```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   6   | Traffic Class |           Flow Label                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|         14 Minutes            |      58       |      64       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Florian::Holzbauer, Markus::Maier, Johanna::Ullrich       |
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                           ff05::IMC24                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     128       |       0       |           Checksum            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|           Identifier          |        Sequence Number        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Destination Reachable:

What ICMPv6 Error Messages Reveal About Their Sources

+-+-+-+-+-

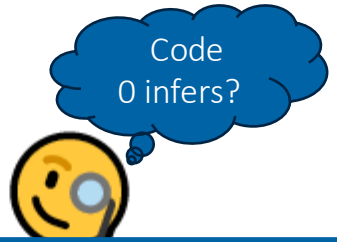
Sending a request to **every IPv4** address takes **less than** an hour

Scanning every address not feasible in IPv6

ICMPv6 error messages are still returned, even when targeting a **random address** inside a network

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   6   | Traffic Class |           Flow Label                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       Payload Length          |      58       |      64       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         2001:db8:5ba::1                       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                     2001:db8:200::random IID                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      128      |       0       |          Checksum             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|           Identifier          |        Sequence Number        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|
+-+-+-+-+-
```

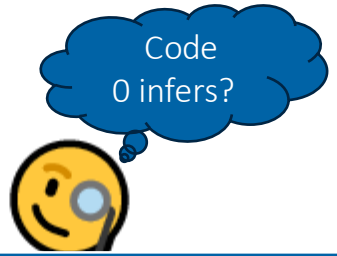
Echo Request



Typ	Error Message	Codes	Level
1	Destination Unreachable	7	SHOULD
2	Packet Too Big	1	MUST
3	Time Exceeded	2	MUST
4	Parameter Problem	3	SHOULD

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   6   | Traffic Class |           Flow Label                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       Payload Length          |      58       |      56       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       2001:db8:200:1000::ab                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       2001:db8:5ba::1                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       1       |       0       |           Checksum            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|           Identifier          |        Sequence Number        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|
+-+-+-+-+-
```

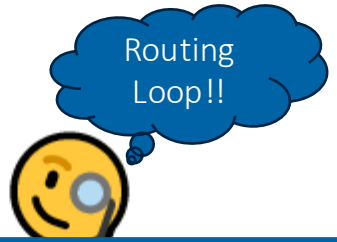
Destination Unreachable



Code	Description
0	No route to destination
1	Communication with destination administratively prohibited
2	Beyond scope of source address
3	Address unreachable
4	Port unreachable
5	Source address failed ingress/egress policy
6	Reject route to destination

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   6   | Traffic Class |           Flow Label                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       Payload Length          |      58       |      56       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        2001:db8:200:1000::ab                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        2001:db8:5ba::1                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       1       |       0       |           Checksum            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|           Identifier          |        Sequence Number        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

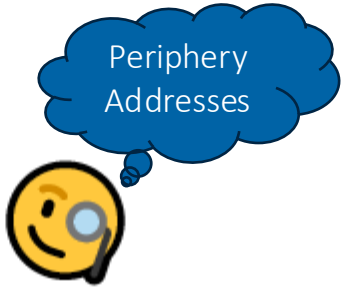
Destination Unreachable



Typ	Error Message	Codes	Level
1	Destination Unreachable	7	SHOULD
2	Packet Too Big	1	MUST
3	**Time Exceeded**	**2**	**MUST**
4	Parameter Problem	3	SHOULD

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   6   | Traffic Class |           Flow Label                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       Payload Length          |      58       |      56       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         2001:db8:200:1000::ab                 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         2001:db8:5ba::1                       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       3       |       0       |           Checksum            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|           Identifier          |        Sequence Number        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|
+-+-+-+-+-
```

Time Exceeded



Error Messages in Measurements

- Edgy (Rye, 2020)
  - 64.8M Last-Hop Routers
- XMap (Li, 2021)
  - 52M Routers + User Equipment (15 ISP ranges)

- Periphery can include your:
  - Home Router
  - Smartphone

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   6   | Traffic Class |           Flow Label                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       Payload Length          |      58       |      56       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         2001:db8:200:1000::ab                 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         2001:db8:5ba::1                       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       1,3     |     Code      |          Checksum             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|           Identifier          |        Sequence Number        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

ICMPv6 Error Message

Our Goal:

Analyze ICMPv6 error messages **beyond** their **source** addresses

Our Contribution:

1. **Verification** of error message **type & code usage** and **classification** of error messages for **11 Billion** IPv6 prefixes

2. ICMPv6 error message **rate-limiting** measurements of **1.4M routers show vendor defaults** & **kernel versions**

What Do ICMPv6 **Error Messages** Reveal About Their **Sources**?

