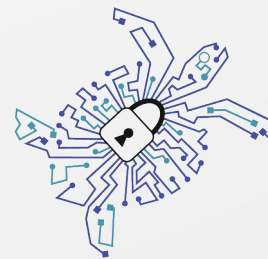


Let's adopt RPKI

ATNOG
November 2019



Foundation for
Applied Privacy

Foundation for Applied Privacy

- 2018 gegründet
- Non-profit Privacy Infrastruktur Provider (AS 208323)
- Privacy Enhancing Technology Dienste für die Öffentlichkeit
- Top 3 Tor Exit Relay Operator (weltweit)
- DNS Privacy Dienste (DoH und DoT)



Foundation for
Applied Privacy

Ziele dieses Vortrags

- Einführung in Routing Security mittels RPKI
- ROA Abdeckung (in AT) verbessern
- RPKI ROV Verbreitung (in AT) steigern
- RPKI Deployments auf den Weg bringen



Warum BGP Routing Security?



Foundation for
Applied Privacy

BORDER GATEWAY PROTOCOL ATTACK —

Suspicious event hijacks Amazon traffic for 2 hours, steals cryptocurrency

Almost 1,300 addresses for Amazon Route 53 rerouted for two hours.

DAN GOODIN - 4/24/2018, 7:00 PM

The Amazon logo, consisting of the word 'amazon.com' in a bold, black, sans-serif font, with a registered trademark symbol (®) to the upper right of the 'm'. Below the text is the orange Amazon smile arrow.

<https://arstechnica.com/information-technology/2018/04/suspicious-event-hijacks-amazon-traffic-for-2-hours-steals-cryptocurrency/>



Foundation for
Applied Privacy



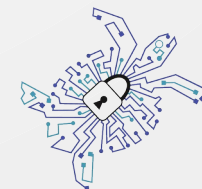
Nigerian ISP's configuration error disrupted Google services

By FRANK BAJAK November 14, 2018



Click to copy

<https://apnews.com/650a5b920b064bafaf98621e24c521b5>



Foundation for
Applied Privacy

 MUST READ: Europe's cloud computing plan won't do much to scare the US giants

Amazon, Facebook internet outage: Verizon blamed for 'cascading catastrophic failure'

Cloudflare loses 15 percent of traffic due to an error at Verizon.



By [Liam Tung](#) | June 25, 2019 -- 11:31 GMT (12:31 BST) | Topic: [Networking](#)

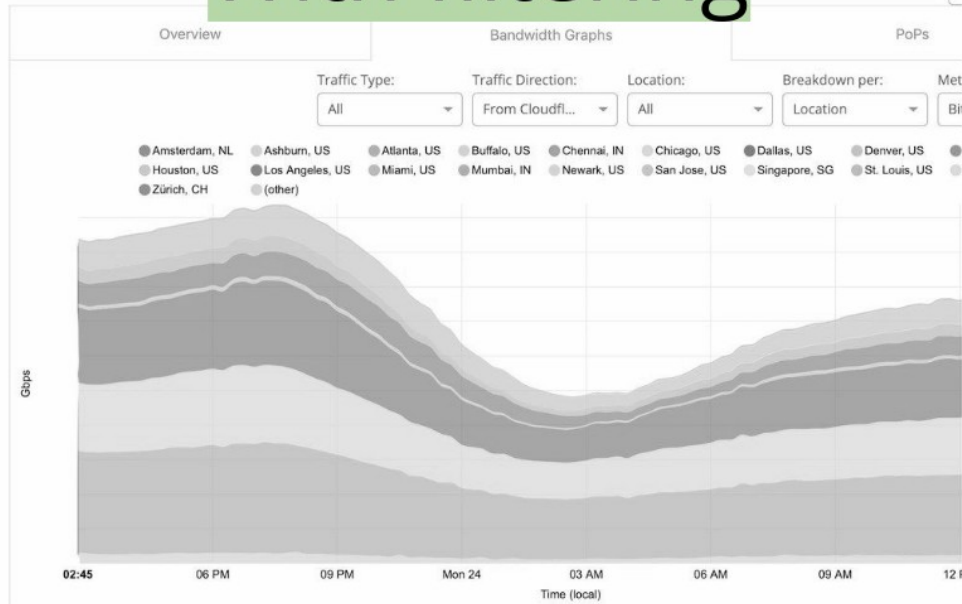
<https://www.zdnet.com/article/amazon-facebook-internet-outage-verizon-blamed-for-cascading-catastrophic-failure/>



