GridGain

apache Ignite

Redis Replaced:
Why Companies Turn to Apache Ignite

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GridGain Product Management

Agenda

- Caching Evolution
  - Hardware and OS Caching
  - Application Caches
  - Distributed Caches
  - Data Grids
  - In-Memory Computing Platforms
- Apache Ignite Way of Caching
  - Database Caching
  - Collocated Processing
  - SQL, ACID and Persistence
- Q & A

Caching Evolution

Cache is a hardware or software component that stores data so future requests for that data can be served faster

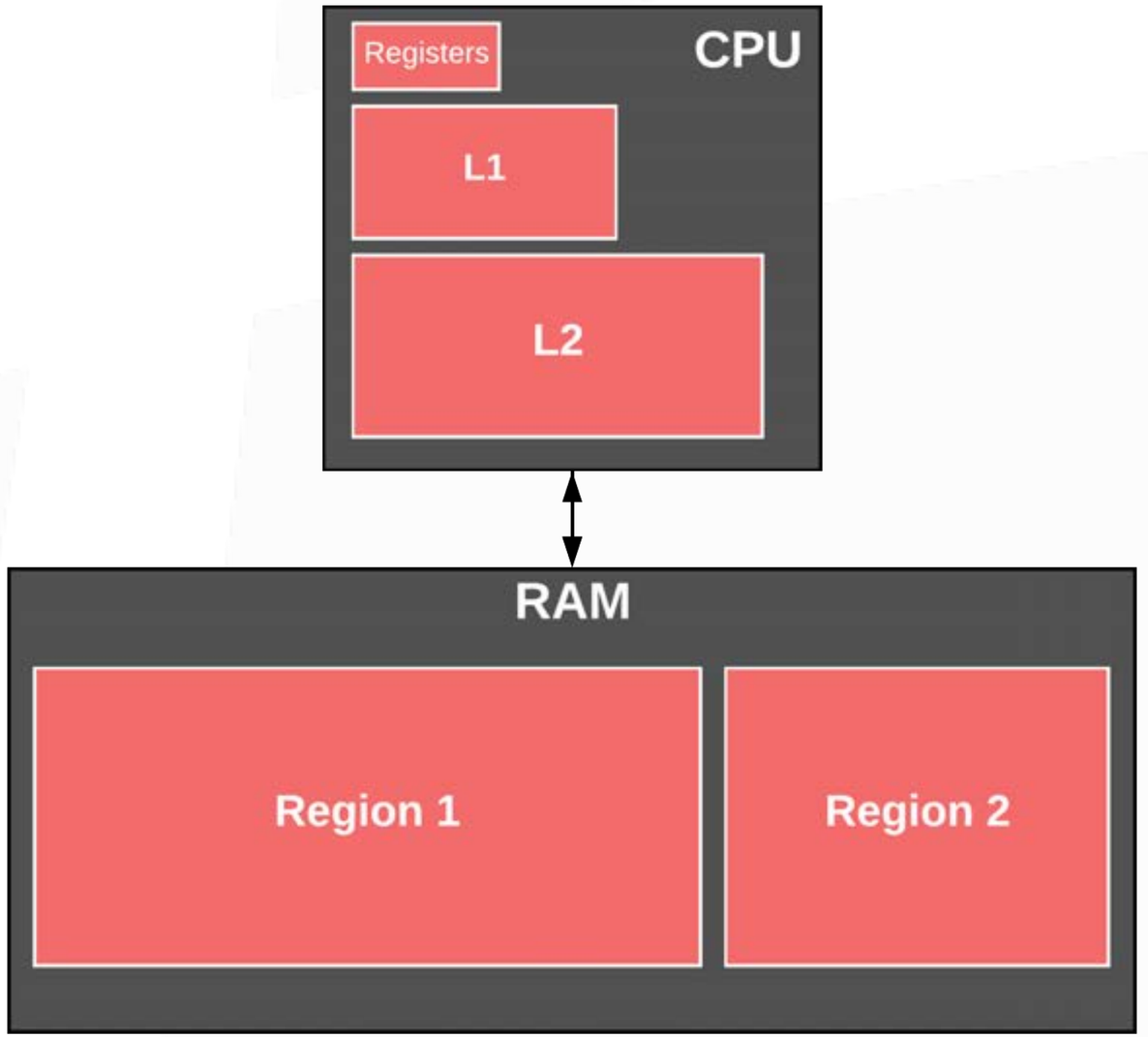
Caching Evolution

CPU Caches 1980	**Linux Page Cache** 1991-2001	**In-App Caches** 90s - early 2000s	**Distributed Caches** Mid 2000s	**Data Grids** Late 2000s	**In-Memory Computing** Present Time

