Beyond RPKI Origin Validation: How to Close the Route Leak Gap with ASPA Today?

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Why are we still talking about route leaks?

JANUARY 23, 2026

Route leak incident on January 22, 2026



Bryton Herdes and Tom Strickx

7 MINUTE READ COPY URL

JANUARY 23, 2026

Route leak incident on January 22, 202

7 MIN

JANUARY 6, 2026

A closer look at a BGP anomaly in Venezuela



Bryton Herdes

10 MINUTE READ COPY URL

The origin can be right…
The path can still be wrong

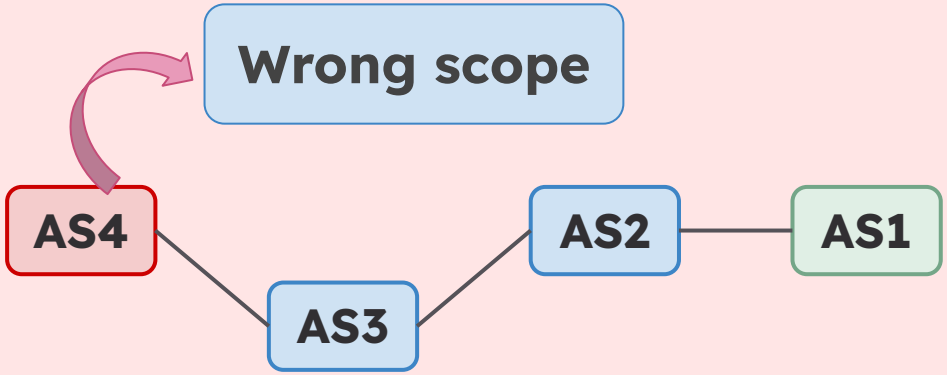
RPKI Route origin validation (ROA/ROV):

Is AS1 authorized to originate 2001:db8:100::/48?
Yes.

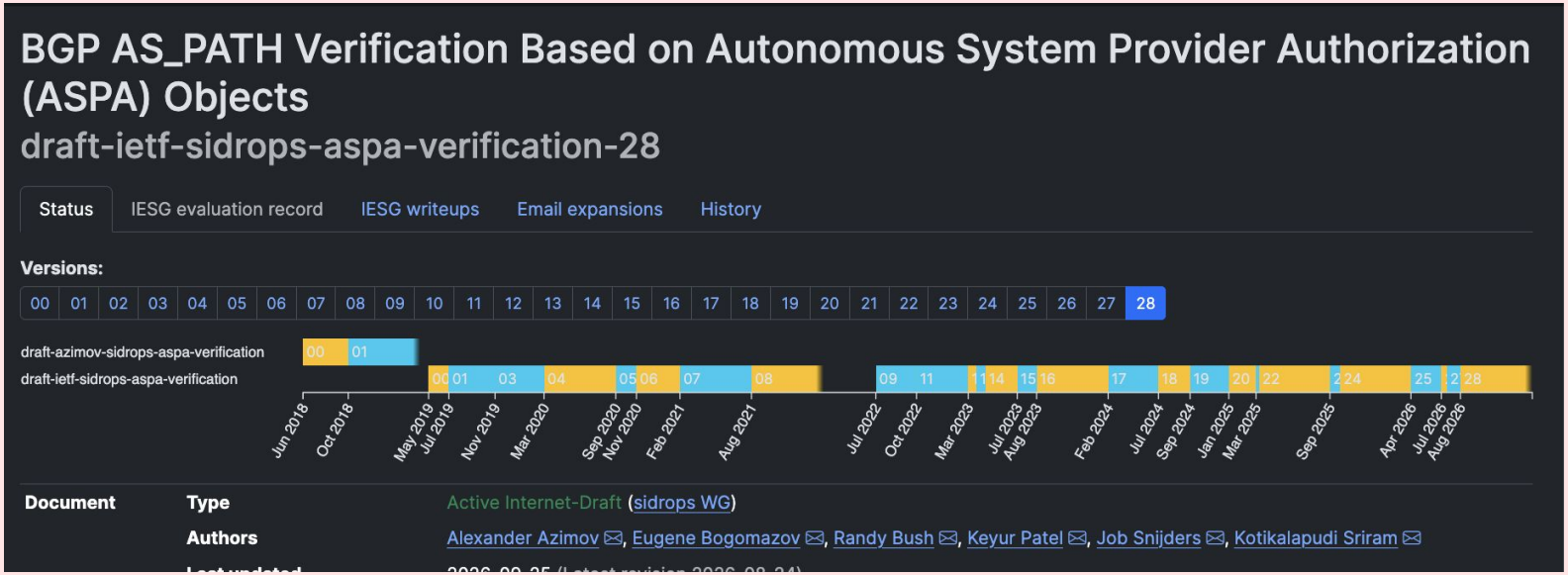
But it doesn't answer:

Should this path have propagated this way?

That is a path question.



