



**RIPE NCC**  
RIPE NETWORK COORDINATION CENTRE

# Local Internet Registry

Training Course

November 2015

# Schedule



09:00 - 09:30

**Coffee, Tea**

11:00 - 11:15

**Break**

13:00 - 14:00

**Lunch**

15:30 - 15:45

**Break**

17:30

**End**

# Introductions



- Name
- Number on the list
- Experience with the RIPE NCC
- Goals

# Overview



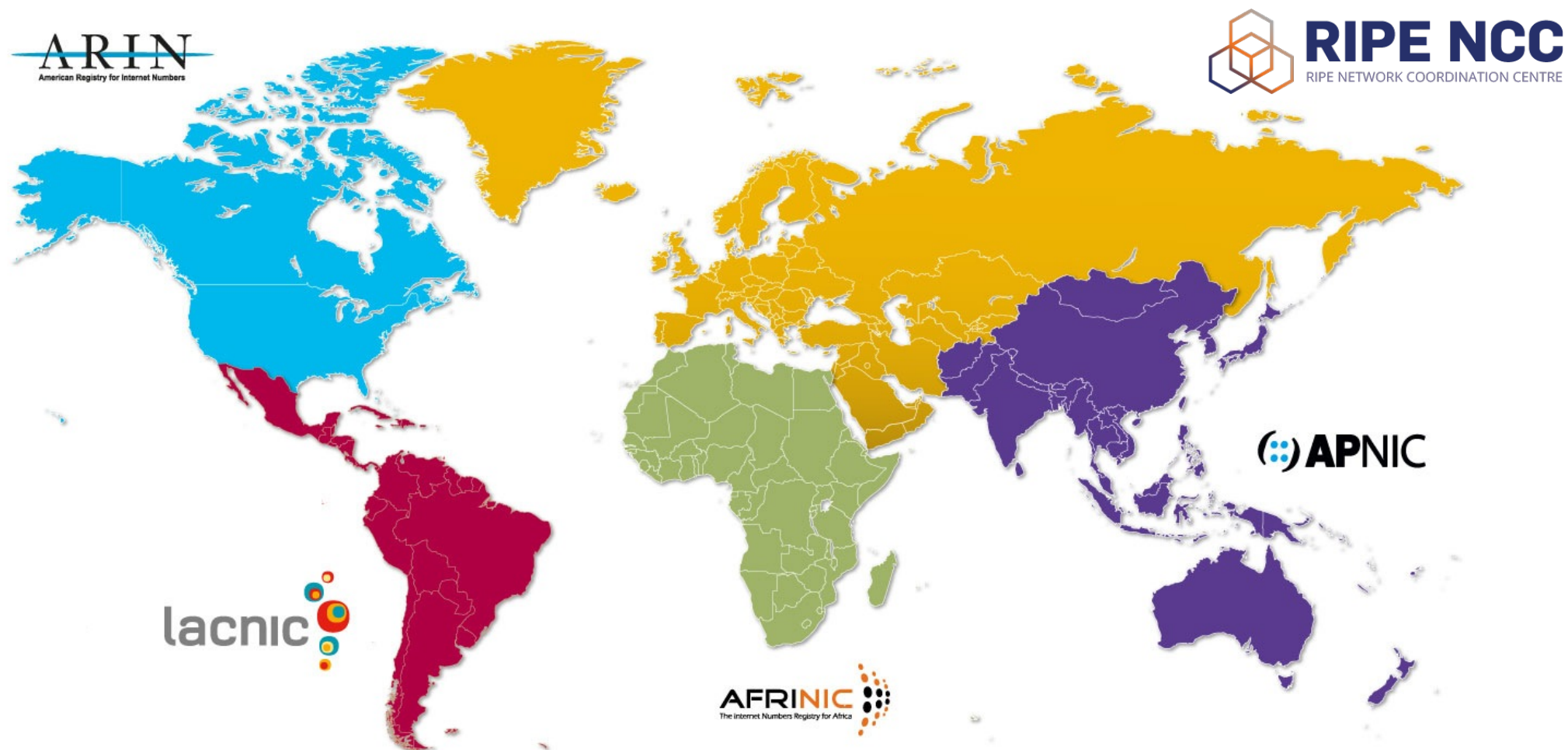
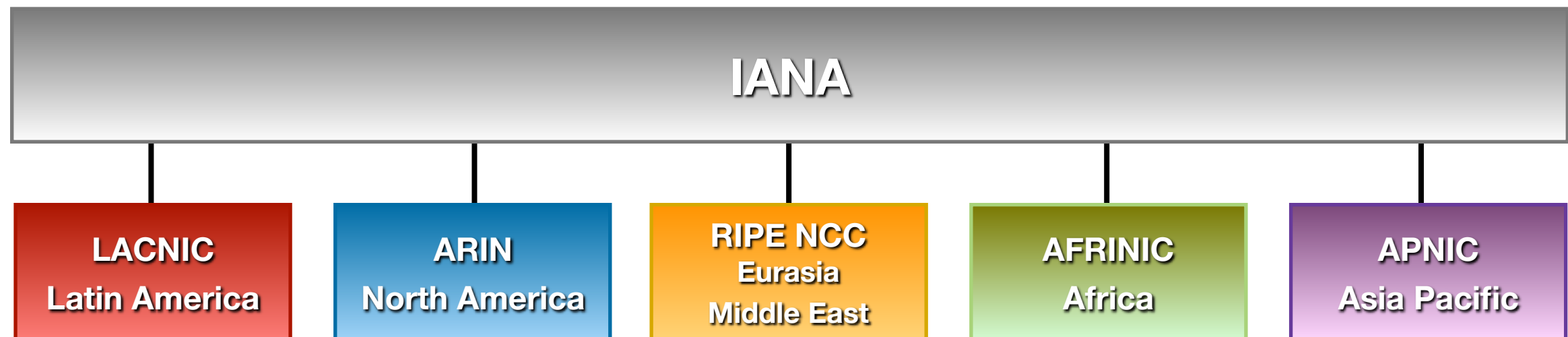
- The Internet Registry (IR) System
- Participating
- Being an LIR
- Exercise: Being an LIR Contact
- The RIPE Database
- Getting Resources
- Transfers
- Distributing Resources
- Exercise: Making Assignments
- Exercise: Registering Assignments
- Managing Resources
- Tips and Tools



# **The Internet Registry System**

## Section 1

# The Internet Registry System



# Regional Internet Registries



- **Five RIRs worldwide**
  - Not-for-profit organisations
  - Funded by membership fees
  - Policies decided by regional communities
  - Neutral, Impartial, Open, Transparent

# Goals: Registration



- **Why?**
  - Ensure uniqueness of Internet number resources
  - Provide contact information
- **How?**
  - RIR whois databases
- **Results:**
  - IP address space used only by one organisation
  - Information available on users of Internet number resources