Hardware Caches

- CPU L1, L2, L3 Caches
- GPU Caches

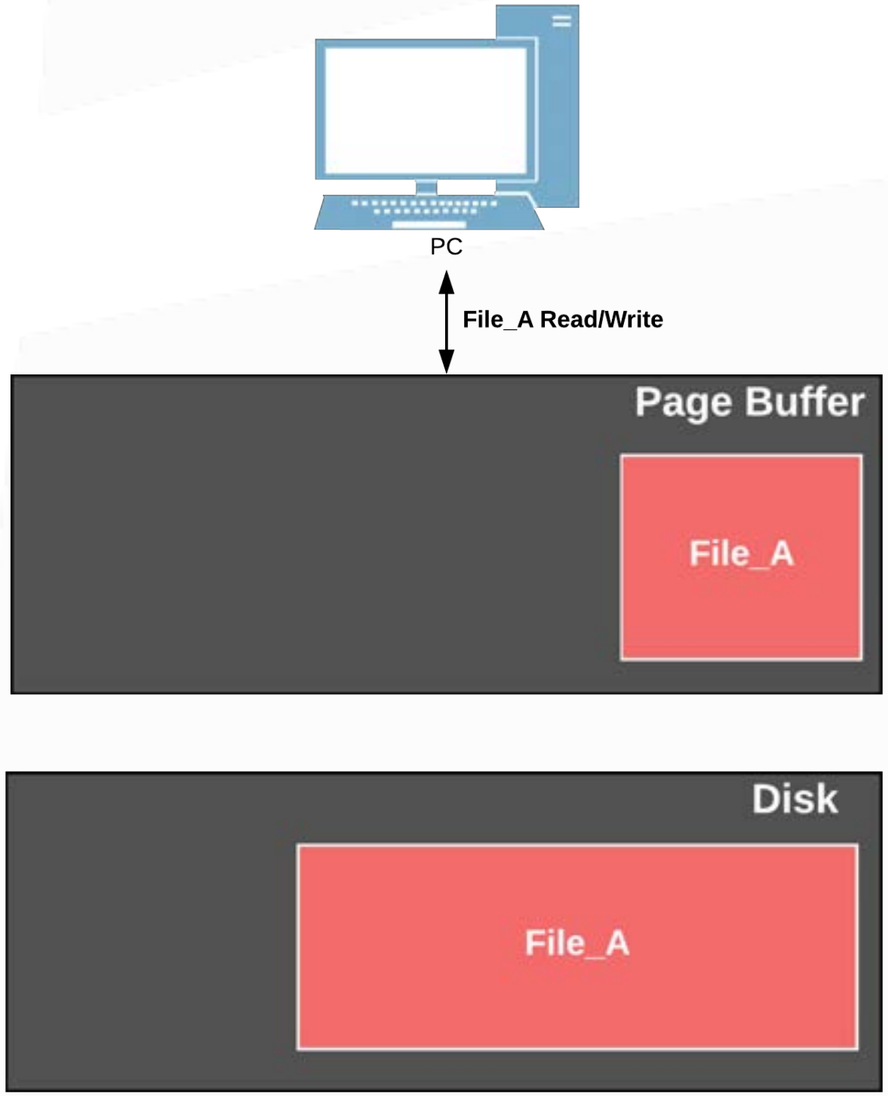
- Benefits
  - Speed up Hardware
  - RAM is slow!



