

IPv6 Address Assignment Practices in Domestic ISPs

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DynamiPs: Analyzing address assignment practices in IPv4 and IPv6

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Motivation: why care about address assignments?

(ranges of) IP addresses are assigned to ISP subscribers

we infer a lot about users from these addresses

the addresses are not permanent, in time or space

Assignment *size* has impact

Reputation: what has an address range been used for in the past?

Geolocation: how much space in the same location?

Measurement targets: scoping

Logging: what is a suitable netmask to meaningfully obfuscate IP addresses in logs?

Assignment *duration* has impact

Reputation: when can the slate be wiped clean?

Geolocation: has this space potentially moved?

Measurement targets: will the target still exist, or be elsewhere?

We study IPv4 addresses and IPv6 /64 prefixes using RIPE Atlas's IP Echo dataset



<https://beta-docs.atlas.ripe.net/built-in/measurements/12027,13027>

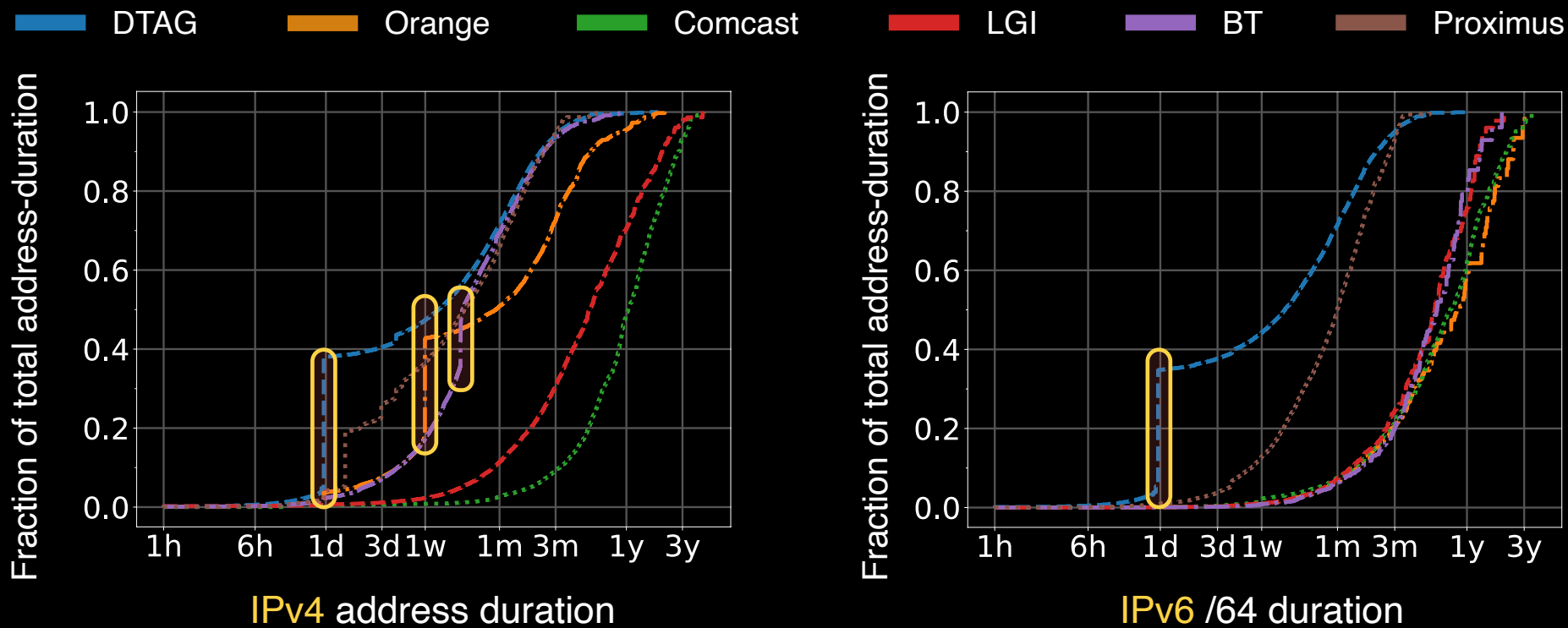
RIPE Atlas platform consists of ~11K active probes

We use the built-in HTTP “IP Echo” dataset (2014 to 2020)

In the paper: we corroborate RIPE Atlas measurements against Akamai’s (much larger) dataset

