Apache Ignite™ SQL Grid

A Hot Blend of Traditional SQL and IMDG

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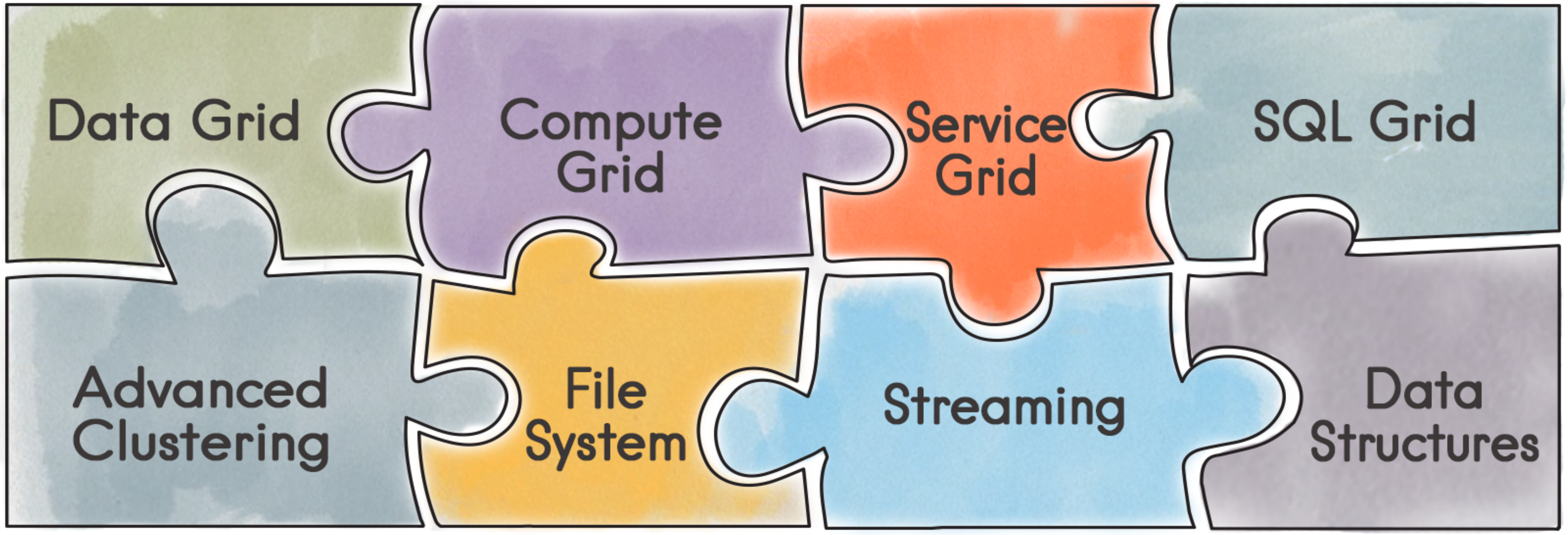
#apacheignite

Agenda

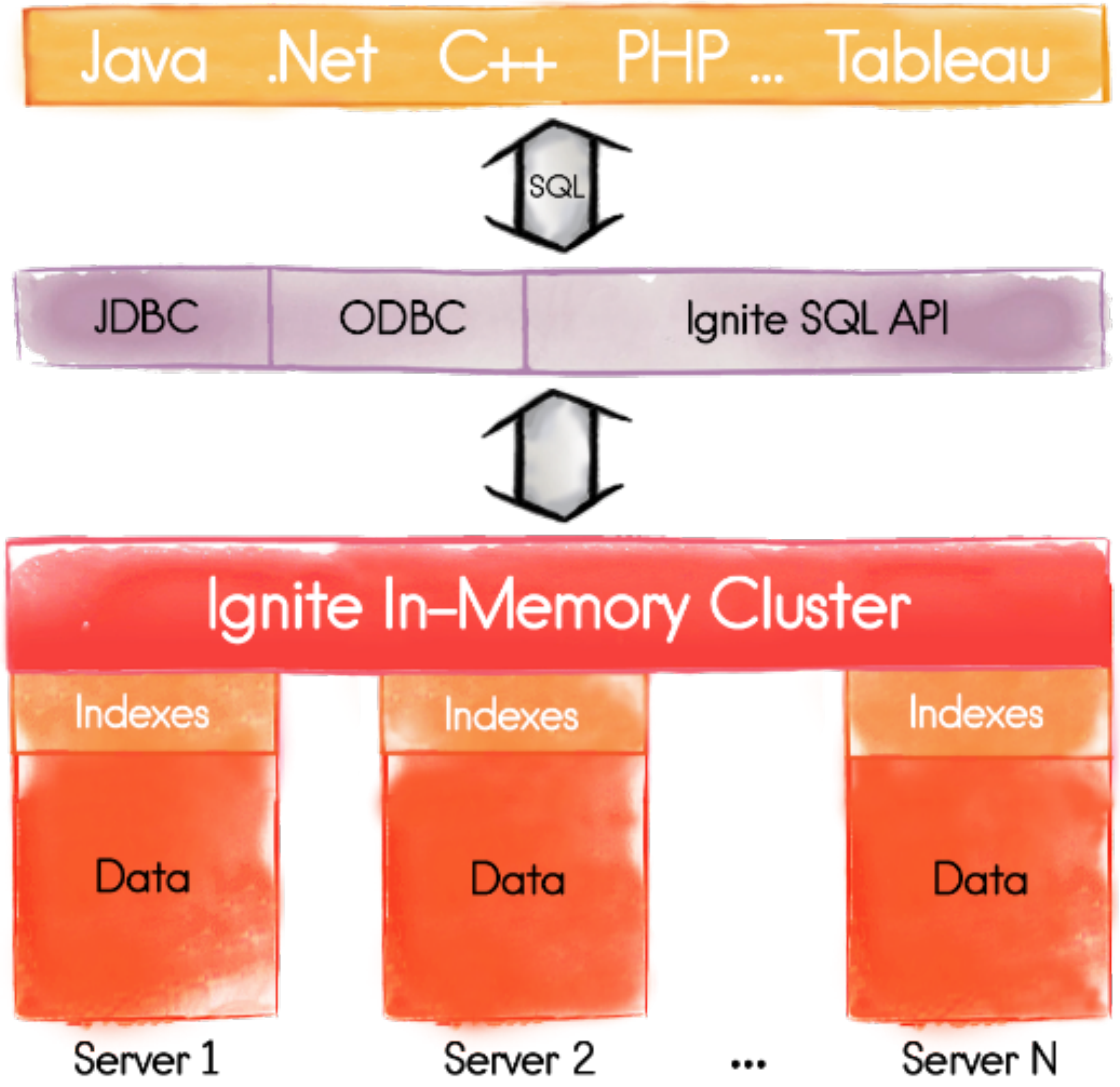
- Apache Ignite SQL Grid
- Distributed Queries
- Distributed DML
- Management & Visualization
- Demo
- Roadmap

