



Measuring the Global Routing Table

by

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Presented by Lixia Zhang at IEPG meeting 7/27/09

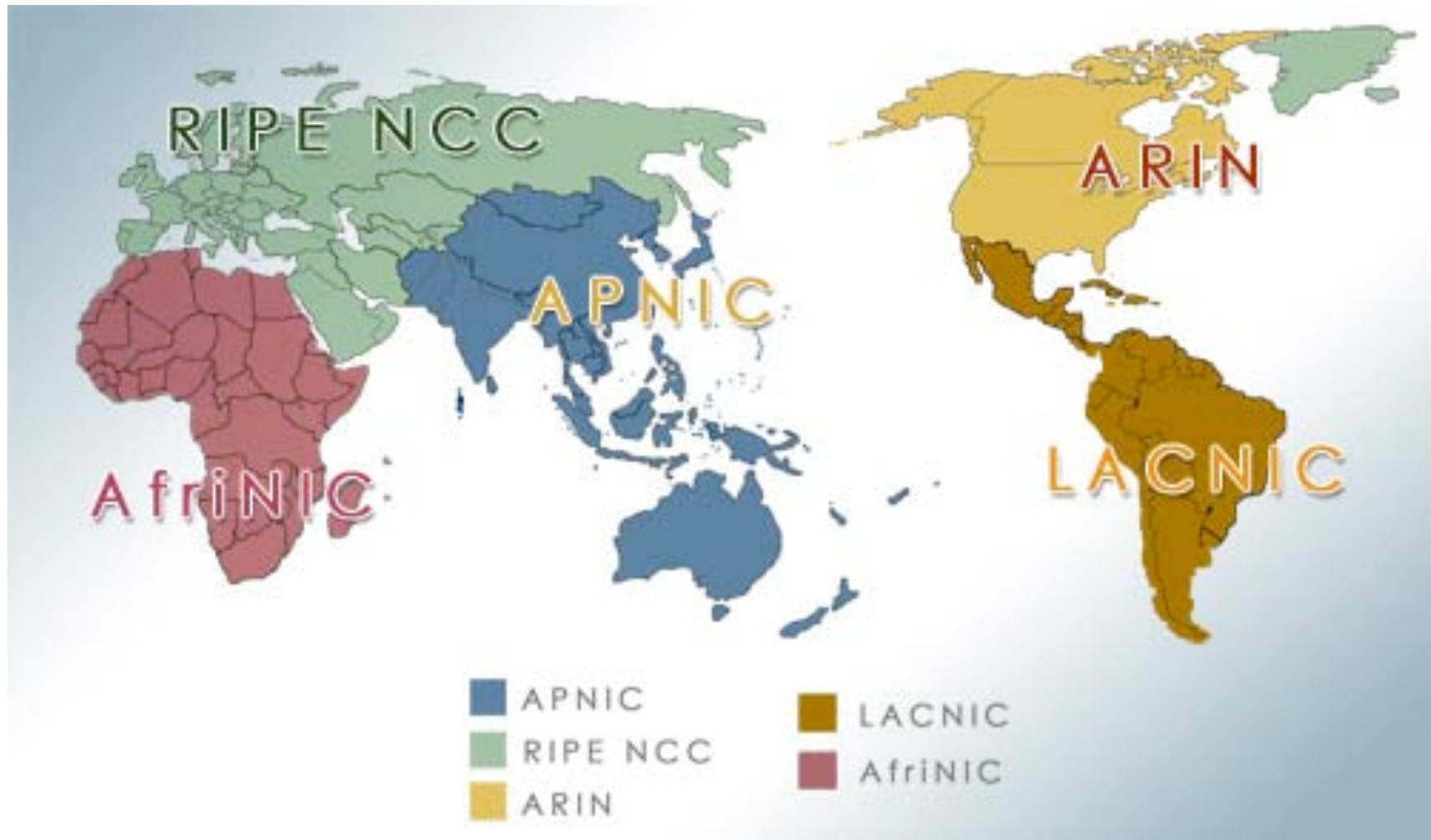
Outline

- ▶ Data sources
- ▶ Announcements, allocations, IP space usage
- ▶ Routing table growth factors
 - ▶ Prefix length
 - ▶ Longevity of announcements
 - ▶ Fragmentation
- ▶ Routing table stability
- ▶ Conclusion



Source for IP allocation history

Regional Internet Registries (RIRs)



Source for BGP announcement history

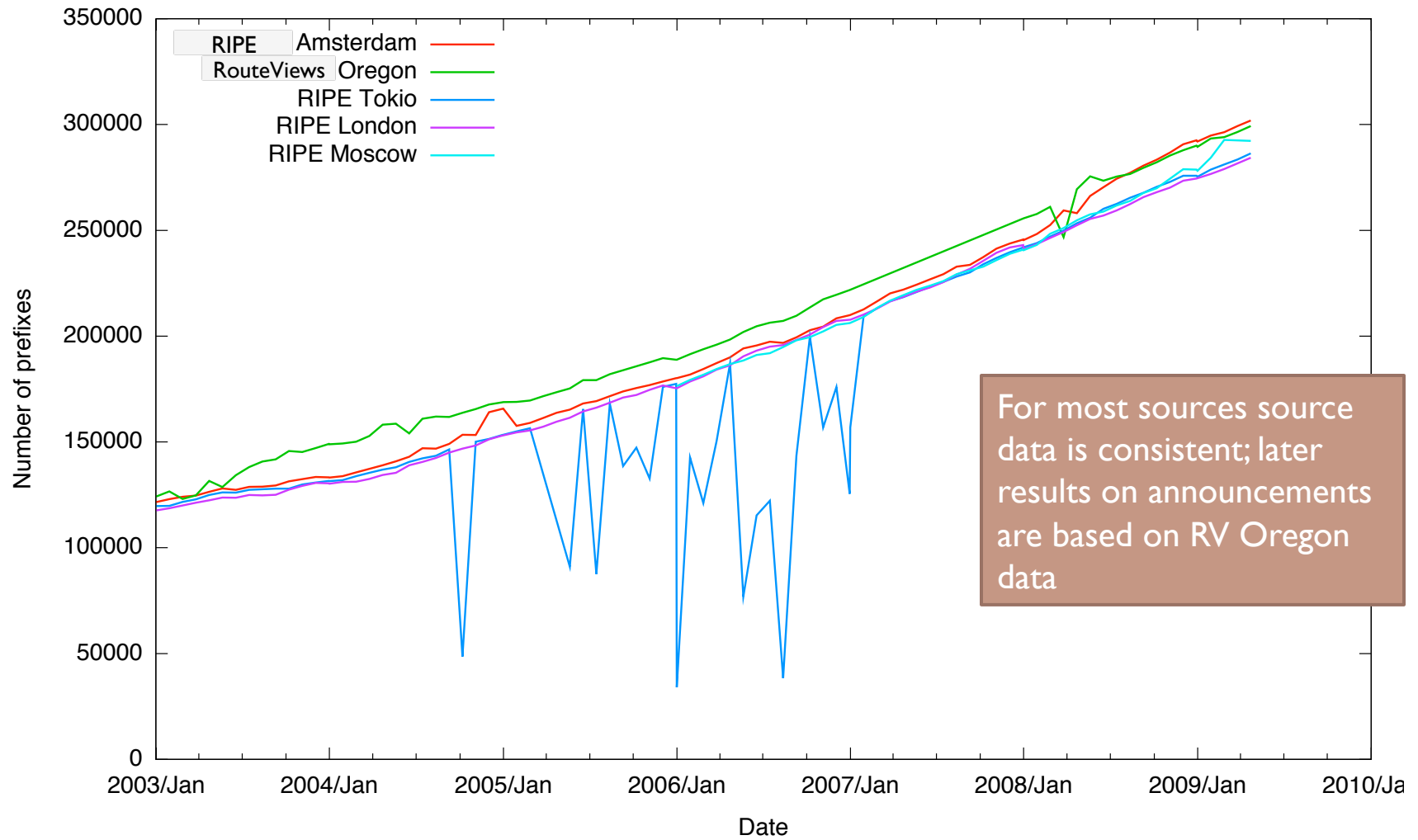
BGP monitors

- ▶ **Two BGP monitor projects**
 - ▶ Route Views of U Oregon
 - ▶ Routing Information Service (RIS) of RIPE NCC
- ▶ **BGP data collected throughout the world**
 - ▶ Currently 24 collecting points
 - ▶ Monitors in US, Europe, Japan, Russia, and Brazil

