Welcome to the

RIPE NCC LIR Tutorial

Overview - LIR Basics

- Being an LIR
- RIPE Database
- Assignment Window
- Making Assignments
- PI Address Space
- AS Numbers
- IPv6 Address Space

Being an LIR

What is an LIR?

- **L**ocal **I**nternet **R**egistry
  - responsible for obtaining, distributing and registering IP resources, according to the RIPE policies
- Member of the RIPE NCC
  - receiving resources directly from the RIPE NCC
- Benefits
  - flexibility
  - independence (BGP multihoming)

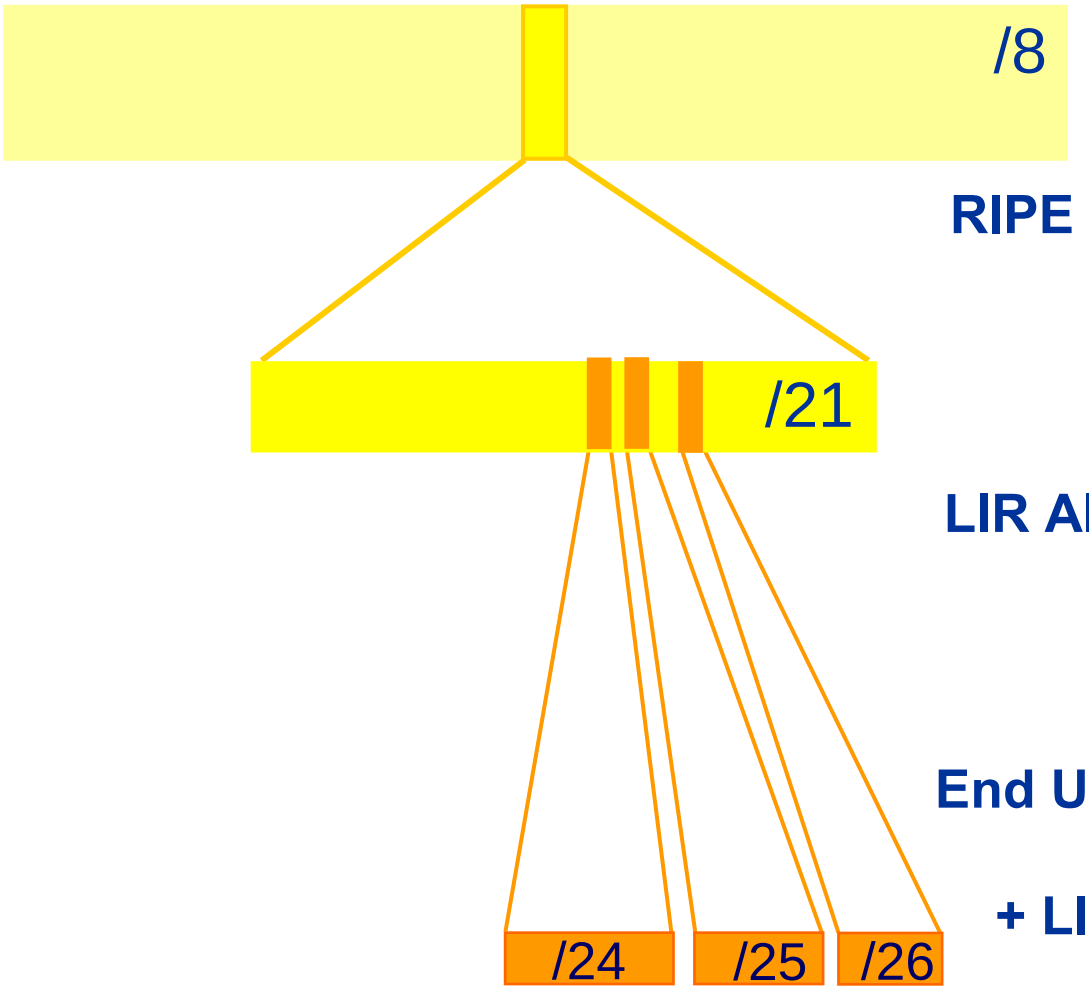
Classless Addressing

- Classful addressing (’80-’93) now obsolete
  - waste of addresses; routing table growth
- ’93: **C**lassless **I**nter **D**omain **R**outing (CIDR)
  - flexible allocation / assignment sizes
  - w.x.y.z/nn notation
- CIDR implemented in all modern routing protocols
- CIDR used for address space distribution

Terminology

- Allocation
  - address space set apart, by the RIPE NCC for LIR's and its customers' future use
- Assignment
  - address space **in use** in networks (End User, downstream ISP or LIR's own infrastructure)
  - made from allocation or sub-allocation
- Assignment Window
  - maximum nr of addresses an LIR can assign without RIPE NCC's approval. New LIR: AW=0

Allocation and Assignment



RIPE NCC Allocation

LIR Allocation

End User Assignments

+ LIR's Infrastructure

LIR Set-up Process

- Steps
  - read policy documents
  - apply for membership
    - RegID, contacts
  - pay the fees
  - sign the contract
- Next steps
  - LIR: register RIPE Database contact data
  - RIPE NCC: “Reg” file, “organisation” object
  - LIR: activate LIR Portal account

