

Week 1

Getting Started with Cassandra



Cassandra Workshop Series

Your path to becoming a Cassandra expert!

~ 7,500 Registrations



<https://lime.link/blog/visualizing-crowd-sizes/>

The Crew





Your hosts



Bettina Swynnerton

Community Engineer



Cédrick Lunven

Developer Advocate



David Jones-Gilardi

Developer Advocate



Aleksandr Volochnev

Developer Advocate



Jack Fryer

Community Manager





Your hosts



Aleksandr Volochnev 

Developer Advocate



Bettina Swynnerton 

Community Engineer



Aleksandr Volochnev 



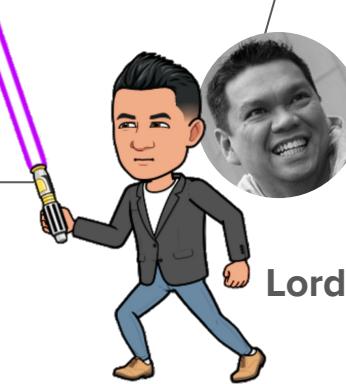
Jack Fryer 

Community Manager



Cédrick Lunven 

Developer Advocate



Erick Ramirez 

Lord of the Cassandra Rings





Developer Workshop Series Week 1

**What we will
cover:**

- Bootstrapping
- Apache Cassandra™ Why, What & When
- Read and Write path
- Uber High Level Data Modeling
- What's NEXT?



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Cassandra Workshop SERIES

PART 1: How to build Applications with Cassandra

- **Week 1 (7/01-7/08)** : Getting Started with Cassandra
- **Week 2 (7/08-7/15)** : Data Modelling for Apache Cassandra™
- **Week 3 (7/15-7/22)** : Application Development, Backend Services and CRUD
- **Week 4 (7/22-7/29)** : Application Development, Microservices and REST API

PART 2: Test, Deploy and monitor your clusters and applications

- **Week 5 (7/29-8/05)**: Operating your Cassandra clusters
- **Week 6 (8/05-8/12)**: Running Cassandra performance tests
- **Week 7 (8/12-8/19)**: Testing your deployments and troubleshooting
- **Week 8 (8/19-8/26)**: Deploying Cassandra with Kubernetes

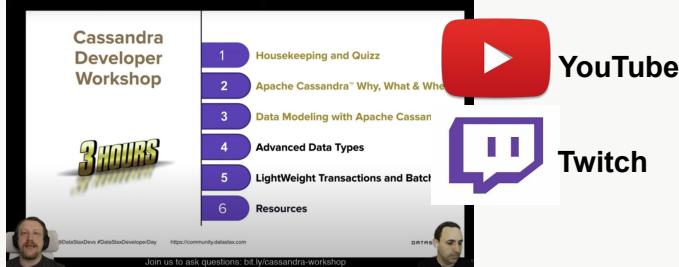


How does it work ?

1

**Attend one of the 2 LIVE STREAMED workshop
(Wednesday or Thursday)**

Courses: Datastax Developers @youtube

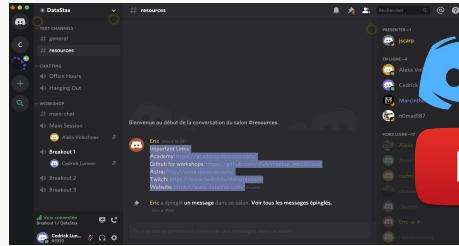


YouTube



Twitch

Questions: bit.ly/cassandra-workshop

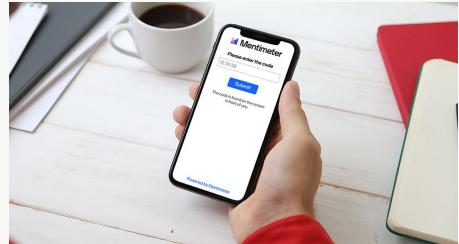


Discord



YouTube

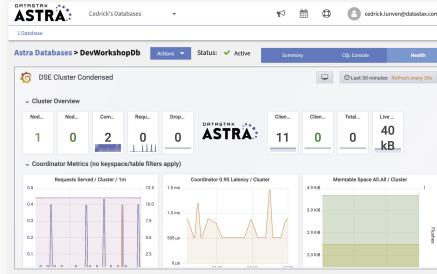
Quizz: menti.com



Available on iPhone
App Store

GET IT ON
Google play

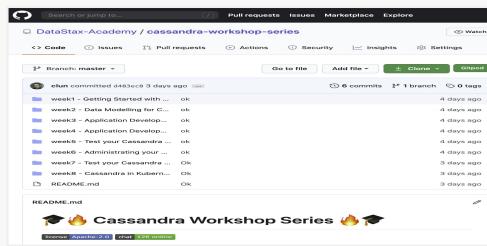
Runtime: astra.datastax.com



DATASTAX
ASTRA



Materials: github.com/DataStax-Academy



Coding (starting week #3)



How does it work ?

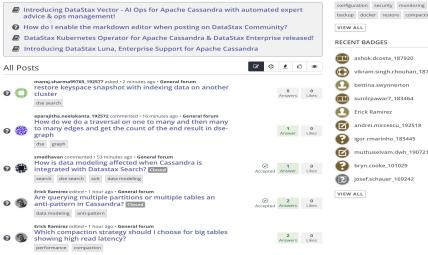


**Attend one of the 2 LIVE STREAMED workshop
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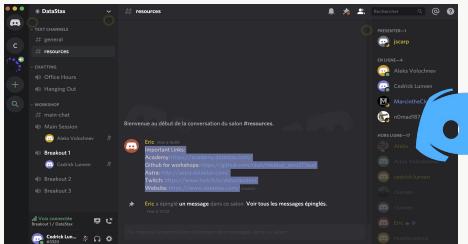


Do Homeworks

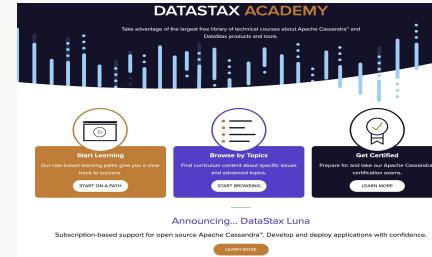
Forum: community.datastax.com



Chat: bit.ly/cassandra-workshop



Training: academy.datastax.com



Validate your week:

Questions Responses

Workshop Week 1 Validation Form

Form description

Fill the following form to validate your week. You can make it !

Cassandra Workshop Series
Your path to becoming a Cassandra expert!
From 1st July • 8 weeks • Live Teaching • Hands-on learning • Lots of fun interaction

1/3 - What is the email of Jeff at end "Working with CQL" notebook *



Google Forms

How does it work ?

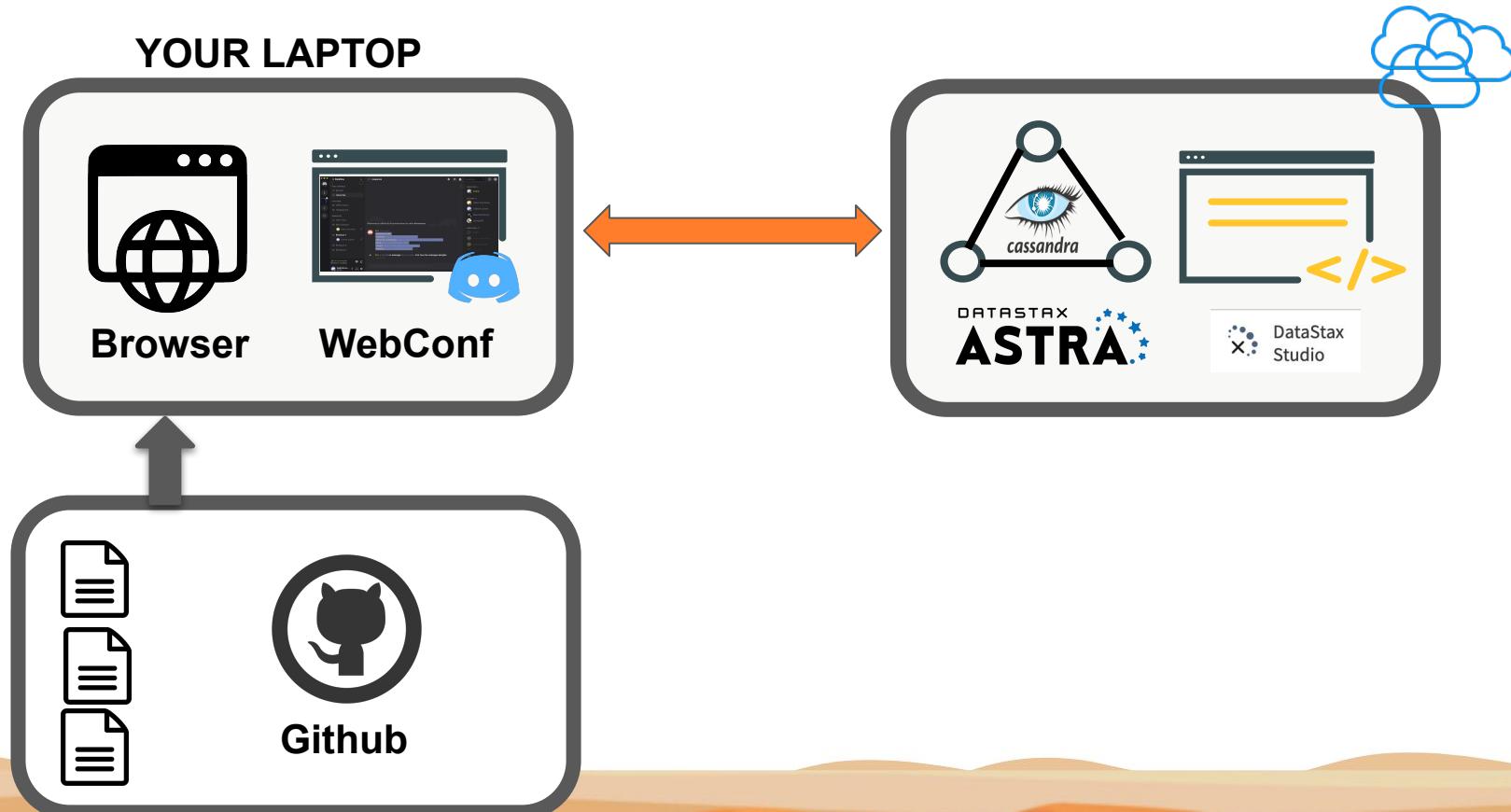
- 
- 1
 - 2
 - 3

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Homeworks

Relax.

Work



menti.com

45 45 72

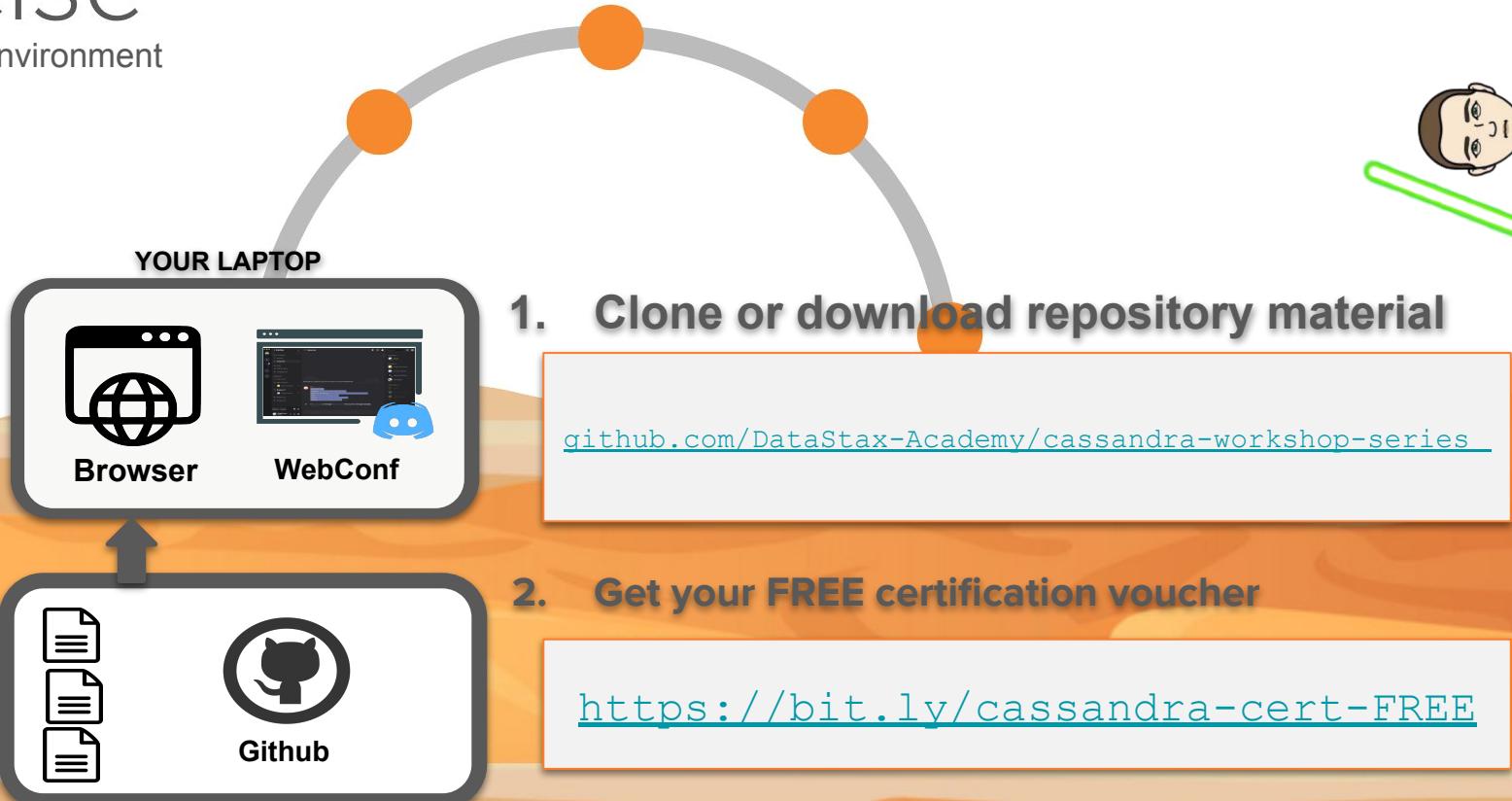


Available on the iPhone
App Store

GET IT ON
Google play

Exercise

Bootstrap your environment



Introducing Astra



CASSANDRA-AS-A-SERVICE

Cloud-native

Database-as-a-Service built on
Apache Cassandra



CLOUD NATIVE

Powered by our open-source
Kubernetes Operator for
Cassandra.



NO OPERATIONS

Eliminate the overhead to install,
operate, and scale Cassandra.



ZERO LOCK-IN

Deploy on AWS or GCP and
keep compatibility with
open-source Cassandra.



POWERFUL APIs

Out-of-the-box REST and
GraphQL endpoints and browser
CQL shell.



10 GIG FREE TIER

Launch a database in the
cloud with a few clicks, no
credit card required.

Introducing Astra



Eliminate Operations

everything from provisioning to backups is fully automated



Secure Your Data

with the most advanced security available for Cassandra



Simplify App Development

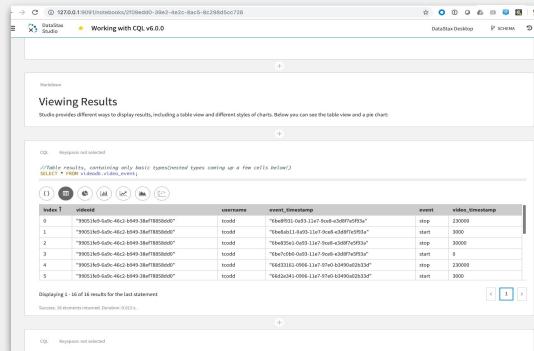
with auto-configured developer tools that deploy with a click

Simplify Application Development

Familiar Language

```
INSERT INTO mytable
(id, name, address) VALUES
(1, 'Bob Smith', '1 Main
Street')
SELECT * FROM mytable
WHERE id=1
UPDATE mytable SET
name='Tom Smith' WHERE
id=1
DELETE FROM mytable WHERE
id=1
```

Easy Dev Tools



The screenshot shows the DataStax Studio interface with a CQL query results table titled "Viewing Results". The table has columns: index, eventid, timestamp, event, and video_id. The data is as follows:

index	eventid	timestamp	event	video_id
0	"99999999-0000-4000-8000-340478785600"	"1e4eff50-0a93-11e7-9e0d-a5287f1c7294"	stop	33000
1	"99999999-0000-4000-8000-340478785600"	"1e4ebab1-0a93-11e7-9e0d-a5287f1c7294"	start	3000
2	"99999999-0000-4000-8000-340478785600"	"1e4ec5a1-0a93-11e7-9e0d-a5287f1c7294"	stop	30000
3	"99999999-0000-4000-8000-340478785600"	"1e4ef28b-0a93-11e7-9e0d-a5287f1c7294"	start	3
4	"99999999-0000-4000-8000-340478785600"	"1e4ef28b-0a93-11e7-9e0d-a5287f1c7294"	stop	330000
5	"99999999-0000-4000-8000-340478785600"	"1e4ef28b-0a93-11e7-9e0d-a5287f1c7294"	start	3000

Great Drivers



Exercise

Creating your Astra instance



DATASTAX CONSTELLATION Your Organization

Provide Feedback cedrick.lunven@datastax.com

2 Databases

Database is initializing. You'll receive an email when the database is ready. While you're waiting, learn how to get started with your database. Database creation started at Jan 22nd 2020 11:49am UTC. This can take as long as 30 minutes but is usually much quicker.

Apollo Databases > screenshot Actions ▾

Screenshot

Keyspace Name: okidoki
Organization: Your Organization

Owner: Cedrick Lunven
Created: January 22, 2020

Size and Location

1 Capacity Unit 500 GB Total Storage Storage Used
Locations: us-east-1 (1 capacity unit)
Compute Size: Startup
Replication Factor: 3

Cost

Spent this month: TBD

Estimated Cost
 Per Hour Per Month
when running TBD/hour
when parked TBD/hour

Connection Details

Connection details are only available for active databases that you own or have connection permissions for.



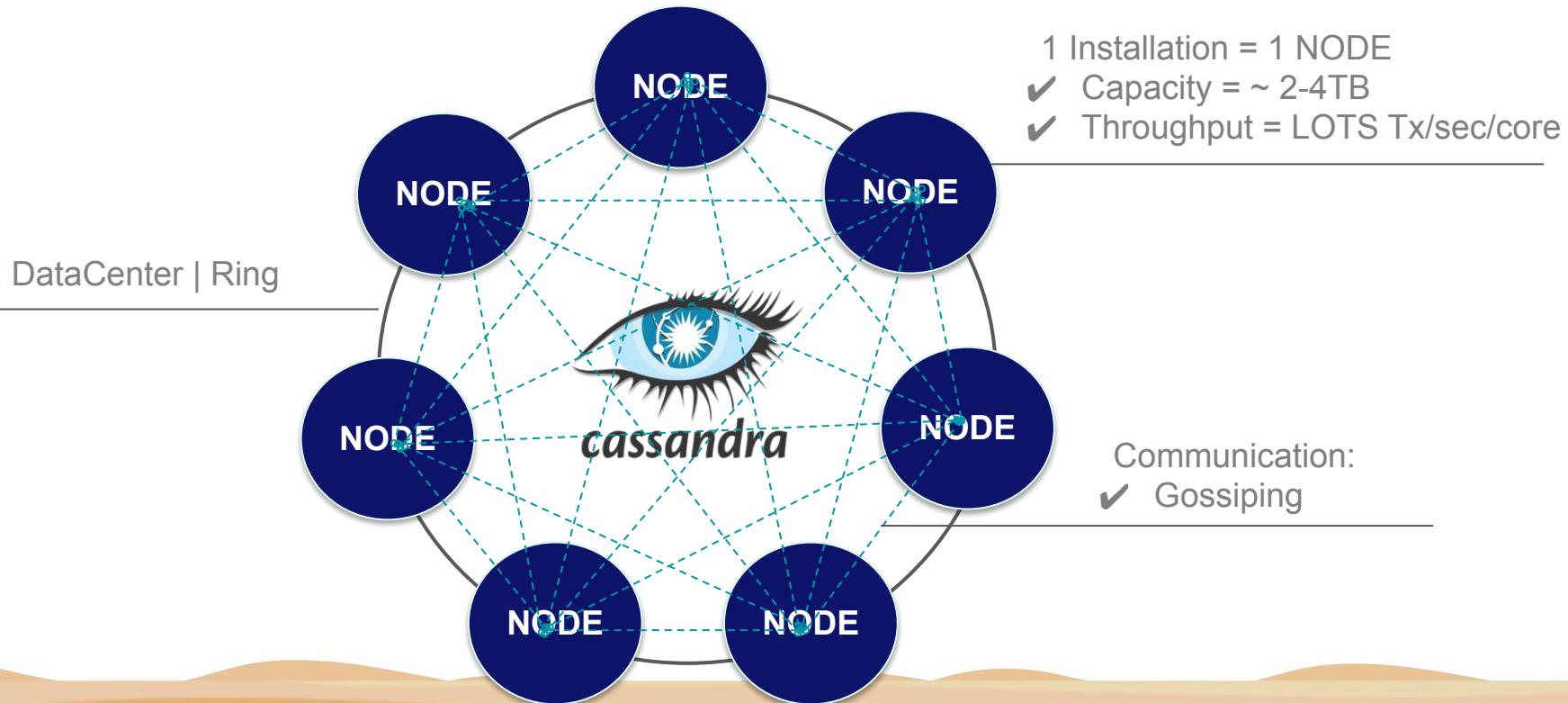


Developer Workshop Series Week 1

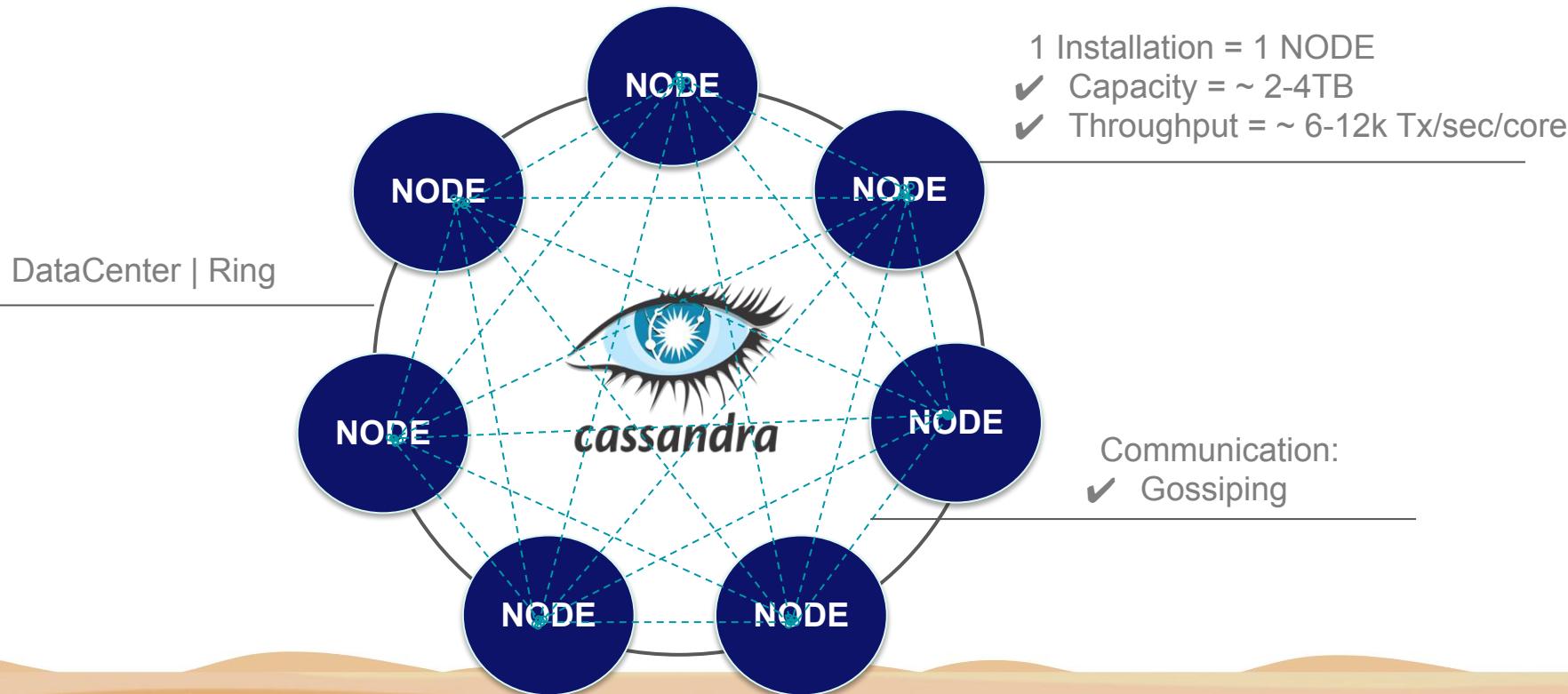
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Apache Cassandra™ = NoSQL Distributed Database



