In our final module we discuss optimizing the costs for Google Cloud's operations suite.

Agenda

The Costs of Monitoring

Bill Estimation

Cost Control Best Practices

Specifically, you will learn to analyze resource utilization costs for operations related components within Google Cloud, and implement best practices for controlling the cost of operations within Google Cloud

Agenda

The Costs of Monitoring

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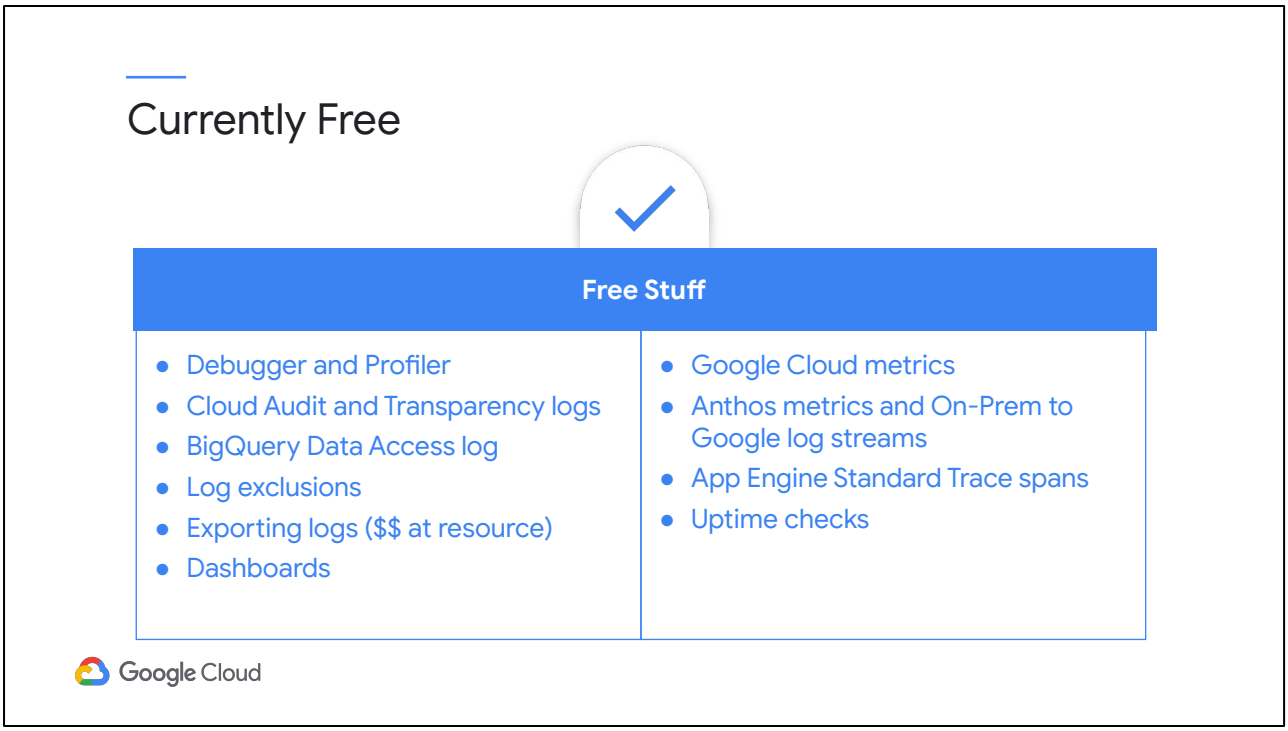
Cost Control Best Practices

