Detecting and Characterizing Exposed BGP Routers

Shyam Krishna Khadka, Suzan Bayhan, Ralph Holz, Cristian Hesselman

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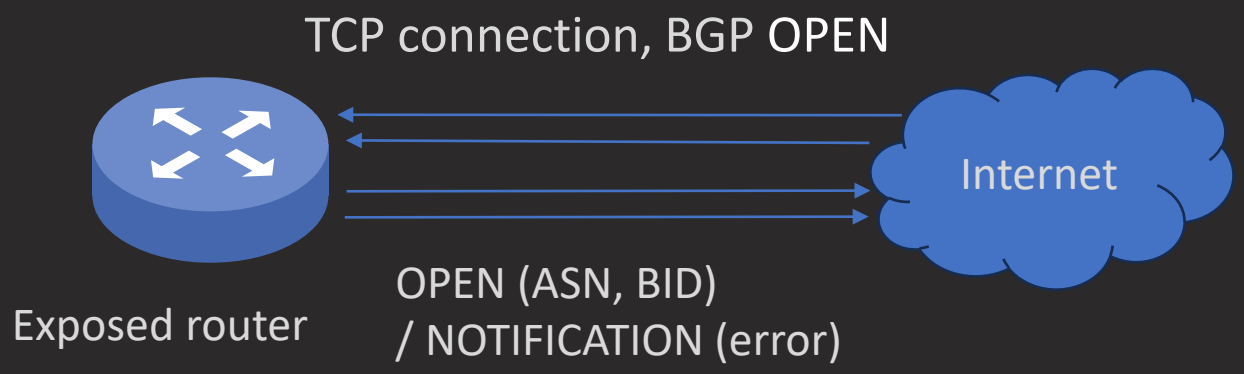
Based on a paper in TMA'26 conference

Exposed BGP router

- RFC 7454 on BGP Operations and Security
  - Restrict BGP (TCP 179) to configured peers only.

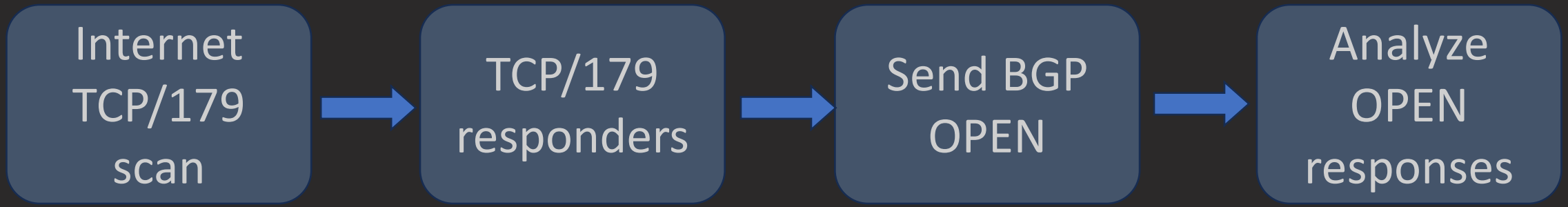
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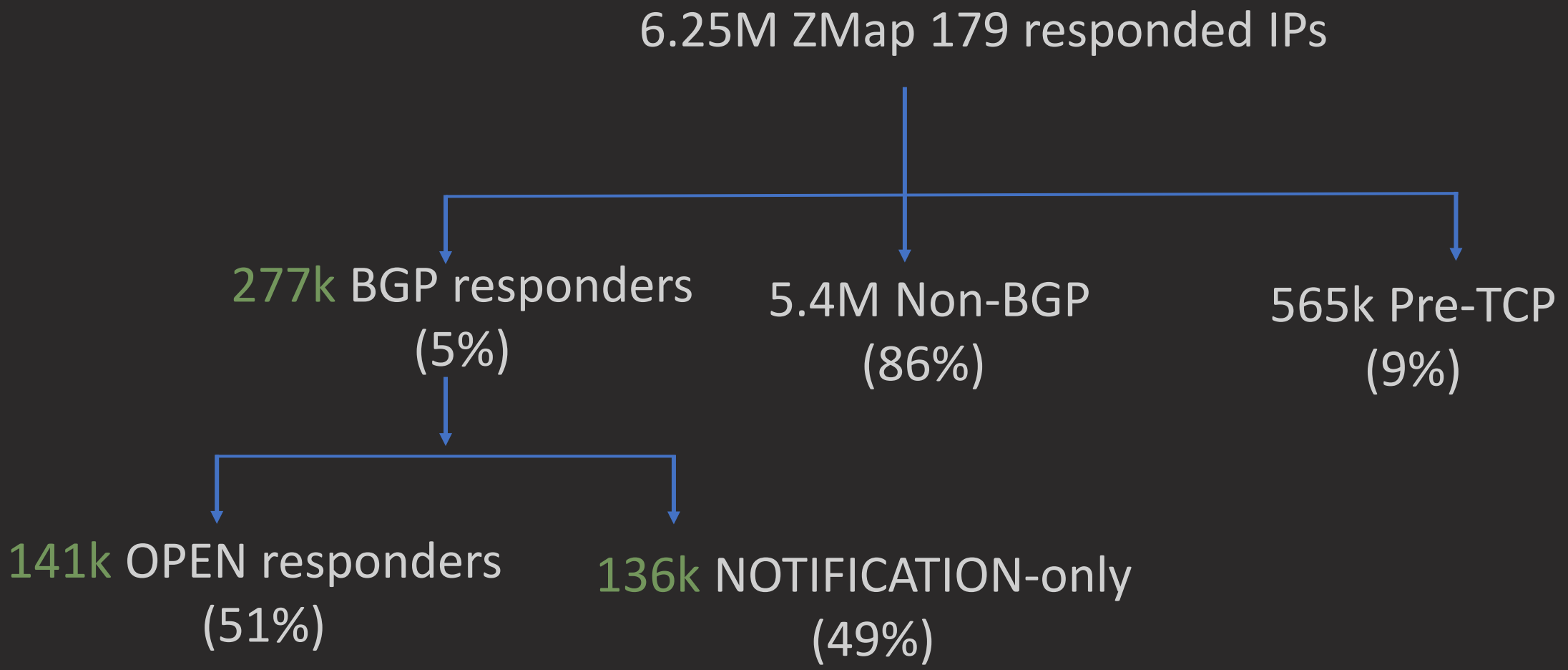
A router that responds to unsolicited BGP OPEN messages.

