Architecting Event-driven Serverless Solutions Using Google Cloud Functions

GETTING STARTED WITH GCP CLOUD FUNCTIONS

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Overview

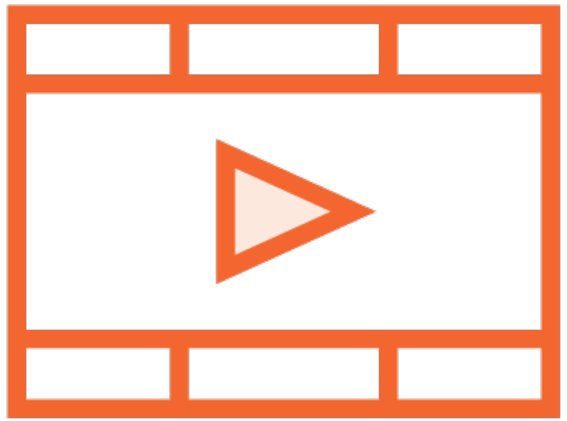
Cloud Functions for serverless compute

Most lightweight compute option

Event-driven and stateless

Python and Node.js runtimes

Prerequisites and Course Outline



Prerequisites: Basic Cloud Computing

Choosing and Implementing Google Cloud Compute Engine Solutions

- Basics of using the Google Cloud Platform

Architecting Google Cloud Storage Configurations

- Basics of storage on Google Cloud

Software and Skills

Basic understanding of cloud computing

Basic understanding of how virtual machines work

Basic programming in Python

Basic programming in JavaScript

Course Outline

Introducing Cloud Functions

HTTP Cloud Functions

Background Cloud Functions

Stackdriver and Cloud Functions

Scenarios: SpikySales.com

Hypothetical Online Retailer

- Flash sales of trending products
- Spikes in user traffic

SpikySales on the GCP

- Cloud computing and storage fits perfectly
- Pay-as-you-go
- No idle capacity during off-sale periods

Use cases: SpikySales.com

SpikySales and Cloud Functions

- Lightweight HTTP end-points for partners and sellers
- Event-driven solutions for managing catalogs

Introducing Google Cloud Functions

Choices in (Any) Computing

Compute

Where and how does code run?

Storage

Where and how is the data stored?

Other choices - networking, logging etc. - are less important

Compute Choices

Less ops (admin, provisioning)

