Blackholing at IXPs

On the Effectiveness of DDoS Mitigation in the Wild

NANOG 67

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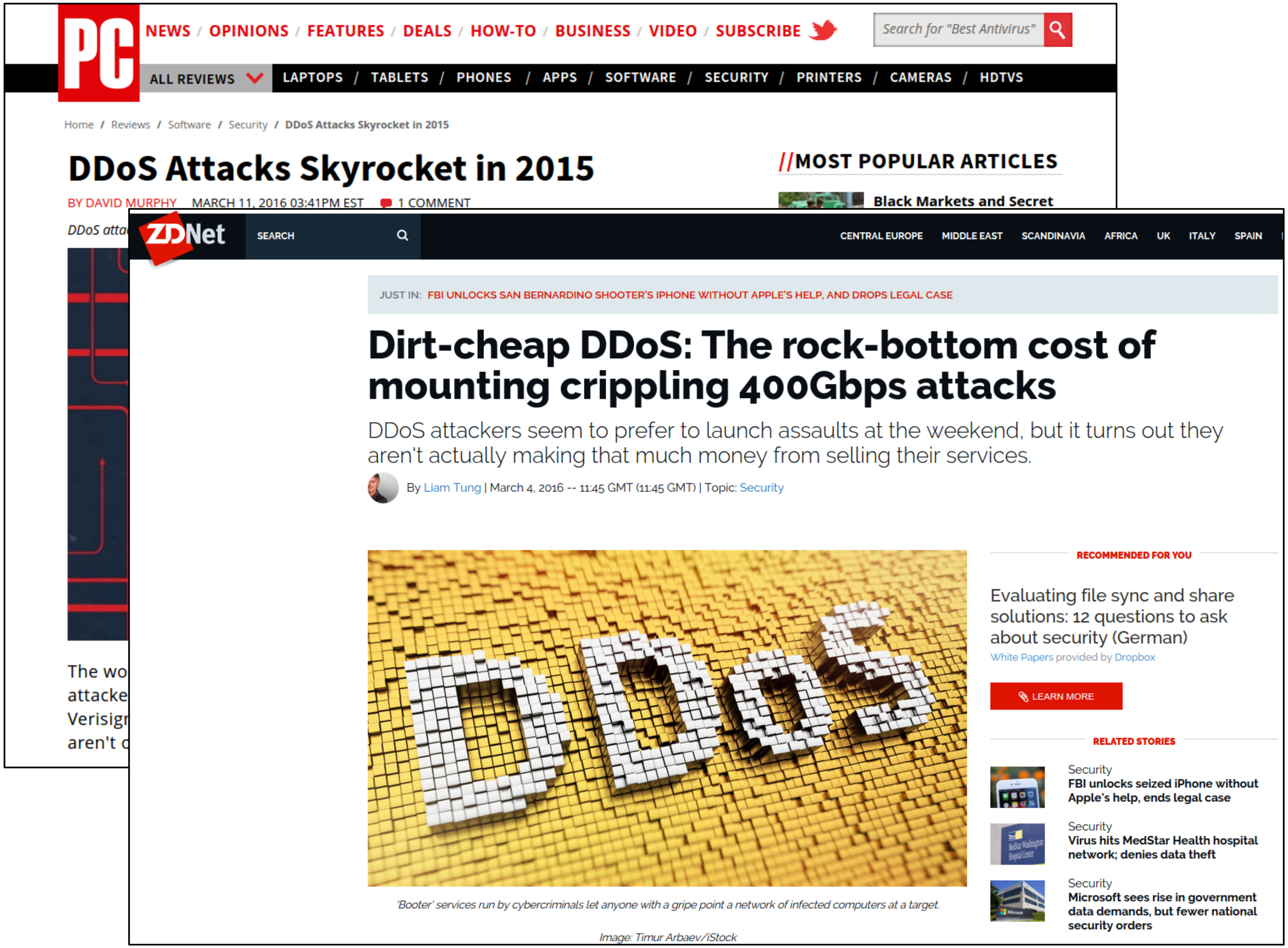
DDoS Attacks Remain a Serious Threat



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DDoS Attacks Skyrocket in 2015

BY DAVID MURPHY   MARCH 11, 2016 03:41PM EST   1 COMMENT

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By Liam Tung | March 4, 2016 -- 11:45 GMT (11:45 GMT) | Topic: Security

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Image: Timur Arbaev/iStock

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What is Blackholing?

