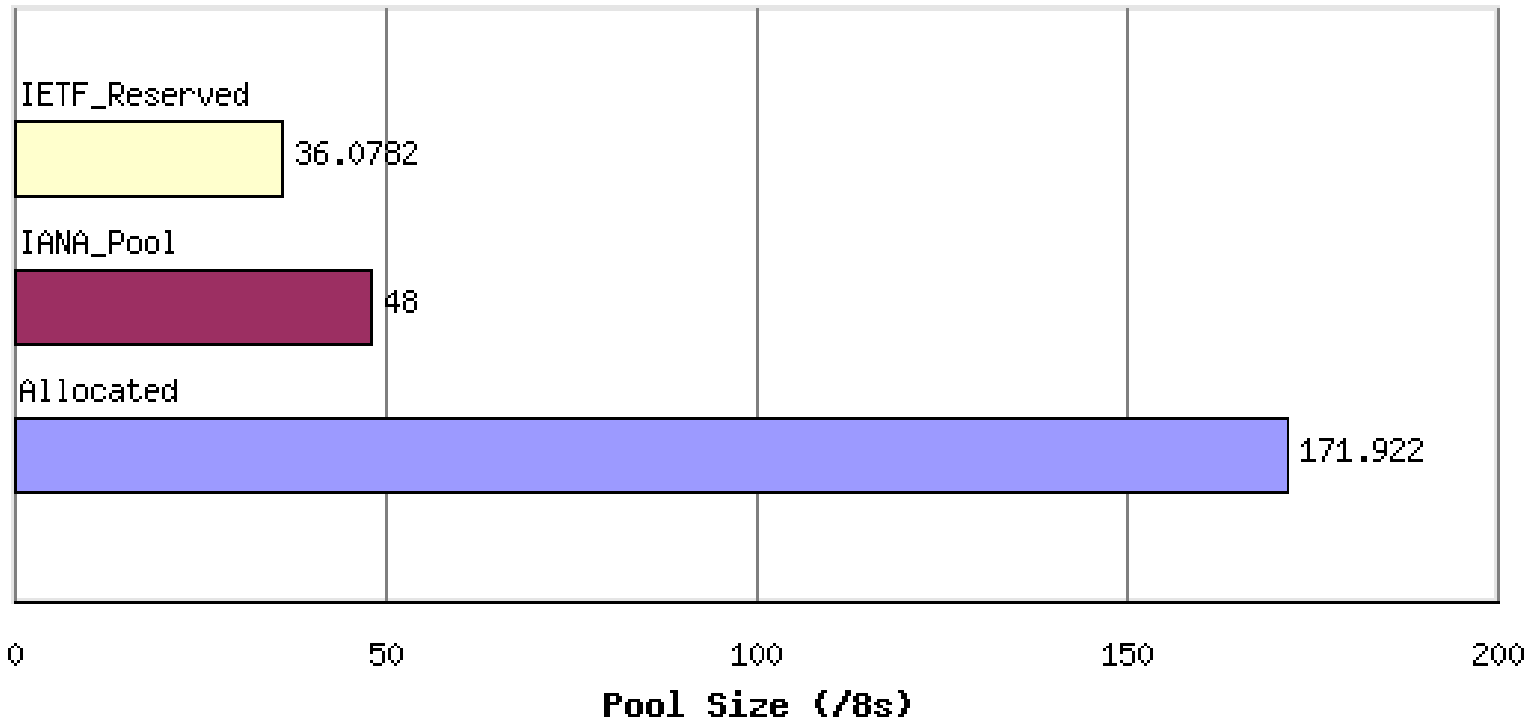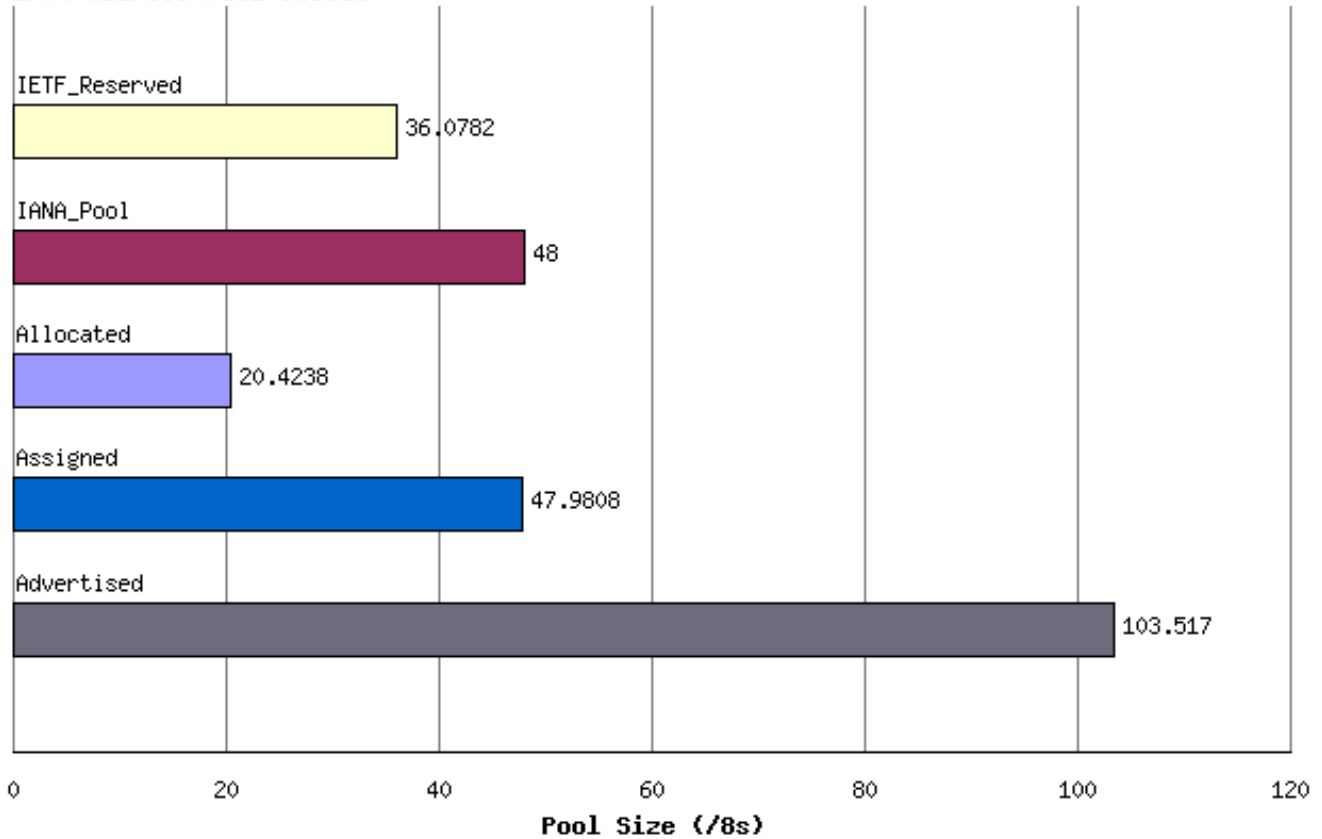# IPv4 Consumption Status

Geoff Huston

Status of IPv4 today

IPv4 Address Pool Status
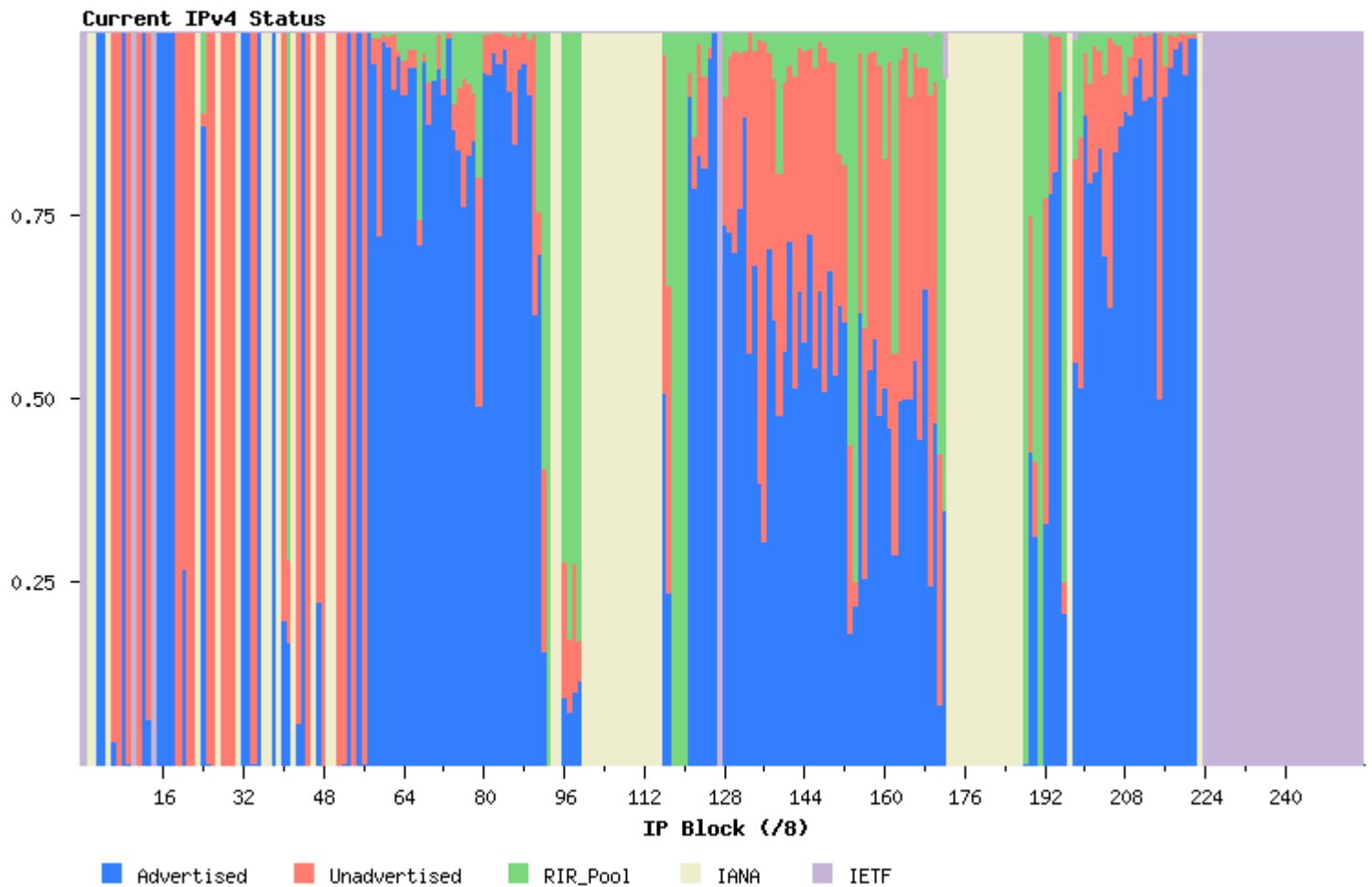
More Views of V4 Space

