Dynamic address durations in RIPE Atlas probes

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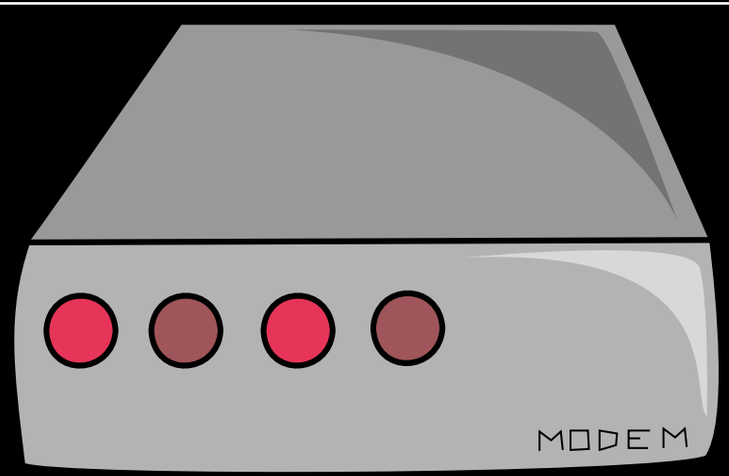
Amogh Dhamdhere, kc claffy, Neil Spring

Dynamic address:
1.2.3.4



How long does a public dynamic address last on a device?

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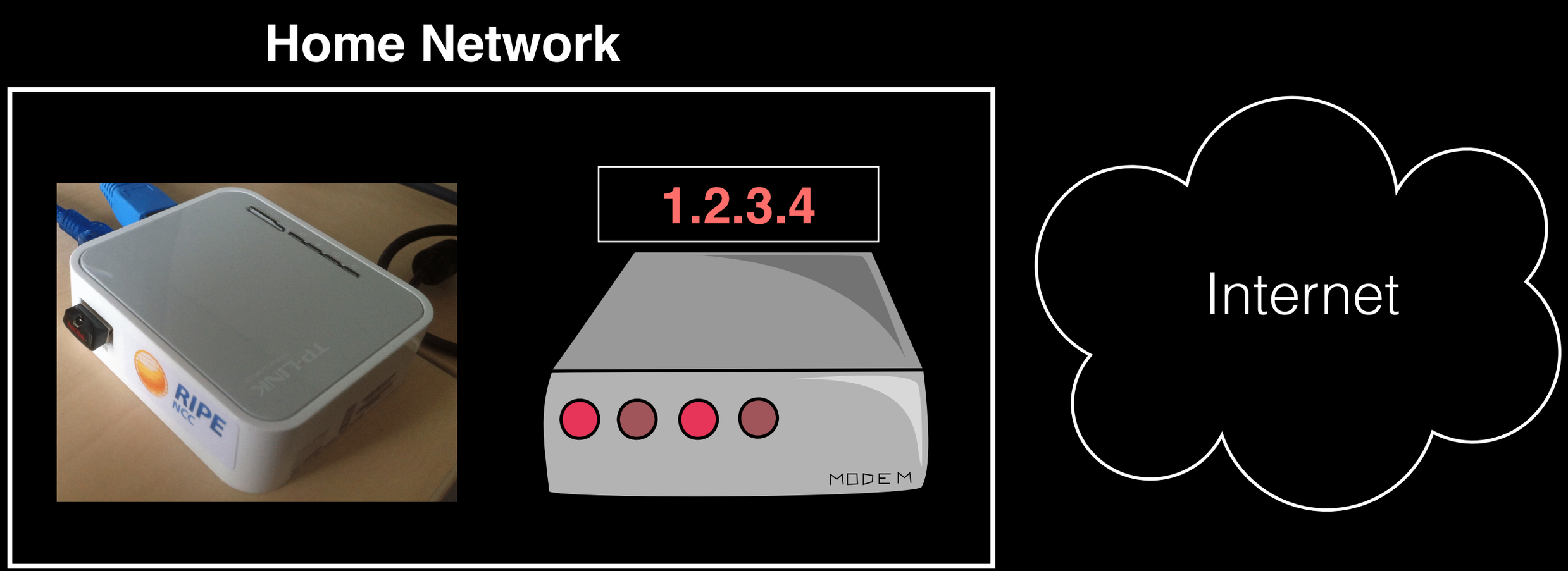
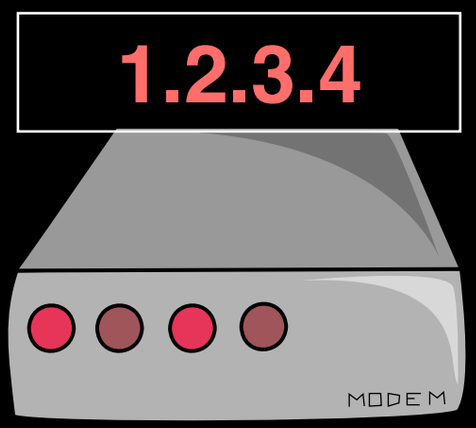


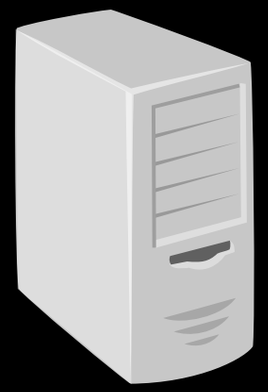
How long does a public dynamic address last on a device?

Home Network



Internet

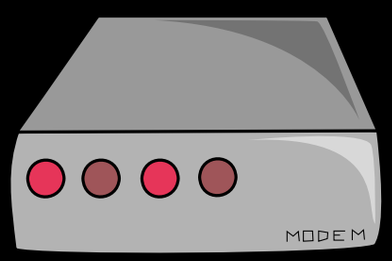
Central Controller



Probes report measurements to central controller over TCP

Controller records these TCP connections in connection logs

Find address changes using probes' TCP connection logs



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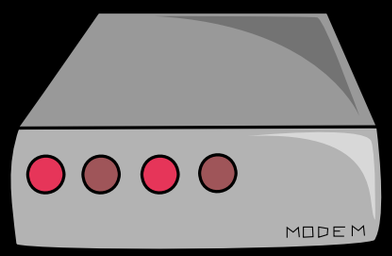
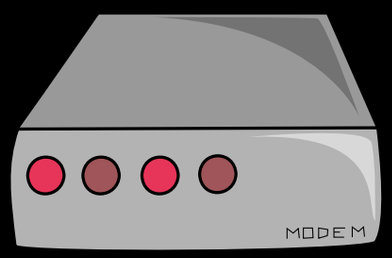


IP_2

Jan 1 Jan 2 Jan 3 Jan 4

Find address changes using probes' TCP connection logs



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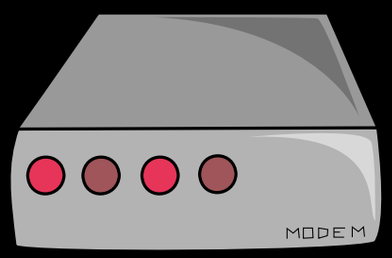

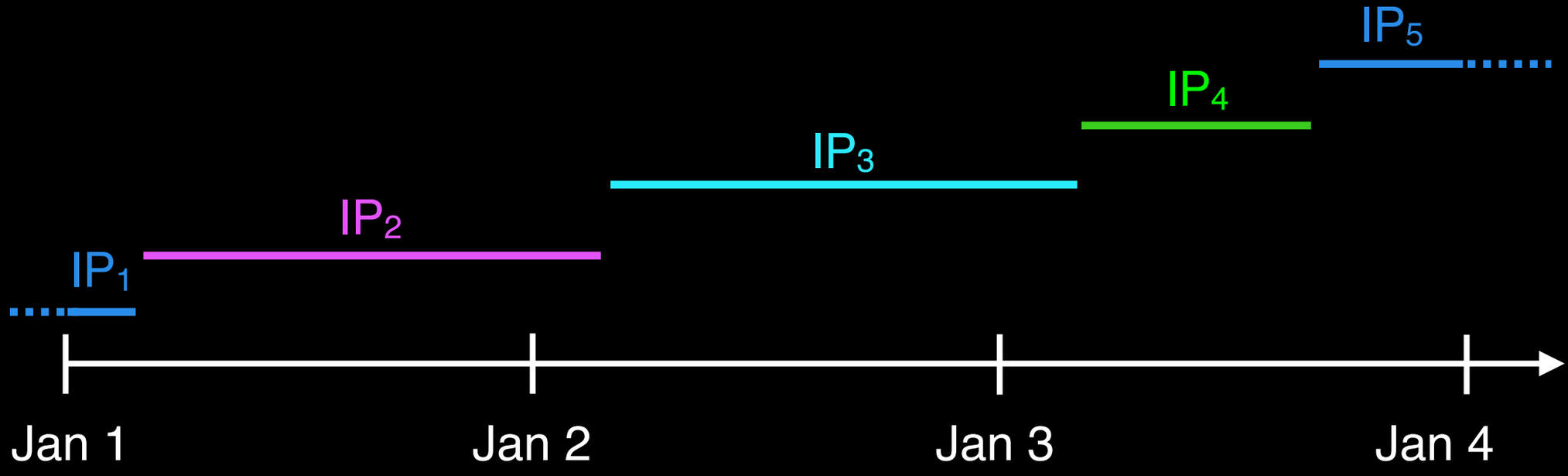

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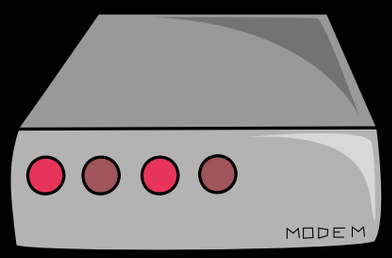