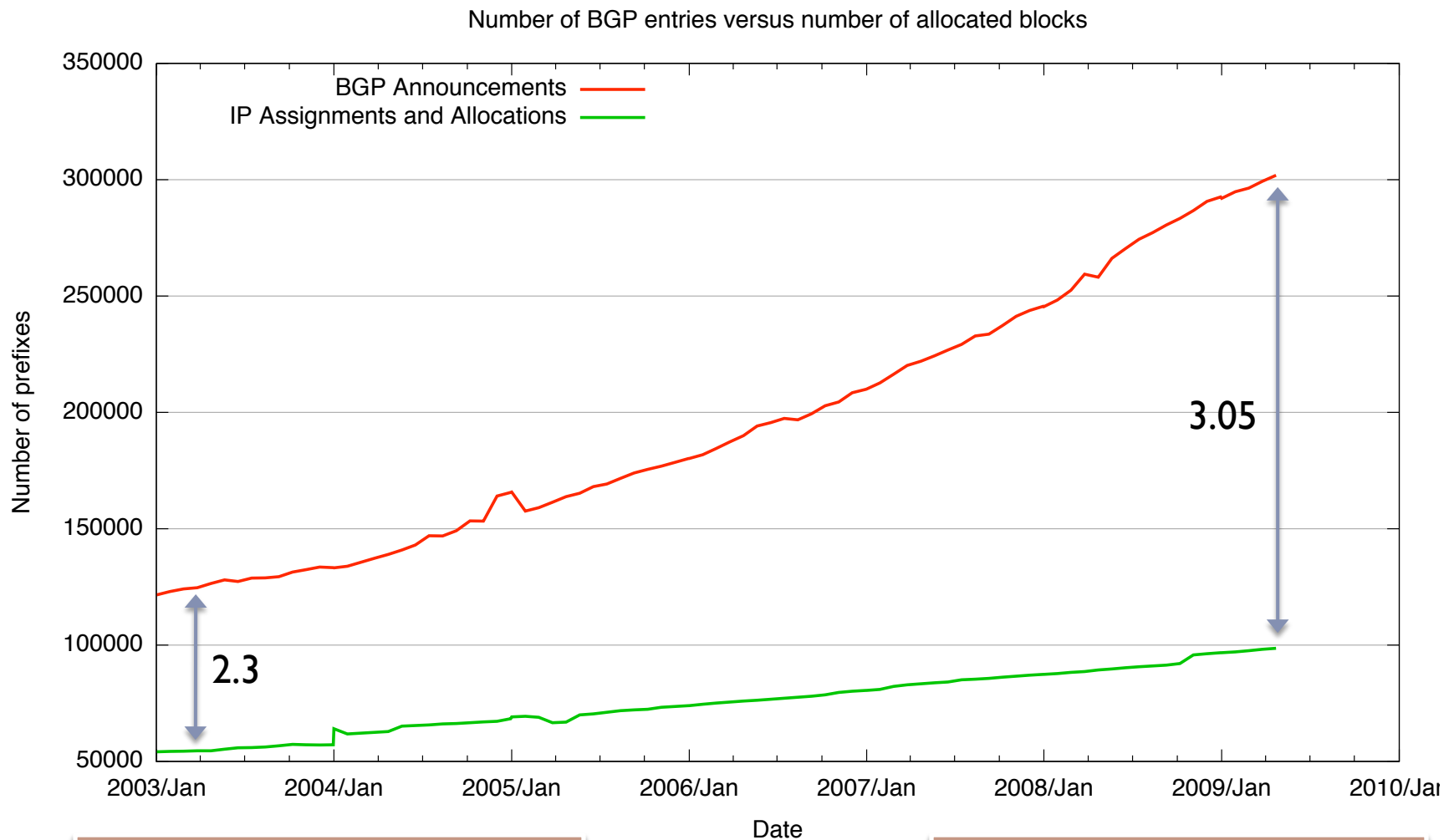


BGP source data

Various BGP monitors



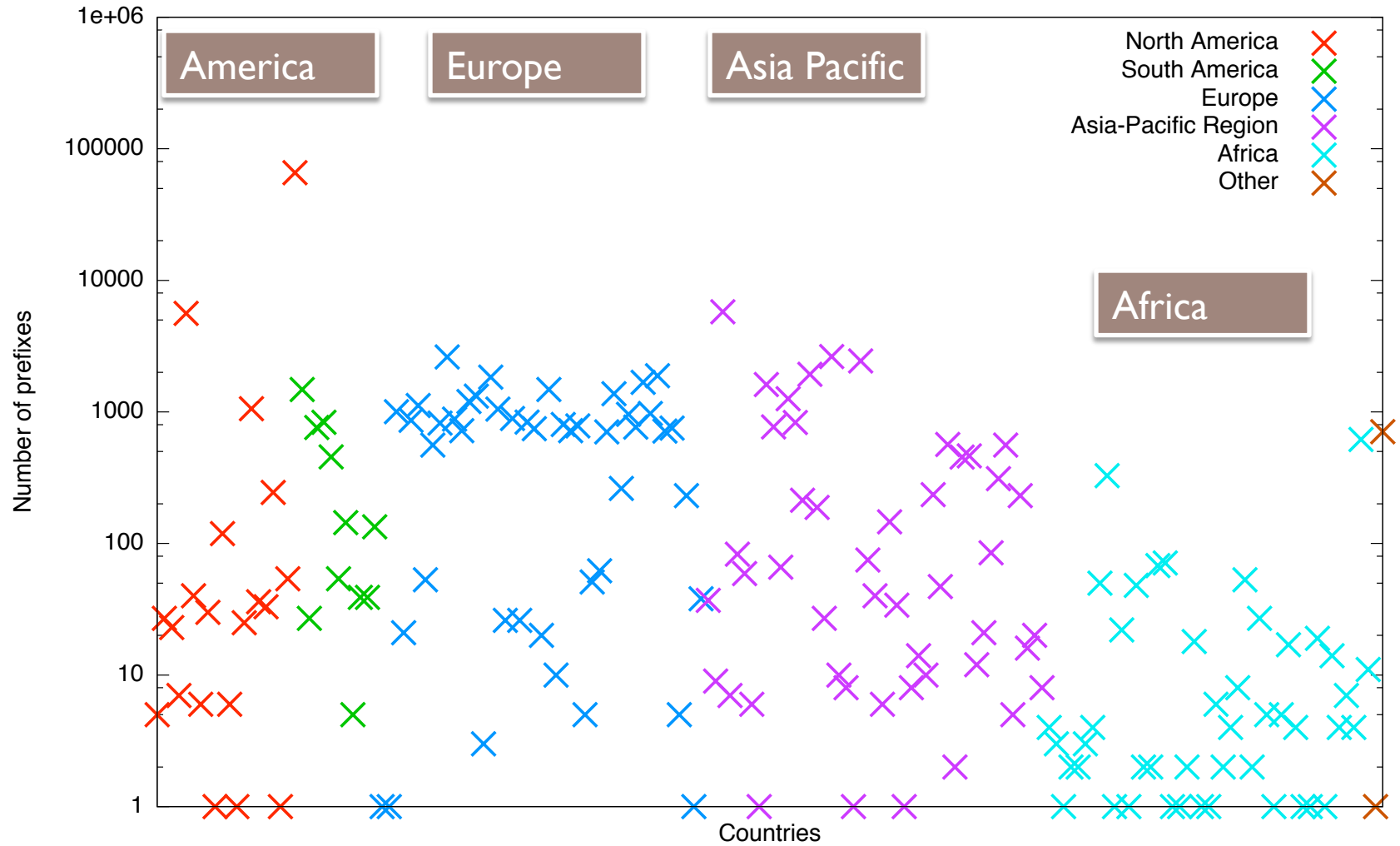
BGP announced prefixes versus IP allocated prefixes (BGP vs RIRs)



