Optimizing Path Tracing Probe Collection for Kafka-based Storage

Identifying and Adressing Performance Bottlenecks

Student

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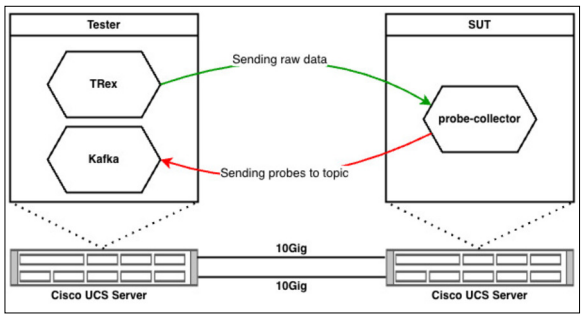
Introduction: Today's service provider networks require advanced monitoring techniques, and Path Tracing technology (draft-filsfils-spring-path-tracing-03) is the defacto solution for many use cases. The technology is still new, and efficient tools for handling Path Tracing probes - the packets generated by Path Tracing - are under development. This project is about the journey of optimizing the first available Path Tracing probe collector. The primary objective was to enhance the collector's performance by identifying and addressing various bottlenecks that negatively impacted its efficiency and overall functionality.

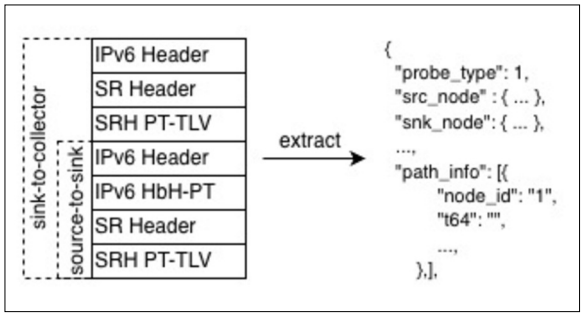
Approach / Technology: An extensive performance evaluation of the initial collector version was conducted, incorporating traffic generation, system load assessment, packet loss tracking, and memory usage examination. Several bottlenecks were pinpointed in packet aggregation, memory consumption, CPU load distribution, and Kafka producer performance. The "gopacket" package from Google was employed for packet aggregation, while memory and CPU load were optimized through efficient struct and pointer utilization and equitable allocation of goroutines. Kafka performance was improved by reducing the number of messages and Kernel calls.

Result: The optimization strategies culminated in a significant enhancement of the probe collector's performance. The throughput of the collector improved by 30%, ensuring seamless handling of Path Tracing probes. This performance improvement was accompanied by minimal memory consumption, thanks to efficient memory management practices and the careful control of concurrent goroutines. The load on the CPU was also optimally distributed, further augmenting the overall performance. These results underscore the value of systematic bottleneck identification and methodical optimization in improving the efficiency of the Path Tracing probe collector. The performance of the probe collector has been enhanced to handle thousands of Path Tracing probes. That is a significant advancement in the development of service provider networks.

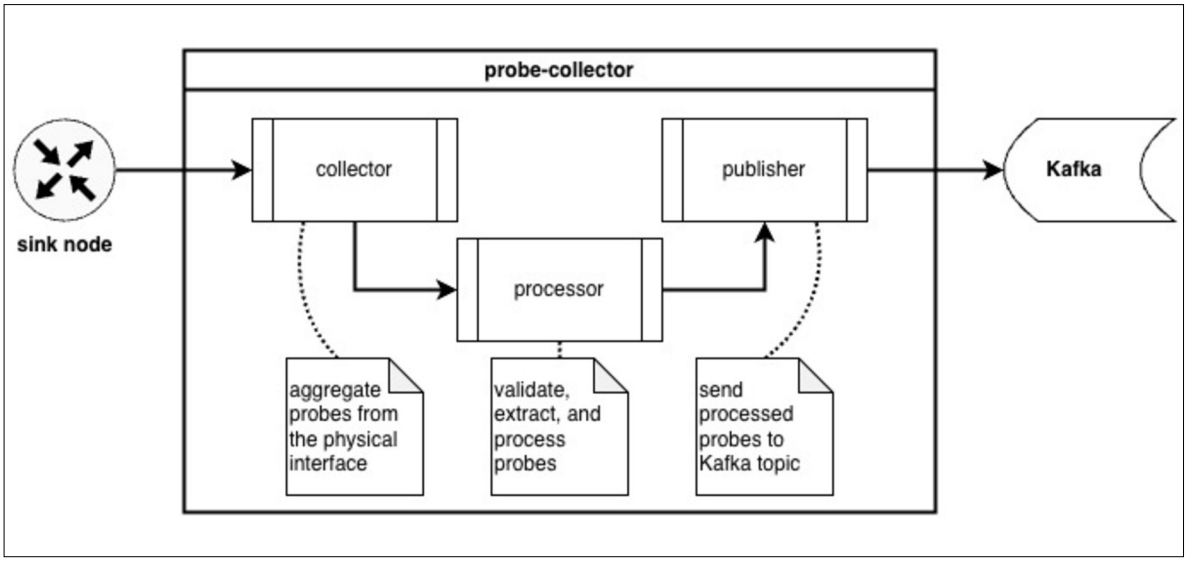
Test Environment
Own presentment



Probe Structure
Own presentment



Probe-Collector Architecture
Own presentment



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Subject Area
Computer Science, Software and Systems

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