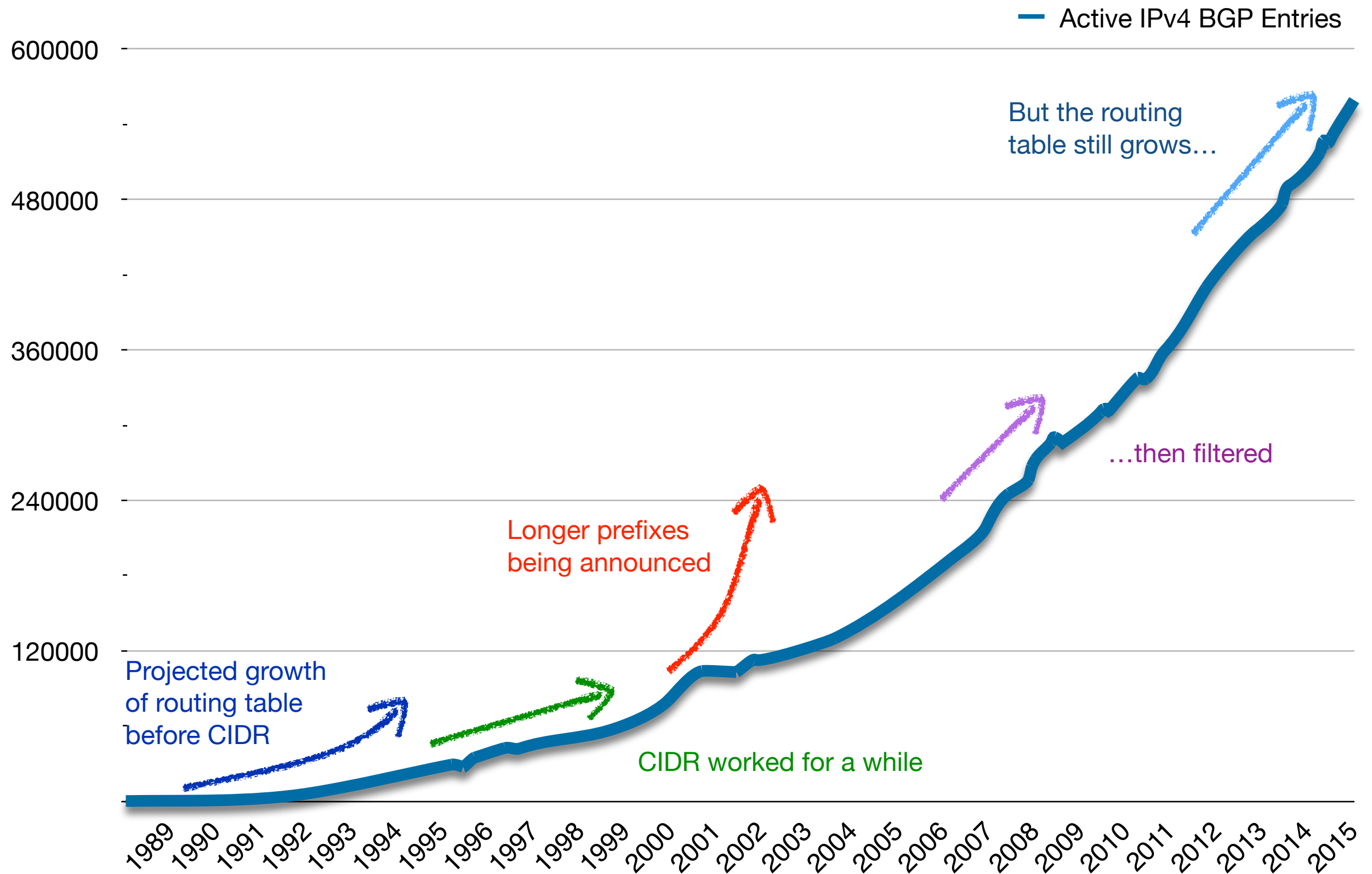


# Goals: Aggregation

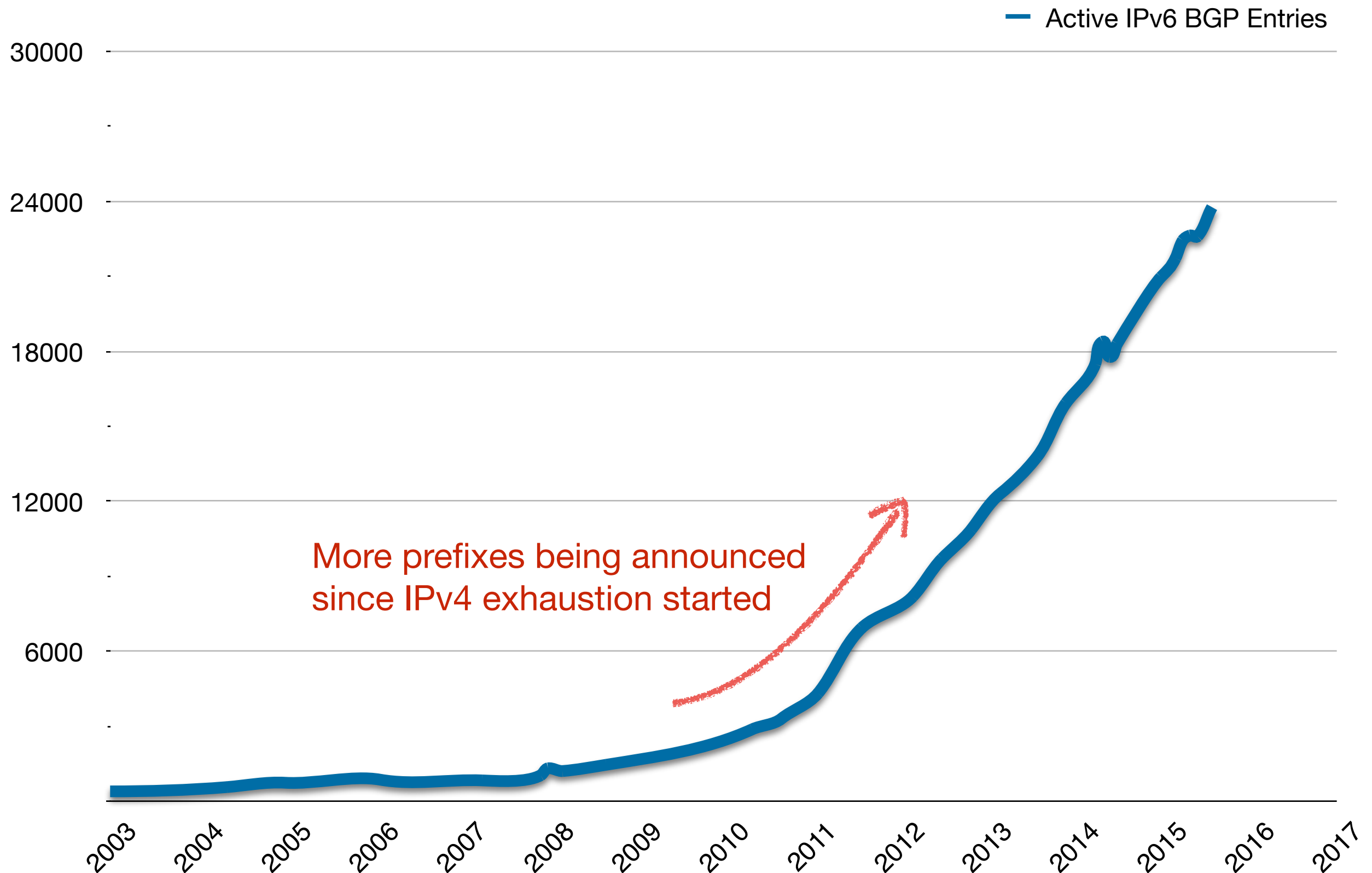


- **Why?**
  - Routing tables growing too fast
  - Provide scalable routing solution for Internet
- **How?**
  - Encourage announcement of whole allocations
  - Introduction of Classless Inter Domain Routing (CIDR)
- **Result:**
  - Growth of routing tables has slowed a bit

# Active IPv4 BGP Entries



# Active IPv6 BGP Entries

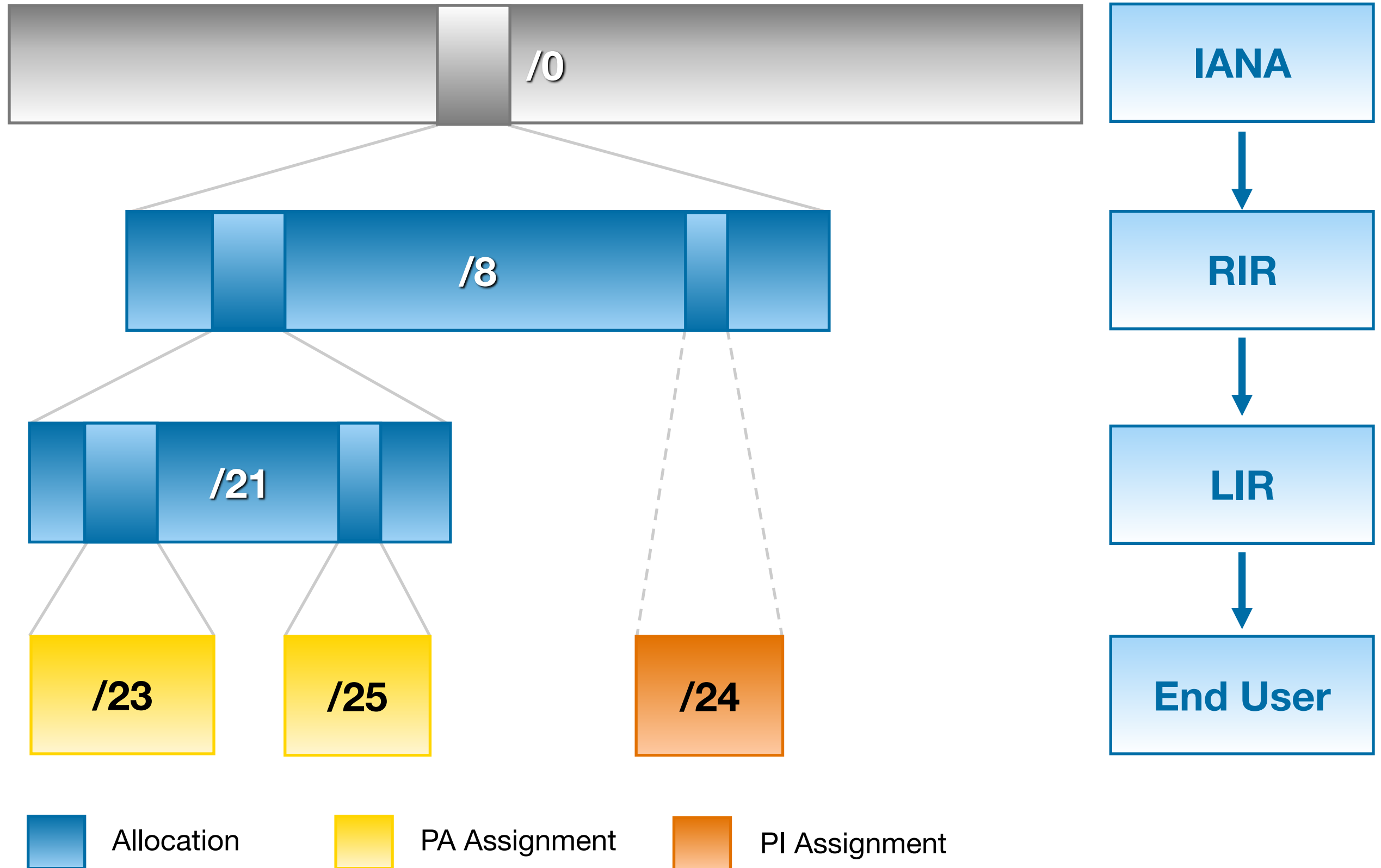


# Goals: Conservation

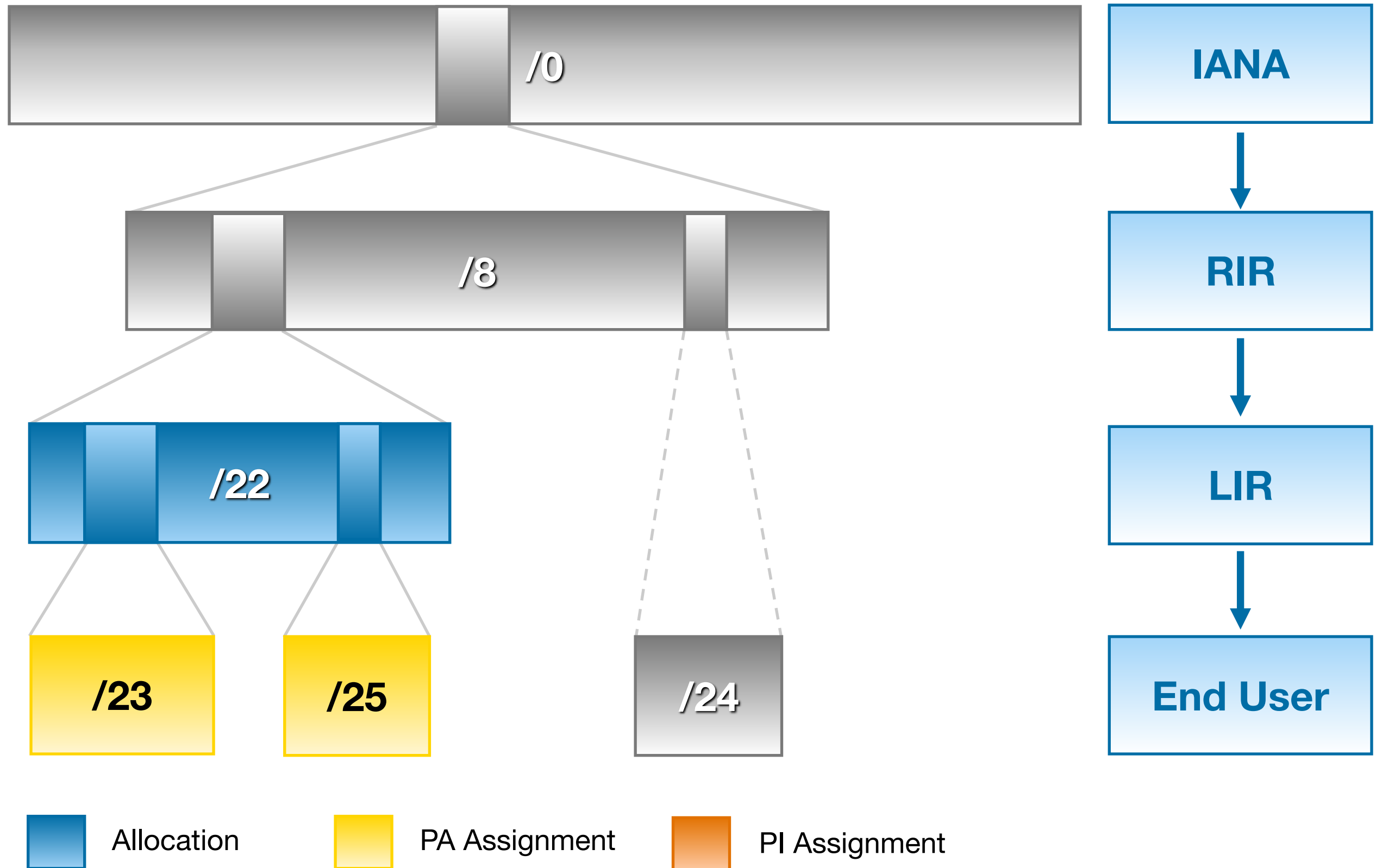


- **Why?**
  - IP addresses and AS Numbers are limited resources
  - These resources were not used efficiently in the past
- **How?**
  - Introduction of CIDR
  - Policies to ensure fair usage
- **Results:**
  - Growth in IP address space usage slowed down
  - Resources were distributed based on need

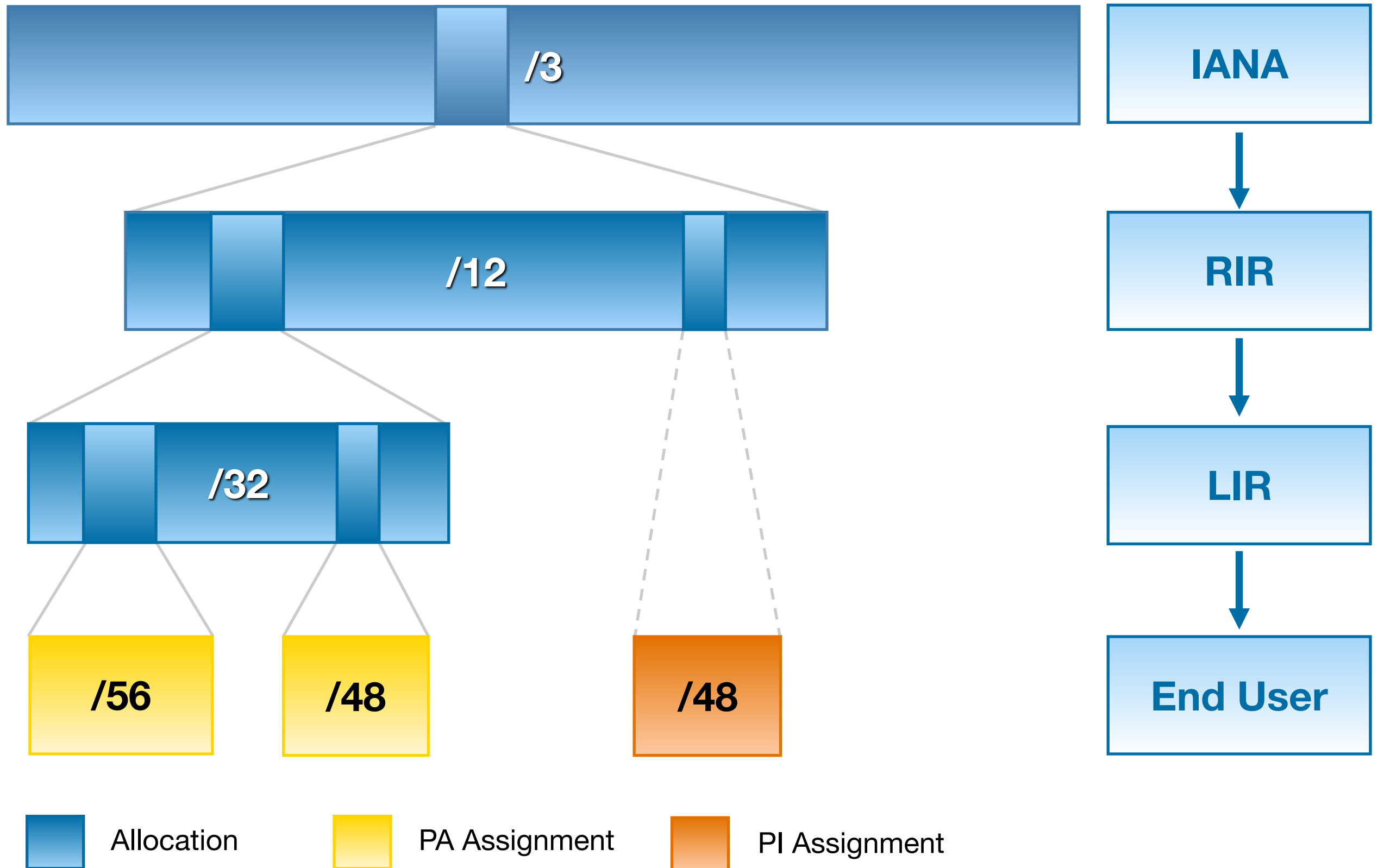
# IPv4 Address Distribution - Historical



