IPv4 Consumption
the end

cooperative association for internet data analysis

Bradley Huffaker <bradley@caida.org>

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question

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 then 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

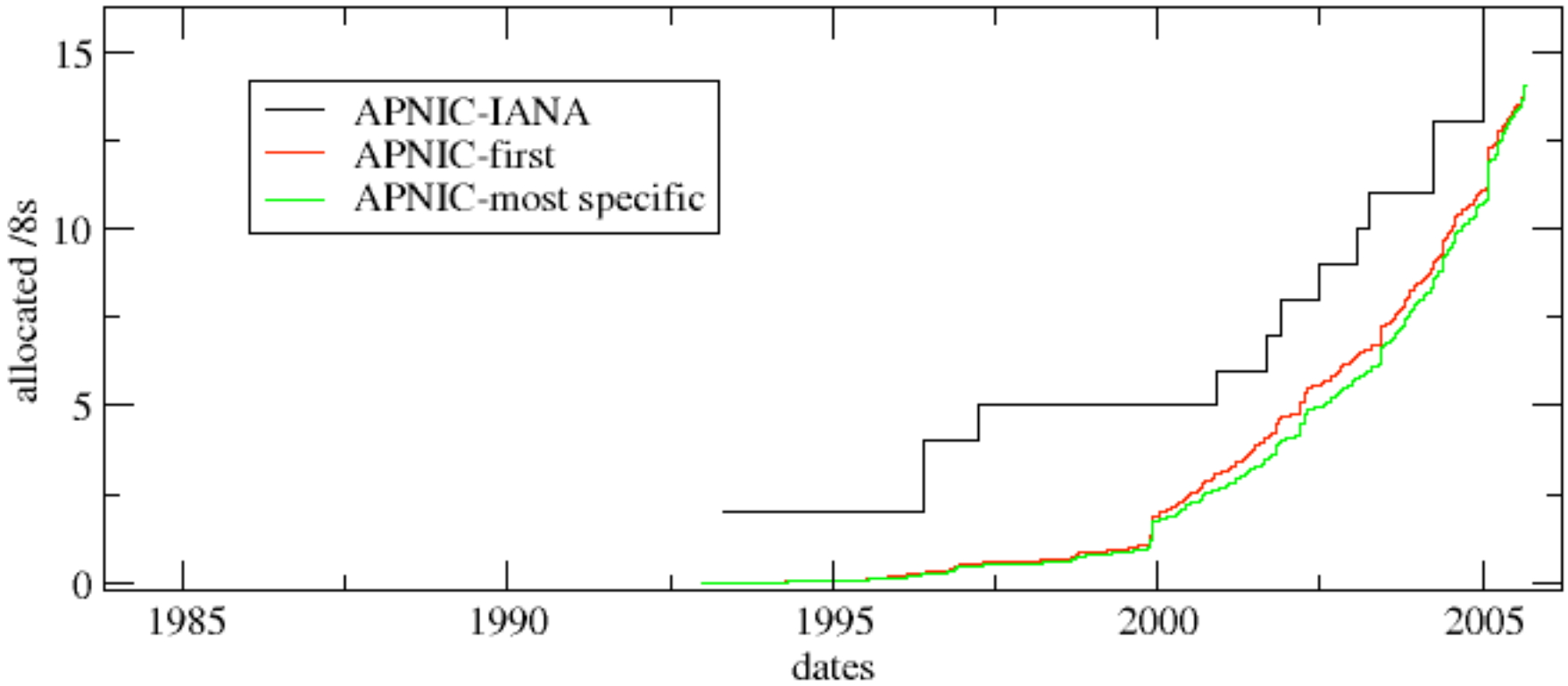
- behavior is sure to change as exhaustion nears

