IPv4 Consumption
the end

cooperative association for internet data analysis

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Assuming current trends continue when will IANA run out of addresses?
methodology

count current “used” space
  • IETF reserved space
  • RIR allocations
  • legacy space

model growth rates
  • end user consumption drives RIR consumption
  • RIR consumption drives IANA consumption

end user consumption reflected in RIR whois databases
data sets

IANA’s “ipv4-address-space” 14 Sept 2005

RIRs Whois database dump (4 out of 5) 31 Aug 2005

- ARIN American Registry for Internet Numbers
- APNIC Asia Pacific Network Information Centre
- LACNIC Latin American and Caribbean Interenet Address Registry
- RIPE NCC Reséaux IP Européens Network Coordination Centre
- AfriNIC African Internet Numbers Registry IP Addresses*

* not available at the time of this study
caveats

AfriNIC data not included
  - not available at time of study
  - small -- less than 1 /8

LACNIC is young and may not continue current rate of growth
  - it is possible that LACNIC’s current growth rate is the result of pent up demand

some end user behavior hidden inside LIRs’ allocations
  - APNIC has more extensive use of LIRs

only assigned address space are counted towards RIRs

assumes no change in end user, RIR, or IANA behavior
  - behavior is sure to change as exhaustion nears
individual RIR’s allocations by /8s

<table>
<thead>
<tr>
<th>RIR</th>
<th>pool (from IANA)</th>
<th>assigned (from whois)</th>
<th>start date (from IANA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>various*</td>
<td>95</td>
<td>81.3</td>
<td>1991/01</td>
</tr>
<tr>
<td>ARIN</td>
<td>22</td>
<td>16.5</td>
<td>1993/04</td>
</tr>
<tr>
<td>APNIC</td>
<td>16</td>
<td>14.0</td>
<td>1993/04</td>
</tr>
<tr>
<td>RIPE</td>
<td>19</td>
<td>14.8</td>
<td>1993/04</td>
</tr>
<tr>
<td>LACNIC</td>
<td>4</td>
<td>1.1</td>
<td>2002/10</td>
</tr>
<tr>
<td>AfriNIC</td>
<td>1</td>
<td>-</td>
<td>2005/04</td>
</tr>
</tbody>
</table>

*various, also called legacy, is a collection of allocations before the creation of the RIRs. Although they are still being allocated among the RIRs.
RIR consumption rates

- **black “IANA”** - number of addresses assigned to the RIR from IANA
- **red “first”** - number of addresses assigned to a customer
- **green “specific”** - number of addresses assigned to "most specific" customer
consumption rates “first”

- exponential curve fit
  number of allocations = $e^{(a + b \times \text{time})}$
- curve fitting to the extracted lines
- when did we start the fit?
RIR available pool size

- RIRs tend to request more allocations when their pool size reaches 2 /8s.
- RIRs request should equal to last 18 months of allocations with maximum of 3 /8s.
consumption model

- end users’ consumption (curve fit)
- curve fit to “first” assignment rate in whois
- RIR’s consumption (model)
  - when pool < 2 /8s send request
  - new allocation equal last 18 months or 3 /8s
- IANA’s consumption (model)
  - legacy allocations + RIR allocations
bringing it all together
when will it all end?
will this happen?

not likely

- community adapted before
- CIDER, NAT, RIRs, and changed allocation policies
- we should expect this to happen again
  - commercial market?
  - IPv6?
IPv6 to the rescue?

- consumption is on the rise
- not enough data for long term projections
conclusions

• 3-4 years until IANA's exhaustion assuming current allocation rates prevail (a wholly unwarranted assumption)
• policies will change, as in the early 1990s
• IPv6 has yet to really pick up
Breakdown by Num Allocations per Organization of ARIN IPv4 Space

ARIN whois data (20050831); excluding DoDNIC, JPNIC, and pre-RIR /8 allocations; stacked plot