



# Apache Ignite and Apache Spark

## Where Fast Data Meets the IoT

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<http://ignite.apache.org>



#apacheignite



#denismagda

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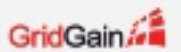


# Agenda

- IoT Demands to Software
- IoT Software Stack
  - Device OS/RTOS
  - Data Collection and Enrichment
  - HTAP Platform
  - Application APIs
- Demo

# IoT Demands to Software

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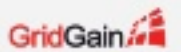
# IoT Demands to Software

- Real-time ingestion
- Real-time processing
- Time-series support
- Flexible Querying APIs
  - SQL
  - Full-text search
  - Geo-spatial
- Analytics
  - BI
  - Machine Learning
- High-availability
- Simple scalability



# IoT Software Stack

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# IoT Software Stack

Application APIs

HTAP Platform

Data Collection and Enrichment

Device OS / Real-Time OS

# Apache IoT Software Stack

Application APIs



HTAP Platform



Data Collection and Enrichment



Device OS / Real-Time OS





# Device OS/RTOS

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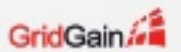
# Apache MyNewt

- Open Source RTOS
  - Cortex M0-M4
  - MIPS & RISC-V
- Networking
  - Bluetooth Low Energy
  - Wi-Fi
  - TCP/IP & UDP
- Build & Package Management
- Secure bootloader and signed images
- Remote Firmware Upgrade



# Data Collection and Enrichment

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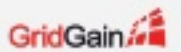
# Data Collection and Enrichment

- Spark Streaming
  - Fault-Tolerant Streams Processing
- Data Collection
  - Sockets
  - Kafka
  - Flume
- Data Enrichment
  - Spark API
- Data Storage
  - Apache Ignite



# HTAP Platform

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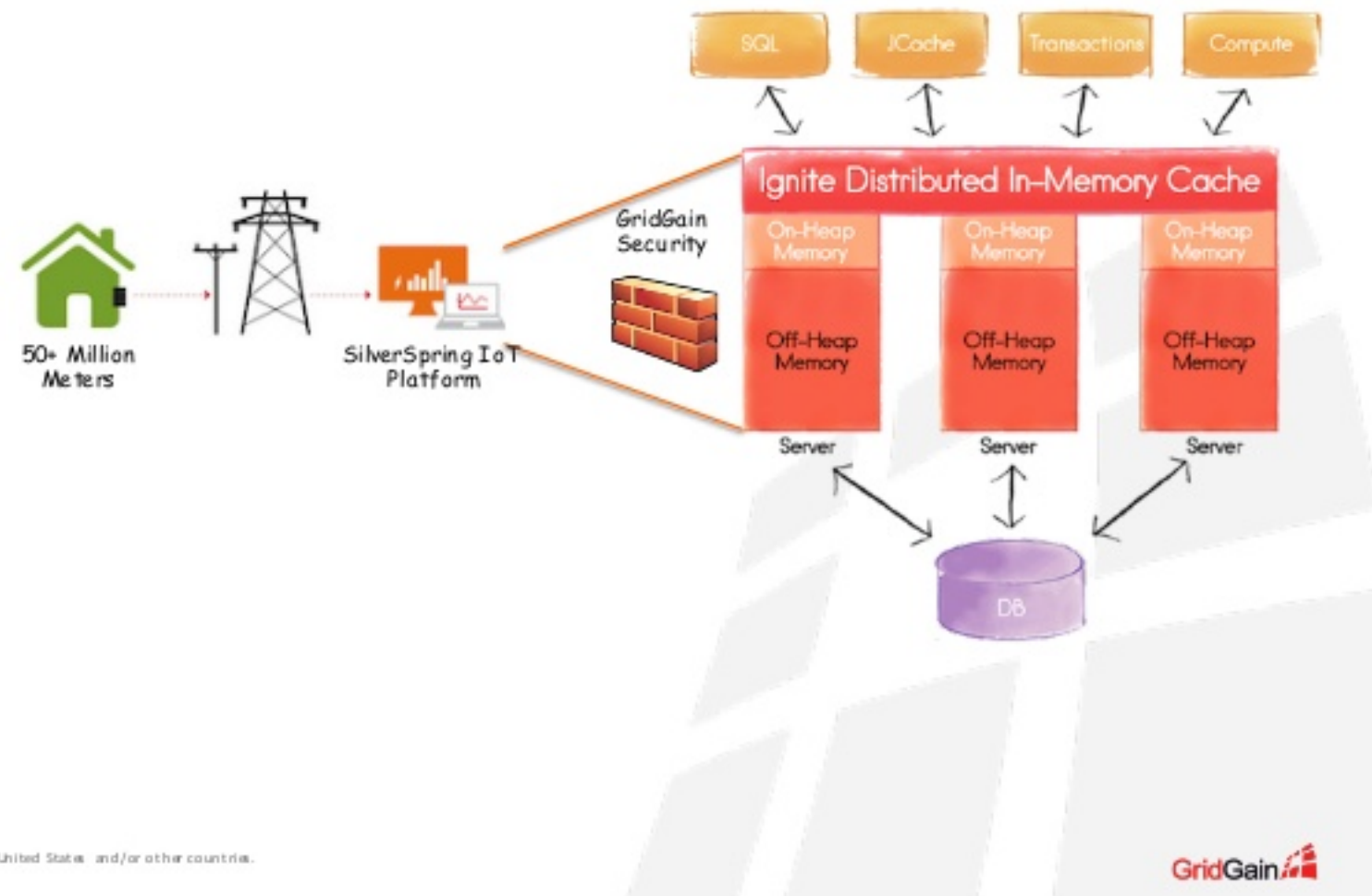


