Local Internet Registry

Training Course

November 2022

RIPE NCC Learning & Development
Please Follow Our Safety Measures

Self-test
Please test yourself and keep everyone safe

Get a mask
Use a mask if this is required at the location

Sanitise your hands
Particularly when entering and leaving rooms

Respect each other's space
Red bracelet: Please keep 1.5 m distance
Green bracelet: You can stand closer
<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00 - 09:30</td>
<td>Coffee, Tea</td>
</tr>
<tr>
<td>11:00 - 11:15</td>
<td>Break</td>
</tr>
<tr>
<td>13:00 - 14:00</td>
<td>Lunch</td>
</tr>
<tr>
<td>15:30 - 15:45</td>
<td>Break</td>
</tr>
<tr>
<td>17:30</td>
<td>End</td>
</tr>
</tbody>
</table>
Introductions

- Name
- Experience with the RIPE NCC
- Goals for today
Overview

• The Internet Registry (IR) System
• Participating
• Being an LIR
• The RIPE Database
  • Activity: Querying the RIPE DB
• Getting Resources
• Transfers
• Distributing Resources
  • Activity: Making/Registering Assignments
• Managing Resources
• Activity: Being an LIR Contact
• Tips and Tools
The Internet Registry System

Section 1
The Internet Registry System

Internet Assigned Numbers Authority
Distribution Hierarchy

IANA — The Internet Assigned Numbers Authority

RIR — Regional Internet Registry (RIR): the RIPE NCC

LIR — Local Internet Registries

Optional

ISP — Internet Service Providers

Users
Regional Internet Registries

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

- RIRs Goals: Registration, Aggregation, Conservation
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
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
RIPE NCC

- Began operating in 1992
- Not-for-profit membership organisation
- 23,000+ Local Internet Registries (LIRs)
- Neutral, Impartial, Open, Transparent
- Provides administrative support to RIPE
Réseaux IP Européens (RIPE) Community

- Since 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 meetings twice a year
What is the difference?

The RIPE community

The RIPE Network Coordination Centre

- ~160 employees
- Offices in Amsterdam, Dubai

Discussion forum open to everybody interested
Participating

Section 2
Working Groups

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

https://www.ripe.net/participate/mail/forum/
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
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

https://www.ripe.net/participate/policies/participation-ripe-pdp
When to Start a Policy Proposal?

• When something is **missing, outdated** or can be **improved** in the policies

• When **not** to do it?
  - Disagreement with RIPE NCCs request evaluation
    First: Revision/Escalation
  - Changes to the RIPE NCC membership (charging, rules)
    Solution: RIPE NCC General Meeting
RIPE NCC General Meeting

- During RIPE Meetings
- RIPE NCC members (LIRs) participate
- 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
Who Does What?

- **The RIPE community**
  - Creates & discuss proposals
  - Seeks consensus

- **Working Group (WG) chairs**
  - Accept proposals
  - Chair the discussions
  - Decide if consensus has been reached

- **The RIPE NCC**
  - Acts as the secretariat to support the process
  - Publishes policies documents and implement them
Questions
Being an LIR

Section 3
Being an LIR

1. Register (fee)
   Updated LIR Info

2. IPs and ASNs Management
   Update DB

3. PDP

4. RIPE NCC Services / Tools
What is in the Local Internet Registry?

Name of the organisation or person operating the LIR

Contact Information
- Postal address
- Phone numbers
- Email addresses

IPv4 & IPv6
- Allocations
- PI assignments

Billing details
- Allocations
- PI assignments

User Accounts

AS Numbers

Preferences
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 LIR does not cooperate with RIPE NCC audits (ARC)

- The RIPE NCC takes on responsibility for address space held by closing LIRs
RIPE NCC Access Account

- For RIPE NCC services
- Free to create
- Can be associated with one or more LIRs
Make an Access account

Activity 1
Demo: LIR Portal Overview

- Account details
- Resources details
- Communicating with the RIPE NCC:
  - Request resources
  - Create tickets
  - Sign up for a training or webinar

LIR Portal: https://my.ripe.net
The RIPE Database

Section 4
The purpose of the RIPE Database

- Registry of who holds IP addresses and ASNs
- Keeps contact information
  - For troubleshooting, notifying outages, etc.
- Publishing routing policies
- Provisioning reverse DNS
RIPE Database Objects

**IPs and ASNs**
- inetnum
- inet6num
- aut-num

**Contact Information**
- organisation
- person
- role

**Routing**
- route
- route6
- as-set

**Reverse DNS**
- domain

**Object Protection**
- mntner
RIPE Database Attributes

- Information in Objects is stored in pairs:

