



*Religion,
Politics and the End of the World*

IPV4




The End of the World is nigh (er) !

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(Another) Review of IPv4 consumption

IPv4 Exhaustion Prediction Technique

- 
- Assemble daily data for the past 1000 days on:
 - IANA to RIR allocations
 - RIR allocation rates
 - Advertised address pool
 - Unadvertised pool



Prediction Technique

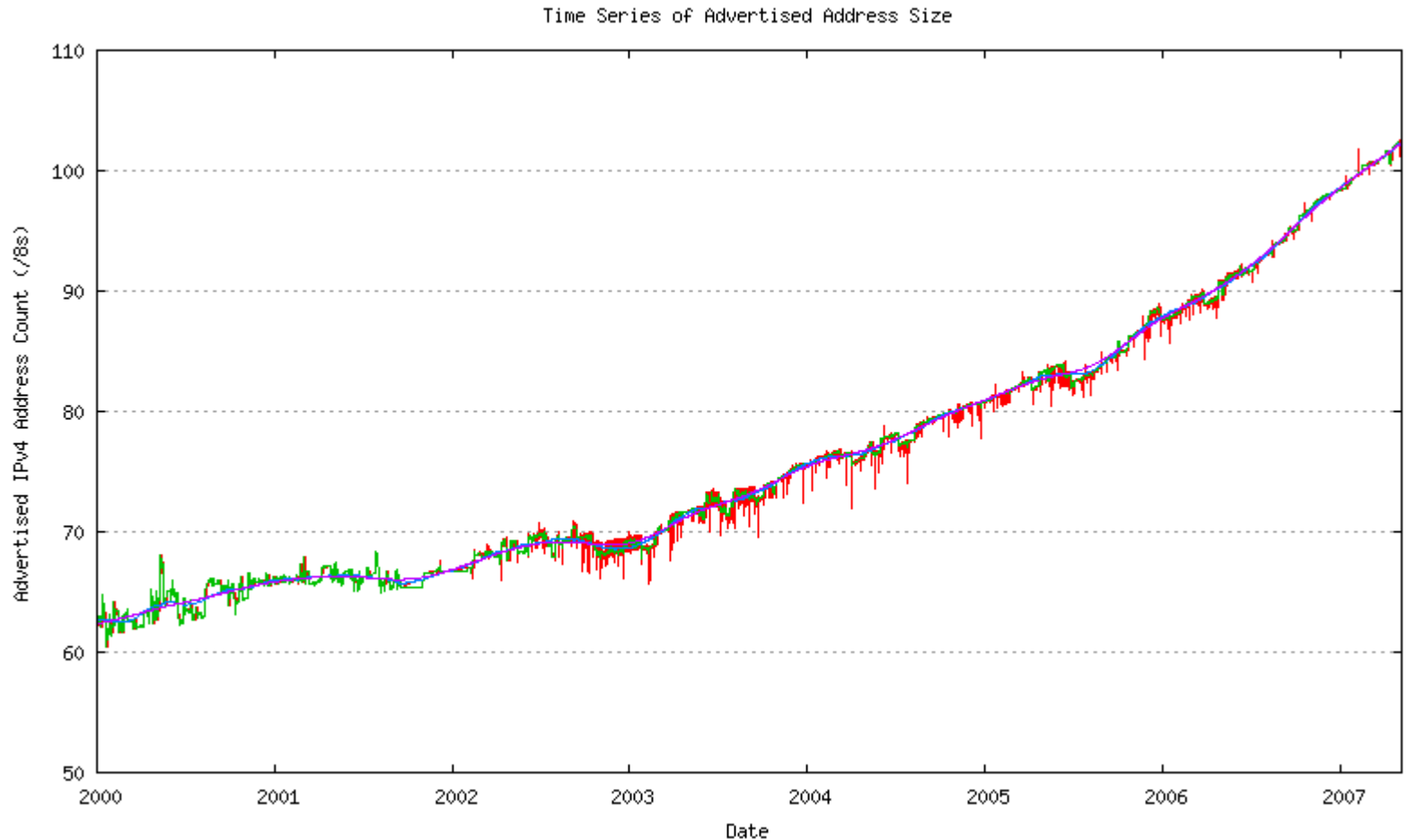
1. Fit a mathematical model over the advertised address pool data as a function of time
2. And then model the unadvertised address pool size as a function of the advertised pool
3. Derive industry demand as the sum of the two pools
4. Then model RIR actions by simulating allocations to match demand
5. Then model IANA actions by simulating IANA to RIR policies
6. Then model the operation of the address distribution system
7. Until the IANA pool exhausts!



