

POSTER: Using RPKI to Aggregate Autonomous Systems by their Managing Organization

Deepak Gouda Cecilia Testart

Georgia Institute of Technology



Introduction

- Accurately mapping Autonomous Systems (ASes) to their managing organizations is essential for understanding Internet structure and resource usage & identifying misconfigurations or malicious activities
- Existing mapping datasets, primarily based on WHOIS records and PeeringDB, often suffer from inconsistencies and incomplete coverage

Objective

Develop a methodology for mapping ASNs to their managing organizations based on RPKI cryptographic mapping by leveraging information from WHOIS and Large Language Models (LLMs) to properly identify organizations behind anonymous certificates.

Challenges

- RPKI Certificates do not have any identifiable organization information
- Intermediate entities might hold the cryptographic keys for the RPKI Certificates of a delegated ASN
- Large organizations may have certificates in different RIRs

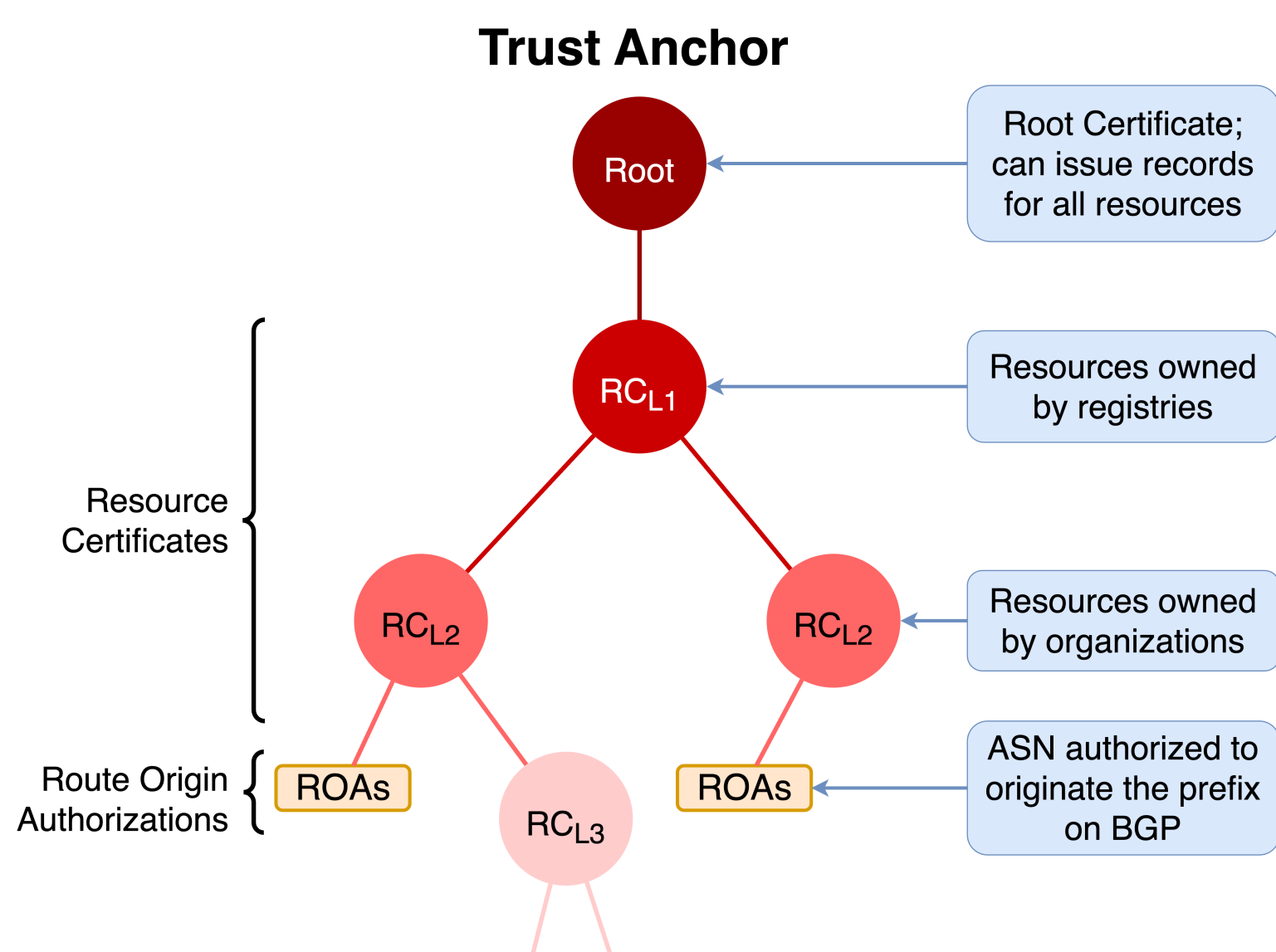


Figure 1. RIR RPKI Certificate Structure

X.509 Resource Certificate

Subject key identifier: FE:F9:14:3B:16:16:CD:A1:15:9B:59:EC:D5:E3:99...
 Authority key identifier: 0E:65:A4:F5:FD:36:B5:BD:68:EB:3C:92:34:08:97...
 Certificate not before: Thu 17 Apr 2025 12:39:16 +0000
 Certificate not after: Wed 01 Jul 2026 00:00:00 +0000
 Subordinate resources:
 AS: 9280 AS: 45261 IP: 27.50.64.0/19 IP: 2400:8100::/32
 AS: 17462 AS: 45425 IP: 27.111.80.0/24 IP: 2400:d400::/32
 AS: 18345 AS: 45671 IP: 27.111.85.0/24 IP: 2403:b800::/32
