Increasing Routing Security through RPKI Deployathon

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Problem Statement

• **Some IRR data cannot be fully trusted**
  - often inaccurate
  - incomplete
  - out of date

• **Not every RIR has an IRR**
  - third-party databases need to be used (RADB, operators)
  - no verification of who holds IP addresses or AS numbers
Accidents Happen

• Fat fingers
  - 2 and 3 are really close on your keyboard

• Policy violations (leaks)
  - “Oops, we didn’t mean this to go to the public Internet”
  - Infamous incident: Pakistan Telecom blackholes Youtube, for the world..
What is RPKI?

- **Resource Public Key Infrastructure**
  - RPKI Repository (digital certificate)
  - Router Origin Authorisation (ROA) - signed prefixes
  - RIPE NCC Validator (other validators also available)

- Securing the Internet infrastructure and BGP routing
  - Developed by the IETF
  - Endorsed by RIRs and network operators
  - Helps reduce the impact of some BGP hijacking attacks and accidental misconfigurations
## RPKI in some European countries

<table>
<thead>
<tr>
<th>Country</th>
<th>% Addresses</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE</td>
<td>78%</td>
<td>100,0%</td>
</tr>
<tr>
<td>BA</td>
<td>62%</td>
<td>100,0%</td>
</tr>
<tr>
<td>RS</td>
<td>57%</td>
<td>99,9%</td>
</tr>
<tr>
<td>HU</td>
<td>57%</td>
<td>99,9%</td>
</tr>
<tr>
<td>BG</td>
<td>54%</td>
<td>99,9%</td>
</tr>
<tr>
<td>SI</td>
<td>54%</td>
<td>100,0%</td>
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<tr>
<td>AL</td>
<td>52%</td>
<td>99,5%</td>
</tr>
<tr>
<td>CZ</td>
<td>46%</td>
<td>99,9%</td>
</tr>
<tr>
<td><strong>HR</strong></td>
<td><strong>18%</strong></td>
<td><strong>100,0%</strong></td>
</tr>
<tr>
<td>AT</td>
<td>18%</td>
<td>100,0%</td>
</tr>
<tr>
<td>SK</td>
<td>10%</td>
<td>100,0%</td>
</tr>
</tbody>
</table>

source: [https://lirportal.ripe.net/certification/content/static/statistics/world-roas.html](https://lirportal.ripe.net/certification/content/static/statistics/world-roas.html)
**RPKI Deployathon**

- **When**
  - 7-8 March 2019

- **Who**
  - Network operators, hackers, software developers and more
  - 40 participants from seven countries

- **It could be in your country next**
Goals of the RPKI Deployathon

• Make progress towards a more secure Internet
  - Increase the number of ROAs
  - Increase confidence to enable invalid == reject
• Bring together network professionals
• Enhance collaboration
  - Deployathons at NOG events in other countries
**RPKI Deployathon**

**Day 1**
- **7 March 2019**
  - **Talks**
    - What is routing security and why it is important
    - What is RPKI and how it works
  - **Hands-on demonstration**
    - Setting up the RPKI Validator
    - Generating certificates and ROAs
    - Configuring the routers using the Validator

**Day 2**
- **8 March 2019**
  - **Talks**
    - Policy considerations
    - How to deploy RPKI in a live network, implications for your helpdesk etc.
  - **Hands-on demonstration**
    - Enabling routing security on live routers (build and implement policies)
    - Enabling policies and so "active reject invalids"
    - Handling exceptions and mitigating DDoS attacks
RPKI Deployathon Results

• > 200 ROAs created
• Deployed on live routers
• Worked with all three validators
  - and fixed some bugs
• Gained confidence for real deployment

Serious momentum is the end-of-day statement from @RIPE_NCC's #RPKIDeployathon day one. These numbers, curated by @Ms_Multicolor, are brilliant! A worthwhile day and a great step-forward for #RPKI and secure routing. 17 LIRs, ~220 ROAs, 14 validators installed. #progress
RPKI Deployathon Results

WHAT ELSE WE NEED TO DO
- DROP INVALIDS (AFTER A FEW BEERS)
- FILTERING
- TOO MANY ROAS (HOW MANY?)
- BUILD CONFIDENCE IN DEPLOYING WITH THE REST OF THE COMMUNITY
- WHAT ARE WE DOING FOR THE NEXT N DAYS? (6 SEPTEMBER 2019)
- FIX VALIDATOR BUGS
- FIX ROA N FOR CUSTOMERS
- JUNOS UPGRADES
- DECIDE WHAT WE’LL DO WITH EXPORTS

THINGS WE’VE LEARNED
- MONITORING ROAS, CONFLICTING
- CLOUDFARE VALIDATOR, ROUTINATOR 3000
- UPDATE JUNOS BEFORE IMPLEMENTING
- DEPLOYED ON LIVE ROUTERS!
- DEPLOYED RPKI ON VIRTUAL LABS
- ASSIGN ROAS
- A LONG WAY SINCE 2011
- CREATED OVER 200 ROAS
- MORE INSIGHTS TO RPKI
- FIXED BUG \( \text{RIPE @ CLOUDFARE} \) (NINE LABS)
- \( \text{SEE HOW PEOPLE USED THE VALIDATORS} \) AND MAKE IMPROVEMENTS

WHAT NOT TO DO
- DON’T DEPLOY ON FRIDAY AFTERNOON
- DON’T DEPLOY ON LIVE ROUTERS BEFORE TESTING
- DON’T BE SCARED TO DEPLOY!
Previous Hackathons

- Nine Hackathons so far
- Themes:
  - RIPE Atlas
  - IXP Tools
  - DNS
  - Quantum Internet
- All code on GitHub
- labs.ripe.net/hackathons