1. Networks

2. Routers

Methods Overview

1. Controlled Environment

2. Verification in the IPv6 Internet

3. IPv6-wide Measurements

- Collect error messages under six different routing **scenarios**
- Find error messages that are returned only for active/inactive networks

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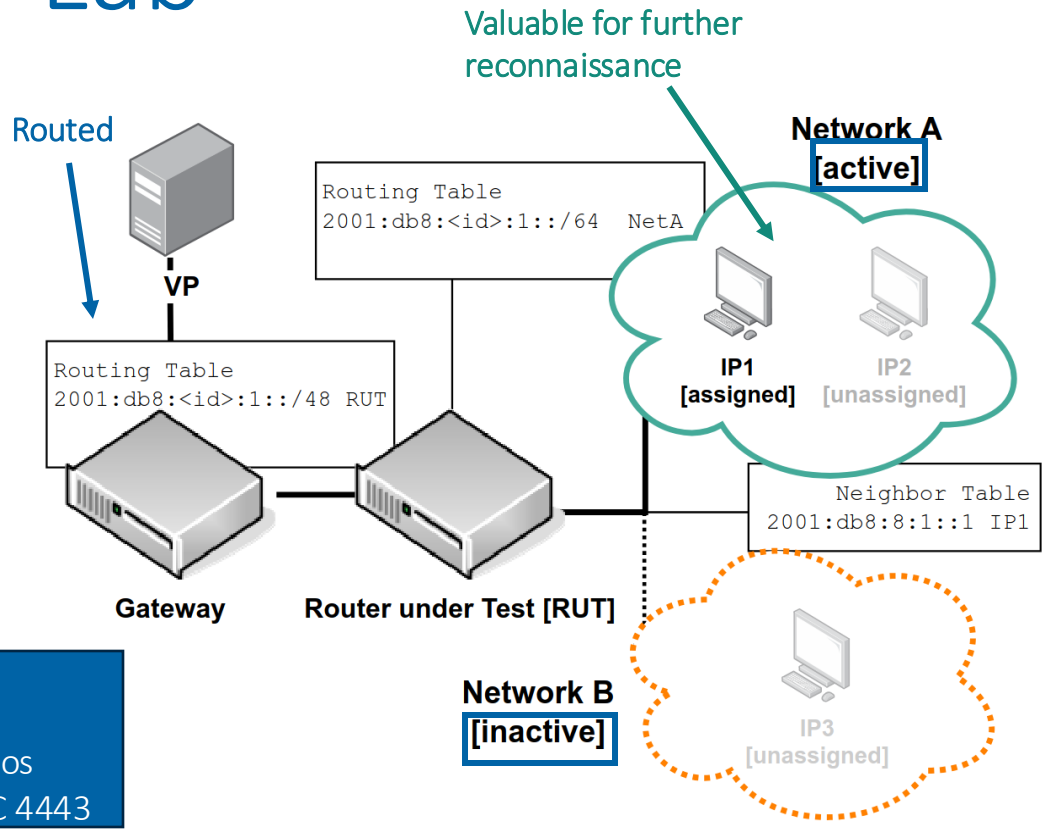
Router Lab



Typ	Router / Router OS
1	Cisco XRv, IOS-XE, IOS
2	Juniper Junos
3	Huawei NetEngine
4	HPE VSR
5	Arista
6	VyOs
7	Mikrotik (2 Versions)
8	OpenWRT (2 Versions)
9	Aruba

Typ	Firewall
1	PfSense
2	Fortigate

11 Vendors,
15 Appliances,
6 routing scenarios
derived from RFC 4443

sbaresearch/router-lab

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Result I: Router Lab

Mikrotik

Scenario	1	2	3	4	5	6	
Description	Active Network	Inactive Network	Active Netw. ACL	Inactive Netw. ACL	Null Route	Routing Loop	Classification
No Route (S2)	○ 0	● 14	● 1	● 2	● 2	○ 0	Ambiguous
Admin. Prohib. (S3,S4)	○ 0	○ 0	● 4	● 5	● 3	○ 0	Ambiguous
Addr. Unreach. (S1)	● 14	○ 0	○ 0	○ 0	● 1	○ 0	Ambiguous
Port Unreach. ()	○ 0	○ 0	● 3	● 2	○ 0	○ 0	Ambiguous
Failed Policy (S3,S4)	○ 0	● 1	● 1	● 2	○ 0	○ 0	Ambiguous
Reject Route (S5)	○ 0	○ 0	○ 0	○ 0	● 2	○ 0	Inactive
Time Exceeded (S6)	○ 0	○ 0	○ 0	○ 0	○ 0	● 15	Inactive
Ø	● 1	○ 0	● 4	● 3	● 9	○ 0	

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Result I: Router Lab

Juniper

Scenario	1	2	3	4	5	6	
Description	Active Network	Inactive Network	Active Netw. ACL	Inactive Netw. ACL	Null Route	Routing Loop	Classification
No Route (S2)	○ 0	● 14	● 1	● 2	● 2	○ 0	Ambiguous
Admin. Prohib. (S3,S4)	○ 0	○ 0	● 4	● 5	● 3	○ 0	Ambiguous
Addr. Unreach. (S1)	● 14	○ 0	○ 0	○ 0	● 1	○ 0	Ambiguous
Port Unreach. ()	○ 0	○ 0	● 3	● 2	○ 0	○ 0	Ambiguous
Failed Policy (S3,S4)	○ 0	● 1	● 1	● 2	○ 0	○ 0	Ambiguous
Reject Route (S5)	○ 0	○ 0	○ 0	○ 0	● 2	○ 0	Inactive
Time Exceeded (S6)	○ 0	○ 0	○ 0	○ 0	○ 0	● 15	Inactive
Ø	● 1	○ 0	● 4	● 3	● 9	○ 0	

Solution: RTTs! AU in S1 shows delays of 2, 3 and 18 seconds, in S5 it is returned immediately