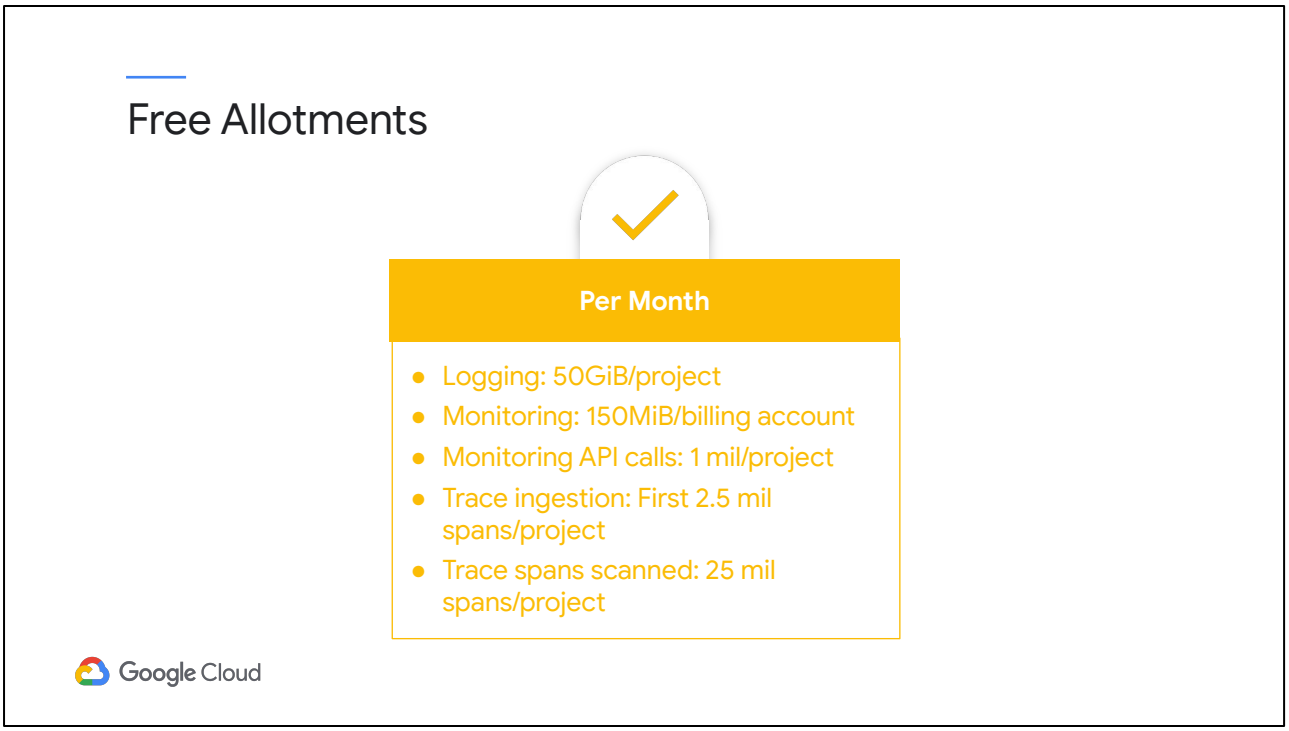
Google Cloud

Let’s start with the costs.



At the time of this writing, there are a number of parts of the Google operations suite that are free, including

- Debugging and using the Profiler
- Collecting and using the Cloud Audit and Transparency logs
- BigQuery Data Access logs
- Anything (excluded from logs)
- Exporting, noting what you export to may incur spend
- Creating and using dashboards
- The metrics themselves
- Anthos metrics and log streams
- App Engine standard trace spans
- And Uptime checks



Other parts of the operations suite have a free tier to get you started. Examples include:

- The first 50Gib of logging per project
- The first 150MiB of monitoring data per billing account
- The first million monitoring API calls per project
- The first 2.5 million trace spans ingested per project
- The first 25 million trace spans scanned per project

Pricing

After Free Allotment

- Logging/project: $0.50/GiB
- Monitoring/billing account
  - $0.285/MiB: <100TiB
  - $0.151/MiB: 100-250TiB
  - $0.061 <250TiB
  - API calls: .01/1,000

- Trace ingestion/billing account: $.20/million spans
- Trace spans scanned: .02/million spans
- Log storage will go to $.01/GiB in April, 2021

Google Cloud

After the free tier, the prices for the various operation related fees you can see on the slide. For the latest pricing information, please always check the Google Documentation.

Network Telemetry Pricing

- Network telemetry logs generate spend
  - VPC Flow, Firewall Rules, and Cloud NAT logging
- Logs stored in Cloud Logging are free to generate, but billed for storage
- Exported logs are billed as follows:

Log Generation	Price
0—10 TB per month	0.50/GB
10—30 TB per month	0.25/GB
30—50 TB per month	0.10/GB
>50 TB per month	0.05/GB

Google Cloud

The Networking logs including, VPC Flow, Firewall Rules, and Cloud NAT, will cost you the standard log storage fees ($.50/GiB), but they won't cost you anything extra to generate, provided you are storing them in Cloud Logging.

If you export the network telemetry logs to an external service, then the table on the bottom of the slide shows how much the logs will cost to generate, above and beyond any destination or networking fees.

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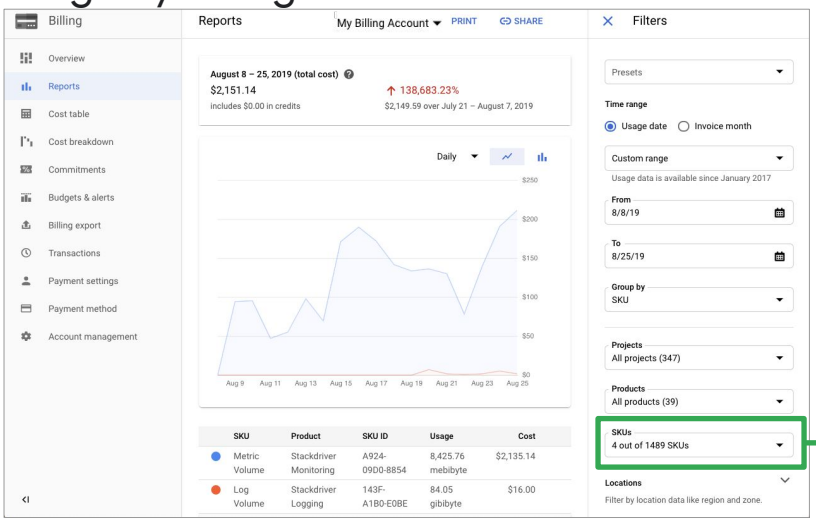
Google Cloud

Ok, we've covered some of the pure costs, now let's talk about bill estimation.