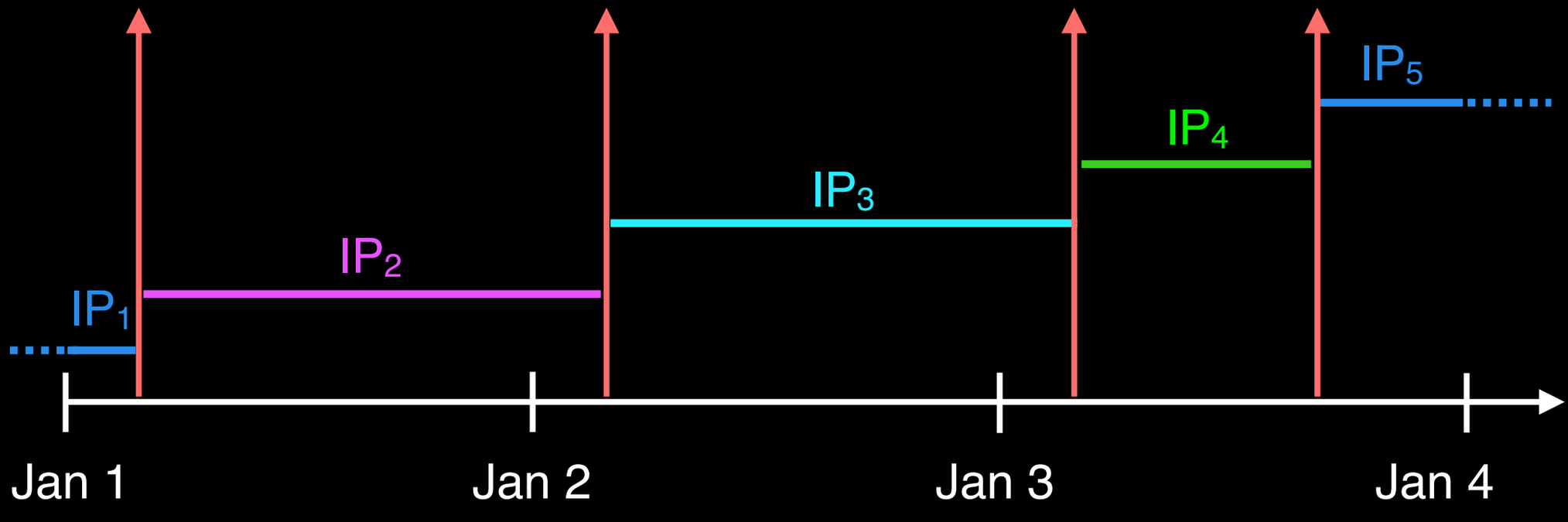

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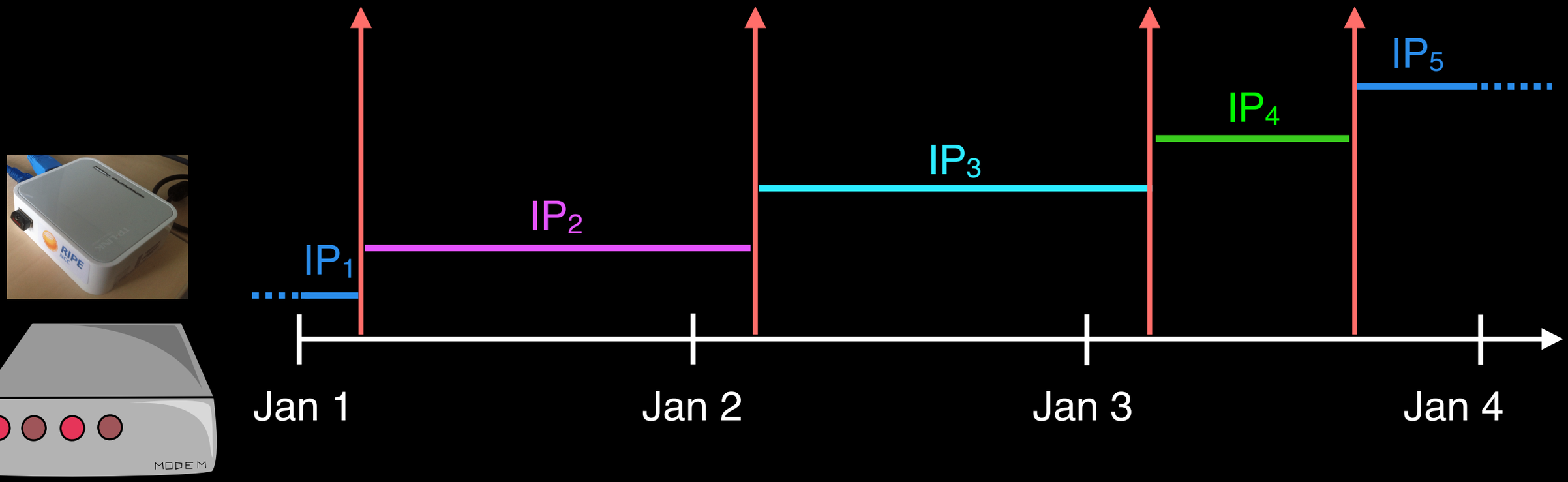

Investigate renumbering triggers to find expected duration

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Do ISPs intentionally renumber?

Do users cause renumbering?

Investigate renumbering triggers to find expected duration

Do ISPs intentionally renumber?

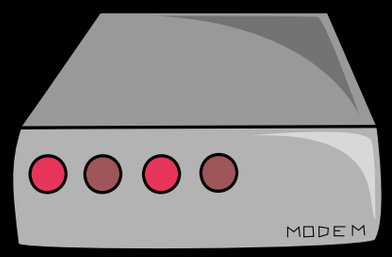
Do users cause renumbering?

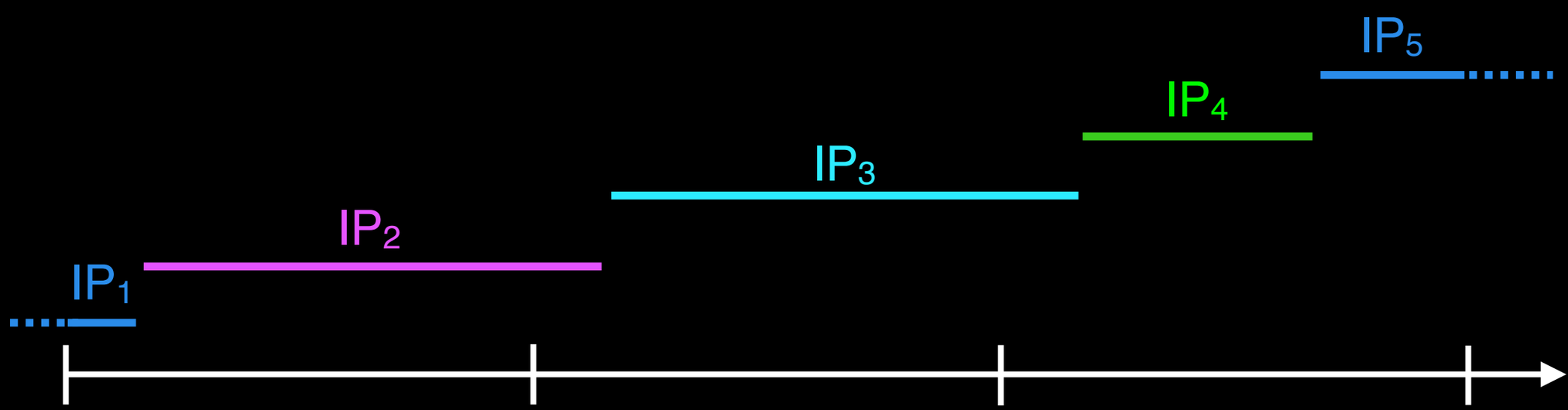
Do ISPs trigger renumbering?

AS	Name	Country	# Probes
AS3215	Orange	France	121
AS3320	Deutsche Telekom (DT)	Germany	68
AS701	Verizon	US	40

Inspect weighted distribution of address-durations

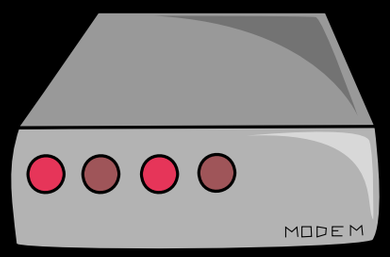
Find address durations

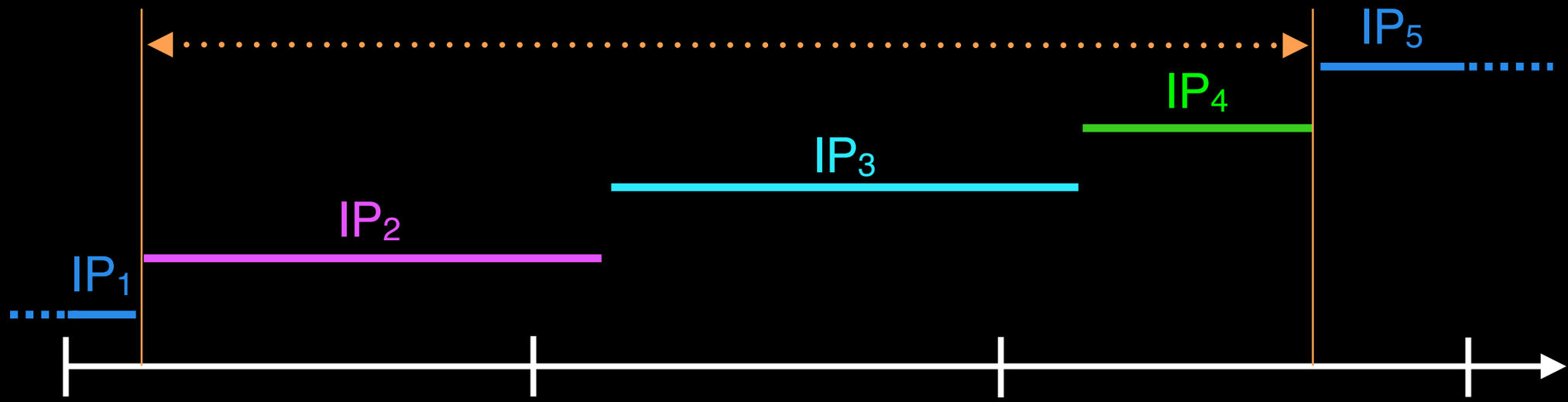




	Address	Duration
IP_1	79.194.205.144	NA
IP_2	79.194.192.169	24
IP_3	79.194.196.241	24
IP_4	79.194.194.4	12
IP_5	91.9.219.235	NA

Find address durations





	Address	Duration
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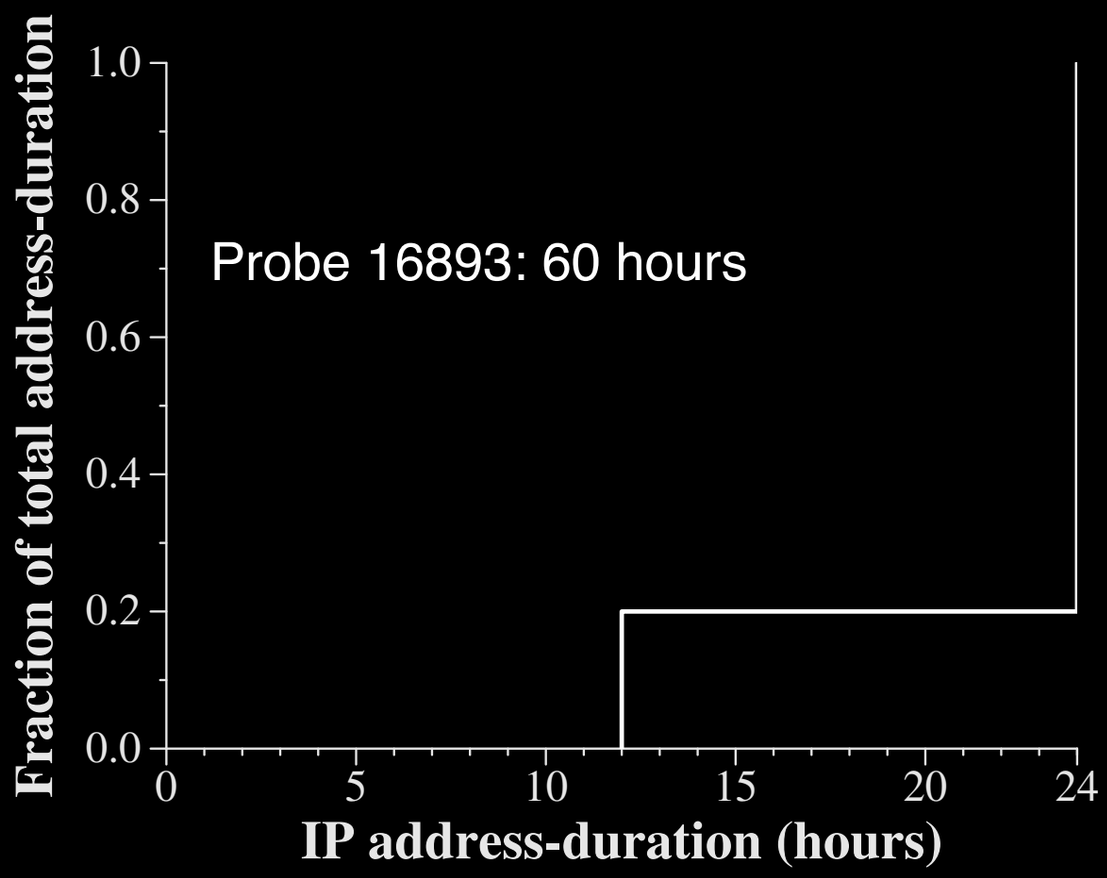
IP_5	91.9.219.235	NA