» Operational technique to counter DDoS attacks

» Triggered directly by IP owners through BGP

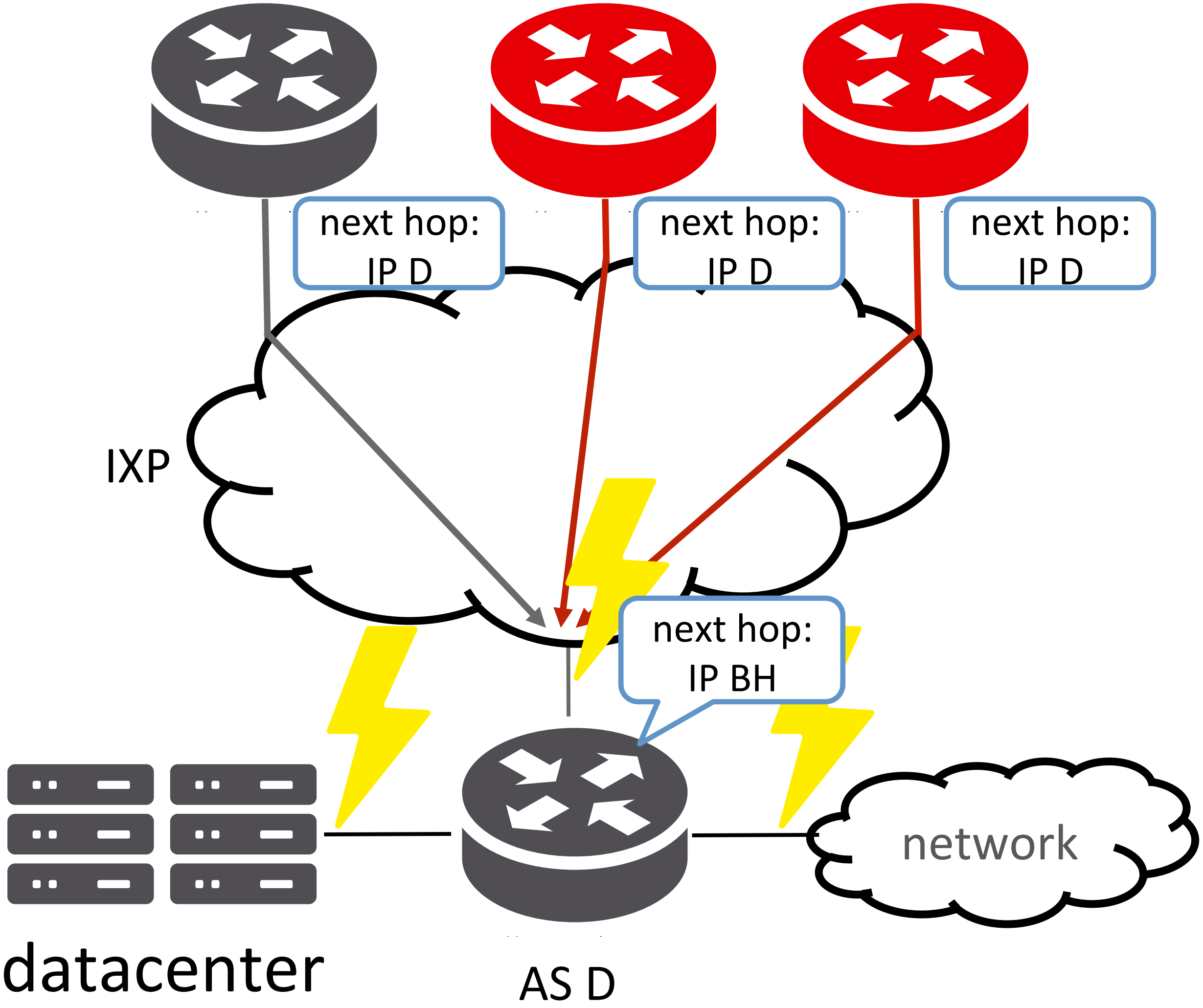
» Last resort to protect upstream/peering link or own network

» Since a few years also at IXPs (DE-CIX, MSK-IX, NETIX, NIX-CZ, …)