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Result I: Router Lab

Scenario	1	2	3	4	5	6	
Description	Active Network	Inactive Network	Active Netw. ACL	Inactive Netw. ACL	Null Route	Routing Loop	Classification
No Route (S2)	○ 0	● 14	● 1	● 2	● 2	○ 0	Ambiguous
Admin. Prohib. (S3,S4)	○ 0	○ 0	● 4	● 5	● 3	○ 0	Ambiguous
Addr. Unreach.$_{RTT \geq 1sec}$	● 14	○ 0	○ 0	○ 0	○ 0	○ 0	**Active**
Addr. Unreach.$_{RTT < 1sec}$	○ 0	○ 0	○ 0	○ 0	● 1	○ 0	**Inactive**
Port Unreach. ()	○ 0	○ 0	● 3	● 2	○ 0	○ 0	Ambiguous
Failed Policy (S3,S4)	○ 0	● 1	● 1	● 2	○ 0	○ 0	Ambiguous
Reject Route (S5)	○ 0	○ 0	○ 0	○ 0	● 2	○ 0	Inactive
Time Exceeded (S6)	○ 0	○ 0	○ 0	○ 0	○ 0	● 15	Inactive
Ø	● 1	○ 0	● 4	● 3	● 9	○ 0	

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Result I: Classification

Scenario	1	2	3	4	5	6	
Description	Active Network	Inactive Network	Active Netw. ACL	Inactive Netw. ACL	Null Route	Routing Loop	Classification
No Route (S2)	○ 0	● 14	● 1	● 2	● 2	○ 0	Ambiguous
Admin. Prohib. (S3,S4)	○ 0	○ 0	● 4	● 5	● 3	○ 0	Ambiguous
Addr. Unreach.$_{RTT \geq 1sec}$	● 14	○ 0	○ 0	○ 0	○ 0	○ 0	Active
Addr. Unreach.$_{RTT < 1sec}$	○ 0	○ 0	○ 0	○ 0	● 1	○ 0	Inactive
Port Unreach. ()	○ 0	○ 0	● 3	● 2	○ 0	○ 0	Ambiguous
Failed Policy (S3,S4)	○ 0	● 1	● 1	● 2	○ 0	○ 0	Ambiguous
Reject Route (S5)	○ 0	○ 0	○ 0	○ 0	● 2	○ 0	Inactive
Time Exceeded (S6)	○ 0	○ 0	○ 0	○ 0	○ 0	● 15	Inactive
Ø	● 1	○ 0	● 4	● 3	● 9	○ 0	

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Methods Overview

1. Controlled Environment

2. Verification in the IPv6 Internet

3. IPv6-wide Measurements

- Goal: Collect error messages for IPv6 **networks** known to be **active and inactive**
- Problem: There is **no** such dataset
  - Scanning random subnets?
    - Target network might not be suballocated
- **BValue Steps** = Border Values to the rescue

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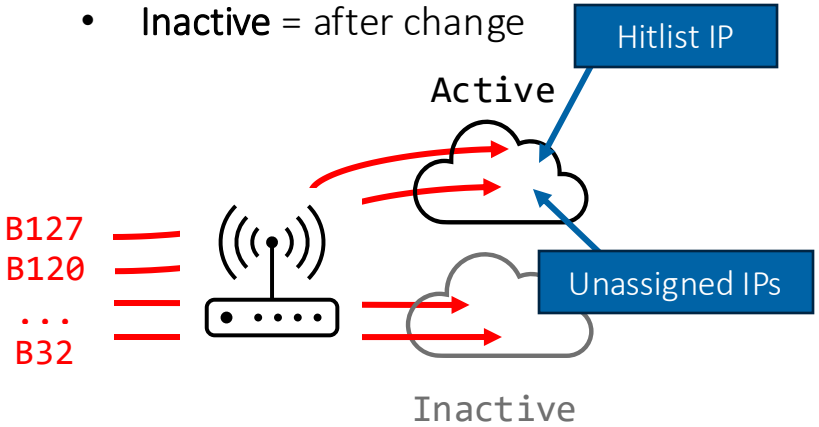
BValue Steps

- Input: **Responsive** IPv6 addresses in **active** network (Hitlist Service; Gasser, 2018)
- **Randomize** more and more of the target address (steps of 8 bits) up to the **routed** network border
- Detect **changes** in response behavior
  - **Active** = before change
  - **Inactive** = after change




```
Original hitlist address:
          2001:db8:1234:abcd:1234:abcd:1234:0101
Generated addresses:
          <original bits>                <random bits>
B127      2001:db8:1234:abcd:1234:abcd:1234:0100
B120      2001:db8:1234:abcd:1234:abcd:1234:01e8
B112      2001:db8:1234:abcd:1234:abcd:1234:6aa1
B104      2001:db8:1234:abcd:1234:abcd:1221:f38d
...
B48       2001:db8:abcd:5276:d080:ccd6:7fc3:311c
B40       2001:db8:ab3e:3eb7:4c66:7f16:ade5:2b3d
B32       2001:db8:7438:221f:b244:476c:66bb:8da5
```

- Applied to one hitlist address/subnet per routed BGP prefix
- 47,923 pass ICMPv6 responsiveness check
- We are able separate active from inactive in 44% (17% are not suballocated, 38% unresponsive)