**Attribute-name : Attribute-value**

<table>
<thead>
<tr>
<th>person:</th>
<th>Jean Blue</th>
</tr>
</thead>
<tbody>
<tr>
<td>address:</td>
<td>Sesame Street 1</td>
</tr>
<tr>
<td>phone:</td>
<td>+1 555 0101</td>
</tr>
<tr>
<td>email:</td>
<td><a href="mailto:john@example.com">john@example.com</a></td>
</tr>
<tr>
<td>nic-hdl:</td>
<td>JS123-RIPE</td>
</tr>
<tr>
<td>mnt-by:</td>
<td>RED-MNT</td>
</tr>
</tbody>
</table>

mntner: RED-MNT

auth: SSO john@example.com
Querying the RIPE Database
Querying the RIPE Database

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

- For finding additional information
  - Insert flag in front of the query:
    -m 193.0.16.0/21
  - Or check appropriate box in a tab

Example, “Hierarchy Flags”:
More Specific inetnums:  -m

-m 193.0.24.0/21

193.0.24.0/21

/24

/26

/25
More Specific inetnums: -M

-M 193.0.24.0/21
Less Specific inetnums:  -l

- l 193.0.25.0/24

193.0.24.0/21

193.0.25.0/24
Less Specific inetnums: \(-L\)

- \(-L\) 193.0.25.0/24

0/0

193.0.24.0/21

193.0.25.0/24
Querying the RIPE Database

Activity 2
Activity: Querying the RIPE Database

• **Time**
  - 15 minutes

• **Goal**
  - Learn to use the web interface to find information in RIPE DB

• **Tasks**
  - Find contact information about an IP address
  - Look for the IP address space of an LIR
Updating the RIPE Database
Protecting Objects

**person:** Jean Blue

- **address:** My Street 9876
- **address:** Office 123
- **phone:** +31 20 876 5432
- **e-mail:** jean@example.net
- **nic-hdl:** JB123-RIPE
- **mnt-by:** LIR-MNT

**mntner:** LIR-MNT

- **admin-c:** JB123-RIPE
- **notify:** noc@example.org
- **upd-to:** noc@example.org
- **auth:** MD5-PW $1$crypto-stuff
- **auth:** SSO email@domain.com
- **auth:** PGP-KEY-<key ID>
- **mnt-by:** LIR-MNT
Update after a Query Result

Responsible organisation: Reseaux IP Europeens Network Coordination Centre (RIPE NCC)
Abuse contact info: abuse@ripe.net

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>inetnum</td>
<td>193.0.24.0 - 193.0.30.255</td>
</tr>
<tr>
<td>netname</td>
<td>RIPENCC-MEETING-PUBLIC</td>
</tr>
<tr>
<td>descr</td>
<td>Reseaux IP Europeens Network Coordination Centre (RIPE NCC)</td>
</tr>
<tr>
<td>remarks</td>
<td>RIPE NCC Training Services &amp; RIPE Meetings</td>
</tr>
<tr>
<td>remarks</td>
<td>This space is used as public space during RIPE meetings</td>
</tr>
<tr>
<td>country</td>
<td>NL</td>
</tr>
<tr>
<td>admin-c</td>
<td>BRD-RIPE</td>
</tr>
<tr>
<td>tech-c</td>
<td>OPS4-RIPE</td>
</tr>
<tr>
<td>status</td>
<td>ASSIGNED PA</td>
</tr>
<tr>
<td>mnt-by</td>
<td>RIPE-NCC-MNT</td>
</tr>
<tr>
<td>mnt-routes</td>
<td>RIPE-NCC-MNT</td>
</tr>
<tr>
<td>mnt-domains</td>
<td>RIPE-NCC-MNT</td>
</tr>
<tr>
<td>created</td>
<td>2013-10-09T14:42:14Z</td>
</tr>
<tr>
<td>last-modified</td>
<td>2017-12-04T14:40:12Z</td>
</tr>
<tr>
<td>source</td>
<td>RIPE</td>
</tr>
</tbody>
</table>

Duplicate the attribute  
Add a new attribute  
Delete the attribute  
Info about the attribute
Creating Objects
# Maintainer and Person/Role

**role:** Technical Team

- **address:** My Street 9876
- **phone:** +31 20 876 5432
- **e-mail:** johndoe@email.net
- **nic-hdl:** JD963-RIPE
- **mnt-by:** PERSONAL-MNT

**mntner:** PERSONAL-MNT

- **admin-c:** JD963-RIPE
- **descr:** Startup maintainer
- **auth:** SSO jean@example.net
- **mnt-by:** PERSONAL-MNT
Create role and maintainer pair (1)

