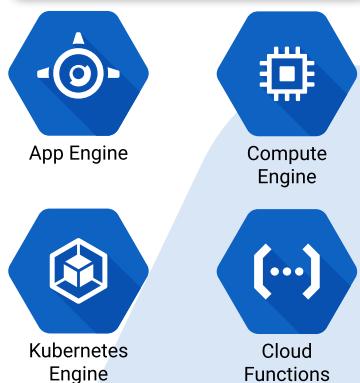
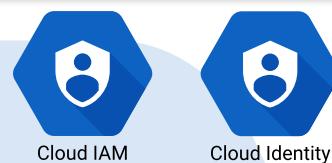




COMPUTE



IDENTITY & SECURITY



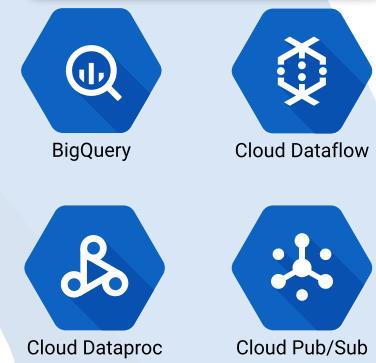
Other Services

STORAGE & DATABASES



Other Services

BIG DATA



Other Services

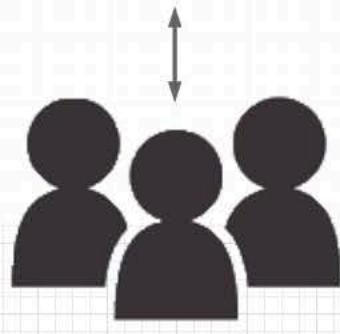
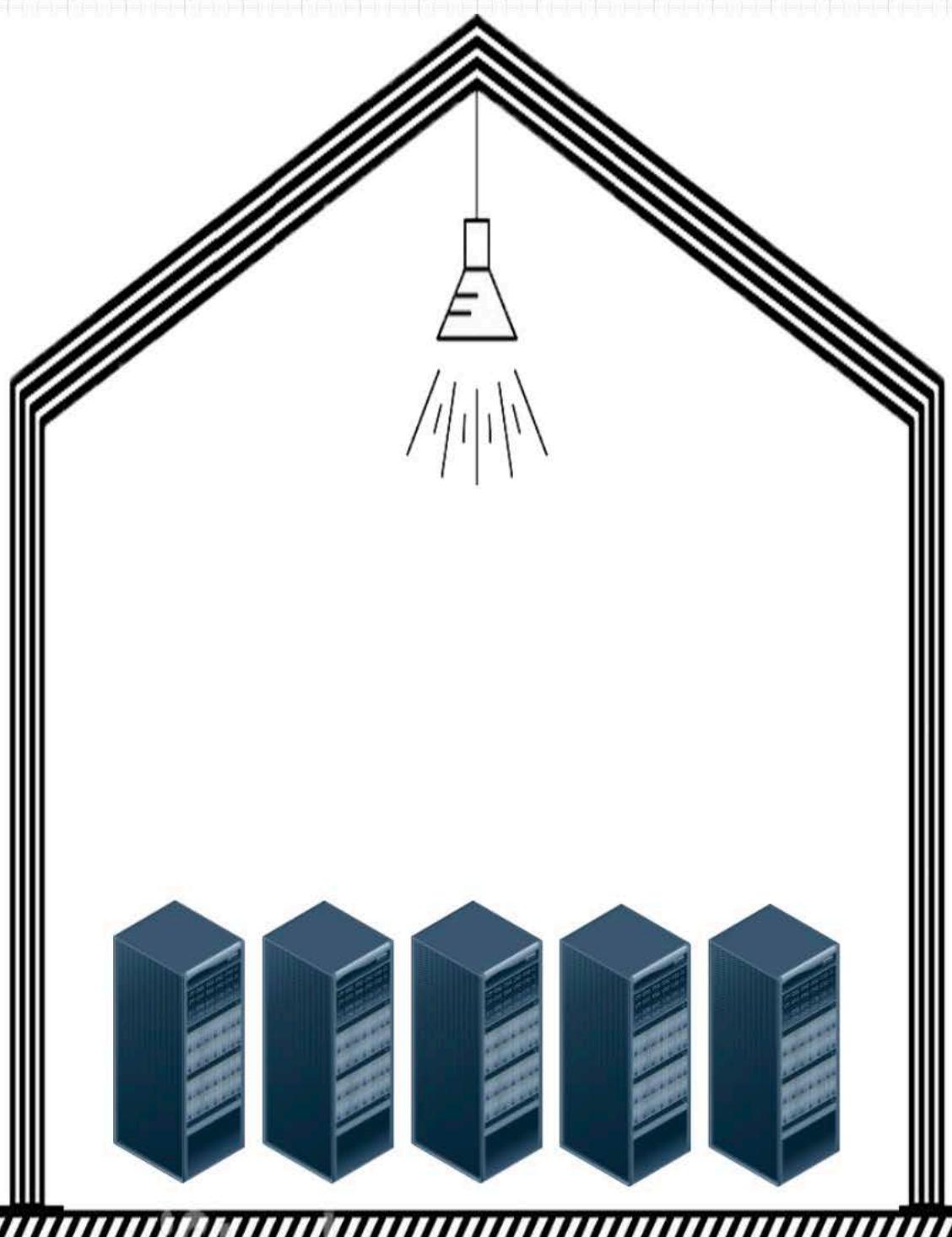
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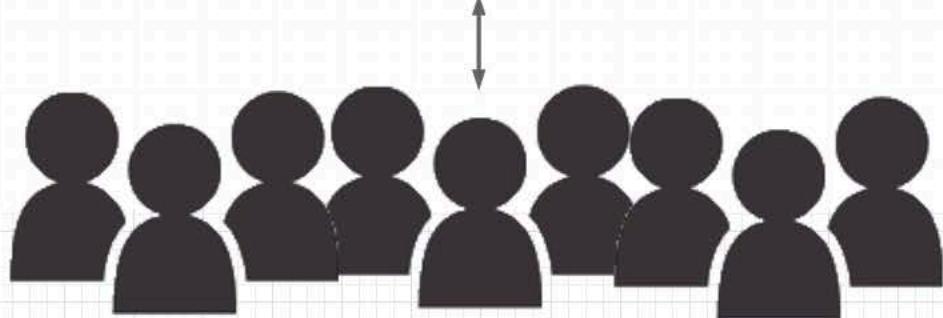
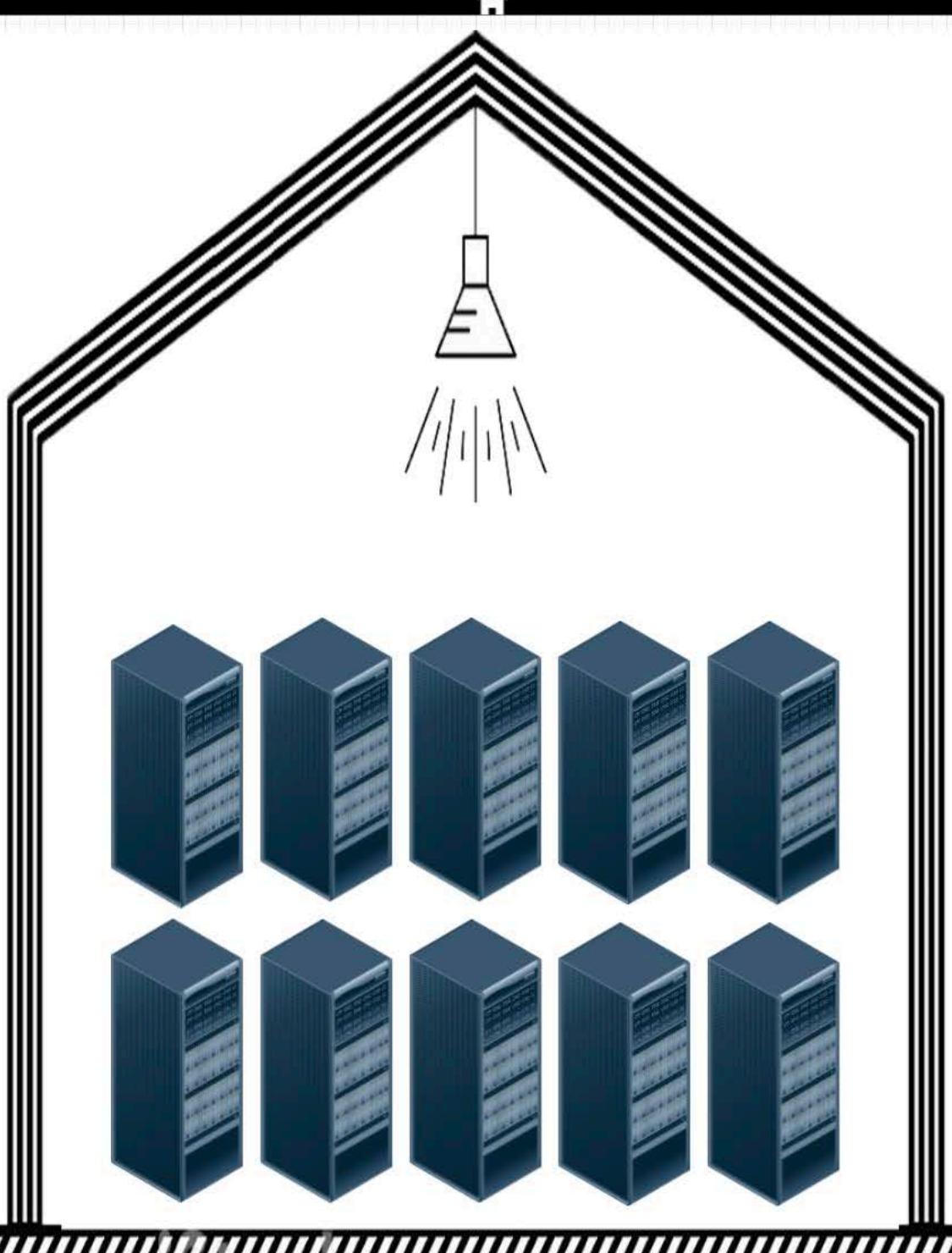


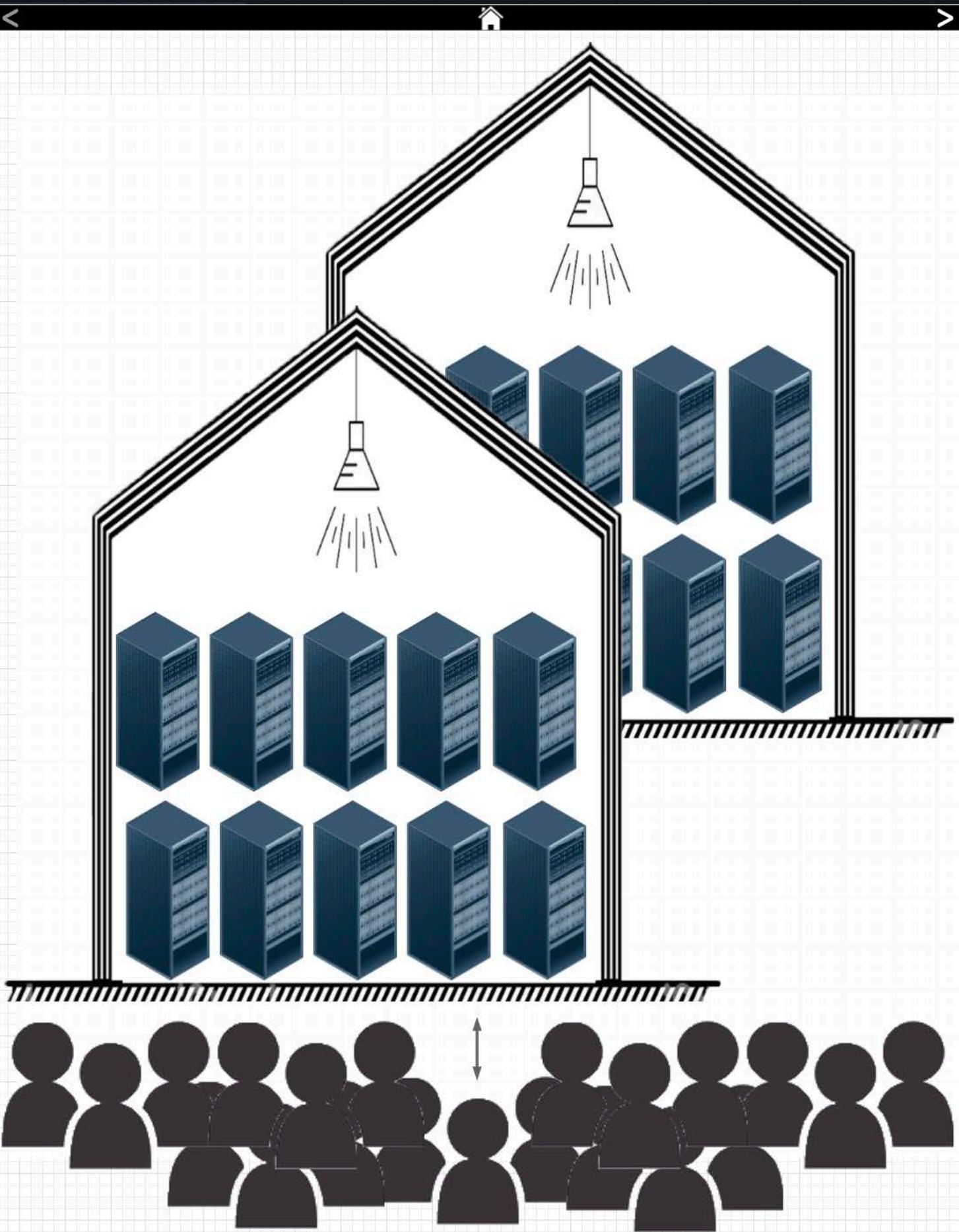
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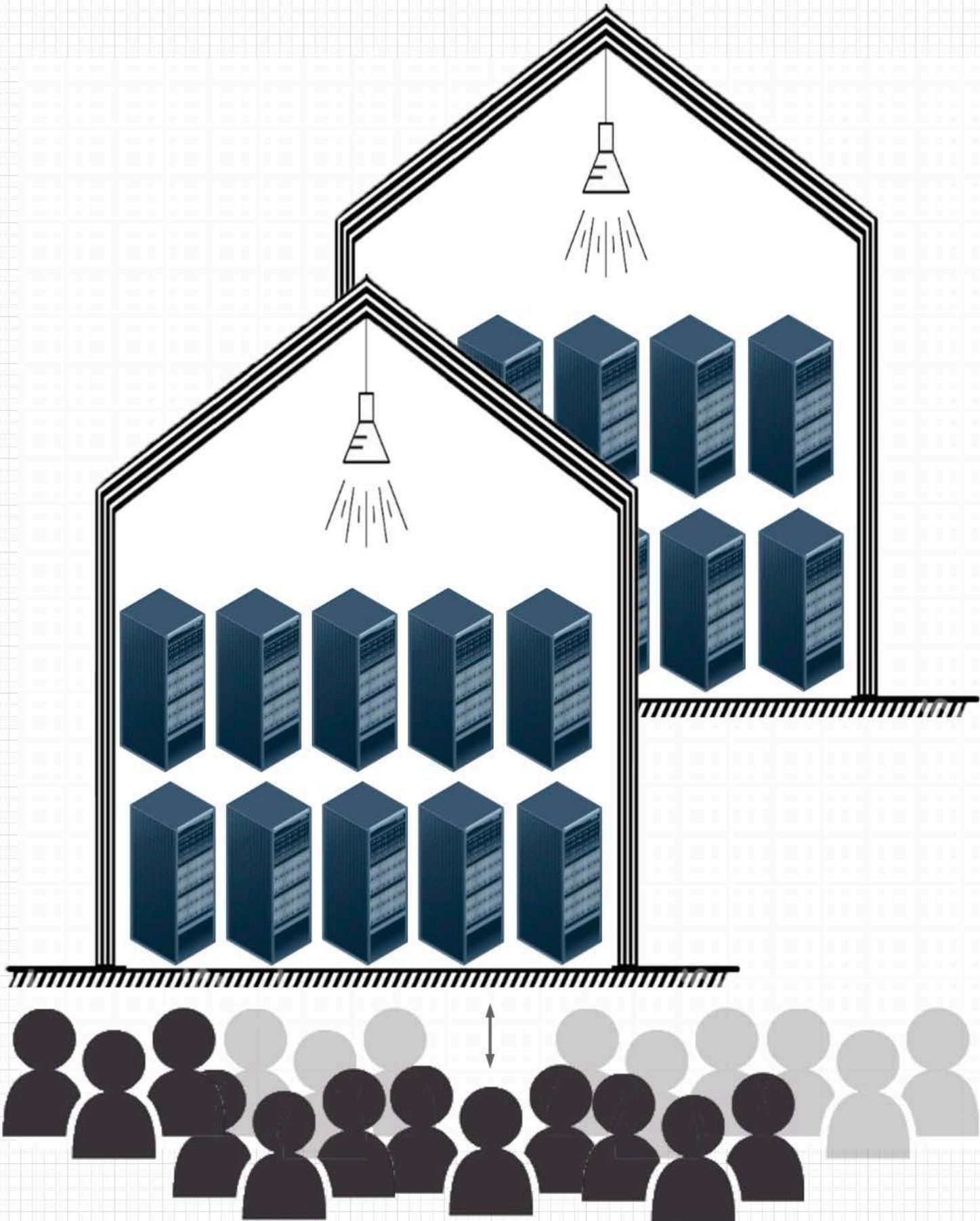
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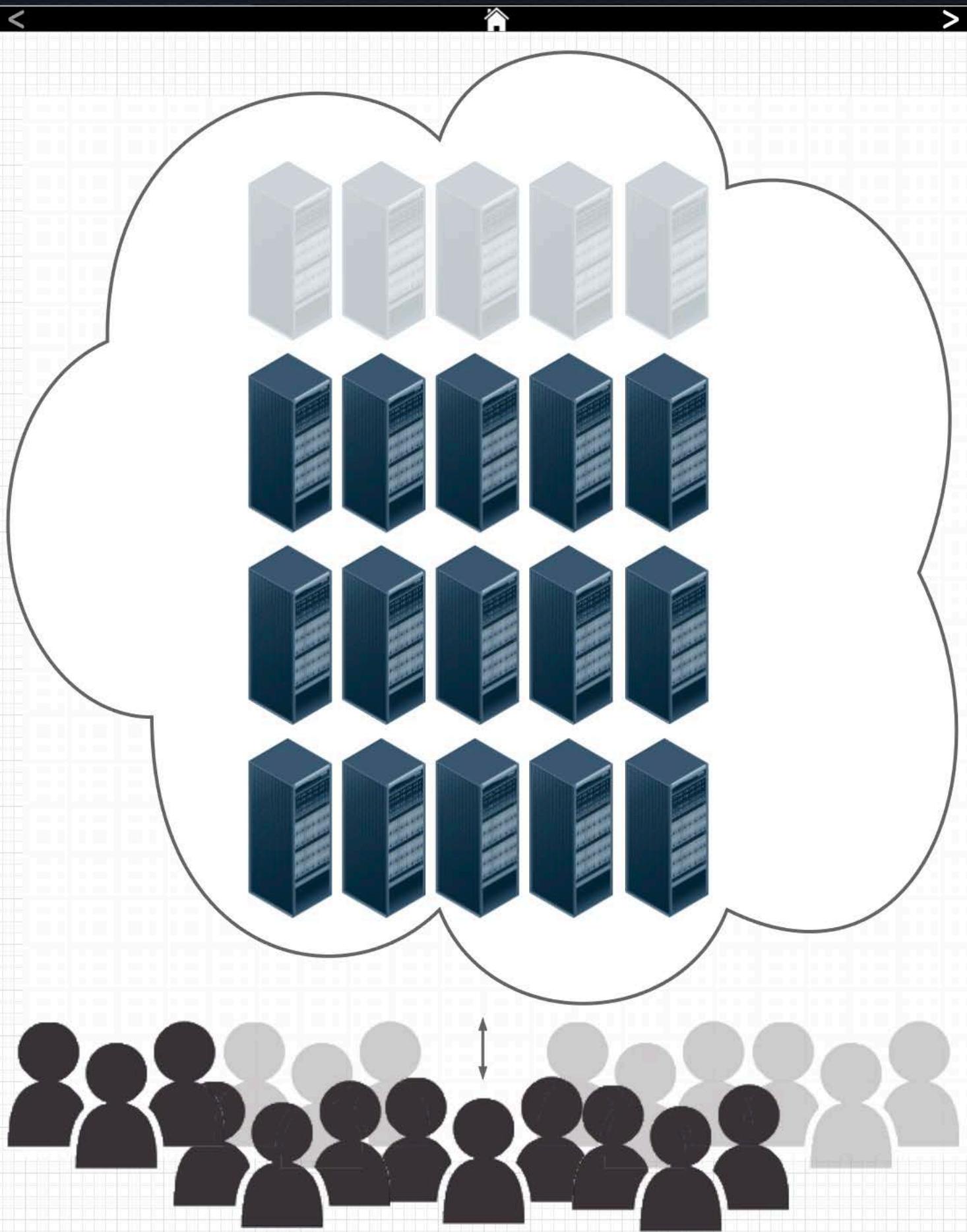


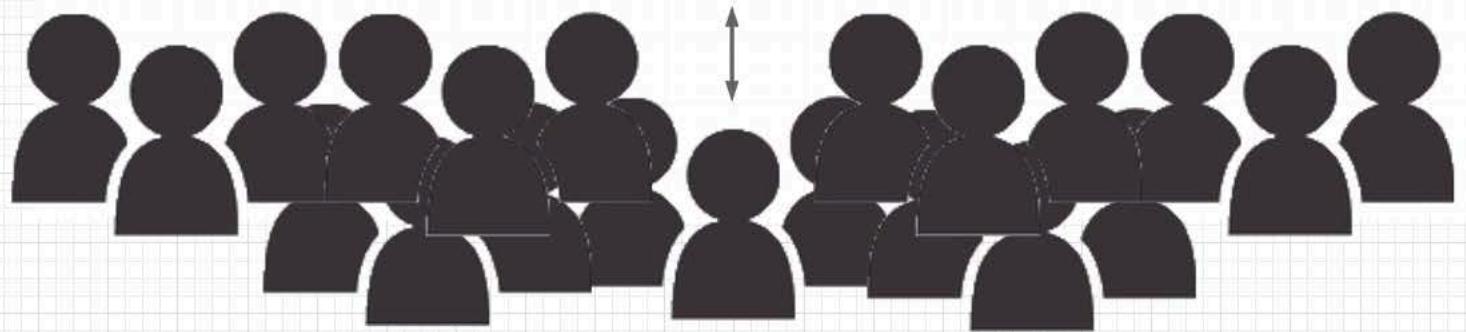
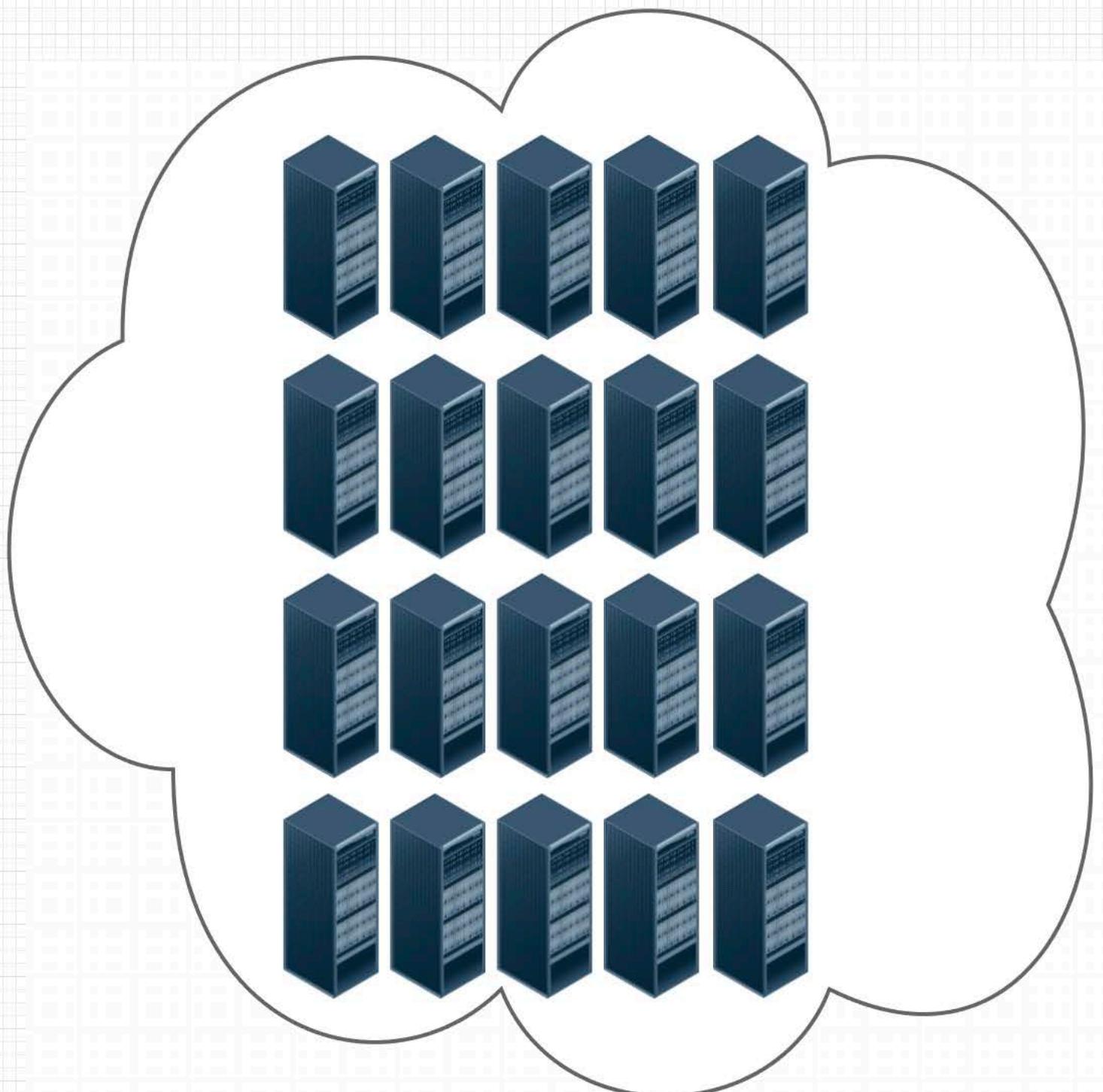


