



NRO

Number Resource Organization

Ray Plzak
President & CEO
ARIN



Overview

- What Is An IP Address?
- RIR
 - ❖ History and Evolution
 - ❖ Structure
 - ❖ Services
- Management
 - ❖ Policy
 - ❖ Administration
- Statistics
- ARIN Activities



What is an IP Address?

- A Number Used by Routers.
- Identifies Computers and Networks.
 - ❖ Origin
 - ❖ Destination
 - ❖ intermediate Points

2001:610:240:0 193.0.0.202 62.109.128 195.048.02.03 178.12.02.02 2001:610:240 193.0.0.203 195.048.02.03
62.109.128 195.048.02.03 2001:610:240 193.0.0.202 62.109.128 195.048.02.03 178.12.02.02 2001:610:240 193.0.0.203
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IP Address vs DNS [Routing Perspective]

- IP Address [Identifier]
 - ❖ More Than 1 Possible Associated DNS Name
 - ❖ Used for Routing

- DNS Name [Reference]
 - ❖ Only 1 Associated Address
 - ❖ Not used for Routing

2001:610:240:0 193.0.0.202 62.109.128 195.048.02.03 178.12.02.02 2001:610:240 193.0.0.203 195.048.02.03
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2001:610:240:0 193.0.0.202 62.109.128 195.048.02.03 178.12.02.02 2001:610:240 193.0.0.203 195.048.02.03
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How Many IP Addresses?

➤ Astronomically Large Numbers

- ❖ IPv4 – 2^{32}

- ❖ IPv6 – 2^{128}

➤ Judicious Management Required

- ❖ Finite Total

- ❖ Technical Requirements

- ❖ Preclude Capricious Consumption

2001:610:240:0 193.0.0.202 62.109.128 195.048.02.03 178.12.02.02 2001:610:240 193.0.0.203 195.048.02.03
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- Number Resource Organization



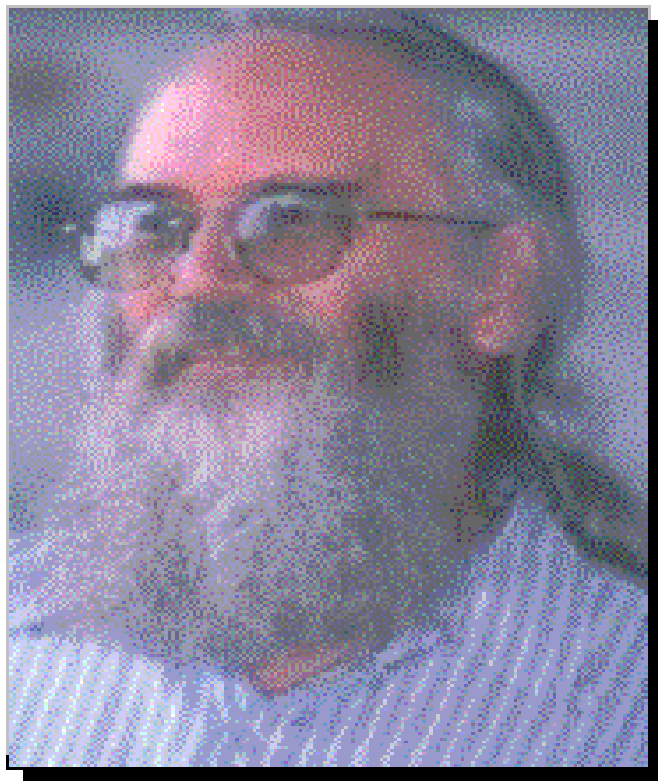
IP Addresses Do Not Disclose

- Geographical Location
- Who is Using
- Where Obtained
- Intended Purpose

2001:610:240:0 193.0.0.202 62.109.128 195.048.02.03 178.12.02.02 2001:610:240 193.0.0.203 195.048.02.03
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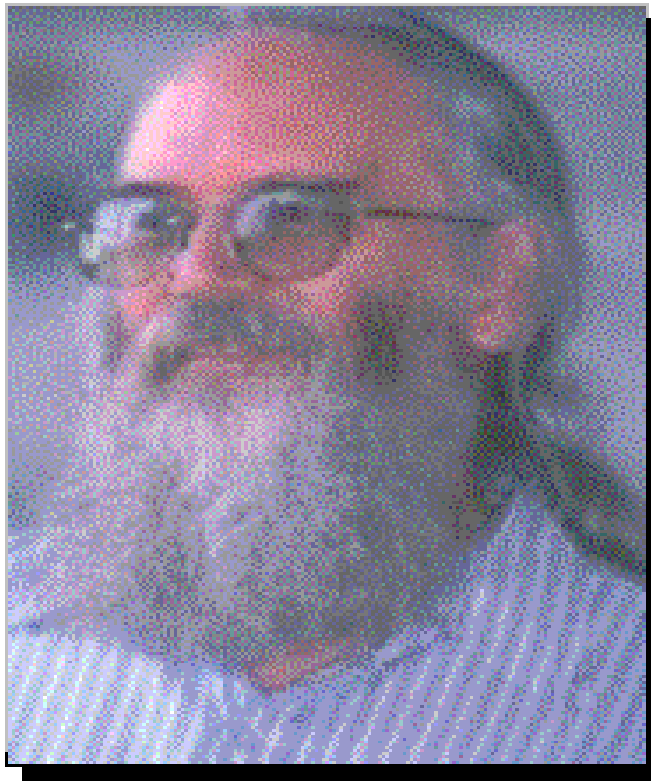


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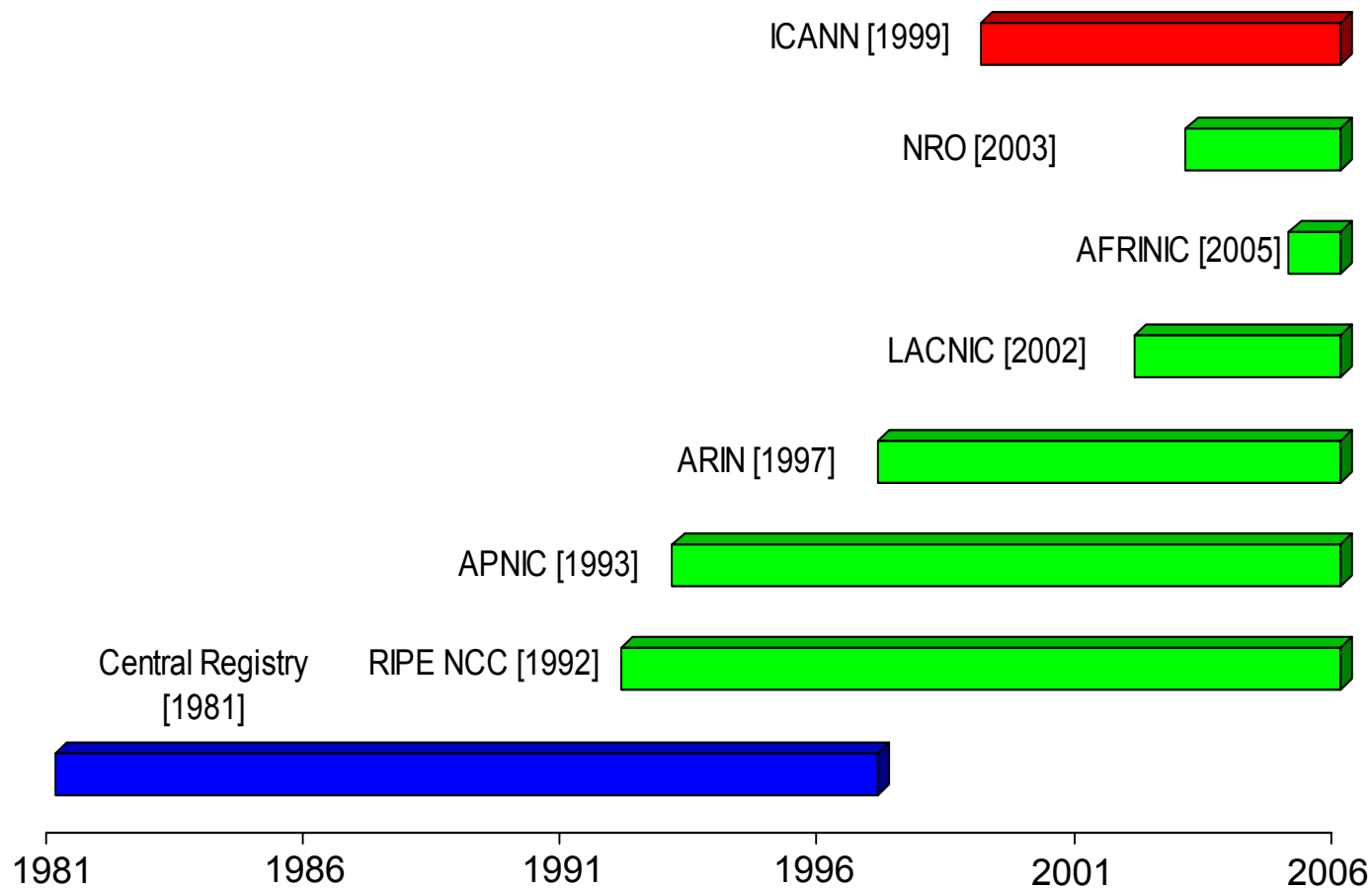


RFC 790 1981

“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.**”



RIR System Evolution



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Self-Regulatory Body

Top Level Technical Coordination of the Internet

- ❖ Names
- ❖ Numbers
- ❖ Root Servers

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Advisory Body for Global Addressing Policy

- ❖ Advise ICANN Board
- ❖ Select ICANN Board Directors [2]
- ❖ Select ICANN NOMCOM Member [1]

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NRO

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Formed by the Regional Internet Registries to formalize their cooperative efforts, the NRO exists to protect the unallocated Number Resource pool, to promote and protect the bottom up policy development process, and to act as a focal point for Internet community input into the RIR system.