Usage by Billing Account



Filter to SKUs

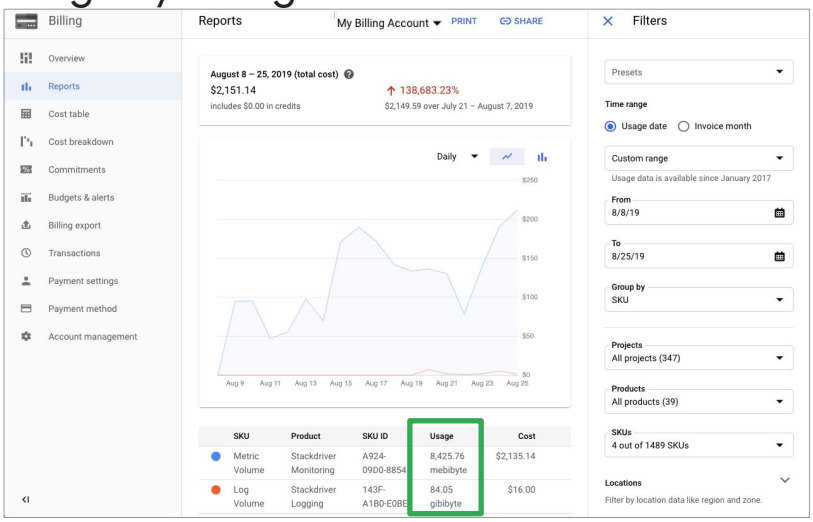
- **Log Volume**
- **Spans Ingested**
- **Metric Volume**
- **Monitoring API Requests**

Google Cloud

Start by going to your billing account reports page. Set your date range and then filter by SKU. The SKUs you want are:

- **Log Volume**
- **Spans Ingested**
- **Metric Volume**
- **Monitoring API Requests**

Usage by Billing Account



Filter to SKUs

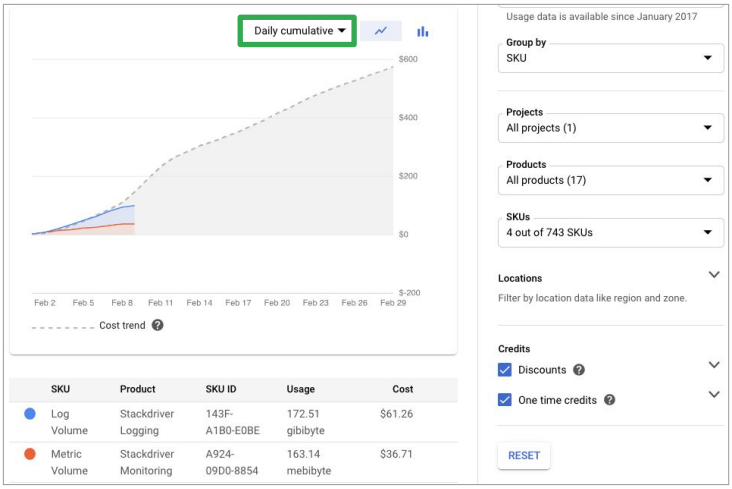
- **Log Volume**
- **Spans Ingested**
- **Metric Volume**
- **Monitoring API Requests**

Google Cloud

Then check your usages and costs.

Note, if SKU usage is 0 for a metric, then it won't appear in list.

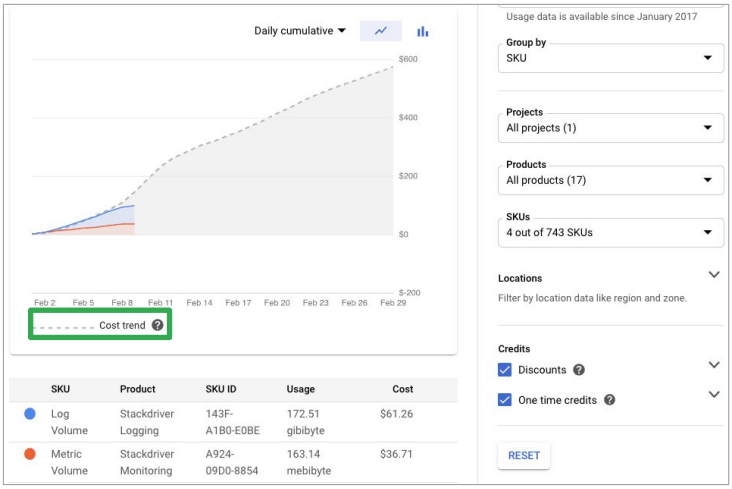
Usage by Billing Account, Cost Trend



Google Cloud

Here's another view of the same page. In the chart, you can change the view to display the data Daily, Monthly, Daily Cumulative, or Monthly Cumulative.