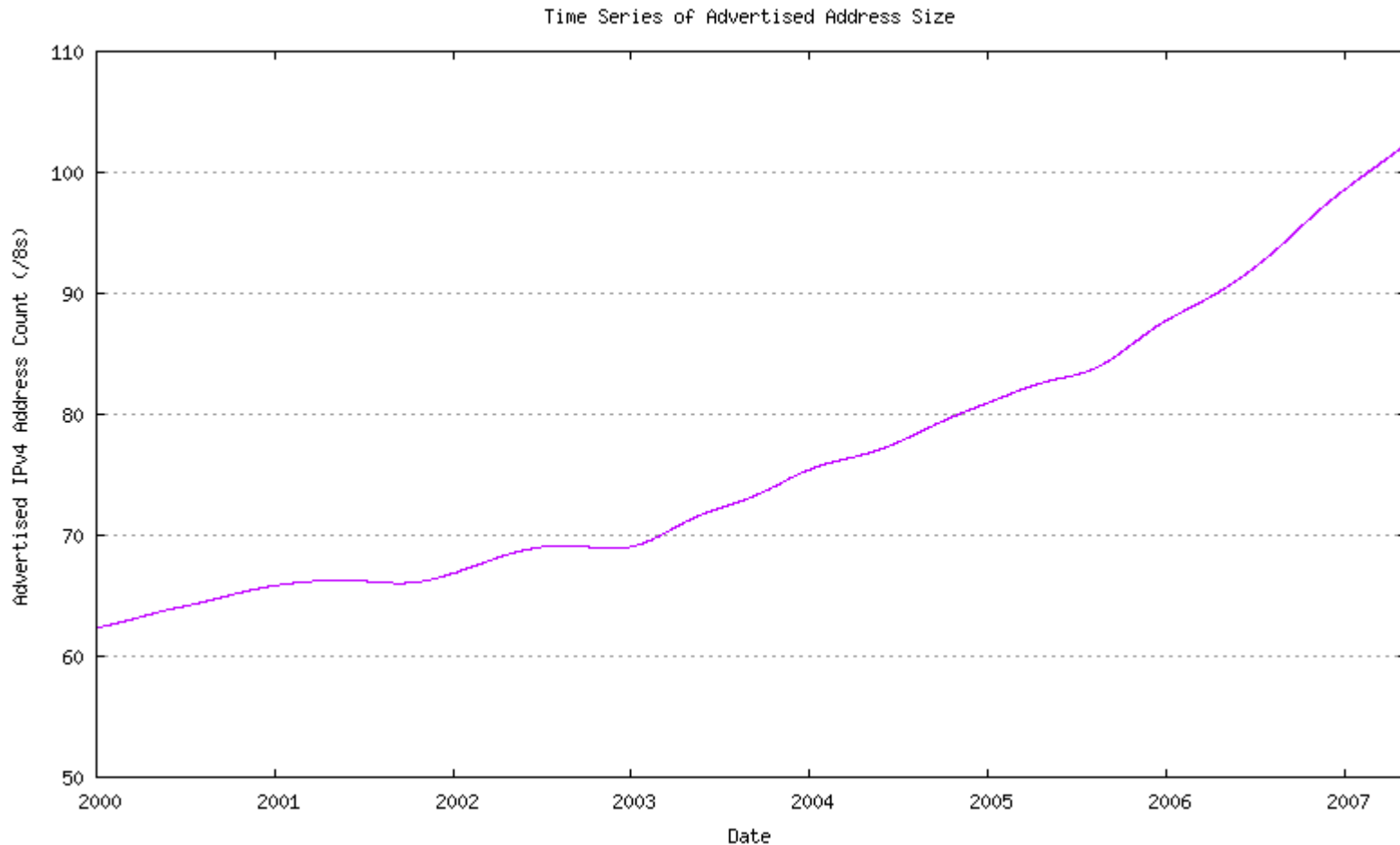
Underlying Assumptions

- Tomorrow is a lot like today
- Trends visible in the recent past continue into the future
- This model assumes that there will be no panic, no change in policies, no change in the underlying demand dynamics, no disruptive externalities, no rationing, and no withholding
 - No, really!

