Introduction to IP Addressing
&
IPv6 Deployment Status

IP Addressing

- What is an IP Address?
- How is IP Address Space Managed?
- How is IP Address Space Policy Developed?

IPv6 Deployment Status

- IPv6 Policy History
- IPv6 Allocation Criteria and Process
- Statistics

What is an IP Address?

- A Number Used for Routing
- Not Dependent on DNS
- A Finite Public Resource
- Not Owned
- IP Does Not Mean "Intellectual Property"

How is IP Address Space Managed

- Address Space Management Objectives
- Implementation of Policy

Conservation

- Efficient Use of Resources
- Based on Need

Address Management Objectives

Aggregation

- Limit Routing Table Growth
- Support Provider-Based Routing Policies

Registration

- Ensure Uniqueness
- Trouble Shooting

Policy Implementation
[Industry Self-Regulation]

- RIR Staffs

- Service Providers

# How is IP Address Policy Developed?

- According to Policy Development Principles
- In a Cyclical Manner

Policy Development Principles

- Open
  - Anyone Can Participate
  - Policy Fora
  - Mail Lists

- Documented
  - Formal Policy Documents
  - Implementation Procedures

- Transparent
  - Mail List Archives
  - Minutes
    - Policy Fora
    - RIR Boards

- Developed Bottom-Up
  - Internet Community
  - Stakeholders
  - Technology Changes
  - IETF

OPEN

TRANSPARENT

Discuss   Consensus

Policy
Development
Cycle

Need   Implement

Evaluate
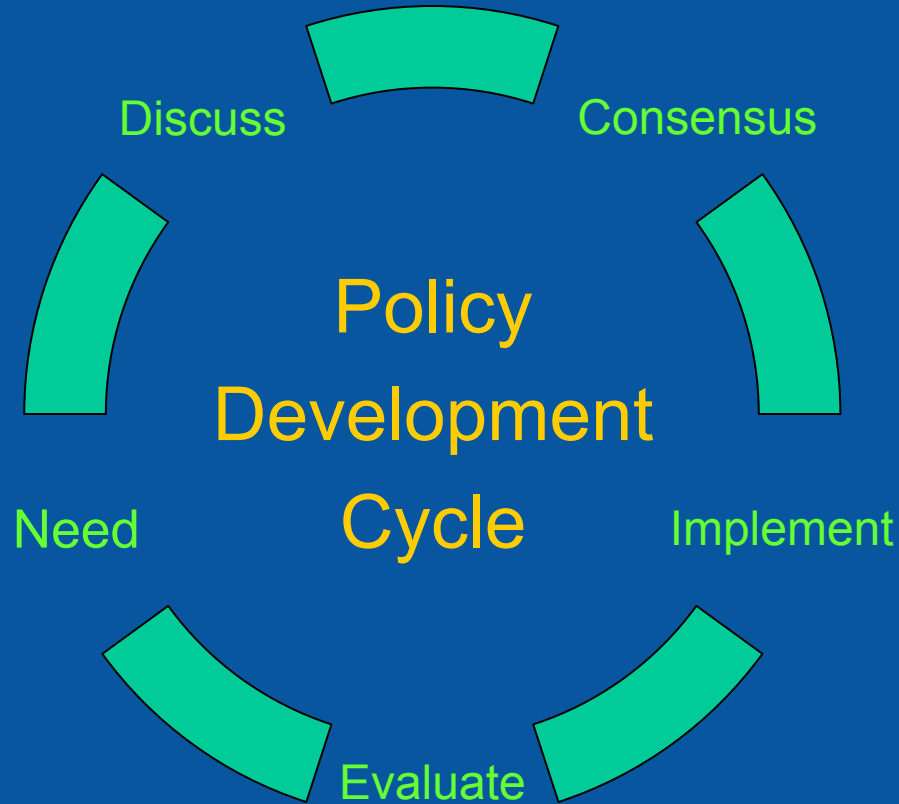
DOCUMENTED

**DEVELOPED
BOTTOM UP**

Recent Open Policy Meetings

- ## APNIC (2 per year)
  3 - 6 Sep ** APNIC 12 - Kita-Kyushu, Fukuoka, JP

- ## RIPE NCC (3 per year)
  9 - 13 Sep ** RIPE 43 - Rhodes, GR

- ## ARIN (2 per year)
  30 Oct – 1 Nov ** ARIN X – Eugene, Oregon, US

- ## LACNIC (2 per year)
  11 – 12 Nov ** Mexico City, MX

IPv6 Deployment Status

IPv6 Policy History

- **Apr 1999** – Joint RIR Consensus
  - Interim Policy
  - IPv6 Allocations Begin