ICANN Support

- ASO Secretariat Staffing
- ICANN Budget
- ASO AC
 - ❖ Fund Activities
 - ❖ Fund Travel

NRO Activities

Outreach

- Meetings and Presentations
 - ❖ Government representatives
 - ❖ Industry groups
- Web Site
- Press Releases

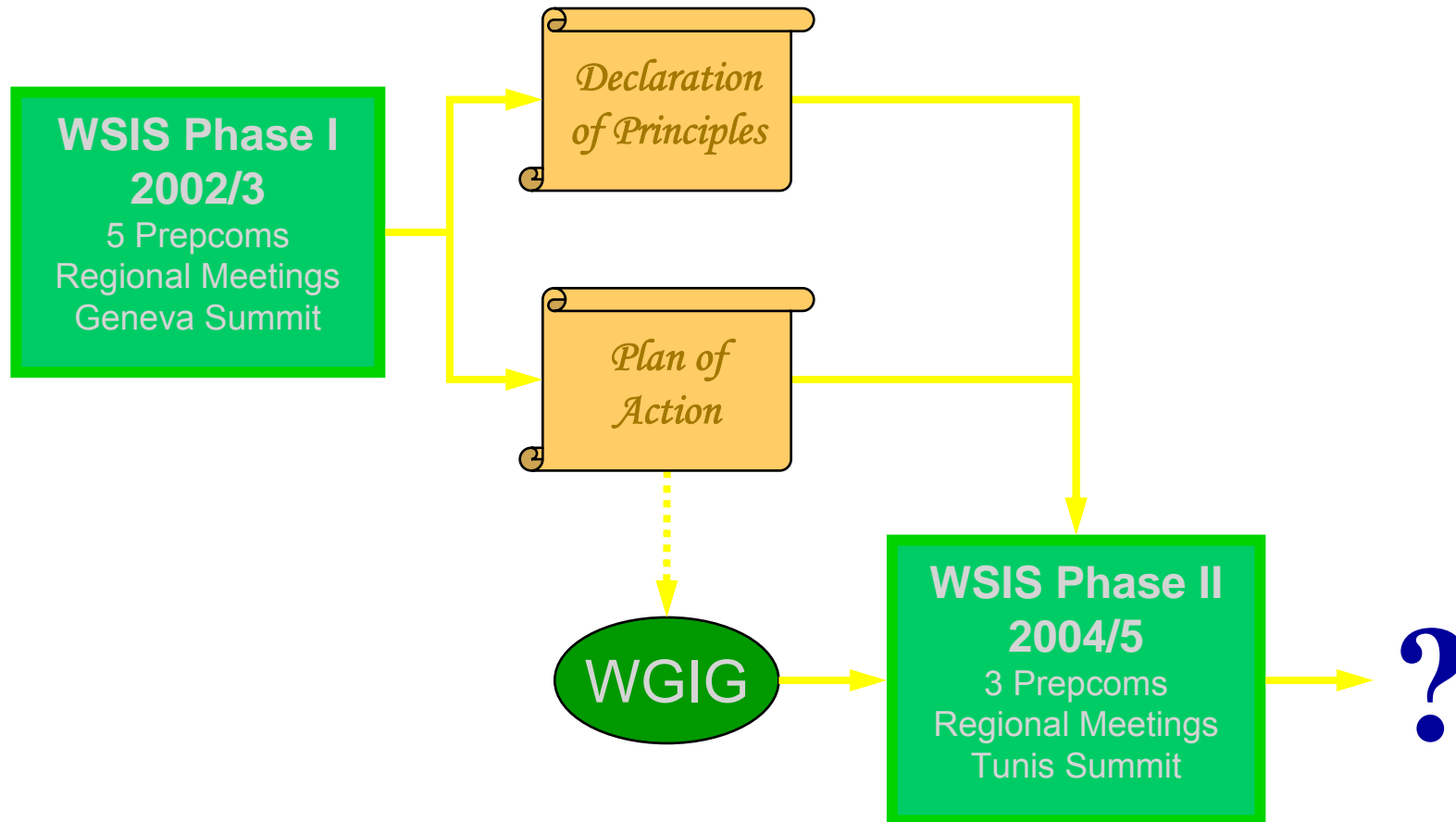
Engineering Coordination

- Reverse DNS
- Directory Services
 - ❖ Joint WHOIS
 - ❖ CRISP

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WSIS flowchart



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RIR Services

Registry

- IP Allocation
- ASN Allocation
- Directories
 - ❖ WHOIS
 - ❖ IRR
- DNS

Organizational

- Elections
- Meetings
- Information
 - ❖ Web Site
 - ❖ Newsletter
- Training

Policy Development Facilitation

- Maintain Discussion Email Lists
- Conduct Policy Meetings
- Publish Policy Documents

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- Number Resource Organization



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NRO Policy Development Cycle



