Scalable Flow Monitoring for Data Center Network

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By
Nirmoy Das

School of Computer and Information Sciences
University of Hyderabad
Hyderabad, India

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Chapter 1

Related Work

Flow monitoring protocols like NetFlow[2] and sFlow[3] can provide important information about traffic that passes through a network. However contemporary computer networking is out-spacing out ability to monitor them efficiently. As data centers are getting virtualized with virtual software switches and scaling to thousands of node, it is our immediate requirement to have monitoring system that can scale efficiently. There are few solutions that provide some methods to have scalable flow monitoring in data center networks.

1.1 EMC2[1]

EMC2 is a scalable network wide monitoring service for data centers. EMC2 stays inside host computer to monitor virtual switches. Monitoring at virtual switch is scalable due to its distributed nature.

1.1.1 Architecture

EMC2 is a multi-threaded application that spawns parser thread upon accepting sFlow/NetFlow packets. EMC2 maintains a 2-level in-memory hash table that contains flow records. Layer-3 source and destination address forms Flow-ID that acts as primary key for in-memory hash table. Flow-ID maps to another hash table where timestamp is the key and flow record is value. Flow record contains number of packets, number of bytes and optional path vector.

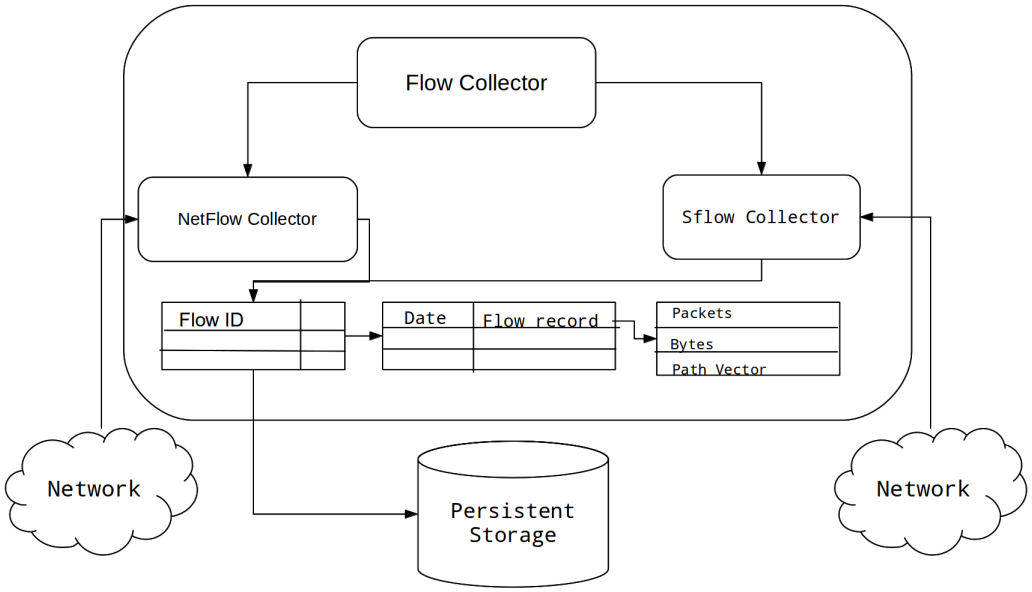

Figure 1.1: Architecture of EMC2.

1.1.2 Deduplication

Deduplication avoids adding of same flow in the flow table reported by multiple Vswitchs for the same flow. EMC2 uses simple heuristics to to detect duplicate flow.

Algorithm 1: Detect Duplicate Flow

```
if flow − ID not exist then
    add flow to the flow table.
    return
else
    if Same exporter then
        update the flow table.
        return
    else
        report duplicate flow.
        update path vector.
        return
    end if
end if
```

1.1.3 Data Rate Prediction in Presence of Sampling

EMC2 predict data rate my multiplying length of the packet with sampling rate given in flow packet. It can also report low sampling rate by accumulating samples from different exported devices.

1.1.4 Advantages and Limitations

Advantages of EMC2 are

- Scalable and distributed monitoring.
- In-memory flow table for fast flow update.

Disadvantages are

- Lack of scalable storage.
- Centralized monitoring will be difficult as it needs to fetch from distributed flats files.

1.2

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