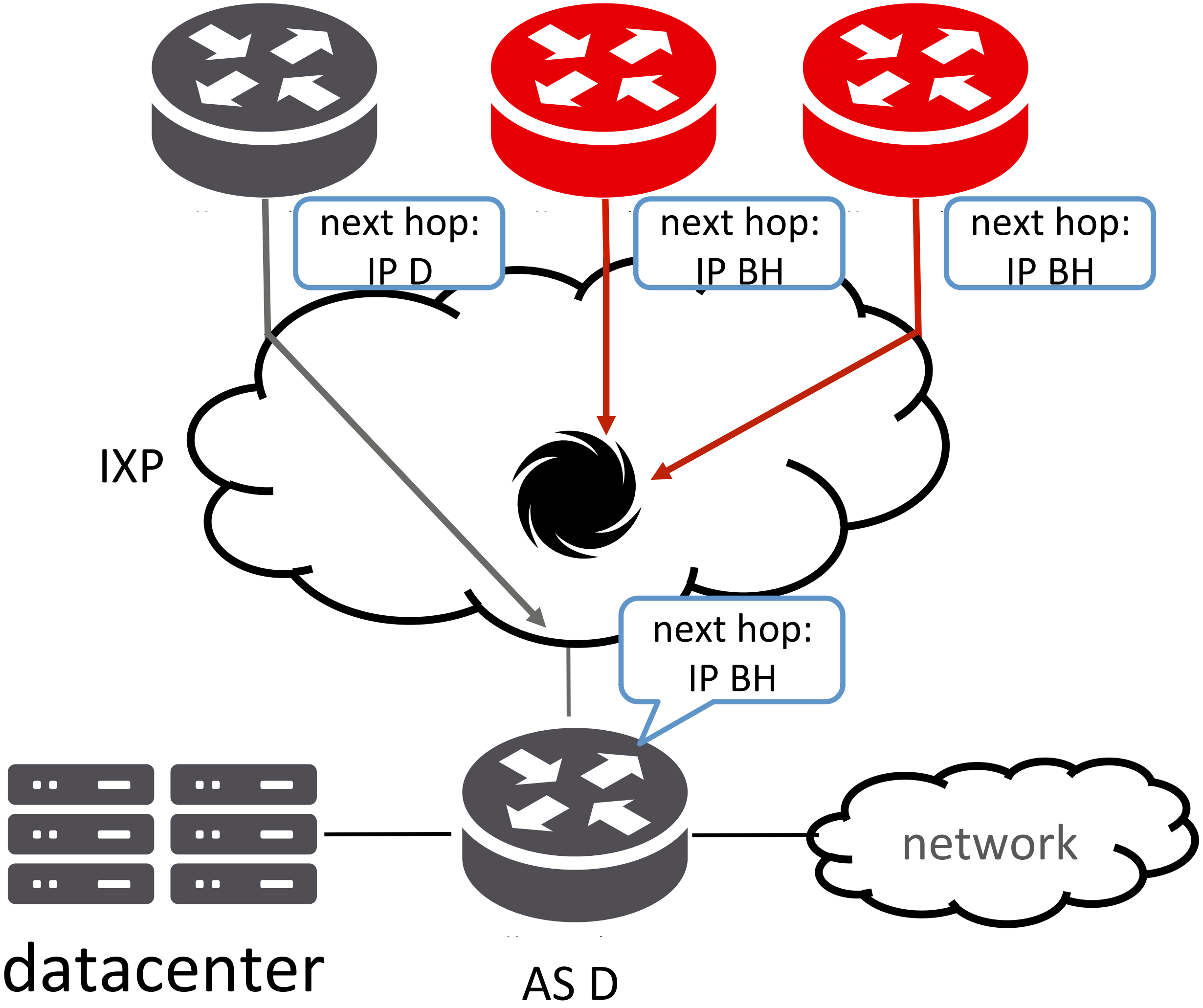
Blackholing – Brief History

- Late 1980s: used on a per device basis
- 2002: within ASes
- 2005 – 2007: major ISPs offer blackholing as a service
- **2010: First IXPs adopt the concept**

Recap – Blackholing at IXPs



Recap – Blackholing at IXPs

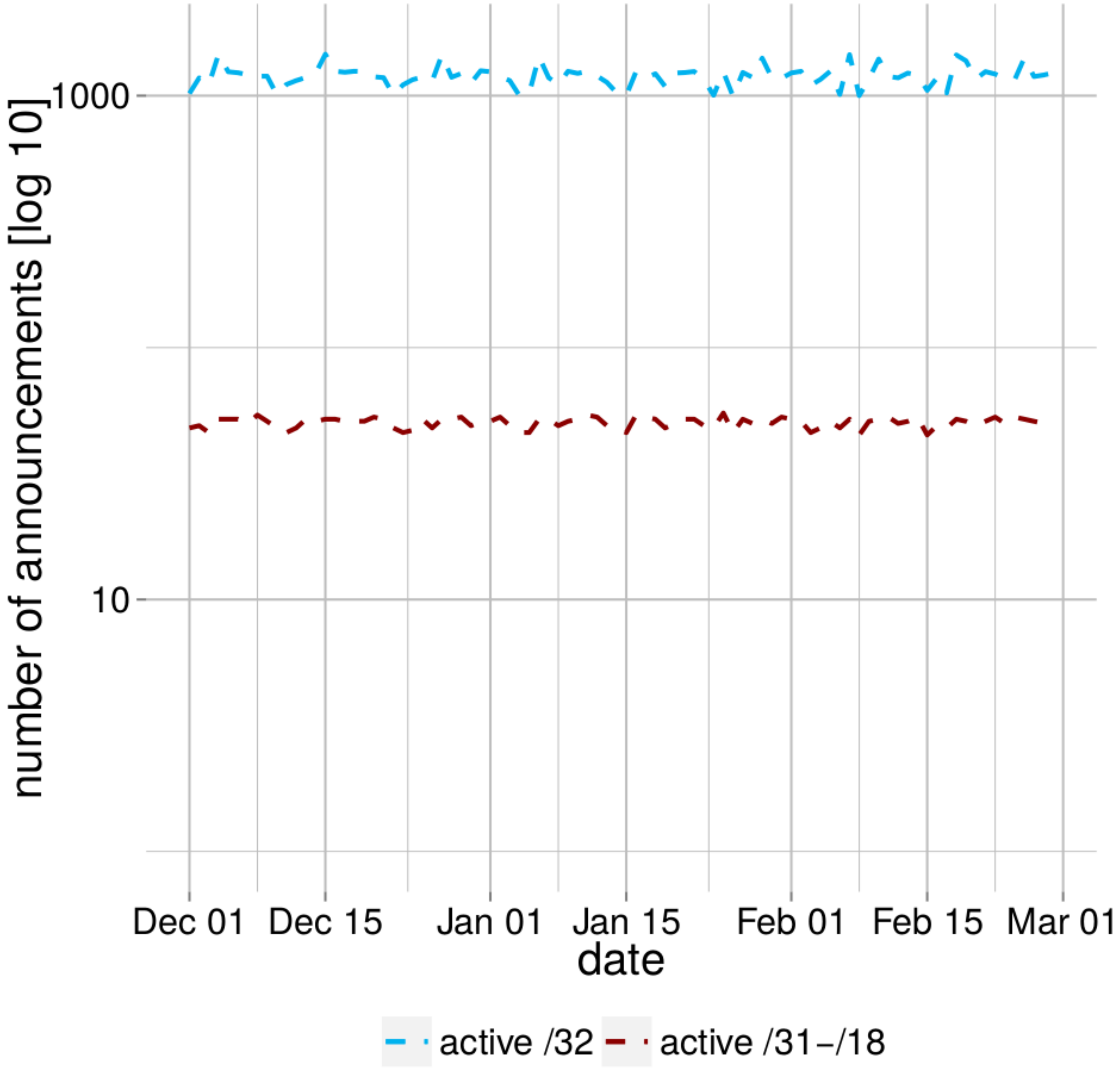


Is it frequently used and how is it used?

What is the impact on traffic?