Apache Ignite SQL Grid

In-Memory Data Fabric: More Than Data Grid



Ignite In-Memory SQL Grid



- ANSI-99
- SQL, DML, DDL
- Distributed JOINs
- ACID Transactions

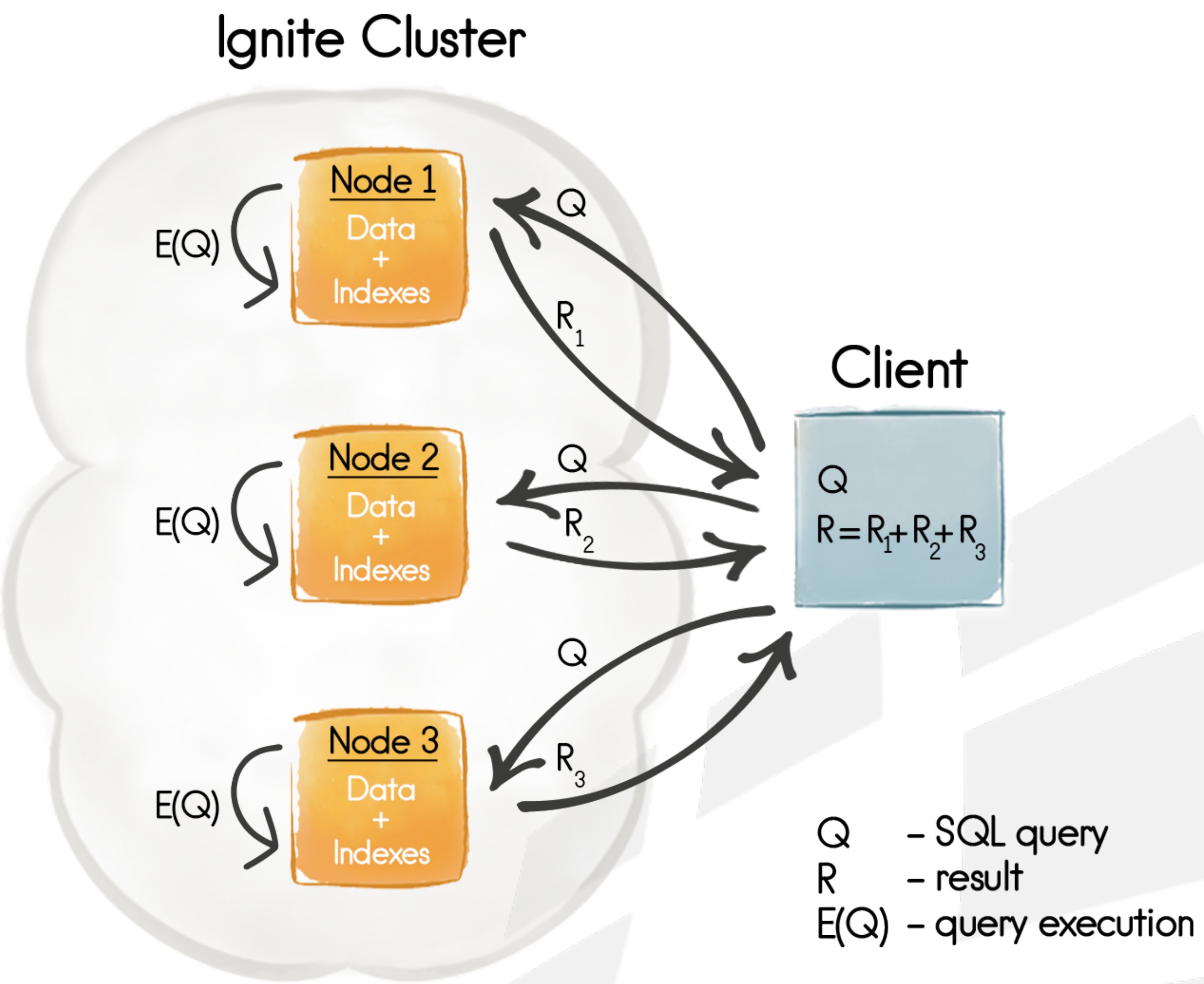
Distributed Queries

Apache Ignite SQL Grid

- ANSI-99 SQL Compliant
  - Aggregations, group by, sorting
  - Cross-cache joins, unions, etc.
- Distributed
  - Always consistent
  - Fault tolerant
- Advanced Indexing Support

