

IETF -125, Shenzhen, China

Are you RPKI ready?

The Road Left to Full ROA Adoption

Deepak Gouda, Romain Fontugne, Cecilia Testart

March 17, 2025



Resource Public Key Infrastructure (RPKI)

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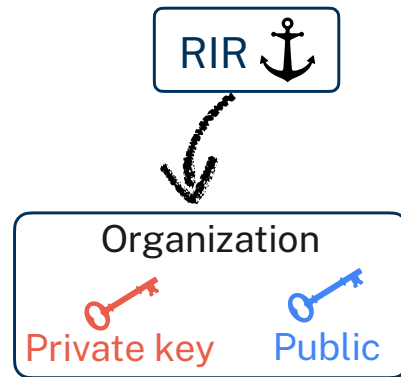
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Resource Public Key Infrastructure (RPKI)

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- RPKI provides a cryptographically-verifiable mechanism to validate information in BGP announcements

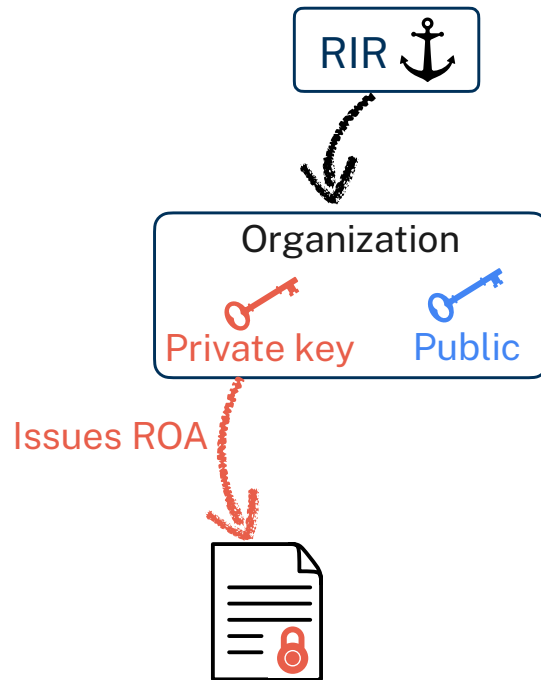
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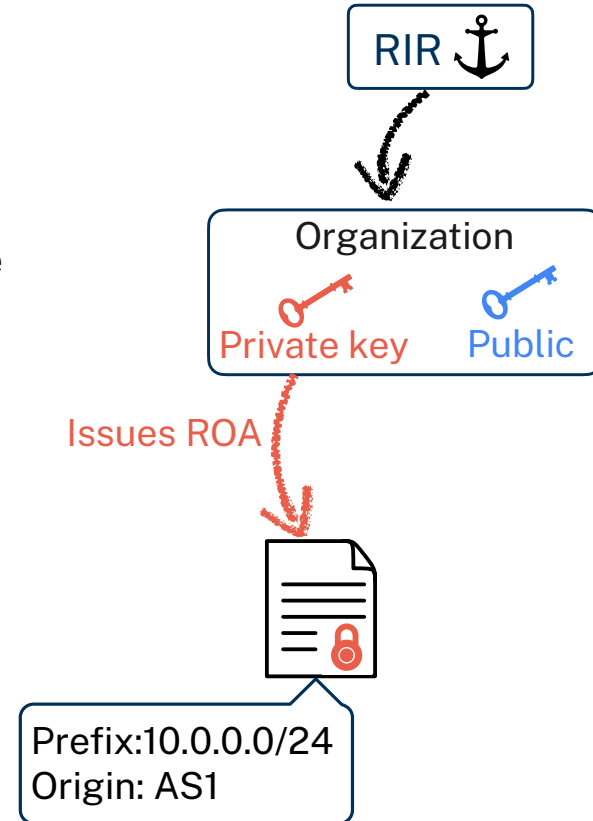
Resource Public Key Infrastructure (RPKI)

- BGP lacks built-in security mechanisms to verify routing announcements
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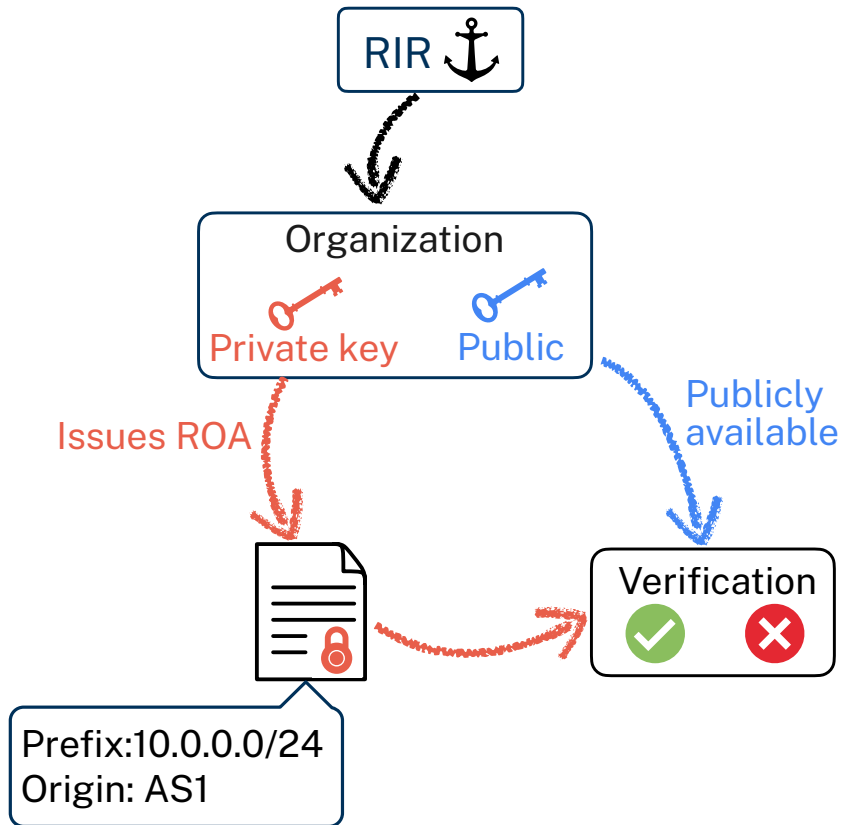
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We have a consensus on the benefits of RPKI

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IMC 2019

RPKI is Coming of Age

A Longitudinal Study of RPKI Deployment and Invalid Route Origins

Taejoong Chung
Rochester Institute of Technology

Emile Aben
RIPE NCC

Tim Bruijnzeels
NLNetLabs

Balakrishnan Chandrasekaran
Max Planck Institute for Informatics

David Choffnes
Northeastern University

Dave Levin
University of Maryland

Bruce M. Maggs
Duke University and
Akamai Technologies

Alan Mislove
Northeastern University

Roland van Rijswijk-Deij
University of Twente and
NLNetLabs

John Rula
Akamai Technologies

Nick Sullivan
Cloudflare

Stop, DROP, and ROA: Effectiveness of Defenses through the lens of DROP

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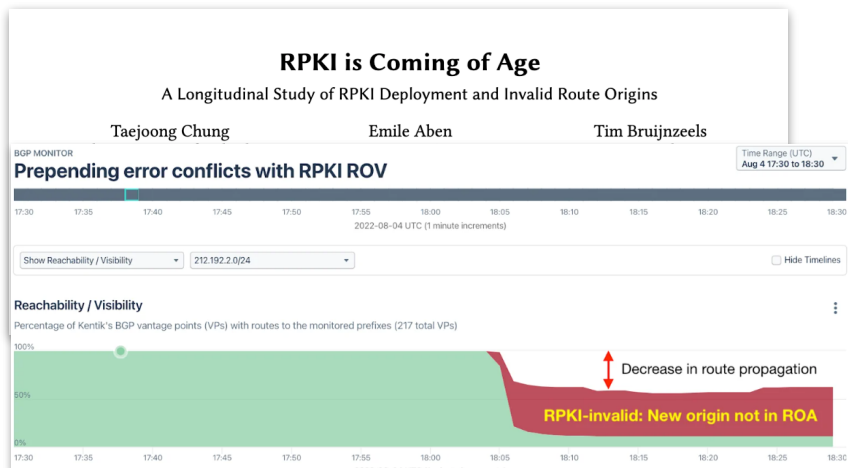
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IMC 2022

We have a consensus on the benefits of RPKI

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[1] Kentik

Stop, DROP, and ROA: Effectiveness of Defenses through the lens of DROP

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Visualizing the Benefits of RPKI