- **Oct 1999** – Policy Review Begins

- **Jun 2001** – Joint RIR Consensus
  - Policy and Technical Boundaries
  - End Site Assignments [RFC 3177]

- **May 2002** – Joint RIR Consensus
  - Initial Allocation Size to ISP/LIR
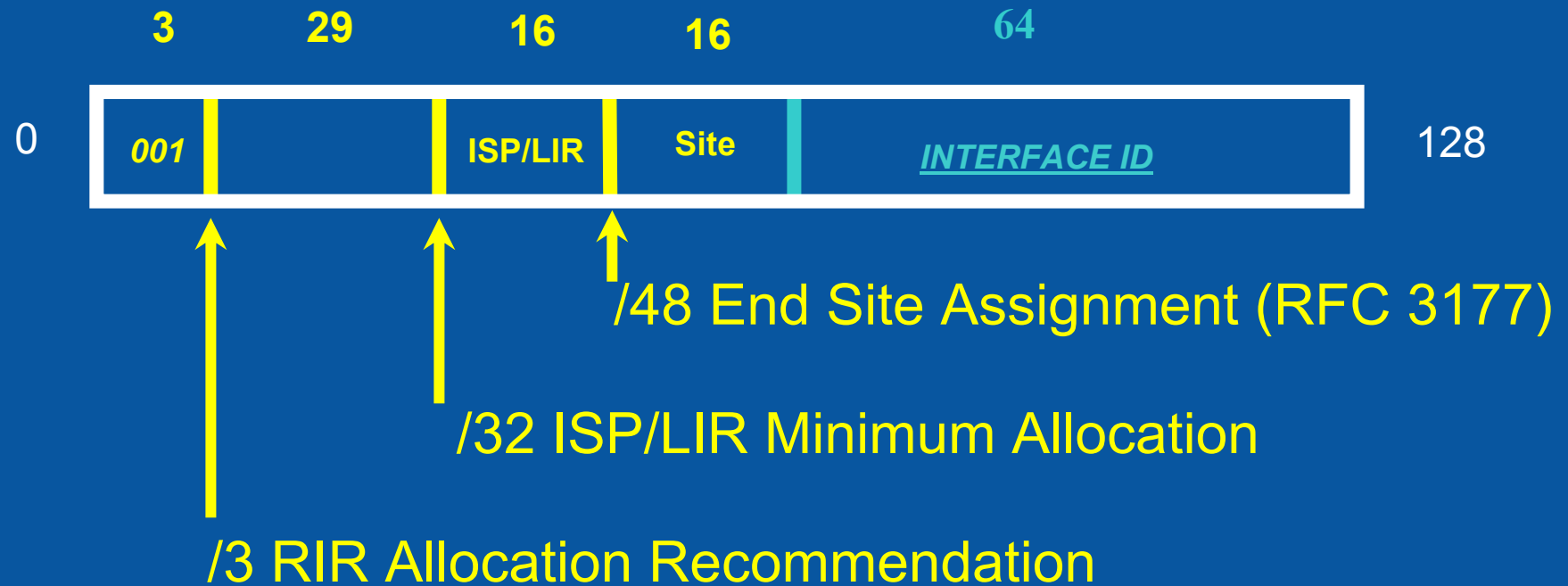 - Initial Allocation Criteria

RFC 2374 IPv6 Boundaries

```
+--+------+------+--+------+------+------------------+
| 3|  13  |  13  | 6|  13  |  16  |      64 bits     |
+--+------+------+--+------+------+------------------+

|FP| TLA  | sub  |Res| NLA | SLA  |    Interface     |
|  | ID   | TLA  |  |  ID  |  ID  |       ID         |
+--+------+------+--+------+------+------------------+
     /23    /29 /35    /48        /64
  <--- public topology -->
                        <-site->
                                <----Interface--->
```

*(Mixes **Policy** and **Technology**)*

IPv6
Technical & Policy Boundaries

	3	29	16	16	64
0	001		ISP/LIR	Site	INTERFACE ID	128

/48 End Site Assignment (RFC 3177)