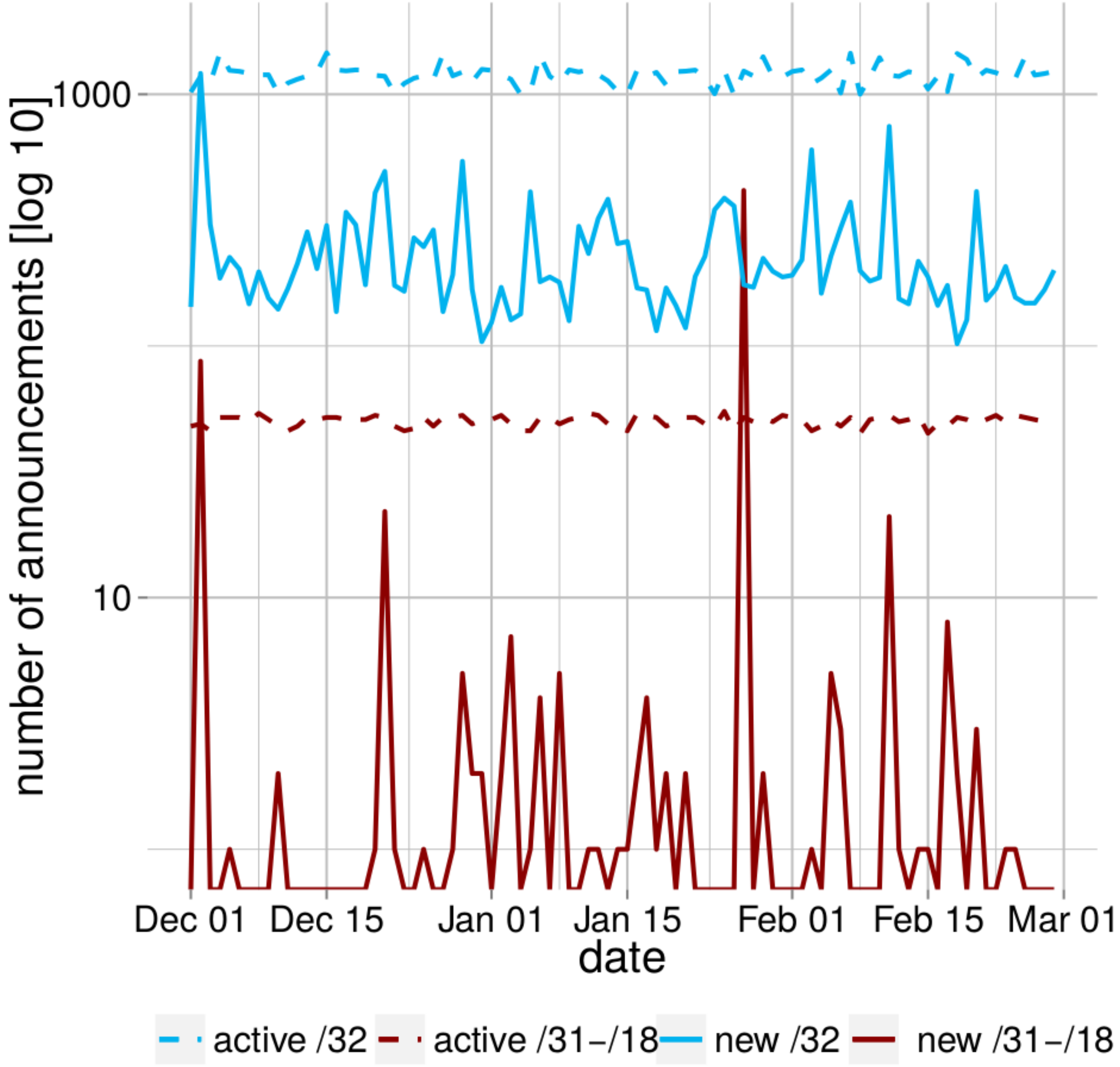
How can we improve blackholing?

Blackholing Usage Analysis – Active Announcements



- About 23,000 announcements
- Stable number of active /32 blackholes (~1200)
- Also stable number of less specifics /31 - /18 (~50)
- **What about new announcements?**

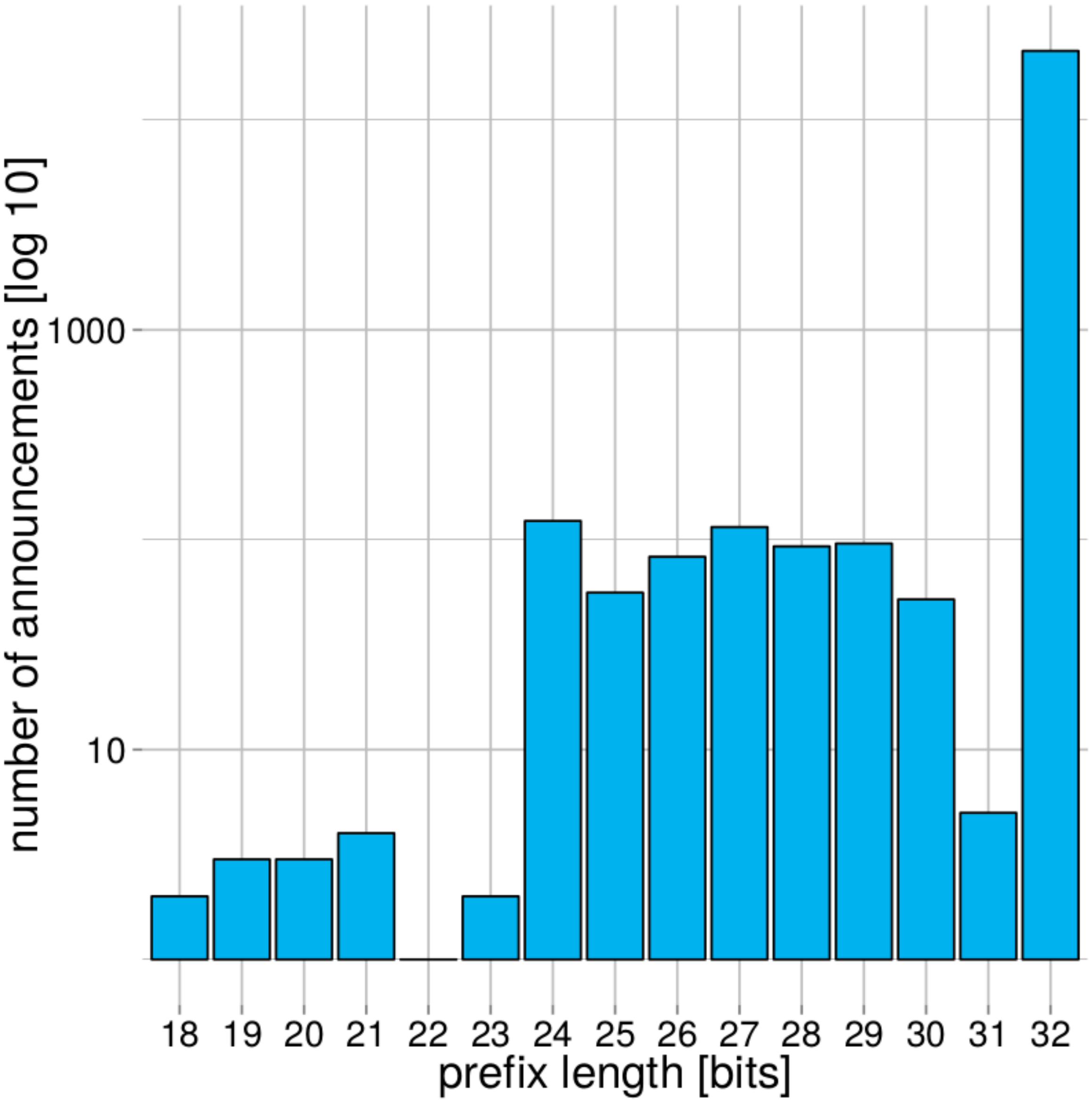
Blackholing Usage Analysis – New Announcements