# Use Case:



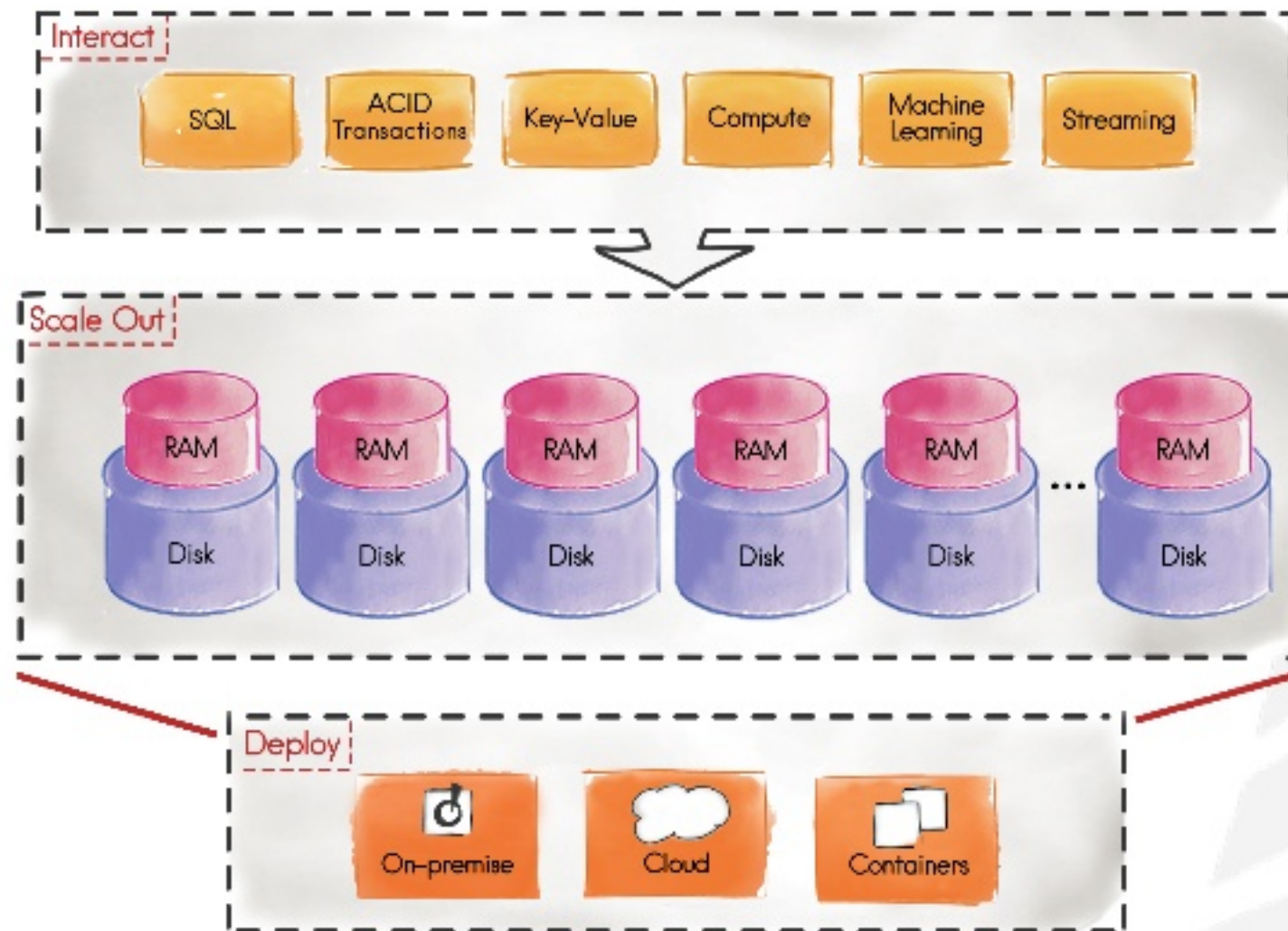
*Smart Metering and Utilities – delivers a comprehensive IOT platform*

