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Use Cases for DDoS Open Threat Signaling (DOTS) Telemetry
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Abstract

DOTS Telemetry enriches base DOTS protocol to assist the mitigator to perform efficient DDoS attack mitigation techniques in the network. This document presents sample use cases for DOTS telemetry: what components are deployed in the network, how they collaborate, and what information is exchanged to perform the techniques.

Status of This Memo

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1. Introduction

Denial-of-Service (DDoS) attacks such as volumetric attacks or resource consumption attacks are critical threats to be handled by service providers. When such DDoS attacks occur, service providers have to mitigate them immediately to protect or recover their services.

Therefore, for the service providers to immediately protect their network services from DDoS attacks, DDoS mitigation needs to be automated. To automate DDoS attack mitigation, it is desirable that multi-vendor elements involved in DDoS attack detection and mitigation collaborate and support standard interfaces to communicate.

DDoS Open Threat Signaling (DOTS) is a set of protocols for real-time signaling, threat-handling requests, and data filtering between the multi-vendor elements. Furthermore, DOTS Telemetry enriches the DOTS protocol with various telemetry attributes allowing optimal DDoS attack mitigation. This document presents sample use cases for DOTS telemetry: what components are deployed in the network, how they collaborate, and what information is exchanged to perform the attack mitigation techniques.

2. Terminology

The readers should be familiar with the terms defined in brabra

In addition, this document makes use of the following terms:

brabra: brabra

3. Use Cases

This section describes DOTS Telemetry use cases use attributes included in DOTS telemetry spec.

3.1. DDoS Mitigation Based on Attack Traffic Bandwidth

3.1.1. Mitigating Attack Flow of Top-talker Preferentially

Large-scale DDoS attack such as amplification attack often occurs in the world these days. On the other hand, many transit providers have to mitigate the large-scale DDoS attack using DMS with limited resources, which is already deployed in their network.

The aim of this use case is to enable the transit providers to use their DMS efficiently under volume-based DDoS attacks whose bandwidth is more than the available capacity of the DMS. To perform it, attack traffics of top talkers are redirected to their DMS preferentially by collaborating forwarding nodes, flow collectors and orchestrators.