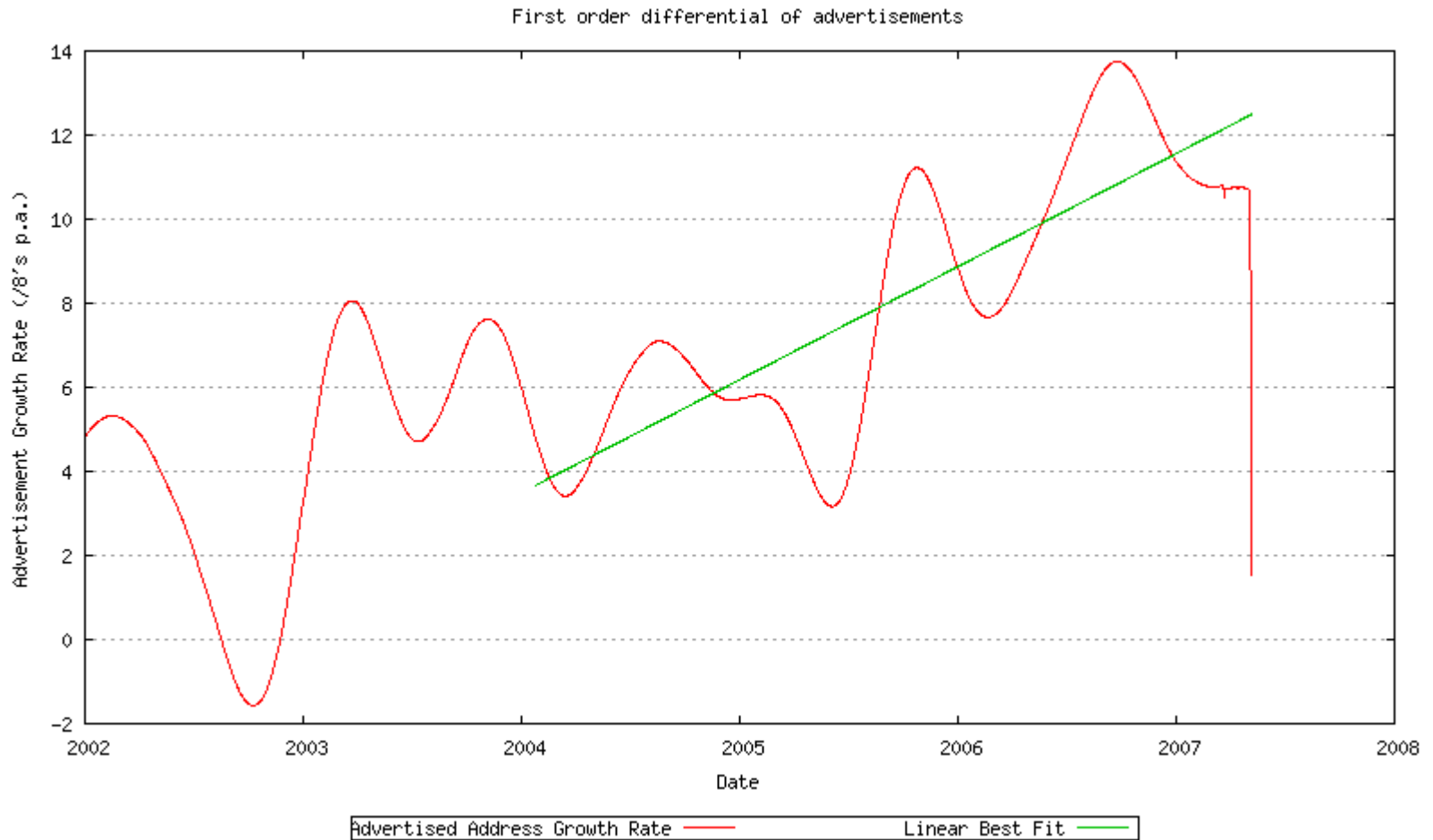
Modelling Data – IPv4 Advertised Address pool since 2000



