Status of IPv6 Addresses and Address Management

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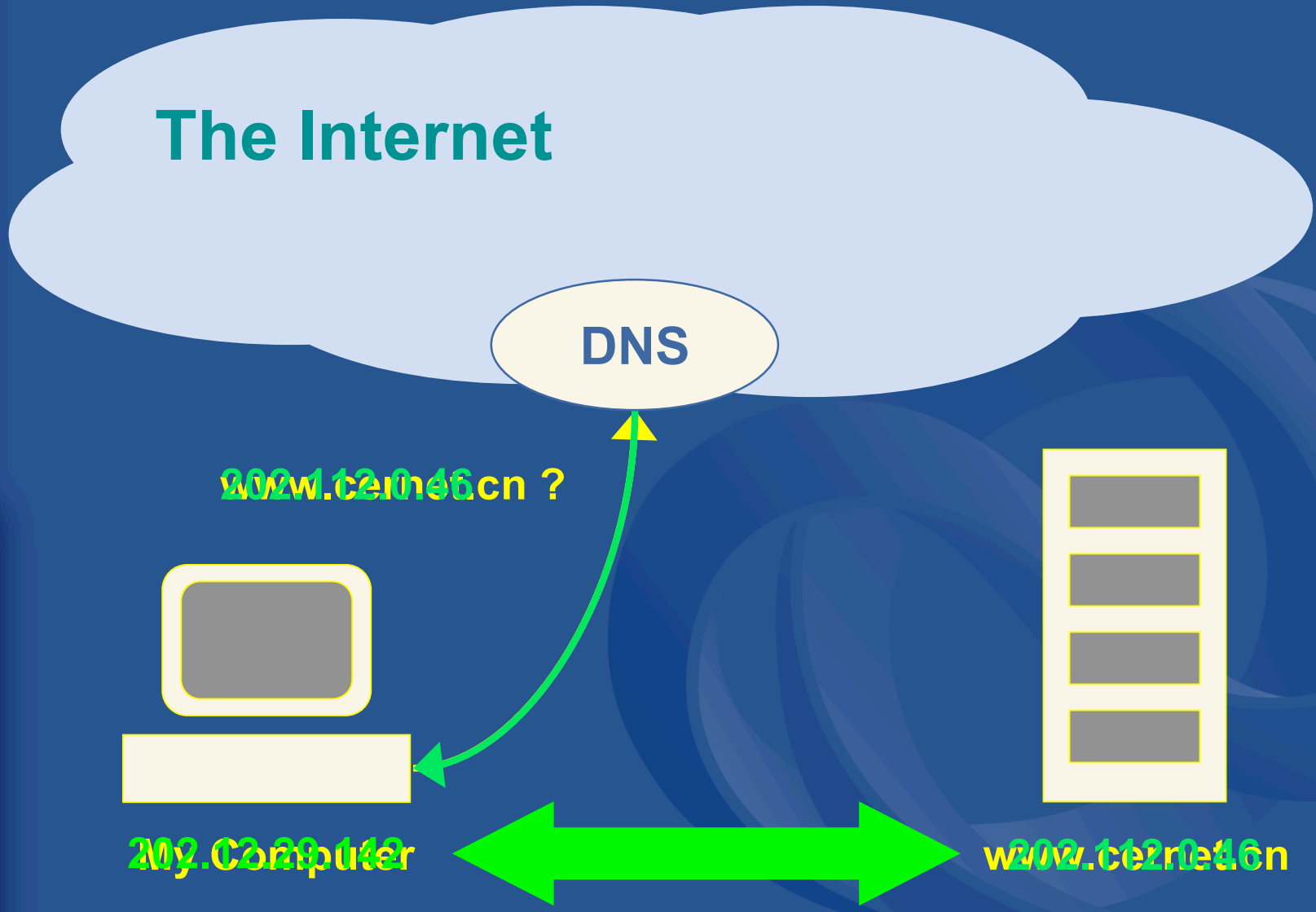
IPv6 Addressing Status Report

- What is an IP address?
- How are IP addresses managed?
- How many addresses are there?
- Where are all the addresses?
- Conclusion

What is an IP address?

- Internet infrastructure address
  - Globally unique*
- A finite common resource
  - IPv4: 32-bit number
    - e.g. 192.131.13.3
    - 4 billion addresses available
  - IPv6: 128-bit number
    - e.g. 3ffe:1a00:ff00::
    - Potentially*, equal to $(IPv4)^4$
- IP does not mean “Intellectual Property”

IP addresses are not domain names…



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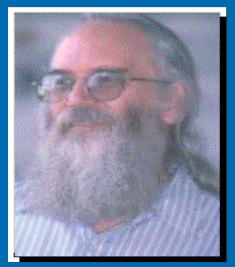
How are IP Addresses managed?

and how did we get here?

1981 - 1992



RFC 790

"The assignment of numbers is also handled by Jon. If you are developing a protocol or application that will require the use of a link, socket, port, protocol, or network number **please contact Jon to receive a number assignment** ."