IPv4 Address Pool Status

Bar chart showing IPv4 Address Pool Status with Pool Size (/8s) on the x-axis:
- IETF_Reserved: 36.0782
- IANA_Pool: 48
- Allocated: 20.4238
- Assigned: 47.9808
- Advertised: 103.517

More Views ...

Current IPv4 Status

Address Run Rates… IANA

Time Series of IANA Allocations
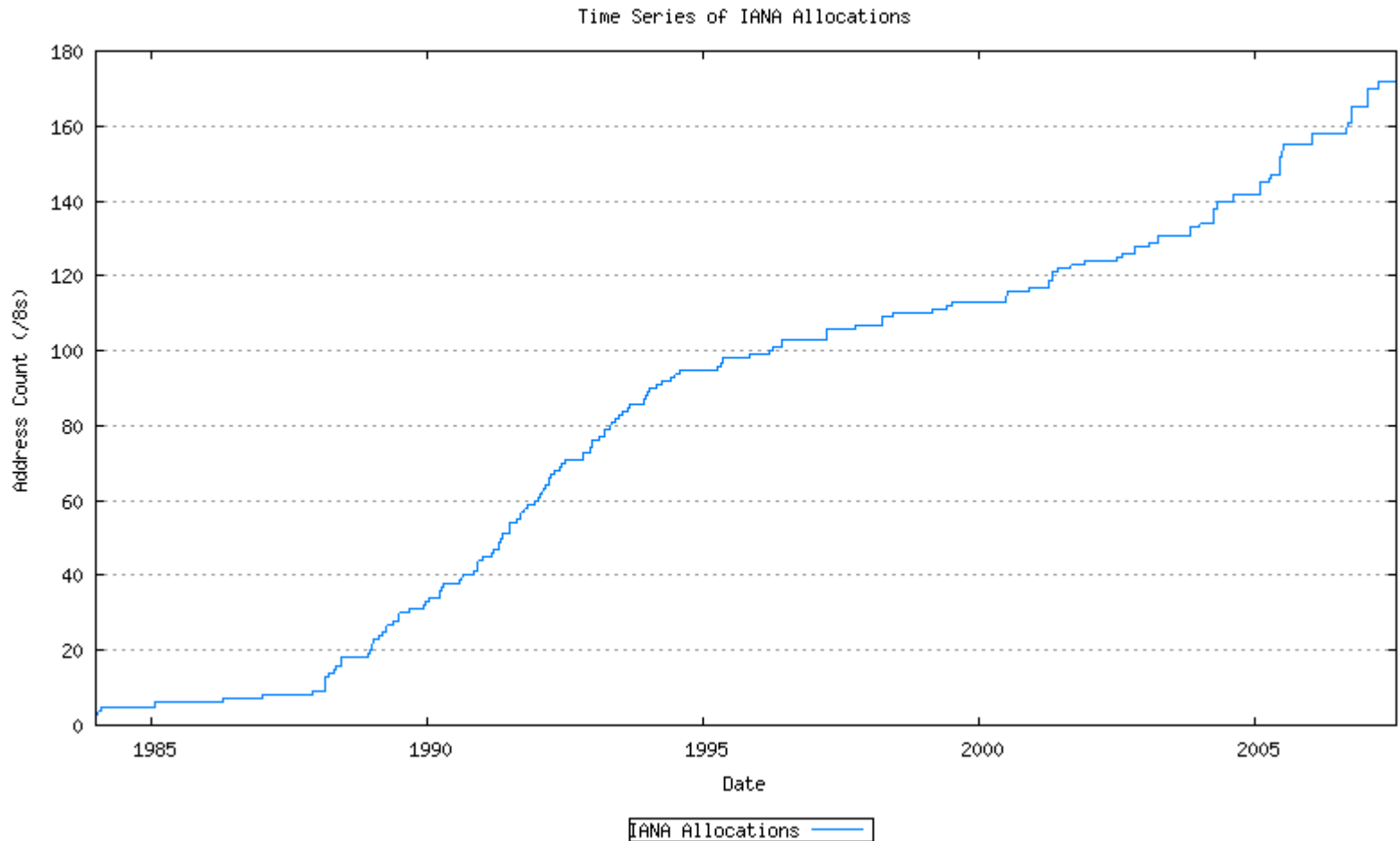
Recent IANA Allocations