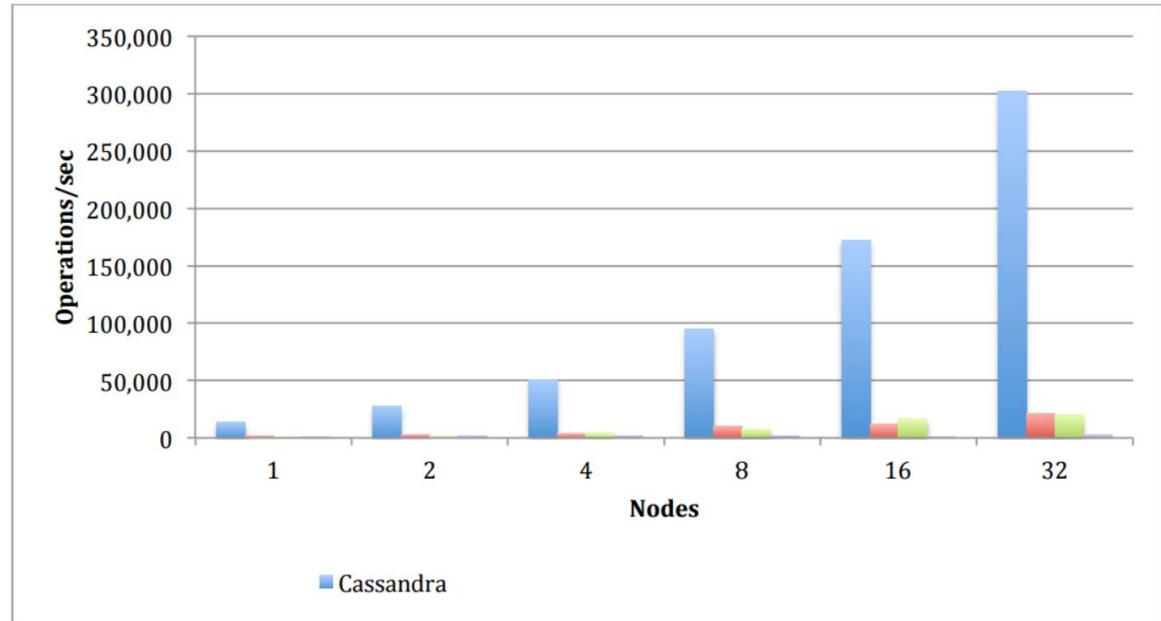
Apache Cassandra™ = NoSQL Distributed Database



Scales Linearly

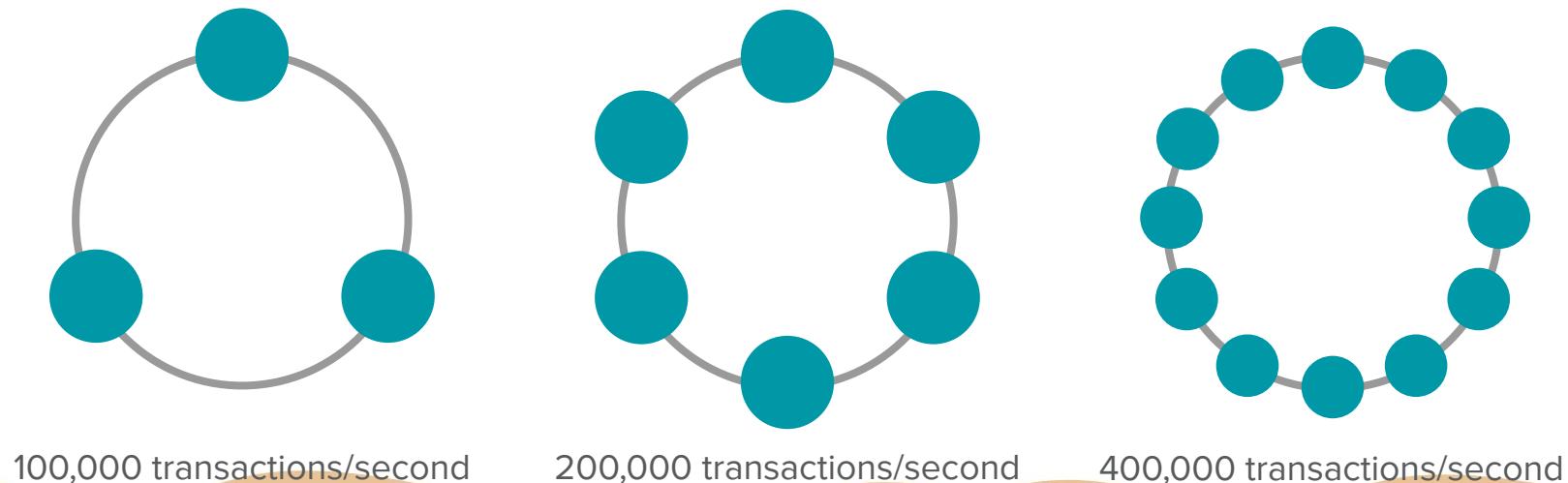
- Need more capacity?
- Need more throughput?
- Add nodes!

Balanced Read/Write Mix

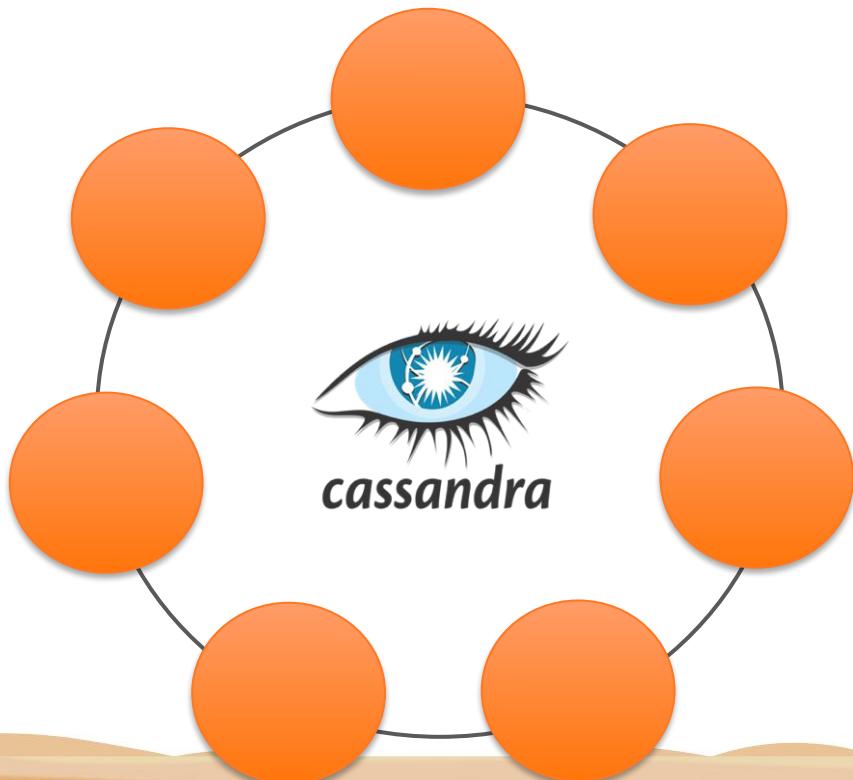


Horizontal vs. Vertical Scaling

- Vertical scaling requires one large expensive machine
- Horizontal scaling requires multiple less-expensive commodity hardware



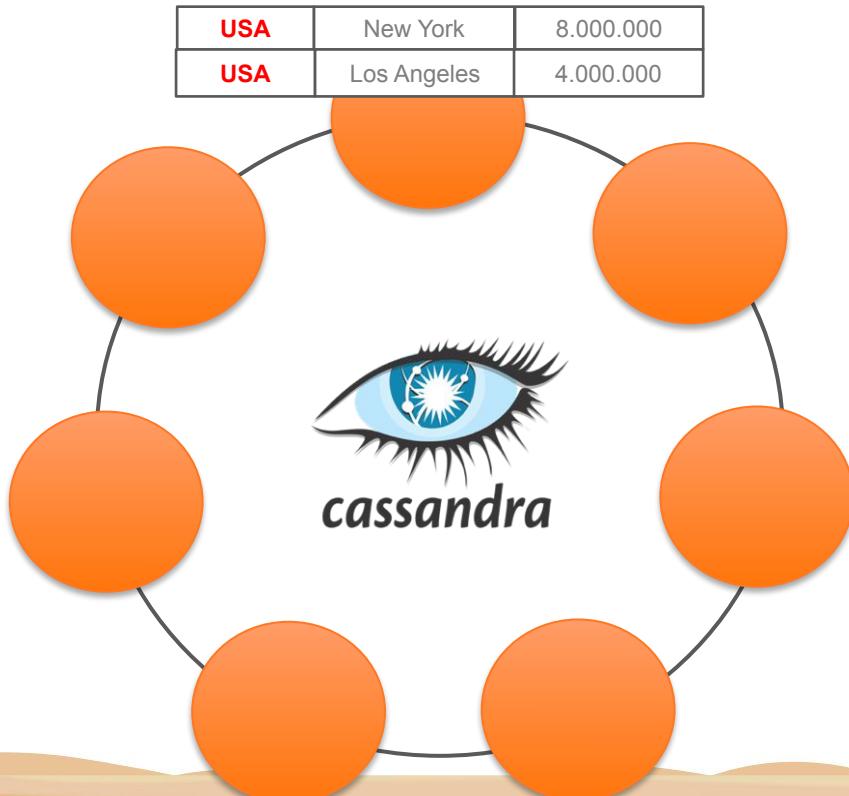
Data is Distributed



Country	City	Population
USA	New York	8.000.000
USA	Los Angeles	4.000.000
FR	Paris	2.230.000
DE	Berlin	3.350.000
UK	London	9.200.000
AU	Sydney	4.900.000
DE	Nuremberg	500.000
CA	Toronto	6.200.000
CA	Montreal	4.200.000
FR	Toulouse	1.100.000
JP	Tokyo	37.430.000
IN	Mumbai	20.200.000

{
 }
Partition Key

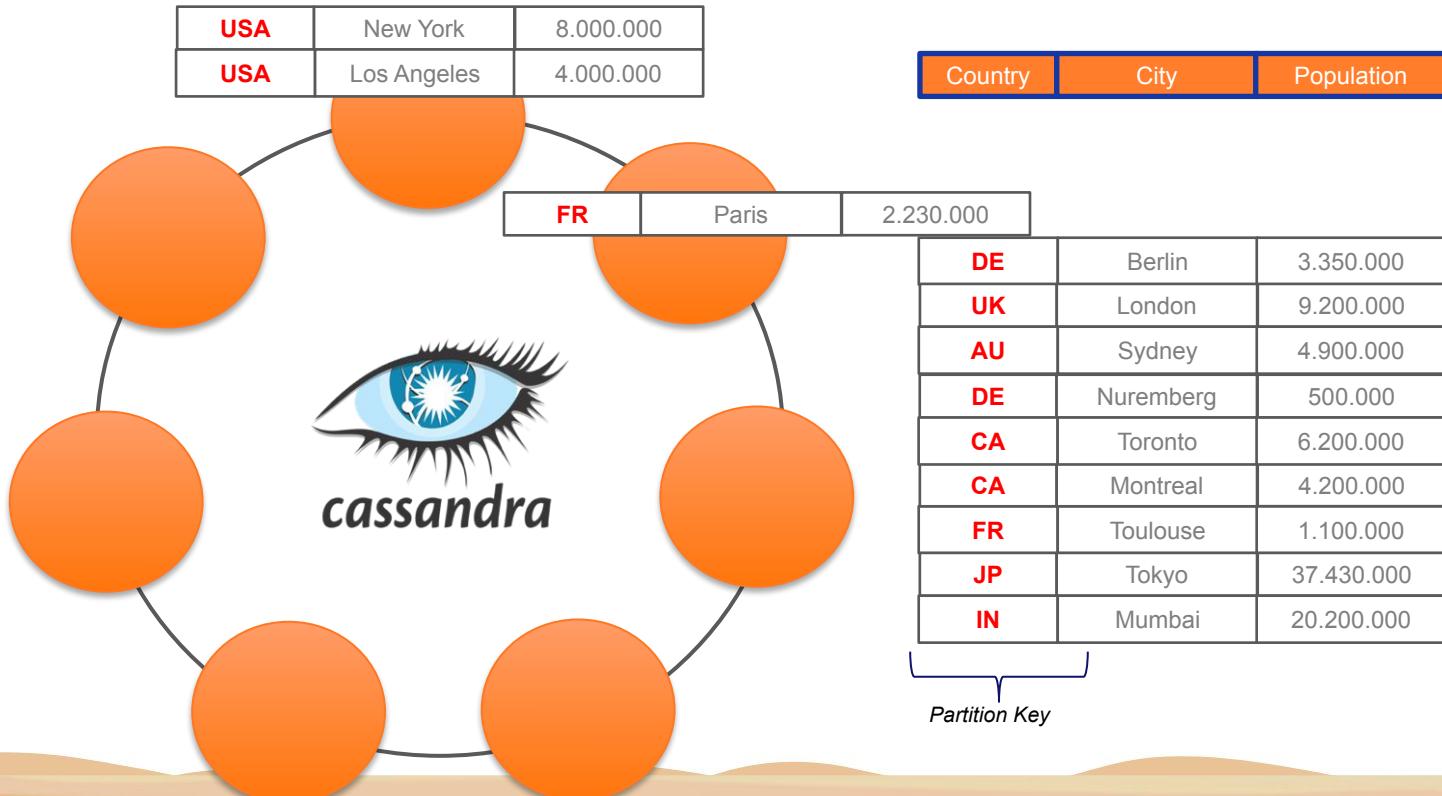
Data is Distributed



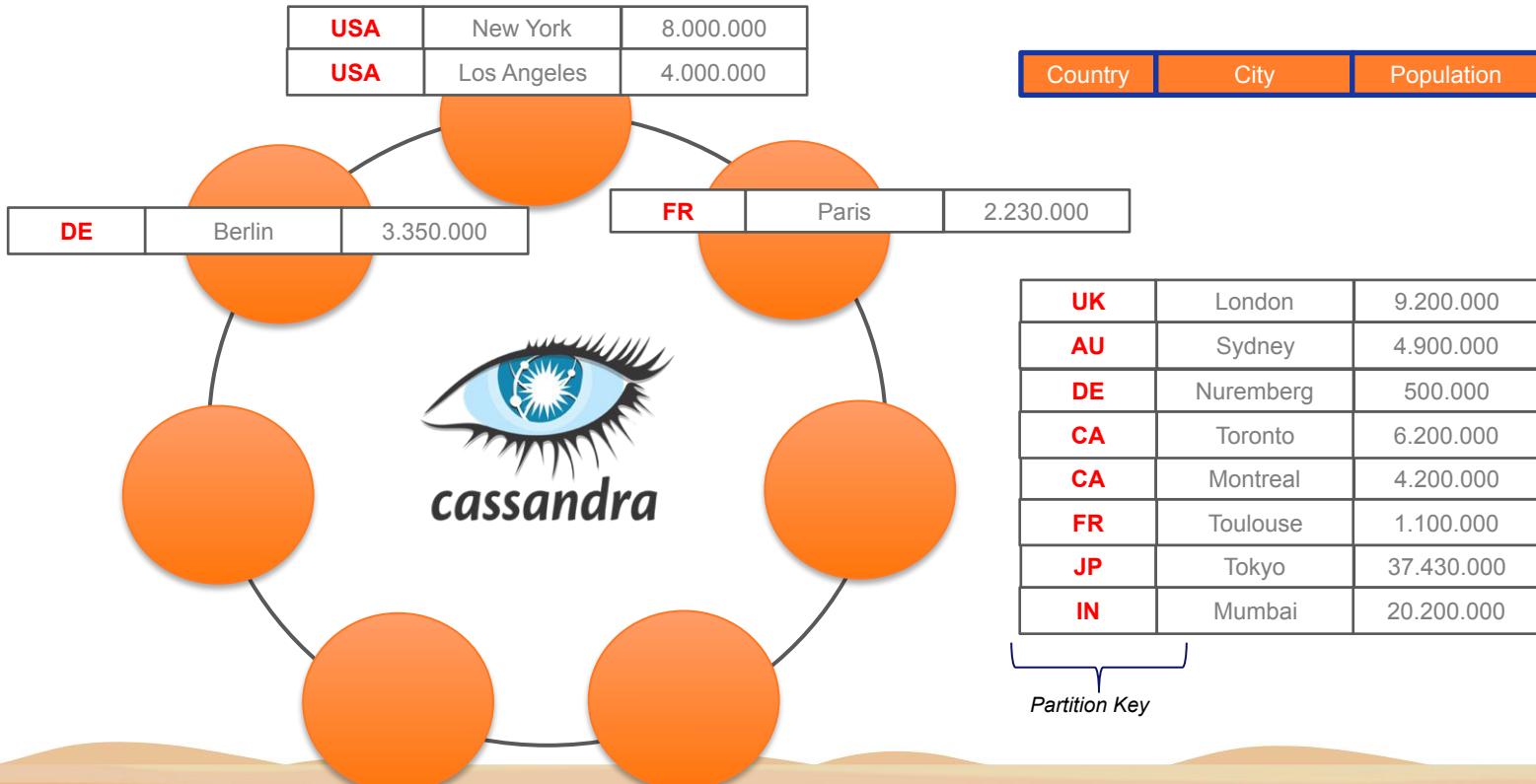
Country	City	Population
FR	Paris	2.230.000
DE	Berlin	3.350.000
UK	London	9.200.000
AU	Sydney	4.900.000
DE	Nuremberg	500.000
CA	Toronto	6.200.000
CA	Montreal	4.200.000
FR	Toulouse	1.100.000
JP	Tokyo	37.430.000
IN	Mumbai	20.200.000

A bracket labeled "Partition Key" is positioned under the first column of the table, indicating that the "Country" field serves as the primary key for partitioning the data across the nodes.

