IP Adressing and the RIR System

Prepared & Presented By
The Number Resource Organization
Consisting of the Five RIRs
AfriNIC, APNIC, ARIN, LACNIC, RIPE NCC

Overview

- IP Addressing
  - What is an IP address?
  - How does an IP address make the Internet work?
- The RIR System
  - Where did the RIRs come from?
  - What does an RIR look like?
  - How does an RIR manage IP address space?

IP Addressing

What is an IP Address?

"On the Internet, nobody knows you're a dog..."

"On the Internet, nobody knows you're a dog."

by Peter Steiner, from The New Yorker, (Vol.69 (LXIX) no. 20)

"On the Internet..." You are nothing but an IP Address!

What is an Address?

- *An identifier which includes information about how to find its subject*
  - (according to some rules of interpretation)
- Normally hierarchical
  - Each part provides more specific detail
- For example…ways to find APNIC
  - +61 7 3858 3188
  - www.apnic.net
  - pwilson@apnic.net
  - 202.12.29.142

What is an IP Address?

- *Internet identifier including information about how to reach a network location*
  - (via the Internet routing system)
- IPv4: 32-bit* number. Written in Dotted Decimal Notation

  205.150.58.7

  4 billion different host addresses
- IPv6: 128-bit* number. Written in Hex Decimal Notation

  2001:0503:0C27:0000:0000:0000:0000:0000

  16 billion billion network addresses

* bit = binary digit

What else is an IP Address?

- Necessary for Internet Routing
- A finite "Common Resource"
- Never "owned" by address users
  - Are not property
  - Cannot be bought, sold, traded…
  - Provided on Non-Permanent Basis for Use
  - Returned to Provider When No Longer Required

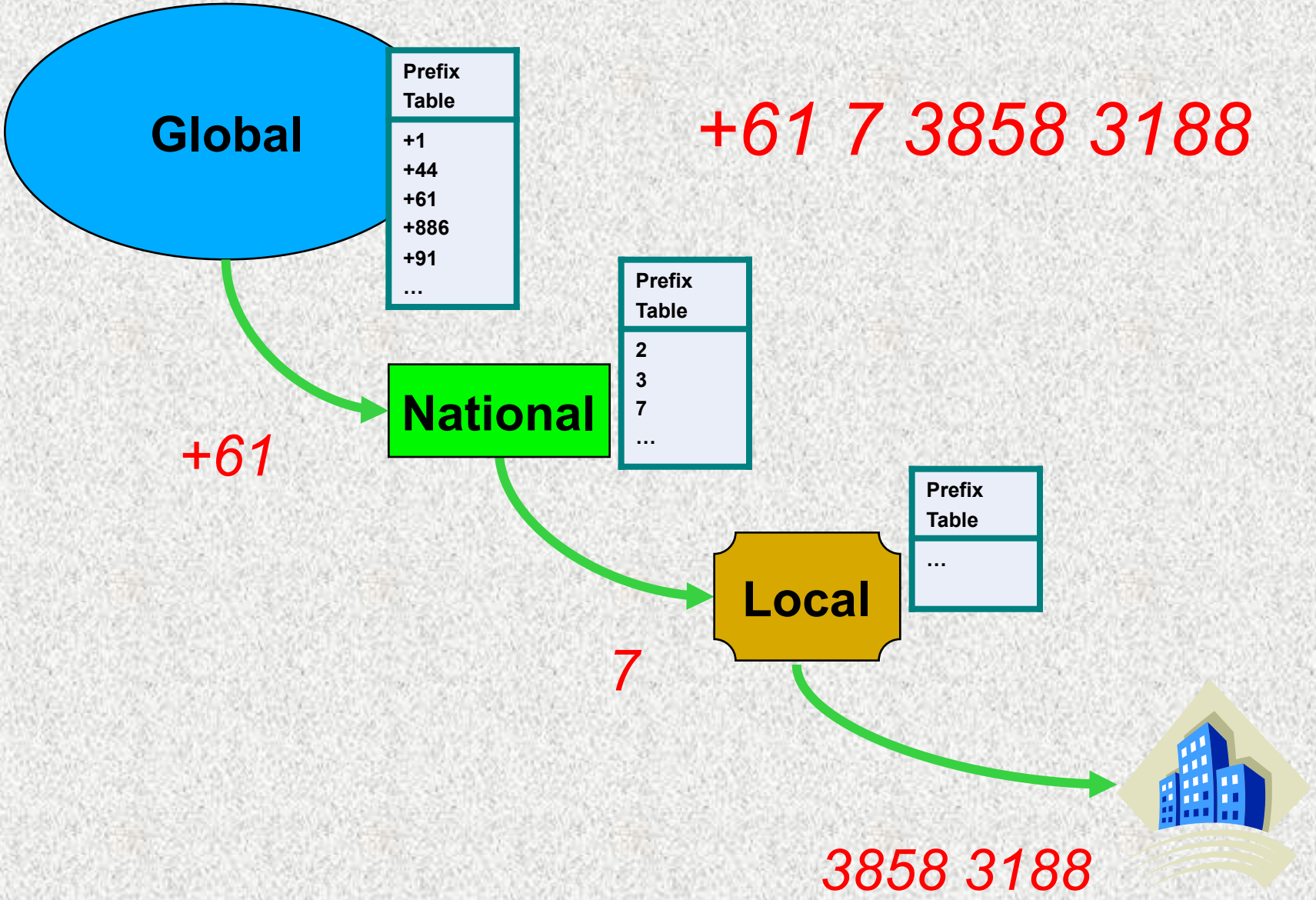
- **Not dependent upon the DNS**

How does an IP address make the Internet work?