/32 ISP/LIR Minimum Allocation

/3 RIR Allocation Recommendation

Assignments by ISP/LIR

ISP/LIR to End Site

- /48
  - Usual Assignment Size
  - 16 bits for subnets
- /64 only one subnet
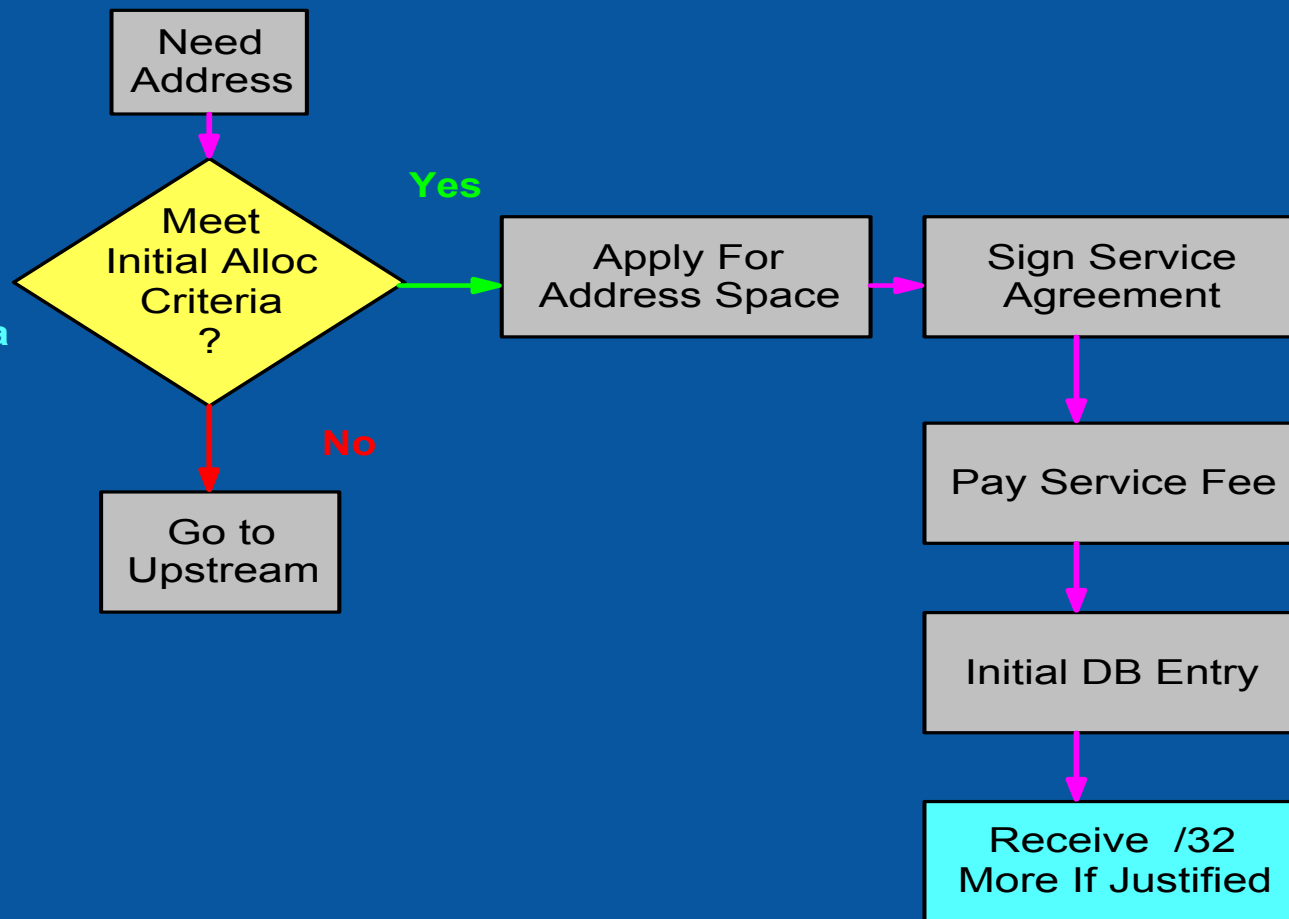- /128 one device connecting