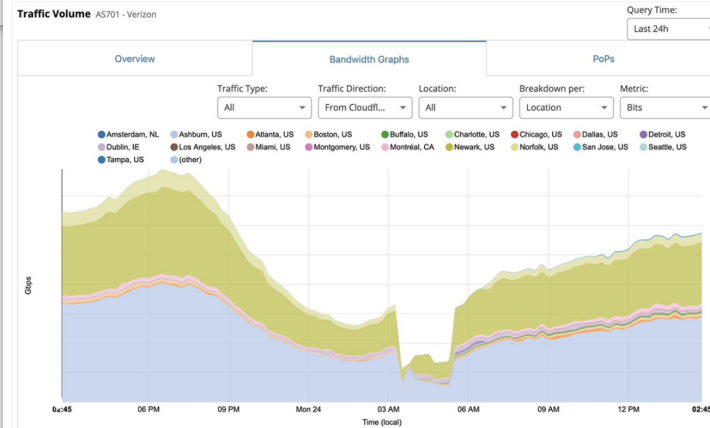
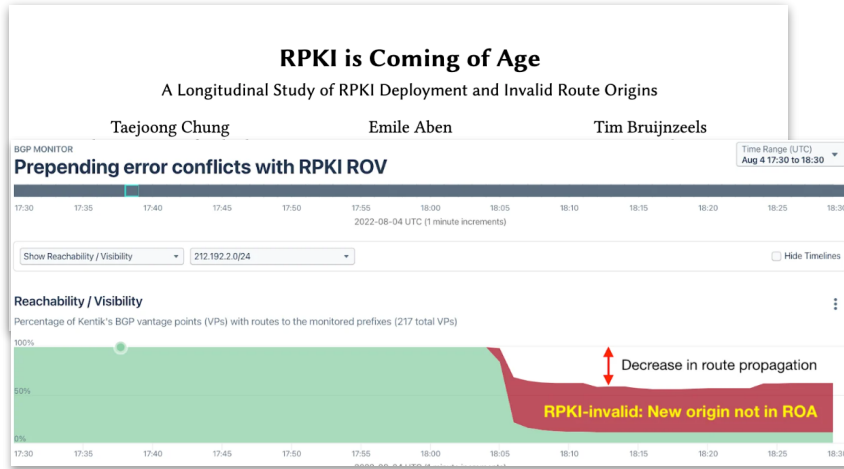


Figure 1: Cloudflare traffic transiting Verizon.

[2] Cisco
Thousandeyes

We have a consensus on the benefits of RPKI

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[1] Kentik

AWS secures internet routing with RPKI plus security checks

by Camden Forgia and Jon Phillibert | on 02 MAY 2025 | in [Networking & Content Delivery](#), [Thought Leadership](#) | [Permalink](#) | [Share](#)

[3] Amazon

Stop, DROP, and ROA: Effectiveness of Defenses through the lens of DROP

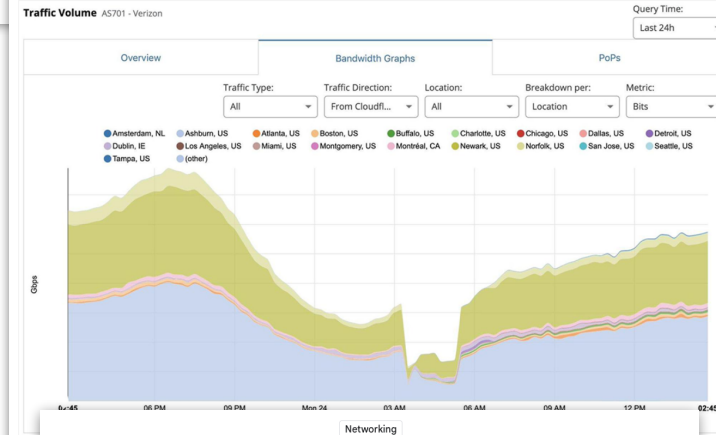
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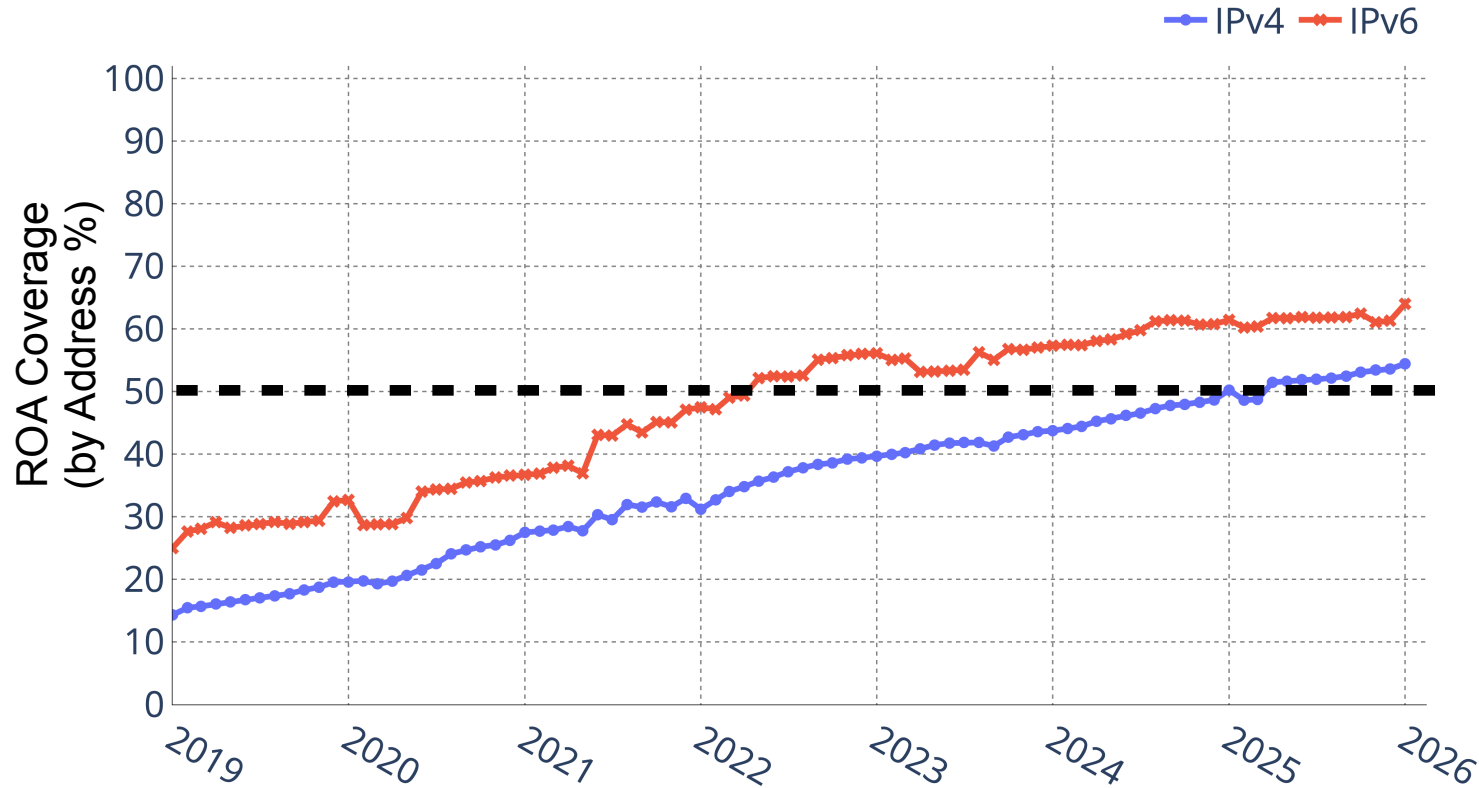
Expanding our commitment to secure Internet routing