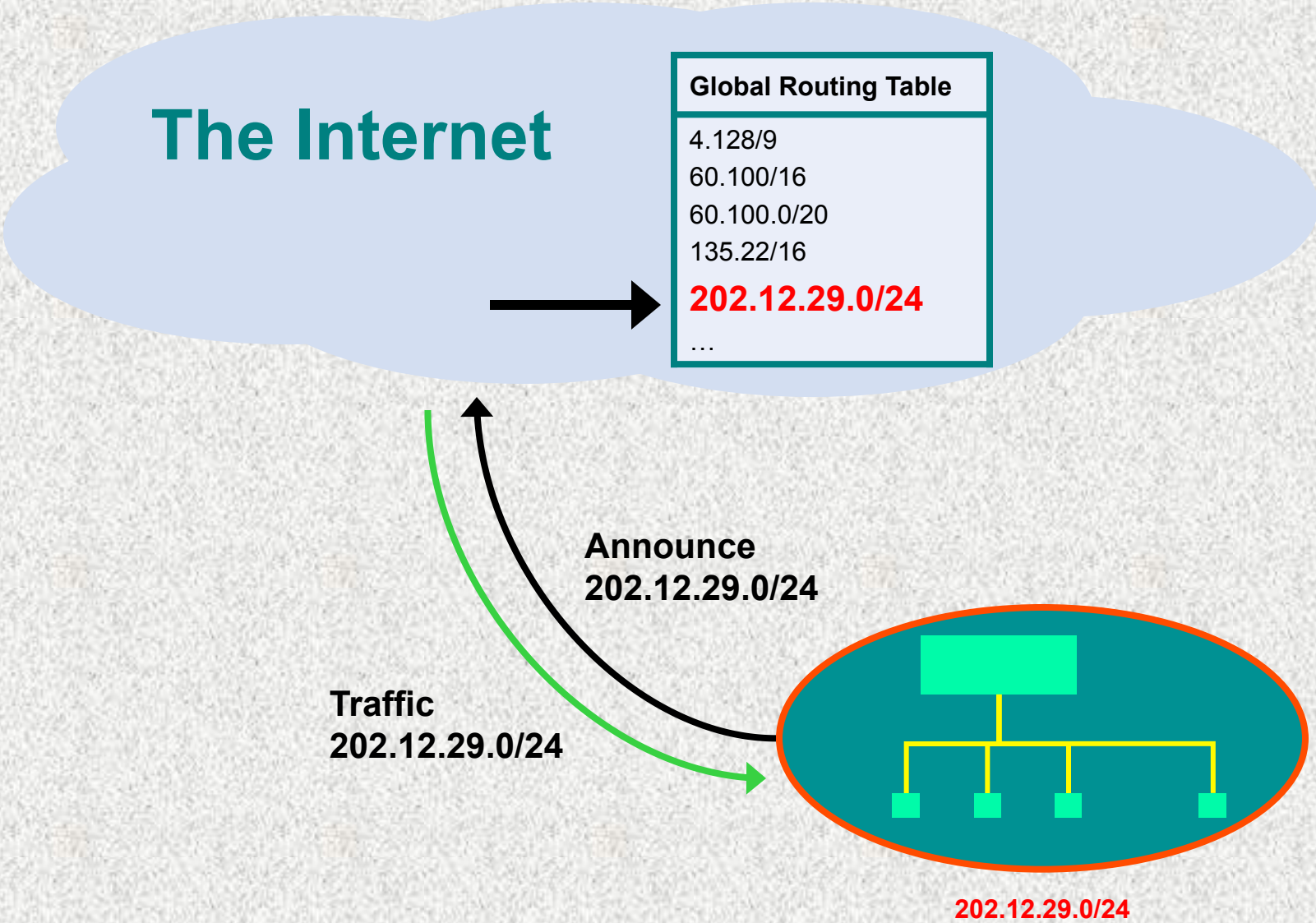
Internet Geography

- "Nations" of the Internet are networks
  - "Frontiers" are border routers
  - "Treaties" are peering relationships between networks
- It's a very dynamic world…
  - New nations are formed daily
  - New borders are established hourly
  - Routing tables change by the minute
  - Driven almost entirely by industry
  - No centralised control
- Very different from "traditional" networks
  - Telephony for example

