

# Brief Introduction to NoSQL

NoSQL is a category of relatively new technologies and products.

# NoSQL Characteristics

- Non-Relational Database
- Big Data
- Distributed Storage & Processing
- Open Source
- Less expensive hardware
- Batch Processing
  - Google Map Reduce
- Interactive and Stream Processing
  - Apache Tez Framework
  - Apache Spark
  - Facebook Presto

# NoSQL Characteristics - continued

- Denormalization at ingestion to speed up query
- Append instead of update to improve performance
- Schema-agnostic

# Facebook Presto

- Open source distributed SQL query engine
- Run interactive analytic queries against data sources of all sizes ranging from gigabytes to petabytes
- Designed for interactive analytics

# Three V's of Big Data

- Volume: Ranges from terabytes to petabytes of data
- Variety: Includes data from a wide range of sources and formats (e.g. web logs, social media interactions, transactions, etc)
- Velocity: data needs to be collected, stored, processed, and analyzed within relatively short windows – ranging from daily to real-time

# NoSQL Databases

## ➤ **Key Value**

- Dynamo, Riak, Basho

## ➤ **Columnar**

- Google's Bigtable, Apache's HBase (part of Hadoop)
- Column Family/Columns

## ➤ **Document**

- MongoDB
- JSON/XML

## ➤ **Graph and Triple Store**

- Neo4j

## ➤ **Analytics and Data Warehousing**

- Hive
- Redshift (Amazon)
- Presto (Facebook)
- Airpal (Airbnb)

# NoSQL Database Use Cases

- **Key-value stores**

- Simple binary values, lists, maps, and strings

- **Columnar stores**

- Related information values can be grouped in column families

- **Document stores**

- Highly complex parent-child hierarchal structures

- **Triple and Graph stores**

- A web of interrelated information



# NoSQL Database Application

## ➤ **Key-value stores**

- provide easy and fast storage of simple data through use of key

## ➤ **Columnar stores**

- support very wide tables but not relationships between tables

## ➤ **Document stores**

- keep JSON and/or XML hierarchical structures

## ➤ **Triple and graph stores**

- store complex relationships

# Key-value Store vs Columnar Store

Key-value store

Key	Timestamp	Value
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Bigtable clone

Row Key	Column Family	Column Name	Timestamp	Value
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# NoSQL Databases Operations

- Memory Cache
- Distributed
- Proprietary Interface
- SQL-like Interface

# Example of SQL-like Interface

- Presto
- Hive QL
- Pig
- Cassandra Query Language (CQL)
- Cosmos/Scope

# Hadoop with Hive vs RDBMS

## Hadoop with Hive

- Can handle petabytes of data and unstructured data.
- Opens source, flexible, fast and still evolving
- Supports distributed architecture
- Can run on commodity hardware
- Cost efficient
- Some traditional data handling features are not available in Hive. For example, ACID principles are not available in Hive

## RDBMS

- Most can handle terabytes of data and only structured data
- Most are proprietary and defined constraints
- Support client server architecture
- Data intensive applications need high-end servers
- High cost to scale
- Provides traditional features such as transaction management and ACID principles for data reliability

# Hive QL

```
Hive> CREATE DATABASE  
Employee
```

```
Hive> CREATE DATABASE  
IF NOT EXISTS Employee
```

# Hive QL

This view retrieves data containing details about graduate courses in New York:

```
CREATE VIEW NY_graduate_courses AS
SELECT *
FROM Universities_courses_all
JOIN course_List ON (course.id = course.id )
WHERE state = 'NY'
```

# Cosmos/Scope – INNER JOIN

```
// INNER JOIN
```

```
rs_inner = SELECT employees.DepID AS EmpDepId,  
                departments.DepID, employees.EmpName,  
                departments.DepName  
FROM employees  
INNER JOIN departments  
ON employees.DepID == departments.DepID;
```



# Cosmos/Scope – LEFT OUTER JOIN

```
// LEFT OUTER JOIN
```

```
rs_left_outer = SELECT employees.DepID AS EmpDepId,  
                    departments.DepID , employees.EmpName,  
                    departments.DepName  
FROM employees  
LEFT OUTER JOIN departments  
ON employees.DepID == departments.DepID;
```