 AS: 23670 AS: 56225 IP: 27.111.87.0/24 IP: 2404:5300::/32
 AS: 24113 AS: 131229 IP: 27.111.90.0/23 IP: 2405:1000::/32
 AS: 24238 AS: 132324

Dataset and Tools

- RPKI Certificates:** Snapshot of the validated certificates April 1, 2025, from RPKIViews Archive [5]
- ASN Organization Information:** Bulk WHOIS data from five RIRs
- Large Language Model:** GPT 4.1
- Benchmark Dataset:** Compared against AS2Org++ *i.e.*, CAIDA AS2Org with AS2Org-IIL [1] and *as2org+* inferences (April 1, 2025)

Example: Servers Australia Pty Ltd

Servers Australia Pty Ltd: Acquired Oz Servers Pty Ltd in 2017 [4]

- Previous work:** two clusters—*Servers Australia Pty. Ltd* (9 ASNs) and *Oz Servers Pty Ltd* (3 ASNs)
- Our approach:** one cluster—12 ASNs

AS9280:

WHOIS descr: Servers Australia Pty Ltd

Org-ID: ORG-SAPL7-AP

RPKI RC: FE:F9:14:3B:16:16:CD:A1:..

AS45261:

WHOIS descr: Oz Servers

Org-ID: ORG-OSPL2-AP

RPKI RC: FE:F9:14:3B:16:16:CD:A1:..

LLM Response: "...there is documented evidence that Servers Australia acquired the customers and assets of Oz Servers in 2017, indicating a direct acquisition relationship between the two companies [4]. This acquisition implies operational integration to some degree, but does not suggest they are the same entity or that one is a subsidiary of the other post-acquisition; rather it is a business asset acquisition. Therefore, the confidence score for them being related via acquisition is moderately high (85), reflecting a verified relationship through acquisition of assets and customers."

