

# Designing Schema for Hive

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# Overview

**Understand normalized storage in traditional databases**

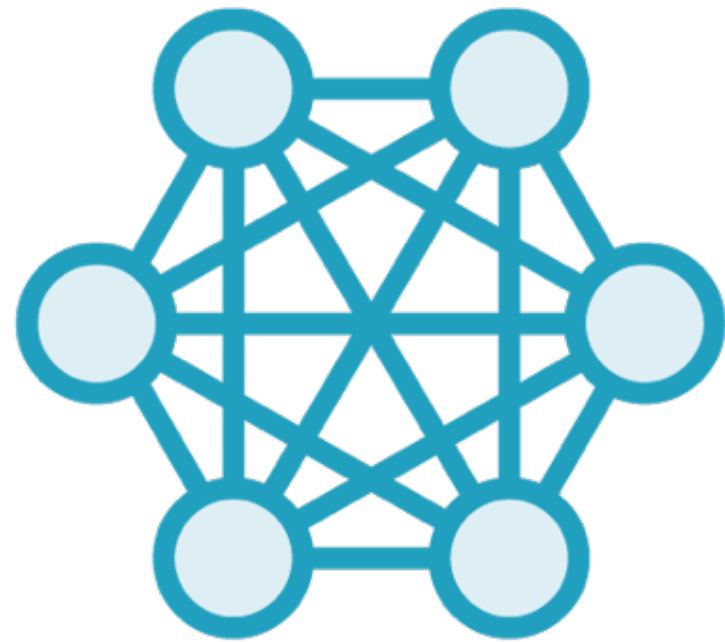
**Understand why Hive stores data in denormalized form**

# Hive Schema Design



**Complex process**

**Based on the type of dataset and kind of queries that are run**



## Column structure and data types

Serialized forms in HDFS

Partitioning to improve query performance

Bucketing to tweak sampling and joins

# Normalized Storage in Traditional Databases

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# Traditional Database Design



**Normalized data**

**Data is stored in a granular form to  
minimize redundancy**

# Employee Information

**name**

**address**

**id**

**subordinates**

**department**

**grade**



**id   name   grade  
department**

**id   subordinates**

**id   address**





# Minimize Redundancy

**Employee Details**

**Employee Subordinates**

**Employee Address**



## Employee Details

Id	Name	Department	Grade
1	Emily	Finance	6

## Employee Subordinates

Id	Subordinate Id
1	2
1	3

## Employee Address

Id	City	Zip Code
1	Palo Alto	94305
2	Seattle	98101



## Employee Details

Id	Name	Function	Grade
1	Emily	Finance	6
2	John	Finance	3
3	Ben	Finance	4

All employee details  
in one table



## Employee Subordinates

id	Subordinate id
1	2
1	3

Employees referenced only  
by ids everywhere else



## Employee Address

Id	City	Zip Code
1	Palo Alto	94305
2	Seattle	98101

**Data is made more granular by splitting it across multiple tables**



Id	Name	Function	Grade
1	Emily	Finance	6

Id	Subordinate Id
1	2
1	3

Id	City	Zip Code
1	Palo Alto	94305
2	Seattle	98101

# Normalization



Id
1

Name	Function	Grade
Emily	Finance	6

join

Id
1
1

Subordinate Id
2
3

Query for Emily's department  
and her subordinates



# Normalization

**Minimizes redundancy, optimizes storage**

**Foreign keys to ensure valid joins**

**Updates in one location, no duplication of data**



# Denormalized Storage in Hive

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# Denormalized Storage



## Denormalized data

**Data is compressed into one table to be read in a single operation**

# Denormalized Storage



**Disk space is very cheap**

**No foreign key constraints**

**Read operations, no data updates**

# Denormalized Storage



**Optimize the number of disk seeks**

**Store data for an entity in one location**

**Ignore redundancy, minimize joins**

# Denormalized Storage

Id	Name	Function	Grade
1	Emily	Finance	6
2	John	Finance	3
3	Ben	Finance	4

Id	Subordinate Id
1	2
1	3

~~join?~~

# Denormalized Storage

Id	Name	Function	Grade
1	Emily	Finance	6
2	John	Finance	3
3	Ben	Finance	4

Id	Subordinate Id
1	2
1	3



Id	Name	Function	Grade	Subordinates
1	Emily	Finance	6	<ARRAY>
2	John	Finance	3	
3	Ben	Finance	4	

# Denormalized Storage

Id	Name	Function	Grade
1	Emily	Finance	6
2	John	Finance	3
3	Ben	Finance	4

Id	Subordinate Id
1	2
1	3



Id	Name	Function	Grade	Subordinates
1	Emily	Finance	6	2,3
2	John	Finance	3	
3	Ben	Finance	4	

# Denormalized Storage

Id	Name	Function	Grade
1	Emily	Finance	6
2	John	Finance	3
3	Ben	Finance	4

Id	City	Zip Code
1	Palo Alto	94305
2	Seattle	98101



Id	Name	Function	Grade	Subordinates	Address
1	Emily	Finance	6	2,3	<STRUCT>
2	John	Finance	3		
3	Ben	Finance	4		



# Denormalized Storage

Id	Name	Function	Grade
1	Emily	Finance	6
2	John	Finance	3
3	Ben	Finance	4

Id	City	Zip Code
1	Palo Alto	94305
2	Seattle	98101



Id	Name	Function	Grade	Subordinates	Address
1	Emily	Finance	6	2,3	Palo Alto, 94305
2	John	Finance	3		
3	Ben	Finance	4		

# Denormalized Storage

Id	Name	Function	Grade	Subordinates	Address
1	Emily	Finance	6	<b>2,3</b>	<b>Palo Alto, 94305</b>
2	John	Finance	3		
3	Ben	Finance	4		

**Store everything related to an employee in the same table**

# Denormalized Storage

Id	Name	Function	Grade	Subordinates	Address
1	Emily	Finance	6	<b>2,3</b>	<b>Palo Alto, 94305</b>
2	John	Finance	3		
3	Ben	Finance	4		

**Get all details about an  
employee in one read operation**

# Summary

**Understood the differences between normalized and denormalized storage**

**Understood why Hive stores data in denormalized form**