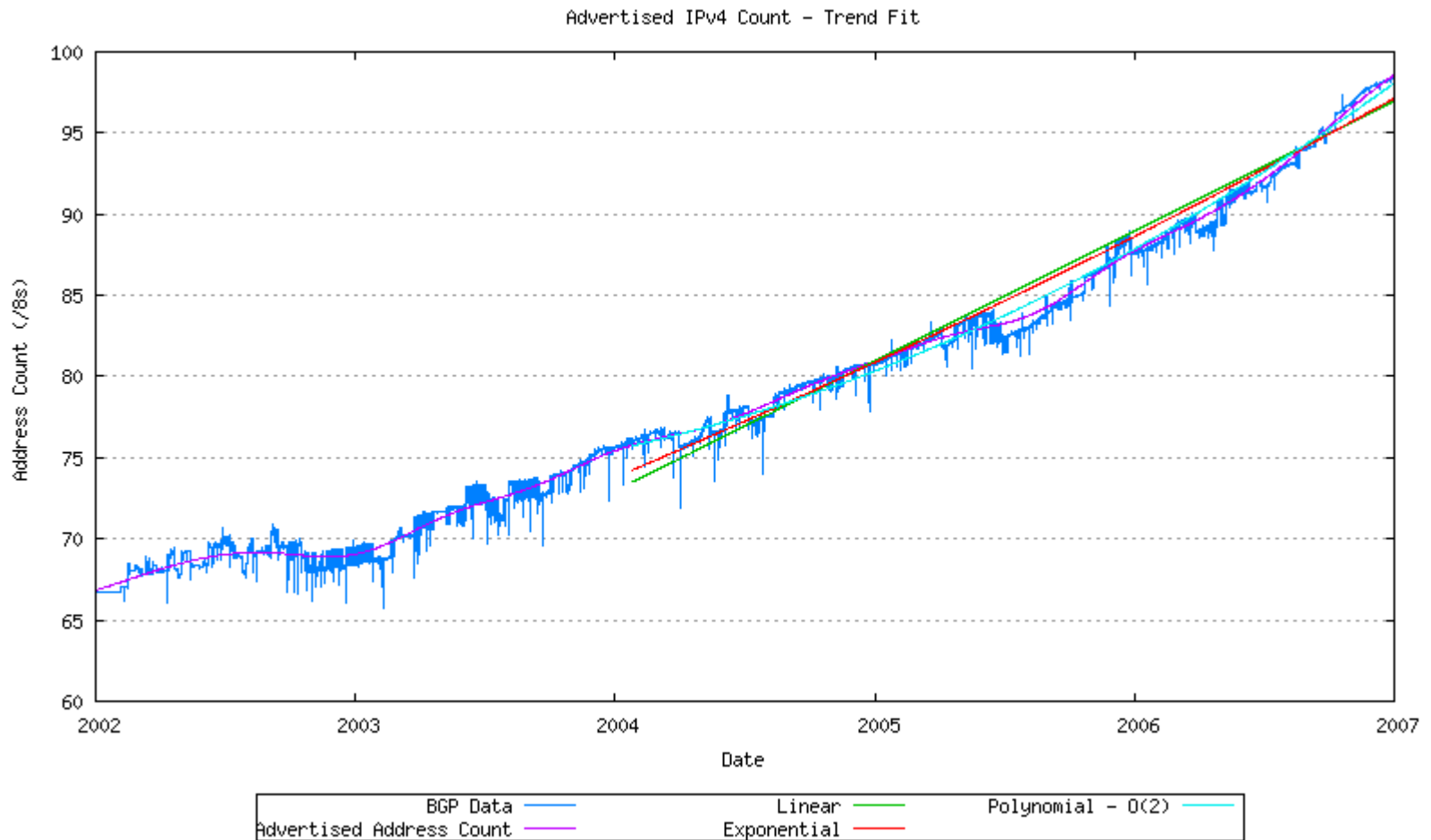
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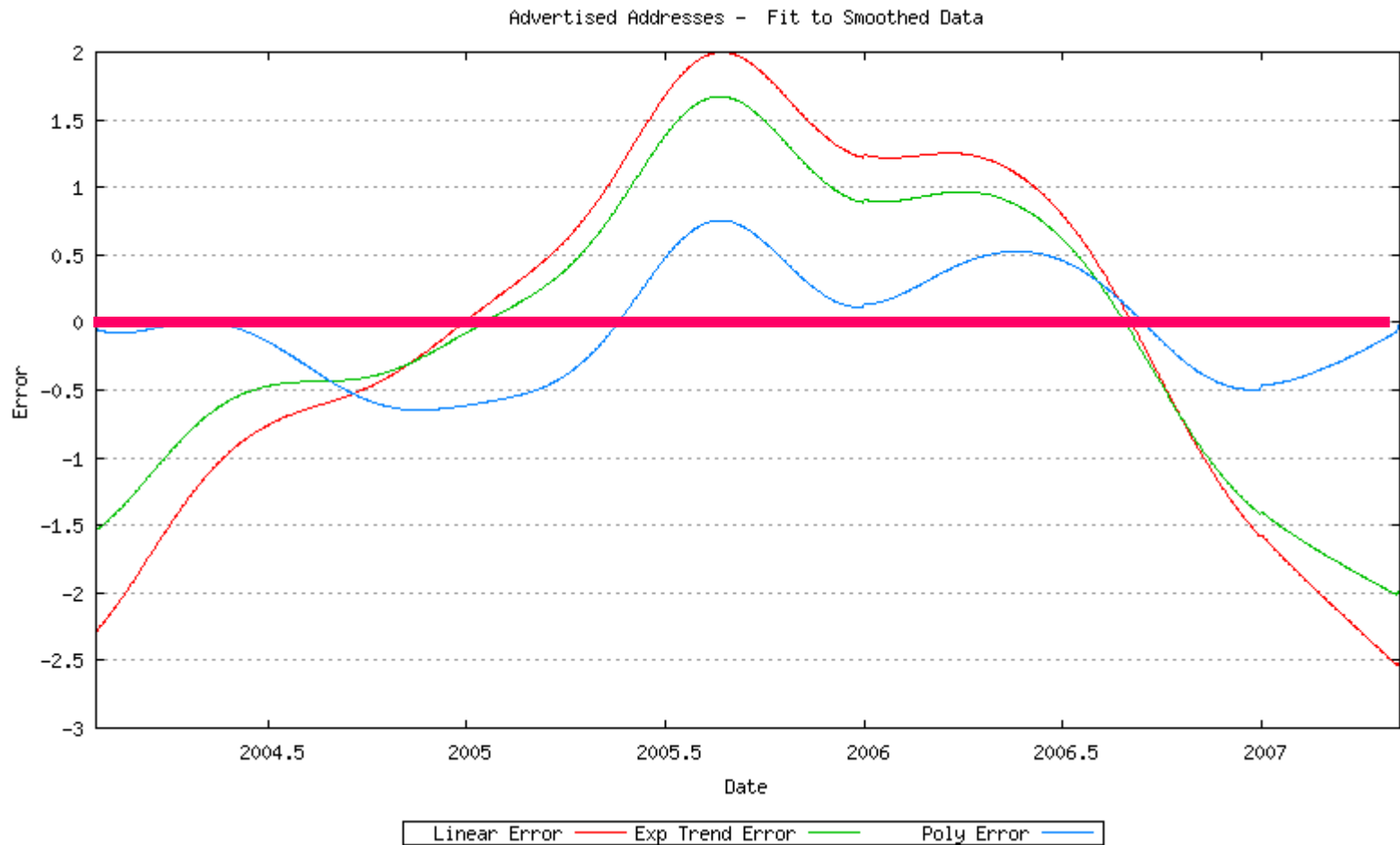
1st Order Differential