December 2, 2020

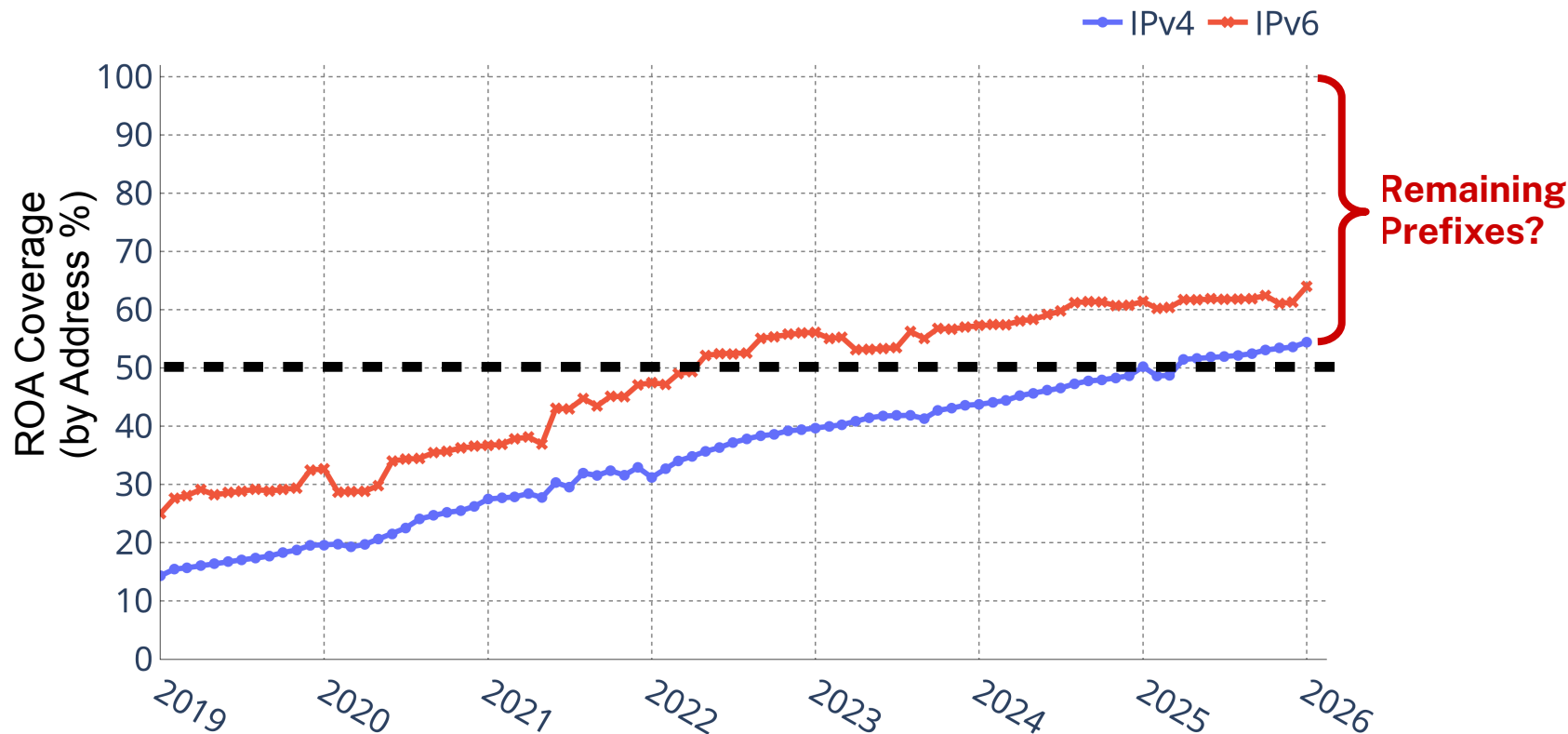
[4] Google

- [1] <https://www.kentik.com/blog/how-much-does-rpki-rov-reduce-the-propagation-of-invalid-routes/>
- [2] <https://www.thousandeyes.com/blog/visualizing-the-benefits-of-rpki>
- [3] <https://aws.amazon.com/blogs/networking-and-content-delivery/aws-secures-internet-routing-with-rpki-plus-security-checks/>
- [4] <https://cloud.google.com/blog/products/networking/how-google-is-working-to-improve-internet-routing-security>

Global ROA Adoption is over 50%!

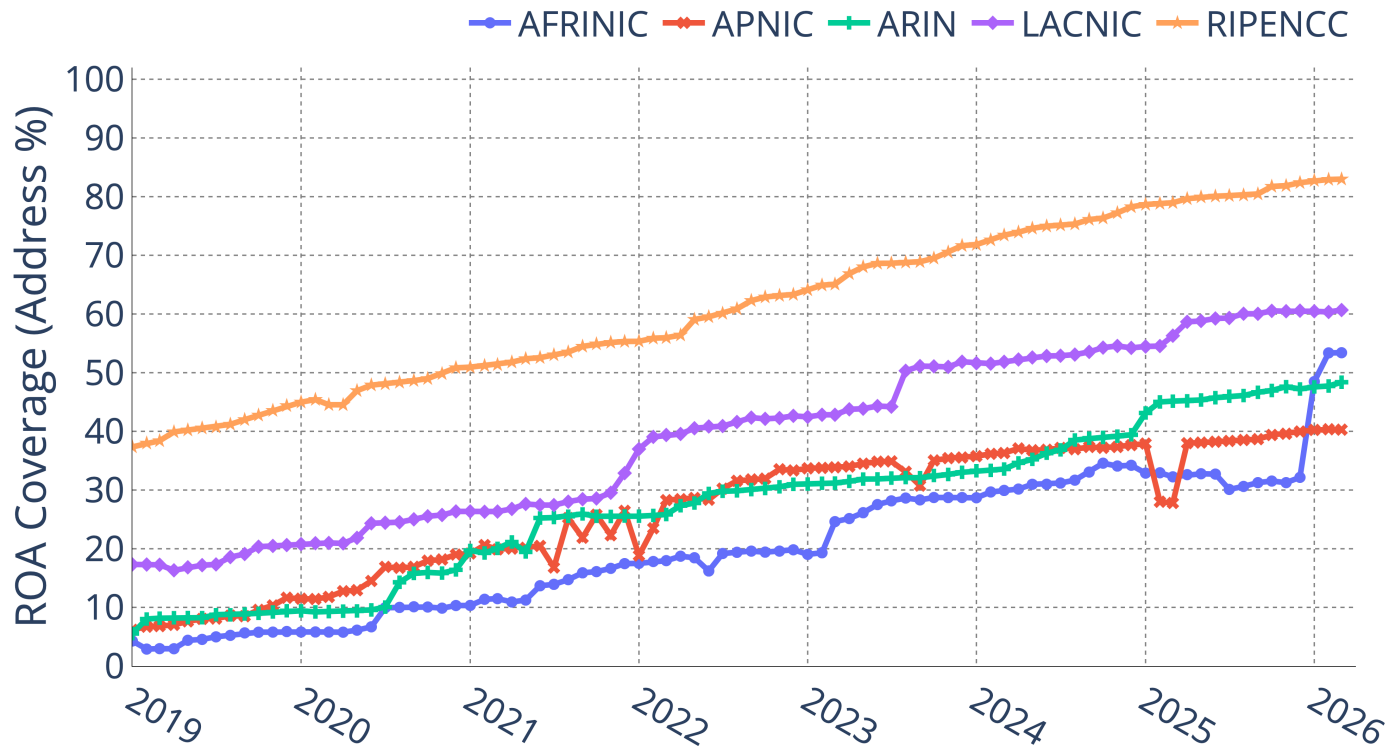


Global ROA Adoption is over 50%!



How can we support RPKI adoption to cover the remaining 50% of prefixes?

ROA adoption in not uniform across RIRs

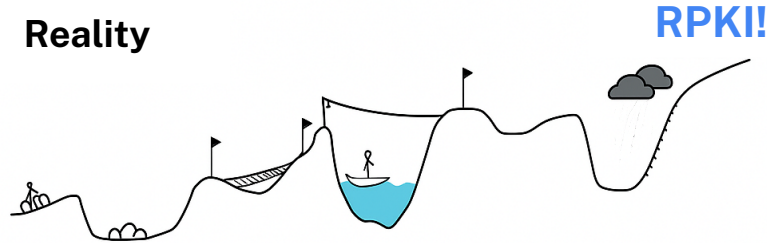


How complex is the planning of a ROA?

Expectation



Reality

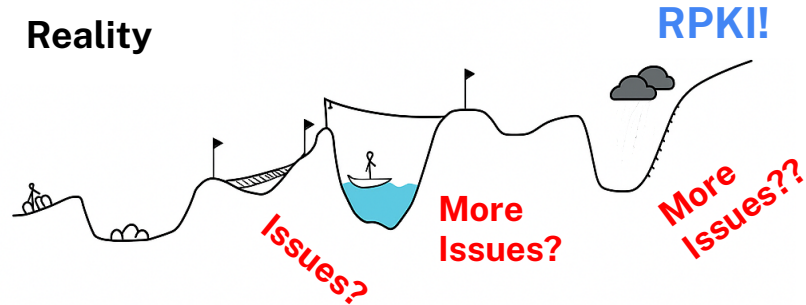


How complex is the planning of a ROA?

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ROA Planning: Example

Prefix		Origin ASN
173.211.80.0/21	→	AS22773

ROA Planning: Example

① Who can issue the ROA?

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Prefix		Origin ASN
173.211.80.0/21	→	AS22773
		Colocation America Corporation

ROA Planning: Example

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② What if more specific prefixes are being routed?