- High variance in new announcements
- Spikey less specifics (/31 - /18)
- Blackholing is indeed widely used!
- **But which prefix sizes?**

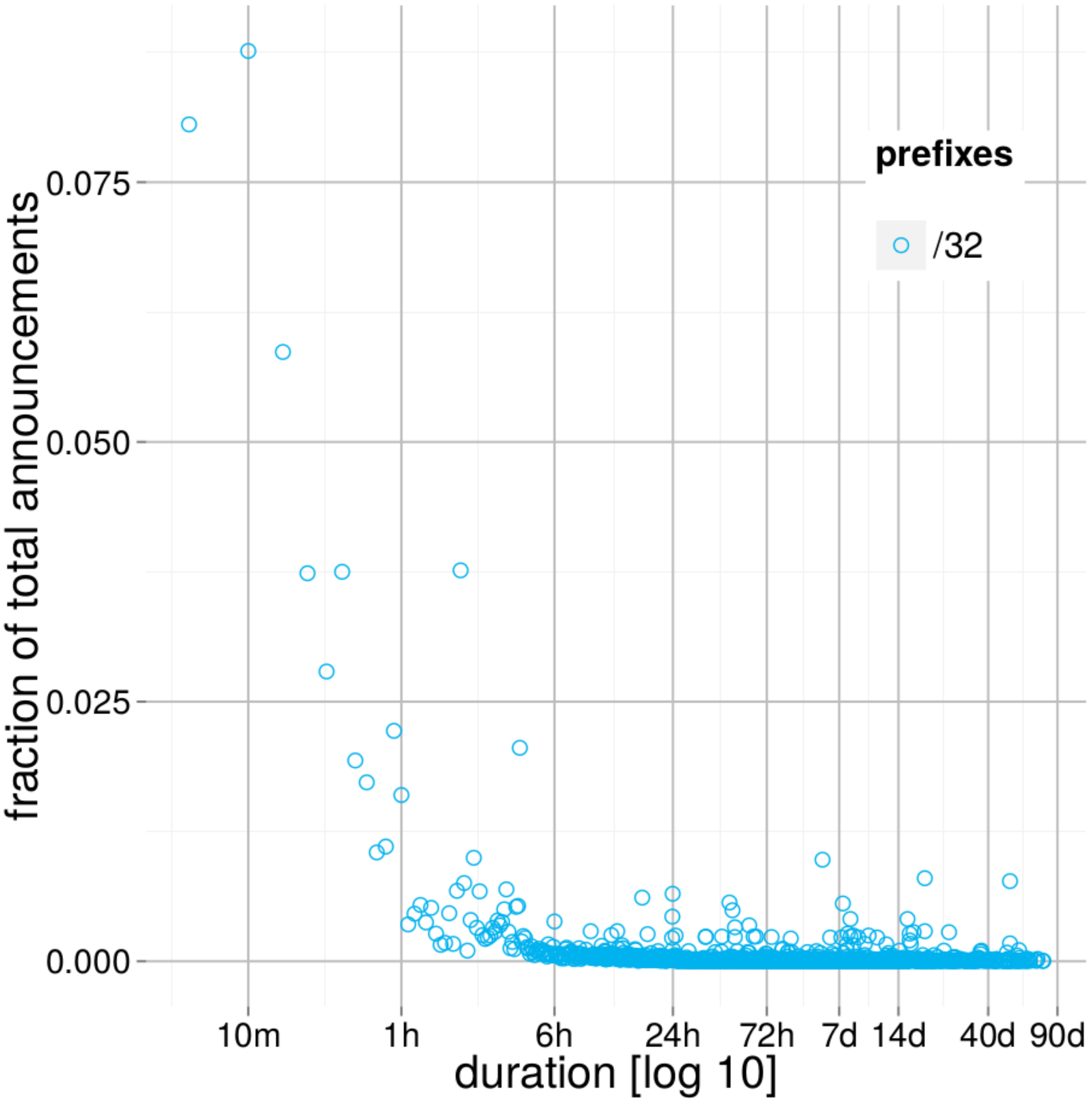
Blackholing Usage Analysis – Prefix Length

- Mainly /32 announcements (97%)
- /24 - /31 account for 2.5%
- 9 announcements for < /24
- More specific acceptance needed
- **Announced for how long?**