This is where ASPA comes in



This is where ASPA comes in

BGP AS_PATH Verification Based on Autonomous System Provider Authorization (ASPA) Objects

draft-ie

Status

Versions:

00 01 02

draft-azimov-sidrc

draft-ietf-sidrops-a

Document

A Profile for Autonomous System Provider Authorization

draft-ietf-sidrops-aspa-profile-29

Status | IESG evaluation record | IESG writeups | Email expansions | History

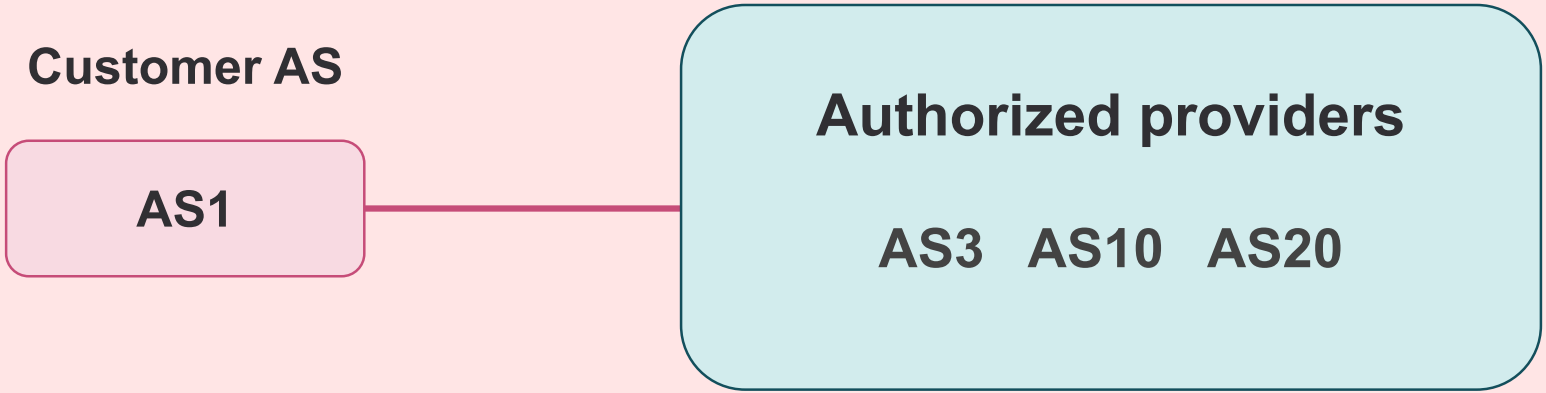
Versions:

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29



Document	**Type**	Active Internet-Draft (sidrops WG)
	Authors	Job Snijders, Alexander Azimov, Eugene Uskov, Randy Bush, Russ Housley, Ben Maddison

An ASPA object says: “these are my providers”



What if I have no providers?

No providers?

Authorized transit providers

AS0 (zero)

No ASPA → We do not know.

ASPA {AS0} → This AS has no providers.

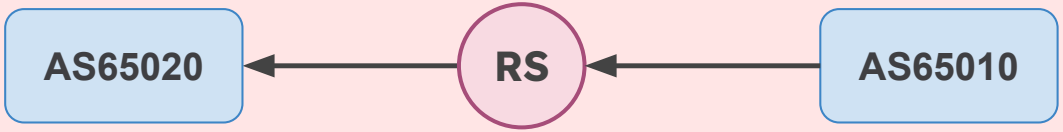
- **eg. Tier-1**

What about pure peering relationship?



Do not include in ASPA

And what about route servers?



Transparent:

AS_PATH: 65020, 65010

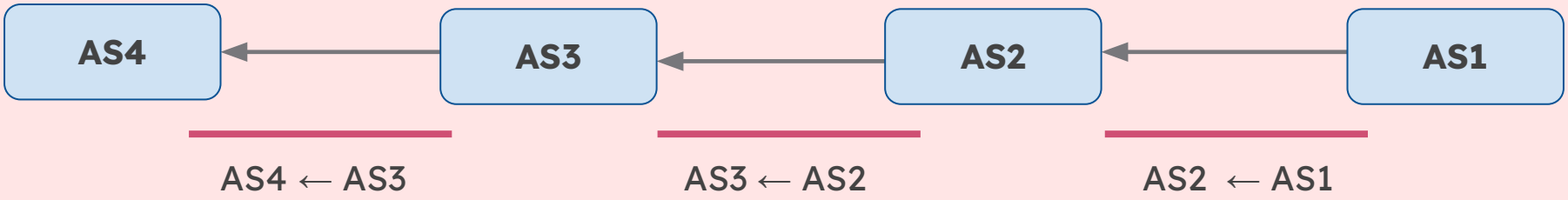
Non-Transparent:

AS_PATH: 65020, RS, 65010

Do not include RS in ASPA

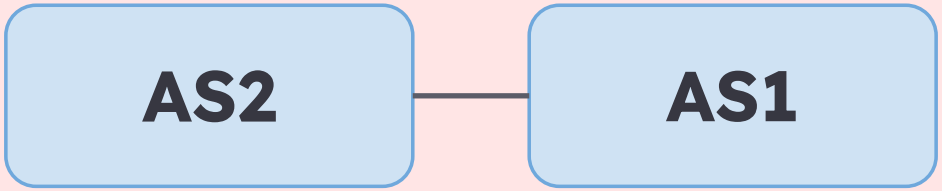
Include RS in ASPA

ASPA turns the received AS_PATH into pairwise questions



For each adjacent pair, ASPA asks: is the next AS an authorized provider?

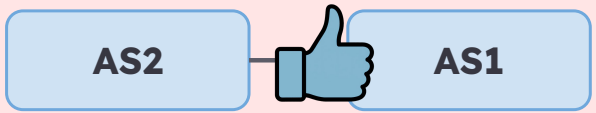
Three things ASPA can tell us for each hop



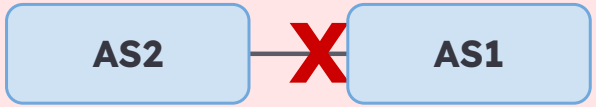
For AS1 → AS2, ask:

Did AS1 authorize AS2 as provider?