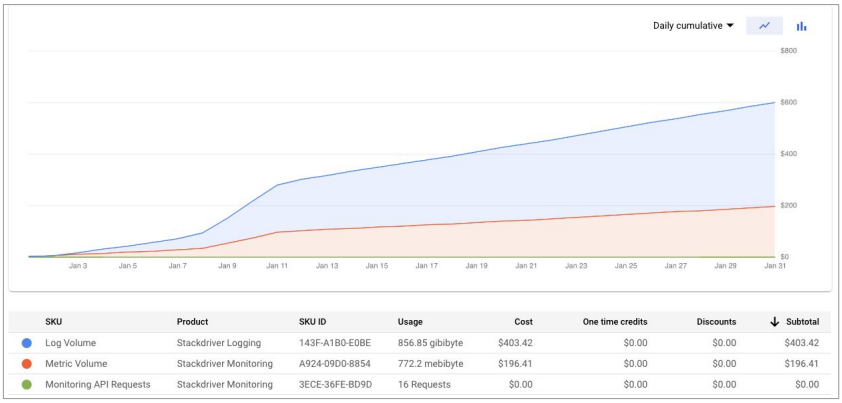
Usage by Billing Account, Cost Trend



Google Cloud

When you put it in Daily cumulative, you can see the cost trend line does a nice job showing where we're headed based on current spend trends. If you recently added logging, this might be a good way to estimate what your bill might do.

Last Month's Spending (What's the Log Vol. from?)



SKU	Product	SKU ID	Usage	Cost	One time credits	Discounts	Subtotal
Log Volume	Stackdriver Logging	143F-A1B0-E0BE	856.85 gibibyte	$403.42	$0.00	$0.00	$403.42
Metric Volume	Stackdriver Monitoring	A924-09D0-8854	772.2 mebibyte	$196.41	$0.00	$0.00	$196.41
Monitoring API Requests	Stackdriver Monitoring	3ECE-36FE-BD9D	16 Requests	$0.00	$0.00	$0.00	$0.00

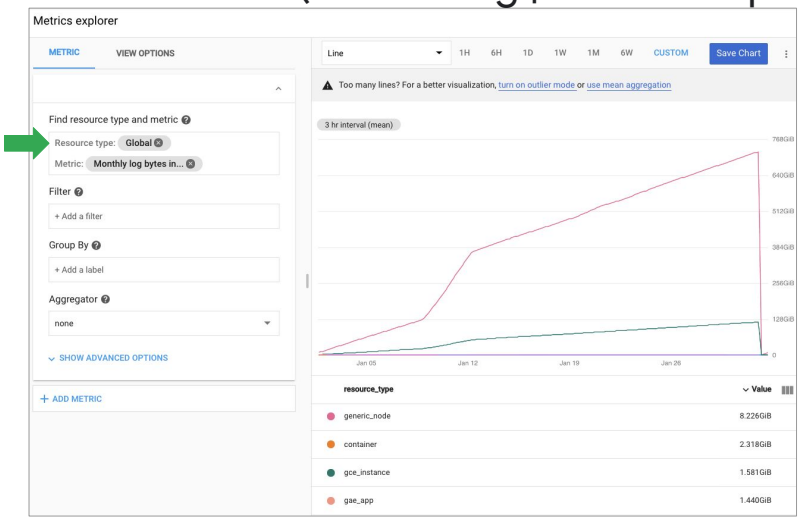
Google Cloud

You can do the same sort of thing to see how money was spent in the past month. In this case, the biggest line item is log volume.

It begs the question. If I'm spending money on logging data, where exactly is that data coming from?

To find the answer, check the Metrics Explorer.

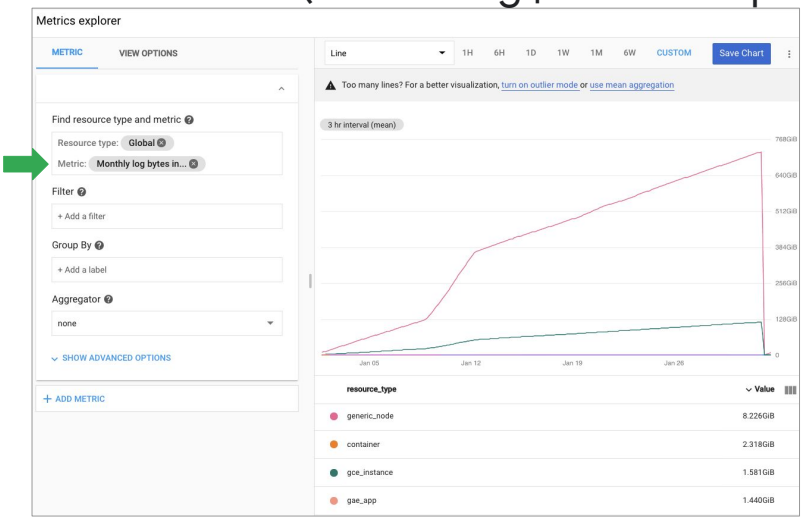
Metric Details (Monitoring | Metrics Explorer)



Google Cloud

Open the Monitoring | Metrics Explorer, and set the Resource type to Global.