ROA Planning: Example

① Who can issue the ROA?

Prefix		Origin ASN
173.211.80.0/21	→	AS22773

Colocation America Corporation

② What if more specific prefixes are being routed?

➡ 173.211.80.0/24	→	AS19437
➡ 173.211.81.0/24	→	AS396356
5 sub-prefixes...		...

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Colocation America Corporation

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5 Origins ASNs ⇒ 5 ROAs!!

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③ Customer organizations?

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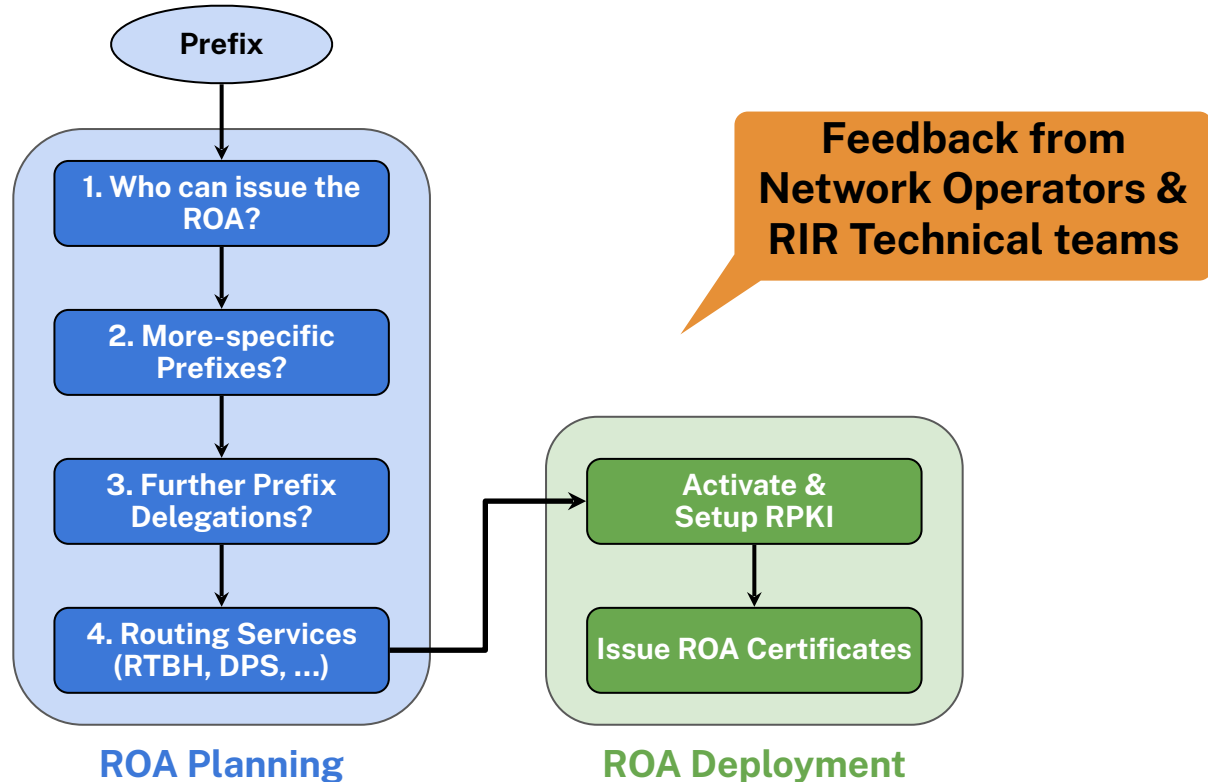
Internet Utilities NA LLC

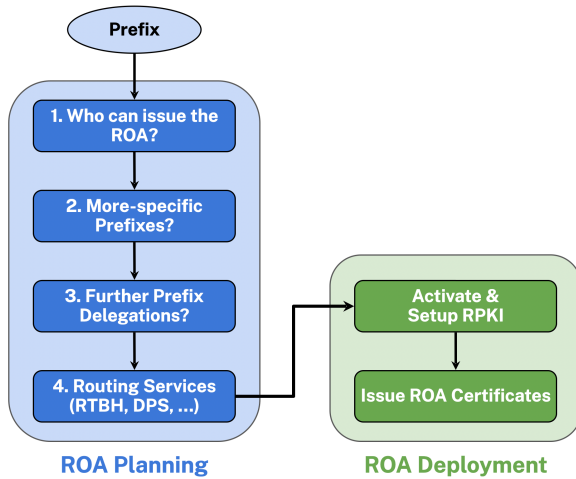
ROA Planning: Example

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			Colocation America Corporation
② What if more specific prefixes are being routed?	➔ 173.211.80.0/24	→	AS19437
	➔ 173.211.81.0/24	→	AS396356
	5 sub-prefixes...		...
③ Customer organizations?		➔	5 Origins ASNs ⇒ 5 ROAs!!
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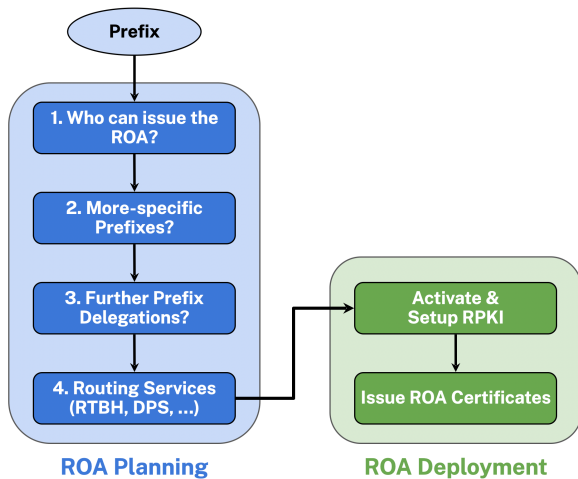
ROA planning can be complex due to multiple factors!

A framework for issuing ROA



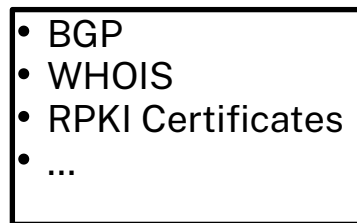


Our Framework

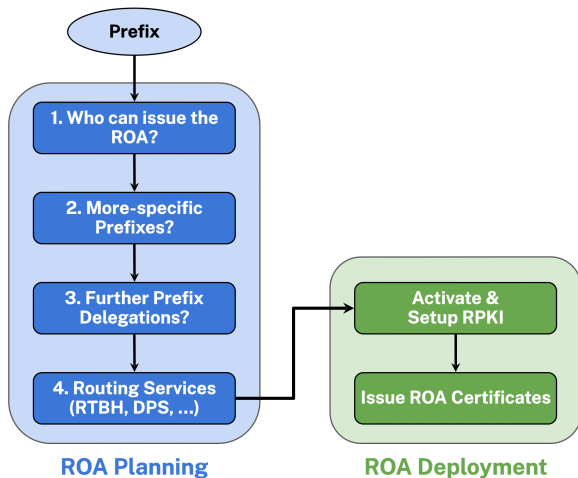


Our Framework

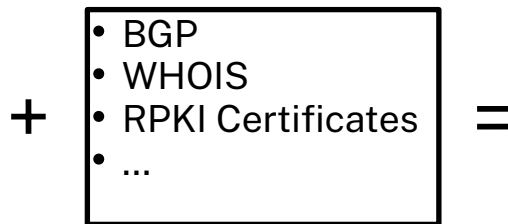
+



Public Data



Our Framework



Public Data

Are you RPKI Ready?
 ru-RPKI-ready: the Road Left to Full ROA Adoption, ACM IMC 2025
 Georgia Institute of Technology

Our Platform

Dashboard: Homepage

Are you RPKI Ready?

