Developing, Deploying, and Monitoring in the Cloud

Agenda

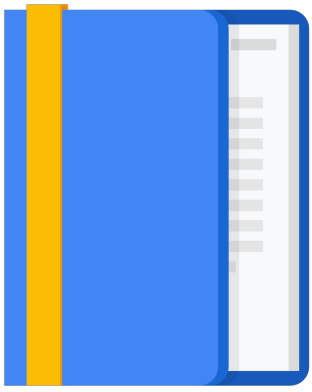
Development in the Cloud

Deployment: Infrastructure as Code

Monitoring: Proactive instrumentation

Lab

Resources



Google Cloud

Cloud Source Repositories

- Fully featured Git repositories hosted on Google Cloud.
- Supports collaborative development of cloud apps.
- Includes integration with Cloud Debugger.

Google Cloud

Cloud Source Repositories provides Git version control to support collaborative development of any application or service, including those that run on App Engine and Compute Engine. If you are using Cloud Debugger, you can use Cloud Source Repositories and related tools to view debugging information alongside your code during application runtime. Cloud Source Repositories also provides a source viewer that you can use to browse and view repository files from within the Cloud Console.

With Cloud Source Repositories, you can have any number of private Git repositories, which allows you to organize the code associated with your cloud project in whatever way works best for you. Google Cloud diagnostics tools like Debugger and Error Reporting can use the code from your Git repositories to let you track down issues to specific errors in your deployed code without slowing down your users. If you've already got your code in GitHub or BitBucket repositories, you can bring that into your cloud project and use it just like any other repository, including browsing and diagnostics.

Cloud Functions

- Create single-purpose functions that respond to events without a server or runtime.
  - Event examples: New instance created, file added to Cloud Storage.
- Written in Javascript (Node.js), Python or Go; execute in managed Node.js environment on Google Cloud.

Google Cloud

Cloud Functions is a lightweight, event-based, asynchronous compute solution that allows you to create small, single-purpose functions that respond to cloud events without the need to manage a server or a runtime environment. You can use these functions to construct applications from bite-sized business logic. You can also use Cloud Functions to connect and extend cloud services.

You are billed, to the nearest 100 milliseconds, only while your code is running.

Cloud Functions are written in Javascript (Node.js), Python or Go and execute in a managed Node.js environment on Google Cloud. Events from Cloud Storage and Pub/Sub can trigger Cloud Functions asynchronously, or you can use HTTP invocation for synchronous execution.

Cloud Events are things that happen in your cloud environment. These might be things like changes to data in a database, files added to a storage system, or a new virtual machine instance being created.

Events occur whether or not you choose to respond to them. Creating a response to an event is done with a trigger. A trigger is a declaration that you are interested in a certain event or set of events. You create triggers to capture events and act on them.

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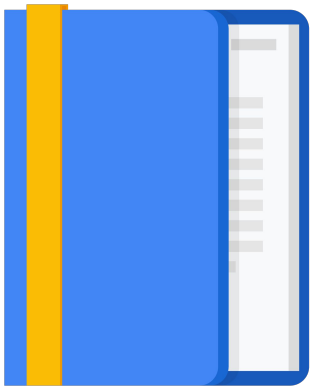

Google Cloud

Cloud Deployment Manager

- Infrastructure management service.
- Create a .yaml template describing your environment and use Deployment Manager to create resources.
- Provides repeatable deployments.

Google Cloud

Cloud Deployment Manager is an infrastructure management service that automates the creation and management of your Google Cloud resources for you.

Setting up your environment in Google Cloud can entail many steps: setting up compute, network, and storage resources and keeping track of their configurations. You can do it all by hand if you want to, taking an imperative approach. But it is more efficient to use a template. That means a specification of what the environment should look like, declarative rather than imperative.

Google Cloud provides Deployment Manager to let do just that. It's an infrastructure management service that automates the creation and management of your Google Cloud resources for you.

To use Deployment Manager, you create a template file, using either the YAML markup language or Python, that describes what you want the components of your environment to look like. Then you give the template to Deployment Manager, which figures out and does the actions needed to create the environment your template describes. If you need to change your environment, edit your template, and then tell Deployment Manager to update the environment to match the change.