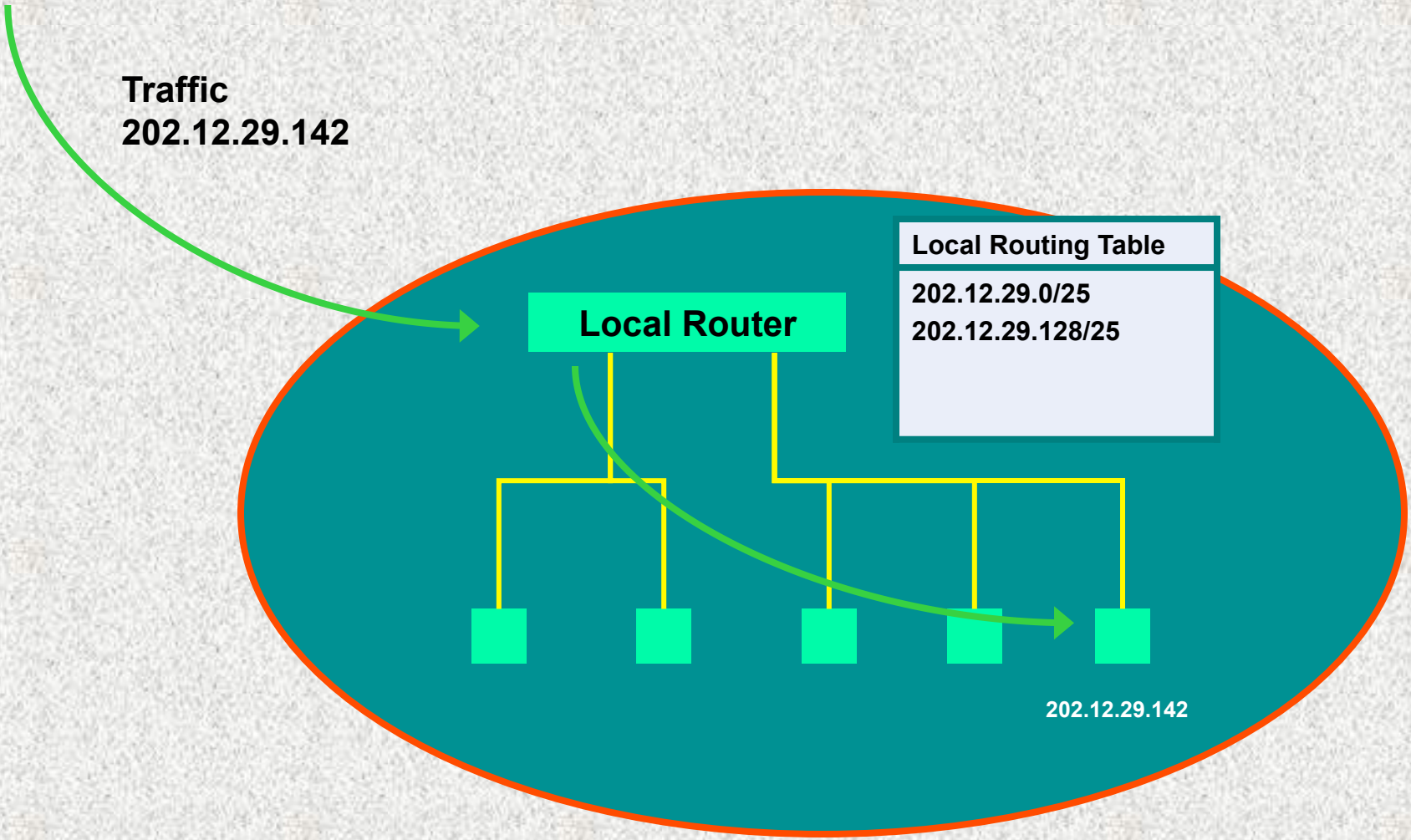
Telephone Network Routing



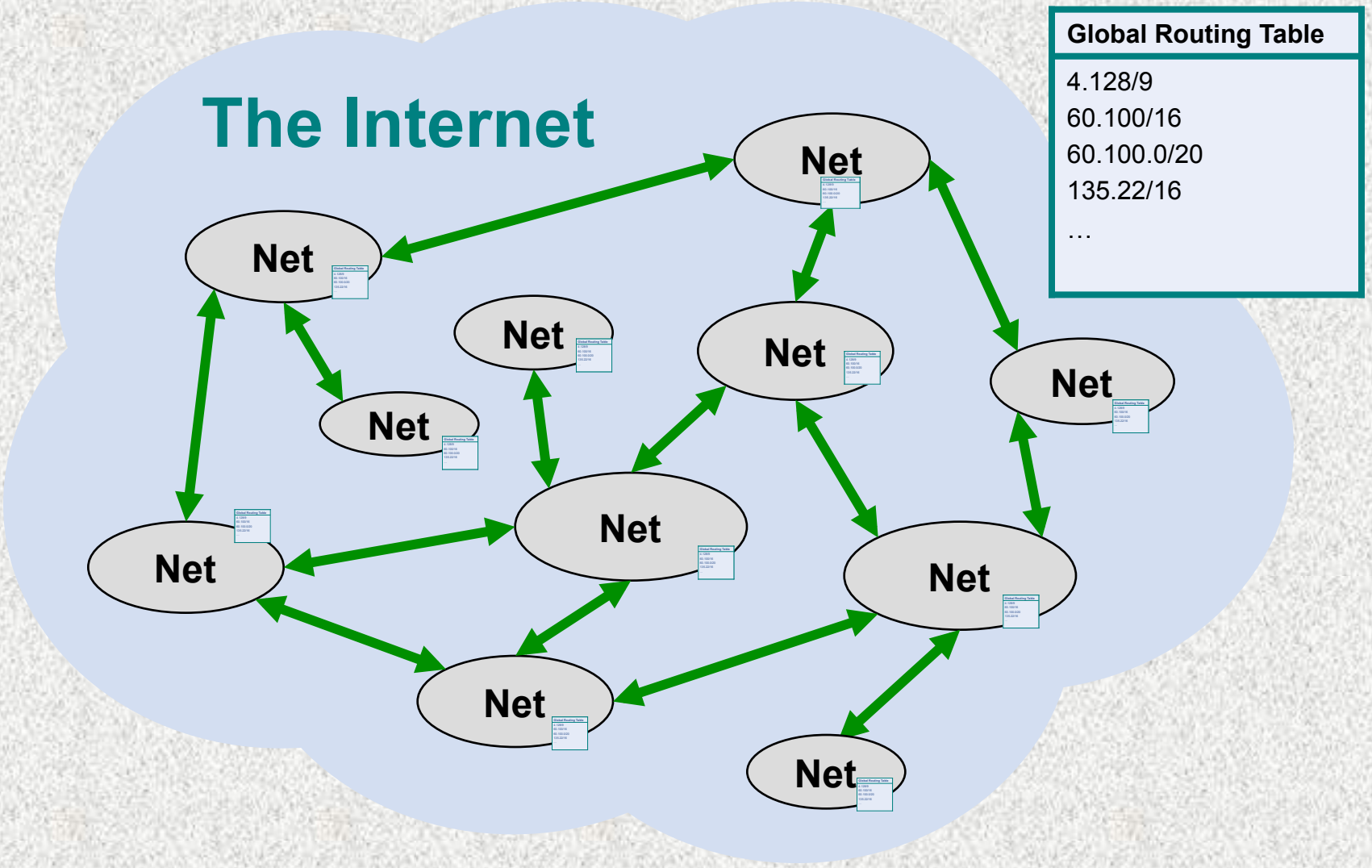
Internet Address Routing



Internet Address Routing



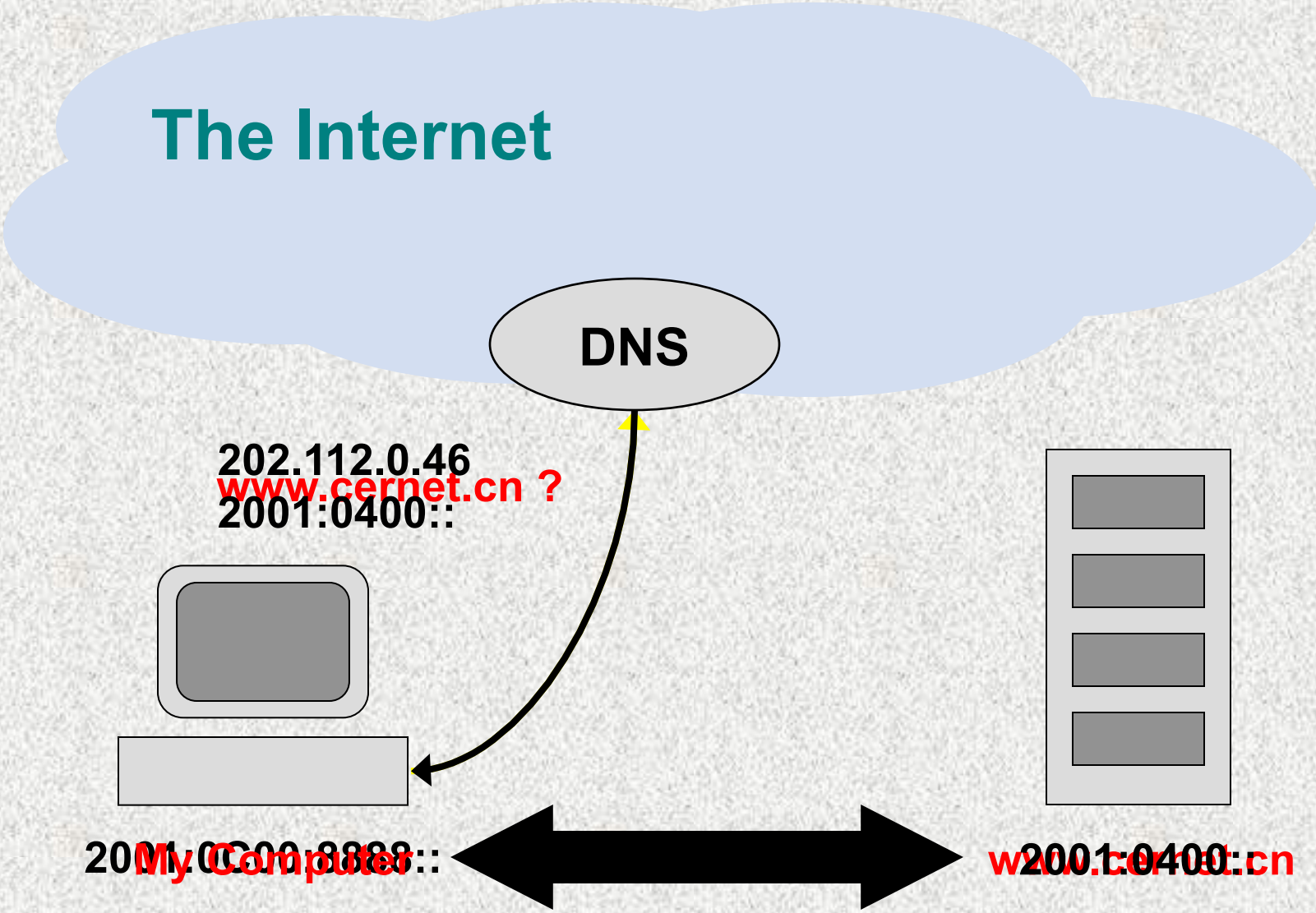
Global Internet Routing



IP Addresses are not Domain Names

- IP Address [Identifier]
  - "Computer-friendly"
  - Unique number identifies computer on Internet
  - Used for routing
- DNS Name [Reference]