individual RIR's allocations by /8s

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

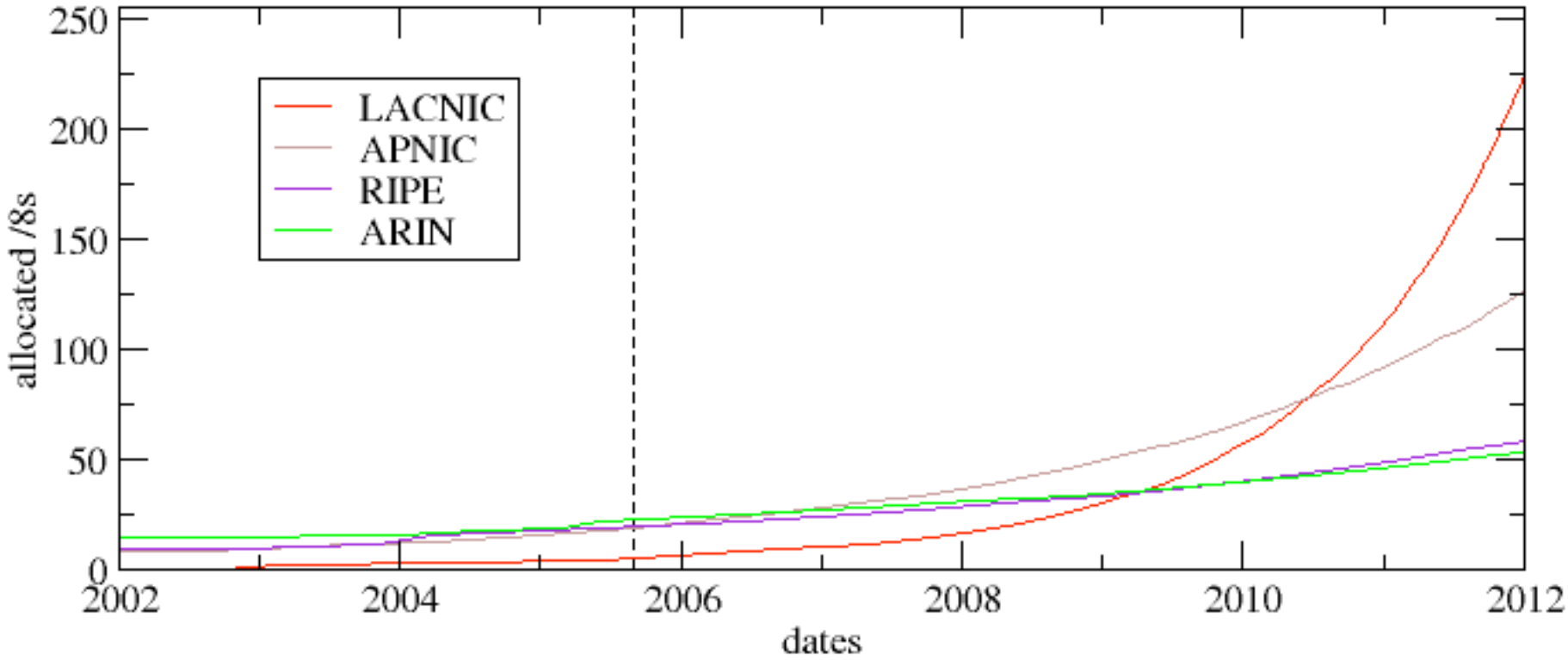
*various, also called legacy, is a collection of allocations before the creation of the RIRs. Although they are still being allocated among the RIRs.