Scan-179: Detecting exposed routers



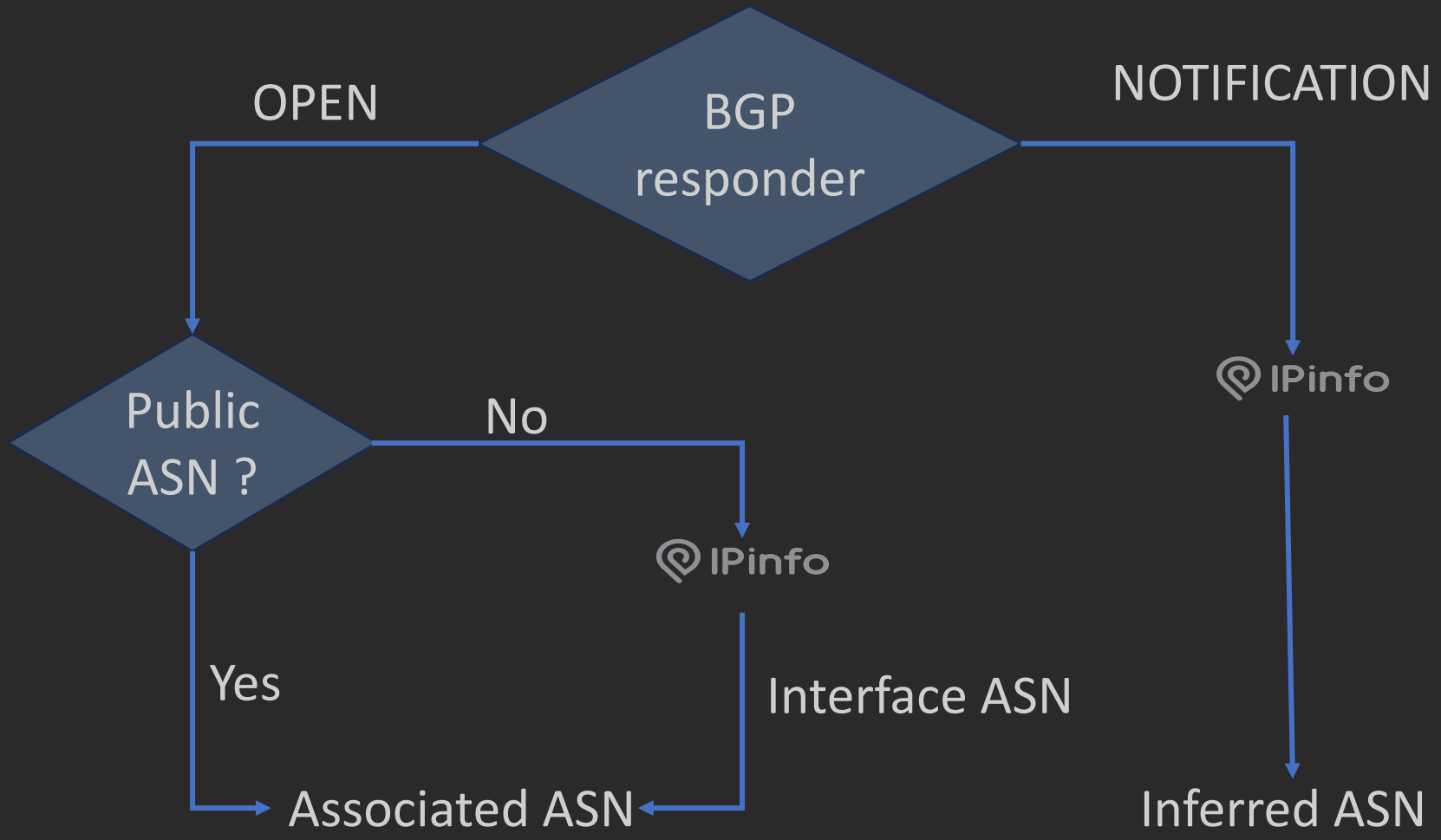
One-shot Internet-wide IPv4 measurement in February 2026.