# IPv4 Address Distribution - Current



# IPv6 Address Distribution



# RIPE NCC



- Began operating in 1992
- Not-for-profit membership organisation
- 12,000+ members (Local Internet Registries)
- Neutral, Impartial, Open, Transparent
- Provides administrative support to RIPE



# Réseaux IP Européens (RIPE)



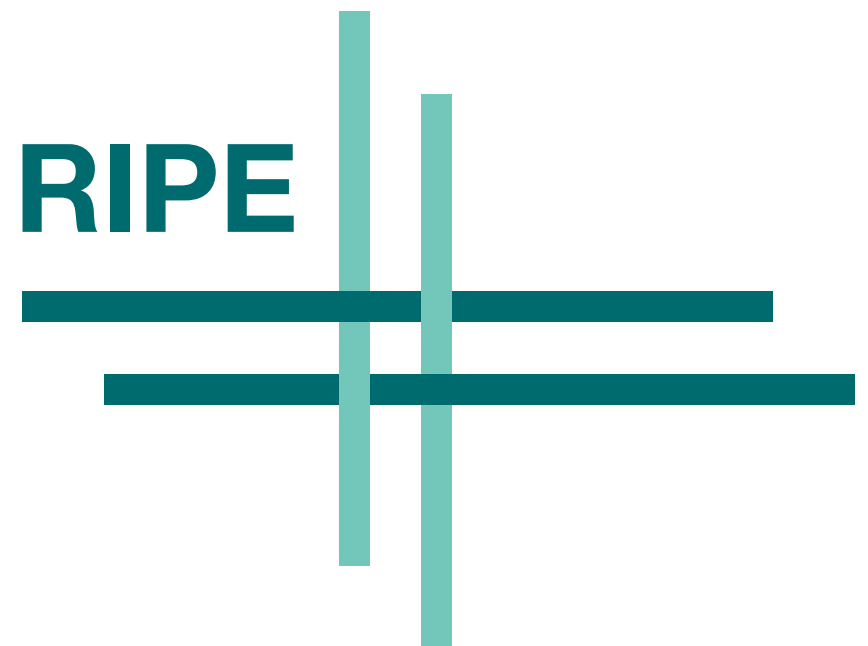
- Started in 1989
- Discussion forum open to all parties interested
- Not a legal entity and no formal membership
- Develops policies
- Work done in Working Groups
- Activities are performed on a voluntary basis
- Decisions formed by consensus

# RIPE Community



- 2000+ subscribed to Address Policy Mailing list
- 678 Attendees at RIPE 70, May 2015
- Includes business, government, regulators, law enforcement agencies, civil society, academia, private citizens
- Meets twice a year at the RIPE meetings

**RIPE**





# Participating

## Section 2

# Does it affect you?



- Listen to the policy proposal
- Hear the pros and the cons
- Does this policy proposal affect your business?
- Are you in favour or against it?

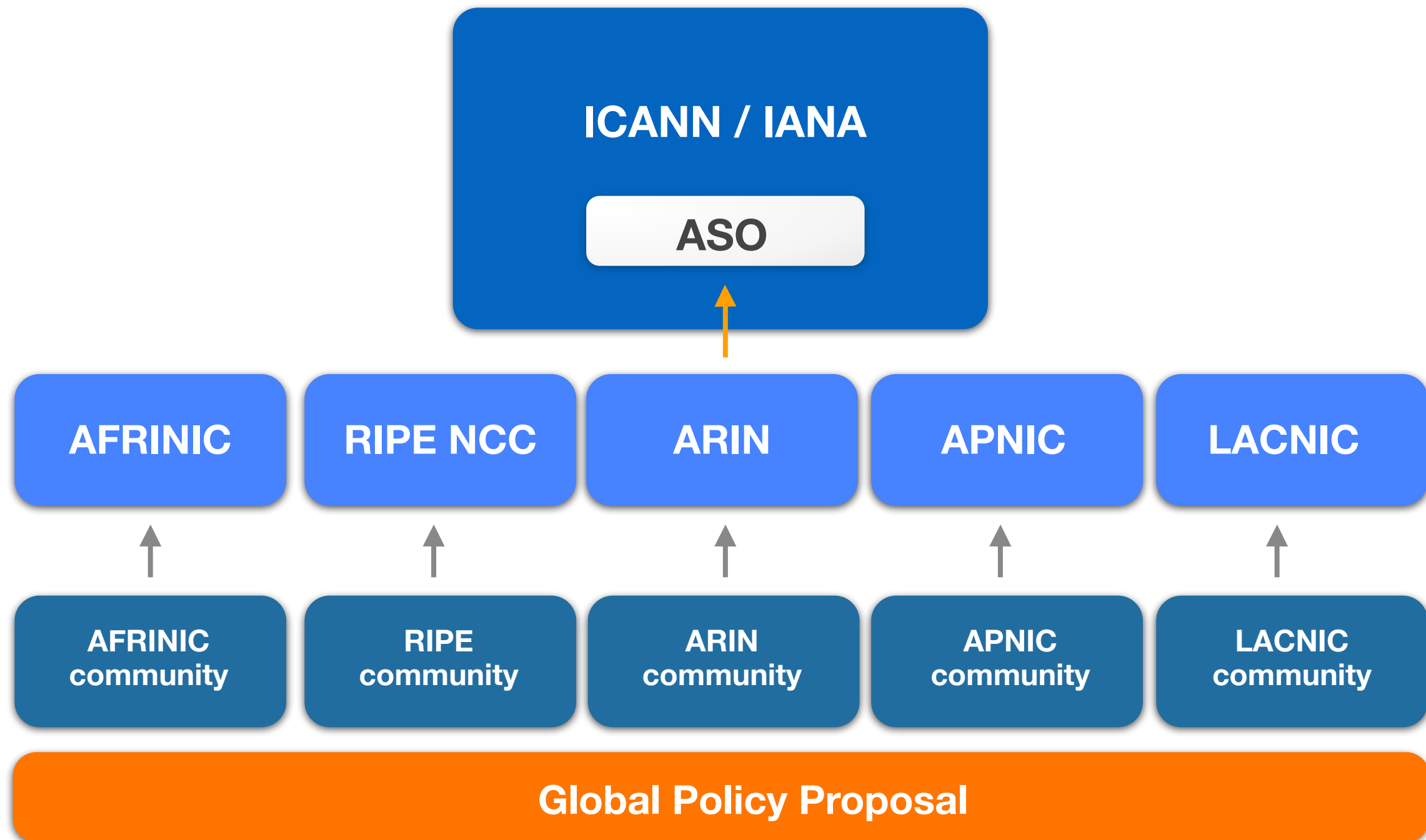


# Policy Development Process



- **Open**
  - Anyone can participate
  - On mailing lists and at meetings
- **Transparent**
  - List discussions archived publicly
  - Meetings transcribed
- **Developed bottom-up**
  - **YOU** make the policies
  - The RIPE NCC implements them

# Who Makes Policies ?



# Who Does What ?



- **The RIPE community**
  - Creates proposals
  - Discusses proposals
  - Seeks consensus
- **Working Group (WG) chairs**
  - Accept proposals
  - Chair the discussions
  - Decide if consensus has been reached

# Who Does What ?



- **The RIPE NCC**

- Acts as the secretariat to support the process
- Publishes the documents
- Implements the proposals



# Working Groups



- Address Policy
- Routing
- Database
- Anti-abuse
- Cooperation
- IPv6
- RIPE NCC Services
- Connect
- Open Source
- Measurement, Analysis and Tools

# Participating in the PDP



- Sign up for the **Policy Development Process Announcements** mailing list
- Join in discussions about policy proposals
- Stay up-to-date with new policies
- Propose a new policy

# RIPE NCC General Meeting



- Discuss the RIPE NCC operations and activities
- Give feedback on the Budget and Activity Plan
- Vote on:
  - Charging Scheme, Resolutions
  - Executive Board membership
  - Financial Report





# Questions





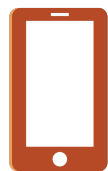
# Being an LIR

## Section 3

# What is in the Local Internet Registry?



Name of the organisation  
or person operating the LIR



## Contact Information

- Postal address
- Phone numbers
- Email addresses



## List of contact persons



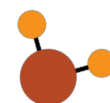
## Billing details

- Allocations
- PI assignments



## IPv4 & IPv6

- Allocations
- PI assignments



## AS Numbers



## Preferences

# LIR's Responsibilities



- Make assignments
- Register assignments in the RIPE Database
- Keep the registry up-to-date

***... following RIPE policies!***

# RIPE NCC Access



- Our single sign-on system
- To RIPE NCC tools
- Non-LIRs can get an account too
- Use Two-step Verification for added security

**<http://access.ripe.net>**



# LIR Portal



RIPE NCC  
Access



LIR Portal

My LIR

General Information

Billing Details

LIR Contacts

GM Preferences

Manage Users

Resources

IPv4 Analyser

IPv6 Analyser

IPv4

IPv6

ASN

Request Forms

Object Editors

IPv4 Transfer Listing Service

Allocations (42)

Grand Totals

Total Addresses

3,088,384

Infra

7.0%

Used

69.6%

Free

30.4%

Free Space

Want to assign a free block? Select the desired prefix size in the drop-down below for a suggestion.

Size /23

Using a conservative algorithm the best suggestion is 62.142.34.0/23, this prefix matches one of your free blocks exactly in size.

Notifications

You currently have no notifications.

2a01:9e00::/32 - ALLOCATED\_BY\_LIR - UK-FAELIX-20110201

2a01:9e00:4000::/34

2a01:9e00:7fff::/48

2a01:9e00:ac00::/38

2a01:9e00:a217::/48

2a01:9e00:3ee3::/33

2a01:9e00::/64

1 Assignments of /48

5 Assignments of /64

1 Assignments of /56

1 Assignments of /64

5 Assignments of /64

4 Assignments of /128

More specific instantiations

Instantiation	Status	Date	Size	AsnSize	Netname
2a01:9e00:4000::/34	ALLOCATED_BY_LIR	03-02-2011	/34		UK-FAELIX-CUSTOMER
2a01:9e00:ac00::/38	ALLOCATED_BY_LIR	04-02-2011	/38		UK-FAELIX-TUNNEL
2a01:9e00:a217::/48	ALLOCATED_BY_LIR	03-02-2011	/48		UK-FAELIX-FAELIX
2a01:9e00:7fff::/48	ALLOCATED_BY_LIR	23-06-2012	/48		UK-FAELIX-CROSSCONNECT

RPKI Dashboard

2 CERTIFIED RESOURCES

NO ALERT EMAIL CONFIGURED

2 BGP Announcements

2 ROAs

2 Valid

0 Invalid

0 Unknown

2 OK

0 Causing problems

BGP Announcements

Route Origin Authorisations (ROAs)

History

Create ROAs for selected BGP Announcements

Valid Invalid Unknown

Origin AS	Prefix	Current Status
AS2121	193.0.24.0/21	VALID
AS2121	2001:67c:64::/48	VALID

Show 25 of 2 items

And more...