IANA Allocations – Smoothed Data

IANA Allocations ——— Smoothed ———

Address Allocations

Time Series of RIR Assignments

Class B Allocations

CIDR Allocations

Mass-Market Broadband Deployments
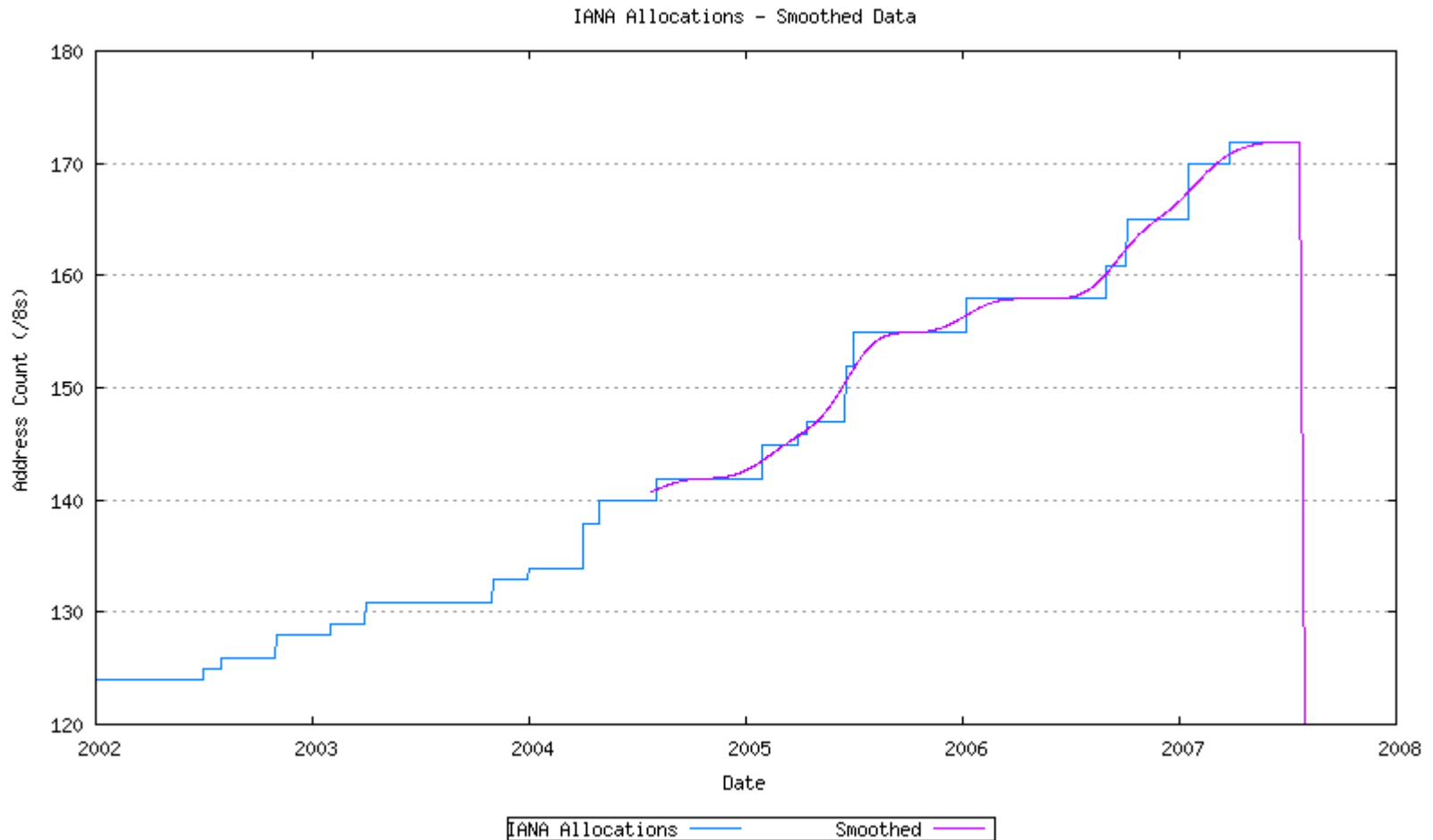
Advertised Address Span
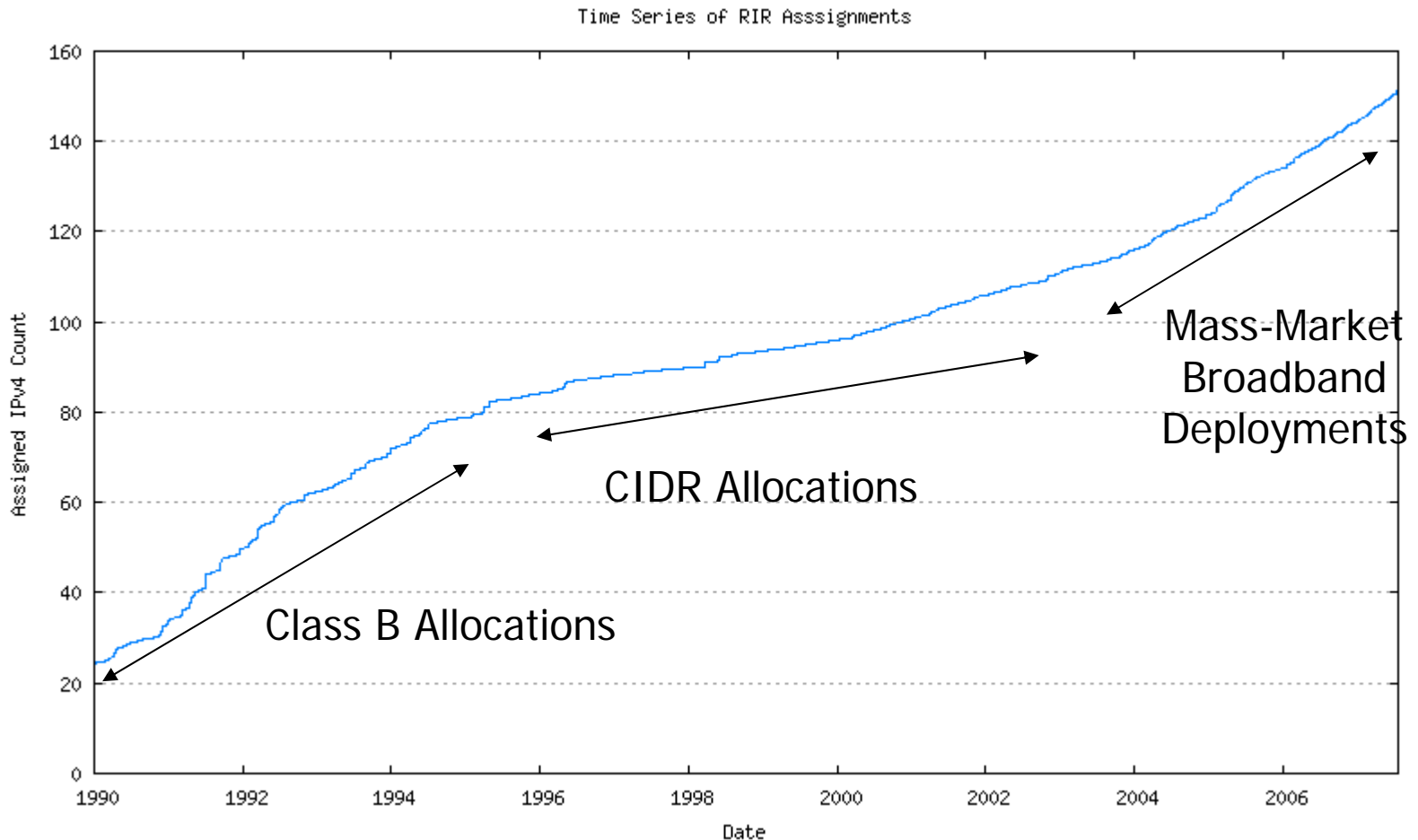
Time Series of Advertised Address Size
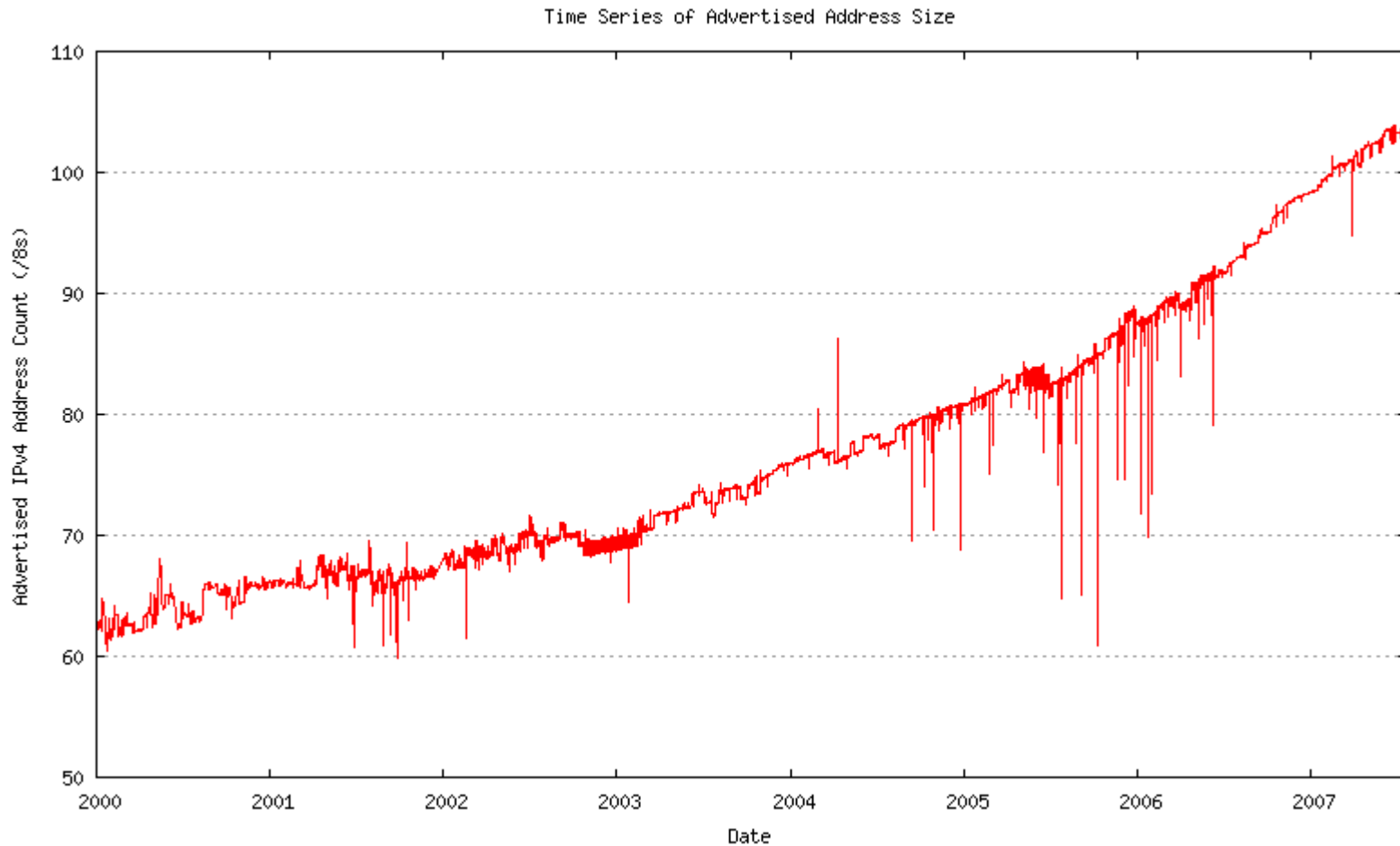
Unadvertised Addresses

Time Series of Advertised and Unadvertised Addresses

Predictions

If exhaustion of the unallocated IPv4 address pool is a near-term prospect, then the key question for many is:

When?

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 last-chance panic, no change in policies, no change in the underlying demand dynamics, no disruptive externalities, no rationing, no inefficiencies, and no withholding
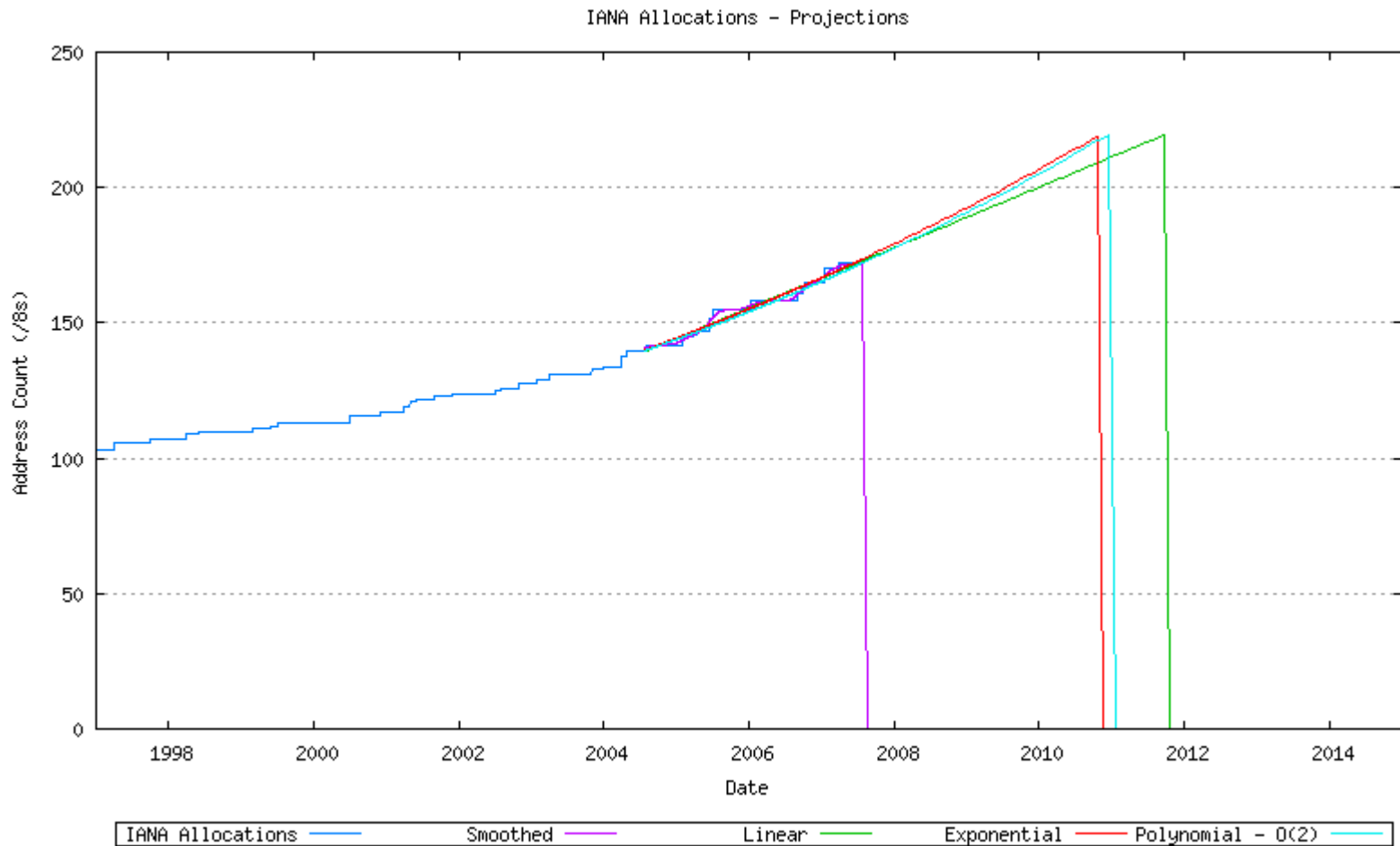
  - *No, really!*