Operating System Caching

- Virtual Memory
- Page Cache and Buffer Cache
- Memory Mapped Files

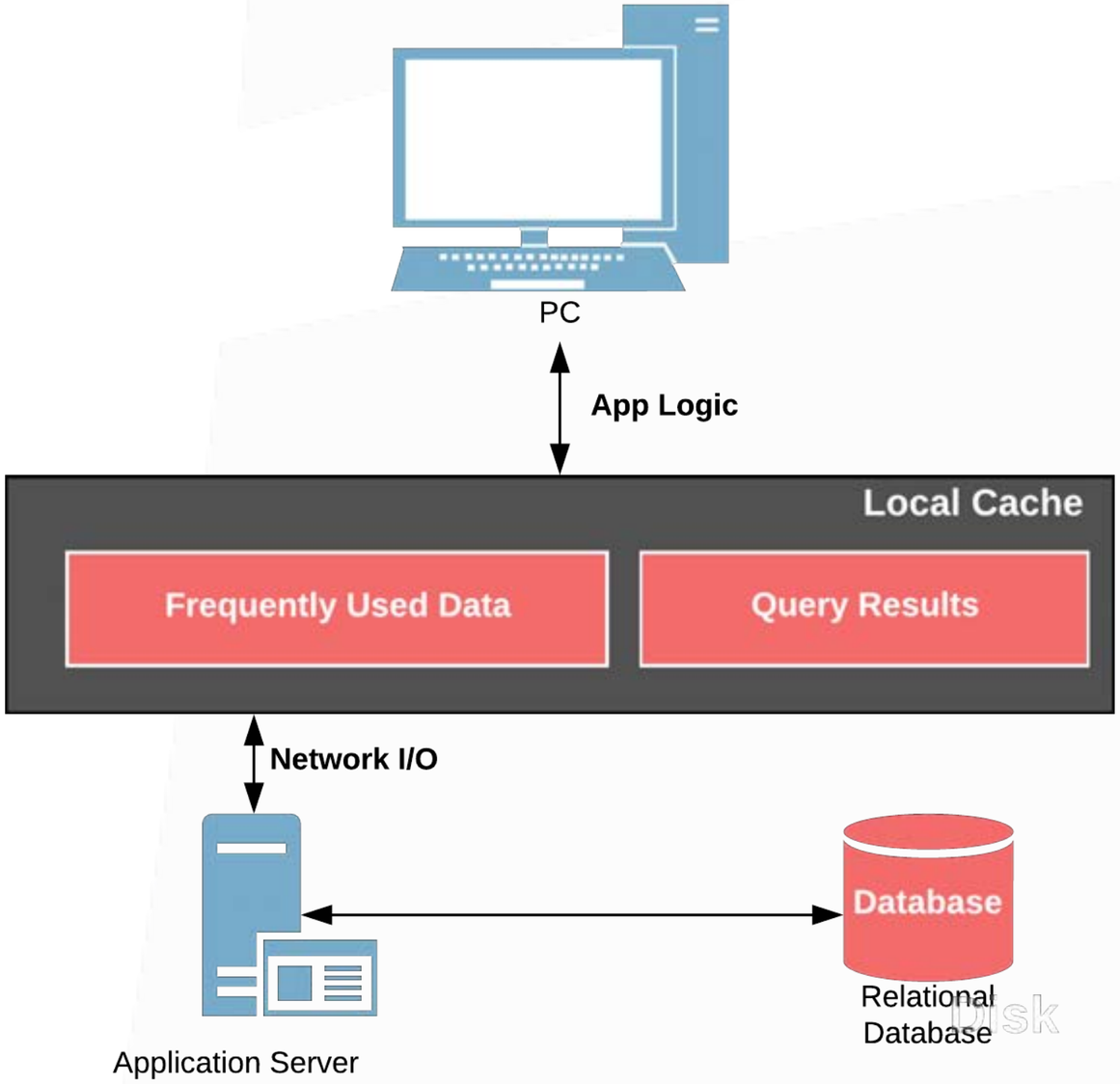
- Benefits
  - Speed up I/O
  - Disk is slow!



In-App Caching

- Application In-Processing Caching
  - Querying Results
  - Most Frequently Used Data
- Browser Caching

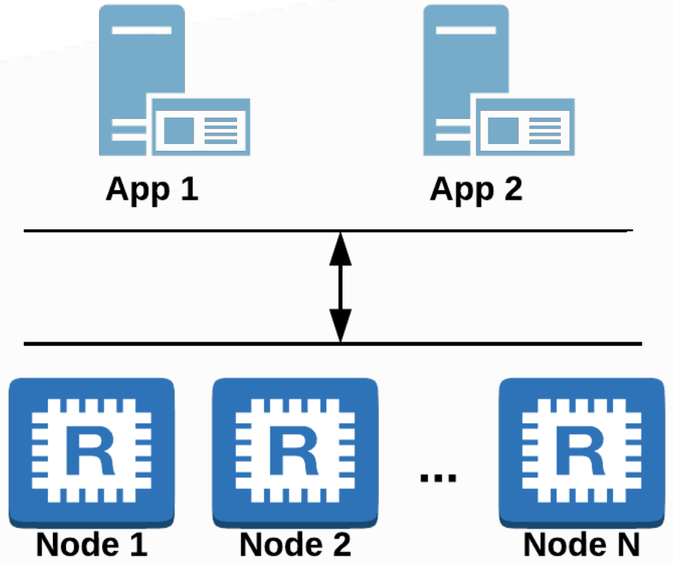
- Benefits
  - Speed up Applications!
  - Network is slow!