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Georgia Institute of Technology

Data as of: 2026-03-01

Prefix

ASN

Organization

Recommend
ROAs

API Access

About

Search by IP Prefix

173.211.80.0/21

Search

Dashboard: Prefix information

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173.211.80.0/21

Search

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173.211.80.0/21

Search

Prefix Information

Download JSON

PREFIX:

173.211.80.0/21

ORIGIN ASN:

AS22773

RPKI STATUS:

NOTFOUND

RPKI ISSUING AUTHORITY:

Colocation America Corporation

CUSTOMER ORGANIZATION:

Internet Utilities NA LLC

CUSTOMER ALLOCATION TYPE:

REALLOCATION

ALLOCATION STATUS:

ALLOCATION

RIR:

ARIN

RPKI CERTIFICATE:

655CA0CCA891023FC50BC68B1C3F67D850017084

TAGS:

ROA Not Found | Certified | Reassigned | Diff SKI pfx,ASN | Covering | Frag-Ext | ROA Org | Large Org | (L)RSA

ROUTED SUBPREFIXES (5):

173.211.80.0/24

173.211.81.0/24

173.211.82.0/23

173.211.85.0/24

173.211.87.0/24

<https://ru-rpki-ready.iss.cc.gatech.edu/>

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Dashboard: Prefix information

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173.211.80.0/21

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Prefix Information

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AS22773

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RPKI ISSUING AUTHORITY:
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CUSTOMER ORGANIZATION:
Internet Utilities NA LLC

CUSTOMER ALLOCATION TYPE:
REALLOCATION

ALLOCATION STATUS:
ALLOCATION

RIR:
ARIN

RPKI CERTIFICATE:
655CA0CCA891023FC50BC68B1C3F67D850017084

TAGS:
ROA Not Found | Certified | Reassigned | Diff SKI pfx,ASN | Covering | Frag-Ext | ROA Org | Large Org | (L)RSA

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<https://ru-rpki-ready.iss.cc.gatech.edu/>

Dashboard: Prefix information

Are you RPKI Ready?

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173.211.80.0/21

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173.211.80.0/21

Search

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<https://ru-rpki-ready.iss.cc.gatech.edu/>

Dashboard: Recommended ROAs for a prefix

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Data as of: 2026-03-01

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Search by IP Prefix

173.211.80.0/21

Search

<https://ru-rpki-ready.iss.cc.gatech.edu/>

Recommend ROAs

☒ Minimal ROAs (grouped by Origin ASN) ☐ Most-Specific ROAs

173.211.80.0/21

Recommend

Recommended ROAs - Minimal (Grouped by Origin ASN)

Total: 6 ROAs grouped into 6 Origin ASNs

▼ Origin ASN: [AS19437](#)

(1 ROA)

PREFIX	MAX LENGTH
173.211.80.0/24	24

▼ Origin ASN: [AS396356](#)

(1 ROA)

PREFIX	MAX LENGTH
173.211.81.0/24	24

▼ Origin ASN: [AS33490](#)

(1 ROA)

PREFIX	MAX LENGTH
173.211.82.0/23	23

▼ Origin ASN: [AS29802](#)

(1 ROA)

PREFIX	MAX LENGTH
173.211.85.0/24	24

▼ Origin ASN: [AS51082](#)

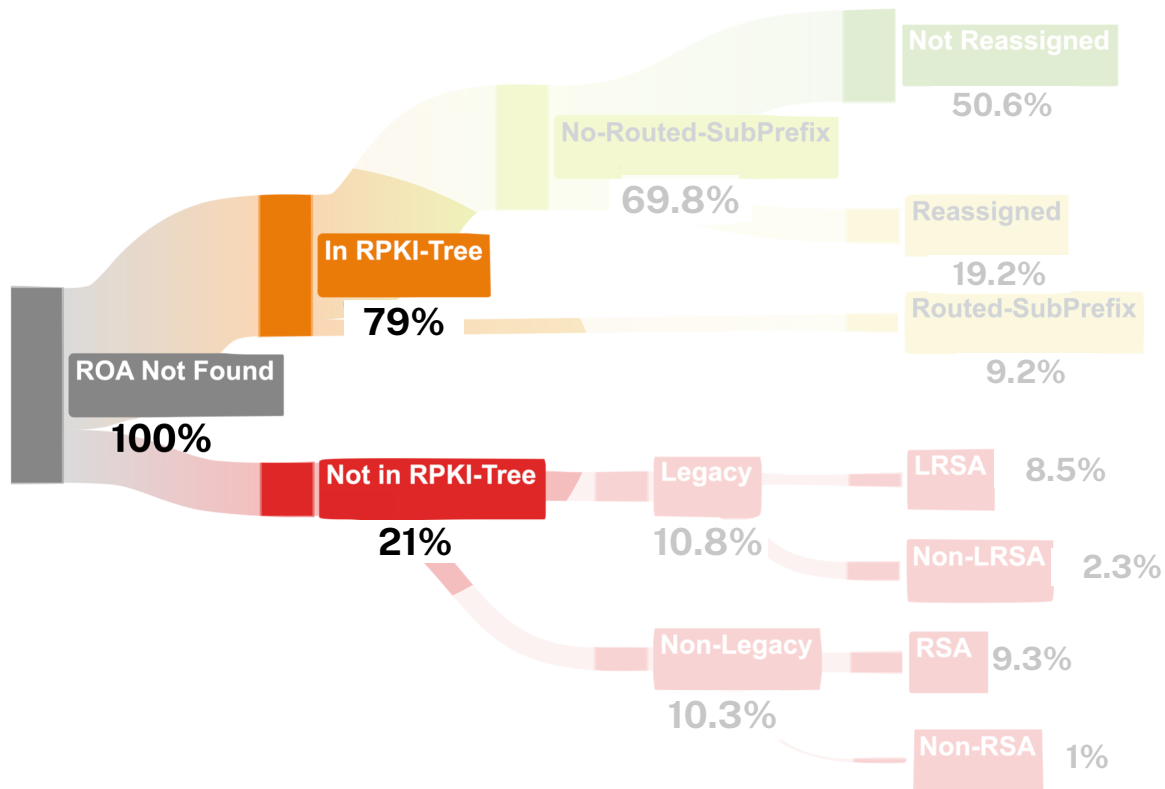
(1 ROA)