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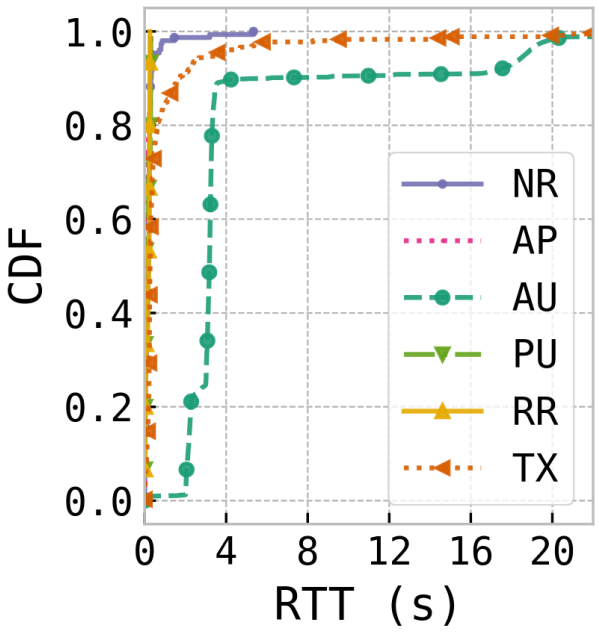
Result II: BValue Steps



Of error messages
for active networks

True Positives

BValues

Error Messages		labeled active Netw.	labeled active σ	labeled active %	labeled inactive Netw.	labeled inactive σ	labeled inactive %
active	ICMPv6	17,361	109	95.1%	471	11	4.6%
	TCP	14,522	112	93.7%	620	12	7.4%
	UDP	12,490	82	56.2%	3,687	35	32.0%
ambig.	ICMPv6	352	10	1.9%	1,645	12	15.9%
	TCP	566	10	3.7%	1,552	14	18.6%
	UDP	9,377	91	42.2%	1,455	7	12.6%
inactive	ICMPv6	537	13	2.9%	8,230	34	79.5%
	TCP	405	8	2.6%	6,191	26	74.0%
	UDP	337	12	1.5%	6,396	49	55.4%

NOTE: σ Standard deviation over five days.

18,250/21,070 Responsive

10,346/21,070 Responsive

True Negatives

- Five days, Three protocols

95% labeled active networks returned $AU_{RTT \geq 1sec}$

80% labeled inactive networks returned $AU_{RTT<1sec}$, Reject Route, Time Exceeded; 16% Ambiguous (Higher share of No Route)

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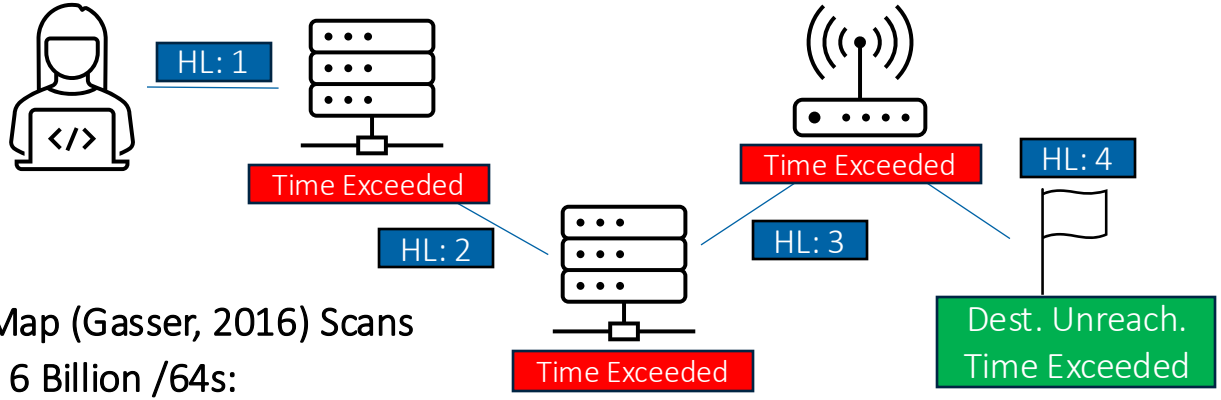
Methods Overview

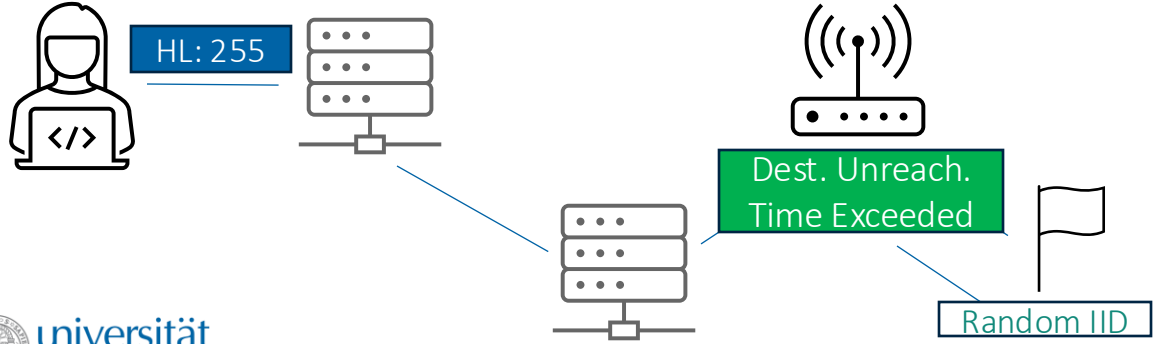
1. Controlled Environment
2. Verification in the IPv6 Internet
3. IPv6-wide Measurements