Sources of Contact Information

LIR Portal

- RIPE NCC confidential
  - access only by “users”
- “admin” creates “users”
- “users” create “contacts”
- Use: Reg-ID, user, pwd

Reg File

- RIPE NCC “contacts” can:
  - request resources
  - update contact info
- Use: Reg-ID, name

RIPE Database

- Public info
  - access by anyone
  - updates by anyone
- Operational contacts
  - troubleshooting
- Responsibility over registered resources
- Use: nic-handle
- Additional authorisation: using “maintainer”

First IPv4 Allocation

- If you
  - want independent addresses
  - have an estimate of usage for two years
  - know how much space needed in first six months
- Send us
  - “IPv4 first allocation request form”
  - PA assignment request form for infrastructure
  - PA assignment request form for each customer
- Slow start: minimum initial allocation size /21

Summary

- You are part of the global Registry System
- Think CIDR!
- LIR Portal: main interface

Questions?

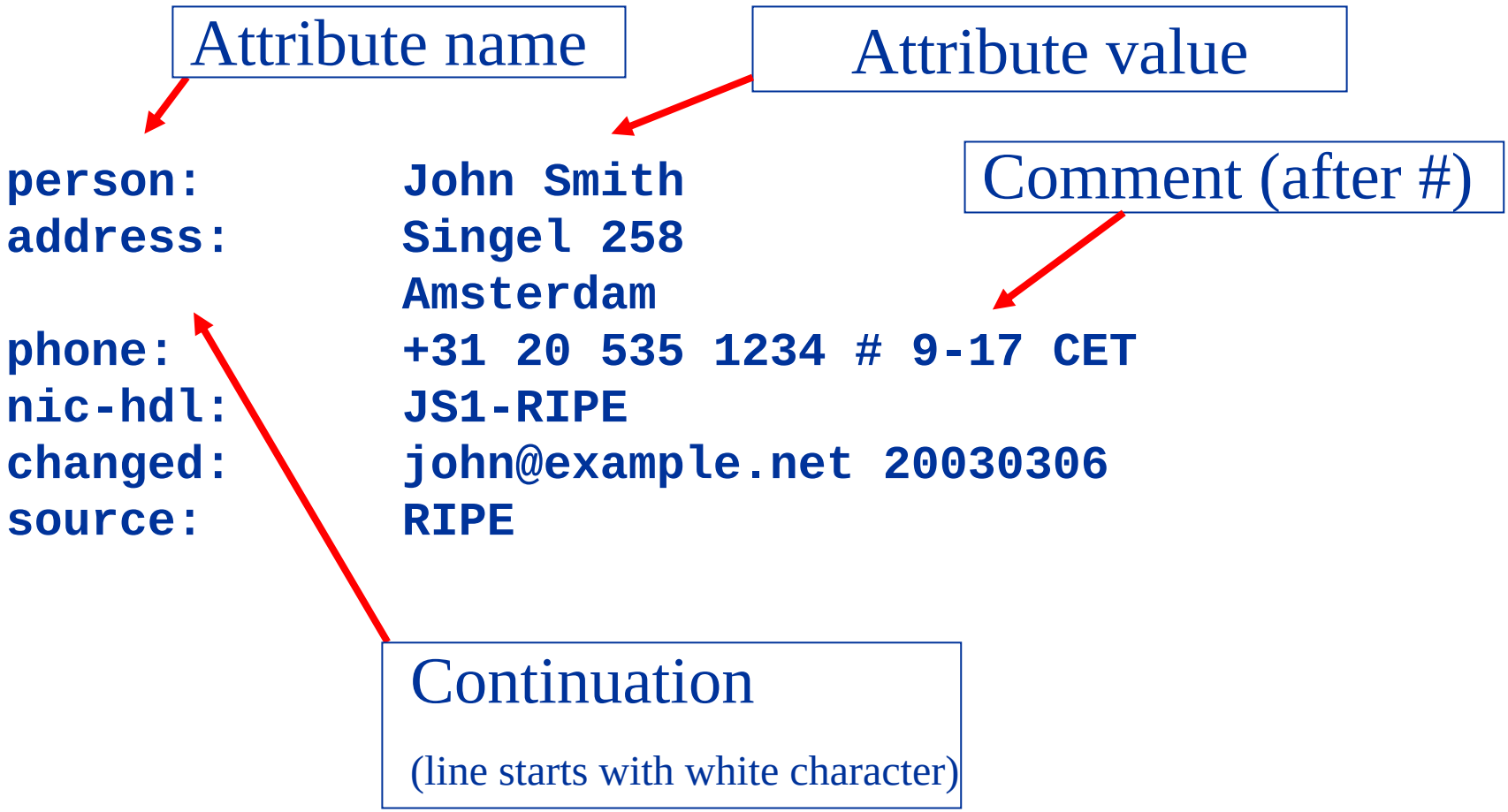
RIPE Database

RIPE Database

- Public Network Management Database
- All LIRs must have
  - **`person`** object
  - **`maintainer`** (**`mntner`**) object
  - **`organisation`** object

