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Cloud Bigtable Overview

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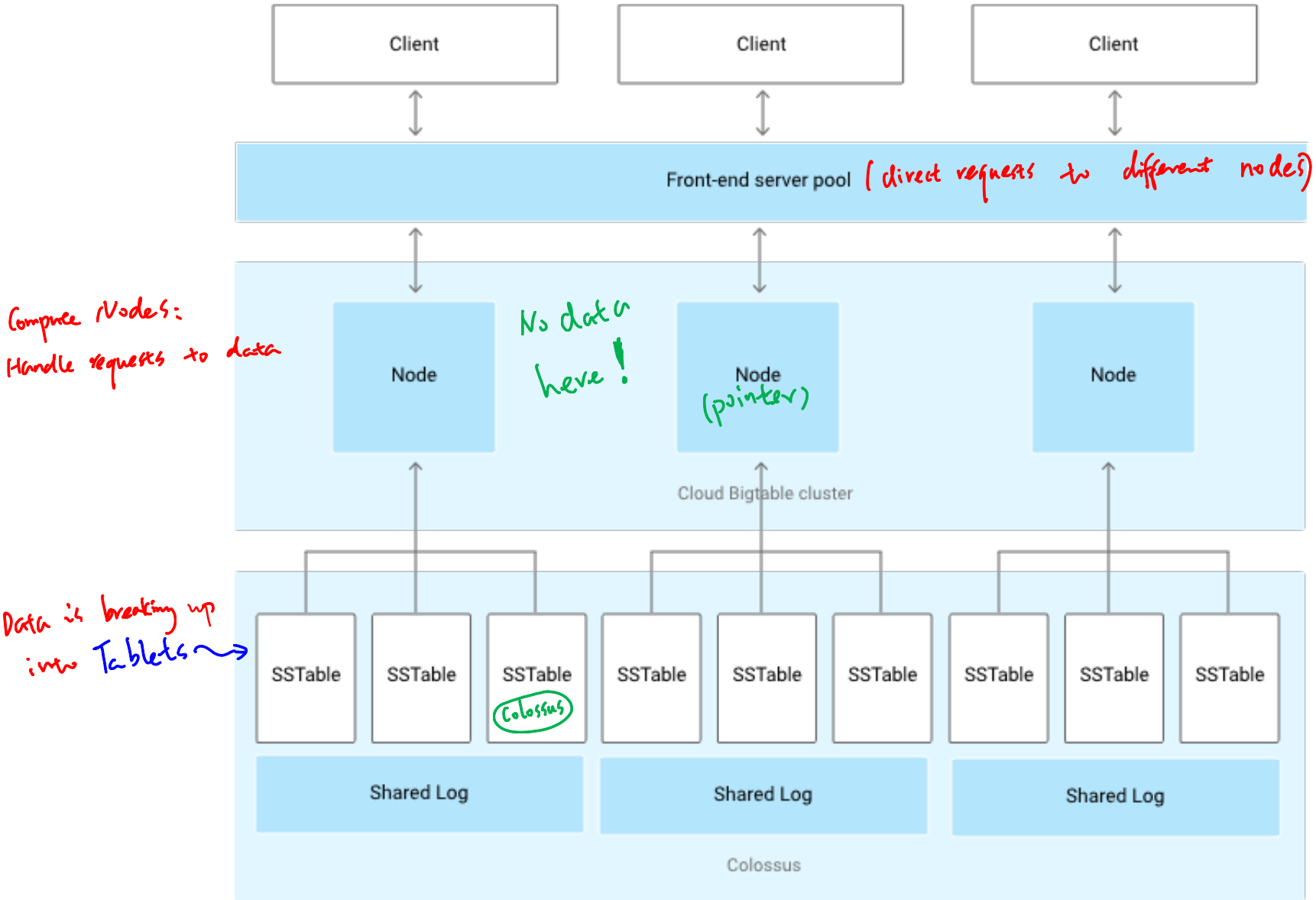
Cloud Bigtable Infrastructure



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exam

Cloud Bigtable Overview

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What is Cloud Bigtable?

- High performance, massively scalable NoSQL database
- Ideal for large analytical workloads

History of Bigtable

- Considered one of the originators for a NoSQL industry
- Developed by Google in 2004
  - Existing database solutions were too slow
  - Needed real-time access to petabytes of data
- Powers Gmail, YouTube, Google Maps, and others

What is it used for?

