Google Cloud

SQL Server on Google Cloud

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Your speakers today

- Not Google speaking, only speaker
- Only public information

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Google Cloud

Agenda

- SQL Server fundamentals

- IaaS SQL server topologies

- Cloud SQL topologies

- Q/A

Agenda

- SQL Server fundamentals

  ○ Services

  ○ Introduced in 2019

  ○ Web edition? The cloud edition

- IaaS SQL server topologies

- Cloud SQL topologies

- Q/A

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Services

- **MSSql: OLTP Sql engine**

  - Performance: B-tree, hash (in-memory), columnstore index, full text

  - Development: Json, Graph, hierarchy, geometry/graphy, computed

  - Admin: snapshot, hybrid/stretch, cloning, data partitioning, backup, temporal

- **SSAS: OLAP engine**

  - Performance: Pre Aggregation algorithm, MOLAP/ROLAP/HOLAP

  - Development: hierarchical, complex measures (lastchild)

  - Admin: partitioning, incremental processing, AD integration

Services

- **SSIS: ETL service**

  - Large amount of connectors (large number of third party providers

  - High level of variabilization of environment with configuration files and scale-out nodes

  - Admin: storage within database, high details of login and security in vault on ssisdb store

- **SSRS: Report Service**

  - Admin: IIS / Sharepoint integration / AD integration

  - Development: rich graphics, report snapshots, linked reports, data-driven subscription

Services

- **Polybase /Big Data clusters**

    ○ Integration with external connectors

    (incl hadoop, mongodb, teradata, oracle, azure storage)

    ○ Spark, Hdfs

    ○ Integration of R/Python

Features on 2019 version

- Sql Server fundamentals

  ○ Services

  ○ New in 2019

  ○ Web edition? The cloud edition

- IaaS Sql server topologies

- Cloud Sql topologies

- Q/A

Capabilities introduced in 2019

- Intelligent Query processing improvements

- Accelerated Database recovery

- Always Encrypted with secure enclaves

- Memory-optimized tempdb metadata

- Resumable index build

- Polybase

- Always-On on containers

- SSL certificates management improvement

Web edition? *Cost efficient*

Bring down the licensing price for stand alone setup:
Web edition: more and more enterprise features are shifting to lower editions

✅ **HADR**: log shipping, db snapshot, Accelerated database recovery

✅ **Scalability and performance**: columnstore, in-memory, stretch, multi-instance, data compression and partitioning, filestream

✅ **Security**: row-level, Always encrypted, dynamic data masking, audit, TDE, roles, contained db, data classification

✅ **Replication**: merge, snapshot, change tracking, transactional

❌ Always-On, online reindexing, BPE, resource governor, native backup encryption, CDC

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Web edition? *Small workloads | Public facing websites*

Bring down the licensing price for stand alone setup:
Web edition: more and more enterprise features are shifting to lower editions

Scale limits

Feature	Enterprise	Standard	Web	Express with Advanced Services	Express
Maximum compute capacity used by a single instance - SQL Server Database Engine[1]	Operating system maximum	Limited to lesser of 4 sockets or 24 cores	Limited to lesser of 4 sockets or 16 cores	Limited to lesser of 1 socket or 4 cores	Limited to lesser of 1 socket or 4 cores
Maximum compute capacity used by a single instance - Analysis Services or Reporting Services	Operating system maximum	Limited to lesser of 4 sockets or 24 cores	Limited to lesser of 4 sockets or 16 cores	Limited to lesser of 1 socket or 4 cores	Limited to lesser of 1 socket or 4 cores

Agenda

- Sql Server fundamentals

- **IaaS Sql server topologies**

  - Stand alone

  - Failover cluster instance

  - Always-On

  - Azure compete

- Cloud Sql topologies

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- IaaS SQL server topologies

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Stand Alone

- **Simple topology: 1 server = 1 instance**
  - No need for HA
  - DR with Log shipping or Backup software
  - Cheaper solution

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BYOL for Microsoft applications on GCE

Easily bring your existing Microsoft licenses to
Google Compute Engine without having to incur any additional
Microsoft software licensing fees.

