



IP leasing

Ongoing work

Bernhard Degen

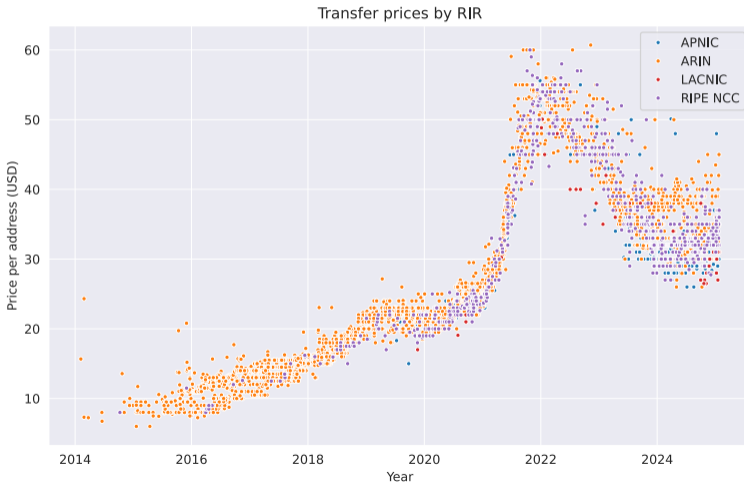
GMI-AIMS-5 February 11, 2025

Motivation

- ▶ Rate of IPv6 adoption slowing down, only $\sim 2\%$ increase in IPv6 clients in 2024¹.
- ▶ Rotating IP addresses lucrative for spammers, VPN providers, and others.
- ▶ How is the IP leasing market developing?
- ▶ To what extent are leased prefixes more likely to be abused?

¹<https://www.google.com/intl/en/ipv6/statistics.html>

Prices have increased 3–5× over the last 10 years



Getting a prefix

From an RIR

- ▶ Only direct from AFRINIC.
- ▶ For other RIRs long waiting times for others: from 498 days for RIPE NCC to 1417 days for LACNIC.
- ▶ Small prefix (/22 to /24).

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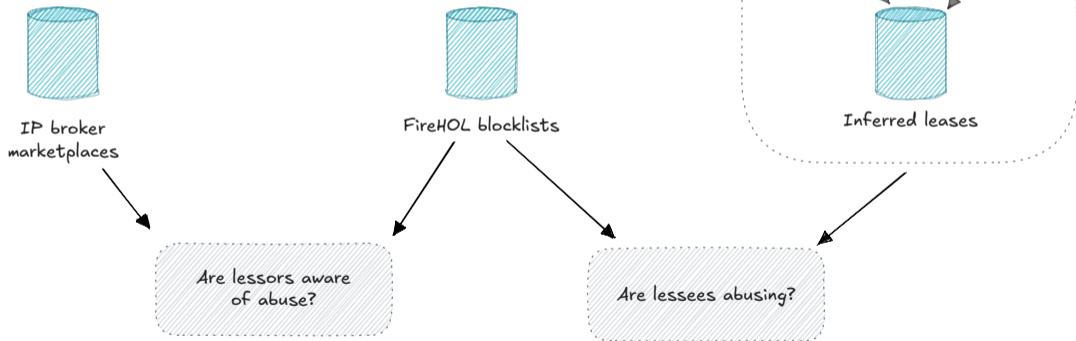
Leasing

- ▶ Flexible; lease term can be as short as one month.
- ▶ Instantly available.

IP brokers

- ▶ Facilitate transfer and leasing of addresses (but not required).
- ▶ Help in price negotiation.
- ▶ May offer additional services like originating prefix and managing RPKI (“BGP Hijack Protection”).
- ▶ Market information typically only available to vetted organizations.

Data overview



Obtaining market place data

Surveyed 17 brokers, of which

15 offer leasing services², of which

5 allowed registration without submitting a prior lease request, of which

2 approved our registration, of which

2 list prefixes available for lease.

²One didn't require registration but instead asked to sign NDA.

Failure modes

- ▶ Most require some proof ownership
ASN, company registration records,
etc.
- ▶ We do not pretend to represent the
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Failure modes

- ▶ Most require some proof ownership ASN, company registration records, etc.
- ▶ We do not pretend to represent the university, we use our real names and when asked state “research” as the intended purpose.

