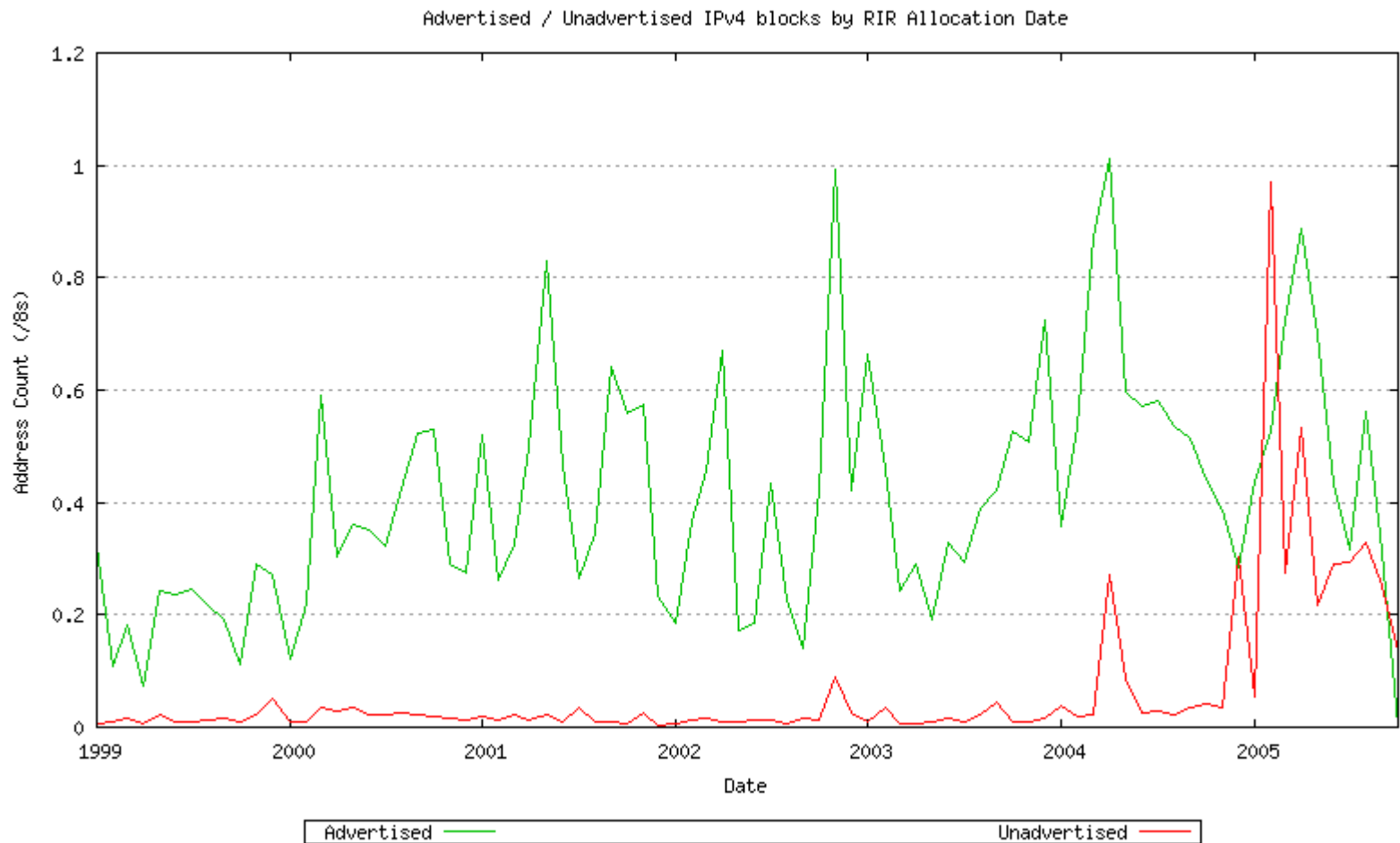


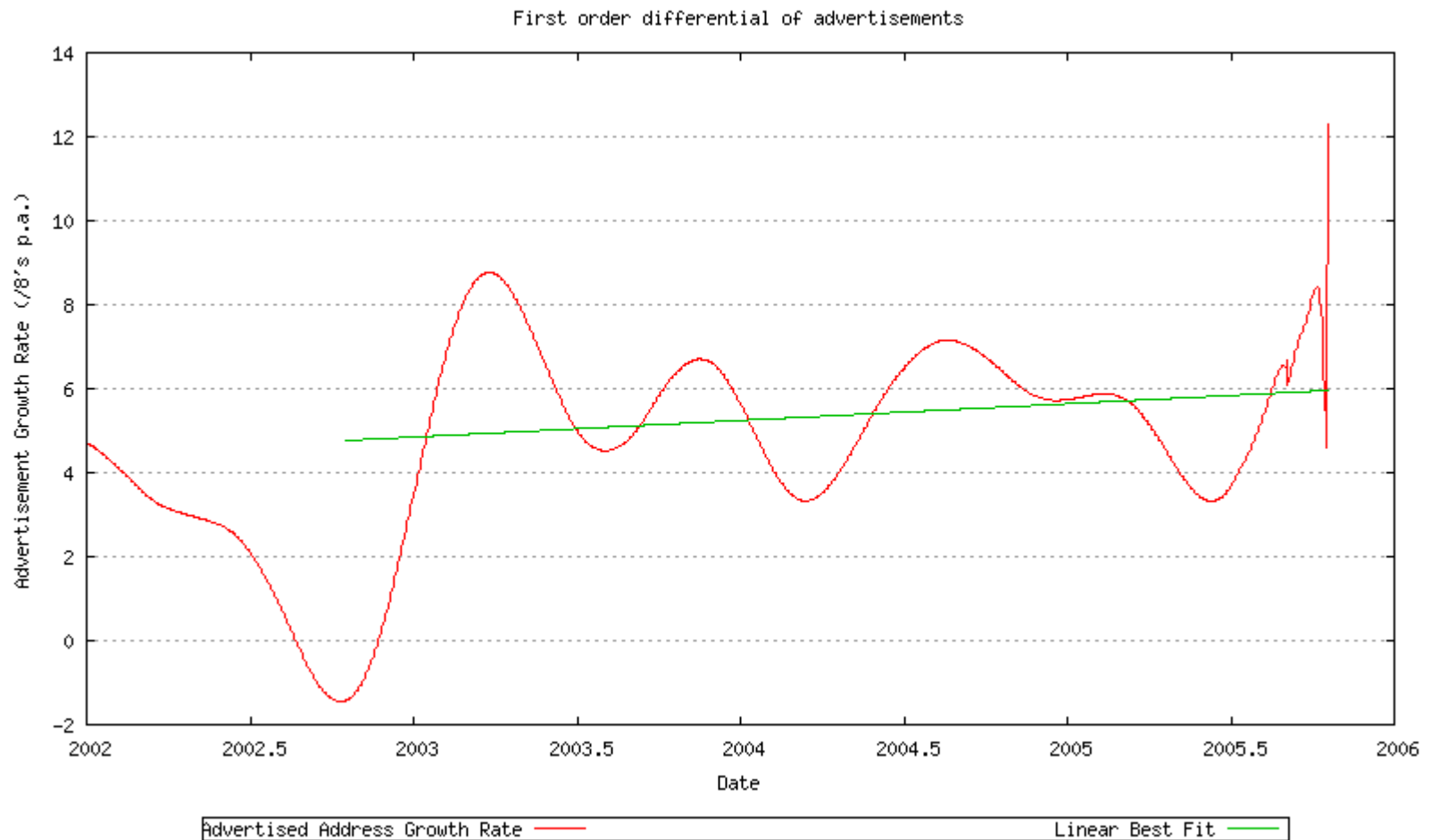
A look at the IPv4 consumption data

- Use a fundamental assumption that **the driver for address consumption is the public Internet**, and that the growth of the Internet is reflected in address consumption demands
- Adjust the model to include each individual RIR's allocation behaviour over time
- Set the 'exhaustion' date at the point when any RIR cannot honour an address request