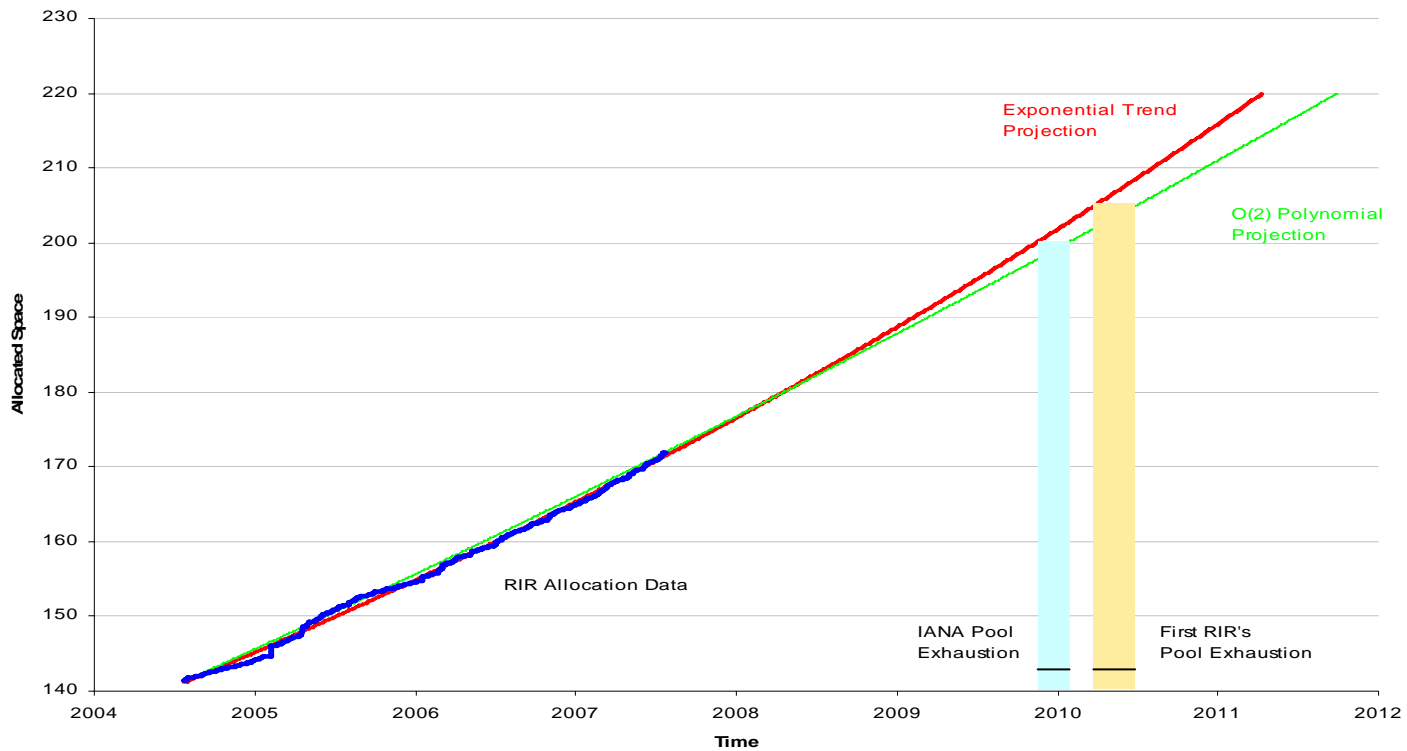# Prediction Technique

- Assemble data on:
    - IANA to RIR allocations
    - RIR allocation rates
    - Advertised address pool
    - Unadvertised pool
- And perform curve-fitting function over these data sequences

IANA Data

IANA Allocations – Projections

RIR Data

RIR Allocation Projection

Modelling the Entire System

- Can we model <u>all</u> of the players?
  - Management of the IANA Pool
  - Allocations of address blocks to RIRs
  - Allocations of address blocks to end uses
  - Advertisement of allocated space in the inter-domain routing space
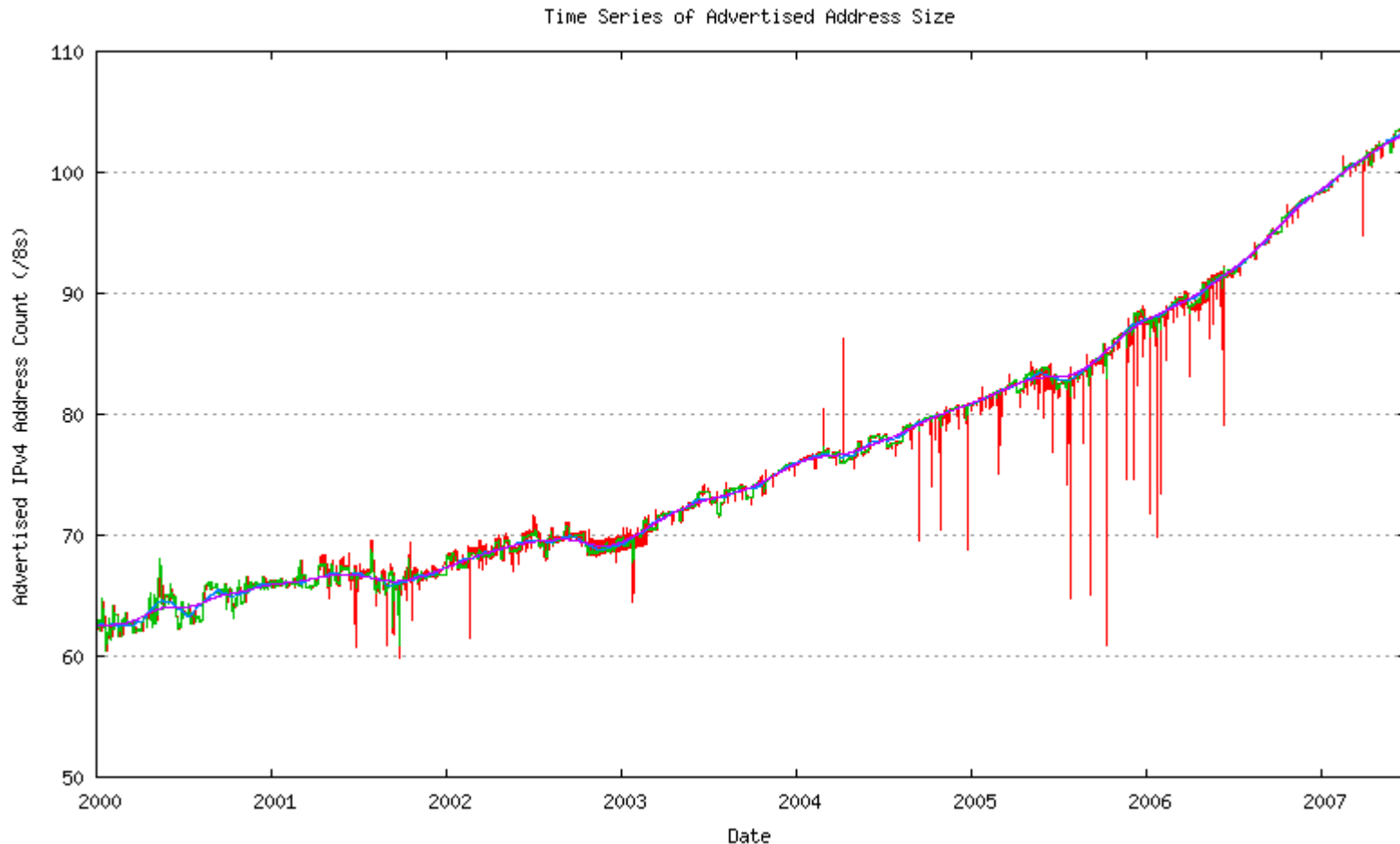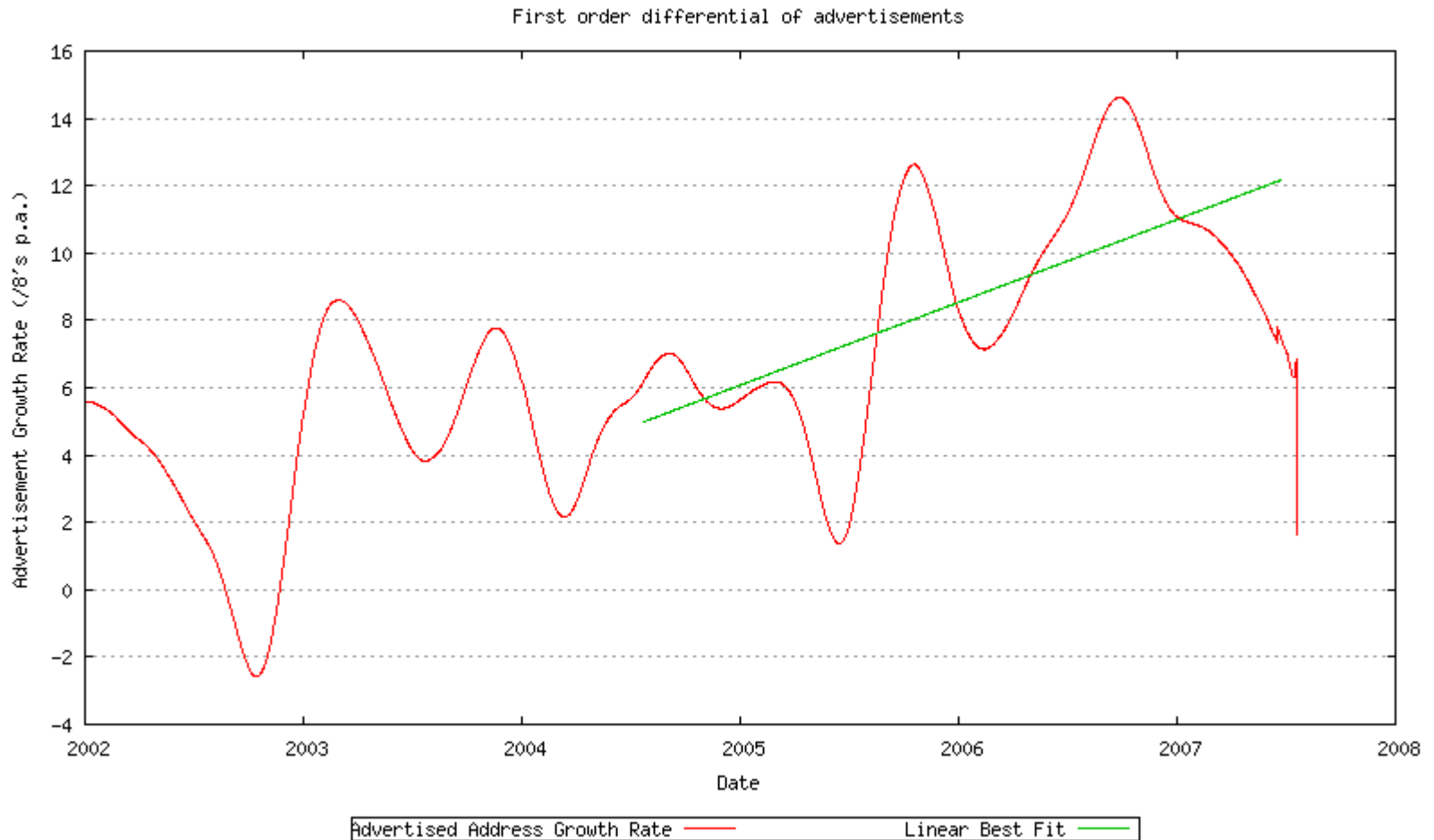
Prediction Technique

