RIPE NCC Days Sofia, 28 June 2023

RIPE NCC

RIPE NETWORK COORDINATION CENTRE

BIX

QoS and DDoS mitigation in IXP

Quality of Service

Different traffic treatment for different services

- **Best-effort** - default
- **Assured forwarding** - reserved bandwidth
- **Expedited forwarding** - low latency (priority)
- **Network Control** - priority and reserved bandwidth

Input **classification** and output **queueing**

What it has to do in neutral IXP infrastructure

QoS on Peering only Member port

Output Queueing

Best effort for everything
Network Control for BGP (and ARP)

QoS on Peering + Multicast

Multicast is used for real-time Audio/Video transport
Highly sensitive for packet loss and variable delay (jitter)

Output Queueing

Best effort for Peering
Network Control for BGP
Expedited forwarding for Multicast

QoS on Multi-service Member port

Private VLANs normally carry more important traffic than peering

Output Queueing

Best effort for Peering
Network Control for BGP
Expedited forwarding for Multicast
Assured forwarding for Private VLANs

QoS with DDoS mitigation

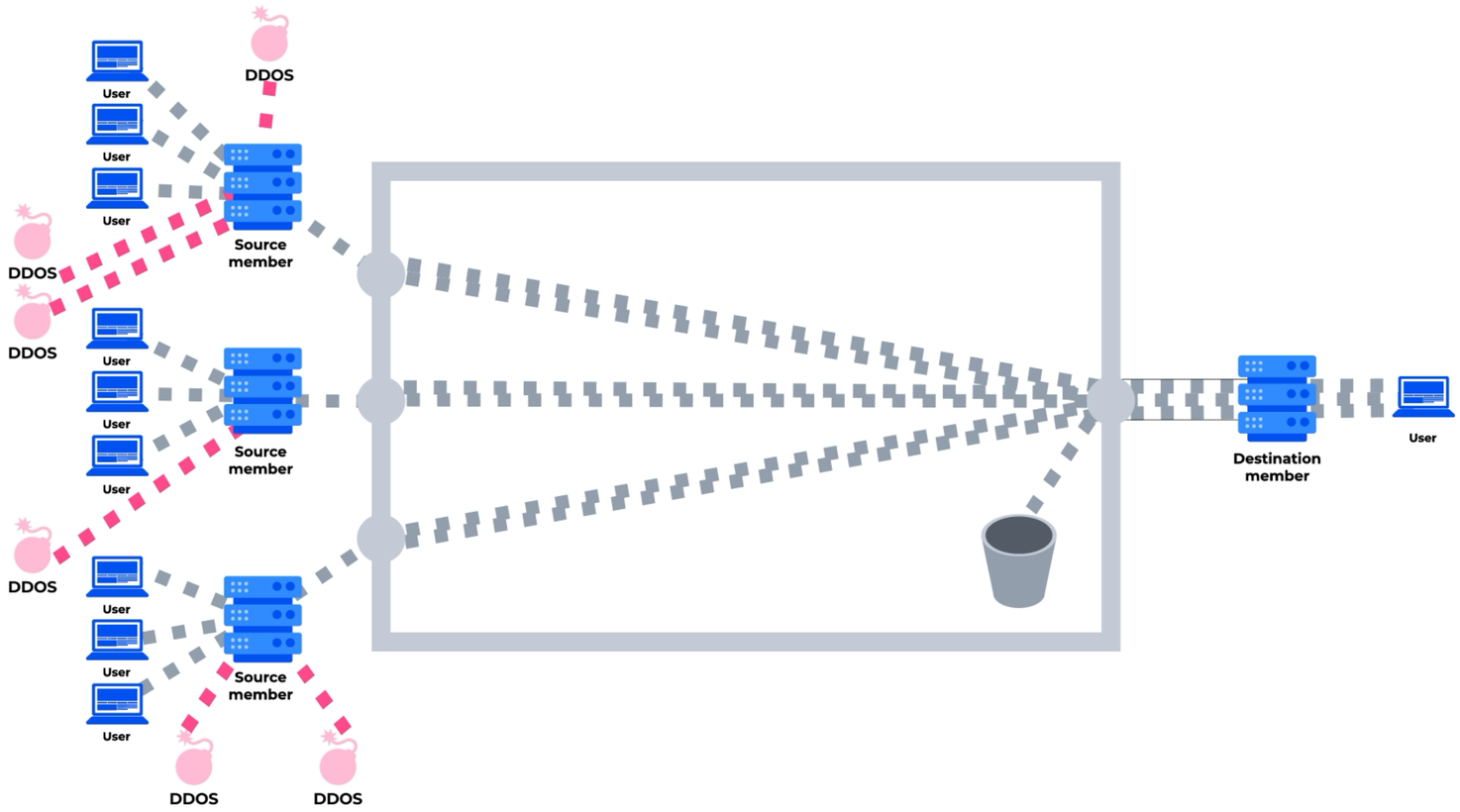
Reserve zero bandwidth for possible DDoS traffic

