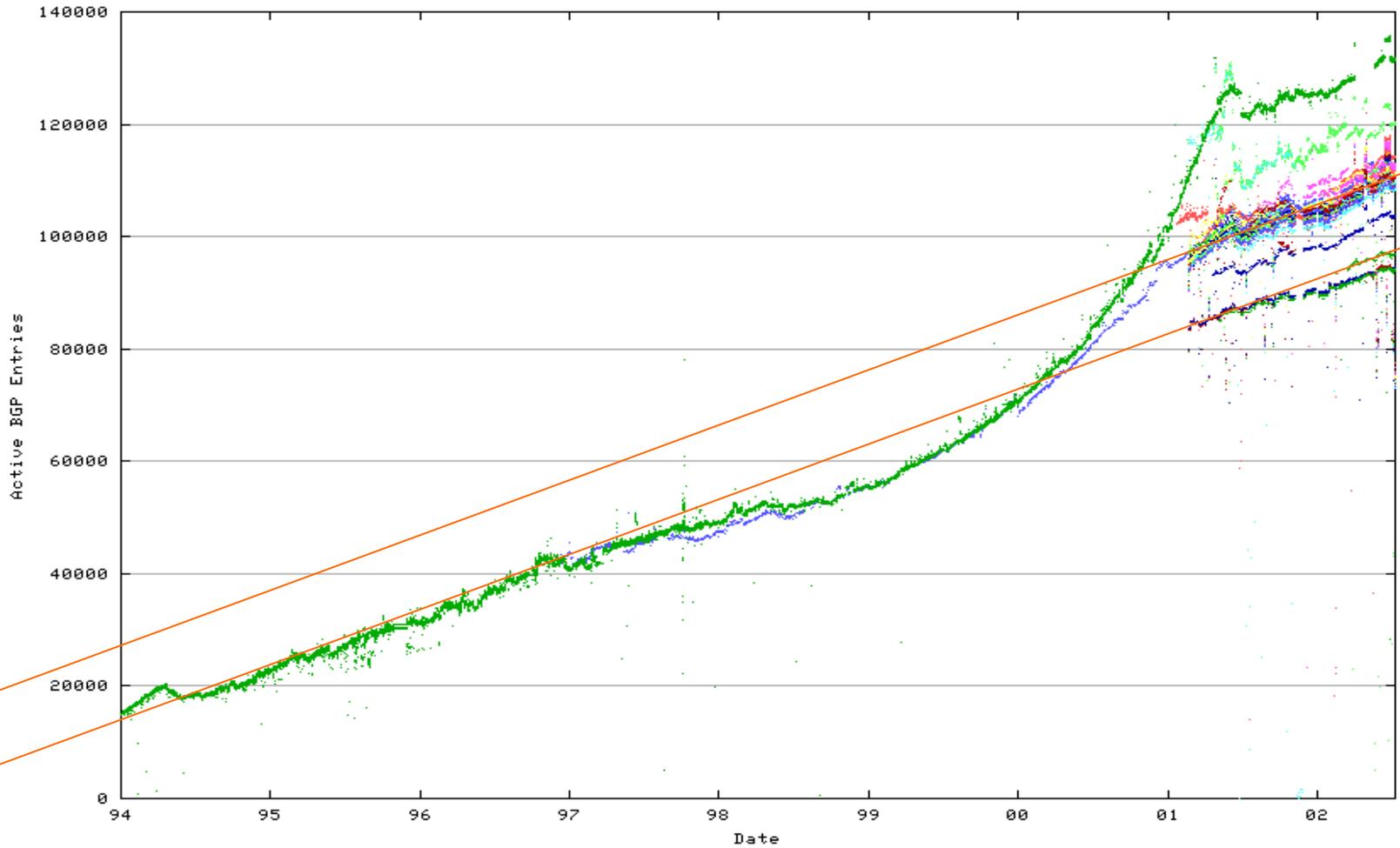
What Happened (AS1221)

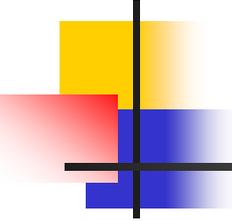


The Route Views' View



Route Views Data





BGP Trends

- Table growth appears to have resumed a linear growth rate of about 10,000 entries per year