# **LIR Portal**

Demonstration

# What Should the RIPE NCC Know?



- If any of these change:
  - Company name
  - VAT number
- Company acquisitions and mergers
- Bankruptcy
- Transfer of resources to another organisation

# Closing LIRs



- **The RIPE NCC may close an LIR if:**
  - The LIR cannot be contacted by the RIPE NCC for a significant period of time
  - The LIR consistently violates RIPE community's policies
  - The LIR does not pay its fee
- **The RIPE NCC takes on responsibility for address space held by closing LIRs**



# Being an LIR contact

Exercise

# Exercise: Being an LIR Contact



- **Time**
  - 15 minutes
- **Goal**
  - Understand the tasks of an LIR contact
- **Scenario**
  - It is your first day as an LIR contact. In which order would you complete these tasks?



# The RIPE Database

## Section 4

# RIPE Database



- **Public Internet resource and routing registry database**
  - Resources (IP addresses, AS Numbers)
  - Contact information for resources
  - Reverse DNS delegations
  - Routing policy



# RIPE Database Objects



- **Resources**
  - inetnum, inet6num, aut-num
- **Contact**
  - organisation, person, role
- **Routing**
  - route, route6
- **Reverse DNS**
  - domain
- **Security**
  - mntner

# Querying the RIPE Database



- Web interface
- Full Text Search
- Command line
- Restful API (XML/JSON)

☐ Show full object details ?  
☐ Do not retrieve related objects ?

You can search up to 5 terms at once in the search box above, separating them with a semicolon.

Sources

Types

Hierarchy Flags

Inverse lookup

☒ RIPE Database ?  
☐ TEST Database ?  
☐ Global Resource Service (GRS) ?

By submitting this form you explicitly express your agreement with the [RIPE Database Terms and Conditions](#)

Search



# Querying the RIPE Database

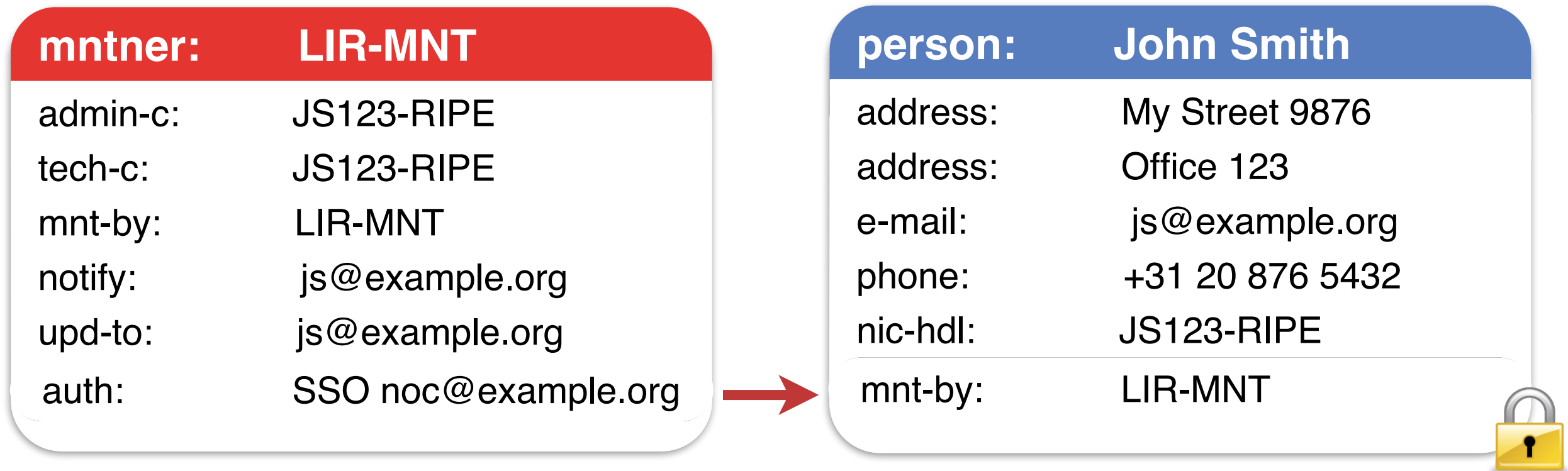
Demonstration

# Don't Get Blocked!



- Email addresses are filtered
  - person/role/mntner objects
- Maximum number of queries per day
  - When exceeding, you get **blocked**
- Use “--no-personal” flag to limit the query
- Request to be whitelisted

# Protecting Your Objects



**Sign in using your  
RIPE NCC Access  
account**

If you don't have a RIPE NCC Access account, [click here to create one.](#)

Email

Password

**Sign in**

[Forgot your password?](#)



# Creating an object



- Webupdates
- Syncupdates
- Email updates
- Restful API (XML/JSON)

Object type: ?

select a type

Source Database: ?

- ☒ RIPE Database
- ☐ TEST Database

Operation:

- ☒ Create object by individual fields
- ☐ Create object in single text area

Create

# Creating an object



Create a new inetnum object

inetnum

↵

+

🗑

?

netname

↵

+

🗑

?

descr

↵

+

🗑

?

country

↵

+

🗑

?

admin-c

↵

+

🗑

?

tech-c

↵

+

🗑

?

status

↵

+

🗑

?

mnt-by

↵

+

🗑

?

source

RIPE

↵

+

🗑

?

By submitting this form you explicitly express your agreement with the [RIPE Database Terms and Conditions](#)

Cancel

Submit



Duplicate the attribute



Add a new attribute



Delete the attribute



Info about the attribute

# Creating an inetnum object - IPv4



Object successfully created

<b>inetnum</b>	192.30.0.0 - 192.30.0.255
<b>netname</b>	CUSTOMER-NETWORK-001
<b>descr</b>	The IPv4 network of the customer 001
<b>country</b>	NL
<b>admin-c</b>	TP30-TEST
<b>tech-c</b>	TP30-TEST
<b>status</b>	ASSIGNED PA
<b>mnt-by</b>	CM30-MNT
<b>created</b>	2015-07-14T07:34:11Z
<b>last-modified</b>	2015-07-14T07:34:11Z
<b>source</b>	RIPE



# Creating an inet6num object - IPv6



Object successfully created

<b>inet6num</b>	2001:ff30:cafe::/48
<b>netname</b>	CUSTOMER-NETWORK-001
<b>descr</b>	The IPv6 network of the customer 001
<b>country</b>	NL
<b>admin-c</b>	TP30-TEST
<b>tech-c</b>	TP30-TEST
<b>status</b>	ASSIGNED
<b>mnt-by</b>	CM30-MNT
<b>created</b>	2015-07-14T07:36:15Z
<b>last-modified</b>	2015-07-14T07:36:15Z
<b>source</b>	RIPE