Output Queueing

Best effort for possible DDoS
Assured forwarding for other Peering
Network Control for BGP

Expedited forwarding for Multicast
Assured forwarding for Private VLANs

Congestions on Member ports



- Routing change
  - policy
  - public peering as backup of private peering
- Increased traffic
  - live events
  - software updates
- DDoS attacks

Detecting Congestion Cause

SFlow / Port Mirroring

PMacct
ElasticSearch
Zabbix

DDoS Attacks

Low-and-Slow DDoS attack
protocol and application layer

High packet rate DDoS attacks

TCP syn, DNS, HTTP/S
spoofed traffic

Solutions: hardware/software solutions, BCP.38

Volumetric DDoS attack
overflow transport links to the victim

Amplification
Bot networks

DDoS Patterns

Application	Protocol	Port
Invalid	UDP	0
Chargen	UDP	19
DNS	UDP	53
NTP	UDP	123
SNMP	UDP	161
U Discovery	UDP	10001
Memcache	UDP	11211
SSDP	UDP	19000

Amplification

- Request from spoofed IP address of the victim
- Large response to target

Most attacks last less than 2 minutes
Multiple protocols

DNS DDoS attacks

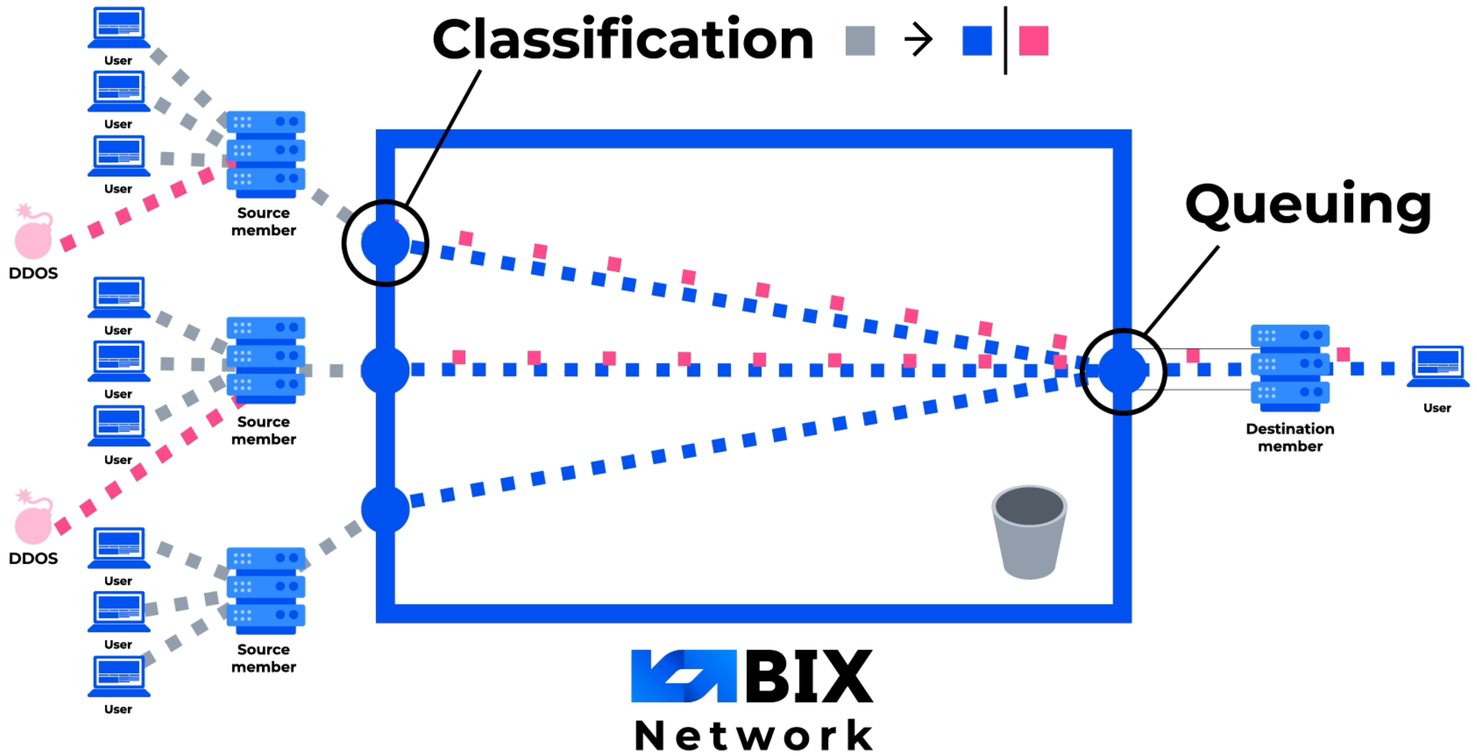
DNS is important but low bandwidth traffic
(Less than 10 Mbps on whole IXP)
Multiple Gbps during attack