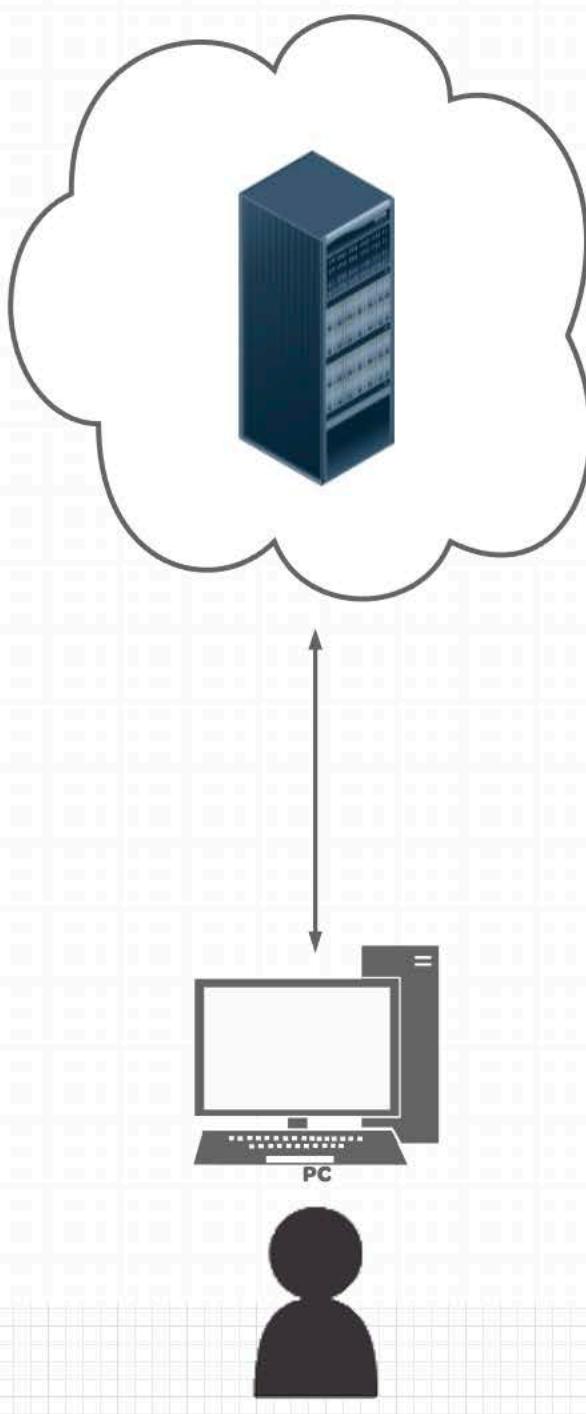


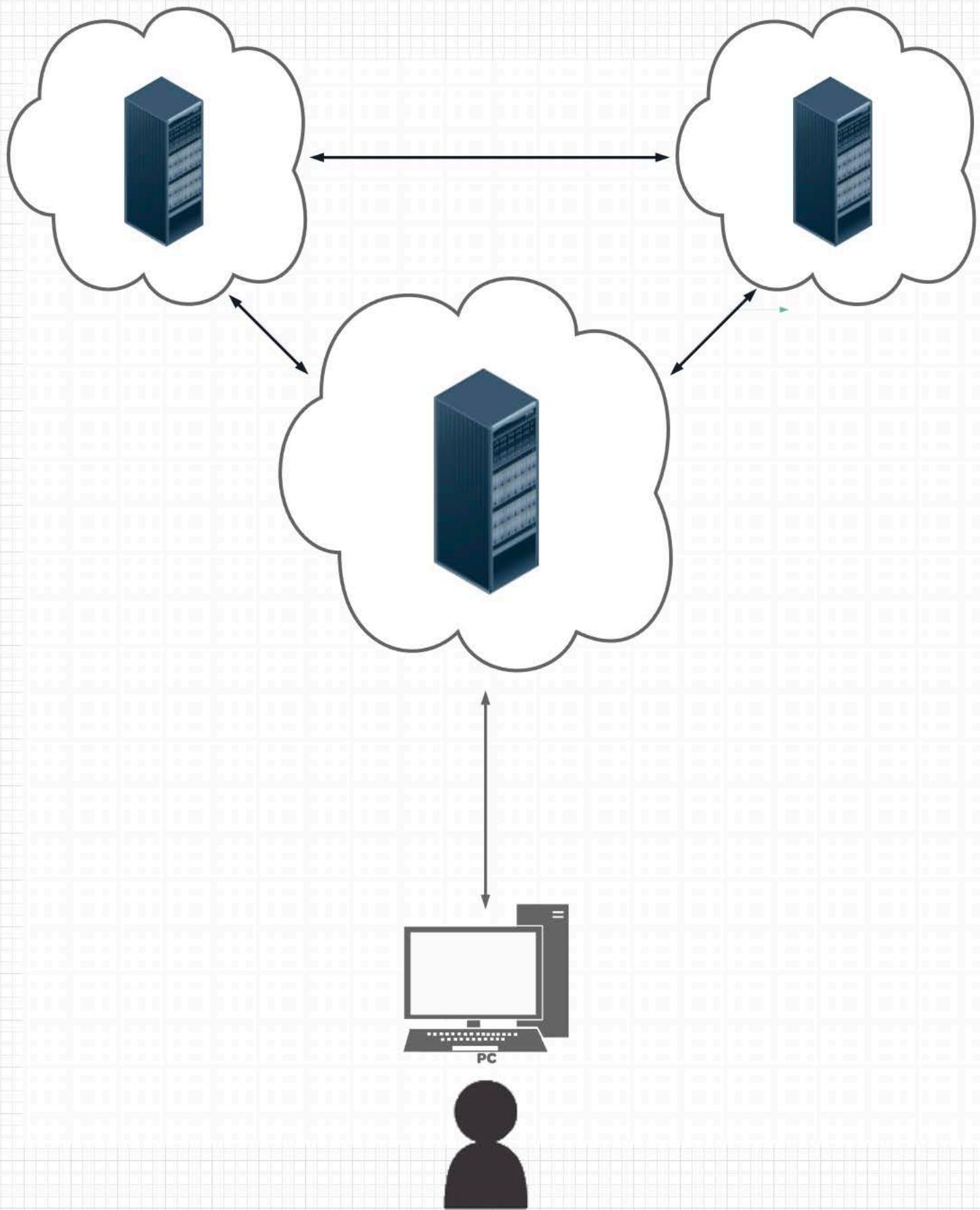


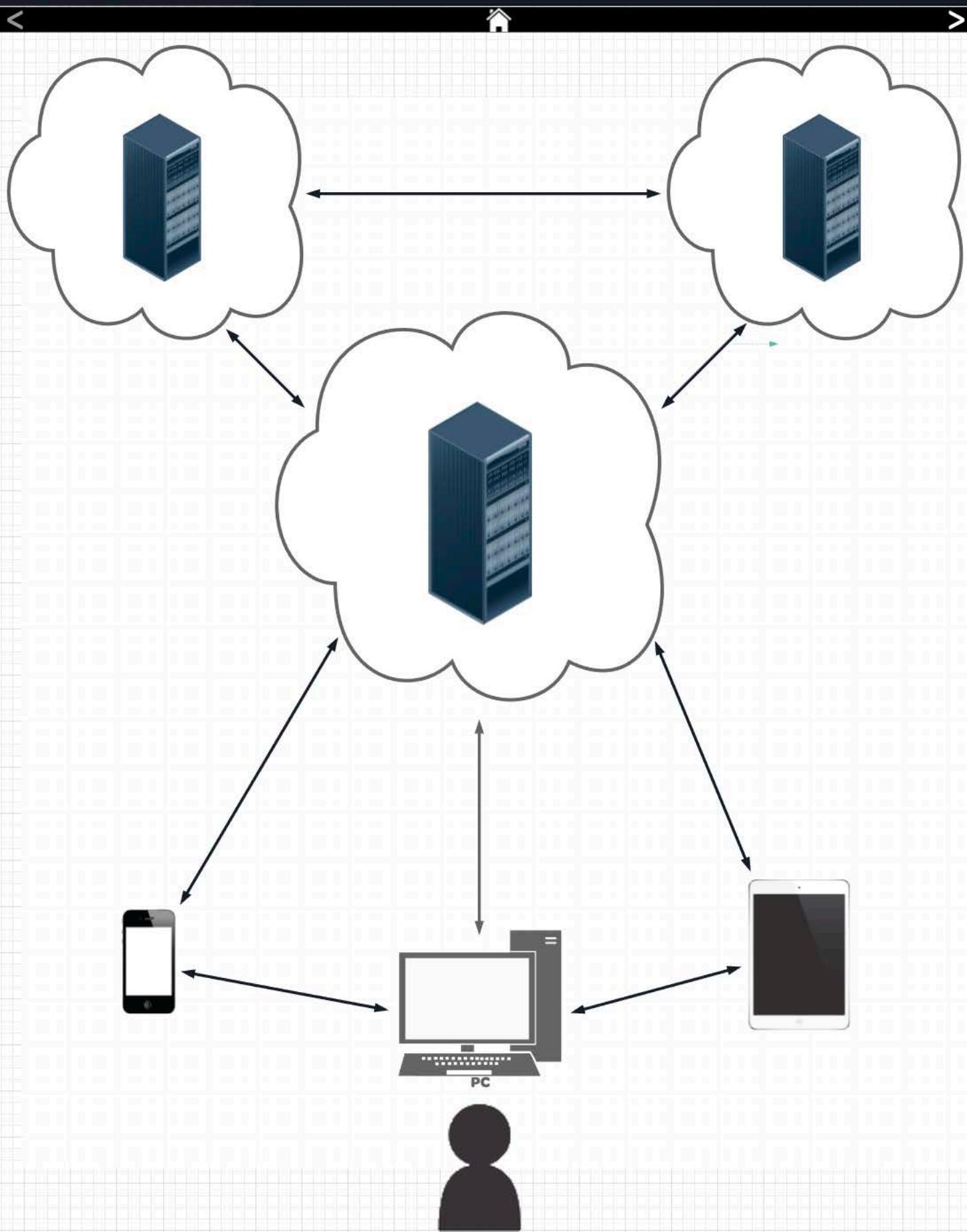


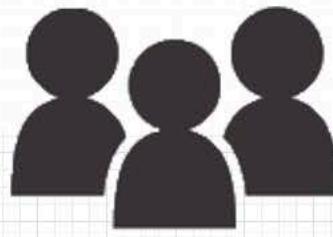
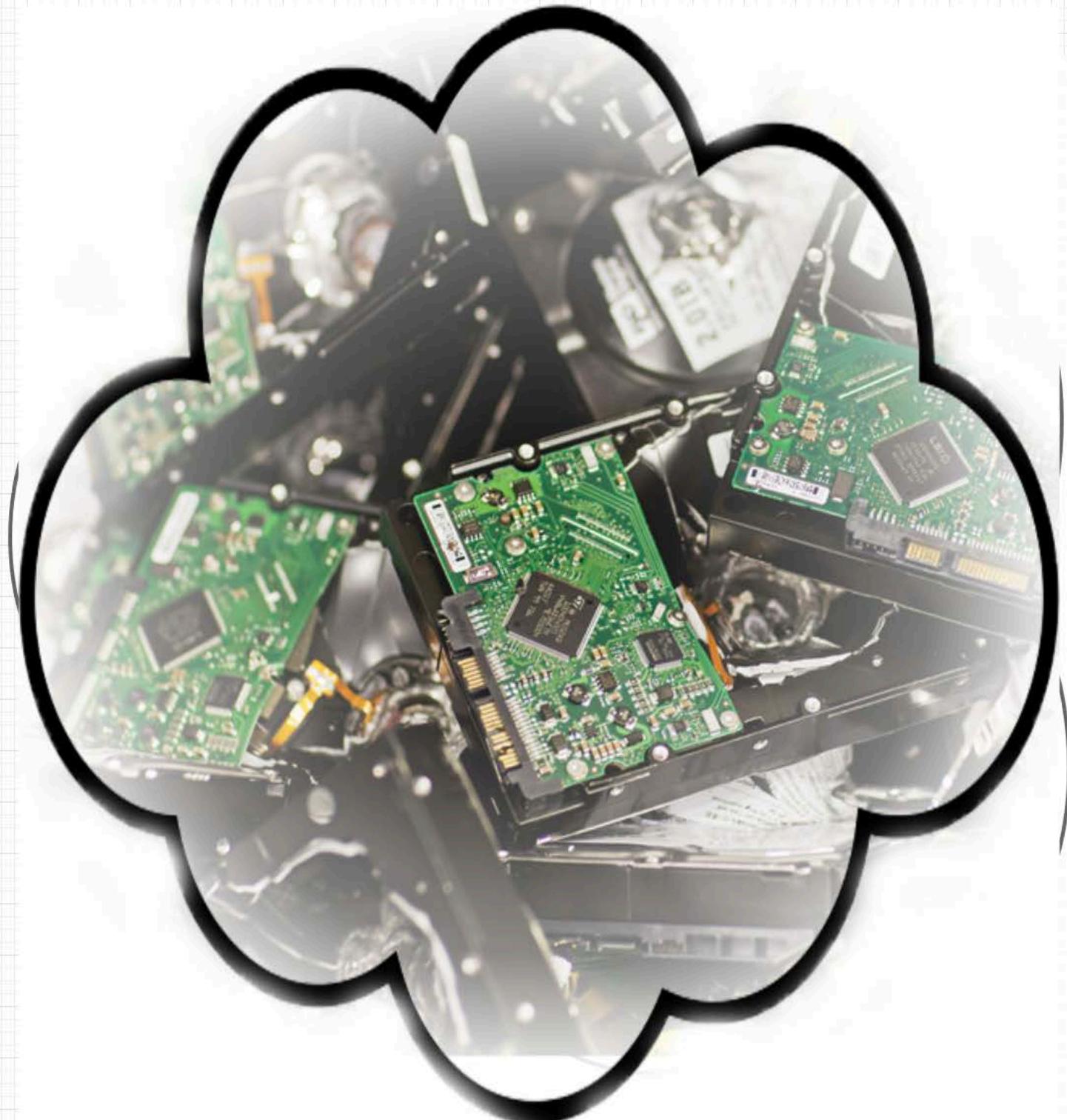