Select object type you would like to create

Object type

role and maintainer pair

Create
Create role and maintainer pair (2)

Create role and maintainer pair

<table>
<thead>
<tr>
<th>mntner</th>
<th>role</th>
<th>address</th>
<th>e-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA320-MNT</td>
<td>ABC Admins</td>
<td>Singel 258, 1016 AB Amsterdam</td>
<td><a href="mailto:abd-admins@abc-company-email.com">abd-admins@abc-company-email.com</a></td>
</tr>
</tbody>
</table>

By submitting this form you explicitly express your agreement with the RIPE Database Terms and Conditions

- Instead of a role, you can create a person object
Create role and maintainer pair (3)

Your objects have been successfully created

role with primary key "AA3-TEST"

<table>
<thead>
<tr>
<th>role:</th>
<th>ABC Admins</th>
</tr>
</thead>
<tbody>
<tr>
<td>address:</td>
<td>Singel 258, 1016 AB, Amsterdam</td>
</tr>
<tr>
<td>e-mail:</td>
<td><a href="mailto:abc-admins@abc-company-email.com">abc-admins@abc-company-email.com</a></td>
</tr>
<tr>
<td>nic-hdl:</td>
<td>AA3-TEST</td>
</tr>
<tr>
<td>mnt-by:</td>
<td>AA320-MNT</td>
</tr>
<tr>
<td>created:</td>
<td>2019-10-16T11:52:09Z</td>
</tr>
<tr>
<td>last-modified:</td>
<td>2019-10-16T11:52:09Z</td>
</tr>
<tr>
<td>source:</td>
<td>TEST</td>
</tr>
</tbody>
</table>

mntner with primary key "AA320-MNT"

<table>
<thead>
<tr>
<th>mntner:</th>
<th>AA320-MNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>admin-c:</td>
<td>AA3-TEST</td>
</tr>
<tr>
<td>upd-to:</td>
<td><a href="mailto:john.smith@abc-company-email.com">john.smith@abc-company-email.com</a></td>
</tr>
<tr>
<td>auth:</td>
<td>SSO <a href="mailto:john.smith@abc-company-email.com">john.smith@abc-company-email.com</a></td>
</tr>
<tr>
<td>mnt-by:</td>
<td>AA320-MNT</td>
</tr>
<tr>
<td>created:</td>
<td>2019-10-16T11:52:09Z</td>
</tr>
<tr>
<td>last-modified:</td>
<td>2019-10-16T11:52:09Z</td>
</tr>
<tr>
<td>source:</td>
<td>TEST</td>
</tr>
</tbody>
</table>
Creating an object (1)

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

Select object type you would like to create

Object type
- role and maintainer pair
- as-set
- aut-num
- domain
- filter-set
- inet-rtr
- inet6num
- inetnum
- irt
- key-cert
- mntner
- organisation
- peering-set
- person
- role
- route
- route-set
- route6
- rtr-set
Creating an object (2)

• Choose a mntner to protect the new object

Create "inetnum" object

Please enter the maintainers you would like to use as mnt-by
Type maintainer name

• Or choose a person object for admin-c (only mntners)

Create "mntner" object

Please select your administrative contact before creating the shared maintainer object

Don't have an administrative contact? Create maintainer and person pair
## Creating an object (3)

### Create "inetnum" object

Please enter the maintainers you would like to use as mnt-by

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>inetnum</td>
<td>Specifies the range of IPv4 addresses in dash or CIDR notation.</td>
</tr>
<tr>
<td>netname</td>
<td>The name of the range of IP address space.</td>
</tr>
<tr>
<td>country</td>
<td>Identifies the country as a two-letter ISO 3166 code, e.g., NL.</td>
</tr>
<tr>
<td>admin-c</td>
<td>NIC-handle of an administrative contact.</td>
</tr>
<tr>
<td>tech-c</td>
<td>NIC-handle of a technical contact.</td>
</tr>
<tr>
<td>status</td>
<td>Specifies the kind of resource.</td>
</tr>
<tr>
<td>source</td>
<td>RIPE</td>
</tr>
</tbody>
</table>

By submitting this form you explicitly express your agreement with the [RIPE Database Terms and Conditions](https://www.ripe.net).
Creating an object (4)