Solution: Policing

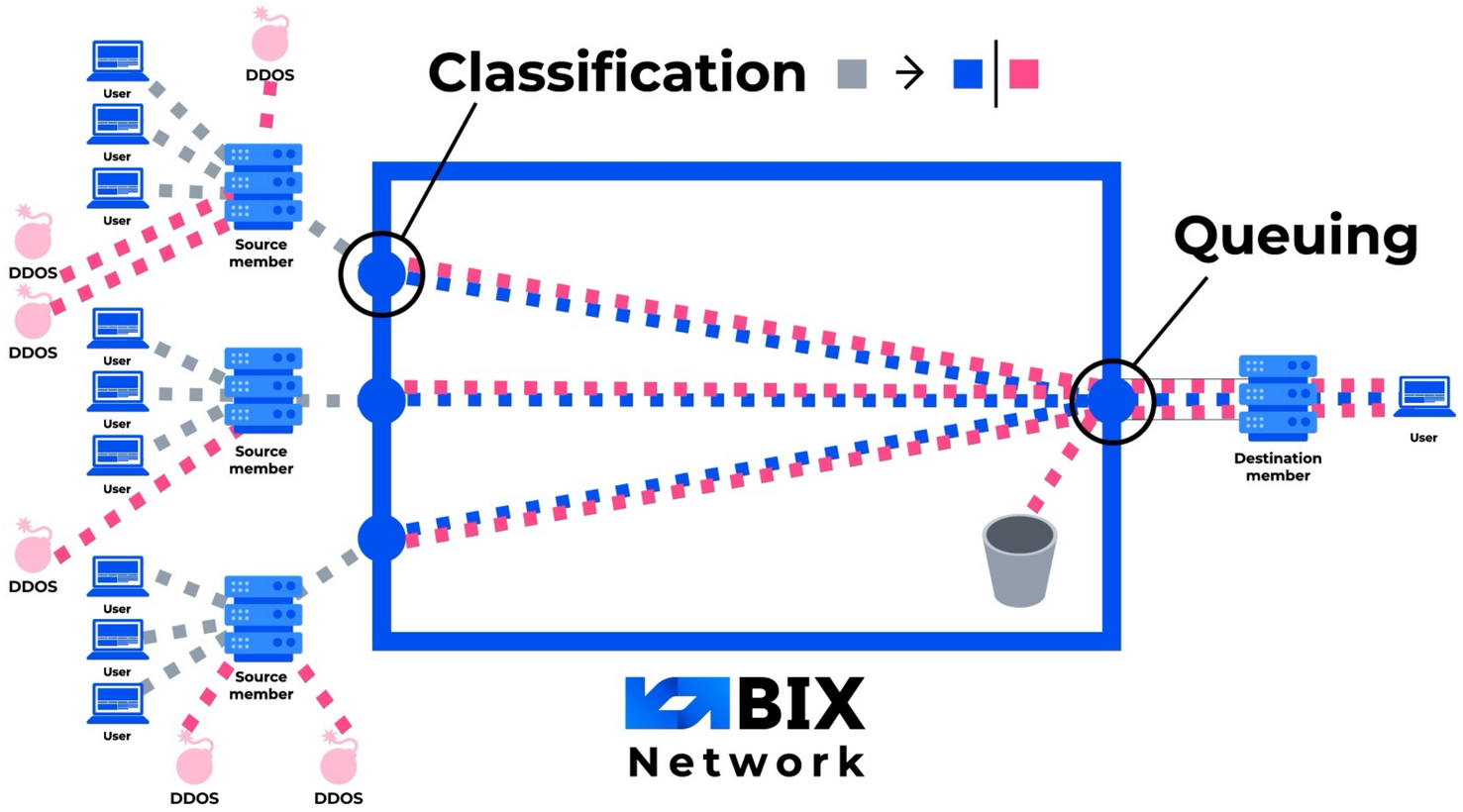
Classify UDP with source 53 exceeding 50 Mbps on all ports as potential DDoS