ISP Infrastructure

/48 per POP

RFC 3177 "IAB/IESG Recommendations on IPv6 Address Allocations to Sites"
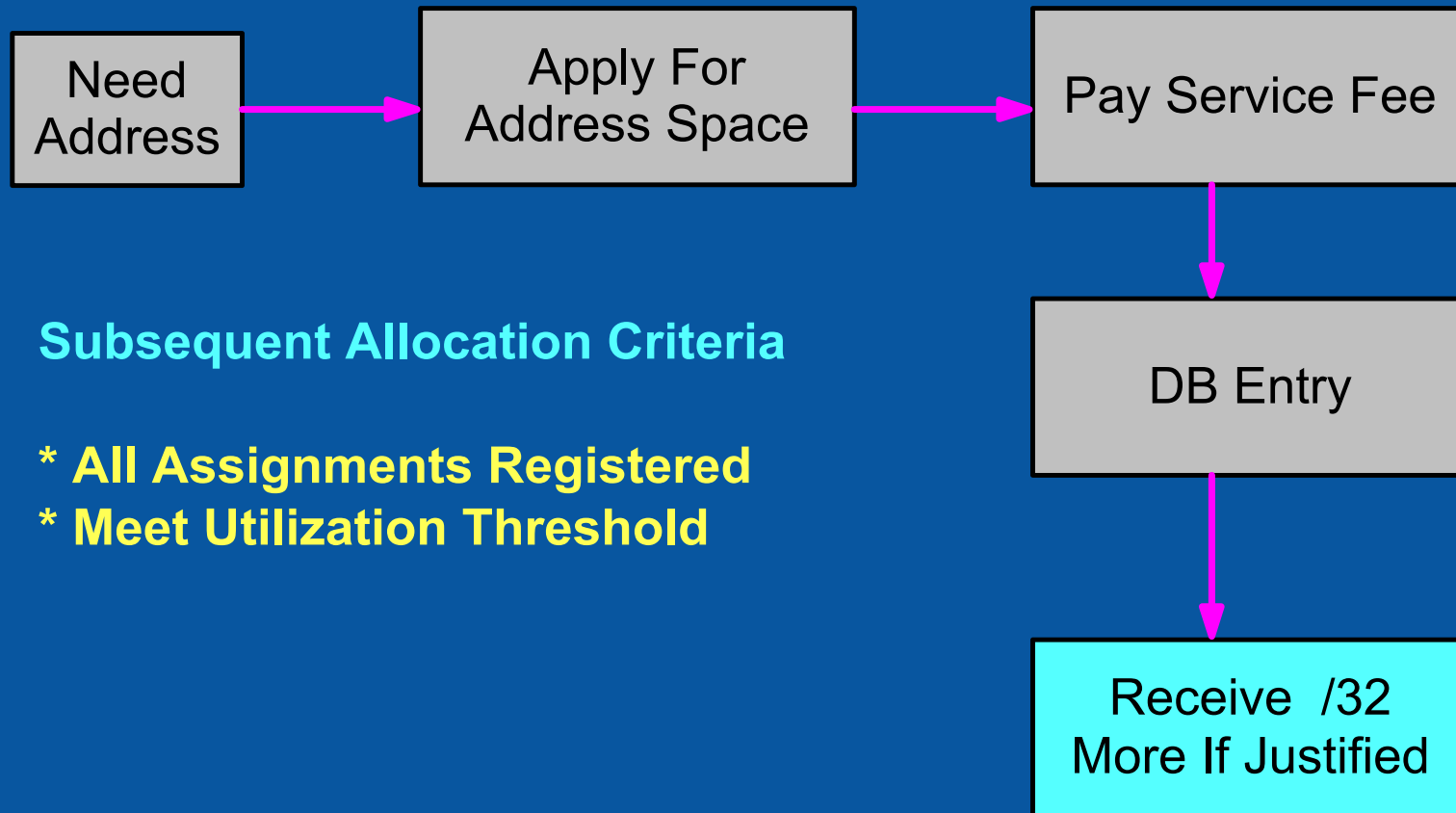
IPv6 Initial Allocation Criteria & Process

Initial Allocation Criteria

* Not An End-Site
* Be An ISP/LIR
* Plan To Provide:
    - IPv6 Connectivity
    - 200 /48 In 2 Years

Need Address

Meet Initial Alloc Criteria ?

