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Penn Law

An Update on Legal Barriers to RPKI Adoption

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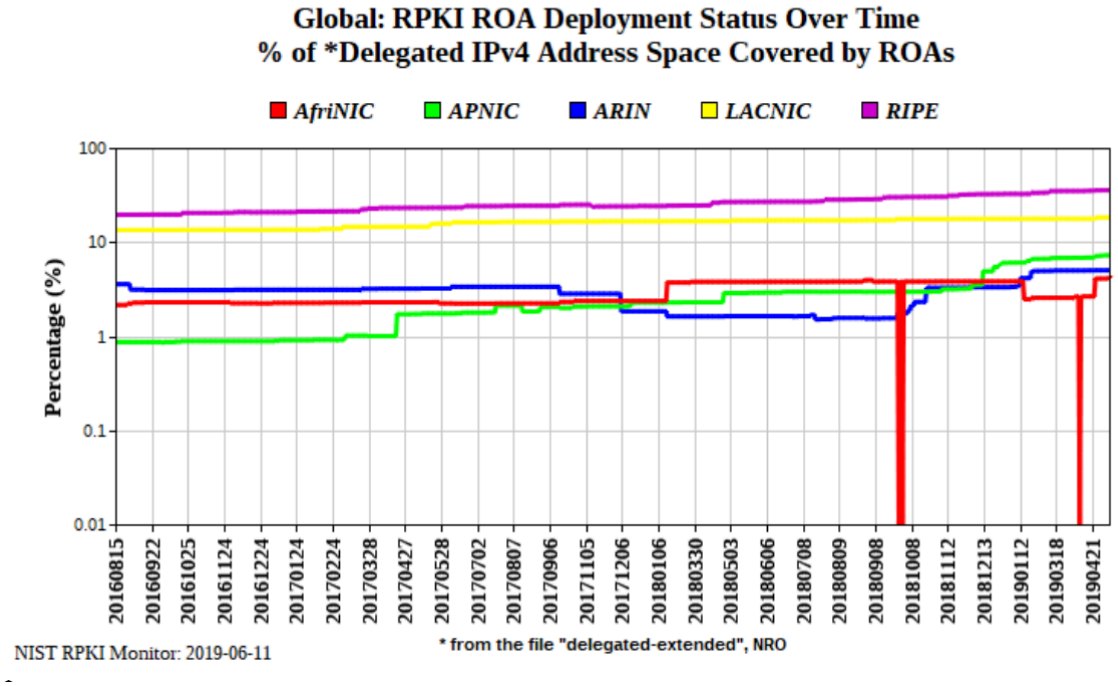
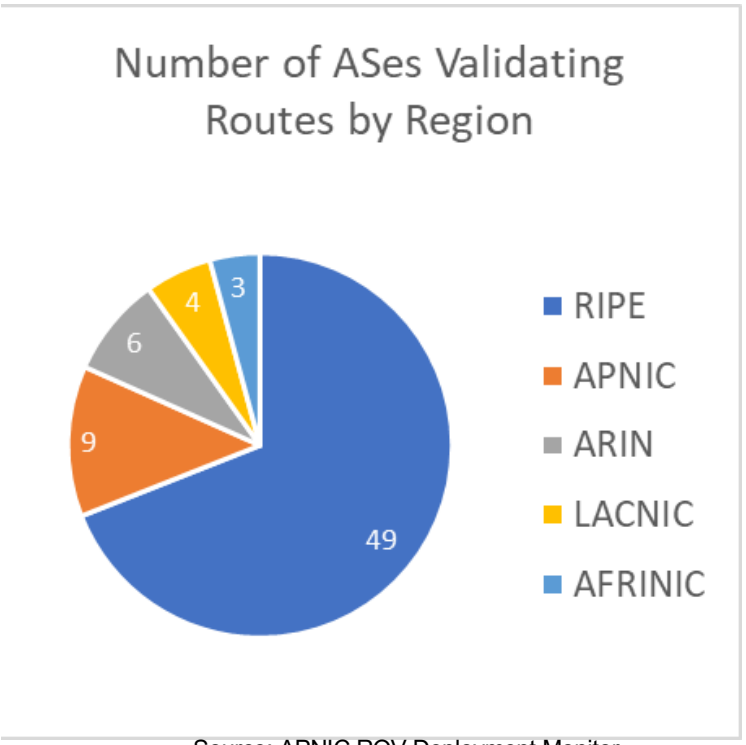
Intro to Resource Public Key Infrastructure (RPKI)