Foundation for
Applied Privacy

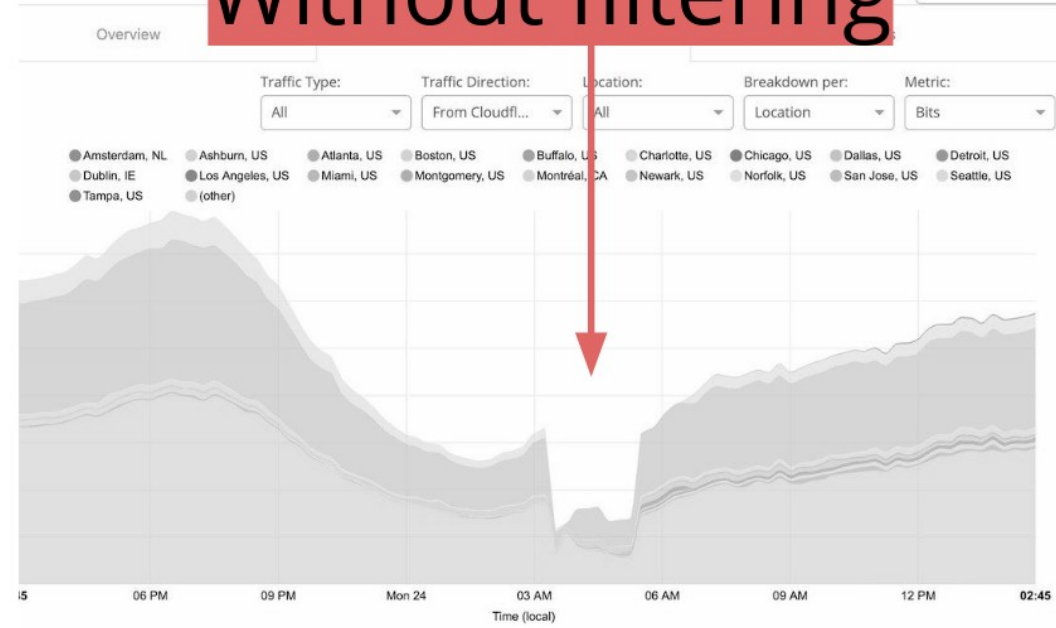
With filtering

Traffic Volume AS7018 - AT&T



Without filtering

lume AS701 - Verizon



<https://www.afpif.org/wp-content/uploads/2019/08/Cloudflare.pdf>



Foundation for
Applied Privacy

Wer ist autorisiert ein Prefix zu announce?