More control, low-level access

GCP Compute Choices

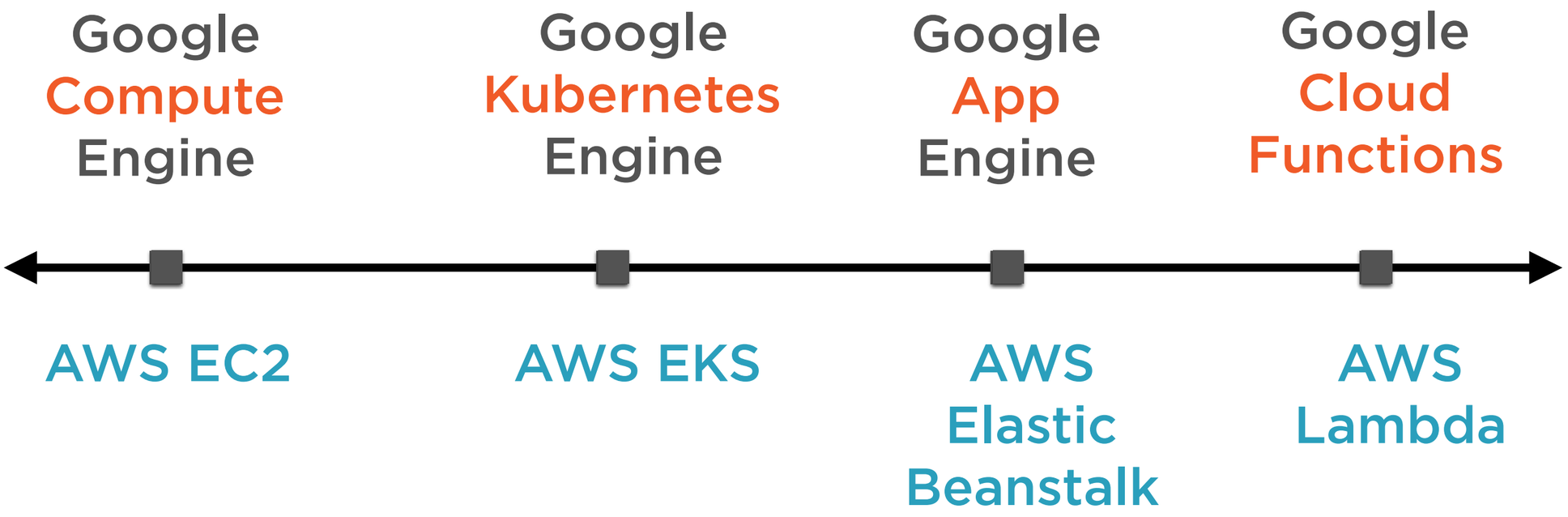
Google Compute Engine

Google Kubernetes Engine

Google App Engine

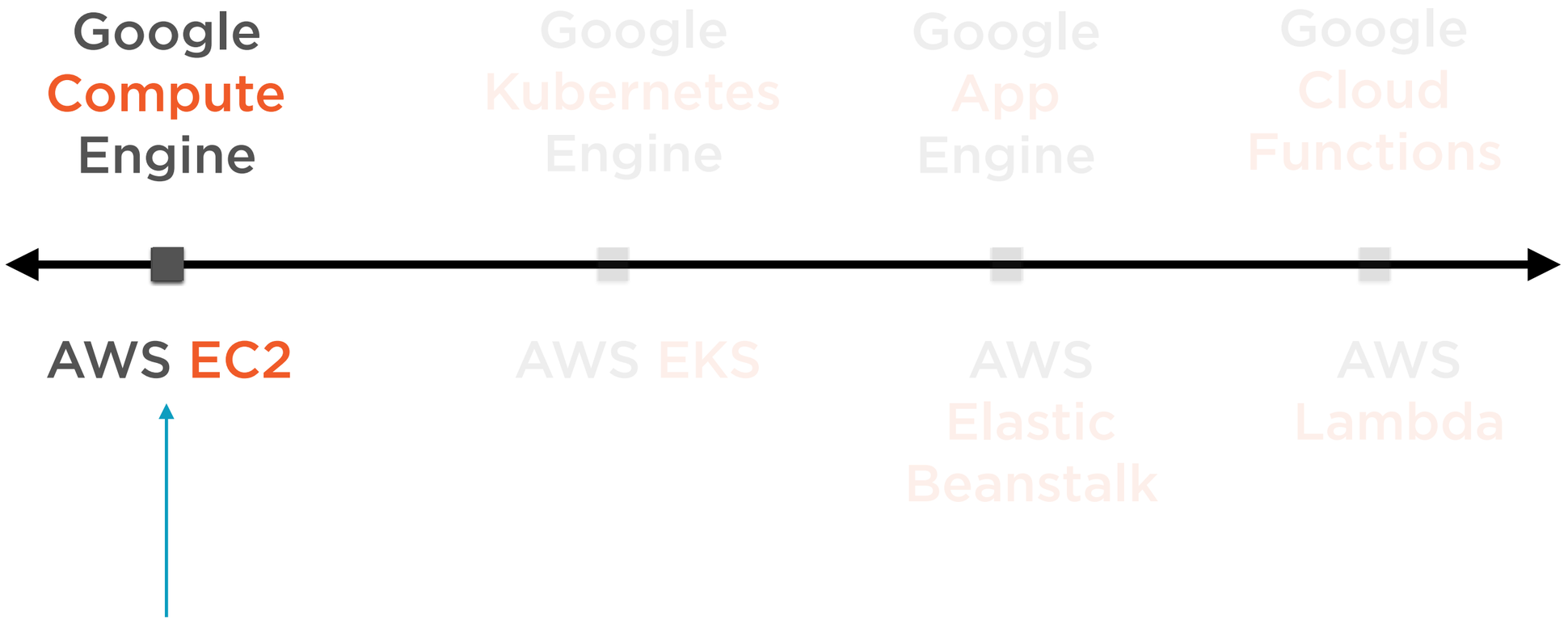
Google Cloud Functions

GCP Compute Choices



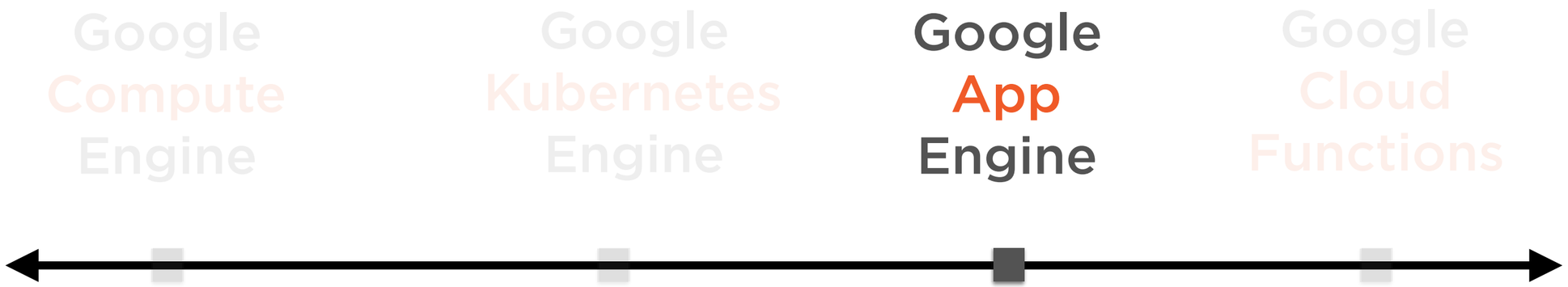
Every major cloud platform supports the same range of compute choices

