Future of Cassandra

Sponsored by DataStax

Cassandra 4.0 (current)

25% performance improvement

Faster big clusters

Introduction of virtual tables for observability

Transient Replicas for storage optimisation

Audit logging + full query logging

Support for JDK 11

Cassandra 4.1 (upcoming)

Pluggable extensions – storage, auth, encryption

Operational guardrails

Improved configuration format

Deny–listing partitions

Paxos v2 consensus protocol
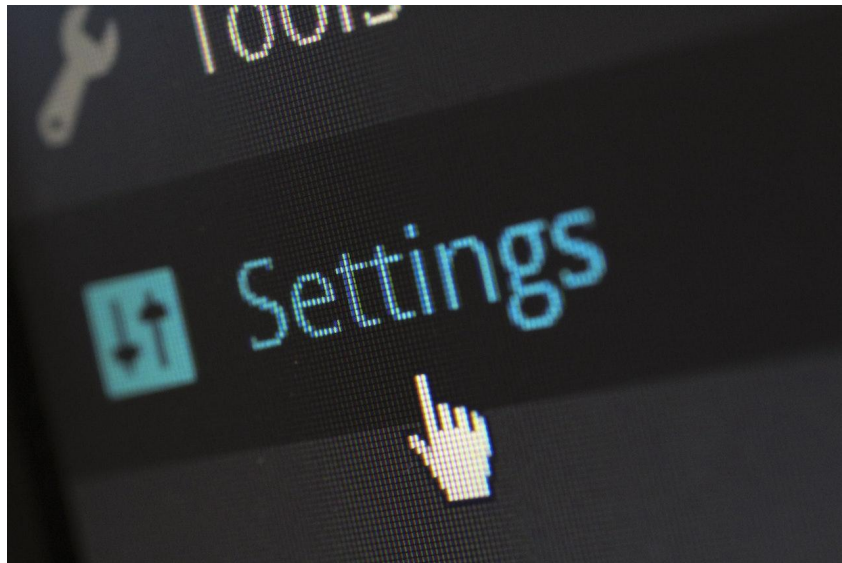
CQL improvements

Consistent hint windows

C* 4.1 – Pluggable extensions

- **Pluggable memtables**
- **Pluggable network encryption**
- **Pluggable authentication**

C* 4.1 – Improved configuration

- **Standardised names**
- **Flexible units in values**
- **Compatibility–mode JVM flags**
- **Use of virtual tables for verification**

C* 4.1 – Guardrails

- **Prevents wrong usage**
- **Hard and soft limits**
- **Override for experts**
- **Based on work in Astra DB**

C* 4.1 – Deny–listing records

- **Disables "bad" partitions**
  - very large partitions
  - unintended data
  - attack vectors
- Prevents partitions from being accessed to minimise negative impact to cluster

Cassandra 5.0 (future)

ACID transactions with Accord consensus

Storage-Attached Index

Transactional cluster metadata

Trie memtables

Dynamic data masking

Support for JDK 17

C* 5.0 – ACID transactions

- Fully-compliant ACID
- Globally available consensus with Accord protocol
- Statements executed **atomically** in **isolation** from other processes