Here's a tip: you can store and version-control your Deployment Manager templates in Cloud Source Repositories.

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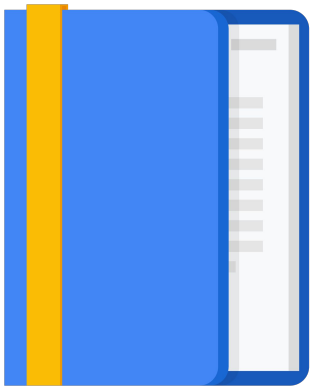
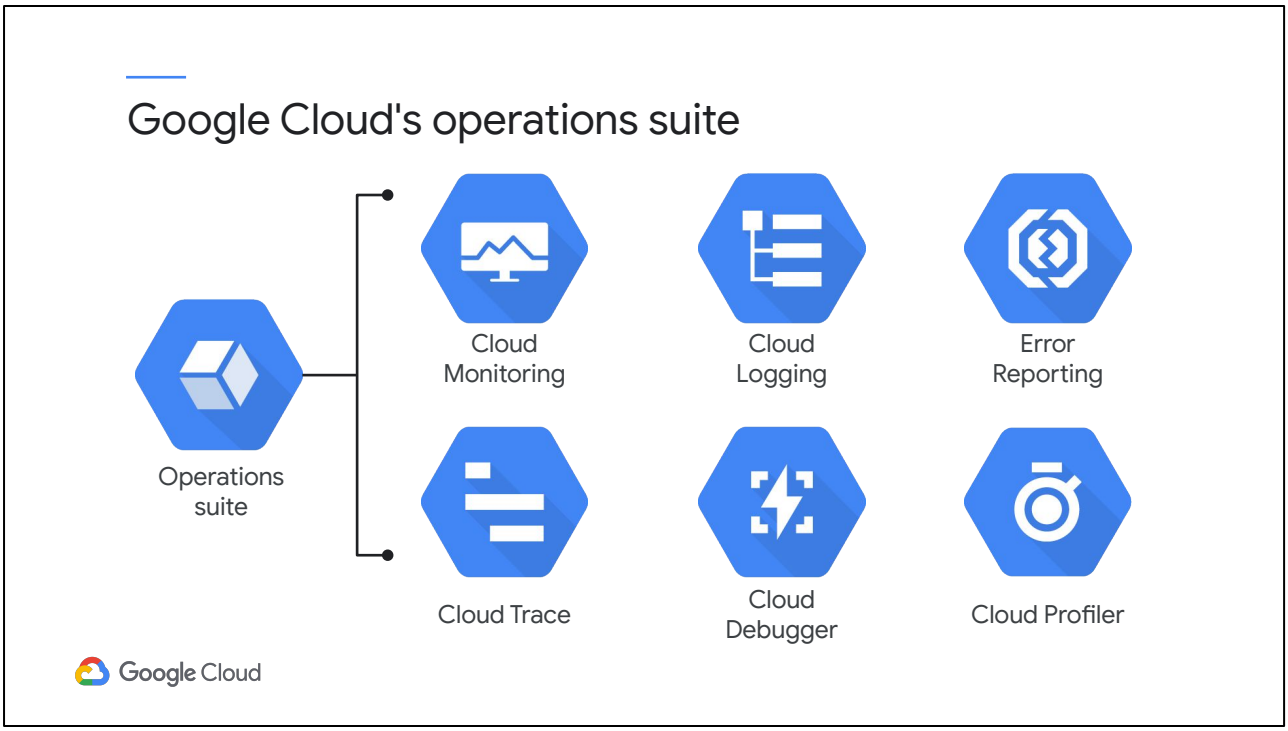
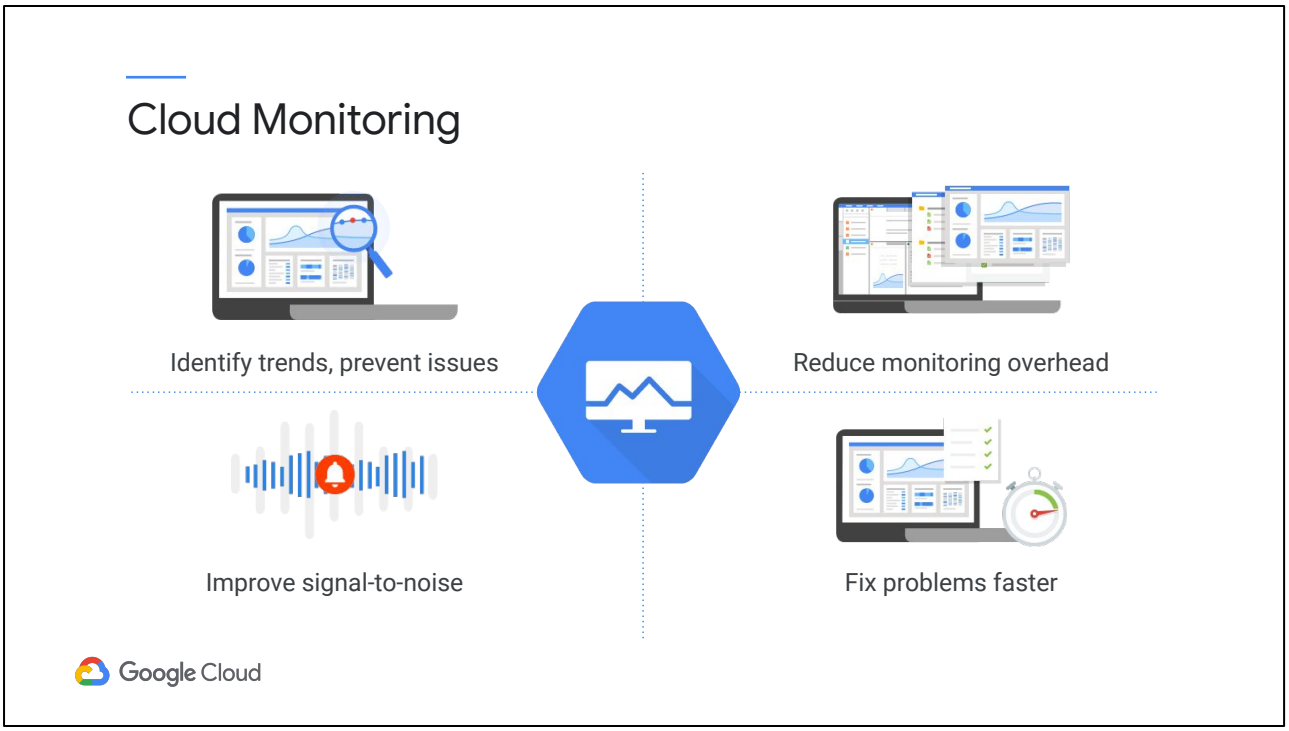