Metric Details (Monitoring | Metrics Explorer)



Google Cloud

Helpful Metrics

- Log bytes ingested
- Monthly log bytes ingested
- Metric bytes ingested
- Trace spans ingested
- Monthly trace spans ingested

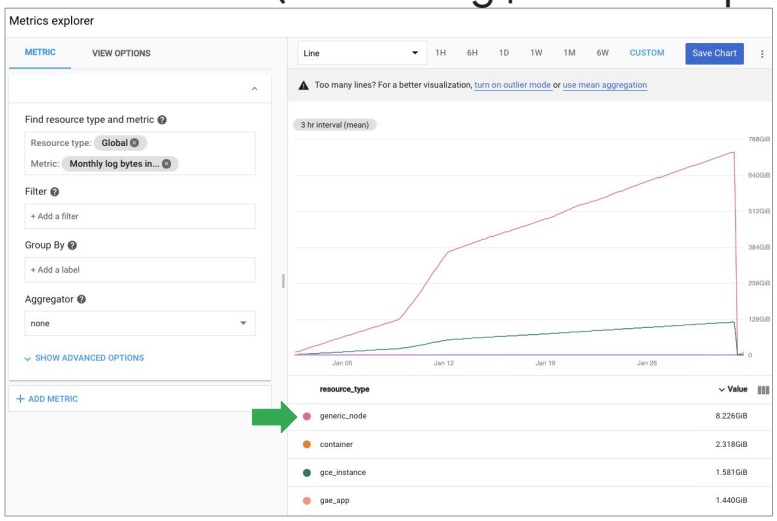
Then, depending on what you're looking for, set the Metric to one of the following:

- Log bytes ingested: Log bytes ingested in Logging.
- Monthly log bytes ingested: Each point represents the month-to-date sum of log bytes ingested in Logging. The monthly total is available on the last day of the month, when it also resets.
- Metric bytes ingested: Chargeable number of bytes of metric data ingested in Monitoring.
- Trace spans ingested: Chargeable trace spans ingested in Trace.

and

- Monthly trace spans ingested: Each point represents the month-to-date sum of trace spans ingested in Trace. It resets on the last day of the month; the monthly total is found on the last day of the month.

Metric Details (Monitoring | Metrics Explorer)



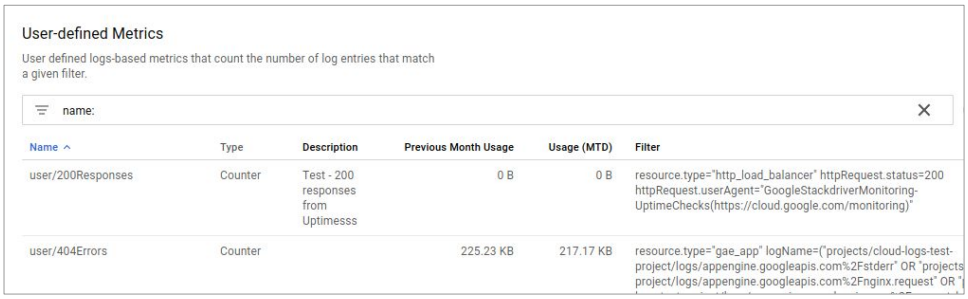
Helpful Metrics

- Log bytes ingested
- Monthly log bytes ingested
- Metric bytes ingested
- Trace spans ingested
- Monthly trace spans ingested

Google Cloud

This example was built on a project doing a lot of VM Migration work. The generic_node is all the logging data coming from Migrate for Compute Engine (formerly Velostrata). You can find more info on Migrate for GCE here.

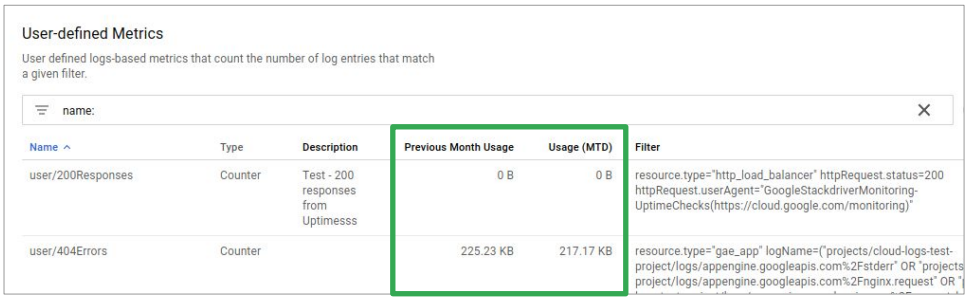
Logging | Logs-Based Metrics



Google Cloud

To see your logs-based metrics usage, head over to Logging | Logs-Based Metrics.