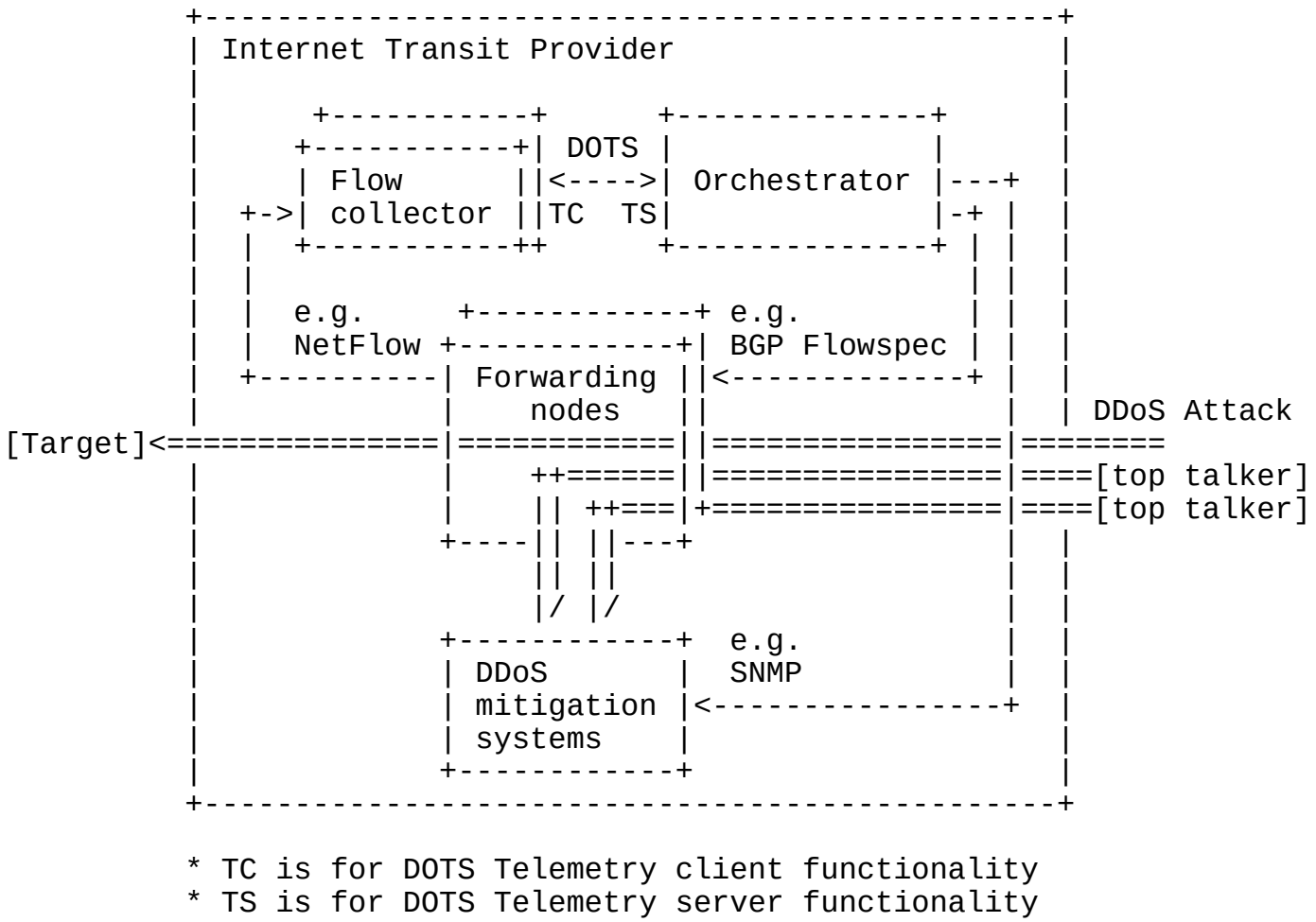


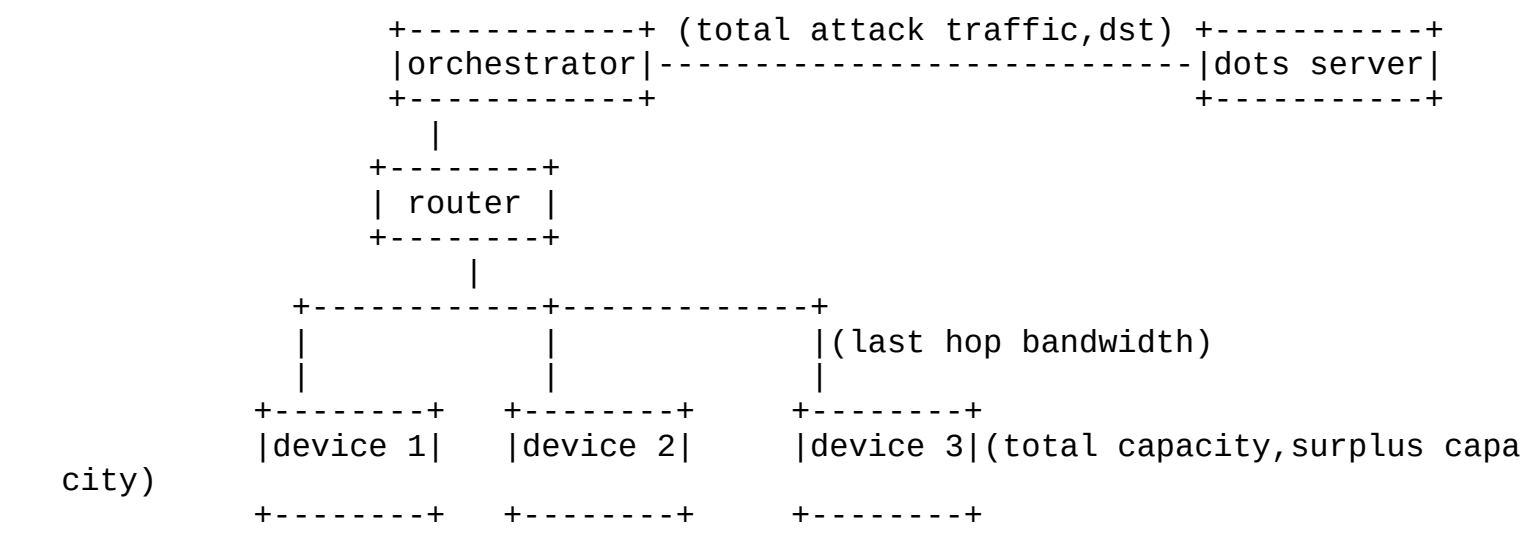
Figure 1: Mitigating DDoS Attack Flow of Top-talker Preferentially