Google Cloud



Google Cloud's operations suite provides powerful monitoring, logging, and diagnostics for apps on Google Cloud. It equips you with insight into the health, performance, and availability of cloud-powered apps, enabling you to find and fix issues faster.

Google Cloud's operations suite gives you access to many different kinds of signals from your infrastructure platforms, virtual machines, containers, middleware, and application tier: logs, metrics, traces. It gives you insight into your application's health, performance, and availability, so if issues occur you can fix them faster.



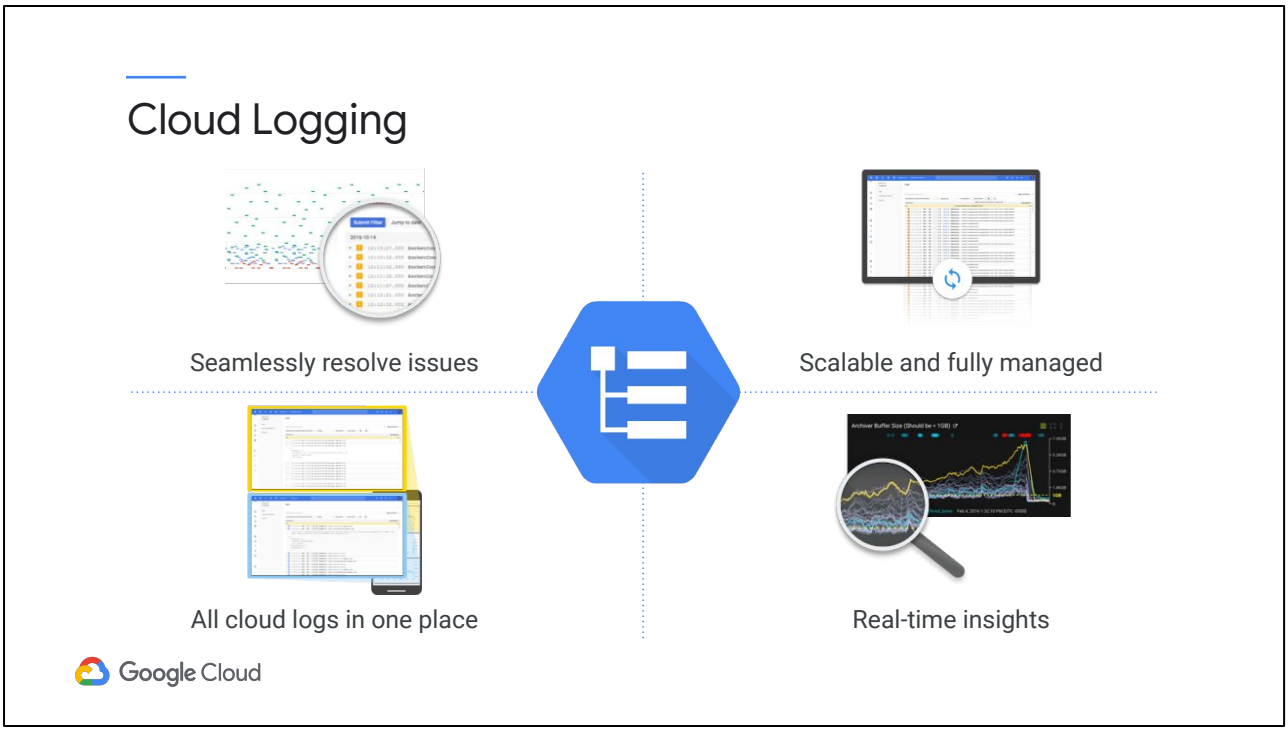
Let’s start by looking at Cloud Monitoring, a full-stack monitoring service that discovers and monitors cloud resources automatically.

Flexible dashboards and rich visualization tools help you to identify emergent issues. Anomaly reporting, pattern detection, and exhaustion prediction provide insights into longer-term trends that may require attention.

Monitoring provides a single integrated service for metrics, dashboards, uptime monitoring, and alerting. This means you spend less time maintaining disparate systems.

Advanced alerting capabilities, including the rate of change, cluster aggregation, and multi-condition policies, help ensure you are notified when critical issues occur while reducing the likelihood of false positives.

Integrated uptime monitoring and health checks ensure quick notification of failures. It’s possible to drill down from alerts to dashboards to logs and traces in order to identify the root cause of problems quickly.

