Enhancing Performance Tracing and Debugging in Remote Deployments

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Google Cloud
Speakers

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Introduction

Intro to tracing
Identifying the problem

● Tracing in On-premises remote deployed containers.
  ○ Tracing across multiple instances
● Machine not accessible to developer.
● Any changes including setting logstash or alternates is not possible because we deploy a standalone binary.
● Problem is three fold:
  ○ Generating Traces
  ○ Moving Traces to the cloud
  ○ Analyzing Traces
● Get everything together - Metrics, Traces and Logs
Existing Solutions

Cloud Tracing
- Great for tracing across GCP services and more
- Great for latency tracking and traces.

Other cloud tracing
- Powerful distributed tracing, headers in calls to other other cloud services.
- Both these services are great for Traces. Aggregation and analysis is easier with Bigquery using our method.
Solving Tracing in multi-container deployments

- Trace Beginning and end of methods
- Add metadata as key-value pairs
  - Metadata is tracked for current method/call.
  - Useful to add valuable side information.
  - Metadata can be any scalar type
- Attach ids to Context as “Spans”
  - Spans are tracked on subcalls as well
  - Useful in tracking sub-events to an event
Trace Logs
Sample code and Log entries
func TestFirstMethod(t * testing.T) {
    // mark start of the event
    eventRecord := Start(ctx, "uber-event")

    // defer the end of the event to the end of this method.
    defer eventRecord.End(ctx)

    // add metadata to the event.
    eventRecord.set("test_key", "test_value")

    // sub method call.
    secondMethod(ctx)
}

func secondMethod(ctx context.Context) {
    // mark start of the event
    eventRecord := Start(ctx, "second_method")

    // defer the end of the event to the end of this method.
    defer eventRecord.End(ctx)

    // add metadata to the event.
    eventRecord.set("second_method_key", "second_method_value")

    // do something in this method.
    time.Sleep(2 * time.Second)
}
Event Sample (ends only)

```json
{
    "AgentID": "mock_agent_id",
    "AgentPool": "mock_agent_pool",
    "Duration": 2000,
    "EndTime": 1692672280041,
    "EventID": "Zc14cb5c-c8cf-4712-94d6-8e64629f42a6",
    "EventName": "second_method",
    "EventPhase": "end",
    "Metadata": {
        "second_method_key": "second_method_value"
    },
    "ProjectID": "mock_project_name",
    "Spans": {
        "example-span-key": "example-span-value"
    },
    "Stack": [
        "example-span-key"
    ],
    "StartTime": 1692672278041
}
```
In stream vs out of stream

How to ship logs
Ship logs instream

- Google Cloud Logging
  - Use Cloud Logging SDK
  - Buffer Logs In Memory (Drop excess)
  - Pros:
    - No File Management
    - Easy SDK integration
    - Easy Integration with Bigquery for analysis
  - Cons:
    - Memory limitations by your application
    - Logs maybe dropped
Ship logs out of stream

- Google Cloud Storage
  - Write Trace logs to file
  - Separate threads to compress files
  - Separate threads to send logs to GCS
  - Pros:
    - Way less memory utilization, garbage generation.
    - Choose compression algorithm to optimize speed vs compressed file size.
    - Easy Integration with Bigquery for analysis
  - Cons:
    - Delay in shipping and compressing files -> <5 minutes
    - Manually pull in for analysis.
Sampling - yes or no?

- Optional
- While sampling is great, our usecase was to solve for each trace
- Usecases where tracking all traces is helpful
  - Identifying events which never closed
  - Aggregation
    - Test statistics in aggregate
    - Hotspotting and concurrency trends
    - Pattern analysis for minority anomalies (eg. some small files causing problems vs most files are large).
Analysis

Lets import to Bigquery!
Analyze logs

- Bigquery
- Import logs
  - Cloud Logging -> Direct Import Via Sink
- Queries
  - Can save project relevant query templates directly
  - Can write compounded queries easily -> Use temp tables if not great at sql to simplify problems
  - Constant analysis, one time analysis.
- Visualize
  - Create sample dashboards/charts. See Demo.
Real life problems we solved
Some problems we solved

- Identify long poles in subprocesses
  - Example - identified an issue in our os.Stat operation
  - OS level issue - would not have detected otherwise.
- Identify Concurrency and Hotspot issue
  - Identified that one of our systems was not honoring thread count limit
  - We were hammering a service we weren’t supposed to.
- Close the loop measurement.
  - Identified that we were not releasing a lock that we were establishing.
Demo !
Thank you