IPv6-wide measurements

YARRP (Beverly, 2016): Traceroutes to 5 Billion /48s:



ZMap (Gasser, 2016) Scans to 6 Billion /64s:



Router Addr, Hop Count & Destination IP = Input for Contribution 2

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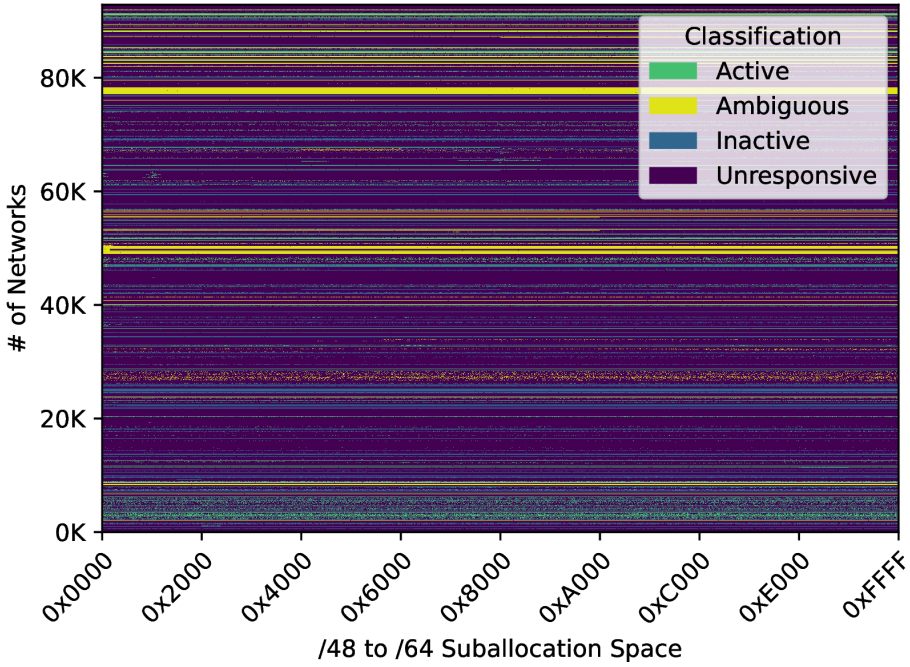
Result III: /64s Measurement



38% of measured networks remain silent

Measured /64s	6,085,410,816 (100%)
Responsive	1,368,371,825 (22.5%)
Unresponsive	4,717,038,991 (77.5%)

Responsive	/64s
Active	355,616,627 = **26%**
Ambiguous	209,970,342 = 15%
Inactive	802,784,856 = **59%**

At least 1 active /64 in 61% of responsive networks

Only 15% of responsive /64s remain ambiguous

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What Do ICMPv6 **Error Messages** Reveal About Their **Sources**?

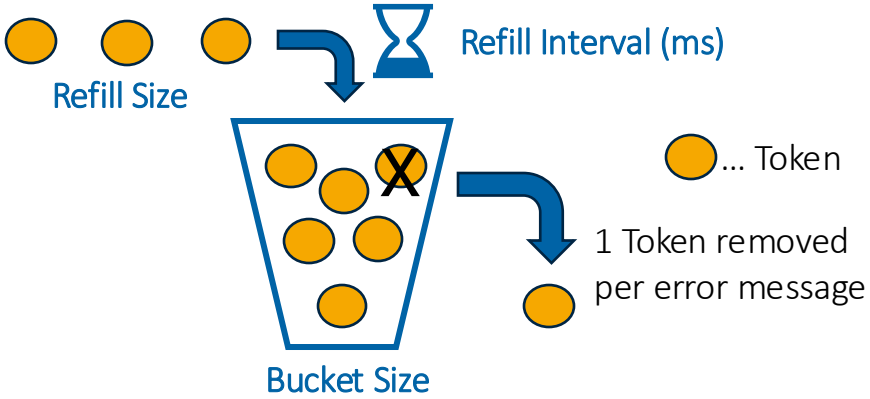
1. Networks

2. Routers

Methods Overview

1. Controlled Environment

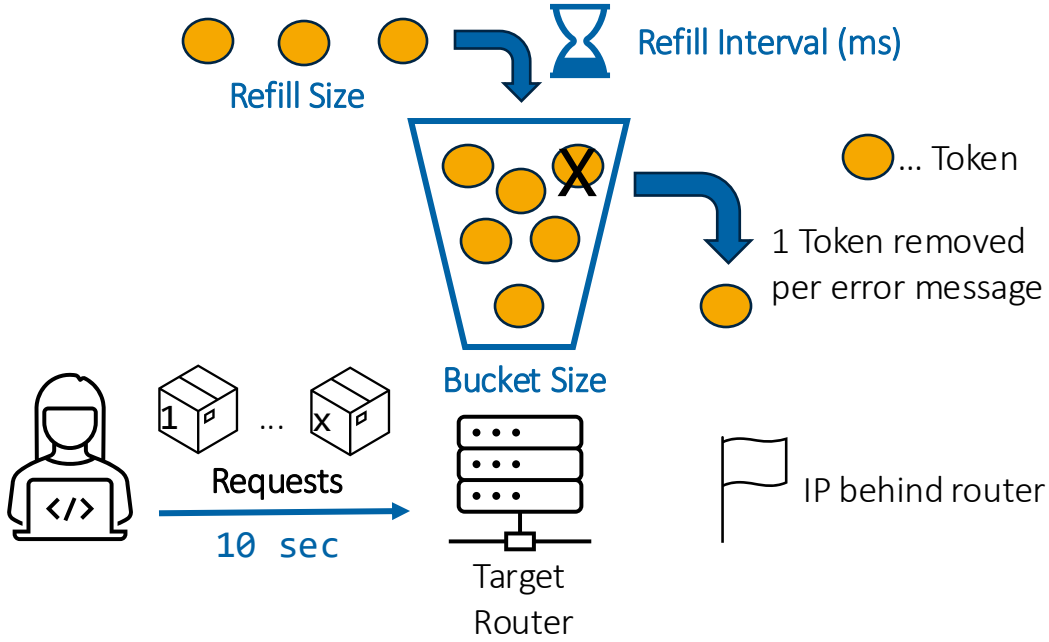
- Origination of ICMPv6 error messages **must be** rate limited
- Measure & detect **rate limits** that are **unique to vendors**