Your object has been successfully created

**inetnum with primary key "193.0.30.0 - 193.0.30.255"**

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>inetnum</td>
<td>193.0.30.0 - 193.0.30.255</td>
</tr>
<tr>
<td>netname</td>
<td>CUSTOMER-NETWORK-001</td>
</tr>
<tr>
<td>descr</td>
<td>The IPv4 network of customer 001</td>
</tr>
<tr>
<td>country</td>
<td>NL</td>
</tr>
<tr>
<td>admin-c</td>
<td>GV5919-RIPE</td>
</tr>
<tr>
<td>tech-c</td>
<td>GV5919-RIPE</td>
</tr>
<tr>
<td>status</td>
<td>ASSIGNED PA</td>
</tr>
<tr>
<td>mnt-by</td>
<td>EXAMPLE-LIR-MNT</td>
</tr>
<tr>
<td>created</td>
<td>2015-12-24T10:02:59Z</td>
</tr>
<tr>
<td>last-modified</td>
<td>2015-12-24T10:02:59Z</td>
</tr>
<tr>
<td>source</td>
<td>RIPE</td>
</tr>
</tbody>
</table>
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
Types of Address Space

- **PA = Provider Aggregatable**
  - Blocks given to LIRs
  - Distributed further to other users
  - When customers change ISP, the IPs go back to LIR

- **PI = Provider Independent**
  - Blocks given directly to a user for their own network
  - User takes IPs with them if they change ISP
PA versus PI

Provider Aggregatable

ISP 1
PA Alloc. 1
PA Assign

ISP 2
PA Alloc. 2
PA Assign

Internet

ISP 1
ISP 2

Provider Independent

PI

PA Assign
PA Assign
IPv4: How it used to be

IANA
- Holds the whole range -> /0

RIR
- RIRs get ALLOCATIONs -> /8s

LIR
- LIRs get an ALLOCATION -> .. /19, /21, /22

ISP
- SUB-ALLOCATIONs

Users
- PA Assignments
- PA Assignments
- PI Assignments

/8 = 16,77 million IPv4 addresses
/16 = 65536 IPv4 addresses
/24 = 256 IPv4 addresses
How it is for IPv4 now

IANA — Holds the whole range → /0

RIR — The RIPE NCC gets ALLOCATIONs from the recycled space

LIR — LIRs get an ALLOCATION → /24

ISP — SUB-ALLOCATIONs

Users — PA Assignments

After quarantine

PI Assignments
How it works for IPv6

IANA distributes 2000::/3

The RIPE NCC receives ALLOCATIONs → /12s

LIRs receive ALLOCATIONs → /32, /29…

SUB-ALLOCATIONs

PA Assignments

PA Assignments

PI Assignments
Sub-allocations

IANA: Global Internet Numbers Pools

RIR: Reserved for future use: Allocations

LIR: Reserved for future use: Allocations

ISP: Reserved or partitioned: Sub-allocations

Users: In use: Assignments
First IPv6 Allocation

- Have `mntner`, `person` and `role` objects ready
- 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
  - Additional bits based on hierarchical and geographical structure, planned longevity and security levels
Requesting an IPv6 PI Assignment

• PI Assignment for End-Users need 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

- Cannot be further sub-assigned to other organisations
- Allowed to give separate addresses (not prefixes) to:
  - Visitors, server or appliance, point-to-point link to 3rd party

inet6num: 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: The Waiting List

• Submit the IPv4 Allocation Request form
  - Use the same mntner, person/role objects from the IPv6 allocation

• Each LIR is put on the first-come-first-served waiting list to get one /24 block
  - = 256 IPv4 addresses

• Cannot be transferred for 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** LIR 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 without sponsoring LIR 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
  - “sponsoring-org:” attribute
Getting IPs and ASNs

Demonstration
Transfers

Section 6
Types of Transfers

- **PA allocations**
  - Between RIPE NCC members

- **PI assignments**
  - Between End Users

- **AS numbers**
  - Between End Users

- **Merger or Acquisition**

- **From Legacy Space**

- **Inter-RIR**
IPv4 Allocation Transfers

LIR → LIR

SIZE LIMIT 722

TEMPORARY PERMANENT

KEEP CALM
No transfer within 24 months
IPv4 PI Assignment Transfers

Temporary

Permanent

SPONSORED BY YOUR LIR

SIZE LIMIT /24

KEEP CALM
No transfer within 24 months
Transfers Restrictions

- **IPv4 or 16-bits ASN**
  - **Received from RIPE NCC**
    - **Transfer to another LIR?** NO
  - **<24 MONTHS**
  - **<24 MONTHS**
  - **<24 MONTHS**
  - **MERGER**
    - **IPv4 ASNs**
    - **IPv4 ASNs**
    - **IPv4 ASNs**
    - **IPv4 ASNs**
    - **IPv4 ASNs**
  - **Transfer to another LIR?** NO
  - **<24 MONTHS**
  - **<24 MONTHS**
  - **Merge/Acquisition with another LIR with resources?** YES
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