  - **`role`** object is convenient

DB Object Syntax



Querying the RIPE Database

- Object types:
  - Resource info
  - Contact info
  - Protection
- Command-line client
- Web interface
  - https://www.ripe.net/whois
- “Glimpse”: full text search
  - http://www.ripe.net/db/whois-free.html

Updating Objects

- Updating = creating, modifying, deleting
- Web, sync, e-mail
  - Mind the primary key!
    - Use new for creating objects
  - Add “changed:” line
- Ack, error and warning messages returned

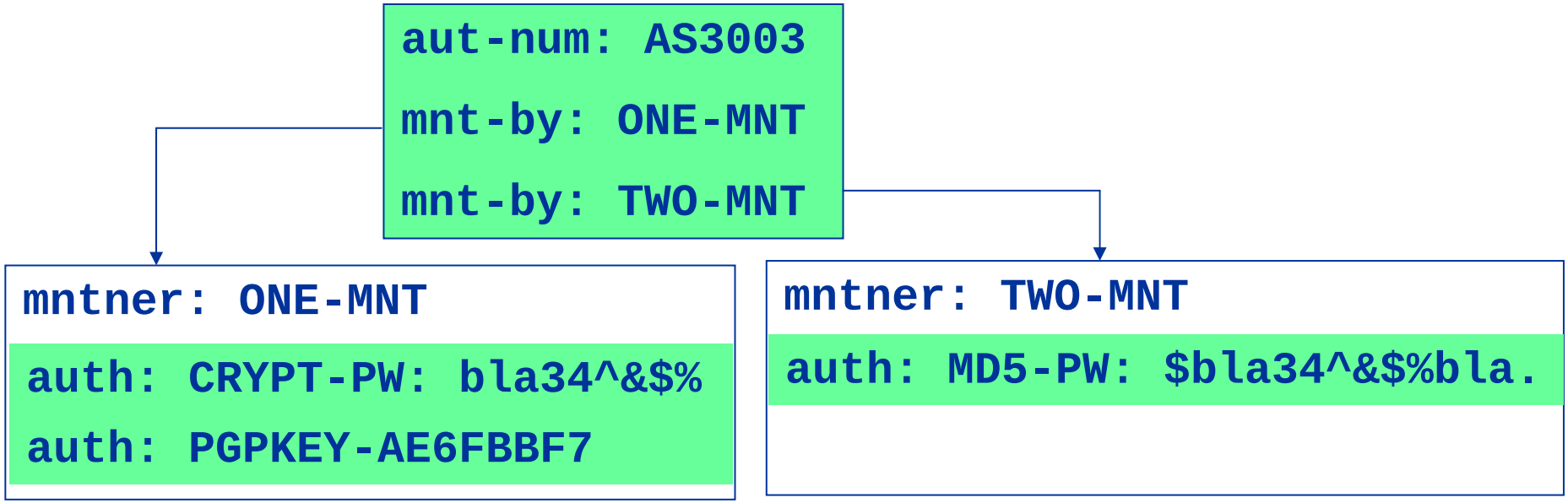
Protection of DB Objects

- "**mnt-by**": attribute refers to **mntner** object
  - Checked at every update

- **Password:**
  - **CRYPT-PW, MD5-PW,**
    - https://www.ripe.net/cgi-bin/crypt.cgi
- **Private key/Public key**
  - **PGPKEY-<id> & key-cert** object
  - **X.509-<id> & key-cert** object

- Multiple auth / mnt-by / mntner-s are OR-ed

Multiple Protection Illustrated

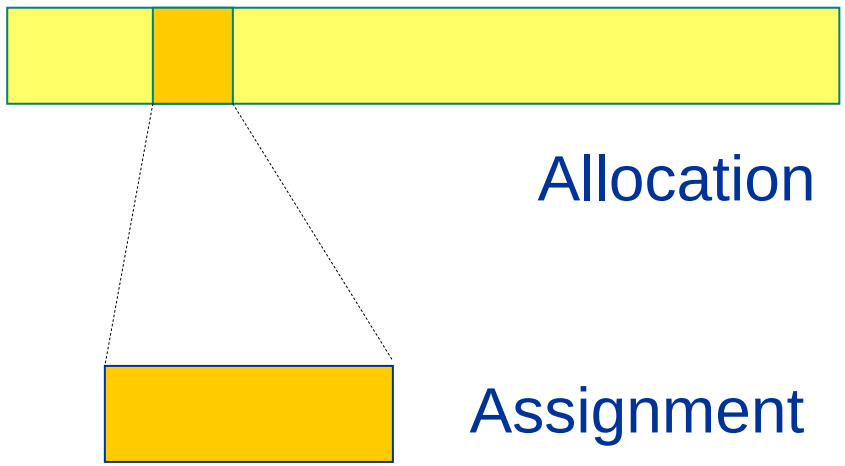


- In order to update the object AS3003, need to have:
  - **Either** the (crypt) password
  - **Or** the MD5 password
  - **Or** the PGP key

Hierarchical Authorisation

```
inetnum: 85.118.184.0/21
status: ALLOCATED PA
mnt-by: RIPE-NCC-HM-MNT
mnt-lower: LIR-MNT
```

```
inetnum: 85.118.186.0/24
status: ASSIGNED PA
mnt-by: LIR-MNT
```



TEST Database

- Playground Database: "**`source: TEST`**"
  - **`whois –h test-whois.ripe.net`**
  - mailto: test-dbm@ripe.net
    - http://www.ripe.net/db/syncupdates/syncupdate-test-minimal.html
    - http://www.ripe.net/webupdates-test

- Differences from RIPE Database:
  - Can create ASN objects automatically
  - Does not contain same info as operational RIPE Database

Summary

- RIPE Database
- Maintainers
- Hierarchical authorisation

Questions?