Methods Overview

1. Controlled Environment

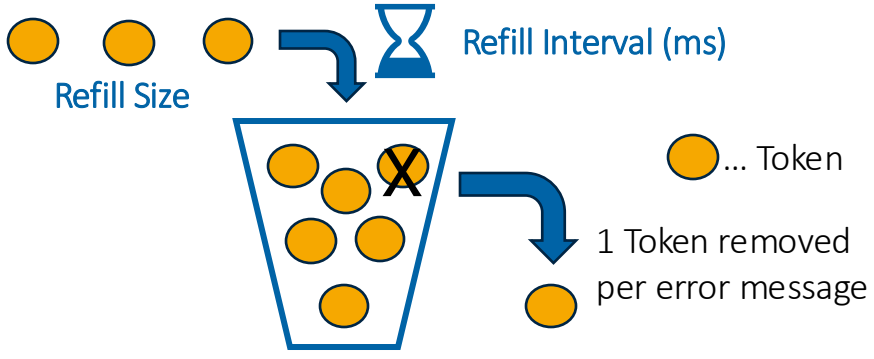
- Origination of ICMPv6 error messages **must be** rate limited
- Measure & detect **rate limits** that are **unique to vendors**



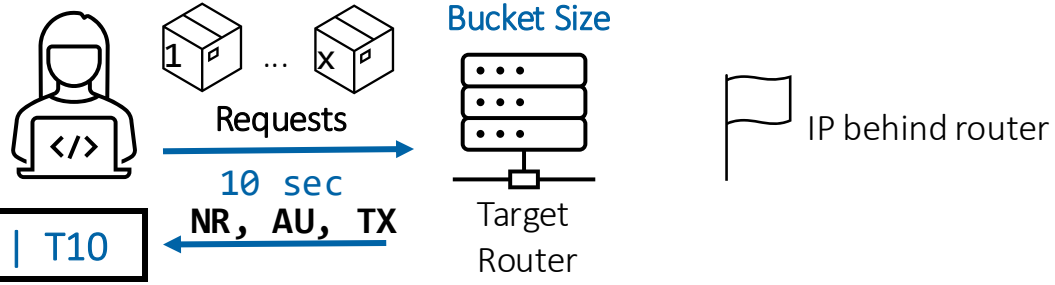
Methods Overview

- Origination of ICMPv6 error messages **must be** rate limited
- Measure & detect **rate limits** that are **unique to vendors**

1. Controlled Environment



NR(10) ... Total error messages over timespan of 10 seconds
T1, T2, T10 Number of error messages during 1st, 2nd, .. 10th second



T1 | T2 | T3 | ... | T10

Result I: Router Lab

Vendor Defaults

Kernel Defaults

	Router OS	iTTL	Delay	Bucket Size			Refill Interval (σ)			Refill Size			# Error Messages			Per
		All	AU	TX	NR	AU	TX	NR	AU	TX	NR	AU	TX	NR	AU	Src
Diff AU/NR/TX	CiscoXRV9000	64	18	10	10	10	1,000	1,000	1,000	1	1	1	19	19	0★	
	CiscoIOS 15.9	64	3	10	10	10	~100	~100	3,800★	1	1	10	~105	~105	22★	
	CiscoCSR1000 17.03	64	3	10	10	10	~100	~100	3,000★	1	1	10	~105	~105	22★	
	Juniper 17.1	64	2	52	12	12	~1,000	10,000	10,000	52	12	12	~520◇	12	12	
	HPE VSR1000	64	3	∞	∞	★	∞	∞	★	∞	∞	★	∞	∞	★	
	Huawei NE40	64	3	100-200	8	/	1,000	1,000	/	100	8	/	1,000-1,100	88	/	
No diff for AU/NR/TX	Arista 4.28	64	3		∞			∞			∞			∞		
	VyOS 1.3	64	3		6			250*			1			45*		✓
	Mikrotik 6.48	64,255	3		6			1000			1			15		✓
	Mikrotik 7.7	64	3		6			250*			1			45*		✓
	OpenWRT 19.07	64	3		6			250			1			45*		✓
	OpenWRT 21.02	64	3		6			250*			1			45*		✓
	ArubaOS 10.09	64	3		6			250*			1			45*		✓
	Fortigate 7.2.0	255	3		6			10			1			1000		✓
	PfSense 2.6.0	64	3		100			1000			100			1000		

~ ... Refill interval is less stable / ... The response type is not returned by the RUT. ★ ...Affected by the Neighbor Discovery Process. ∗ ... /48 destination prefix; for other prefix sizes see Table 7 ∞ ... RUT is either not rate-limited or > *scanrate* (tested up to 10K pps). ◇ ... Juniper's Neighbor Discovery for hop limit 0 packets causes a 2-second delay also for TX.