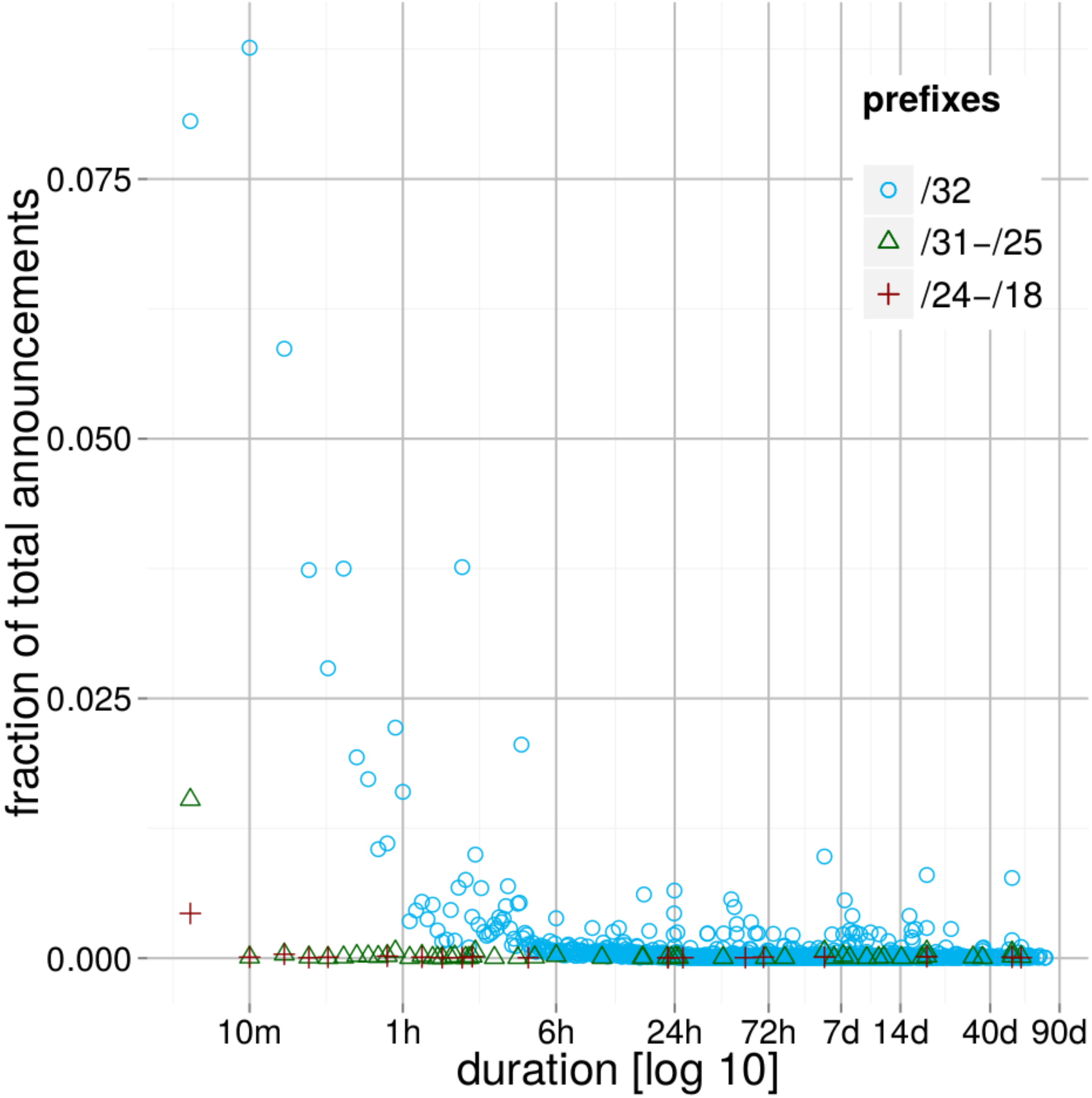
Blackholing Usage Analysis – Active Duration

- Active duration per prefix (/32)
- Majority is short-lived (~50% <= 3 hours)
- Longest observed announcement 76.31 days



Blackholing Usage Analysis – Active Duration

- Majority is short-lived
- Also very long living announcements
- **Could be the same prefix?!**

