Internet Number Resource Management

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
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
How Many IP Addresses?

- Astronomically Large Numbers
  - IPv4 – $2^{32}$
  - IPv6 – $2^{128}$

- Judicious Management Required
  - Finite Total
  - Technical Requirements
  - Preclude Capricious Consumption
Who Owns IP Addresses?

- Not Property. Cannot be:
  - Bought
  - Sold
  - Traded
  - Transferred
  - Attached
  - Otherwise Provided to Anyone Other Than by Policy

- Provided on Non-Permanent Basis for Use
  - RIR to Internet Service Provider (ISP)
  - ISP to Consumers
  - In Manner Described by Community Developed Technical and Operational Policy

- Returned to Provider When Use is No Longer Required
IP Addresses
Do Not Disclose

- Geographical Location
- Who is Using
- Where Obtained
- Intended Purpose
History & Evolution
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.”
ICANN
Internet Corporation for Assigned Names and Numbers

What Is It?
Self-Regulatory Body

What Does It Do?
Top Level Technical Coordination of the Internet
  - Names
  - Numbers
  - Root Servers
Organization

ICANN

Supporting Organizations
ASO
ccNSO
gNSO

Committees
ALAC
GAC
SSAC
RSSAC
TLG
ASO
Address Supporting Organization

What Is It?
Advisory Body for Global Addressing Policy

What Does It Do?
- Advise ICANN Board
- Select ICANN Board Directors [2]
- Select ICANN NOMCOM Member [1]
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.
NRO structure

1 member from each RIR

3 members from each region (2 + 1)
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
http://www.nro.net
WSIS flowchart

WSIS Phase I
2002/3
5 Prepcoms
Regional Meetings
Geneva Summit

Declaration of Principles

Plan of Action

WSIS Phase II
2004/5
3 Prepcoms
Regional Meetings
Tunis Summit

WGIG

?
WSIS II – Plan

Prepcom-1
Roadmap to Tunis

Task Force on Financial Mechanisms (TFFM)
Updates/consultations

Relevant thematic, regional and other related meetings

Prepcom-2
(1 sub-committee)
stocktaking of implementation at national, regional & international levels;
consideration of the report of TFFM;
beginning of consideration of the final document(s);
consideration of the preliminary report of WGIG;
promotion of partnerships between stakeholders;
consideration of any other relevant issues.

Open-ended informal consultations (if needed)

Prepcom-3
(2 sub-committees)
stocktaking of implementation at national, regional & international levels;
consideration of final report of WGIG;
promotion of partnerships between stakeholders;
continuation of consideration of the report of TFFM (if needed);
consideration of any other relevant issues;
negotiation of final document(s).

Summit

Working Group on Internet Governance (WGIG)
Updates/consultations

Updates/consultations

Updates/consultations

Updates/consultations

* from http://www.itu.int/wsis/preparatory2/hammamet
RIR Structure
RIR Structure

Not for Profit

• Fee for Services
• Open Financial Reporting
RIR Structure

Not for Profit
• Fee for Services
• Open Financial Reporting

Membership
• Open to All Interested Parties
• Consists of Thousands
  – ISPs
  – Other Companies
  – Stakeholders
RIR Structure

**Not for Profit**
- Fee for Services
- Open Financial Reporting

**Membership**
- Open to All Interested Parties
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  - ISPs
  - Other Companies
  - Stakeholders

**Industry Regulated**
- Elected Executive Board
- Member Approved Activities
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
IP ADDRESS MANAGEMENT

Policy Objectives
- ConServe
- Aggregate
- Unique
- Fair

Administration Principles
- Consistent
- Neutral
- Impartial
Policy Development
Policy Development Principles

- Inclusive
- Transparent
- Documented
- Bottom-Up
Policy Development Cycle
Policy Development Cycle

Need
Policy Development Cycle

- Need
- Discuss
Policy Development Cycle

- Need
- Discuss
- Consensus
Policy Development Cycle

- Need
- Discuss
- Consensus
- Implement
Policy Development Cycle

- Discuss
- Consensus
- Need
- Implement
- Evaluate
Internet Number Resource Status Report