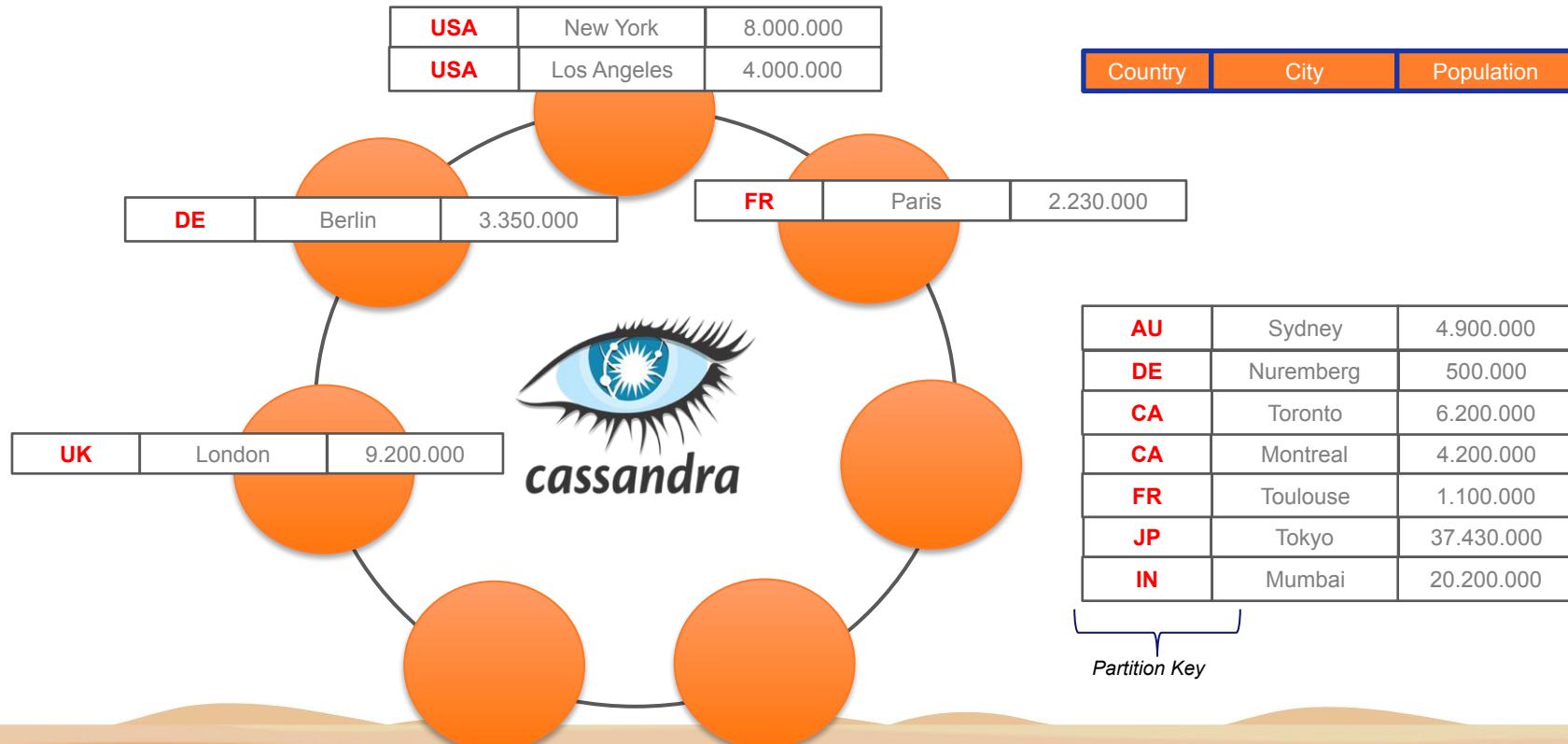
Data is Distributed



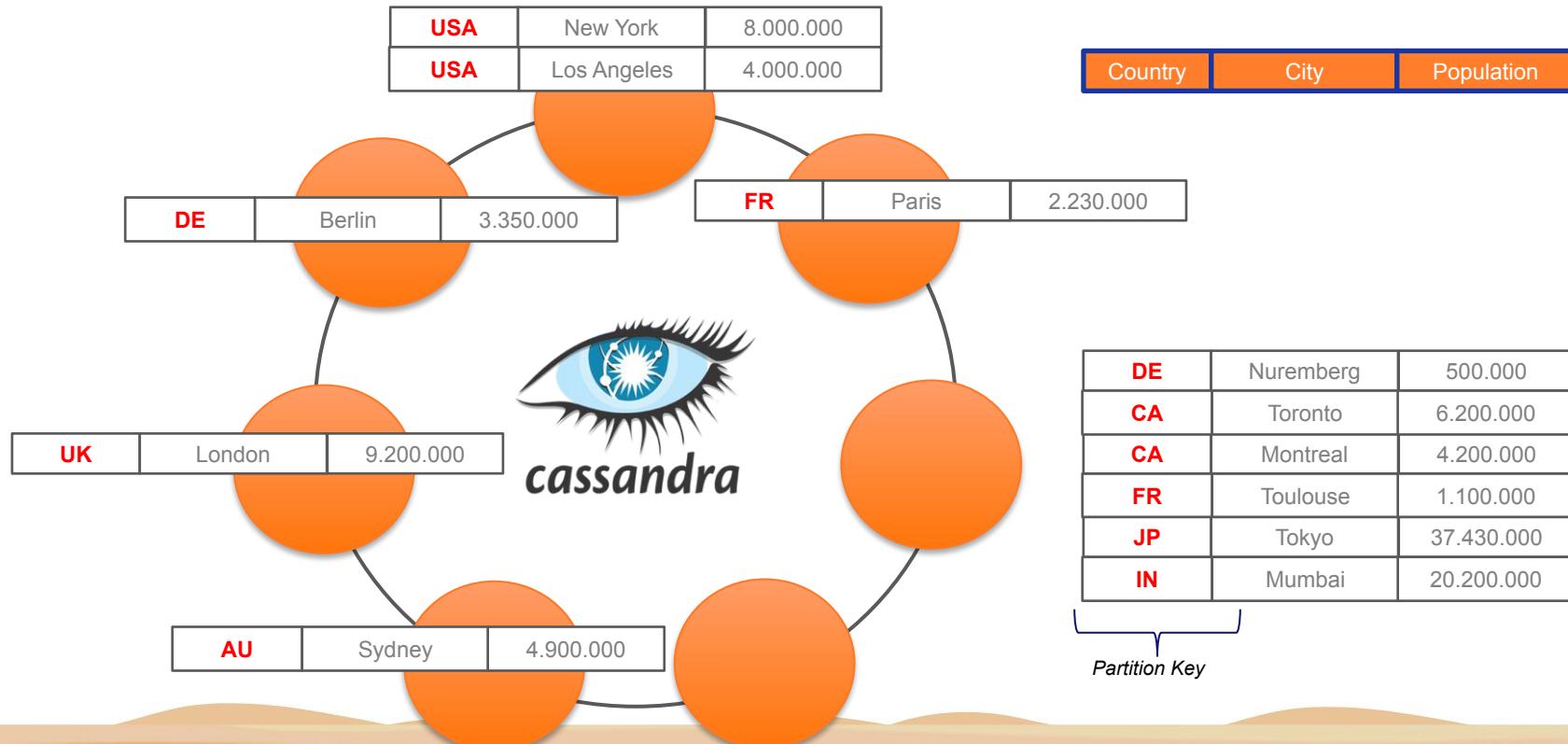
Data is Distributed



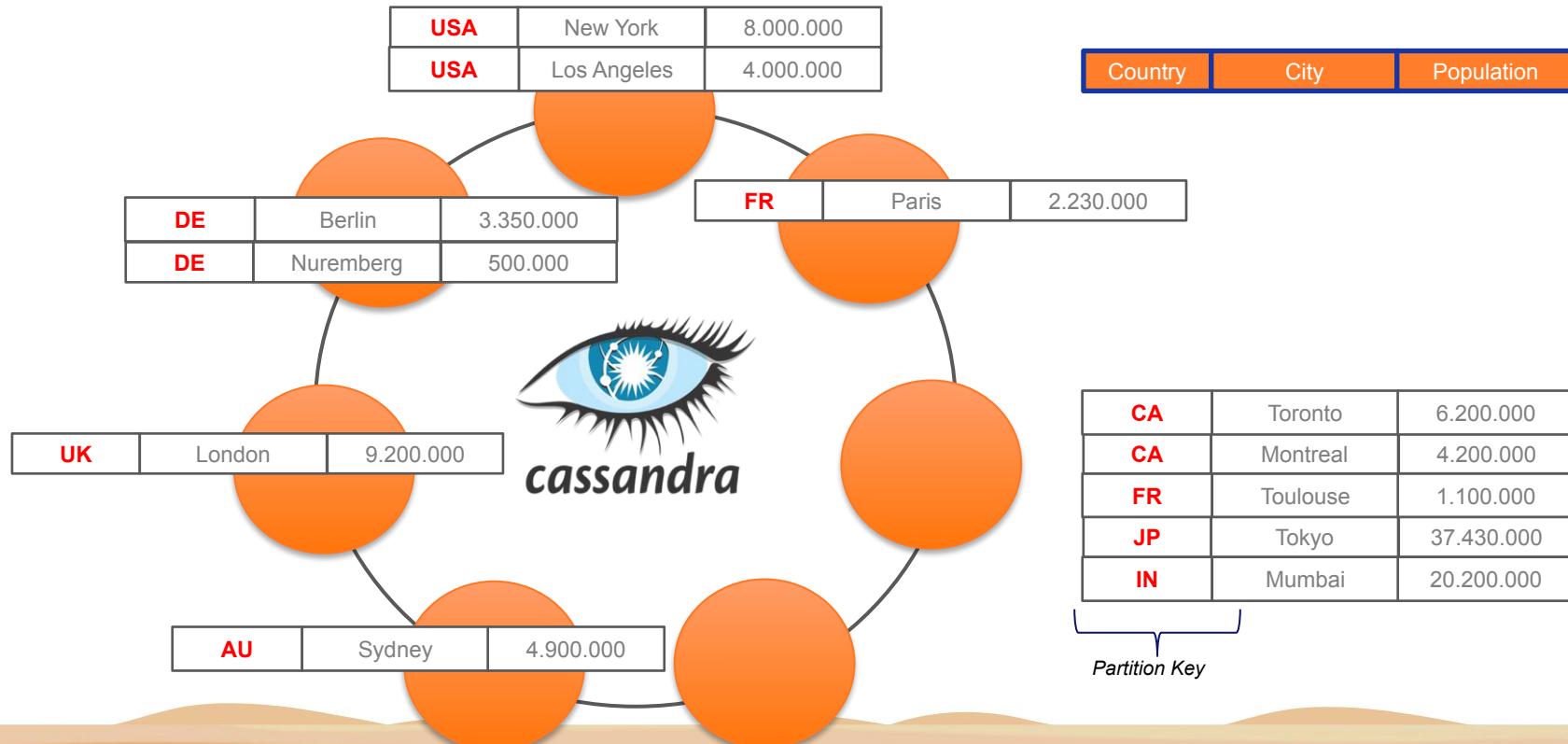
Data is Distributed



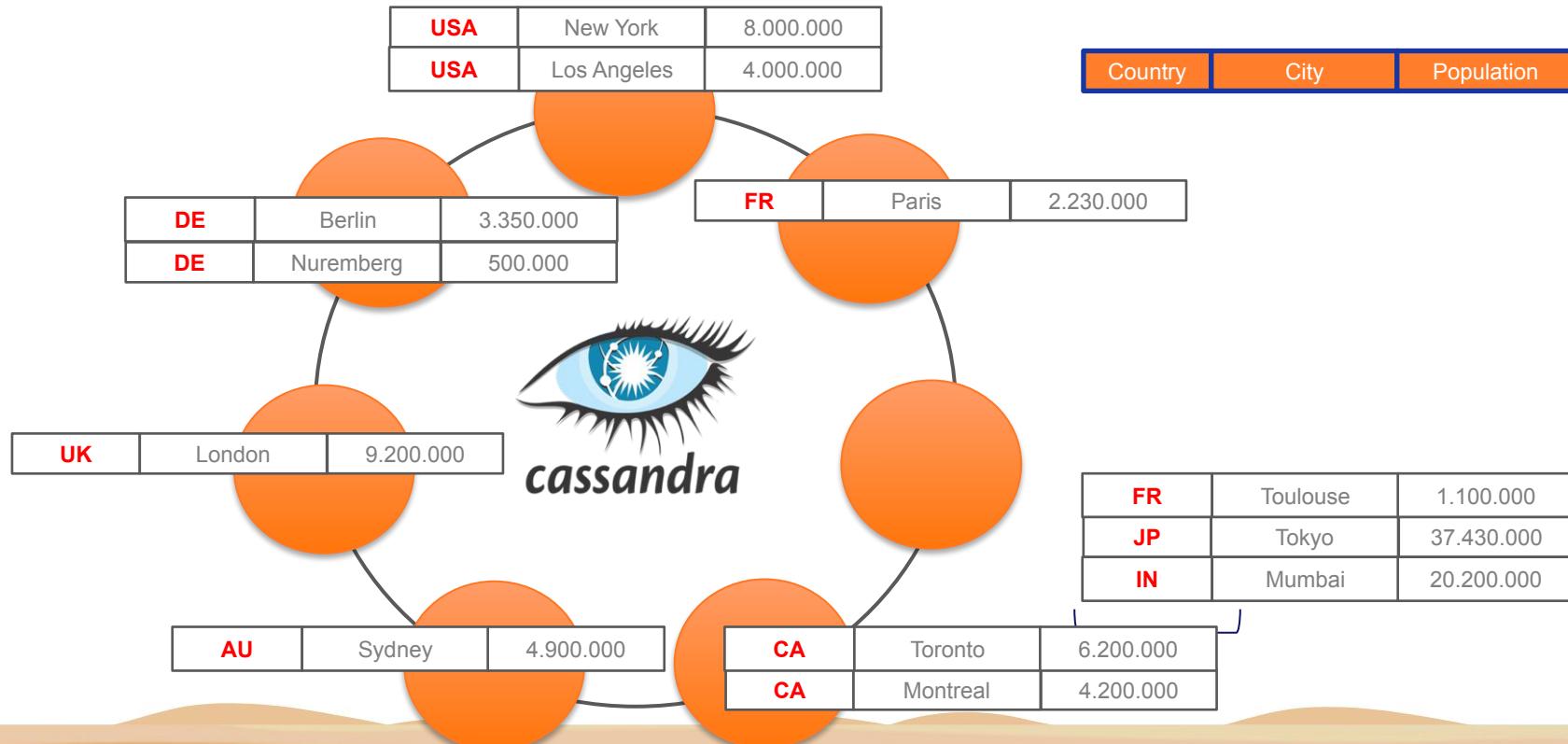
Data is Distributed



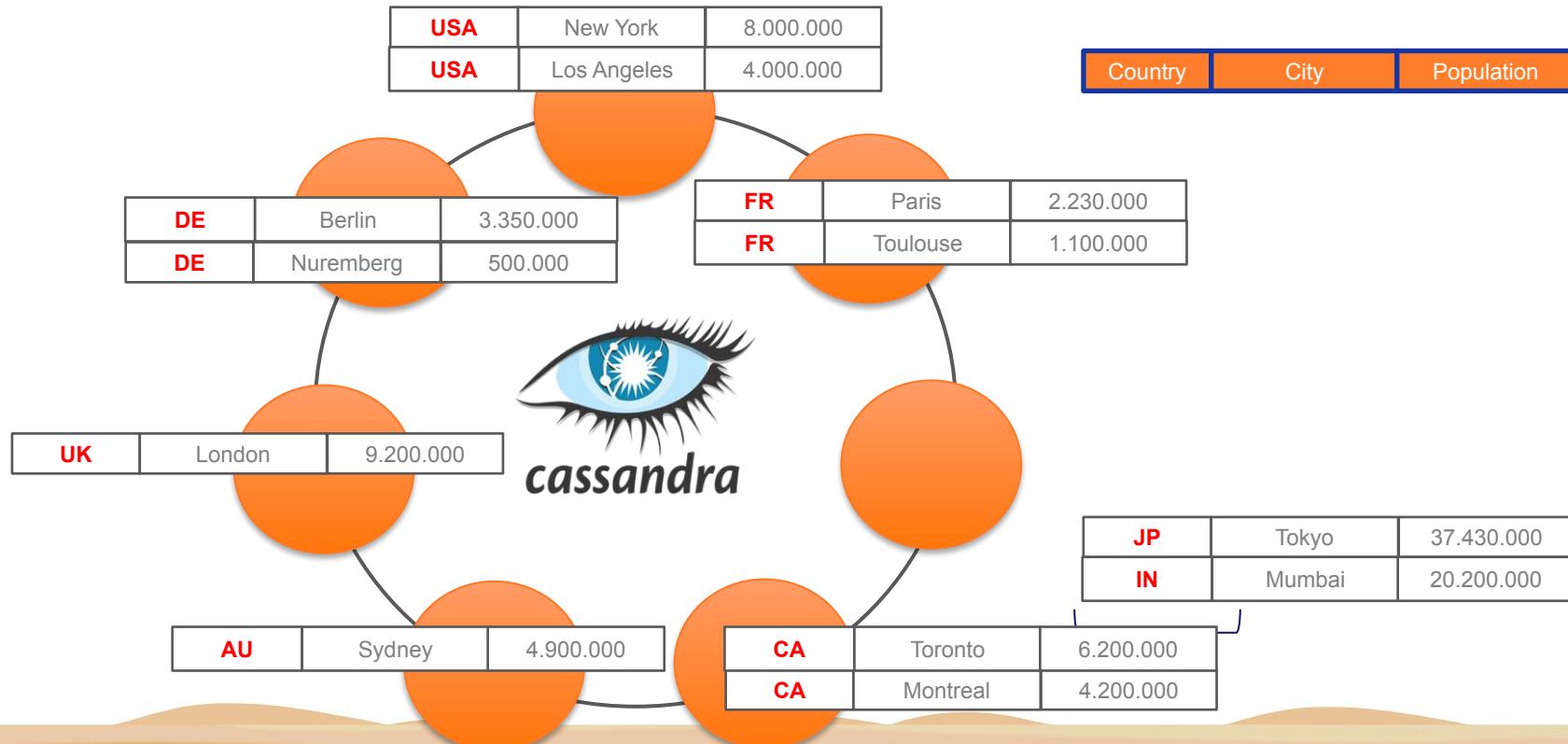
Data is Distributed



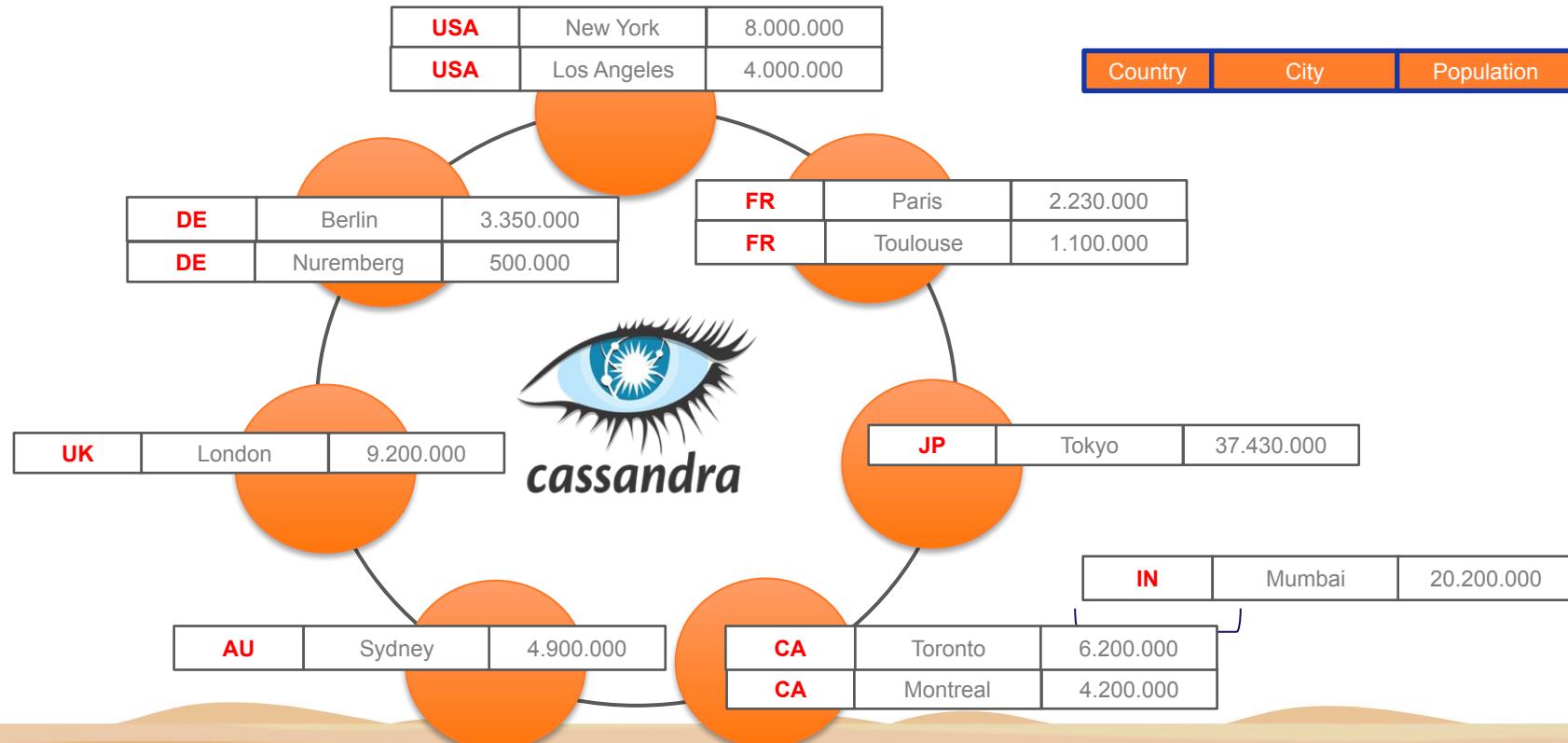
Data is Distributed



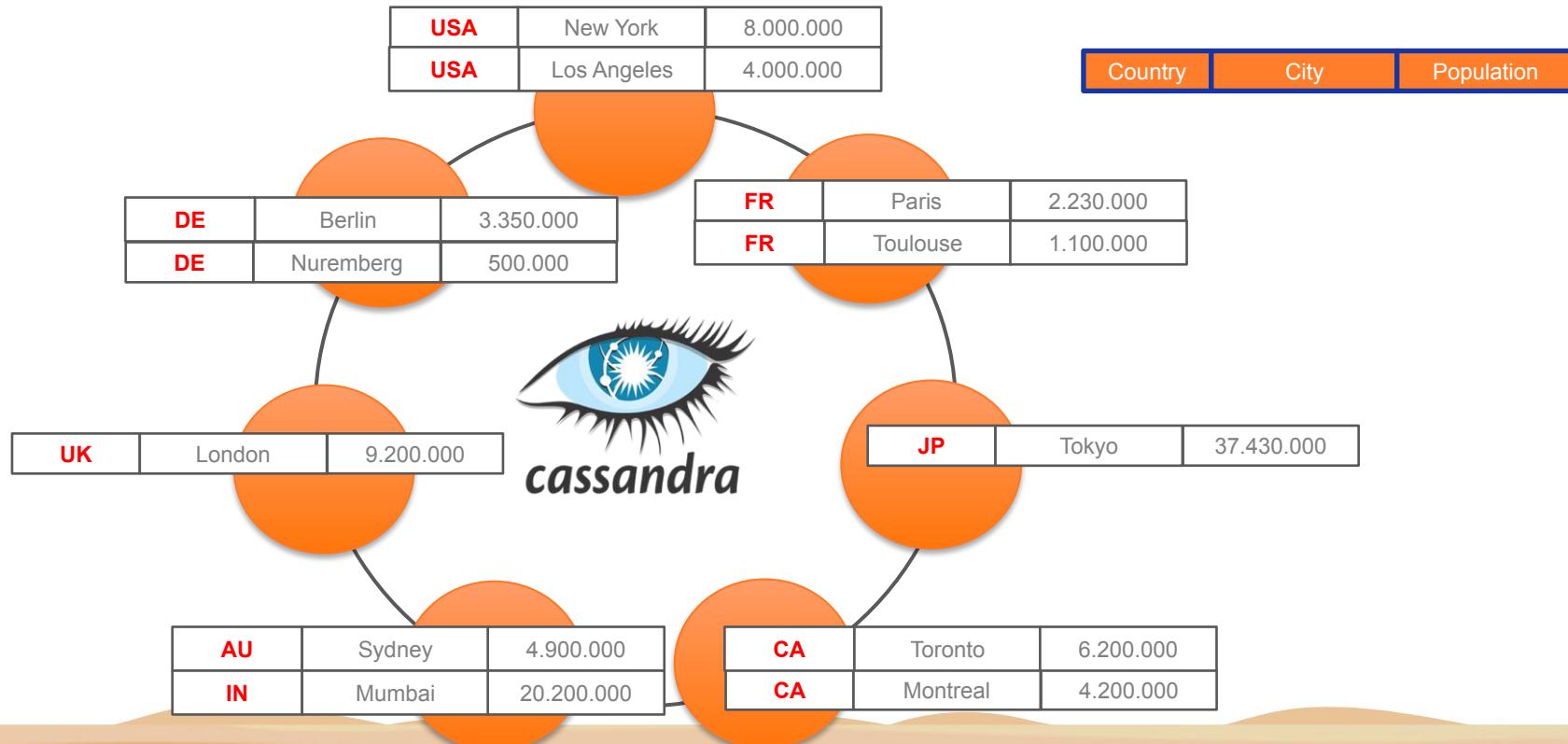
Data is Distributed



Data is Distributed



Data is Distributed

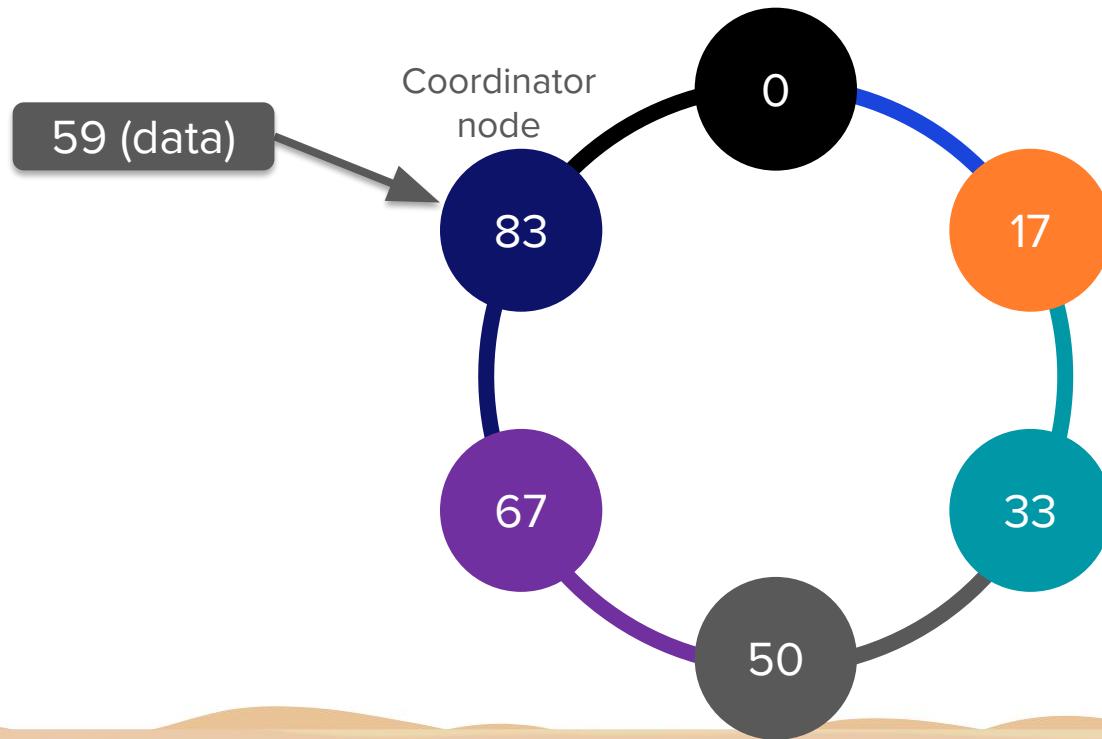




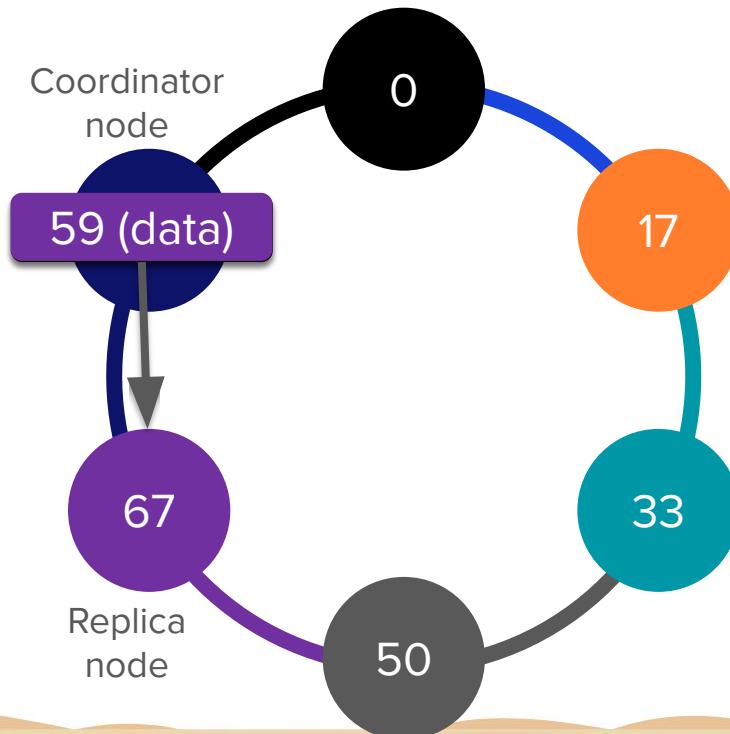
Replication



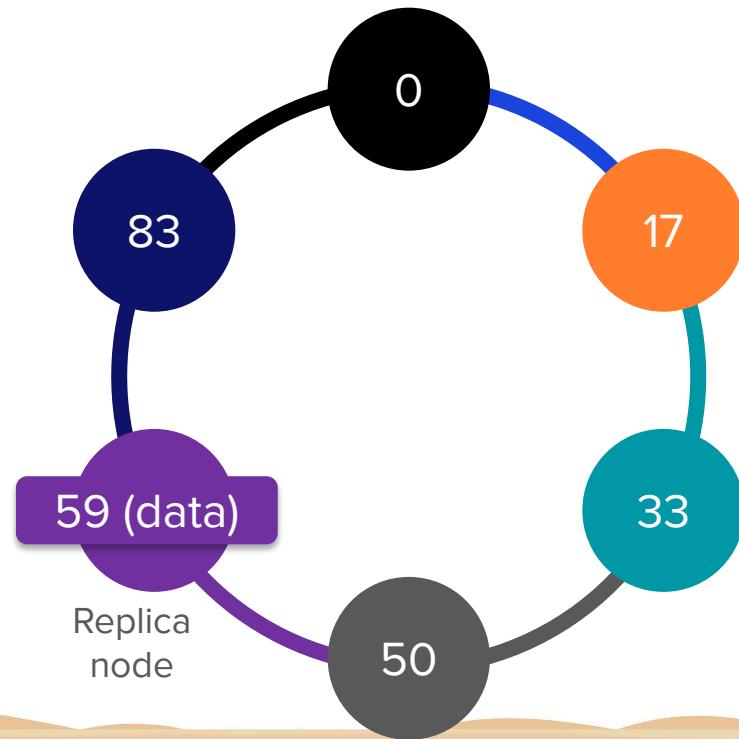
How the Ring Works



How the Ring Works

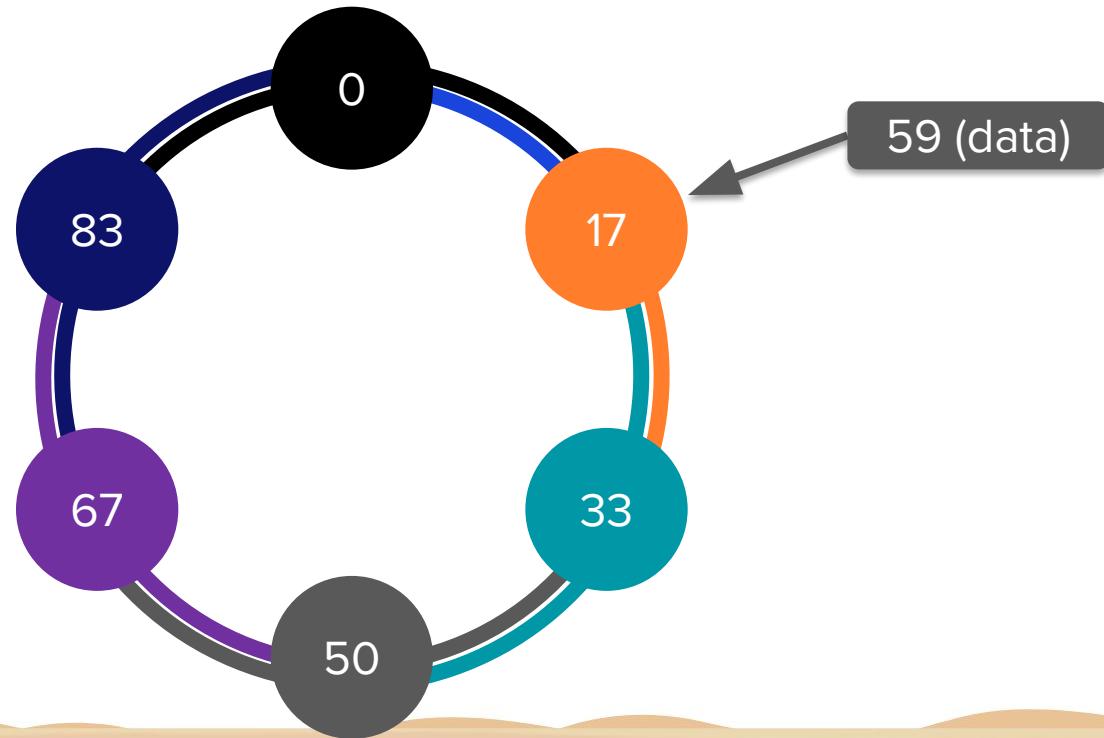


How the Ring Works