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Policy Development Cycle

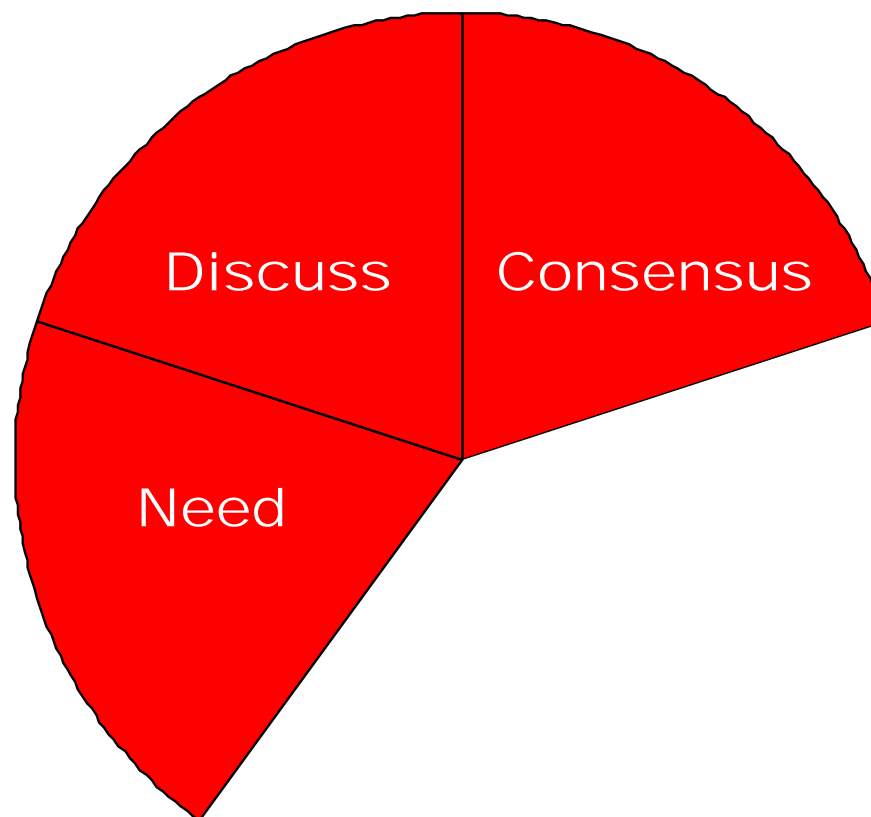


Need

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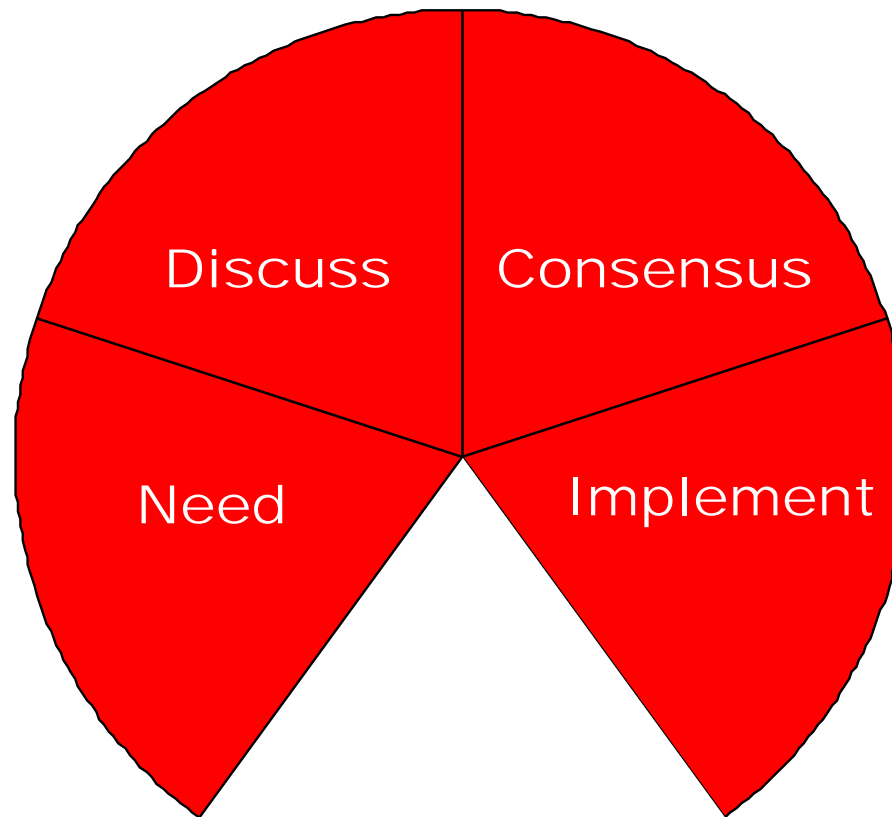
Policy Development Cycle



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Policy Development Cycle

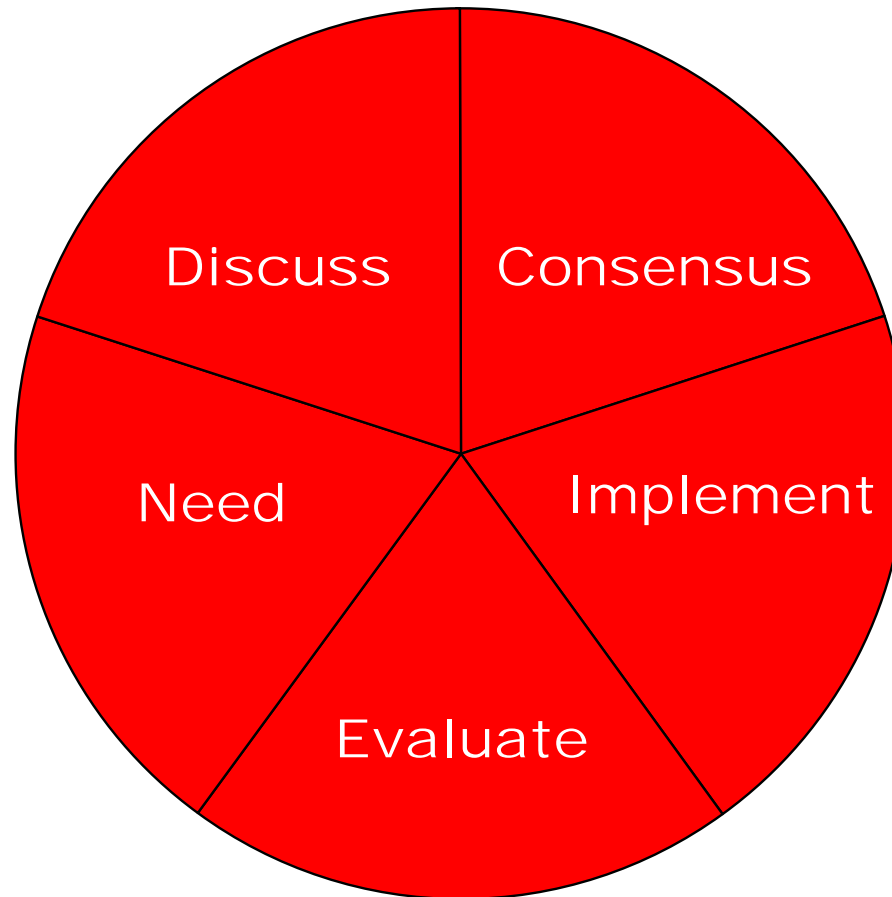


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NRO

Policy Development Cycle



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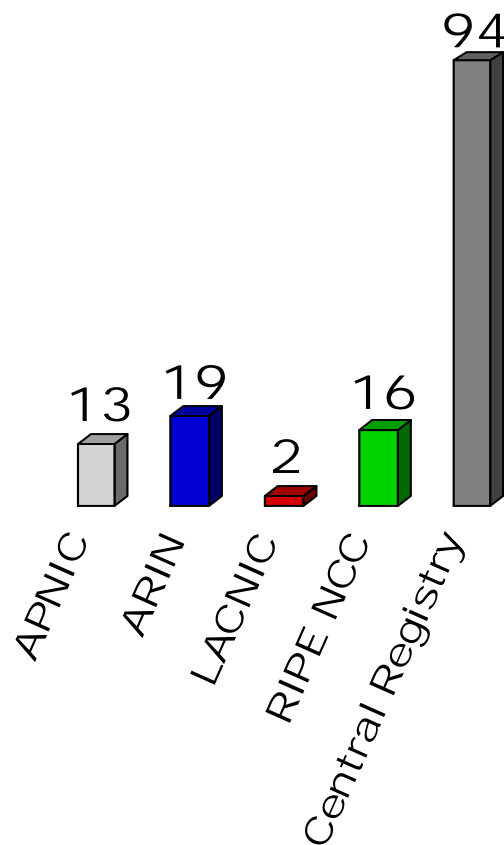


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IPv4 /8 Address Space Status