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
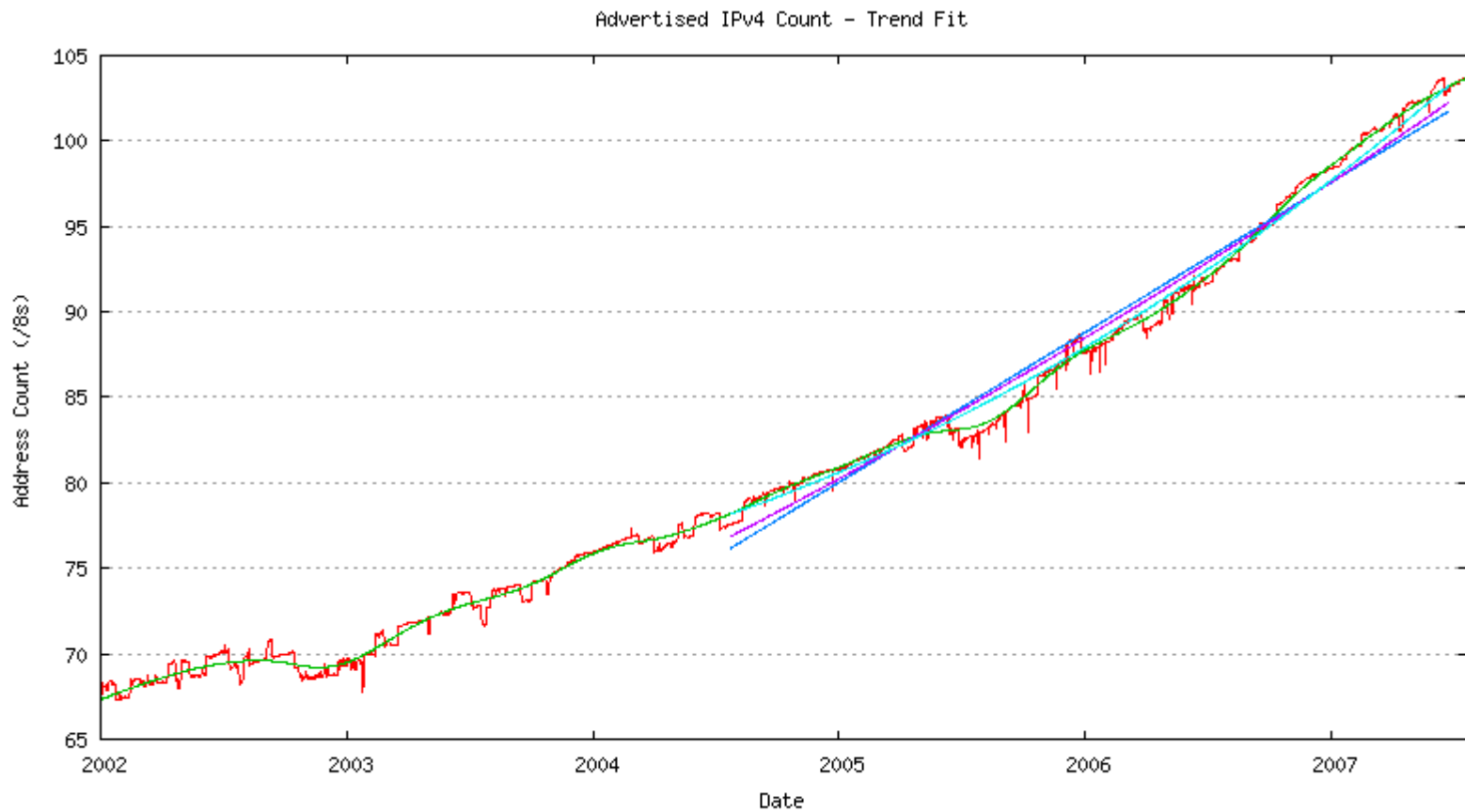7. Run until all address pools exhaust!

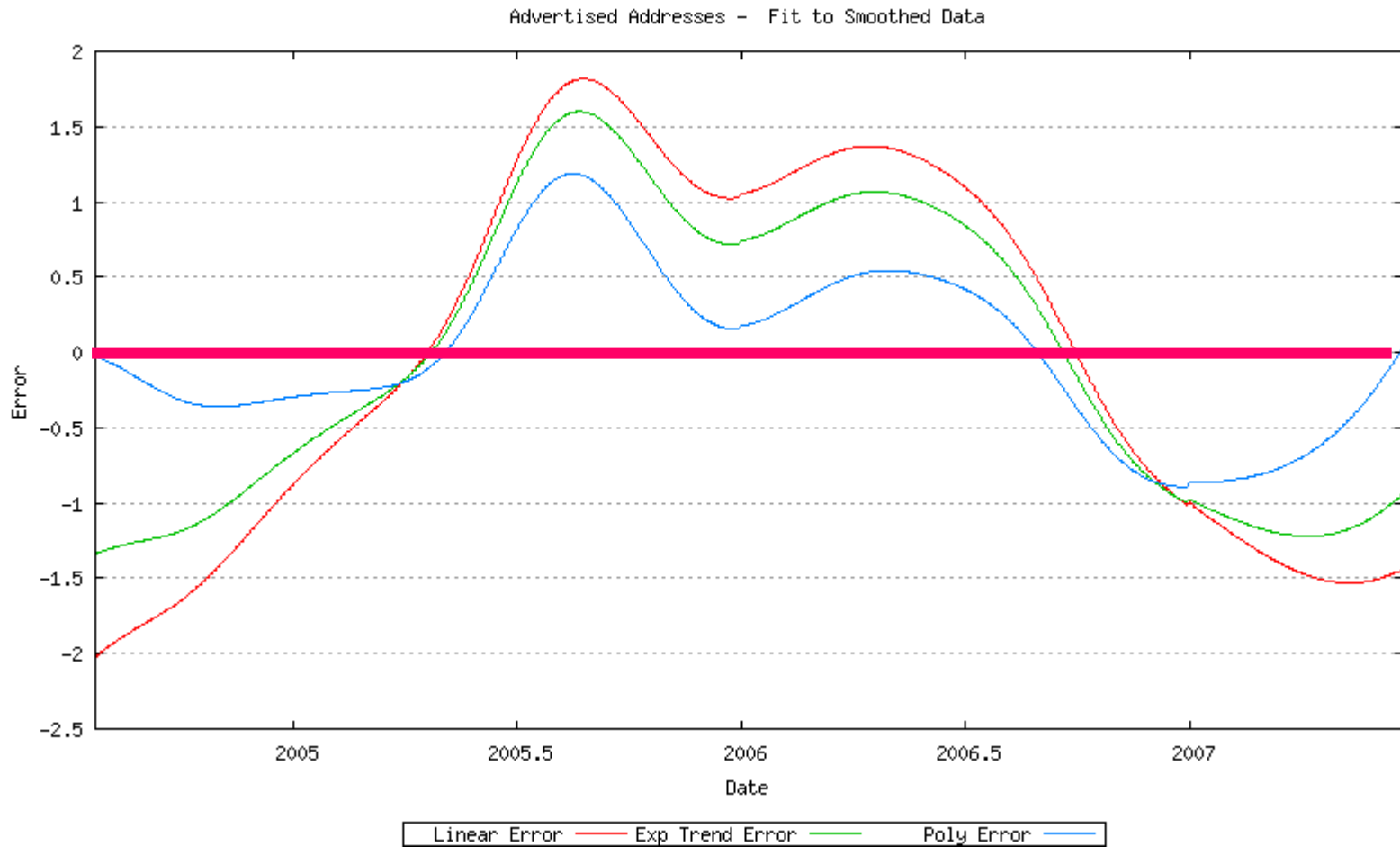# Modelling Data – IPv4 Advertised Address pool since 2000