Kernels: Linux, Wind River Linux and FreeBSD.

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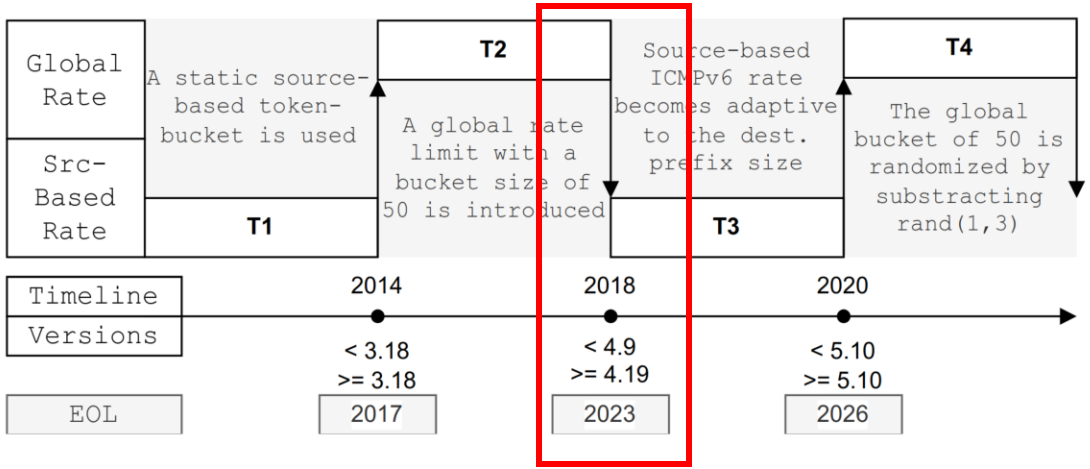
Result I: Changes in the Kernel

	Kernel Version	Release	IPv4	IPv6
Linux	2.6.26-1-2	2008	15	15
	3.16.0-4-6	2014	15	15
	4.9.0-3-13	2016	15	15
	4.19.0-5-21	2018	15	45
	5.10.0-8-22	2020	15	45
	6.1.0-9	2022	15	45
Freebsd	11.0	2016	2000	1000
Netbsd	8.2	2020	1000	1000

- Number of error messages over 10 seconds
- Static and dynamic testing of the Linux kernel shows a change for IPv6 in kernel version 4.

Three rate-limiting changes over time:

1. Introduction of global rate
2. **Peer-based becomes adaptive to dest. prefix**
3. Global bucket is randomized



Methods Overview

2. Verification in the IPv6 Internet

- Our Goal:

  1) Validate collected defaults in the Internet

  2) Extend defaults with new rate-limits for which the vendor is known (see Paper)

- Data Source:
  - Extract SNMPv3 vendor labels for **476K IPv6** routers (Albakour, 2021)
  - **50,952** match our tracerouting data, for which we can collect rate limit parameters
    - requires: destination behind router, hop limit

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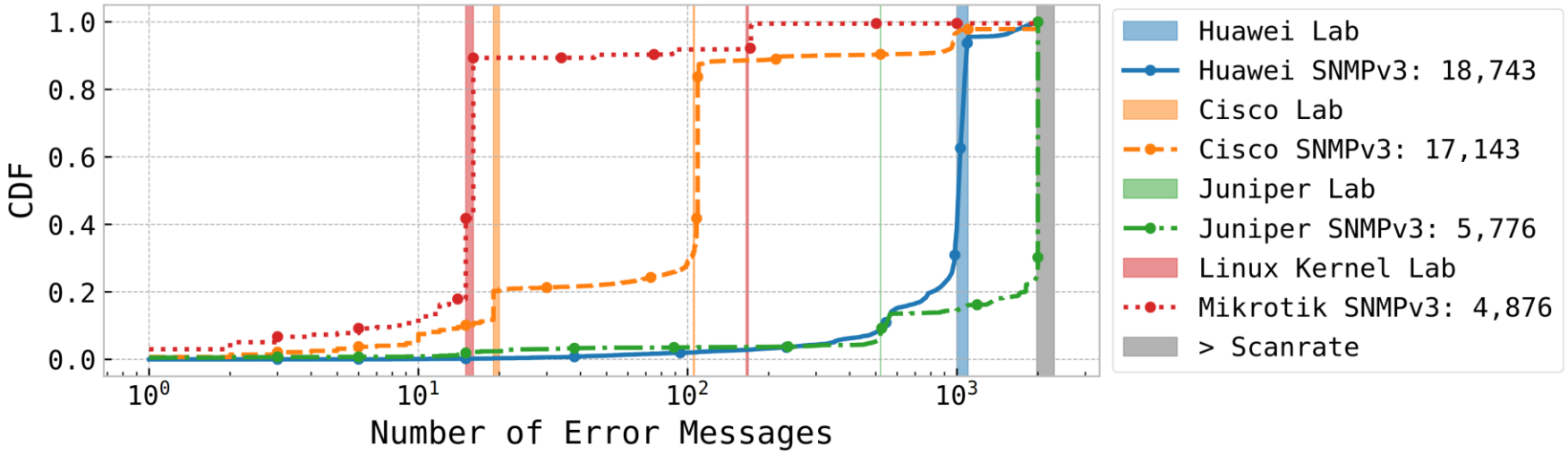
Result II: SNMPv3 Label Comparison