RIR consumption rates



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

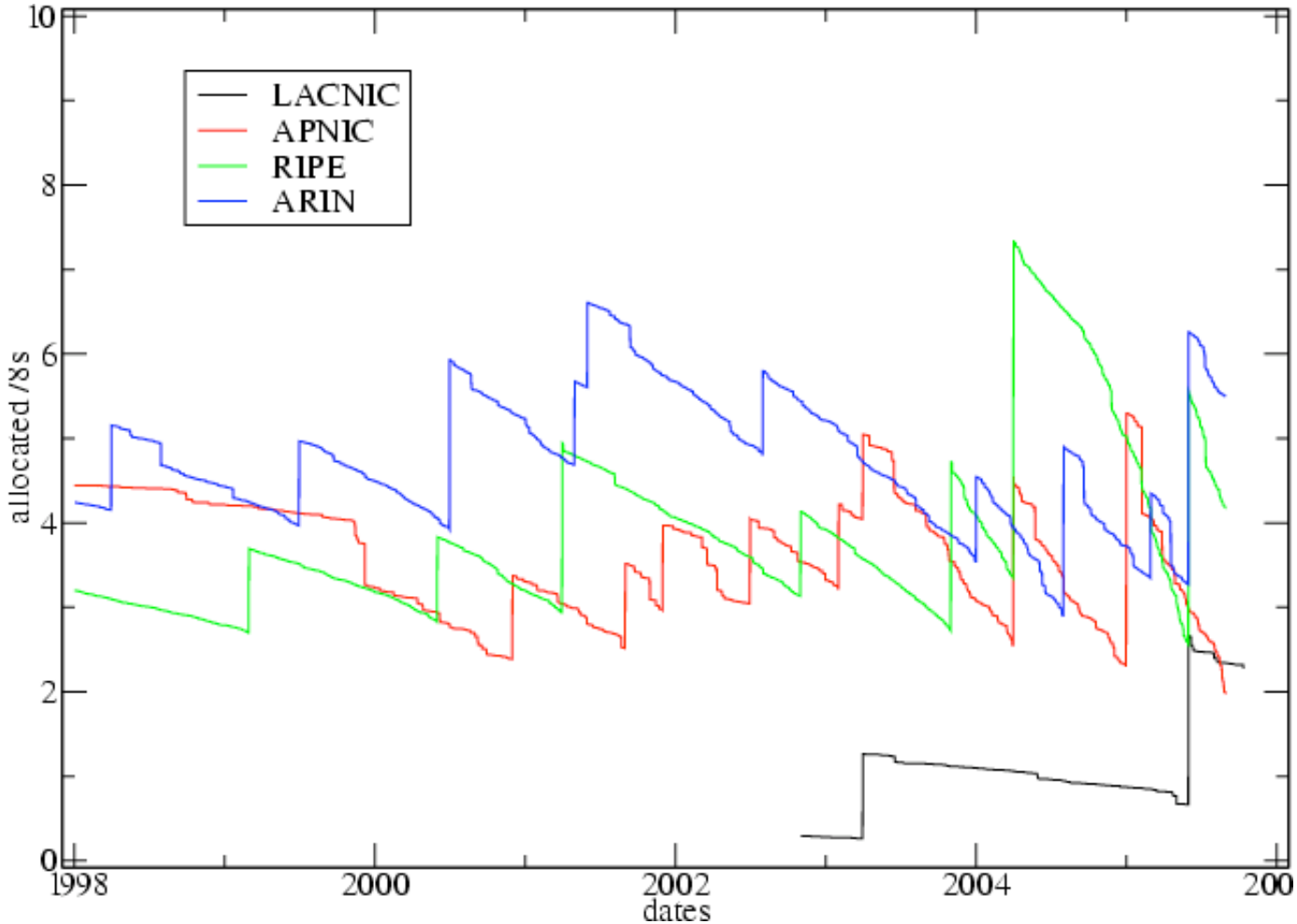
consumption rates "first"



- exponential curve fit

  number of allocations = e**(a + b*time)
- curve fitting to the extracted lines
- when did we start the fit?