Time Series of Advertised Address Size

1st Order Differential

First order differential of advertisements

Advertisement Growth Rate (/8's p.a.)

Date

Advertised Address Growth Rate ——— Linear Best Fit ———

Curve Fitting

Advertised IPv4 Count - Trend Fit

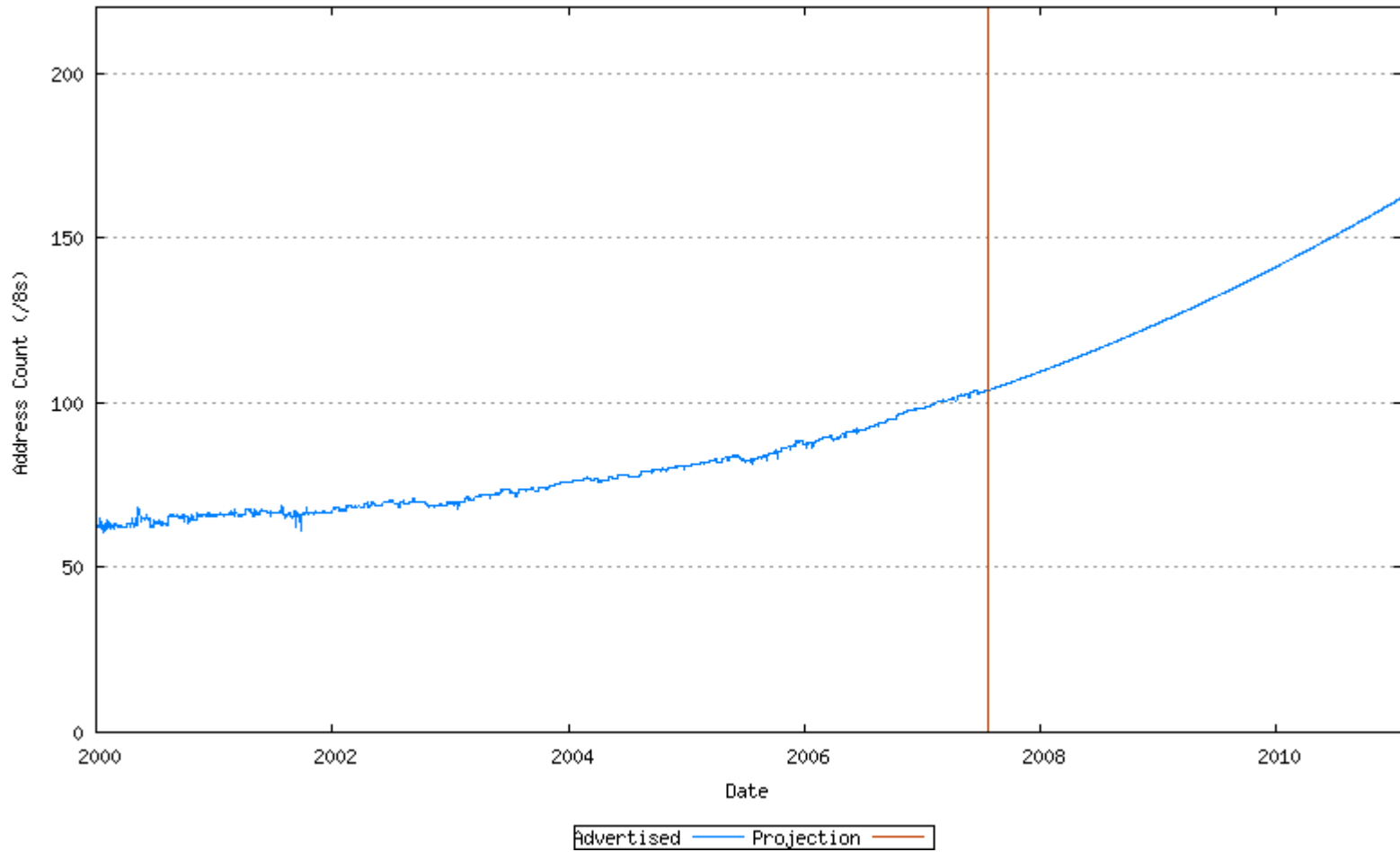# Curve Fitting Error

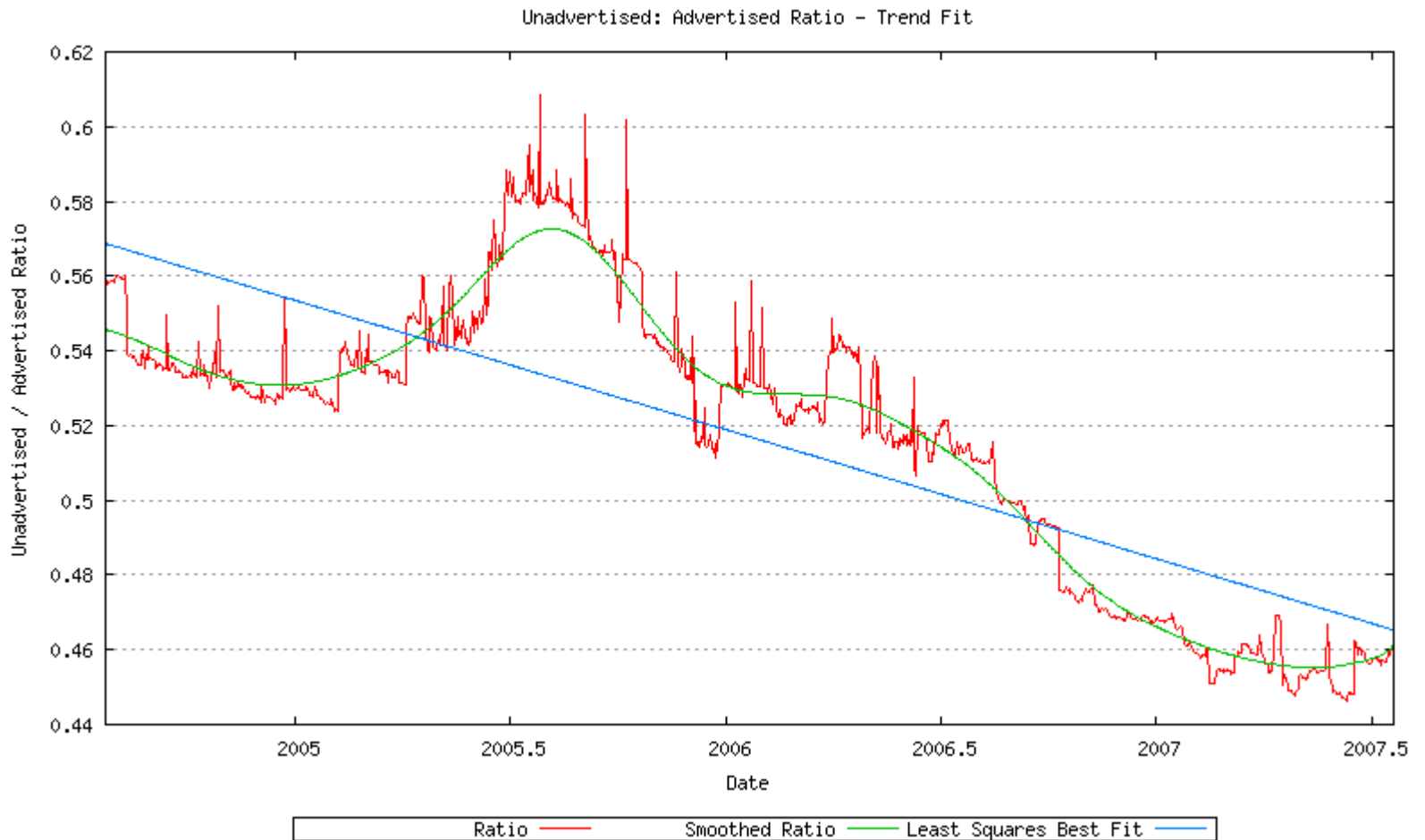Advertised Addresses – Fit to Smoothed Data