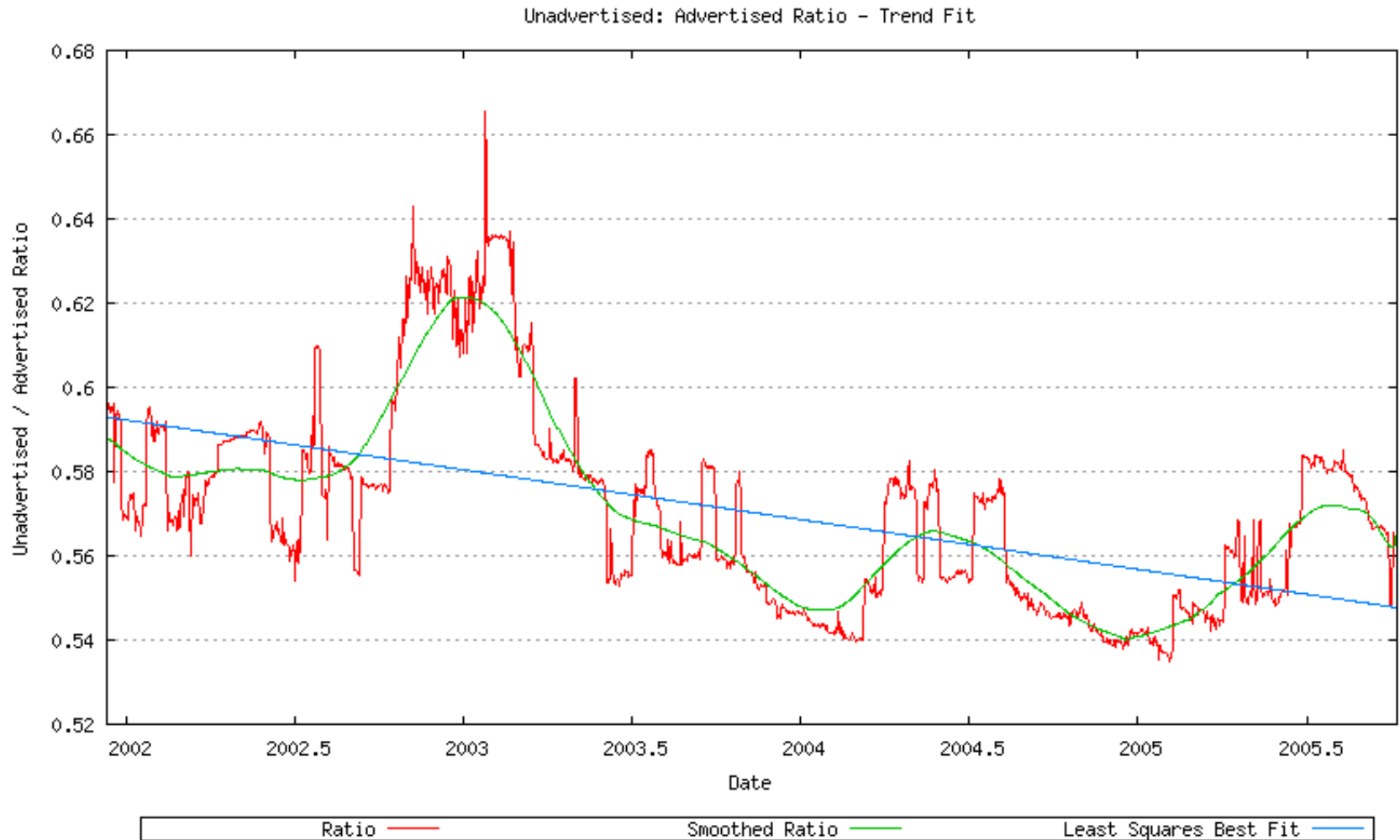
Advertised and Unadvertised Addresses



Advertised Address Growth

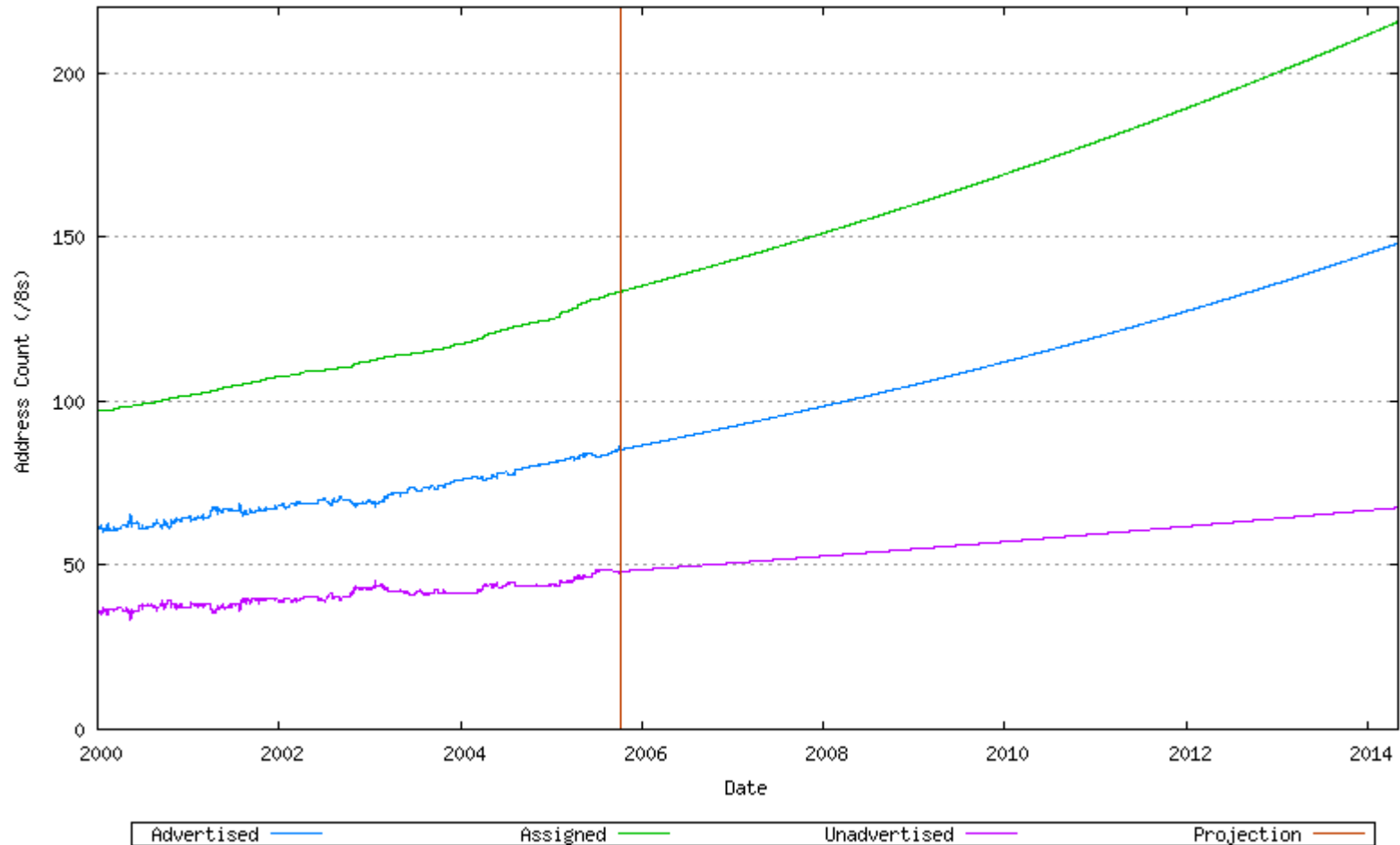


Unadvertised / Advertised Ratio



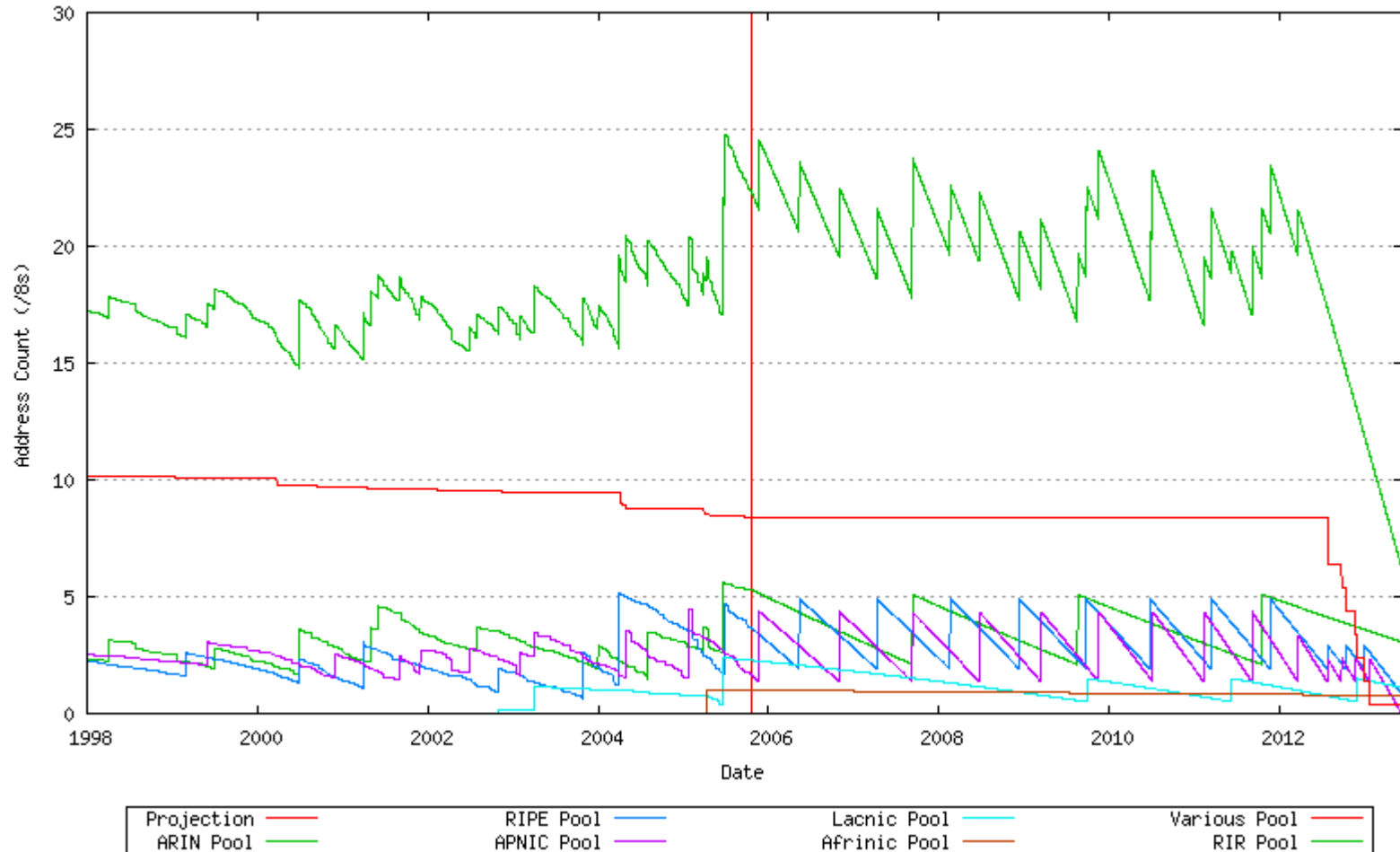
The Address Consumption Model

Total demand level



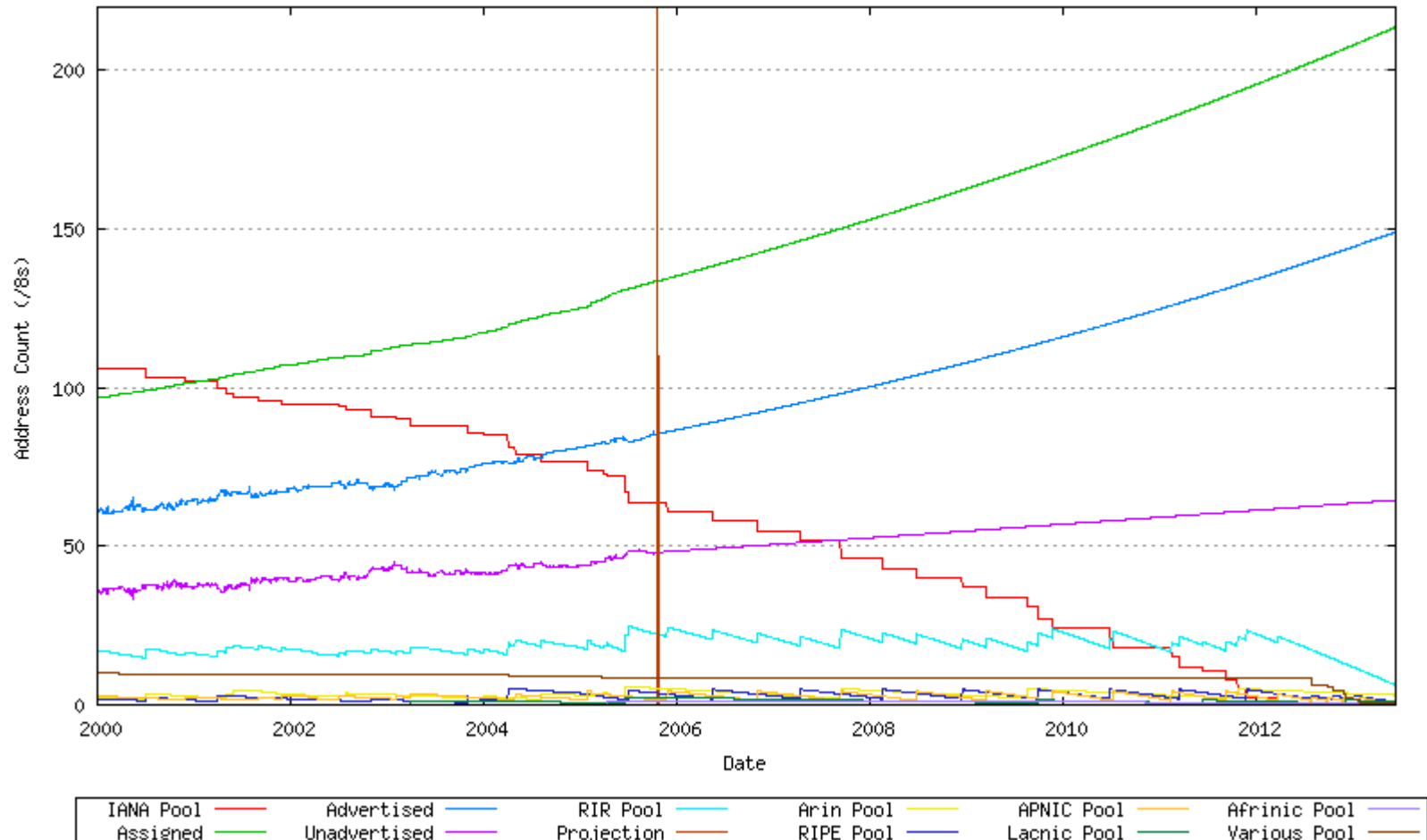
The Address Consumption Model

Combined RIR Model



The Address Consumption Model

Full Model



Some Projections from this Model

- IANA Pool exhaustion
15 March 2012
- RIR Pool exhaustion
4 June 2013



gory details and code:

<http://www.potaroo.net/tools/ipv4>

Commentary

- These address consumption models assumes an orderly procession right up to the point of effective exhaustion of the unallocated IPv4 address pool
 - This is **highly unlikely** to eventuate!
 - Within the current policy framework a more likely industry response will be accelerating demands as imminent exhaustion of the unallocated address pool becomes more visible