Logging | Logs-Based Metrics

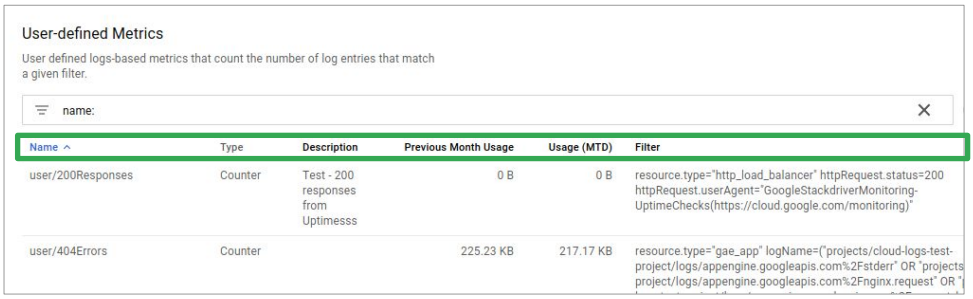


Google Cloud

Previous Month Usage represents the sum of bytes ingested in the logs-based metric in the previous calendar month.

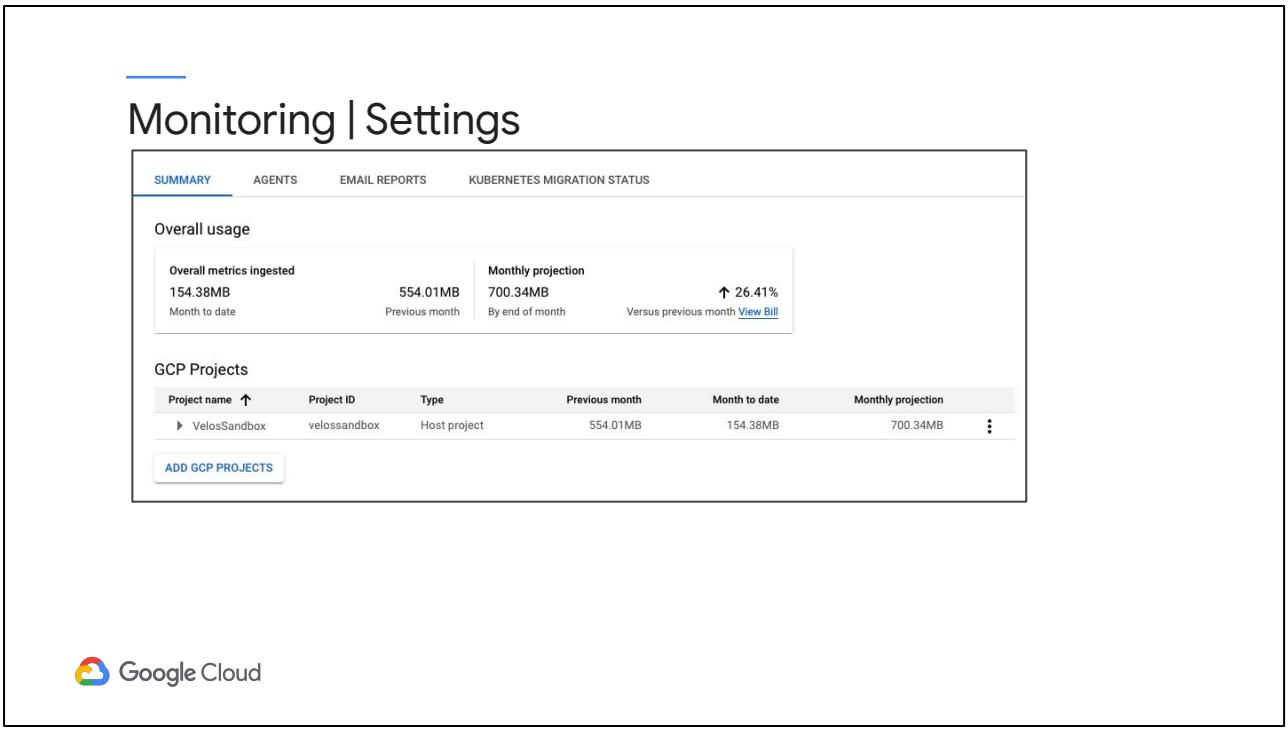
Usage (MTD) represents the sum of bytes ingested in the logs-based metric in the current calendar month.

Logging | Logs-Based Metrics



Google Cloud

Clicking any of the column names lets you sort data in ascending or descending order. This is helpful, for example, if you want to review which metrics ingest the most data.



Early on in this series of modules, we learned that a Workspace is used in Cloud Monitoring to monitor the resources you care about, whether they are in a Google Cloud project, an AWS account, or multiple Google Cloud projects and AWS accounts. To view your Monitoring usage by workspace, go to Monitoring | Settings.

On the Summary tab, the **Metrics Ingested** table displays a summary of your metrics ingestion data by resource. This data includes the previous month's total usage, the current month's to-date usage, and projected usage for the current month.

To get your project-level usage in detail, click **View Bill** in the **Metrics Ingested** table. This takes you to the Cloud Billing Reports page.