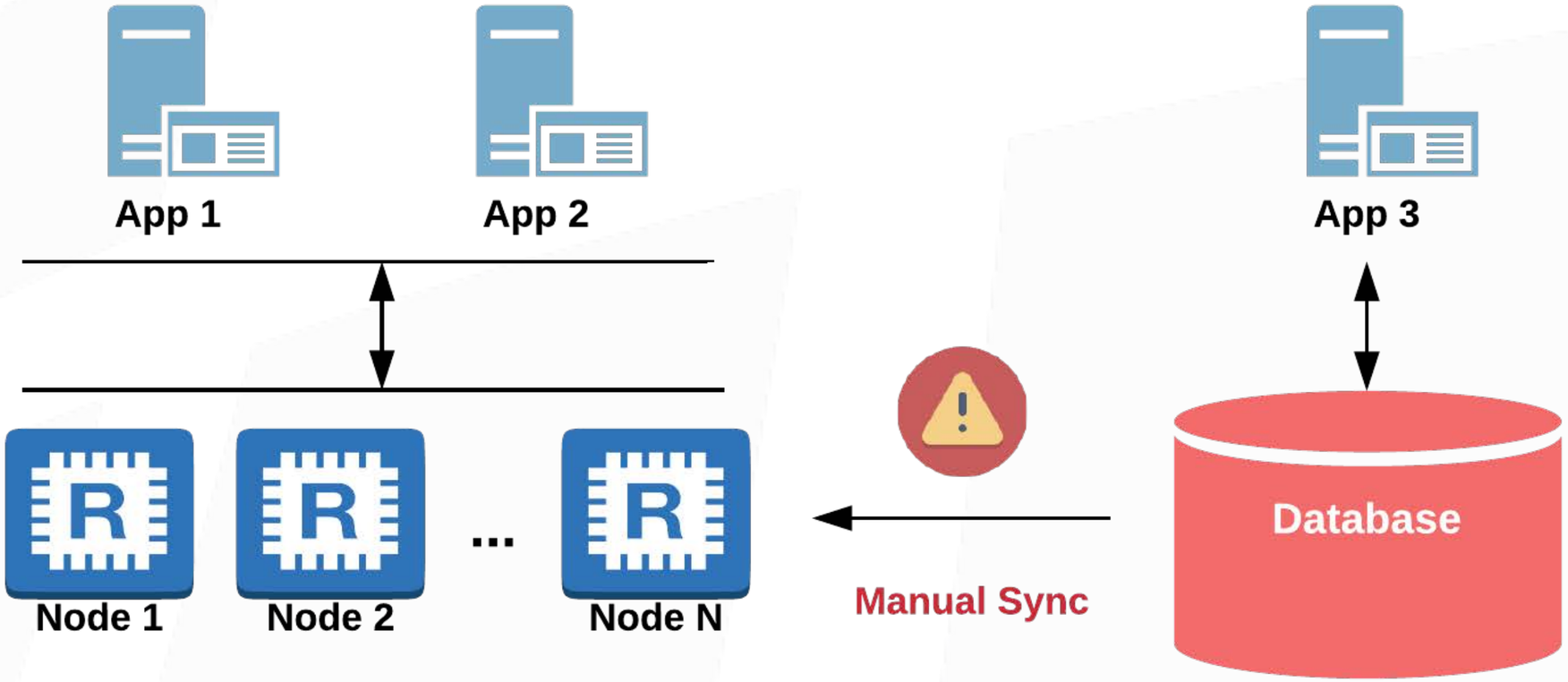
Distributed Caches

- Single Distributed Cache
- Memcached, Redis

- Benefits
  - Shared Cache!
  - Beyond local RAM capacity
  - Ease of maintenance