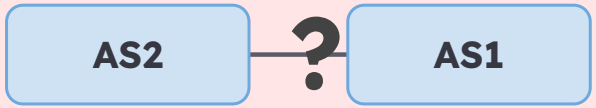
Three things ASPA can tell us for each hop



Provider: AS2 is listed in AS1's ASPA



Not_Provider: AS2 is NOT listed in AS1's ASPA



No_Attestation: AS1 has no ASPA

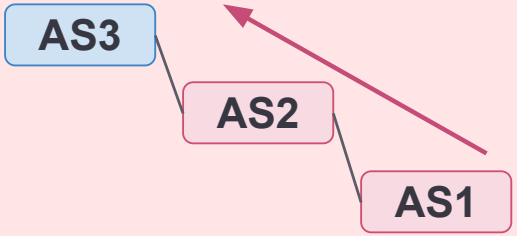
ASPA uses two path-verification algorithms

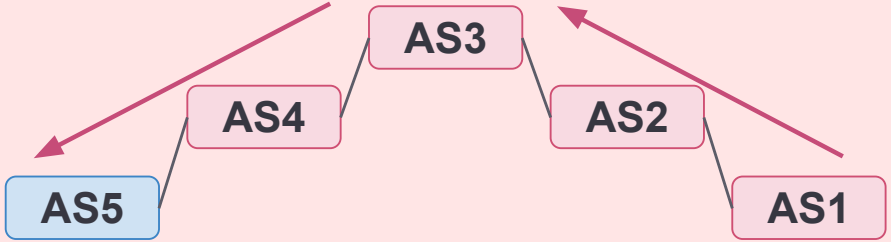
Upstream algorithm

Path received from a **Customer** or **Peer**
(+ route-server cases)

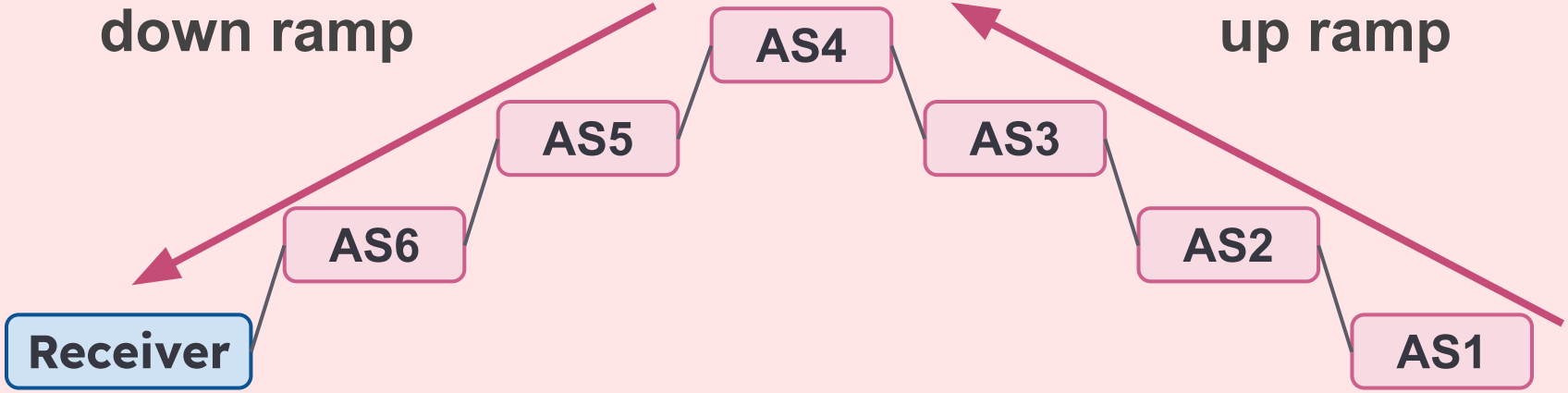
Downstream algorithm

Path received from a **Provider**.

