BROADCOM

Product Brief

Flow Tracker

Flow-Based Monitoring for Improved Network and Application Visibility

Key Features

- Advanced Network Monitoring
- Troubleshooting
- Network Forensics
- Bandwidth Monitoring

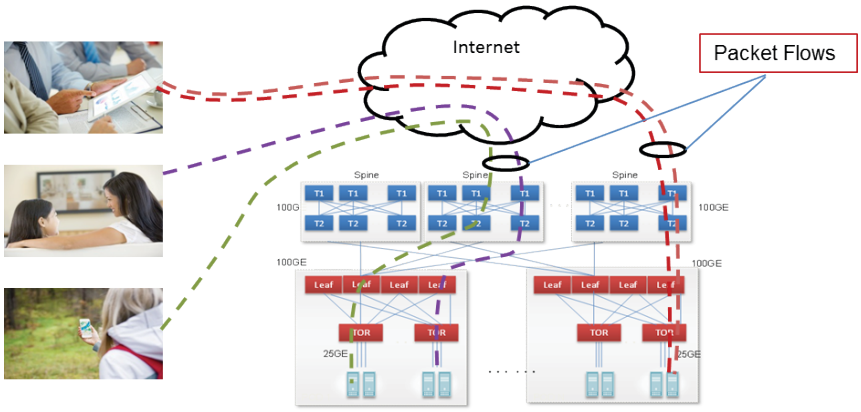
Key Products

- Flow Tracker Firmware
- BroadView™ Agent
- BroadView Analytics
- IPFIX Collector Application

Overview

Traffic going through an IP network can be viewed as a set of flows. Packets belonging to a flow share certain characteristics at a given time interval. For example, packets belonging to a movie downloaded by a subscriber from the internet represent one flow. An intermediate switch or a router can gather some properties of a flow, create a flow record in Internet Protocol Flow Information Export (IPFIX) format, and then export it to a remote collector for further analysis. Some applications require flow metrics reports based on inspecting every packet rather than just a few sampled packets. Gaining visibility into these flows instantly enables network operators to optimize their networks and improve the Quality of Experience (QoE).

Figure 1: Internet Packet Flows



IPFIX is a unidirectional protocol for data export. This data-exporting element defines a template and sends it to the collector to communicate the structure of the flow data records. Subsequently, flow data records that are compliant with the template are sent to the collector on a periodic basis.

The Internet Engineering Task Force (IETF) has defined an information model for commonly used IPFIX information elements and has enabled the ability to include proprietary information elements.

Troubleshooting

Flow-based network monitoring makes it easier to troubleshoot and discover root causes of some of the hard-to-debug network issues. For example, by correlating packet counts for a flow across the network hop-by-hop, it becomes easier to identify the node that is dropping the packets.

Network Forensics

Having the ability to define flexible criterion for monitoring flows enables easier gathering of network forensic reports. Typically, 5-tuples are used to define criterion for capturing flow metadata that can define wildcards for some of the tuples. This makes it easy to gather and analyze reports, as an example, for a particular source and destination IP address combination.

Bandwidth Monitoring

Bandwidth monitoring is a very important aspect for network planning and service-level assurance purposes. By using the number of packets and accumulated byte count for a given flow, it is easier to identify the sources of bandwidth consumption. By ensuring that applications and services are consuming the bandwidth within the limits they are allocated, network operators can guarantee predictable bandwidth availability in a reasonable manner. Network operators will also be able to arrive at an accurate estimate of the network equipment upgrades needed to satisfy the ever-growing bandwidth requirements.

BroadView Flow Tracker Solution

To enable easier tracking of IP flows on its silicon, Broadcom has developed the BroadView Instrumentation solution as part of its advanced analytics platform.

In this solution, operators configure 5-tuples for which the flows should be monitored. It is possible to use wildcards for some parameters of the 5-tuple. Flow-related metrics are captured within the ASIC and are exported in IPFIX format to a remote collector at regular intervals. Periodically, stale flows are purged.