Sum: 60

Plot weighted CDF



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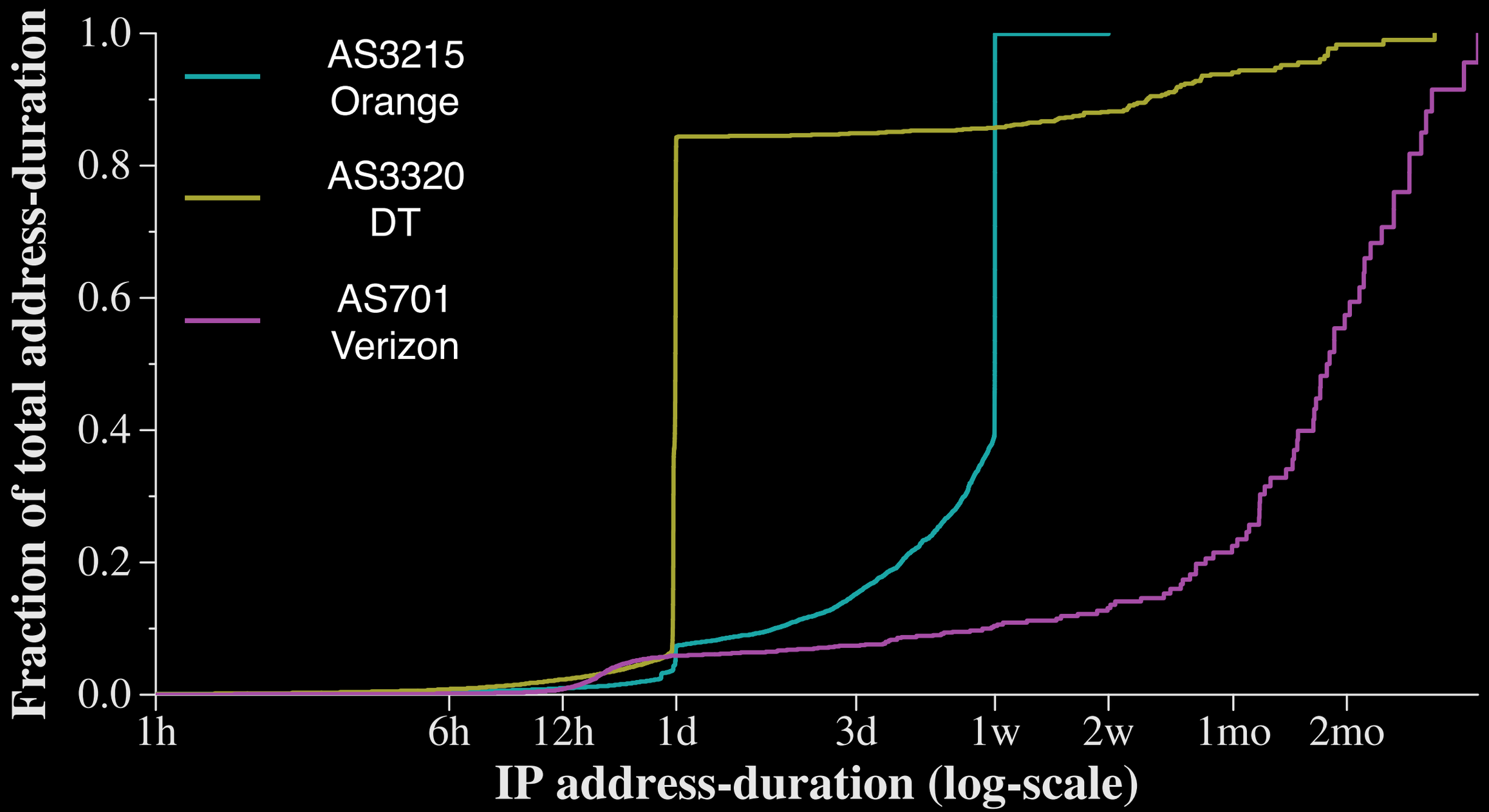
Sum: 60

If some durations are observed more often than others, could indicate ISP-triggered renumbering

Orange, DT have characteristic address-durations



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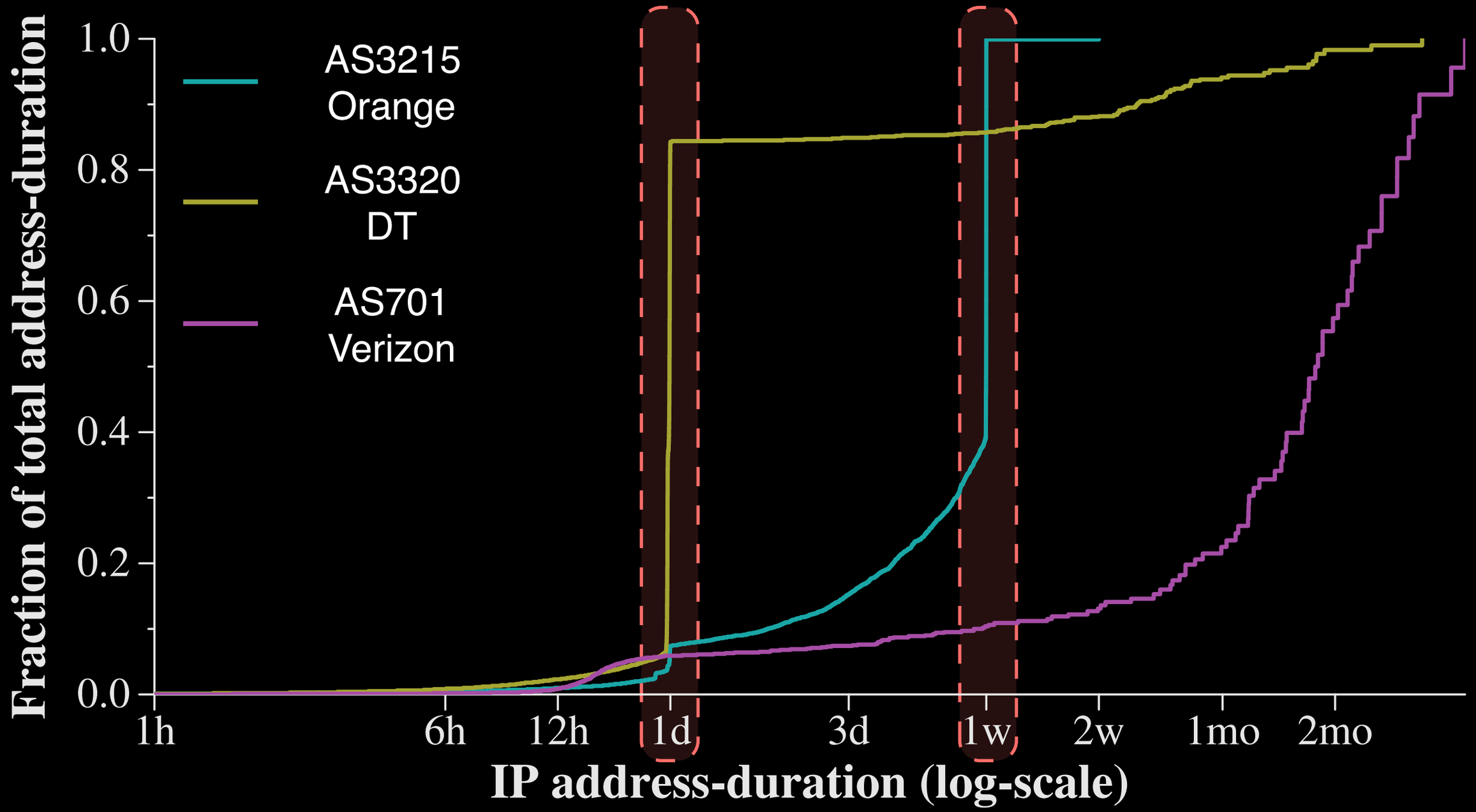
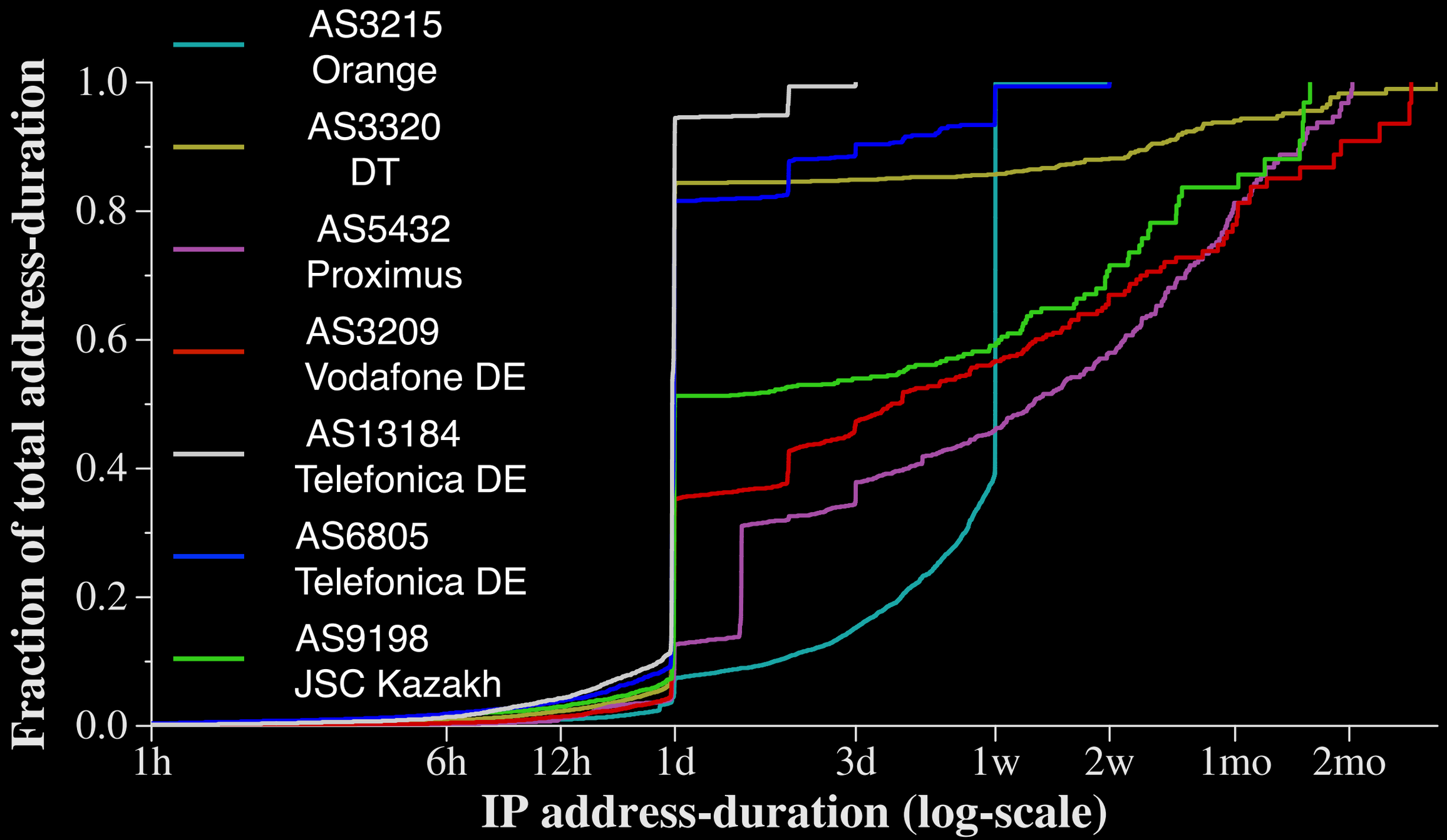
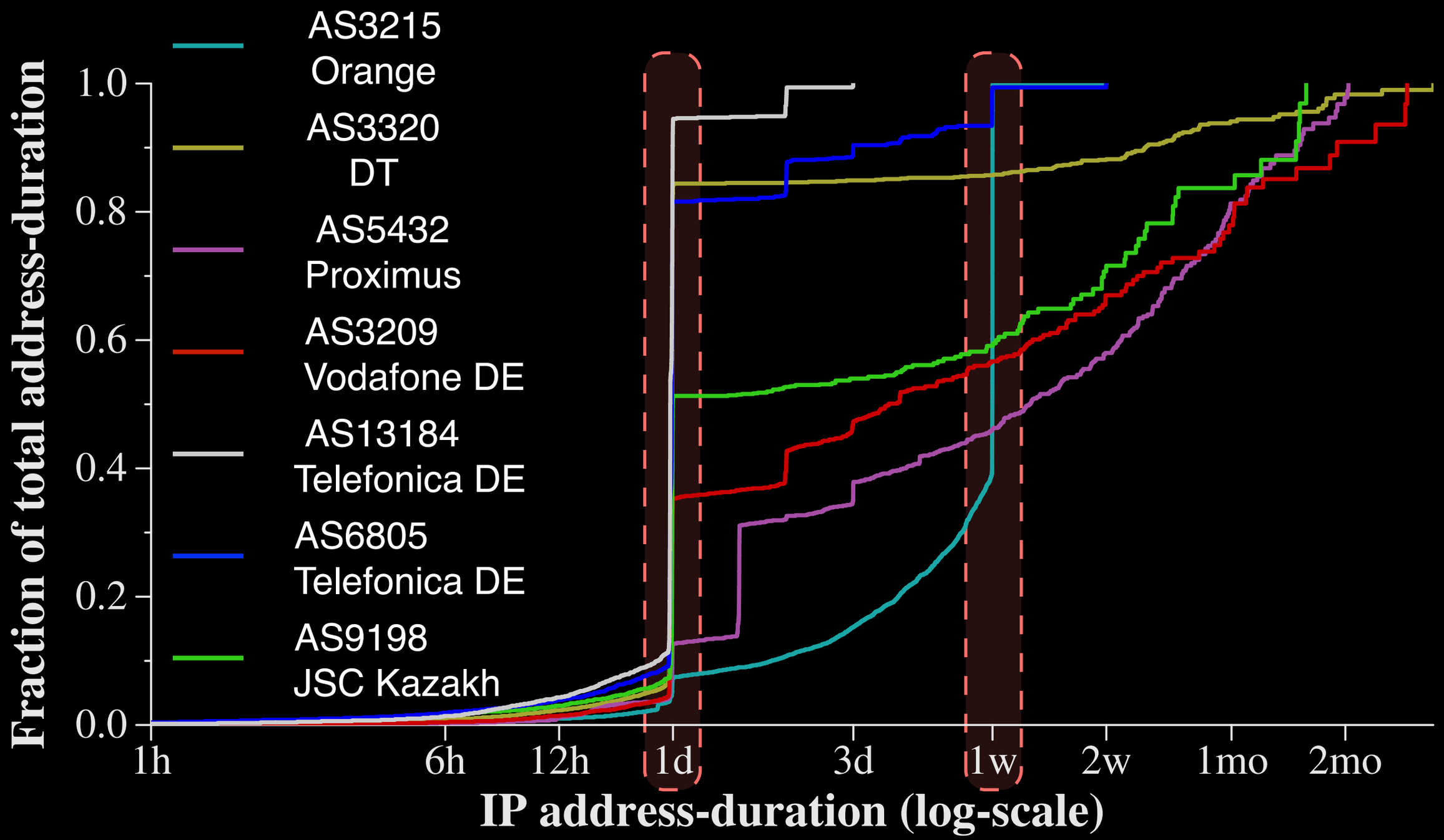