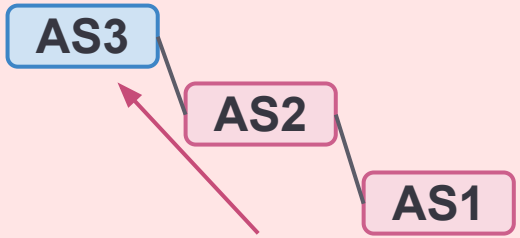


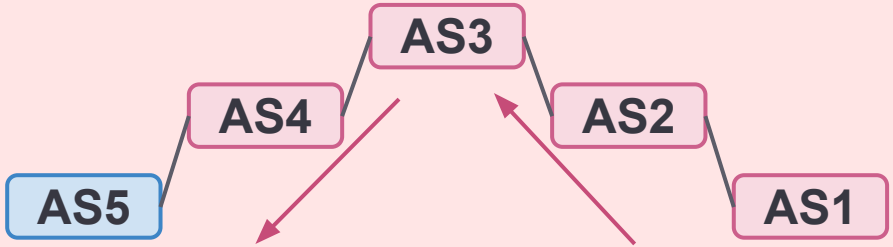


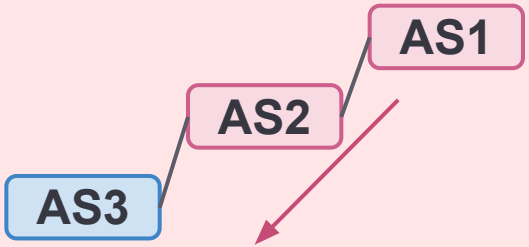
Up-ramp and Down-ramp

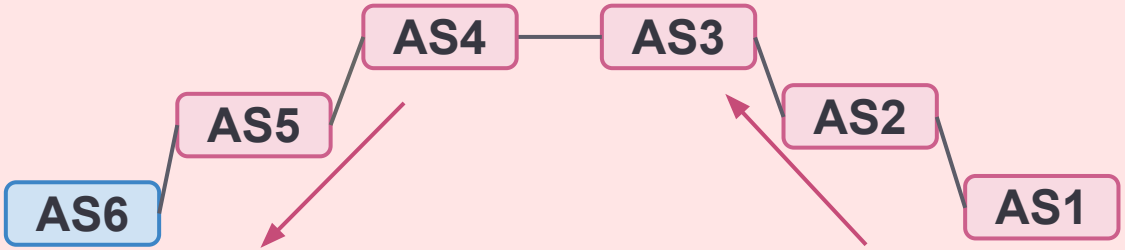


This is what we call Valley-Free

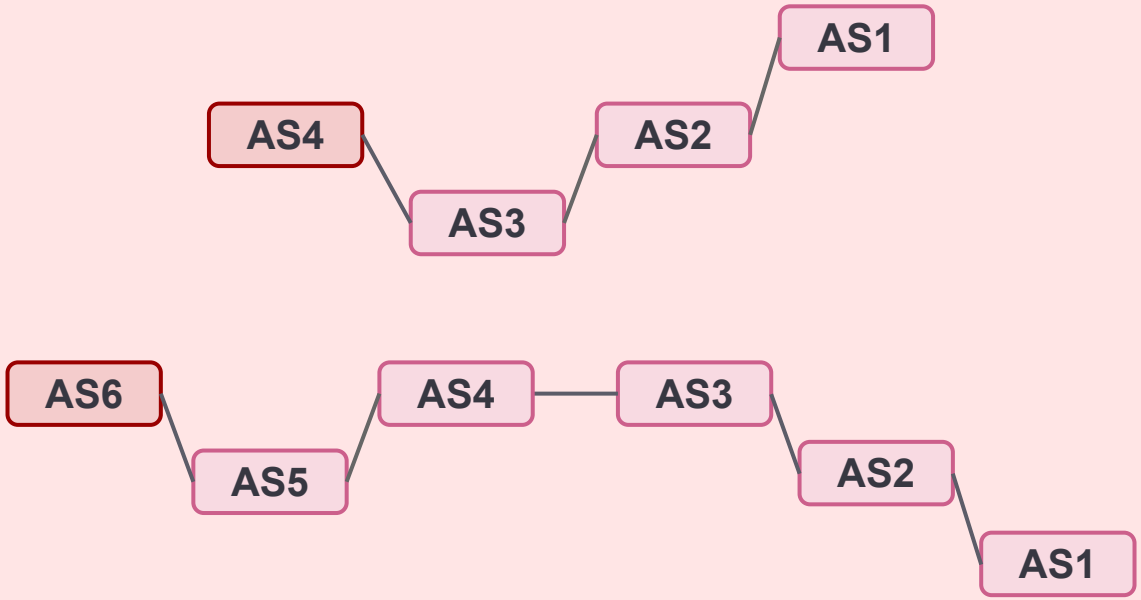








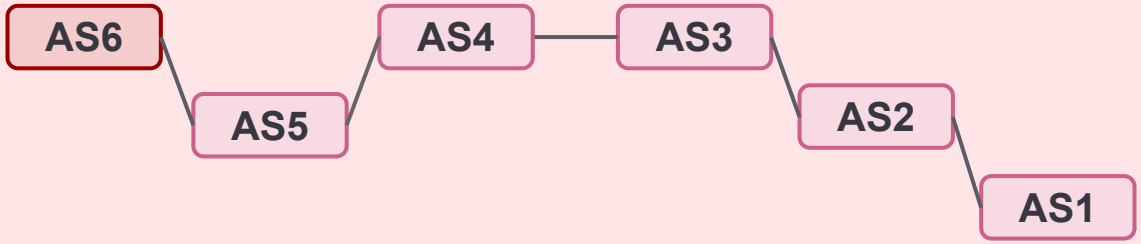
A classic route leak can create a valley