of IP allocations increased
1.8 times

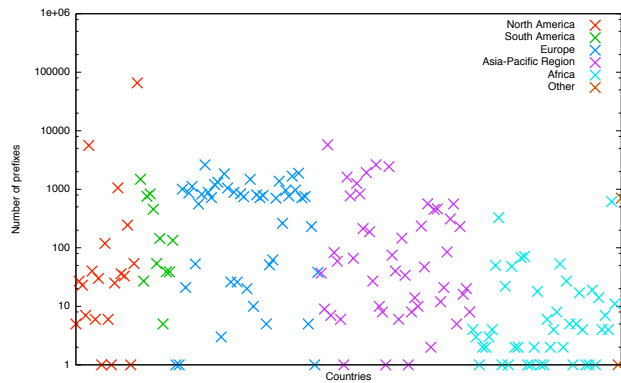
of BGP entries increased
2.4 times

Distribution of BGP announced prefixes in 2003

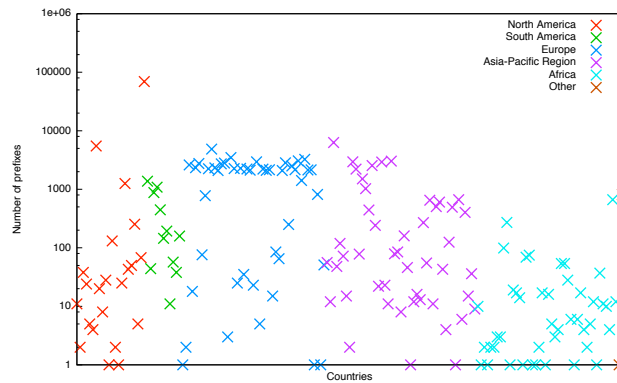


Distribution of BGP announced prefixes

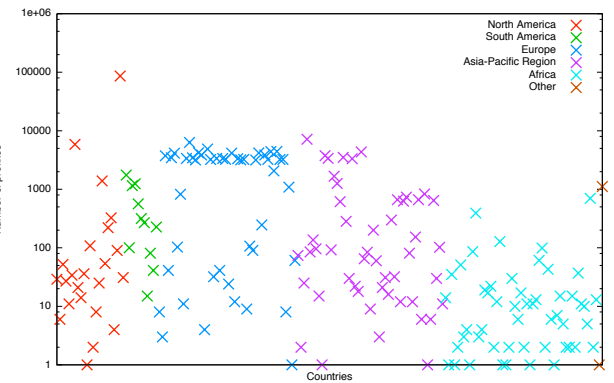
2003



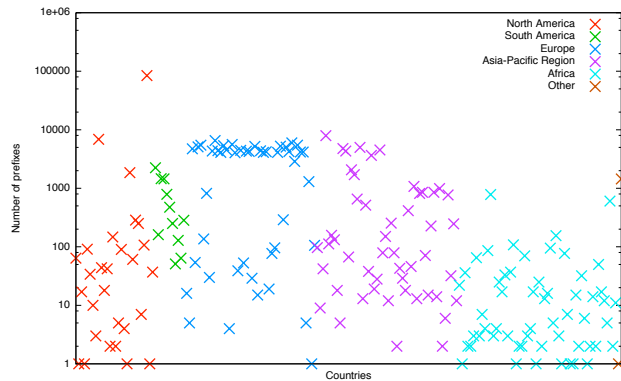
2004



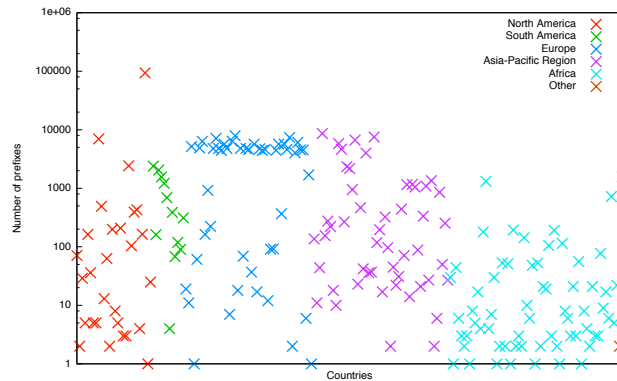
2005



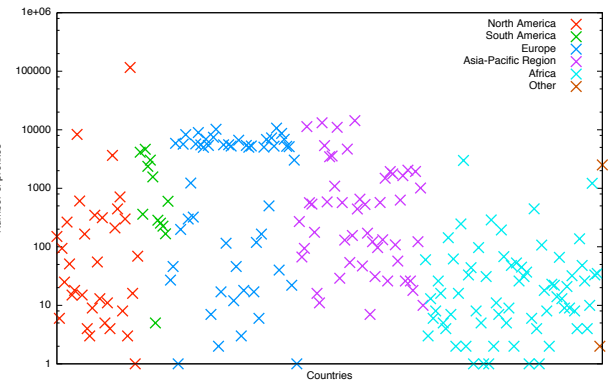
2006



2007

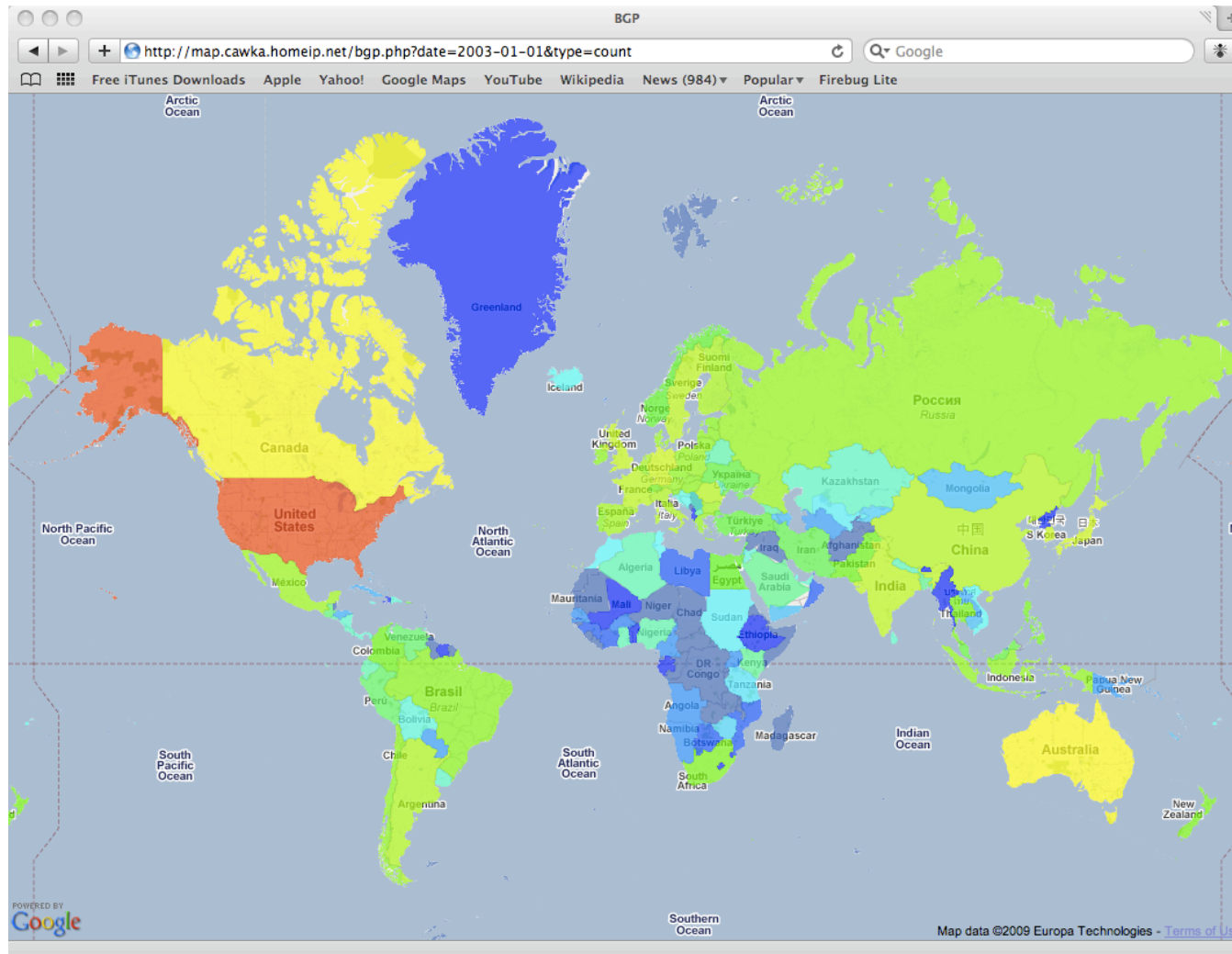


2009

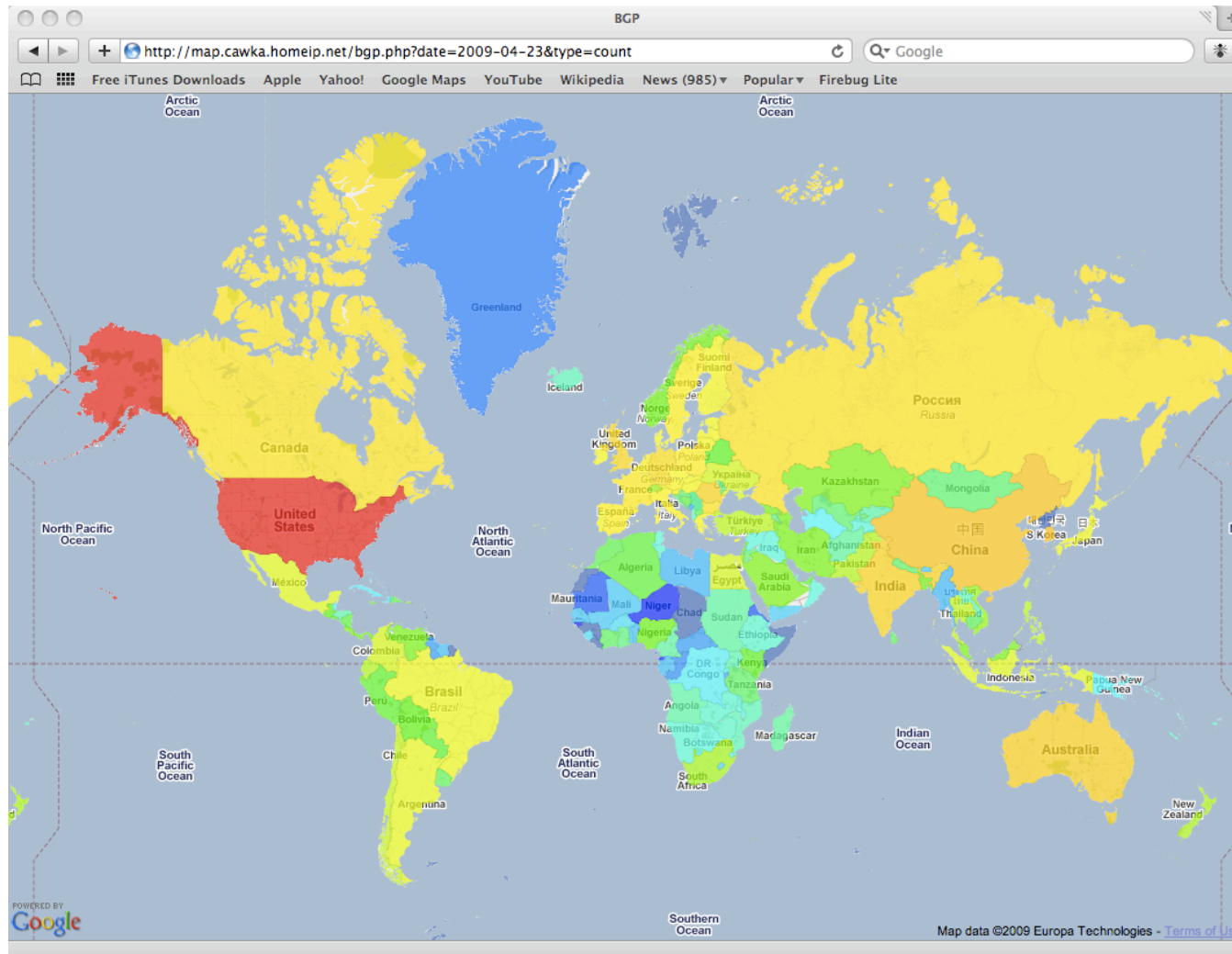


General trend - substantial growth of # announced prefixes globally

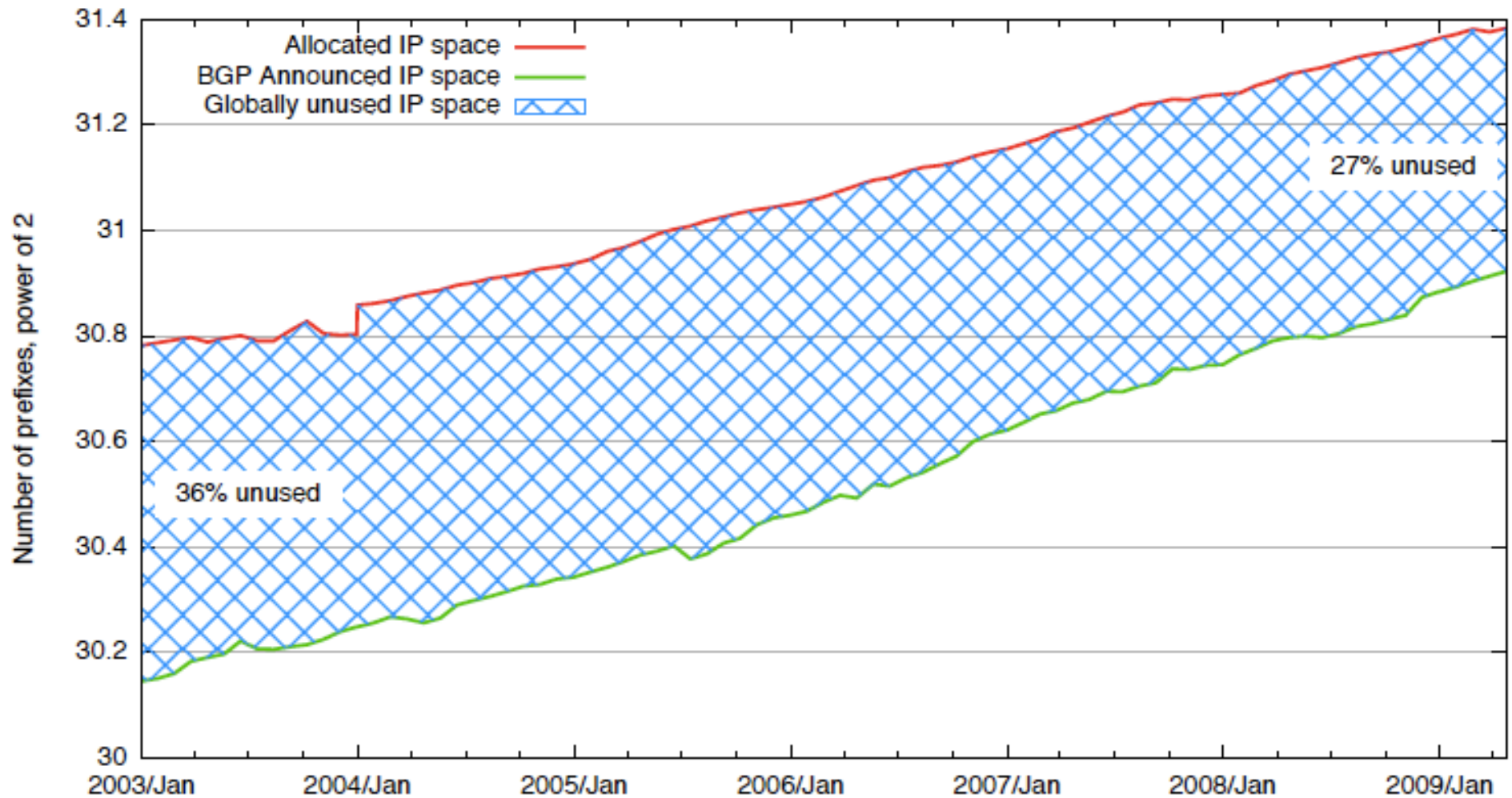
Distribution of BGP announced prefixes 2003