- High throughput analytics
- Huge datasets

> 1TB datasets

Use Cases

- Financial data – stock prices
- IoT data
- Marketing data – purchase histories

Access Control

(IAM access)

- Project wide or instance level
- Read/Write/Manage

Cloud Bigtable

expensive, not for small business

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Cloud Bigtable

Instance Configuration

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Instance basics

- Not no-ops
  - Must configure nodes
- Entire Bigtable project called 'instance'
  - All nodes and clusters
- Nodes grouped into clusters
  - 1 or more clusters per instance
- Auto-scaling storage
- Instance types
  - Development - low cost, single node in a single cluster
    - No replication (for testing)
  - Production - 3+ nodes per cluster, also can create other clusters too
    - Replication available, throughput guarantee

Replication and Changes

- Synchronize data between clusters
  - One additional cluster, total
  - (Beta) available cross-region (may change later)
- Resizing
  - Add and remove nodes and clusters with no downtime
- Changing disk type (e.g. HDD to SSD) requires new instance
  1. export data to cloud storage
  2. create new instance
  3. re-import data again

Interacting with Bigtable

- Command line - cbt tool ① or HBase shell ②
  - cbt tool is simpler and preferred option

① How many nodes in your cluster?

② What type of disk you use?

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cbt : we're interacting with bigtable

Cloud Bigtable

Instance Configuration

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Bigtable interaction using cbt

- Install the cbt command in Google SDK
  - sudo gcloud components update
  - gcloud components install cbt
- Configure cbt to use your project and instance via .cbtrc file'
  - echo -e "project = [PROJECT_ID]\ninstance = [INSTANCE_ID]" > ~/.cbtrc
- Create table
  - cbt createtable my-table
- List table
  - cbt ls
- Add column family
  - cbt createfamily my-table cf1 (family name is cf1)
- List column family
  - cbt ls my-table
- Add value to row 1, using column family cf1 and column qualifier c1
  - cbt set my-table r1 cf1:c1=test-value
- Delete table (if not deleting instance)
  - cbt deletetable my-table
- Read the contents of your table
  - cbt read my-table

Get help with cbt command using 'cbt --help'

Memorize the page ↑

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Data Organization

How data is organized in big table

Data Organization

- One big table (hence the name Bigtable)
- Table can be thousands of columns/billions of rows
- Table is sharded across tablets

Table components

- Row Key
  - First column
- Columns grouped into column families

	Column-Family-1		Column-Family-2	
Row Key	*Column-Qualifier-1*	*Column-Qualifier-2*	*Column-Qualifier-1*	*Column-Qualifier-2*
r1	r1, cf1:cq1	r1, cf1:cq2	r1, cf1:cq1	r1, cf1:cq2
r2	r2, cf1:cq1	r2, cf1:cq2	r2, cf1:cq1	r2, cf1:cq2

Indexing and Queries

- Only the row key is indexed
- Schema design is necessary for efficient queries!
- Field promotion - move fields from column data to row key

Row key	Column data
BATTERY#Corrie#20150301124501001	METRIC:PERCENTAGE:98
BATTERY#Corrie#20150301124501003	METRIC:PERCENTAGE:96
BATTERY#Jo#20150301124501002	METRIC:PERCENTAGE:54
BATTERY#Sam#20150301124501004	METRIC:PERCENTAGE:43
BATTERY#Sam#20150301124501005	METRIC:PERCENTAGE:38

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Row Key
memusage+user+timestamp
20-mattu-201805082048

good schema for row key

Schema Design (exam topic)

choose the best schema for the row key for max out of efficiency.

Schema Design

1. Per table – Row key is the only indexed item
2. Keep all entity info in a single row
3. Related entities should be in adjacent rows
   - More efficient reads
4. Tables are sparse – empty columns take no space

Schema Efficiency

- Well-defined row keys = less work
  - Multiple values in row key
- Row key (or prefix) should be sufficient for a search
- Goal = spread loads over multiple nodes
  - All on one node = hotspotting

Row Key Best Practices

- Good row keys = distributed load
  1. Reverse domain names (com.linuxacademy.support)
  2. String identifiers (mattu)
  3. Timestamps (reverse, NOT at front/or only identifier) Y-m-d
- Poor row keys = hotspotting
  - Domain names (support.linuxacademy.com)
  - Sequential ID's
  - Timestamps alone/at front

Table Design - Time Series Data

{ tall and narrow / short and wide

- For time series data, use tall and narrow tables (one event per row)
  - Easier to run queries against data