Enhancing Performance Tracing and Debugging in Remote Deployments

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Google Cloud

Contents

Speakers

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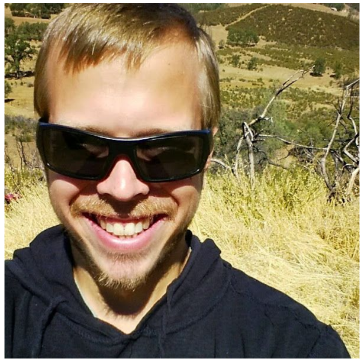
GCP Data Transfer



AJ Ortega

GCP Data Transfer

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

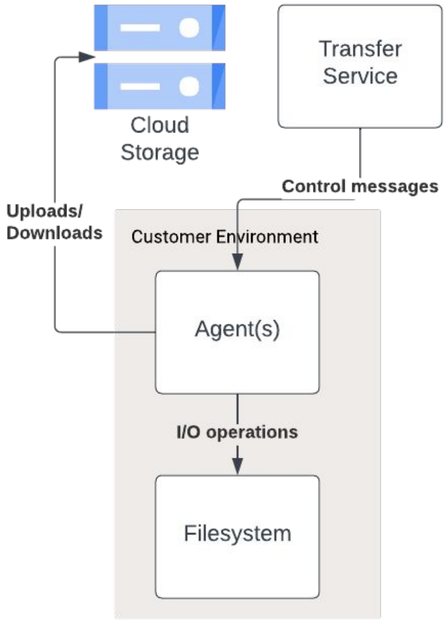
Existing Solutions

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

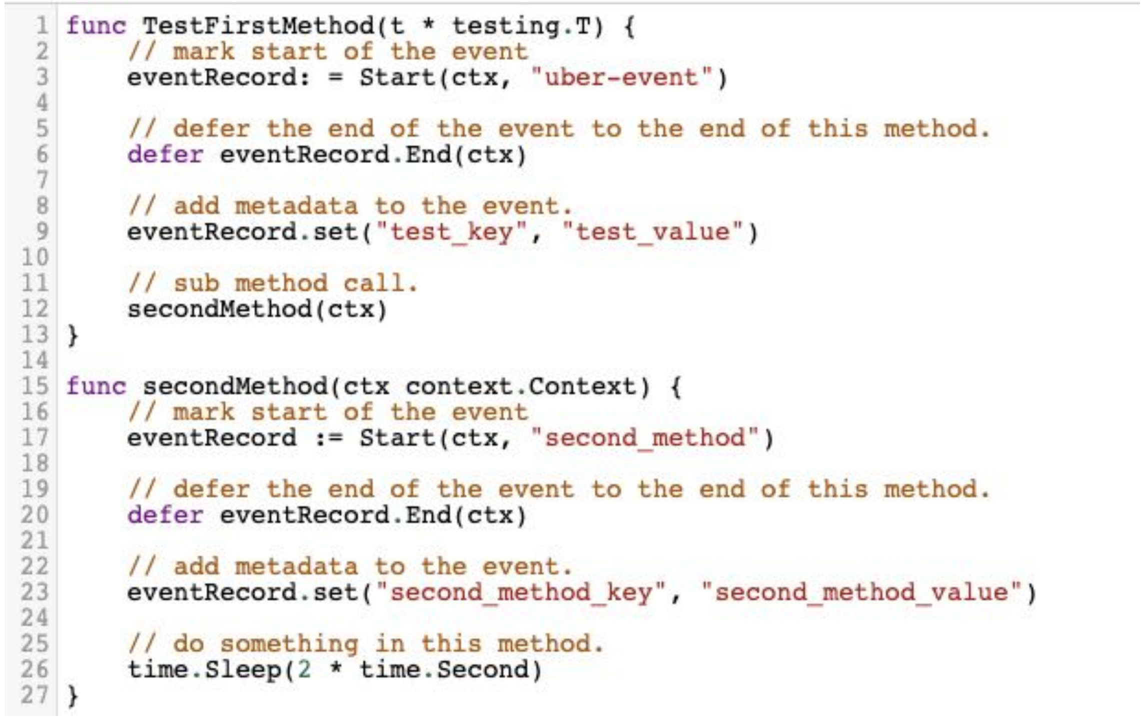
- Trace Beginning and end of methods
- Add metadata as key-value pairs
  - Metadata is tracked for current method/call.
  - Useful to add valuable side information.
  - Metadata can be any scalar type
- Attach ids to Context as "Spans"
  - Spans are tracked on subcalls as well
  - Useful in tracking sub-events to an event