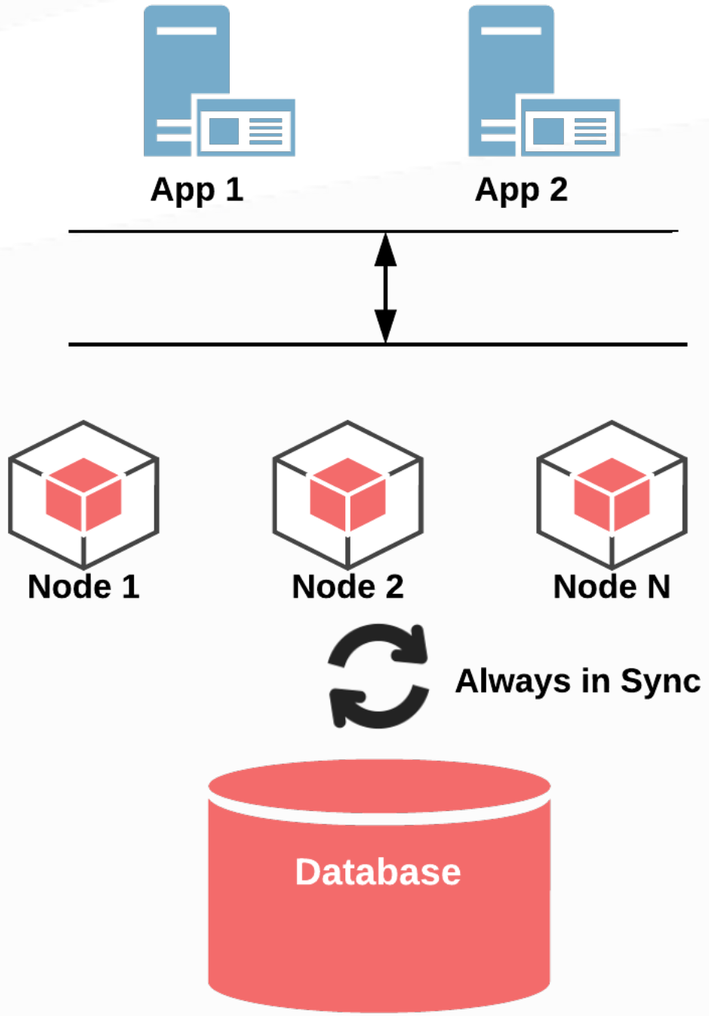
Where Distributed Caches Fail?



Data Grids

- Distributed Cache with Brains
- Primary in-RAM Storage
- Hazelcast, GigaSpaces, Ignite

- Benefits
  - Database Read/Write-Through
  - Collocated Processing
  - Better Scalability



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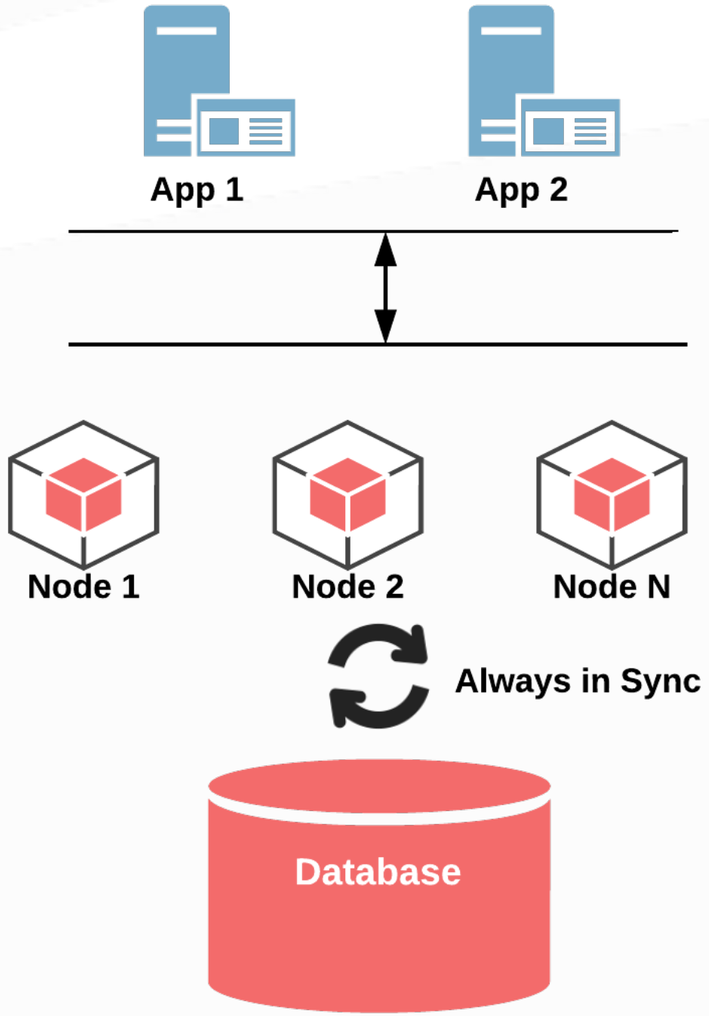

Where Data Grids Fail?