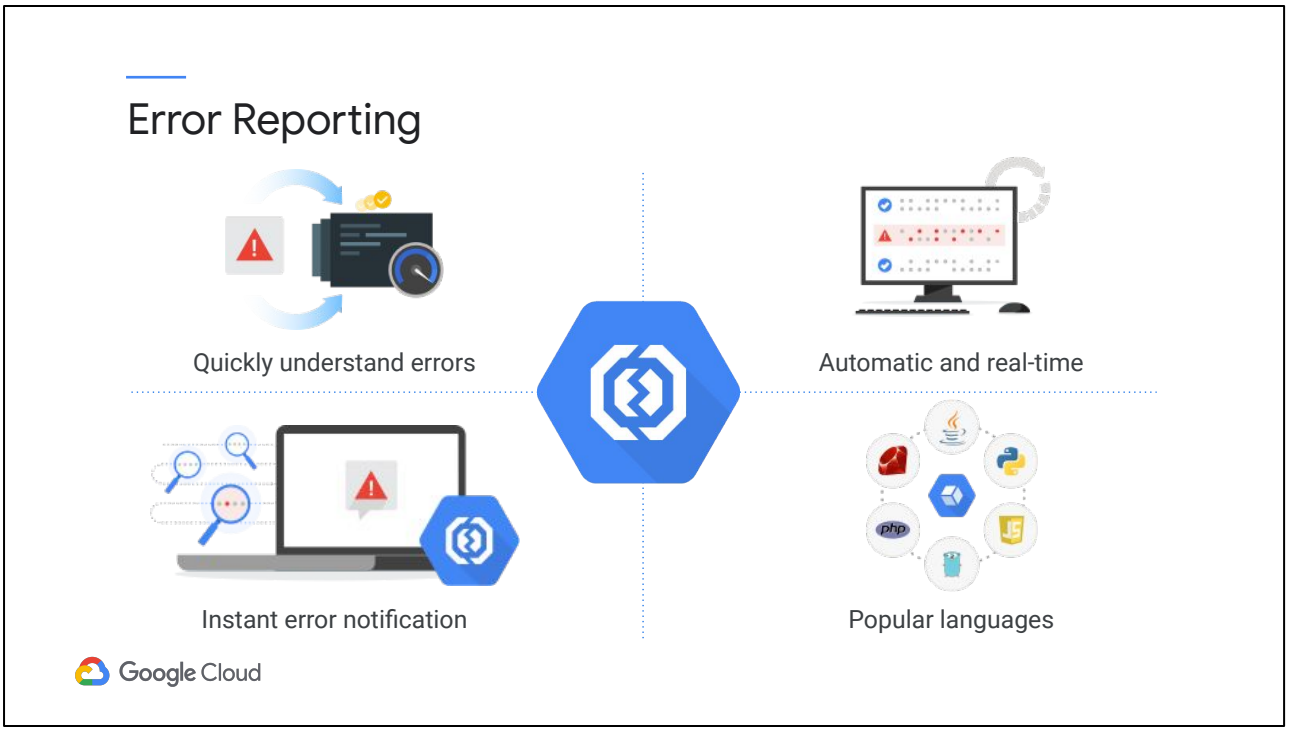


Cloud Logging is a fully integrated solution that works seamlessly with Cloud Monitoring, Trace, Error Reporting, and Debugger. The integration allows users to navigate between incidents, charts, traces, errors, and logs. This helps users quickly find the root causes of issues in their system and applications.

Logging is built to scale and works well at sub-second ingestion latency at terabytes per second. Logging is a fully managed solution that takes away the overhead of deploying or managing a cluster, thus allowing users to focus their energy on innovation and building a product.

Logging provides a central place for all your logs. You can also configure Logging to export logs to other systems automatically.

Logging allows you to analyze high-volume application and system logs in real time. Advanced log analysis can be achieved by combining the power of the operations suite with the data and analytics products of Google Cloud. For example, you can create powerful real-time metrics from the log data and analyze log data in real time in BigQuery.