- SilverSpring Requirements
  - Migrate to in-memory processing
  - Add scalability & elasticity
  - Use open source technologies
- SilverSpring Solution
  - SaaS Architecture
    - Multi-Tenancy
    - Advanced Security
  - Strong compute capabilities
    - Co-located in-memory processing
  - Demonstrated best
    - On-demand elasticity & scalability
    - ANSI-99 SQL Support
    - Transactional consistency



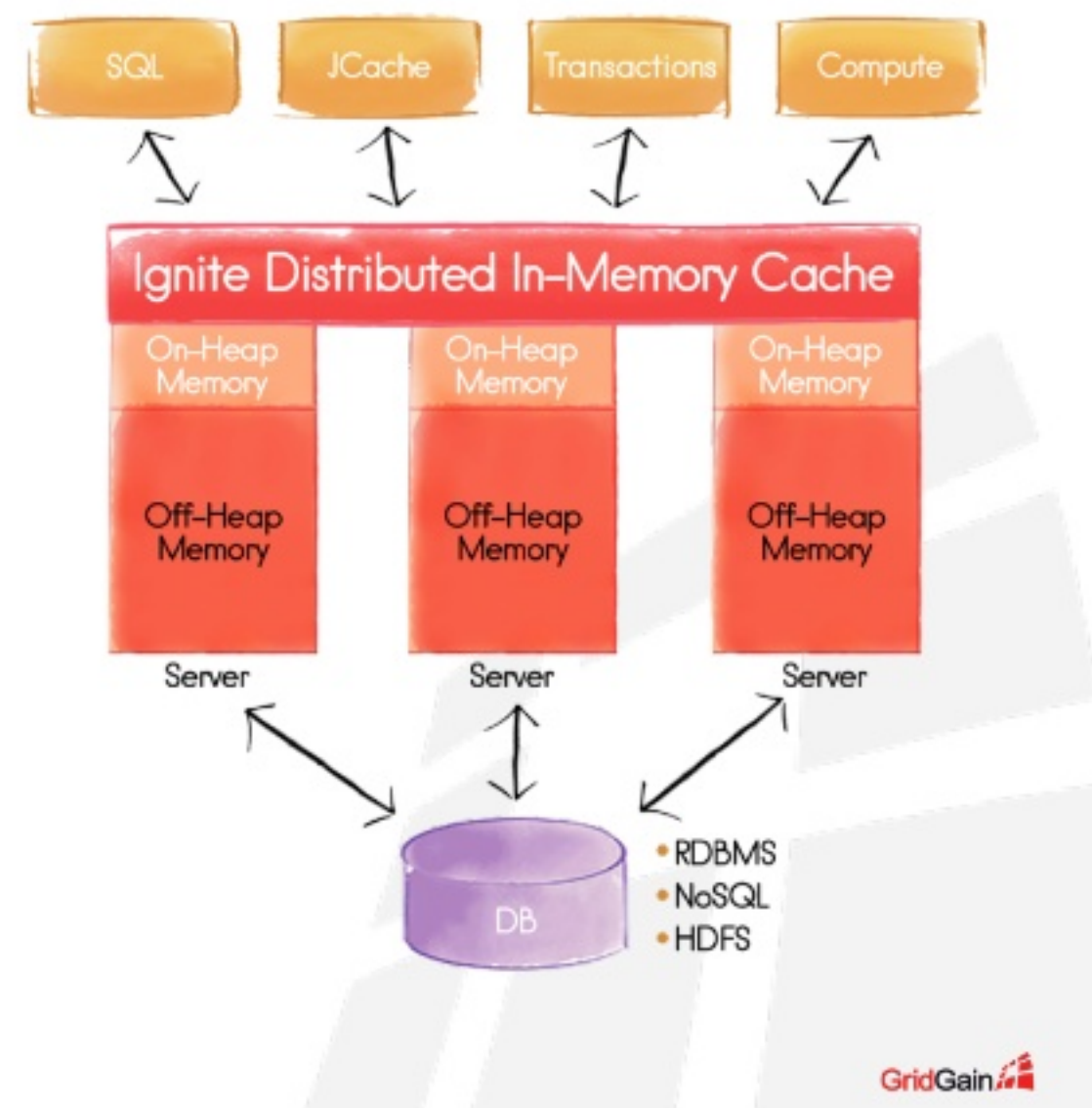


# Apache Ignite HTAP Platform



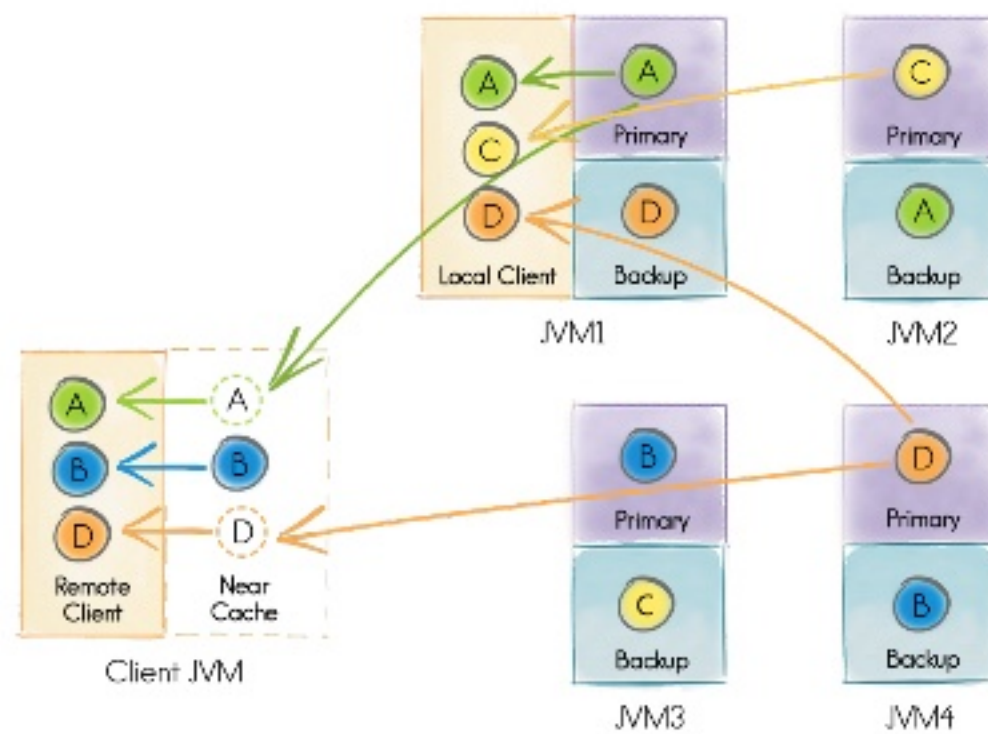
# Key-Value Data Grid

- Distributed Key-Value Data Store
- Data Reliability
- High-Availability
  - Active replicas, automatic failover
- Data Consistency
  - ACID distributed transactions