Collocated SQL Queries

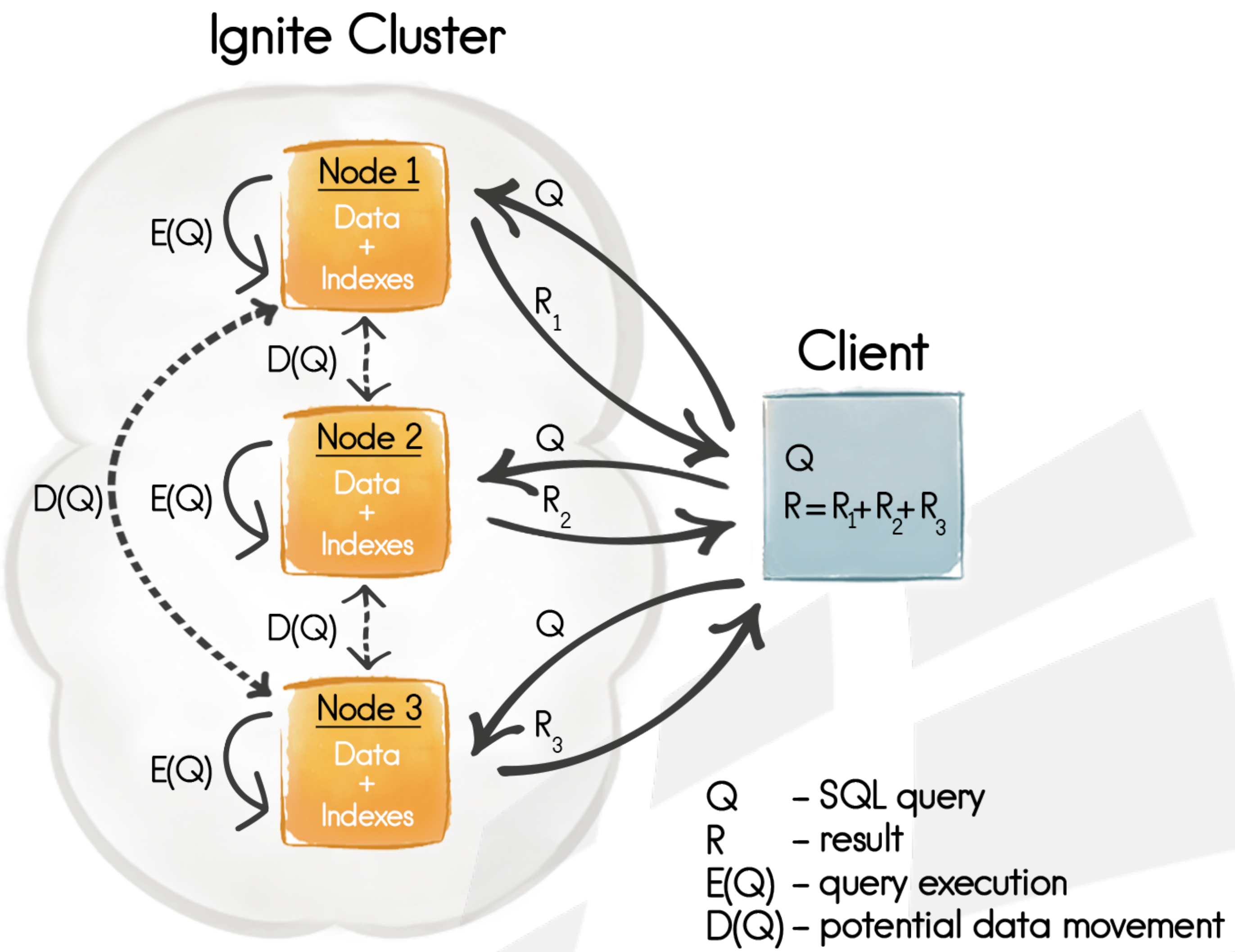
- Collocated Mode
  - Any kind of JOINs (ANSI-99)
  - Data has to be collocated in advance*
- Recommended mode
  - Avoids data movement
  - Enabled by default



Q – SQL query
R – result
E(Q) – query execution

Non-Collocated SQL Queries

- Non-Collocated Mode
  - No need to collocate data
  - Data movement on joins
- Use case
  - No feasible to achieve collocation
  - To support 100% of all SQL queries
- Disabled by default



Q – SQL query
R – result
E(Q) – query execution
D(Q) – potential data movement

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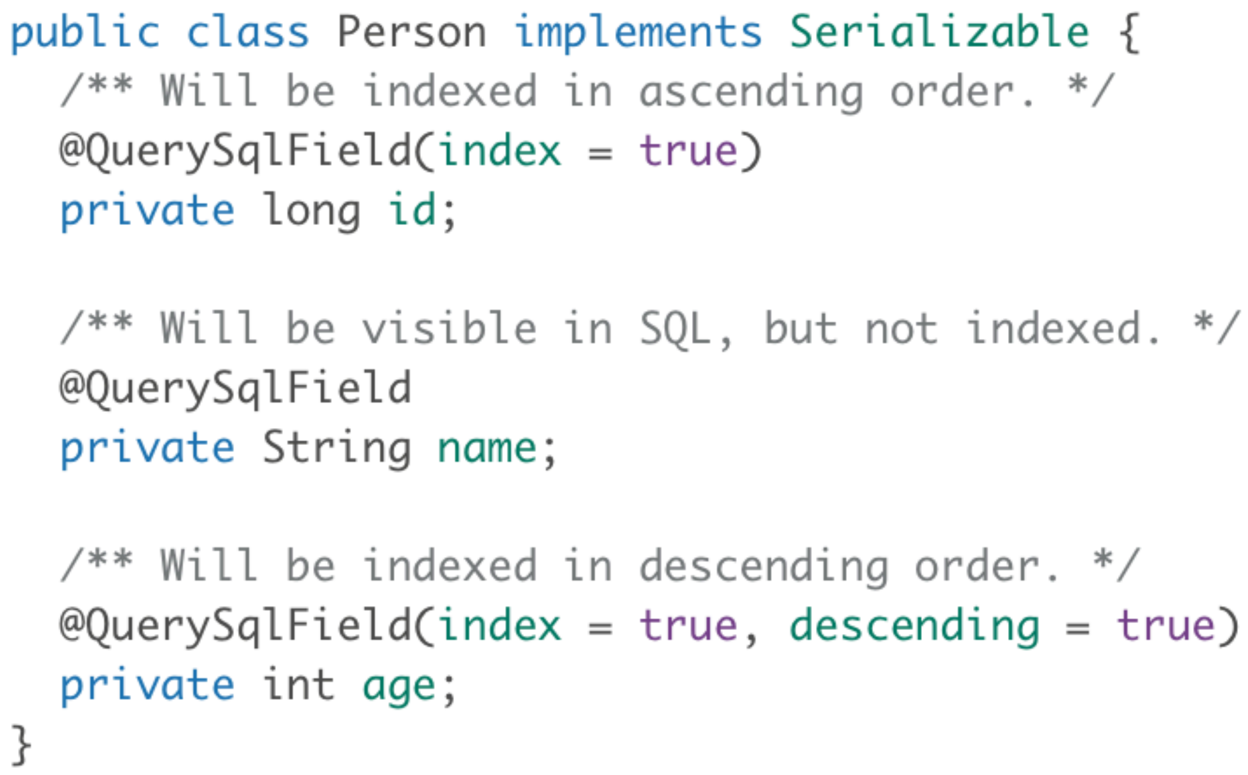
Apache Ignite SQL Grid: Indexes

- Single Field and Group Indexes
  - Annotate in code
  - Predefine in the configuration
- On-Heap Indexes
  - AVL tree with fast cloning
  - Concurrent skip list (default)
- Off-Heap Indexes
  - AVL tree with fast cloning