- Huawei labeled match lab default
- Cisco labeled match XRv and IOS lab defaults
- Majority of Juniper labeled is limited above measurement scanrate of 200pps
- Mikrotik matches Linux kernel defaults

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Methods Overview

3. IPv6-wide Measurements

- We collected rate-limits for **1.4M** of the IPv6 routers
  - Split Routers based on **Centrality Score**:
    - Number of paths to a /48 destination a router is seen on
  - **Distance-based matching** to known rate limiting paramters
    - Bin the number of responses for each second (**T1,T2,..T10**) and compute distance
    - Match **rate limiting parameters** (Bucket Size, Refill Interval, Refill Size) for rates within adaptive threshold (10 to 100 based on NR(10))
  - Measurement Parameters: **200 PPS, 10 seconds, Time Exceeded**

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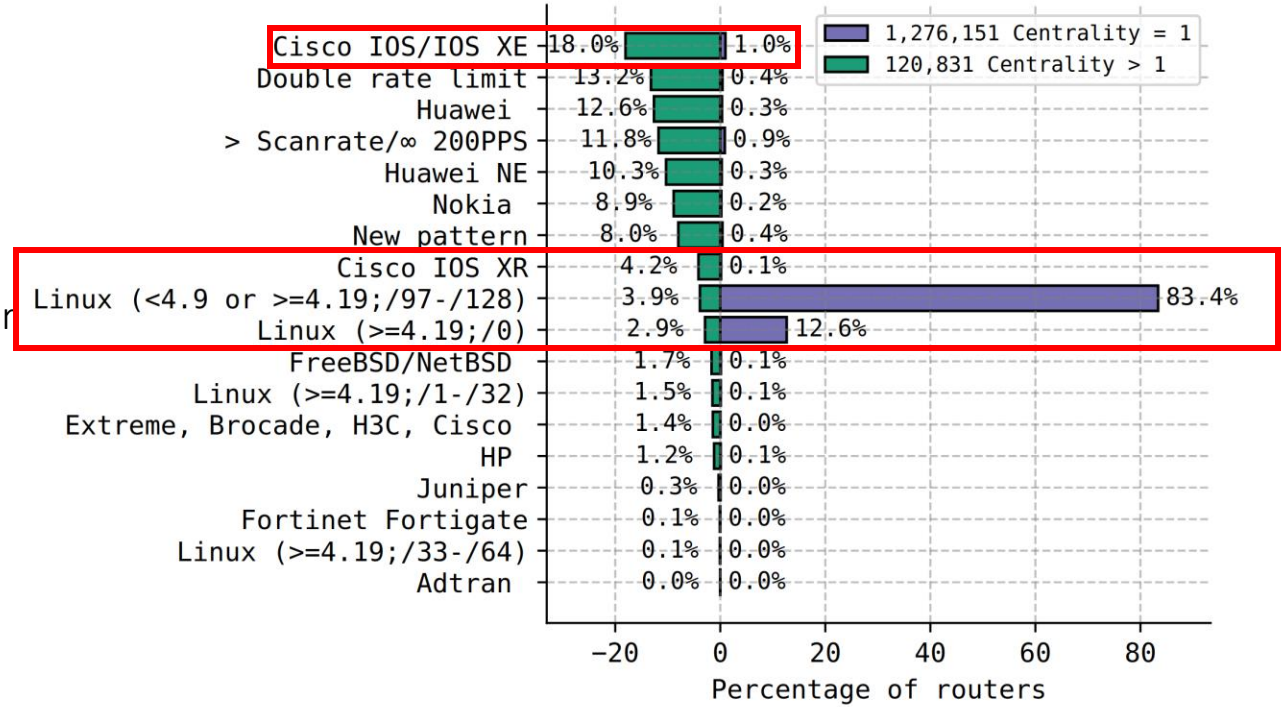
Result III: Rate Limit Matching

- Routers on multiple paths (green), more **distinguishable** rate limits
  - E.g. Cisco (18% IOS, 4.2% XRv)
- Periphery (purple)
  - 83.4% Linux <4.9 or newer version with small dest. prefix sizes (less likely)
  - 12.6% ≥4.19 with default route



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Conclusion: What Do ICMPv6 **Error Messages** Reveal About Their **Sources**?

1. Networks

+ Active
  - $AU_{RTT \geq 1\ sec}$
+ Inactive
  - RR, TX & $AU_{RTT<1sec}$

2. Routers

+ Centrality > 1:
  - Vendors
+ Centrality = 1:
  - Kernel Version

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Artifacts available:

sbaresearch/icmpv6-destination-reachable

sbaresearch/router-lab

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   6   | Traffic Class |           Flow Label                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       Payload Length          |      58       |      56       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        2001:db8:200:1000::ab                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        2001:db8:5ba::1                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    129,1,3    |      Code     |          Checksum             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|           Identifier          |        Sequence Number        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Questions?

| … Please set Typ and Code accordingly :)

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