As of 30 September 2004
IPv4 /8 Address Space Status

- Allocated:
  - APNIC: 13
  - ARIN: 19
  - LACNIC: 2
  - RIPE NCC: 16
  - Central Registry: 94

- Available:
  - IANA Reserve: 94

- Not Available:
  - Multicast: 16
  - Private Use: 1
  - Public Data Network: 1
IPv4 Allocations from RIRs to LIRs/ISPs Yearly Comparison

APNIC, ARIN, LA CNIC, RIPE NCC

/8s

1999 2000 2001 2002 2003 2004
IPv4 Allocations
RIRs to LIRs/ISPs
Cumulative Total

- APNIC 9.13
  - 33%
- LACNIC 0.51
  - 2%
- RIPE NCC 8.57
  - 31%
- ARIN 9.32
  - 34%
ASN Assignments
RIRs to LIRs/ISPs
Yearly Comparison
ASN Assignments
RIRs to LIRs/ISPs
Cumulative Total

ARIN 11,676 54%
RIPE NCC 6,750 31%
APNIC 2,588 12%
LACNIC 600 3%
IANA IPv6 Allocations to RIRs
(no of /23)

- APNIC: 4
- ARIN: 3
- LACNIC: 1
- RIPE NCC: 23
RIR IPv6 Allocations

- **APNIC, 164, 25%**
- **RIPE-NCC, 386, 58%**
- **ARIN, 107, 16%**
- **LACNIC, 10, 1%**
RIR IPv6 Allocations (no of /32)

- APNIC: 177.5
- ARIN: 107.75
- LACNIC: 10
- RIPE NCC: 5027
IPv6 Allocations
RIRs to LIRs/ISPs
Yearly Comparison

[Graph showing IPv6 allocations from 1999 to 2004 by APNIC, ARIN, LACNIC, and RIPE NCC]
IPv6 Allocations
RIRs to LIRs/ISPs
Cumulative Total

<table>
<thead>
<tr>
<th>RIR</th>
<th>Cumulative Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARIN</td>
<td>115, 16%</td>
</tr>
<tr>
<td>APNIC</td>
<td>172, 24%</td>
</tr>
<tr>
<td>RIPE NCC</td>
<td>398, 57%</td>
</tr>
<tr>
<td>LACNIC</td>
<td>19, 3%</td>
</tr>
</tbody>
</table>
Total IPv6 Allocations from RIRs to LIRs/ISPs Top 10 Countries

- **US**: 94
- **JP**: 71
- **DE**: 68
- **NL**: 42
- **UK**: 35
- **KR**: 31
- **IT**: 22
- **FR**: 23
- **SE**: 19
- **CA**: 17
Number Resources in Africa

IPv4
- ARIN: 81.3%
- RIPE NCC: 18.5%
- APNIC: 0.2%

ASN
- ARIN: 64.9%
- RIPE NCC: 34.1%
- APNIC: 1.0%

IPv6
- RIPE NCC 1 (tn)
- ARIN 5 (za)
Links to RIR Statistics

- Raw Data/Historical RIR Allocations:
  - http://www.aso.icann.org/stats/index.html
  - http://www.iana.org/assignments/ipv4-address-space

- RIR Stats:
  - http://www.apnic.net/info/reports/index.html
  - http://www.ripe.net/ripencc/pub-services/stats
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
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/i pep.html
Milestones

- Proposed Policy Submitted 60 Days Prior to Open Policy Meeting
- ARIN AC Initial Review
- Formal Proposal Posting 30 Days Prior to Policy Meeting
- Open Policy Meeting
- ARIN AC Appraisal
- Last Call for 10 Working Days
- ARIN AC Last Call Review
- ARIN BoT Ratification
- ARIN Staff
- Put Into Practice

Need

Discuss

Consensus

Implement

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
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