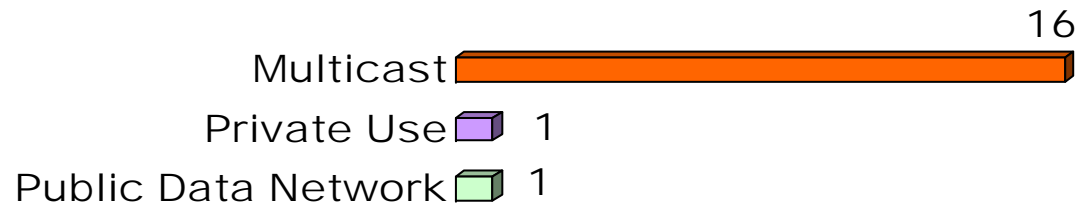
Allocated



Available



Not Available

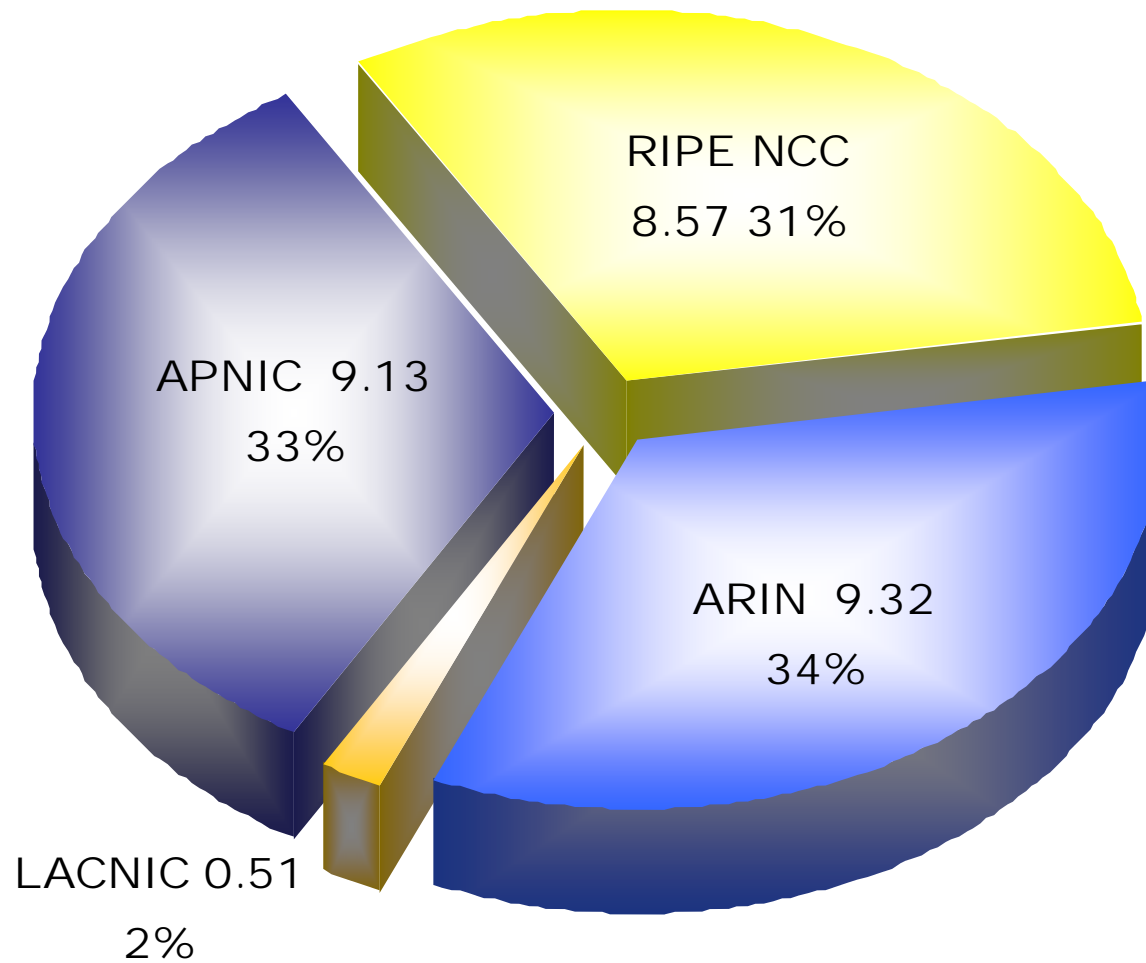


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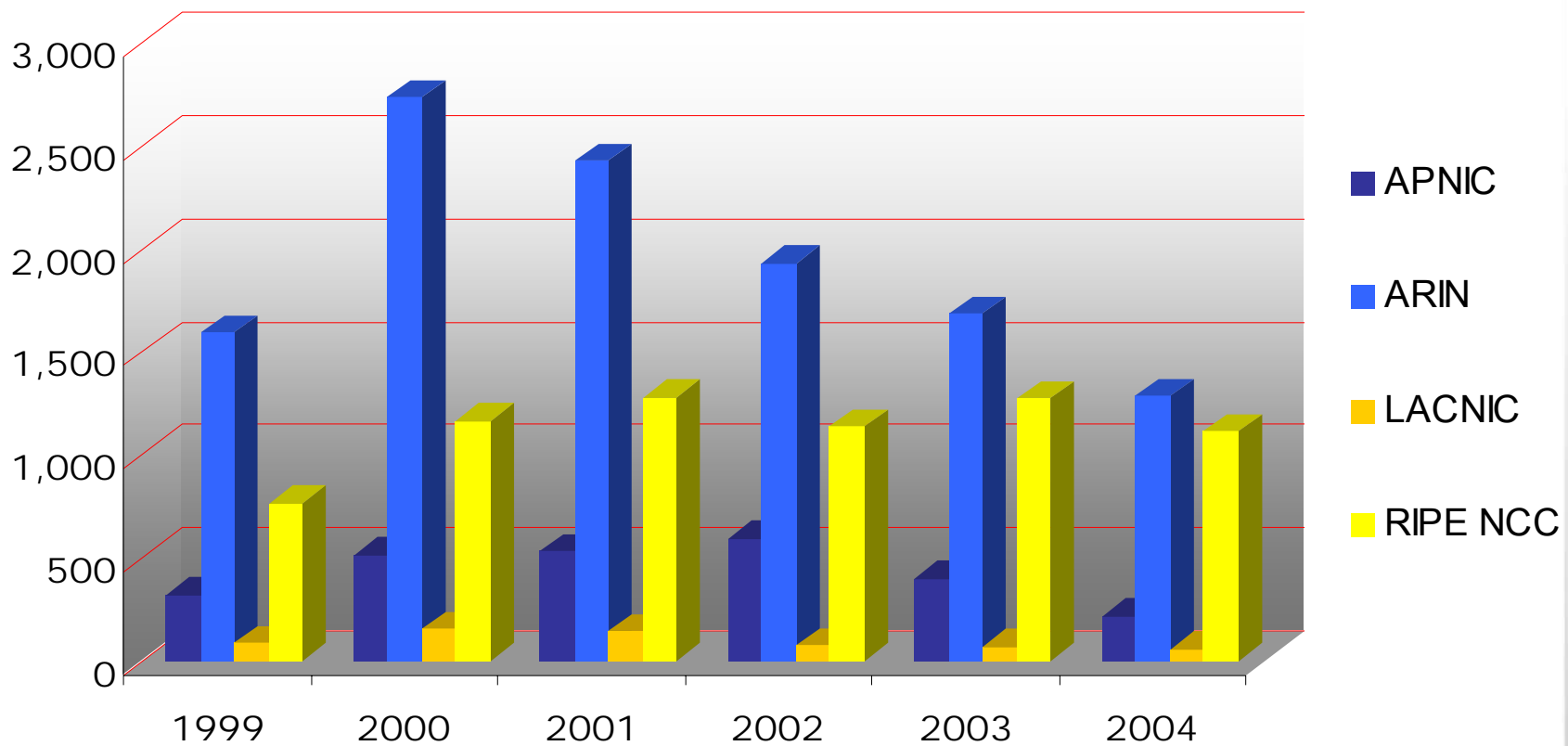
IPv4 Allocations RIRs to LIRs/ISPs Cumulative Total



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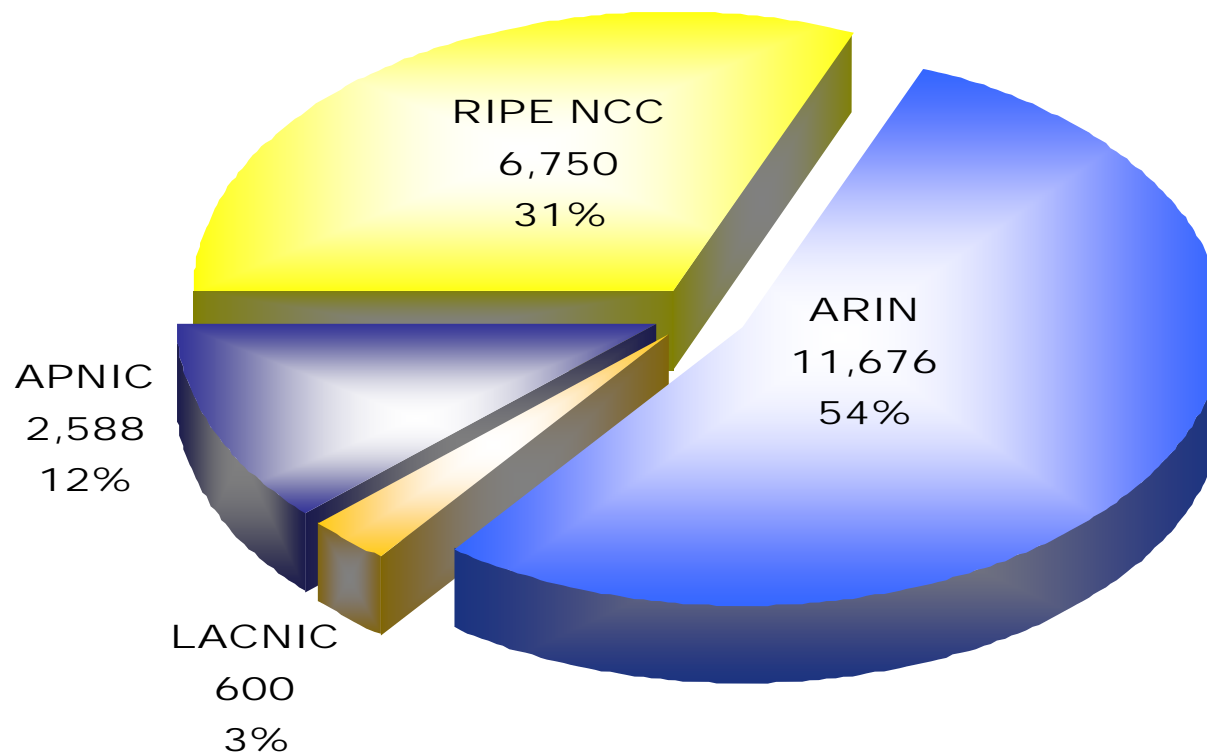