Foundation for
Applied Privacy

IRR



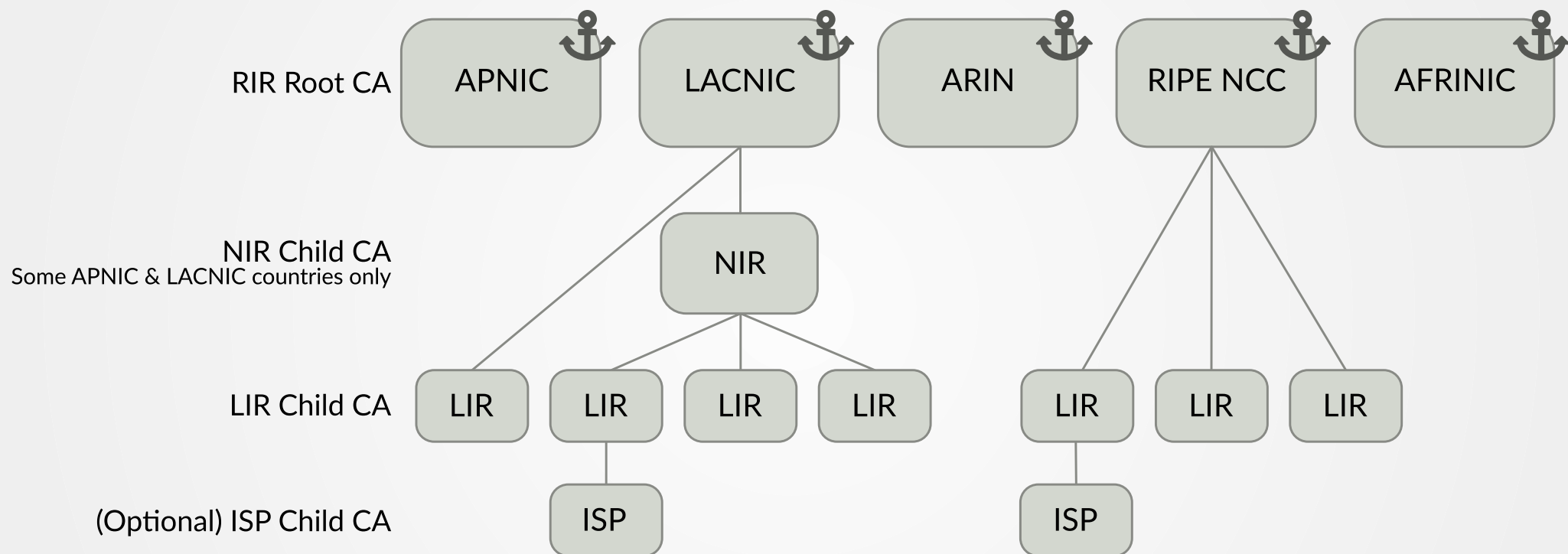
Foundation for
Applied Privacy

RPKI

Resource Public Key Infrastructure



Foundation for
Applied Privacy



<https://rpki.readthedocs.io/en/latest/rpki/introduction.html>



Foundation for
Applied Privacy

Wer betreibt die LIR CA?

- **Hosted (von RIR für LIR betrieben)**
- Delegated (von LIR selbst betrieben)



Route Origin Authorization (ROA)

- Origin (ASN)
- Prefix
- Maxlength (optional)



Route Origin Authorization (ROA)

Validated ROAs

Show entries

ASN	Prefix	Max Length	Trust Anchors
208323	109.70.100.0/24	24	RIPE NCC RPKI Root



Foundation for
Applied Privacy

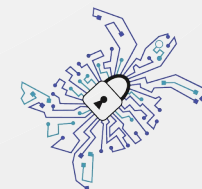
Maxlength Empfehlung

Network Working Group
Internet-Draft
Intended status: Best Current Practice
Expires: April 25, 2020

Y. Gilad
Hebrew University of Jerusalem
S. Goldberg
Boston University
K. Sriram
USA NIST
J. Snijders
NTT
B. Maddison
Workonline Communications
October 23, 2019

The Use of Maxlength in the RPKI
draft-ietf-sidrops-rpkimaxlen-03

For this reason, this document recommends that, whenever possible, operators SHOULD use "minimal ROAs" that include only those IP prefixes that are actually originated in BGP, and no other prefixes.



ROA Maxlength Video (RIPE NCC)

<https://www.youtube.com/watch?v=I3Owb0u8Wuk>



**Foundation for
Applied Privacy**

Wie erstelle ich ROAs?



Foundation for
Applied Privacy

RIPE RPKI Dashboard

RPKI Dashboard

18 CERTIFIED RESOURCES

ALERTS ARE SENT TO 2 ADDRESSES

 **4 BGP Announcements**

 **21 ROAs**

 4 Valid

 0 Invalid

 0 Unknown

 21 OK

 0 Causing problems

BGP Announcements

Route Origin Authorisations (ROAs)

History

Search...