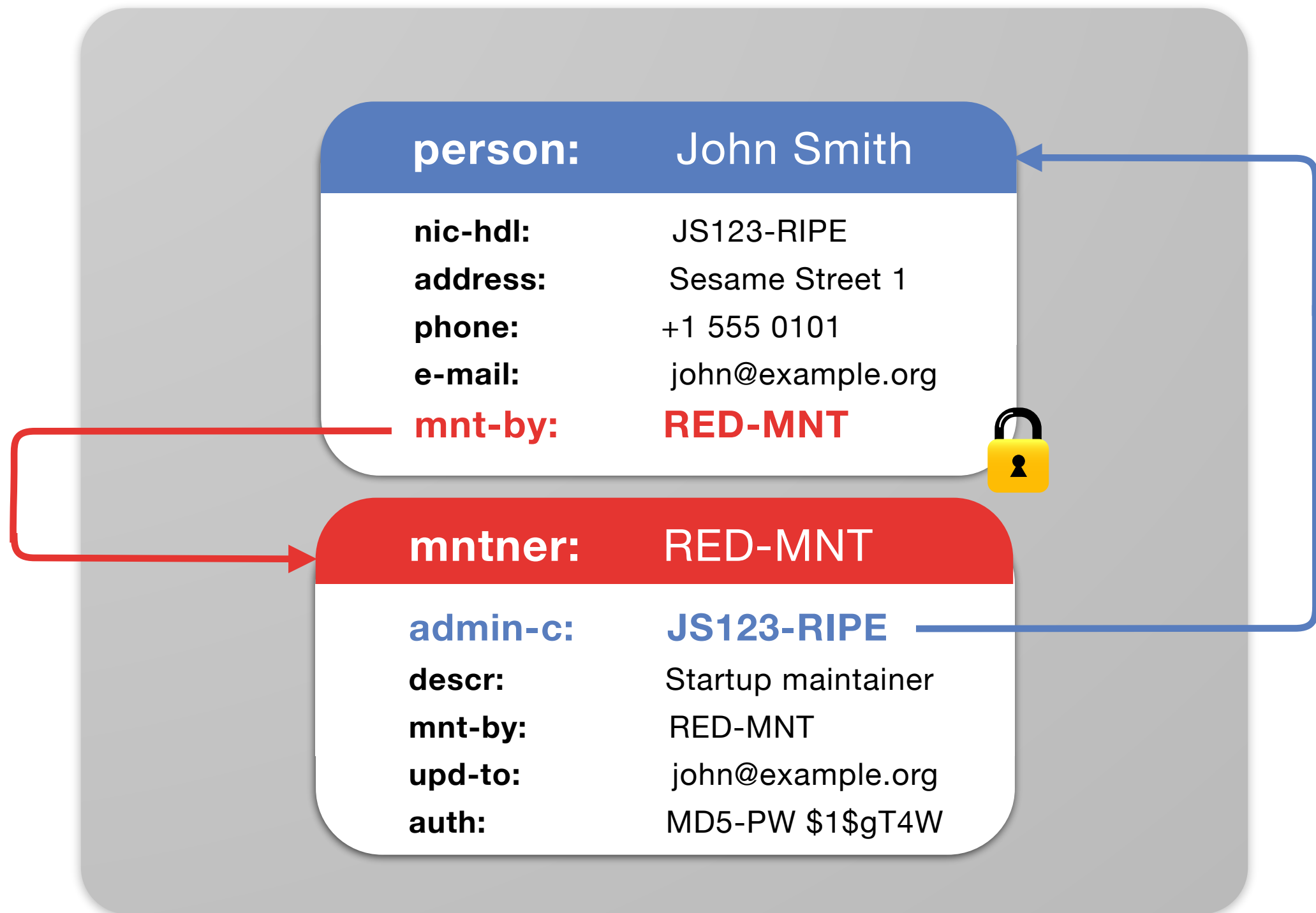
# Updating the RIPE Database

Demonstration

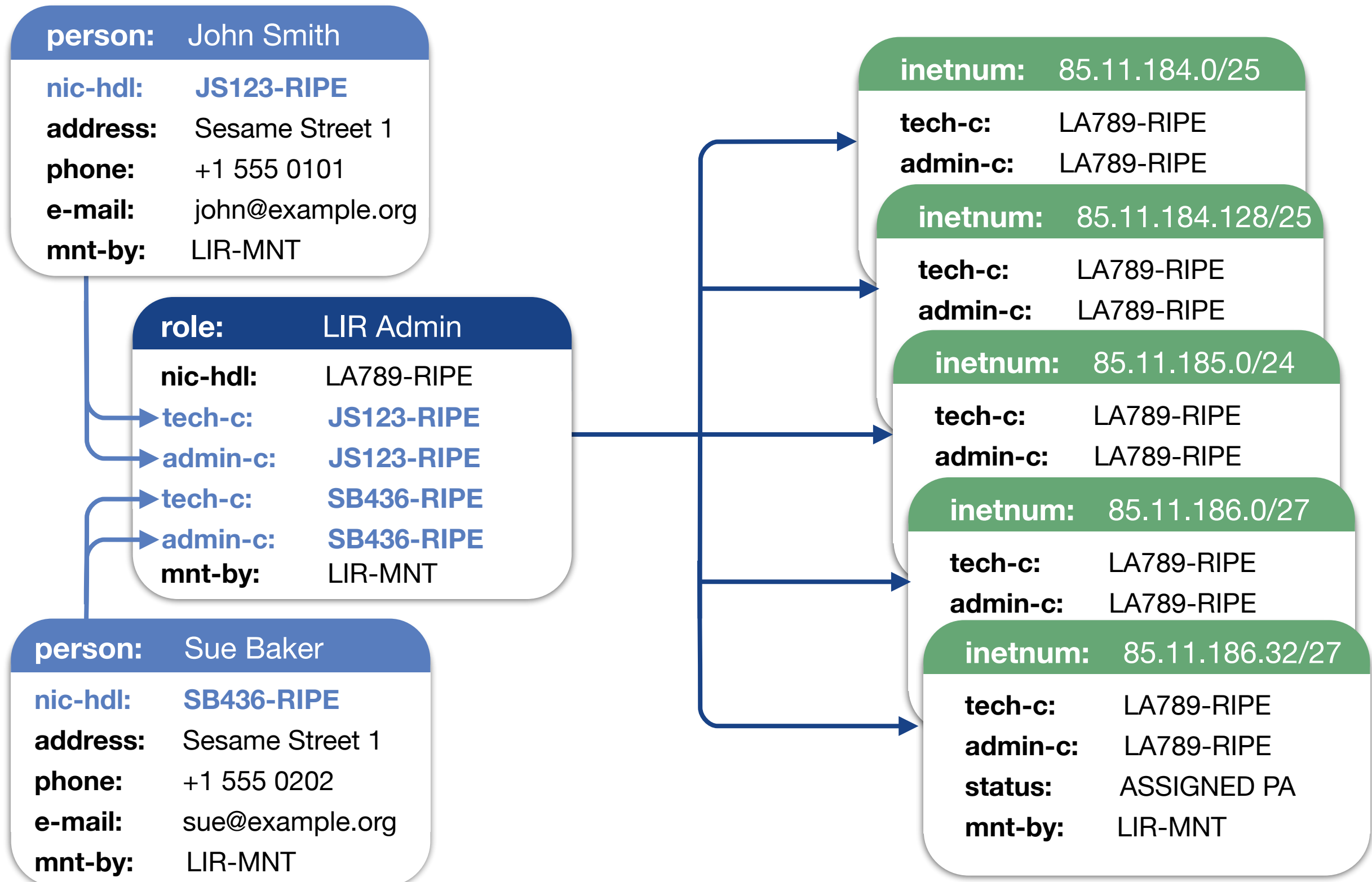
# Person object: contact info



- Creation of first **person** - **mntner** object pair



# Using a role Object





# Questions





# Getting Resources

## Section 5

# Terminology



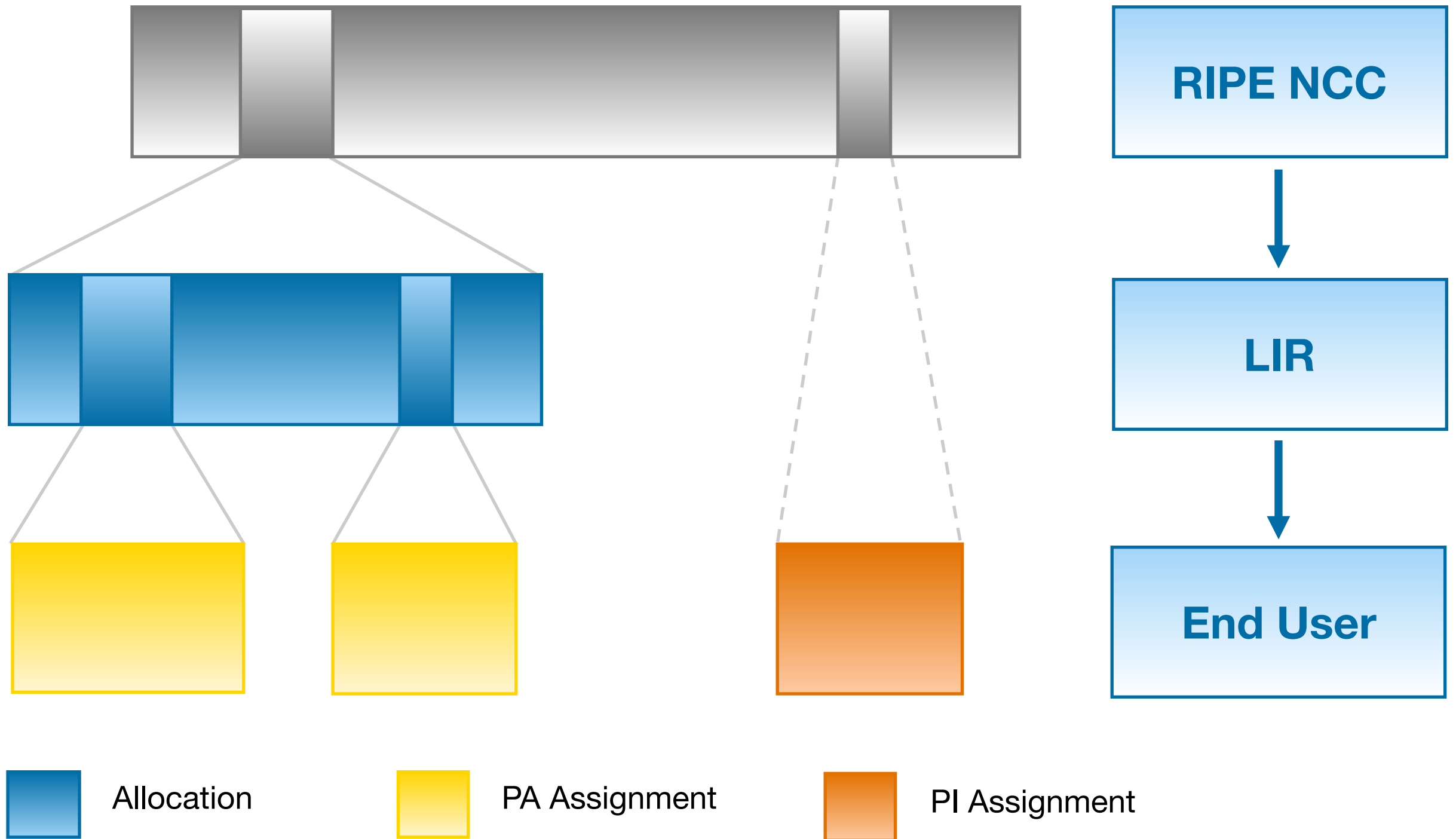
- **Allocation**

- Block of IP addresses reserved for future use

- **Assignment**

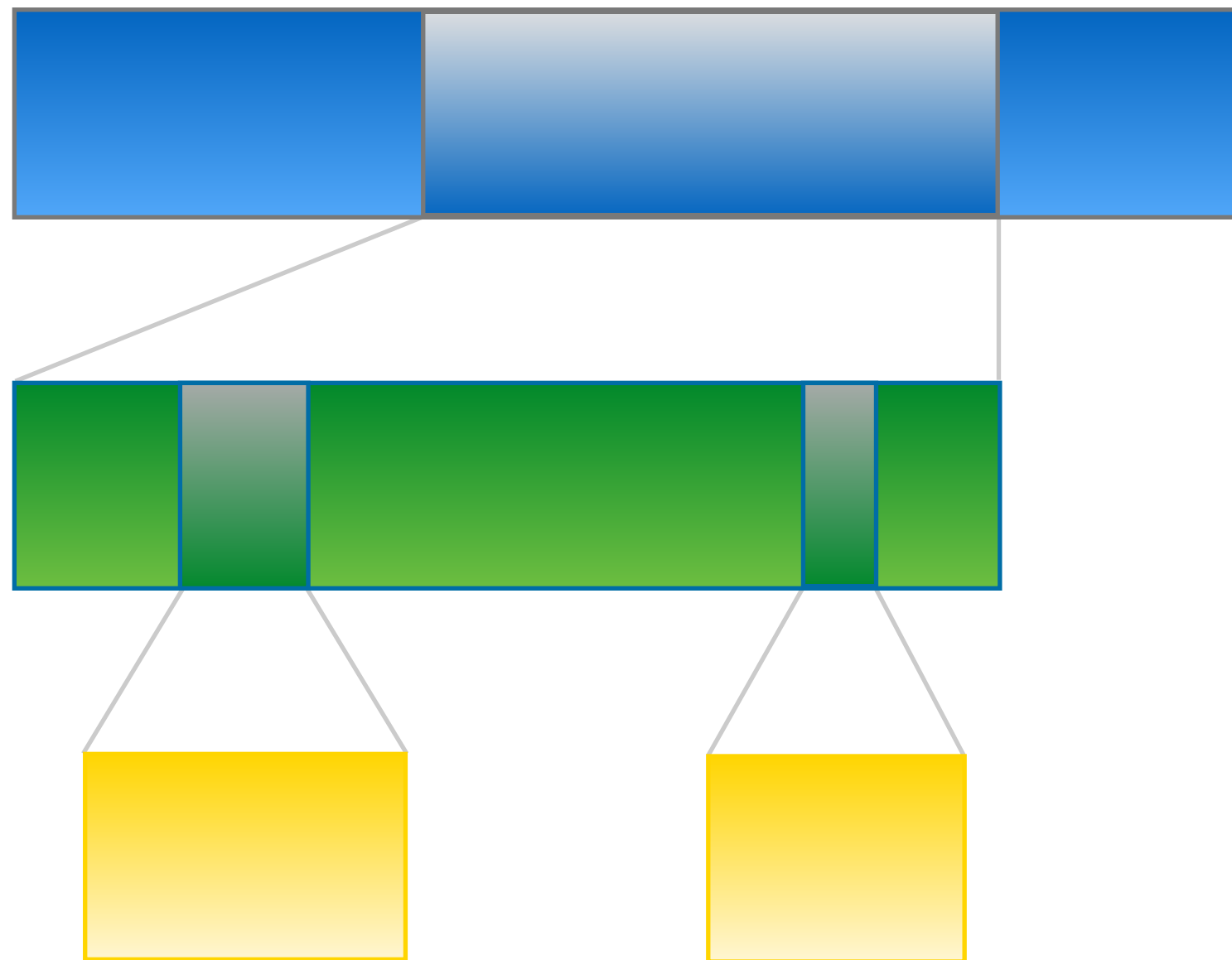
- A chunk of addresses from an allocation that is used:
  - in your own infrastructure
  - in an End User network

# Allocation and Assignment





# Sub-allocations



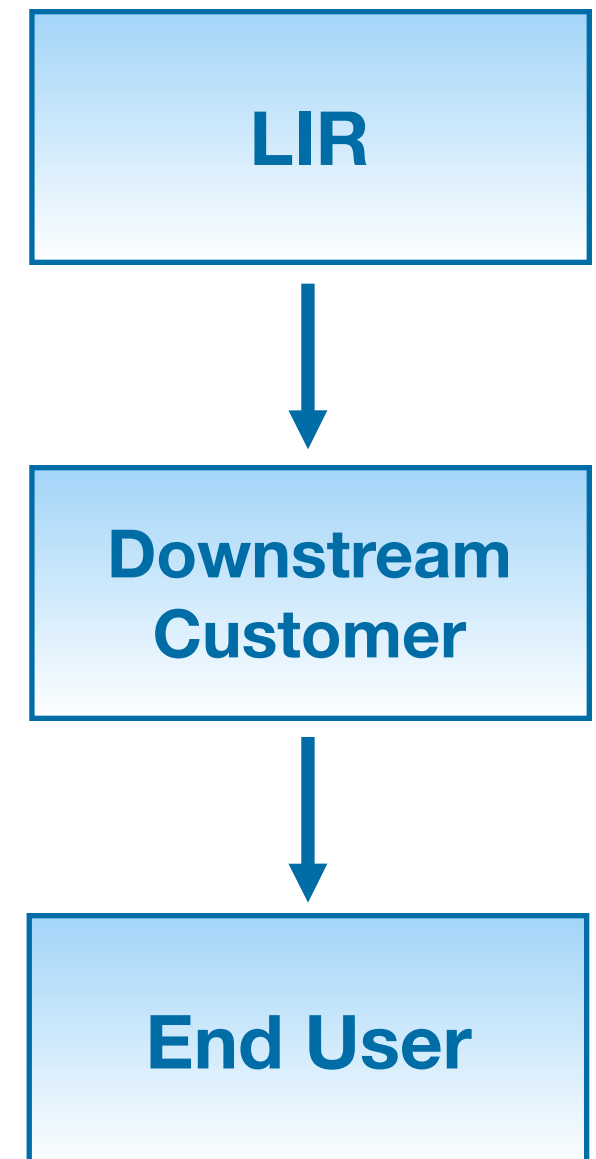
PA Allocation



PA Sub-allocation



PA Assignment



# Types of Address Space



- **Provider Aggregatable (PA)**

- Assignments made from member's allocation
- Allocated to LIR / Assigned by LIR
- Address space remains with LIR
- Customer has to renumber when changing ISP

- **Provider Independent (PI)**

- Assignment made directly by the RIPE NCC
- Assigned to End User
- End User takes the address space with them