Is it common for ASes to have characteristic address-durations?

Several ASes have characteristic address-durations



Several ASes have characteristic address-durations



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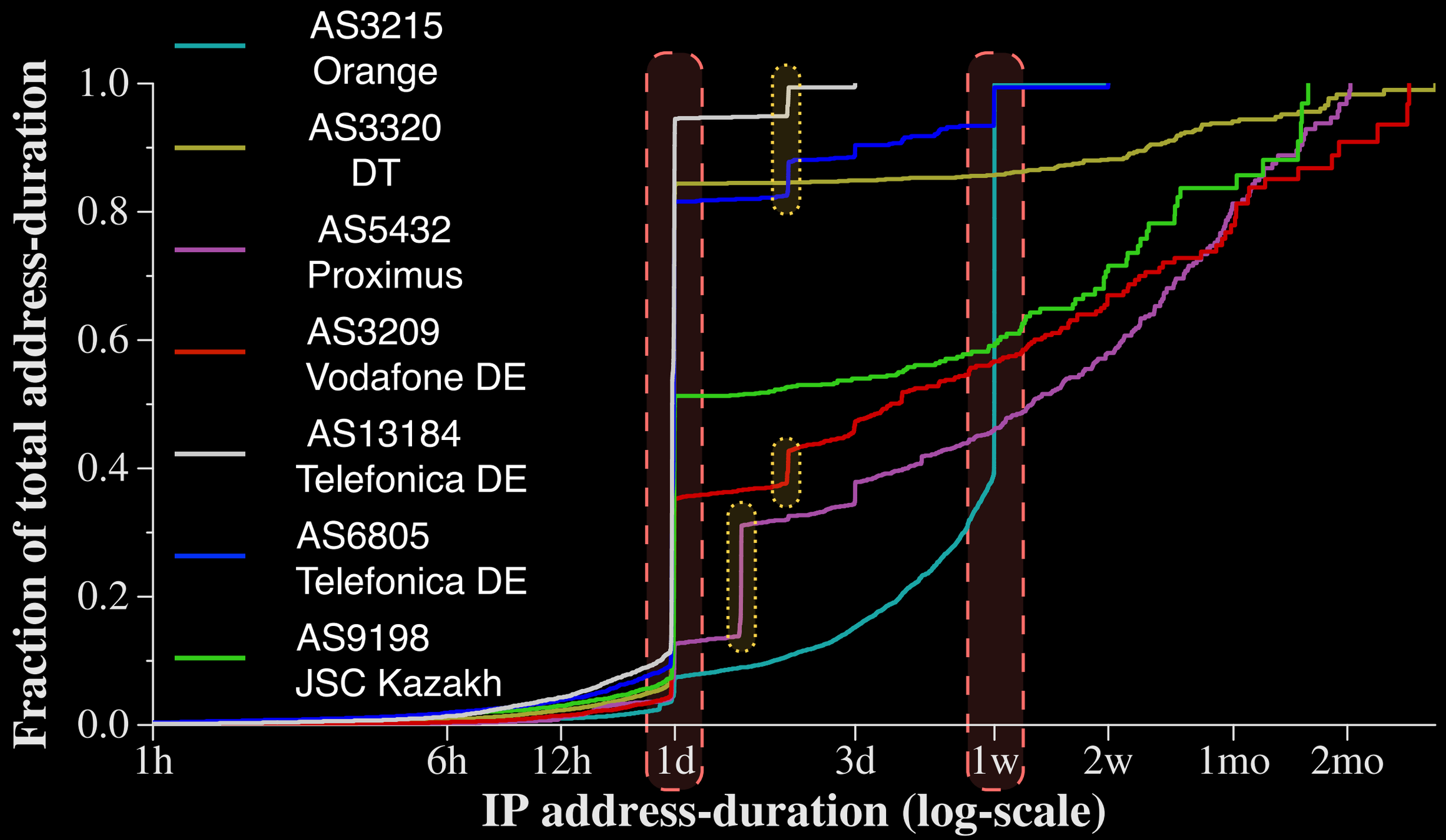
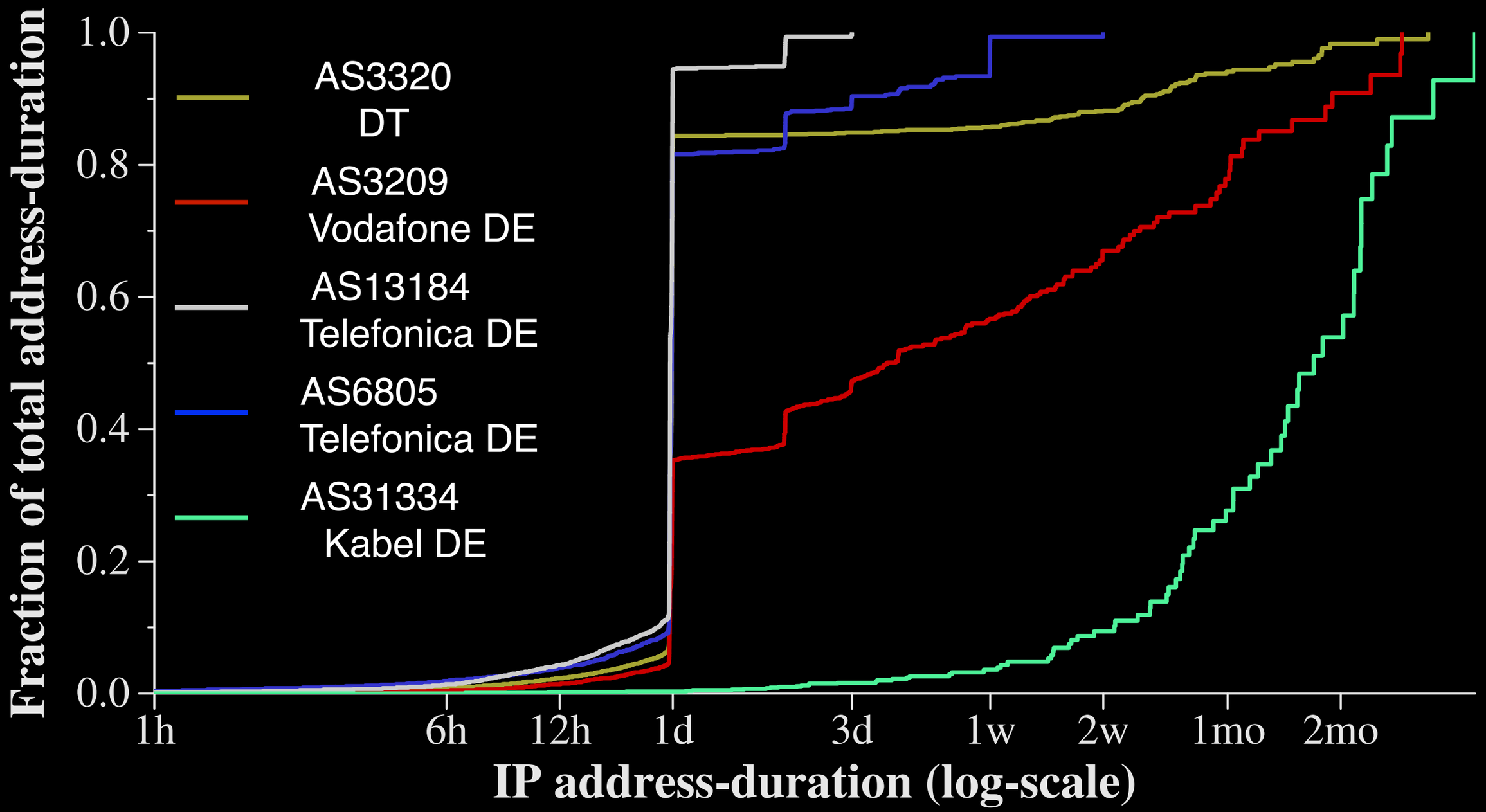