⌵

Create ROAs for selected BGP Announcements

☒ Valid

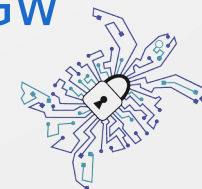
☐ Invalid

☐ Unknown

☐	Origin AS	Prefix	Current Status	
☐	AS51531	185.70.20.0/22	VALID	
☐	AS51531	2a02:c50::/32	VALID	
☐	AS51531	46.31.120.0/21	VALID	
☐	AS196610	2a02:c50:db8::/48	VALID	

Show 25 of 4 items

<https://www.youtube.com/watch?v=gLwHp12wOGw>
(RIPE NCC)



Foundation for
Applied Privacy

ROAs inspizieren

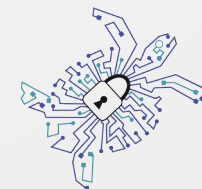
→ ↺ <https://rpki-validator.ripe.net/trust-anchors>

RPKI Validator Trust Anchors ROAs Ignore Filters Whitelist BGP Preview Announcement Preview

Configured Trust Anchors

Trust Anchors	Processed Items		
AfriNIC RPKI Root	1153	0	0
APNIC RPKI Root	11717	0	0
ARIN	8002	0	0
LACNIC RPKI Root	6976	0	0
RIPE NCC RPKI Root	41851	0	0

<https://rpki-validator.ripe.net>



Foundation for
Applied Privacy

RPKI in RIPEstat

AS Routing Consistency (208323)

Reload this widget by entering a resource here 

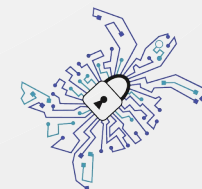
Prefixes Imports Exports

Show **10** entries Search:

prefix	In RIS	RIPE IRR	Other IRRs	RPKI
109.70.100.0/24	yes	yes	no	
2a03:e600:100::/48	yes	yes	no	