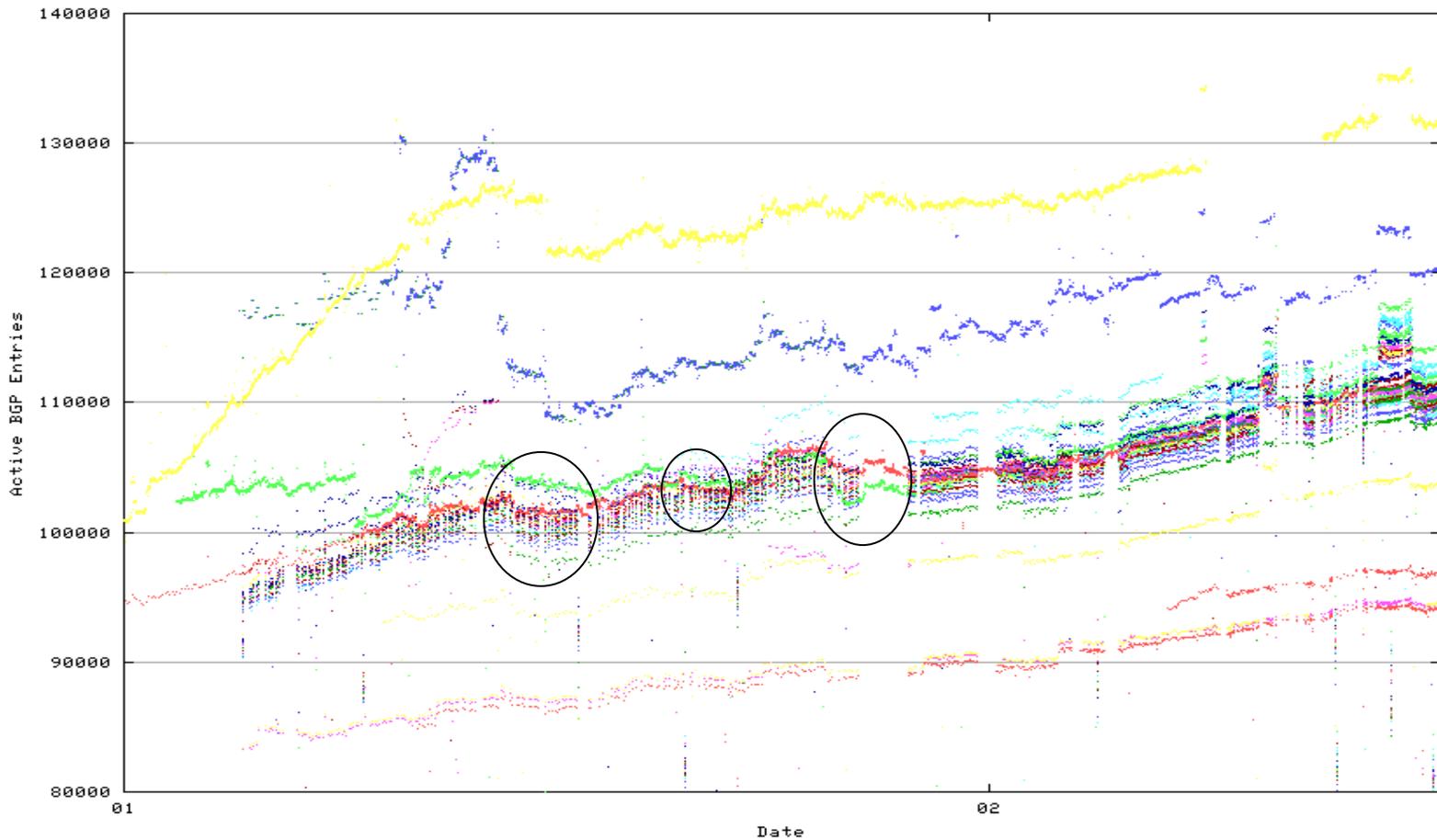
Is this a stable state?

For how long?

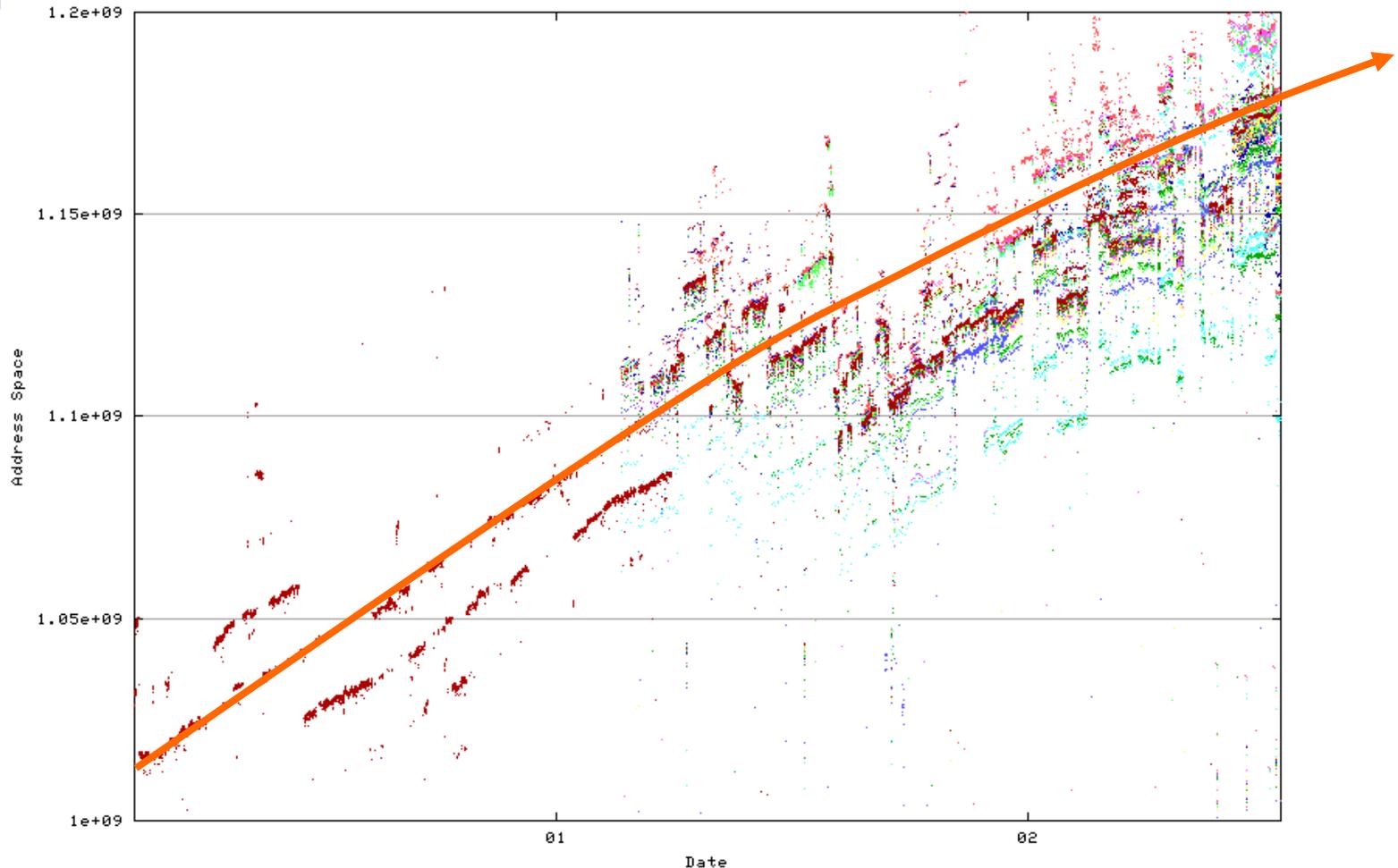
Will exponential growth resume?