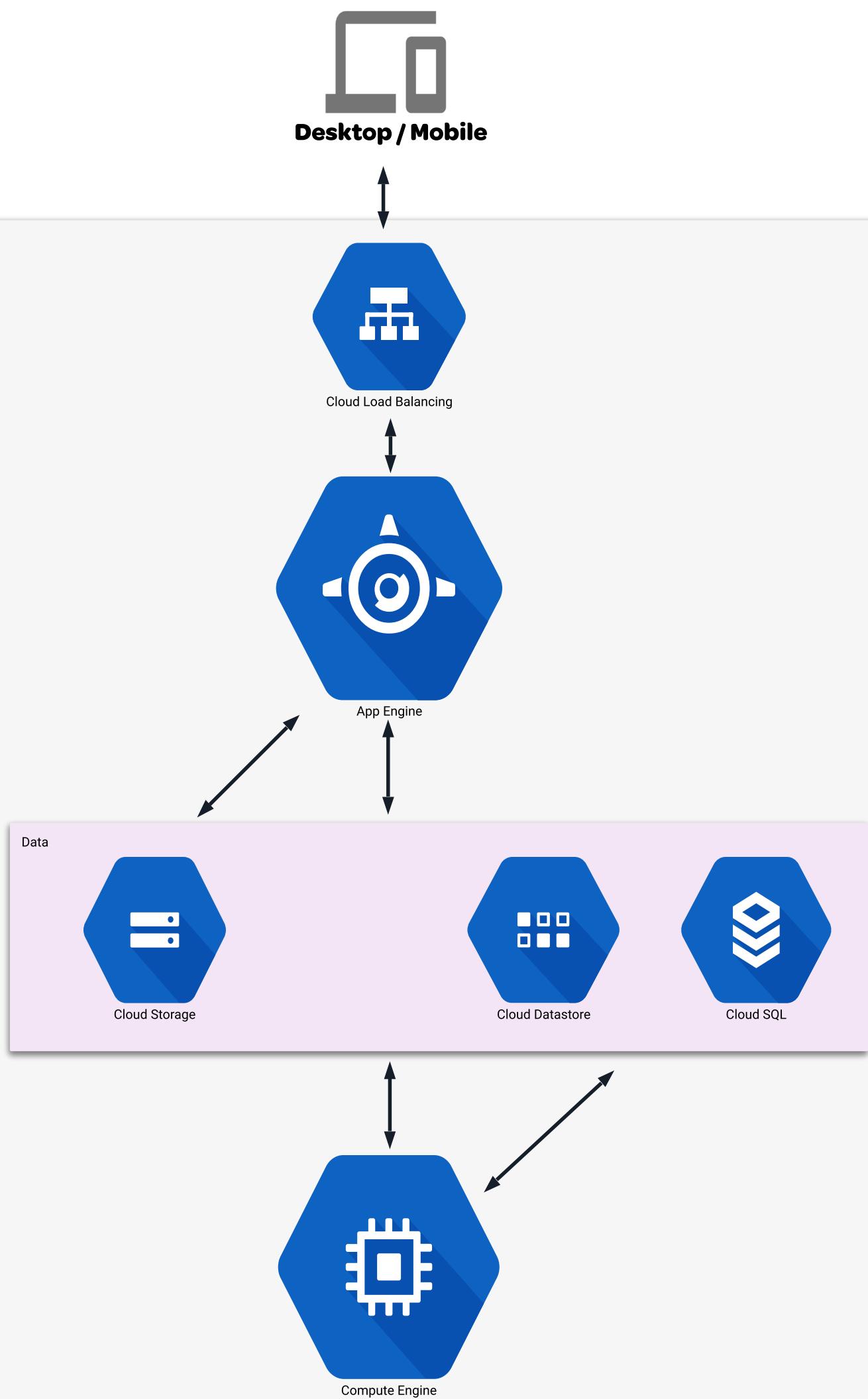






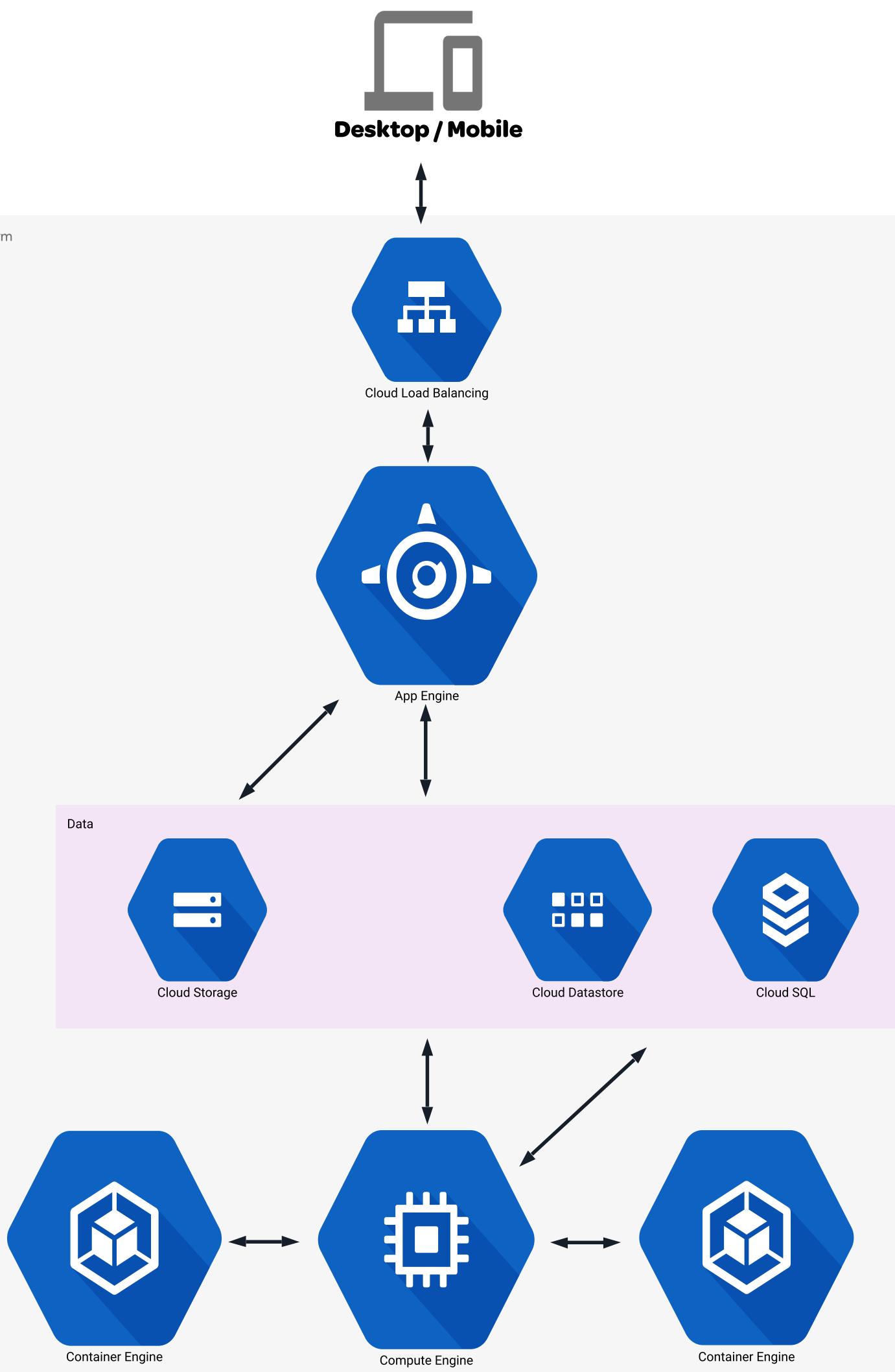


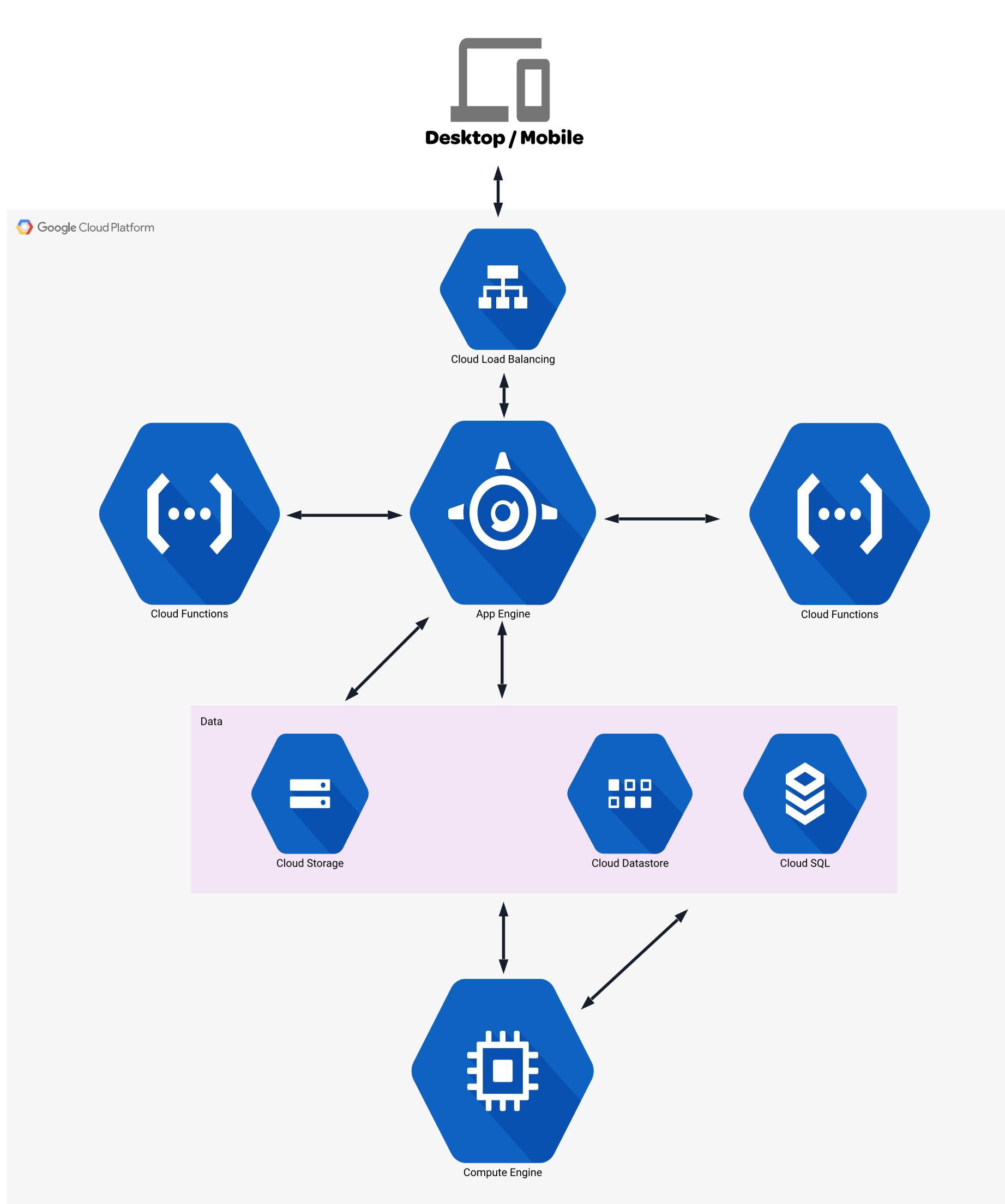
Google Cloud Platform





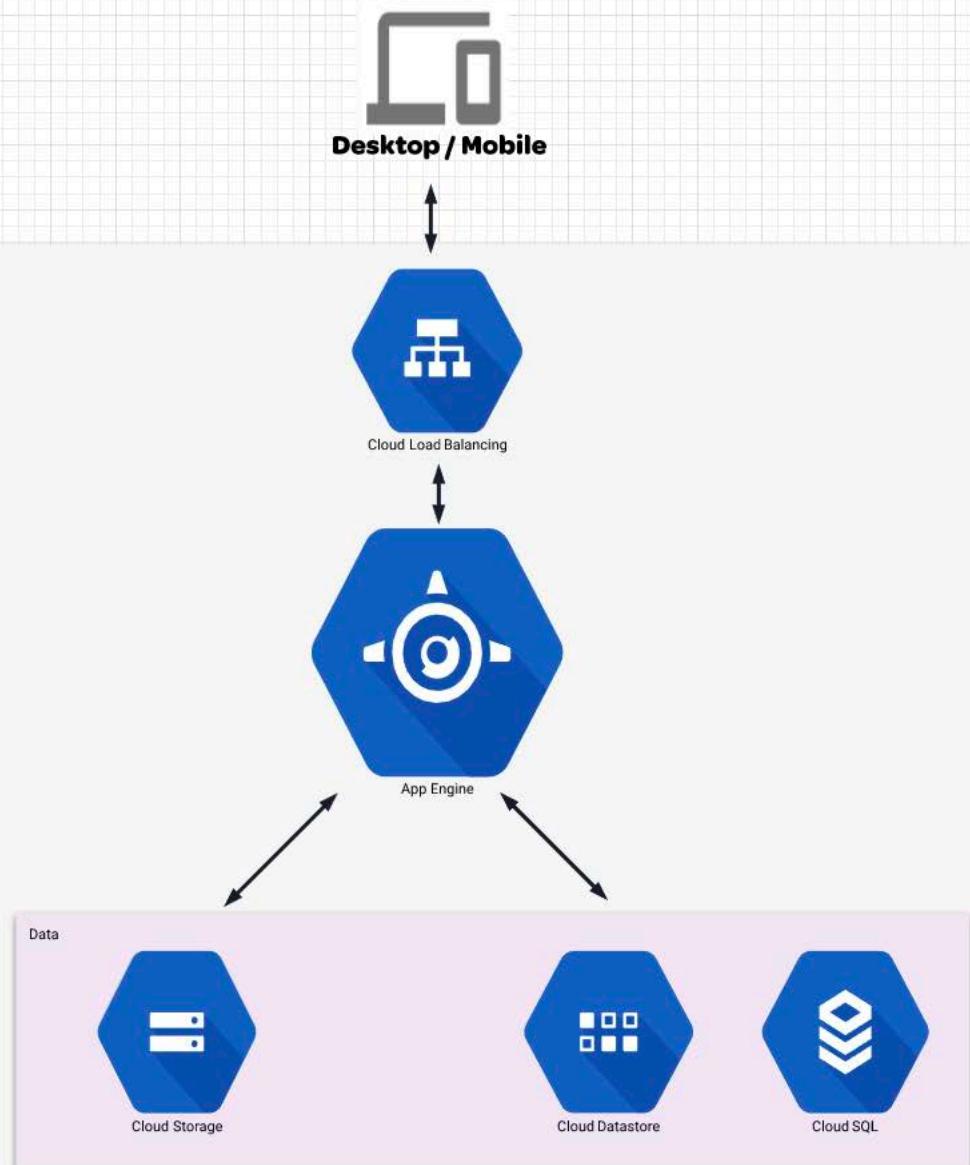
Google Cloud Platform







Google Cloud Platform





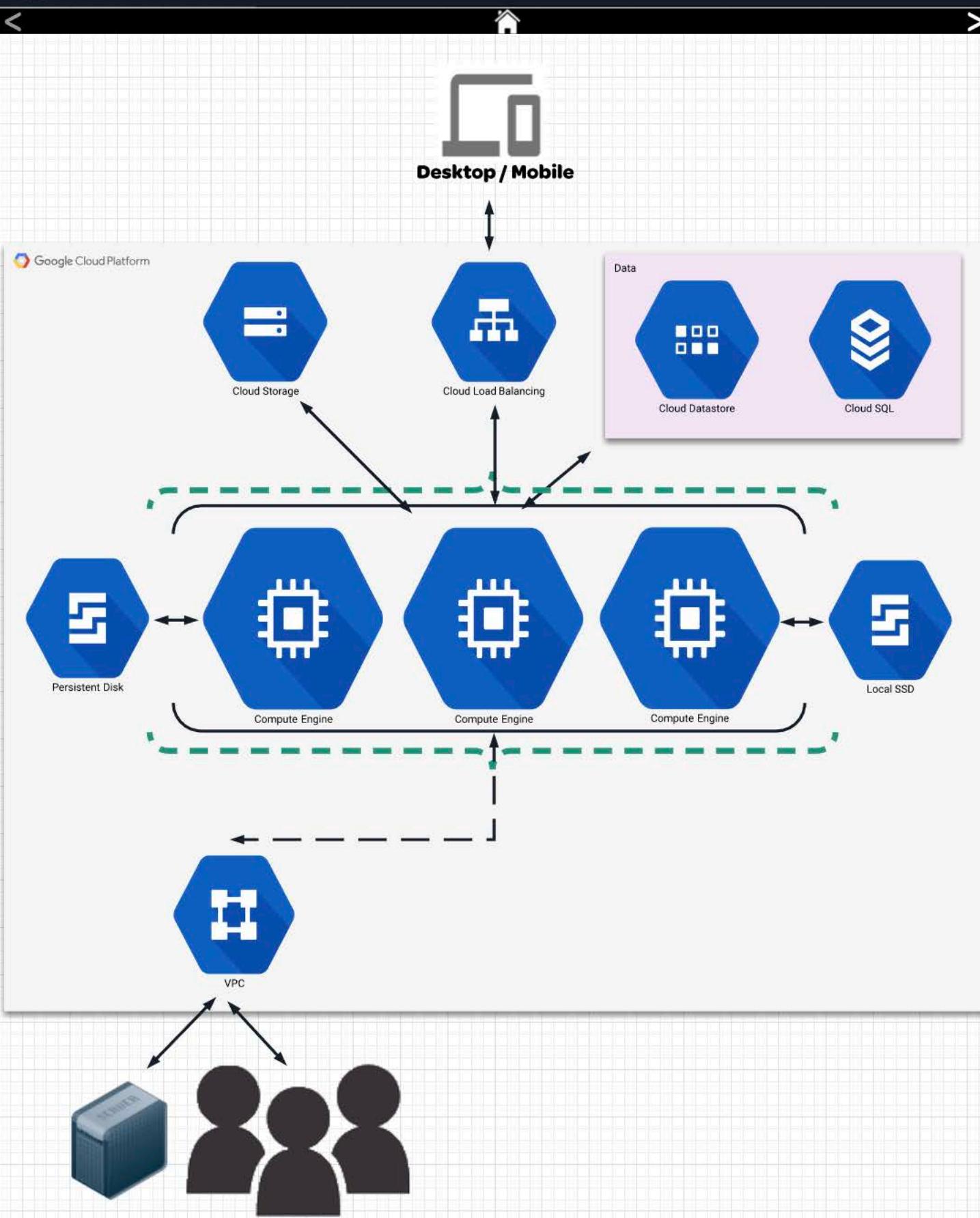
Google Cloud Platform



App Engine Fundamentals



- PaaS - Platform as a Service
- No server setup or provisioning with minimal management required
- Automatic scaling and load-balancing
- Great for websites, mobile apps, and line of business apps
- Standard Environment:
 - Earliest implementation
 - More proprietary
 - Limited languages and access
 - Faster instance spin-up
 - Less expensive
- Flexible Environment:
 - Recently introduced
 - Standardized on Docker
 - Broader language/version use
 - Slower instance spin-up
 - More expensive





Google Cloud Platform

Data



Cloud Datastore

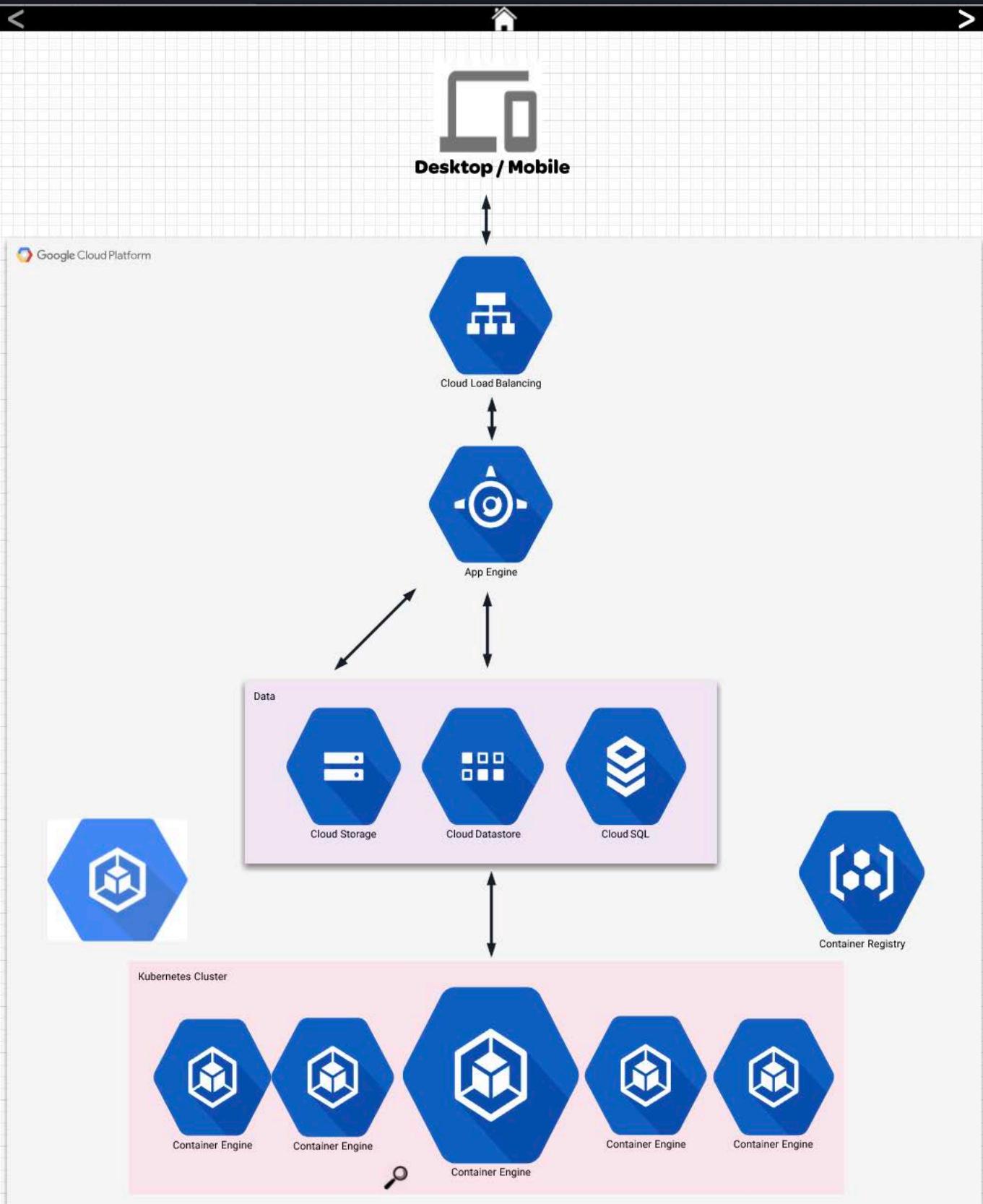


Cloud SQL



Compute Engine Fundamentals

- IaaS - Infrastructure as a Service
- Scalable, high-performance virtual machines (VMs)
- Numerous configurations, completely customizable
- Run public disk images or private images
- Various storage options
- Optionally, works with containers
- Virtual Private Network (VPC) support
- Default and custom firewalls
- Complete routing support





Google Cloud Platform



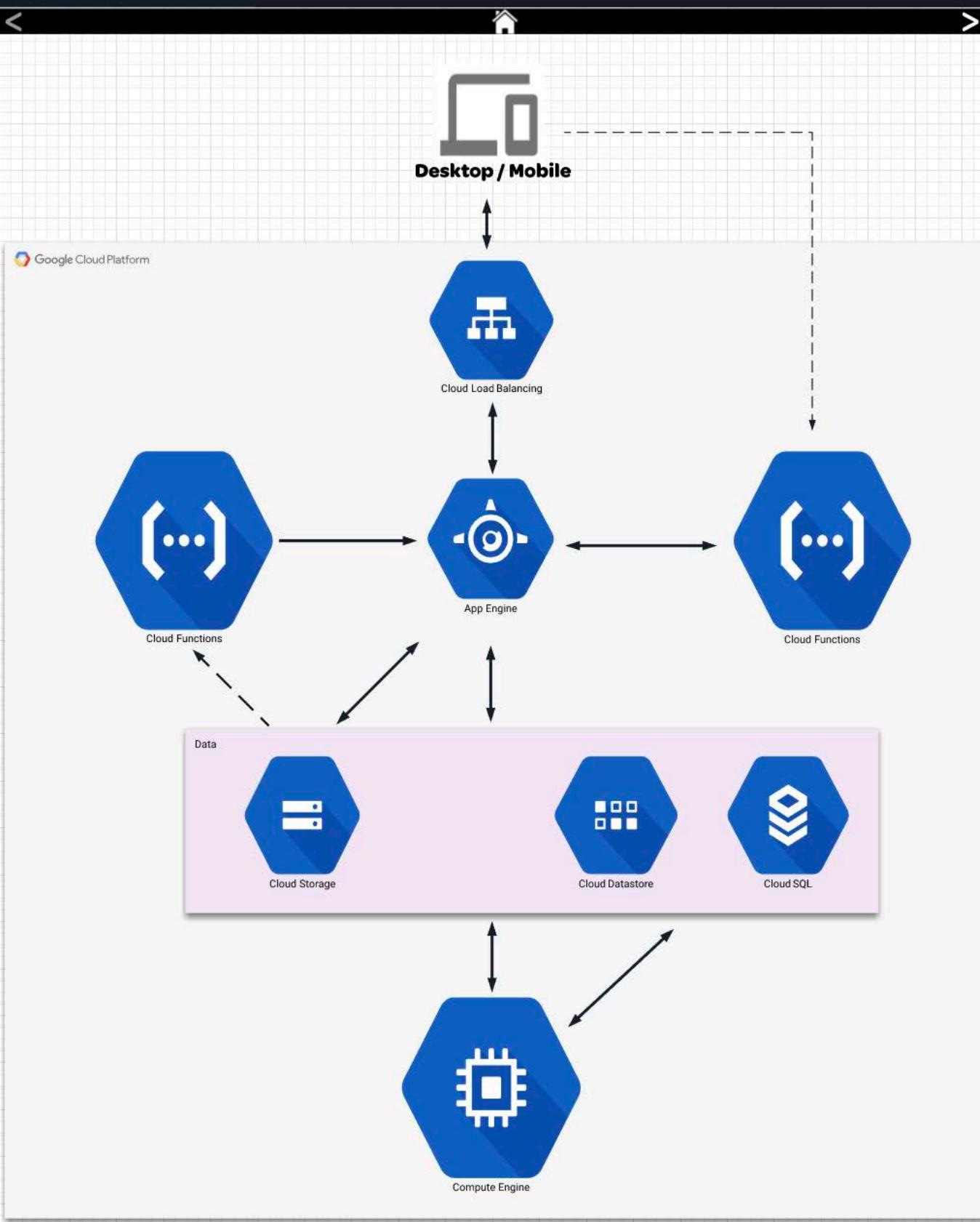
Kubernetes Engine Fundamentals

- Managed, orchestrated environment for containerized applications
- Uses Compute Engine instances to form cluster
- Relies on open source Kubernetes cluster management system
- Currently only Docker containers are supported
- Benefits:
 - Load-balancing integrated
 - Node pools supported
 - Automatic cluster and node scaling
 - Automatic upgrades
 - Automatic repair based on health reports
 - Automatic logging and monitoring with Stackdriver





LACA International





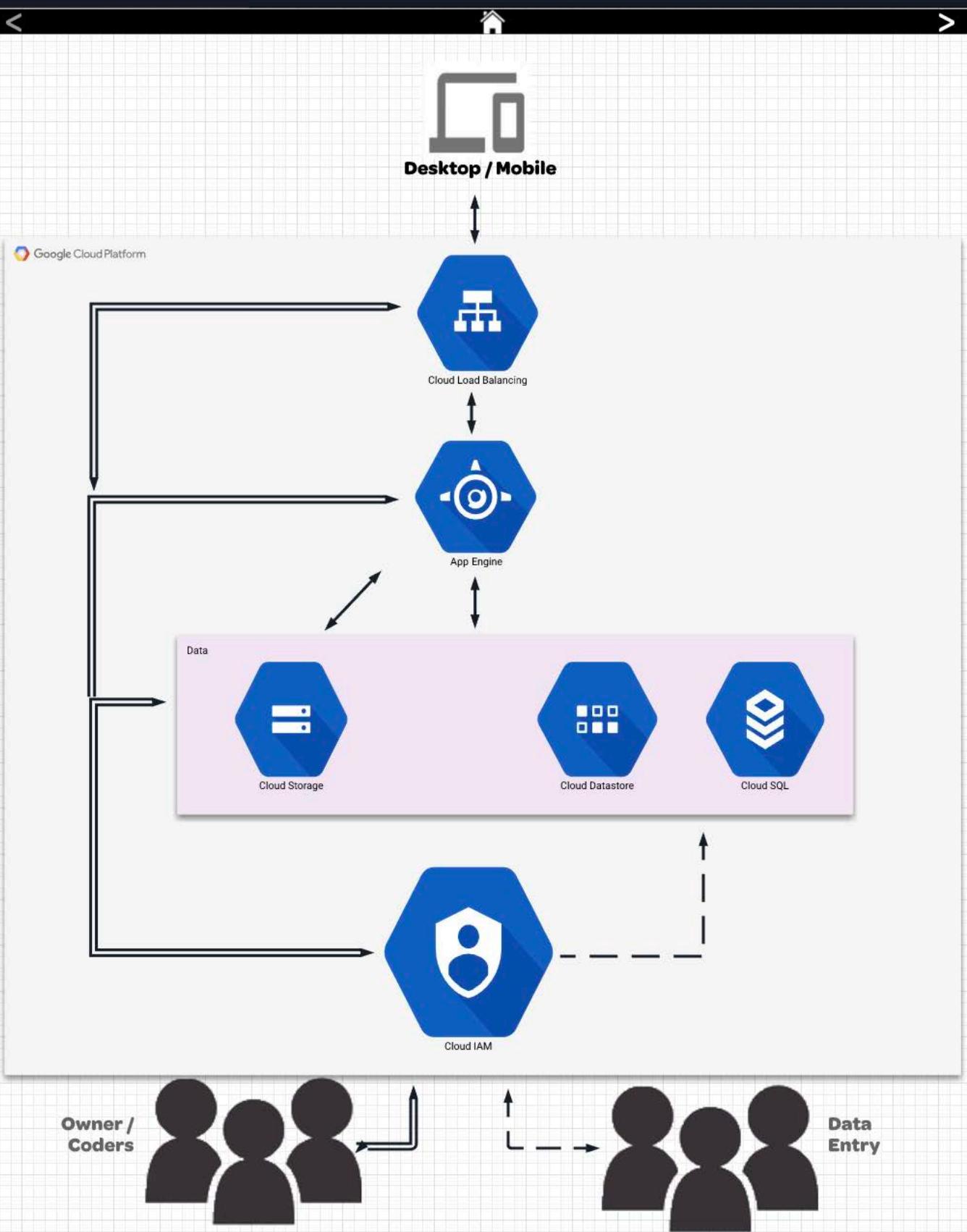
Google Cloud Platform

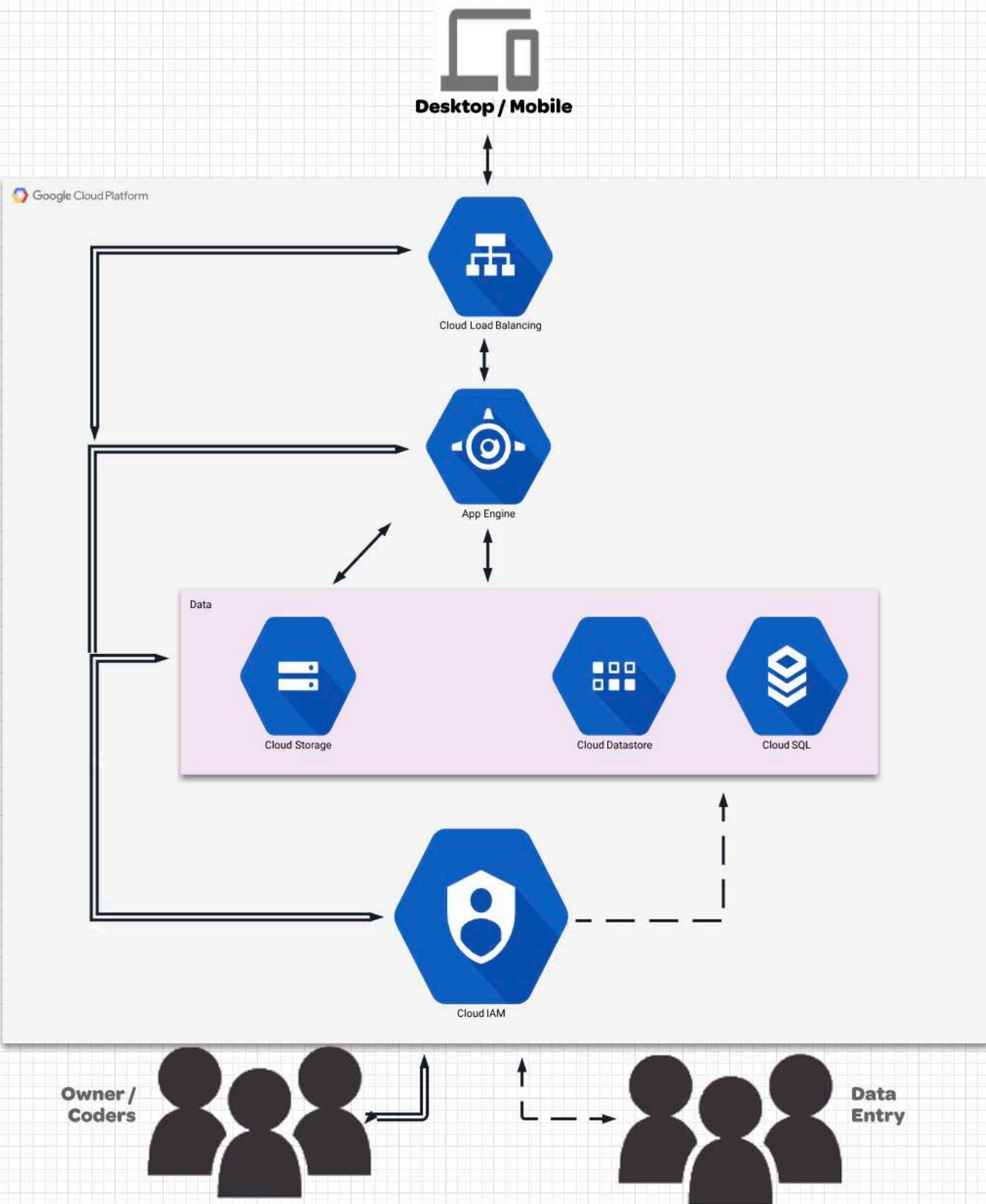


Cloud Functions Fundamentals

- Serverless environment for executing code and connecting cloud services
- Fully managed: zero infrastructure or management requirements
- JavaScript functions in a Node.js wrapper
- Triggers:
 - HTTP request
 - Cloud Storage event
 - Pub/Sub event
- Use cases:
 - Webhooks - Respond to any HTTP request
 - Data & Image Processing - Validate/transform data or manipulate images.
 - Mobile Back end - React to storage, authentication or data events.
 - Internet of Things - Respond to Pub/Sub messages from devices.