Assignment Window

Assignment Window Concept

- Maximum number of IP addresses the LIR can assign without approval from the RIPE NCC
- For each End User, within any 12 months
- New LIR, AW = zero
- RIPE NCC increases AW gradually

Infrastructure versus End User

- LIR / ISP infrastructure
  - **blocks** for co-location: server housing, web hosting
  - **blocks** for connection to End Users (dial-up, P2P)

- End User network
  - their equipment, their location
  - separate subnet(s)

Assignments for LIRs' Infrastructure

- LIR can make multiple assignments to own infrastructure. Each assignment = or < AW

- In **`inetnum`** object: ***separate*** attribute:

  `remarks: INFRA-AW`

  - Only if assignment hasn't been requested!
  - Cannot be merged

- Keep documentation to justify assignments

- **Assignments > AW : send request to the RIPE NCC !**

Ask for Approval if…

- Request is above AW:
  - This request and all previous assignments you made without the RIPE NCC to the same End User in the last 12 months
  - New LIR's AW=0 – need approval for **every** assignment!

Summary

- New LIR: AW=0
- Assignment > AW: send request for approval
- Assignment < AW: evaluate & assign yourself

Questions?

Making Assignments

Get it Right

- Before sending PA request, read:
  - FAQ, “Quick Tips”
  - “IPv4 Address Assignment and Allocation Policies”
  - “The LIR Handbook”
- Request online via LIR Portal
  - or “PA Assignment Request Form”
  - or “PA Assignment Wizard” via LIR Portal
- Not more than 5 requests at a time

Step 1: LIR Collects Information

- Why?
  - To determine the operational need
  - To justify the decision
- Info needed
  - Contact details
  - Network setup
  - Current address space usage
  - Address space requirements
  - Future plans
- Confidential, local language