Yes

No

Apply For Address Space

Sign Service Agreement

Go to Upstream

Pay Service Fee

Initial DB Entry

Receive /32 More If Justified

Subsequent Allocation Criteria & Process

```
┌──────────┐      ┌──────────────┐      ┌──────────────────┐
│  Need    │ ───▶ │  Apply For   │ ───▶ │ Pay Service Fee  │
│  Address │      │ Address Space│      │                  │
└──────────┘      └──────────────┘      └──────────────────┘
                                                │
                                                ▼
                                        ┌──────────────────┐
                                        │    DB Entry      │
                                        └──────────────────┘
                                                │
                                                ▼
                                        ┌──────────────────┐
                                        │  Receive  /32    │
                                        │ More If Justified│
                                        └──────────────────┘
```

Subsequent Allocation Criteria

* All Assignments Registered
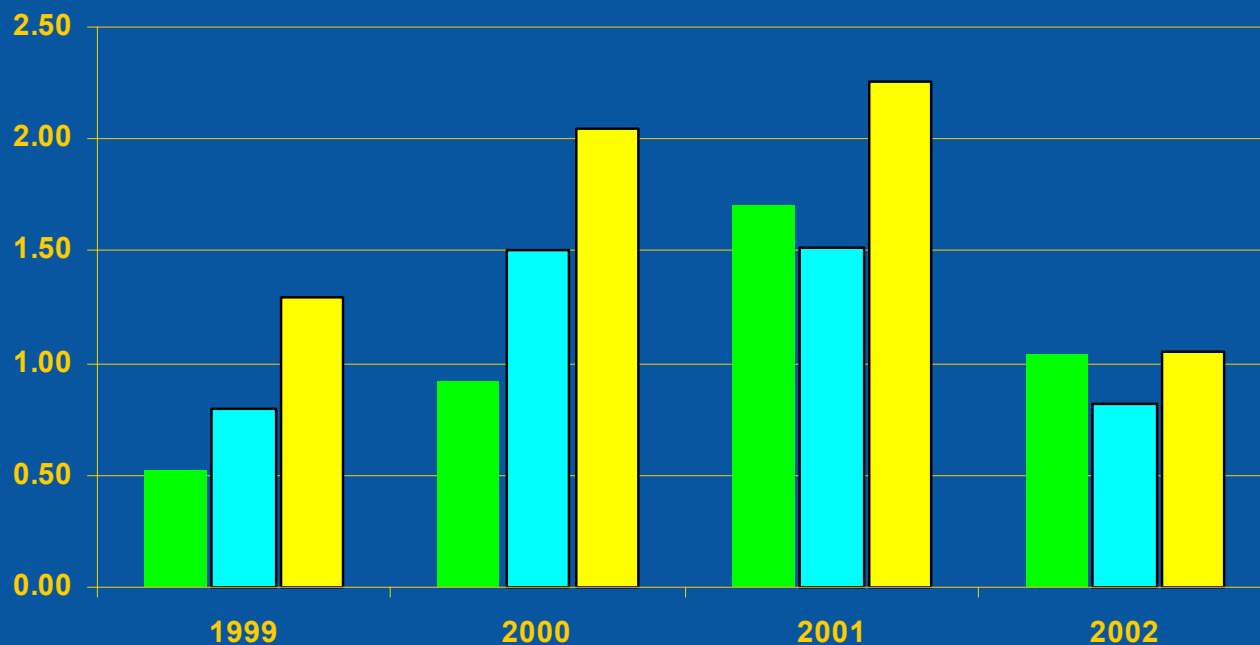*** Meet Utilization Threshold**
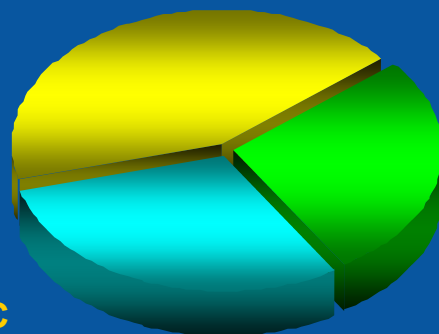
Statistics
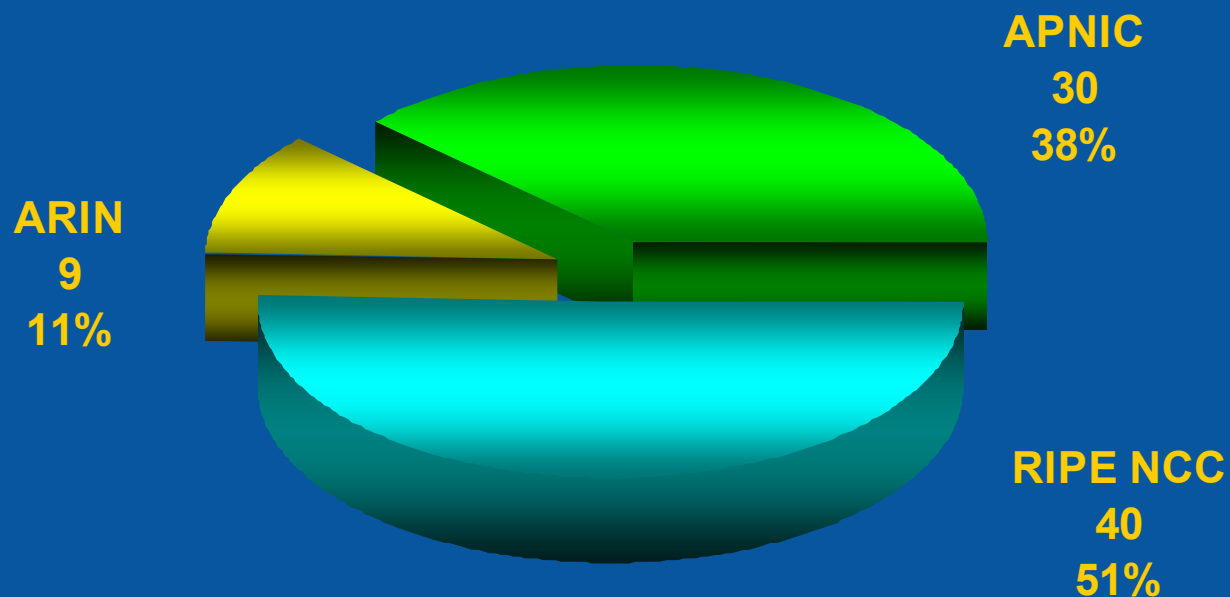
IPv4 /8 Address Space Allocation
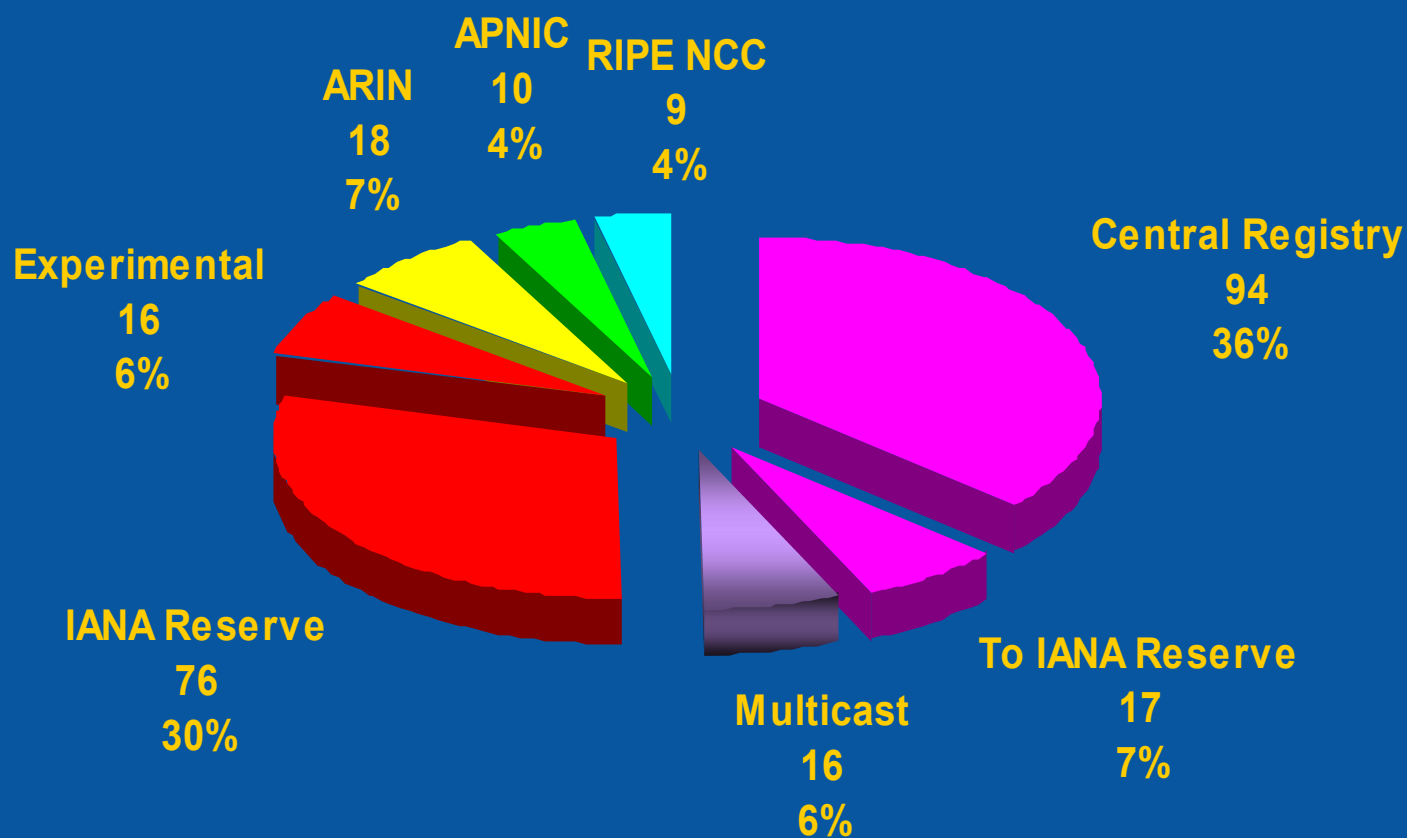
Cumulative IPv4 Allocations