Cloud IAM Fundamentals



- Unified resource access management system
- For both users and services
- 3 main components: policies, roles, resources.
- Policy: Who can do what on which resources
- Roles: List of permissions assigned to identities/members
- Identities:
 - Google account (managed account), unmanaged account
 - Service account
 - Google Group, G-Suite Domain, Cloud Identity Domain
- Resources:
 - Projects and folders
 - Cloud services (Compute Engine, Cloud Storage, Pub/Sub, etc.)
 - Aspects of those services (instances, buckets, topics, etc.)



Cloud IAM



Cloud IAM Fundamentals



IAM Policy



Identity

Google Account
Service Account
Google Group
Google Apps Domain



Role

Owner
Viewer
Editor
compute.instanceAdmin
storage.objectAdmin
...



Cloud Platform
Projects
Compute Engine
App Engine
Cloud Storage
Cloud Logging



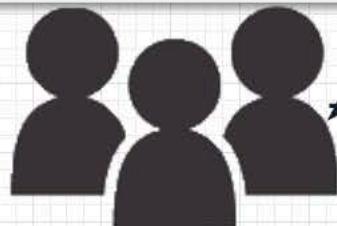
Cloud Storage

Cloud Datastore

Cloud SQL

Cloud IAM

Owner /
Coders



Data
Entry



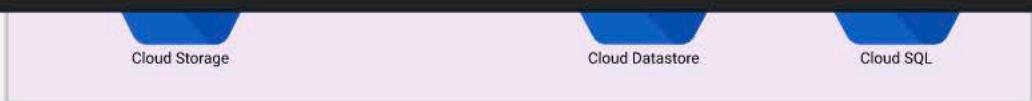
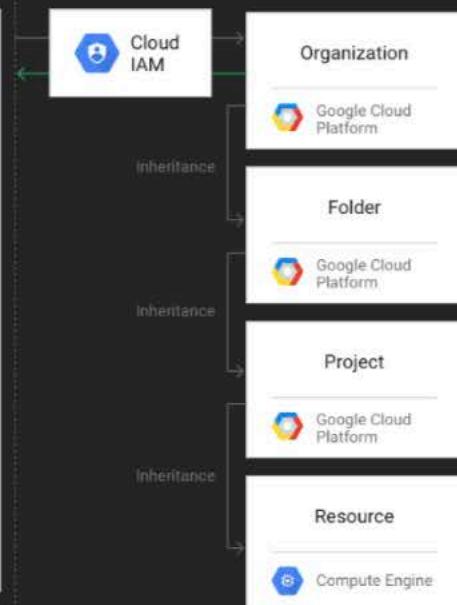
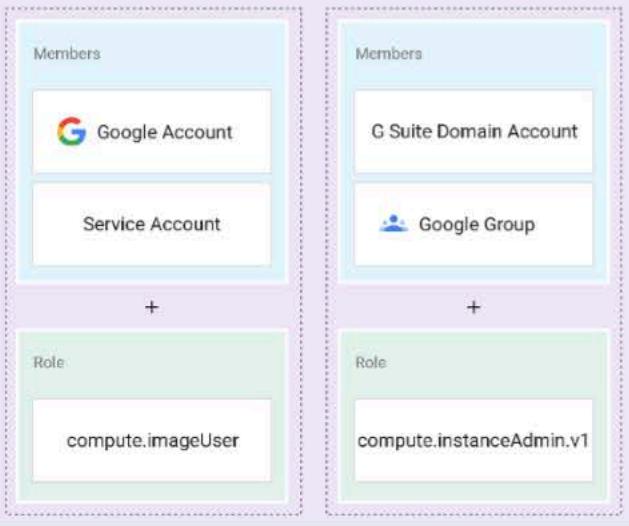


Cloud IAM Fundamentals

Policy

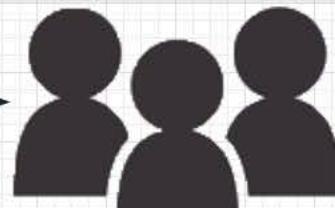


Bindings (1 or more)



Cloud IAM

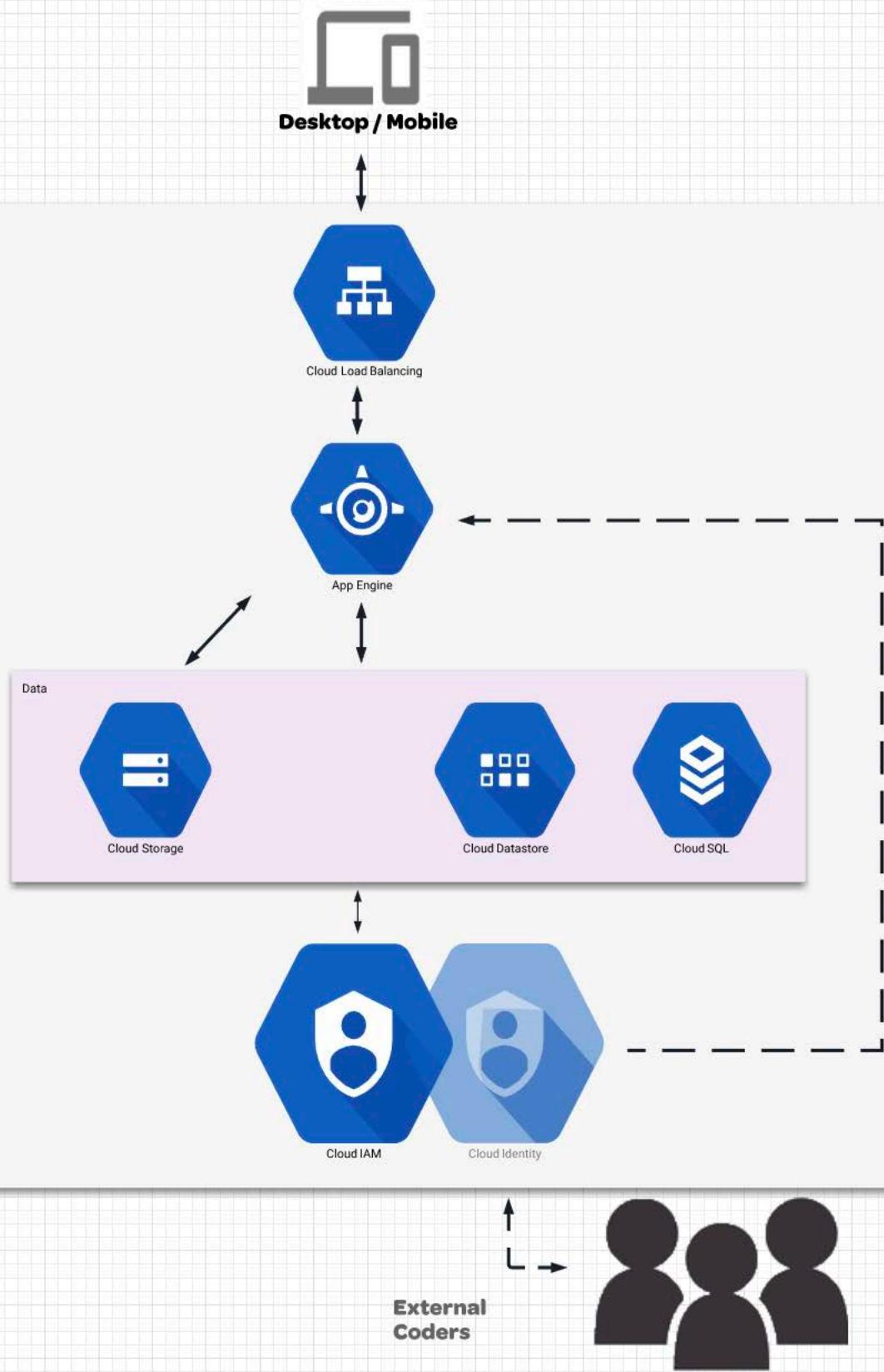
Owner /
Coders

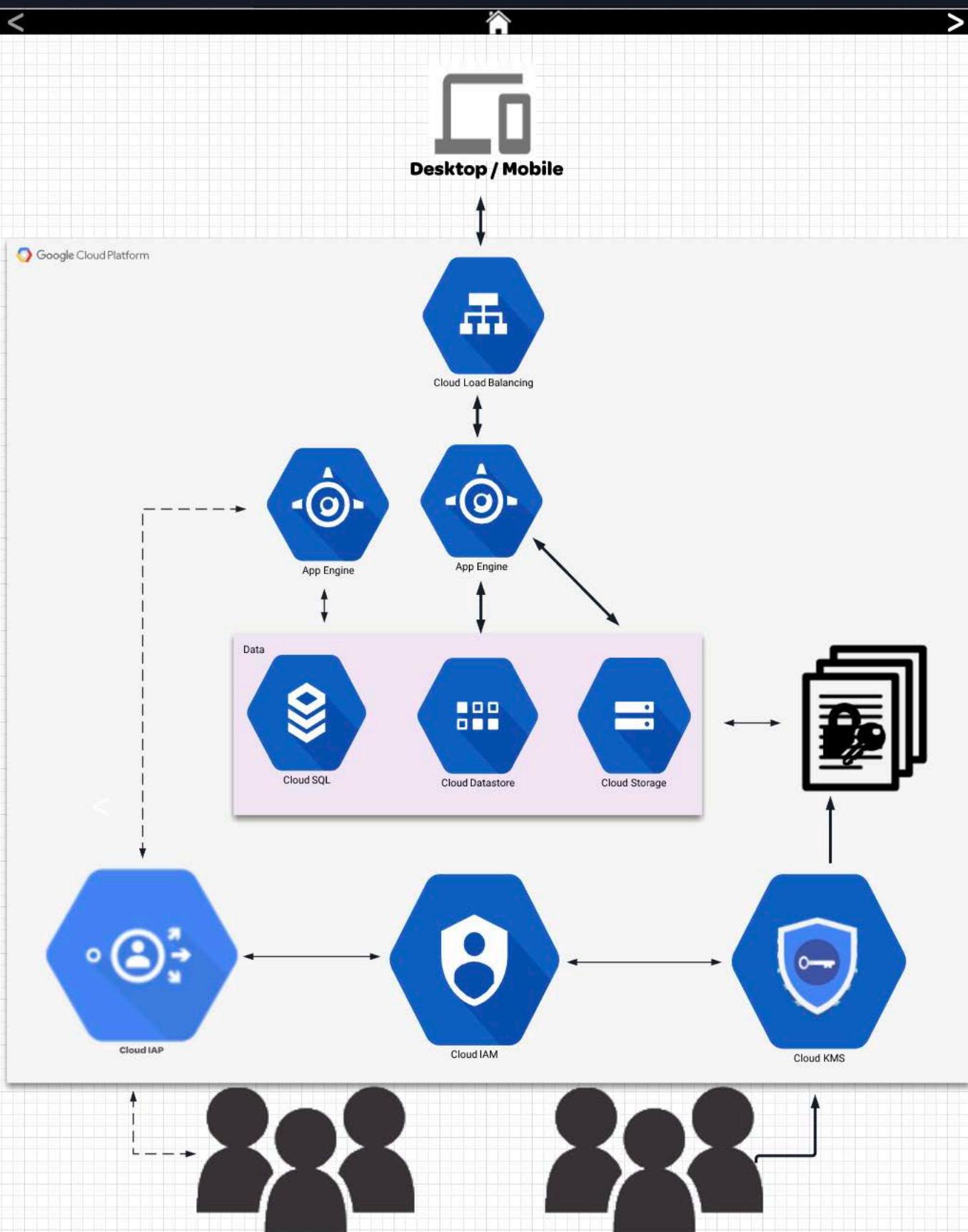


Data
Entry



Google Cloud Platform







Google Cloud Platform



Cloud Load Balancing



App Engine



Data



Cloud Bigtable



Cloud Storage



Cloud Datastore



Cloud SQL

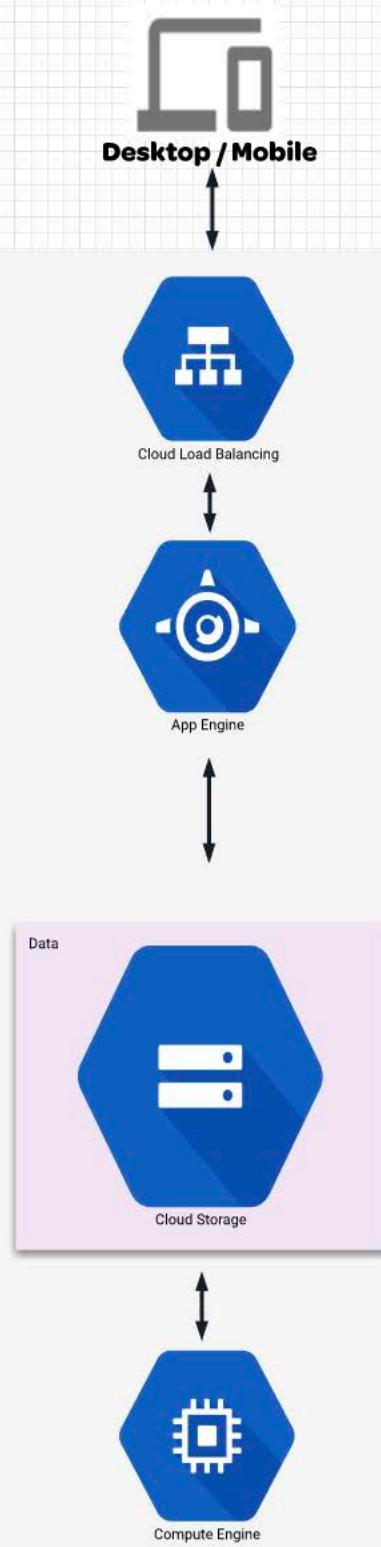


Compute Engine





Google Cloud Platform



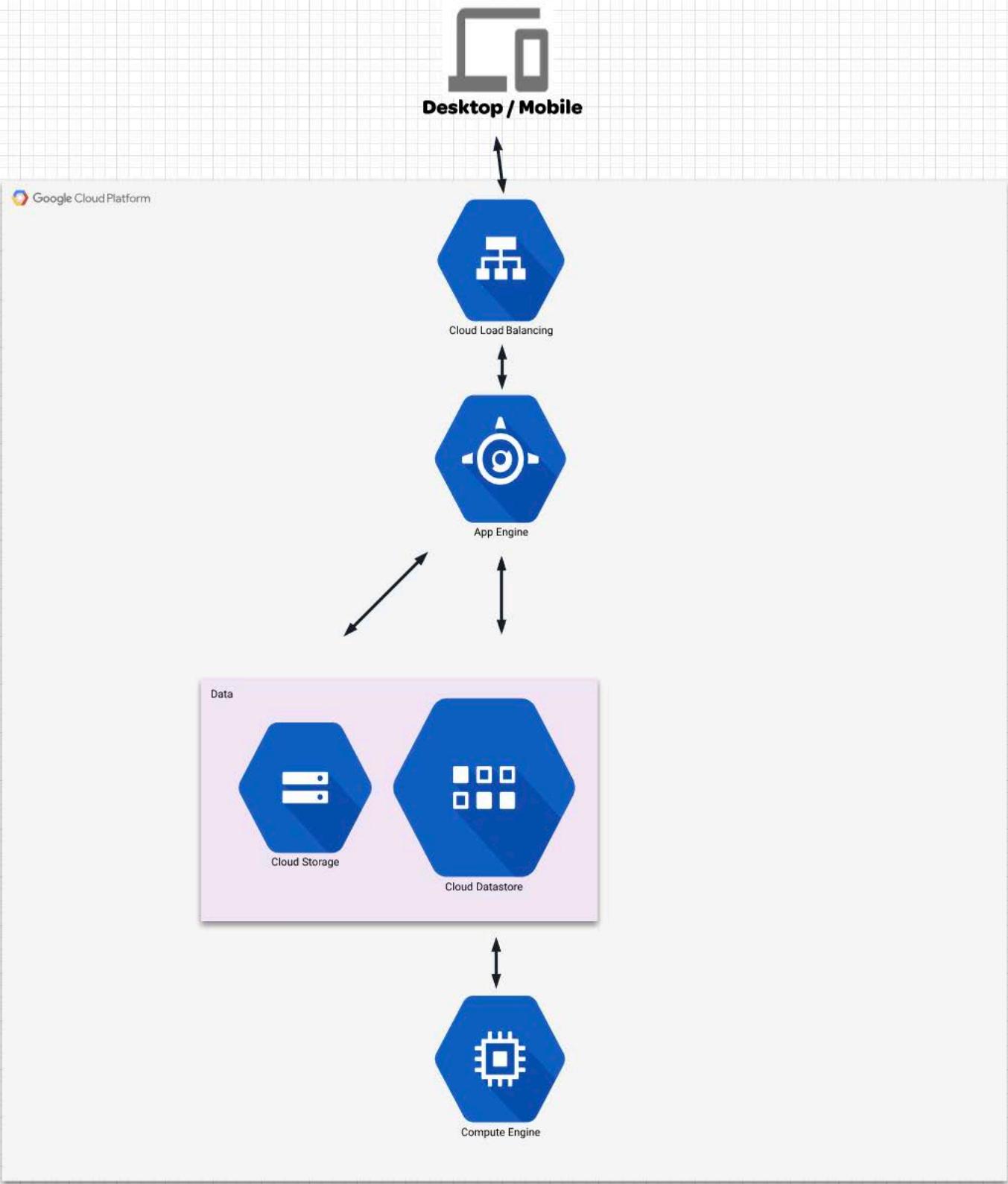


Cloud Storage Fundamentals

Google

- Binary large object (BLOB) storage
- Images, videos, audio files, documents, static websites, etc.
- Automatic data encryption at rest and decryption on delivery
- Primary container: buckets
 - Project-based
 - Globally unique ID
 - Specific location
- Set class for optimum price/performance
 - Multi-regional - highest availability, most frequently accessed
 - Regional - routinely accessed, best for analytics
 - Nearline - infrequently accessed, used for archival and data backup
 - Coldline - least accessed, lowest cost, typically for disaster recovery







Cloud Datastore Fundamentals

Google

- NoSQL document database for semi-structured data
- Key features:
 - ACID transactions
 - Highly available and scalable
 - Multiple access options, i.e., Console, JSON API, and open source clients
 - SQL-like language, GQL
- Structure - similar to traditional, but more flexible (schemaless):
 - Kinds - like tables
 - Entity - like row, but can have different properties
 - Property - like field, but can multiple properties possible
 - Key - like primary index
 - Supports optional ancestors and children
- Uses: product catalogs, user profiles, ACID transactions, etc.



Compute Engine



Google Cloud Platform



Cloud Load Balancing

App Engine

Data



Compute Engine





Cloud SQL Fundamentals



- Fully managed relational database service
- Supports PostgreSQL 9.6
- Supports MySQL 5.5 (1st generation) and 5.6 or 5.7 (2nd generation)
- Robust scalability
- Automatic replication and backup
- Highly configurable SQL instances
- Data automatically encrypted
- Default firewalls for each instance
- Full integration with Google Cloud services

Data



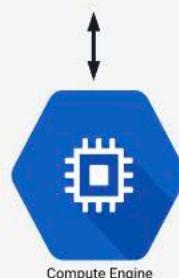
Cloud Storage



Cloud Datastore



Cloud SQL



Compute Engine

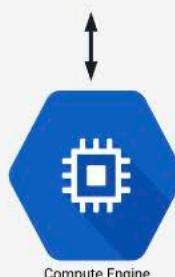




Google Cloud Platform



Data

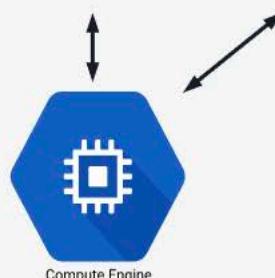
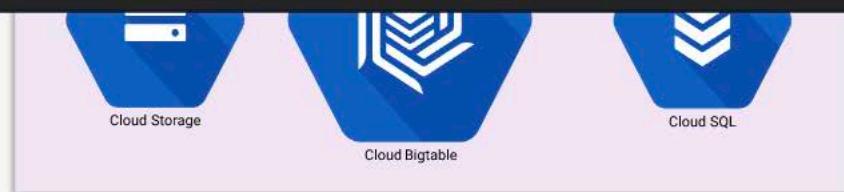


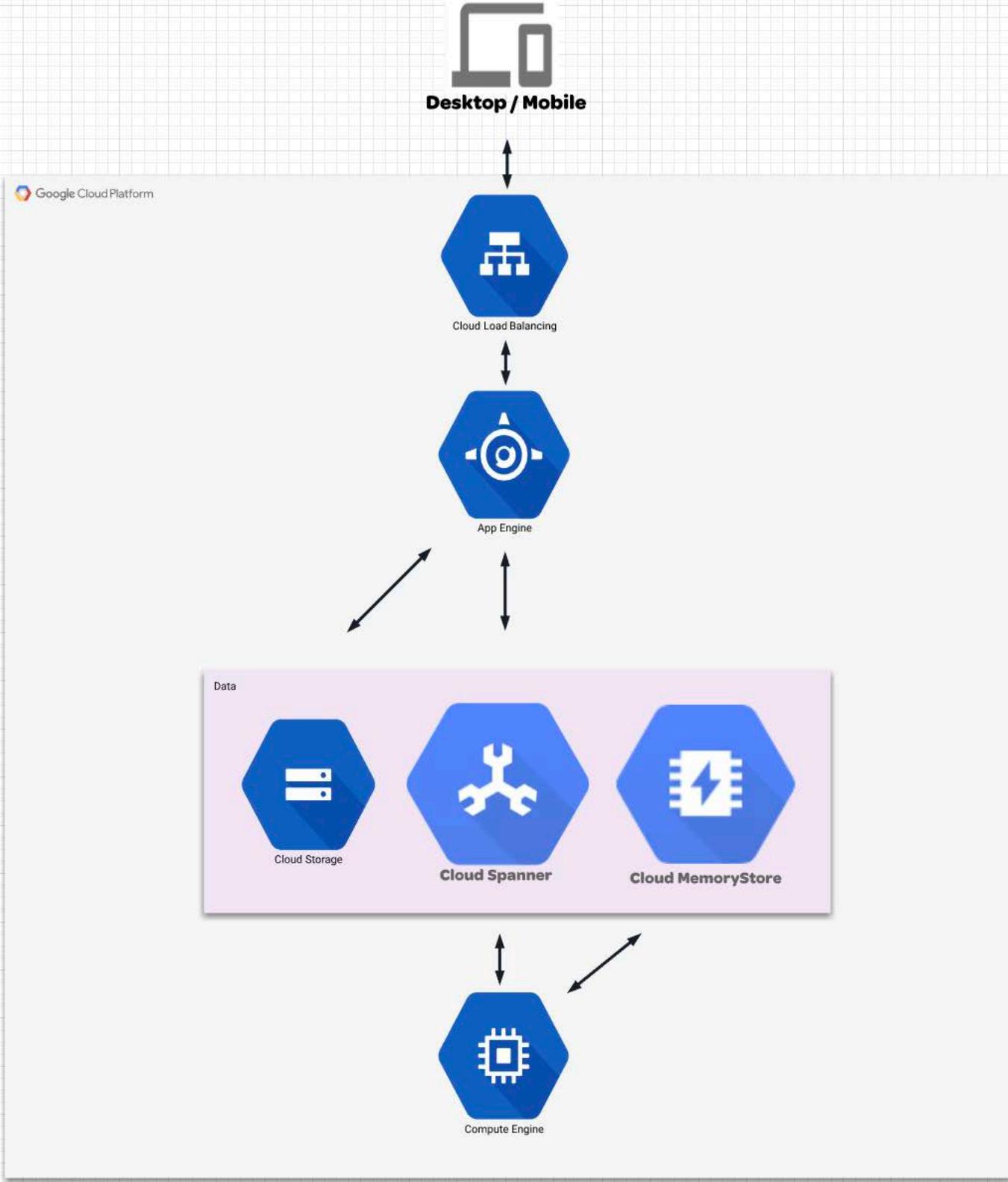


Cloud Bigtable Fundamentals



- Fully managed, massively scalable NoSQL database service for big data
- Used for Gmail, Google Search, Maps & Analytics as well as eBay and Spotify
- Although also NoSQL, different from Cloud Datastore
 - Wide column database vs document database
 - No SQL-like language available
 - Single key per row
- Capable of holding hundreds of petabytes of information
- Columns wide enough for entire web pages or satellite imagery
- Consistent low latency and high throughput
- Dynamically change cluster size without stopping and restarting
- Use cases: graph data, financial data, IoT data, marketing data, etc.





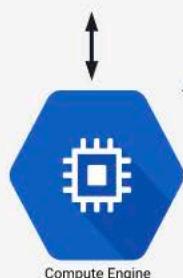
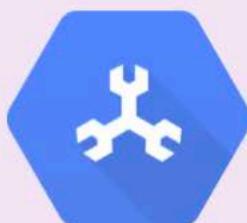


Cloud Spanner Fundamentals

Google

- Fully managed, enterprise-grade, relational database service
- Is to Cloud SQL as Cloud Bigtable is to Cloud Datastore
- Scales horizontally like NoSQL databases
- High availability (99.999% uptime) with strong consistency
- Industry standard SQL support
- Supports data definition language (DDL)
- Client libraries: C#, Go, Java, Node.js, PHP, Python, and Ruby
- Full console support
- Use cases: call centers, financial trading, telecom, transportation, etc.