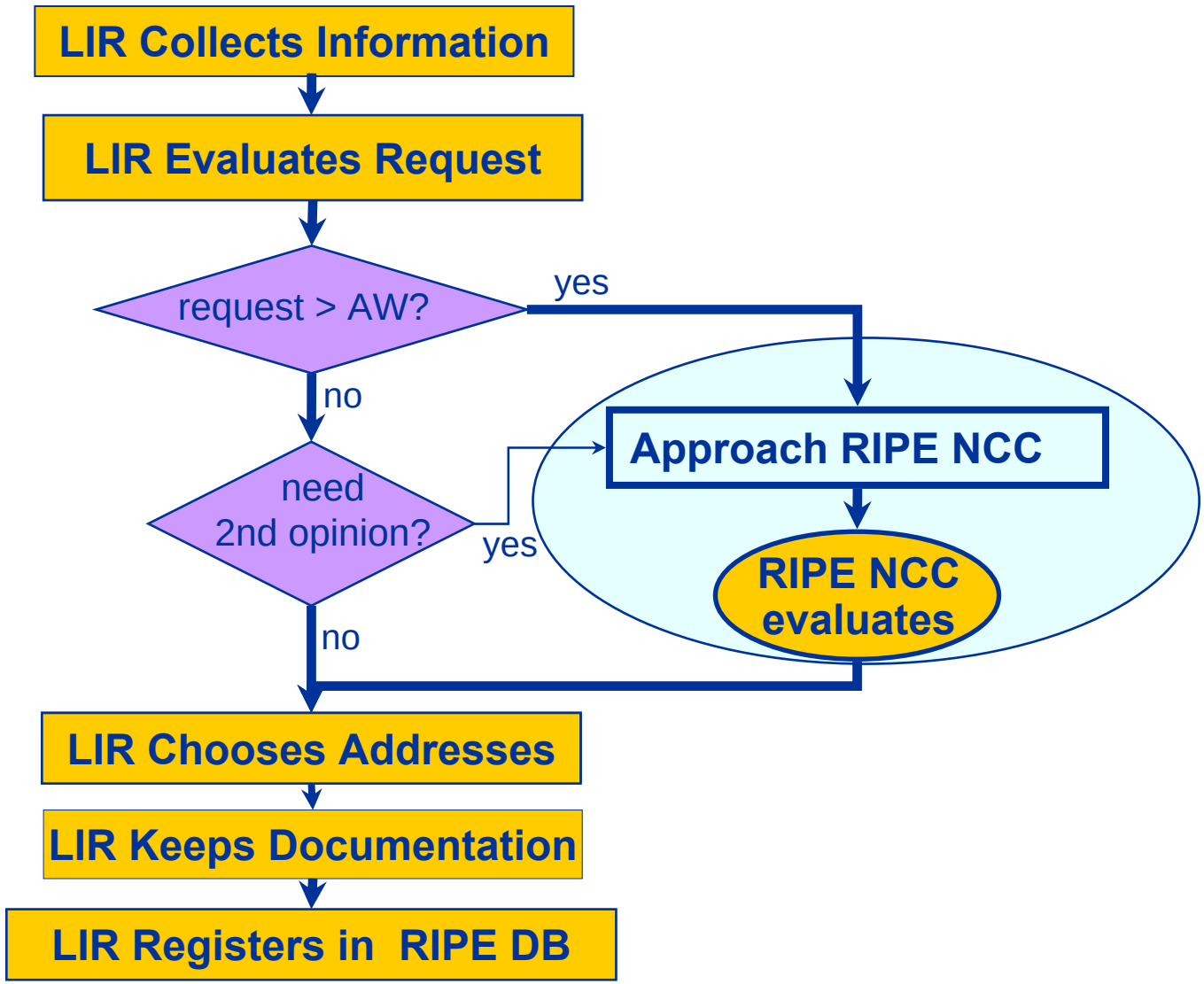
Step 2: LIR Evaluates Request

- Current address space
- Returning addresses?
  - Renumbering encouraged!
- All subnets classless
- Planning of growth two years ahead maximum
  - utilisation: 25% now, 50% in one year

Step 3: LIR Makes Decision

- Size
  - Based on demonstrated need
- For End User? For own Infrastructure?
- Classless
  - “/23 & /25” or /27… not always /24
- Range
  - Your choice