GCP Compute Choices



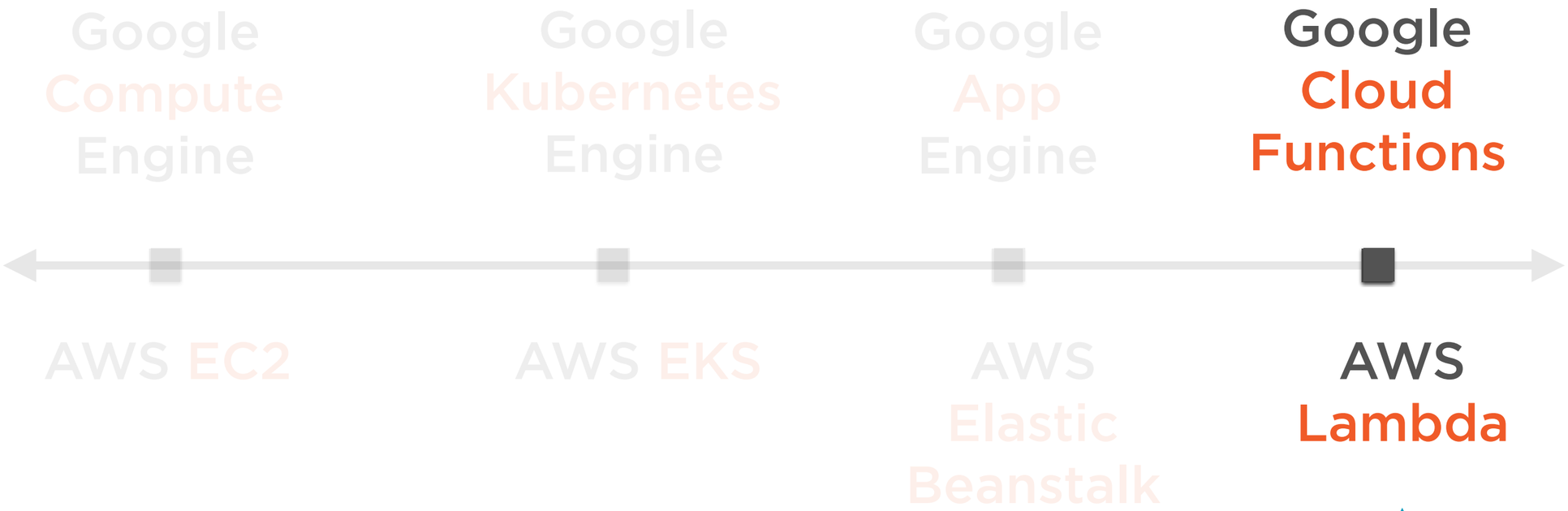
"**I**nfrastructure-**a**s-**a**-**S**ervice" (IaaS)

GCP Compute Choices



"**P**latform-**a**s-**a**-**S**ervice" (PaaS)

GCP Compute Choices



Cloud Functions

Event-driven serverless compute platform

Serverless compute
abstracts away provisioning,
managing servers and
configuring software