If so, at what rate?

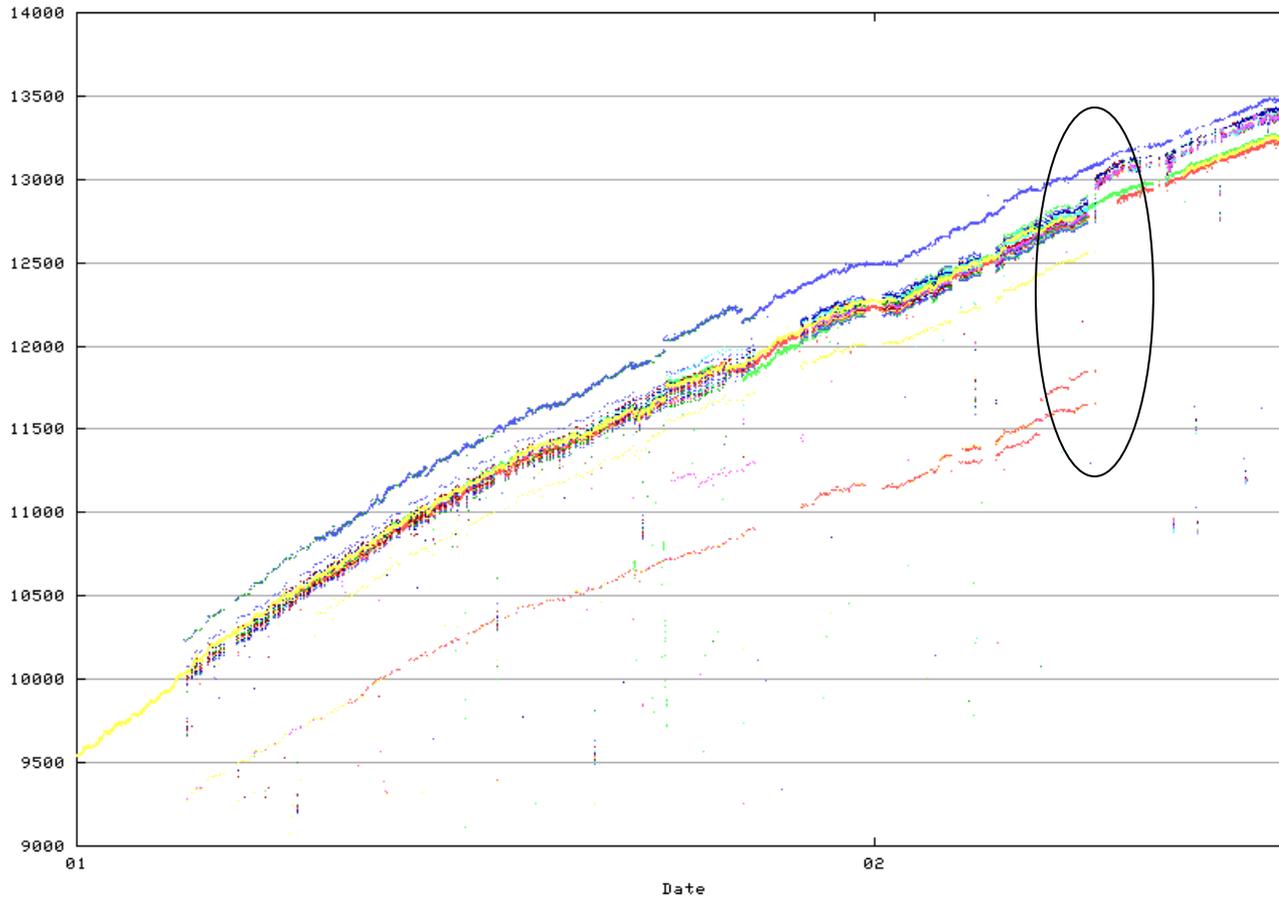
Route Views Data



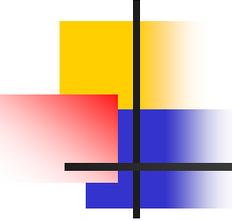
Total Size of Address Space Advertised in the BGP Table



Number of AS's

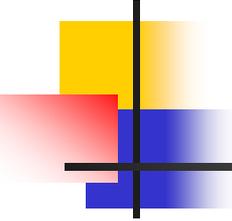


- Declining growth rate of announcing ASs



What Happened...