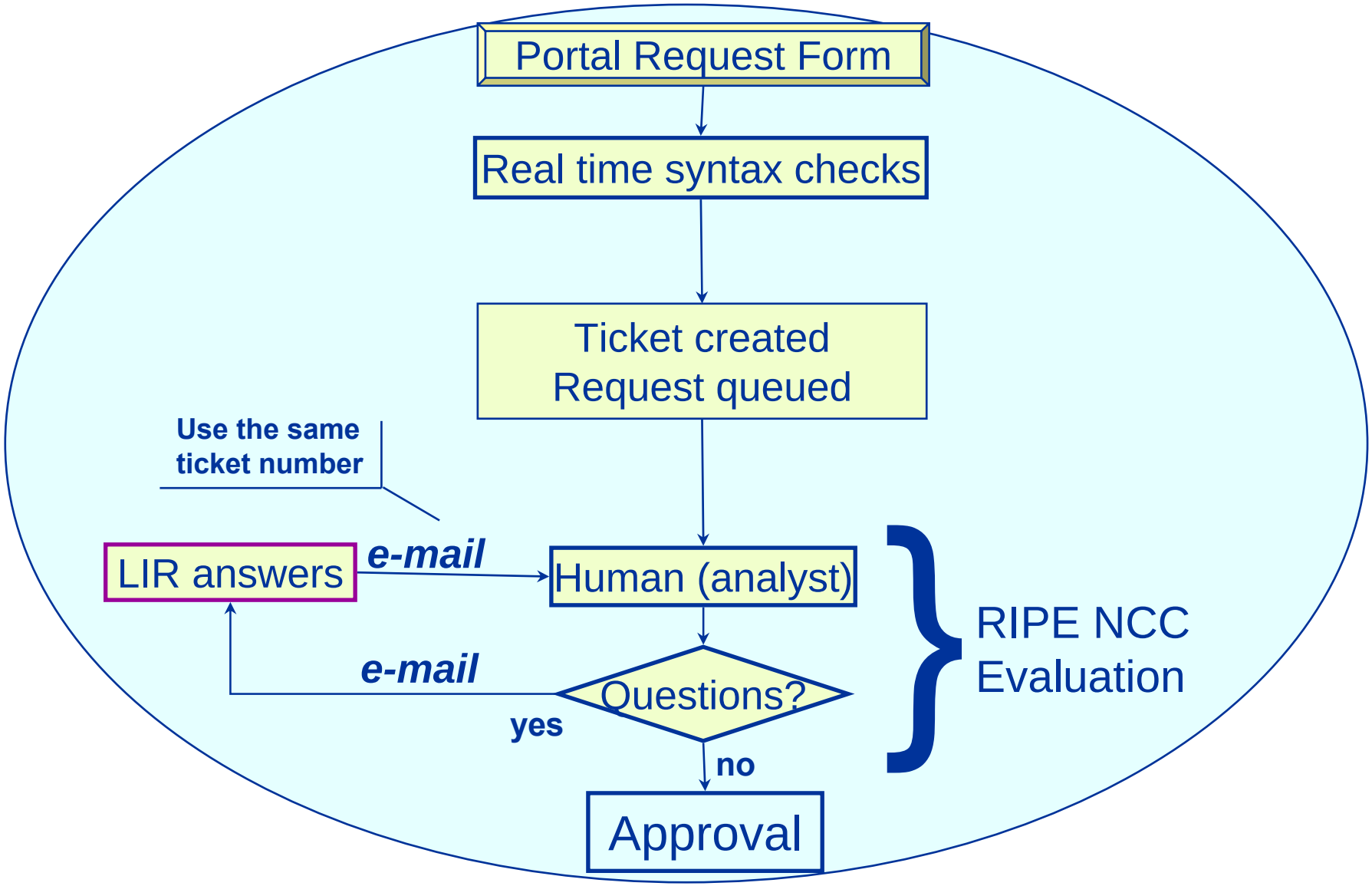
Assignment Process



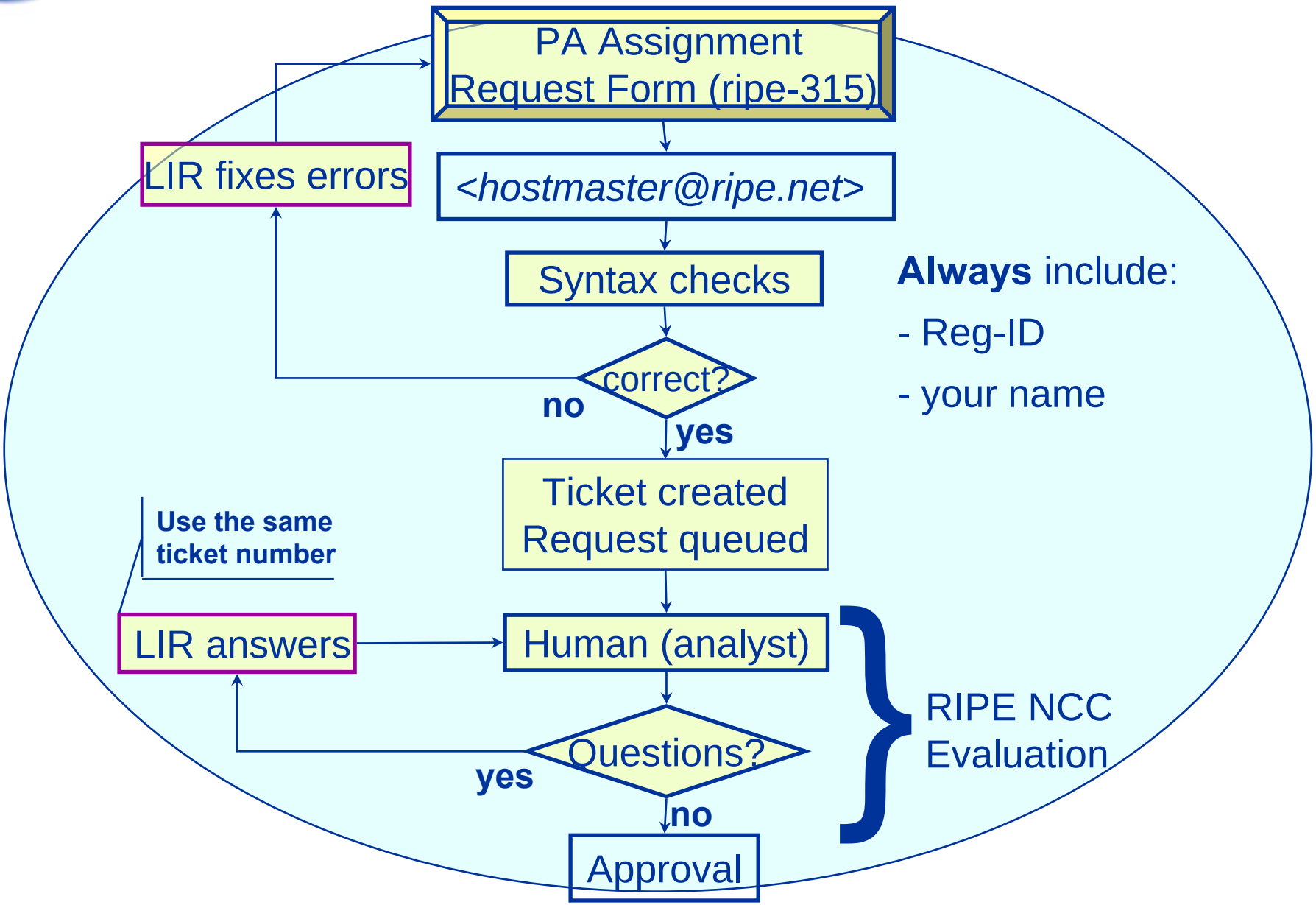
Step 4: Request Form

- General Information
- Address Space User
- Addressing Plan
- Equipment description
- Network description
- Network diagram

Portal Communication



Email Communication



RIPE NCC Evaluates Requests

- Based on “IPv4 Address Policies” document
  - Dynamic assigning encouraged
    - not static
  - More than /20: usage statistics verification
    - Always-on technologies: xDSL, cable, GPRS…
  - Name-based virtual web hosting encouraged
    - not IP-based
    - exceptions: SSL, ftp & mail servers...

Approval

- RIPE NCC sends approval message to LIR
  - Size
  - **“netname:”**
  - Date
    - ticket closed
- LIR keeps approval message
    - keep all original documents too
- Next steps
  - LIR chooses addresses
  - LIR creates **inetnum** object

Step 5: LIR Registers in RIPE DB

- Validity
- Uniqueness
- Overview
  - range
  - netname
- Contact info
  - admin-c
  - tech-c
- **`inetnum`** must match internal documentation

Registering End Users Separately

- Obligatory

- Benefits:
  - Abuse complaints can go directly to End User
  - Network operators can block End User prefix

Summary

- Evaluate End User needs
- Always register End Users separately

Questions?