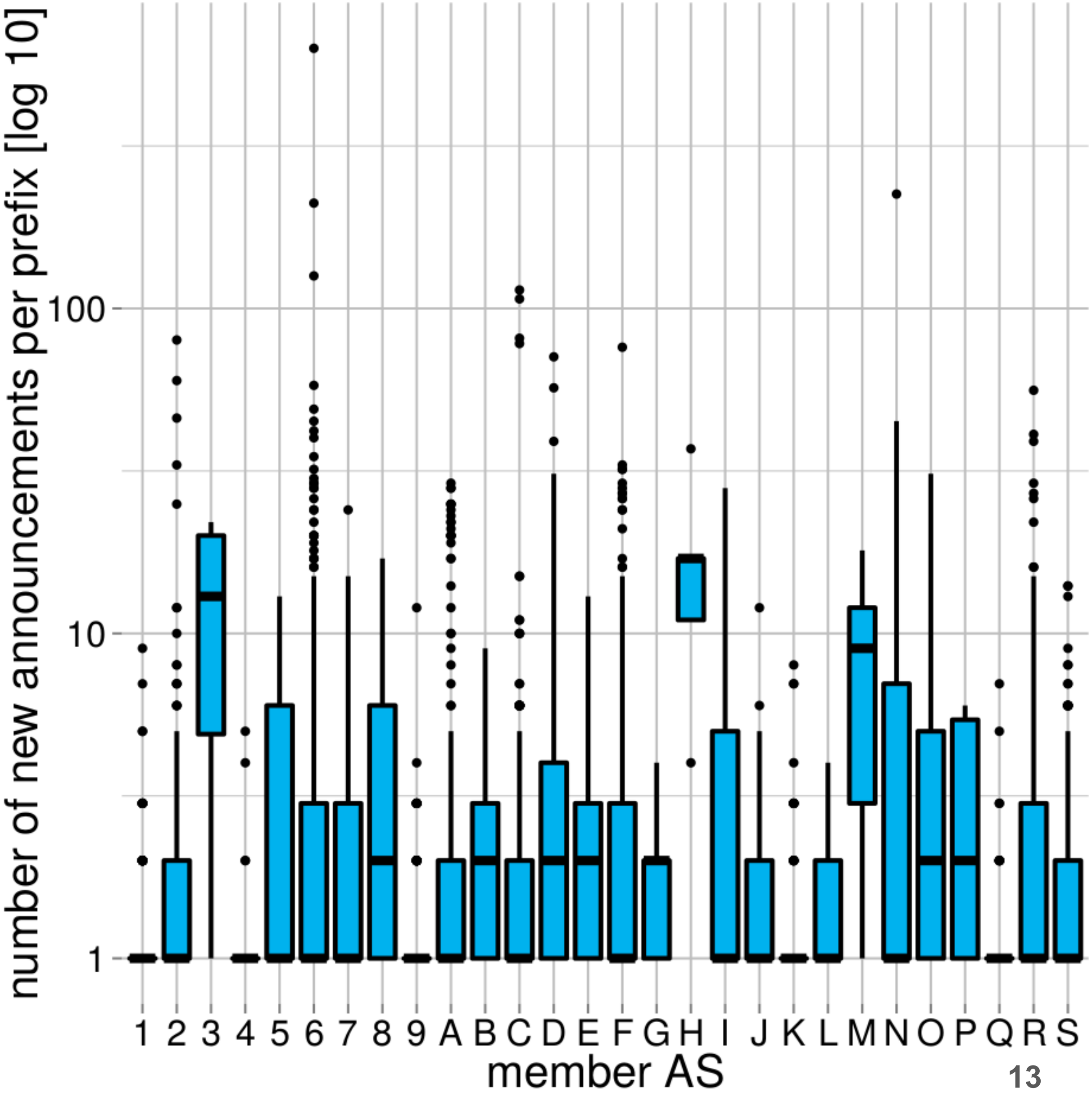


Blackholing Usage Analysis – Re-Announcements per Prefix

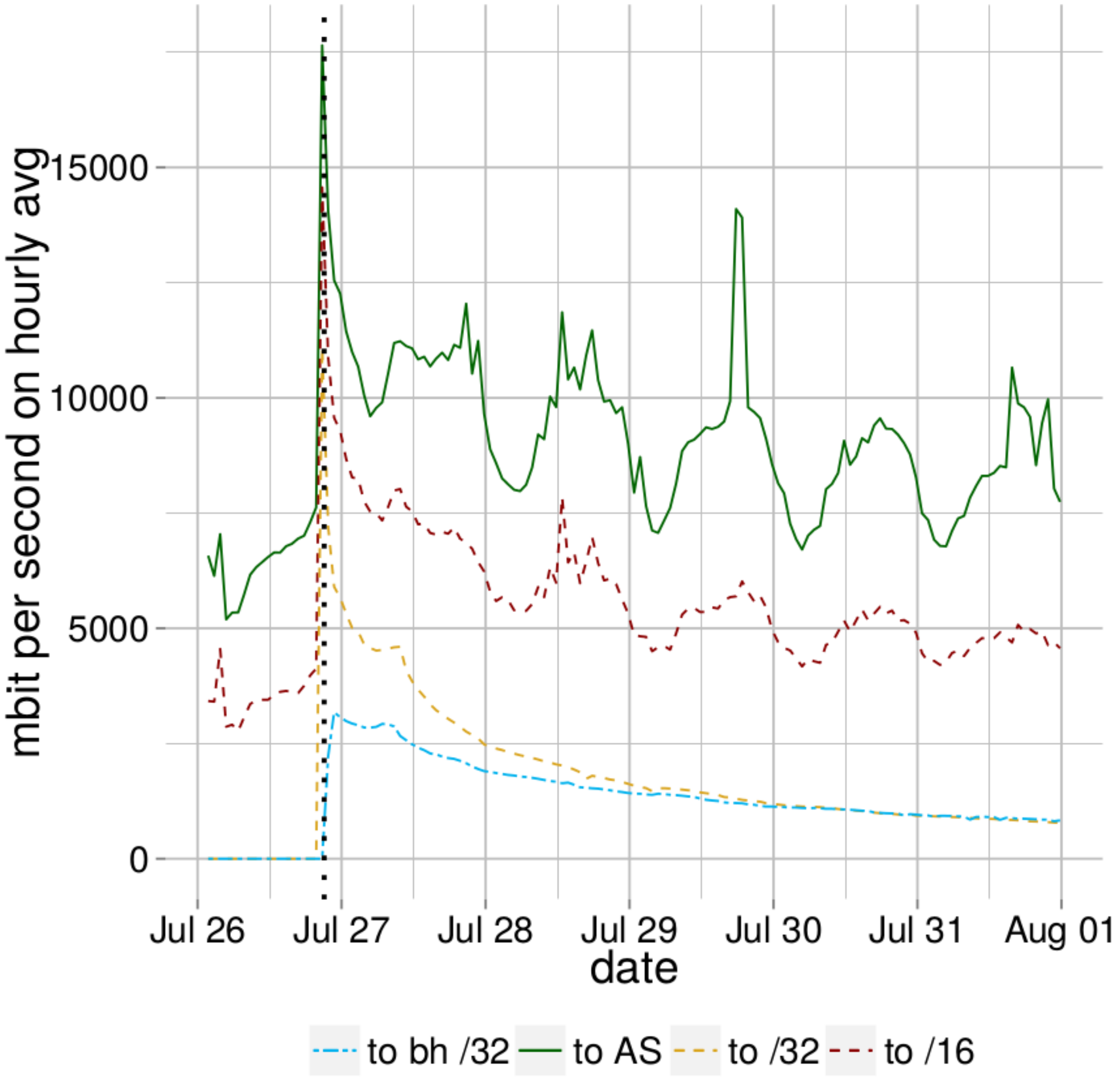
- 7,864 unique prefixes

- Most prefixes announced once (10%), or between two and three times (15%)