  - "People-Friendly"
  - Maps host name to unique IP address
  - Not used for routing

IP addresses are not domain names...



Definitions

- Routing

  The act of moving information across an internetwork from a source to a destination.

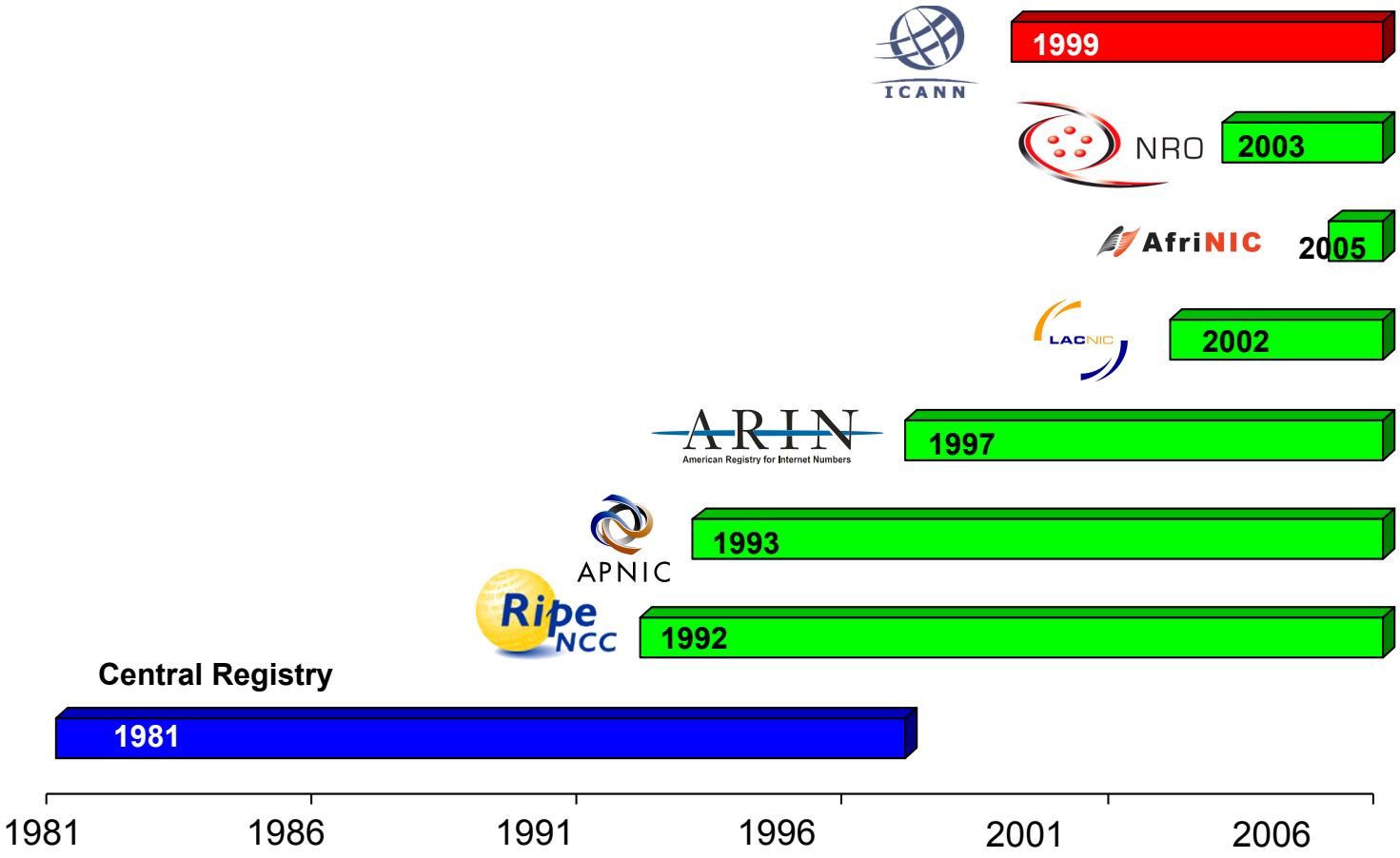
- Domain Name System [DNS]

  A means of storing and retrieving information about hostnames and IP addresses in a distributed data base.