PI Address Space

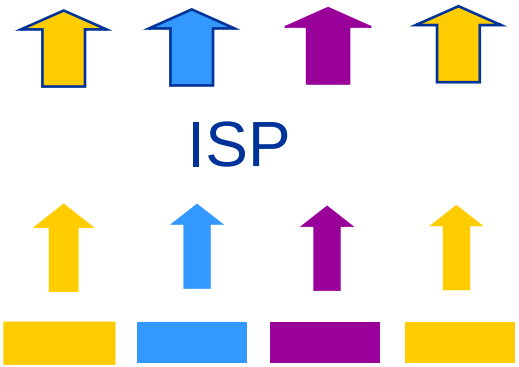
PA versus PI Assignments

- **P**rovider **A**ggregatable assignments
  - LIR assigns to End User
  - Must renumber when changing providers
  - Only way to effectively scale the Internet!
- **P**rovider **I**ndependent assignments
  - RIPE NCC assigns to End User
  - Portable
  - Can be difficult to route
  - Next assignment not aggregatable
  - Affects yearly fee
  - Increases size of the routing tables

PI versus PA Assignments

No Aggregation

BGP Announcements (4)



ISP

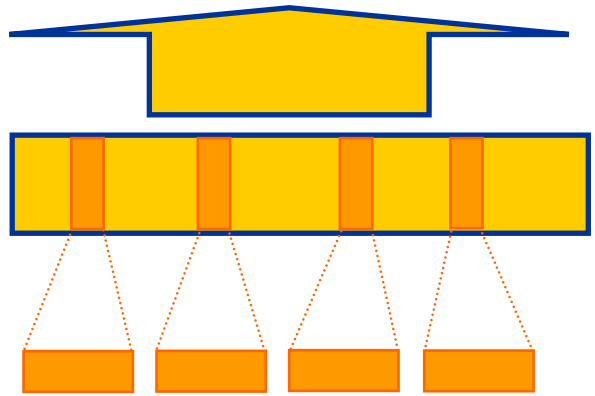
Customer Assignments

Provider **I**ndependent

(Portable Assignments)

Aggregation

BGP Announcement (1)



LIR Allocation

Customer Assignments

Provider **A**ggregatable

(Non-portable Assignments)

Requesting PI Space

- Explain consequences to End User
- Create RIPE Database objects
  - **`person/role, mntner, organisation`**
- Send request on behalf of End User
  - LIR Portal, or
  - “PI Assignment Request Form”

Evaluation of PI requests

- Additional questions
  - Why does End User want PI (and not PA)?
  - Requesting extra address space for routing?
  - Aware of consequences?
- Same criteria as for PA assignments
  - Conservative estimates
  - Classless
- Assignment is only valid as long as original criteria remain valid

PI Responsibilities

- RIPE NCC
  - Assigns to End User
  - Creates **`inetnum`**
- LIR
  - Makes contracts with End Users
  - Helps End Users with reverse DNS, **`route`** objects
  - Helps End Users if changing provider
- End User
  - Maintains objects
  - Must not assign further