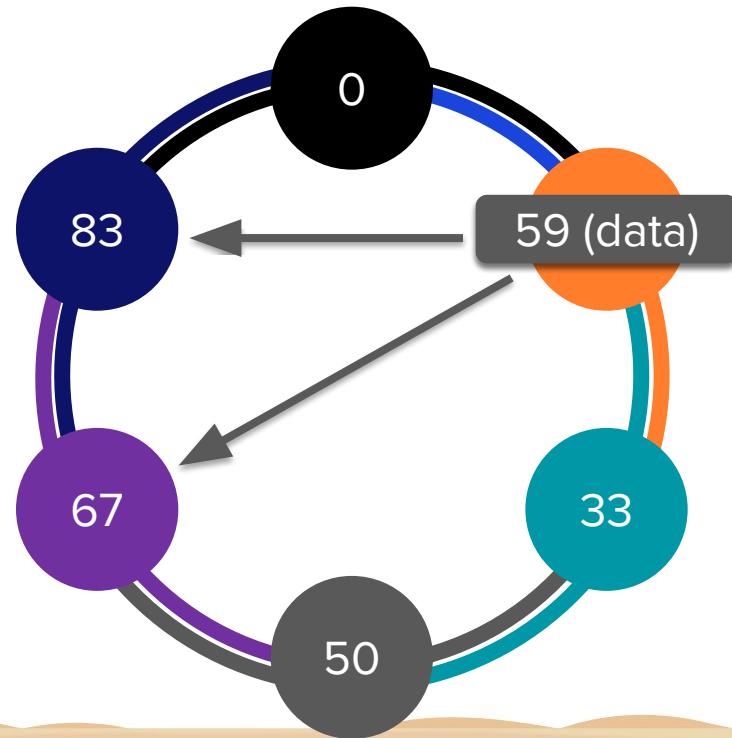
Replication within the Ring

RF = 2



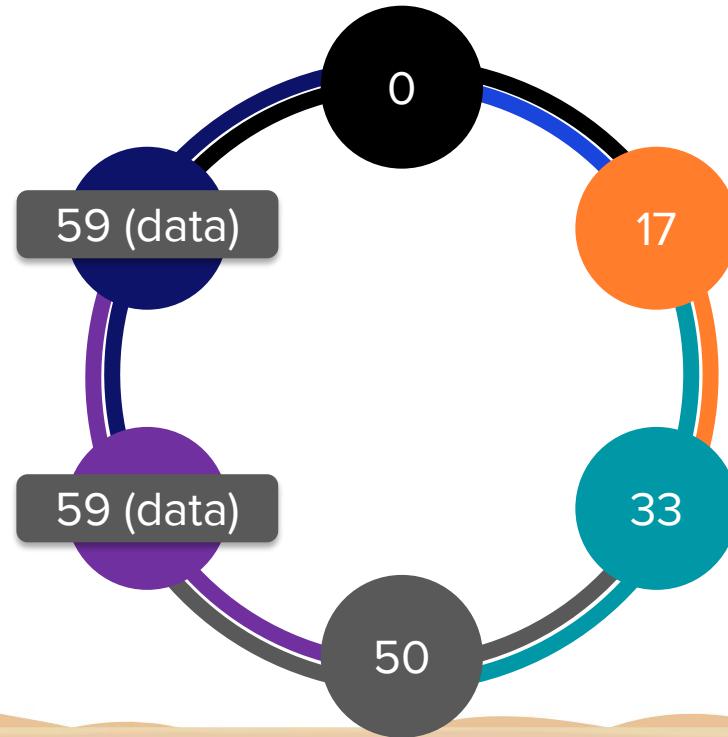
Replication within the Ring

RF = 2



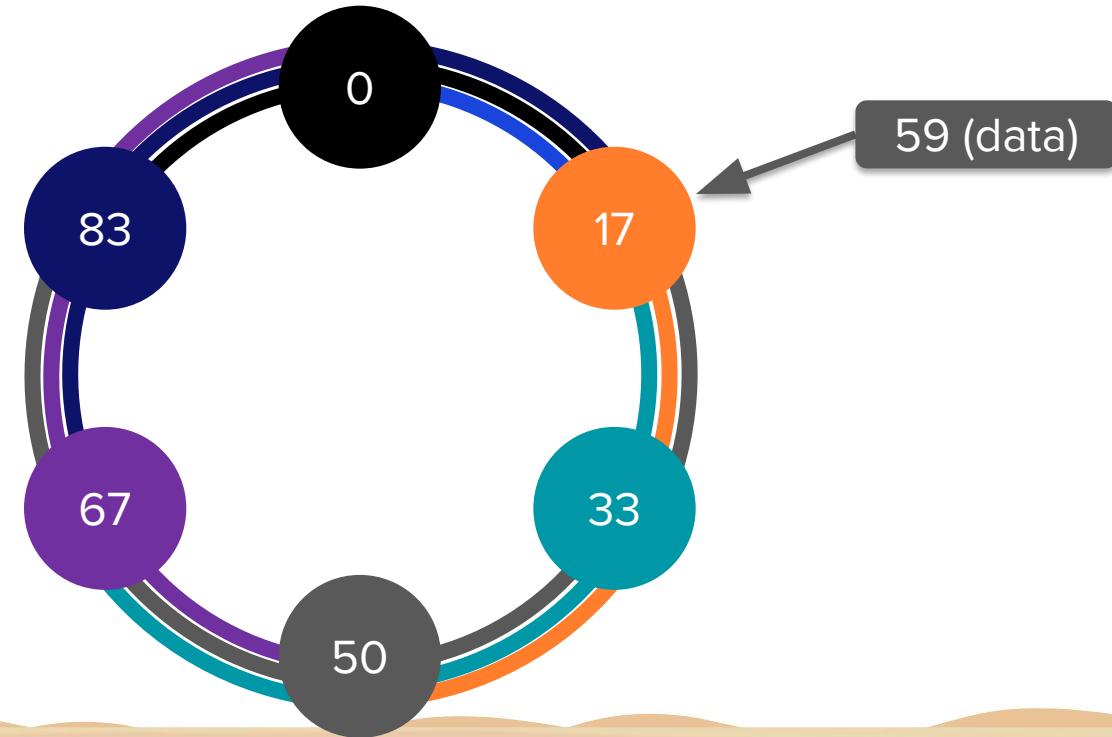
Replication within the Ring

RF = 2



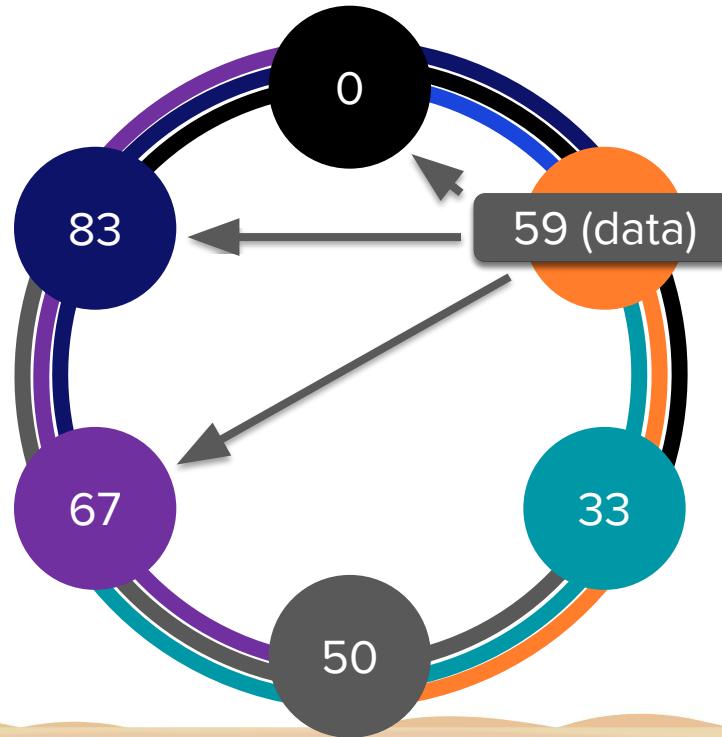
Replication within the Ring

RF = 3



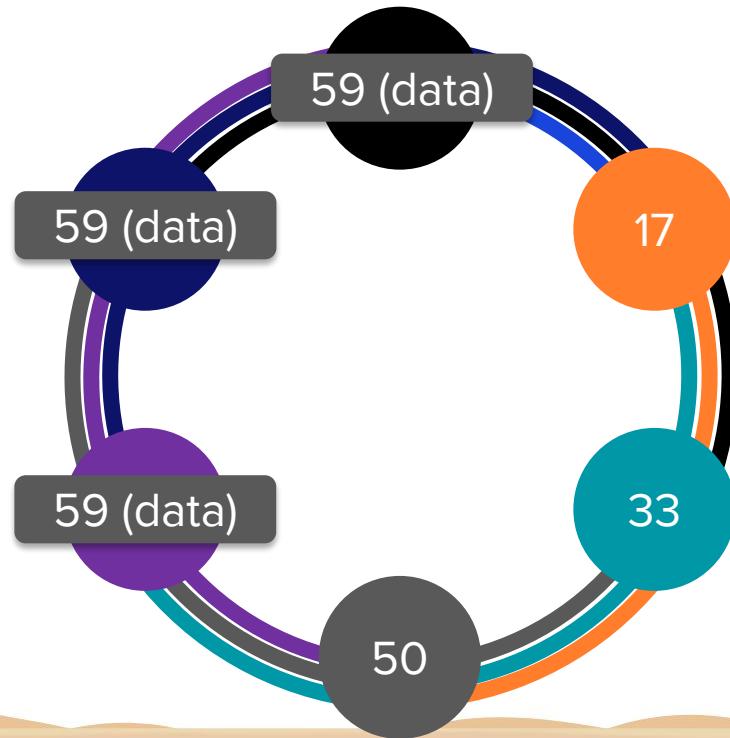
Replication within the Ring

RF = 3



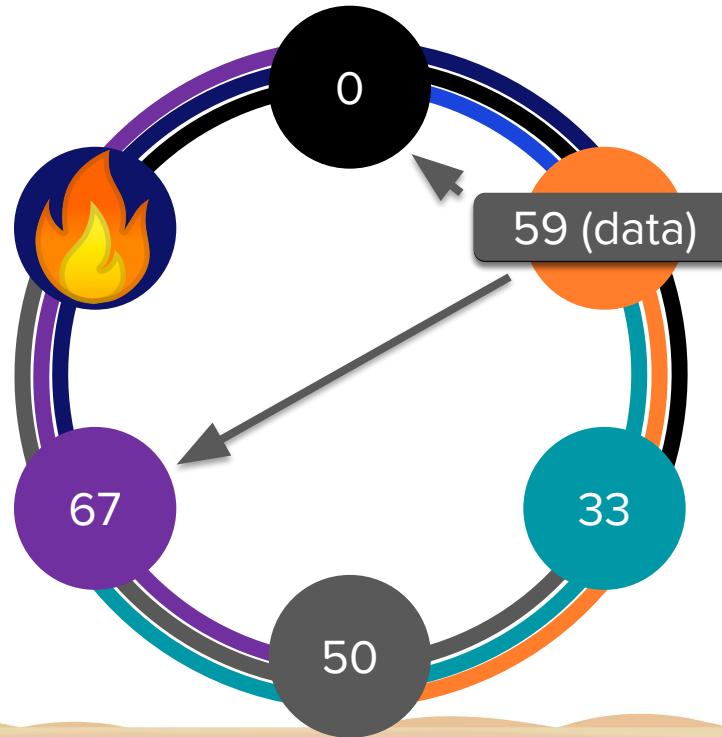
Replication within the Ring

RF = 3



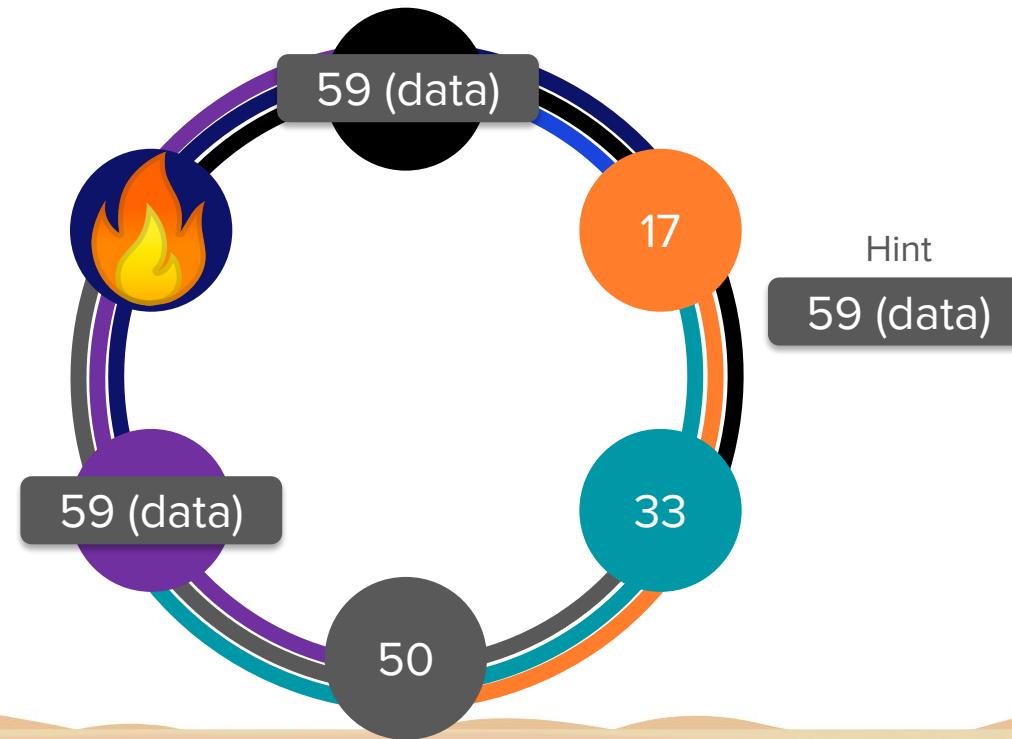
Node Failure

RF = 3



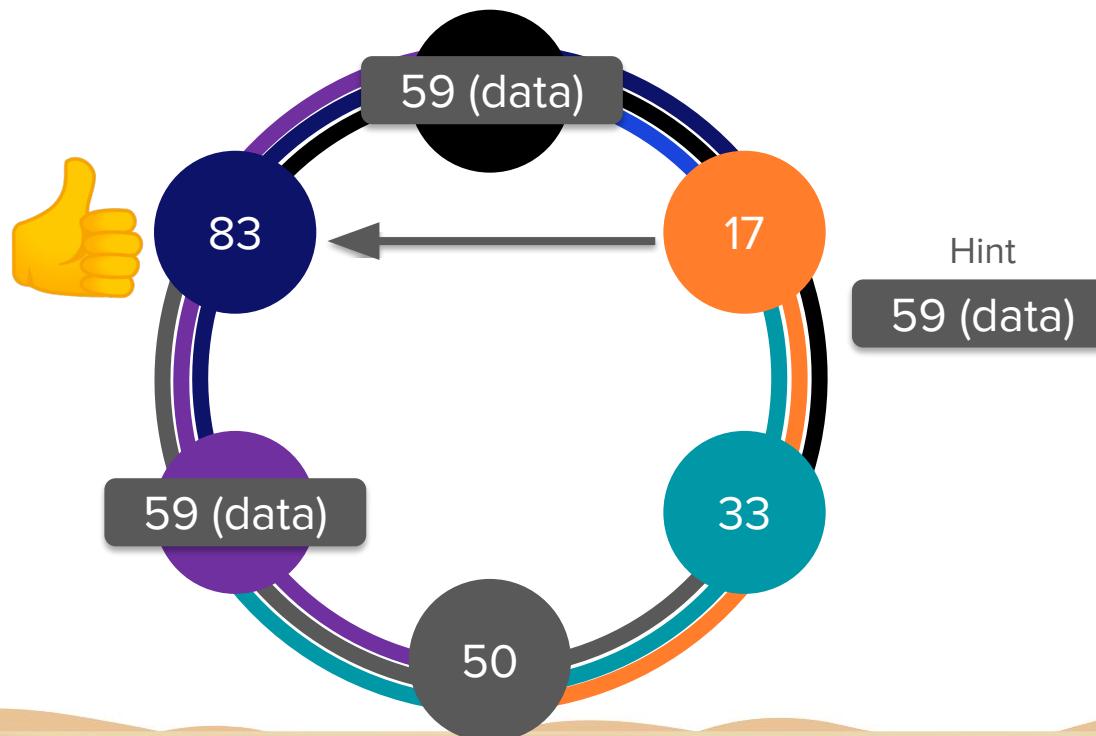
Node Failure

RF = 3



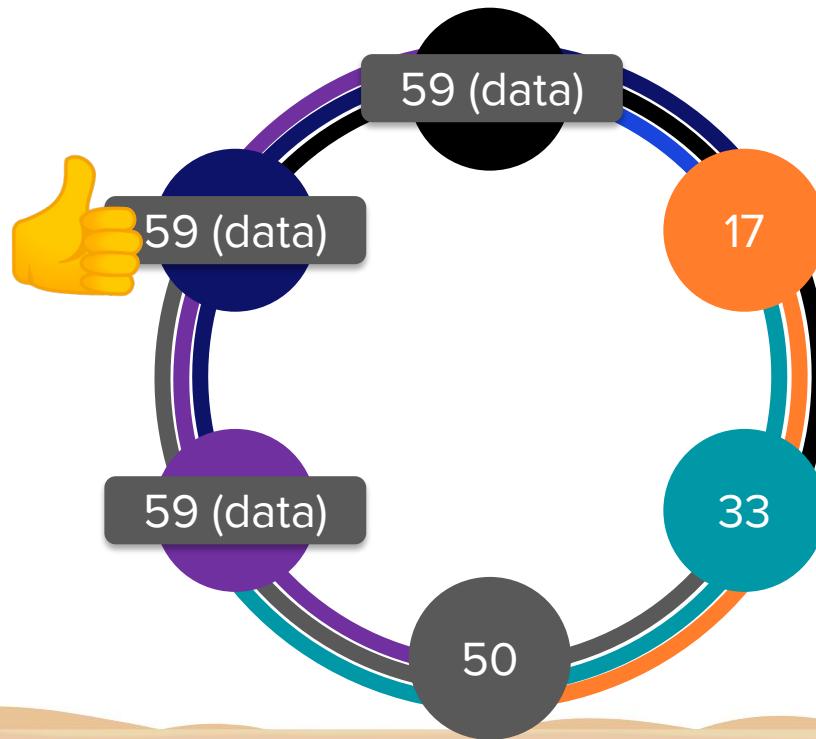
Node Failure

RF = 3



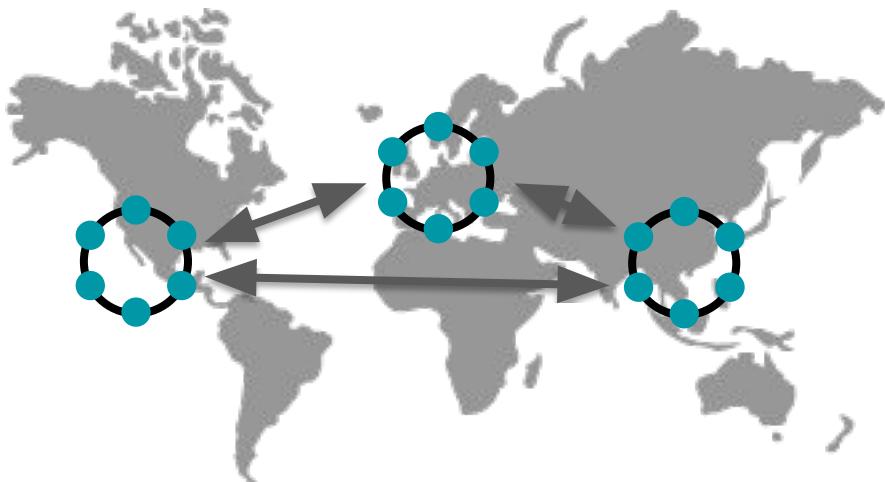
Node Failure – Recovered!