German ASes have characteristic 24-hour address-durations



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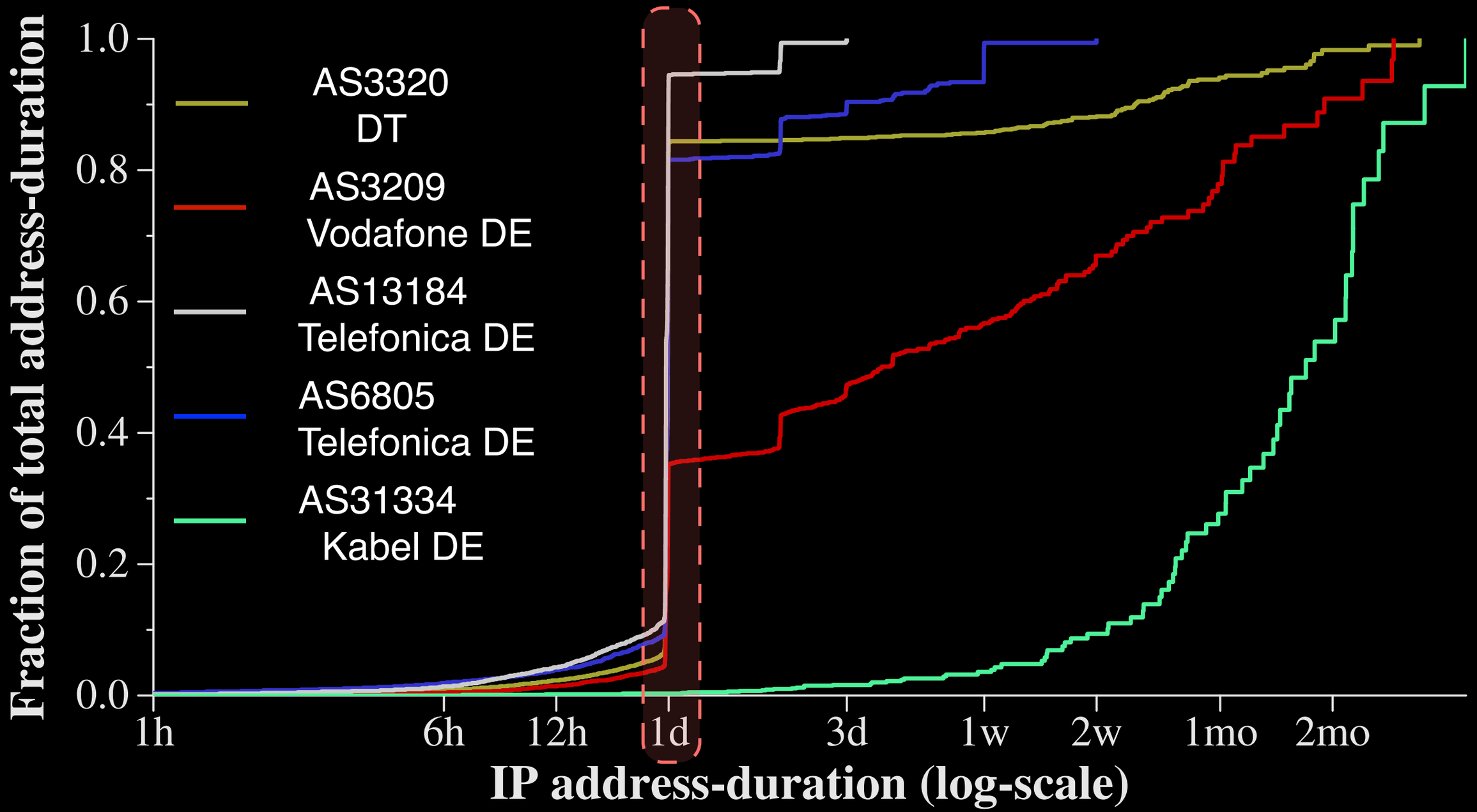
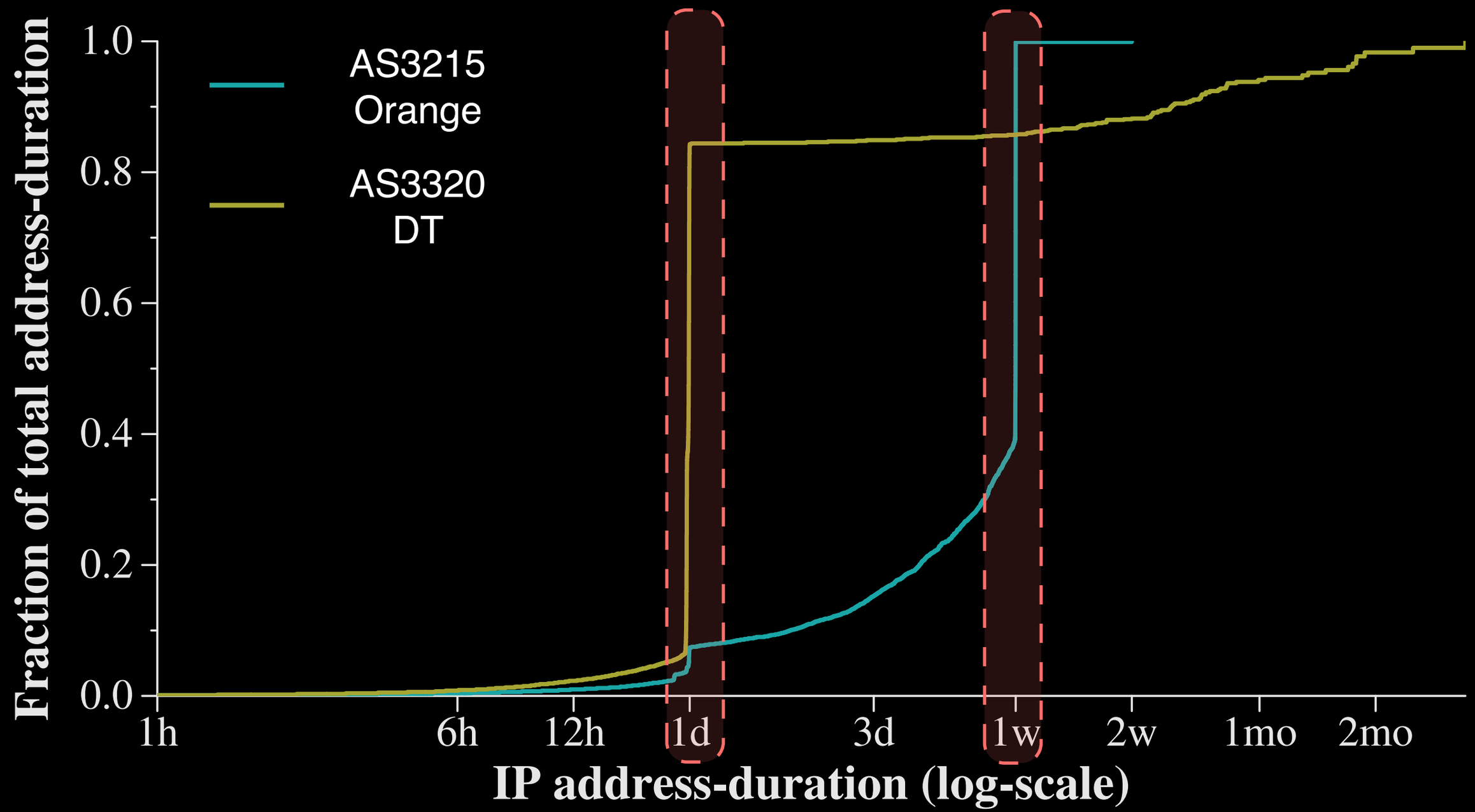


Characteristic durations exist. How are they distributed among probes?

How are characteristic durations distributed among DT and Orange probes?



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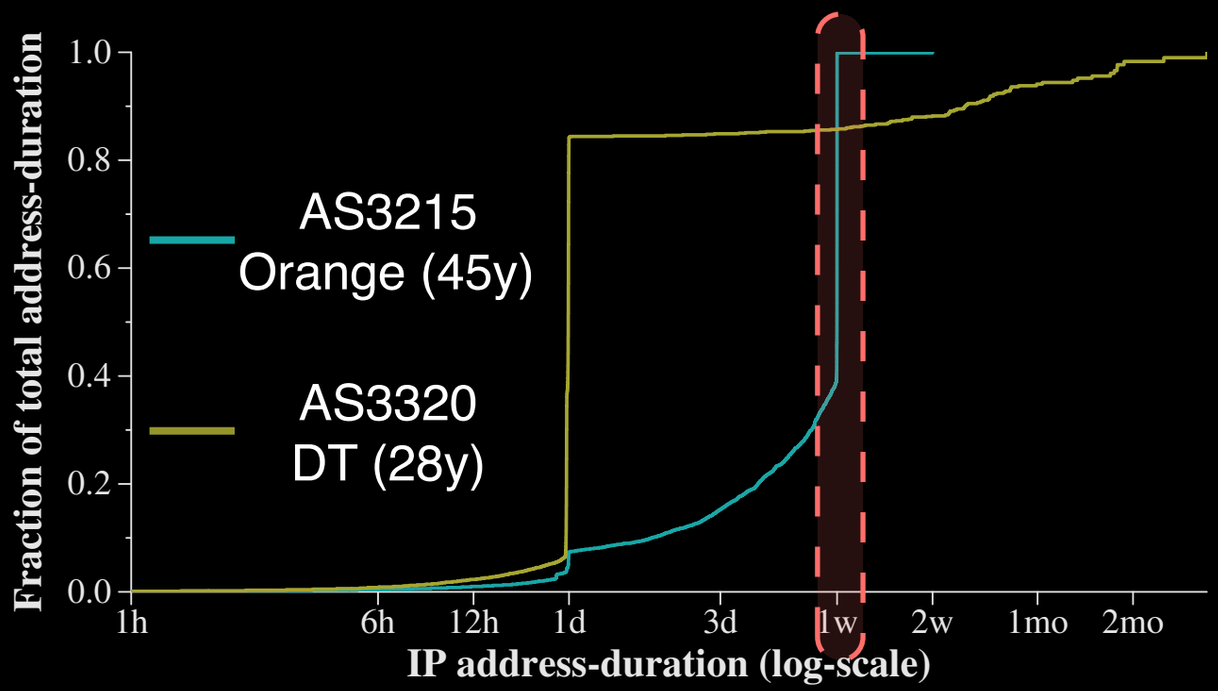

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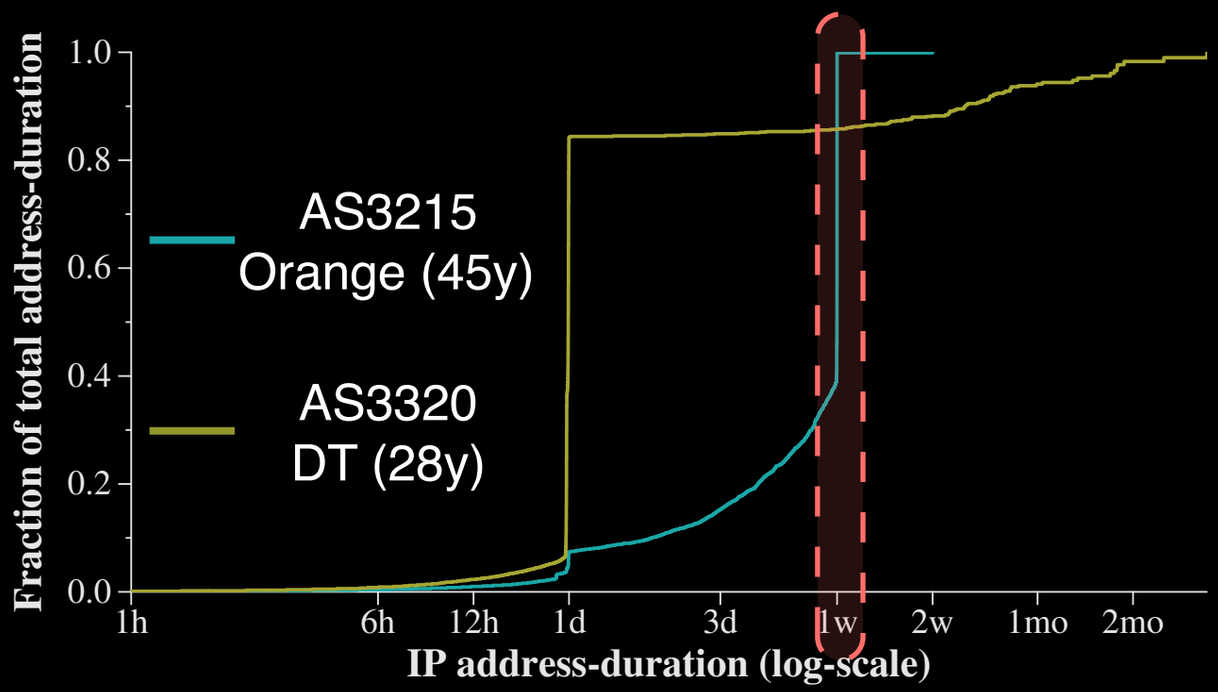

Hypothetical Address-durations

3
7
24
72
136
168
168
168
168
168
168
168
168

How are characteristic durations distributed among DT and Orange probes?

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3
7
24
72
136
168
168
168
168
168
168
168
168

How are characteristic durations distributed among DT and Orange probes?