Figure 1 shows the abstract of the use case. In the use case, the forwarding nodes send statistics of traffic flow to the flow collectors by using monitoring functions such as NetFlow. When DDoS attacks occur, the flow collectors detect attack traffic and send (src_ip, dst_ip, bandwidth)-tuple information of the top talker to the orchestrator. Then, the orchestrator checks the available capacity of DMS. After that, the orchestrator orders forwarding nodes to redirect the top taker’s traffic to the DMS as much as possible by dissemination of flow specification rules protocols such as BGP Flowspec.

In this case, the flow collector implements a DOTS telemetry client while the orchestrator implements a DOTS server.

3.1.2. Selecting Available DMS

Usually, DDoS attack mitigation providers have a number of ddos clean devices which up to the capability of service, ddos clean device can exists in both individual and clustered forms that based on the network requirements, we can all identify it as a DMS, each DMS has three attributes: total capacity, surplus capacity, the last hop bandwidth. When ddos attack occurs, DOTS telemetry carries the value of total attack traffic, orchestrator based on the total attack traffic, and each DMS's triad parameters to select the optimal DMS for mitigation. How to make the decision of DMS will be based on the first principle that operate fast and efficiently, and the detail algorithm is out of scope, this scenario is suitable for scenarios that are sensitive to the processing capabilities of the DMS.



3.1.3. Selecting Best Path for Redirection

Choosing the appropriate path for traffic redirection can also based on the total attack traffic and total pipe capability, but only internet service providers have the ability to know the overall load capacity of each physical paths and load limitation. ISP has many DMS and they are deployed according to the administrative division. After the ddos attack traffic are redirected to the DMS, DMS can perform cleaning operation and inject the normal service flow back. From the perspective of network load management, how to select the bast way to redirect requires the calculation on total attack traffic(TAT),total traffic(TT) and total pipe capability(TPC).