Data





Cloud MemoryStore Fundamentals

Goog

- Fully managed, in-memory datastore service
- Recently released
- Redis protocol compatible
- Extremely low latency: sub-millisecond
- As-needed scaling, up to 300 GB instance
- Connect with App Engine, Compute Engine, or Kubernetes Engine
- Service tiers:
 - Basic - default, for basic caching
 - Standard - for highly available Redis instance
- Use cases: caching layer in gaming & analytical pipelines, stream processing



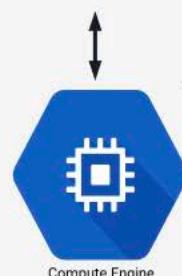
Cloud Storage



Cloud Spanner



Cloud MemoryStore

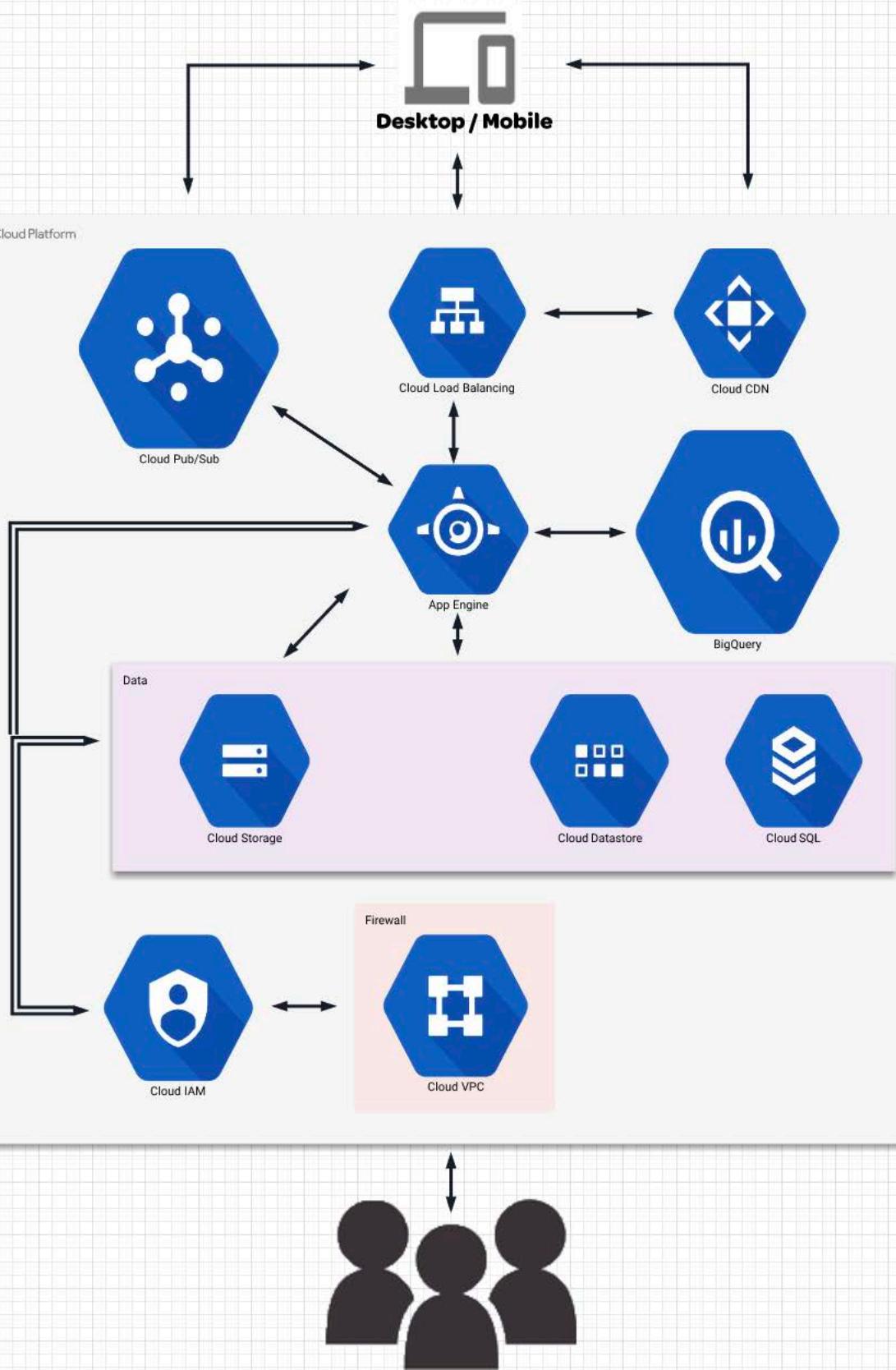


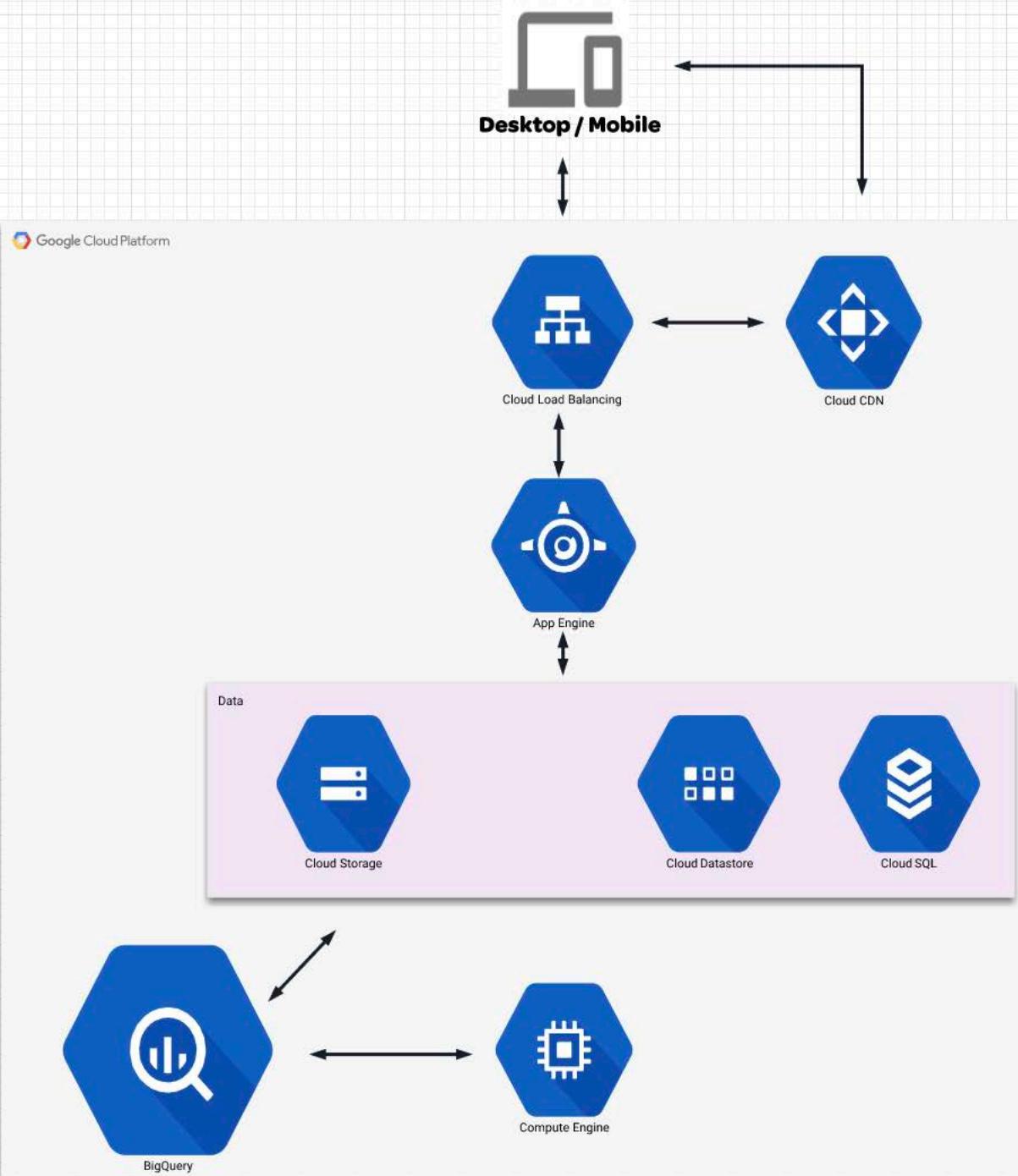
Compute Engine

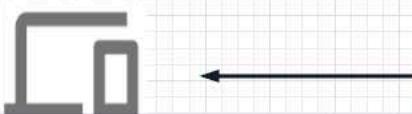




Google Cloud Platform







Cloud BigQuery Fundamentals

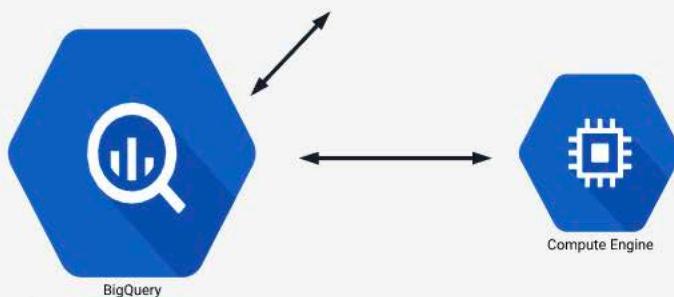


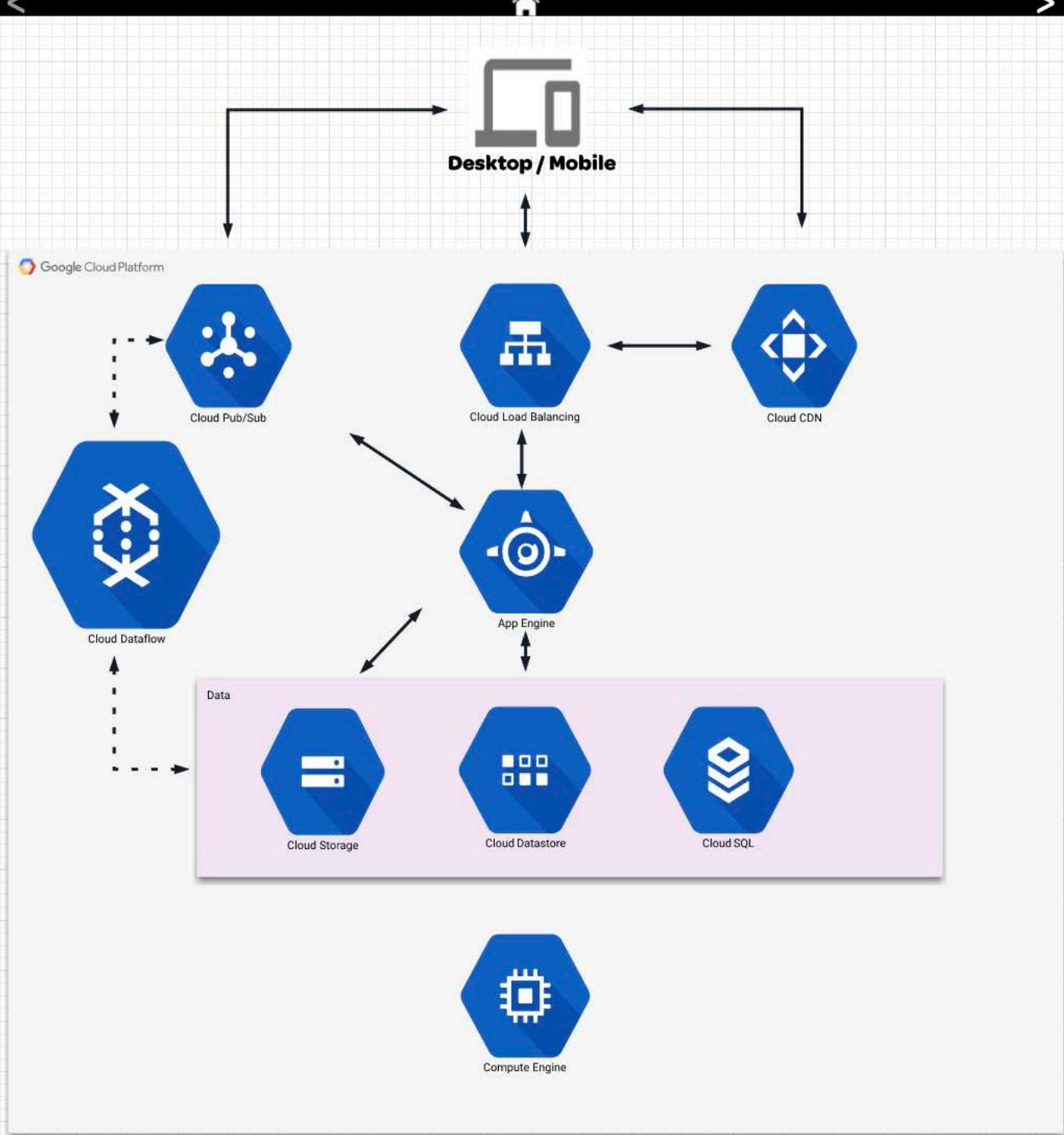
- Fully managed data warehouse for big data
- Near real-time interactive analysis of massive datasets
- Analyze terabytes of data in seconds
- Standard SQL supported
- Storage and computing handled and billed separately
- Query public or commercial dataset with your own
- External services queries: Cloud Storage, Cloud Bigtable & Google Drive
- Automatic data replication
- Modify data with Data Definition Language
- Use cases: real-time inventory, predictive digital marketing, analytical events

Cloud Storage

Cloud Datastore

Cloud SQL







Cloud Dataflow Fundamentals



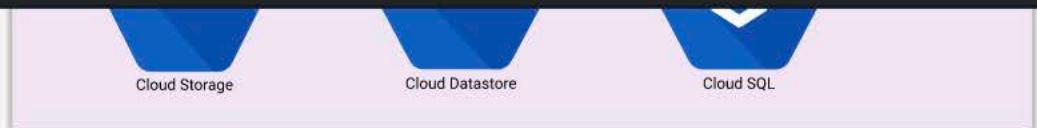
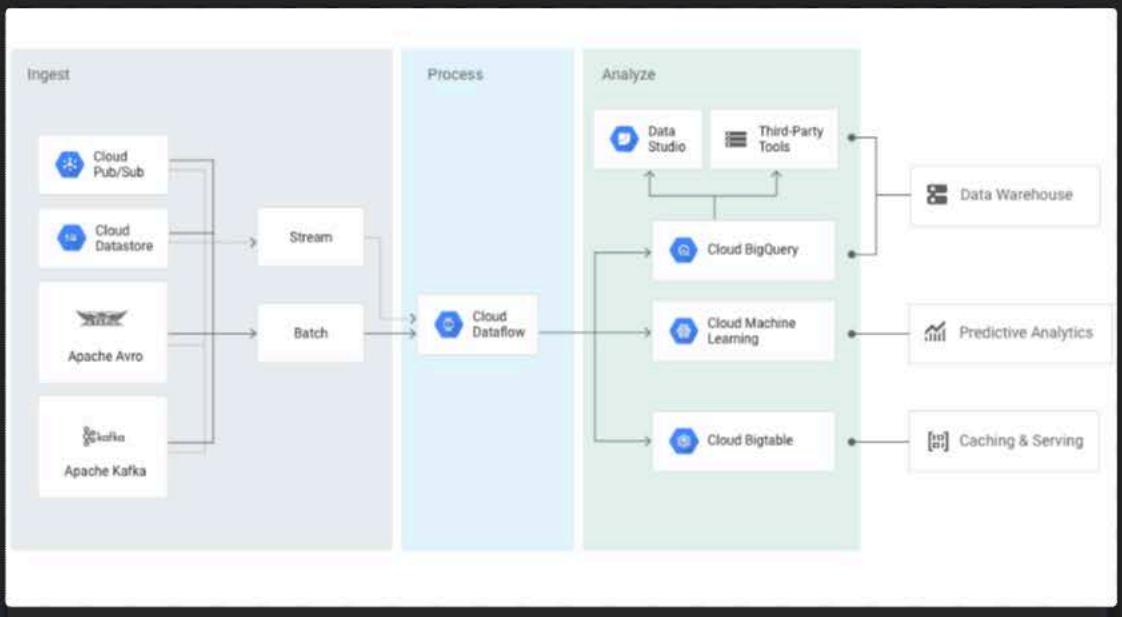
- Fully managed service for creating pipelines to process data
- Based on Apache Beam
- Processes data on multiple machines in parallel
- Handles both streaming (live) and batch (archived) data
- No instances or clusters to establish: serverless
- Easy replication of services with templates:
 - No need to recompile code before processing pipeline
 - Execute pipeline without dev environment and its dependencies
 - Can customize execution with template parameters
 - Can be executed via the console or gcloud command
- Best option if no current implementation with Apache Hadoop or Spark
- Use cases: analytical dashboards , forecasting sales trends, ETL operations



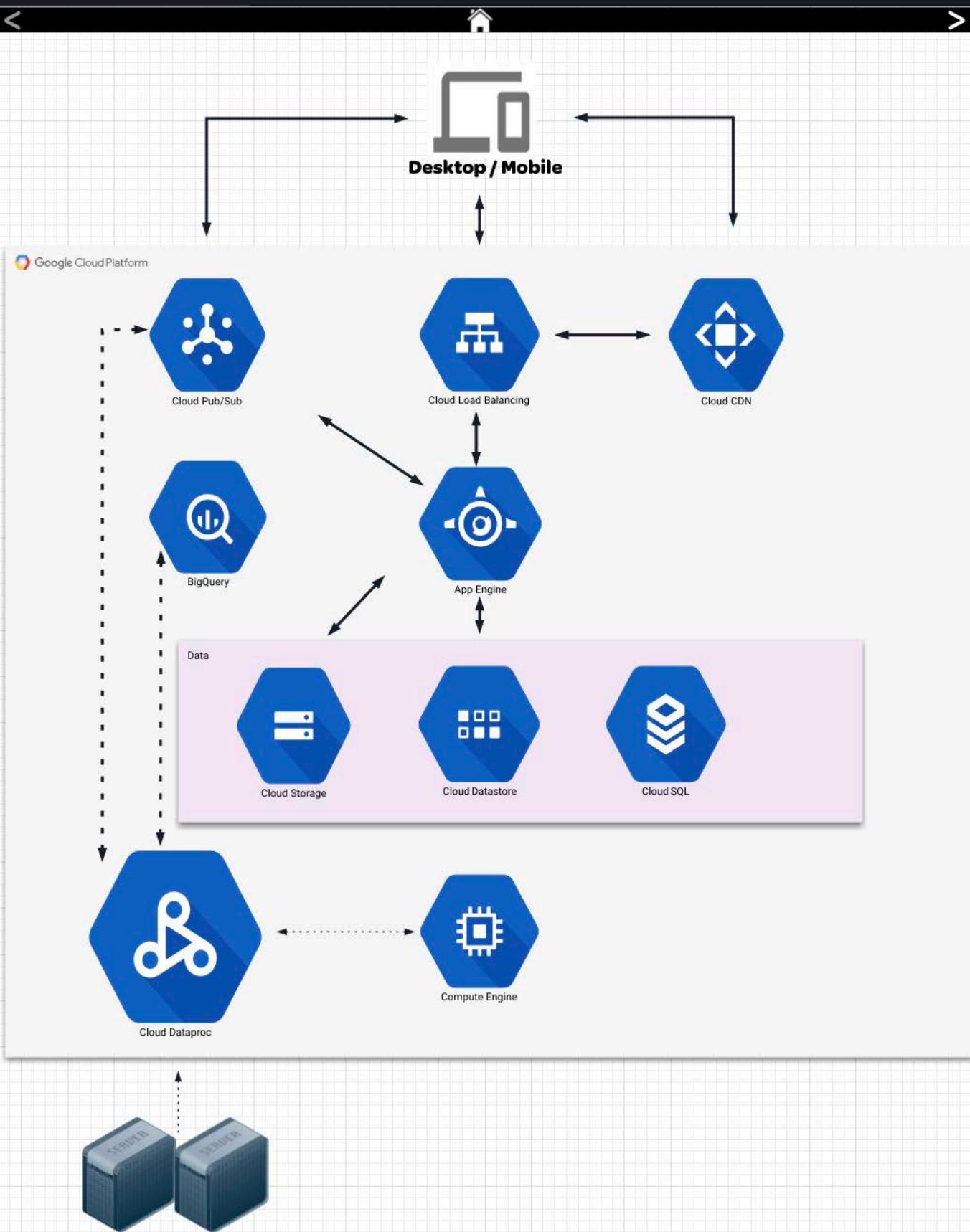
Compute Engine



Cloud Dataflow Fundamentals



Compute Engine

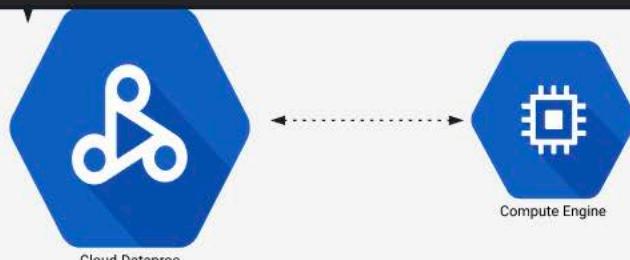




Cloud Dataproc Fundamentals

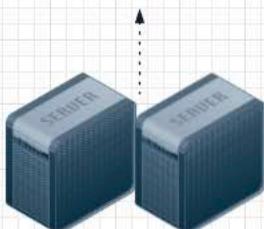


- Fully managed cluster data processing service
- Compatible with Apache Hadoop, Spark, and Hive
- Move existing projects or pipelines without redevelopment
- Boasts fast cluster creation - 90 seconds vs. 5 - 30 minutes
- Can scale clusters up and down without stopping the job
- Can switch to different versions of Hadoop, Spark, and others
- Workflow templates recently added
 - Create template, add job, and instantiate template
 - Workflow 1: Creates cluster, runs jobs, and deletes cluster
 - Workflow 2: Works with existing cluster and runs jobs
 - Similar to Cloud Dataflow
 - Both data process
 - Both handle batch and streaming data