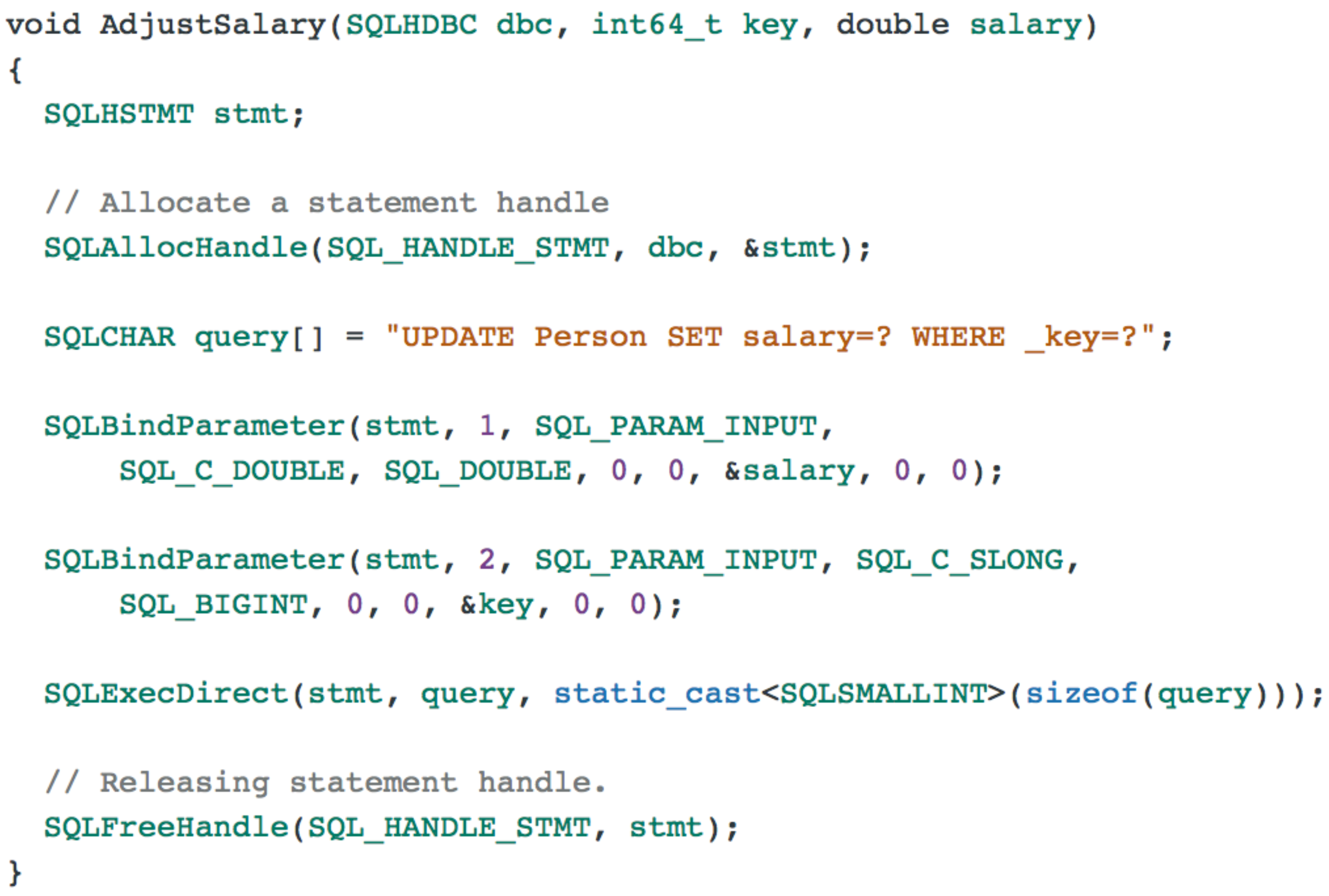


```
public class Person implements Serializable {
  /** Will be indexed in ascending order. */
  @QuerySqlField(index = true)
  private long id;

  /** Will be visible in SQL, but not indexed. */
  @QuerySqlField
  private String name;

  /** Will be indexed in descending order. */
  @QuerySqlField(index = true, descending = true)
  private int age;
}
```

Distributed DML

Distributed DML

- ANSI-99 Compliant
  - INSERT
  - UPDATE
  - DELETE
  - MERGE
- APIs
  - Java, .NET, C++
  - ODBC & JDBC

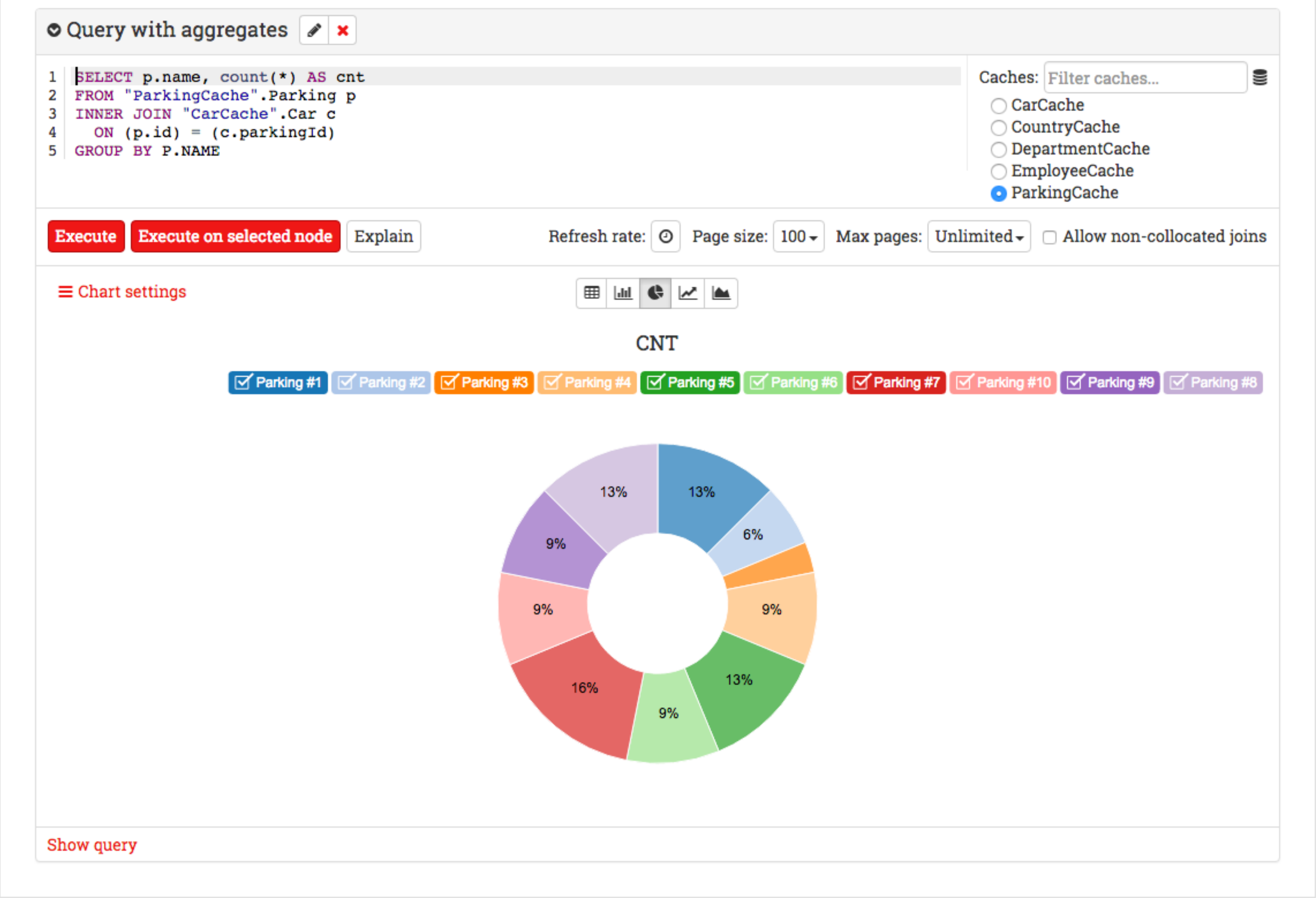


```
void AdjustSalary(SQLHDBC dbc, int64_t key, double salary)
{
  SQLHSTMT stmt;

  // Allocate a statement handle
  SQLAllocHandle(SQL_HANDLE_STMT, dbc, &stmt);

  SQLCHAR query[] = "UPDATE Person SET salary=? WHERE _key=?";

  SQLBindParameter(stmt, 1, SQL_PARAM_INPUT,
      SQL_C_DOUBLE, SQL_DOUBLE, 0, 0, &salary, 0, 0);

  SQLBindParameter(stmt, 2, SQL_PARAM_INPUT, SQL_C_SLONG,
      SQL_BIGINT, 0, 0, &key, 0, 0);

  SQLExecDirect(stmt, query, static_cast<SQLSMALLINT>(sizeof(query)));

  // Releasing statement handle.
  SQLFreeHandle(SQL_HANDLE_STMT, stmt);
}
```