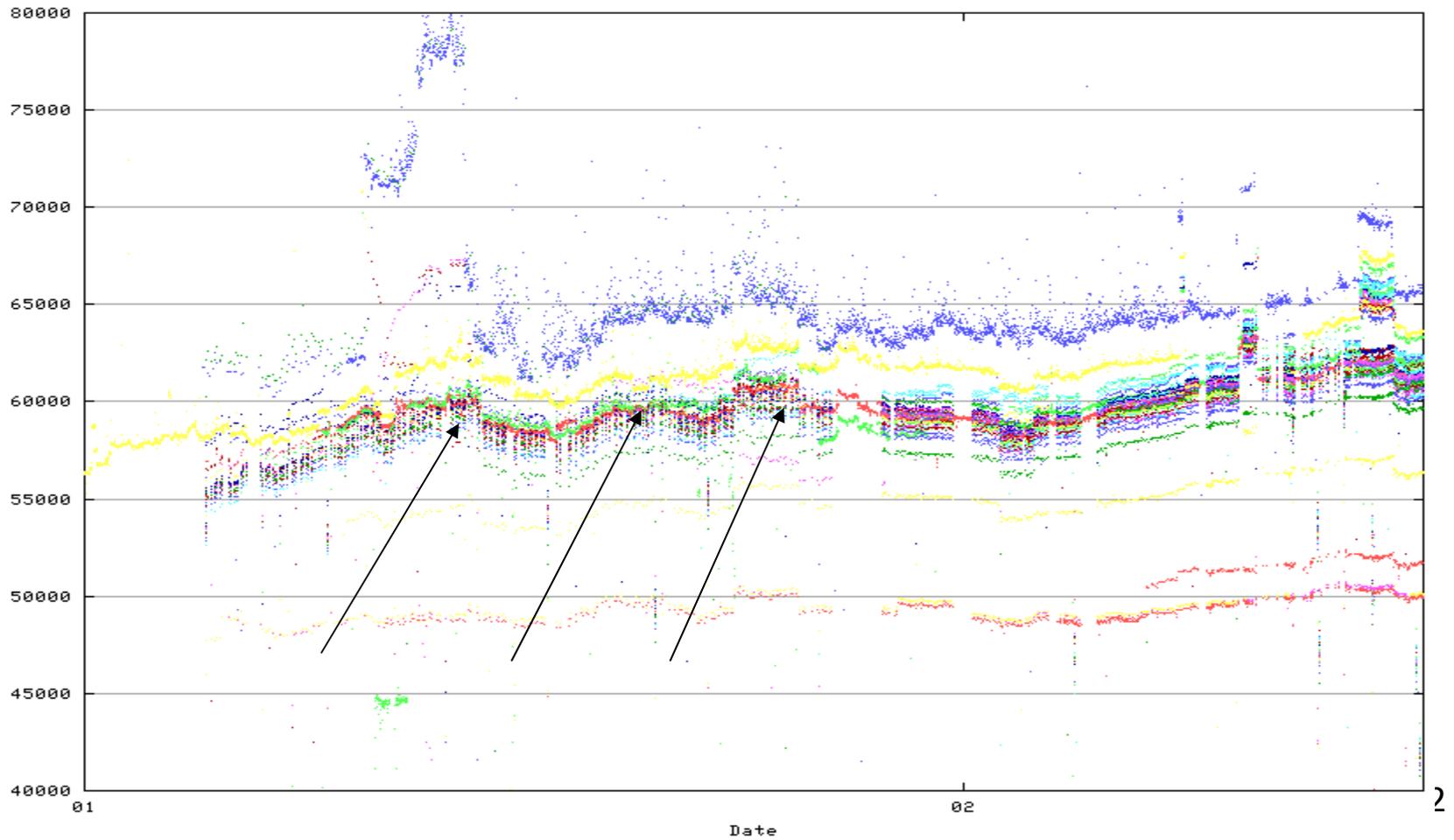
- Growth rates have come down
- The routing space appeared to be better managed in 2001
 - Less routing “noise”
 - Better adherence to hierarchical aggregation in the routed address space



