IPv4 Consumption Status

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Status of IPv4 today

IPv4 Address Pool Status

- IETF Reserved: 36,0782
- IANA Pool: 48
- Allocated: 171,922
More Views of V4 Space

IPv4 Address Pool Status

- IETF_Reserved: 36,0732
- IANA_Pool: 48
- Allocated: 20,4238
- Assigned: 47,9806
- Advertised: 103,517
Address Run Rates... IANA
Recent IANA Allocations
Address Allocations

Time Series of RTR Assignments

- Mass-Market Broadband Deployments
- CIDR Allocations
- Class B Allocations

Date

Assigned IPv4 Count

Advertised Address Span

Time Series of Advertised Address Size

Date

Advertised IPv4 Address Count (/8s)
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
Modelling the Entire System

- Can we model all 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

Advertised IPv4 Address Count (×10^7)

Date

2000 2001 2002 2003 2004 2005 2006 2007
1st Order Differential
Curve Fitting
Curve Fitting Error
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

![Graph showing the increase in advertised address space from 2000 to 2010. The x-axis represents the date, and the y-axis represents the address count (in billions). Two lines are shown: the blue line represents the advertised address space, and the green line represents the projection. The graph indicates a steady increase in address space over the years.]
Address Consumption Model

[Graph showing the relationship between total address demand, advertised addresses, unadvertised addresses, and data versus prediction from 2000 to 2010.]

- Total address demand
- Advertised addresses
- Unadvertised addresses

Data vs. Prediction

Legend:
- Advertised
- Assigned
- Unadvertised
- Projection
Modelling RIR Actions

![Graph showing address count over time for different RIR pools.](image-url)
IANA Exhaustion

![Graph showing the exhaustion of address counts over time](image-url)
Address Consumption Model

![Graph showing address consumption model over time with data and prediction lines for IANA Pool and RIR Pool]
So -- when?

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

\textit{This is the model’s predicted exhaustion date as of the 23\textsuperscript{th} 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

[Cartoon image showing a person holding a sign that says "NO INTERNET ADDRESS" while other people look on.]
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