- Lack of SQL
- Lack of ACID Transactions
- Database is a bottleneck
  - + single point of failure
- RAM warm-up on restart

Apache Ignite as In-Memory Computing Platform

SQL | Key/Value | Transactions | Compute | Services | Streaming | ML

Memory-Centric Storage
Scale to 1000s of Nodes & Store TBs of Data

Ignite Native Persistence
(Flash, SSD, Intel 3D XPoint)

Third-Party Persistence
Keep Your Own DB
(RDBMS, HDFS, NoSQL)

GridGain In-Memory Computing Platform

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Data Snapshots & Recovery

Monitoring & Management

Security & Auditing

Data Center Replication

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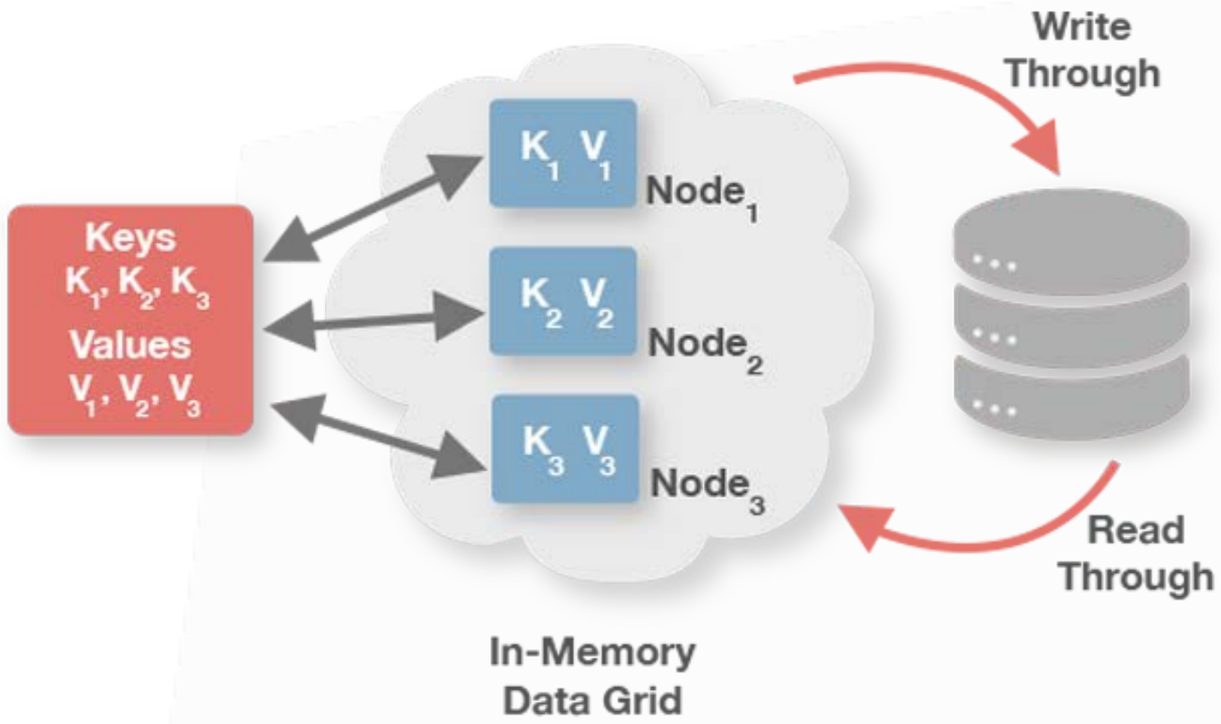
Apache Ignite Way of Caching

3rd Party Database Caching

- No rip-and-replace
  - Keep your Database
- Automatic Read/Write-Through
  - Key-Value Only
- Distributed SQL
  - Over Ignite Data
- ACID Transactions