- Outliers spread from 10 to 100, max 623



Case Study - Impact on Traffic

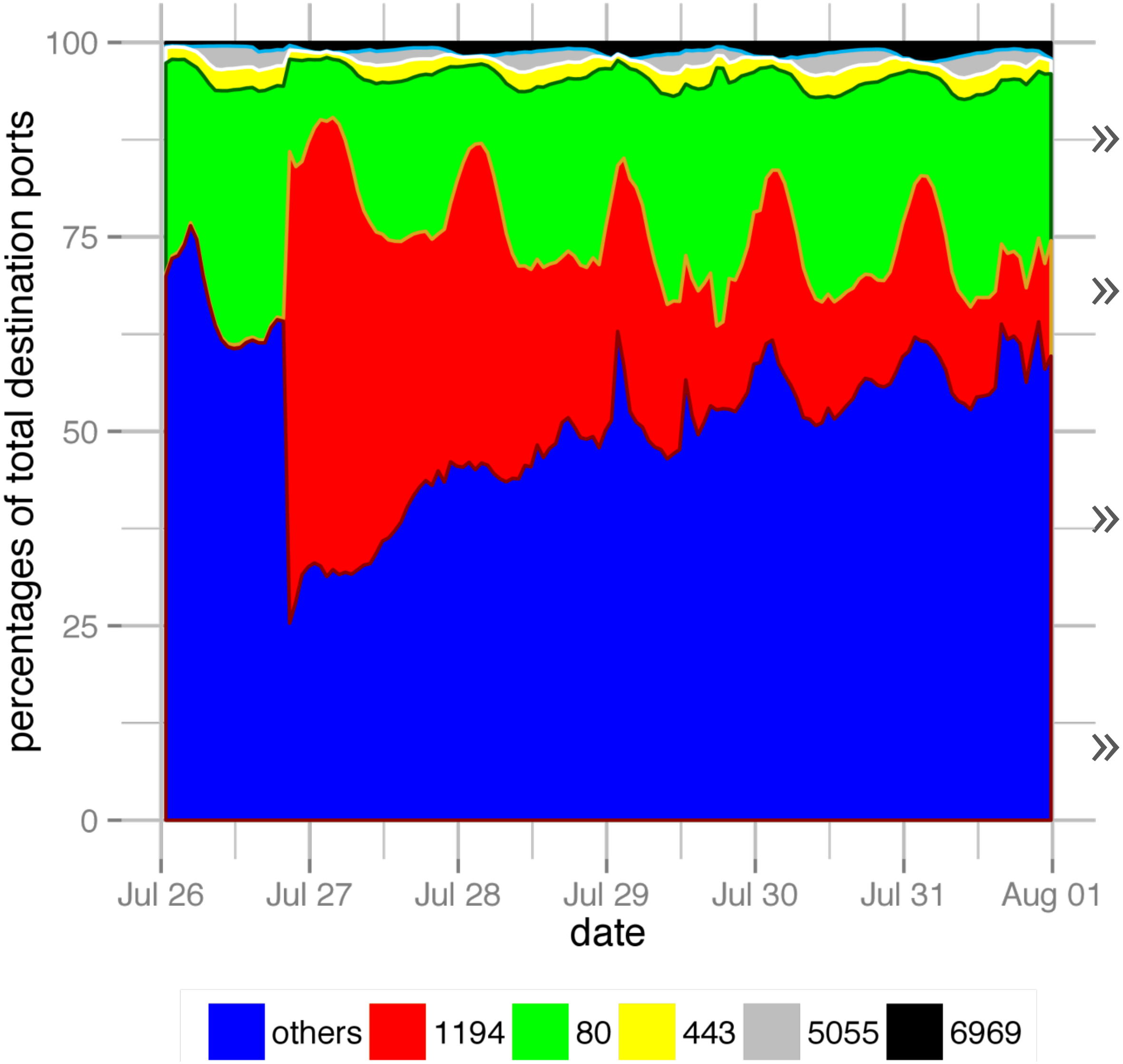


» Traffic for one /32

» Traffic rises up to 17.6 Gbit/s

» Traffic is reduced by one third

Case Study - Impact on Traffic



- Effectiveness indicator
- Port mix of customer port traffic
- Port 1194 (OpenVPN) share increases to ~50%
- Blackhole takes effect, port mix converges to initial distribution

Summary

» 23,000 announced blackholes (over a three month period)

» Stable number of 1200 active blackholes

» Observed least specific was a /18

» Very diverse announcement patterns (frequency, duration, …)

» Succeeds in mitigating large DDoS attacks

Full paper at http://www.net.t-labs.tu-berlin.de/papers/DFK-BIXPO-16.pdf

Future Work

- Acceptance of /32 blackholing announcements
- Standardized triggering
- Blackholing traffic monitoring
- Fine-grained blackholing

Security Considerations

- BGP communities can be altered (RPKI/BGPSec won’t help)
  - Strict filtering [RFC7454]
- DDoS attack through blackholing?
  - Strict filtering [RFC7454]
- Resource exhaustion attack against router
  - No known defense

Standardized Triggering of Blackholing

- Well-defined community for triggering blackholing
- First version of Internet Draft available [2]
- Extended beyond IXPs and more Operational Recommendations added
- Will become RFC status this year

[2] https://tools.ietf.org/html/draft-ymbk-grow-blackholing-01

Comments? Questions?

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