ASN Assignments RIRs to LIRs/ISPs Yearly Comparison





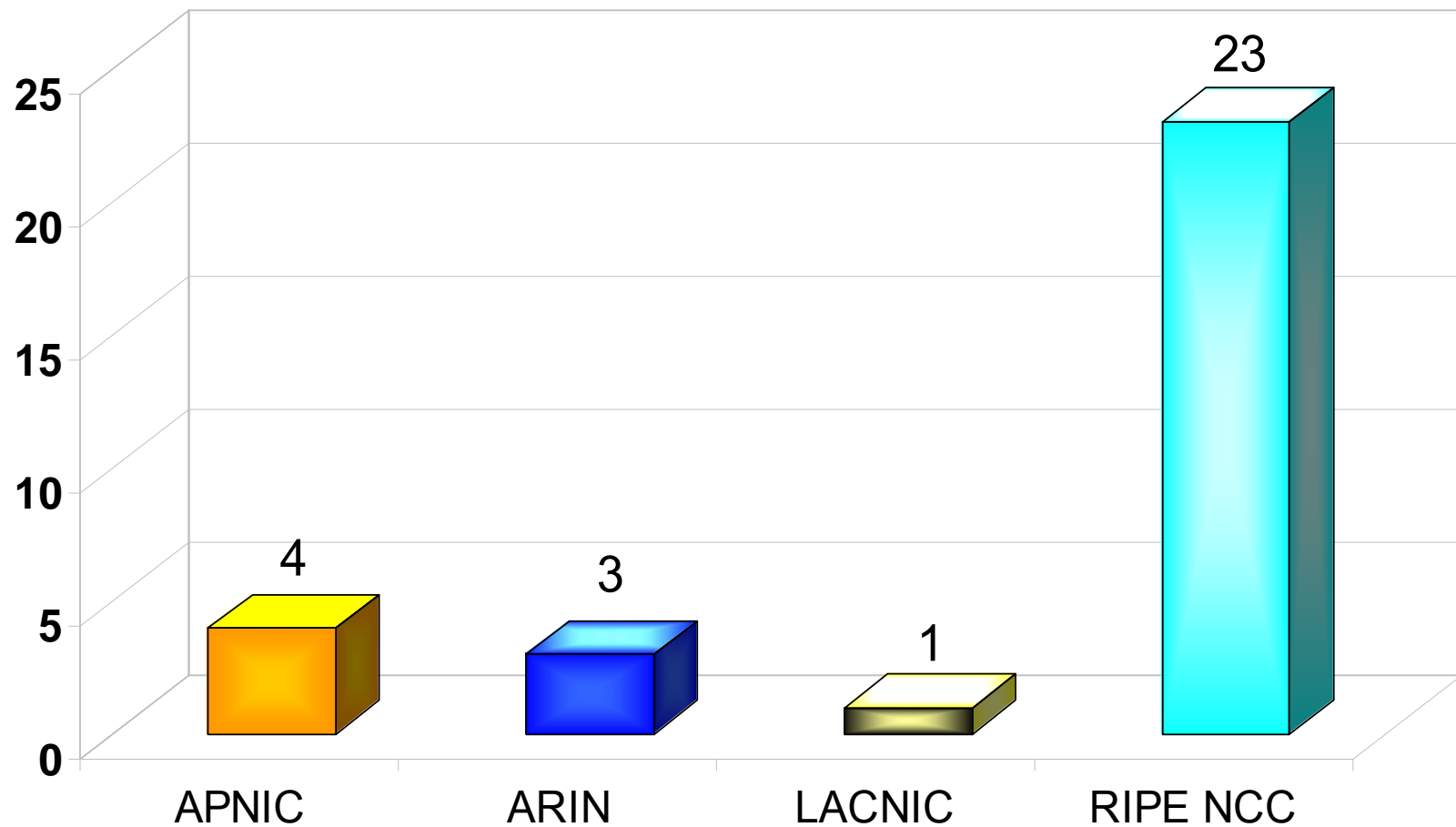
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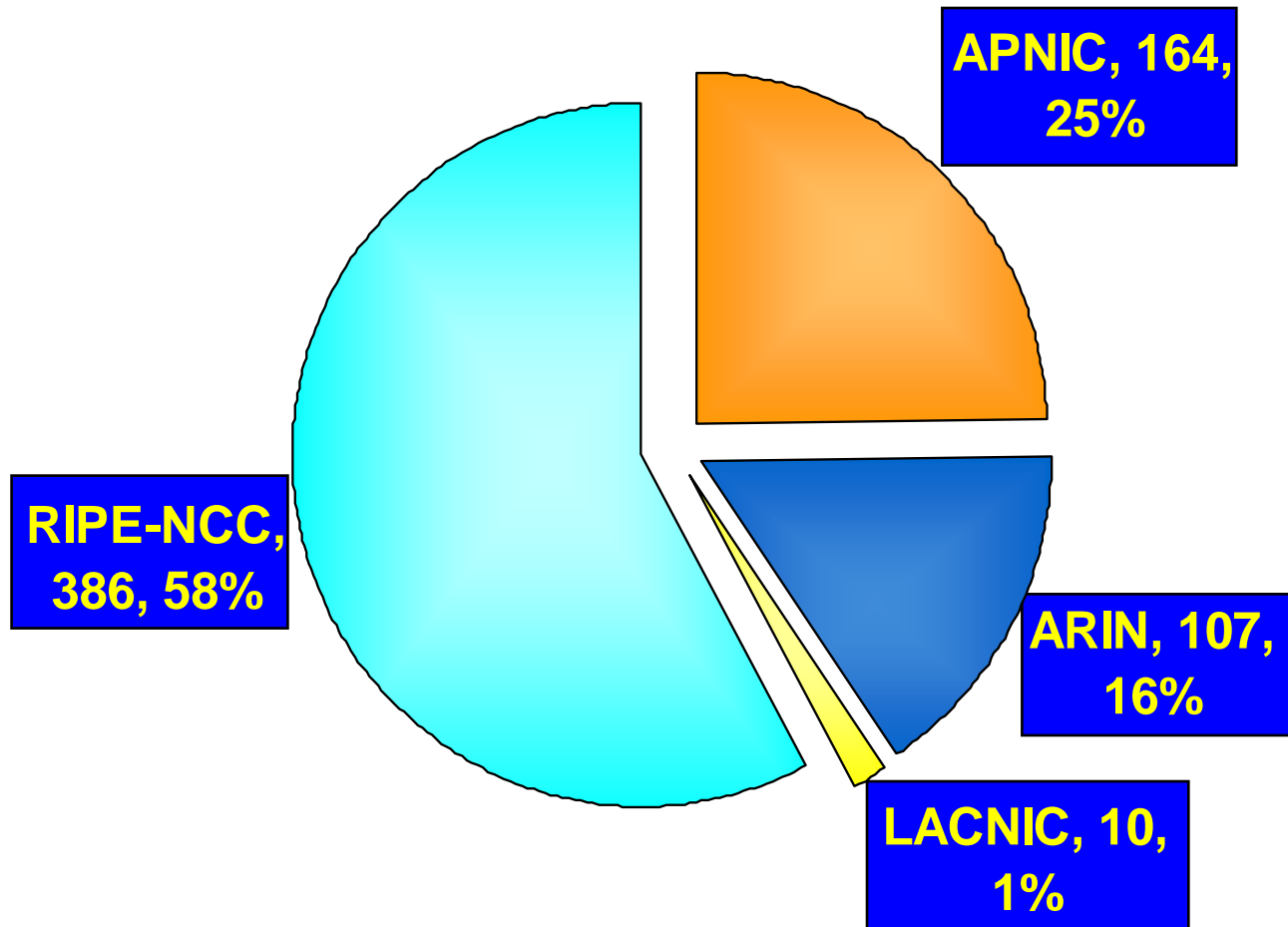


IANA IPv6 Allocations to RIRs (no of /23)



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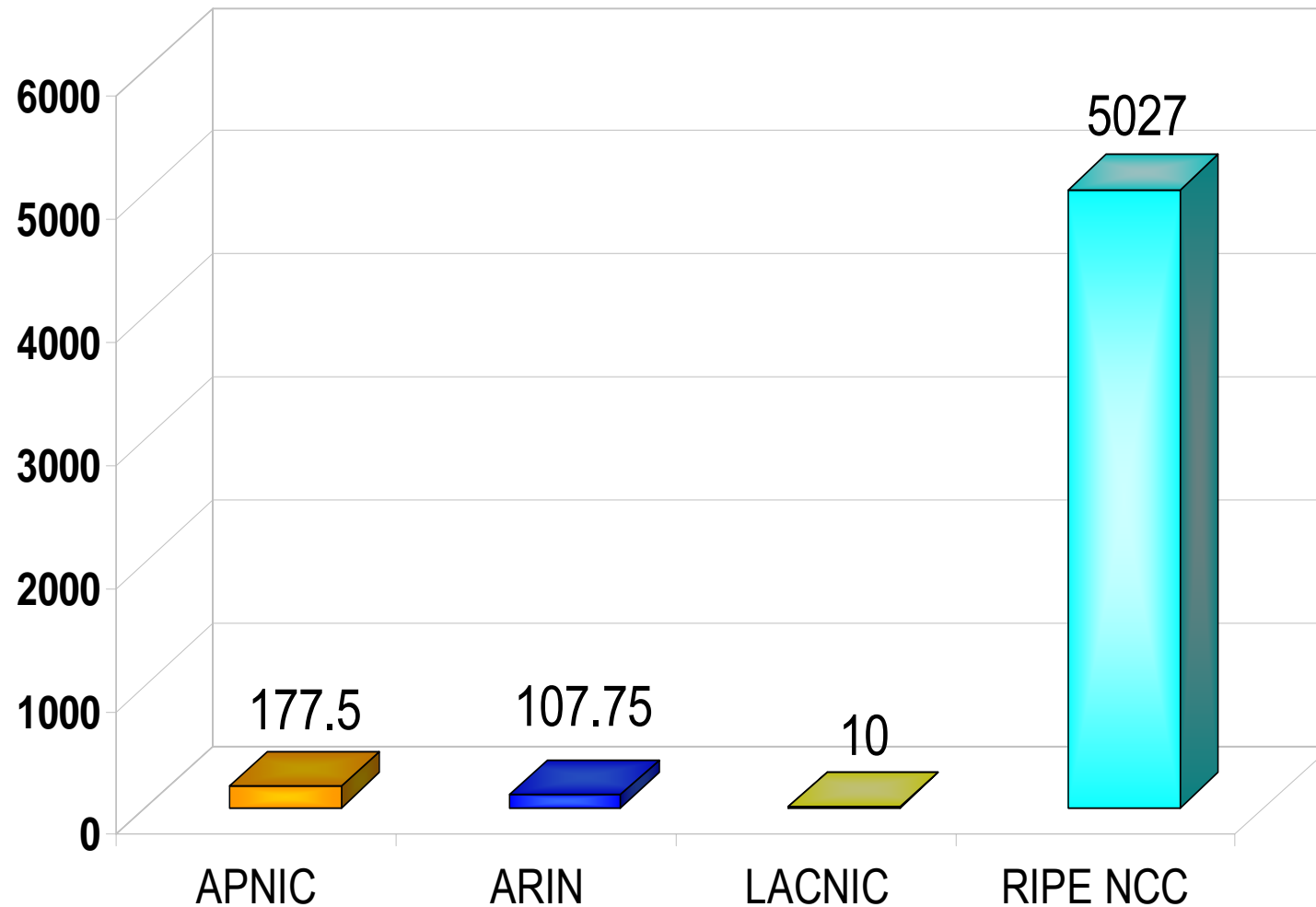
RIR IPv6 Allocations