Distribution of BGP announced prefixes May 2009

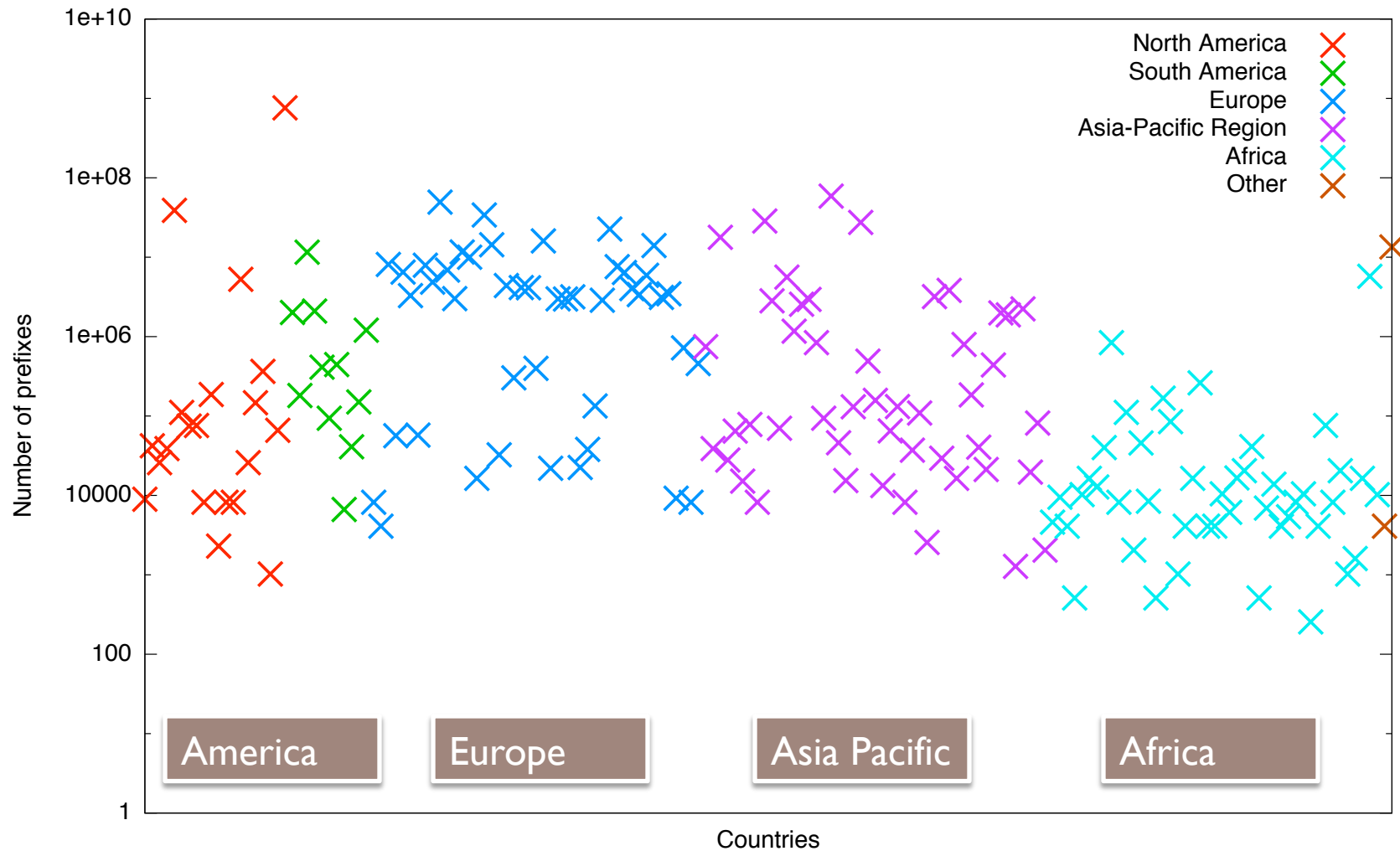


Allocated vs announced IP space

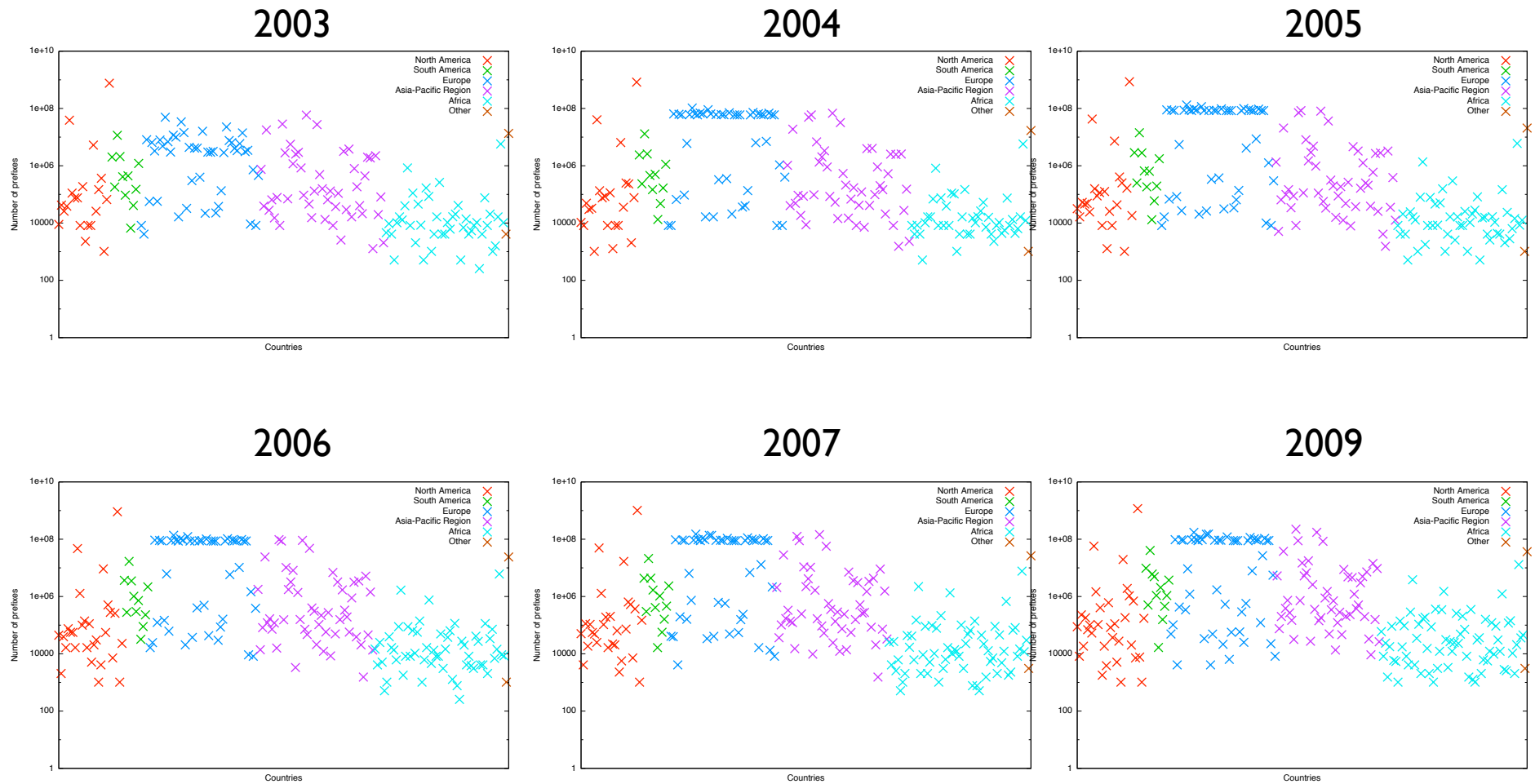


1. BGP table doesn't cover all allocated IP space
2. There are globally unused IPs

Distribution of announced IP space in 2003

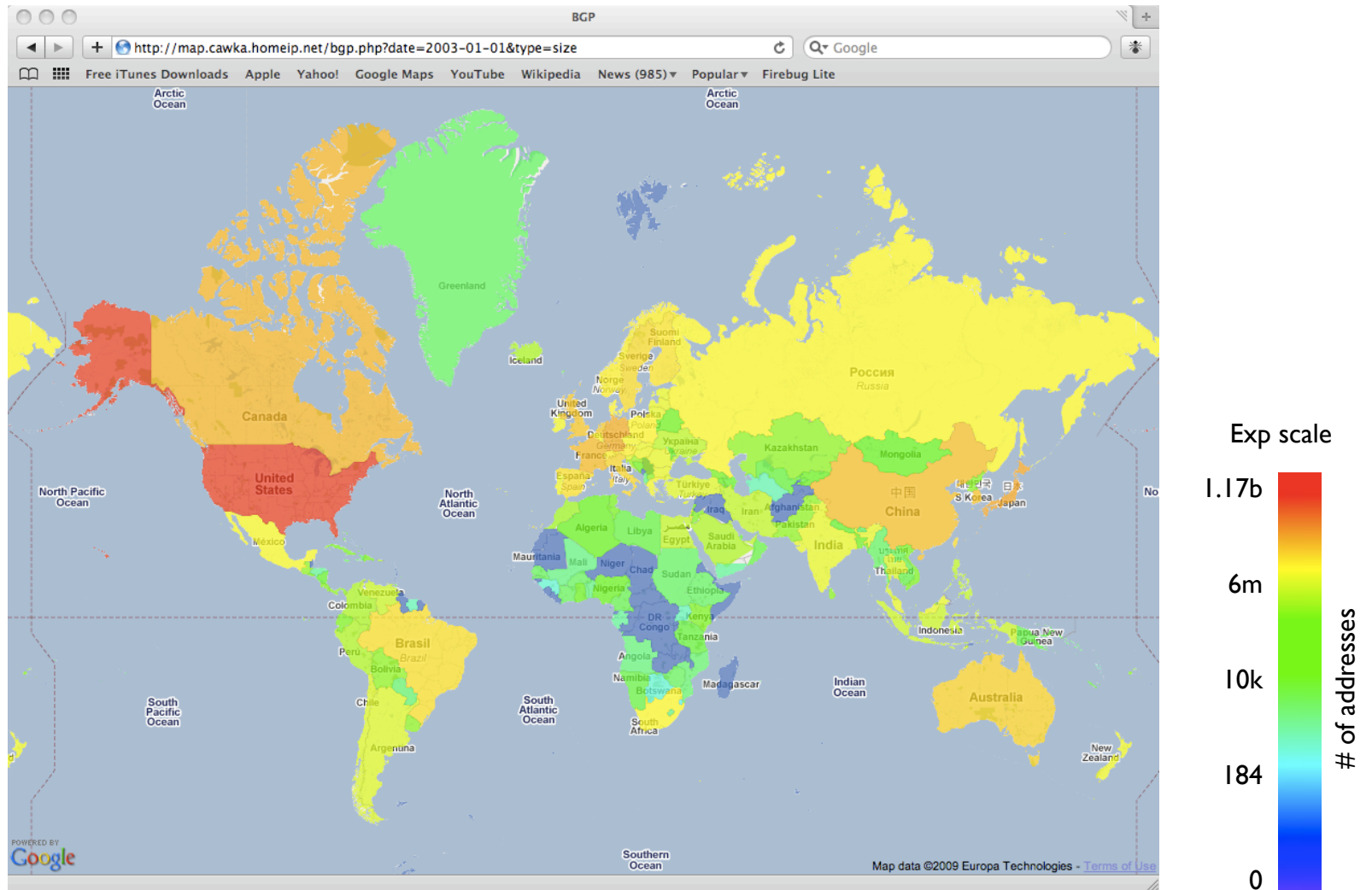