RF = 3

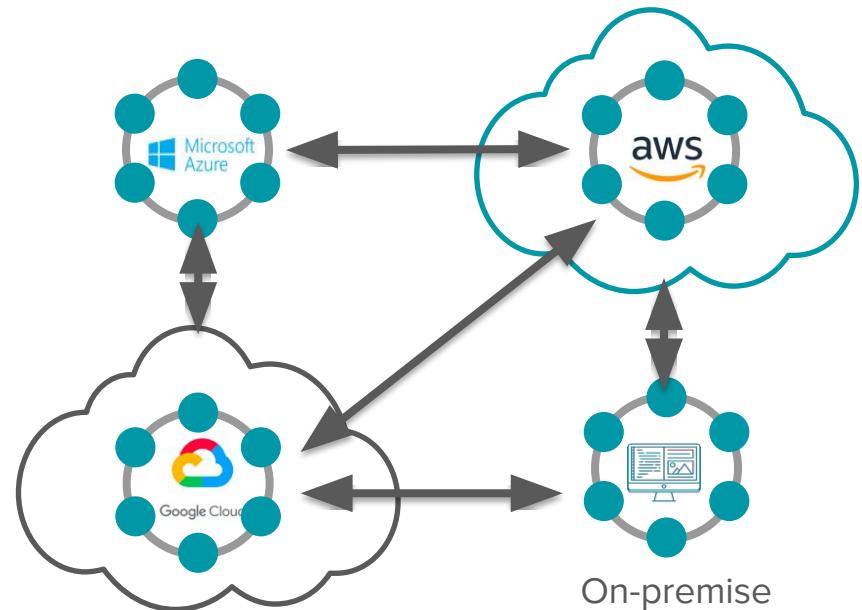


Data Distributed Everywhere

- Geographic Distribution



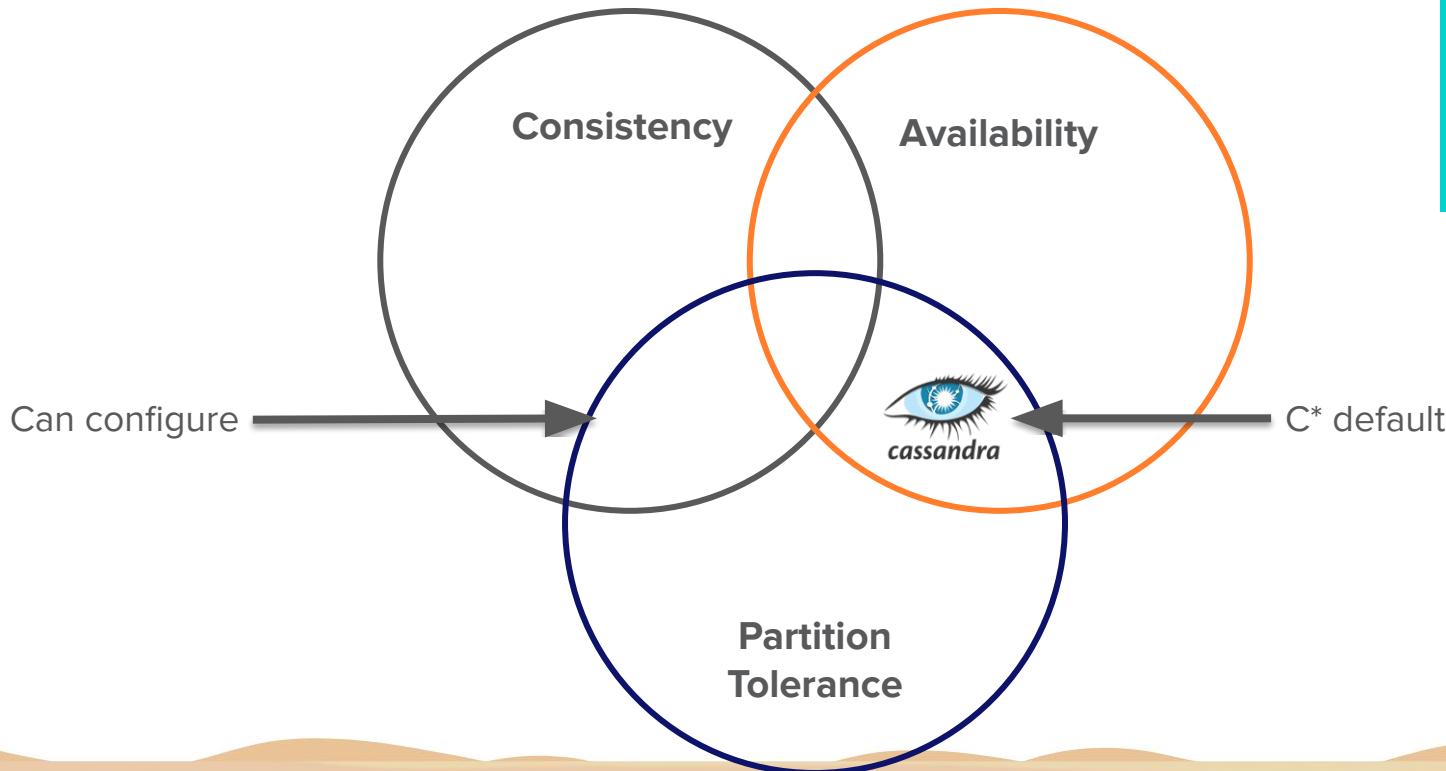
- Hybrid-Cloud and Multi-Cloud



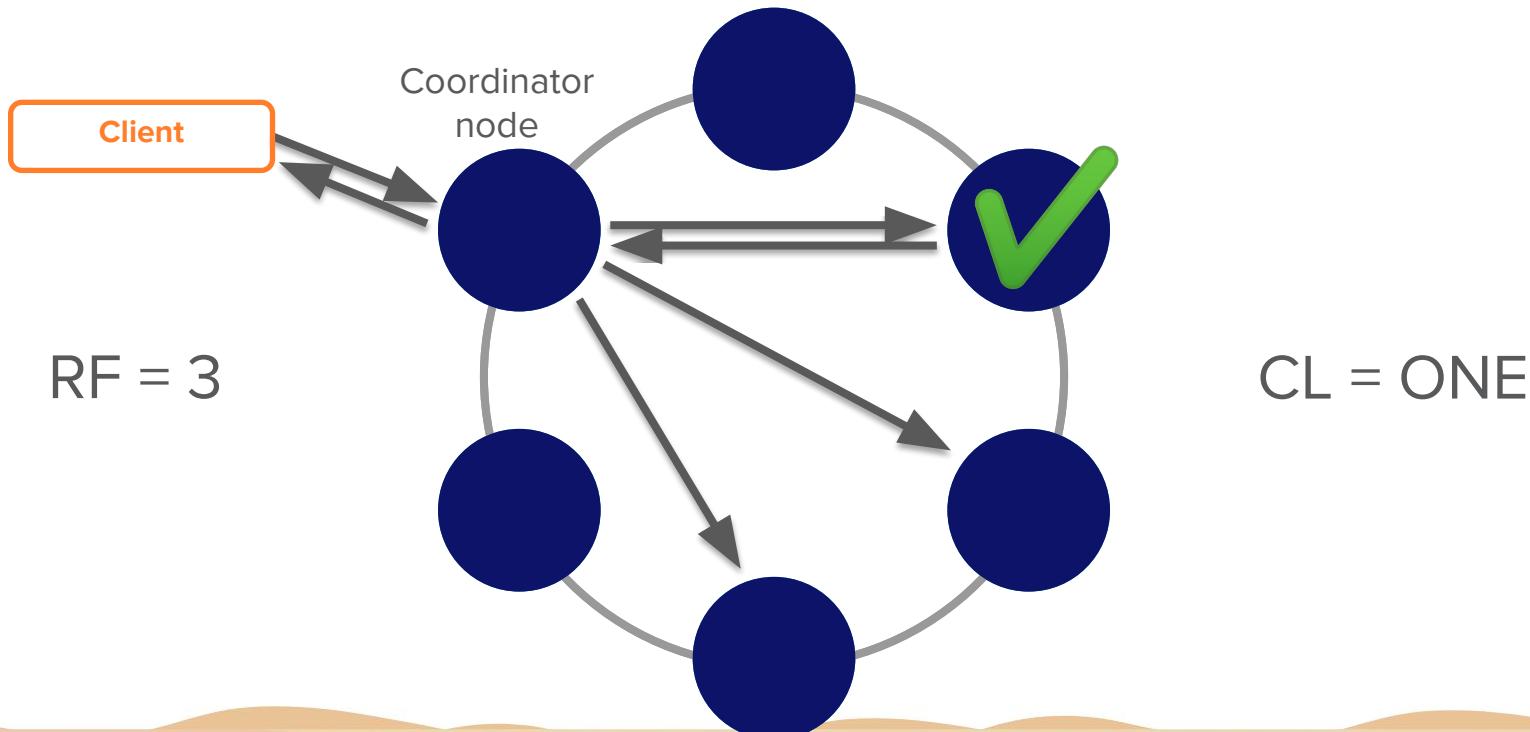
Consistency



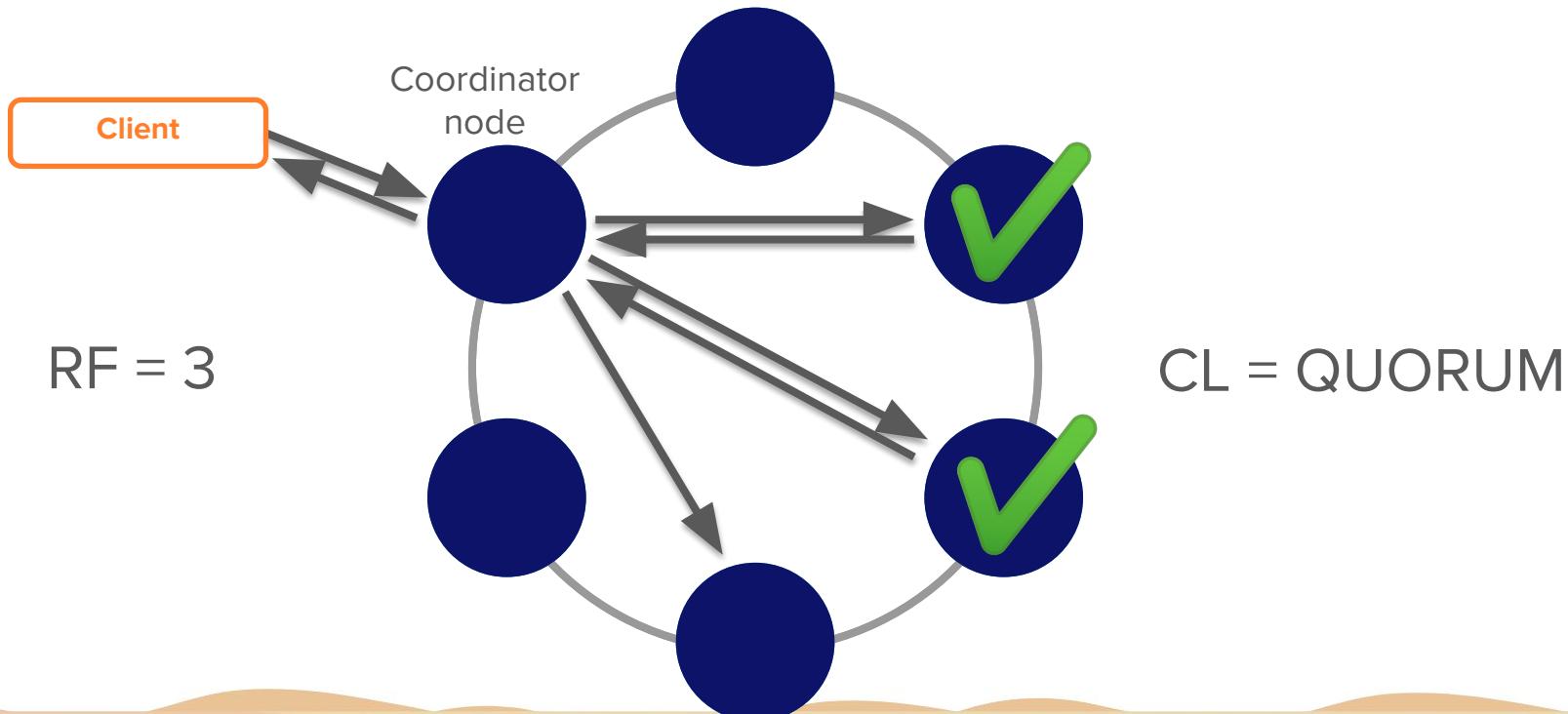
CAP Theorem



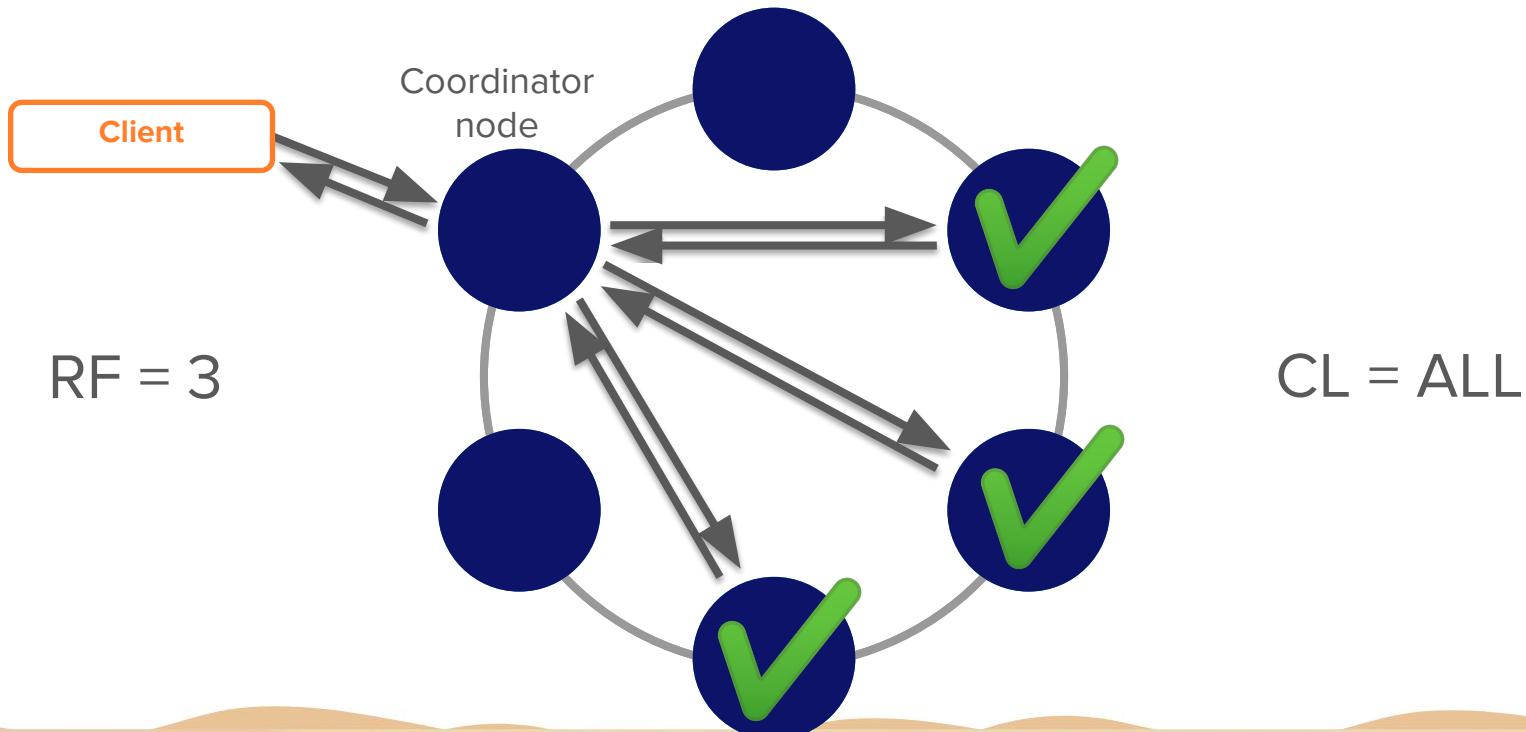
Consistency Levels



Consistency Levels



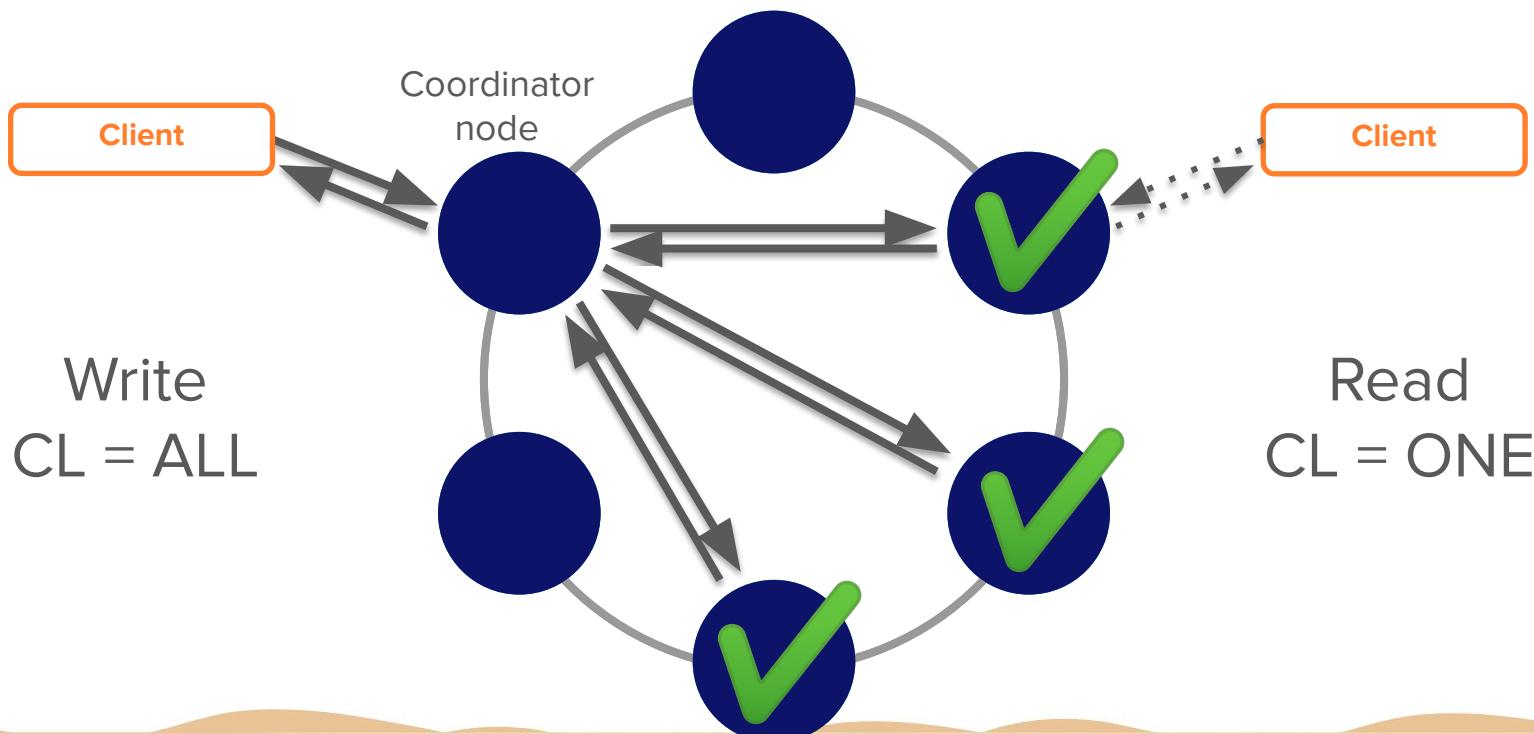
Consistency Levels



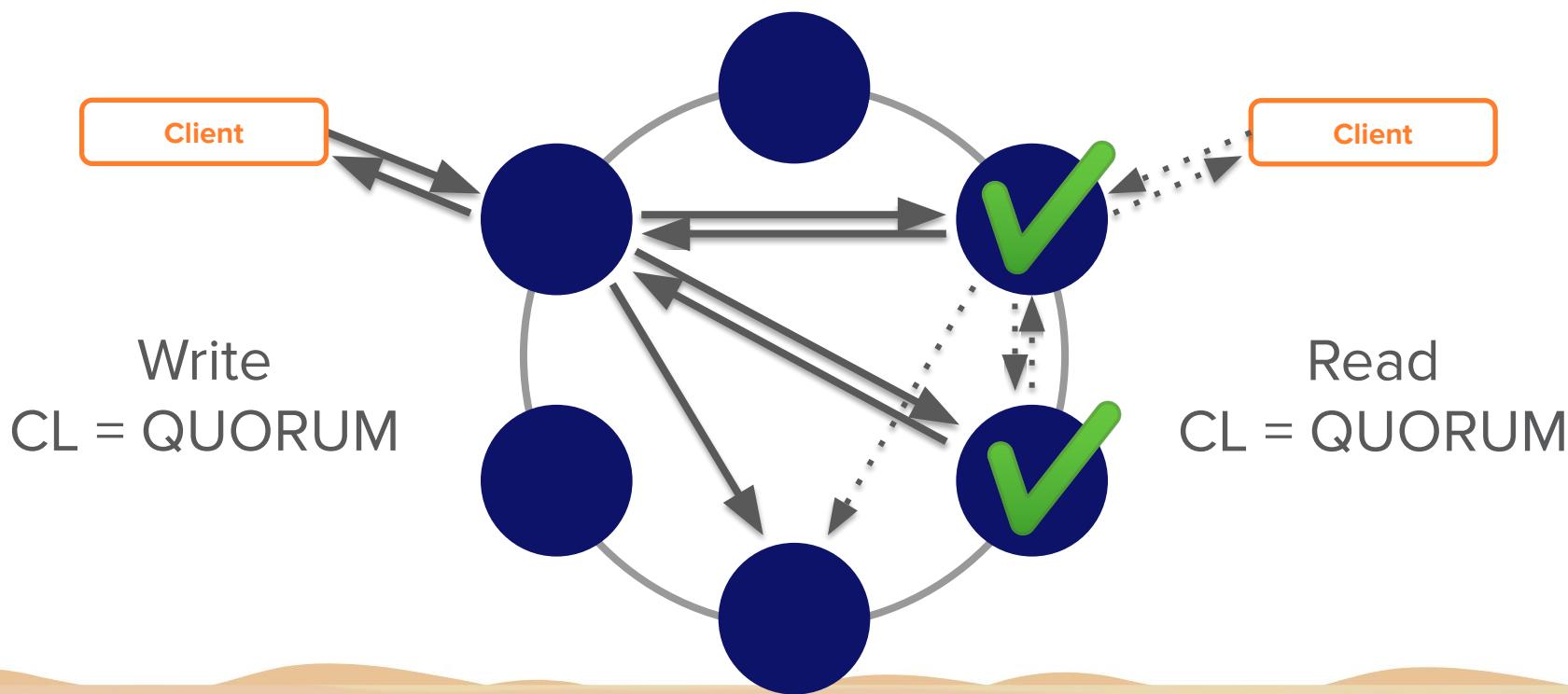
Immediate Consistency


$$CL_{read} + CL_{write} > RF$$

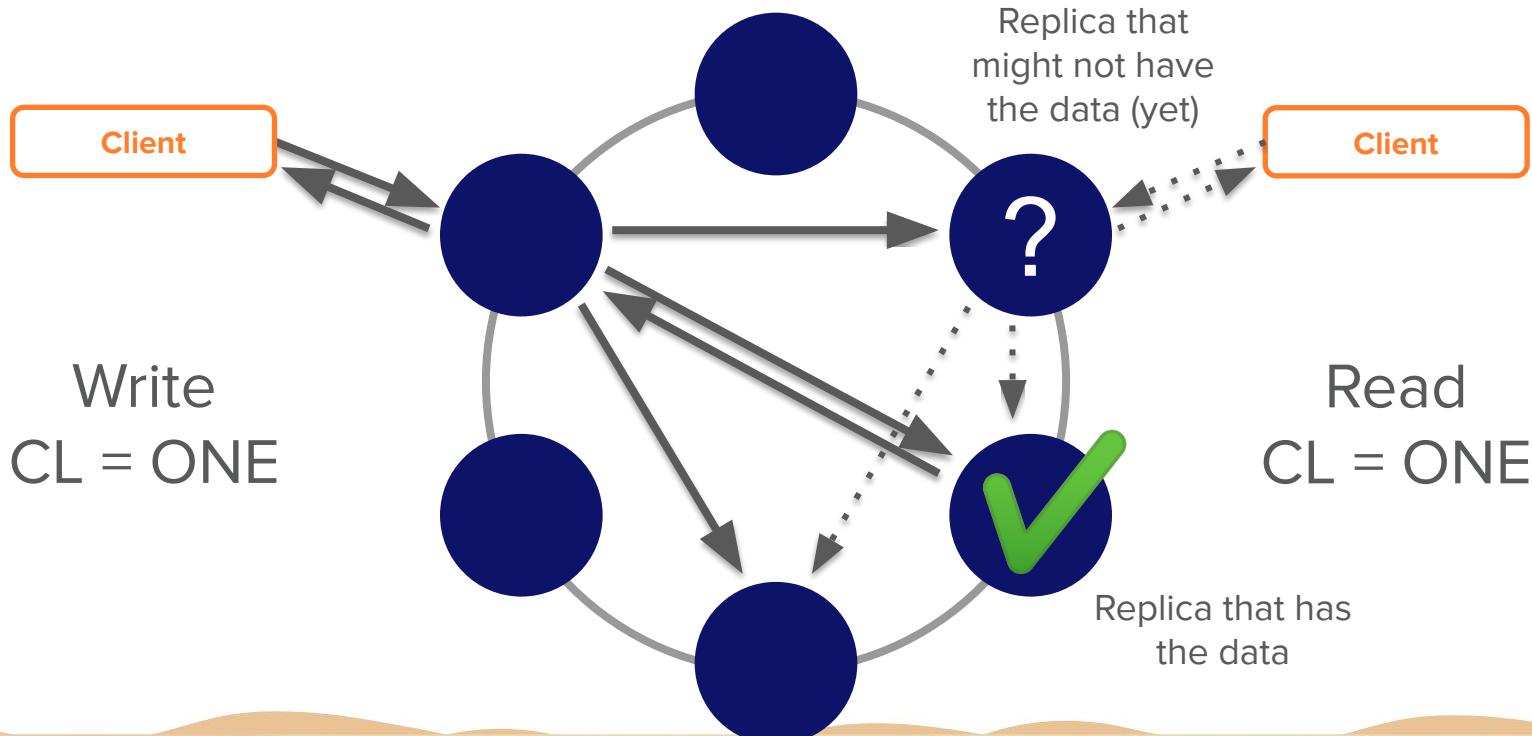
Immediate Consistency – One Way



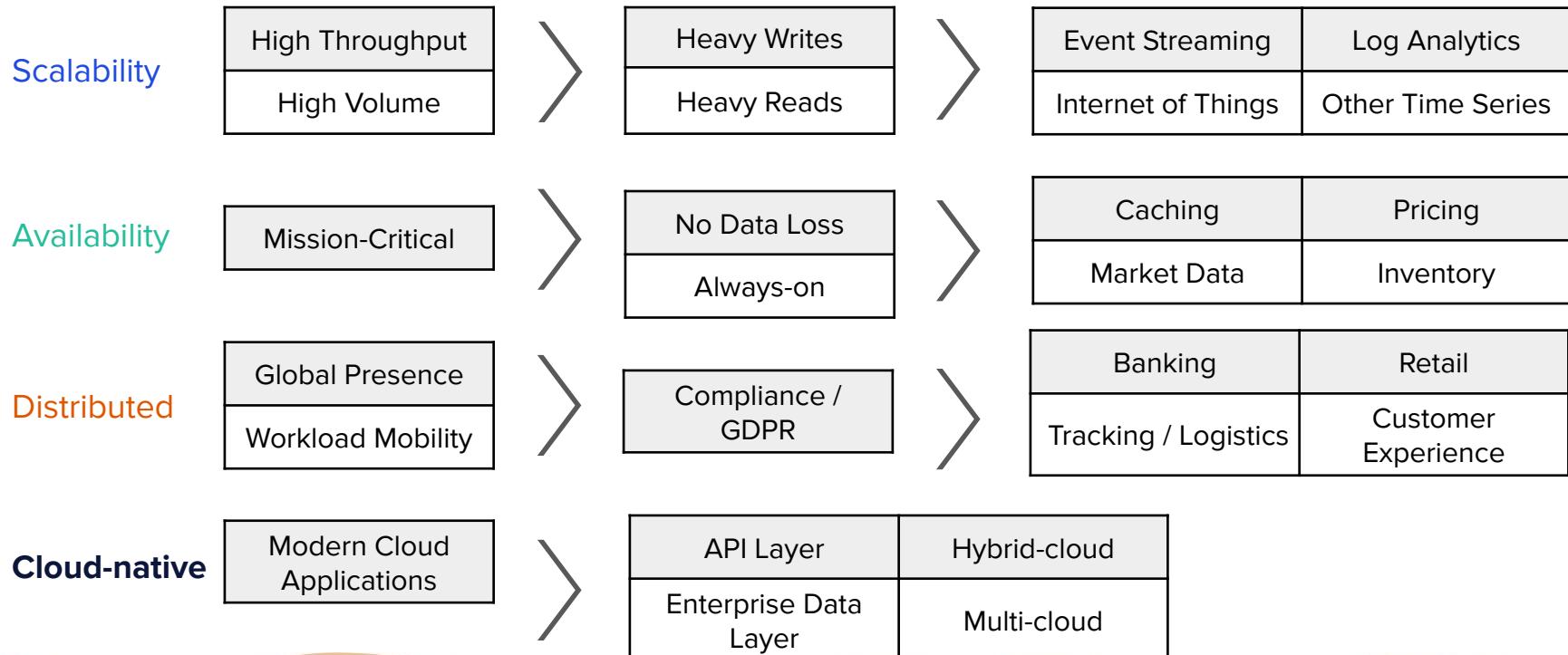
Immediate Consistency – A Better Way



Weak(er) Consistency



Understanding Use Cases



Exercise

DataStax Studio



The screenshot shows the DataStax Studio interface with the title "Cassandra Developer Workshop #2 - Datastax Studio". The main content area is titled "Use the Markdown Editor". It contains instructions for the user:

In this section, you will do the following things:

- Expand the cell to see the markdown code editor
- Edit the markdown
- Render the markdown to show your changes

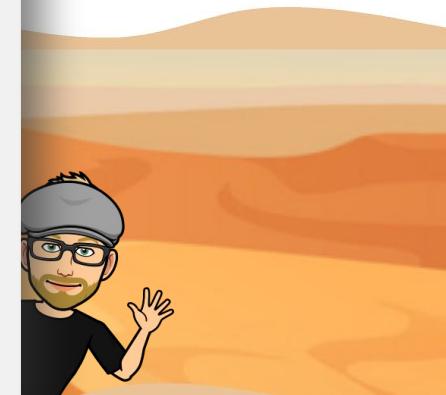
To start with, there are two sections to cells, the code editor and the results section. You are currently looking at the results section and the code editor is hidden.

Step 1: Let's switch to the code editor. Hover over the right-hand corner of this cell and click the icon that looks like an eye.