RIR available pool size

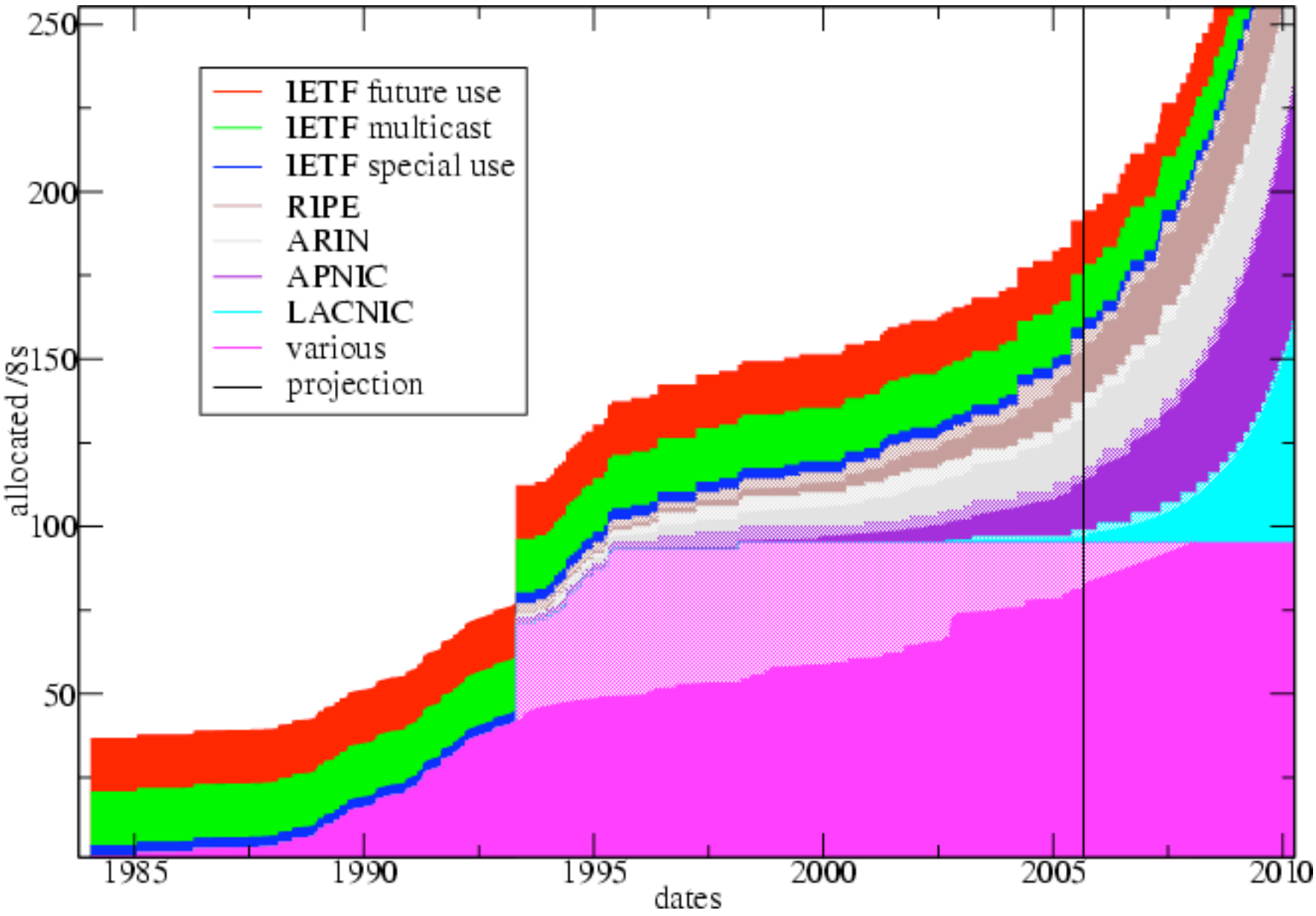


- RIRs tend to request more allocations when their pool size reaches 2 /8s.
- RIRs request should equal to last 18 months of allocations with maximum of 3 /8s.