Per-Prefix views

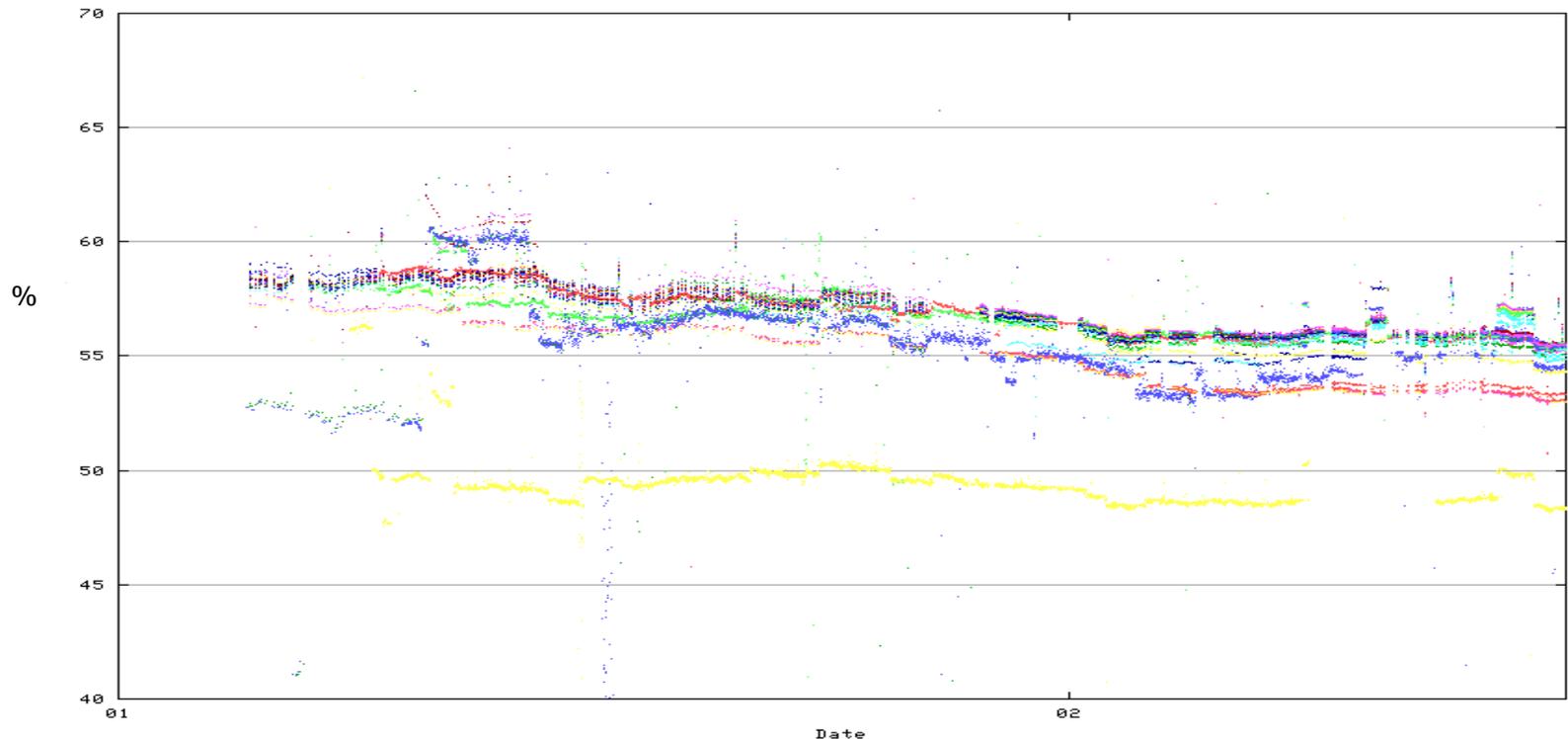
- Some 60% of the routing table are /24 or smaller
- “Better” management of the routing space would see the relative numbers of small-sized prefixes declining
- And we have observed this.....

/24 Prefixes



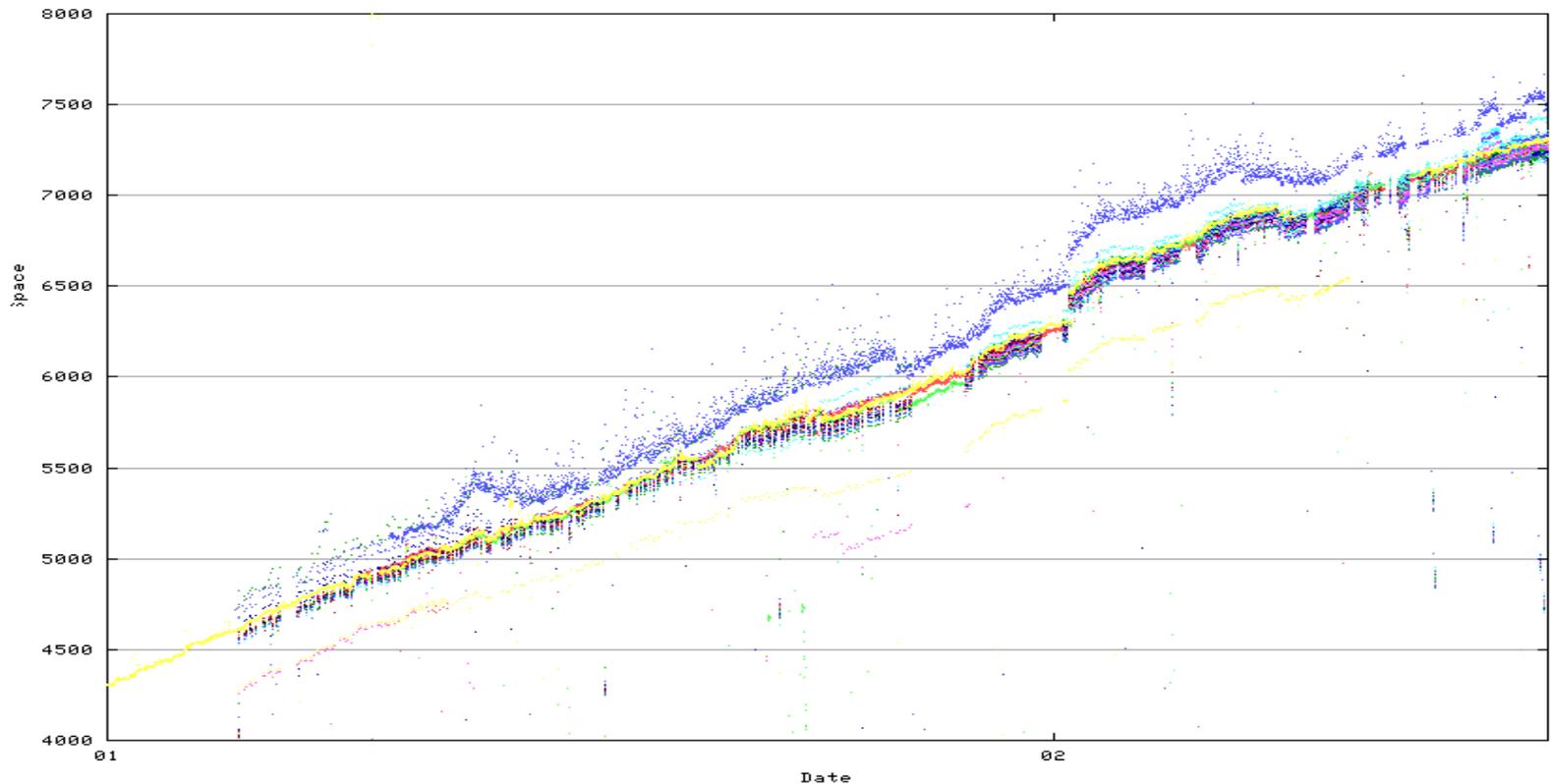
Relative percentage of /24 prefixes in the Routing Table