Same solution for other patterns

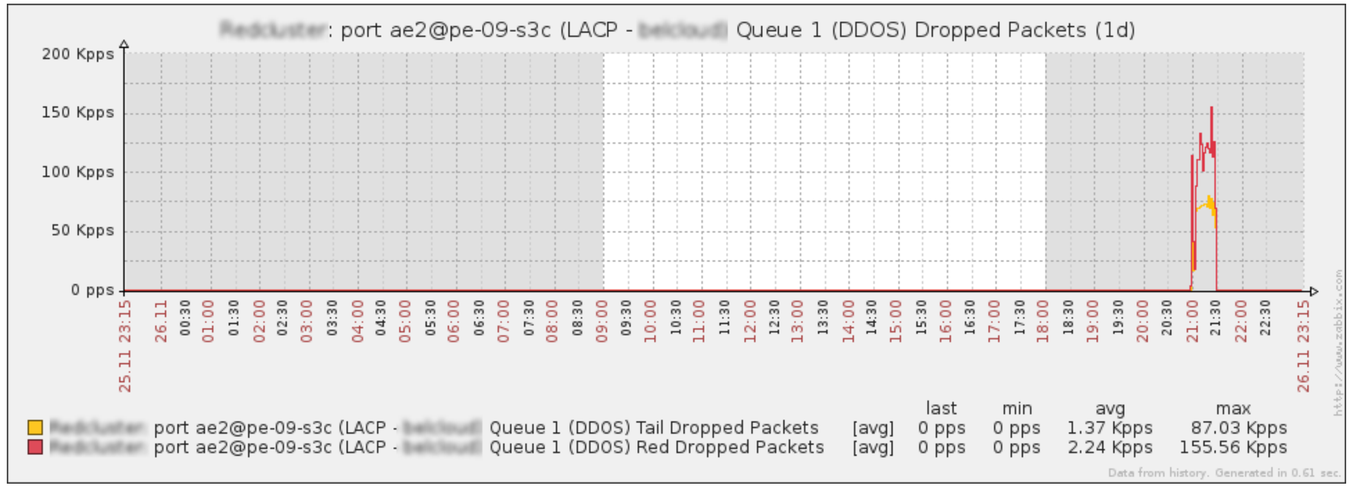
DDoS attack w/o congestion



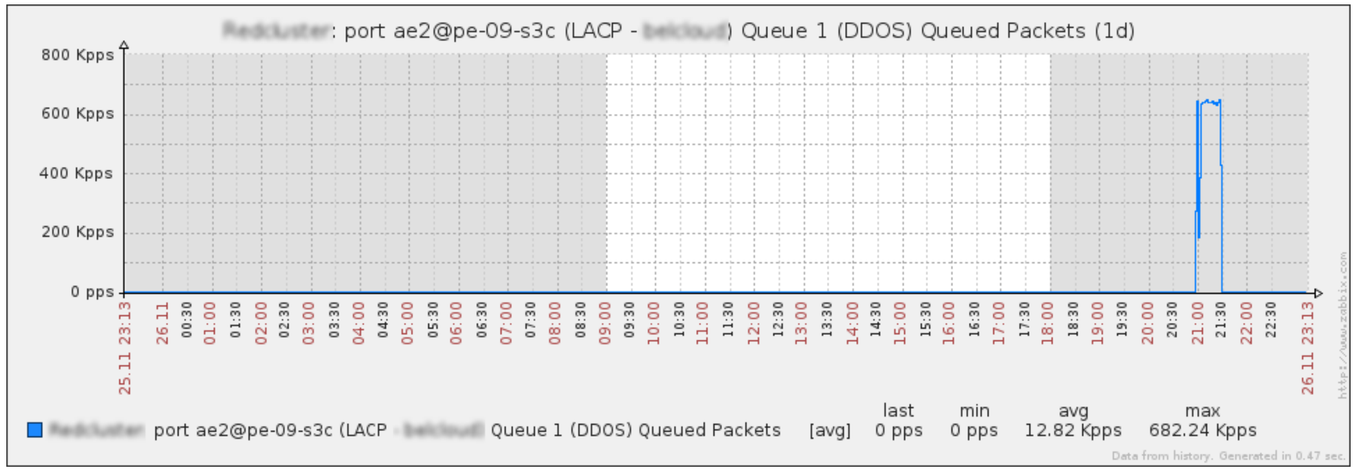
DDoS attack causing congestion



Real Attack in Monitoring

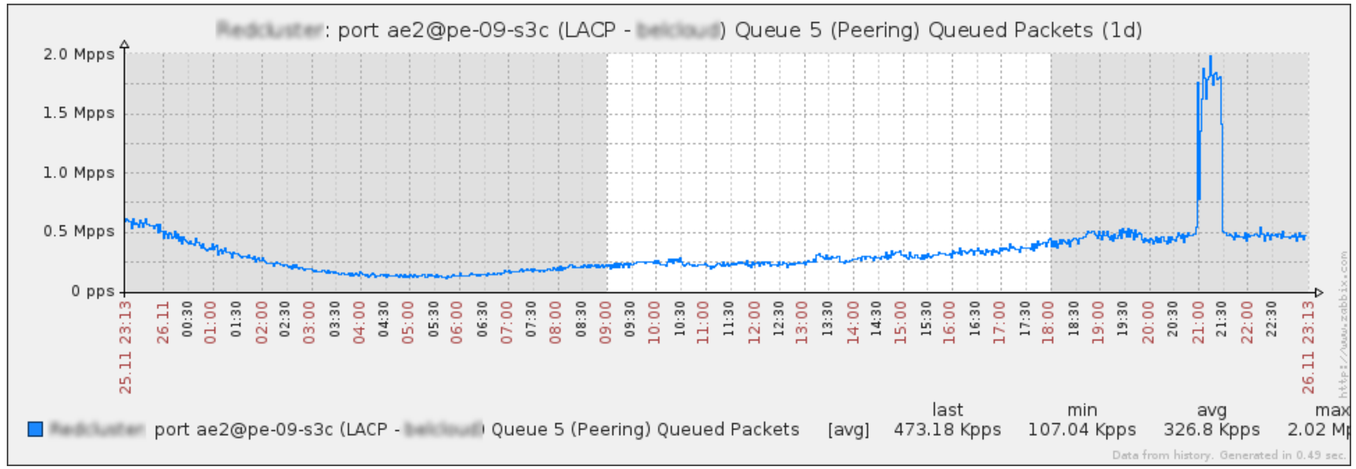


DDoS Queue
Dropped in pps

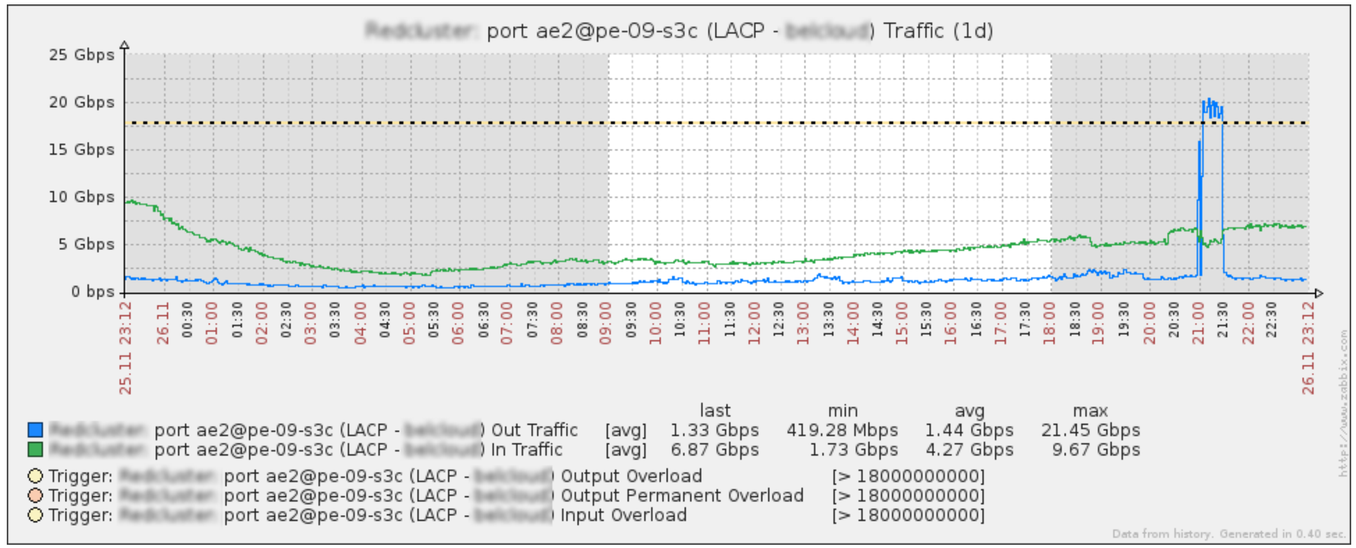


DDoS Queue
Queued in pps

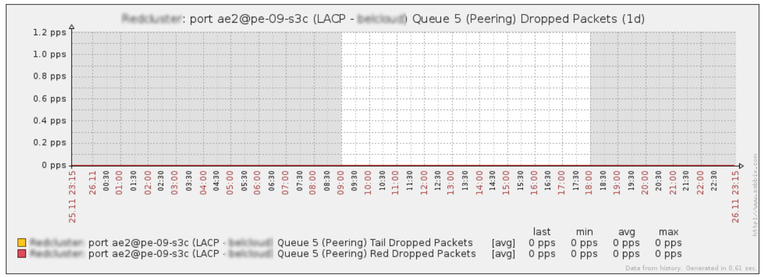
Real Attack in Monitoring



Peering Queue
Queued in pps



Peering Queue
traffic in Gbps



Peering Queue
Dropped in pps - 0

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DDoS Solution

Pros & Cons

DDoS solution pros

- Always on, works for shot time frame attacks
- Whole network protected, including core links
- Dot1p mark on output traffic

DDoS solution cons

- Minimal possibility for classifying useful traffic as DDoS
- Zero-day DDoS Attacks
- Output Queue on Reseller ports (Applied on port not VLAN)
- Remote Peering Ports with lower speed than port speed

DDoS solution future development Ideas

- Whitelisting
- Calculate IP Address reputation
- Per-VLAN queueing on Carrier/Reseller ports
- Port speed shaping (Member configured in my.bix.bg)

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Thank you!

Q&A

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