“We regret to inform you that your Company on our platform is now Closed.”

“Unfortunately, we are not yet able to approve your registration on the [...] marketplace. It is possible that we need some additional information to complete your registration.”

“NDA is mandatory to start working with us. [...] It’s a quite standard document, that has been accepted by all our customers and partners. Please do consider it.”

Normalizing data

Normalizing market data:

- ▶ Prefixes are typically offered in multiple denominations, causing subnets of large prefixes to be overrepresented.
- ▶ Only consider the largest one.

Normalizing blocklist data:

- ▶ To mitigate biases in individual blocklists, we use an aggregated, categorized blocklist.
- ▶ If a blocklist is more frequently updated than once a day, use the one day aggregates.

Which blocklists to use?

- ▶ FireHOL has 245 lists.

- ▶ 23.62% of all v4 addresses on list (!)

- ▶ No clear connection between prefix price and blocklist status.

- ▶ Need to devise with selection strategy.

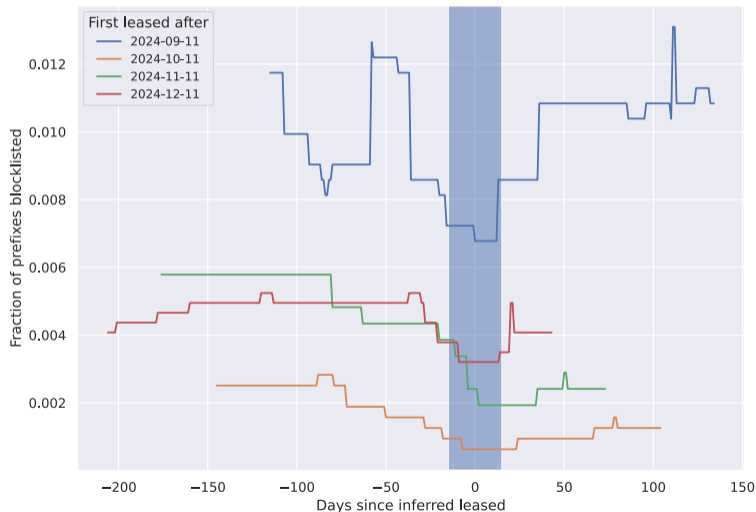
Category	Lists		Entries		Addresses	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
anonymizers	19	7.8	1 102 905	55.4	1 244 903	0.1
reputation	20	8.2	137 827	6.9	77 373 336	4.5
unroutable	2	0.8	18	0.0	588 514 808	34.5
attacks	57	23.3	262 848	13.2	682 995 803	40.0
organizations	41	16.7	47 665	2.4	320 405 873	18.8
spam	17	6.9	71 127	3.6	71 126	0.0
abuse	21	8.6	247 184	12.4	696 648	0.0
malware	68	27.8	120 435	6.1	35 538 323	2.1

The leasing market



- ▶ Limited amount of data.
- ▶ Amortization time: 5–7 years.
- ▶ Broker B charges lessee fee, broker A doesn't.

Blocklist reports before and after leasing started



- ▶ Using FireHOL level 1 blocklist.
- ▶ ~60k leased prefixes.
- ▶ Prefixes not leased in *the previous month*, aligned by inferred lease start date.
- ▶ Are prefixes cleaned before offered?

Future work

What can we infer from traffic patterns to blocklisted prefixes?

Approach Lease blocklisted and non-blocklisted prefixes.



Cayhan

Franke

SCHÖN

F. Schwäbe

I. A. Solari-B.

ISLAMI

★ AMOS ★

Büllesch

H3

KUHNS

EMST

DAVIES

NAUMI WOLFF

Y. Laso

References I

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- Giotsas, Vasileios, et al., “A First Look at the Misuse and Abuse of the IPv4 Transfer Market”. *Passive and Active Measurement*. Edited by Anna Sperotto et al., Springer International Publishing, 2020, pp. 88–103, https://doi.org/10.1007/978-3-030-44081-7_6.
- Prehn, Lars, et al., “When Wells Run Dry: The 2020 IPv4 Address Market”. *Proceedings of the 16th International Conference on Emerging Networking EXperiments and Technologies*. CoNEXT '20, Association for Computing Machinery, Nov. 2020, pp. 46–54, <https://doi.org/10.1145/3386367.3431301>.