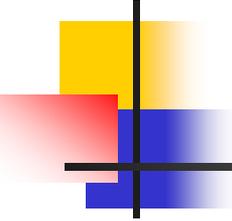
- /24 prefixes have declined by 3 – 4 %



/20 Prefixes

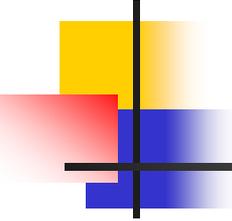
- 45% growth per year





Changes in the Routing Table

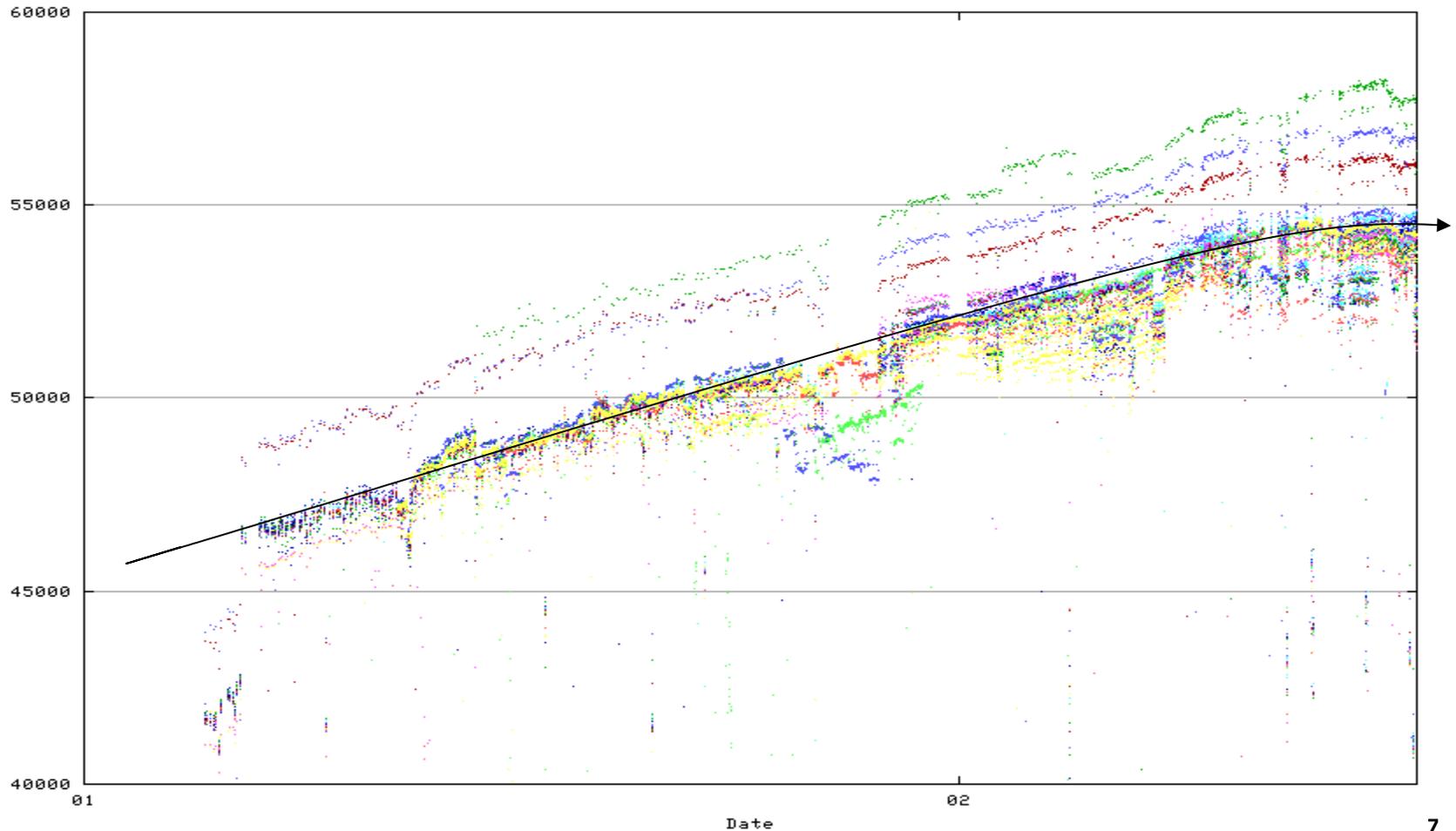
- No major table growth from small prefixes (/24 and smaller)
- Table growth occurred using RIR allocation prefix sizes (/18 through /20)
- Growth in /18 - /20 prefix numbers even through the period