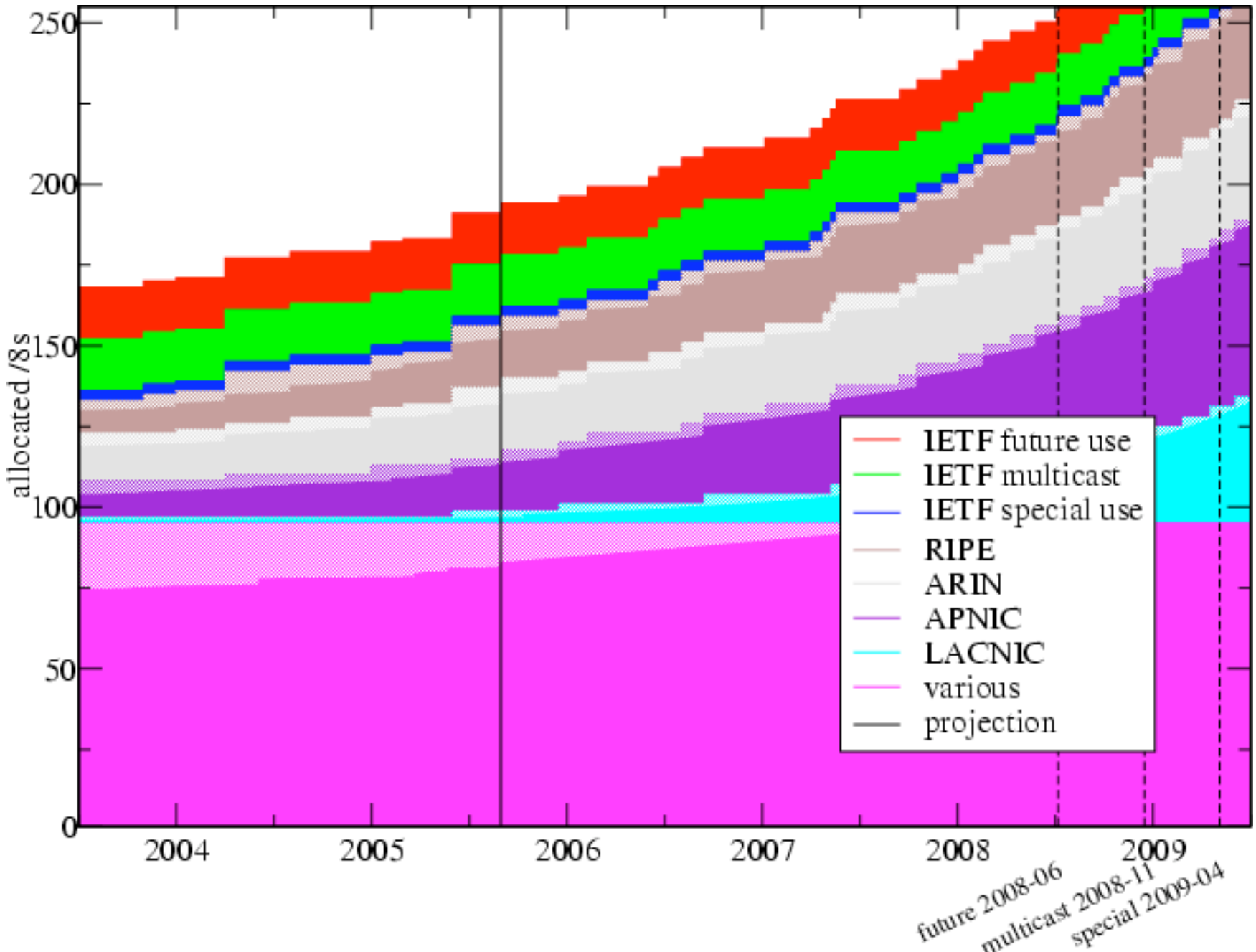
consumption model

- 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

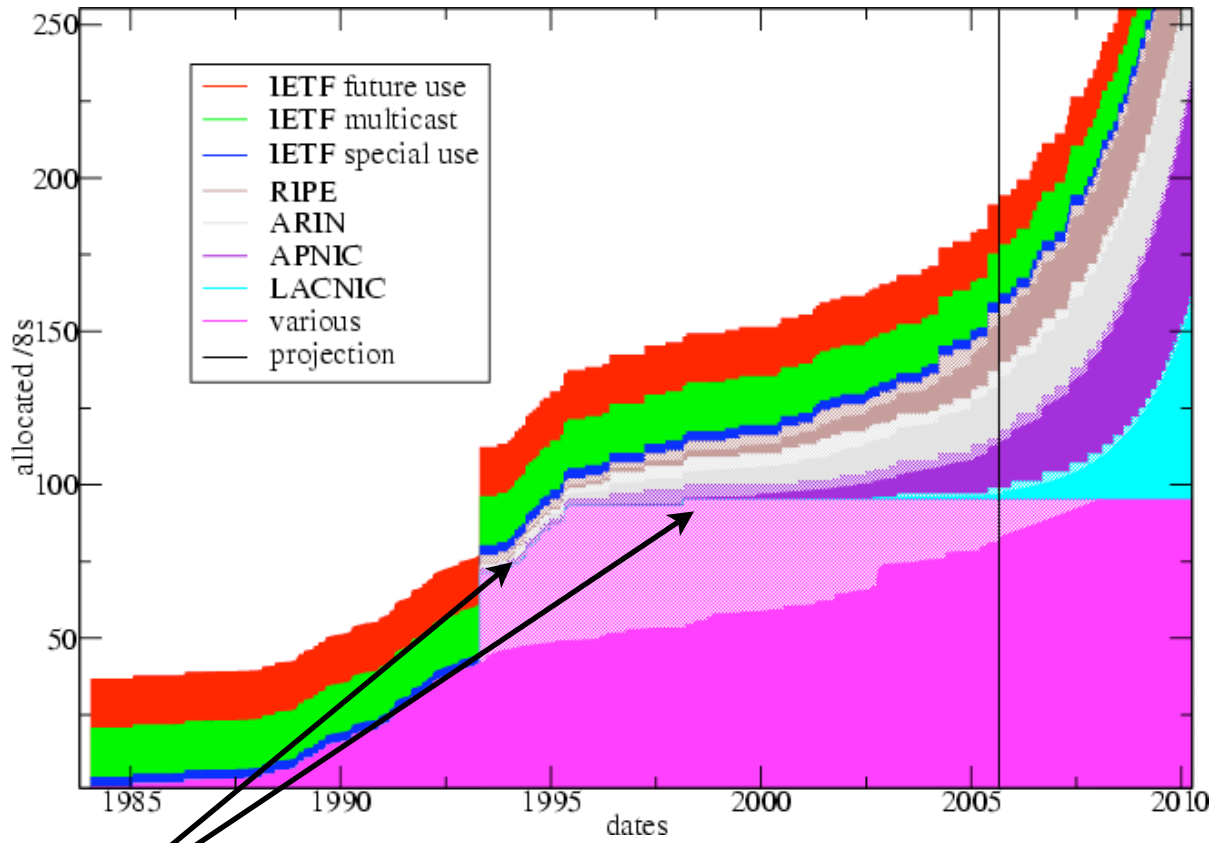


when will it all end?