The solution consists of:

- A Flow Tracker firmware that runs in the ARM-core processor embedded inside the ASIC
- The BroadView Agent that runs in the host CPU
- An IPFIX-compliant collector application, such as ntopng, that runs in an x86 server outside the switch system
- The BroadView Analytics application that facilitates the configuration of the BroadView Agent, that typically runs in an x86 server outside the switch system

Flow Tracker Firmware

The Flow Tracker firmware is the only mandatory component of the BroadView solution for tracking network flows. This component uses one core in the embedded ARM-core processor and uses ASIC resources such as Exact Match (EM) tables for building a flow table inside the ASIC. The Flow Tracker enables learning of the flows for a 5-tuple configured by the application. The ASIC tracks the statistics of a learned flow, such as number of packets, accumulated byte-count, etc., at line rate. The Flow Tracker also prepares flow records in IPFIX format and pushes them out through the forwarding plane to a remote collector configured by the application. Because the flow records go out on the front panel ports, there is no additional impact to the host CPU. The Flow Tracker firmware exports flow records over UDP every 100 ms and the export interval is configurable in multiples of 100 ms. Periodically the firmware checks and removes stale flow entries. The minimum default interval for removing stale flows is one minute, but a higher number can be configured.

BroadView Agent

The BroadView Agent facilitates configuring and exporting flow-group records to a remote IPFIX-enabled collector application. The BroadView Agent exposes application-friendly REST API for configuring flow-groups and remote collector application connectivity details.

BroadView Agent (continued)

Using the BroadView agent for exporting flow-group records enables the Flow Tracker firmware to deliver higher scalability. In a pre-engineered end-to-end solution, the BroadView Agent receives configuration from the BroadView Analytics application and configures the Flow Tracker firmware and silicon as needed. The firmware and SDK keep track of flow-group related statistics, such as number of groups, flows learned per group, etc. These flow-group records are exported by the BroadView Agent to the remote IPFIX collector. The BroadView Agent is an optional component of the Flow Tracker solution.

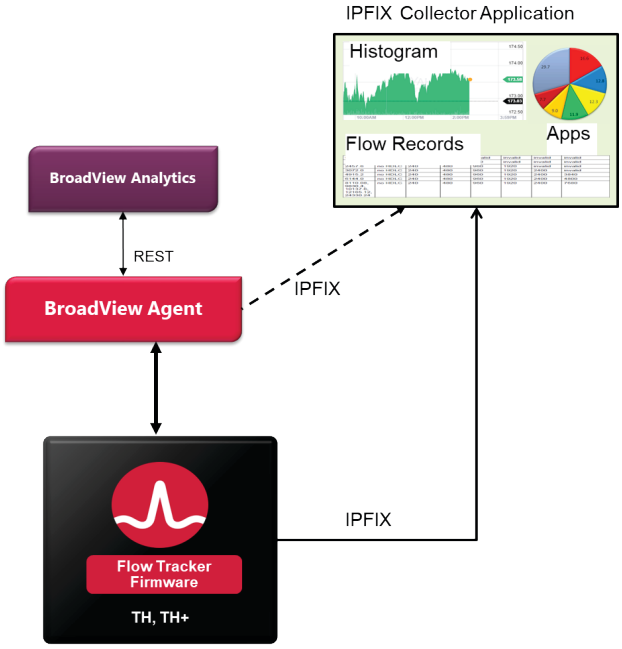
BroadView Analytics

BroadView Analytics is a GUI-based application that configures the BroadView Agent and provides dashboards to visualize various reports delivered by the BroadView Agent. In the Flow Tracker solution, BroadView Analytics configures the BroadView Agent using its REST API. It is an optional part of the solution and customers can use any application to invoke the REST API exported by the BroadView Agent.

IPFIX Collector Application

Broadcom's Flow Tracking solution is compliant with standard IPFIX protocol. So, any third-party application that is IPFIX-capable can be used. Note that ntopng was used for demonstration purposes only. The IPFIX collector application must be sourced separately from a third-party vendor.

Figure 2: BroadView Solutions



References

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- RFC 7011
- https://www.ietf.org/edu/tutorials/ipfix-tutorial.pdf
- https://www.ntop.org

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