Showing 1 to 2 of 2 entries  

<https://stat.ripe.net/widget/as-routing-consistency#w.resource=208323>



Foundation for
Applied Privacy

Number of ROAs



☒ AfriNIC



☒ APNIC



☒ ARIN

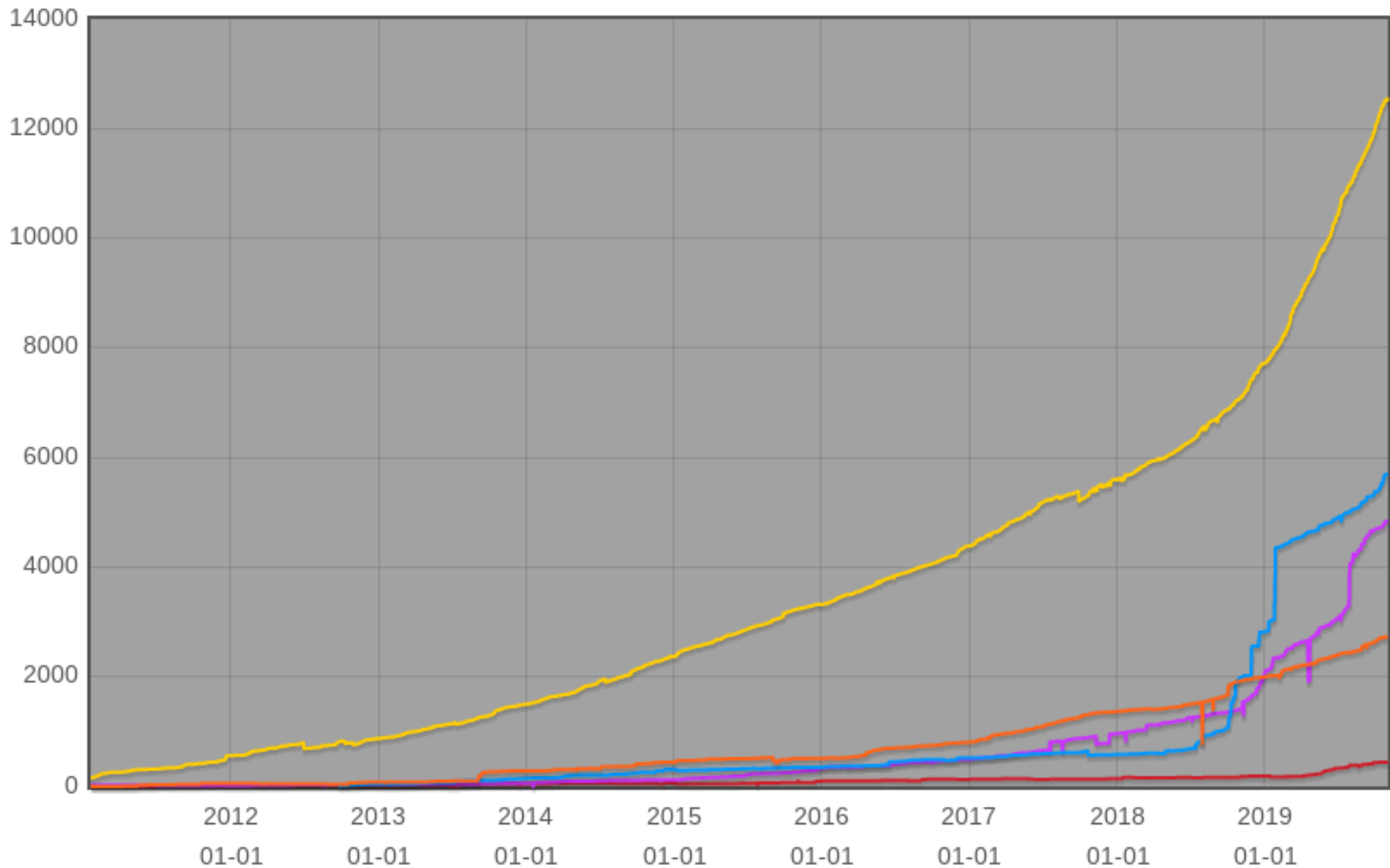


☒ LACNIC



☒ RIPE NCC