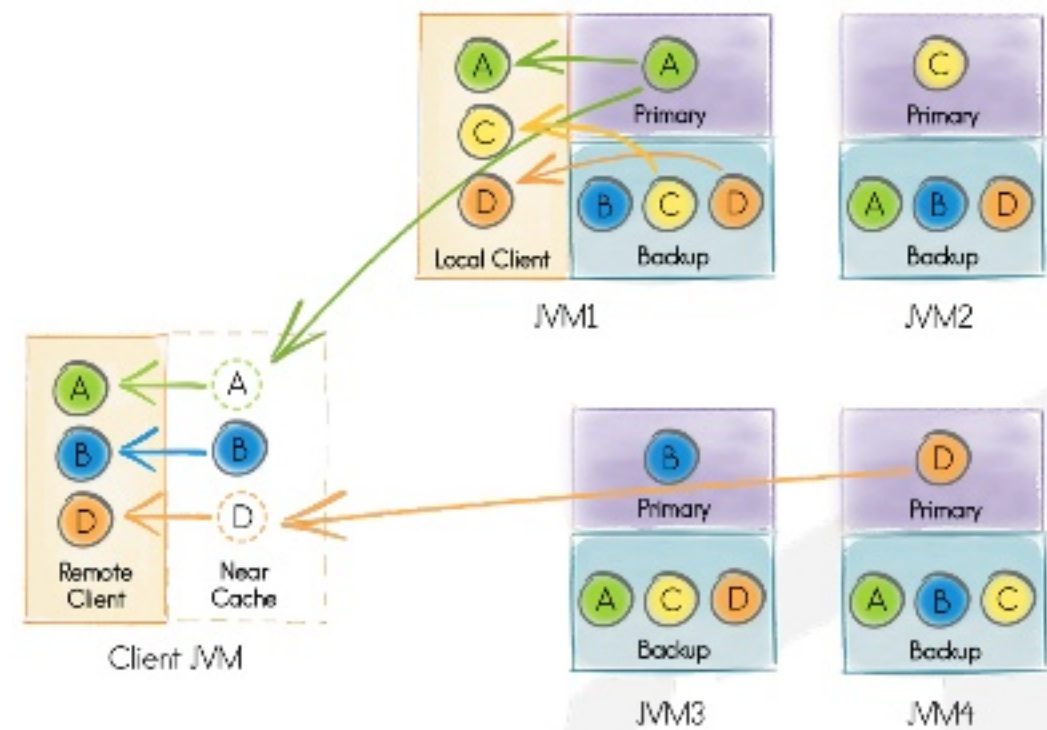




# In-Memory Data Grid: Partitioning



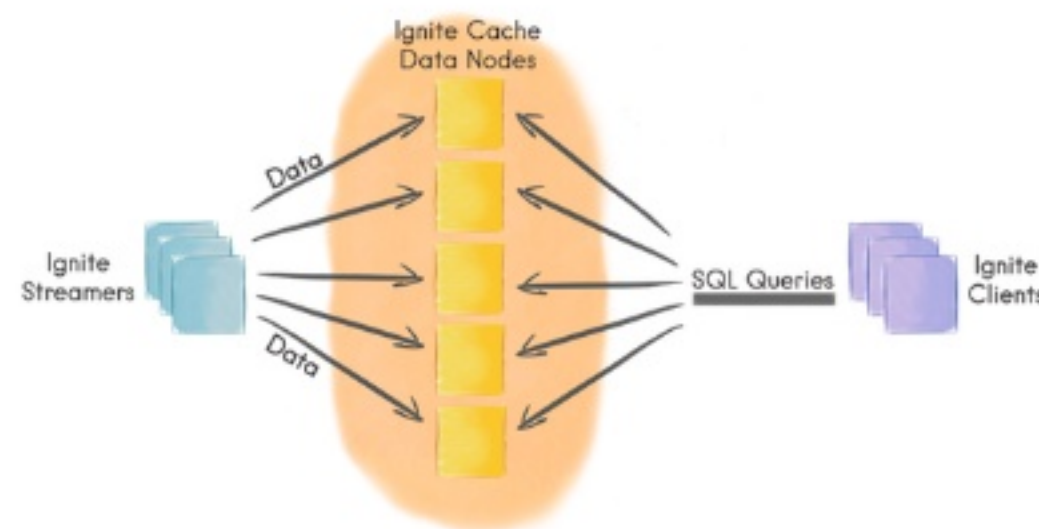
Partitioned Cache



Replicated Cache

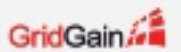
# Streaming to Ignite

- Ignite Data Streamer
  - Fastest Data Injection
  - Automatic data partitioning
- Stream Receivers
  - Custom logic execution
  - Additional data transformation
- Stream Adapter
  - Socket
  - Kafka
  - Flink
  - RocketMQ
  - etc.