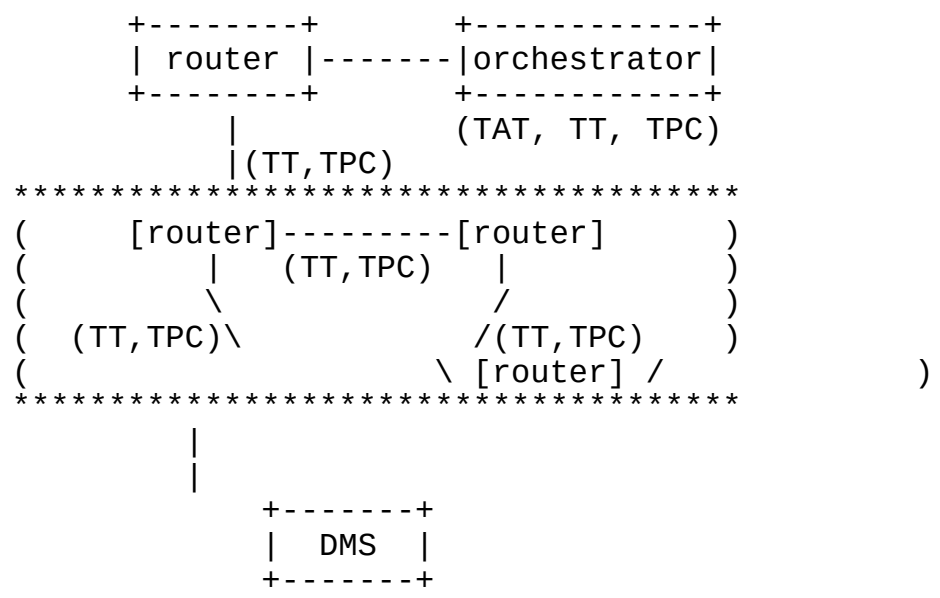


Figure 2:

3.1.4. Offloading Extream Volumetric Attack Flow

NOTES: China Mobile Use Case will be described by Meiling? (Describe Motivation, what componets are deployed in the network, how they collaborate, and what information are exchanged to perform the use case) https://datatracker.ietf.org/meeting/104/materials/slides-104-dots-attack-bandwidth-and-attack-type-expansion-01.pdf p.4

3.2. DDoS Mitigation Based on Attack Type

3.2.1. Selecting Mitigation Technique

Some volumetric attacks such as amplification attack can be detected with high accuracy by checking layer 3 or layer 4 information of attack packets. These attacks can be detected and mitigated by collaborating forwarding nodes and flow collectors using NetFlow. On the other hand, it is necessary to inspect layer 7 information of attack packets to detect some attacks such as DNS Water Torture Attack. These attacks traffic should be detected and mitigated at DMS.

Aim of this use case is to enable the transit providers to select mitigation technique based on the type of attack traffic: amplification attack or not. To perform it, attack traffic is blocked at forwarding nodes or redirected to DMS base on attack type by collaborating forwarding nodes, flow collectors and an orchestrator.