Temporal dynamics

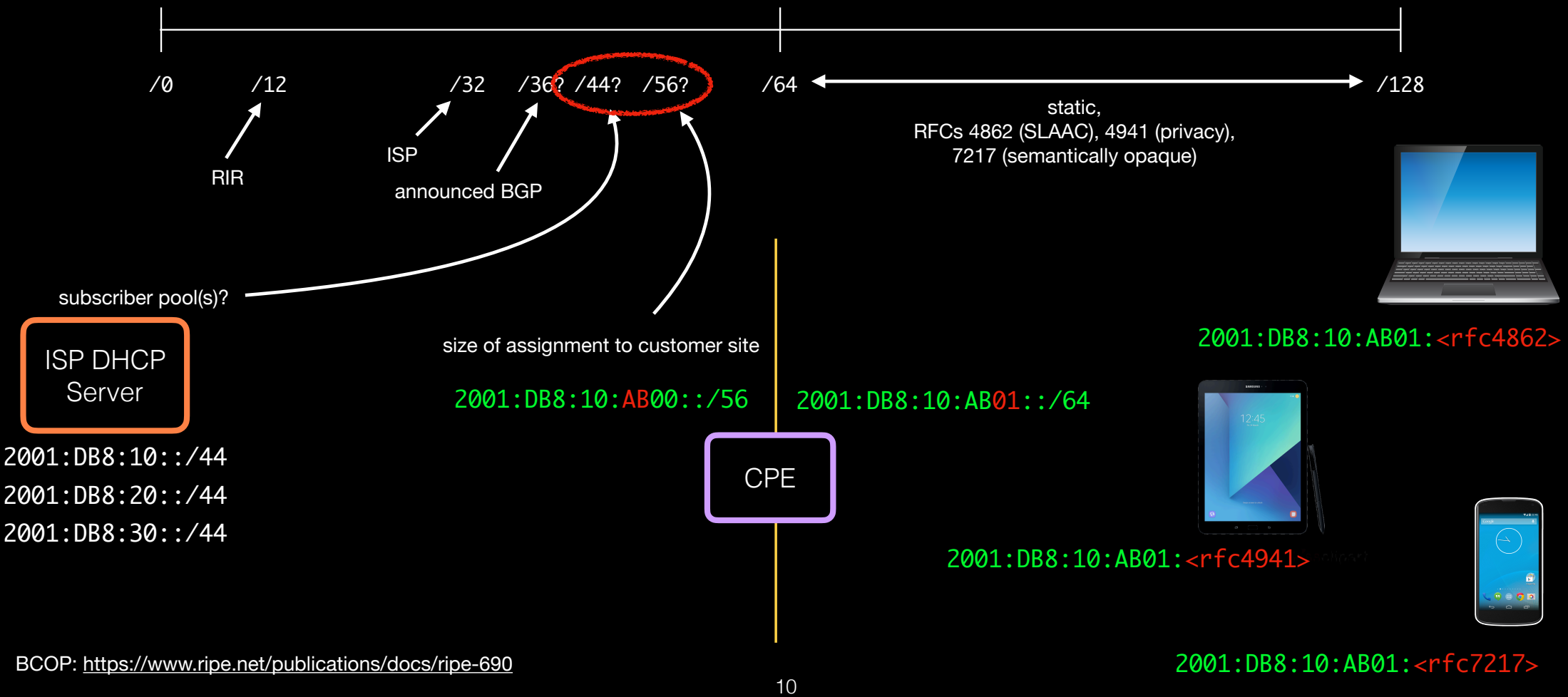
IPv6 assignments have longer durations than IPv4 assignments



The CDN dataset corroborates our observations of long assignment durations

Spatial dynamics

IPv6 assignment practices



Finding a subscriber's pool and delegated prefix by observing assignments over time

IPv6 /64s assigned over time to probe 17511 in Sky U.K. (AS 5607)

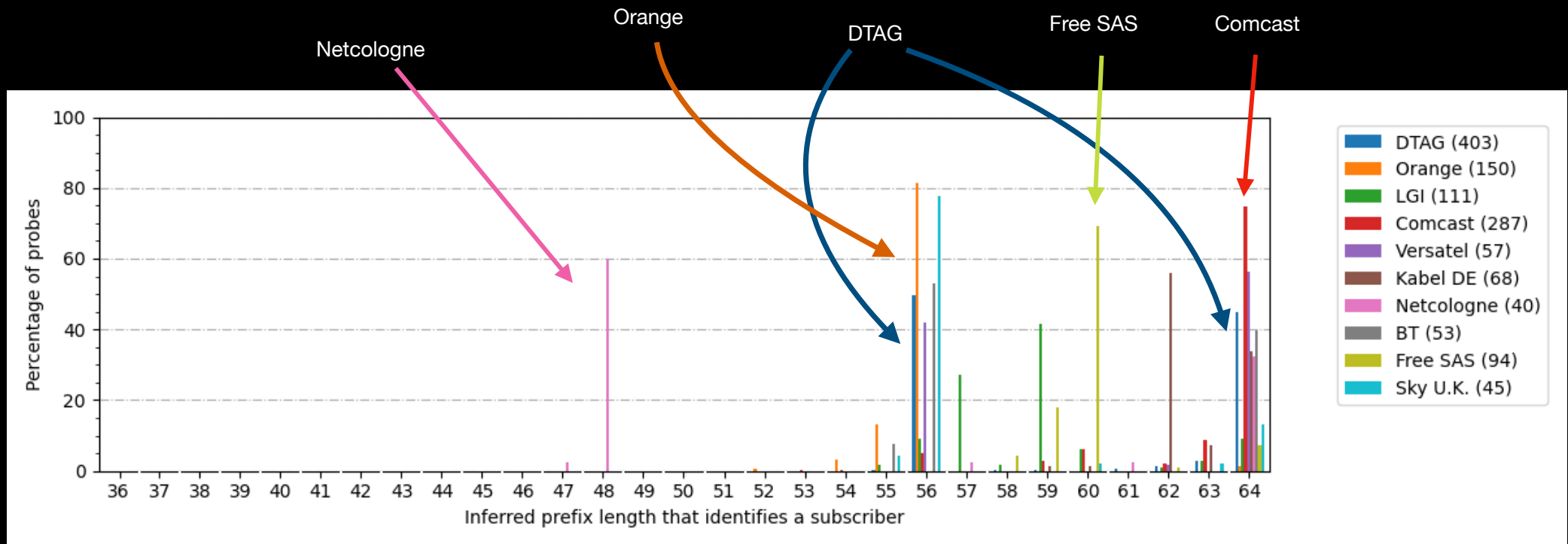
Suggests this subscriber pool roughly a /40

```
2a02:0c7f:c610:0f00::/64
2a02:0c7f:c616:1300::/64
2a02:0c7f:c61b:e700::/64
2a02:0c7f:c622:2400::/64
2a02:0c7f:c60f:3300::/64
2a02:0c7f:c623:a500::/64
2a02:0c7f:c627:9d00::/64
2a02:0c7f:c617:6d00::/64
2a02:0c7f:c66a:bf00::/64
2a02:0c7f:c666:bb00::/64
2a02:0c7f:c670:d000::/64
2a02:0c7f:c630:0e00::/64
```