# First IPv6 Allocation



- **Create mntner, person and role objects**
  - Use the new organisation startup tool
- **Submit the First IPv6 Allocation Request form**
  - Have a plan for making assignments within two years
- **Minimum allocation size is /32**
  - Up to a /29 without additional justification
  - More if justified by customer numbers and the extent of the infrastructure

# Requesting an IPv6 PI Assignment



- Every PI Assignment must have a Sponsoring LIR
- Needs organisation, person and mntner objects
- Minimum size = /48
- Send us:
  - PI Assignment Request Form
  - End User Assignment Agreement
  - Company registration document or picture ID (for a private individual)

# IPv6 PI Assignments



- **PI space cannot be used for sub-assignments!**
  - Not even a single address for the connection
  - If you have customers, you cannot use PI for them

<b>inet6num:</b>	2001:db8:1234::/48
descr:	Some PI Assignment
status:	ASSIGNED PI
mnt-by:	RIPE-NCC-END-MNT
mnt-by:	ENDUSER-MNT
mnt-routes:	ENDUSER-MNT
mnt-domains:	ENDUSER-MNT

- **Yearly charges for PI Assignments**
  - See the RIPE NCC Charging Scheme

# IPv4 Allocation from the Last /8



- **Submit the IPv4 Allocation Request form**
  - Use the same mntner, person and role objects from the IPv6 allocation
- **Each LIR can get one /22 block**
  - = 1024 IPv4 addresses
- **Cannot be transferred within 24 months after receiving it**

# IPv4 PI Assignments



- Since IPv4 exhaustion, no new PI assignments
- No sub-assigning allowed
- Yearly charges for PI Assignments
  - See the RIPE NCC Charging Scheme
- Convert PI assignments into PA allocations

# Autonomous System Numbers



- **Assignment requirements**
  - Address space
  - Multihoming
  - One AS Number per network
- **For LIR itself**
- **For End User**
  - Sponsoring LIR requests it for End User
- **32-bit is the default**
  - 16-bit available on request



# PI / ASN and Sponsoring LIR



- **Options for End Users holding PI / ASN:**
  - Sign End User Agreement with an LIR
  - Become an LIR themselves
  - Return the resources
- **Sponsoring LIR is published in the RIPE Database**



# Getting IPs and ASNs

Demonstration



# Transfers

## Section 6

# Types of Transfers



## PA allocations

*between RIPE NCC members*

## Merger or Acquisition

## PI assignments

*between End Users*

## From Legacy Space

## AS numbers

*between End Users*

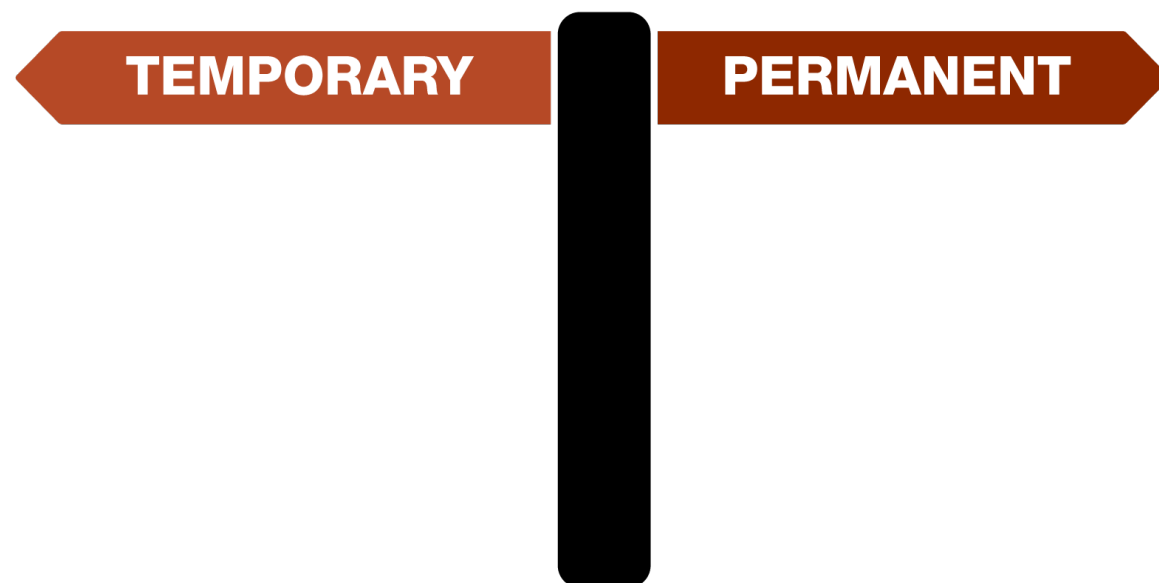
## Inter-RIR

COMING  
SOON!

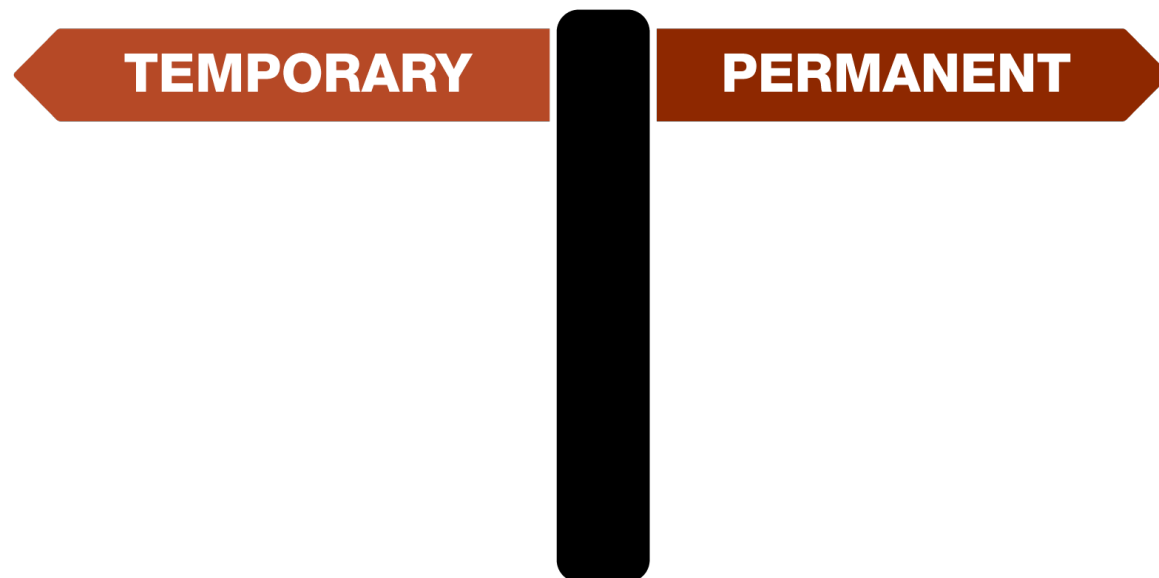
# IPv4 Allocation Transfers



**LIR** → **LIR**



# IPv4 PI Assignment Transfers



***SPONSORED BY***  
**YOUR LIR**

# IPv4 Transfers: Where to Look



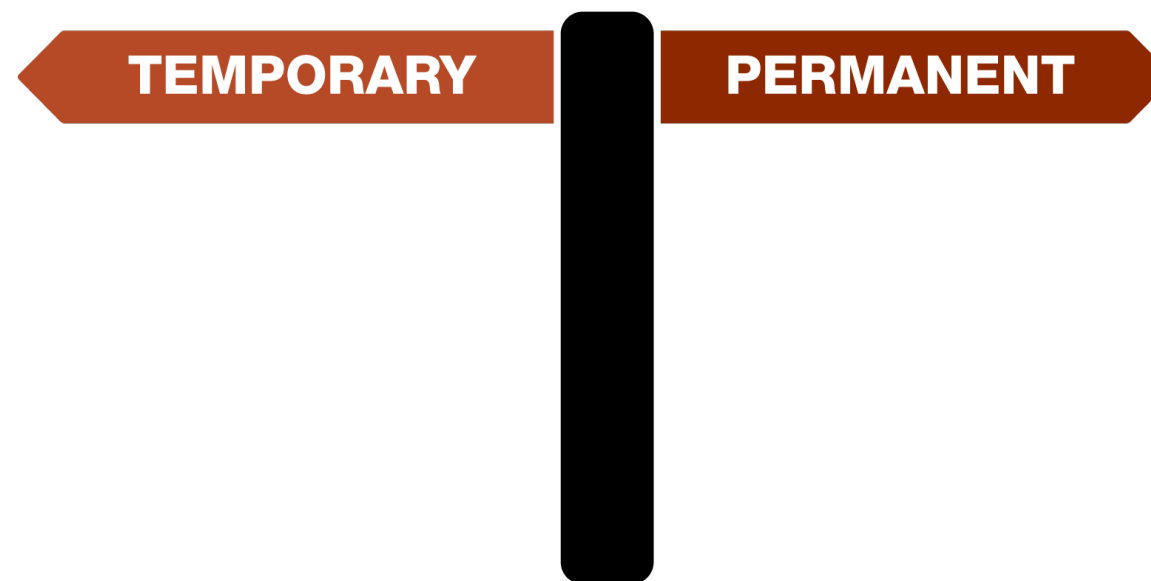
- **IPv4 Listing Service**
  - Accessible from LIR Portal account
- **Brokers**
  - Listed on RIPE NCC website
  - **NOT** endorsed by RIPE NCC
  - Signed an agreement to conform to RIPE Policies