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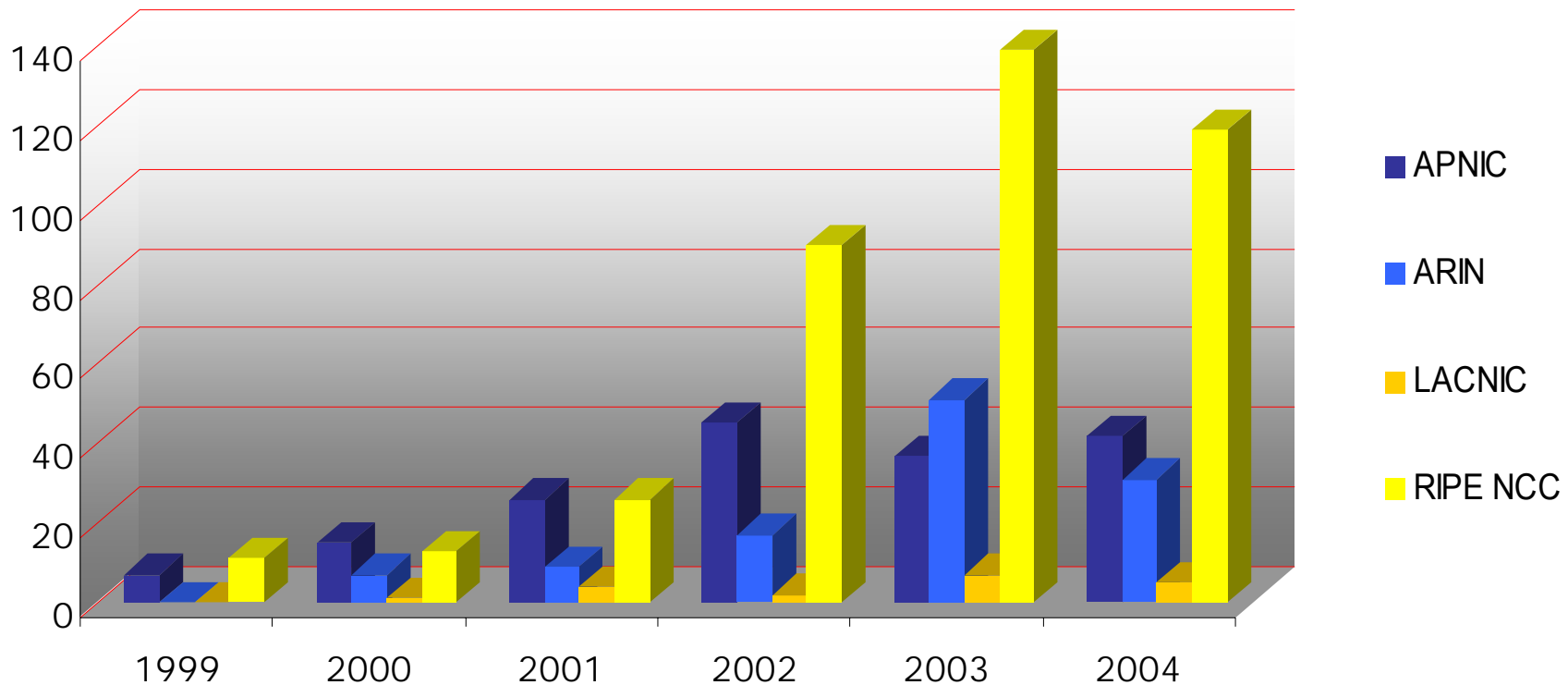
RIR IPv6 Allocations (no of /32)



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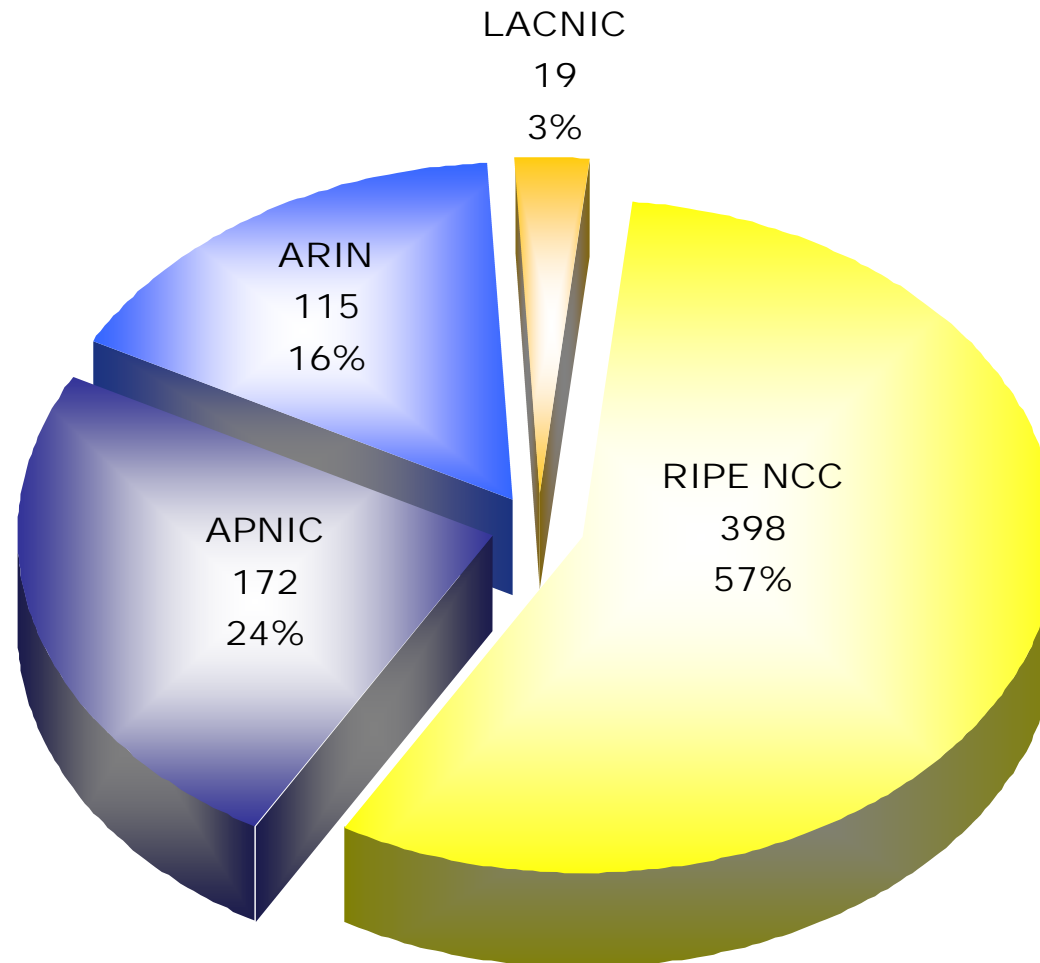


