Top 5 Tips & Tricks with Cassandra / DSE

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1	**Data Modeling**
2	Compaction
3	POC Mistakes
4	Hardware Selection
5	Two Common Anti-Patterns

Avoid Secondary Indexes For Most Cases

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Assume a user table and the following queries

```
create table users (
        userid uuid,
        first_name text,
        last_name text,
        email text,
        created_date timestamp,
        PRIMARY KEY (userid)
);
```

1) Get user details for a given userid
2) Get all the users with the first name of John
3) Get user details for user given an email
4) Get all the users created on June 3rd 2014

Wrong Way

```
create index users_first on users (first_name);
create index users_last on users (last_name);
create index users_date on users (created_date);
```

Why Not?

- High Cardinality
- Many Nodes Required to Deliver Result
- Tombstones
- Heavy Resource Usage
- Slow Performance!!!

Avoid Secondary Indexes For Most Queries

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Better Way

All the users with the first name of John

```
create table users_by_fname (
        userid uuid,
        first_name text,
        last_name text,
        email text,
        created_time timestamp,
        PRIMARY KEY (first_name,userid)
);
```

User details for user with the email ‘john.doe@datastax.com’

```
create table users_by_email (
        userid uuid,
        first_name text,
        last_name text,
        email text,
        created_time timestamp,
        PRIMARY KEY (email)
);
```

All the users for a create day

```
create table users_by_day (
        userid uuid,
        first_name text,
        last_name text,
        email text,
        created_time timestamp,
        created_day text, //yyyynndd date
        PRIMARY KEY (
        created_day, created_time, userid)
);
```

Also can sort by create time within the day in query!

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Compaction Choices

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Why Does It Matter?

- Write performance
- Read Performance
- Sizing impact – different free space requirements

What Are my Options?

- Size Tiered
- Leveled
- Date Tiered

Compaction Choices

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Size-Tiered

When to Use?

- Slow Storage (spinning disk)
- Insert Heavy Workload
- Few Updates

Negatives

- Requires Lots of Free Space
- Can read many sstables to satisfy a query

Compaction Choices

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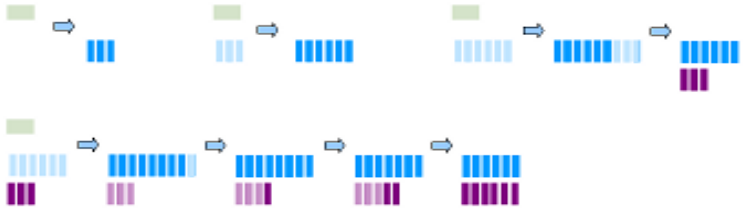
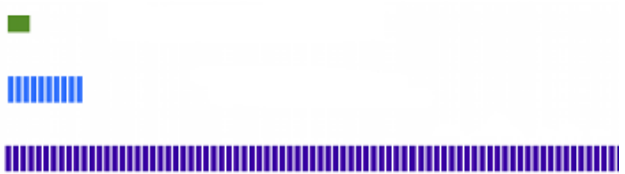
Leveled



When to Use?

- Read Latency Sensitive Queries
- SSD hardware
- Less Free Space



Negatives

- Uses significantly more IO to compact
- No performance gain on partitions written to once and never updated

Compaction Choices

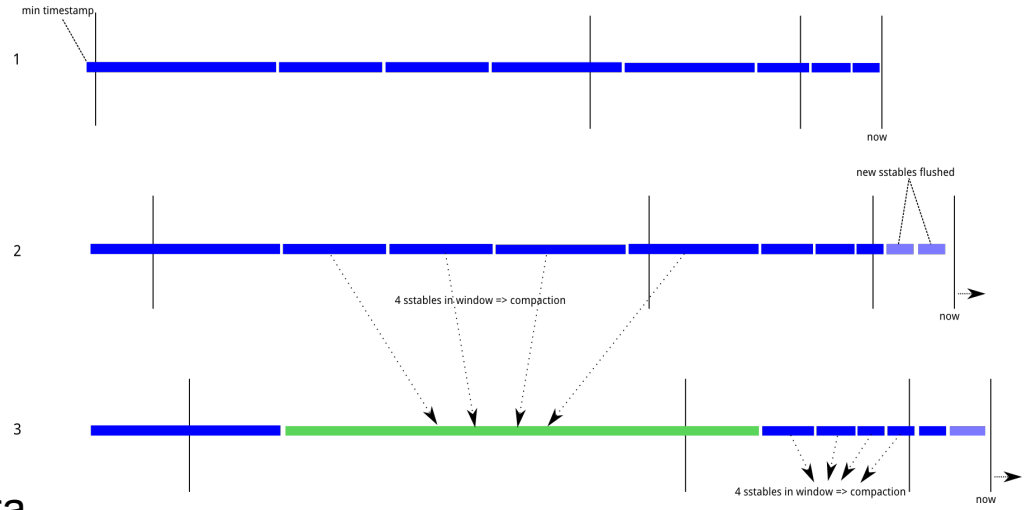
When to Use?