- RPKI protects against route hijacks by authenticating route origins
  - IP address holders create certificates identifying authentic IP address origins
  - Operators use validator software to verify that routes are pointing to correct origins
- Last 12 months have been eventful for RPKI
  - NTT began combining RPKI information with IRR data in July 2018
  - Amazon DNS was hijacked in Aug. 2018
  - Cloudflare committed to RPKI and began developing own validator software
  - AT&T began filtering routes (dropping invalids) in Feb. 2019
  - Google began flagging routes and will begin filtering routes in 2019
  - 100+ networks joined ISOC's Mutually Agreed Norms for Routing Security

Global RPKI Deployment

% of Declared IPv4 Space Covered By ROAs





Source: APNIC ROV Deployment Monitor

- 80% of those engaging in ROV omit the ARIN TAL (Cartwright-Cox, 2018)

NSF Grant on Legal Barriers to RPKI Adoption

- Motivation: reports that legal issues were slowing RPKI adoption in the ARIN region (particularly the RPA's indemnification clause)

- Methodology
  - Analysis of relevant contracts and policies
  - Interviews with broad range of stakeholders
  - Engagement with the ARIN and NANOG communities

Milestones

- Presentations at NANOGs 73-75
- Release of report and recommendations (Dec. 2018)
  - (Report link: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3308619)
- Presentation at ARIN 43 (Apr. 2019)
  - ARIN has committed to conducting a full review, likely concluding by the end of 2019
  - Commenters encouraged swift action
  - One commenter even said, 'Increase our fees if it helps!'

Key Issues

- RPA acceptance/RPA clauses regarding liability
  - Elimination of the RPA vs. possible replacement of indemnification clause with as-is disclaimer
  - Possible creation of new nonprofit for RPKI
  - Integration of RPA acceptance into validator software

RPA Acceptance Through Routinator 0.4.0

```
Before we can install the ARIN TAL, you must have read
and agree to the ARIN Relying Party Agreement. It is
available at

https://www.arin.net/resources/manage/rpki/rpa.pdf

If you agree to the agreement, please run the command
again with the --accept-arin-rpa option.
Mascarpone:~ alex$ routinator init --accept-arin-rpa
Created local repository directory /Users/alex/.rpki-cache/repository
Installed the five TALs in /Users/alex/.rpki-cache/tals
Mascarpone:~ alex$ routinator -v vrps
rsyncing from rsync://rpki.ripe.net/ta/.
rsyncing from rsync://repository.lacnic.net/rpki/.
rsyncing from rsync://rpki.apnic.net/repository/.
rsyncing from rsync://rpki.afrinic.net/repository/.
rsync://rpki.ripe.net/ta: The RIPE NCC Certification Repository is subject to Terms and Conditions
rsync://rpki.ripe.net/ta: See http://www.ripe.net/lir-services/ncc/legal/certification/repository-tc
rsync://rpki.ripe.net/ta:
Found valid trust anchor rsync://rpki.ripe.net/ta/ripe-ncc-ta.cer. Processing.
rsyncing from rsync://rpki.ripe.net/repository/.
Found valid trust anchor rsync://rpki.afrinic.net/repository/AfriNIC.cer. Processing.
rsyncing from rsync://rpki.arin.net/repository/.
Found valid trust anchor rsync://rpki.arin.net/repository/arin-rpki-ta.cer. Processing.
```

Key Issues

- RPA acceptance/RPA clauses regarding liability
  - Elimination of the RPA vs. possible replacement of indemnification clause with as-is disclaimer
  - Integration of RPA acceptance into validator software
  - Possible creation of new nonprofit for RPKI
- Revisions to the RPA's prohibited conduct clause
- Inclusion of RPKI in procurement requirements
- Information regarding best practices
- Other recommendations

Deployment of Best Practices

- RPKI deployment is only valuable if done safely (esp. failover)
- For network operators, best practices exist
  - Operators should follow the advice of the key RFC 7115 and 6480
  - Operators should solicit advice—from MANRS, Internet2, RIRs
- For RIRs, best practices require disclosure around service levels and perhaps increased service commitments

Potential Next Steps

- ARIN should consider RPA changes
  - Revising the liability provisions or dropping the RPA
  - Enabling machine-readable redistribution of RPKI info
- The ARIN community should consider whether to support the development of a new nonprofit for RPKI certificate publication
- Network operators and RIRs should focus on best practices and high-leverage tactics like requiring RPKI from vendors
- Everyone interested in enhancing routing security should keep up the momentum

Questions and Discussion