 - It is not easy to model such “last chance run” behaviours based purely on the historical address allocation and BGP data
 - Some other form of modelling of social and market behaviour of a last chance run would be better positioned to make some guesstimates here

Early signs of a rush?

Advertised / Unadvertised IPv4 blocks by RIR Allocation Date



Commentary

- Exhaustion of the IPv4 unallocated address pool does not imply complete unavailability of IPv4 address resources to industry players
- The exhaustion of the unallocated IPv4 address pool does not appear to imply a forced IPv6 conversion onto the industry at that point in time
- There is strong reason to believe that the global Internet industry will continue to use IPv4 as a base protocol long after this IPv4 unallocated address pool exhaustion date comes and goes

Post Exhaustion?

- In the absence of the imposition of specific external control functions, a conventional economic response would be the emergence of various forms of trading markets in IPv4 address resources
- In conventional markets scarcity tends to operate as a pricing premium factor
- Market behaviours would then imply an entirely different characteristic in terms of IPv4 address distribution
- Unadvertised address pools, poorly utilized address pools and release of current address holdings based on conversion to address compression technologies may come into play within a market-based pricing dynamic
- What form of market regulation would be appropriate? How would it be applied? Who would apply it? Why would it be useful to have?
- How can address utility and the integrity of address uniqueness be ensured in an environment of market-based trading?

Food for Thought

- RIR Allocation Policies:
 - What is the threshold point where the application of different IPv4 address allocation policies may be appropriate? Or is “no change” a wiser course of action?
 - Should the RIRs establish “strategic reserve address pools? Why?
- Emergence of IP Address Markets:
 - Is the emergence of such markets Good or Bad? Avoidable or Inevitable? Appropriate or Inappropriate? Fair or Unfair?
 - Are there practical alternatives? How would such alternatives fit within existing public policy frameworks? Within industry expectations?
 - How are trading markets best supported?
 - Would such address markets be regulated? How? By whom? Why?
 - What is the RIR role in such an environment?
- Global Implications:
 - What about “Equity”, “Affordability”, “Fairness” of access at a global level?
 - And in what venue are such concerns best expressed?

Address Policy Questions

- When the current RIR IPv4 allocations policies are no longer applicable, what are most appropriate address management policy measures that will support the continued well-being of the global Internet and its users?
- And when will they be needed?