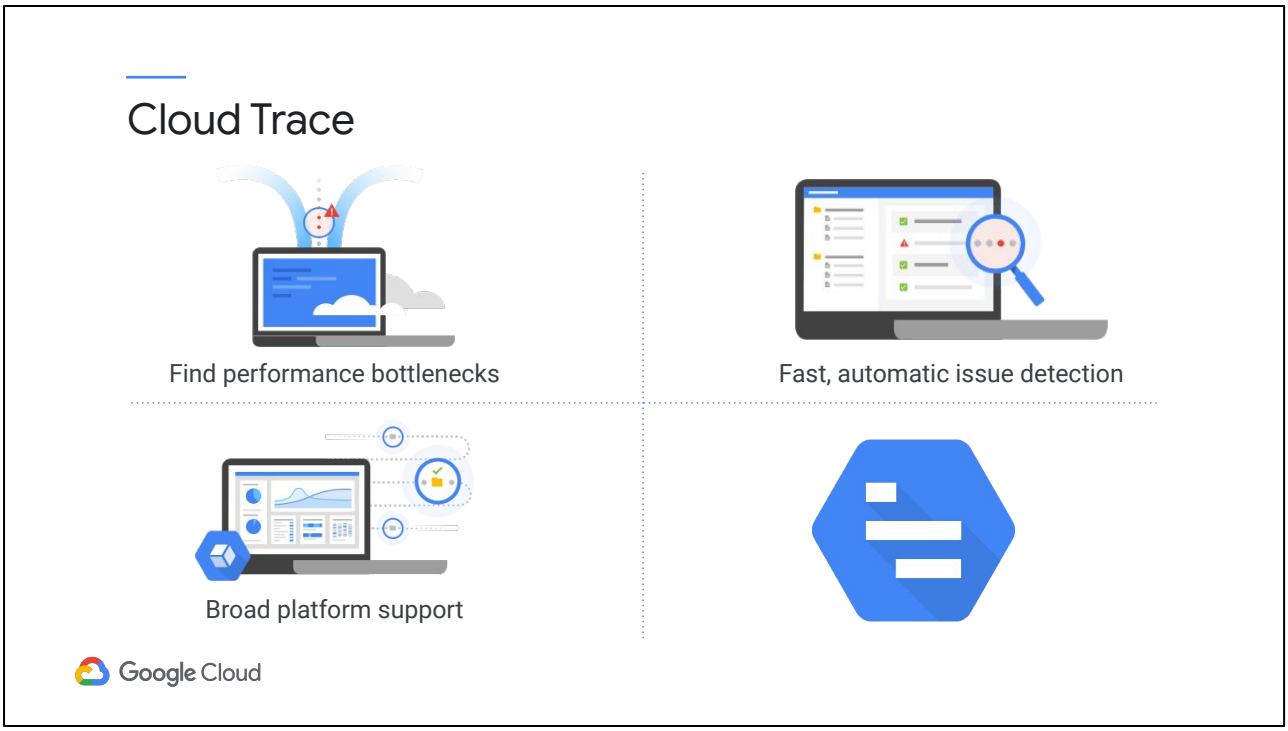
Error Reporting allows you to identify and understand application errors through real-time exception monitoring and alerting.

Error Reporting allows you to see your application's top errors in a dashboard.

Real production problems can be hidden in mountains of data. Error Reporting helps you see problems through the noise by constantly analyzing exceptions and intelligently aggregating them into meaningful groups tailored to your programming language and framework.

Error Reporting is constantly watching your service and instantly alerts you when a new application error cannot be grouped with existing ones. Directly jump from a notification to the details of the new error.

The exception stack trace parser is able to process Go, Java, .NET, Node.js, PHP, Python, and Ruby. You can also use Google's client libraries and REST APIs to send errors with Cloud Logging.