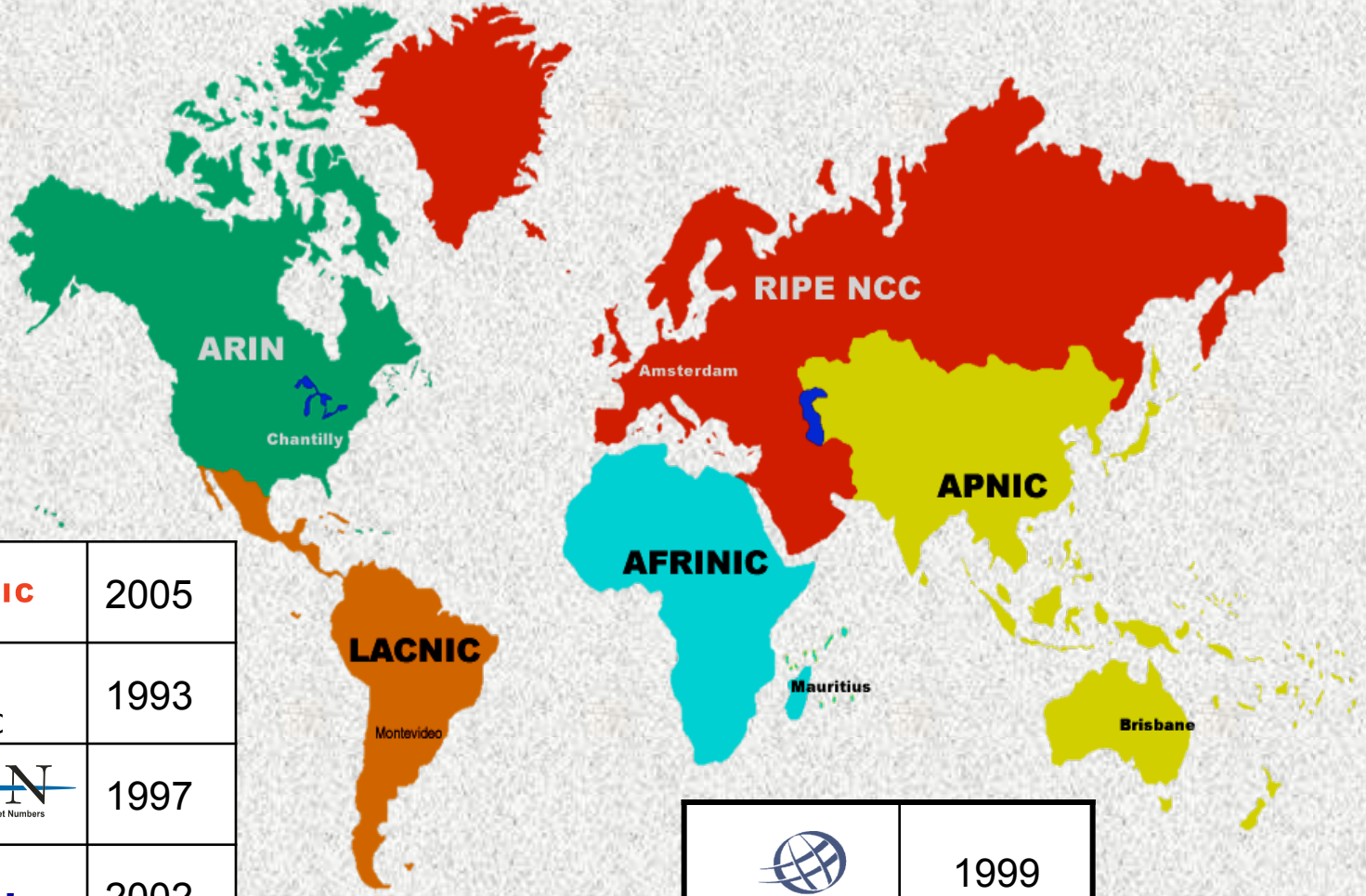
The RIR System

Where did the RIRs Come From?