TEMPORARY PERMANENT
IPv6 PI Assignment Transfers

MIN SIZE /48

TEMPORARY PERMANENT

SPONSORED BY YOUR LIR
Transfers: How to Request

• Use the “Request Transfer” wizard

• 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
Inter-RIR Transfers

- Between RIRs with compatible policies (ARIN, APNIC, LACNIC)
- IPv4 addresses and AS Numbers (including legacy)
- Send your request to inter-rir@ripe.net
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 for each 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, amount of hosts in a subnet is irrelevant!
IPv6 Assignments

• Default IPv6 subnet = /64

• Every “end site” can be assigned between /64 and larger without prior approval of the RIPE NCC
  - Keep assignment documentation in case of audit!

• Assignments for your own infrastructure
  - /48 per Point of Presence
  - Additional /48 for the core network
Making Assignments
Activity 3
Activity: 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
  - How would you document the assignments?
## Making assignments - Solution

### IPv4

<table>
<thead>
<tr>
<th>Service</th>
<th>Now</th>
<th>1 Year</th>
<th>2 Years</th>
<th>IPv4 Prefix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared Webhosting</td>
<td>$(150/10) + 3 = 18$</td>
<td>$(300/10) + 3 = 33$</td>
<td>$(600 / 10) + 3 = 63$</td>
<td>/26</td>
</tr>
<tr>
<td>SSL Webhosting</td>
<td>$7 + 3 = 10$ IPs</td>
<td>$14 + 3 = 17$ IPs</td>
<td>$28 + 3 = 31$ IPs</td>
<td>/27</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>$10 + 3 = 13$ IPs</td>
<td></td>
<td></td>
<td>/28</td>
</tr>
</tbody>
</table>

### IPv6

- A prefix with at least 3 /64s. Make it easy, use a /48
IPv6 Registration in the Database

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

**Assignment**

<table>
<thead>
<tr>
<th>inet6num: 2001:db8:aaaa::/48</th>
</tr>
</thead>
<tbody>
<tr>
<td>descr: Customer 321</td>
</tr>
<tr>
<td>country: EU</td>
</tr>
<tr>
<td>admin-c: LA789-RIPE</td>
</tr>
<tr>
<td>tech-c: LA789-RIPE</td>
</tr>
<tr>
<td>status: ASSIGNED</td>
</tr>
<tr>
<td>mnt-by: LIR-MNT</td>
</tr>
</tbody>
</table>

**Sub-allocation**

<table>
<thead>
<tr>
<th>inet6num: 2001:db8:f000::/36</th>
</tr>
</thead>
<tbody>
<tr>
<td>descr: Branch office #1</td>
</tr>
<tr>
<td>country: EU</td>
</tr>
<tr>
<td>admin-c: LA789-RIPE</td>
</tr>
<tr>
<td>tech-c: LA789-RIPE</td>
</tr>
<tr>
<td>status: ALLOCATED-BY-LIR</td>
</tr>
<tr>
<td>mnt-by: LIR-MNT</td>
</tr>
</tbody>
</table>
Grouping Customer Assignments

inet6num: 2001:db8::/36

descr: DSL customers
admin-c: LA789-RIPE
tech-c: LA789-RIPE
status: AGGREGATED-BY-LIR
assignment-size: 48
mnt-by: LIR-MNT

inet6num: 2001:db8:100::/48

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

inet6num: 2001:db8:101::/48

inet6num: 2001:db8:102::/48

inet6num: 2001:db8:103::/48
IPv4 Resources

- LIRs are allocated only one /24
  - 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!
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

Activity 4
Activity: Registering an Assignment

• Time
  - 25 minutes

• Goal
  - Practice how to register an assignment

• Task
  - Use the assignment from the previous activity
  - Choose the range(s) from your allocation
  - Create the inetnum and inet6num objects in the TEST RIPE Database
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
Managing IPv4 Address Space

- LIRs can join the waiting list, and at some point get one /24 allocation (can be done only once)
  - 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
ARC

- 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
- Increase LIR account security
- 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
Being an LIR contact

Activity 5
Activity: Being an LIR Contact

- **Time**
  - 25 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?
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 User Accounts in the LIR Portal up to date
- Know the policies and procedures

- In case of questions, contact Registration Services
  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 the 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 10,000+ 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
RIPE NCC Certified Professionals

- IPv6 Fundamentals Analyst
- RIPE Database Associate
- IPv6 Security Expert

https://getcertified.ripe.net/
Questions
We want your feedback!

What did you think about this session?

Take our survey at:

https://www.ripe.net/support/training/feedback/lir/