Management & Visualization

Apache Ignite Web Console

- Configuration Wizard
- Management and Monitoring
- Benefits
  - No Connectivity Issues
  - HA and Fault-Tolerance
  - Multiple Deployment Modes
  - Lightweight Web Application



Query with aggregates

```
SELECT p.name, count(*) AS cnt
FROM "ParkingCache".Parking p
INNER JOIN "CarCache".Car c
  ON (p.id) = (c.parkingId)
GROUP BY P.NAME
```

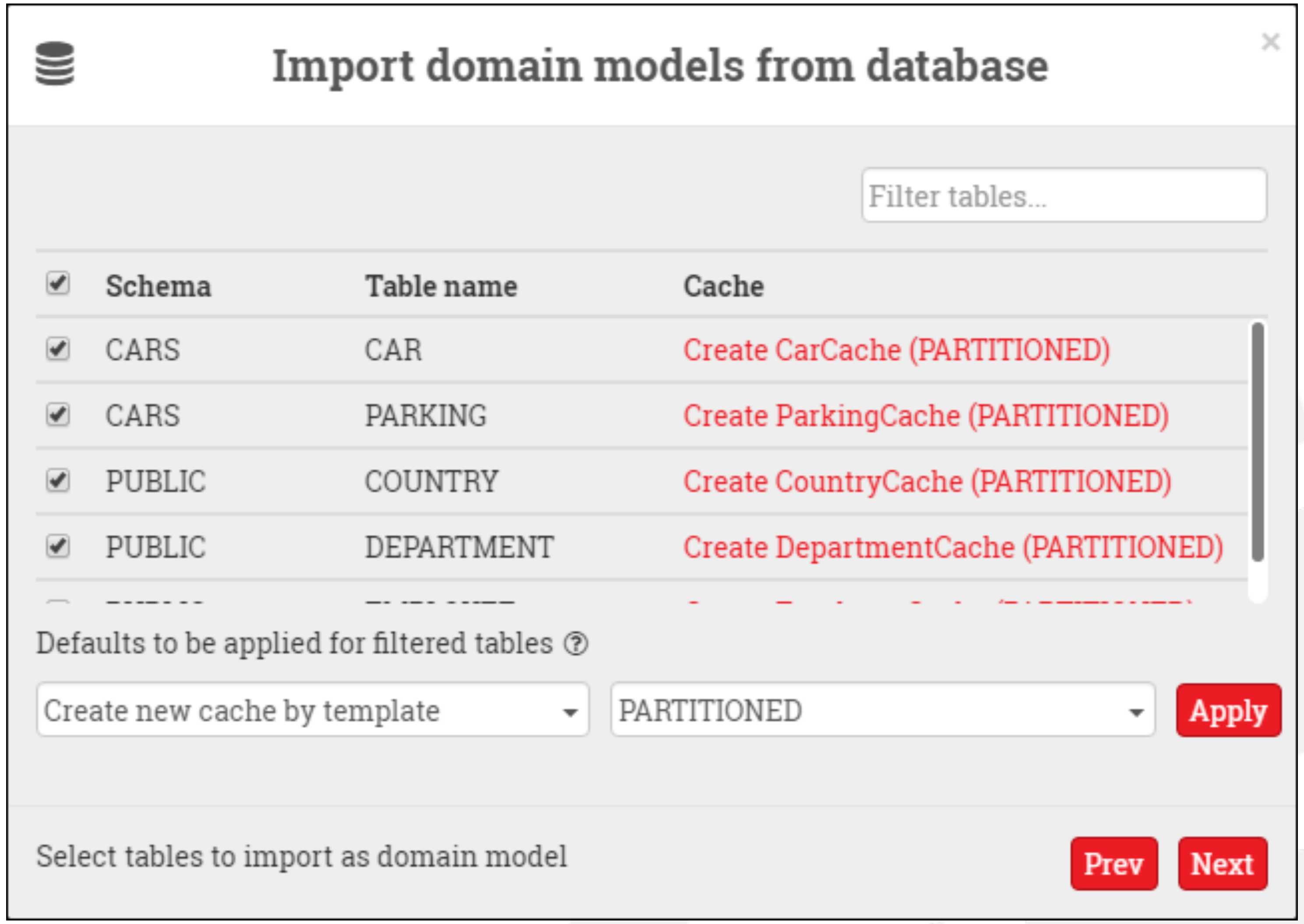
Caches: Filter caches...