**Once a path starts going down,
it should not climb again.**

How ASPA detects a route leak

A Downstream verification performed by a customer of AS6

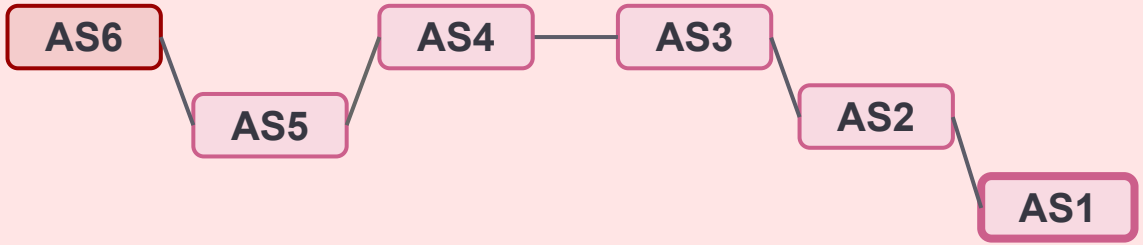


Maximum ramp
✓ or ? can continue
X stops it

Minimum ramp

Only ✓ is accepted

How ASPA detects a route leak



up_ramp = 1

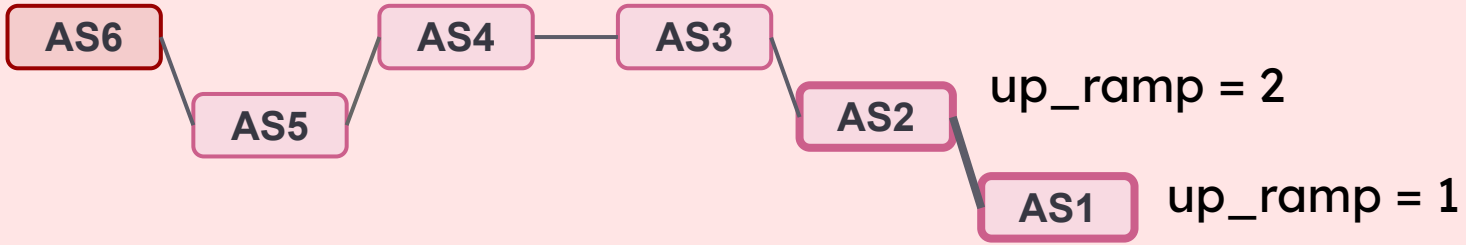
Customer: AS1 Providers: AS2

Customer: AS2 Providers: AS3

Customer: AS3 Providers: AS0

Customer: AS6 Providers: AS0

How ASPA detects a route leak



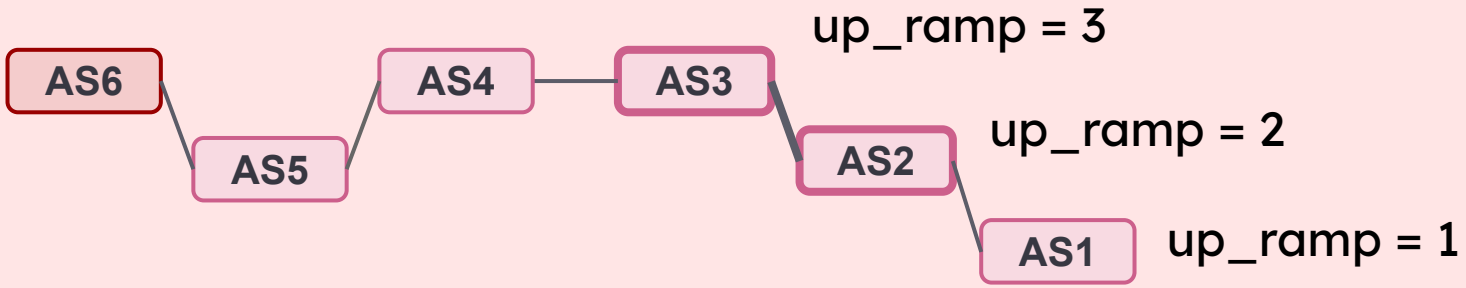
Customer: AS1 Providers: AS2

Customer: AS2 Providers: AS3

Customer: AS3 Providers: AS0

Customer: AS6 Providers: AS0

How ASPA detects a route leak



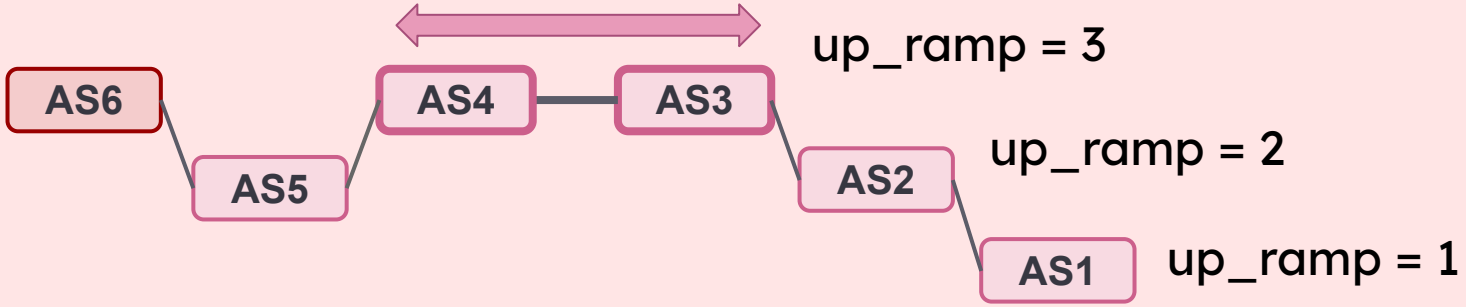
Customer: AS1
Providers: AS2

Customer: AS2
Providers: AS3

Customer: AS3
Providers: AS0

Customer: AS6