1993 - 2001

1998: IAB asks RIRs to prepare for IPv6 allocations

1999: ICANN

2002 - 2004

2003: NRO

NRO

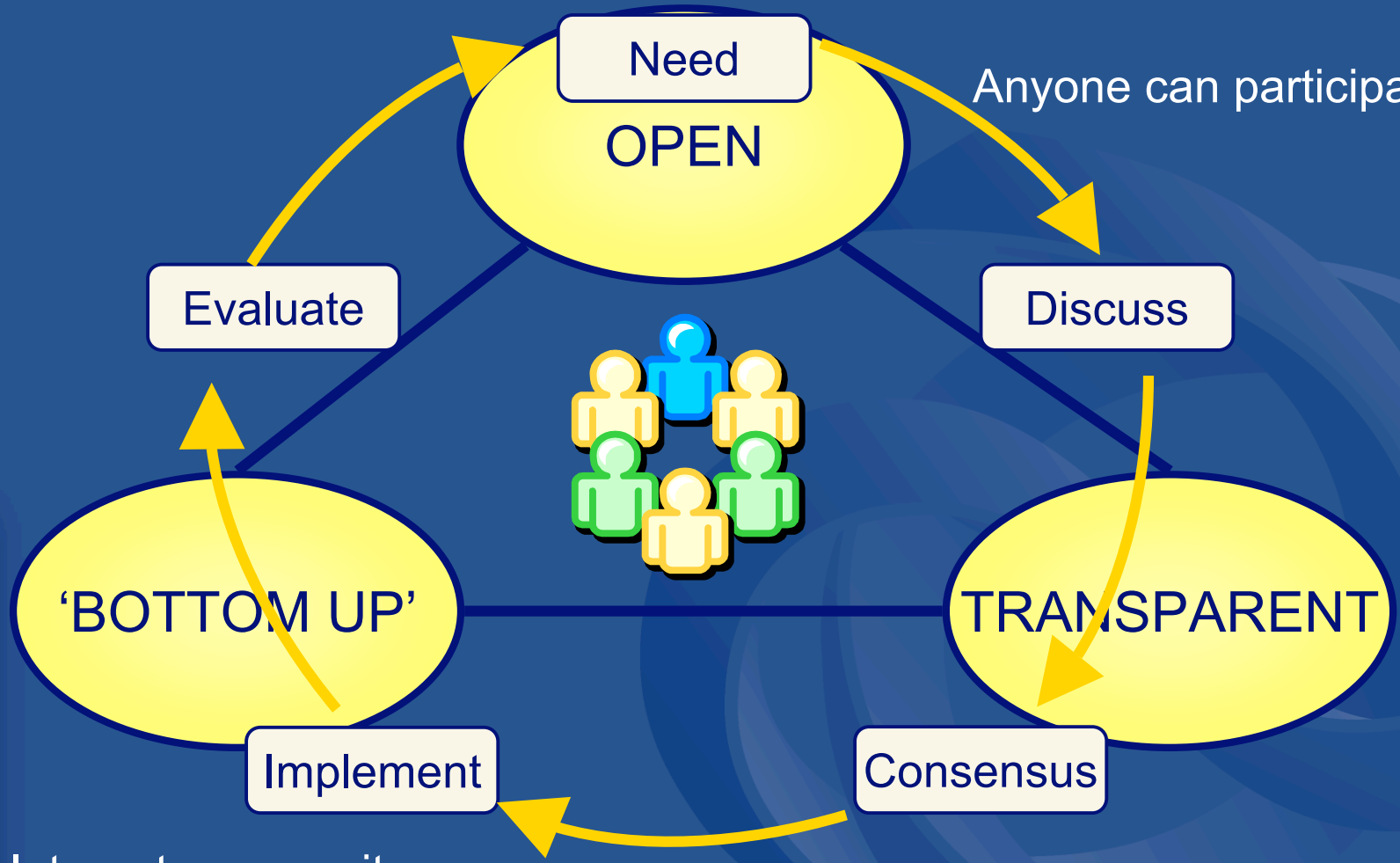
What are RIRs?

- Regional Internet (address) Registries
  - Industry self-regulatory structures
  - Non-profit, open membership bodies
- First established in early 1990's
  - In response to call from IETF (RFC1366)
  - To satisfy emerging technical/admin needs
  - Voluntarily by consensus of community
- In the "Internet Tradition"
  - Consensus-based, open and transparent

What do RIRs do?

- Internet resource management
  - Primarily, IP addresses – IPv4 and IPv6
  - Registration services (“whois”)
- Training, outreach and liaison
  - Training courses, seminars, conferences…
  - Liaison: IETF, ICANN, ITU, regional orgs…
  - Newsletters, reports, web sites…
- Policy development and coordination
  - Open Policy Meetings and processes

RIR Policy Development



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How many IP Addresses?

and how many are left?

IPv4 vs IPv6

IPv4: 32 bits

- 2^{32} addresses

  = 4 billion addresses

  Being extended through use of “NAT”