PREFIX	MAX LENGTH
173.211.87.0/24	24

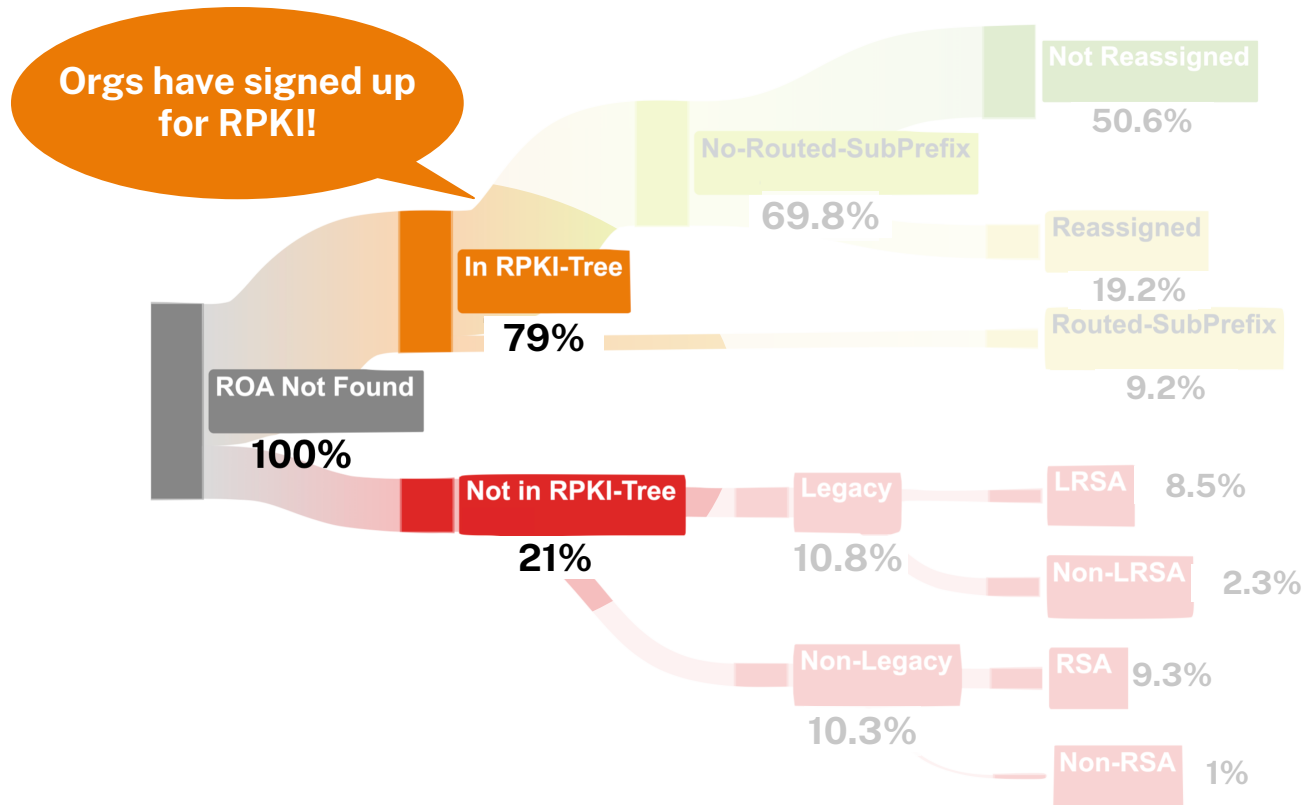
Download JSON

Characterization of Prefixes without ROAs

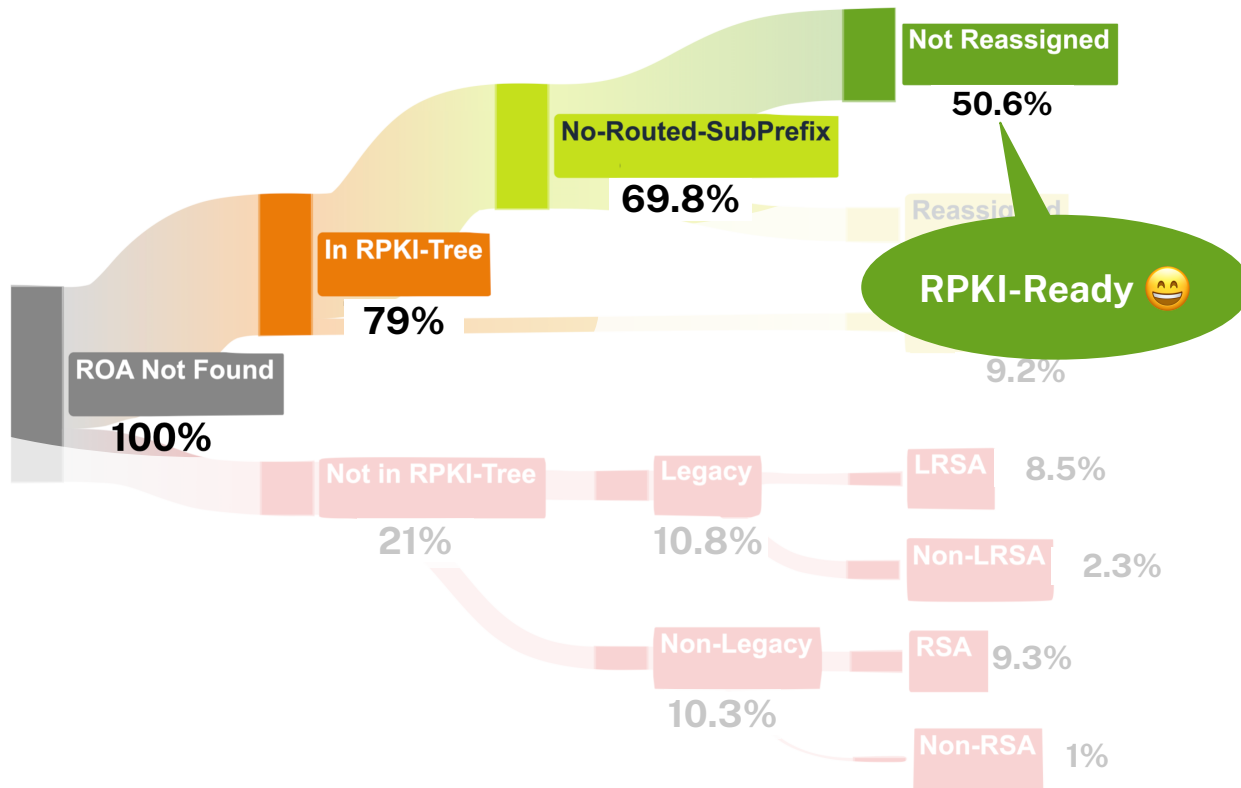
Breakdown of IPv4 Prefixes without ROAs



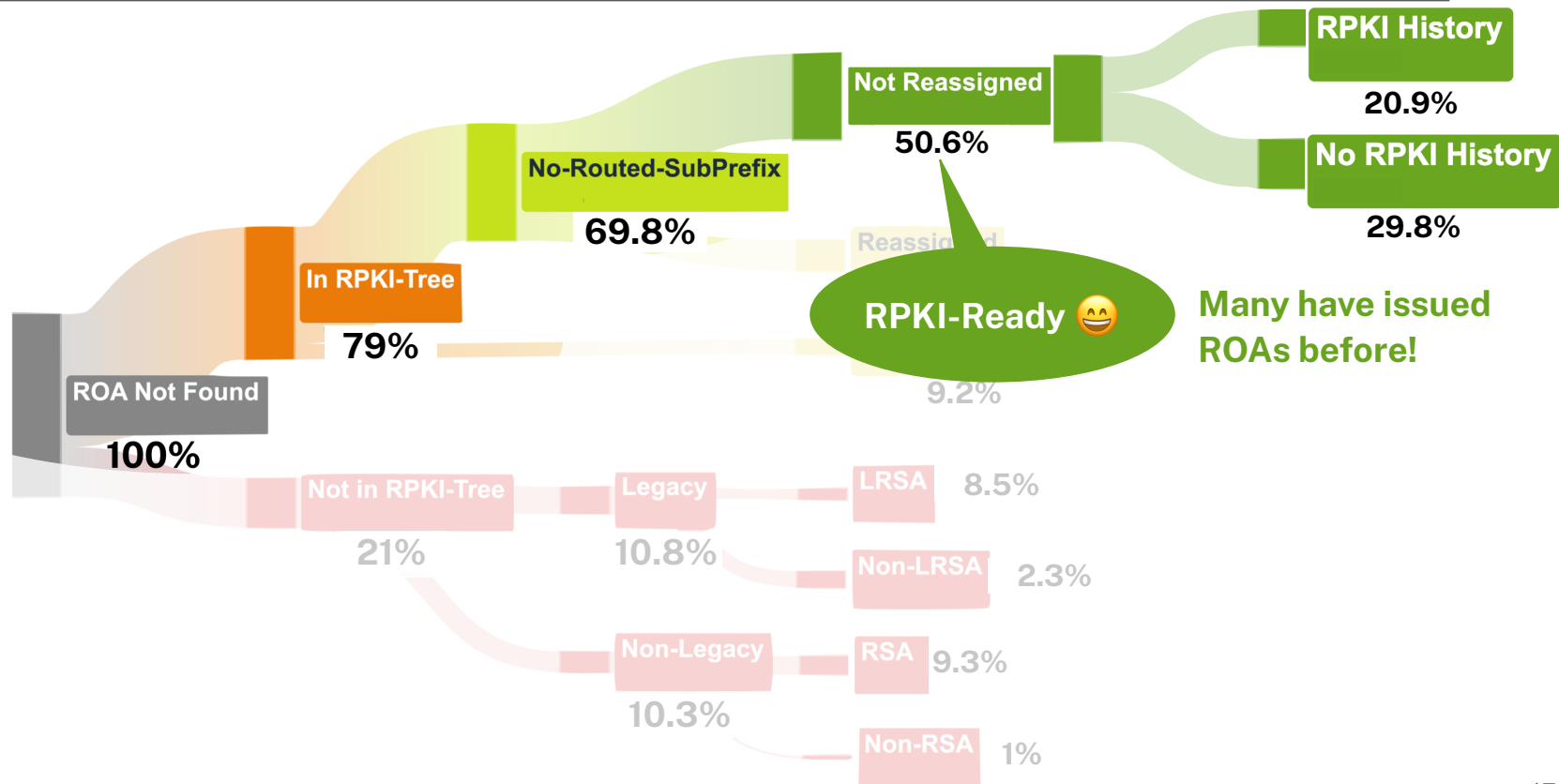