Distribution of announced IP space

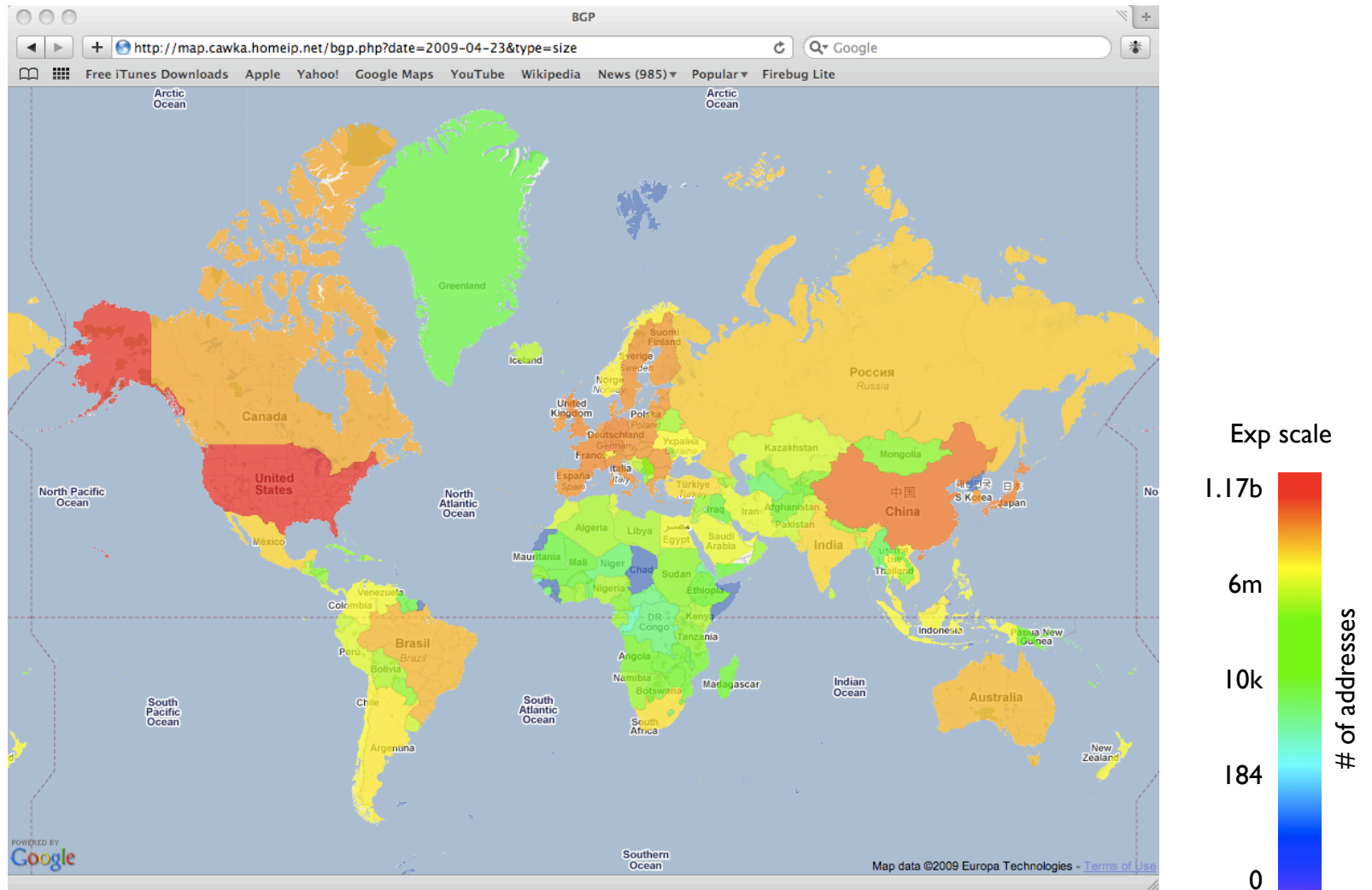


General trend - growth of used IP space globally

Distribution of announced IP space 2003

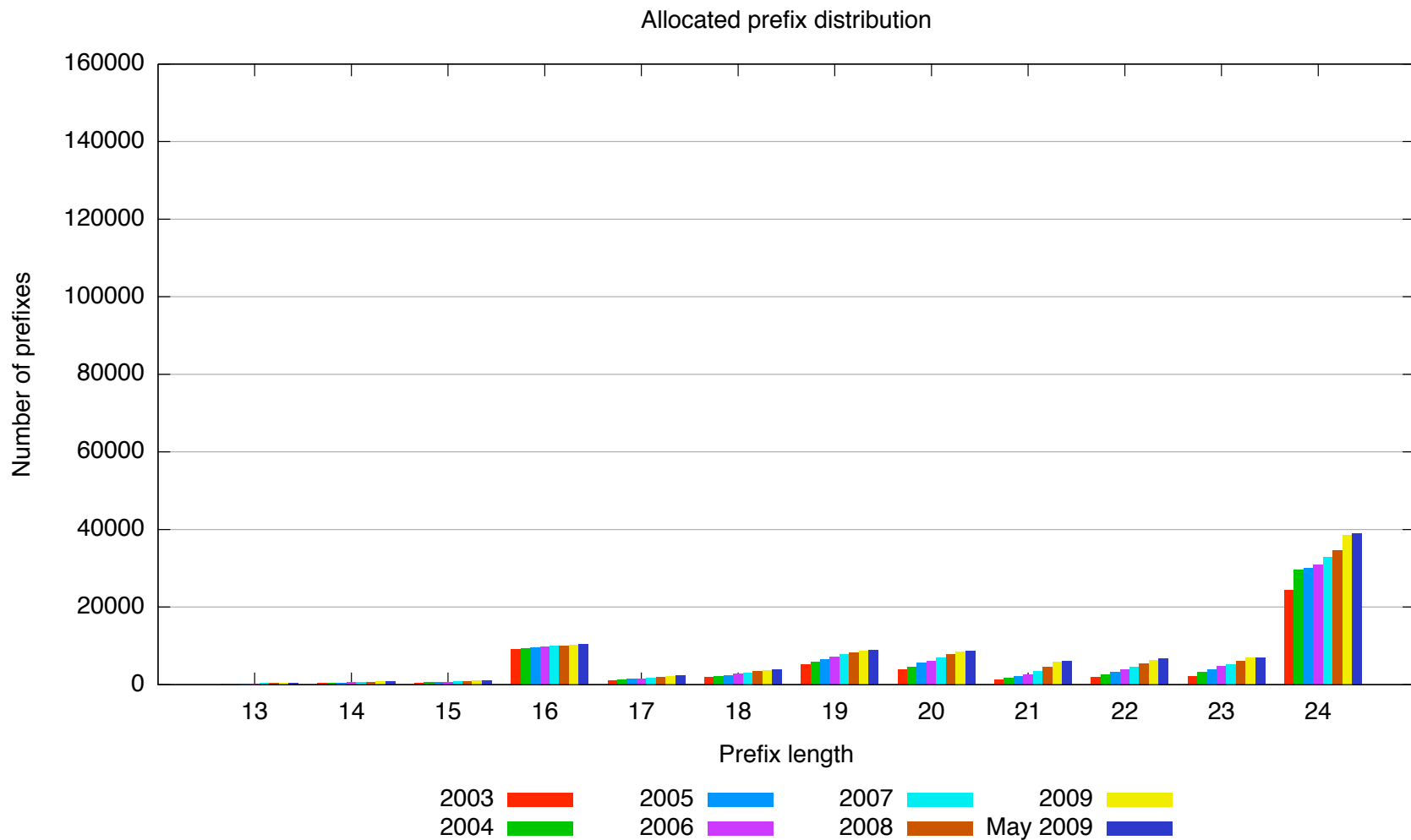


Distribution of announced IP space May 2009



Distribution of prefix lengths