✓ Take advantage of license mobility with your
Microsoft Software Assurance agreement and
bring your SQL Server licenses.

✓ Use your existing Windows Server or SQL
Server licenses (no SA required) on BYOL
sole-tenant nodes.

	Buy licenses from Google Cloud	Bring your licenses
Microsoft SQL Server	Premium images (pay for use) on multi-tenant VMs	Software Assurance License Mobility for multi-tenant VMs
Windows Server	Premium images (pay for use) on multi-tenant VMs	BYOL to sole tenant infrastructure

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Windows Server containers in GKE

Use Google cloud to containerize and modernize your Windows server applications.

✓ Ready to use Windows Server images tuned for containers

✓ Run Linux and Windows container pods side by side to in GKE.

✓ Upgrade legacy Windows server apps, develop cloud-native micro-services architectures and/or adopt DevOps

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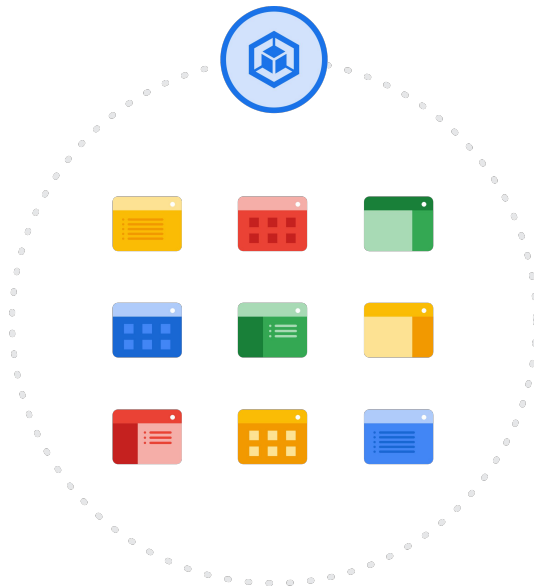
Web Edition

On K8S

Bring down the licensing price:
Web edition: modernize and run it via containers
([official sql microsoft registry](#))

MSSQL_PID is the Product ID (PID) or Edition that the container will run with. Acceptable values:

- Developer : This will run the container using the Developer Edition (this is the default if no MSSQL_PID environment variable is supplied)
- Express : This will run the container using the Express Edition
- Standard : This will run the container using the Standard Edition
- Enterprise : This will run the container using the Enterprise Edition

```
gcloud beta container --project "searce-sandbox" clusters create
"mssql-gke-rk" --zone "asia-south1-a" --username "admin" --cluster-
version "1.10.9-gke.5" --machine-type "custom-1-2048" --image-type
"COS" --disk-type "pd-standard" --disk-size "100"  --num-nodes=2
```

```
kubectl apply -f mssql-base-volume.yaml
kubectl apply -f mssql-mdf-volume.yaml
kubectl apply -f mssql-ldf-volume.yaml
```
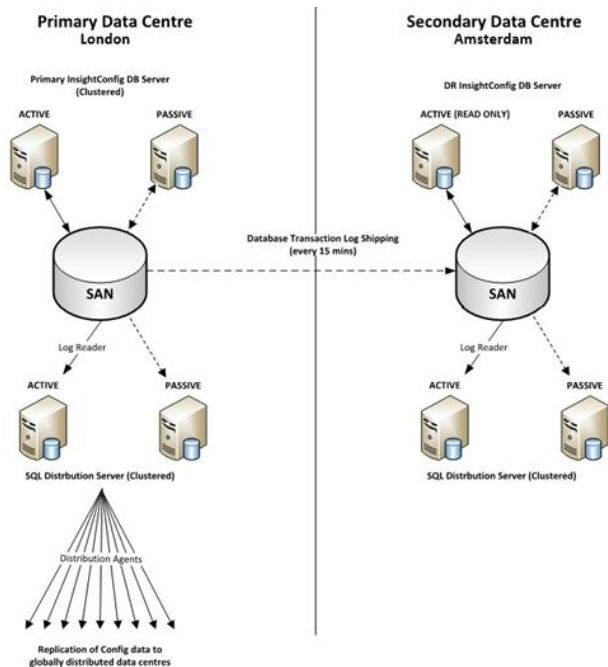
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Stand Alone