○ CarCache
○ CountryCache
○ DepartmentCache
○ EmployeeCache
● ParkingCache

Refresh rate: Page size: 100 Max pages: Unlimited □ Allow non-collocated joins

Apache Ignite Web Console: RDBMS Schema Import

- Connect to Existing RDBMS
  - JDBC compliant
- Import Relational Scheme
  - Relational Tables to Caches
  - Indexes
- Benefit From Cache POJO Store
  - Read-through and write-through
  - Automatic data preloading



Import domain models from database

☑	Schema	Table name	Cache
☑	CARS	CAR	Create CarCache (PARTITIONED)
☑	CARS	PARKING	Create ParkingCache (PARTITIONED)
☑	PUBLIC	COUNTRY	Create CountryCache (PARTITIONED)
☑	PUBLIC	DEPARTMENT	Create DepartmentCache (PARTITIONED)

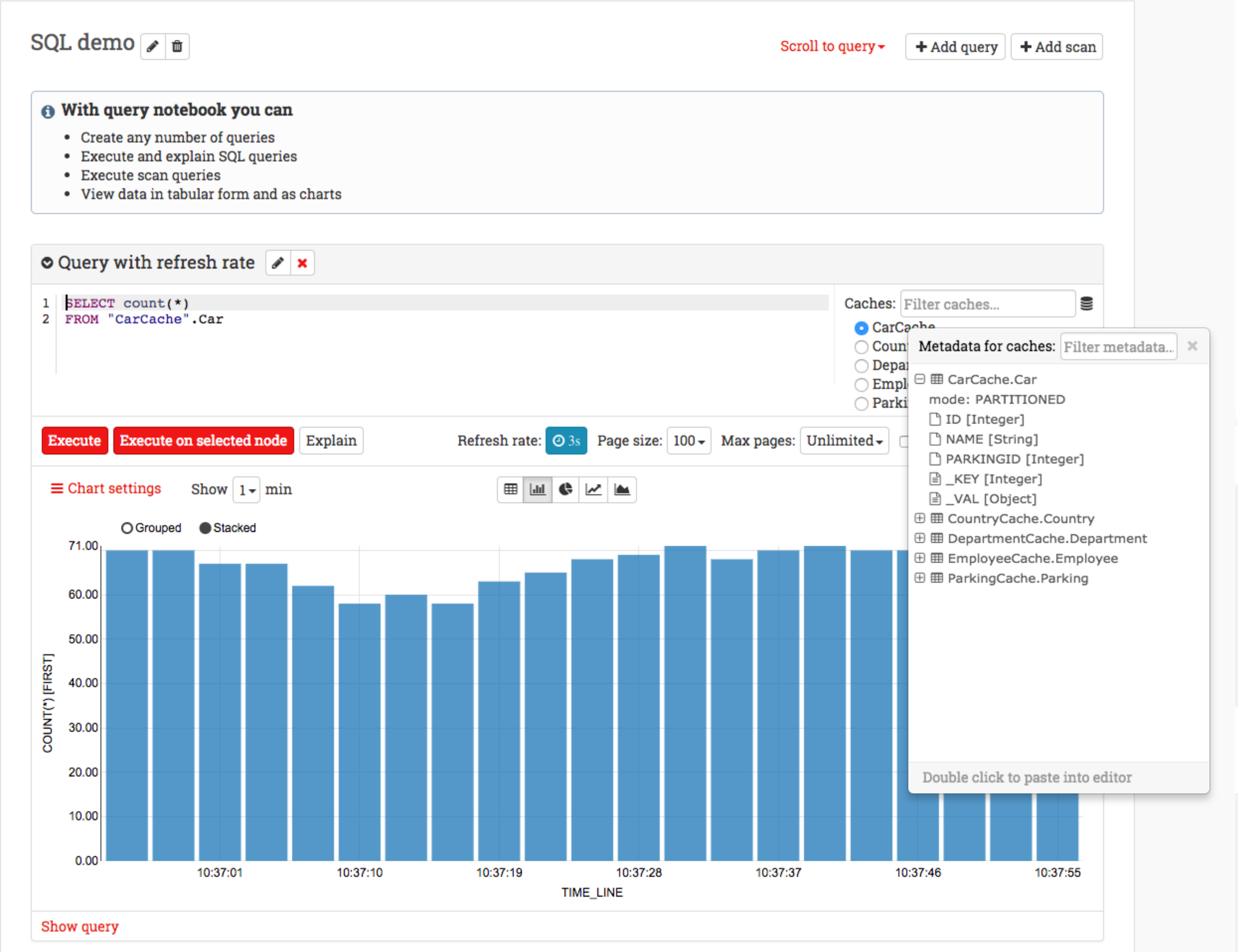
Defaults to be applied for filtered tables ?

Create new cache by template ▾ PARTITIONED ▾ Apply

Select tables to import as domain model

Apache Ignite Web Console: Queries Execution

- SQL Queries
  - SELECTs and DML
  - Execution plan
- Flexible Output
  - Tabular Form
  - Streaming Charts
  - Graphs



With query notebook you can

- Create any number of queries
- Execute and explain SQL queries
- Execute scan queries
- View data in tabular form and as charts

```
SELECT count(*)
FROM "CarCache".Car
```

Caches: Filter caches...

● CarCache
○ Coun
○ Depa
○ Empl
○ Parki

Metadata for caches: Filter metadata...