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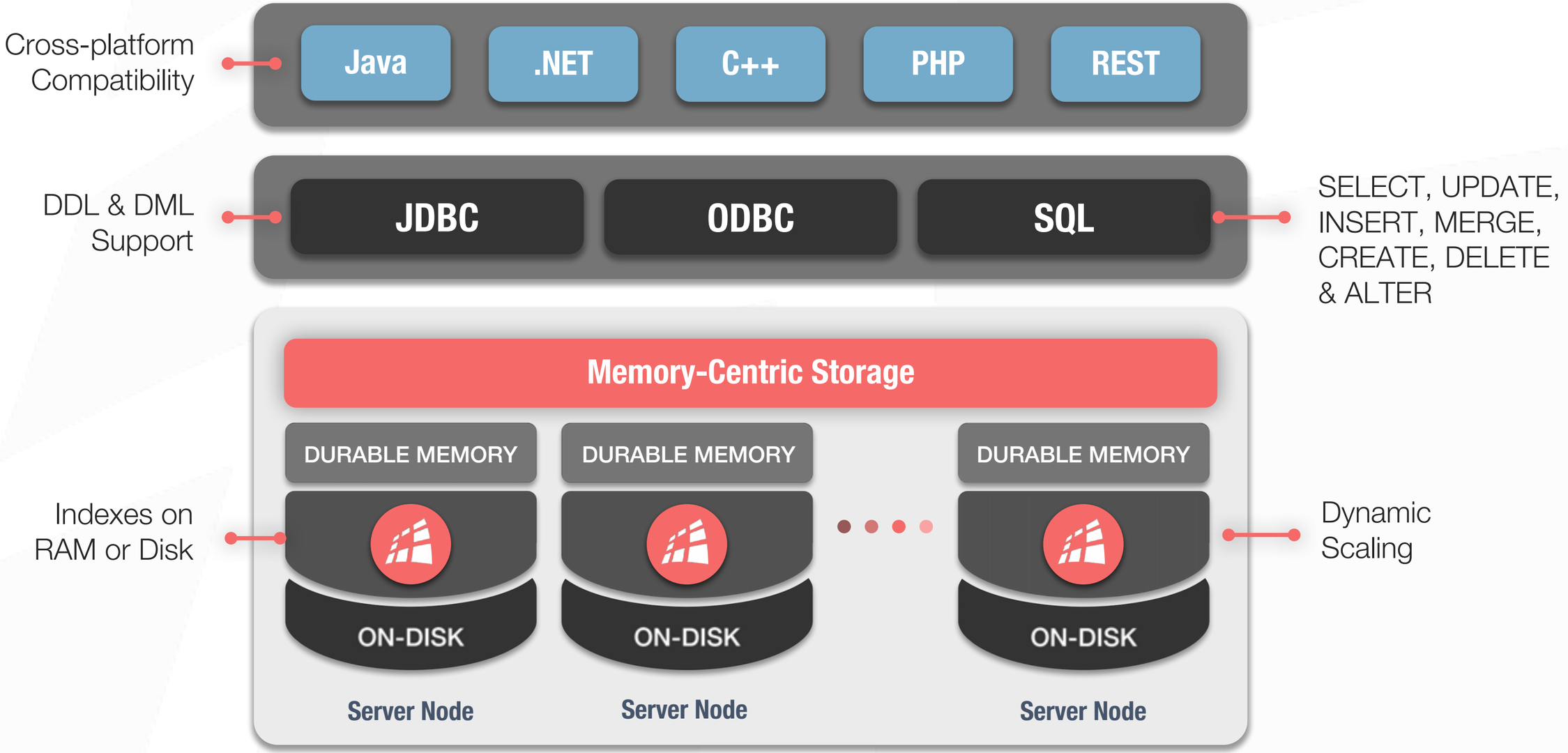
Distributed SQL



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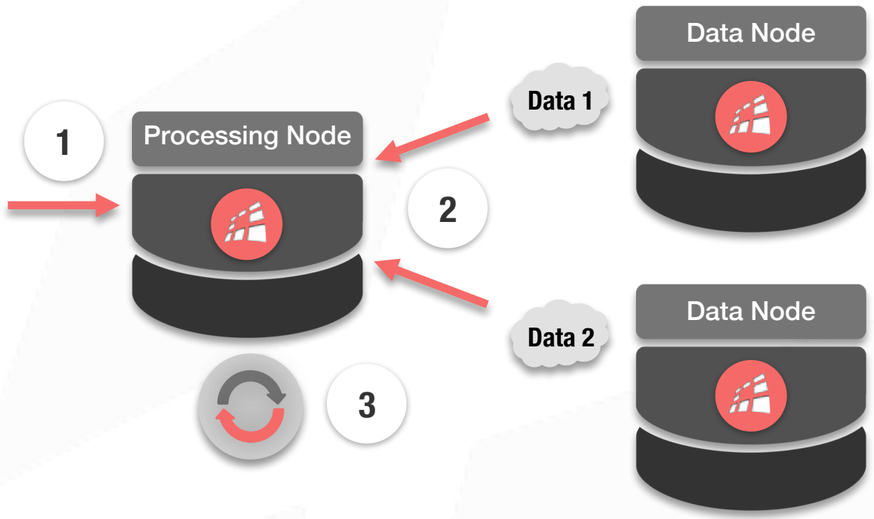
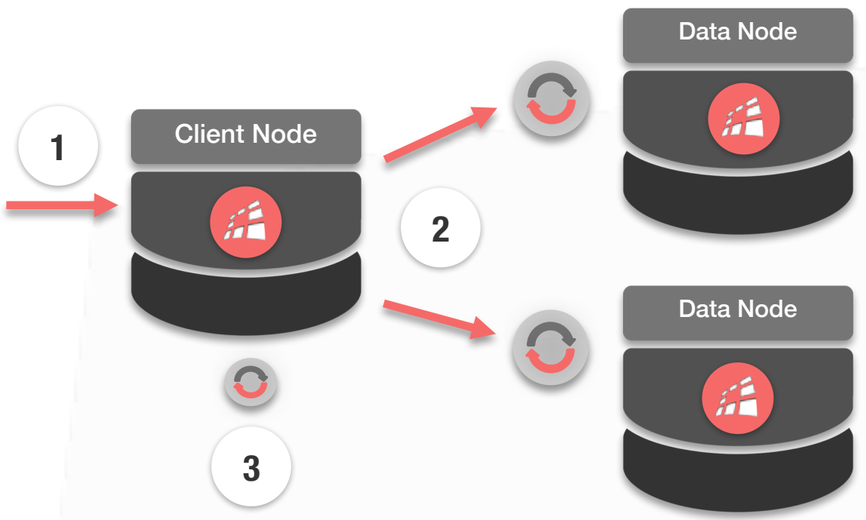
Client-Server Processing