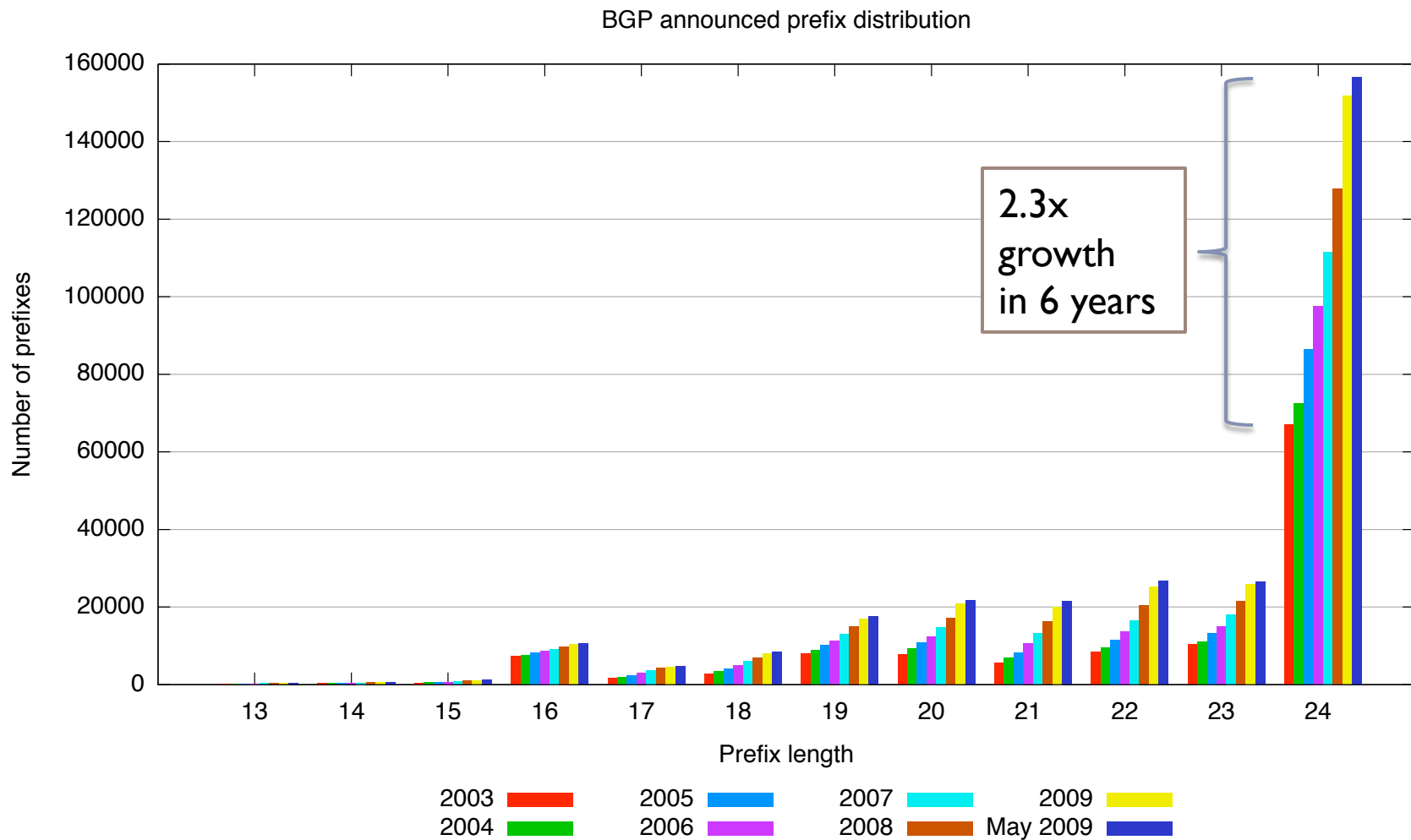
IP allocations



Most of IP allocations are /24 blocks
Big number of allocations of /16, /19 and /20 blocks

Distribution of prefix lengths

BGP announcements

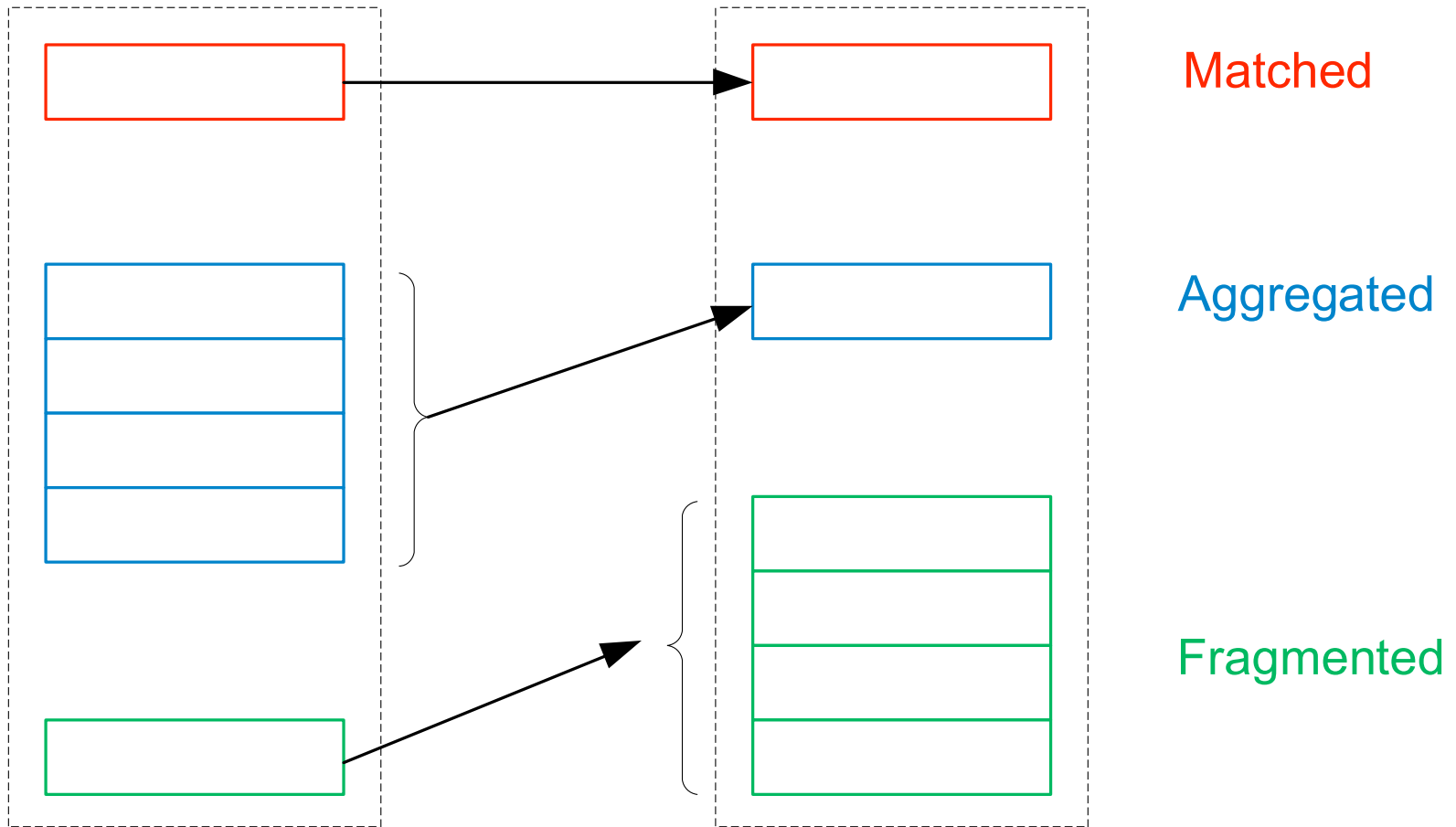


Most of BGP entries are /24 blocks - 50%
 /16, /19, /20, /21, /22 and /23 - the rest of 50%