A callout bubble points to a small eye icon in the top right corner of a code editor window. The window has "Language: Markdown" selected. Below the window, a button says "Replace this text with your name".

Now, let's make a change to the markdown to see how it works.

Step 2: Scroll the bottom of the code editor window and find "Hello your_name_goes_here". Replace `your_name_goes_here` with your name.



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45 45 72



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GET IT ON
Google play



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- What's NEXT?

Write path



Write Path

RAM

DISK

Write Path

RAM

1 Dev Awesome

TX

Houston

DISK



Write Path

MemTable

RAM

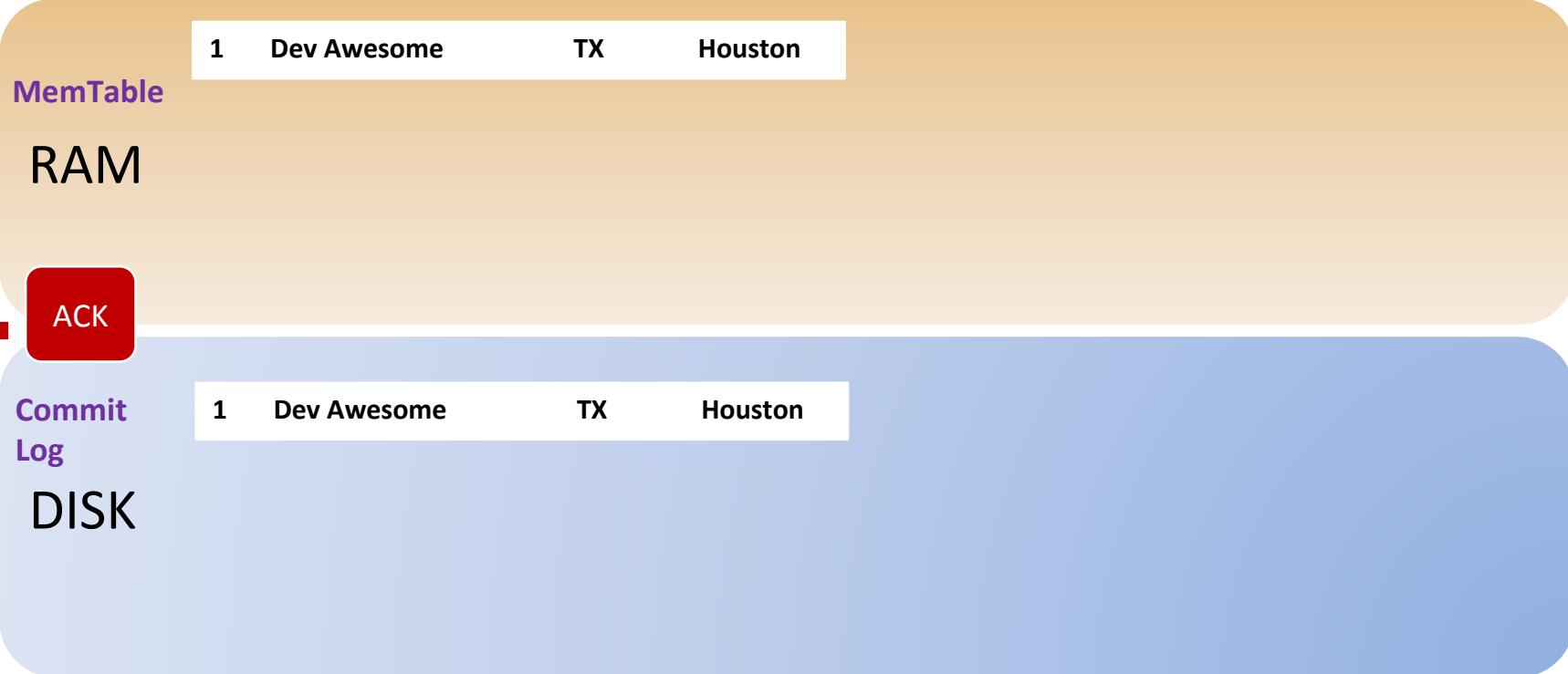
1	Dev Awesome	TX	Houston
---	-------------	----	---------

Commit Log

DISK

1	Dev Awesome	TX	Houston
---	-------------	----	---------

Write Path



Write Path

MemTable

RAM

1 Dev Awesome TX Houston

MemTable

RAM

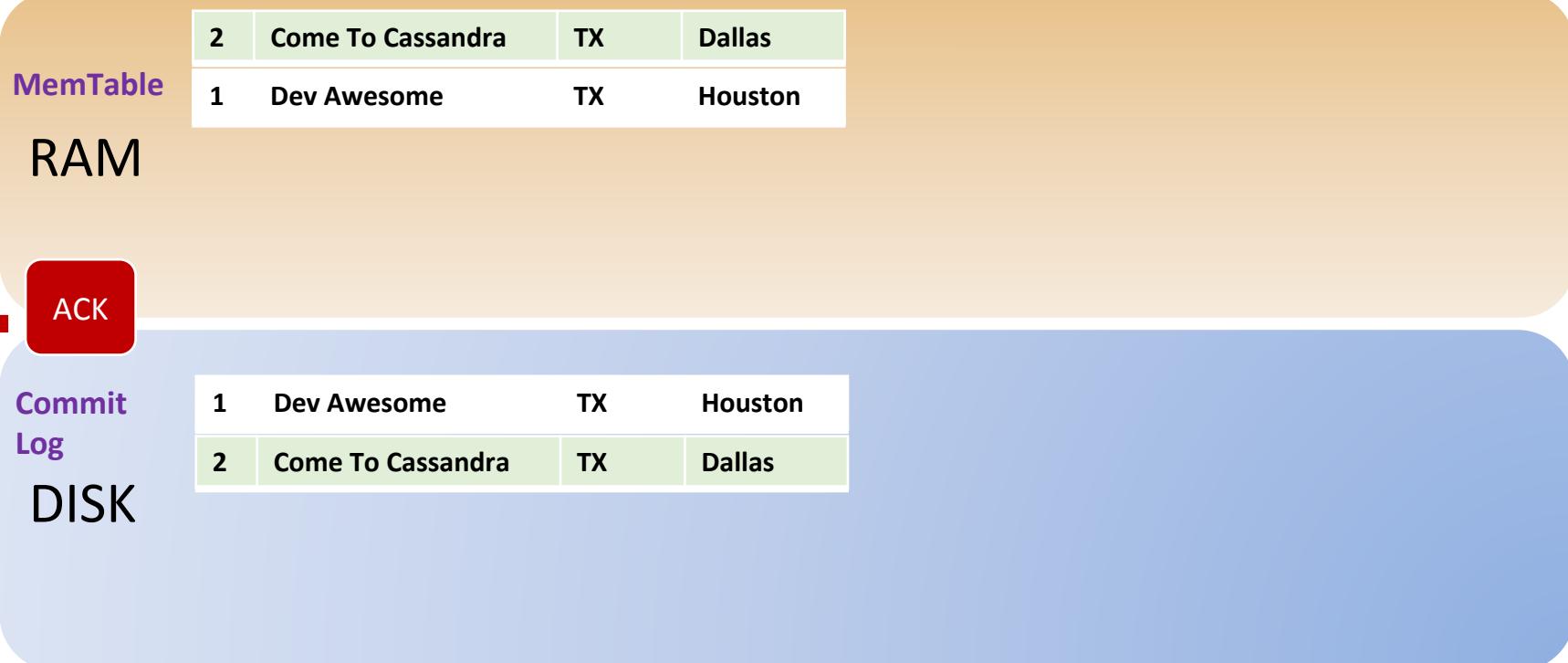
2 Come To Cassandra TX Dallas

Commit Log

DISK

1 Dev Awesome TX Houston

Write Path



Write Path

MemTable

2	Come To Cassandra	TX	Dallas
1	Dev Awesome	TX	Houston

RAM

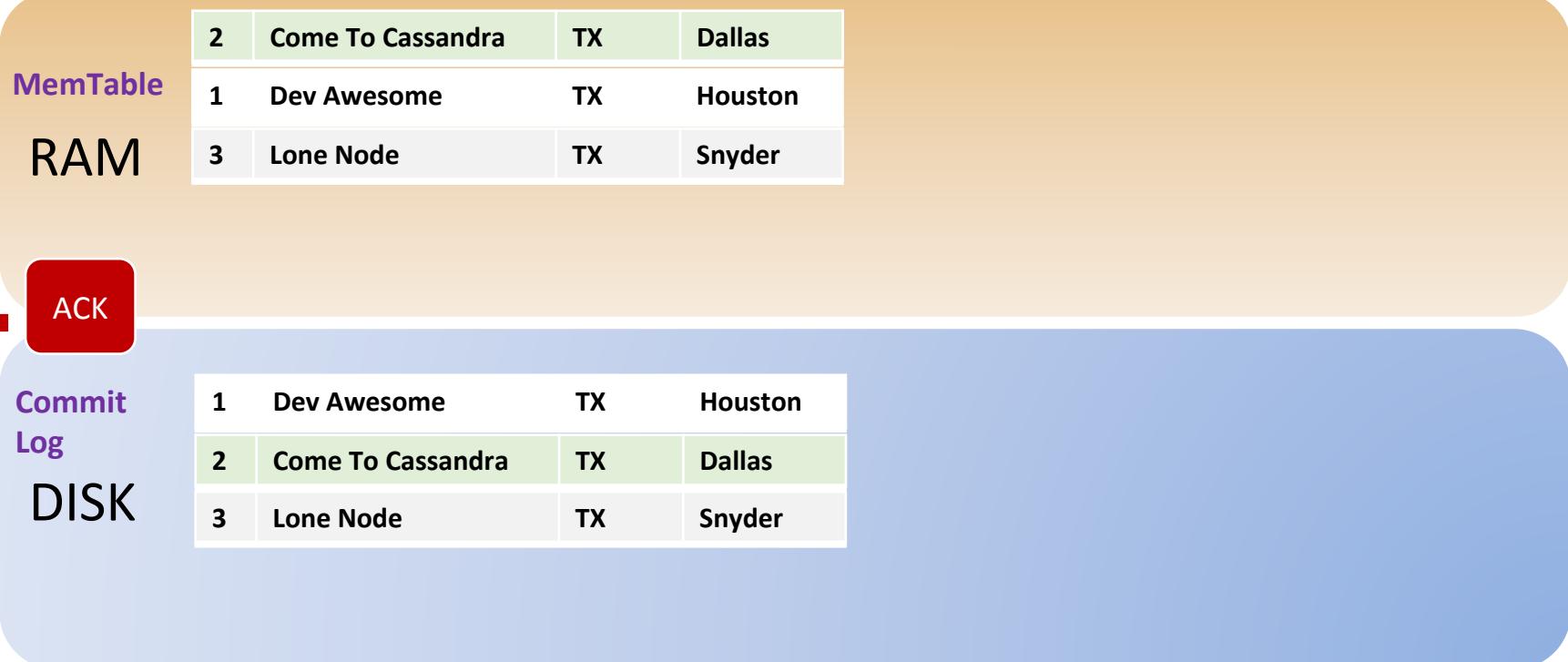


Commit
Log

3	Lone Node	TX	Snyder
1	Dev Awesome	TX	Houston
2	Come To Cassandra	TX	Dallas

DISK

Write Path



Write Path

MemTable RAM	2	Come To Cassandra	TX	Dallas
	1	Dev Awesome	TX	Houston
	3	Lone Node	TX	Snyder

→

Commit Log DISK	4	IgotUr Data	TX	Austin
	1	Dev Awesome	TX	Houston
	2	Come To Cassandra	TX	Dallas
	3	Lone Node	TX	Snyder