IPv6 Allocations RIRs to LIRs/ISPs Yearly Comparison





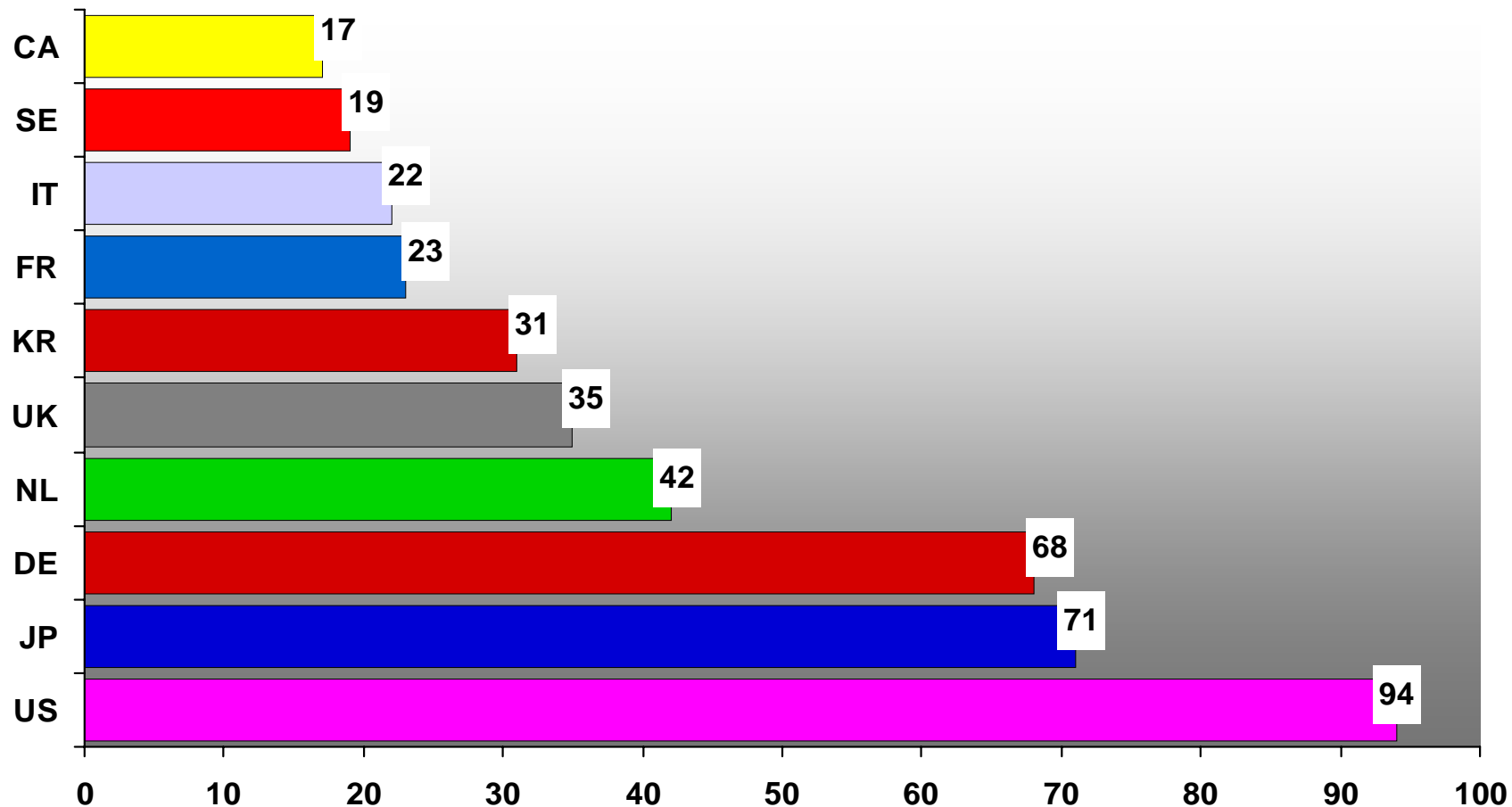
IPv6 Allocations RIRs to LIRs/ISPs Cumulative Total



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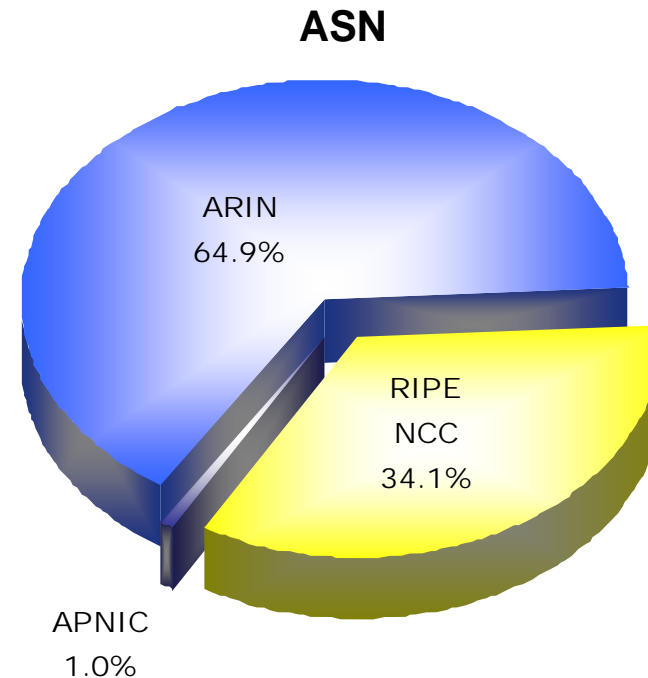
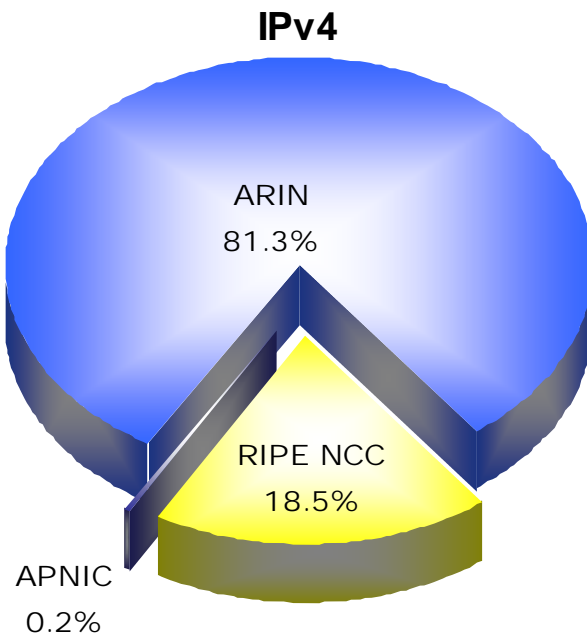
Total IPv6 Allocations from RIRs to LIRs/ISPs Top 10 Countries



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Number Resources in Africa



IPv6
RIPE NCC 1 (tn)
ARIN 5 (za)

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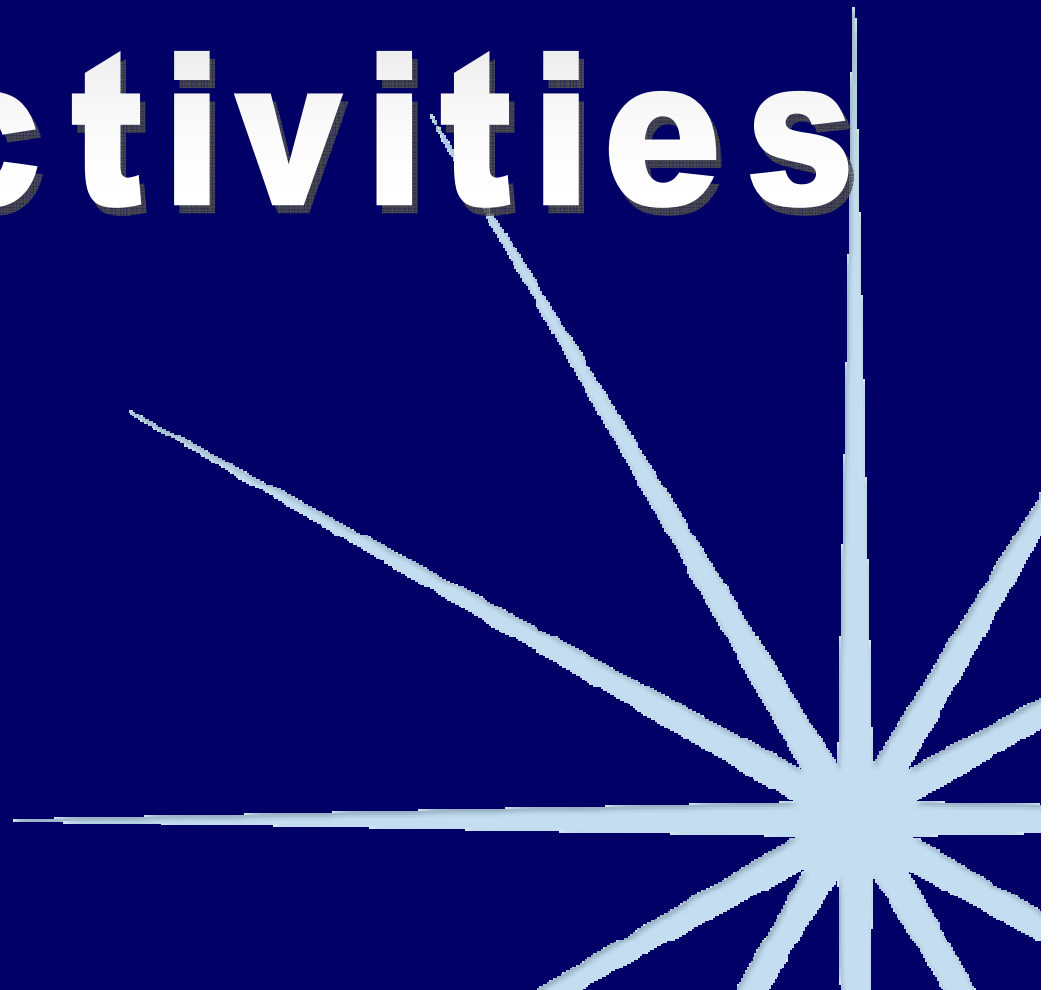