This graph shows the total number of valid Route Origin Authorisation (ROA) objects created by the holders of a certificate



<https://certification-stats.ripe.net/>



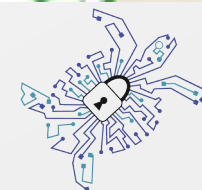
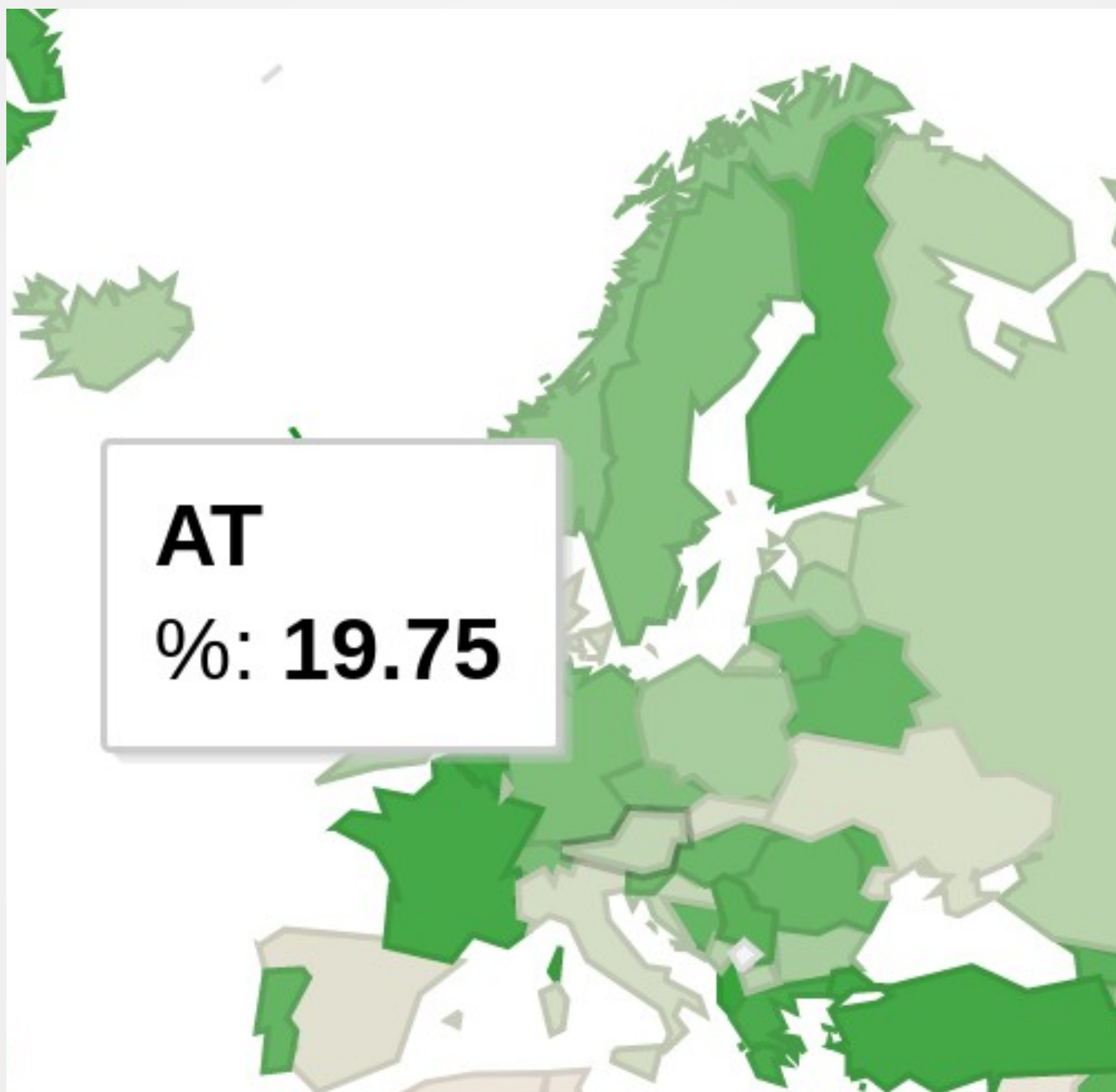
Foundation for
Applied Privacy