- HADR (DR with Log shipping or

  backup software device)

- Shared storage : SAN or S2D*

- Available Standard and Enterprise

  editions

Virtual name and IP

Node 1

Node 2

Node 3..8

Storage Network
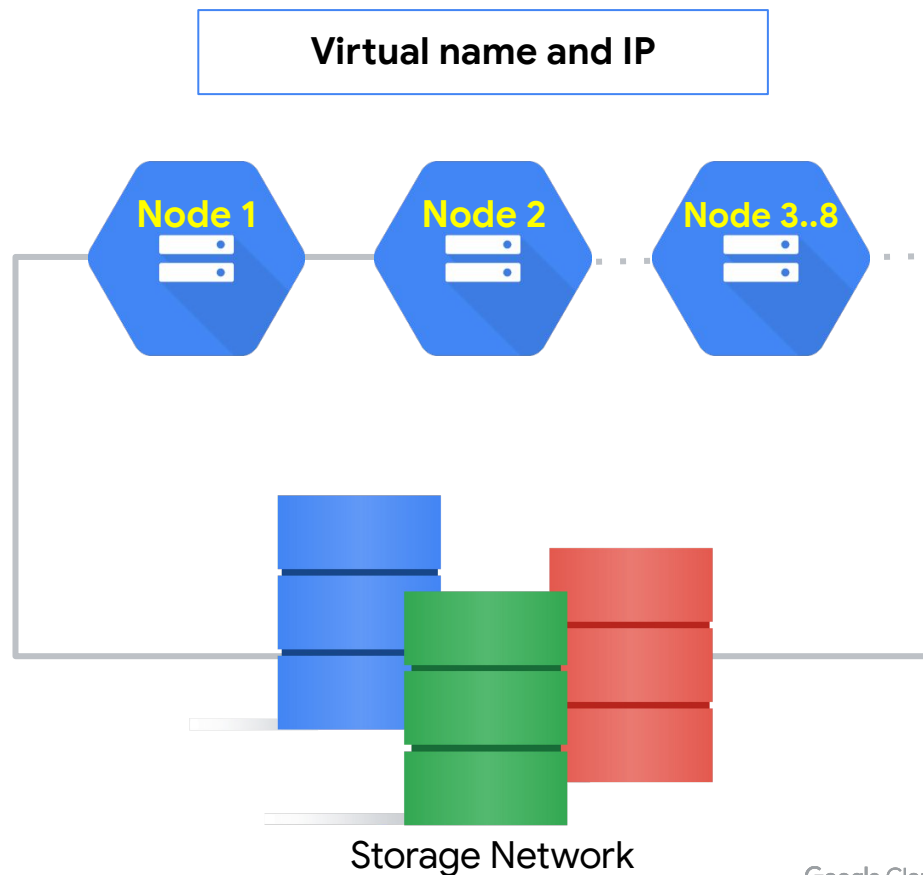
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# Case study 1: 2 FCIs + Log Shipping

Current state

Final state in Google Cloud

- europe-west2 (London) as the primary data region

- europe-west3 (Frankfurt) as the disaster recovery region

- 2 instances on each region with Windows 2016 OS and SQL Server 2014 Enterprise Edition configure FCI using Storage Spaces Direct (S2D) for disks

- Use log shipping to ship data from primary cluster to the secondary cluster

Always on

- Shared-nothing HADR

- Databases can be grouped by Availability Group (Standard 1 database per group BAG)