Providers: AS0

How ASPA detects a route leak



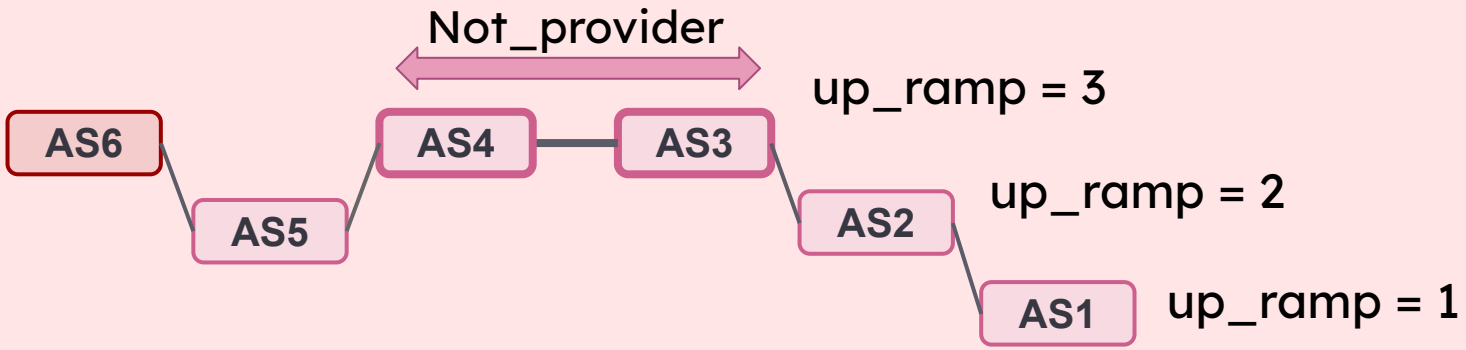
Customer: AS1
Providers: AS2

Customer: AS2
Providers: AS3

Customer: AS3
Providers: AS0

Customer: AS6
Providers: AS0

How ASPA detects a route leak



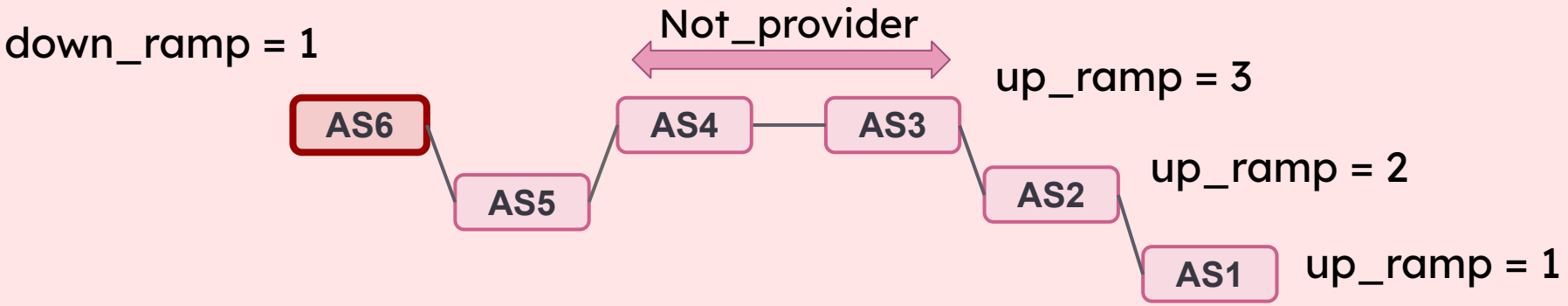
Customer: AS1
Providers: AS2

Customer: AS2
Providers: AS3

Customer: AS3
Providers: AS0

Customer: AS6
Providers: AS0

How ASPA detects a route leak



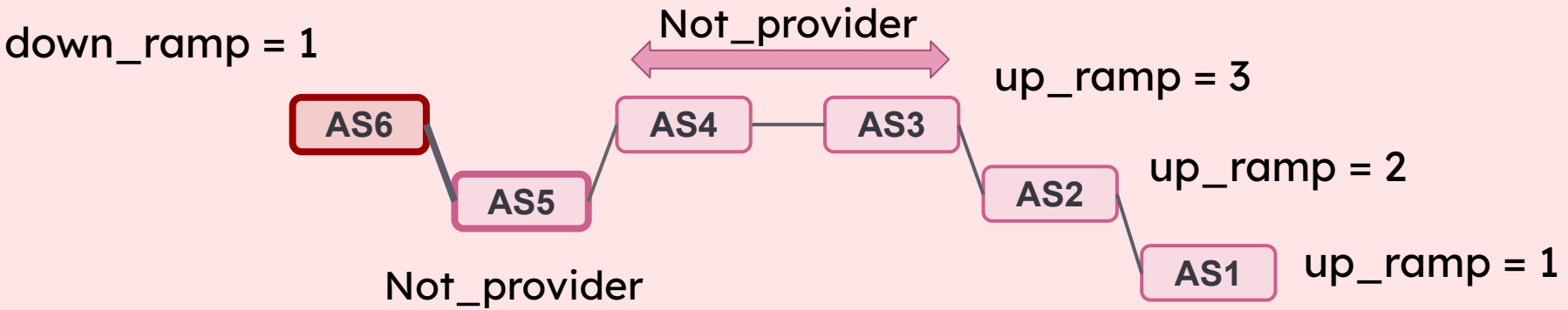
Customer: AS1
Providers: AS2

Customer: AS2
Providers: AS3

Customer: AS3
Providers: AS0

Customer: AS6
Providers: AS0

How ASPA detects a route leak



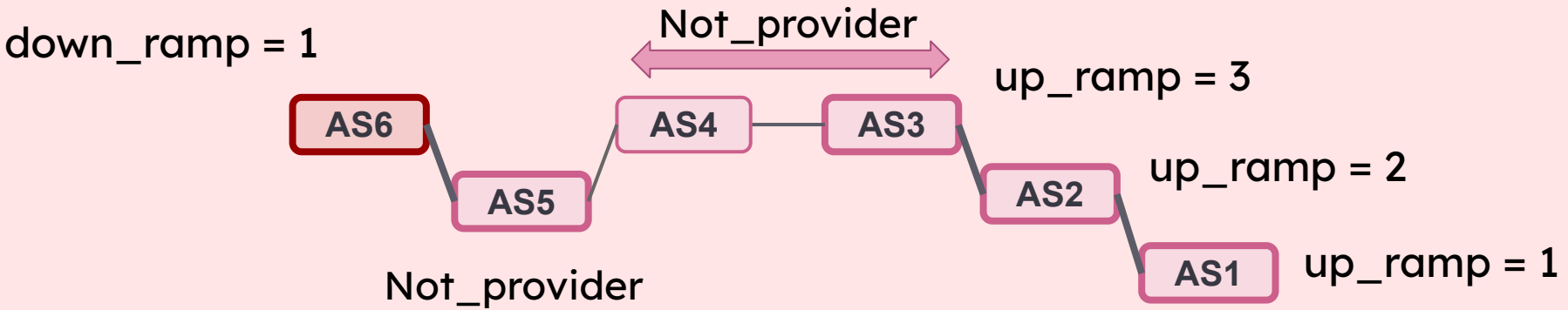
Customer: AS1
Providers: AS2

Customer: AS2
Providers: AS3

Customer: AS3
Providers: AS0

Customer: AS6
Providers: AS0

How ASPA detects a route leak



up_ramp + down_ramp < route size
Invalid!