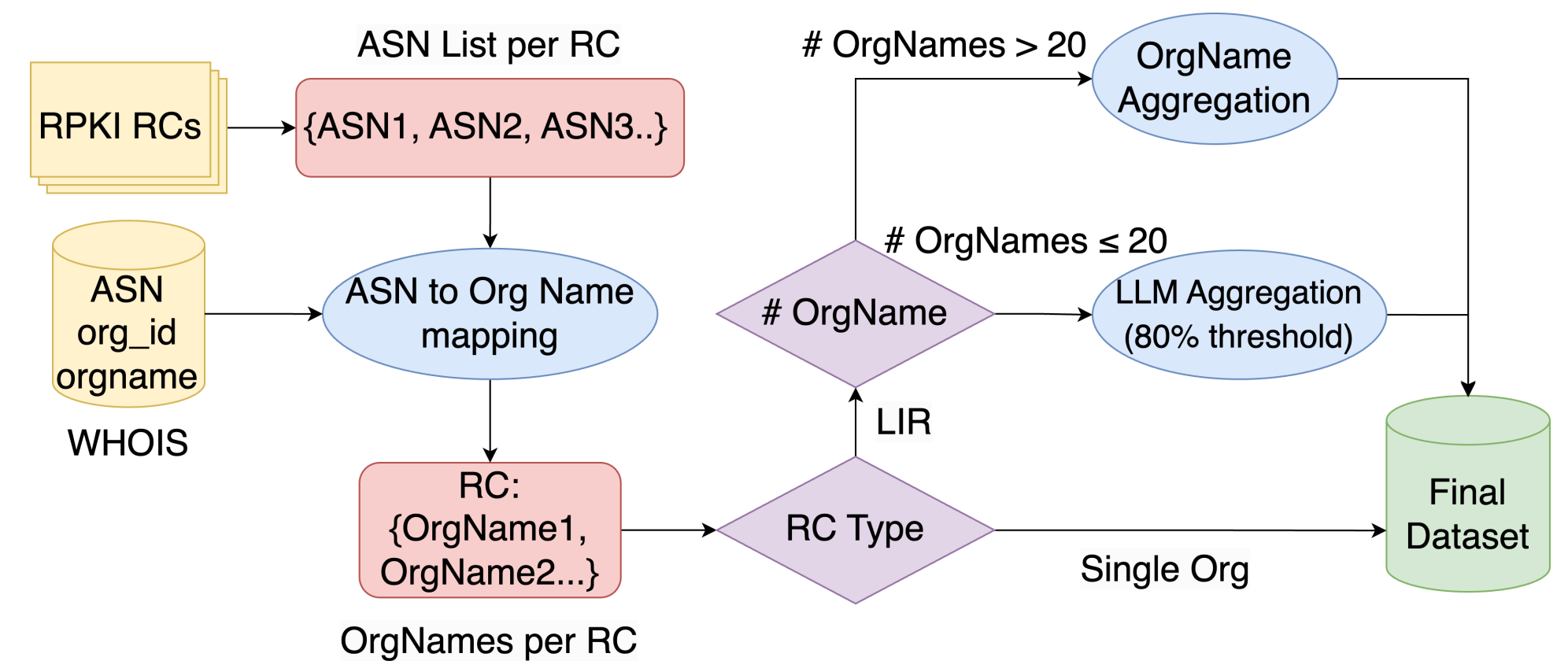


Figure 2. Methodology

Results

- We analyzed 270 RCs containing ASNs registered under multiple organization name
- Our final dataset consists of 84k clusters covering 108k ASNs, representing 82.8% of all routed ASNs
- We improve the management organization mapping of 7,884 ASNs

Method	Our Clusters	# ASNs	# AS2Org++ Differences	# ASNs in Differences
RPKI RC Grouping	33,226	46,248	8	14
LLM Inference	695	3,214	1,992	2,665
Manual (9 RCs, Group)	9	5,086	4,544	5,102
Manual (14 RCs)	50,074	53,473	28	103
Total	84,004	108,021	6,572	7,884

Table 1. Comparison of ASN-to-Organization clusters by our methodology against existing ASN-to-Organization datasets (referred as AS2Org++).

Future Work

- Handle LIR/NIR certificates that aggregate large numbers of ASNs across many organizations
- Address organizations holding multiple RCs across different registries

References

- Chen, Zhiyi and Bischof, Zachary S. and Testart, Cecilia and Dainotti, Alberto, Improving the Inference of Sibling Autonomous Systems, *Passive and Active Measurement*, 2023, pages 345–372.
- Corinne Reichert, Vocus completes AU\$861m acquisition of Nextgen Networks, 2016.
- Vocus announces acquisition of Nextgen Networks AND NWCS Development Project supported by a \$652 Million capital raising, 2016.
- Michael Jenkin, Servers Australia acquires Brisbane hosting provider Oz Servers, 2017.
- Job Snijders, RPKIViews, 2025.