Selecting a model

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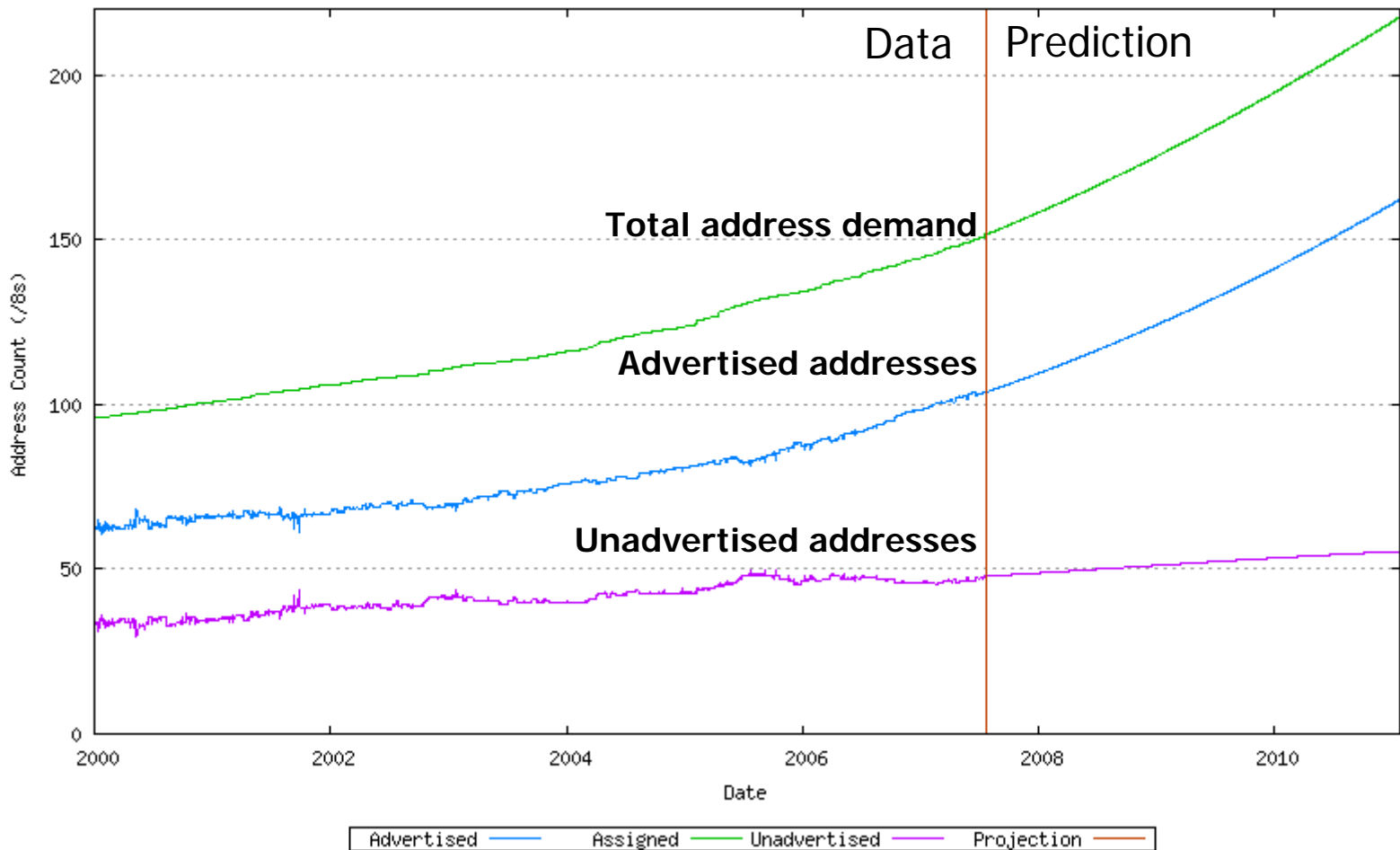 - i.e Address demand is increasing at a constant rate

Advertised Address Space

Unadvertised / Advertised Ratio
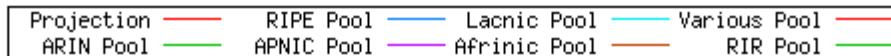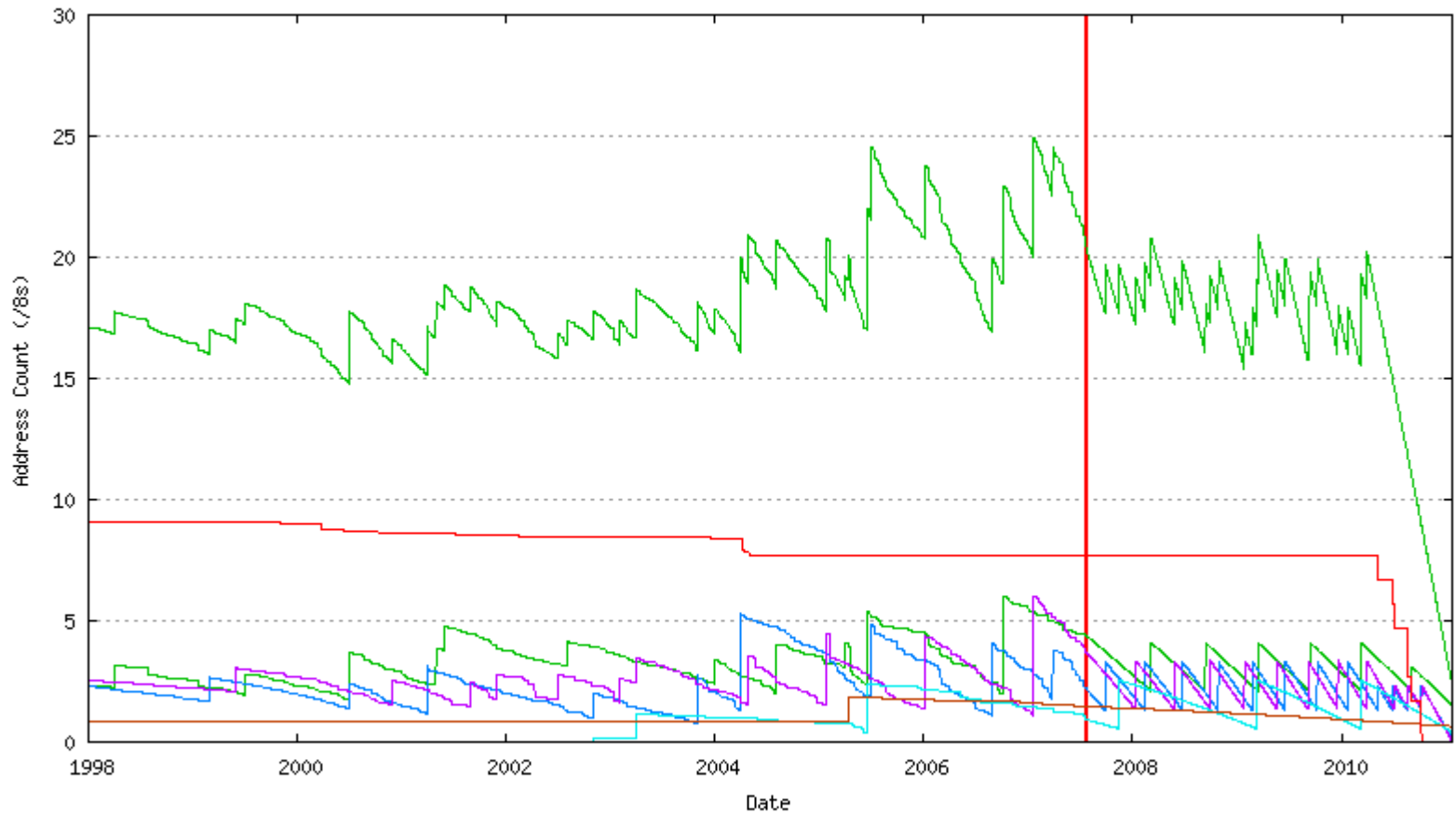