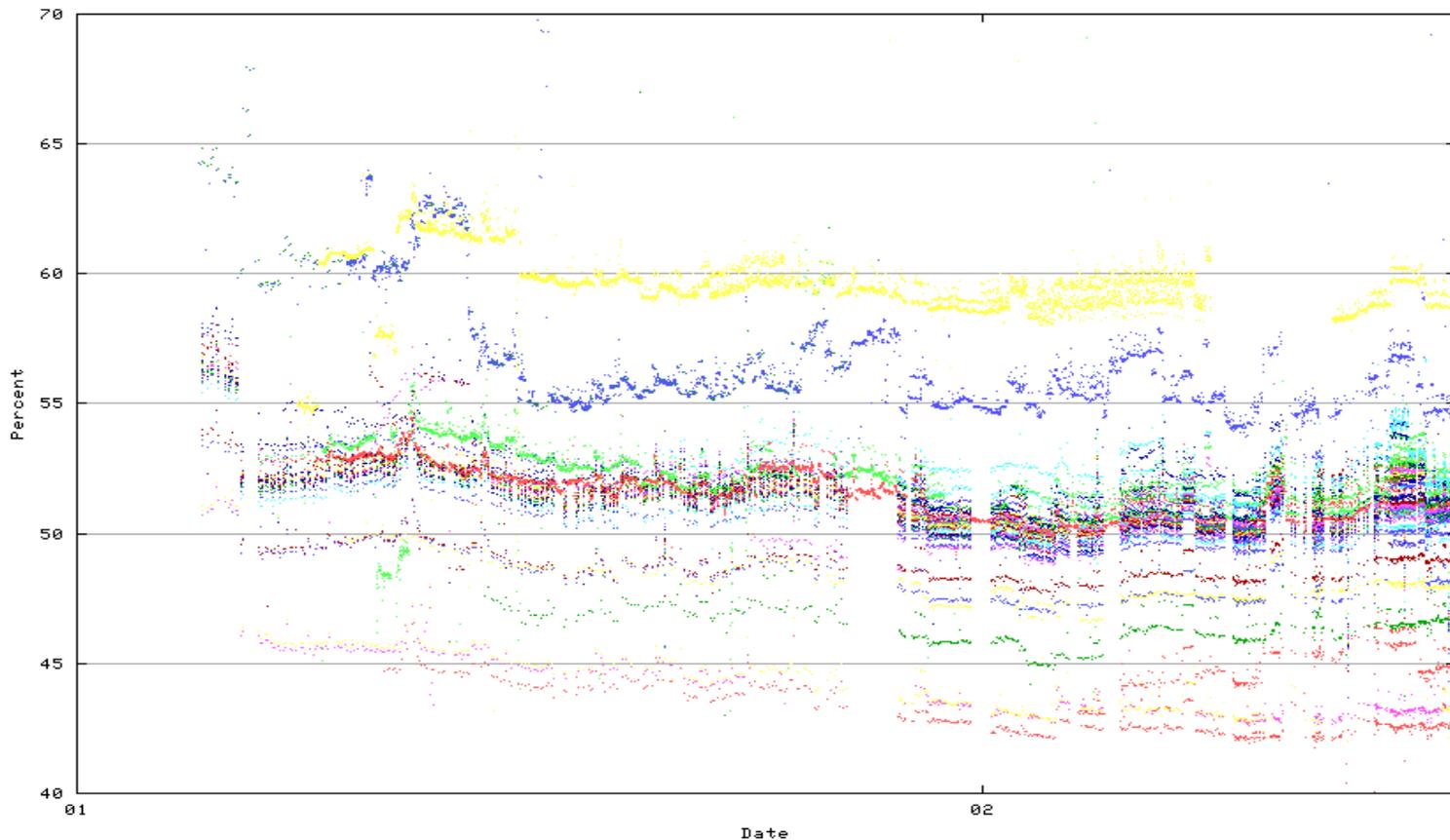
A “Root” Table Entry

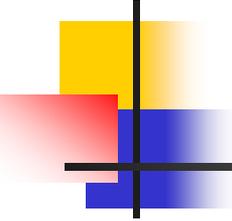
- Is not part of an enclosing aggregate
- May contain any number of more specific entries
 - irrespective of AS Path of the specific entry
- Is the minimal spanning set of entries using a strict view of address / routing hierarchies
- Provides a view of the “best case” of the hierarchical model of route aggregation

Number of BGP "Roots"



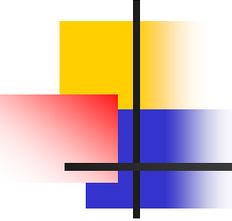
More Specifics (non-Roots) as a percentage of the table size