Hypothetical Address-durations	Probe 1	Probe 2	Probe 3	Probe 4
3	168	168	3	7
7	168	168	168	72
24	168	168	24	136
72				
136				
168				
168				
168				
168				
168				
168				
168				

How are characteristic durations distributed among DT and Orange probes?

Hypothetical Address-durations

3
7
24
72
136
168
168
168
168
168
168
168
168
168

Probe 1	Probe 2	Probe 3	Probe 4
168	168	3	7
168	168	168	72
168	168	24	136

(or)

How are characteristic durations distributed among DT and Orange probes?

Hypothetical Address-durations

3
7
24
72
136
168
168
168
168
168
168
168
168

Probe 1	Probe 2	Probe 3	Probe 4
168	168	3	7
168	168	168	72
168	168	24	136

(or)

Probe 1	Probe 2	Probe 3	Probe 4
3	24	168	7
168	168	168	168
168	168	7	136

How are characteristic durations distributed among DT and Orange probes?

Hypothetical Address-durations

3
7
24
72
136
168
168
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168
168
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168

Probe 1	Probe 2	Probe 3	Probe 4
168	168	3	7
168	168	168	72
168	168	24	136

(or)

Probe 1	Probe 2	Probe 3	Probe 4
3	24	168	7
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168	168	7	136

Inspect avg address-duration per probe

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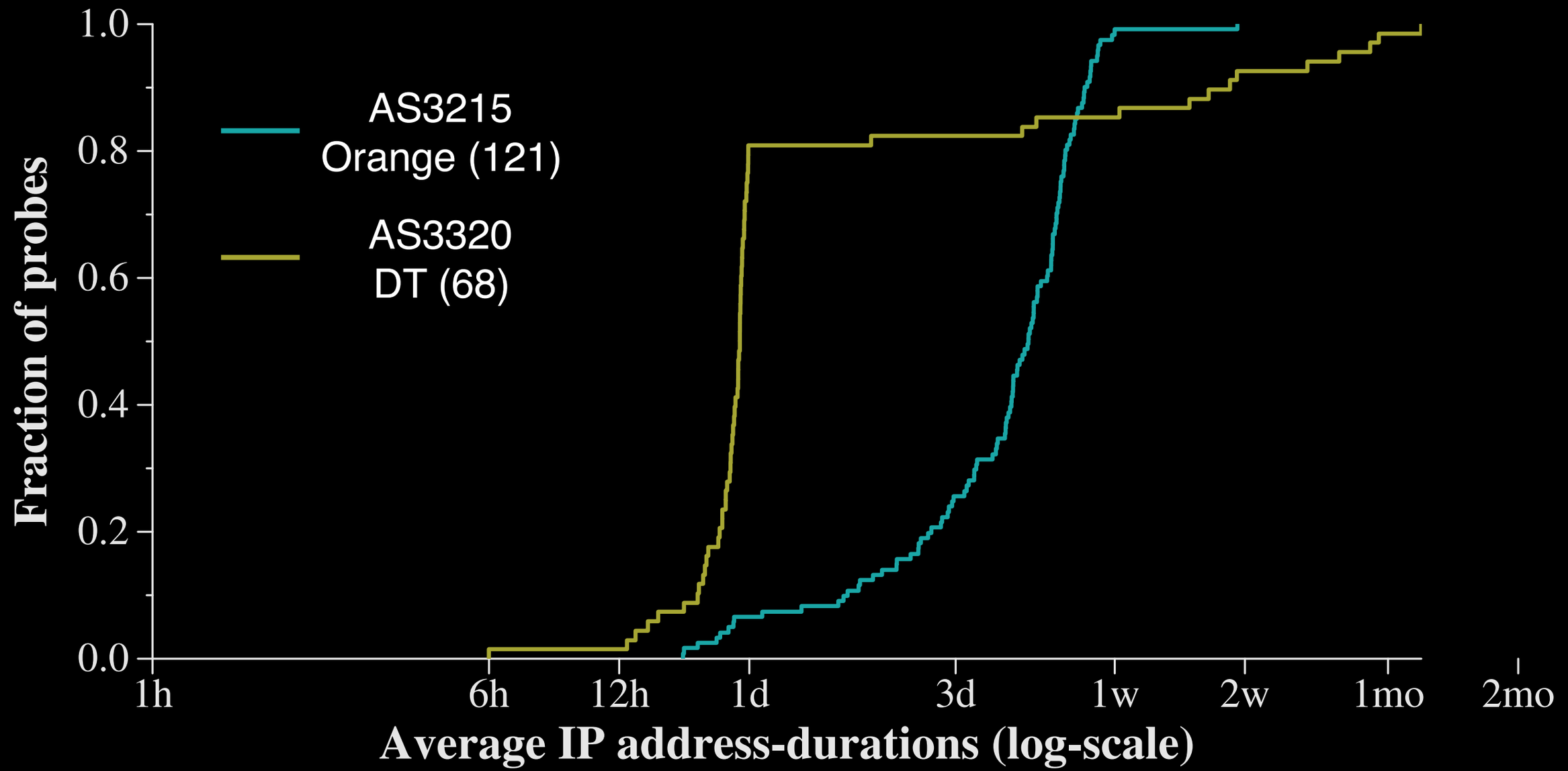
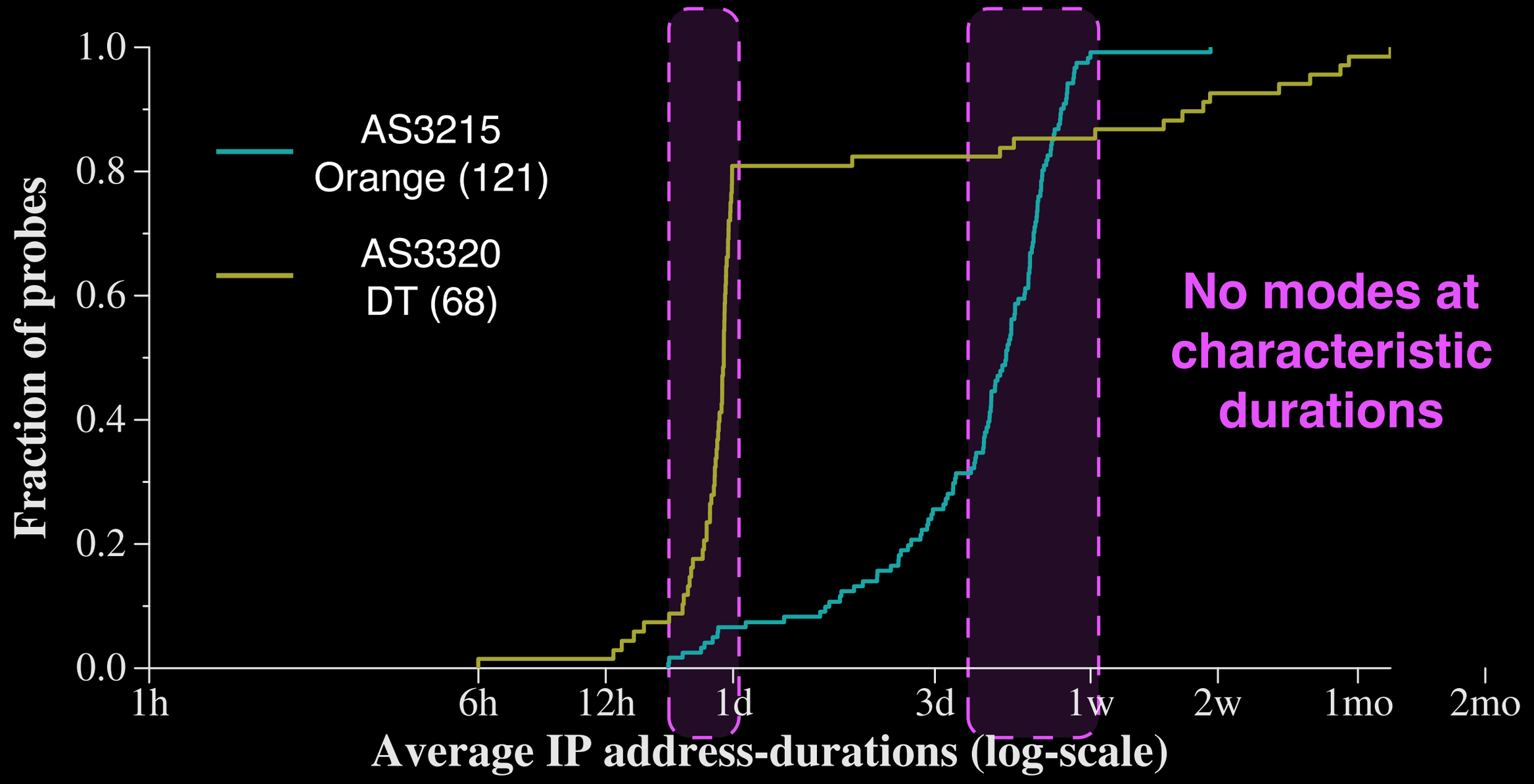


Shorter durations interspersed with characteristic durations

Inspect avg. address-duration per probe



Shorter durations interspersed with characteristic durations

Perhaps there are other triggers for renumbering?

Investigate renumbering triggers to find expected duration

Do ISPs intentionally renumber?

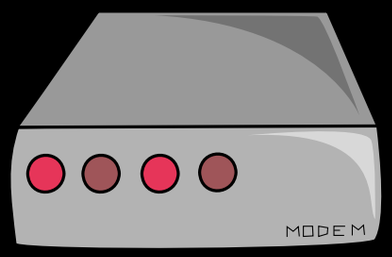
Do users cause renumbering?

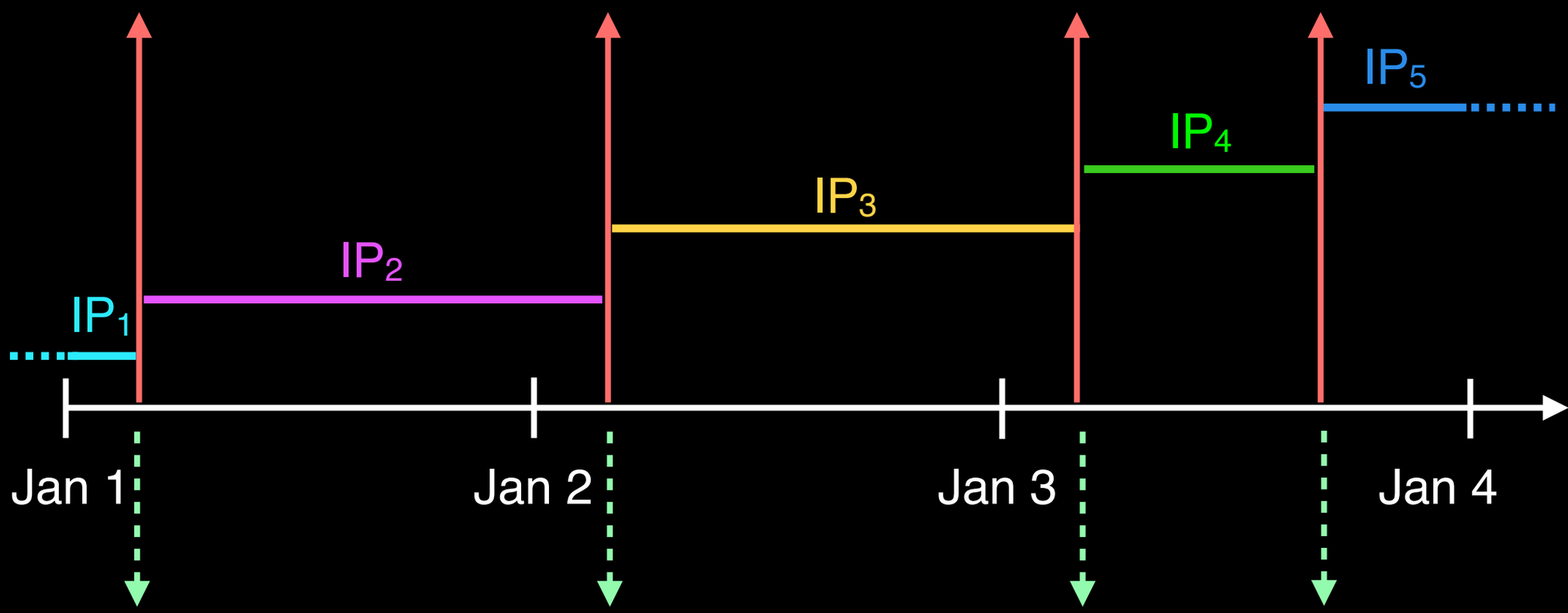
Investigate renumbering triggers to find expected duration

Do ISPs intentionally renumber?