Event-driven Serverless Compute

Event Occurs

Platform triggers execution

Cloud Function code runs

Invokes other GCP services

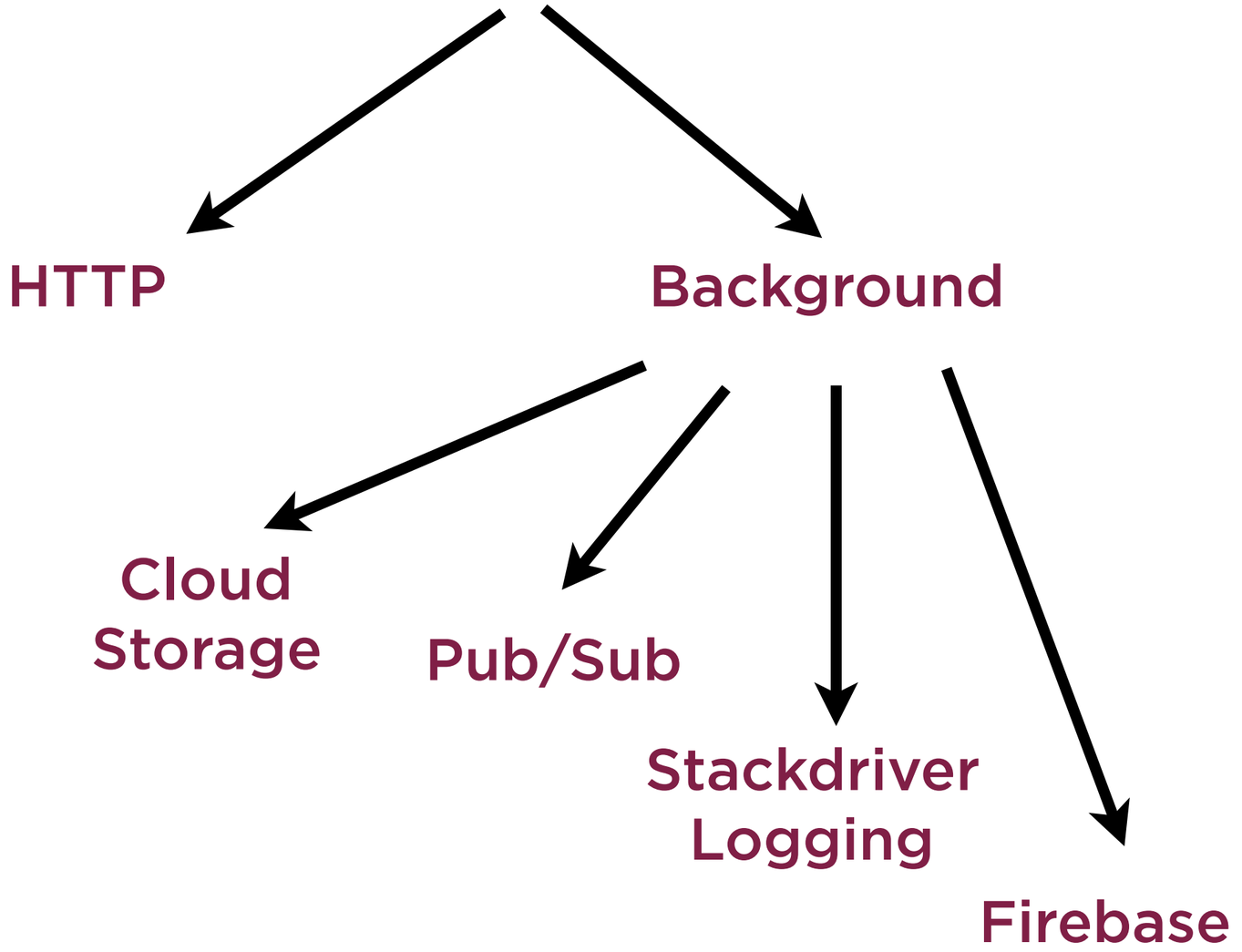
Events

Occurs in the external environment

Functions can choose to respond to an event

Events are wired up to trigger functions

Types of Events



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Triggers

When event occurs, GCP takes over

Ensures that event information is passed to cloud function

Function parameters nicely packaged up

Type of event determines parameters

Additional context also included

Event-driven Serverless Compute

Event Occurs

Platform triggers execution

Cloud Function code runs

Invokes other GCP services

Execution Environments

Currently, limited runtimes

Python

- Python 3.7.0
- Flask to handle requests

JavaScript

- Node.js 6.14.0 default
- Node.js 8.11.1 beta

Concurrency and Scale

Multiple function instances based on current load

Functions do not share memory or variables

An instance processes a single request

Functions should be stateless

Execution Guarantees

HTTP functions: Invoked at most once

Background functions: Invoked at least once

- Can be retried on failure

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Event-driven Serverless Compute