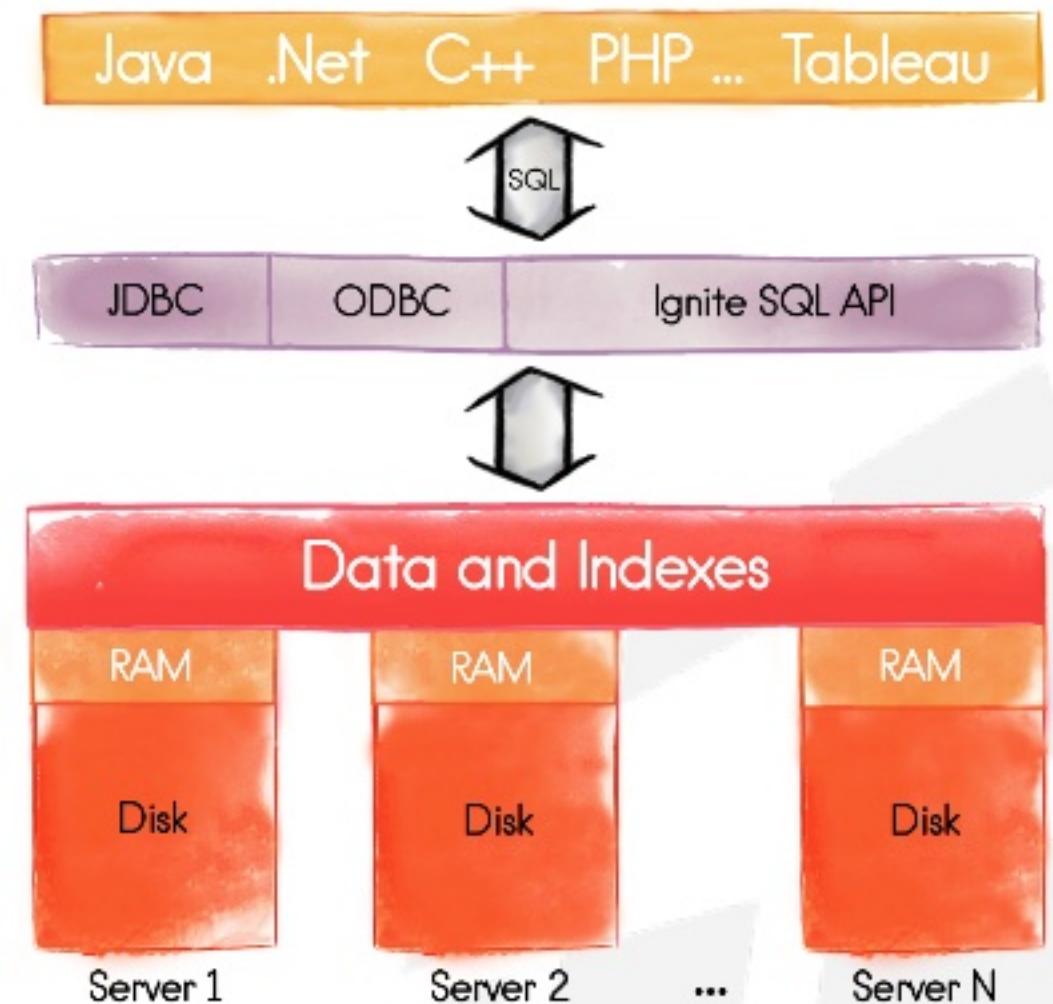
# Application APIs

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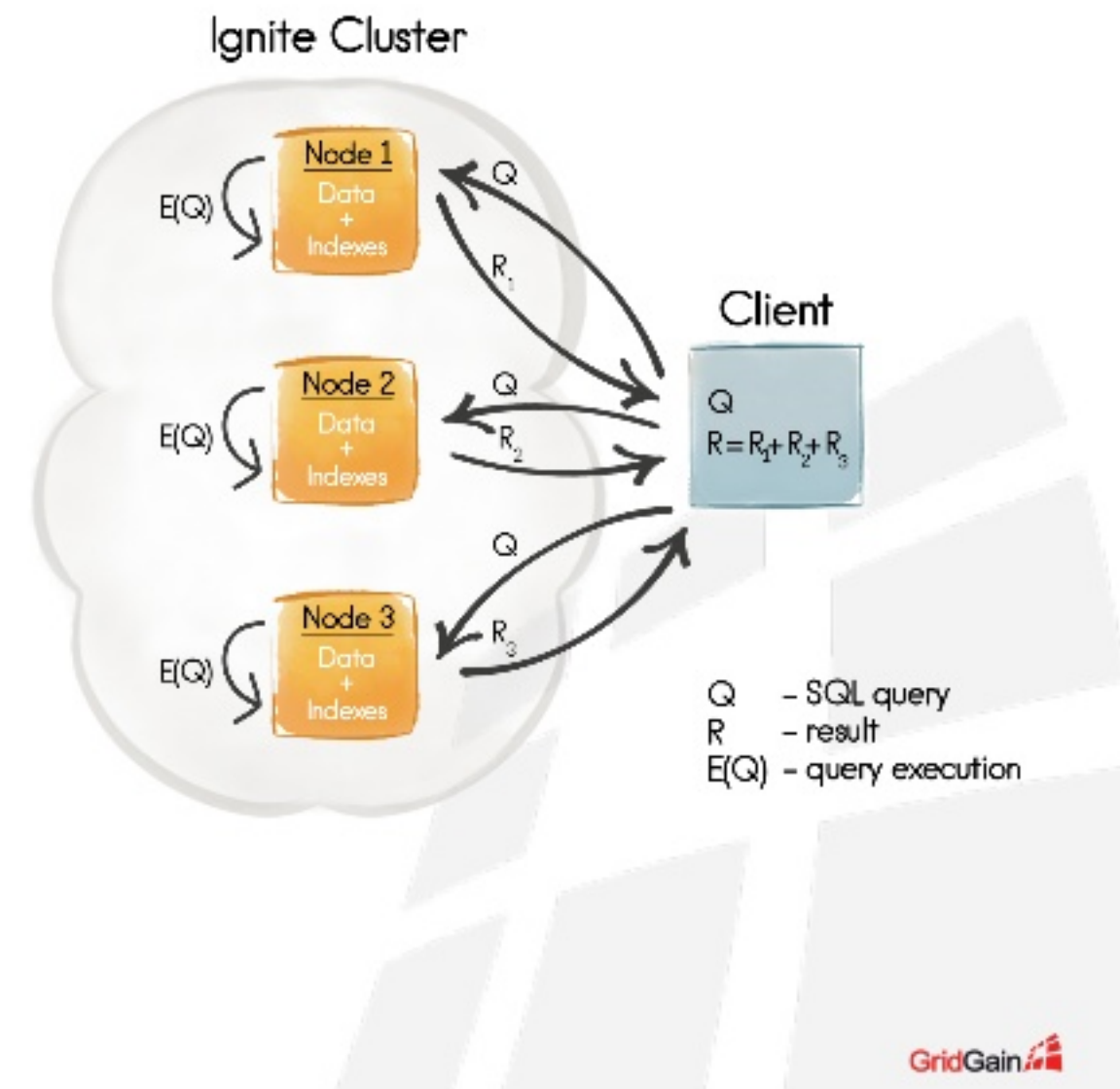
# Apache Ignite SQL APIs

- ANSI-99 SQL
- Geo-spatial Queries
- Full-text Search
- Always Consistent
- Fault Tolerant
- Cross-Platform
  - JDBC and ODBC drivers
  - DML (INSERT, UPDATE, etc.)
  - DDL (CREATE, DROP, etc.)