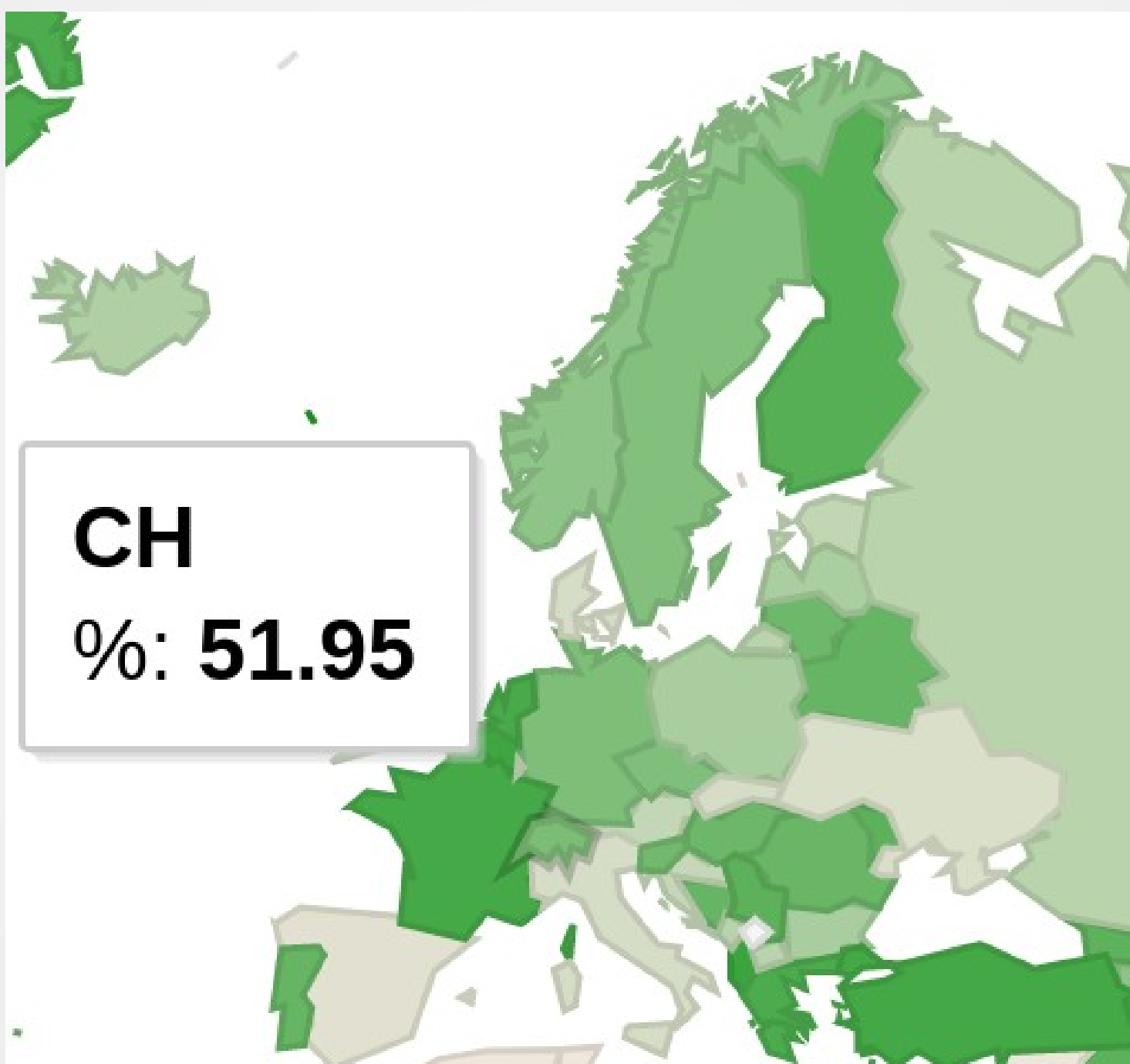
IPv4 space covered



(05.11.2019)







RPKI: Zwei Bestandteile

- Signieren: ROAs erstellen
- Validieren: ROAs mit BGP Announcements abgleichen



RPKI Router Support

- Cisco
- Juniper
- Nokia
- BIRD
- FRRouting
- GoBGP
- VyOS
- OpenBGPD



Validator Software

- **Routinator 3000 (NLnet Labs)**



- RPKI Validator (RIPE NCC)
- FORT Validator (LACNIC & NIC.MX)
- OctoRPKI+GoRTR (Cloudflare)



Foundation for
Applied Privacy

RPKI Validator Aufgaben

- Download der RPKI Repository Daten
 - rsync
 - RPKI Repository Delta Protocol (**RRDP**)
- Kryptografische Validierung
- Bereitstellung der Ergebnisse via RPKI-to-Router (RTR) Protocol an Router



ARIN TAL nicht vergessen!