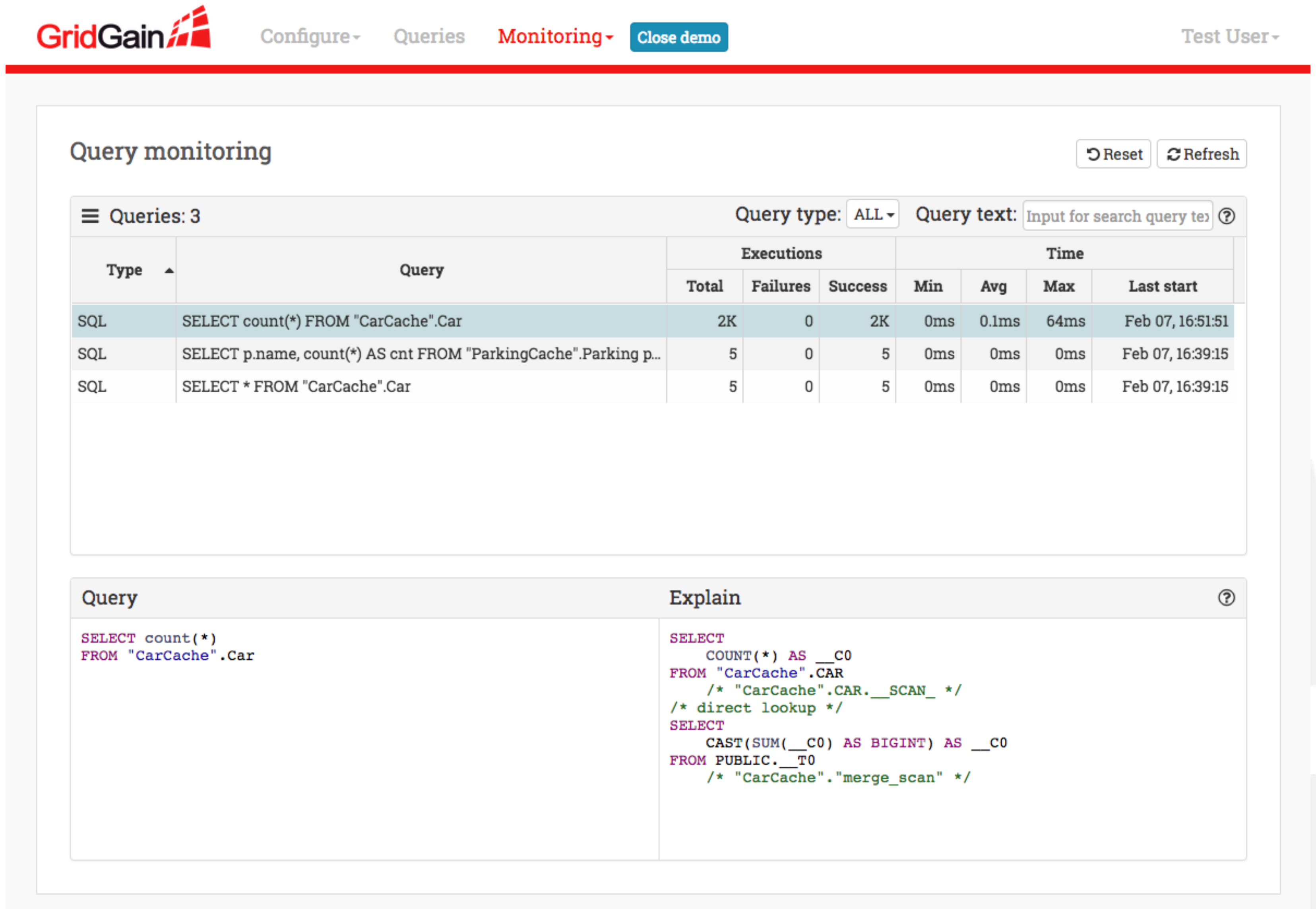
```
⊟ CarCache.Car
  mode: PARTITIONED
  ID [Integer]
  NAME [String]
  PARKINGID [Integer]
  _KEY [Integer]
  _VAL [Object]
⊞ CountryCache.Country
⊞ DepartmentCache.Department
⊞ EmployeeCache.Employee
⊞ ParkingCache.Parking
```

Double click to paste into editor

Refresh rate: 3s Page size: 100 Max pages: Unlimited

Apache Ignite Web Console:
Queries Monitoring

- Queries Monitoring
  - Queries Execution History
  - Running Queries Overview
- Management
  - Long Running Queries Termination



Query monitoring

Queries: 3

Type	Query	Executions			Time			
		Total	Failures	Success	Min	Avg	Max	Last start
SQL	SELECT count(*) FROM "CarCache".Car	2K	0	2K	0ms	0.1ms	64ms	Feb 07, 16:51:51
SQL	SELECT p.name, count(*) AS cnt FROM "ParkingCache".Parking p...	5	0	5	0ms	0ms	0ms	Feb 07, 16:39:15
SQL	SELECT * FROM "CarCache".Car	5	0	5	0ms	0ms	0ms	Feb 07, 16:39:15

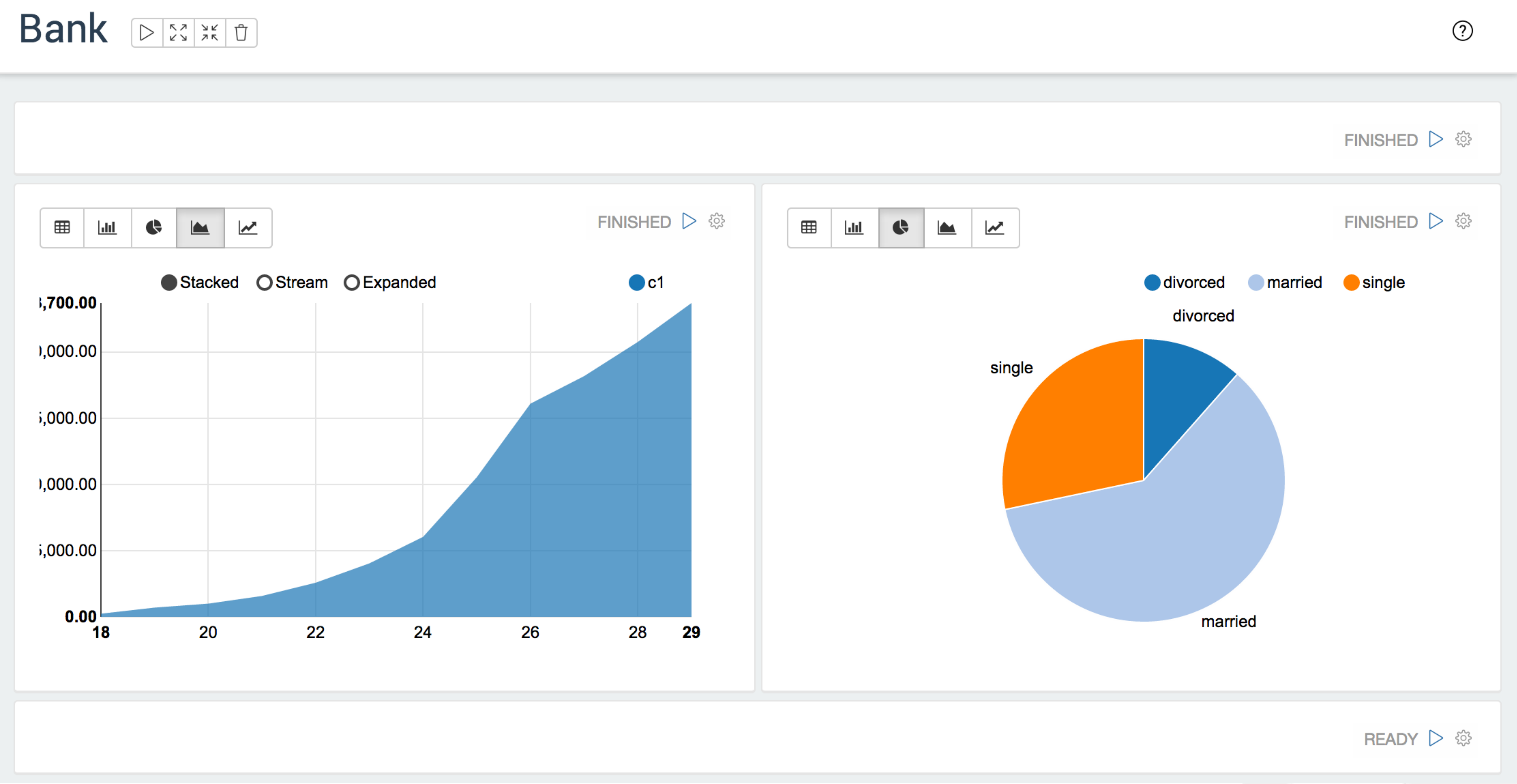
Query

```
SELECT count(*)
FROM "CarCache".Car
```