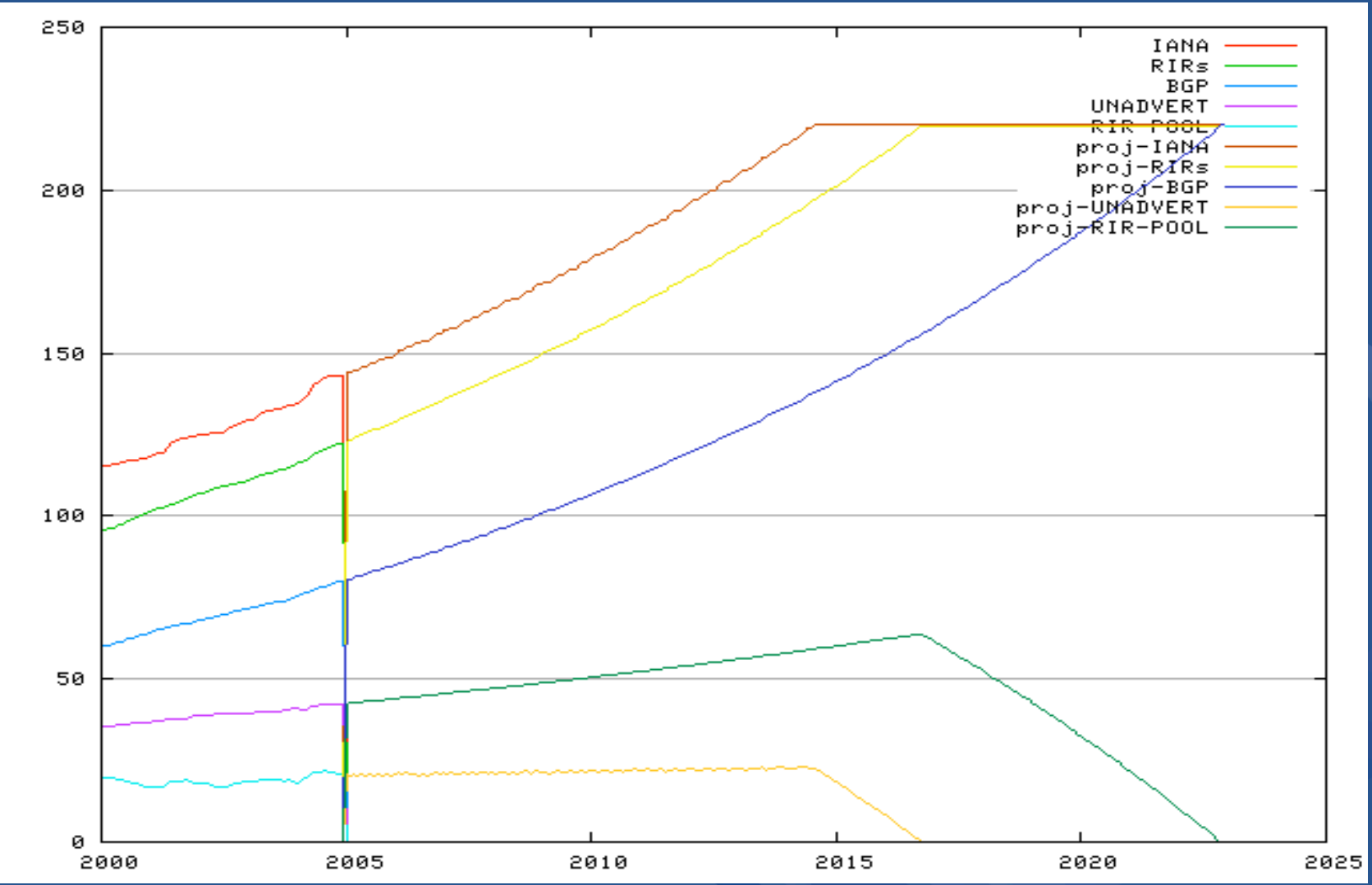
IPv6: 128 bits

- 2^{128} addresses?

  = 340 billion billion billion billion addresses?

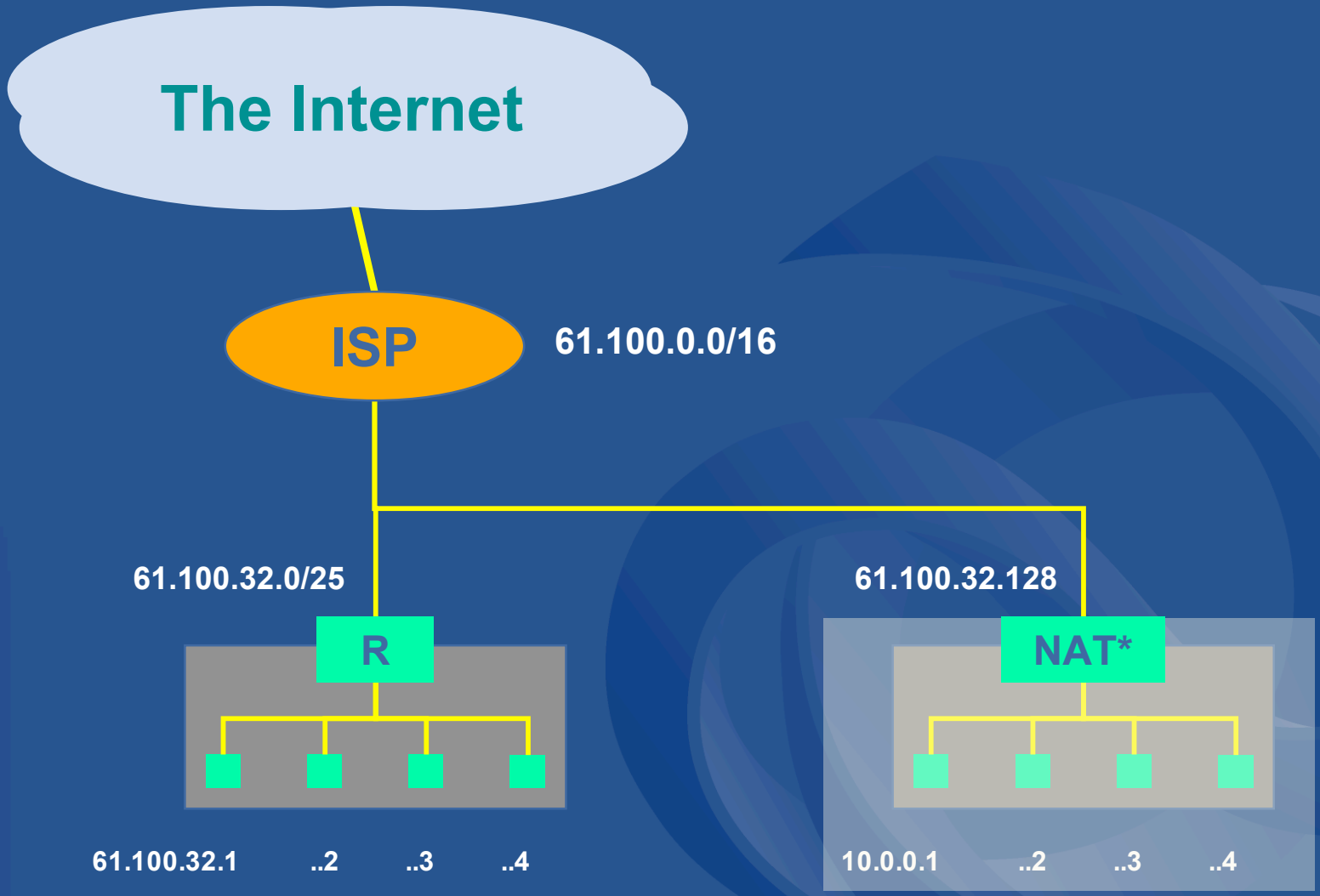
  Much less, due to IPv6 address structure…

How much IPv4?