# IPv6 Allocation Transfers



**LIR** → **LIR**

MIN  
SIZE  
**/32**

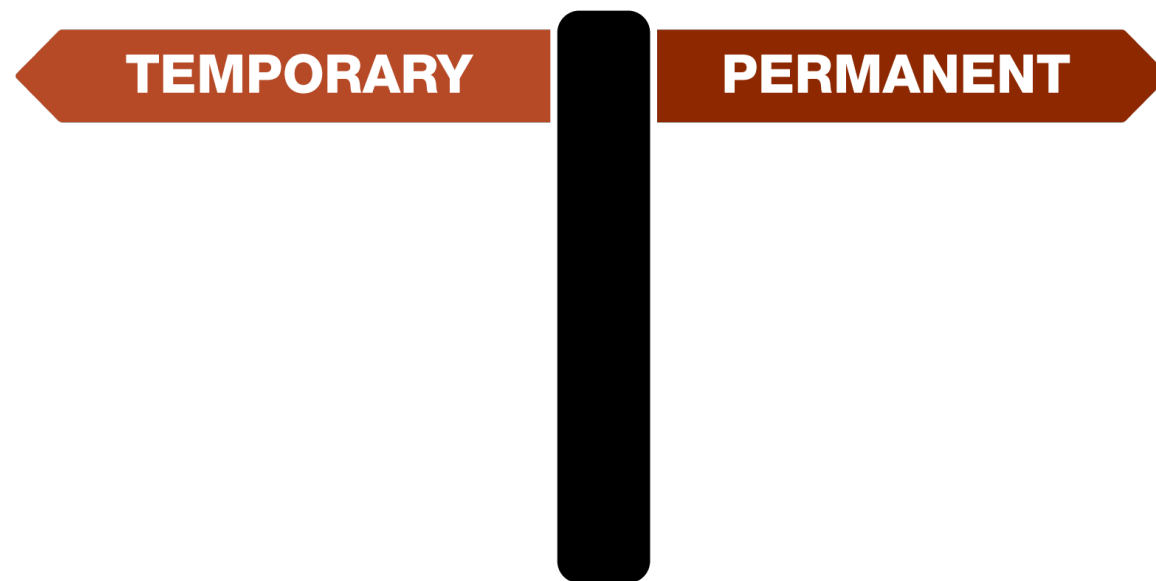




# IPv6 PI Assignment Transfers

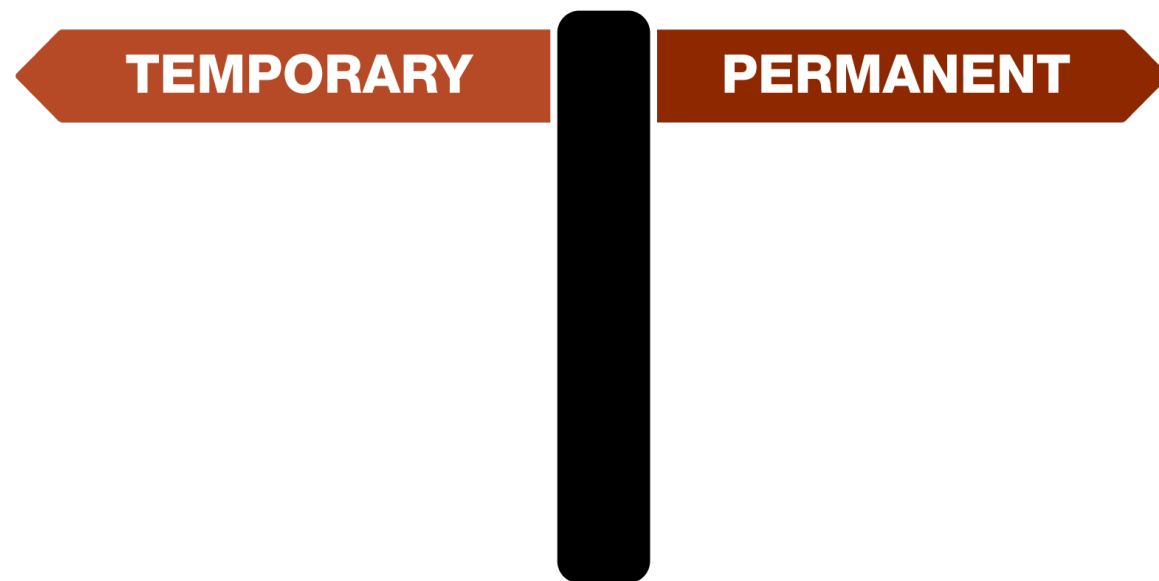
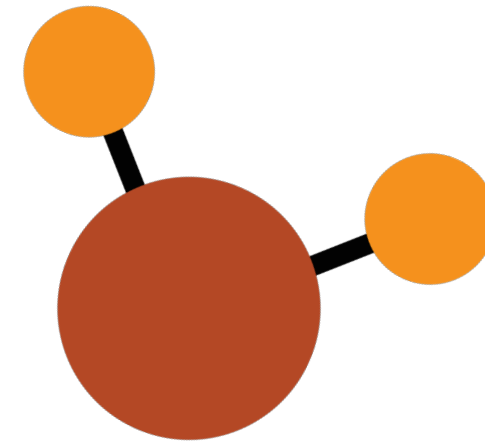


MIN  
SIZE  
**/48**



***SPONSORED BY***  
**YOUR LIR**

# AS Number Transfers



***SPONSORED BY***  
**YOUR LIR**

# Transfers: How to Request



- Send an email to [lir-help@ripe.net](mailto:lir-help@ripe.net)
- Include the following information & documents:
  - IPv4 / IPv6 / ASN being transferred
  - company names and contact details
  - company registration papers
  - Transfer Agreement
- For PI transfers, sponsoring LIR agreement is needed too



# Questions





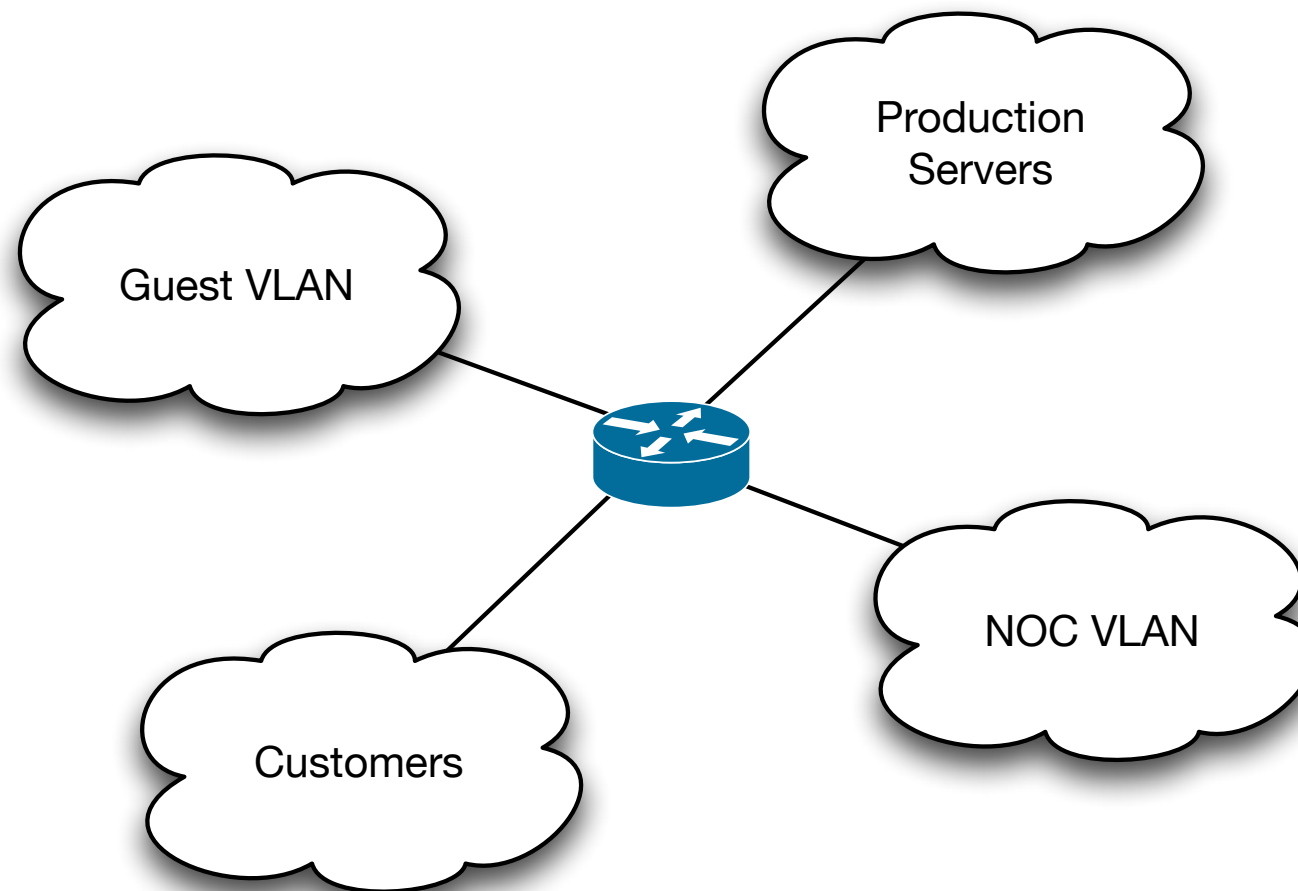
# Distributing Resources

## Section 7

# How Much Address Space?



- Think about how the network will be split up
- Subnets are used to group hosts



- Calculate how much address space you will need!

# IPv4 subnets



- 3 IPs required per subnet
  - network
  - broadcast
  - gateway
- Usable IPs = [subnet size] - 3 IPs
  - /24 = 256 IPs = 256 - 3 = 253 usable IPs

# IPv6 Subnets



/64 = 1 subnet = 18,446,744,073,709,551,616 IPs

...

/60 = 16 subnets

...

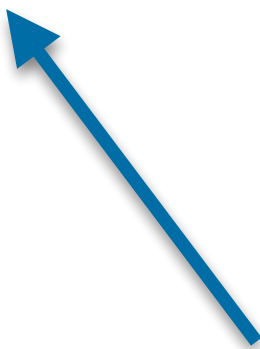
/56 = 256 subnets

...

/52 = 4096 subnets

...

/48 = 65536 subnets



*In IPv6  
the amount of hosts  
in a subnet is  
irrelevant!*





# Making Assignments

Exercise

# Exercise: Making assignments



- **Time**
  - 30 minutes
- **Goal**
  - Understand and practice the Assignment Process
- **Task**
  - Ask the End User for more information, if needed
  - Decide the assignment sizes

# IPv6 Assignments



- Default IPv6 subnet = /64
- Every “end site” can be assigned between /64 and /48 without prior approval of the RIPE NCC
  - For larger assignments, send in request form
- Assignments for your own infrastructure
  - /48 per Point of Presence
  - Additional /48 for the core network

# IPv6 Registration in the Database



- All assignments and sub-allocations must be registered to make them valid!

**inet6num:** 2001:db8:aaaa::/48

**descr:** Customer 321  
**country:** EU  
**admin-c:** LA789-RIPE  
**tech-c:** LA789-RIPE  
**status:** ASSIGNED  
**mnt-by:** LIR-MNT

**inet6num:** 2001:db8:f000::/36

**descr:** Branch office #1  
**country:** EU  
**admin-c:** LA789-RIPE  
**tech-c:** LA789-RIPE  
**status:** ALLOCATED-BY-LIR  
**mnt-by:** LIR-MNT

# Grouping Customer Assignments



<b>inet6num:</b>	2001:db8::/36
<b>descr:</b>	DSL customers
<b>admin-c:</b>	LA789-RIPE
<b>tech-c:</b>	LA789-RIPE
<b>status:</b>	<b>AGGREGATED-BY-LIR</b>
<b>assignment-size:</b>	48
<b>mnt-by:</b>	LIR-MNT



<b>inet6num:</b>	2001:db8:103::/48
<b>inet6num:</b>	2001:db8:102::/48
<b>inet6num:</b>	2001:db8:101::/48
<b>inet6num:</b>	2001:db8:100::/48
<b>descr:</b>	Customer 321
<b>country:</b>	EU
<b>admin-c:</b>	LA789-RIPE
<b>tech-c:</b>	LA789-RIPE
<b>status:</b>	ASSIGNED
<b>mnt-by:</b>	LIR-MNT

# IPv4 Resources



- **LIRs are allocated only one /22**
  - More IPv4 space through transfers
  - Assignment size is limited to total of IPv4 space an LIR holds
- **All assignments must be registered correctly in the RIPE Database**

<http://www.ripe.net/ripe/docs/ipv4-policies.html>

# IPv4 Registration in the Database



- All assignments and sub-allocations must be registered to make them valid!

**inetnum:** 10.0.3.0 - 10.0.3.255

**descr:** Customer 321  
**country:** EU  
**admin-c:** LA789-RIPE  
**tech-c:** LA789-RIPE  
**status:** ASSIGNED PA  
**mnt-by:** LIR-MNT

**inetnum:** 10.0.1.0 - 10.0.2.255

**descr:** Branch office #1  
**country:** EU  
**admin-c:** LA789-RIPE  
**tech-c:** LA789-RIPE  
**status:** SUB-ALLOCATED PA  
**mnt-by:** LIR-MNT

# Infrastructure vs. End User



## Infrastructure

**Blocks for connections to End Users:**

- Point of Presence
- Point-to-Point
- Broadband address pools

**(Also LIRs own network)**

## End User

**Their equipment, their location**

- End User networks
- Offices
- Co-located subnets



# Infrastructure vs. End User



## Infrastructure

Blocks for connections to End Users:

- Point of Presence
- Point-to-Point
- Broadband address pools

(Also LIRs own network)

## Grey Area

Co-location  
Server housing  
Web hosting  
Application Services

## End User

Their equipment,  
their location

- End User networks
- Offices
- Co-located subnets

When the End User has  
a few addresses out of  
a larger address block

If the End User has  
a separate subnet



# Registering the Assignments

Exercise

# Exercise: Registering an Assignment



- **Time**
  - 15 minutes
- **Goal**
  - Practice how to register an assignment
- **Task**
  - Use the assignment from the previous exercise
  - Choose the range(s) from your allocation
  - Create the inetnum and inet6num objects in the TEST RIPE Database



# Managing Resources

## Section 8

# Managing IPv6 Address Space



- **Consider your mental health**
  - Use assignments on 4-bit boundary
- **Don't be too conservative**
  - Business customers often get a /48
  - /56 is a popular size for residential customers
- **Use "AGGREGATED-BY-LIR"**
  - to group assignments of the same size