Responses to Scan-179

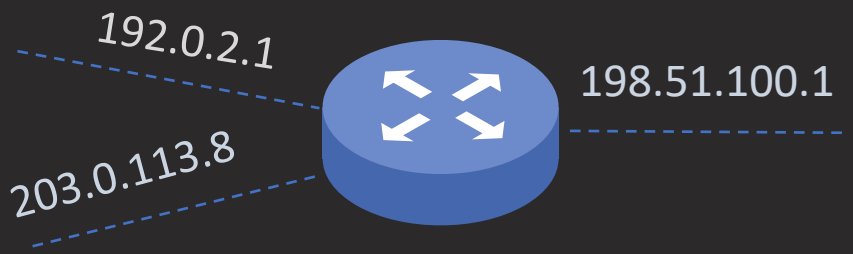


OPEN responders formed the basis of our subsequent analysis.

Identifying associated ASes



Mapping OPEN responder IPs to routers



AS 64500

OPEN message

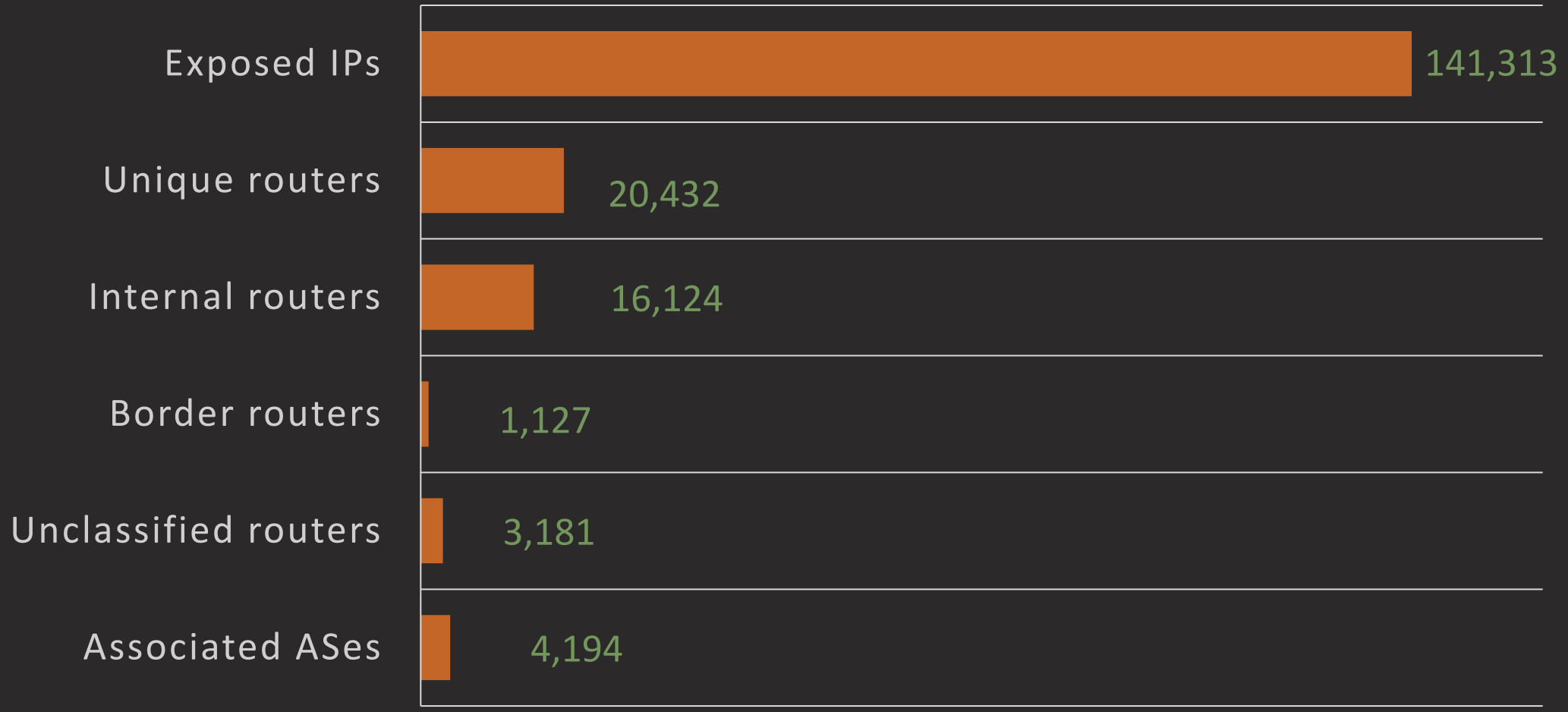
IP	BID	OPEN ASN
192.0.2.1	192.0.2.254	64500
203.0.113.8	192.0.2.254	64500
198.51.100.1	192.0.2.254	64500