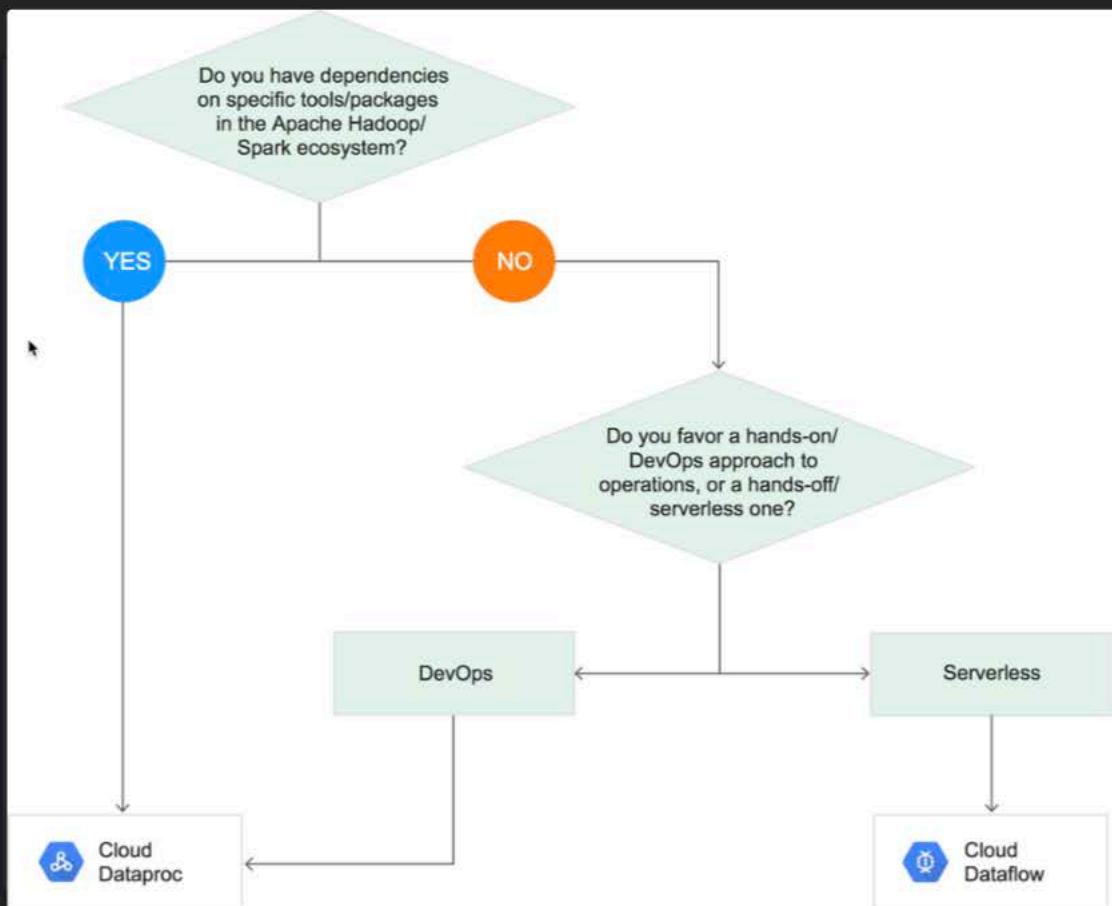
Cloud Dataproc

Compute Engine





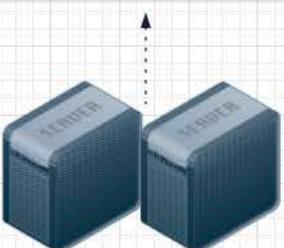
Cloud Dataflow Fundamentals

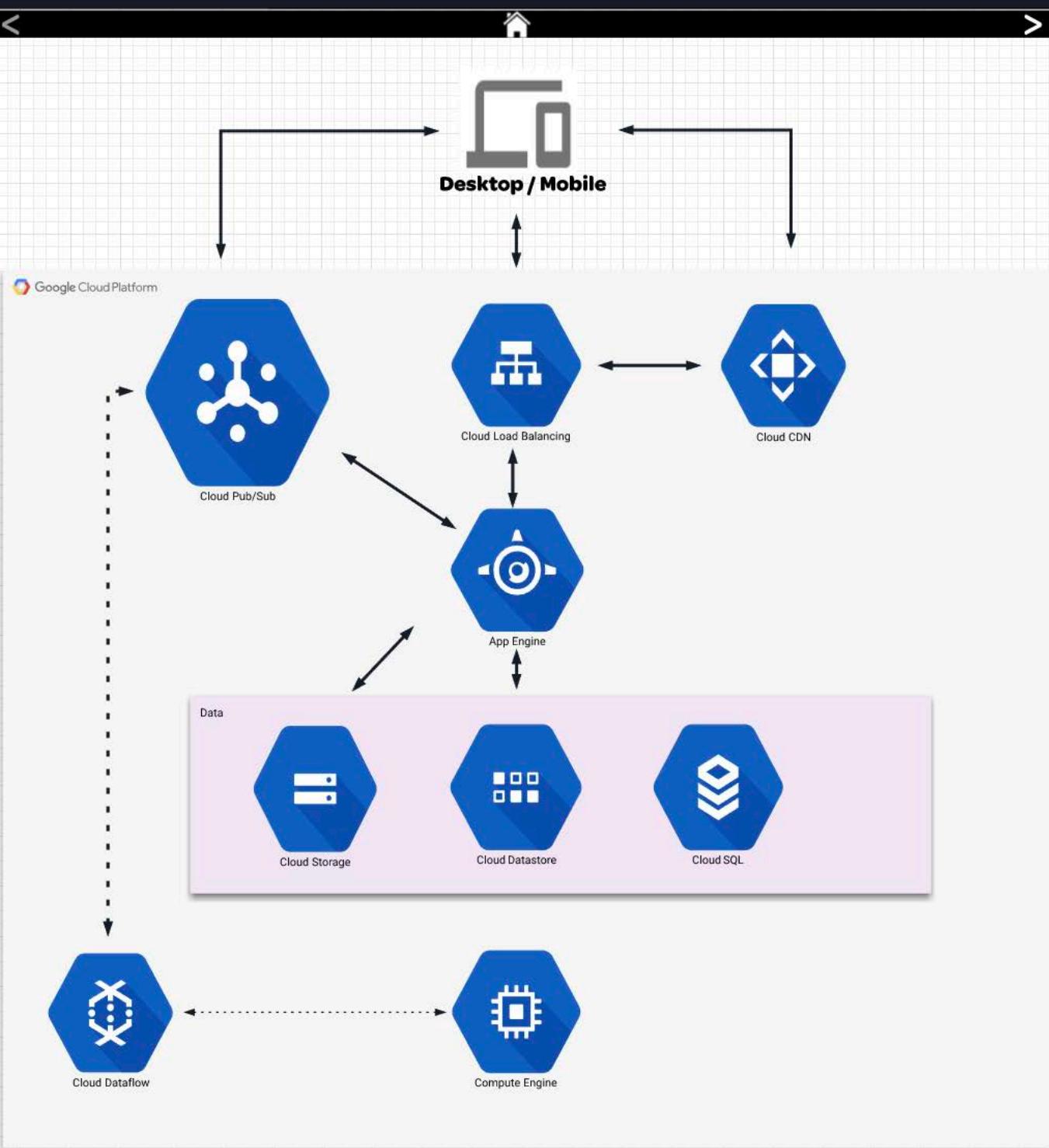


Cloud Dataproc



Compute Engine







Cloud Pub/Sub Fundamentals



- Fully managed messaging middleware service
- Allows secure and highly available messages between independent apps
- Works with both Google Cloud and external services
- Full range of communication:
 - One to many
 - Many to one
 - Many to many
- Both push and pull options
- Messages encrypted and HIPAA compliant
- Use cases: streaming data, event notifications, asynchronous workflows, etc.



Cloud Storage

Cloud Datastore

Cloud SQL



Cloud Dataflow

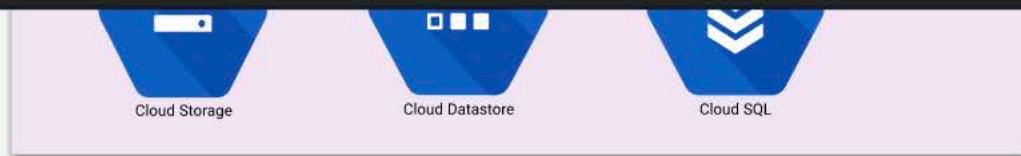
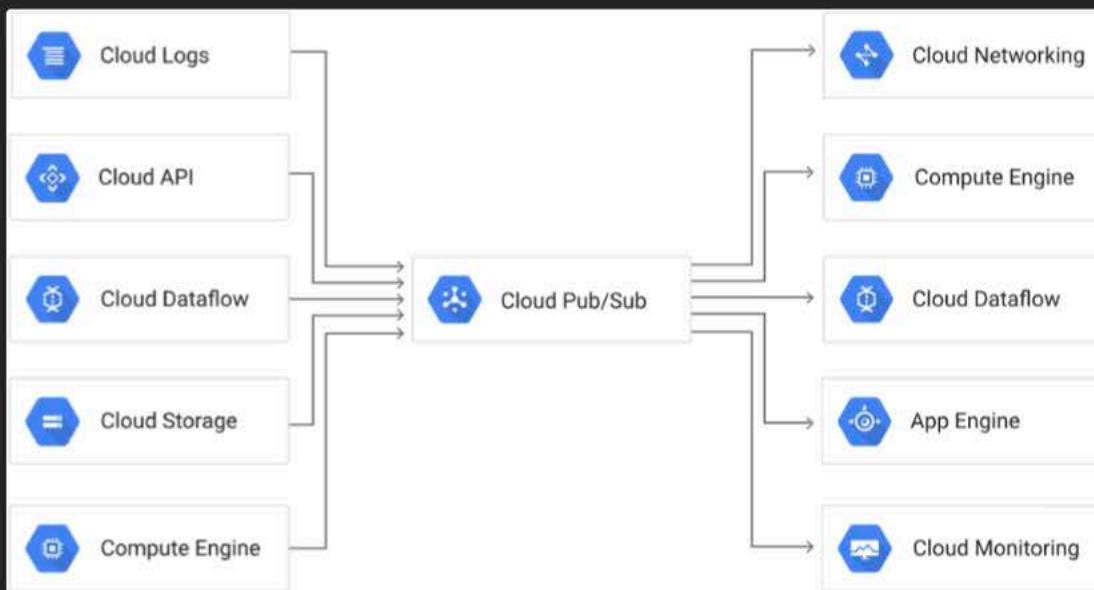


Compute Engine



Cloud Pub/Sub Fundamentals

Google



Cloud Dataflow

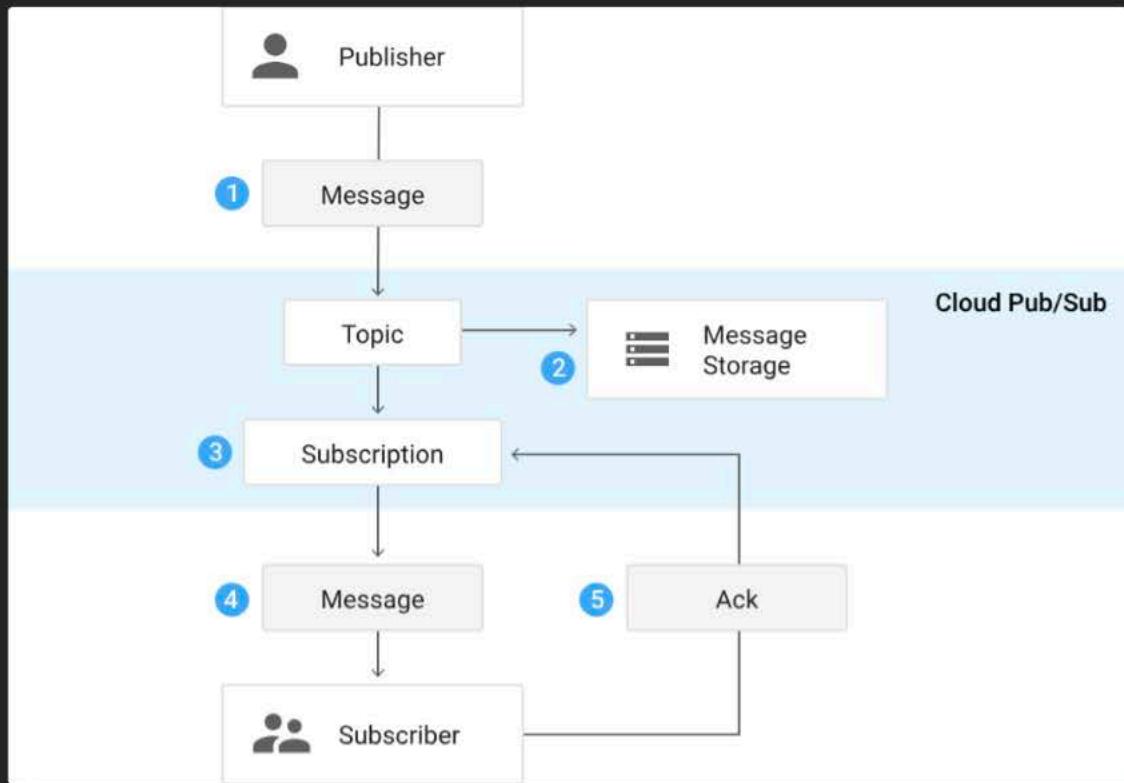


Compute Engine



Cloud Pub/Sub Fundamentals

Goog

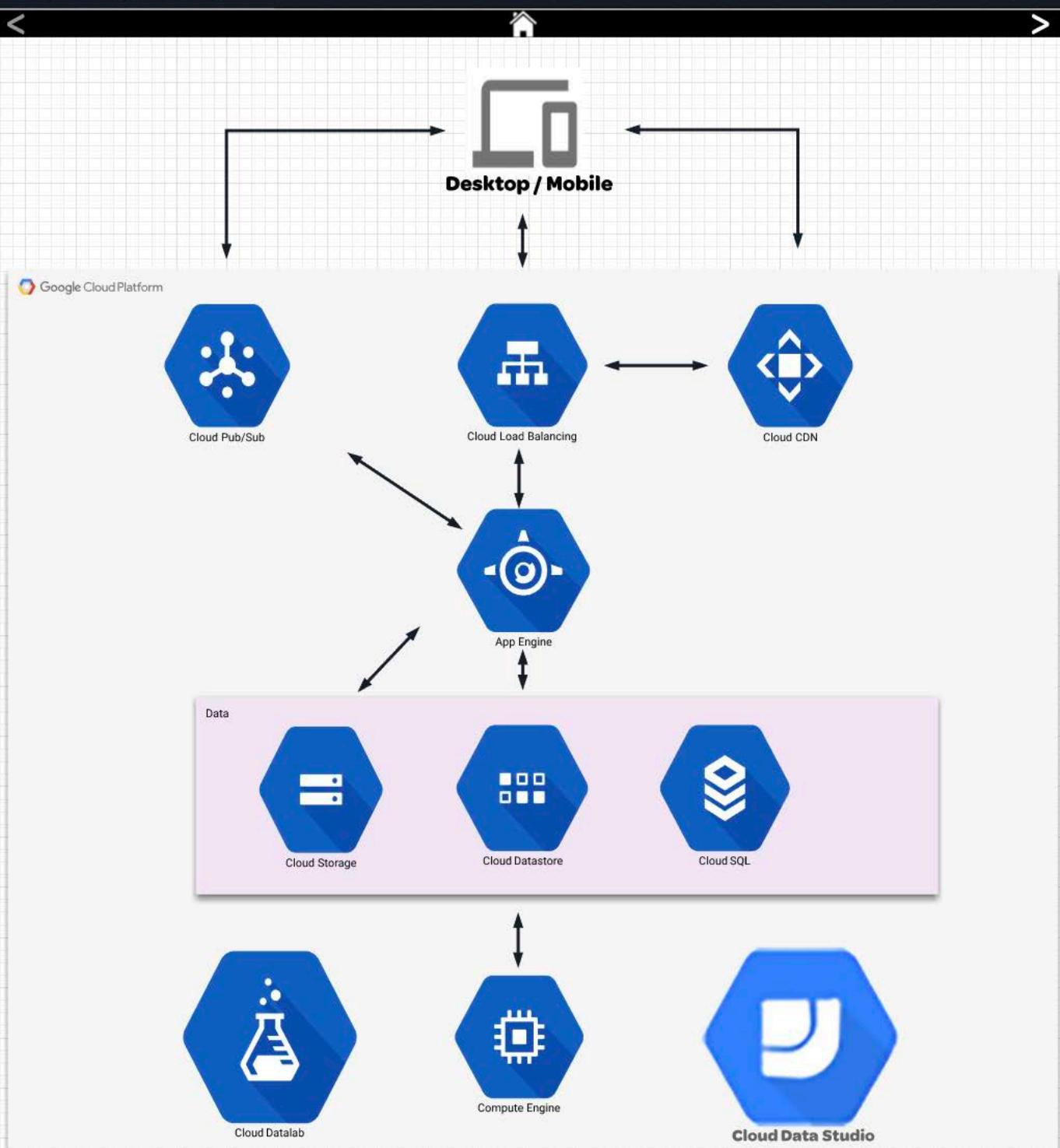


Cloud Dataflow



Compute Engine







Cloud Datalab Fundamentals



- Interactive data analysis and machine learning environment
- Packaged as a container and runs in a VM instance
- Based on Jupyter notebooks
- Notebooks:
 - Contain code, docs in markdown, and code results
 - Code results can be text, image, JavaScript, or HTML
 - Can be shared with team members
 - Collection of cells containing code or markdown

Data



Cloud Storage



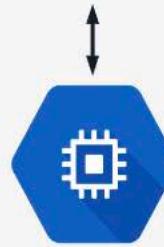
Cloud Datastore



Cloud SQL



Cloud Datalab



Compute Engine



Cloud Data Studio



Cloud Data Studio Fundamentals



- Interactive report and big data visualizer
- Creates dashboards, charts, and tables
- Connects to Cloud BigQuery, Cloud Spanner, Cloud SQL, & Cloud Storage
- Stores shareable files on Google Drive
- Basic process is three steps:
 - Connect to data source
 - Visualize data in report
 - Share report

Data



Cloud Storage



Cloud Datastore



Cloud SQL



Cloud Datalab



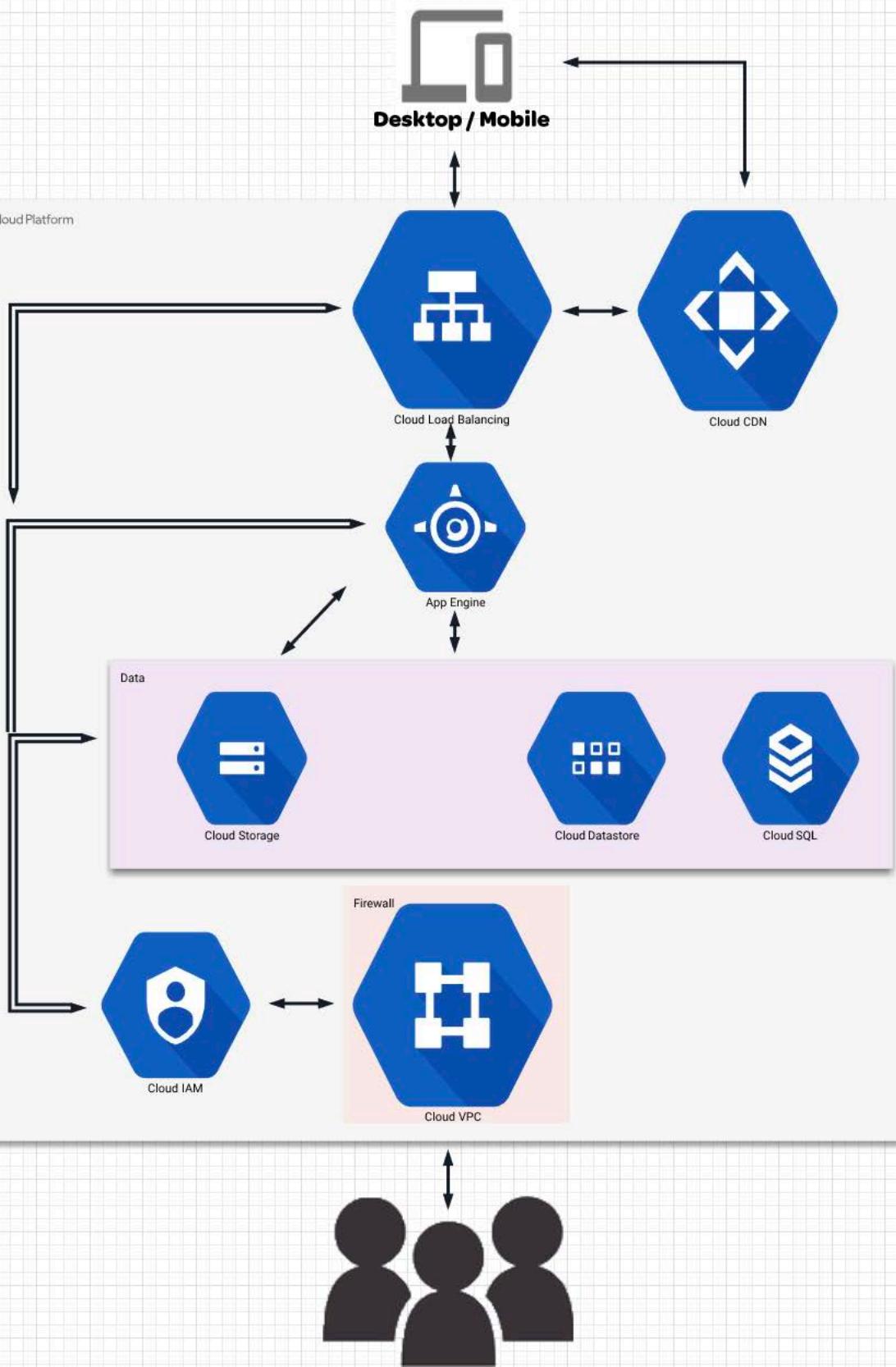
Compute Engine



Cloud Data Studio

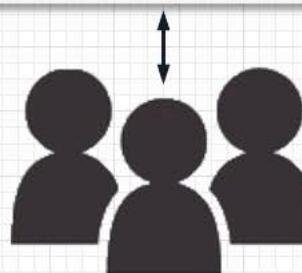
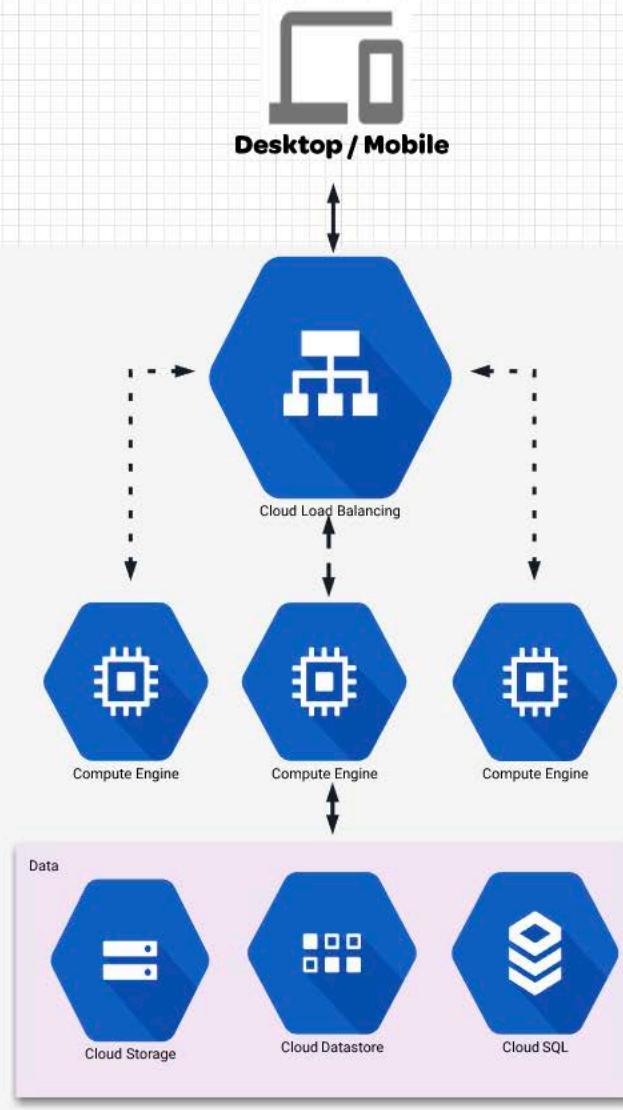


Google Cloud Platform



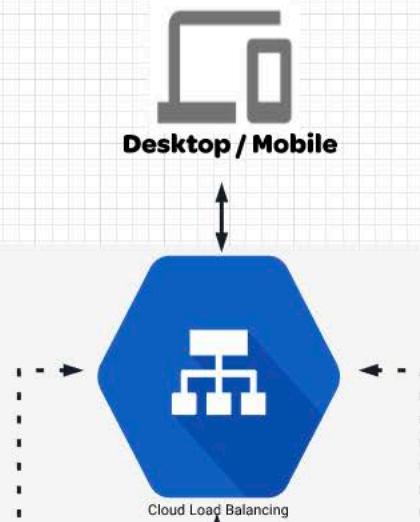


Google Cloud Platform





Google Cloud Platform



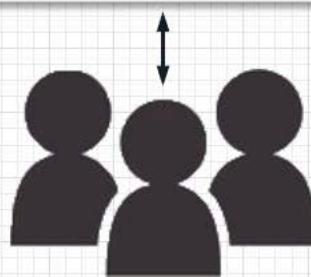
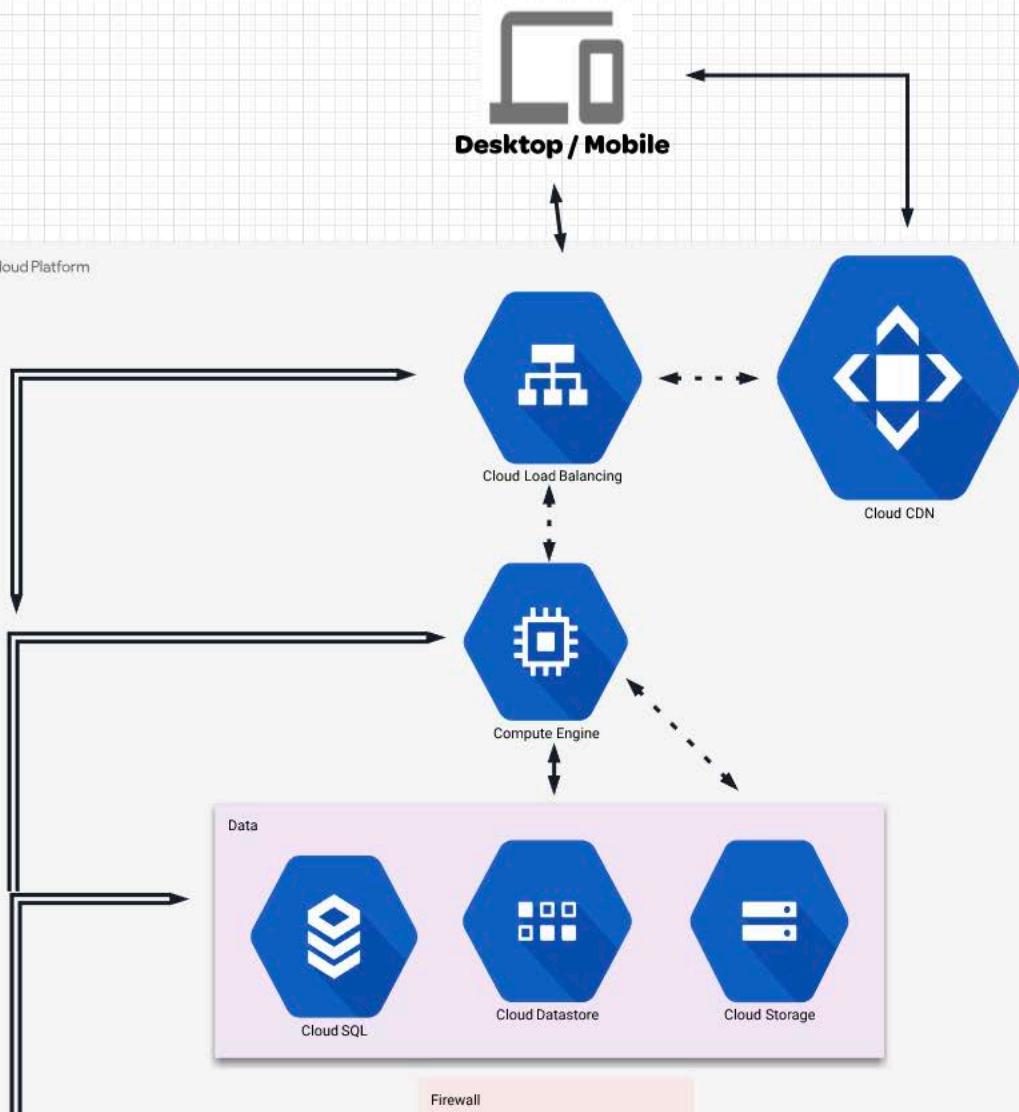
Cloud Load Balancing