Breakdown of IPv4 Prefixes without ROAs



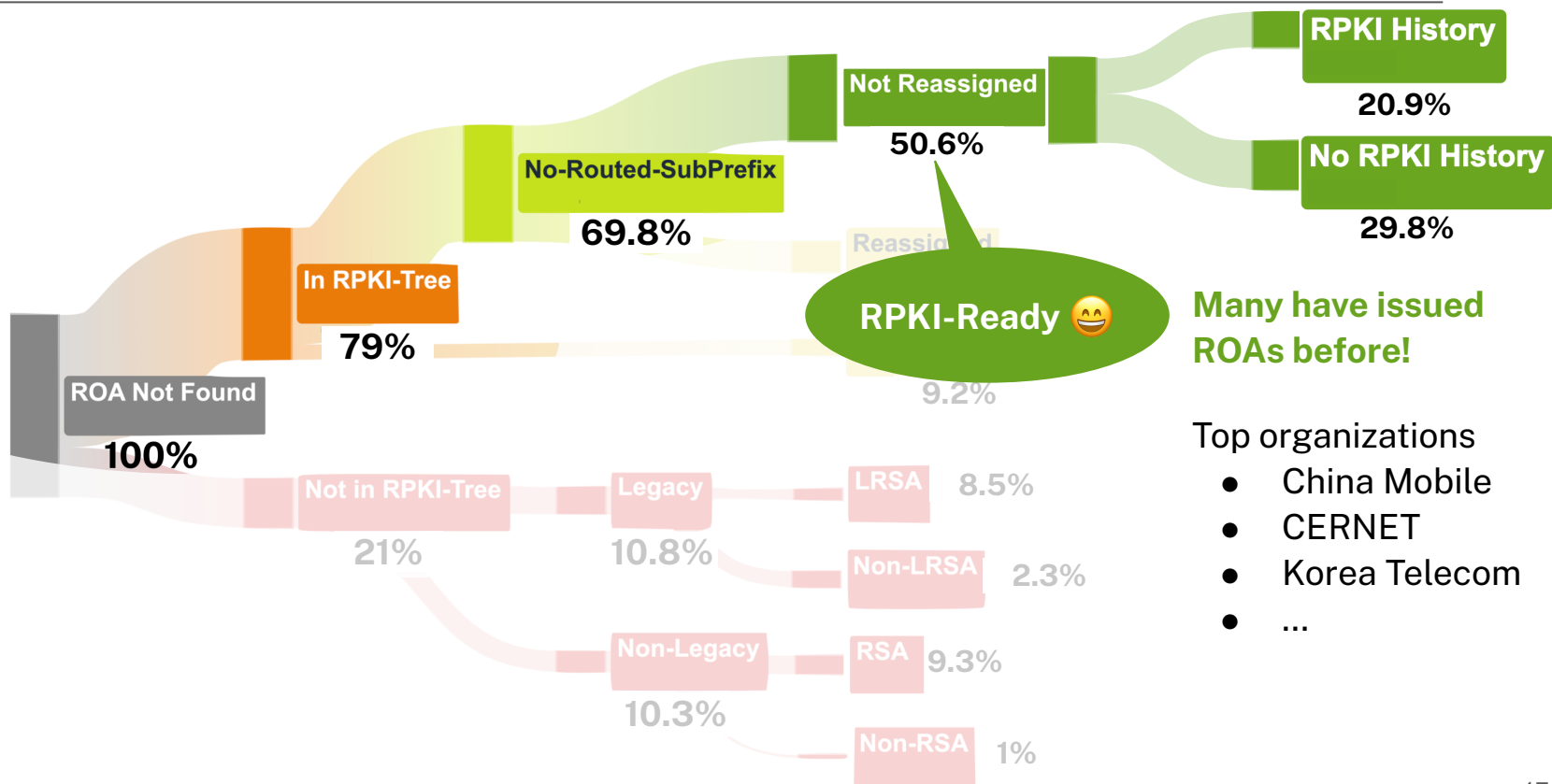
Breakdown of IPv4 Prefixes without ROAs



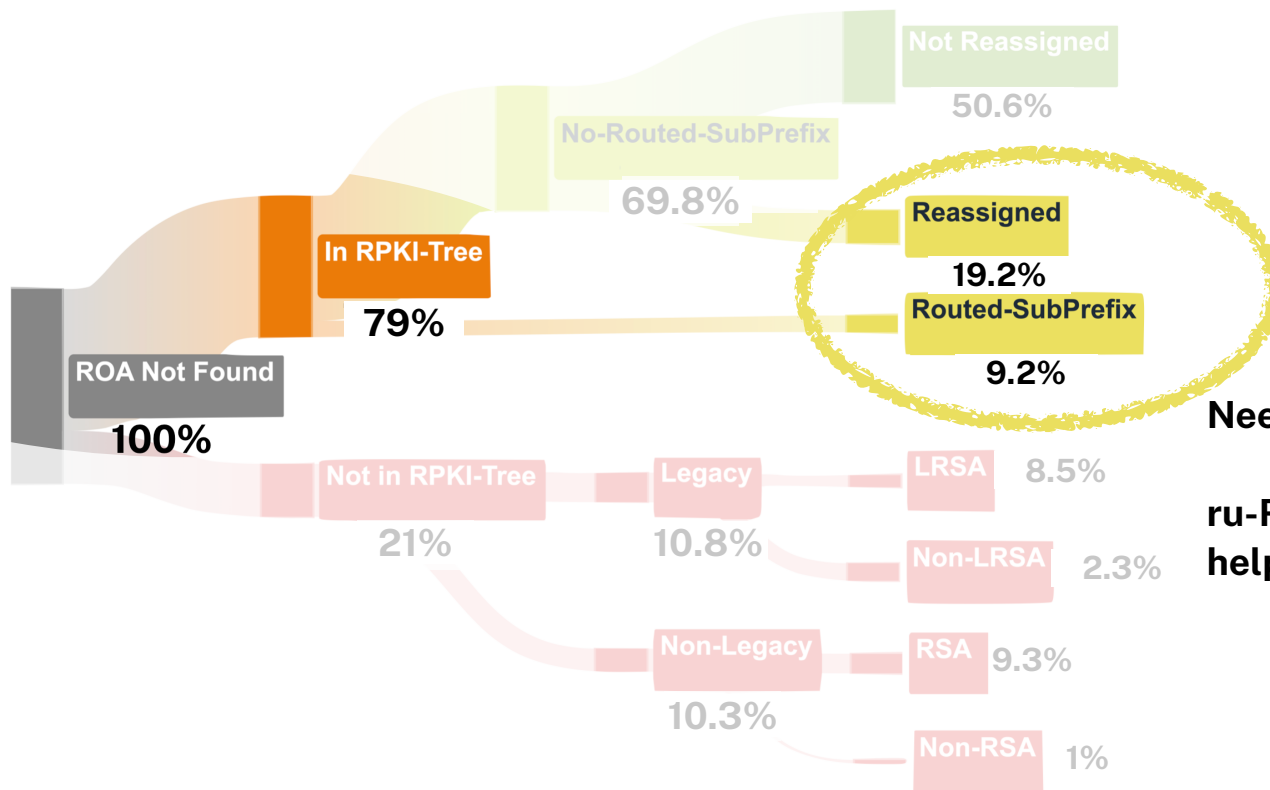
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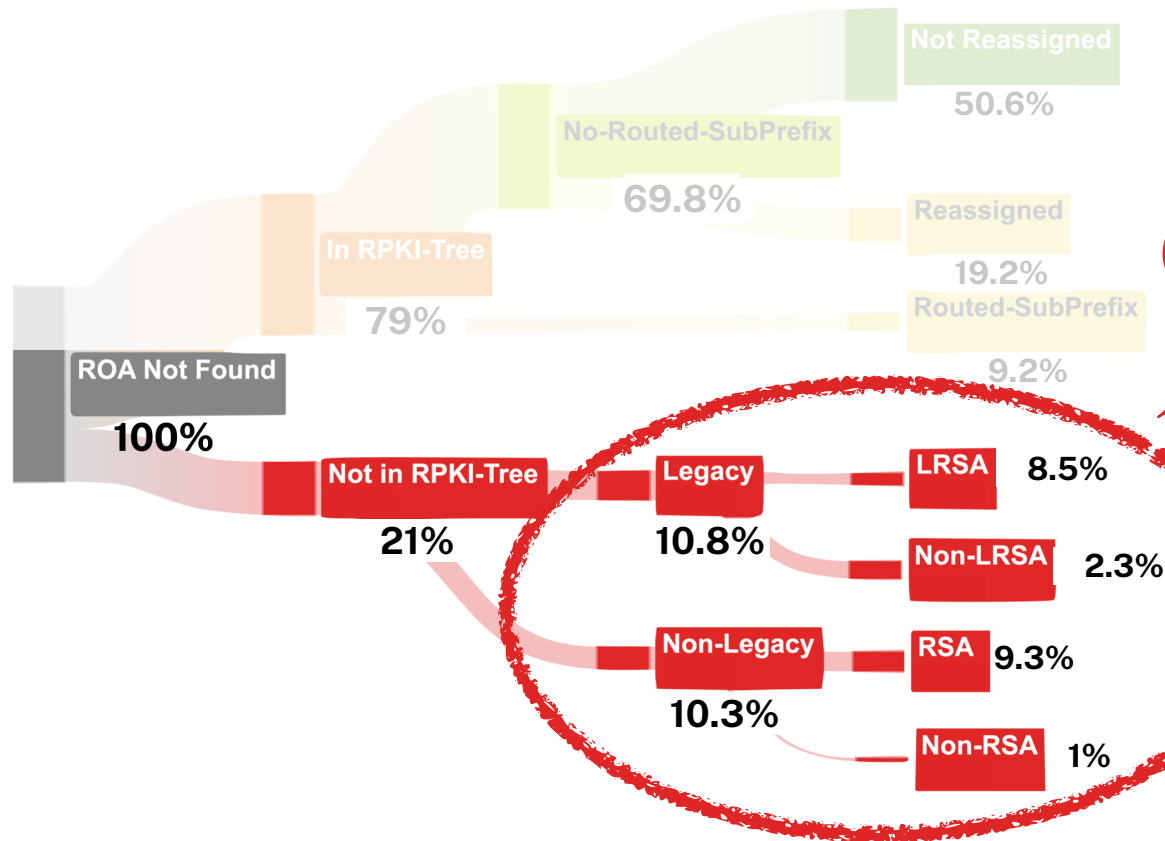
Breakdown of IPv4 Prefixes without ROAs