- RFC 6286 states BID is unique per router in an ASN.
- Public OPEN ASN: BID + OPEN ASN -> Router.
- Non-public OPEN ASN: BID + OPEN ASN + Interface ASN -> Router.

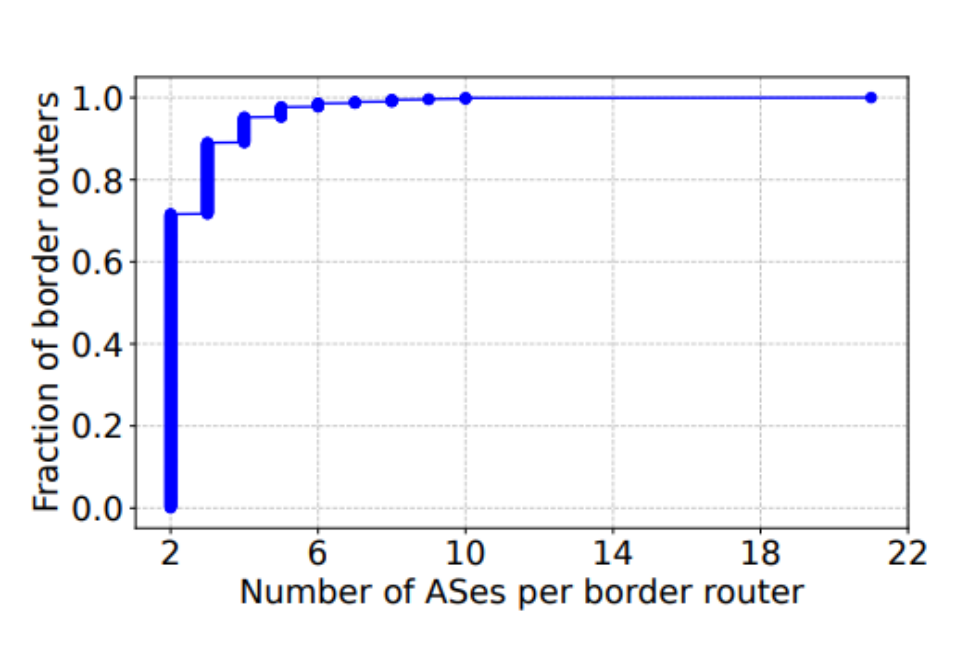
Classifying router: internal and border

- Internal: Non-public OPEN ASN, AS confederations.
- Border: eBGP peering.
  - Public OPEN ASN + one interface IP belongs to another ASN.
- Unclassified:
  - Public OPEN ASN, but all interface IPs map to the same ASN.
  - Could be iBGP peering or the host AS is providing the IP.