- 1 listener per availability group (FC required)
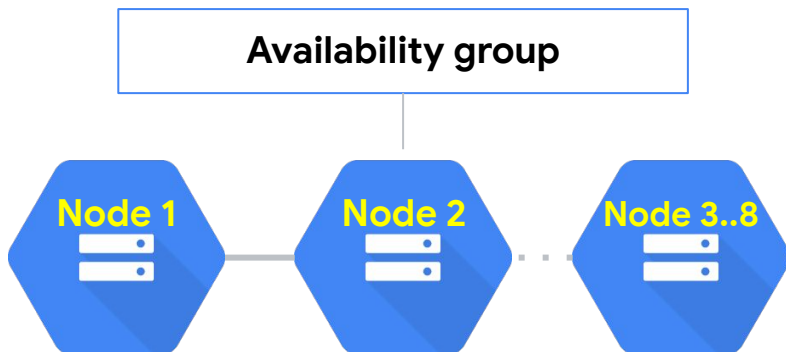
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Case study 2: SQL Server final state in Google Cloud

Migration approach:
Lift and Shift
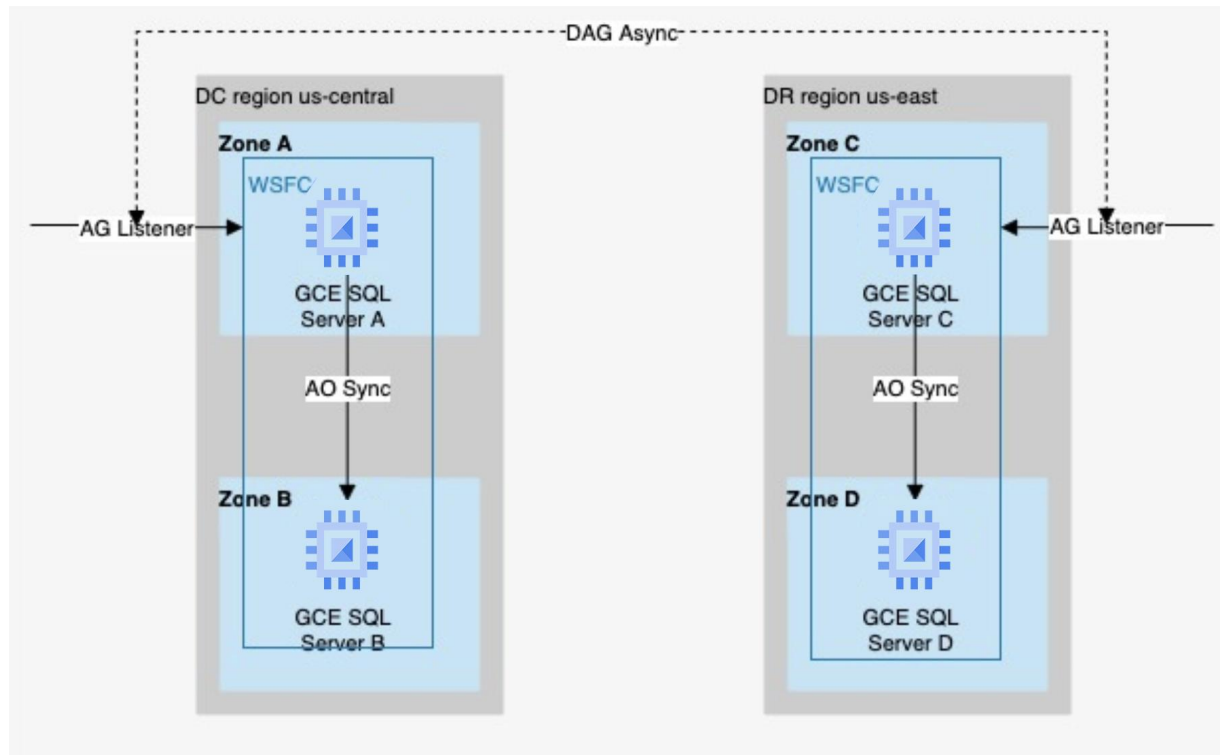
Case study 2: SQL Server final state in Google Cloud

Inside Region(s)

- Inside each region two SQL Server VMs will be created in separate zones.
- Both VMs will be part of Windows Server Failover Cluster (WSFC).
- On top of which Always On AG would be created.