# Apache Ignite SQL Grid: Queries

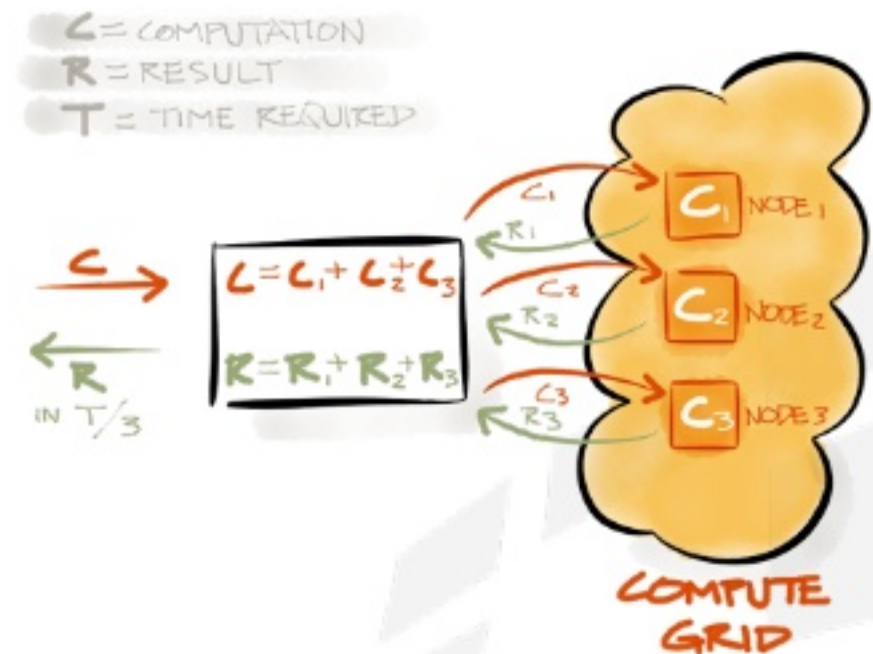
- Distributed Joins
- Automatic Group By, Aggregations, Sorting
- Cross-Cache Joins, Unions, etc.
- Ad-Hoc SQL Support





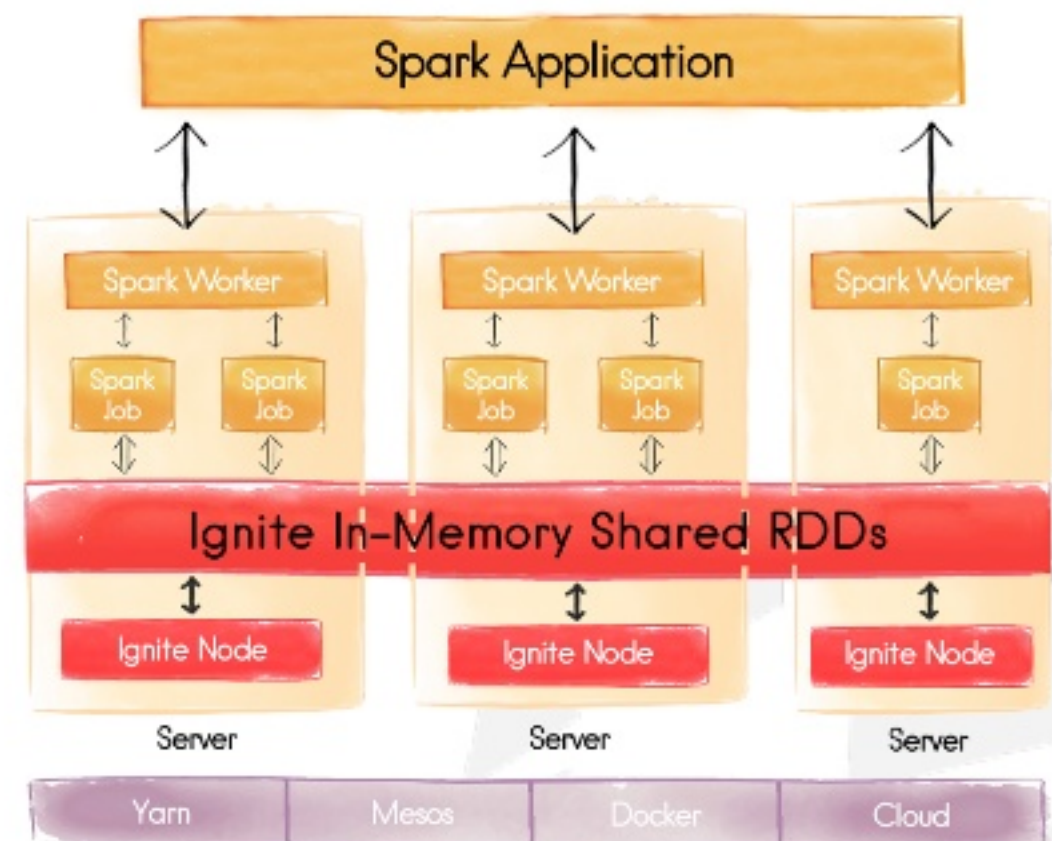
# Apache Ignite Compute Grid

- Direct API for MapReduce
- Direct API for ForkJoin
- Zero Deployment
- State Checkpoints
- Load Balancing
- Automatic Failover