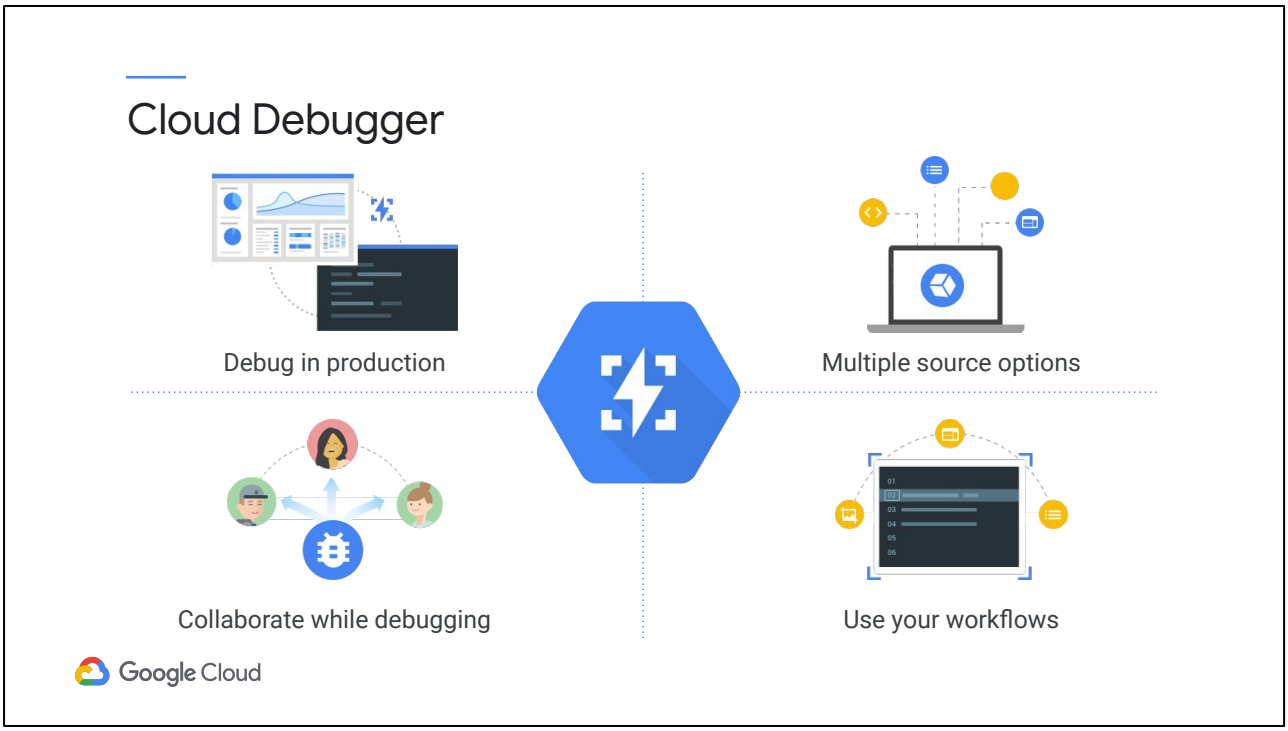


Cloud Trace is a distributed tracing system that collects latency data from applications and displays it in the Cloud Console.

Using Cloud Trace, you can inspect detailed latency information for a single request or view aggregate latency for your entire application. You can quickly find where bottlenecks are occurring and more quickly identify their root cause.

Trace continuously gathers and analyzes data from applications to automatically identify changes to an application's performance. These latency distributions, available through the Analysis Reports feature, can be compared over time or versions, and Trace will automatically generate an alert if it detects a significant shift in an application's latency profile.

The language-specific SDKs of Trace can analyze projects running on VMs. The Trace SDK is currently available for Java, Node.js, Ruby, and Go, and the Trace API can be used to submit and retrieve trace data from any source. A Zipkin collector is also available, which allows Zipkin tracers to submit data to Trace. Cloud Trace works out-of-the-box on many Google Cloud services like App Engine.



Cloud Debugger is a feature of Google Cloud that lets you inspect the state of a running application in real time, without stopping or slowing it down.

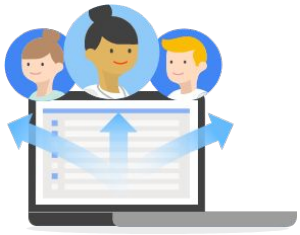
Debugger can be used with production applications. With a few mouse clicks, you can take a snapshot of your running application state or inject a new logging statement. A snapshot captures the call stack and variables at a specific code location the first time any instance executes that code. The injected log point behaves as if it were part of the deployed code writing the log messages to the same log stream.

Debugger is easier to use when source code is available. It knows how to display the correct version of the source code when a version control system is used, such as Cloud Source Repositories, GitHub, Bitbucket, or GitLab.

Users can easily collaborate with other team members by sharing their debug session. Sharing a debug session is as easy as sending the Console URL.

Debugger is integrated into existing developer workflows. Users can launch Debugger and take snapshots directly from Cloud Logging, Error Reporting, dashboards, integrated development environments, and the gcloud command-line interface.

Cloud Profiler



Low-impact production profiling

Broad platform support

Google Cloud

Poorly performing code increases the latency and cost of applications and web services every day. Cloud Profiler continuously analyzes the performance of CPU or memory-intensive functions executed across an application.

While it's possible to measure code performance in development environments, the results generally don't map well to what's happening in production. Many production profiling techniques either slow down code execution or can only inspect a small subset of a codebase. Profiler uses statistical techniques and extremely low-impact instrumentation that runs across all production application instances to provide a complete picture of an application's performance without slowing it down.

Profiler allows developers to analyze applications running anywhere, including Google Cloud, other cloud platforms, or on-premises, with support for Java, Go, Node.js, and Python.