Whats Happening

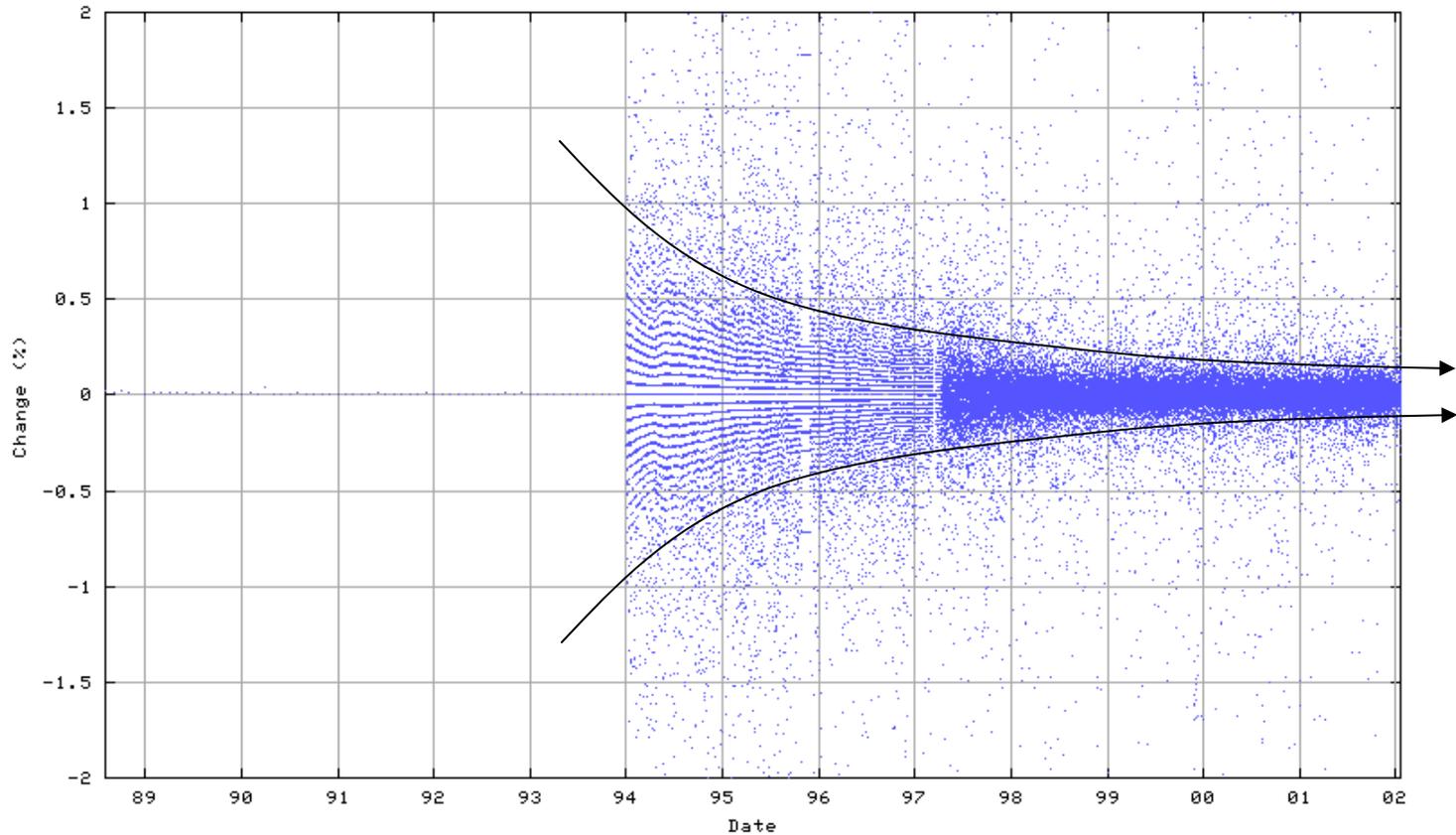
- More specific entries in the routing table are slowly declining in relative terms
- Possibly due to:
 - increasing amount of prefix-length route filtering
 - Increasing peer pressure to conform to RIR-allocated prefixes
 - Better understanding in the operator community of how to manage the routing space

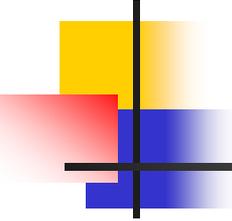


Stability Rates

- Smaller prefixes tend to contribute greater relative update load levels than larger prefixes
- Decreasing relative number of small prefixes is improving BGP stability levels (slightly)

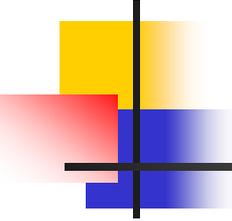
Hourly BGP Update Rate (%)





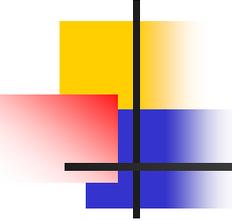
BGP Update Rate

- Proportion of BGP table entries updated each hour is decreasing over time
- The BGP table is becoming more stable
 - Protocol implementation maturity
 - Widespread deployment of flap damping
 - Greater levels of circuit reliability (?)



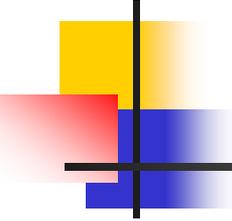
The Good News

- BGP Table growth has been slowed down considerably
- This is largely the result of more care in routing announcements, coupled with more widespread prefix length route filters.



The Not So Good News

- Insufficient data to determine if this is a short term growth correction that will be followed by a resumption of exponential growth
 - Multi-homing, TE, mobility, and various dynamic path controllers all contribute to a continuing pressure for non-aggregated atomic entries to be externally advertised



Much more BGP data.....

<http://bgp.potaroo.net>