Finding on IPs, routers, and ASes

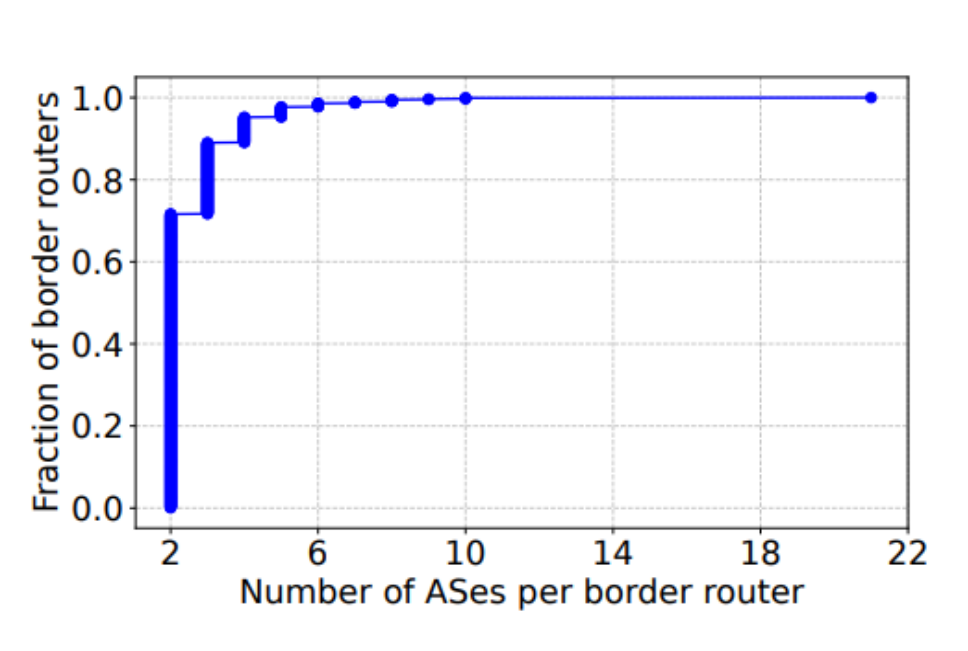


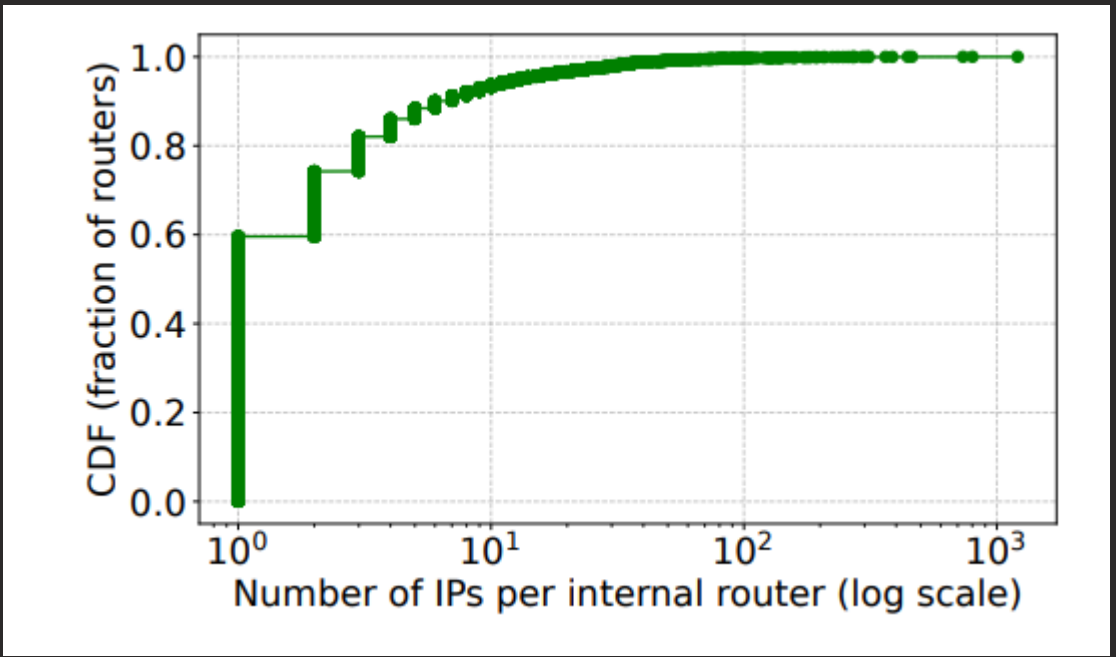
Criticality of border and internal routers



- Around 75% of border routers connect to one AS.
- A border router connects to 21 ASes.

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- 60% have one IP, and around 90% have fewer than 10 IPs.
- 10% of internal routers have up to 1,208 IPs.

Takeaways

- A non-trivial number of BGP routers are exposed violating RFC 7454.
- 20,432 routers managed by 4,194 ASes.
- Reasons for such exposure?

THANK YOU
Questions & Discussions

Paper



s.k.khadka@utwente.nl

Personal website