RIR System Evolution



RIR Service Regions

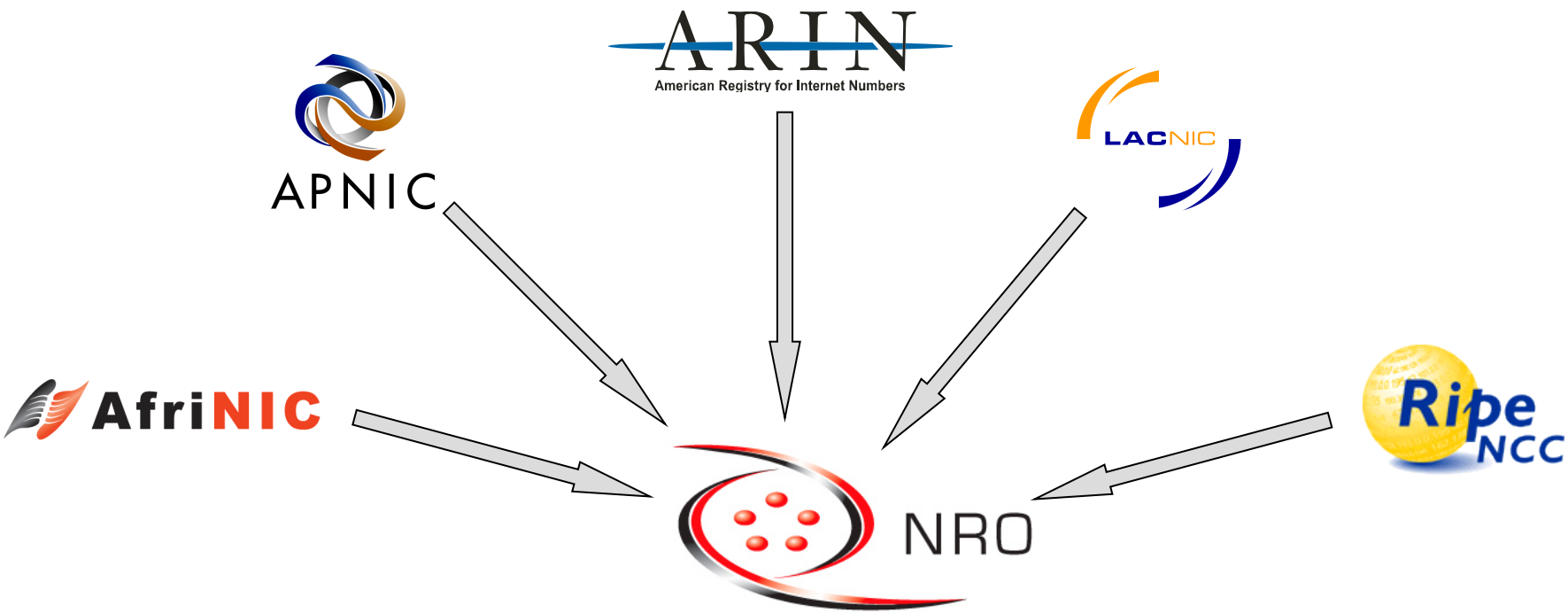


AfriNIC	2005
APNIC	1993
ARIN — American Registry for Internet Numbers	1997
LACNIC	2002
Ripe NCC	1992

ICANN	1999
NRO	2003

Number Resource Organization

24 October 2003



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.

What does an RIR Look Like?

RIR Structure

Not For Profit	Membership Organization	Community Regulated
• Fee for Services NOT Number Resources • 100% membership funded	• Open • Broad-based – Private Sector – Public Sector – Civil Society	• Community Developed Polices • Member Elected Executive Board • Open and transparent processes

RIR Services

Number Resources	Organization	Policy Development Process
• IP Address Allocation Assignment • ASN Assignment • Directory Services – WHOIS – IRR • DNS (reverse)	• Elections • Meetings • Information Dissemination – Web Site – Newsletters – Round Tables • Training	• Maintain e-mail discussion lists • Conduct public policy meetings • Publish policy documents

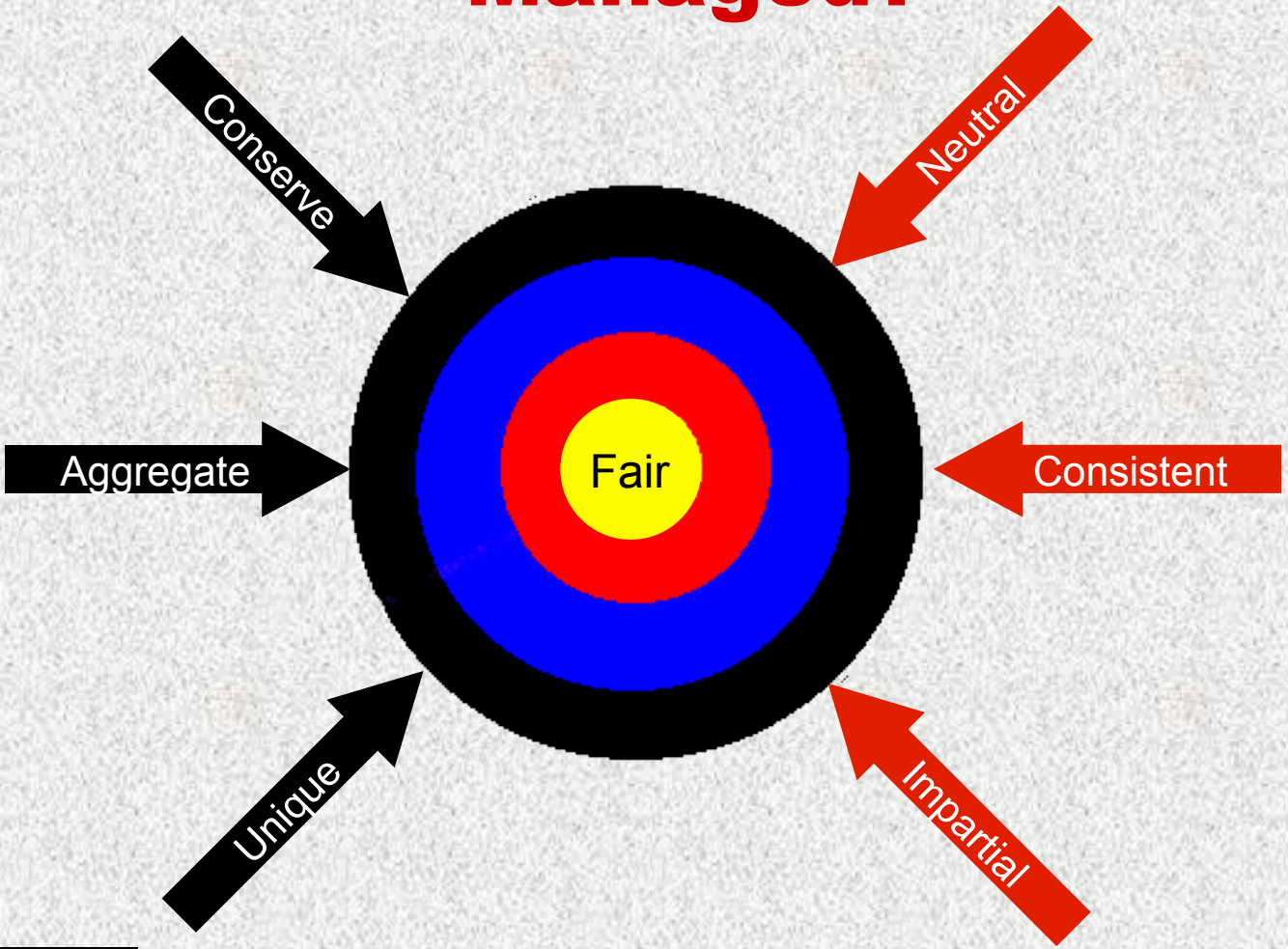
How does an RIR Manage IP Address Space?

Why Manage IP Address Space?