- <http://www.aso.icann.org/stats/index.html>
<http://www.iana.org/assignments/ipv4-address-space>

- <http://www.apnic.net/info/reports/index.html>
<http://www.arin.net/statistics/index.html>
<http://www.lacnic.net/en/est.html>
<http://www.ripe.net/ripenncc/pub-services/stats>

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ARIN Services and Activities



IPv4 Policy Review

★ Single-homed Policy for ISPs

- ▶ ARIN's minimum allocation size is a /20
- ▶ Demonstrate efficient utilization of a /20 from upstream (initial requests)
- ▶ Demonstrate 80% efficient utilization of prior ARIN allocations (subsequent requests)
- ▶ Report reassignment information via SWIP or RWhois
- ▶ Provide utilization information

★ Immediate Need

- ▶ Demonstrate immediate need for /20

IPv4 Policy Review

Single-homed Policy for End-Users

- ▶ Minimum assignment size is a /20
- ▶ Demonstrate immediate need of 25% for requested block
- ▶ Demonstrate one-year projected need of 50% for requested block

IPv4 Policy Review

★ Multi-homed Policy

- ▶ Minimum allocation/assignment size of /22
- ▶ Applies to ISPs and end-users
- ▶ Demonstrate efficient utilization of a /23 and renumber

IPv6 Policy Review

★ RIR to LIR (ISP)

- ▶ Size
 - ▶ Minimum: /32
 - ▶ Maximum: None
- ▶ Criteria
 - ▶ Be an LIR (ISP)
 - ▶ Not an end site
 - ▶ Plan to provide
 - ▶ IPv6 connectivity
 - ▶ /48 assignments
 - 200 in 5 years

Micro-allocation Policy

Each RIR has a micro-allocation policy designed for:

- ▶ Public exchange points
- ▶ Community defined critical Internet infrastructure networks
- ▶ Applies to IPv4 and IPv6

AS Number Policy Review

*Unique Routing Policy

- ▶ Must demonstrate that routing policies are different from border gateway peers

*Multi-homed Site

- ▶ Must be multi-homed or will immediately become multi-homed, and must describe:
 - ▶ Exterior gateway protocol to be used
 - ▶ IP network addresses that will make up the AS
 - ▶ AS numbers of upstreams and/or peers

Registration Transfers

- ★ Cases of acquisition, merger, or corporate name change considered
- ★ Legal documentation required
- ★ Utilization verified

Additional Services

- ★ in-addr.arpa
- ★ WHOIS Directory Service
 - ▶ Bulk format via FTP
 - ▶ Port 43
 - ▶ Port 80
- ★ RWhois
- ★ Routing Registry Service
- ★ Cryptographic Authentication
- ★ ARIN website documentation
- ★ IPv6 Services
 - ▶ DNS, FTP, HTTP, WHOIS via port 80

Active Projects

- ★ DNSsec
- ★ CRISP
- ★ Joint WHOIS
- ★ ERX (near completion)

Policy Development

- ★ Developed in open policy forums
- ★ Responsive policy development
- ★ Technical challenges
- ★ Internet Resource Policy Evaluation Process:
<http://www.arin.net/policy/ipep.html>

Milestones



<http://www.arin.net/policy/ipep.html>

Additional Paths

★ **Author Petition Points**

- ▶ After the Initial AC Review
- ▶ After the AC Appraisal or Last Call Review

★ **Board of Trustees**

- ▶ Emergency Clause
- ▶ Suspension Clause

Recent Developments

- ★ Legal Counsel review
- ★ ARIN staff implementation analysis

Policy Manual Project

★ Purpose

- ▶ Enumerate all policies into a single manual
- ▶ Eliminate reference difficulties
- ▶ Protect integrity of policy documentation

★ Review and Publication

- ▶ Advisory Council
- ▶ Board of Trustees
- ▶ Published 15 October 2004

Active Policy Proposals

- ★ Amendment to Residential Customer Privacy Policy
http://www.arin.net/mailing_lists/ppml/2765.html
- ★ IANA to RIR IPv6 Allocation
http://www.arin.net/mailing_lists/ppml/2758.html
- ★ Address Space for Multiple Discrete Networks
http://www.arin.net/mailing_lists/ppml/2759.html
- ★ Privacy of Reassignment Information
http://www.arin.net/mailing_lists/ppml/2760.html
- ★ Global Addresses for Private Network Inter-Connectivity
http://www.arin.net/mailing_lists/ppml/2781.html

ARIN XIV Public Policy & Members Meetings

Third back-to-back meeting with NANOG

Public Policy Meeting: October 20–21

Members Meeting: Friday, October 22

Register onsite:

Sunday: 12PM – 4PM

Monday: 8AM – 5PM

Tuesday: 3PM – 7PM

Outreach

★ Training and Education

- ▶ Registration help desk
- ▶ Standardized registration training programs

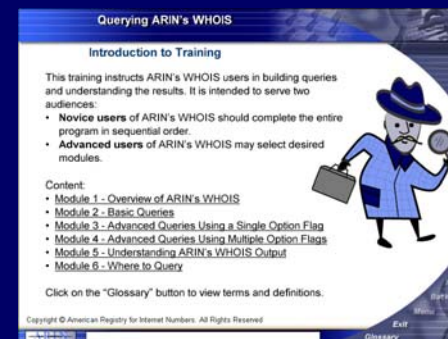
★ Information dissemination

- ▶ News agencies
- ▶ Industry specific meetings (like the GSM-NA)
- ▶ US Government

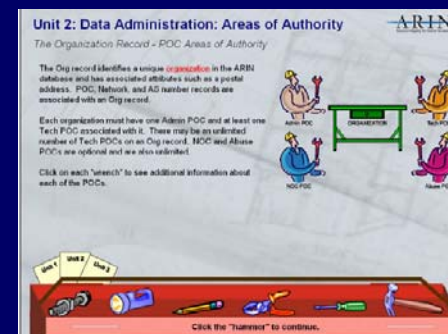
On-demand Training

<http://www.arin.net/library/training/>

Registration Process Flowcharts



Querying ARIN's WHOIS



ARIN Database & Templates

Mailing List Discussions

Public Policy (ppml@arin.net)

ARIN Elections

★ ASO Address Council – 1 open seat

- ▶ All NANOG 32 attendees may vote Tuesday, October 19, until 5:00 PM at <http://onsite.arin.net>

★ ARIN Board and Advisory Council

- ▶ Board of Trustees: (2) open seats
- ▶ Advisory Council: (5) open seats
- ▶ Voting open to ARIN's General Members in good standing only

2004 ARIN Region ASO AC Election

★ One Open Seat

- ▶ Incumbent – Eric Decker
- ▶ Term Expires – December 31, 2004

★ Term

- ▶ Three Years – Beginning January 1, 2005

★ Candidate biographies online at

<http://www.arin.net/elections/aso/asobios.html>

NANOG Voting Procedures

Tuesday, October 19, 2004

- ★ Vote Online – <http://onsite.arin.net>
- ★ Polls Open – 9:00 AM EDT
- ★ Polls Close – 5:00 PM EDT
- ★ Eligibility – Registered for NANOG 32
- ★ Required Information
 - ▶ First & Last Name
 - ▶ E-mail address used for NANOG 32 registration

Your Participation



Your Involvement is Key!

- ★ ARIN's website: <http://www.arin.net>
- ★ Public Policy Mailing List: ppml@arin.net
- ★ ARIN-announce: arin-announce@arin.net
- ★ NRO website: <http://www.nro.org>
- ★ WSIS website: <http://www.wsis.org>

Register Now for ARIN XIV

- ★ Agenda:
<http://www.arin.net/ARIN-XIV/>
- ★ Registration Hours:
 - ▶ Sunday: 12PM – 4PM
 - ▶ Monday: 8AM – 5PM
 - ▶ Tuesday: 3PM – 7PM
- ★ Onsite Registration Fee: \$150 (waived for ARIN General Members in good standing)
- ★ Registration Services Help Desk Open onsite during ARIN XIV

Participation This Week

Monday [9 PM] BoF – Optimizing Operational Input to ARIN:
What Is Needed and How Do We Get It?

Tuesday [9AM – 5PM] VOTE for the ICANN ASO AC

Tuesday [5 PM] Tutorial - ARIN's CA

Tuesday [6PM] Policy Proposal BoF

Register & attend for
ARIN XIV

Contact Information

★ Registration Services Help Desk

- ▶ (703) 227-0660
- ▶ Monday – Friday, 7AM – 7PM US Eastern time

★ Billing Help Desk

- ▶ (703) 227-9886
- ▶ Monday - Friday, 9AM-5PM US Eastern Time

★ Hostmaster E-mail

- ▶ hostmaster@arin.net
- ▶ Ticketing system for request/inquiry tracking

★ <http://www.arin.net>

THANK YOU