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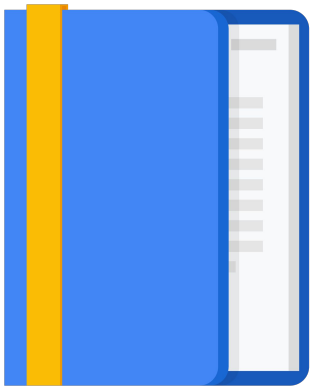

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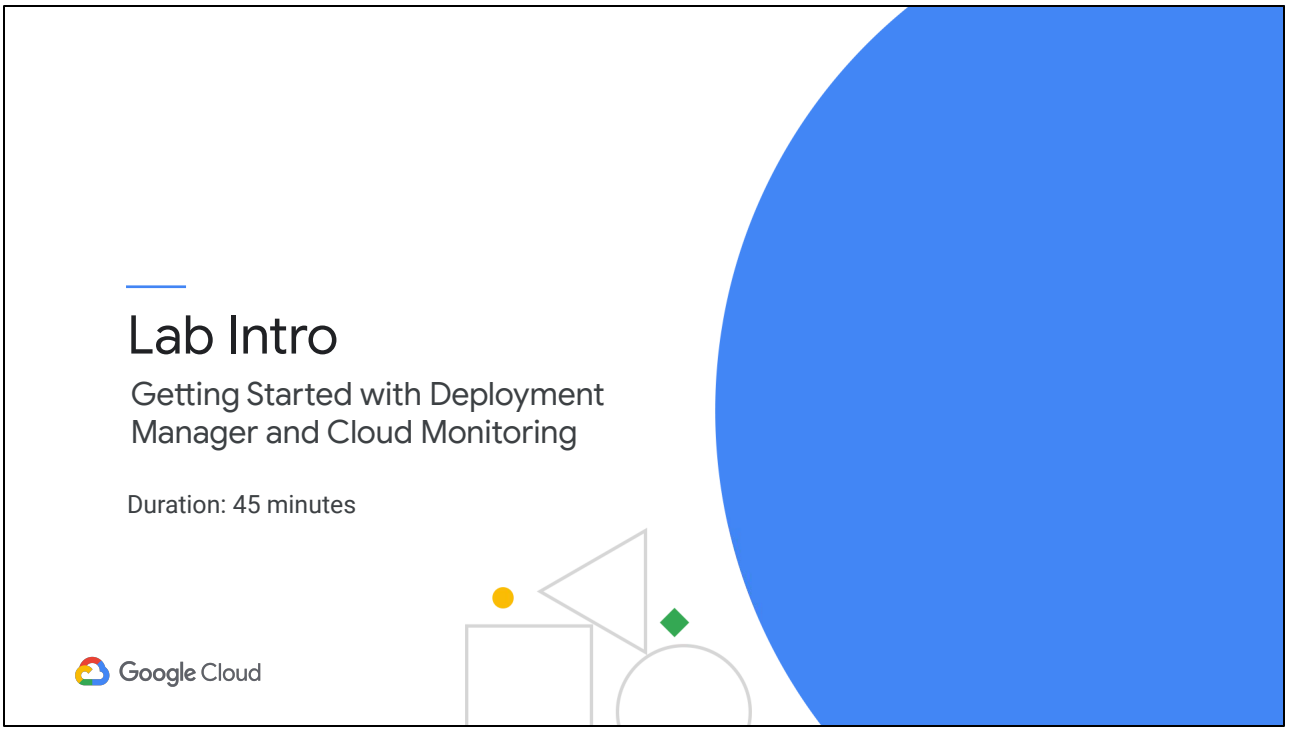

The objectives for this lab are for you to:

- Create a Deployment Manager deployment.
- Update a Deployment Manager deployment.
- View the load on a VM instance using Cloud Monitoring.

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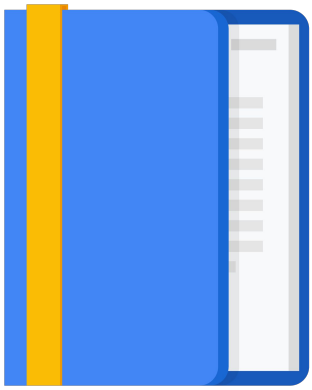

Google Cloud

Resources

Cloud Source Repositories https://cloud.google.com/source-repositories/docs/

Deployment Manager https://cloud.google.com/deployment-manager/docs/

Google Cloud operations suite https://cloud.google.com/stackdriver/docs/


Google Cloud