Write Path

MemTable
RAM

4	IgotUr Data	TX	Austin
2	Come To Cassandra	TX	Dallas
1	Dev Awesome	TX	Houston
3	Lone Node	TX	Snyder

ACK

Commit
Log
DISK

1	Dev Awesome	TX	Houston
2	Come To Cassandra	TX	Dallas
3	Lone Node	TX	Snyder
4	IgotUr Data	TX	Austin

Write Path

MemTable
RAM

4	IgotUr Data	TX	Austin
2	Come To Cassandra	TX	Dallas
1	Dev Awesome	TX	Houston
3	Lone Node	TX	Snyder

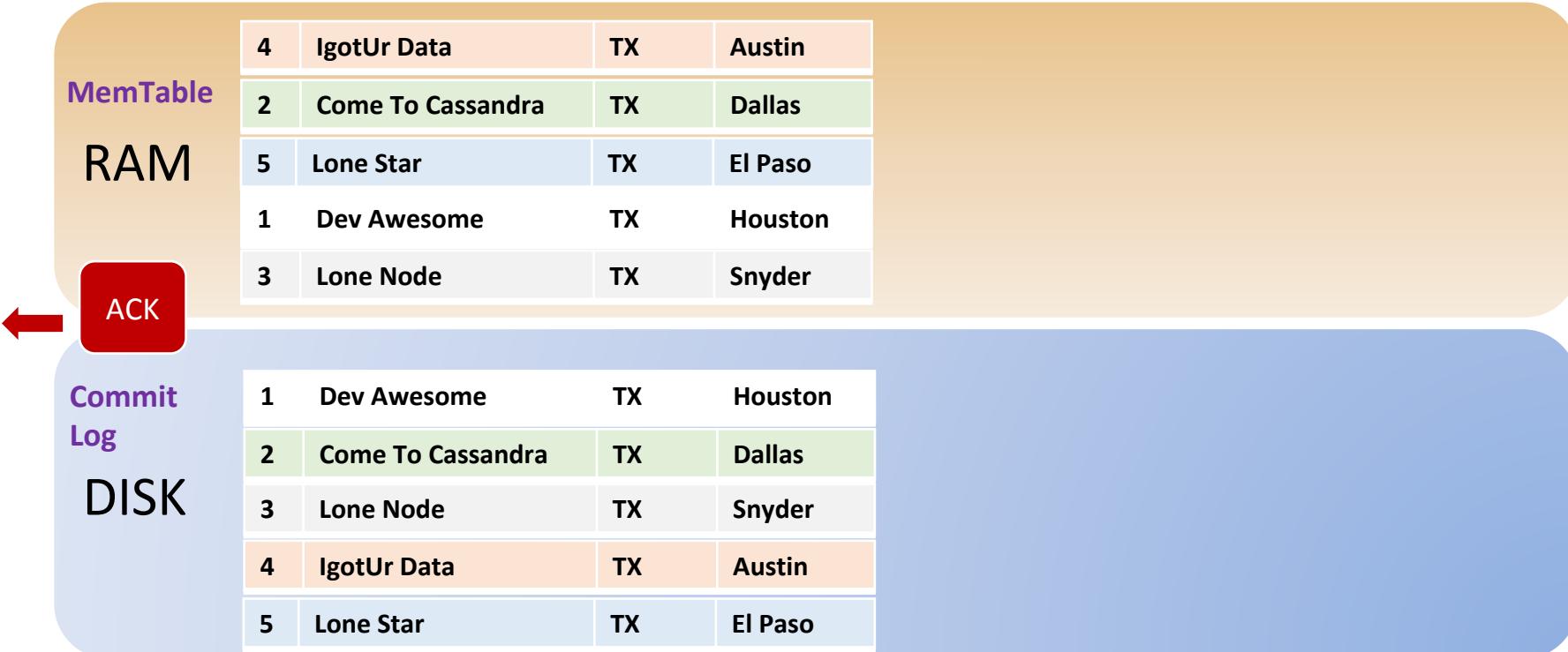
→

5	Lone Star	TX	El Paso
---	-----------	----	---------

Commit
Log
DISK

1	Dev Awesome	TX	Houston
2	Come To Cassandra	TX	Dallas
3	Lone Node	TX	Snyder
4	IgotUr Data	TX	Austin

Write Path



Write Path

MemTable
RAM

4	IgotUr Data	TX	Austin
2	Come To Cassandra	TX	Dallas
5	Lone Star	TX	El Paso
1	Dev Awesome	TX	Houston
3	Lone Node	TX	Snyder

FLUSH

Commit
Log
DISK

1	Dev Awesome	TX	Houston
2	Come To Cassandra	TX	Dallas
3	Lone Node	TX	Snyder
4	IgotUr Data	TX	Austin
5	Lone Star	TX	El Paso

SSTABLE

4	IgotUr Data	TX	Austin
2	Come To Cassandra	TX	Dallas
5	Lone Star	TX	El Paso
1	Dev Awesome	TX	Houston
3	Lone Node	TX	Snyder

Write Path

MemTable

RAM

Commit Log

DISK

1	Dev Awesome	TX	Houston
2	Come To Cassandra		Dallas
3	Lone Node	TX	Snyder
4	IgotUr Data		Austin
5	Lone Star	TX	El Paso



SSTABLE			
4	IgotUr Data	TX	Austin
2	Come To Cassandra	TX	Dallas
5	Lone Star	TX	El Paso
1	Dev Awesome	TX	Houston
3	Lone Node	TX	Snyder

Write Path

MemTable

RAM

DISK

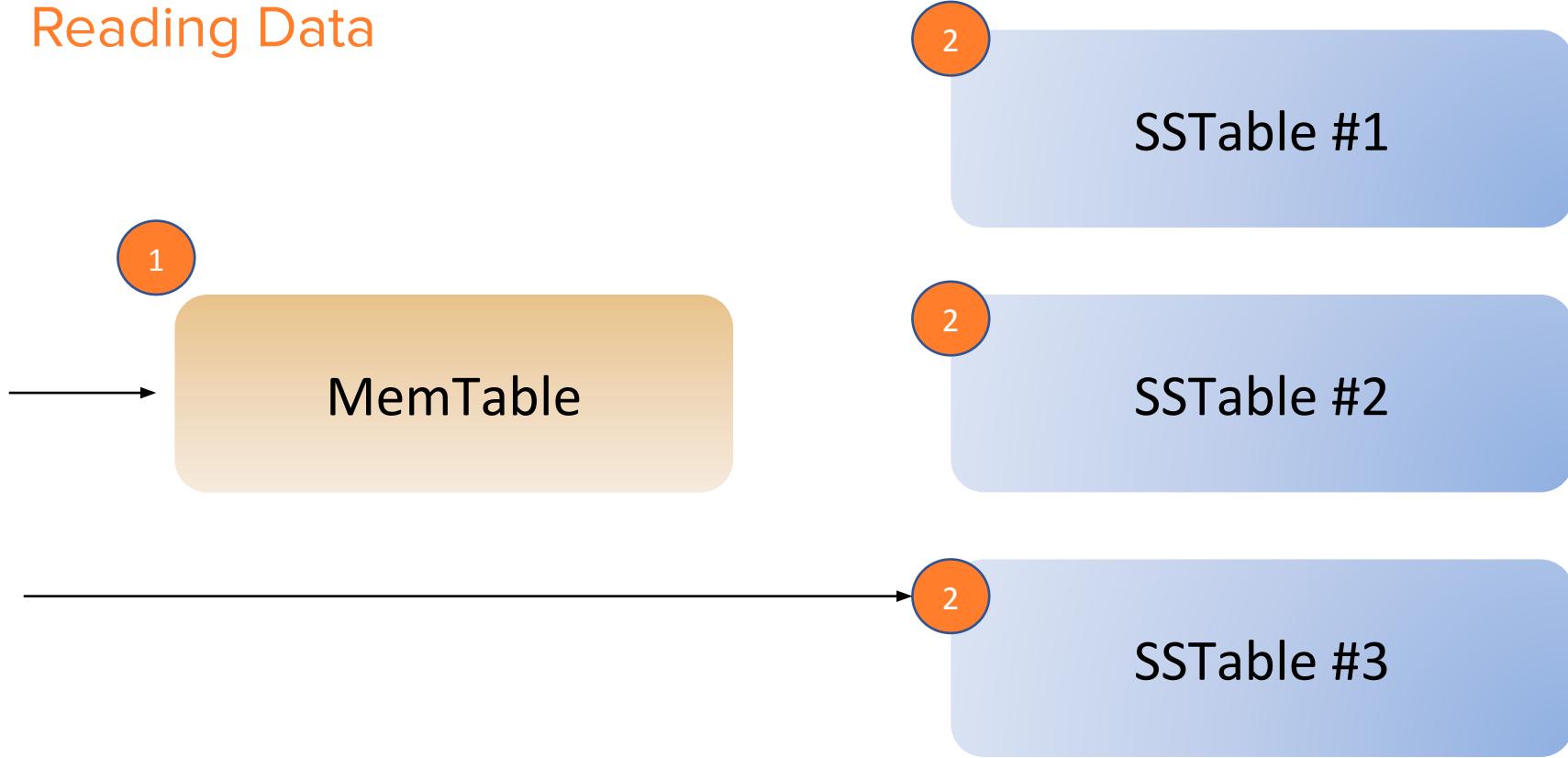
SSTABLE
(IMMUTABLE)

4	IgotUr Data	TX	Austin
2	Come To Cassandra	TX	Dallas
5	Lone Star	TX	El Paso
1	Dev Awesome	TX	Houston
3	Lone Node	TX	Snyder

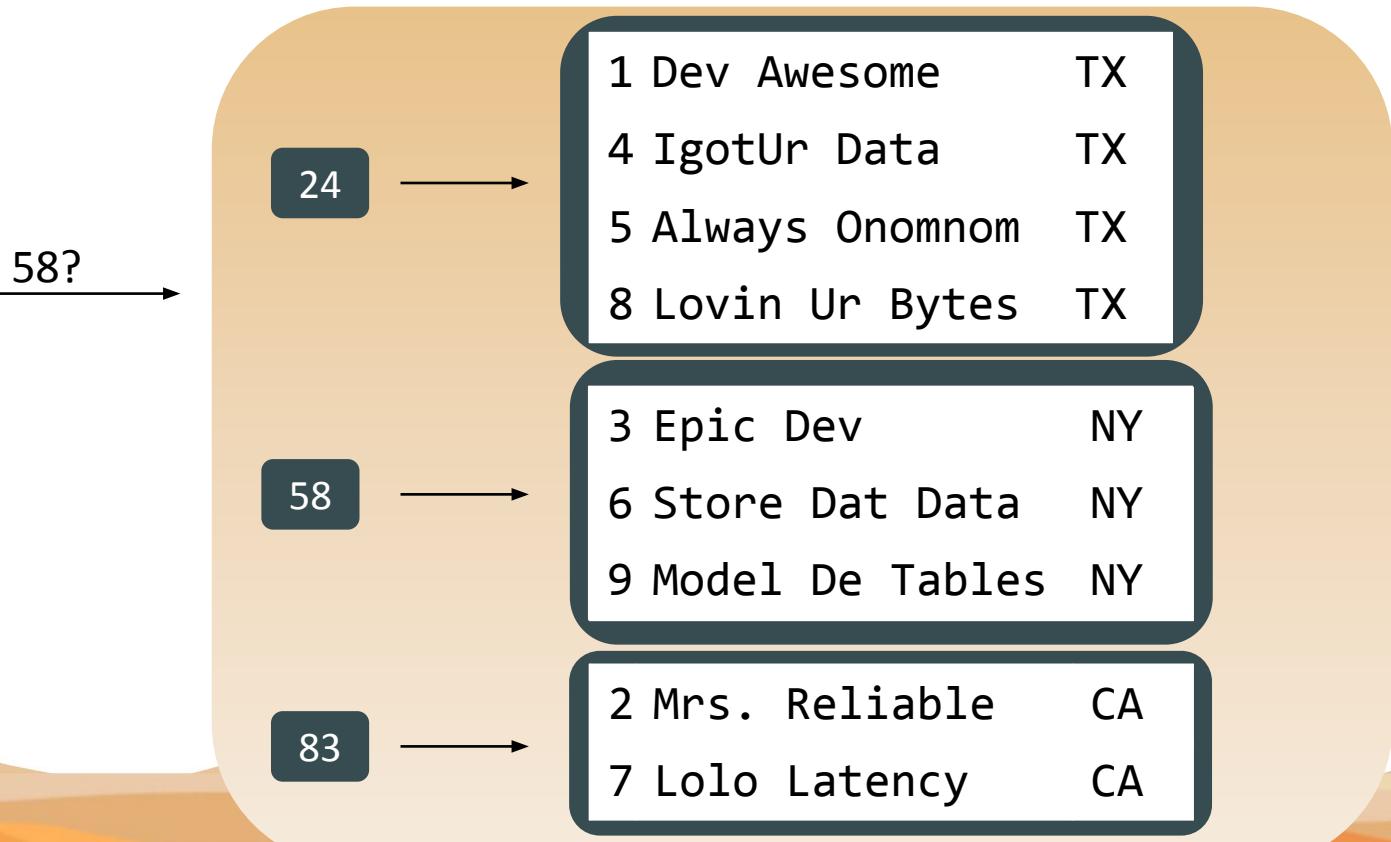
Read path



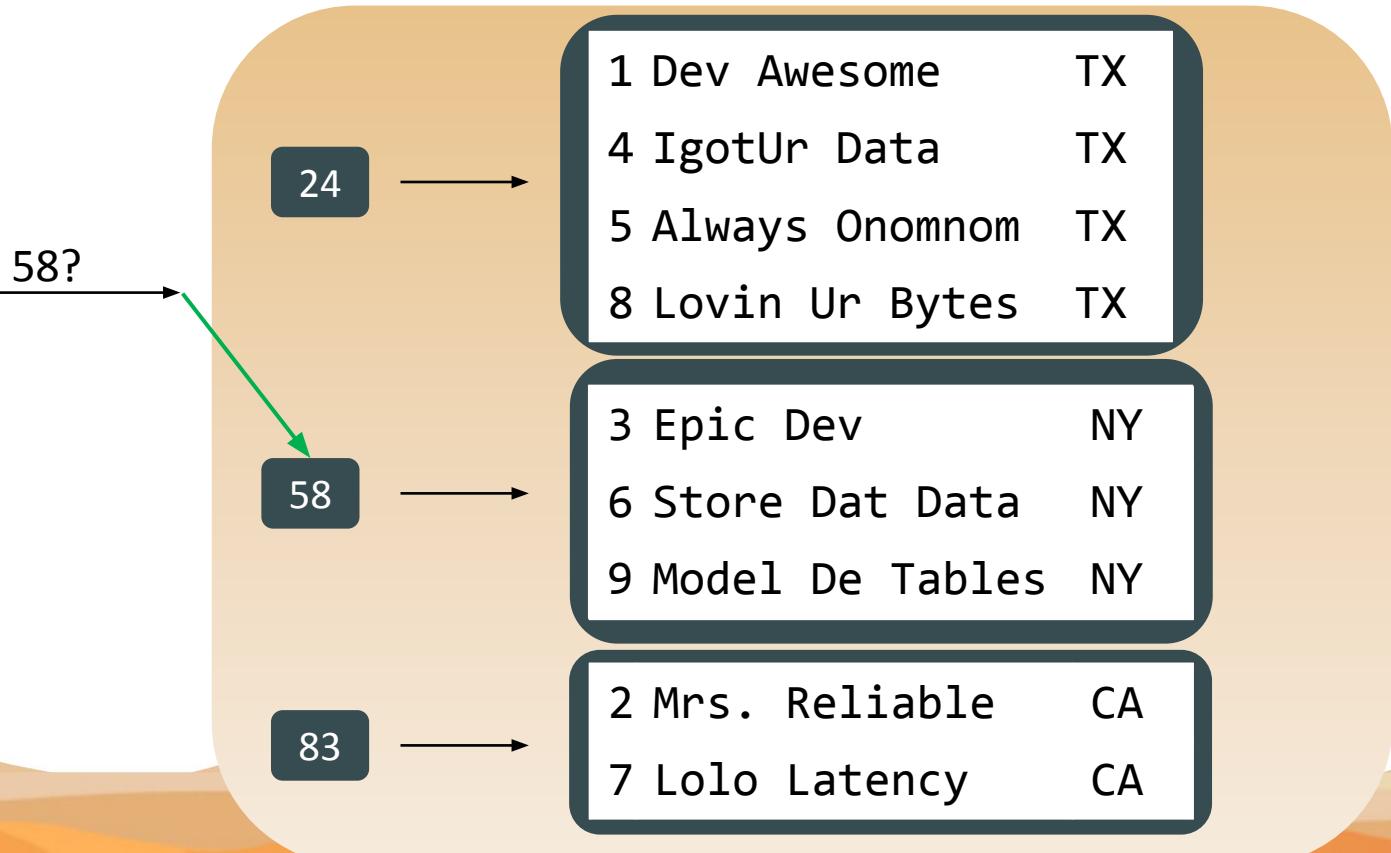
Reading Data



Reading a MemTable



Reading a MemTable

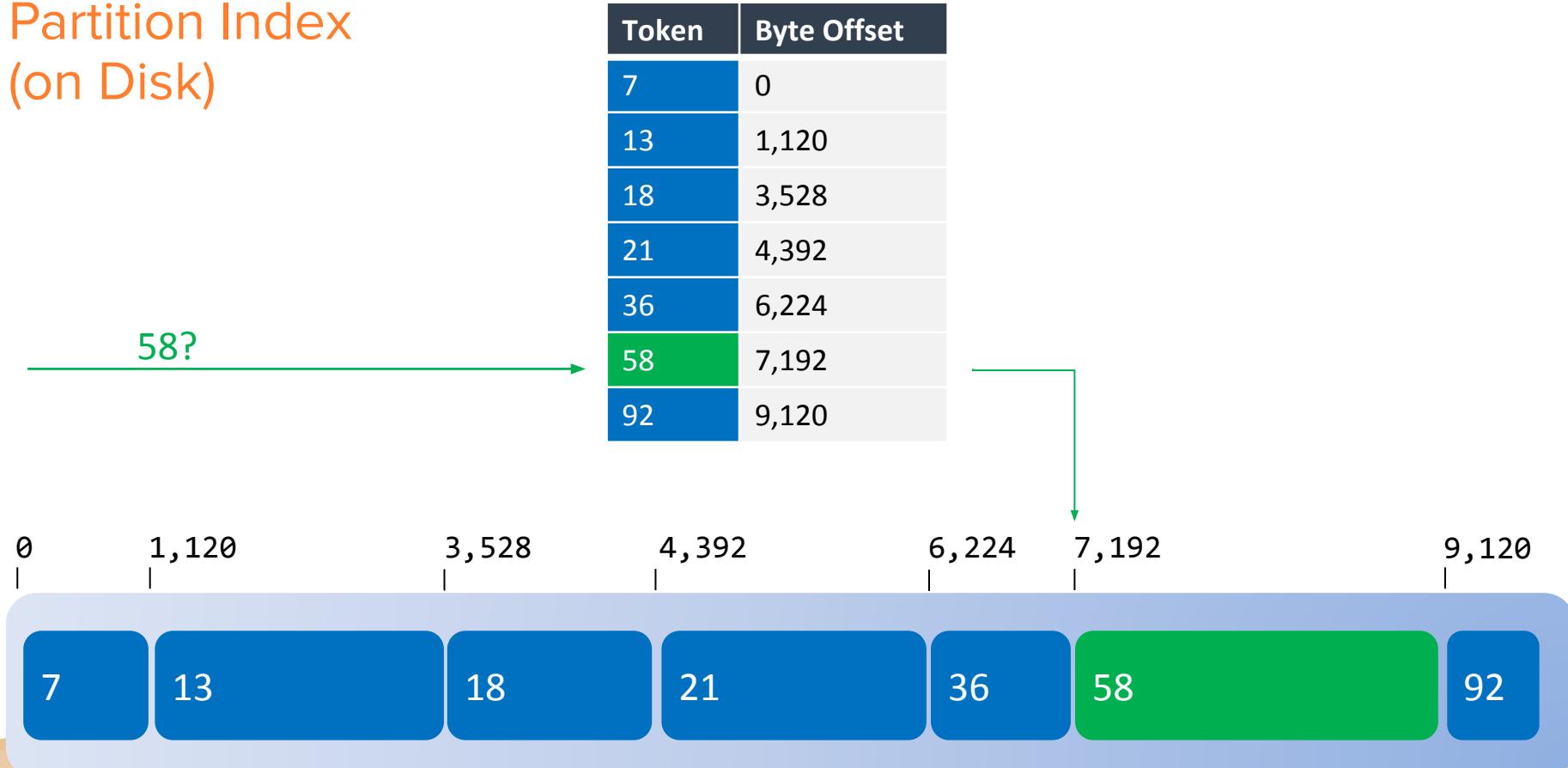


Reading a SSTable

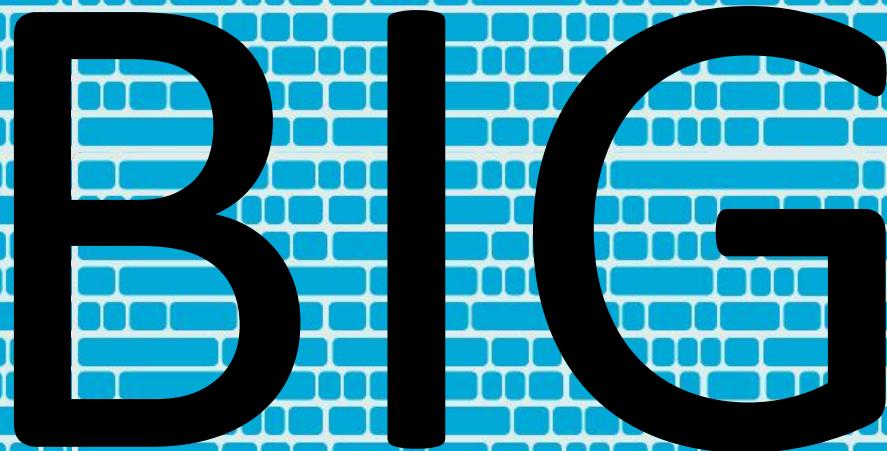


- ❖ A SSTable holds ordered partitions
- ❖ A partition can be split in multiple SSTables
- ❖ We can mark offset of each partition

Partition Index (on Disk)

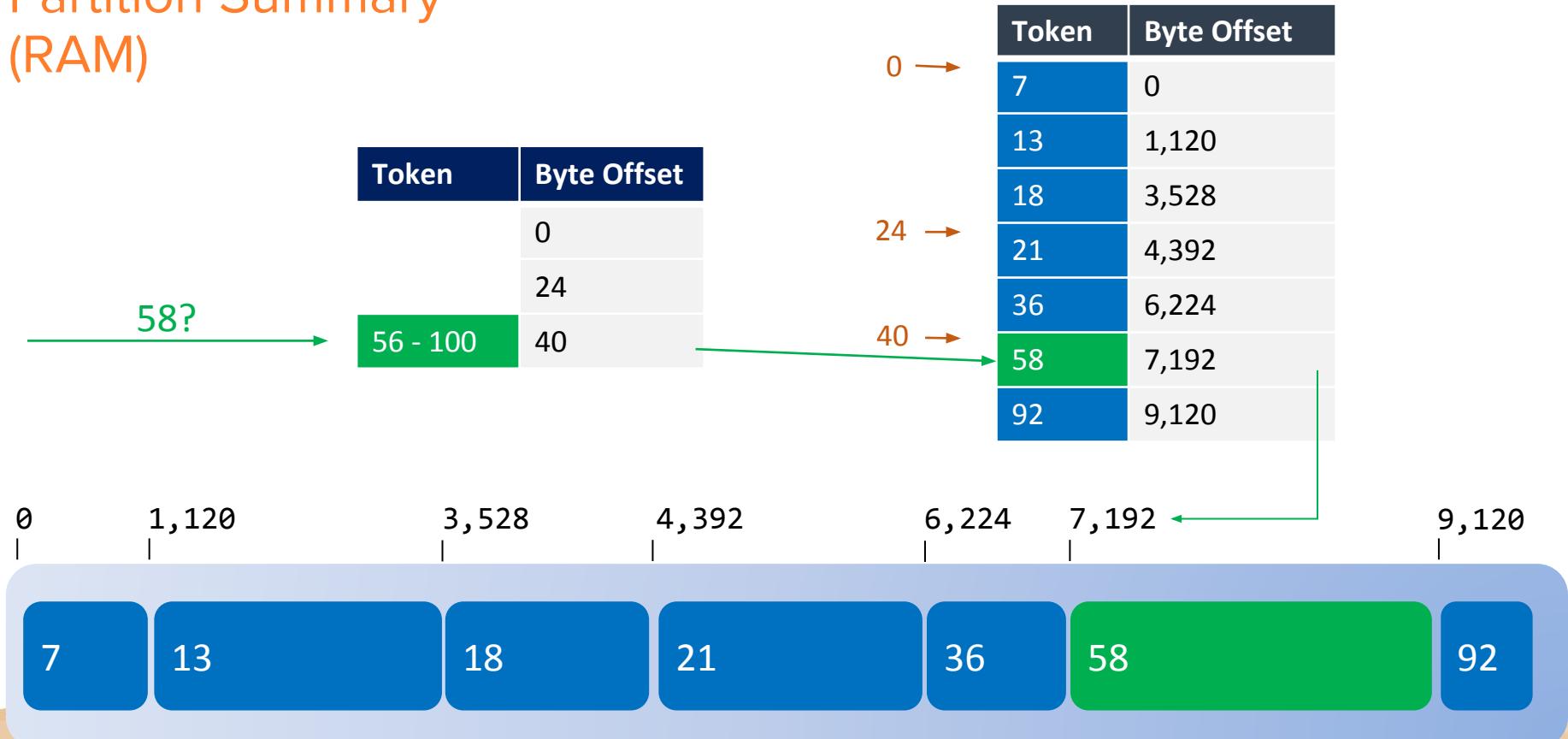


...but a SSTABLE is ...