Summary

- PA recommended
- LIR requests PI space for End User
- Shared responsibilities

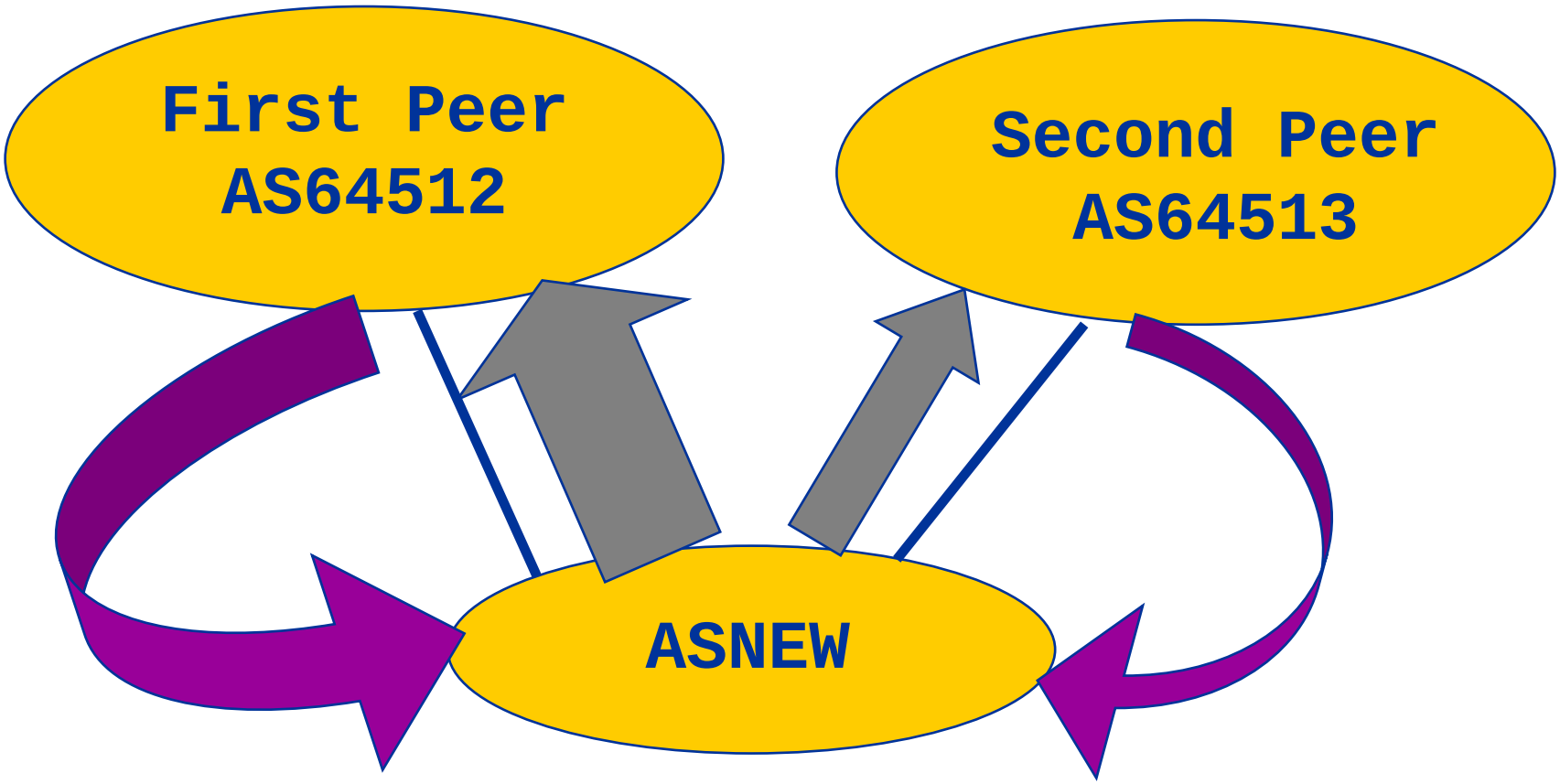
Questions?

Autonomous System Numbers

Autonomous System

- RFC 1930:
  - "An AS is a connected group of … IP prefixes … which has a **single** and **clearly defined** routing policy."
- LIR can request an ASN
  - For own network, or for another organisation
- Assignment criteria: multihomed
  - Unique routing policy
  - E-mail addresses of peers

Multihomed Routing Policy



aut-num in ASN Request Form

```
aut-num:  ASNEW
as-name:  Bluelight-ASN
descr:    Bluelight Ltd
org:      ORG-Bb2-RIPE
import:   from AS64512   action pref=20;
          accept ANY
export:   to AS64512
          announce ASNEW
import:   from AS64513   action pref=80;
          accept ANY
export:   to AS64513
          announce ASNEW
[... ]
```

aut-num Object

- RIPE NCC creates **aut-num** object
  - **-mnt-by: LIR-MNT**
  - **-mnt-routes: End-User-MNT (or LIR)**
  - **-org: ORG-End-User-RIPE (or LIR)**

- When the peering is established, LIR should update routing policy

- AS Number assignment is only valid as long as the original criteria remain valid

`route` Object

- **`route`** objects: part of Routing Registry

- LIR creates **`route/route6`** objects for any (new) allocations they announce
  - Both **“`route:`” `and` “`origin:`”** are primary key
  - Complex hierarchical authorisation for creation
  - Used for prefix filtering by some ISPs

- “How do I find IPv6 prefixes that originate from a certain AS Number?”

ASN: Learning Points

- If you want to be multihomed
- Describe your routing policy
- **`Route`** object recommended

Questions

IPv6 Address Space

First IPv6 Allocation

- If you
  - a) are an LIR
  - b) not an End Site
  - c) plan to provide IPv6 connectivity to aggregated ‘customers’, who are assigned /48s
  - d) plan to assign 200 /48s within two years
- Send us “IPv6 first allocation request form”
- Minimum initial allocation size /32
  - Assignment policy being discussed

IPv6 Assignments

- Usual assignment size - /48 for each “site”
  - End User network
  - LIR infrastructure (per PoP)
  - No approval needed
- Smaller size
  - /64 just one subnet
  - /128 just one device
- Multiple /48 for very large End Users
  - Approval needed

New IPv6 Allocation

- HD ratio = 0.8 usage of previous allocation
  - 7132 /48s assignments in a /32
- Correct registrations (all /48s registered)

- New allocation's size: the same as the first
  - Resulting in IPv6 prefix one bit shorter
  - Or bigger if justified (sufficient for two years)

Tutorial Summary

- To get the resources you need, use LIRPortal
- To keep your LIR info up-to-date, use LIRPortal
- To register for RIPE NCC courses, use LIRPortal
  - LIR course
  - Routing Registry course
  - DNS for LIRs course
- E-Learning

The End!

Liðugt

Finis

Край

Соңы

Slán

النهاية

Ende

Fund

Кінець

Konec

Kraj

The End

Son

Vége

Kpaj

Fine

Lõpp

Críochnaithe

Endir

Sfârşit

Fin

Τέλος

Einde

Конец

Slut

Slutt

Amaia

Baigti

Fim

Loppu

Tmiem

Koniec

The End