Blackholing at IXPs

DDoS Mitigation at the Core of the Internet

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How does Blackholing Work?
The Problem: Massive DDoS Attack

If an IXP customer is hit by a massive DDoS attack its port can get congested and impact legitimate traffic.
A Solution: Blackholing

For the IP prefix for which a blackholing is triggered all traffic is discarded at the IXP. Traffic for other IP prefixes gets through without any congestion.
IXP: What is Needed

1. The IXP operator selects an IP address from the Peering LAN as Blackhole IP address (e.g. 80.81.193.66)
2. The IXP operator selects a MAC address as Blackhole MAC address (e.g. de:ad:be:ef:66:95)
3. IXP operator sets up a server that provides ARP responses to the Blackhole IP address
4. IXP operator installs ACL filters on customer ports to drop all traffic with destination Blackhole MAC address
5. IXP operator updates the configuration of the route server to allow next hops to be the Blackhole IP address (and self)
Using Blackholing at an IXP
Customer: How to Trigger a Blackhole

» The customer announces the IP prefix under attack with the next hop IP address set to the blackhole IP address
» Blackholing works with bi-lateral and multi-lateral (route server) peerings
» Limited acceptance of /32 IP prefixes. < /24 is preferred.
» Route server: policy control to whitelist/blacklist a particular ASN can be used
Usage Statistics at DE-CIX Frankfurt
Number of ASNs (≈ Customers)

![Graph showing the number of ASNs over time.

- The y-axis represents the number of ASes.
- The x-axis represents the dates from Jan 01 to März 01.
- The graph shows fluctuations in the number of ASNs across the months, with a significant peak in February.]
Number of Prefixes Blackholed

Number of new announcements

Date:
- Dez 01
- Dez 15
- Jan 01
- Jan 15
- Feb 01
- Feb 15
- Mär 01
New Developments
Well-Known BGP Community for Blackholing

» Currently, many IXPs provide the blackholing feature
» Triggering is implemented differently at different IXPs (e.g. BGP community, next hop IP address)
» A commonly agreed trigger is preferred: Well-known BGP community for blackholing
» All IXPs offering the blackholing feature voted on the Euro-IX tech mailing list for: 65535:666
» An Internet Draft is currently coined – support is highly appreciated
  » draft-ymbk-grow-blackholing-00
How to monitor state changes of DDoS attack traffic if the traffic is discarded by an active blackhole? Current situation: switching on and off blackholing is a sup-optimal solution.

DE-CIX started a research project on DDoS state change notification by analyzing IPFIX data from blackholed traffic

Customer will be notified by mail/API if the DDoS traffic characteristics for their blackhole changes
BGP-ACL

» Why limiting blackholing to IP prefixes?
» Why not providing a mechanism to customers to control certain types on ACLs on the IXP-side?
» Idea: define BGP communities (or other API) to trigger blackholing depending on
  » Source and destination MAC address
  » Source and destination IP address
  » Source and destination TCP/UDP port
» BoF during RIPE 68 about this idea
» Current state: Implementing this with existing gear does not scale
Thank you!

Any Questions?

Visit: de-cix.net → Products & Services → Blackholing

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