ARIN
6.65
43%

APNIC
4.19
27%

RIPE NCC
4.62
30%

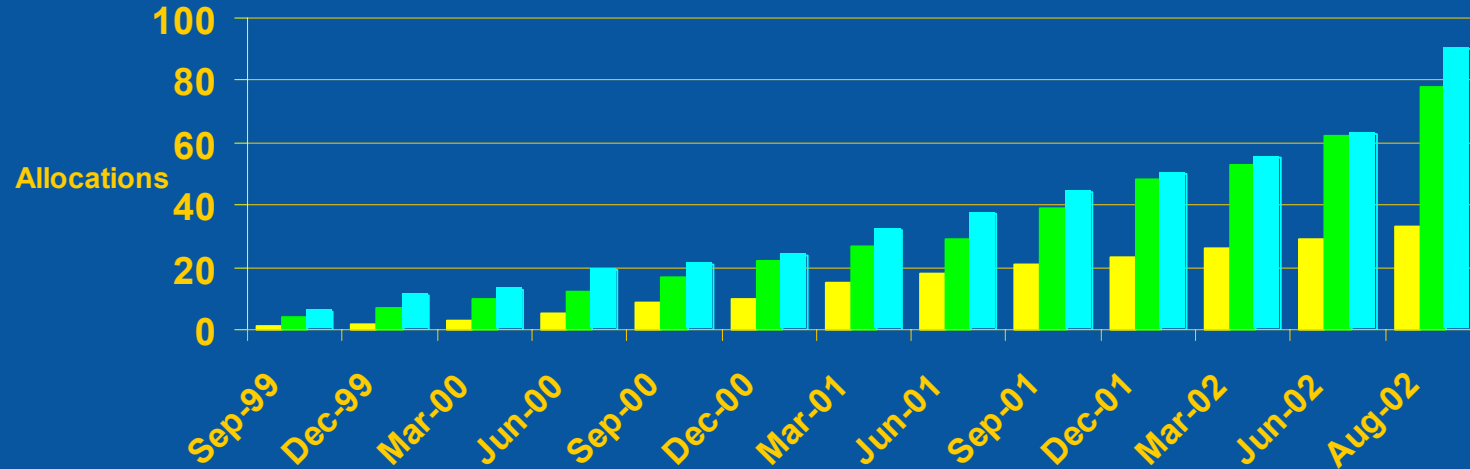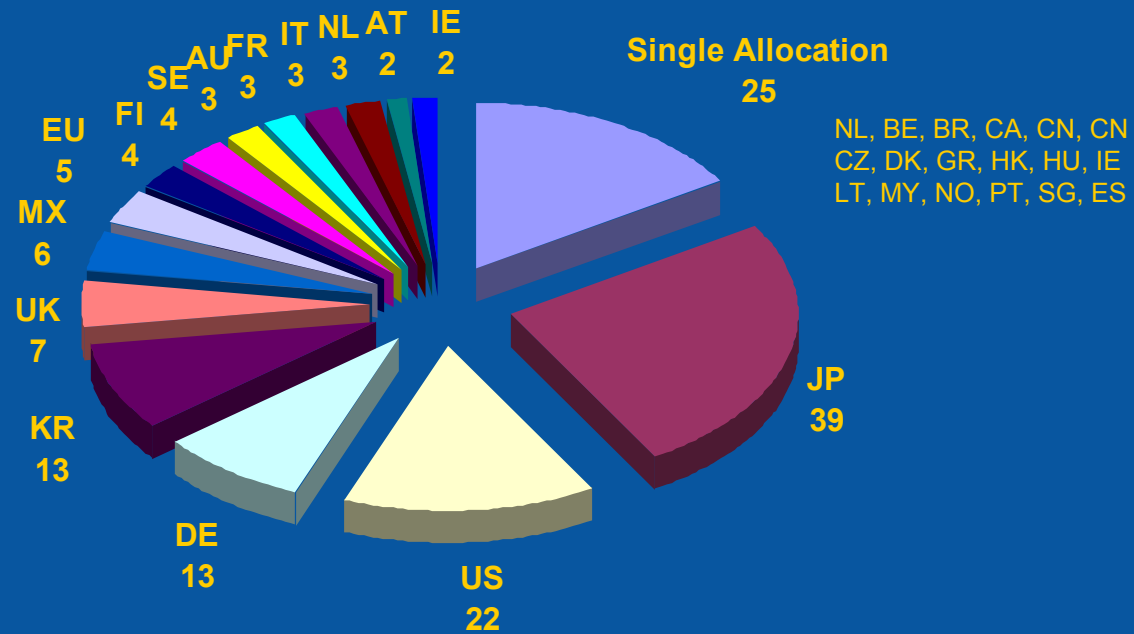# 2002 IPv6 Allocations
31 Aug 2002