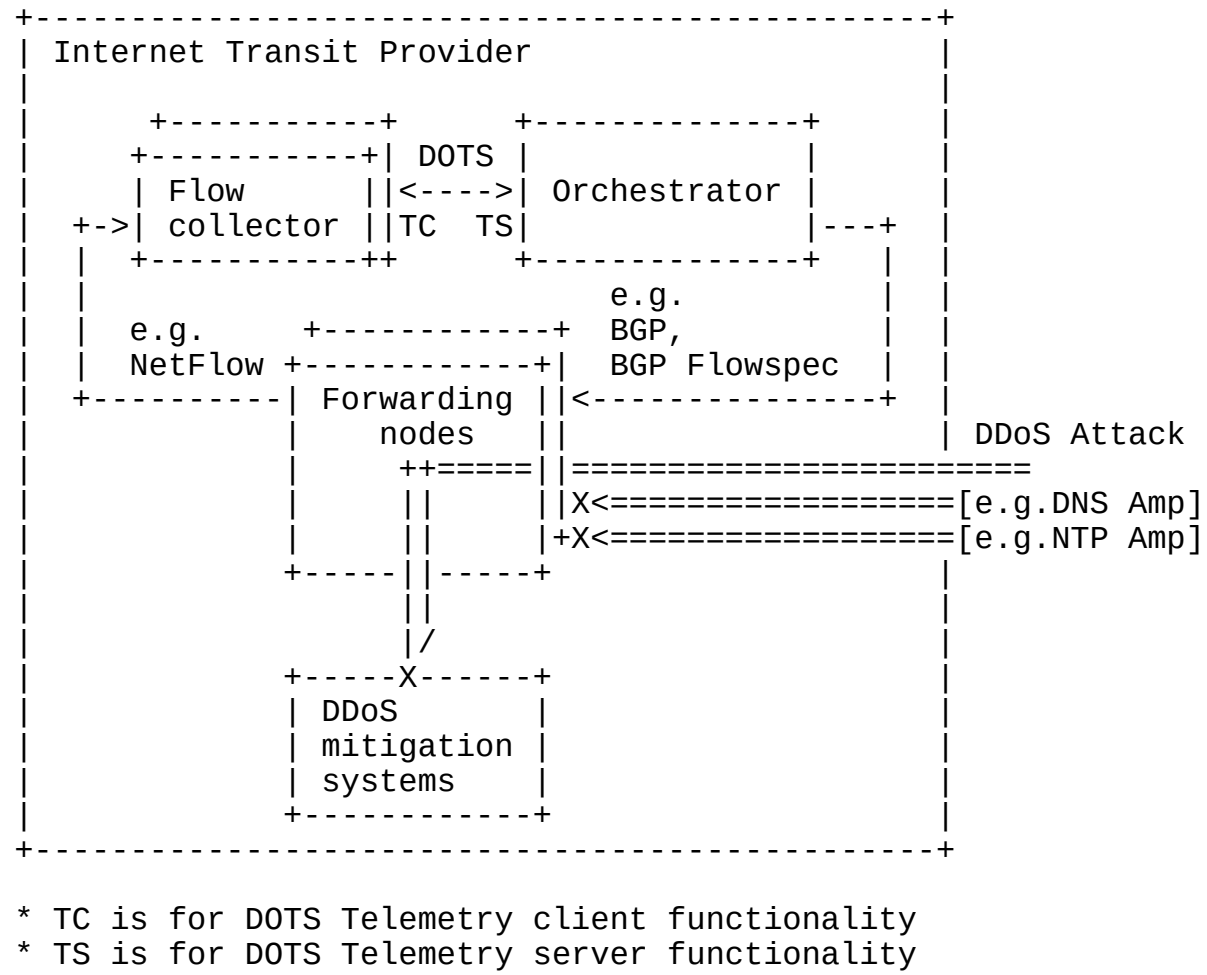


Figure 3: DDoS Mitigation Based on Attack Type

Figure 3 shows the abstract of the use case. In the use case, the forwarding nodes send statistics of traffic flow to the flow collectors by using monitoring function such as NetFlow. When DDoS attacks occur, the flow collectors detect attack traffic and send (dst_ip, src_port, attack_type)-tuple information to the orchestrator. Then, the orchestrator orders forwarding nodes to block (dst_ip, src_port)-tuple flow of amp attack traffic by dissemination of flow specification rules protocols such as BGP Flowspec. On the other hand, the orchestrator orders forwarding nodes to redirect other than the amp attack traffic by routing protocol such as BGP.

In this case, the flow collector implements a DOTS telemetry client while the orchestrator implements a DOTS server.

3.2.2. Selecting Available DMS

NOTES: China Mobile Use Case will be described by Meiling? (Describe Motivation, what componets are deployed in the network, how they collaborate, and what information are exchanged to perform the use case) https://datatracker.ietf.org/meeting/104/materials/slides-104-dots-attack-bandwidth-and-attack-type-expansion-01.pdf p.6

3.3. DDoS Detection Support Using Machine Learning

DDoS detection based on flow monitoring such as NetFlow is a lighter weight way to detect DDoS attacks than DMS in the internet transit provider network. On the other hand, DDoS detection based on DMS is a more accurate way to detect DDoS attacks than flow monitoring.

Aim of this use case is that the flow collector raises their detection accuracy performance carrying out supervised machine learning techniques based on the detection result of DMS. To perform it, forwarding nodes, flow collector and a DMS collaborate.