Do users cause renumbering?

Use Uptime counter data from RIPE Atlas to infer reboots





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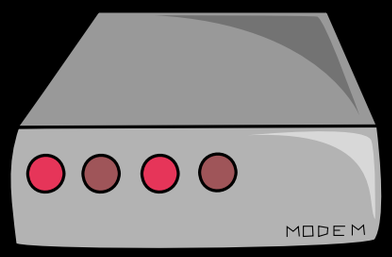
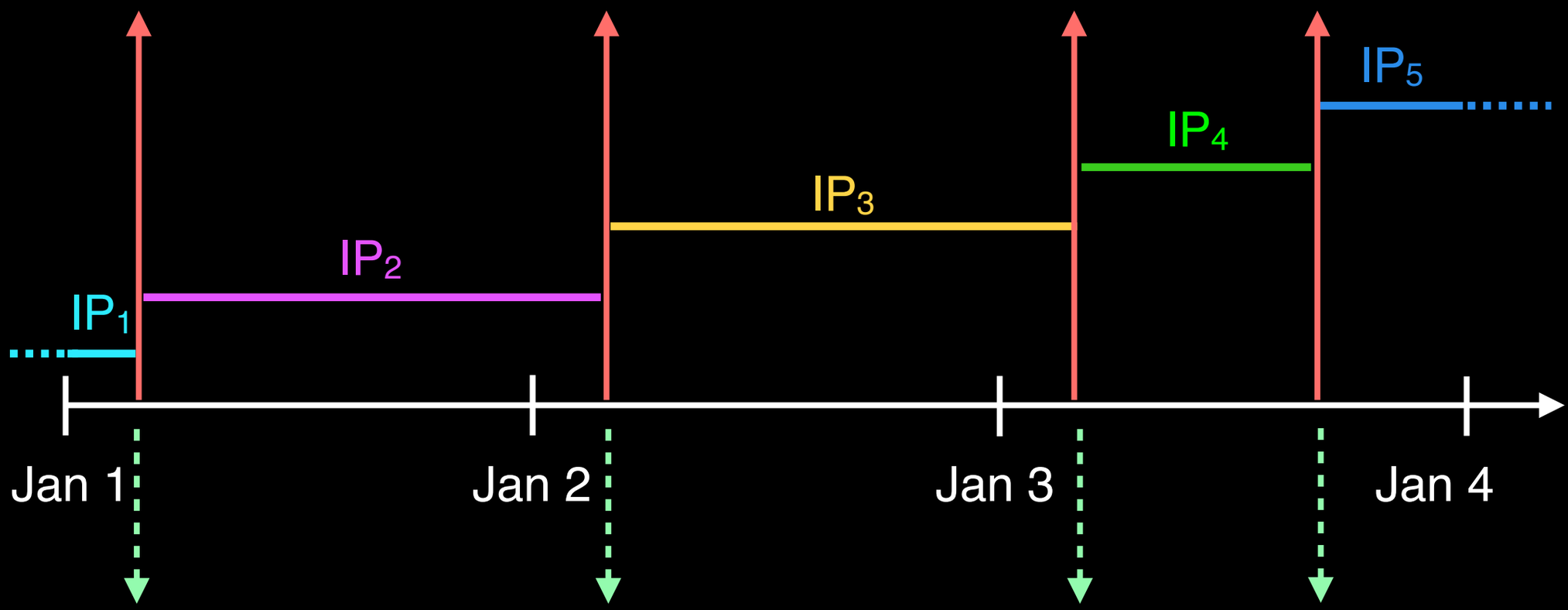
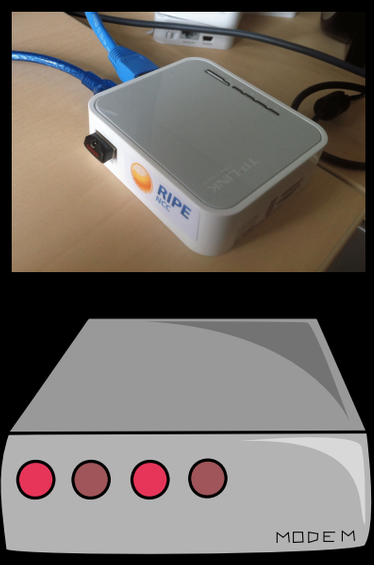
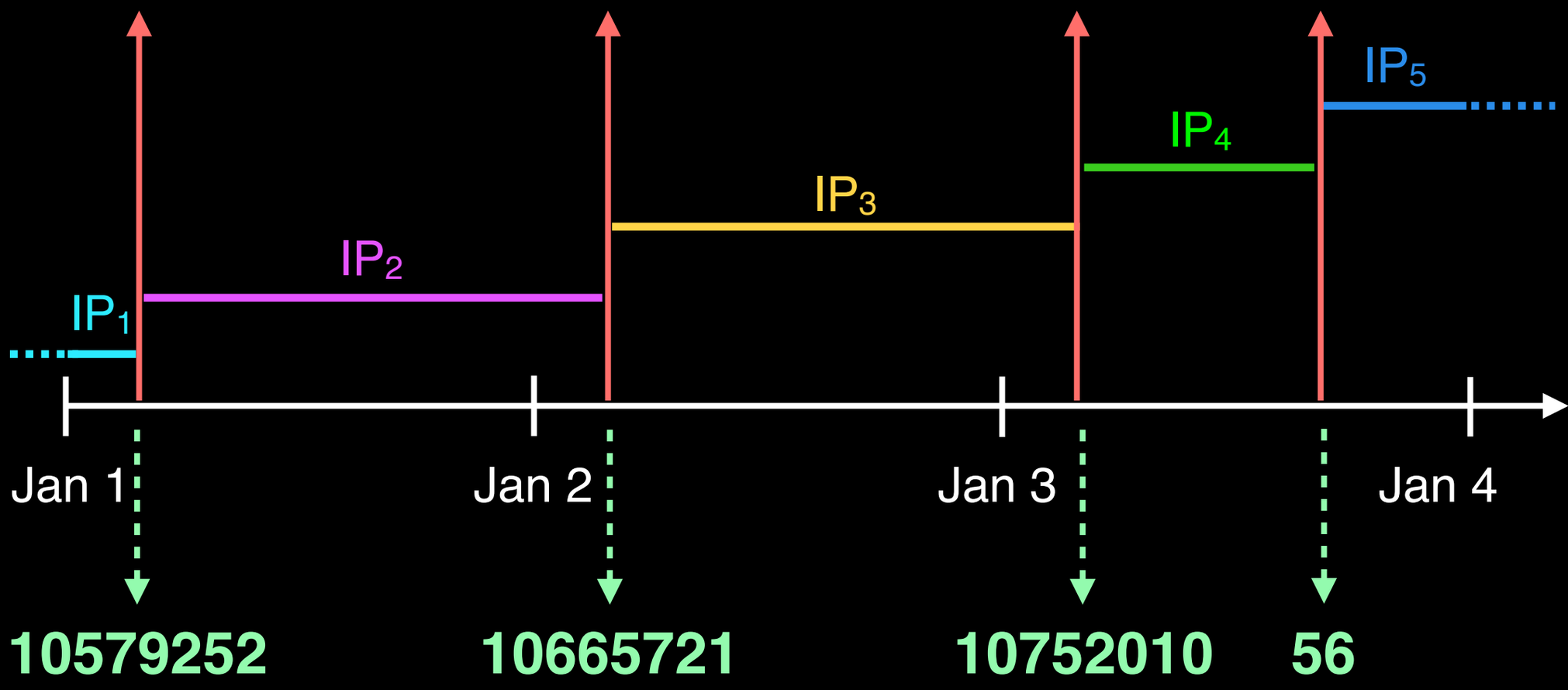




RIPE Atlas records uptime counter values for probes

Use Uptime counter data from RIPE Atlas to infer reboots





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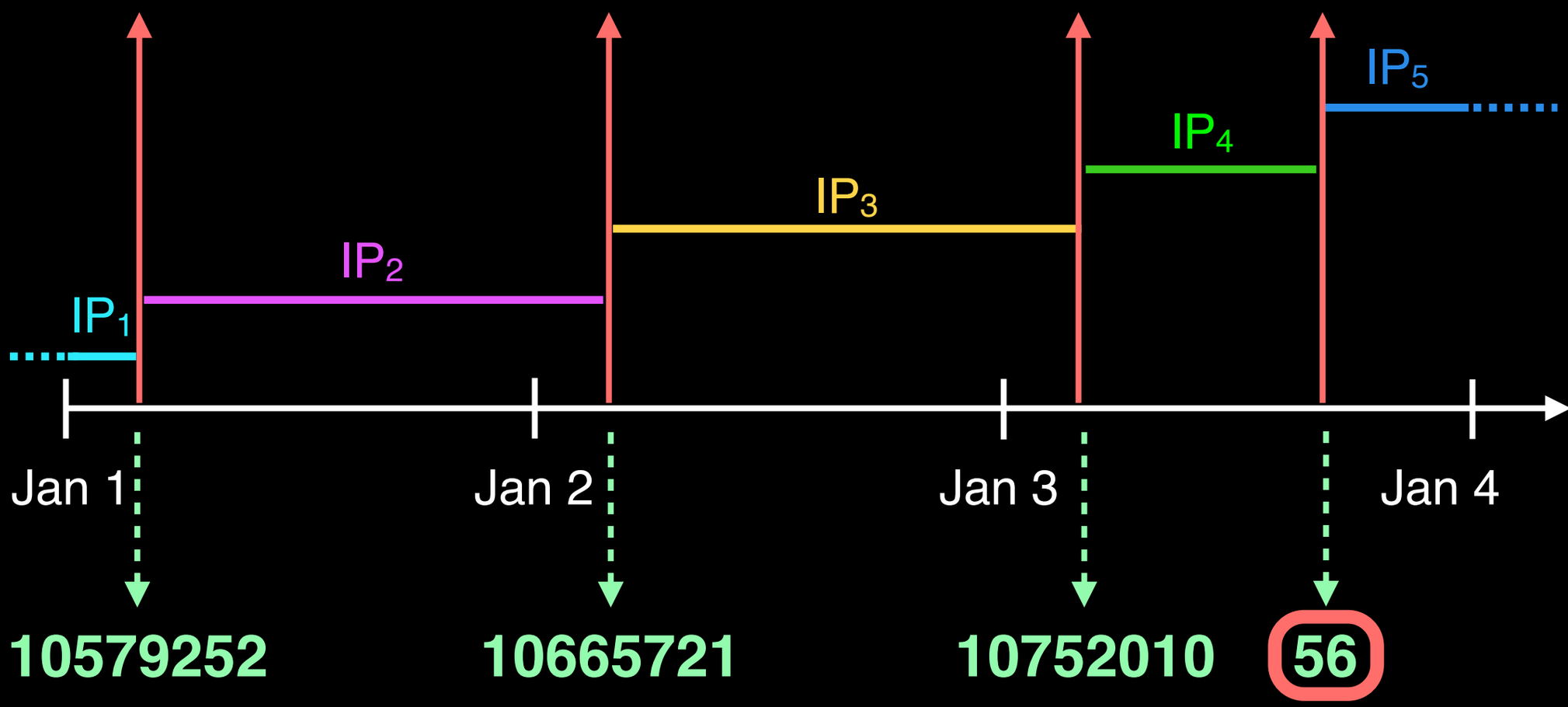