Address Space Constraints Require Good Stewardship

- Technical Requirements
  - Defined Characteristics Create a Finite Common Resource
  - Network Topology Realities
- Prevent Capricious Consumption
- Ensure Fair Distribution to All

How Are IP Addresses Managed?



Administration

Address Management Terms

Provision	The act of allocating or assigning IP Address Space.
Allocation	The act of providing IP Address space to a service provider.
Assignment	The act of providing IP Address space to an enterprise.
Service Provider	Entity that provides Internet transit service to enterprises and other service providers.
Enterprise	Entity that provides Internet access to its community.

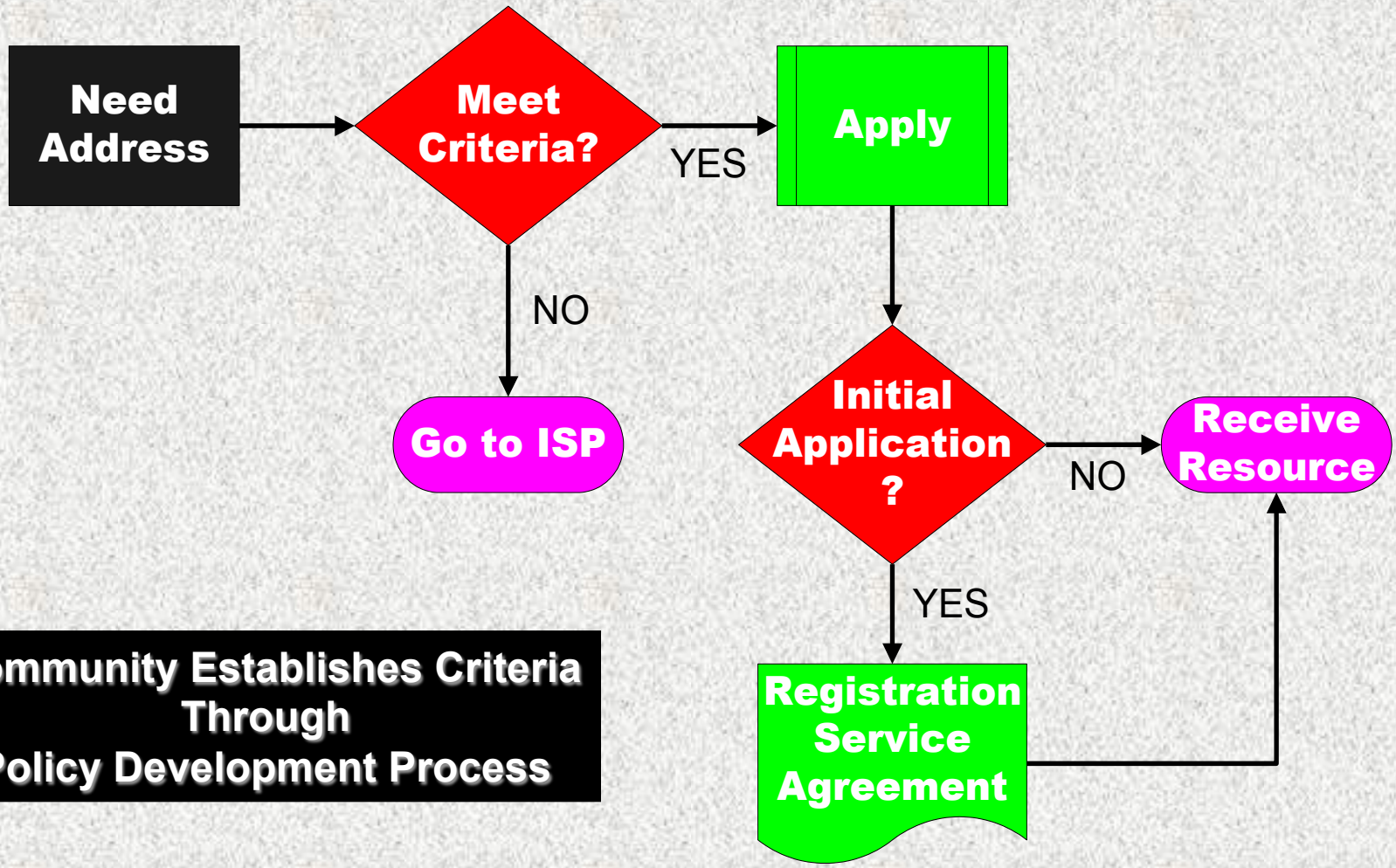
Discussing IPv4 [Formerly]

Class	Host Addresses
1 Class C	256
4 Class C	1,024
16 Class C	4,096
1 Class B	65,536
1 Class A	16,777,216

Discussing IPv4 [Now]

CIDR Prefix	Class Equivalent	Host Addresses
/24	1 Class C	256
/22	4 Class C	1,024
/20	16 Class C	4,096
/16	1 Class B	65,536
/8	1 Class A	16,777,216

How Are IP Addresses Provisioned?