# IPv6 Analyser



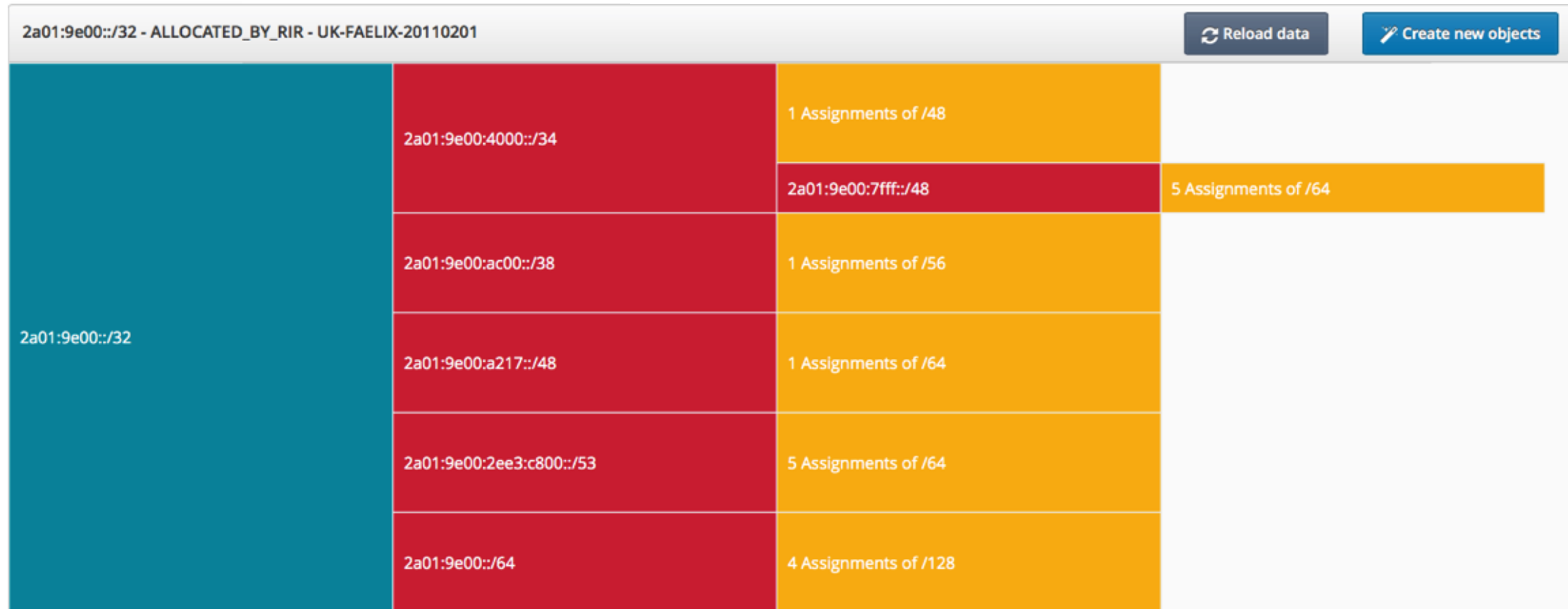
Legend

ALLOCATED-BY-RIR

ALLOCATED-BY-LIR

AGGREGATED-BY-LIR

ASSIGNMENT



More specific inet6nums Filter on range...

inet6num	Status	Date	Size	AsgSize	Netname	
2a01:9e00:4000::/34	ALLOCATED_BY_LIR	03-02-2011	/34		UK-FAELIX-CUSTOMER	⚙
2a01:9e00:ac00::/38	ALLOCATED_BY_LIR	04-02-2011	/38		UK-FAELIX-TUNNEL	⚙
2a01:9e00:a217::/48	ALLOCATED_BY_LIR	03-02-2011	/48		UK-FAELIX-FAELIX	⚙
2a01:9e00:7fff::/48	ALLOCATED_BY_LIR	23-06-2012	/48		UK-FAELIX-CROSSCONNECT	⚙

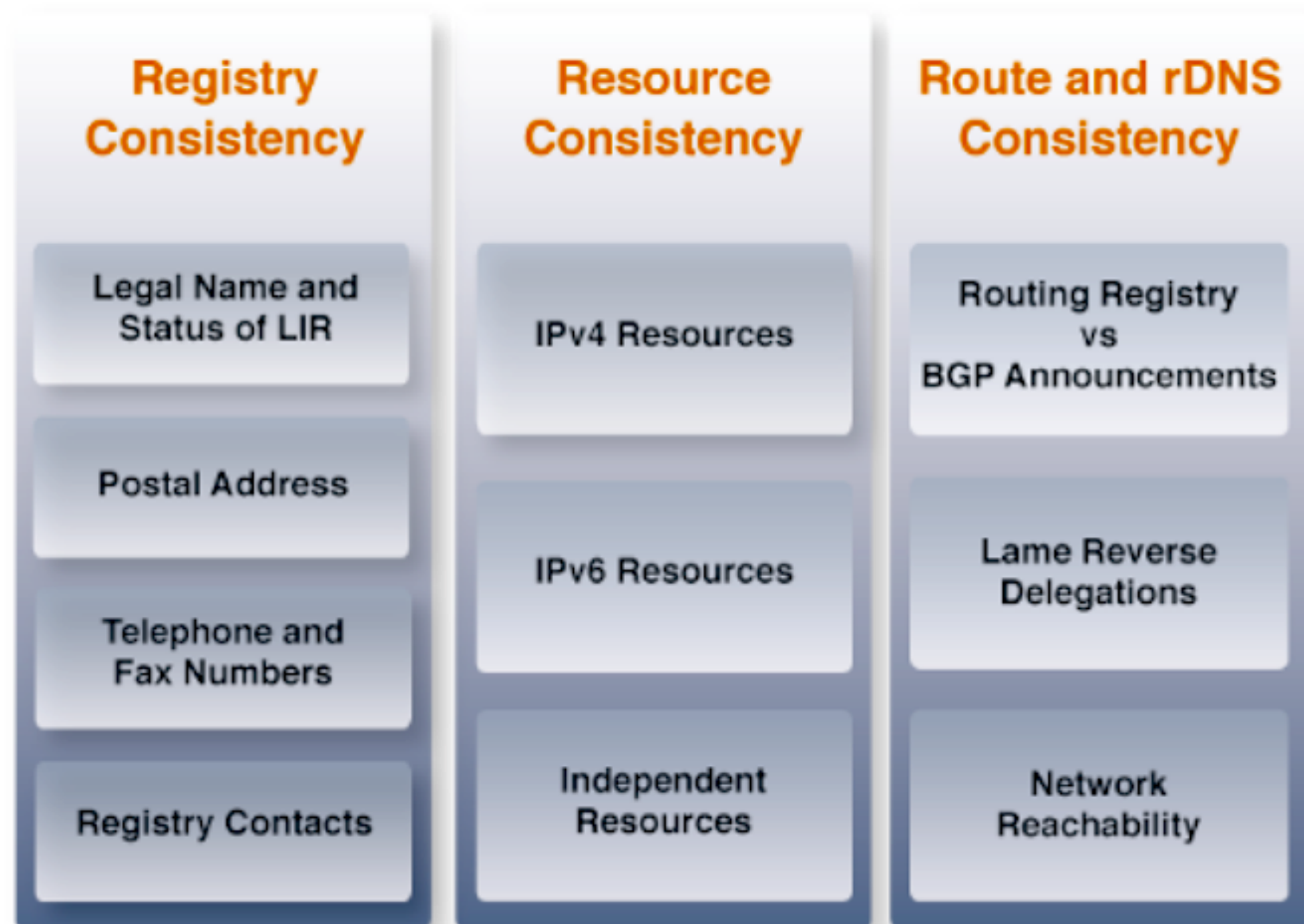
# Managing IPv4 Address Space



- LIRs get only one last /22 allocation
  - Make classless assignments
  - inetnum does not have to be CIDR
  - Do not fragment your allocation
- Need is not a criteria for obtaining more IPv4 address space
- Keep the RIPE Database up to date



- Assisted Registry Check





# ARC Goals



- Keep registry clean and up to date
- Make you aware of any inconsistencies with the registry data
- Support you with your registration tasks
- Keep in touch with you!

# RPKI Digital Resource Certificates



- Issue digital certificates along with the registration of Internet number resources
- Two main purposes:
  - Make the registry more robust
  - Making Internet routing more secure
- Added value comes with validation
  - The possibility to perform BGP Origin Validation



# Using Certificates



- **Certification is a free, opt-in service**
  - Your choice to request a certificate
    - Linked to your membership
    - Renewed every 12 months
    - Available in LIR Portal
- **Certificate does not list any identity information**
  - That information is in the RIPE Database
- **Digital proof you are the holder of a resource**
  - and you're authorised to announce it





# Questions





# Tips and Tools

## Section 9

# Lost Maintainer Password



- Go to <https://apps.db.ripe.net/change-auth/>
- Automated process
  - Recovery link sent to “**upd-to:**” email address
- Manual process
  - Send statement & registration papers to us
  - After verification, we will send you an email with the recovery link
  - We will add your Access account to the maintainer

# Protect Your Resources



- Maintain your contact info in the RIPE database
- Keep your LIR contacts in the LIR Portal up to date
- Know the policies and procedures
- In case of questions, contact

Registration Services

[lir-help@ripe.net](mailto:lir-help@ripe.net)



# RIPE NCC Resource Quality Assistance



- **Address distribution - no claims about routability**
  - Assistance in case of filtering issues:
    - Help to establish a direct communication
    - Provide available contact details
    - Provide information about tools
- **To reduce routability problems, the RIPE NCC:**
  - Announces pilot prefixes of every newly allocated IP address block
  - Quarantines returned IP address space



# RIPEstat



- One-stop-shop for viewing all IP-resource related data from RIPE NCC
- Registry data, routing, reverse DNS, measurements & 3rd-party data
- Main interface: web-based widgets
  - also available as: CLI, data API & mobile
  - personalised via RIPE NCC Access

**<http://stat.ripe.net>**

# RIPE Atlas - Active Measurements



- Next generation Internet measurement network
  - Gives a big picture about Internet traffic
- Currently around 8,700 active probes worldwide
- User Defined Measurements available for LIRs
  - ping, traceroute, DNS, SSL
- Set up IPv6 reachability test



<http://atlas.ripe.net>

# RIPE Labs



- A place to showcase new and interesting Internet related developments
- Anyone can:
  - Present research
  - Showcase prototype tools
  - Share operational experience
  - Exchange ideas

**<http://labs.ripe.net>**



# Questions



# RIPE NCC Academy



**RIPE**  
**NCC** ACADEMY

**Graduate to the next level!**

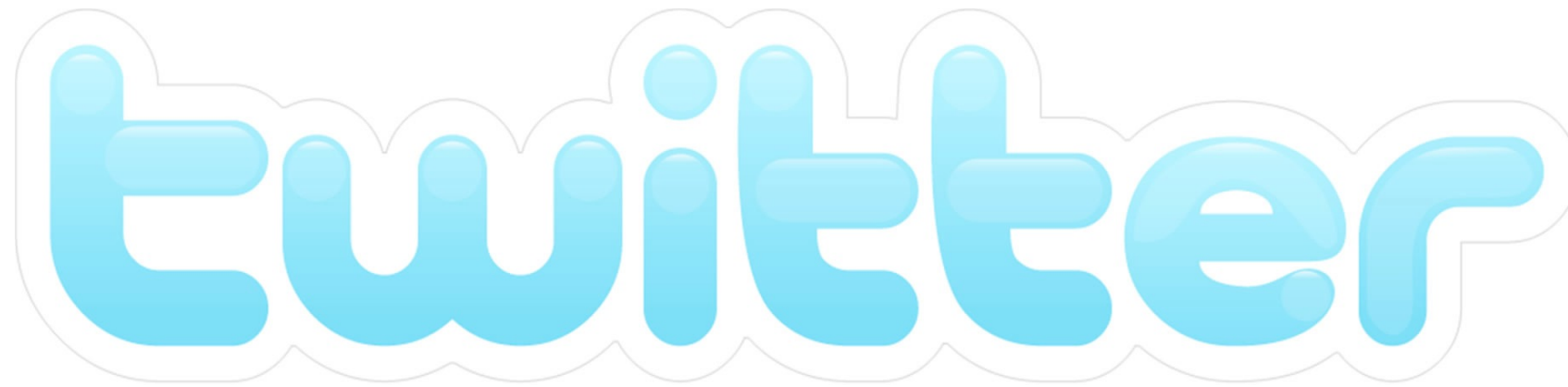
<http://academy.ripe.net>

# Feedback!



<https://www.ripe.net/training/lir/feedback>

**Follow us!**



@TrainingRIPENCC

**The End!**

**Край**

**Y Diwedd**

**النهاية**

**Соңы**

**ჟღერჟ**

**Fí**

**Finis**

**Ende**

**Finvezh**

**Liðugt**

**Кінець**

**Konec**

**Kraj**

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**Fund**

**پایان**

**Lõpp**

**Beigas**

**Vége**

**Son**

**An Críoch**

**Kraj**

**הסוף**

**Fine**

**Endir**

**Sfârșit**

**Fin**

**Τέλος**

**Einde**

**Конец**

**Slut**

**Slutt**

**დასასრული**

**Pabaiga**

**Fim**

**Amaia**

**Loppu**

**Tmíem**

**Koniec**