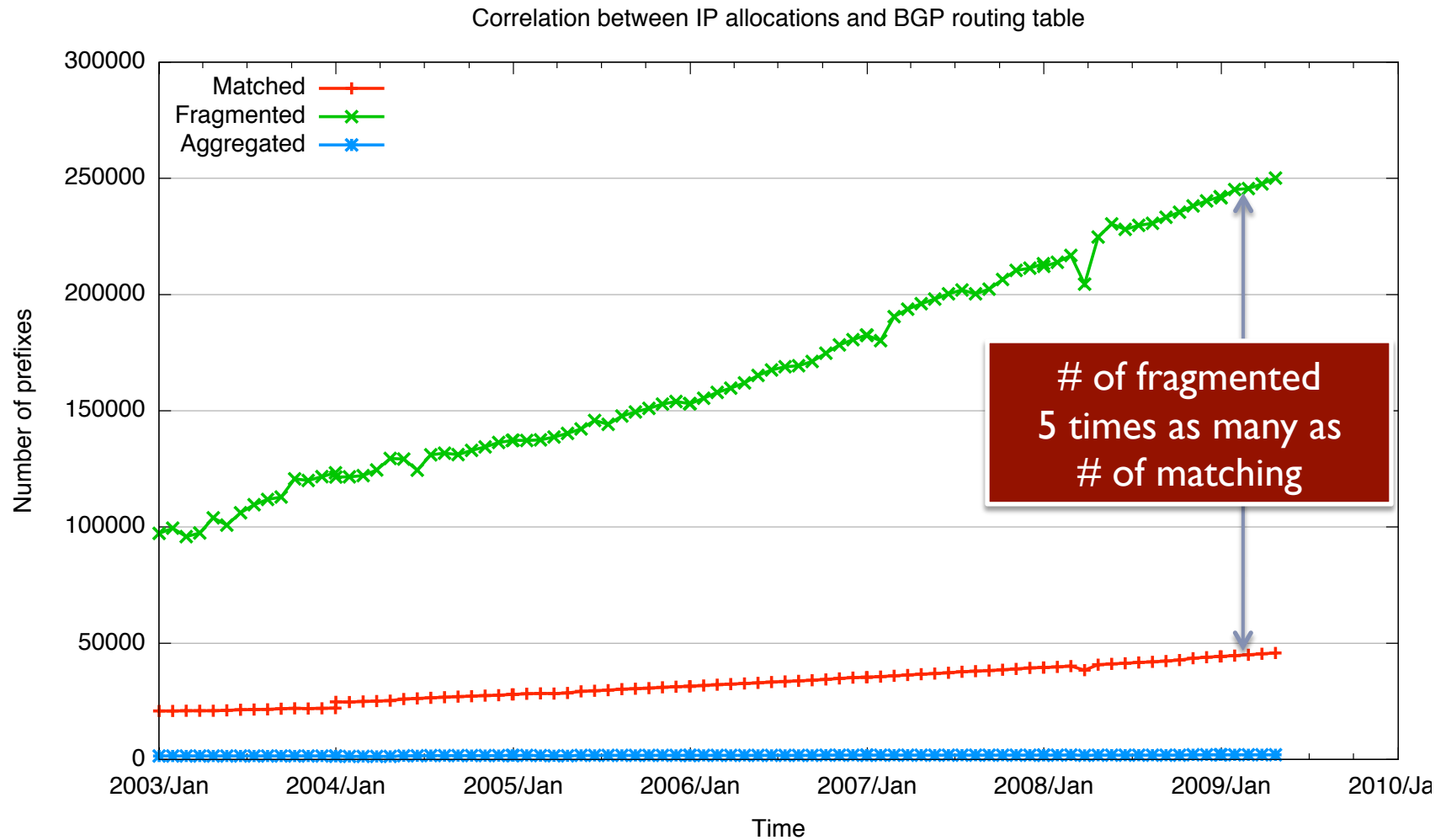
Some definitions

IP allocations

BGP table entries

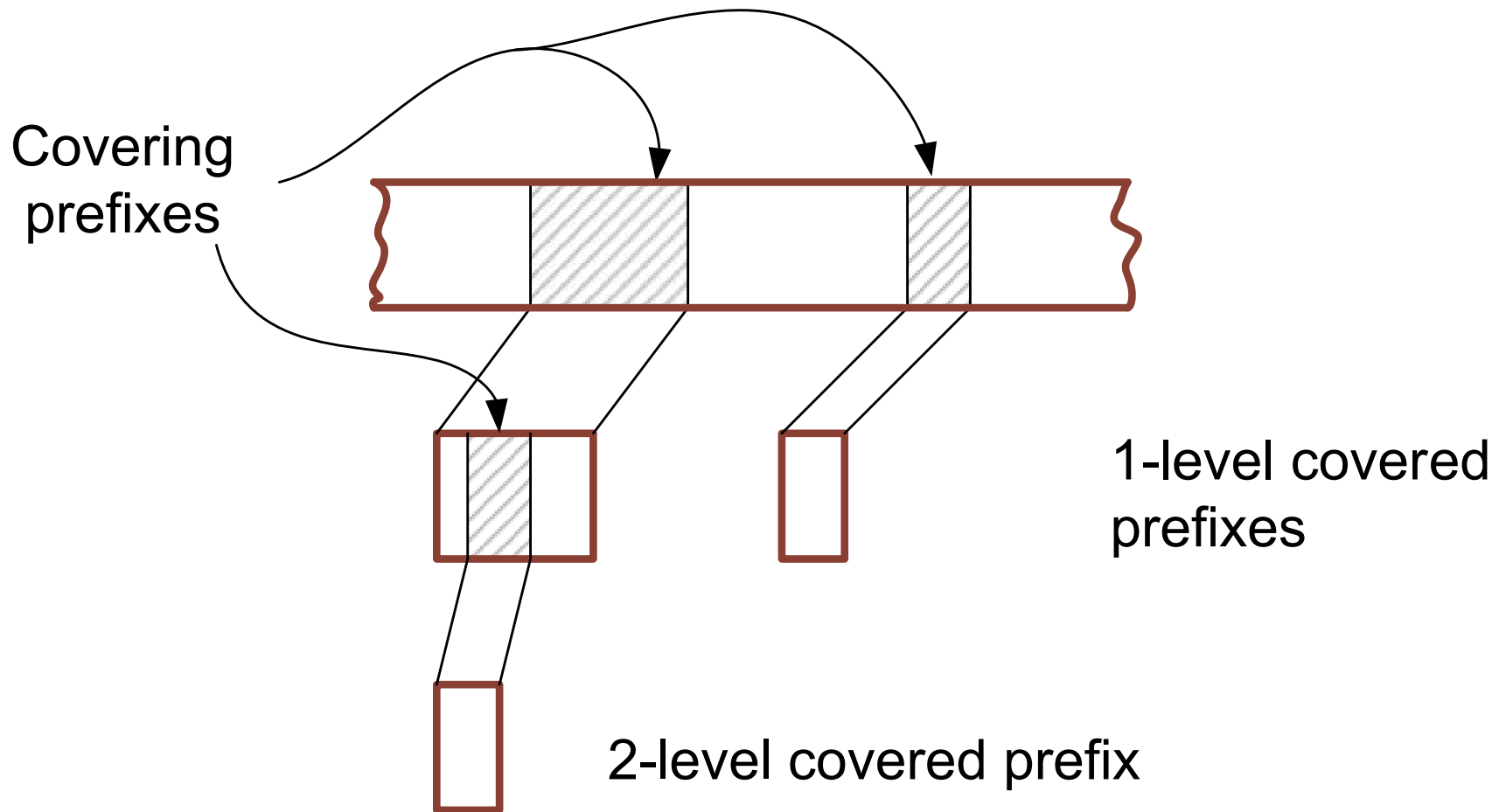


Impact of the fragmentation on the BGP routing table size



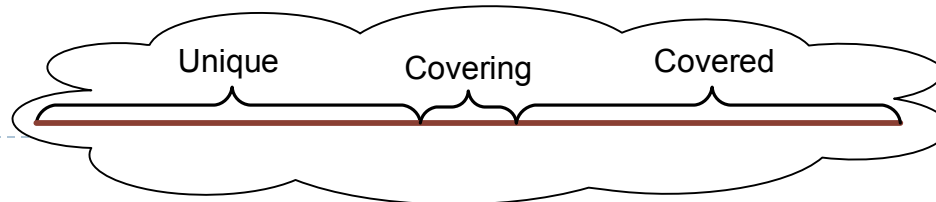
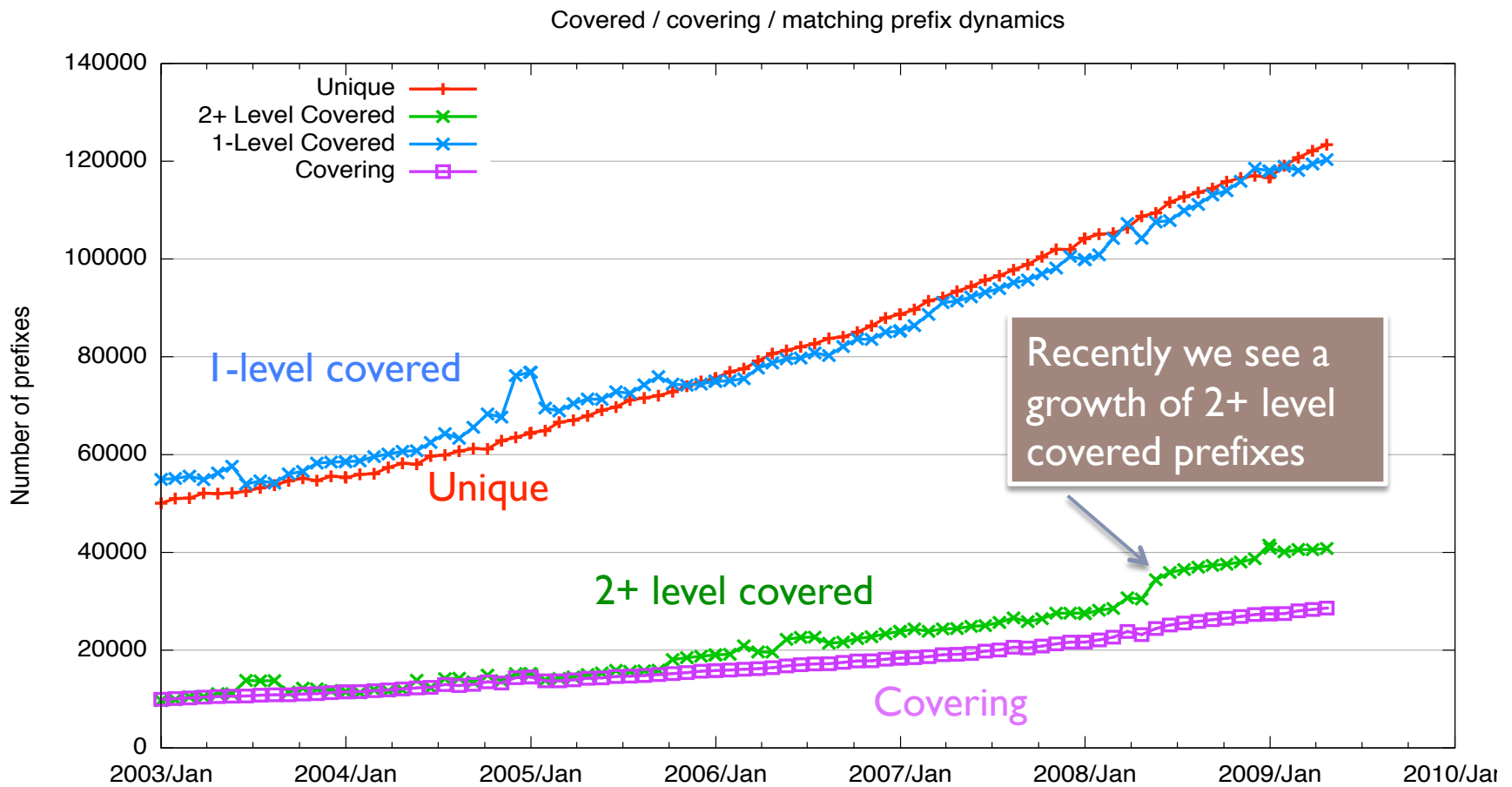
BGP aggregation of allocated blocks is very rare (1400 – 2000 prefixes)