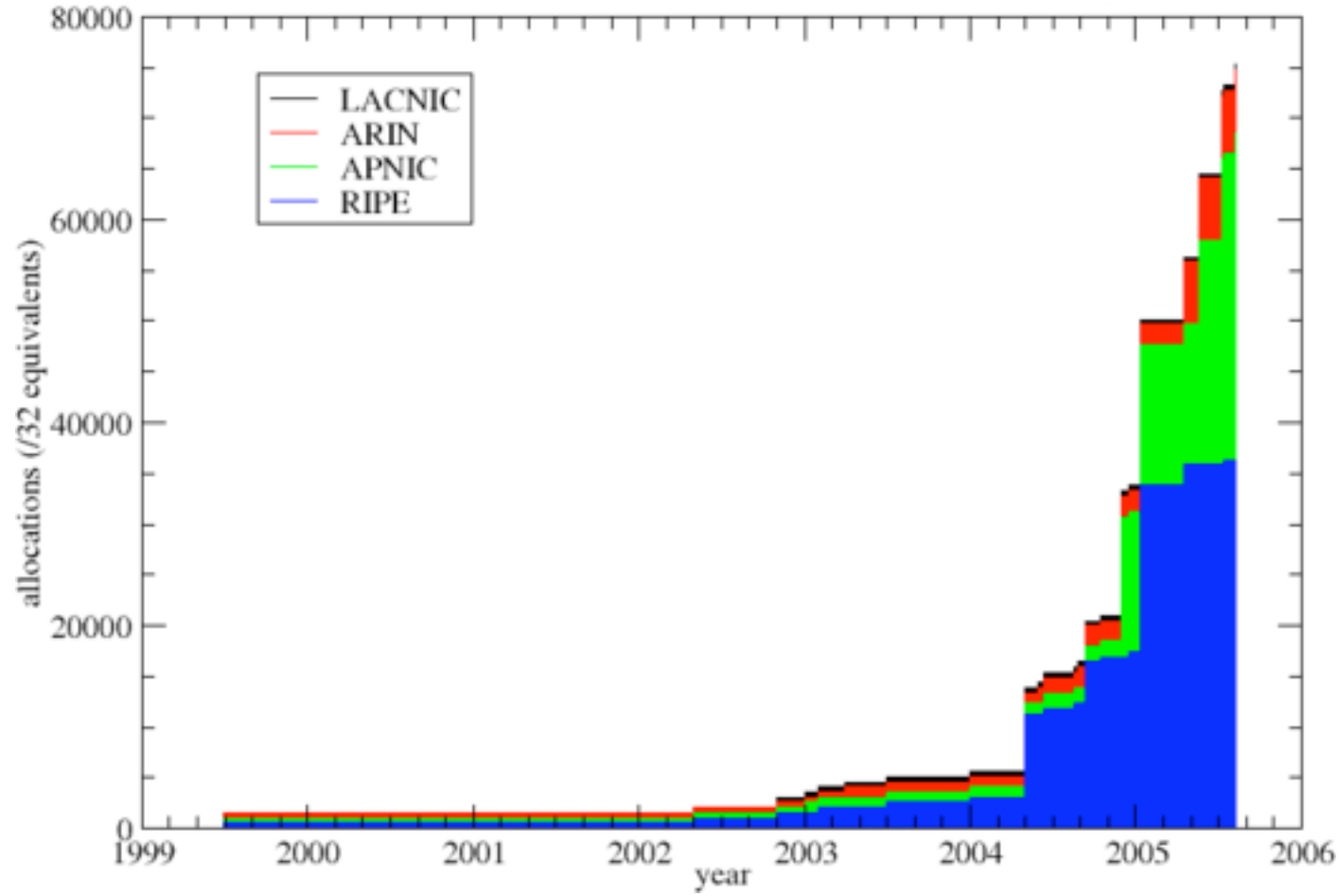
will this happen?

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

bonus material