Across Regions

- SQL Server will be deployed in two regions.
- Each region will have one availability group listener, which will be used by applications to connect databases. However only one of them will be used for writes at any given point of time. Mainly DC region will only get new writes via AG Listener while DR's AG Listener can only be used for reads wherever applicable.
- DC Region will send all the transactions to DR region via Distributed Availability Group (DAG).

Azure compete for non-managed HA topologies

- Distributed network name (FCI/AG)
- Cloud Witness (FCI/AG)
- Azure hybrid licence
- Hybrid storage / stretch
- Azure blob storage container
- Azure Active Directory

- Internal Load Balancer
- GCE, Cloud Volume
- BYOL
- Filegroup management
- GCS+FUSE/WinFSP/Powershell
- Google Cloud managed Active-directory

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IaaS Sql server topologies

Cloud Sql topologies

- Key benefits

- Rds vs Gcp comparison

- Known limitations

- roadmap

Q/A

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- SQL Server fundamentals

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- Cloud SQL topologies

  - Key benefits

  - RDS vs Google Cloud comparison

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Key Benefits of Google Cloud SQL

Compatibility

Cloud SQL offers Sql Server instances on 2017, 2019 versions with Express, Standard, Web and Entreprise editions.

Use standard connection drivers and built-in migration tools to get started quickly.

Simple & Fully Managed

Easy to use with no manual software installation, data backup or maintenance. HA option. Integrated monitoring and alerts.

Performance & Scale

Designed for performance-intensive workloads. Easily scale up to 96 processor cores and more than 624 GB of RAM.

Create database instances up to 30TB in size.

Security & Compliance

Automatic data encryption at rest and in transit. User controlled network access with firewall protection. Cloud SQL is SSAE 16, ISO 27001, PCI DSS v3.0, and HIPAA compliant.

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Backup - overview

Characteristics on managed backups
- Up to 365 daily automated backups for each instance.
- Incremental Backups
- Storage used by backups is charged at a reduced rate. (see pricing)
- Backups can not be exported - only instance data (see doc for export)
- Backups are deleted after instance is deleted (Data export required to retain data; read replica for export without perf. impact)
- Backups are disk-level snapshots stored on GCS

Types
- **On-Demand**
  - Create disk-level snapshot backup at any time
  - Not deleted automatically

- **Automated**
  - 4 hour backup window (e.g. 11am - 3pm)
  - Schedule when instance has least activity
  - If data has not changed since last backup then no backup is taken

Backup - configuration

Storage Location

- **Default Location**
  - Stored in two regions for redundancy (remains on same continent except there is only one region available e.g. Australia is stored in Asia)

- **Custom Location**
  - Currently can only be setup through API (see [documentation](#))

Backup User
- CloudSQL creates a database user `cloudsqladmin` to perform and log backups.

Pricing

- Instance and resource pricing is identical to Cloud SQL for PostgreSQL

- In addition to instance and resource pricing, SQL Server also has a licensing component based on the chosen edition.

- High availability, or regional instances, will only incur the cost for a single license for the active resource.

Licence	Price per Core Hour
Enterprise	$0.47
Standard	$0.13
Web	$0.01134
Express	$0

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Highlight: explaining high availability (RePD)