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GCP Integration

Cloud Functions seamlessly work with other GCP services

- Create VMs or provision resources
- Stackdriver suite for operations
- Interact with BigQuery/Cloud Storage

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Cloud Functions

Simplest compute option

Event-driven

Serverless - software and infrastructure fully managed by Google

Pay only while code runs

Pricing of Google Cloud Functions

Pay-as-you-use, no charges unless Cloud Functions are invoked

Total Price = Invocations + Compute time + Networking

Cloud Function Pricing

Three components of pricing

Total Price = **Invocations** + Compute time + Networking

Invocations

Flat rate of $0.4 per million invocations

Total Price = **Invocations** + Compute time + Networking

Invocations Free Tier

Charges kick in after 2 Million free invocations per month

Total Price = Invocations + **Compute time** + Networking

Compute Cost

$0.0000025 per GB-Second for memory; $0.00001 per GHZ-Second for compute

Total Price = Invocations + **Compute time** + Networking

Compute Free Tier

Charges kick in after 1 million seconds of free compute per month

Total Price = Invocations + **Compute time** + Networking

Compute Cost

Need to specify amount of memory and CPU at time of deployment

Indicative Compute Configurations

128 MB, 200 MHz	256 MB, 400 MHz	512 MB, 800 MHz	1 GB, 1.4 GHz	2 GB, 2.4 GHz
Testing	Small simple functions	Moderate load	Balance cost, speed	Compute-intensive

Need to specify amount of memory and CPU at time of deployment

Total Price = Invocations + Compute time + **Networking**

Networking Cost

Flat rate of $0.12 per GB

Total Price = Invocations + Compute time + **Networking**

Networking Free Tier

Charges kick in after 5 GB of internet egress per month

Indicative Compute Configurations

128 MB, 200 MHz	256 MB, 400 MHz	512 MB, 800 MHz	1 GB, 1.4 GHz	2 GB, 2.4 GHz
Testing	Small simple functions	Moderate load	Balance cost, speed	Compute-intensive

Need to specify amount of memory and CPU at time of deployment

Indicative Compute Configurations

128 MB, 200 MHz	256 MB, 400 MHz	512 MB, 800 MHz	1 GB, 1.4 GHz	2 GB, 2.4 GHz
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Need to specify amount of memory and CPU at time of deployment

Pricing Scenario #1

Trial Project: $0/month

Property	Usage	Cost
Invocations	1 Million	$0
Storage	75,000 GB-seconds	$0
Compute	120,000 GHz-seconds	$0
Networking	0	$0
Total Cost		$0

Indicative Compute Configurations

128 MB, 200 MHz	**256 MB, 400 MHz**	512 MB, 800 MHz	1 GB, 1.4 GHz	2 GB, 2.4 GHz
Testing	**Small simple functions**	Moderate load	Balance cost, speed	Compute-intensive

Need to specify amount of memory and CPU at time of deployment

Pricing Scenario #2

Simple Function: $14/month

Property	Usage	Cost
Invocations	10 Million	$3.2
Storage	750,000 GB-seconds	$0.88
Compute	1,200,000 GHz-seconds	$10
Networking	0	$0
Total Cost		$14.08

Indicative Compute Configurations

128 MB, 200 MHz	256 MB, 400 MHz	**512 MB, 800 MHz**	1 GB, 1.4 GHz	2 GB, 2.4 GHz
Testing	Small simple functions	**Moderate load**	Balance cost, speed	Compute-intensive

Need to specify amount of memory and CPU at time of deployment

Pricing Scenario #3

Moderate load: $164/month

Property	Usage	Cost
Invocations	30 Million	$11.2
Storage	7,500,000 GB-seconds	$17.75
Compute	12,000,000 GHz-seconds	$118
Networking	0	$16.57
Total Cost		$163.52

Demo

Getting started with Cloud Functions

Summary

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Most lightweight compute option

Event-driven and stateless

Python and Node.js runtimes