Valid, Invalid, or Unknown?

The available ASPA data is sufficient to confirm a ASPA valid path shape.



ASPA data is sufficient to prove that the path is ASPA invalid

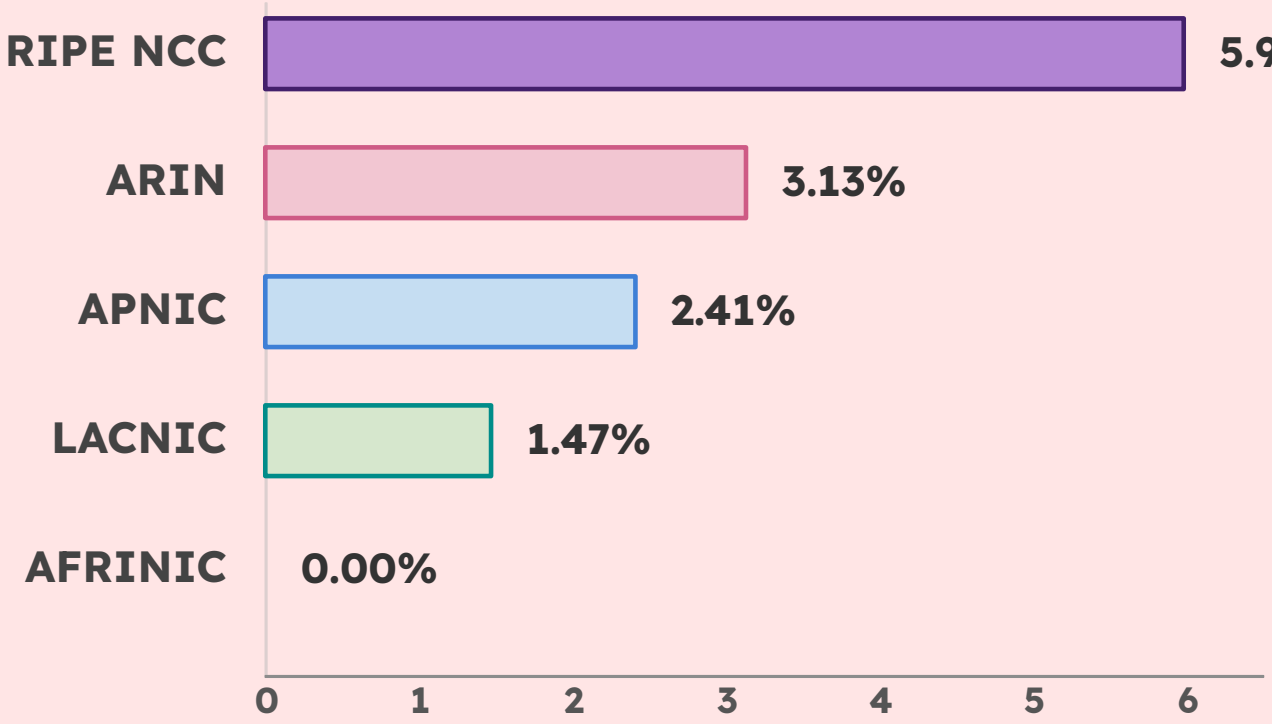
X

There is not enough ASPA data to prove either Valid or Invalid.

?

Missing ASPA data may lead to Unknown, but it does not override evidence of an Invalid path.

ASPA publication is still early



3.66% of routed ASNs

3,249 out of 88,714

Routed ASN adoption reported by Hurricane Electric (October 14, 2026)

ASPA publication in LACNIC region



195 LACNIC ASNs publishing a valid ASPA

187 routed ASNs publishing a valid ASPA

(according to Hurricane Electric)

Should You Publish an ASPA Today?

ASPA is a natural next step. But did we finish the first one?

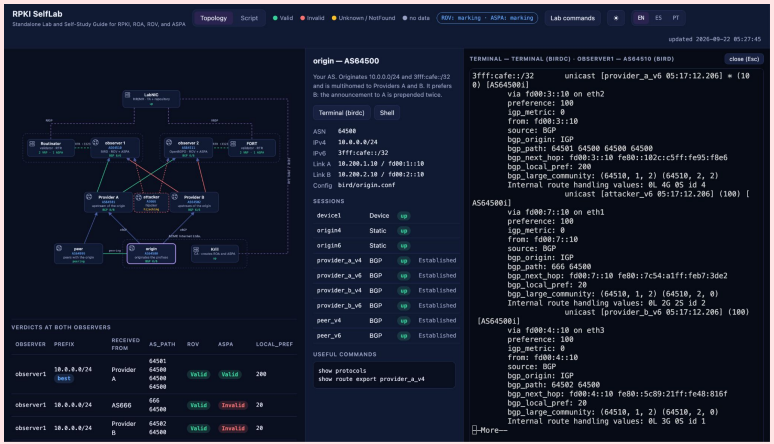
ROA ⟹ ROV ⟹ ASPA

ROA and ROV are a good way to get familiar with the RPKI ecosystem before exploring ASPA.

Get comfortable with the process

Learn RPKI and ASPA

https://github.com/moreiras/rpki-selflab



Self-contained **RPKI teaching lab in Docker:** ROAs, ROV and ASPA.