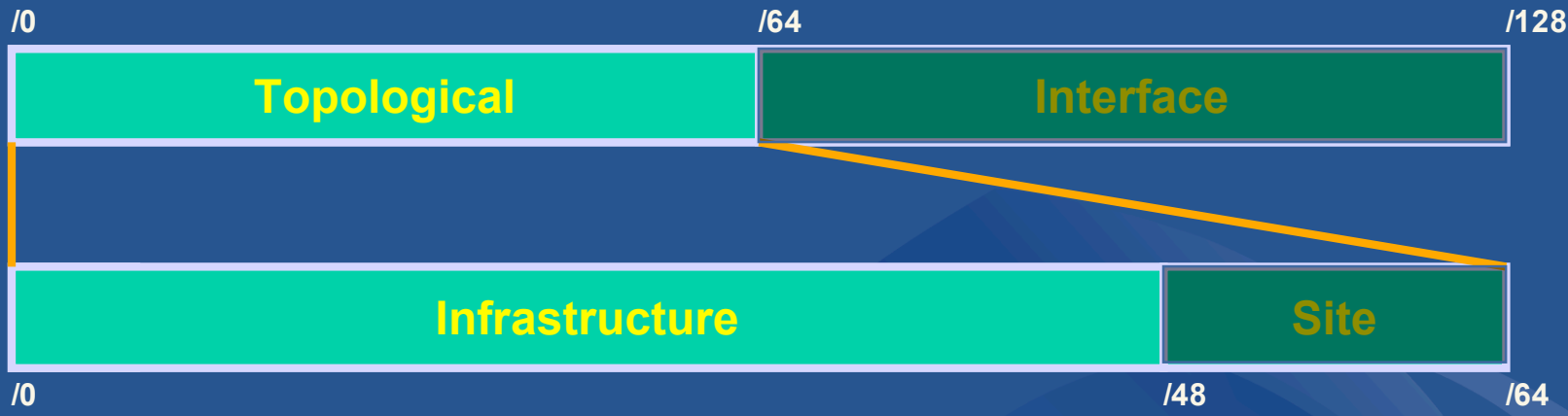
See www.potaroo.net

The NAT "Problem"



*AKA home router, ICS, firewall

How much IPv6?



- 2^{64} "subnet" addresses
  - = 18 billion billion subnet addresses
  - Assigned to individual network segments
- 2^{48} site addresses
  - = 281 thousand billion site addresses
  - Assigned to "sites" - homes, cars, phones etc