- Synchronous replication

- Failover metric

  60s with no heartbeat

- Failover replicas continue to serve

  data from healthy zone from same IP

- **Available for all editions**

  (even web and Express)
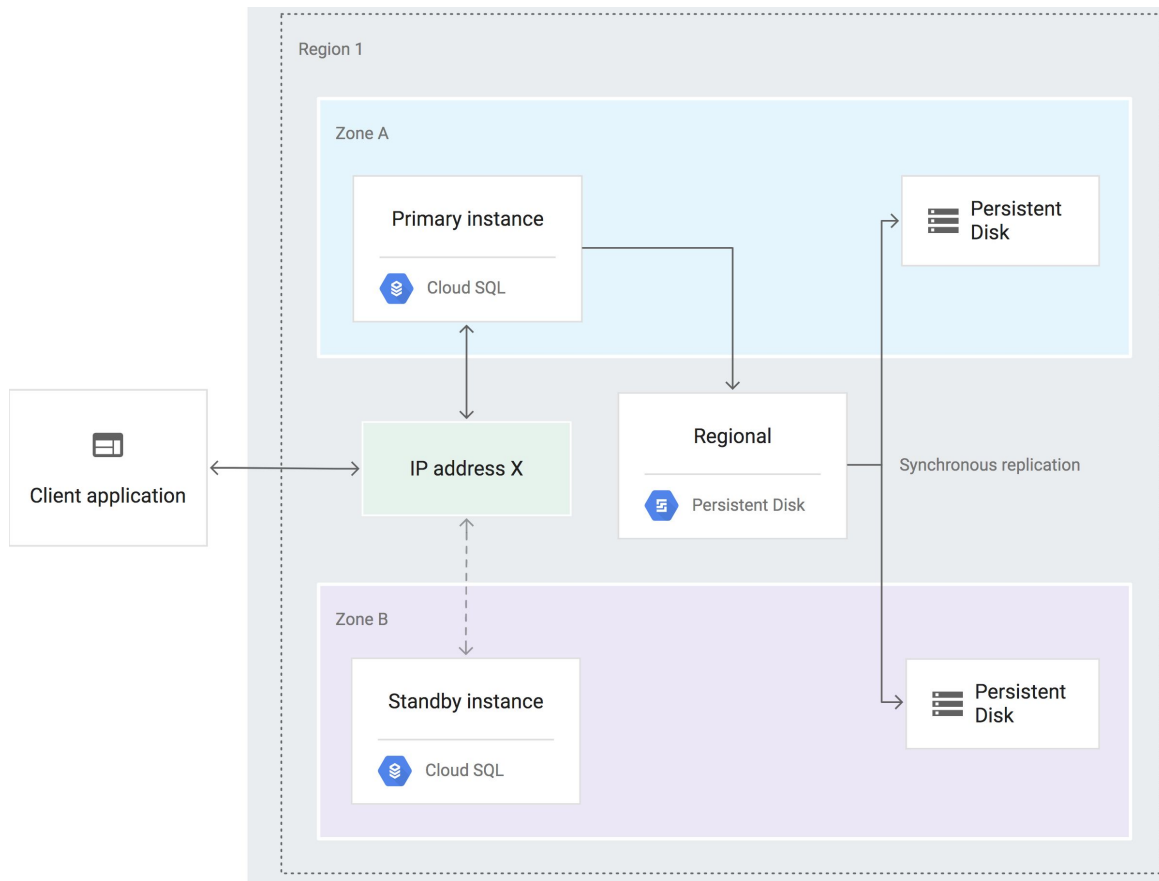
Admin API Access Management

IAM permissions and curated roles for "admin" actions, such as changing machine type

Permissions

- e.g. changing machine type requires cloudsql.instances.update

Roles

- roles/cloudsql.admin
- roles/cloudsql.editor
- roles/cloudsql.viewer
- roles/cloudsql.client

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CMEK encryption

Characteristics

- CMEK allows to use own cryptographic keys for data at rest in CloudSQL
- CloudSQL uses envelope encryption whereas the data encryption key (DEK) is stored with the encrypted data on the PD.
- The customer managed encryption key is used to create, revoke, delete and wrap the key encryption key (KEK)