APNIC
30
38%

ARIN
9
11%

RIPE NCC
40
51%

Cumulative IPv6 Allocations
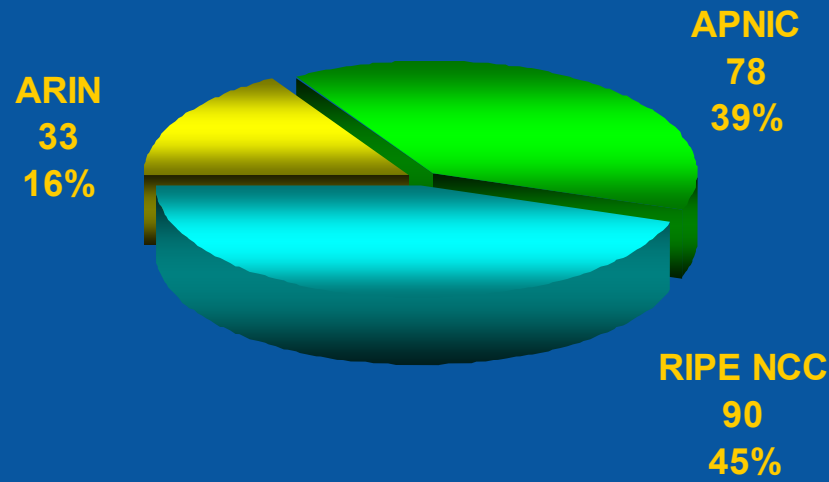
IPv6 Allocation By Country

Single Allocation
25

NL, BE, BR, CA, CN, CN
CZ, DK, GR, HK, HU, IE
LT, MY, NO, PT, SG, ES

JP 39

US 22

DE 13

KR 13

UK 7

MX 6

EU 5

FI 4

SE 4

AU 3

FR 3

IT 3

NL 3

AT 2

IE 2

Vielen Dank

Hvala

Merci

ขอบคุณ

Bedankt

Thank You

Díky

Gracias

شكراً

Teşekkürler

Obrigado!

Grazie

Köszönettel