- Time Series Tables
  - Higher node density
- Few if any updates
- Predictable deletes (Default TTL)

Negatives

- Not good if frequent updates/deletes
- Only appropriate for time ordered data

Date-Tiered



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3	**POC Mistakes**
4	Hardware Selection
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Common Proof of Concept Mistakes

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- Performance testing on different hardware
  - VMs on SAN will not reflect production performance
- Not using queries that represent the final product
  - Use Cassandra 2.1's cassandra-stress to test against actual tables
  - Understand the queries against the system
- Using empty nodes for performance testing
  - OS Buffer cache masks IO system

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4	**Hardware Selection**
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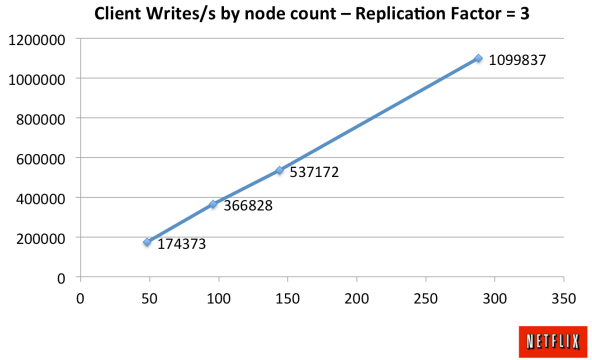
Hardware

- More Moderate Sized Nodes > Few Larger Nodes
  - Cassandra is JVM based, Heap limitations
  - Scale out not up
  - Scaling really is linear →
- CPU
  - 4-16 Cores
- RAM
  - 32+GB
  - OS Buffer Cache via mmap

Scale-Up Linearity



Hardware

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- Local Storage
  - SAN -> SPOF, Latency Spikes, Throughput Issues

- Why SSD?
  - Read Latency
  - Compaction
  - Repair
  - Performance

12ms	7200RPM
7ms	10k
5ms	15k
.04 ms	SSD

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Loading Data via Batch

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- Cassandra Provides Logged and Unlogged Batch Statements
  - Logged protects against partial completion
    - Often used to keep multiple tables with same data points in sync
  - Unlogged is just a grouping of statements

Don’t do this!

```
BEGIN UNLOGGED BATCH;
        insert into users (userid,first_name,…) values(1,”John”,…);
        insert into users (userid,first_name,…) values(2,”Jeff”,…);
        insert into users (userid,first_name,…) values(3,”Joe”,…);
        insert into users (userid,first_name,…) values(4,”Jason”,…);
APPLY BATCH
```

Loading Data via Batch

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- Why Not?
  - Puts extra work load on the coordinator
  - Adds a network hop by nullifying token awareness
  - JVM Pressure on Coordinator
- What Should you Do?
  - Asynchronous inserts via Prepared Statements
  - Faster execution wait
  - Better usage of built in load balancing

Cassandra Queues with Improper Data Model

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- What is the anti-pattern?
  - Cassandra has to scan across tombstones in a partition to read from that partition
  - gc_grace_period poses a dilema
- Example

```
create table queue (
        element_name text,
        queue_time timeuuid,
        payload blob,
        PRIMARY KEY (element_name,queue_time)
);
```

If we queue 1000 payloads for a given element_name and delete the payloads as they are dequeued there will be 1000 tombstones in this partition that need to be scanned across.

- Workarounds
  - Multiple Tables with some time element and truncate the tables when empty
  - Have each worker create it's own table for a workload and truncate the table when the work is complete
  - Both of these methods have pros and cons, so be careful and understand your workload!

Questions?

Thank You

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