Curve Fitting



Curve Fitting Error

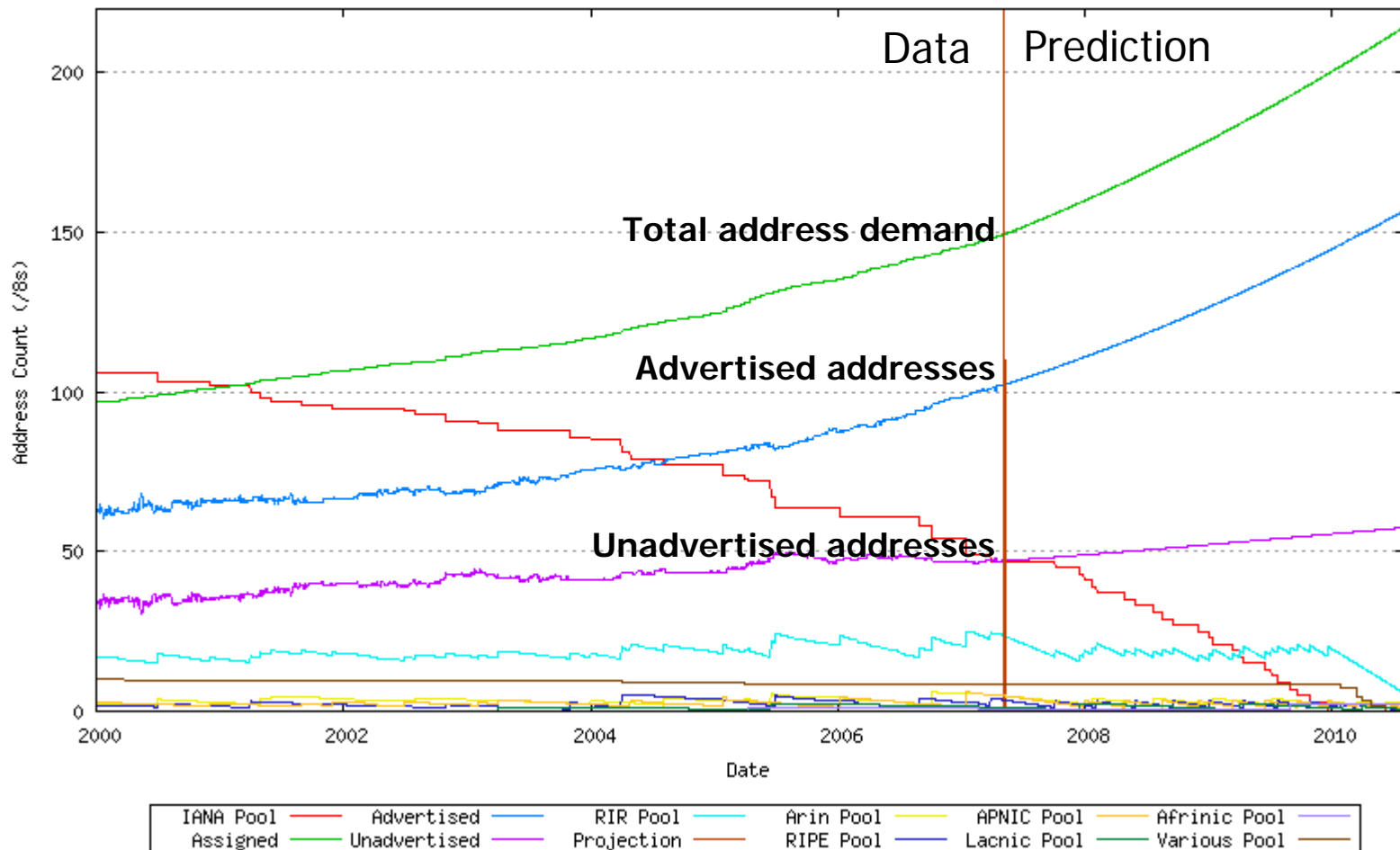




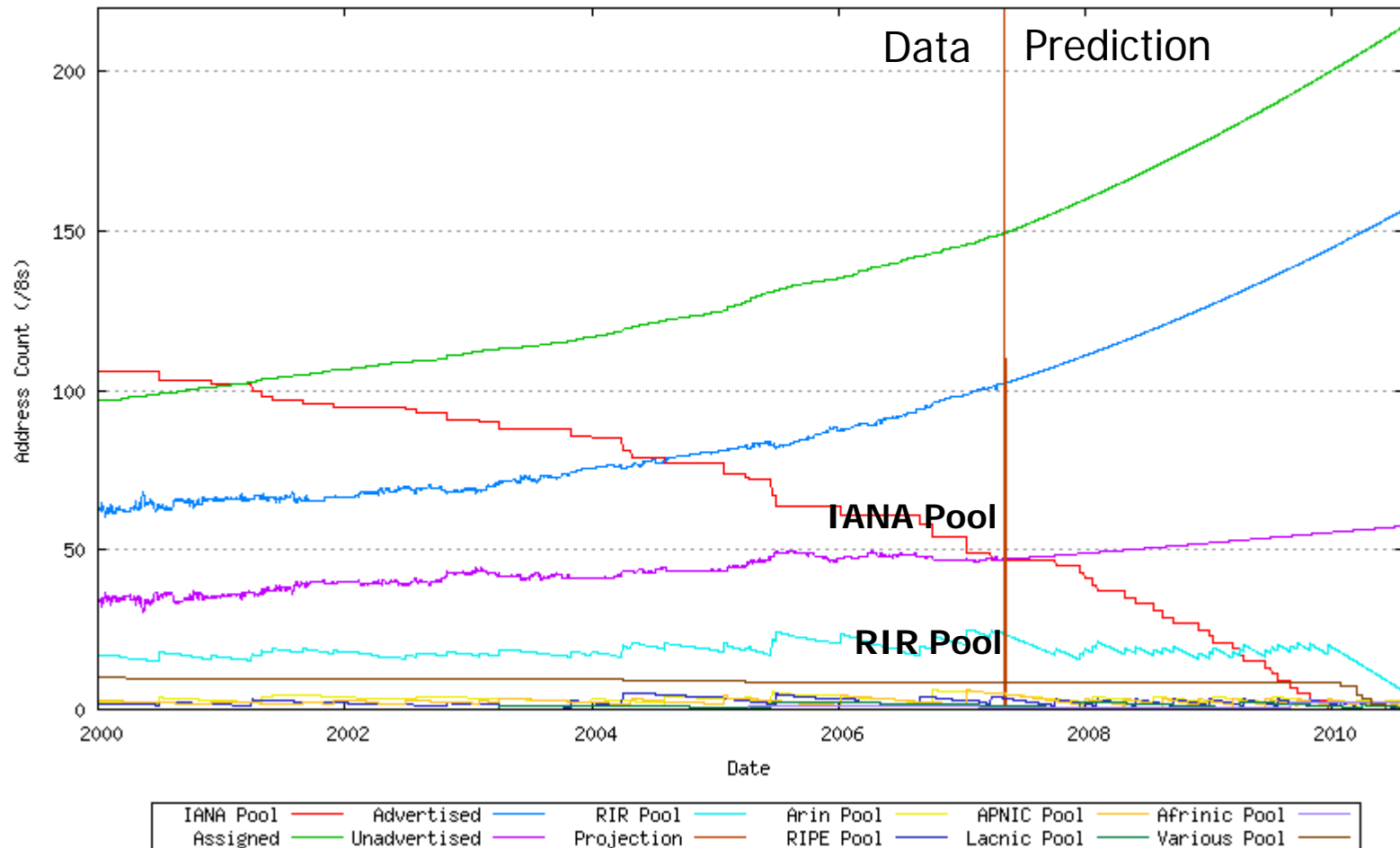
Selecting a predictive model

- Lowest error on fit to data is the quadratic growth model
 - Linear and exponential growth models indicate a worse fit to recent data
 - i.e Address demand is increasing at a constant rate