Another bunch of definitions

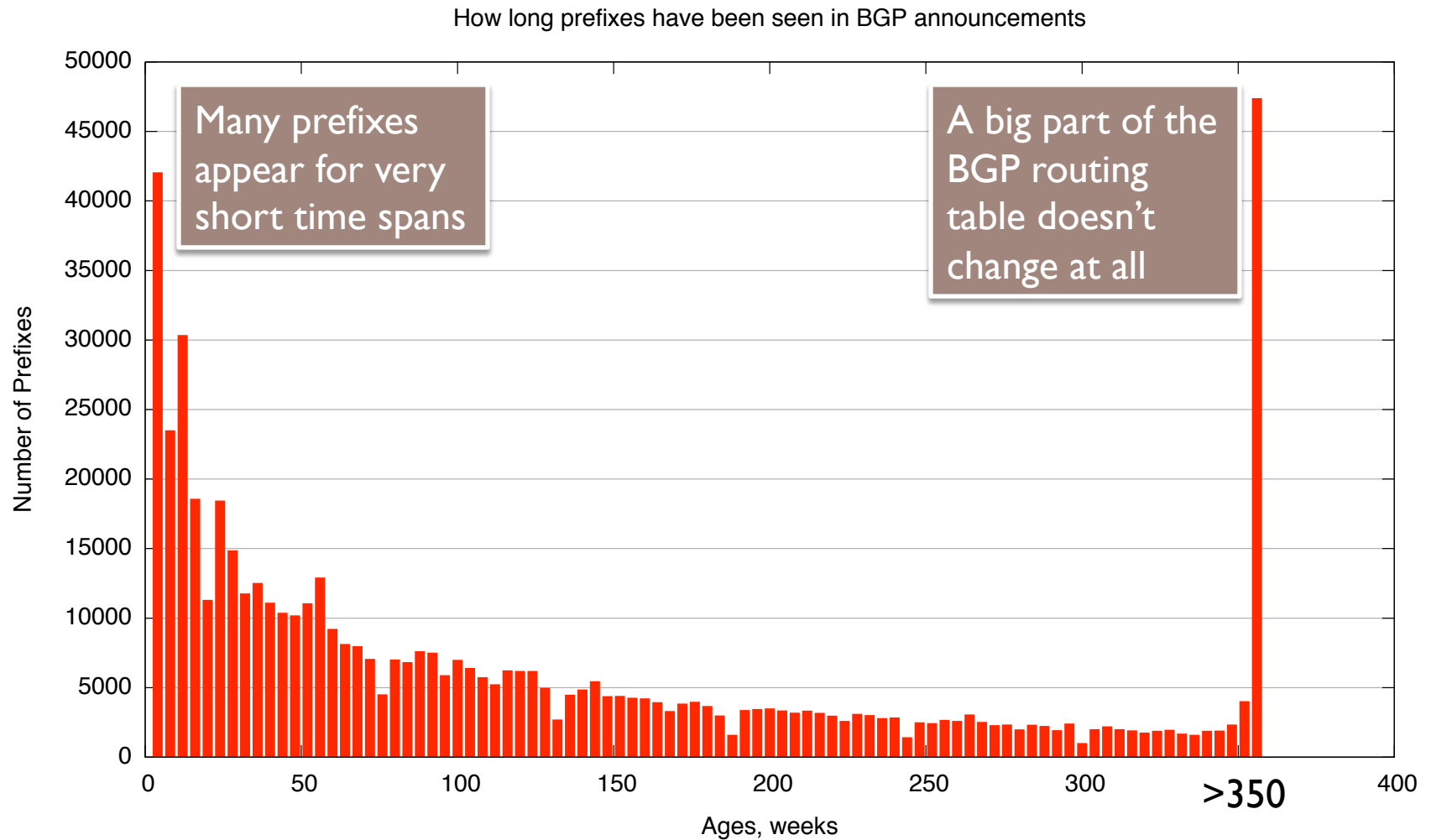


Duplication in BGP routing table

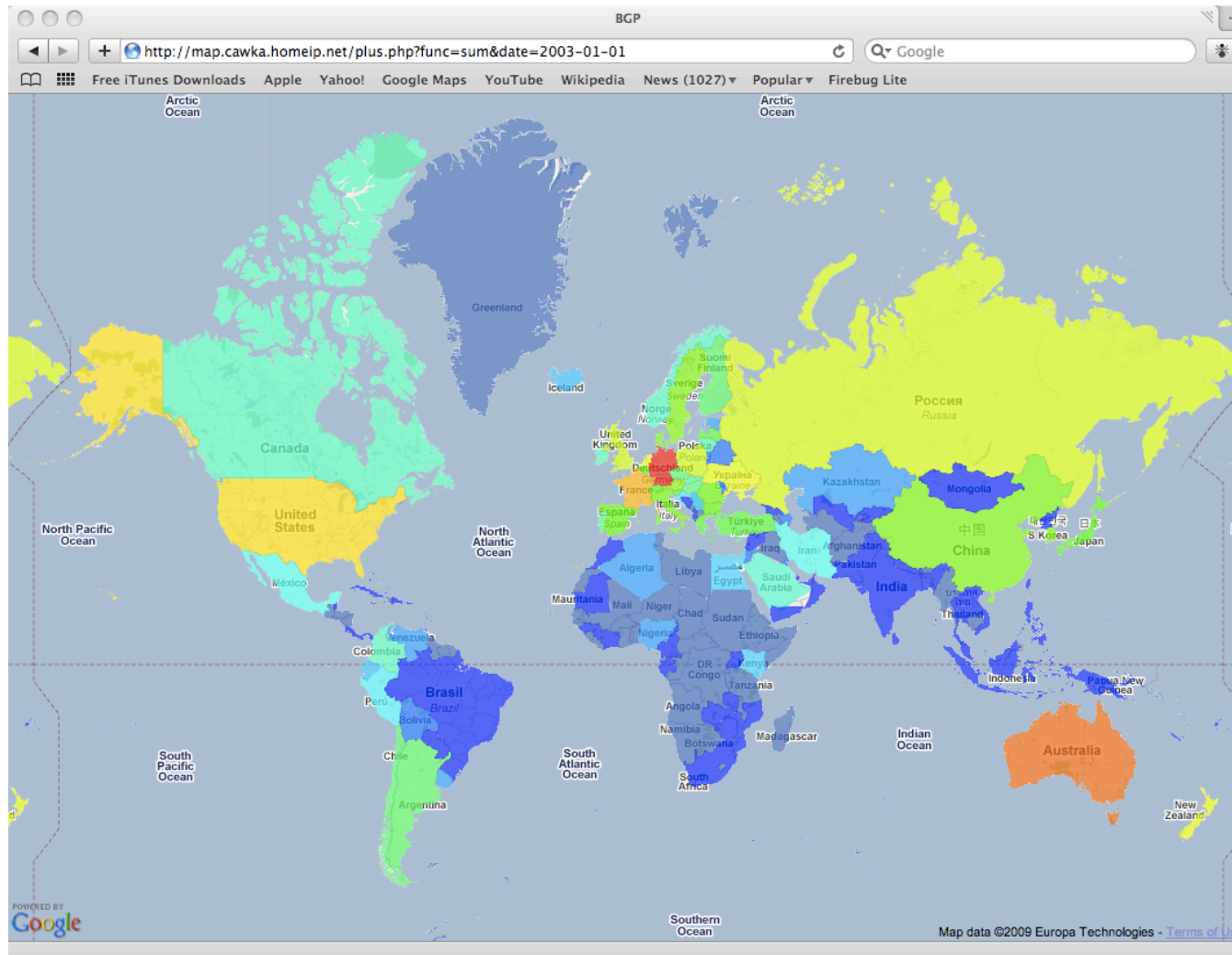
Unique, Covered and Covering prefixes



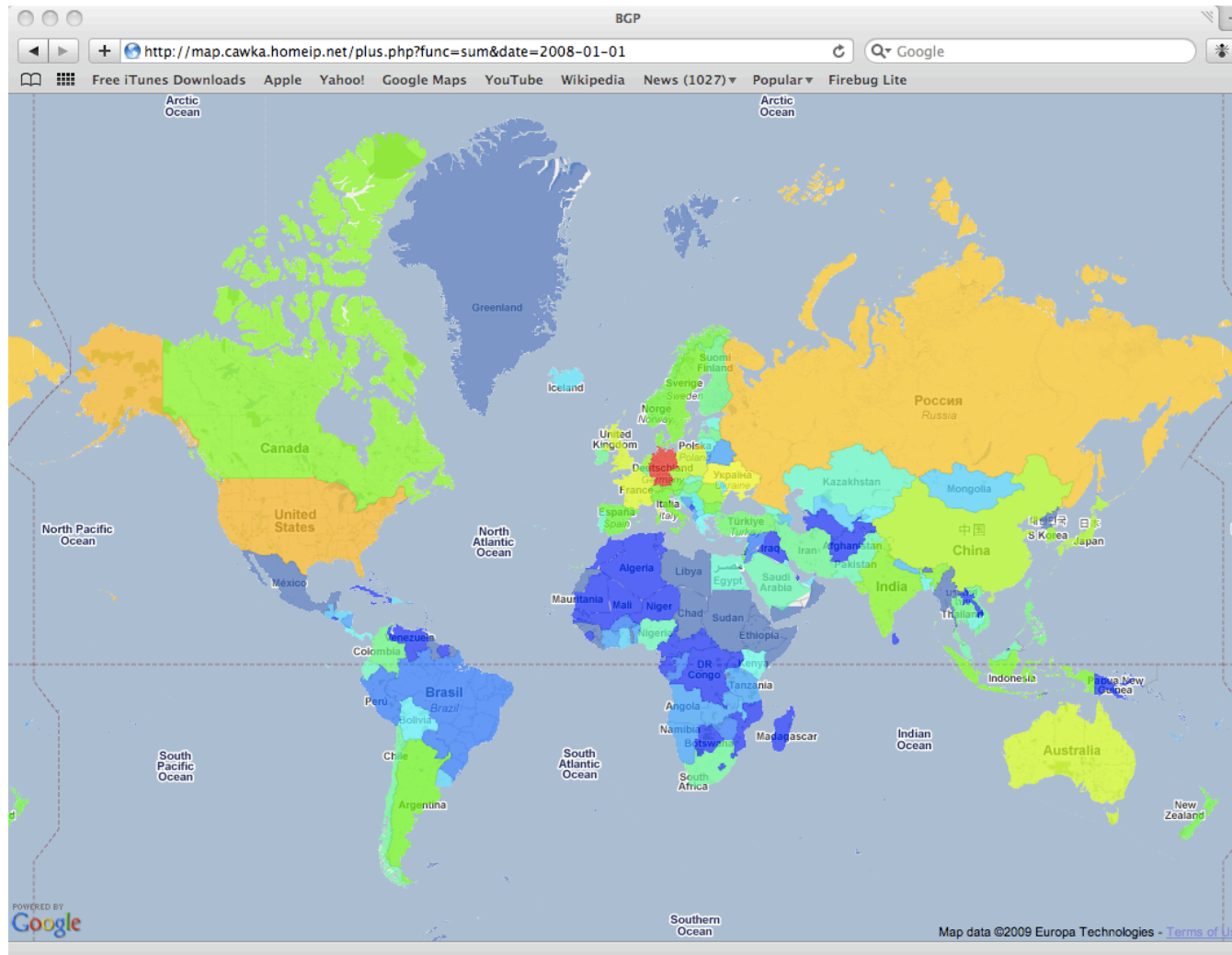
Longevity of BGP announcements



IP allocation changes geography 2003-2004



IP allocation changes geography 2008-2009



Conclusions

- ▶ BGP table has more than doubled in 6 years
- ▶ The BGP table growth outstrips IP allocation rate
- ▶ Every industrialized nation is participating in BGP table growth
- ▶ Multihoming and traffic engineering techniques introduce redundancy in BGP table (58% in 2009)
- ▶ BGP table content is highly dynamic