Foundation for
Applied Privacy

RPKI Announcement Validity

- UNKNOWN
- VALID
- INVALID
 - Invalid ASN
 - Invalid Length

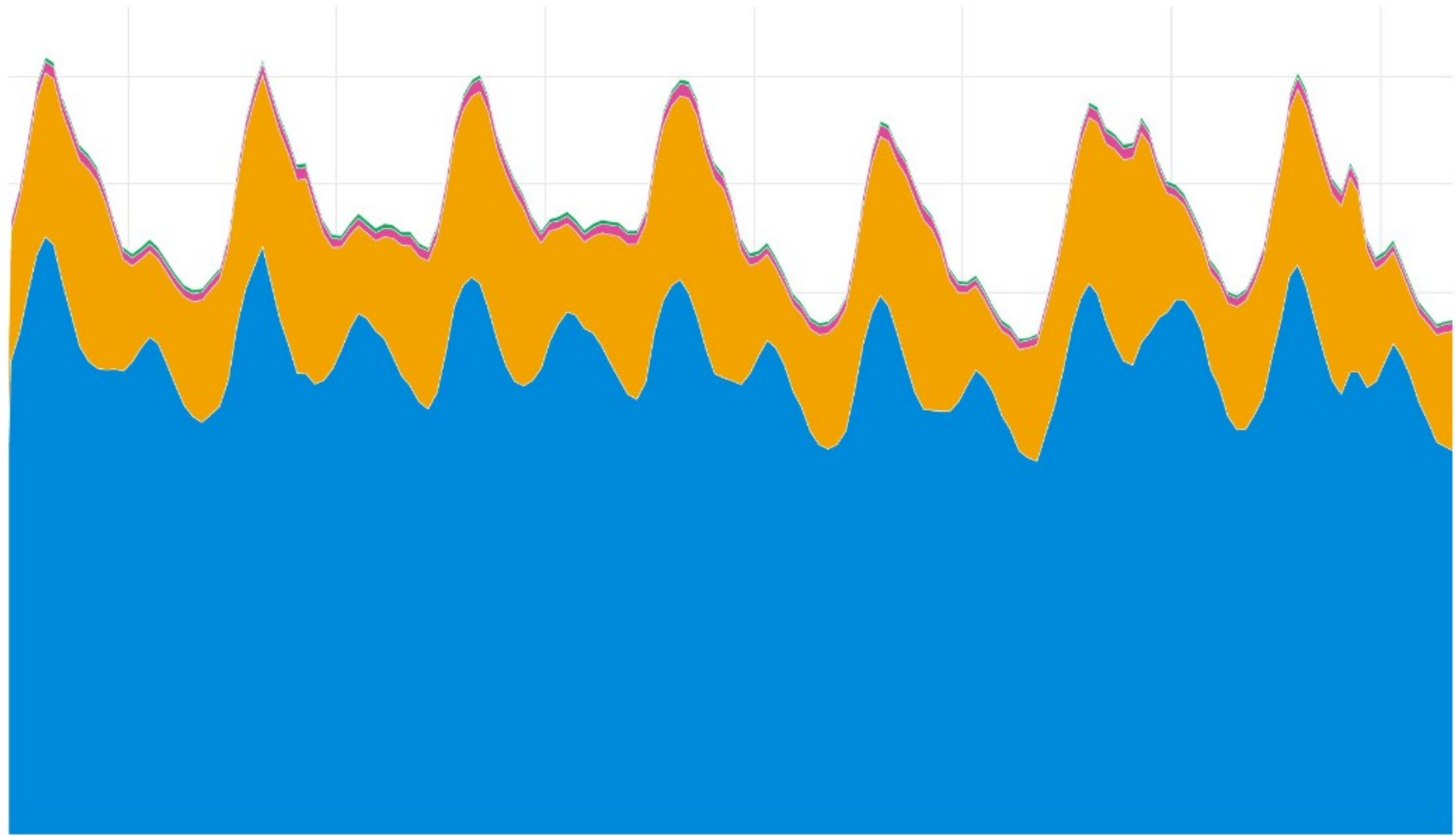


**Wieviel Traffic verliere ich wenn
ich INVALIDs verwerfe?**



Foundation for
Applied Privacy

A view from AS 2914 / NTT's global backbone



Slide: Job Snijders (NTT), RIPE78, Mai 2019

https://ripe78.ripe.net/wp-content/uploads/presentations/113-routing_security_ripe78_snijders.pdf

<http://www.pmacct.net/>

Wer hat bereits RPKI ROV deployed?



Foundation for
Applied Privacy



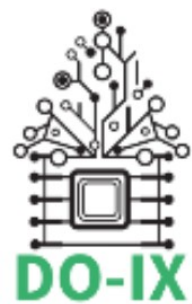
AT&T



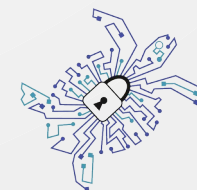
amsix



DE-CIX



Work in progress:



Foundation for
Applied Privacy

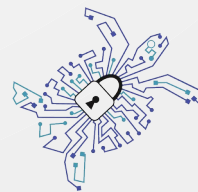


RPKI TEST

a RIPE Labs **experiment** in collaboration with Job Snijders/NTT



<https://www.ripe.net/s/rpki-test>



Foundation for
Applied Privacy



Calling ISPs!

Help protect the Internet core.

JOIN MANRS

www.manrs.org



MANRS

**Schütze dein Netz,
erstelle ROAs!**



Foundation for
Applied Privacy

Fragen?

✉ contact@appliedprivacy.net

🐦 [@applied_privacy](https://twitter.com/applied_privacy)

🐙 https://mastodon.social/@applied_privacy

<https://applied-privacy.net>



Foundation for
Applied Privacy

RPKI Resourcen

- <https://rpki.readthedocs.io/en/latest/>
- RPKI Mailing Liste:
<https://nlnetlabs.nl/mailman/listinfo/rpki>
- RIPE NCC <https://ripe.net/rpki>