Explain

```
SELECT
    COUNT(*) AS __C0
FROM "CarCache".CAR
    /* "CarCache".CAR.__SCAN_ */
/* direct lookup */
SELECT
    CAST(SUM(__C0) AS BIGINT) AS __C0
FROM PUBLIC.__T0
    /* "CarCache"."merge_scan" */
```

Interactive SQL with Apache Zeppelin



Data Analysis with Tableau

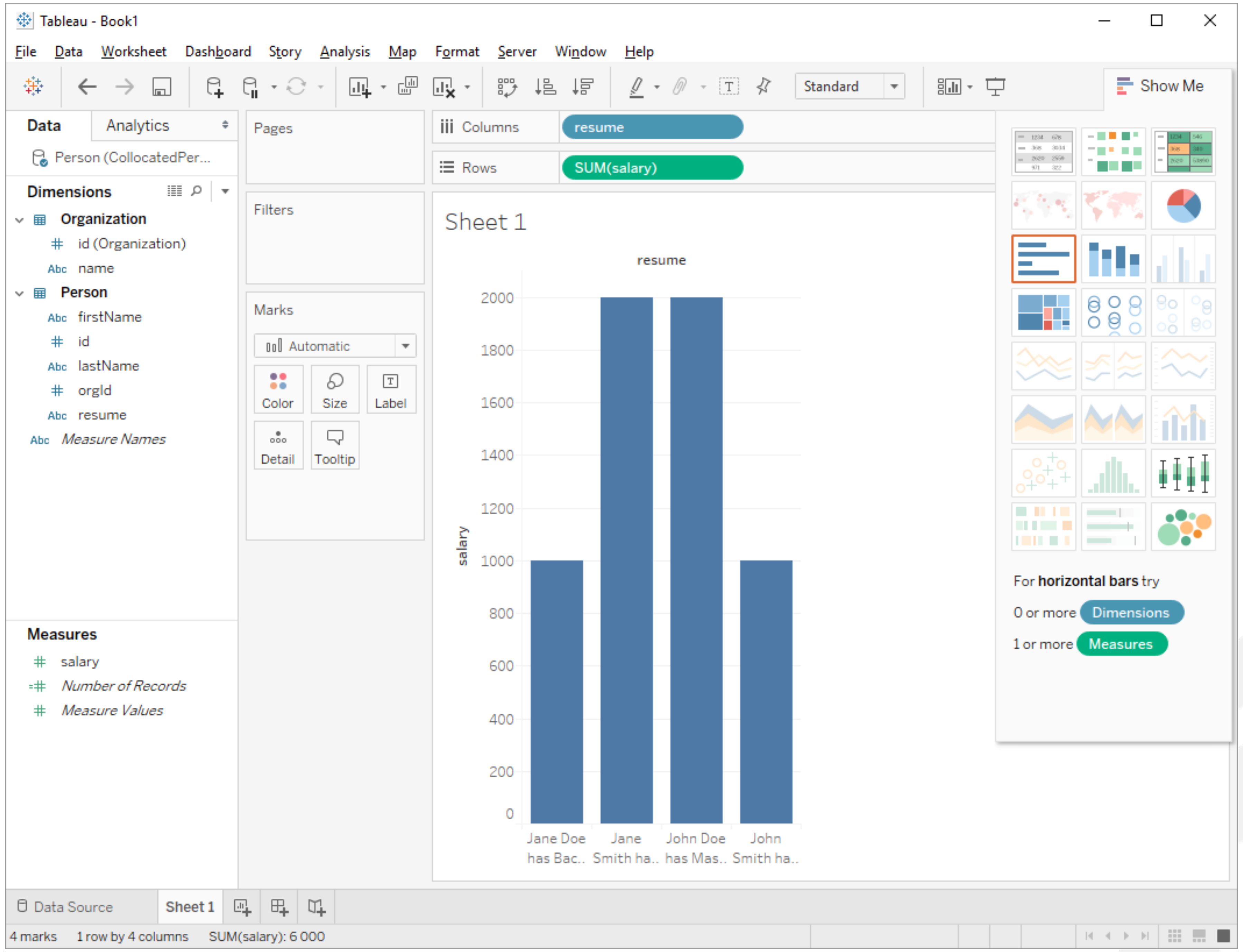


Tableau - Book1

Data: Person (CollocatedPer...

Dimensions
- Organization
  - id (Organization)
  - name
- Person
  - firstName
  - id
  - lastName
  - orgId
  - resume
- *Measure Names*

Measures
- salary
- *Number of Records*
- *Measure Values*

Columns: resume

Rows: SUM(salary)

Marks: Automatic

Sheet 1

For **horizontal bars** try

0 or more Dimensions

1 or more Measures

4 marks 1 row by 4 columns SUM(salary): 6 000

Demo

Roadmap

Apache Ignite SQL Grid: Roadmap

- Dynamic Indexes
- Distributed DDL
  - CREATE/DROP
  - ALTER
- Performance, performance!
  - OLTP & OLAP

ANY QUESTIONS?

Thank you for joining us. Follow the conversation.

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