- Fully managed incoming traffic service
- Distributes traffic across several VM instances
- Benefits:
 - Autoscaling (by policy, CPU utilization, or serving capacity)
 - Supports heavy traffic
 - Route traffic to closest instances
 - Detect and remove unhealthy instances
- Types of load balancing supported:
 - Global external - HTTP/S, SSL, and TCP
 - Regional external - TCP/UDP within a region
 - Regional internal - between groups of instances in a region





Google Cloud Platform

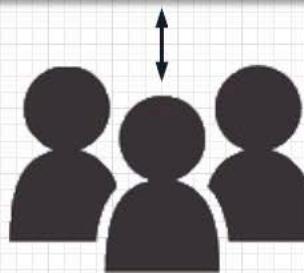




Cloud CDN Fundamentals



- Accelerates delivery from Compute Engine and Cloud Storage
- Lowers network latency, offloads origin servers, and reduces serving costs
- Features include:
 - Offers SSL at no additional cost
 - Supports HTTP/1.0, HTTP/1.1, and HTTP/2
 - Supports cache invalidation
 - Cache-to-cache filling supported
- General availability caches to 10 GB, Large Object Caching (Beta) to 5 TB
- Caching considerations:
 - Caching is reactive
 - Caches cannot be pre-loaded
 - Once enabled, caching is automatic
 - HTTP(S) load balancer is required

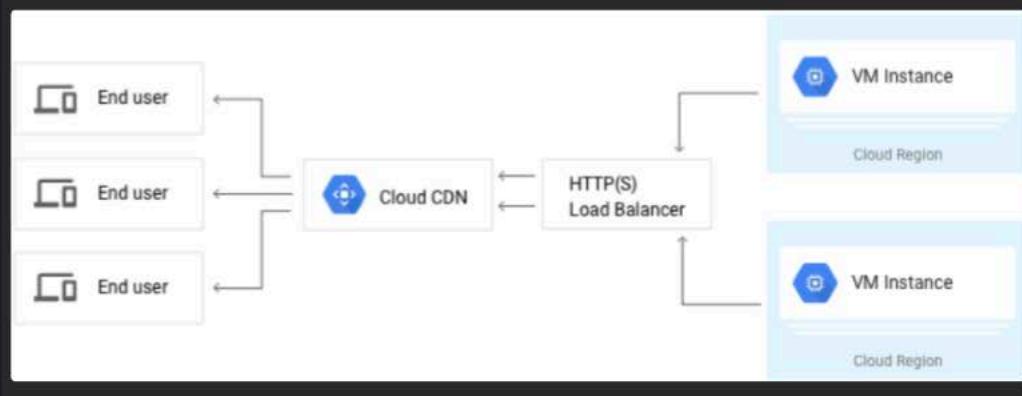




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Cloud CDN Fundamentals

Google



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Data



Cloud SQL



Cloud Datastore



Cloud Storage

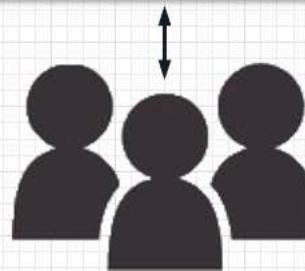
Firewall

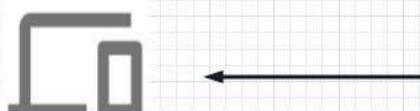


Cloud IAM



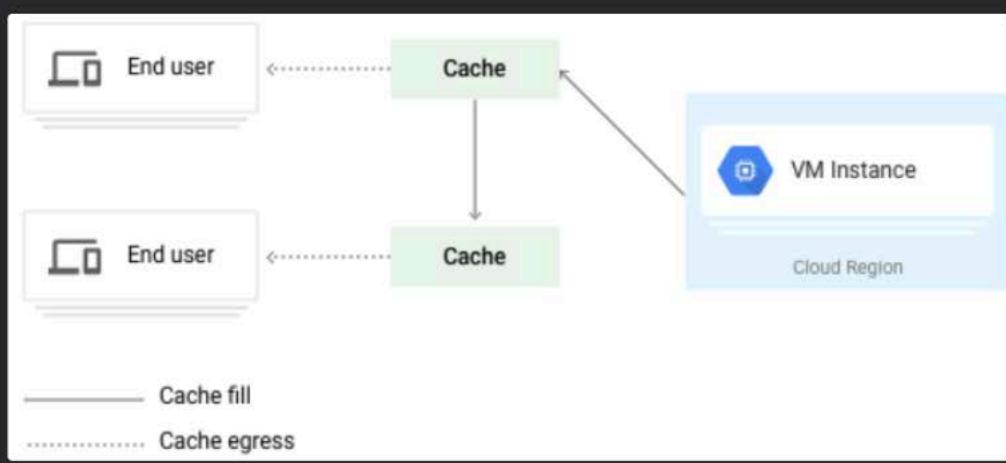
Cloud VPC





Cloud CDN Fundamentals

Google



Data



Cloud SQL



Cloud Datastore



Cloud Storage

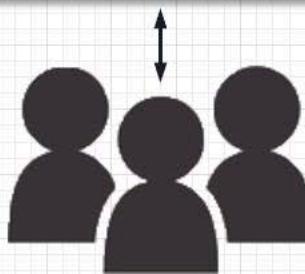
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Cloud IAM

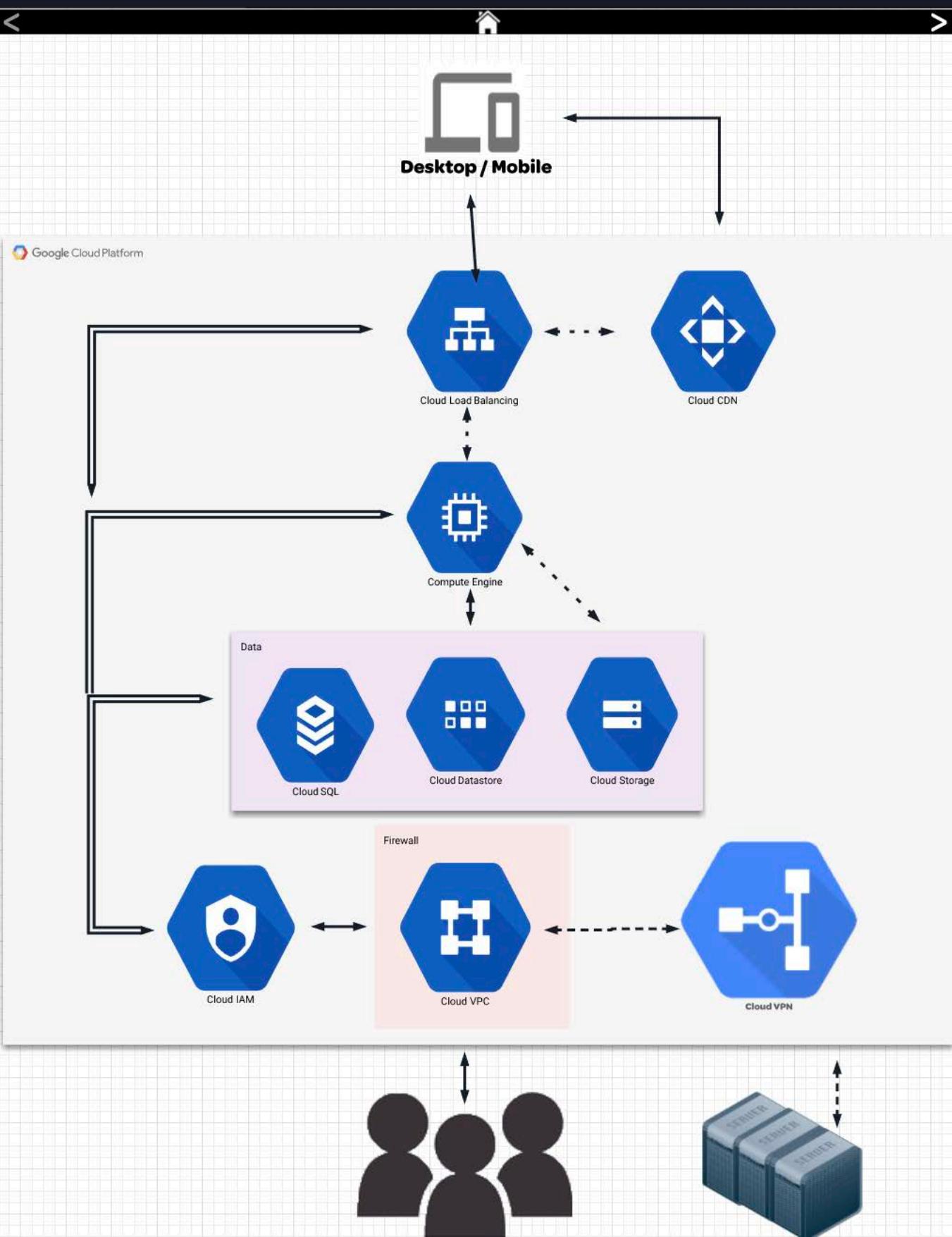


Cloud VPC





LACA International

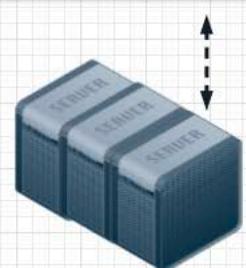
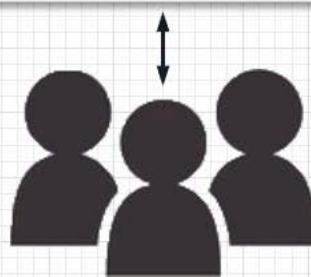
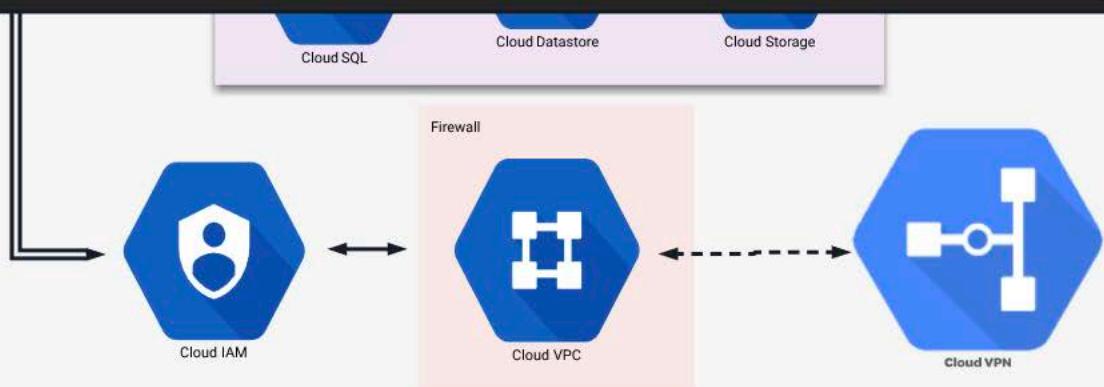




Cloud VPN Fundamentals

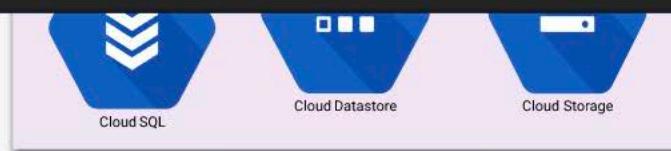
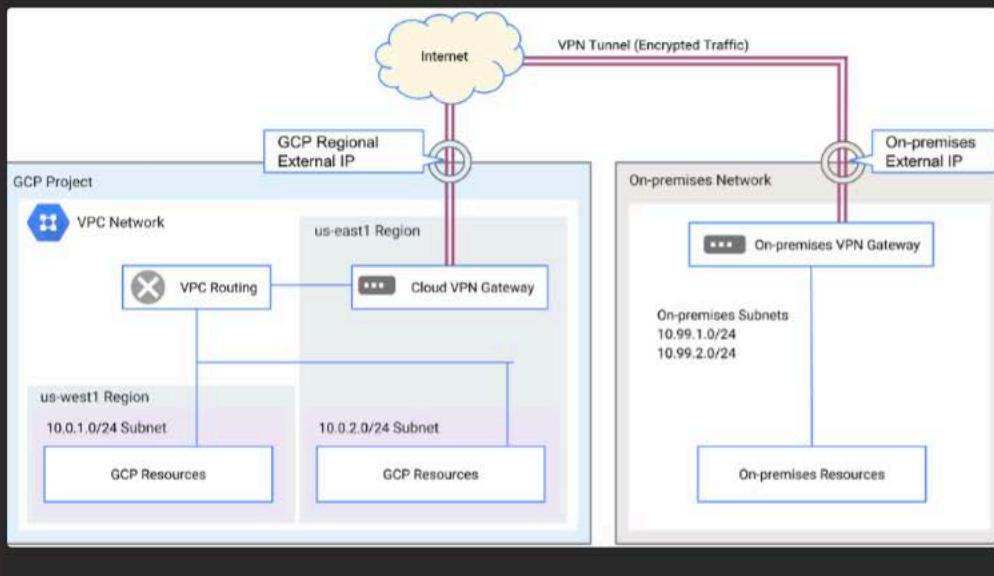


- Provides secure connection between on-premises and Cloud VPC
- Utilizes IPsec VPN gateways with encrypted/decrypted traffic
- Features include:
 - Site-to-site VPN via simple topology or with redundancy
 - Supports Internet Key Exchange (IKE) v1 and v2 with shared secret
 - Uses ESP in Tunnel mode with authentication for encryption
- Routing methods supported:
 - Dynamic gateways using Border Gateway Protocol
 - Policy-based routing
 - Route-based VPN
- Best for low/medium traffic: 3 Gbps with direct peering; 1.5 Gbps without

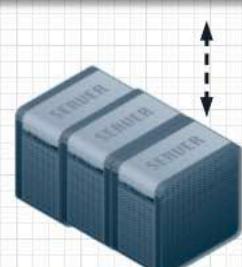
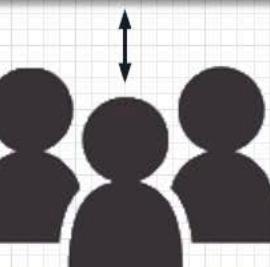
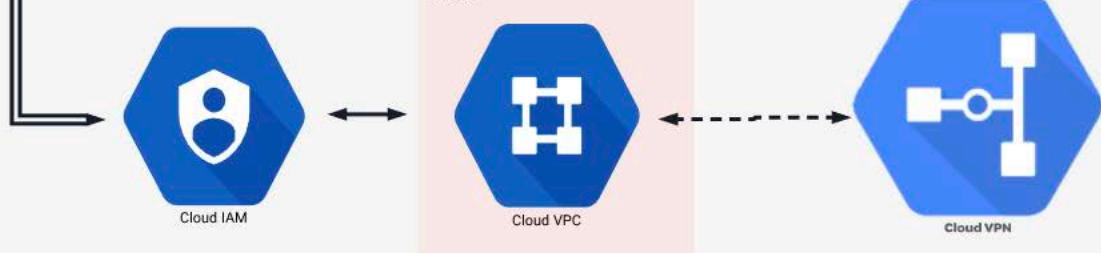




Cloud CDN Fundamentals



Firewall





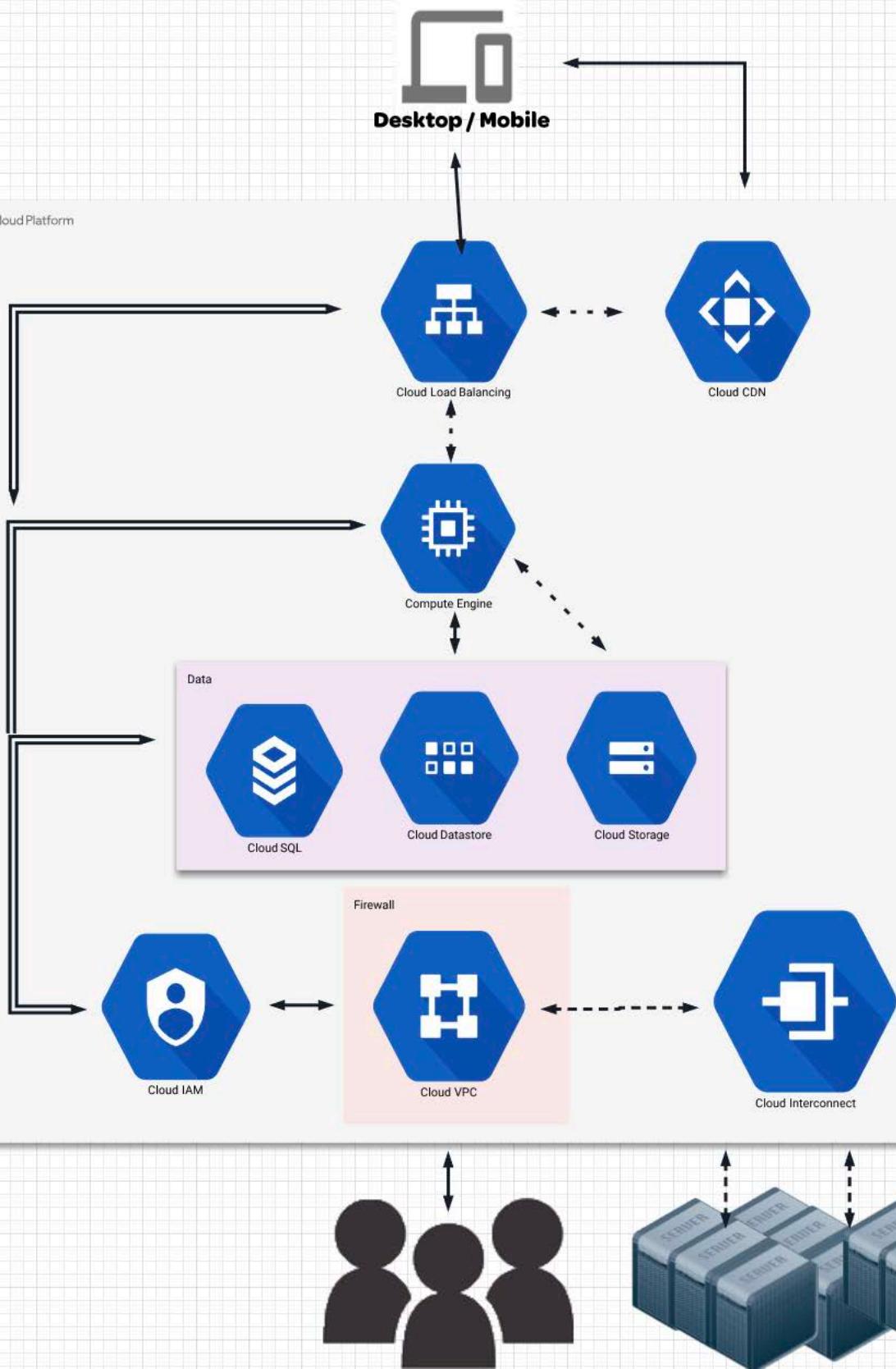
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Google Cloud Platform





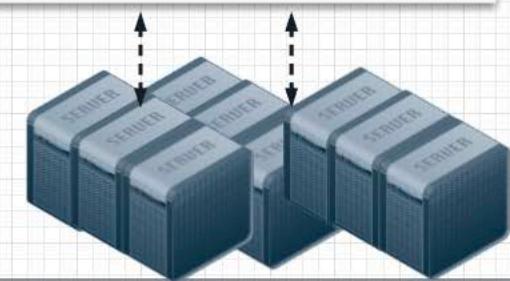
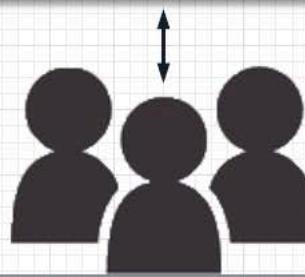
Cloud Interconnect Fundamentals

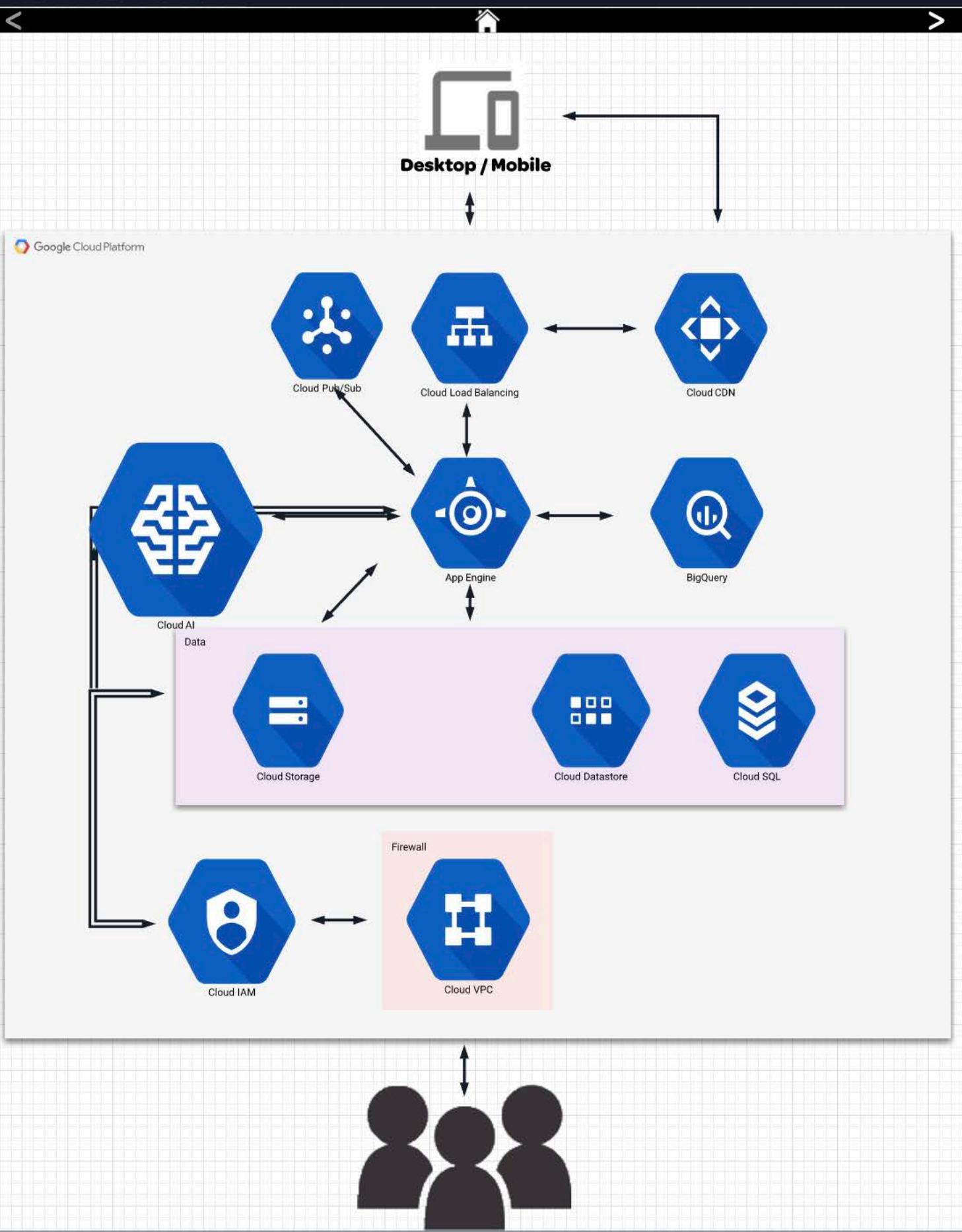
- Provides higher-capacity connections between on-prem and Cloud VPC
- Dedicated Interconnect
 - Direct physical connections with Google network
 - 69 colocation facilities in 17 regions
 - Highest bandwidth: 10 Gbps per circuit (8 circuits max)
 - Routing equipment in colocation facility required
- Partner Interconnect
 - Connect to 3rd party service provider
 - Many more connection possibilities
 - Bandwidth from 50 Mbps to 10 Gbps
 - Routing equipment not required
- Public internet bypassed
- VPN tunnels or NAT devices not needed
- Not encrypted - use app level encryption or own VPN