Trace Logs

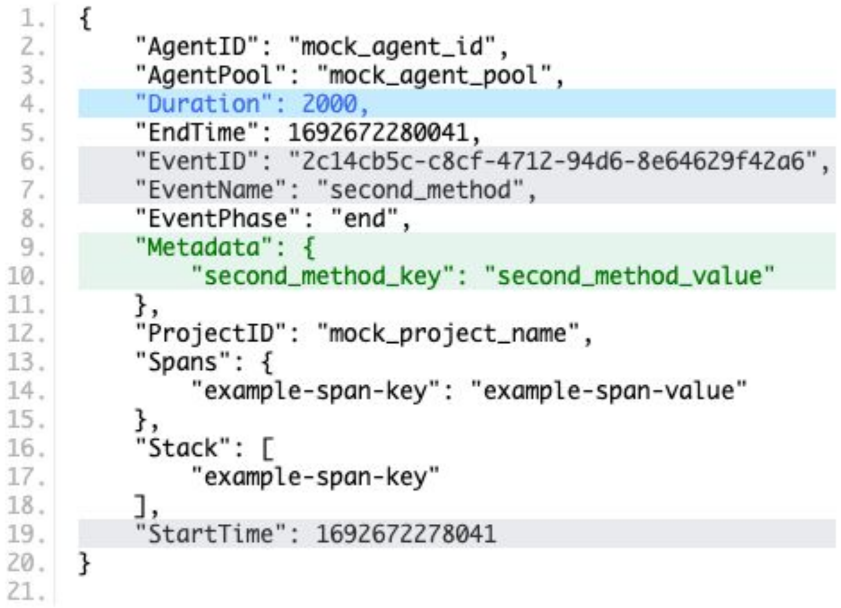
Sample code and Log entries

Code Sample(go)

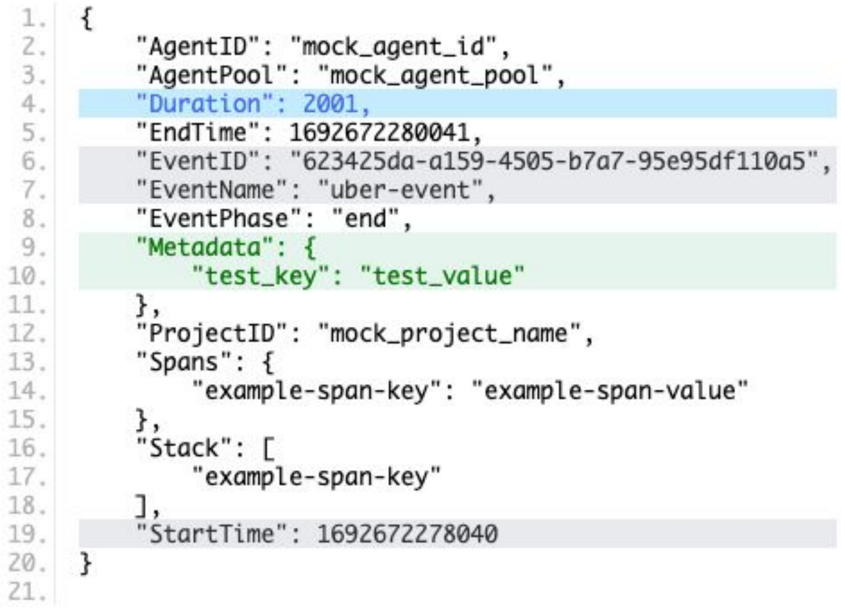


```go
func TestFirstMethod(t * testing.T) {
    // mark start of the event
    eventRecord: = Start(ctx, "uber-event")

    // 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)



```
{
    "AgentID": "mock_agent_id",
    "AgentPool": "mock_agent_pool",
    "Duration": 2000,
    "EndTime": 1692672280041,
    "EventID": "2c14cb5c-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
}
```



```
{
    "AgentID": "mock_agent_id",
    "AgentPool": "mock_agent_pool",
    "Duration": 2001,
    "EndTime": 1692672280041,
    "EventID": "623425da-a159-4505-b7a7-95e95df110a5",
    "EventName": "uber-event",
    "EventPhase": "end",
    "Metadata": {
        "test_key": "test_value"
    },
    "ProjectID": "mock_project_name",
    "Spans": {
        "example-span-key": "example-span-value"
    },
    "Stack": [
        "example-span-key"
    ],
    "StartTime": 1692672278040
}
```

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
    - GCS Bucket -> Manual import -> Can import gz files.
- 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 !

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Video Demo here

Thank you

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