IPv6 Address space lifetime

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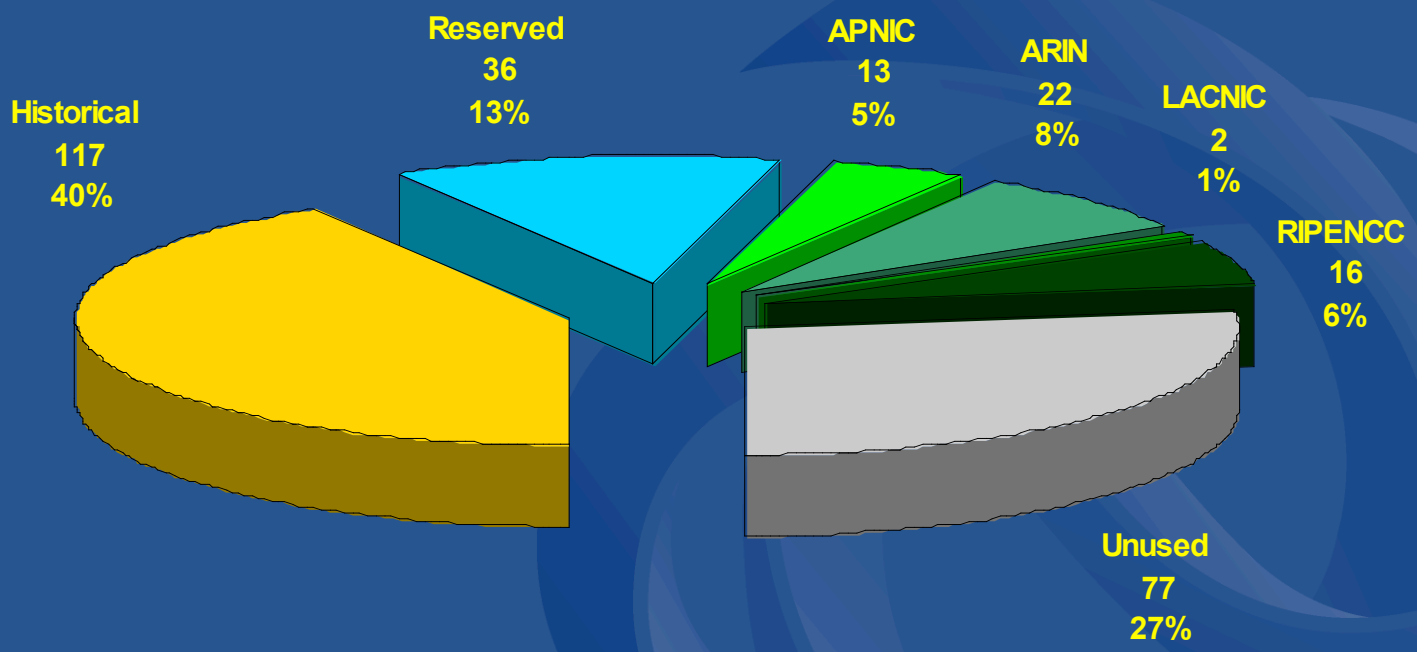
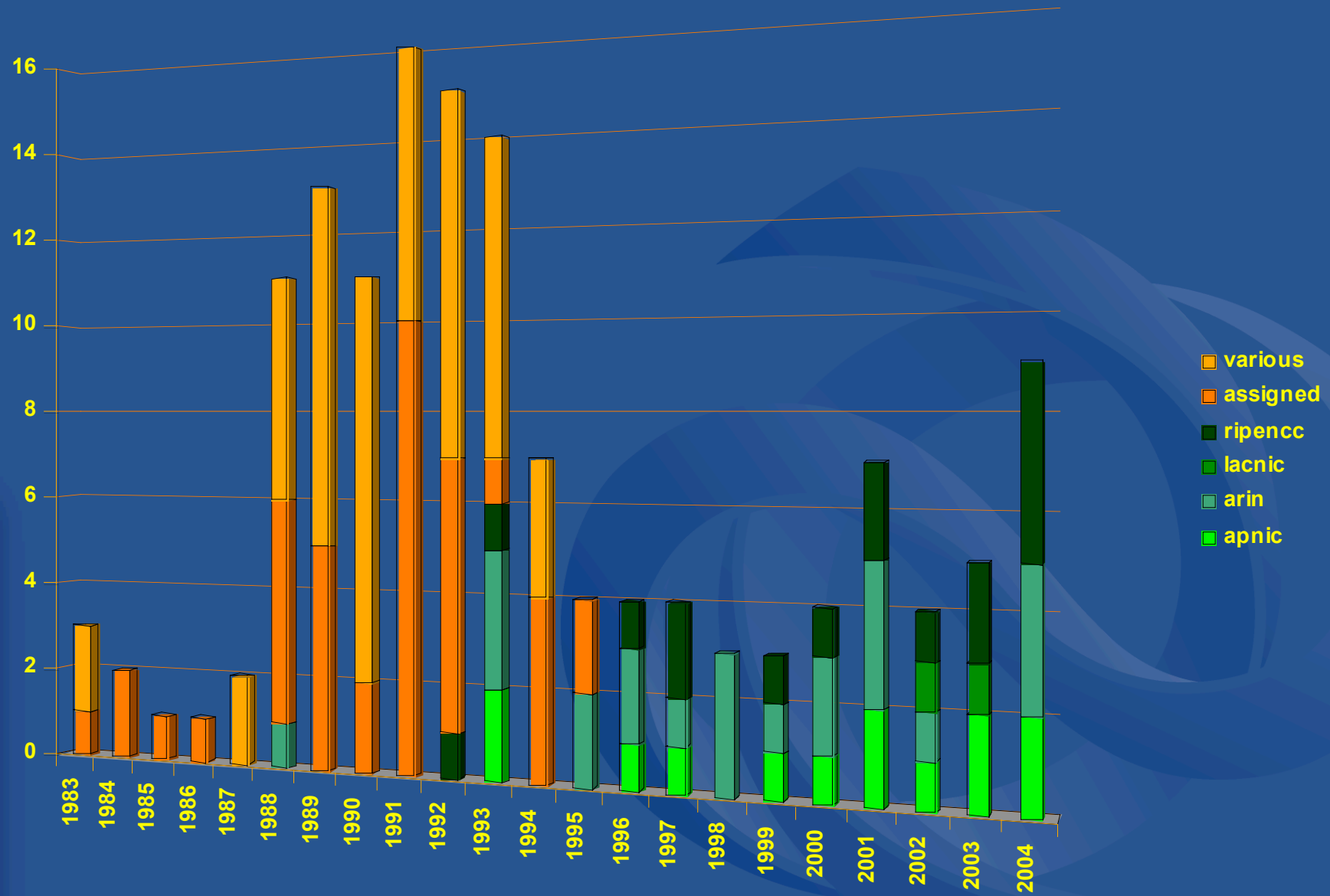
Where are all the addresses?

and how many are left?