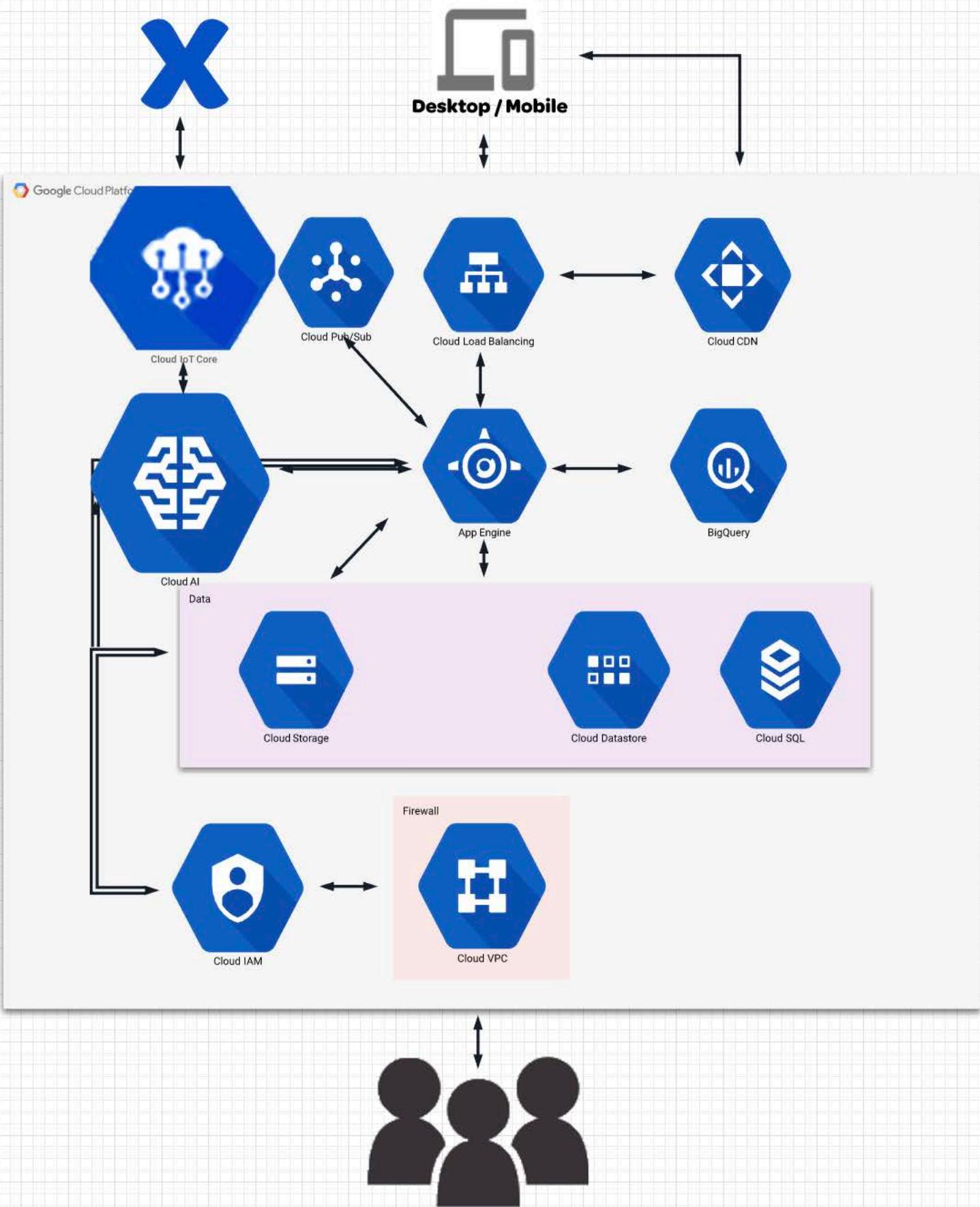
Cloud IAM

Cloud VPC

Cloud Interconnect

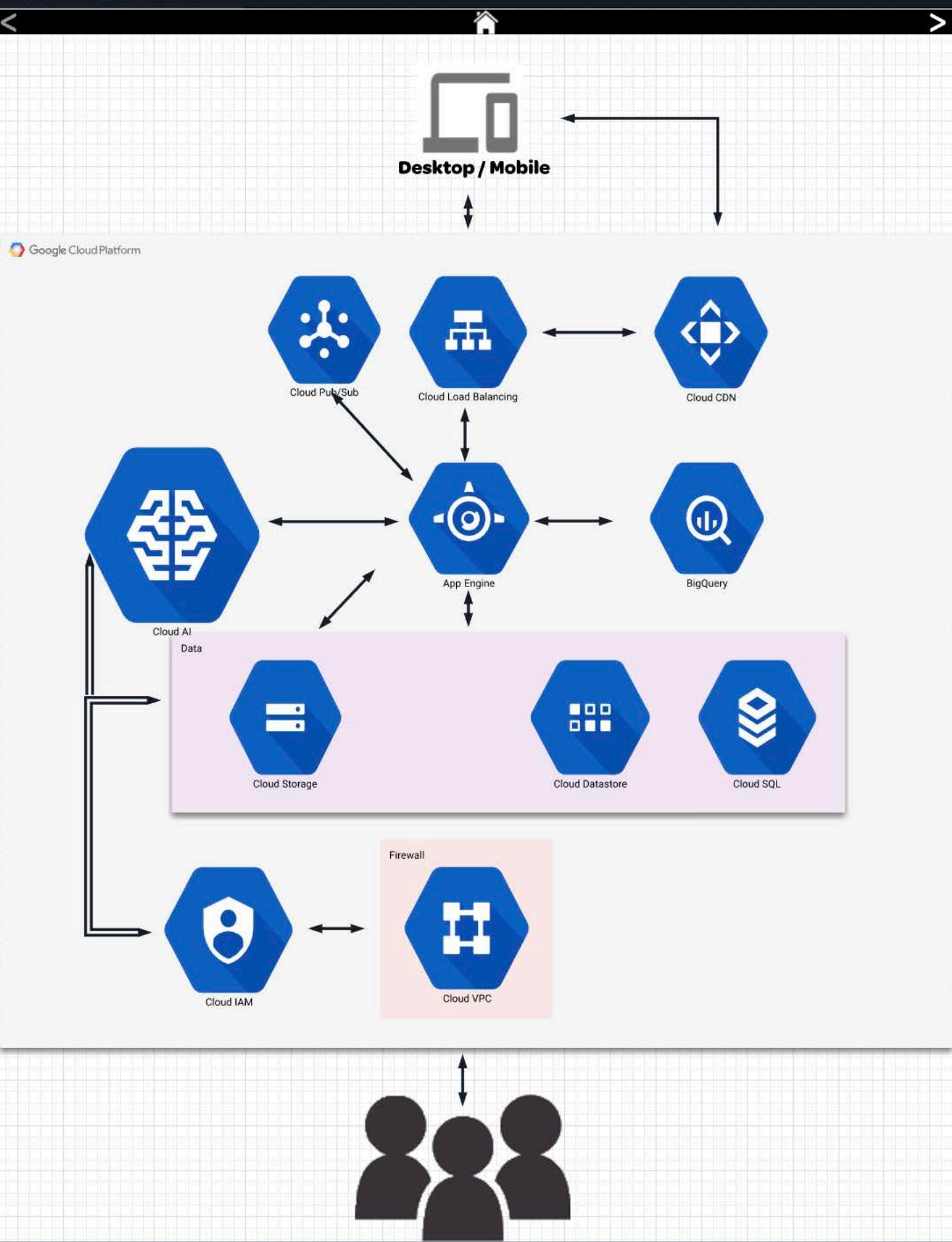


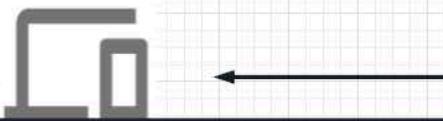






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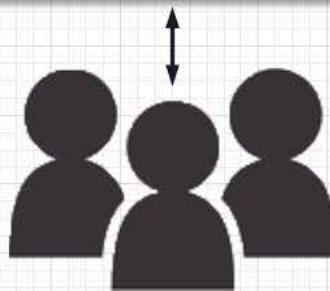


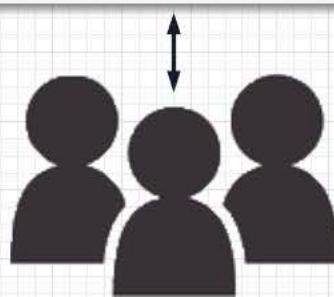
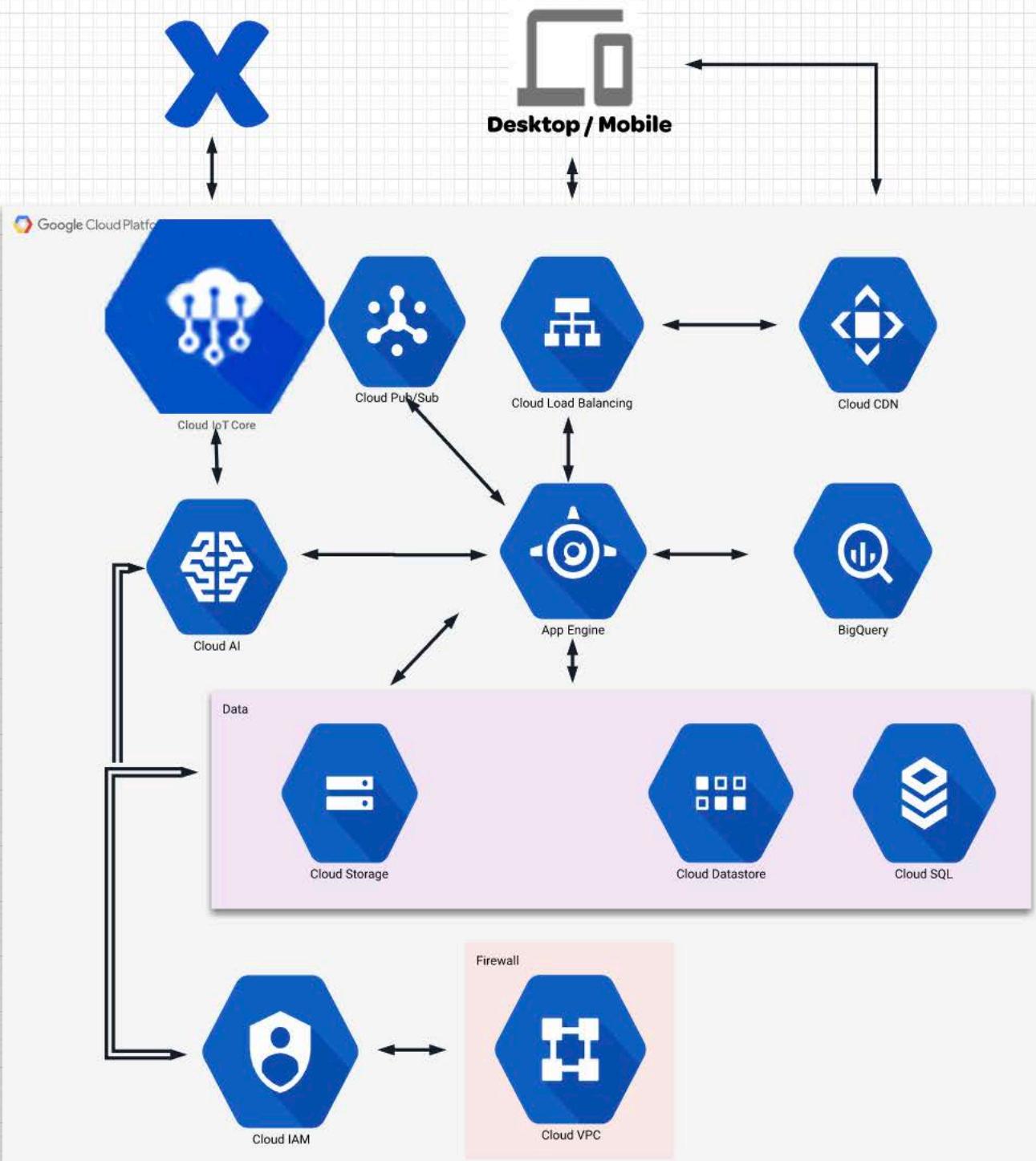


Cloud AI Fundamentals



- Collection of services and APIs designed to facilitate machine learning
- Includes hardware accelerators: TPUs (TensorFlow Processing Units)
- Primary service: Cloud Machine Learning Engine (ML Engine)
 - Training
 - Trains computer models to recognize patterns in data
 - Supports TensorFlow, scikit-learn, and XGBoost
 - Prediction
 - Online
 - Real-time processing with fully managed ML Engines
 - No Docker container required & supports multiple frameworks
 - Batch
 - For asynchronous operations
 - Scales to terabytes of data
 - Data must be stored in accessible location, e.g., Cloud Storage



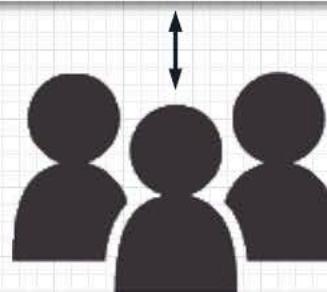
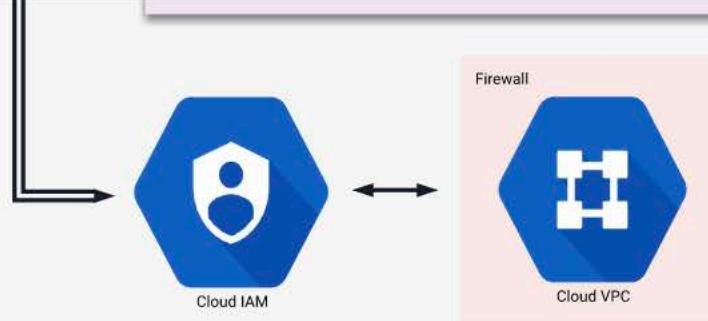




Cloud IoT Core Fundamentals

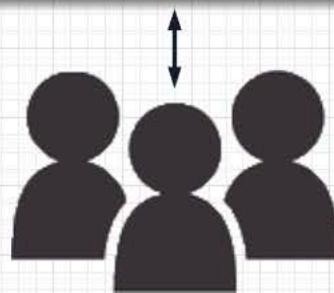
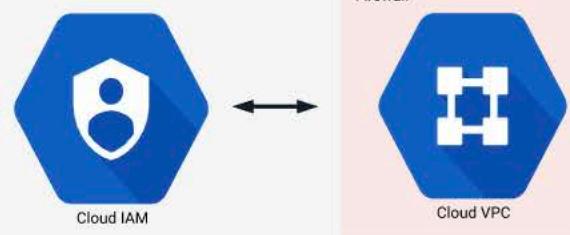
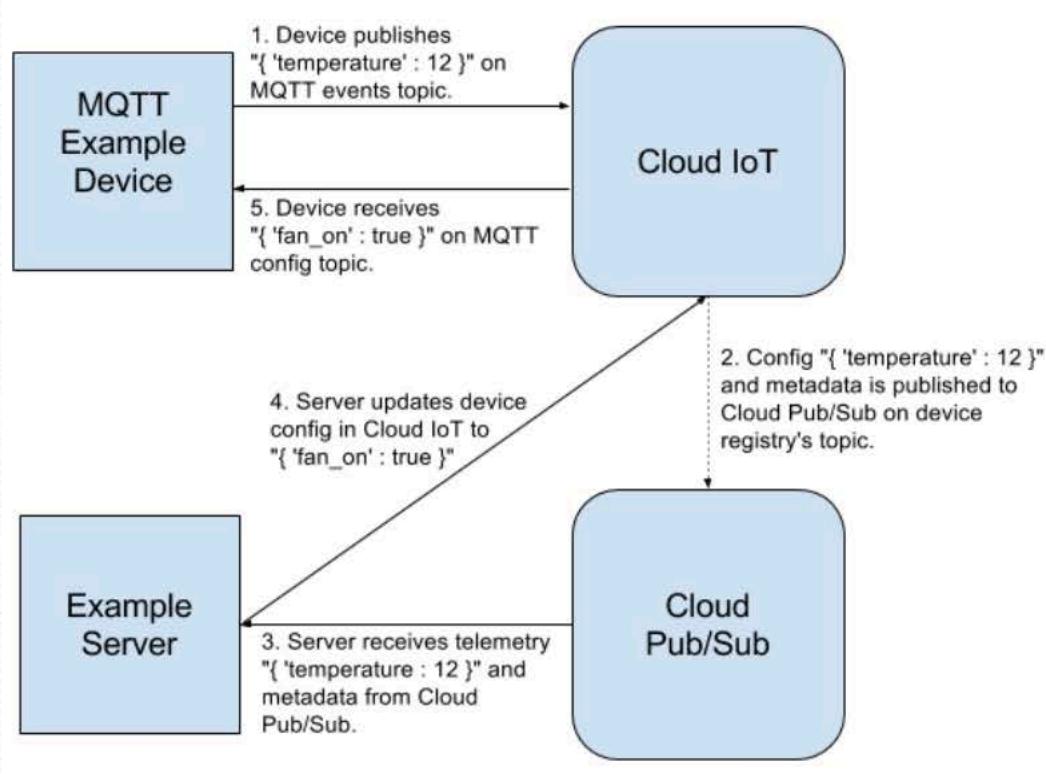


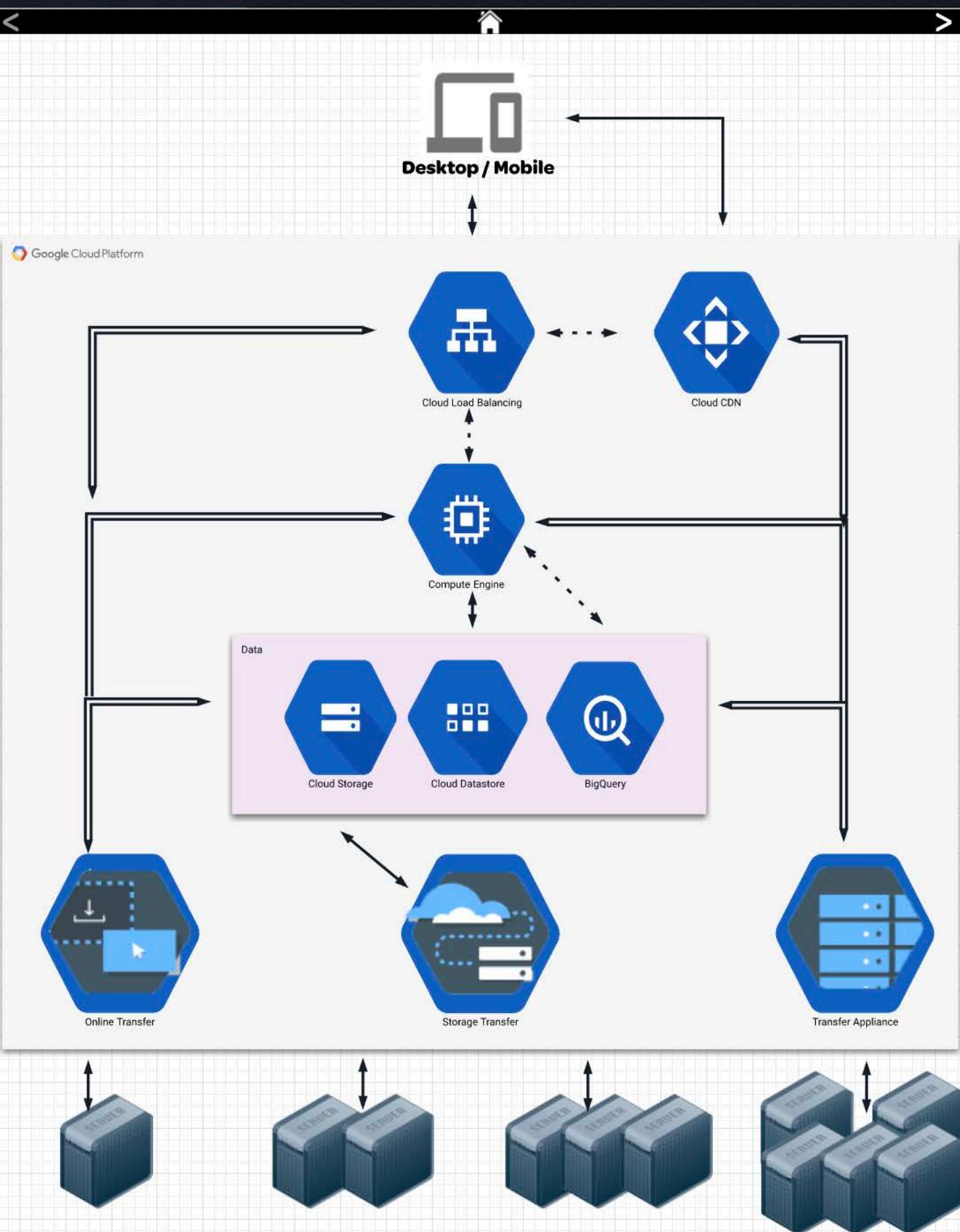
- Fully managed service for connecting and managing IoT devices
- Devices must be registered
- Works with both telemetry (event data) & device state data
- Receives data and sends to Cloud Pub/Sub topic
- Supports HTTP and MQTT protocols for communication
- Highly secure:
 - Each device uses JSON Web Tokens for public/private keys
 - Supports RSA or Elliptic Curve algorithms to verify signatures
 - Key rotation support
 - Access to IoT core controlled by Cloud IAM roles and permissions
- Part of an IoT eco-system with Android Things and Google Beacon





Cloud IoT Core Fundamentals





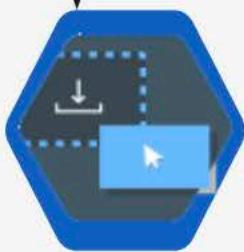


Cloud Data Transfer Fundamentals

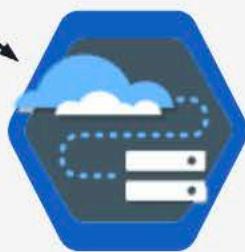


- Range of options available for transferring data to Google Cloud
- Online Transfer
 - Tools available: console upload, JSON REST API, gsutil
- Storage Transfer Service
 - Imports online data to Cloud Storage
 - Supports transfer of objects from AWS S3
- Transfer Appliance
 - Physical device loaded on-prem and shipped to Google data center
 - Single device can hold petabyte of data
 - Far faster than online transfer for large amounts of data

Cloud Storage Cloud Datastore BigQuery



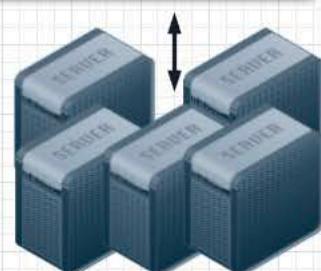
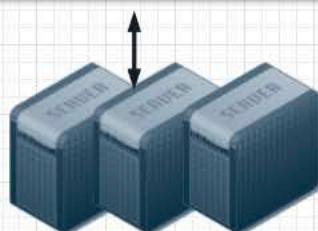
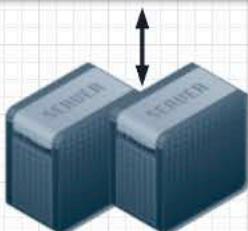
Online Transfer

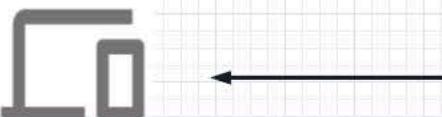


Storage Transfer



Transfer Appliance

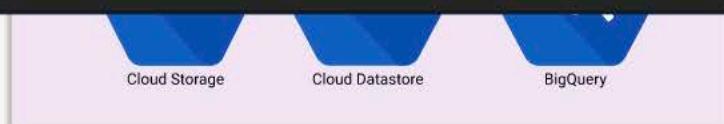




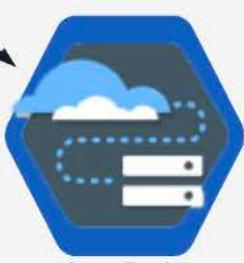
Cloud Data Transfer Fundamentals



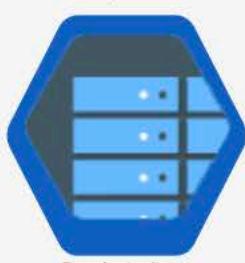
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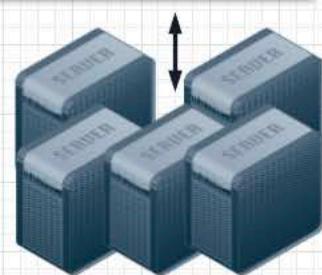
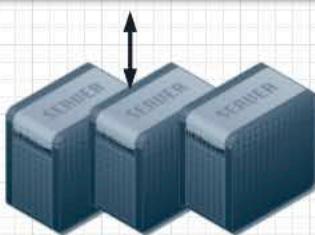
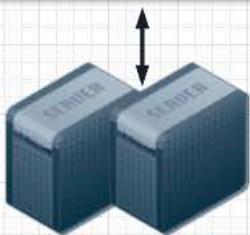
Online Transfer



Storage Transfer



Transfer Appliance



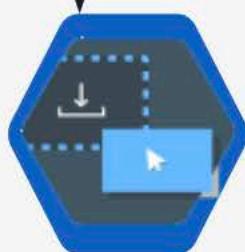


Cloud Data Transfer Fundamentals

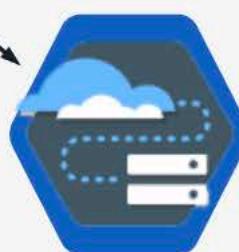


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Cloud Storage Cloud Datastore BigQuery



Online Transfer



Storage Transfer



Transfer Appliance