Limitations

- You cannot
  - rotate key versions on existing instances
  - assign a different key version to a replica
  - assign a different key version to a clone
- You cannot use CMEK keys to encrypt:
  - External servers (external master instances and external replicas)
  - Instance metadata, such as the instance ID, database version, machine type, flags, backup schedule, etc.
- You cannot use customer-managed encryption keys to
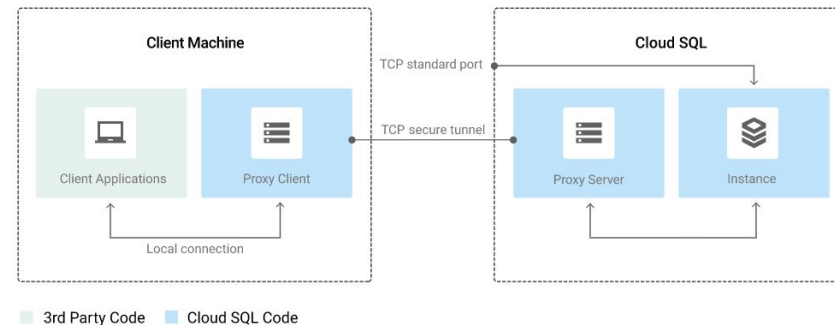 - encrypt user data in transit, such as user queries and responses.
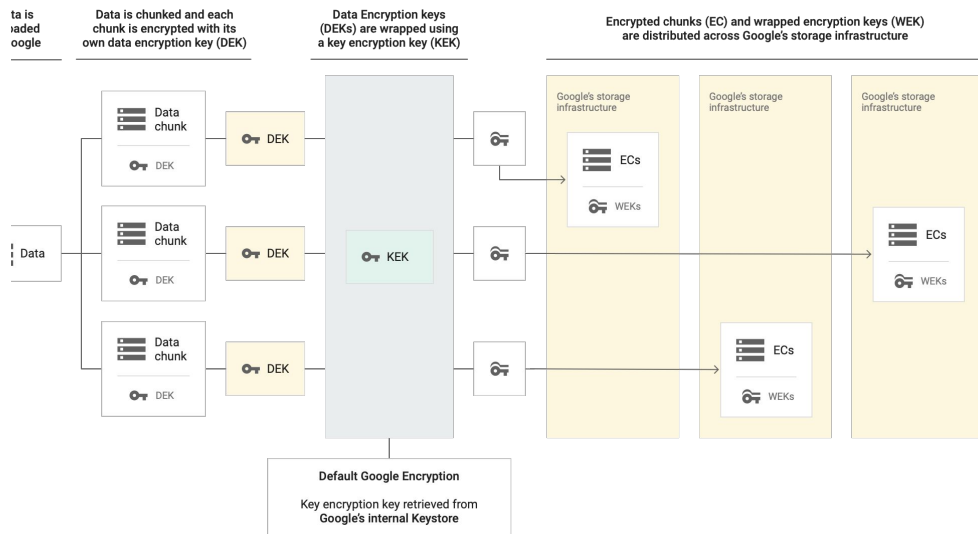
Cloud SQL Proxy

Cloud SQL Proxy provides secure access to your instances without the need for Authorized networks or for configuring SSL

Advantages
- No need to whitelist IPs
- Secure (TLS)

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Cloud SQL Active Directory Authentication - Public Preview

Cloud SQL provides secure access to your instances via Active directory.

Advantages
- Uniformed authentication protocol
- Centralized authentication management
- Strong password and expiration policies

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RDS vs Cloud Sql : Competitive Functionality Assessment

Feature	RDS	Cloud SQL GA	Comments
Core Managed SQL Server functionality (basic connectivity, backup, patching, …)	✅	✅	
"Always On" or comparable HA	✅	✅	RePd HA
Active Directory Integration	✅	✅	Managed AD
Per second billing, CUDs/Reservations	✅	❌	
99.95% Availability SLA	✅	✅	
Multi-Region Replication	✅	✅	AlwaysOn CRR
Advanced Native Functionality (CDC, DTC, DB Mail…)	✅	✅ *	CDC only
Integrated Data Analytic Services	✅	❌	
Migration Tooling (DMS)	✅	✅ *	Public preview

*CDC only for now
Functionality gaps based on current estimates and parity must meet same level of robustness/quality as RDS

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Known limitations

- Replication including read replicas and T-SQL replication

- Auxiliary analytical services (SSRS, SSAS, SSIS, R services, ...)

- PITR (workaround exists)

Specific Commands can be found here:

https://cloud.google.com/sql/docs/sqlserver/features

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Q&A

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