BIG

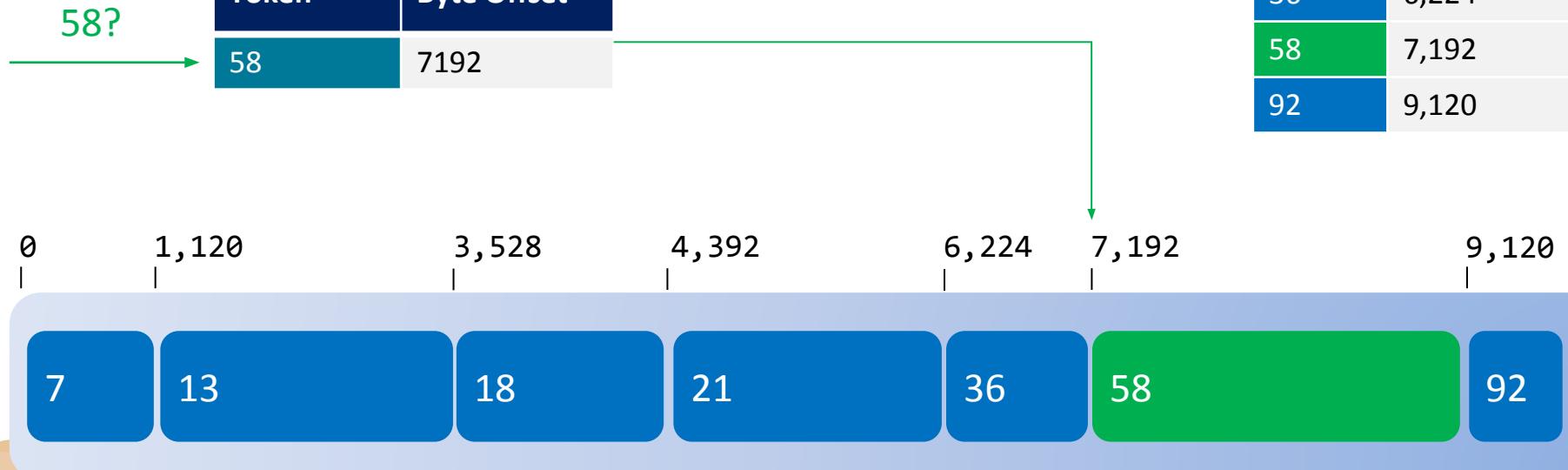
Partition Summary (RAM)



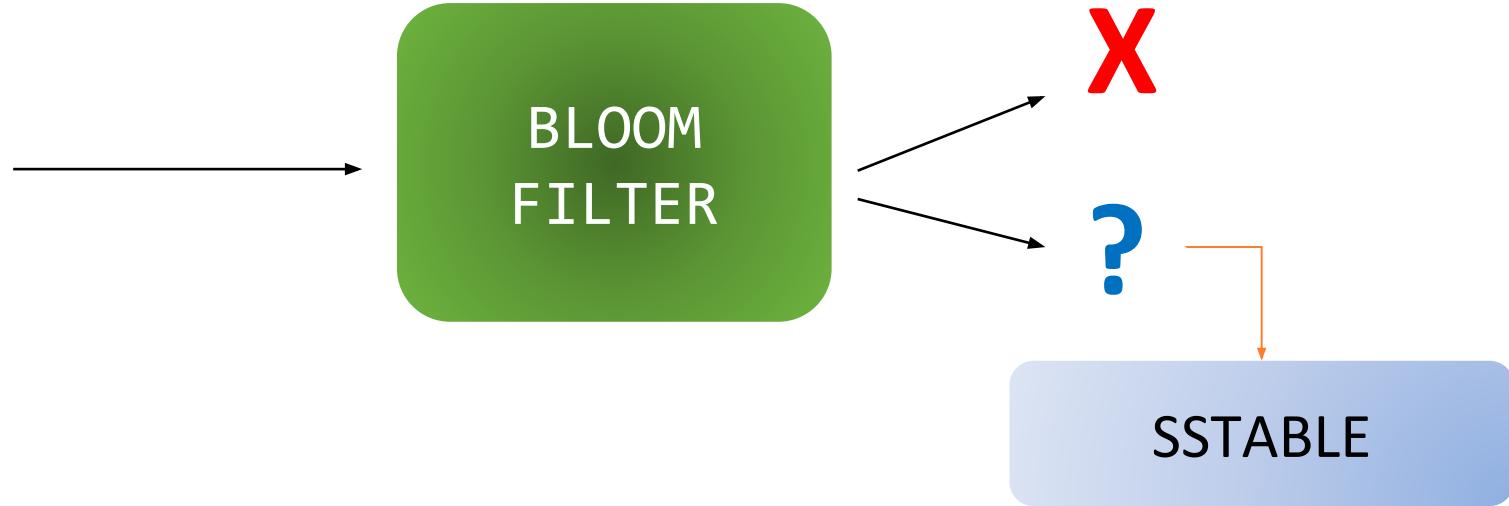
Key Cache (RAM)

Token	Byte Offset
0	
24	
40	

Token	Byte Offset
58	7192



Bloom Filter



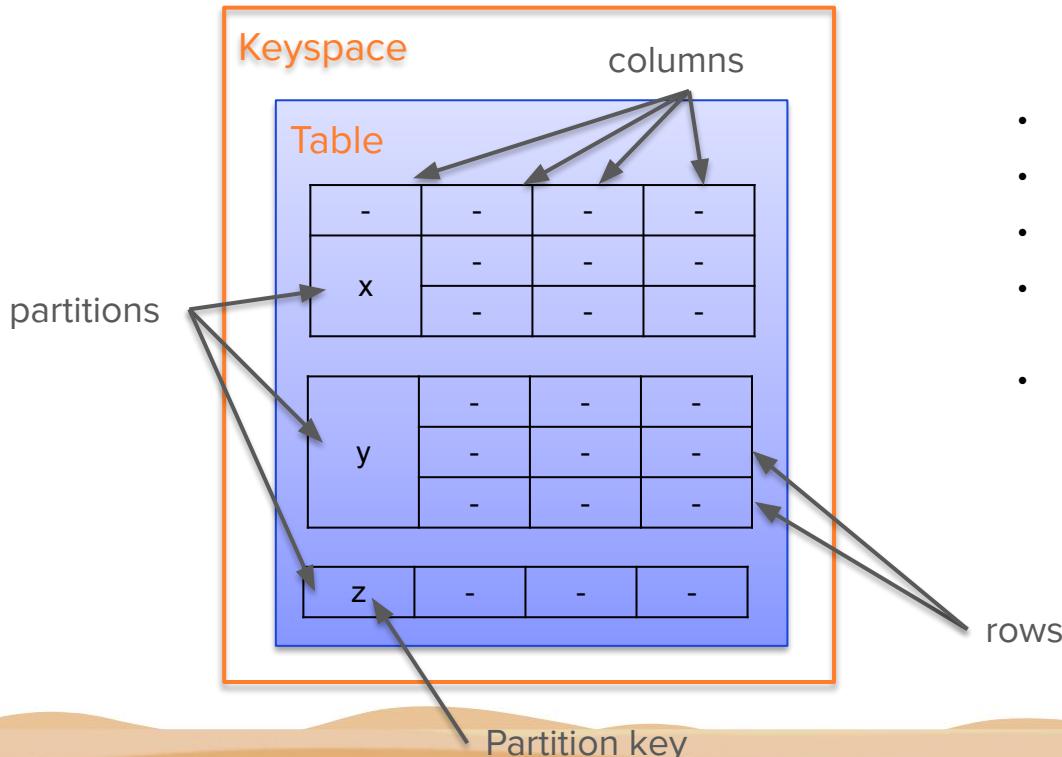


Developer Workshop Series Week 1

**What we will
cover:**

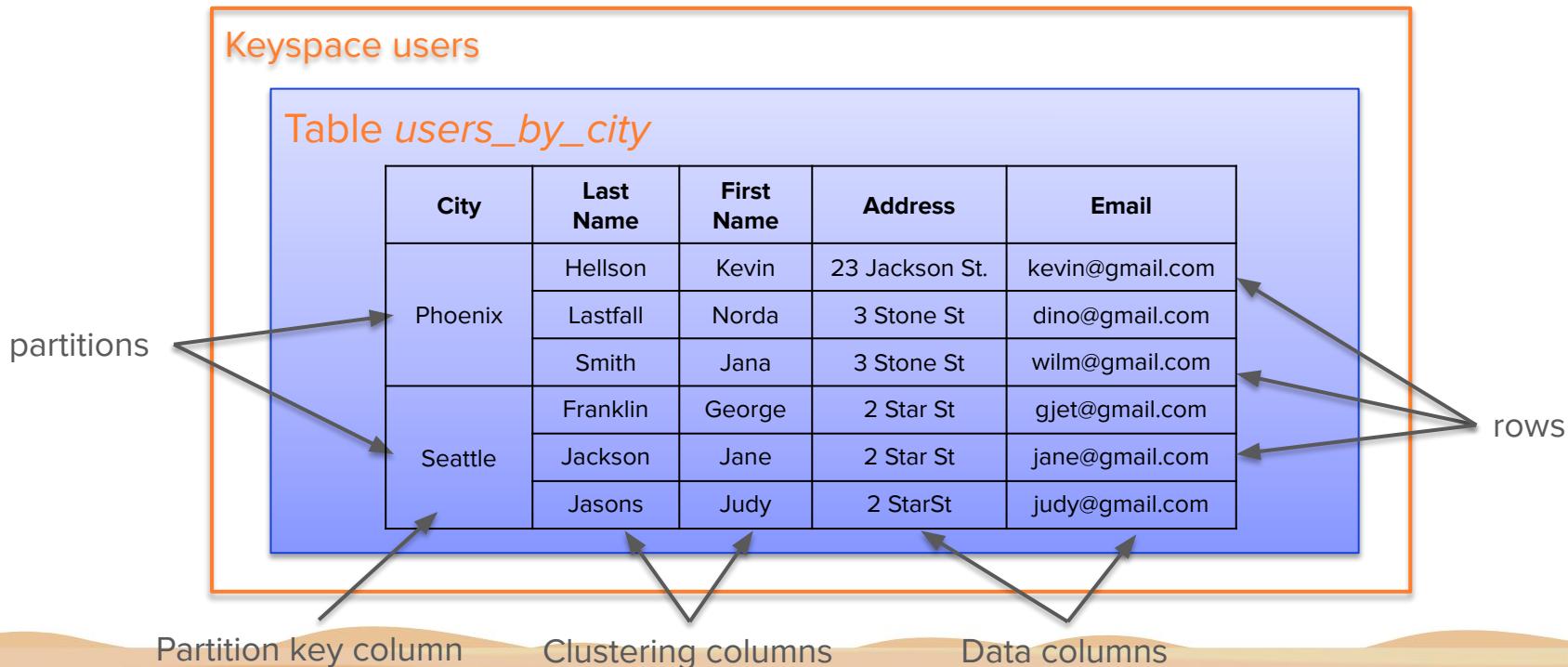
- Bootstrapping
- Apache Cassandra™ Why, What & When
- Read and Write path
- Uber High Level Data Modeling
- What's NEXT?

Cassandra Structure - Partition



- Tabular data model, with one twist
- *Keyspaces* contain *tables*
- *Tables* are organized in *rows* and *columns*
- Groups of related rows called *partitions* are stored together on the same node (or nodes)
- Each row contains a *partition key*
 - One or more columns that are hashed to determine which node(s) store that data

Example Data – Users organized by city



Tables Hold Many Partitions

City	Last Name	First Name	Address	Email
Phoenix	Hellson	Kevin	23 Jackson St.	kevin@gmail.com
	Lastfall	Norda	3 Stone St	dino@gmail.com
	Smith	Jana	3 Stone St	wilm@gmail.com

Table *users_by_city*

Tables Hold Many Partitions

City	Last Name	First Name	Address	Email
Seattle	Franklin	George	2 Star St	gjet@gmail.com
	Jackson	Jane	2 Star St	jane@gmail.com
	Jasons	Judy	2 StarSt	judy@gmail.com

Table *users_by_city*

City	Last Name	First Name	Address	Email
Phoenix	---	---	---	---
	---	---	---	---
	---	---	---	---

Tables Hold Many Partitions

City	Last Name	First Name	Address	Email
Charlotte	Azrael	Chris	5 Blue St	chris@gmail.com
	Stilson	Brainy	7 Azure Ln	brain@gmail.com
	Smith	Cristina	4 Teal Cir	clu@gmail.com
	Sage	Grant	9 Royal St	grant@gmail.com
	Seterson	Peter	2 Navy Ct	peter@gmail.com

Table *users_by_city*

City	Last Name	First Name	Address	Email
Phoenix	---	---	---	---
	---	---	---	---
	---	---	---	---

City	Last Name	First Name	Address	Email
Seattle	---	---	---	---
	---	---	---	---
	---	---	---	---

Tables Hold Many Partitions

Table *users_by_city*

City	Last Name	First Name	Address	Email
Phoenix	---	---	---	---
	---	---	---	---
	---	---	---	---

Seattle	---	---	---	---
	---	---	---	---
	---	---	---	---

Charlotte	---	---	---	---
	---	---	---	---
	---	---	---	---
	---	---	---	---
	---	---	---	---

Creating a Keyspace in CQL

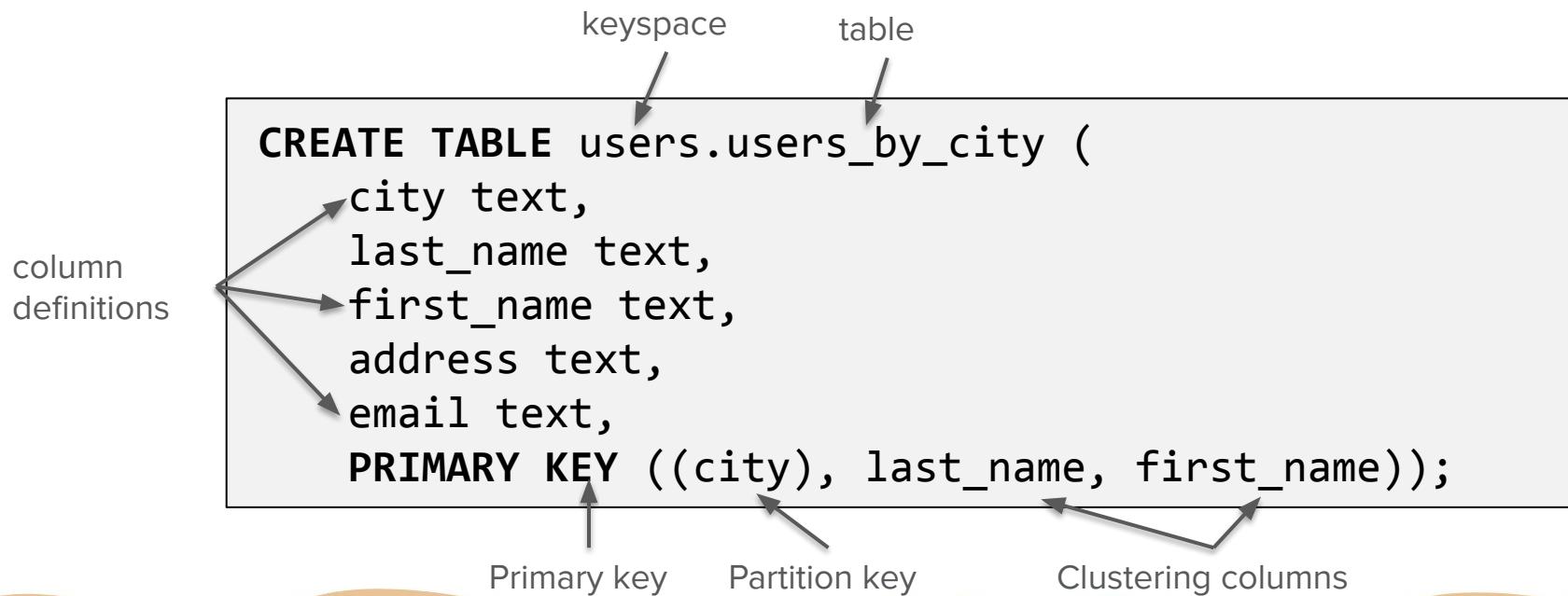
```
CREATE KEYSPACE users
  WITH REPLICATION = {
    'class' : 'NetworkTopologyStrategy',
    'datacenter1' : 3
};
```

keyspace

replication strategy

Replication factor by data center

Creating a Table in CQL



Exercise

Working with CQL



The screenshot shows the DataStax Studio interface for a Cassandra Developer Workshop. The title bar reads "Cassandra Developer Workshop #3 - Working with CQL". The main area is a code editor with the language set to "Markdown". The text in the editor is:

DESCRIBE KEYSPACE Command

In this section, you will do the following things:

- Inspect the `killrvideo` keyspace

Step 1: In the following CQL cell, execute a `DESCRIBE KEYSPACE` command for the `killrvideo` keyspace.

Language: CQL Keyspace: `killrvideo`

On the right side of the interface, the schema browser shows the `killrvideo` keyspace with its tables and other schema elements:

- Tables
 - comments_by_user
 - comments_by_video
 - latest_videos
 - tags_by_letter
 - user_credentials
 - user_videos
 - users
 - video_playback_stats
 - video_ratings
 - video_ratings_by_user
 - video_recommendations
 - video_recommendations_by_video
 - videos
 - videos_by_tag
- User Defined Types
- User Defined Functions
- User Defined Aggregates
- Materialized Views

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Developer Workshop Series Week 1

**What we will
cover:**

- Bootstrapping
- Apache Cassandra™ Why, What & When
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- Uber High Level Data Modeling
- What's NEXT?



Homework Week 1



1. Finish notebooks if you are not done
2. Please provide feedback to ASTRA team with the FORM
3. Create Accounts on Academy and Community
4. Watch DS201 (videos | quizz)
5. Complete exercise of the week (3 questions)



Developer Resources

LEARN

Join academy.datastax.com

<https://academy.datastax.com/resources/cassandra-developer-workshop>

Free online courses - Cassandra certifications

ASK/SHARE

Join community.datastax.com

Ask/answer community user questions - share your expertise

CONNECT

Follow us

We are on Twitter - Twitch!

REVIEW

Slides and code for this course are available at

<https://github.com/DataStax-Academy/online-Cassandra-workshop>

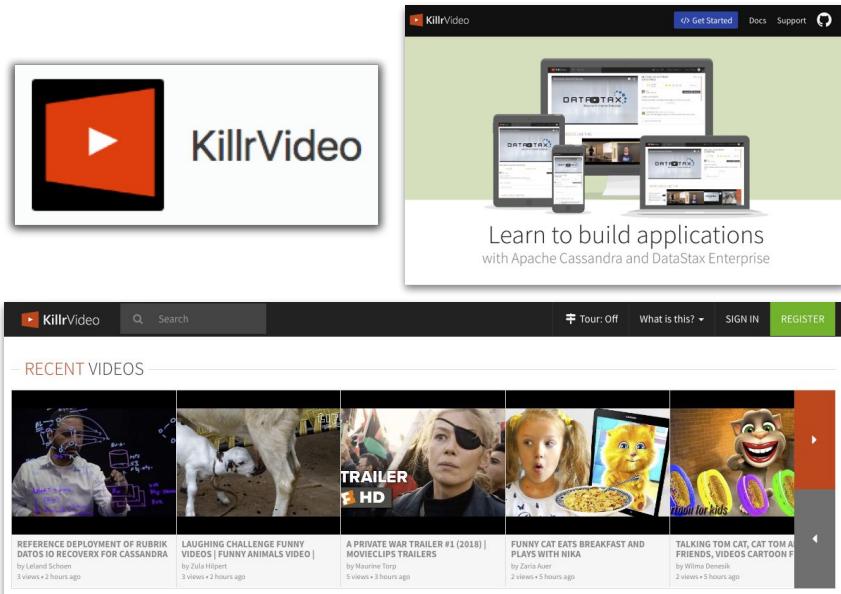
Training Courses at DataStax Academy

- Free self-paced DSE 6 courses
 - ◆ [DS201: DataStax Enterprise 6 Foundations of Apache Cassandra™](#)



KillrVideo Reference Application

- Reference application for learning how to use Apache Cassandra and DataStax Enterprise
 - ◆ DataStax Drivers
 - ◆ Docker images
- Source code freely available
 - ◆ <https://github.com/killrvideo>
- Live version
 - ◆ <http://killrvideo.com>
- Download, test, modify, contribute!



Part 1 - How to build Applications with Cassandra

Every Wednesday (NAM/LATAM) - 9am PDT / 12pm EDT / 5:00pm BST / 6:00pm CEST / 21:30pm IST

July 1

Getting Started with Cassandra



July 8

Data Modelling for Apache Cassandra™

July 15

Application Development with Cassandra part 1

July 22

Application Development with Cassandra part 2

Part 2 - Test, Deploy and Monitor

Every Wednesday (NAM/LATAM) - 9am PDT / 12pm EDT / 5:00pm BST / 6:00pm CEST / 21:30pm IST

July 29 Operating your Cassandra clusters

Aug 5 Running Cassandra performance tests

Aug 12 Testing your deployments and troubleshooting

Aug 19 Deploying Cassandra with Kubernetes

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July 2

Getting Started with Cassandra



July 9

Data Modelling for Apache Cassandra™

July 16

Application Development with Cassandra part 1

July 23

Application Development with Cassandra part 2

Part 2 - Test, Deploy and Monitor

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July 30 Operating your Cassandra clusters

Aug 6 Running Cassandra performance tests

Aug 13 Testing your deployments and troubleshooting

Aug 20 Deploying Cassandra with Kubernetes



Thank You