Rightmost 8 bits in the network part are always set to 0

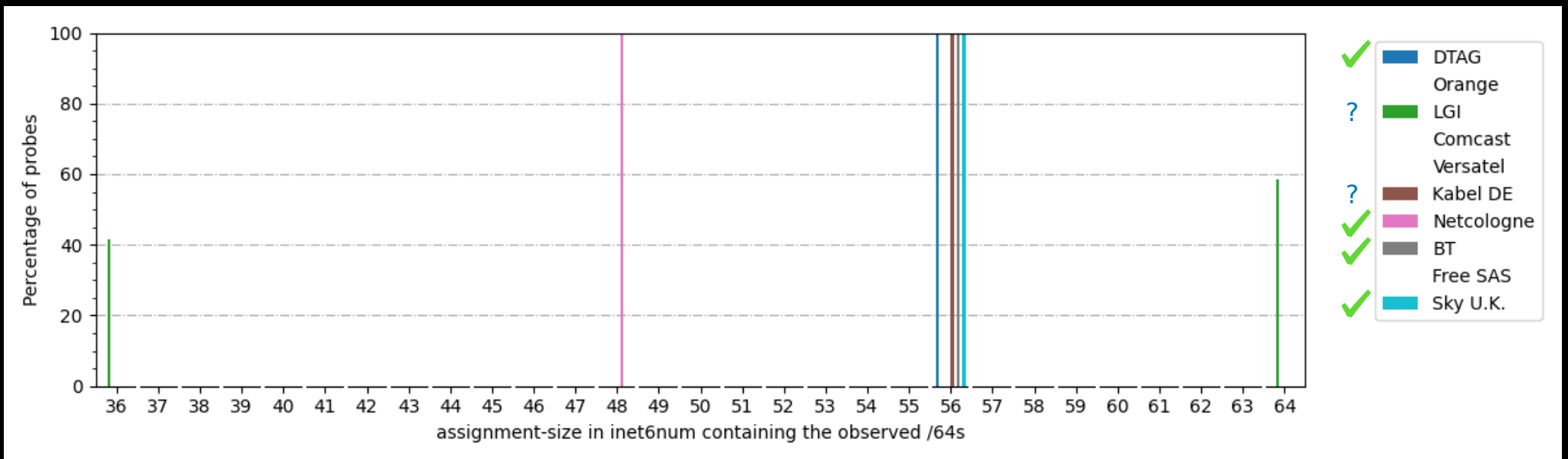
Inferred delegated prefix: /56

Finding a subscriber's delegated prefix by observing multiple /64 assignments over time



Declaring assignment size in the RIPE DB

Operators can declare an *assignment-size* for blocks assigned to subscribers, in an AGGREGATED-BY-LIR object (RIPE DB only; not implemented in other RIRs)



<https://www.ripe.net/manage-ips-and-asns/db/support/documentation/documenting-ipv6-assignments-in-the-ripe-database>

Findings

Temporal:

- IPv6 assignments to residential subscribers may remain unchanged for months

Spatial:

- subscriber pools often $\sim/40$
- delegated prefix lengths vary widely across ISPs

Questions?

more:

Akamai dataset in paper corroborates public RIPE Atlas data

https://catalog.caida.org/details/paper/2020_dynamips

https://labs.ripe.net/author/stephen_stowes/address-assignment-practices-in-ipv4-and-ipv6/

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