Agenda

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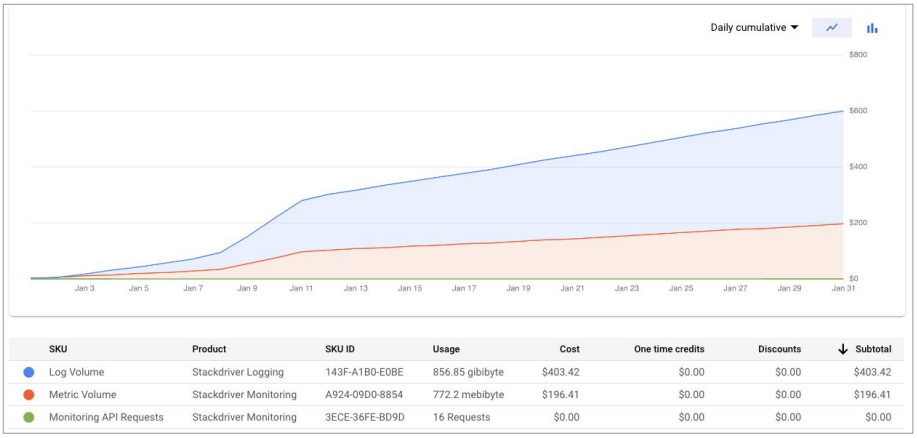
Google Cloud

Finally, let’s discuss some billing best practices.

Know Your Costs!



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Monitoring API Requests	Stackdriver Monitoring	3ECE-36FE-BD9D	16 Requests	$0.00	$0.00	$0.00	$0.00

Google Cloud

Start with what we've already discussed in this module, mostly in the last section. Know your costs. Know your operations related spend, and exactly where it goes. Know what the big-ticket items are.

Know What You're Paying For

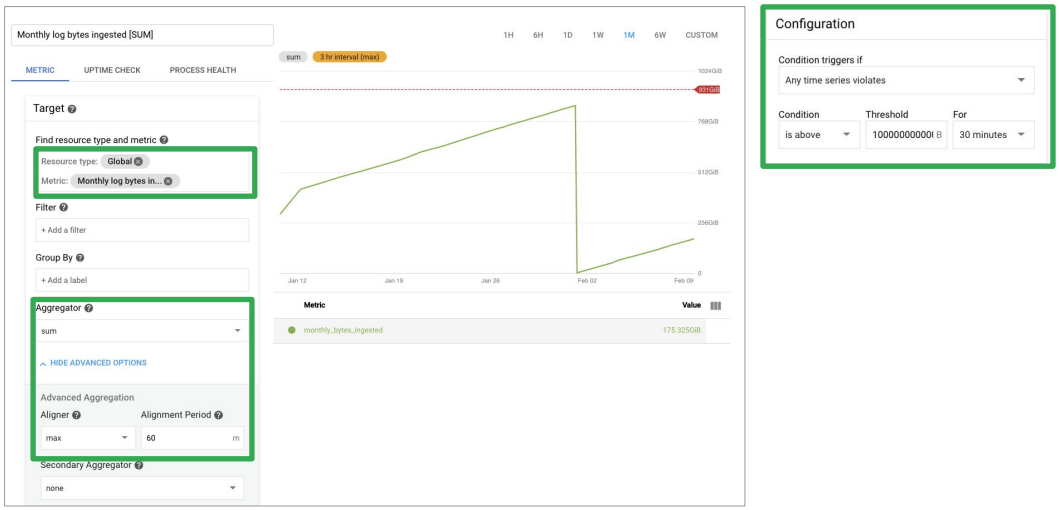
After Free Allotment	

• Logging/project: $0.50/GiB
• Monitoring/billing account
  ○ $0.285/MiB: <100TiB
  ○ $0.151/MiB: 100-250TiB
  ○ $0.061 <250TiB
  ○ API calls: .01/1,000
	• Trace ingestion/billing account: $.20/million spans
	• Trace spans scanned: .02/million spans

Google Cloud

Know what exactly you're paying for.

Use Alerts



Google Cloud

If you're adding a new type of logging, create alerts to spot runaway spend.

In the example you see on the current slide.

- The Resource type is Global, and the metric is Monthly log bytes ingested. So this is our logging data which, thanks to the last slide, we know will be billed at $0.50/GiB.
- To get the total amount, the Aggregator is set to sum. No reason for this to be super live information, so we've set the aligner function to max, and the alignment Period to 60min.
- The alert will trigger if Any time series is above some threshold for some period.

Products Which Can Generate Big Logs

- Cloud Load Balancing
- The Logging agent on Compute Engine (or AWS)
- The write operation in the Cloud Logging API

Google Cloud

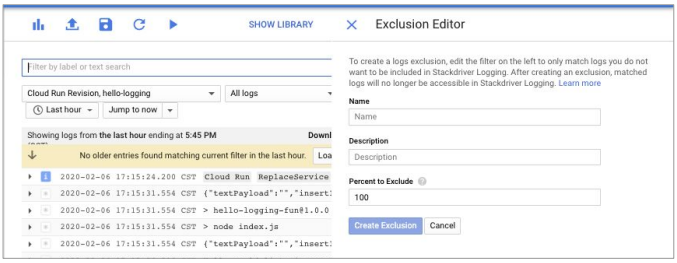
Some products which might generate substantial logs include: Cloud Load Balancing, the Compute Engine logging agents, and write operations in the Cloud Logging API.