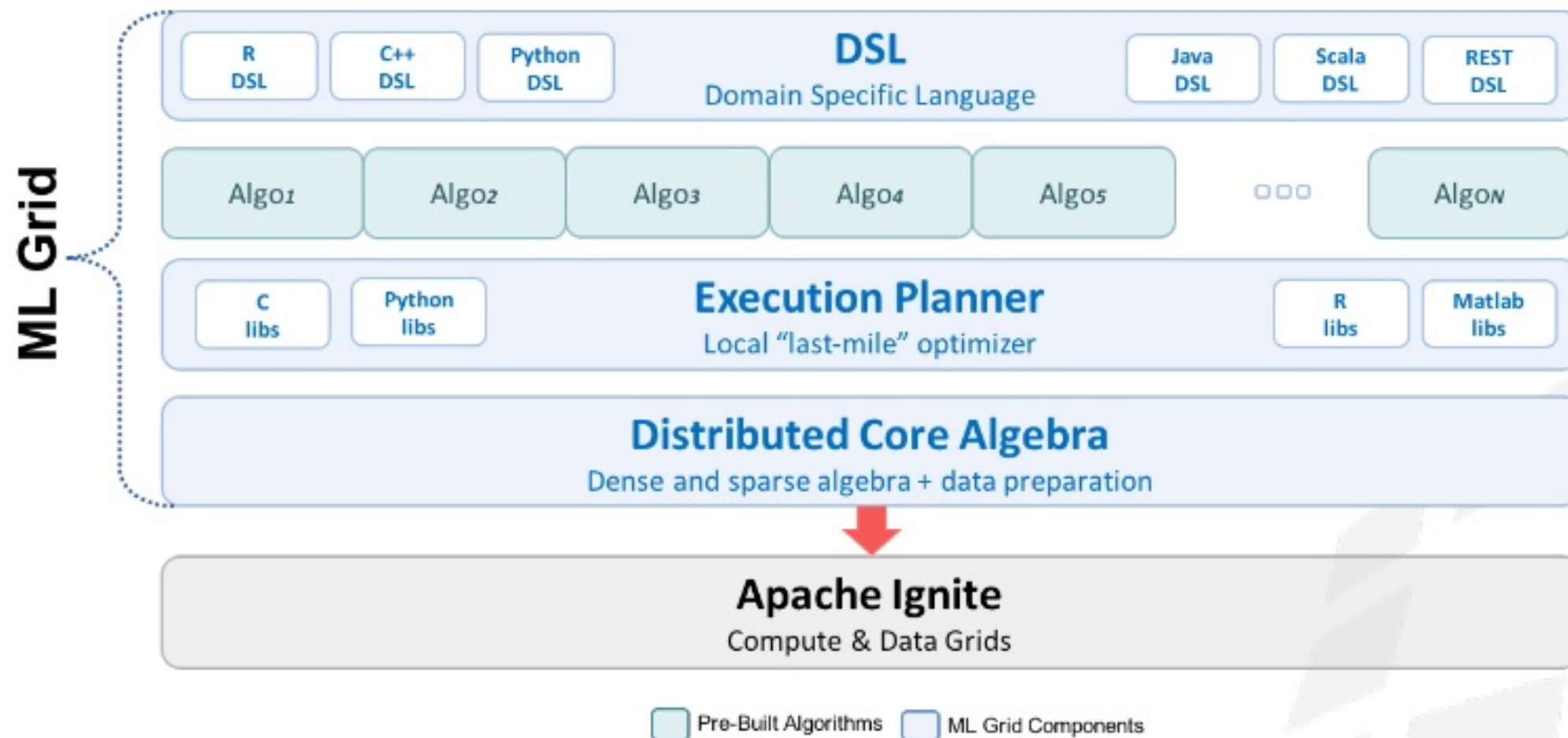
# Spark Shared RDDs

- IgniteRDD
  - Share RDD across jobs on the host
  - Share RDD across jobs in the application
  - Share RDD globally
- Faster SQL
  - In-Memory Indexes
  - SQL on top of Shared RDD



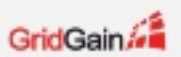


# Machine Learning Grid



# Demo

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# Resources

- Documentation:
  - Apache Ignite: <https://apacheignite.readme.io/docs>
  - Apache Spark Streaming: <http://spark.apache.org/streaming/>
  - Ignite and Spark Integration: <https://apacheignite-fs.readme.io/docs/ignite-for-spark>
  - Apache MyNewt: <http://mynewt.apache.org>
- Demo Source Code:
  - <https://github.com/dmagda/igniteSparkIoT>



## ANY QUESTIONS?

Thank you for joining us. Follow the conversation.

<http://ignite.apache.org>



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