C* 5.0 – Example transaction

```
BEGIN TRANSACTION

    LET fromBalance = (SELECT balance FROM accounts

        WHERE holder='alice');

    IF fromBalance.balance >= 20 THEN

        UPDATE accounts SET balance -= 20 WHERE holder='alice';

        UPDATE accounts SET balance += 20 WHERE holder='bob';

    END IF

COMMIT TRANSACTION ;
```
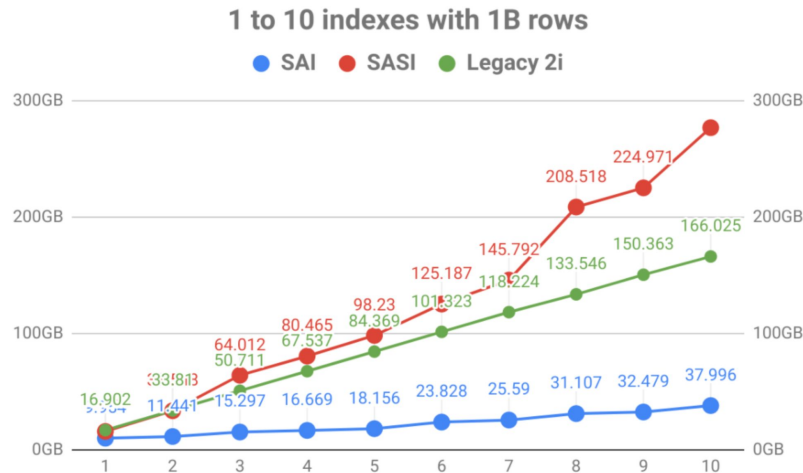
C* 5.0 – Storage Attached Index

- **Replaces legacy secondary indexing and SASI**
- **Highly-scalable**
- **Globally-distributed index**
- **Faster than existing implementations**
- **Uses significantly less disk space**

1 to 10 indexes with 1B rows

● SAI   ● SASI   ● Legacy 2i

SAI values: 5.904, 11.441, 15.297, 16.669, 18.156, 23.828, 25.59, 31.107, 32.479, 37.996

SASI values: 33.813, 50.711, 64.012, 80.465, 98.23, 125.187, 145.792, 208.518, 224.971

Legacy 2i values: 16.902, 33.813, 67.537, 84.369, 101.323, 118.224, 133.546, 150.363, 166.025

C* 5.0 – Transactional cluster metadata

- Fast, unlimited concurrent schema changes
- Better elasticity with fast scale up and down
- Automatic rebalancing of nodes
- PLUS more to come
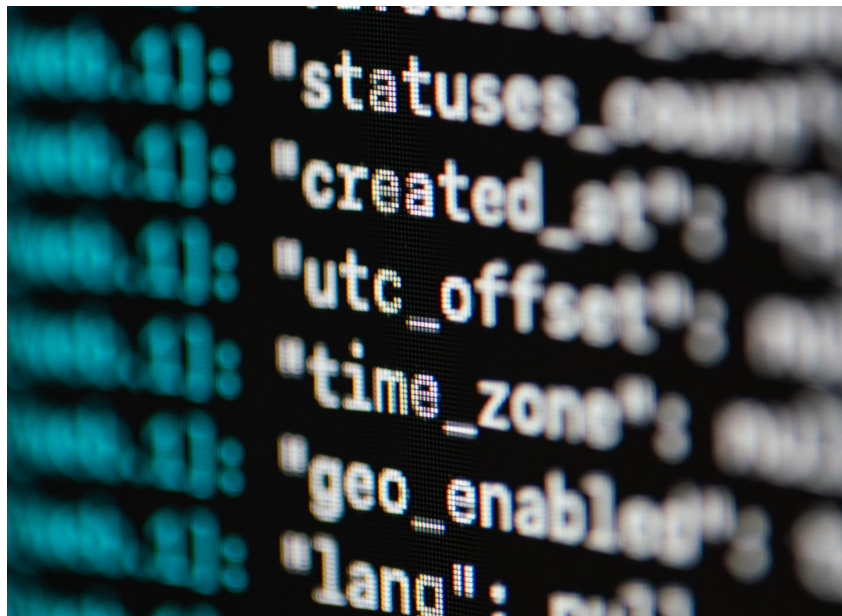
C* 5.0 – Trie memtables

- Memtable implementation based on trie data structure
- Better memory management due to more compact storage
- Can be placed off–heap, GC–friendly when on–heap
- Fast lookups resulting in faster writes + faster memtable reads

We need you!

- Anyone can contribute
- Mentors will guide you through the process
- Documentation is an easy way to get started
- Career booster + get hired!
- **cassandra.apache.org**

Be a contributor today!