Exclude what you don't need.

Exclude What You Don't Need

Common exclusions:

- Load Balancer (90%)
- VPC Flow Logs
  - Percentage
  - Message type (CIDR)
- HTTP 200 OK from requests



Google Cloud

If you Exclude log entries, you don't pay for them, but, they're also gone forever, so be careful what you leave in and what you leave out.

Also, remember you can exclude a percentage of entries, so another good trick is to do exclusions, but leave enough that you still get a taste.

Common exclusions:

- Google has several different load balancers, and they all support various forms of monitoring and/or logging. For load balancers that support logging, frequently, all you need is a small percentage. Exclude 90% or more.
- VPC Flow Logs is another good example. Again, you can often exclude 95%+ of the entries and still get enough to monitor the VPC. Also, remember that your exclusion can filter on entry contents. Perhaps you only want to retain logs from sources with a CIDR outside your network.
- Another common exclusion is web applications and services kicking out HTTP 200 OK from requests. Frequently, OK messages don't provide much insight, and they can generate a lot of entries.

Logging Charges from Metrics

- Logging agents installed in a VM or on AWS
- Custom metrics in OpenCensus, OpenTelemetry, or custom code
  - OpenCensus and OpenTelemetry support sampling to reduce volume
- External metrics like Prometheus or NetApp
- Logs-based metrics

Google Cloud

To reduce metric-related charges, watch your agents. Virtual Machine Monitoring and Logging Agents both can generate a lot of data. Though installing them is undoubtedly a best practice, there are absolutely going to be exceptions. Weigh the pros and cons, and remember that both the agents are customizable through configuration files.

Like the agents, custom metrics can generate spend. Newer metrics created using OpenCensus or OpenTelemetry support sampling to help reduce volume.

Metrics also might come from installed, third-party libraries like Prometheus or NetApp. They help provide visibility, but they also bump the bill.

And don't forget logs-based metrics we discussed previously.

Trace Costs

- Pay by spans ingested and later scanned (count)
  - Except for App Engine Standard
- Surprise costs
  - Manual spans added to any code, even App Engine
  - Load Balancing spans and logs
- Spans created in high frequency loops

Google Cloud

Trace charges are based on the number of trace spans ingested and scanned. When latency data is sent to Trace, it's packaged as a *trace* that is composed of *spans*, and the spans are *ingested* by the Cloud Trace backend. When you view trace data, the stored spans are *scanned* by Cloud Trace.

Trace prices are based on the number of spans ingested and eventually scanned. Some Google Cloud services, such as the App Engine standard environment, automatically produce non-chargeable spans, and trace has a free allotment per month, mentioned previously.

Don't be surprised by costs related to:

- Manual spans added to App Engine or custom application.
- Load balancing spans and logs.

Since spans are charged by count, watch code that generates lots of spans by looping, repeated operations.

Logging Exports

- Exports themselves are free, but not target Resource
  - Cloud Storage
  - BigQuery storage, streaming, and queries
  - Pub/Sub message and network egress fees
- Review usage (resource, metric)
  - gcs_bucket, total_bytes
  - bigquery_dataset, stored_bytes
  - pubsub_topic, byte_cost
- Be specific with your filter
- **Trick: Export and Exclude**

Google Cloud

Log exports themselves are free, but not the target Resource:

- Storage fees in Cloud Storage.
- Storage, streaming, and query fees in BigQuery.
- Pub/Sub message and networking egress fees.

Review your usage. The following values are listed resource, metric:

- gcs_bucket, total_bytes
- bigquery_dataset, stored_bytes
- pubsub_topic, byte_cost

Be specific with your export filters.

Also, remember you can exclude and export simultaneously. That way, the data isn't gone, but it's stored outside of logging.

As a point of fact:

- 2 TiBs of data access log data stored in Logging would cost about $1,000.
- The same 2 TiBs stored in a regional, standard class bucket, would cost about $40. With archival, it would be much cheaper.

Be Selective with the Logging Agent

- Logs from third-party apps may be extensive
  - Apache, NGINX, MySQL
- May omit agent installation on selective machines
  - Standard logs still exist
  - Dev machines?
- Can install but configure on the machine
  - Disable integration with selected third-party apps

Google Cloud

As mentioned earlier, be selective with the Logging Agent on your virtual machines.

Some third-party apps may generate a lot of logging and/or monitoring data (Apache, NGINX, MySQL).

You may want to omit agent installation on selective machines. Most of those apps are still generating local logs, which could be accessed if needed. Also, perhaps the logging is enabled on the dev machines, but not in production?

The Logging and Monitoring Agents are also customizable, to exclude or include particular metrics or logs.