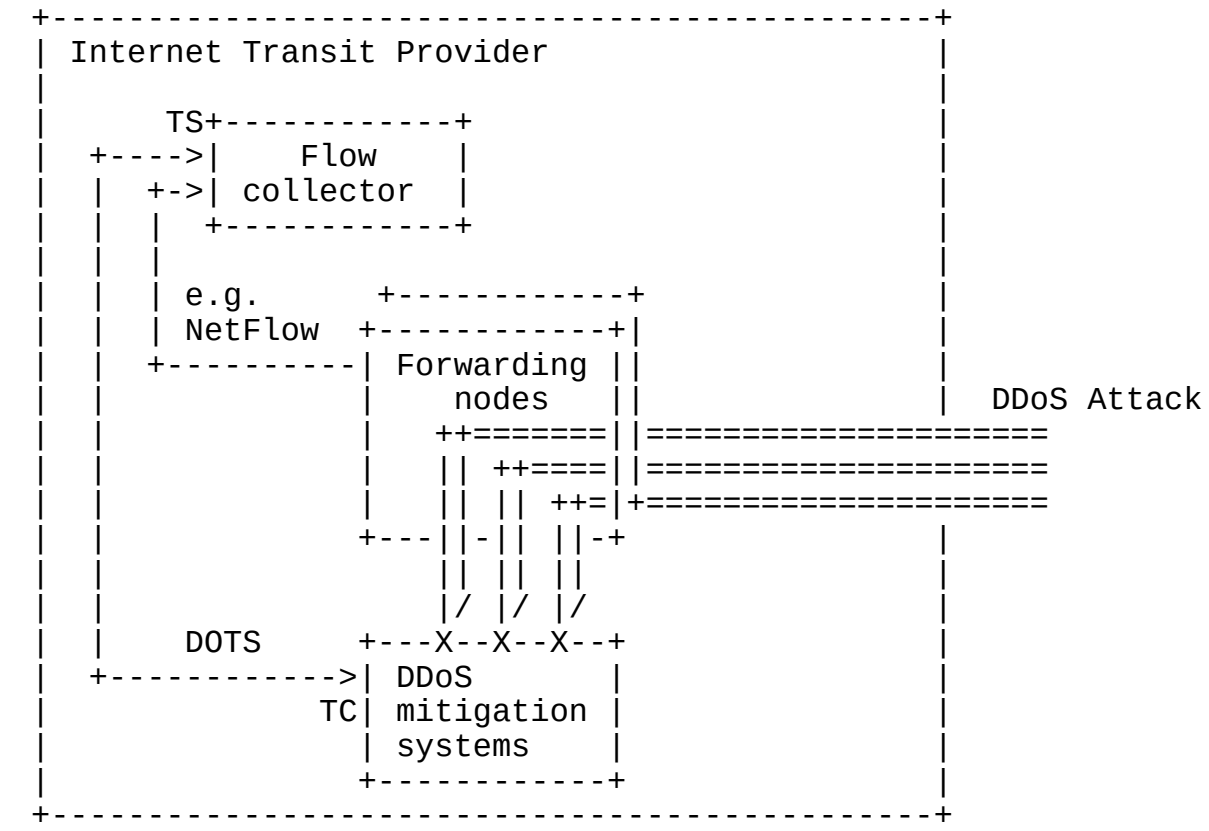


Figure 5: DDoS Detection Support Using Machine Learning

Figure 5 shows the abstract of the use case. In the use case, the forwarding nodes send statistics of traffic flow to the flow collectors by using monitoring functions such as NetFlow. When DDoS attacks occur, DDoS orchestration use case is carried out and mitigate attack traffic at the DMS. Then, DDoS Mitigation system reports (src_ip, dst_ip, src_port, dst_port, attack_type)-tuple information of detected attack traffic to flow collector. Finally, the flow collector attaches teacher label to the NetFlow using the reports, and carry out supervised machine learning and raise their detection accuracy.

In this case, the DMS implements a DOTS telemetry client while the flow collector implements a DOTS server.

4. Security Considerations

The document does not describe any protocol.

5. IANA Considerations

This document does not require any action from IANA.

6. Acknowledgement

The authors would like to thank among others brabra...

7. References

7.1. Normative References

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