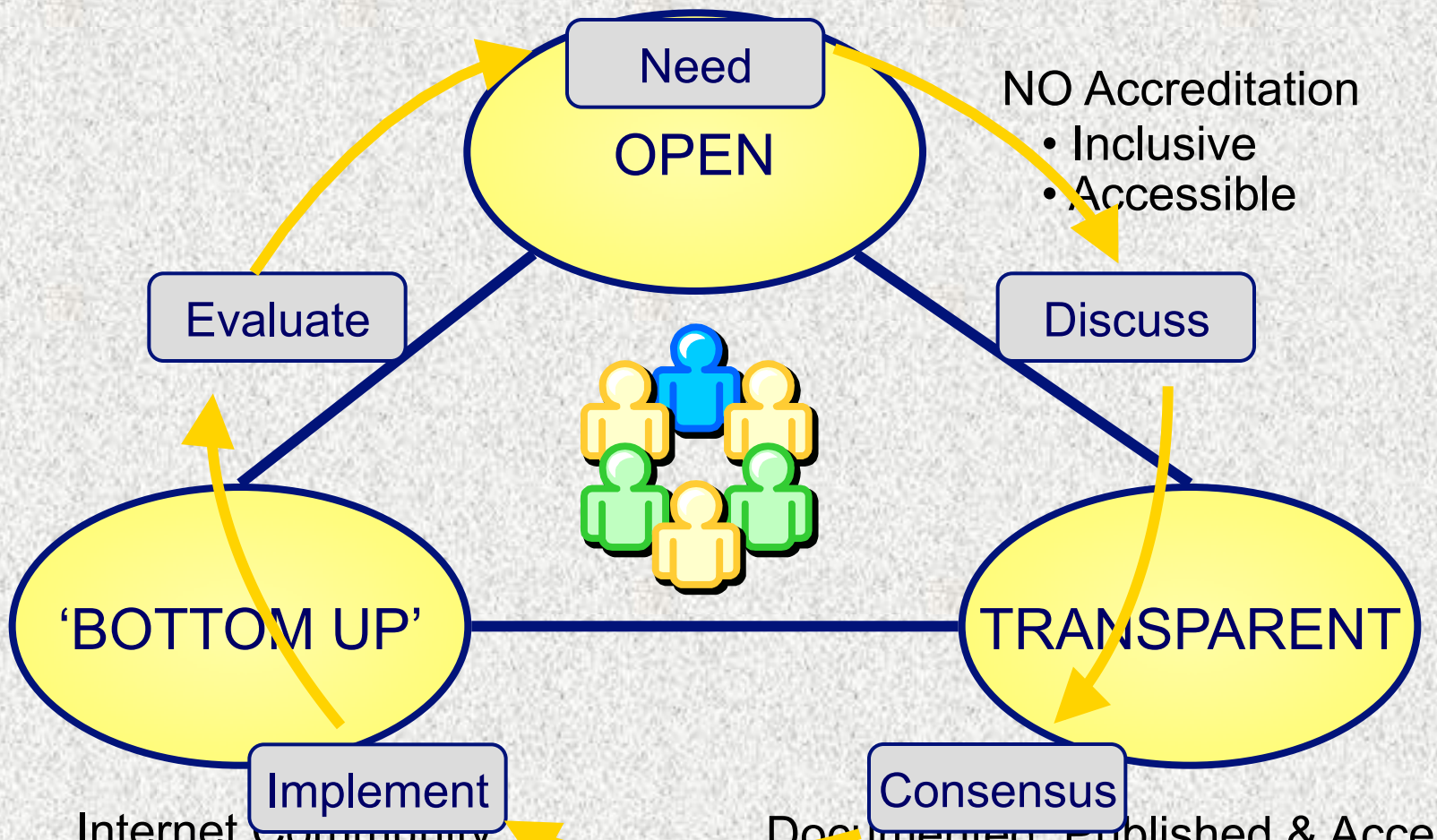


Who Are the IP Address Provisioning Organizations?

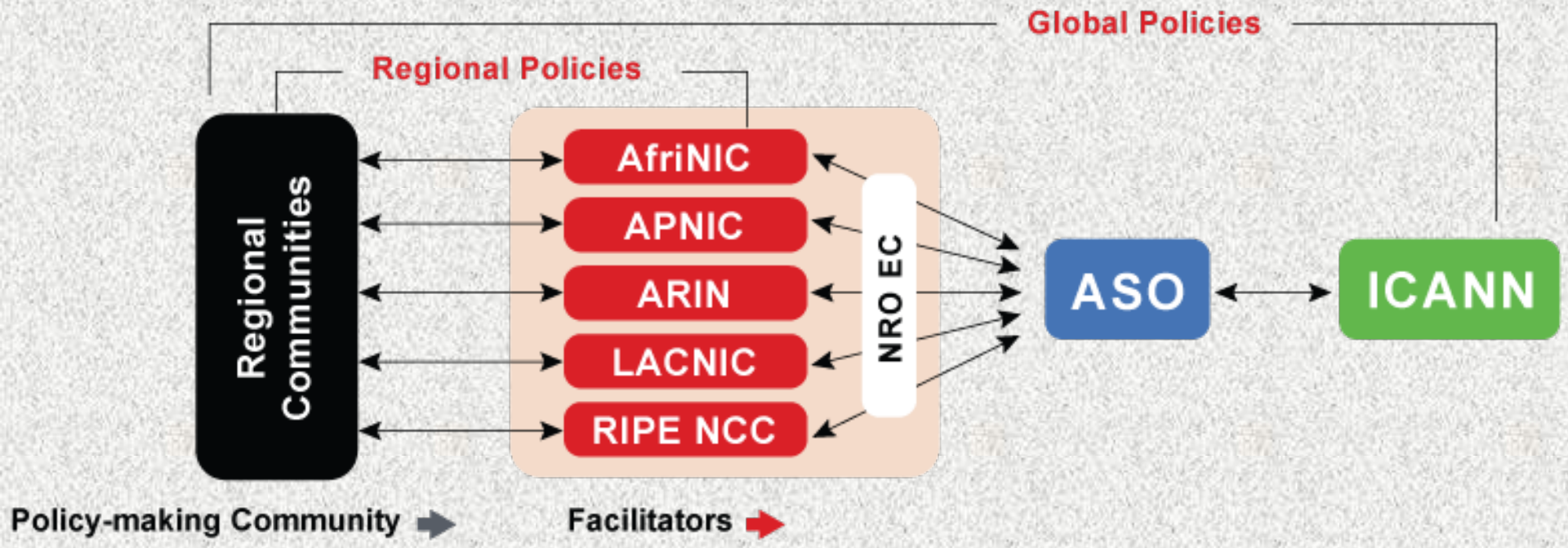
ICANN IANA	• Allocate to RIRs
RIR AFRINIC, APNIC, ARIN, LACNIC, RIPE NCC	• Allocate to Service Providers • Assign to Enterprises
NIR/LIR/ISP	• Reallocate to Service Providers • Reassign to Enterprises

Policy Development Process

RIR Policy Development Process



The RIR PDP in the Global PDP



Public Policy Meetings

RIR	DATE	LOCATION
AfriNIC – The African registry for Internet Numbers	12-14 December 2005	Cairo
APNIC	28 February - 3 March 2006	Perth
ARIN – American Registry for Internet Numbers	26 – 28 October 2005	Los Angeles
LACNIC	22- 26 May 2006	TBA
Ripe NCC	10 – 14 October 2005	Amsterdam

Links

http://www.afrinic.net

http://www.apnic.net

http://www.arin.net

http://www.lacnic.net

http://www.ripe.net

http://www.nro.net

http://www.icann.org

Thank You

Discussion