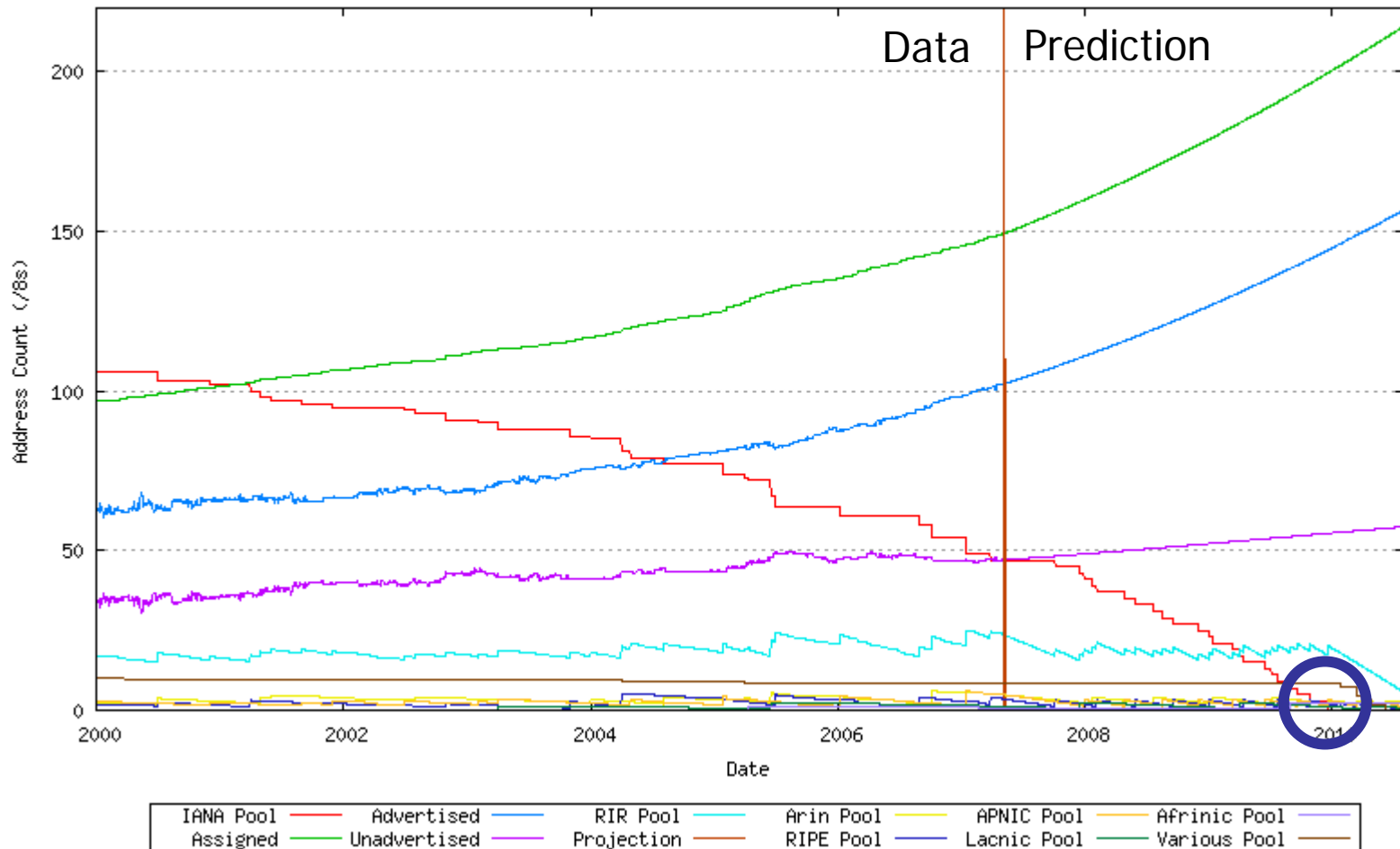
The Current IPv4 Model



The Current IPv4 Model



The Current IPv4 Model





So -- when?

In this model, IANA allocates its last IPv4 /8 to an RIR on the 18th December 2009

This is the model's predicted exhaustion date as of the 9th May 2007. Tomorrow's prediction may be different!



But ...