Follow a hijacker and a leaky peer as origin and path validation are deployed on independent stacks:

- BIRD + Routinator,
- OpenBGPD + FORT.
- OpenBGPD + rpki-client

If You Feel Ready to do ASPA

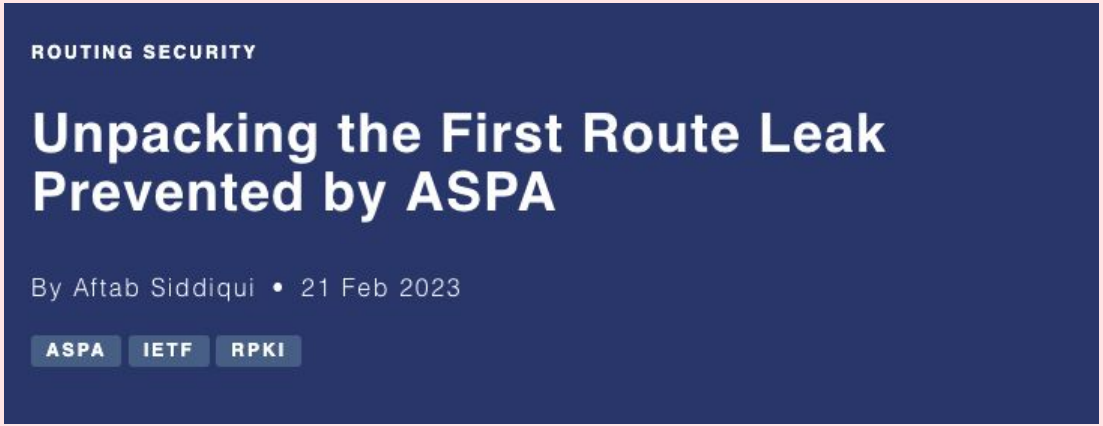
- Know your providers!
- Create the ASPA
- Start observing, not dropping



And again… Know your providers!

Why is it so important to know your providers?

A missing provider can make a legitimate route Invalid



A missing provider can make a legitimate route Invalid



- AS945 published an ASPA
- AS61138 was a real provider, but was missing from the object
- The route became ASPA Invalid

The verification was not wrong

**ASPA checks what you publish,
not what you intended to publish.**

Where can I publish ASPA in the LACNIC region?

Hosted RPKI

The registry operates the Resource CA for you.

You manage objects through the portal.

Delegated RPKI

You operate your own Resource CA.

Example: Krill.
The registry delegates your resources to that CA.

ASPA is now available in MiLACNIC!

Stay tuned for tomorrow's session :)

October 21 · 14:00

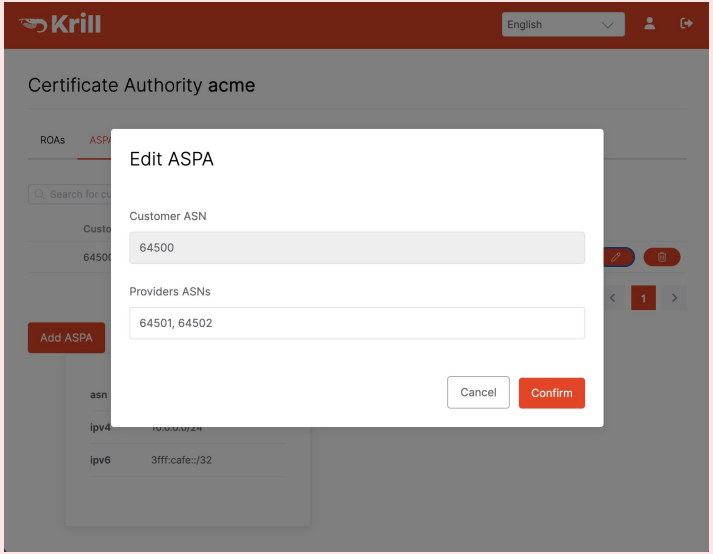
Publishing with Krill

ASPA is supported in **Krill 0.14.0 and later.**

If you already use Krill for RPKI, you already operate a delegated CA.

If you already publish ROAs with Krill, your publication infrastructure is already in place.

You only need to create the ASPA objects!




```
krillc aspas list
krillc aspas add --aspa "AS64500 => AS64501, AS64502"
krillc aspas update --customer AS64500 --add AS64503 --remove AS64502
krillc aspas remove --customer AS64500
```

Validation

Routinator supports ASPA since version 0.13.0. Since 0.14.1, ASPA support is included in the standard build.
Needs: **--enable-aspa**
without it, ASPA objects are silently ignored

FORT supports ASPA starting with version 1.7.0.experimental.

ASPA PDUs only exist in RTR v2 (draft-ietf-sidrops-8210bis)


```
{
  "metadata": {
    "generated": 1790050172,
    "generatedTime": "2026-09-22T04:09:32Z"
  },
  "roas": [
    {
      (...)
    }
  ],
  "aspas": [
    {
      "customer": "AS64500",
      "providers": [
        "AS64501",
        "AS64502"
      ],
      "ta": "ta"
    }
  ]
}
```

Router support: where are we today?

Routing software:

OpenBGPD: Available
(Thanks Snijders et al :)
BIRD: Available/evolving
(Thanks Maria et al :)
FRR: Not Available yet

Good scenario for IXPs

Commercial Routers:

Huawei (OK in NetEngine 8000)
Juniper (will be in Junos OS 26.1)
MikroTik (will consider implementing after RFCs)
Cisco (testing in IOS XR)

IXPs are a good place to start testing ASPA

- BIRD / OpenBGPD are already available
- RPKI validation is already common in the workflow
- One route server reaches many members
- Observe first, enforce later

Obrigada! Gracias! Thanks!

e-mail: **sthefany.duquini@ufms.br**