Needs careful planning

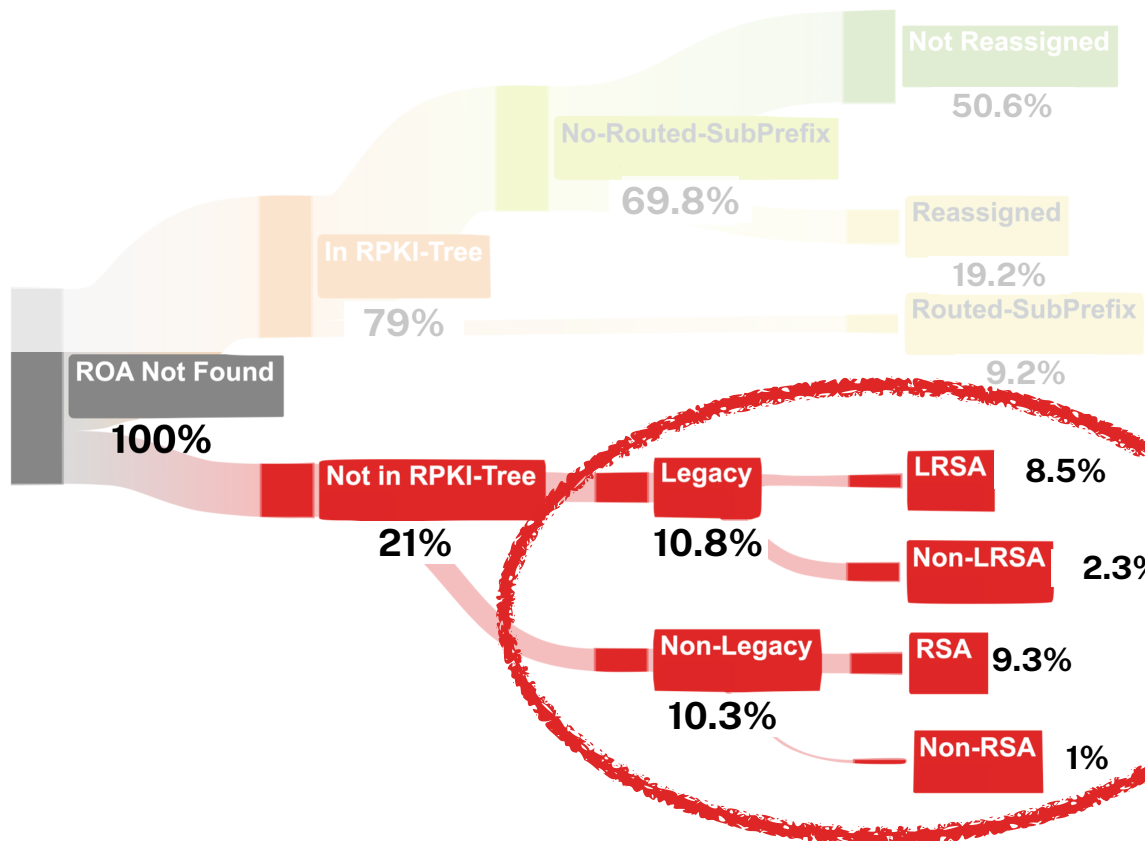
ru-RPKI-ready can help!

Breakdown of IPv4 Prefixes without ROAs



Not so easy 😞

Breakdown of IPv4 Prefixes without ROAs



Not so easy 😞

Major US federal institutions

- DoD NIC
- USAIC
- USDA
- Air Force Systems

Key Takeaways

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- Non-technical aspects impact the ROA adoption percentage

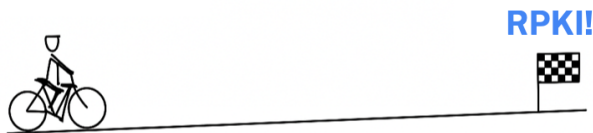
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- Growth of ROA coverage needs continued support and training

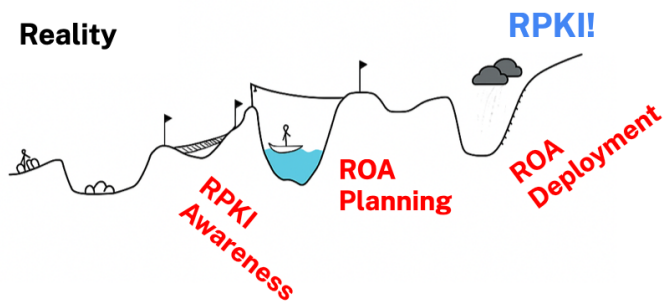
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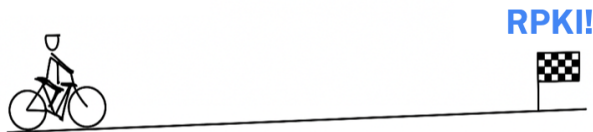
Reality



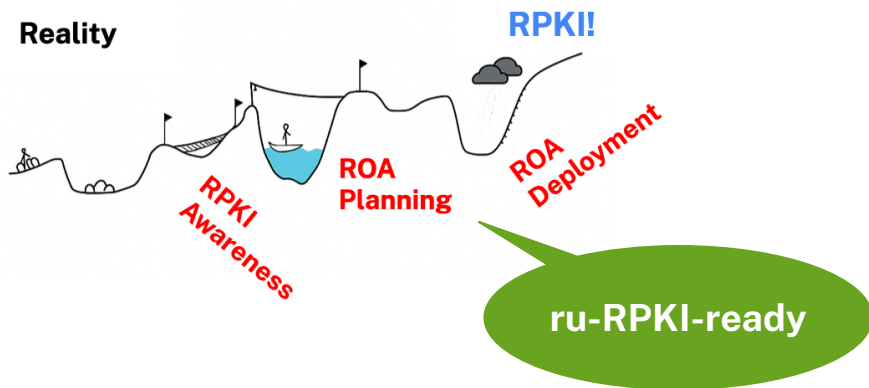
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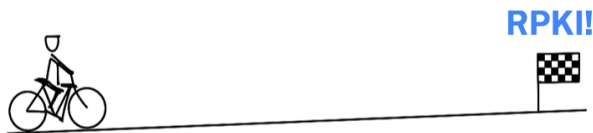
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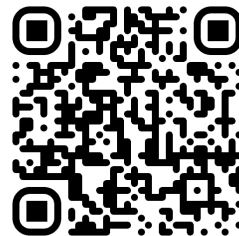
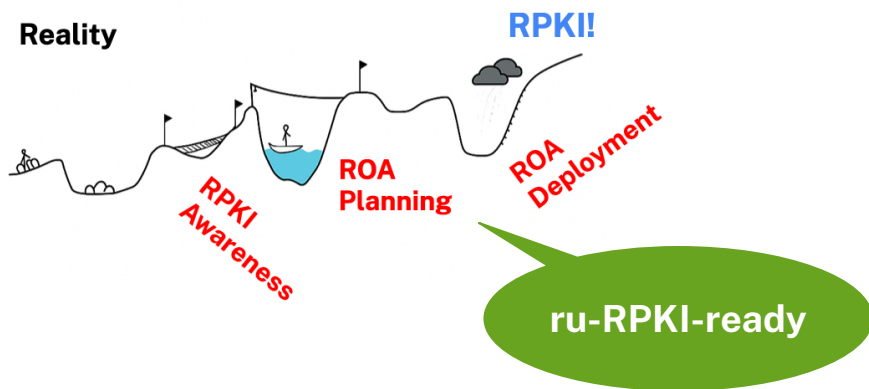
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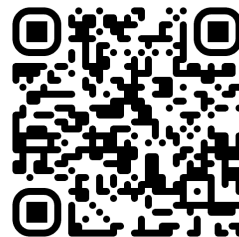
Expectation



Reality



IMC '25 Paper



Dashboard

deepakgouda@gatech.edu



Questions!

`deepakgouda@gatech.edu`