NVIDIA DOCA NetFlow Exporter

Reference Application Guide

MLNX-15-060473 _v1.1 | August 2021

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Chapter 1. Introduction

NetFlow is a protocol used for exporting device network flows information to a NetFlow collector. A flow refers to any connection or connection-like communication channel between two communication nodes.

The most common definition of a flow is by a standard 5-tuple.

Using NetFlow requires three network nodes:

- NetFlow exporter – a network device in charge of collecting flow information and exporting it to a flow collector
- NetFlow collector – a server that receives exported flow information
- NetFlow analyzer – an application which runs on the collector and analyzes flow information collected by the flow collector

Using a NetFlow monitoring solution allows monitoring and analyzing these flow records more efficiently and effectively for traffic within the network.

Netflow main use-case:

- Bandwidth utilization and network resource allocation (QoS)

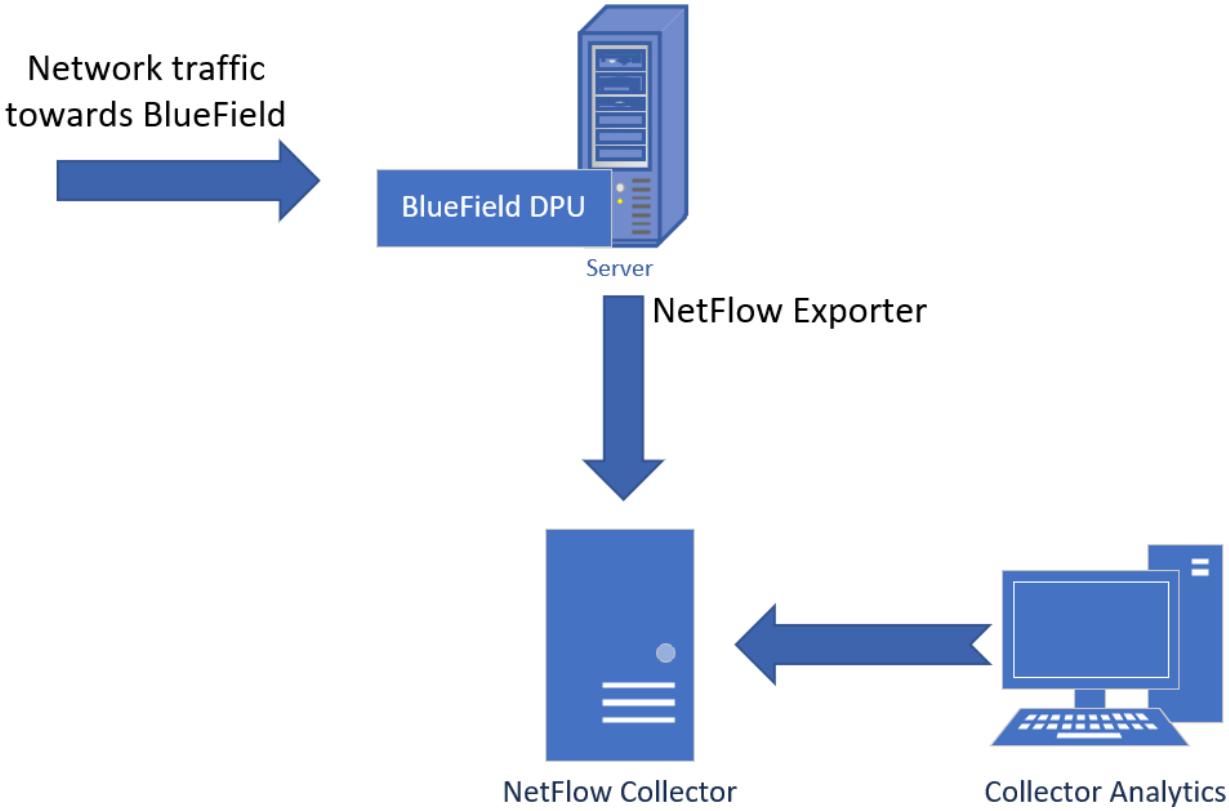
  NetFlow data allows network administrators to view a complete report on traffic which allows them to understand bandwidth consumption, network resource utilization, etc.
- Anomaly-based attack detection

  Flow-based analysis relies on algorithms and behavior rather than signature matching. This gives the flow analyzer the ability to detect attacks before a signature is available.
- Network visibility

  NetFlow provides the ability to drill down into network traffic to see source and destination address and ports, protocol, and more. With this information, it is possible to identify traffic patterns throughout the entire network. Full view of traffic flow allows network operation and security operation teams to monitor when and how often users access applications in the network.