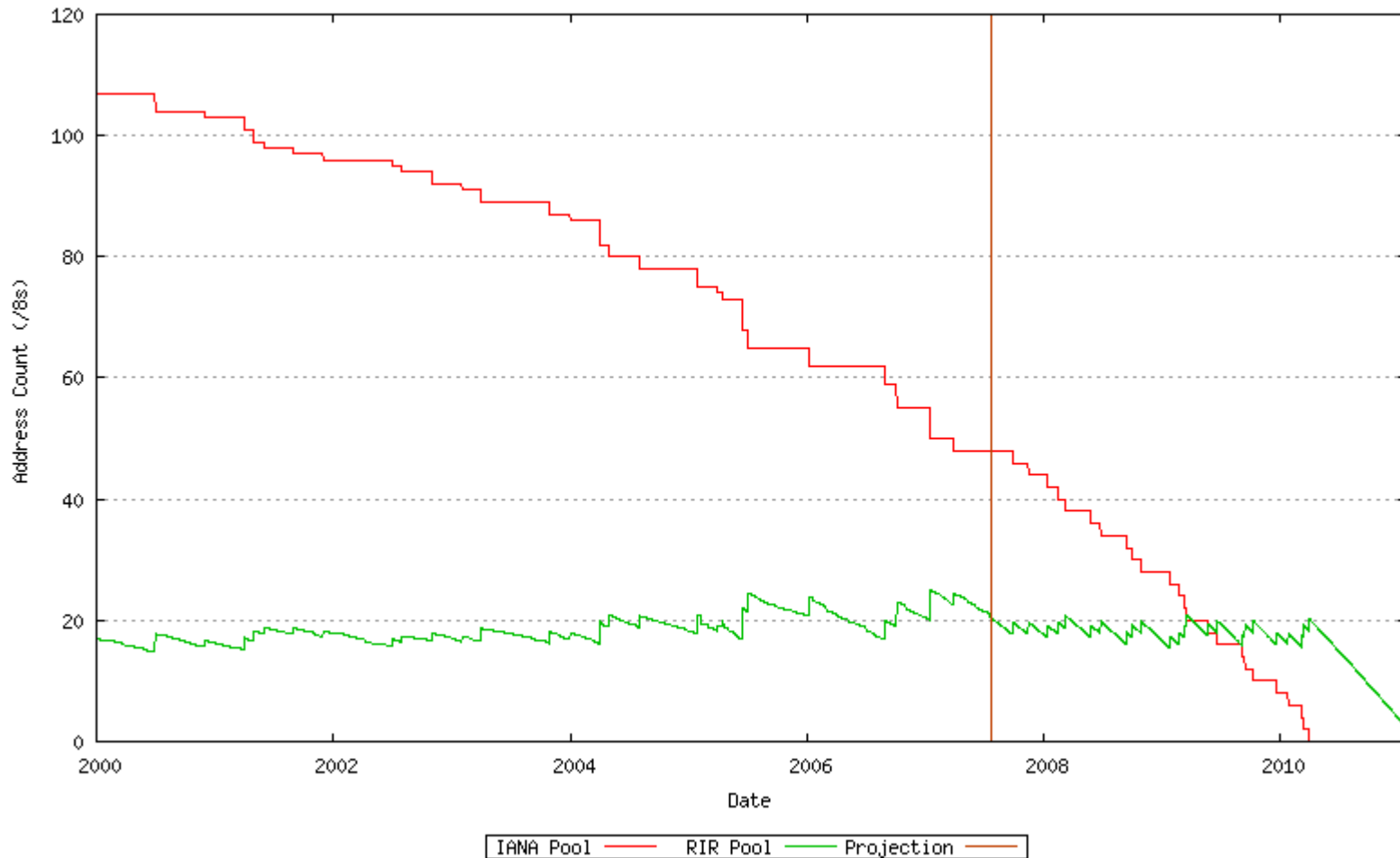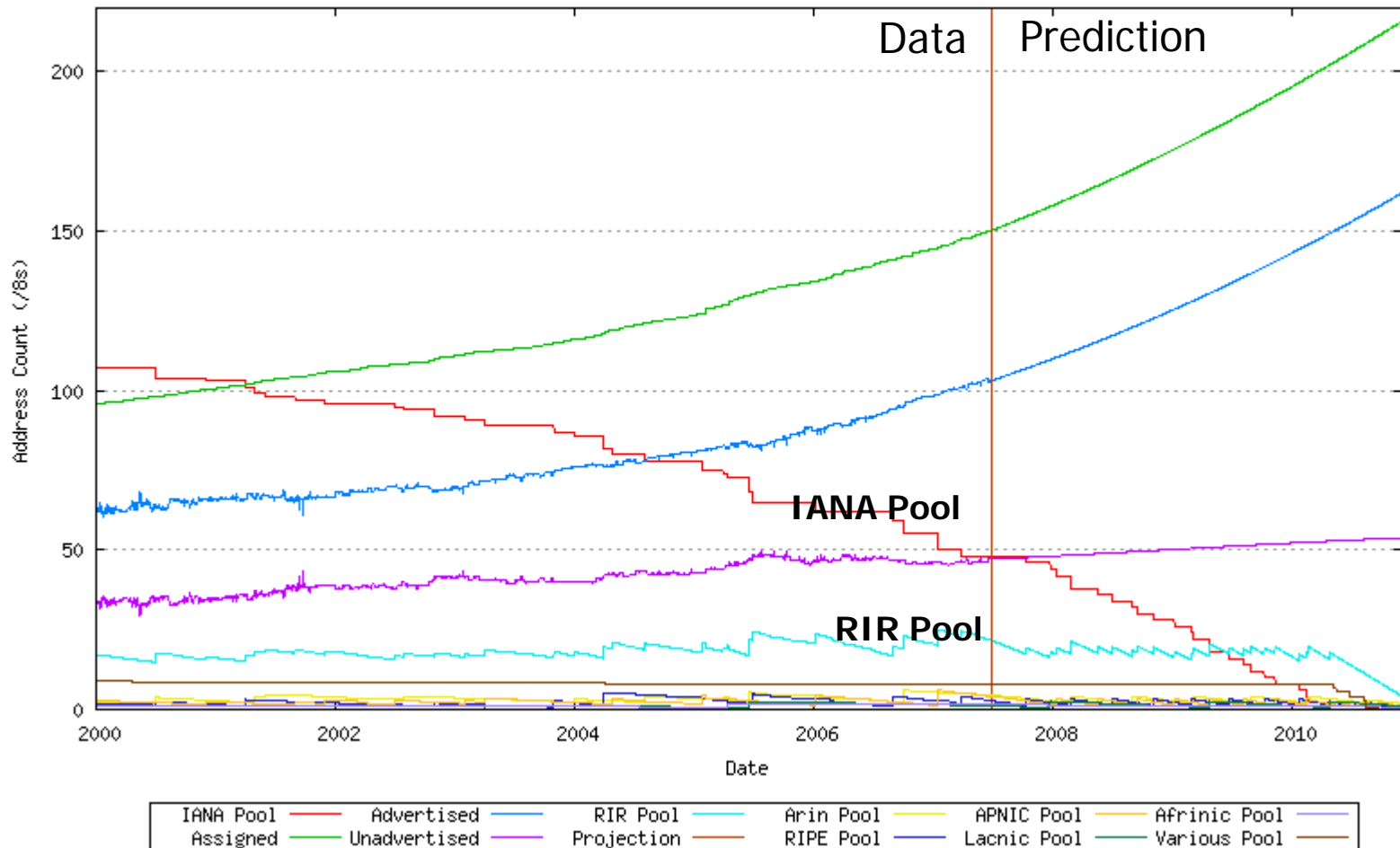Unadvertised: Advertised Ratio – Trend Fit

Address Consumption Model

Modelling RIR Actions

IANA Exhaustion

Address Consumption Model

So -- when?

In this model, IANA allocates its last IPv4 /8 to an RIR on the 27th March 2010

This is the model's predicted exhaustion date as of the 23th July 2007. Tomorrow's prediction may be different!

RIR address pool exhaustion will follow in 6 to 24 months thereafter – depending on which RIR
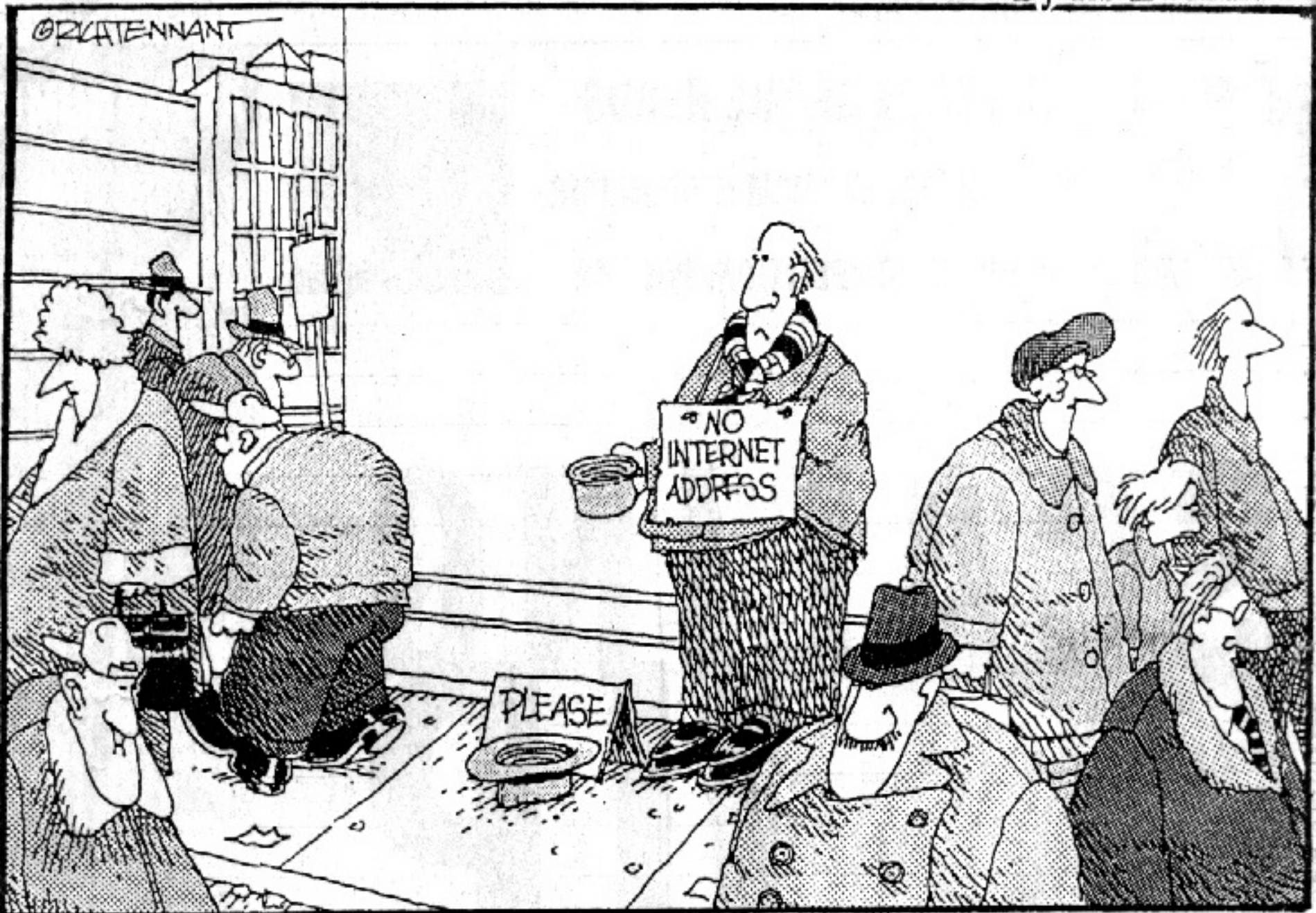
That's less then 3 years away!

What Then?

The 5th Wave

By Rich Tennant

NO INTERNET ADDRESS

PLEASE

This material has been compiled from public data sources. More information on the prediction technique and the data used for this analysis is at:

http://ipv4.potaroo.net