This curve fitting is just an exercise in numbers

Reality often turns out to be different

Just how different reality will be is something
you need to determine *for yourself*

<http://ipv4.potaroo.net>



Implications

- There is no “flag day” for transition out of IPv4
- IPv4 addresses will continue to be in demand beyond the date of exhaustion of the unallocated pool
 - But the mechanisms of management of the address distribution function will change



Options

- Persist in IPv4 networks using more NATs
- Persist in IPv4 networks and use a market for IPv4 address trading
- Dual Stack IPv4 / IPv6 – everywhere?
- coexistence of multiple transitional protocol models may be prohibitively expensive
IPv4 markets + IPv4 / NATs + IPv6 = \$\$\$



Implications

For network managers:

Understanding growth requirements and matching this to address accessibility

Forward planning to minimize disruption risk

For product and service vendors:

Planning ahead of demand rather than lagging

For regulators and policy makers:

Phrasing clear and achievable objectives with unambiguous regulatory signals to industry players

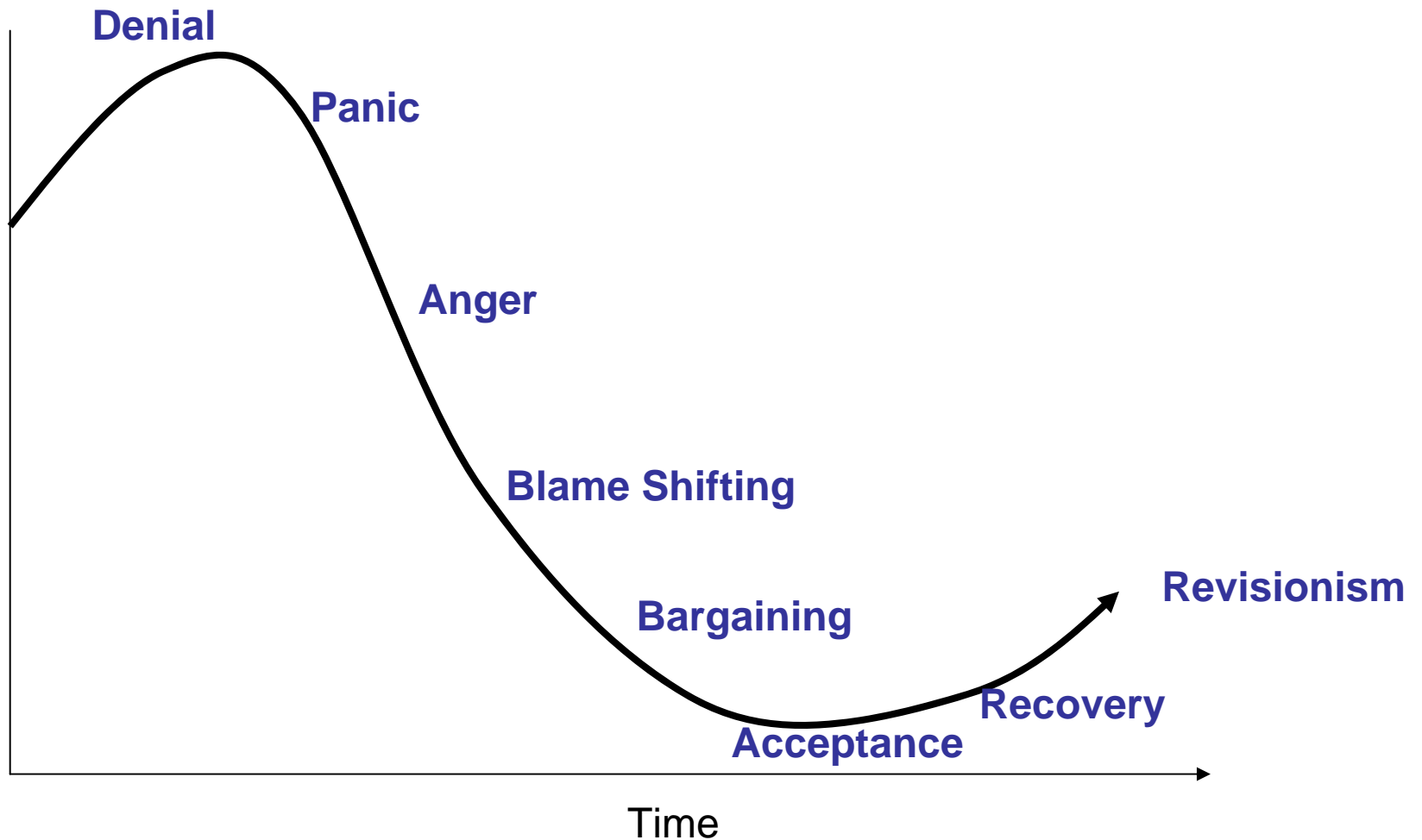


Implications

It is likely that there will be some disruptive aspects of this transition that will impact the entire industry

This will probably not be seamless nor costless

Coping with Crises



Coping with Crises – IPv4 Exhaustion