Chapter 2. System Design

The following diagram illustrates NetFlow architecture and nodes:



Chapter 3. Application Architecture

1. Define record struct and template.

   The application must define a TLV NetFlow v9 template. This is done by using `doca_netflow_types.h` defined macros. The order has no significance for the collector but must be maintained for the record struct. The struct should be in packed format without pointers. The app can use the default record struct and template by using structs `doca_netflow_default_record` and `doca_netflow_template_default_get()`.

   The app can use the default record struct and template by using structs `doca_netflow_default_record` and `doca_netflow_template_default_get()`.

2. Initiate NetFlow Exporter.

   Call `doca_netflow_exporter_init()` to initiate the exporter. Pass the configuration file or pass NULL for the default path.

   The configuration file is located by default at `/etc/doca-netflow.conf`. The configutation file should contain:

   - Title – [doca_netflow_conf]
   - Target – the IP and port of the collector (to send the NetFlow records)
   - Source ID – the source ID of the NetFlow exporter (defined by the user) to send alongside the NetFlow records to identify the source of the record
   - Version – 9 (for future development)

   For example:

   ```
   [doca_netflow_conf]
   target = 127.0.0.1:2055
   source_id = 10
   version = 9
   ```

3. Update record information.

   The app should update the flow information with information that extracted from the packets. For information on this process, please refer to the NVIDIA DOCA Application Recognition Reference Guide.

This part should be periodically updated before sending the records.

4. Send records.

   Call `doca_netflow_exporter_send()` to send the records to the collector.

   This function should be periodically called, and must contain all the current active flows or flow-sampled records in that period of time.

5. Destroy.

   Call `doca_netflow_exporter_destroy()` to close the exporter before exiting the application.

The NetFlow example source file shows how to set up the exporter and send an array of record flows to a collector. It contains 2 functions:

- `default_template_example()` – this example uses the default template with the default struct
- `custom_template_example()` – this example creates a custom template that can be altered to meet the application's needs

  For simplicity and generalization, the example sends a static dummy record duplicated over an array of records. This is the part the app that includes the NetFlow lib should supply.

Chapter 4. Configuration Flow

1. Create a new record with a default template.

   Note: It is possible to configure a custom record.

```
struct doca_netflow_default_record record = {
        .src_addr_v4,/* Source IP Address */
        .dst_addr_v4,/* Destination IP Address */
        .next_hop,/* Next hop router's IP Address */
        .input,/* Input interface index */
        .output,/* Output interface index */
        .src_port,/* TCP/UDP source port number or equivalent */
        .dst_port,/* TCP/UDP destination port number or equivalent */
        .tcp_flags,/* Cumulative OR of tcp flags */
        .protocol,/* IP protocol type (for example, TCP = 6, UDP = 17) */
        .tos,/* IP Type-of-Service */
        .src_as,/* originating AS of source address */
        .dst_as,/* originating AS of destination address */
        .src_mask,/* source address prefix mask bits */
        .dst_mask,/* destination address prefix mask bits */
        .d_pkts,/* Packets sent in Duration */
        .d_octets,/* Octets sent in Duration. */
        .first,/* SysUptime at start of flow */
        .last,/* and of last packet of flow */
        .flow_id,/* This identifies a transaction within a connection */
        .application_name /* Name associated with a classification */
        };
```

2. Initialize NetFlow exporter. Run:

```
doca_netflow_exporter_init(file_path);
```

3. Send NetFlow records. Run:

```
doca_netflow_exporter_send(&template, (const void **)(records), records_length,
 &err)
```

Chapter 5. Running Application on BlueField

1. Please refer to the DOCA Installation Guide for details on how to install BlueField related software.
2. To build the application:
   a). Modify the code. Change the "netflow.c" example, the configuration file location, the record to send, the template, etc.
   b). Prepare the configuration file which may be found by default at `/etc/doca_netflow.conf`.
   c). Compile the example. Run:
   ```
   cd /opt/mellanox/doca/examples/netflow/src
   meson /tmp/build
   ninja -C /tmp/build
   ```
3. To run the application, simply run `doca_netflow`.

Chapter 6. References

- `/opt/mellanox/doca/examples/netflow/src/netflow.c`

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