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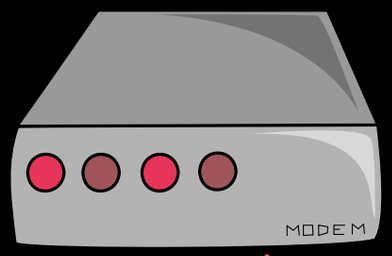
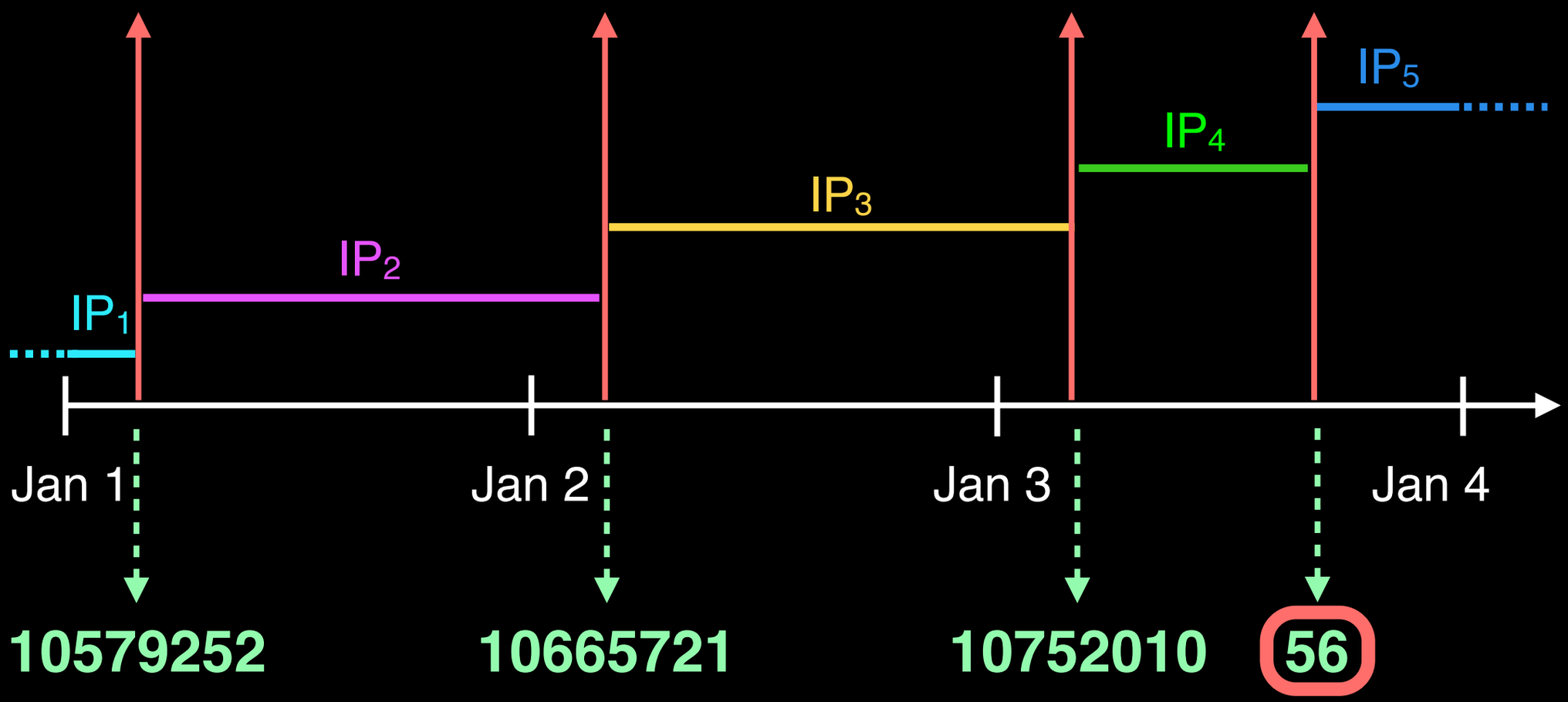


If shared fate



RIPE Atlas records uptime counter values for probes

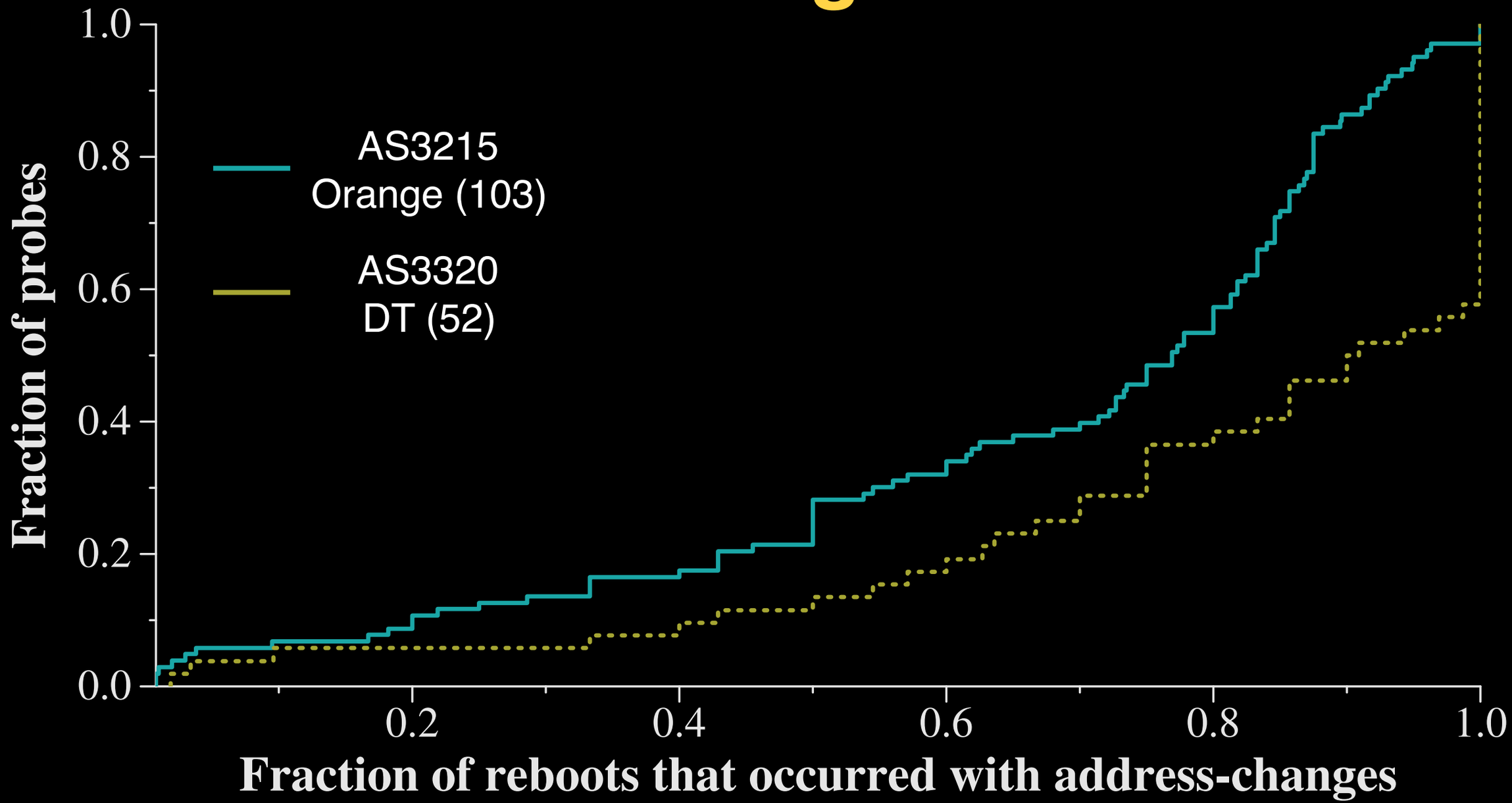
When reboots occur, how often do address changes occur?

Find fraction of reboots that occurred with a renumbering per probe and CDF

- If fraction == 0, no reboots occurred with an address change

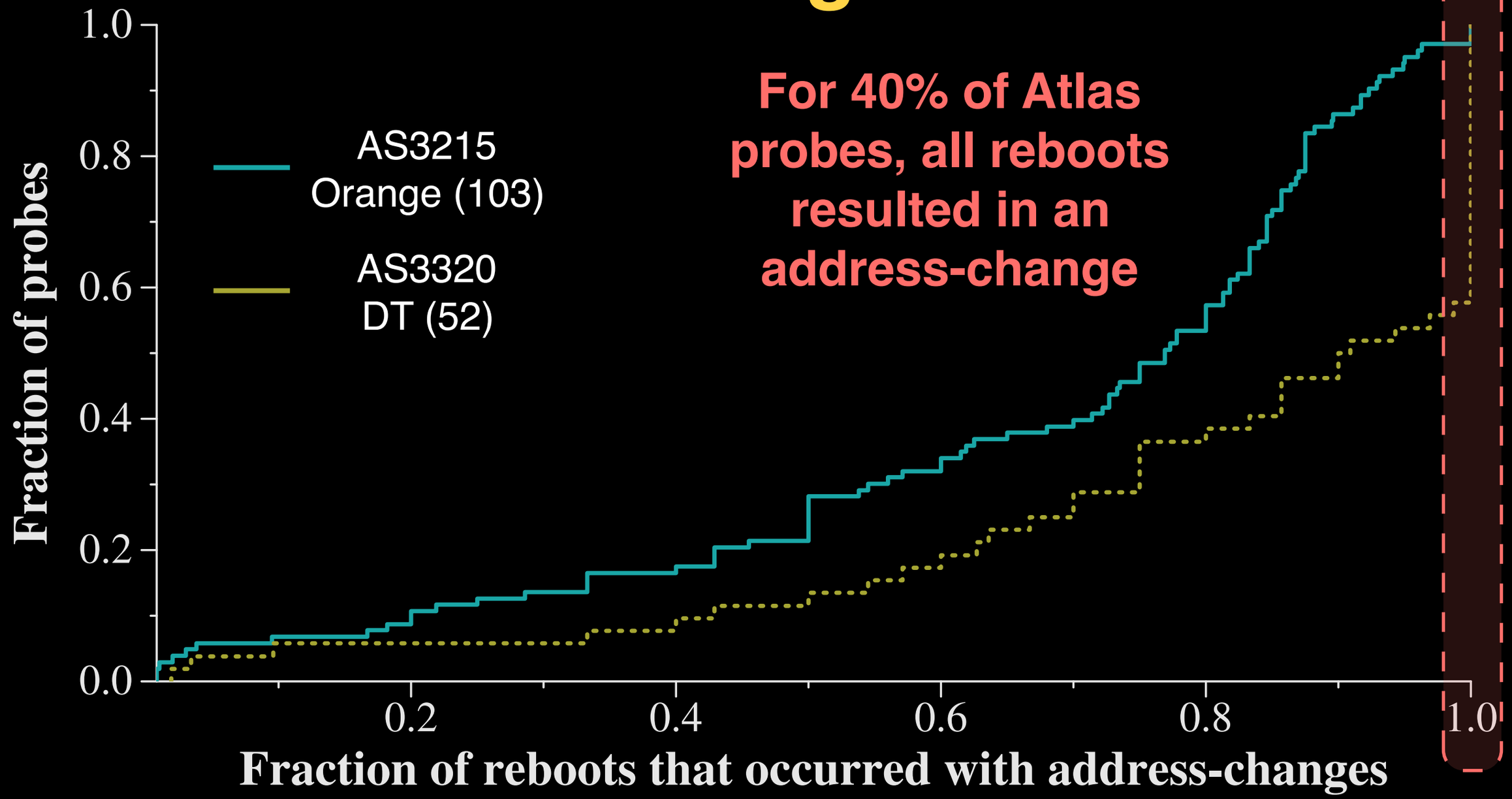
- If fraction == 1, all reboots occurred with an address change

When reboots occur, how often do address changes occur?



Users can trigger address-changes with reboots!

When reboots occur, how often do address changes occur?



Users can trigger address-changes with reboots!

Summary

Investigated renumbering triggers for dynamic addresses in RIPE Atlas probes

- ISP triggered:
  - Many European Autonomous Systems have characteristic address-durations
- User triggered
  - For DT and Orange, reboots are often correlated with address-changes