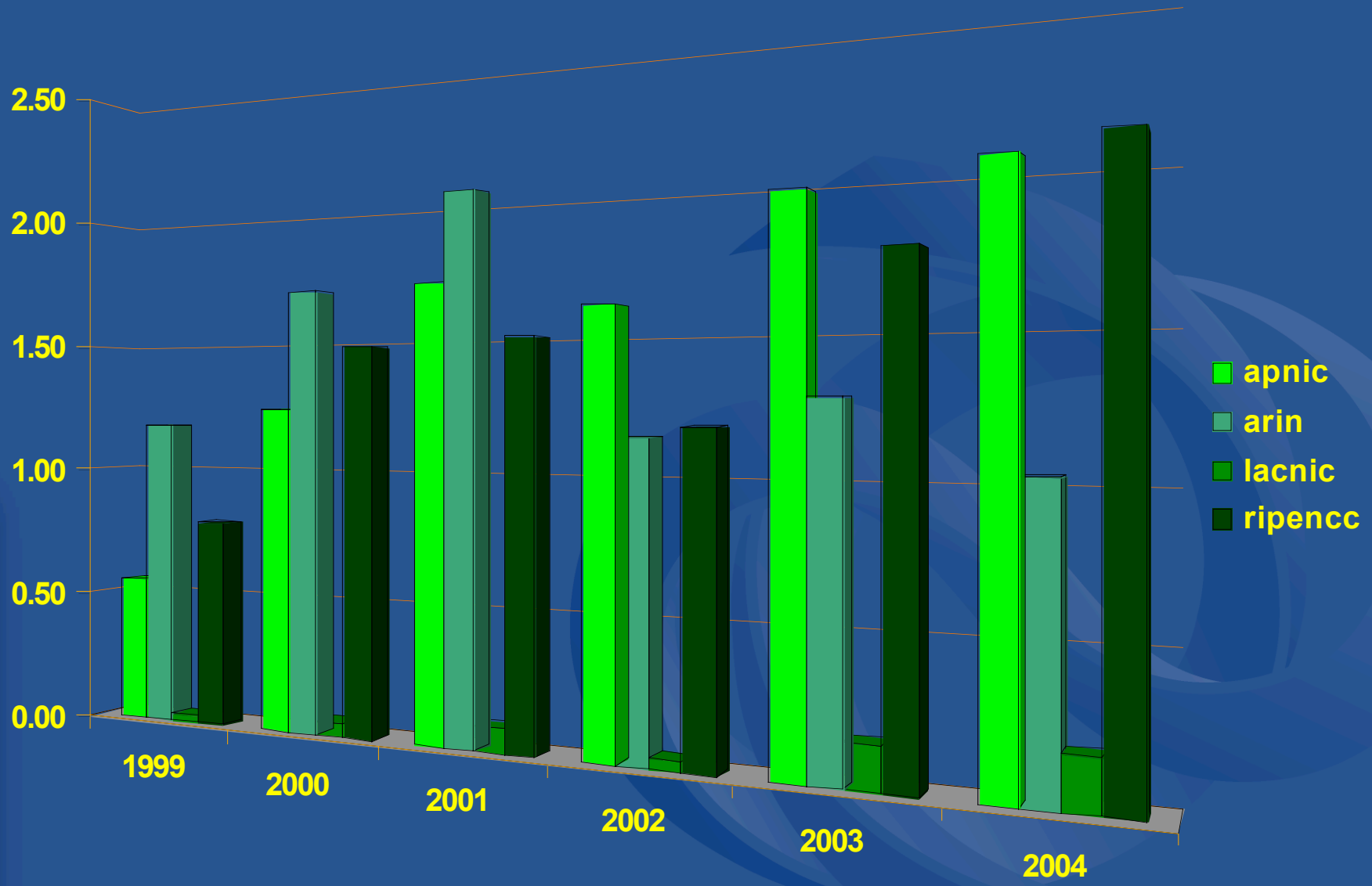
IPv4 Allocations – IANA total



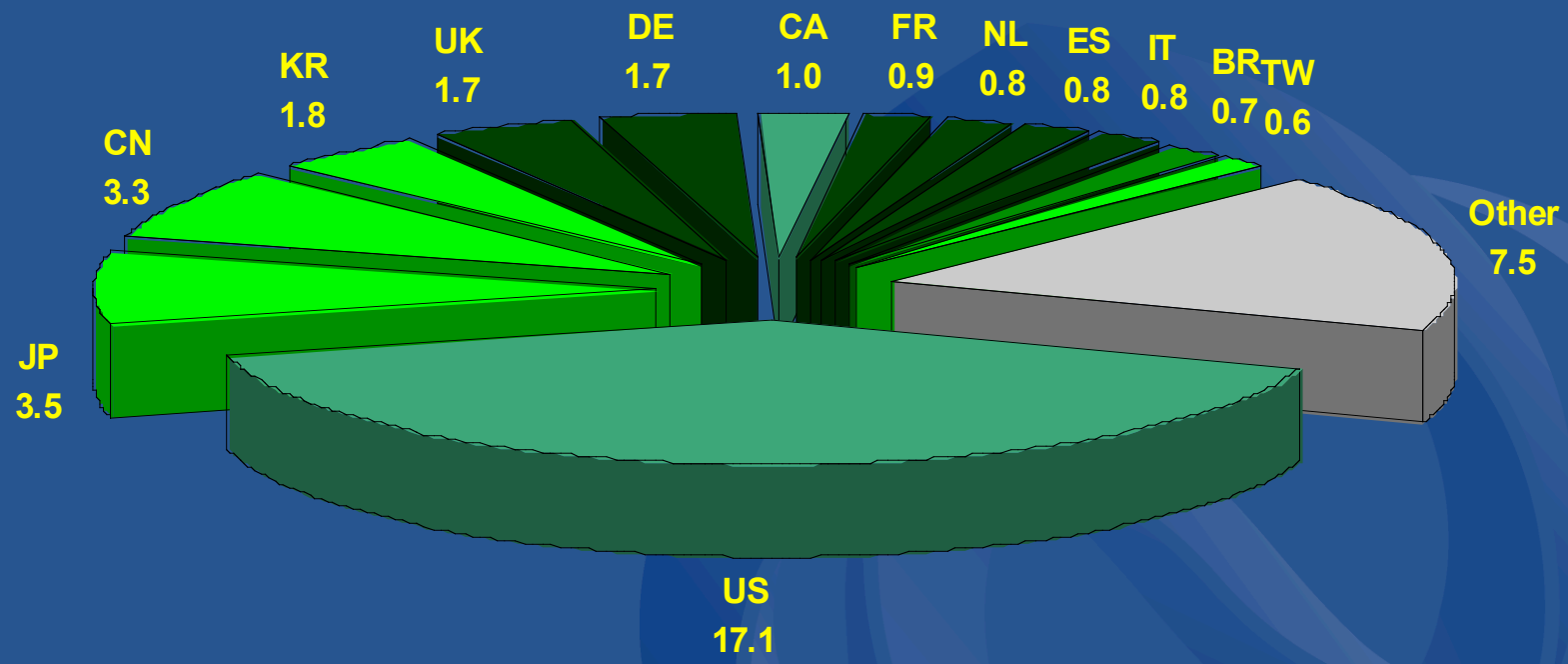
IPv4 Allocations – IANA



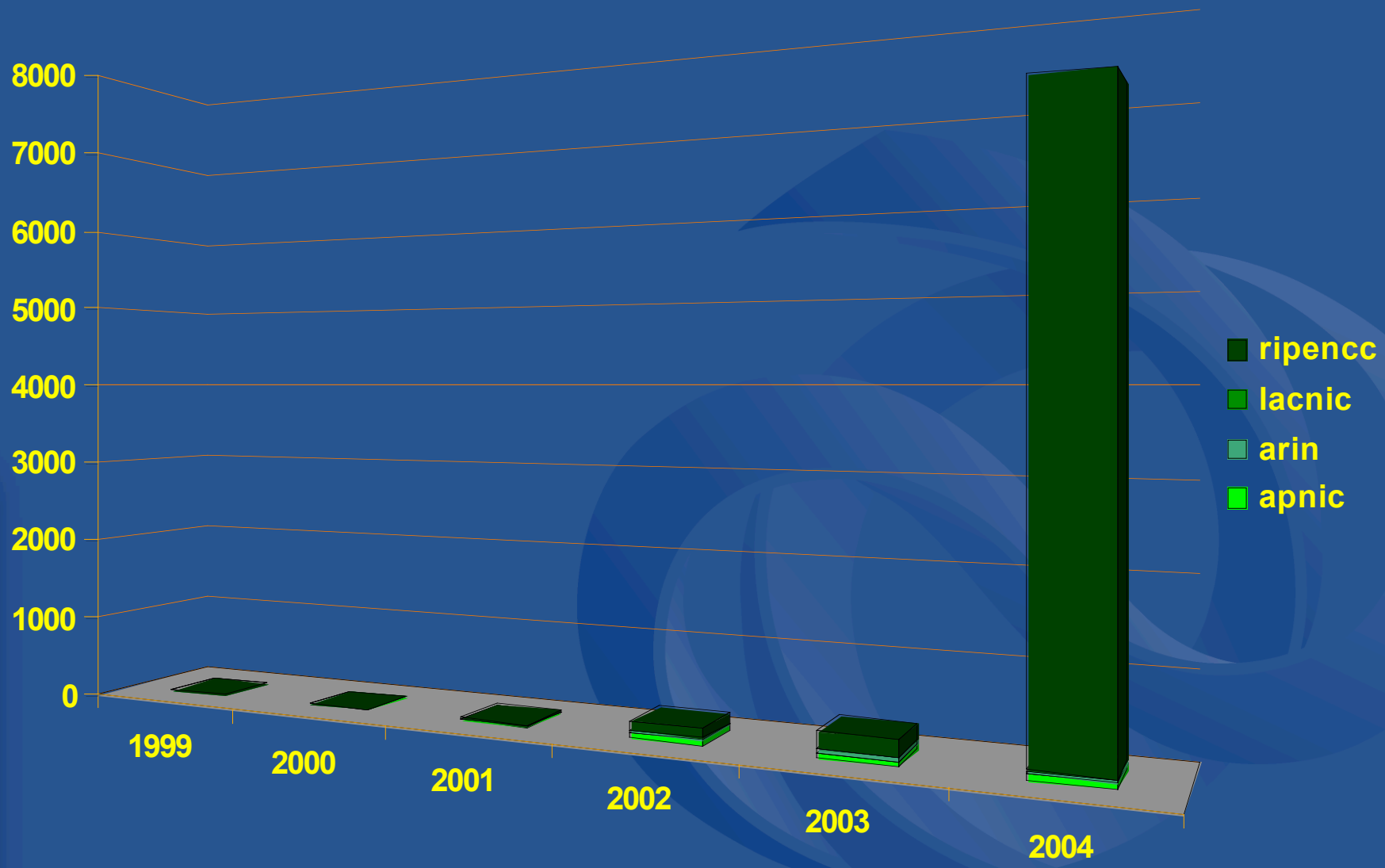
IPv4 Allocations – RIRs



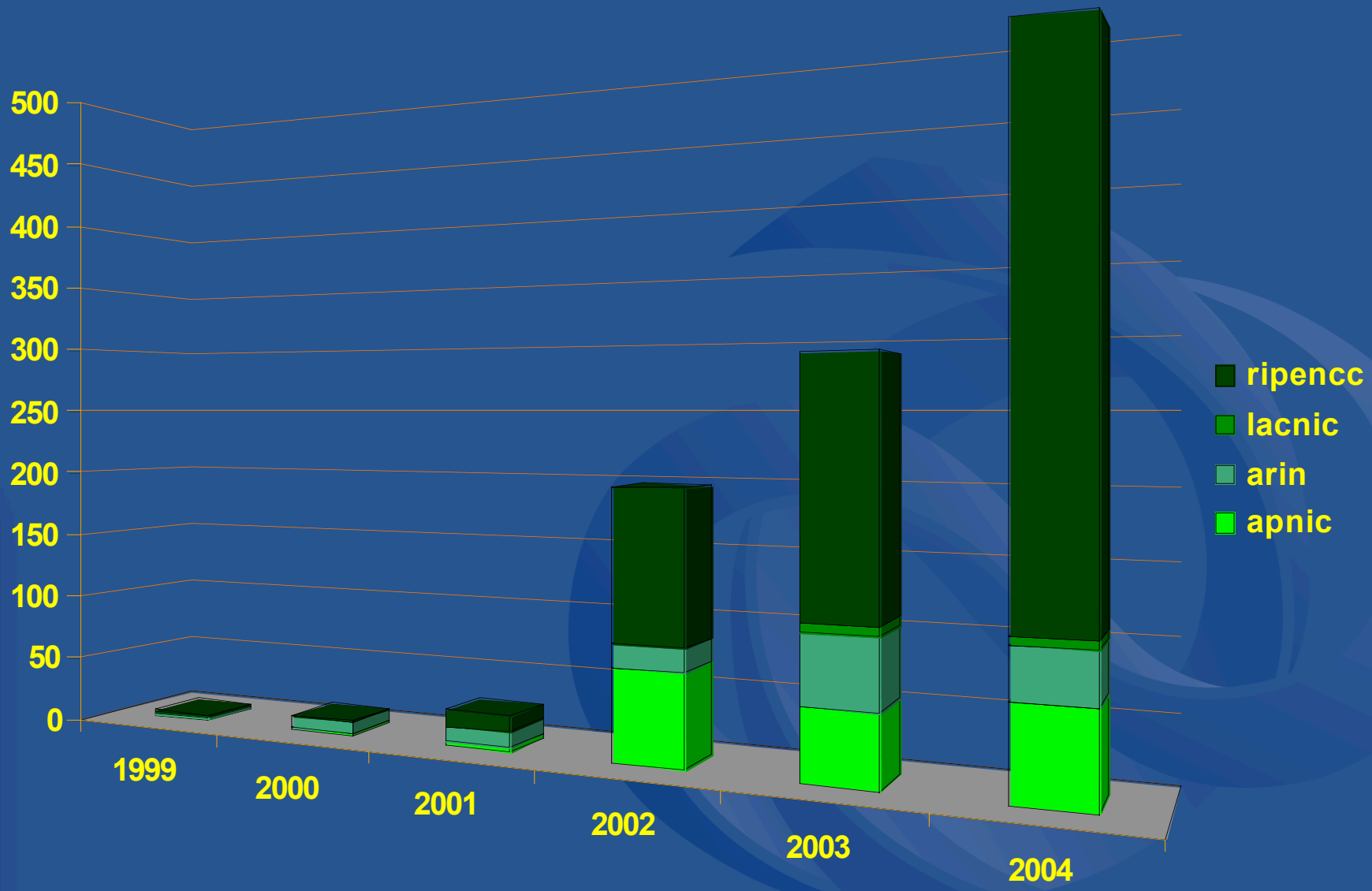
IPv4 Allocations – Global



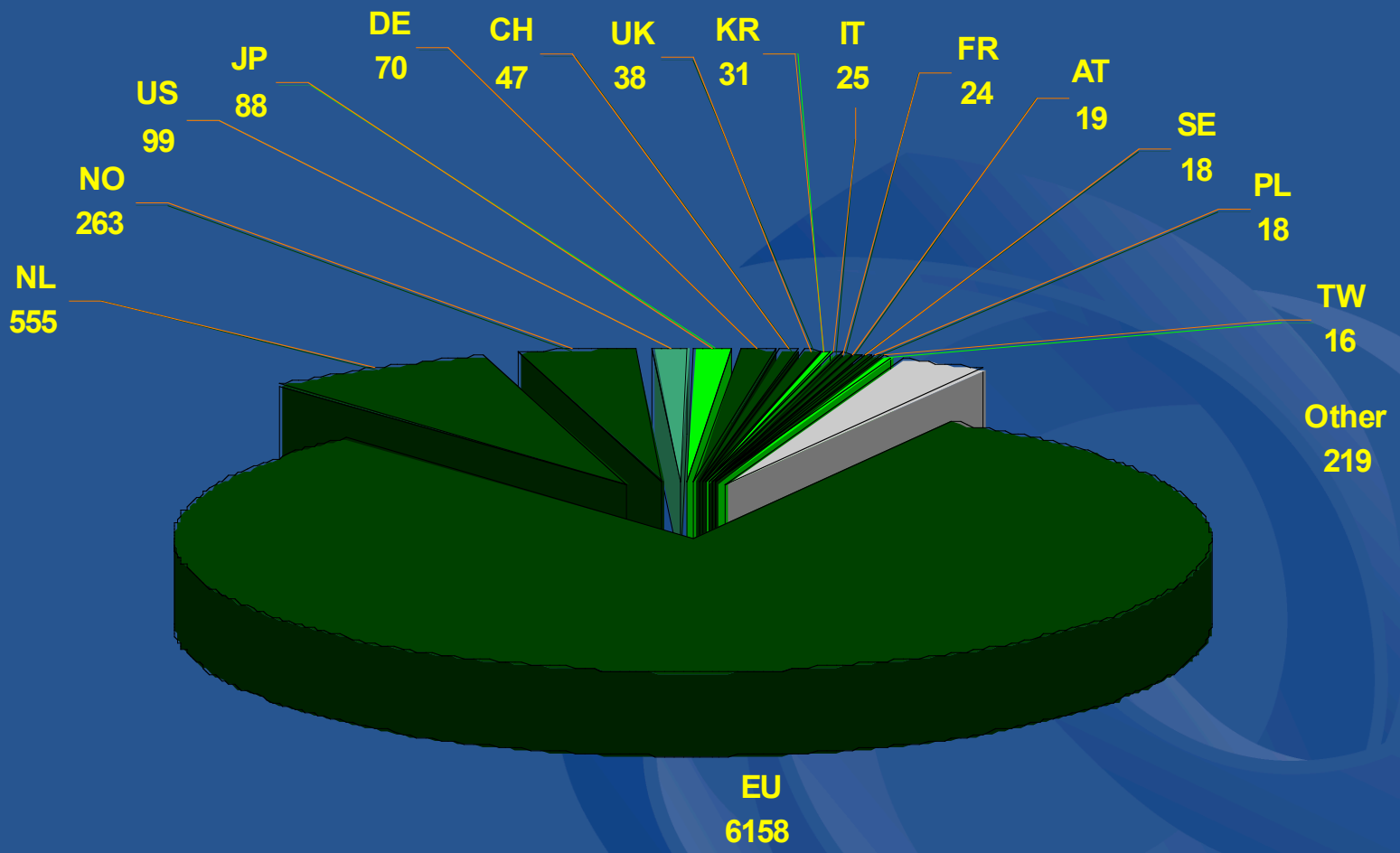
IPv6 Allocations – RIRs



IPv6 Allocations – RIRs



IPv6 Allocations – Global



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Conclusion

What is the future?

IPv6 – Internet for everything!

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IPv6 – Summary

- The good news…
  - IPv6 is available
  - IPv6 addresses are very easy to get
- The not so good news…
  - Cost: transition from IPv4
  - Demand: Do users want it?
  - “Chicken and Egg” syndrome
- The reality: A long process…
  - “Changing engines mid-flight”
  - Critical message: Start now!

Thank You

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