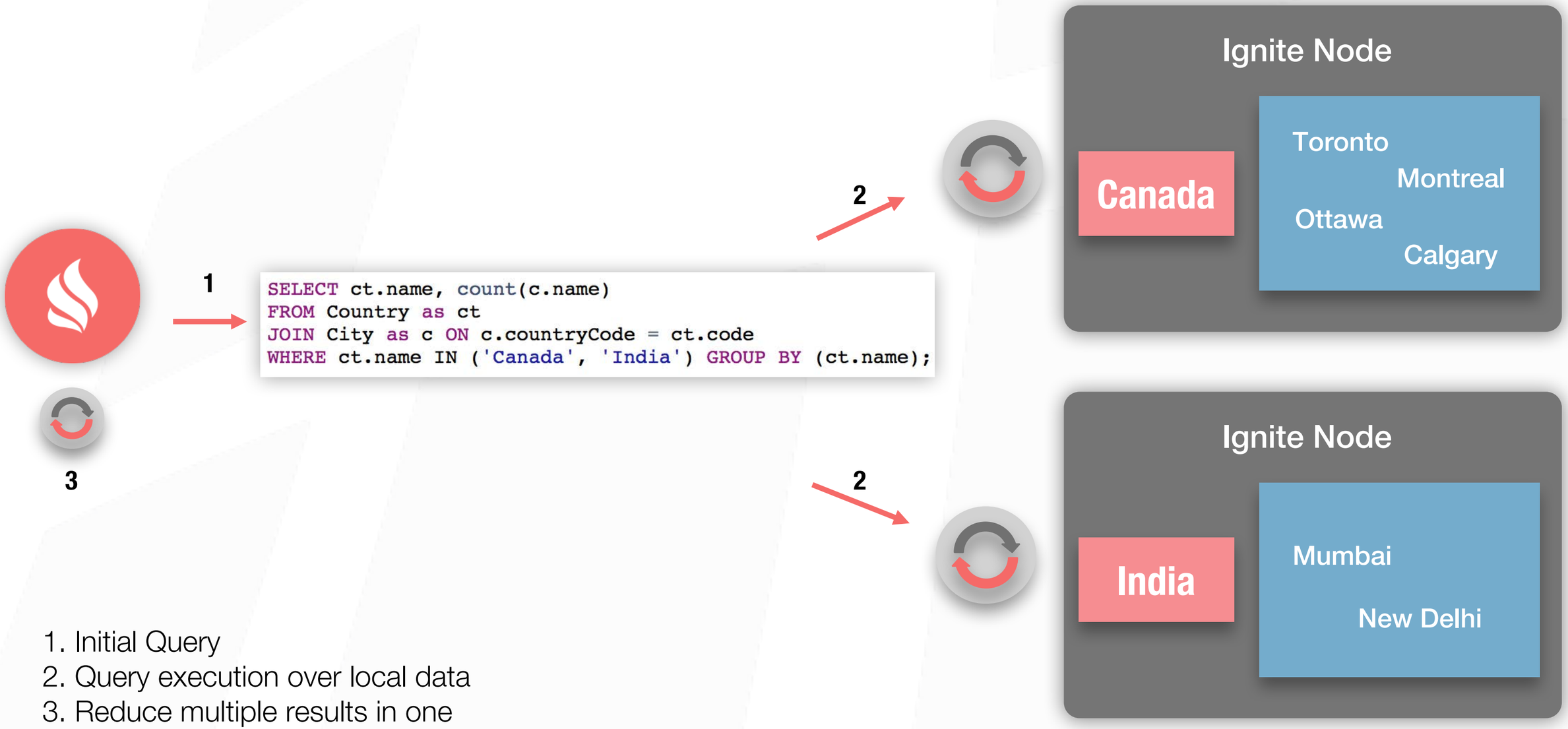
1. Initial Request
2. Fetch data from remote nodes
3. Process the entire data-set

Co-located Processing



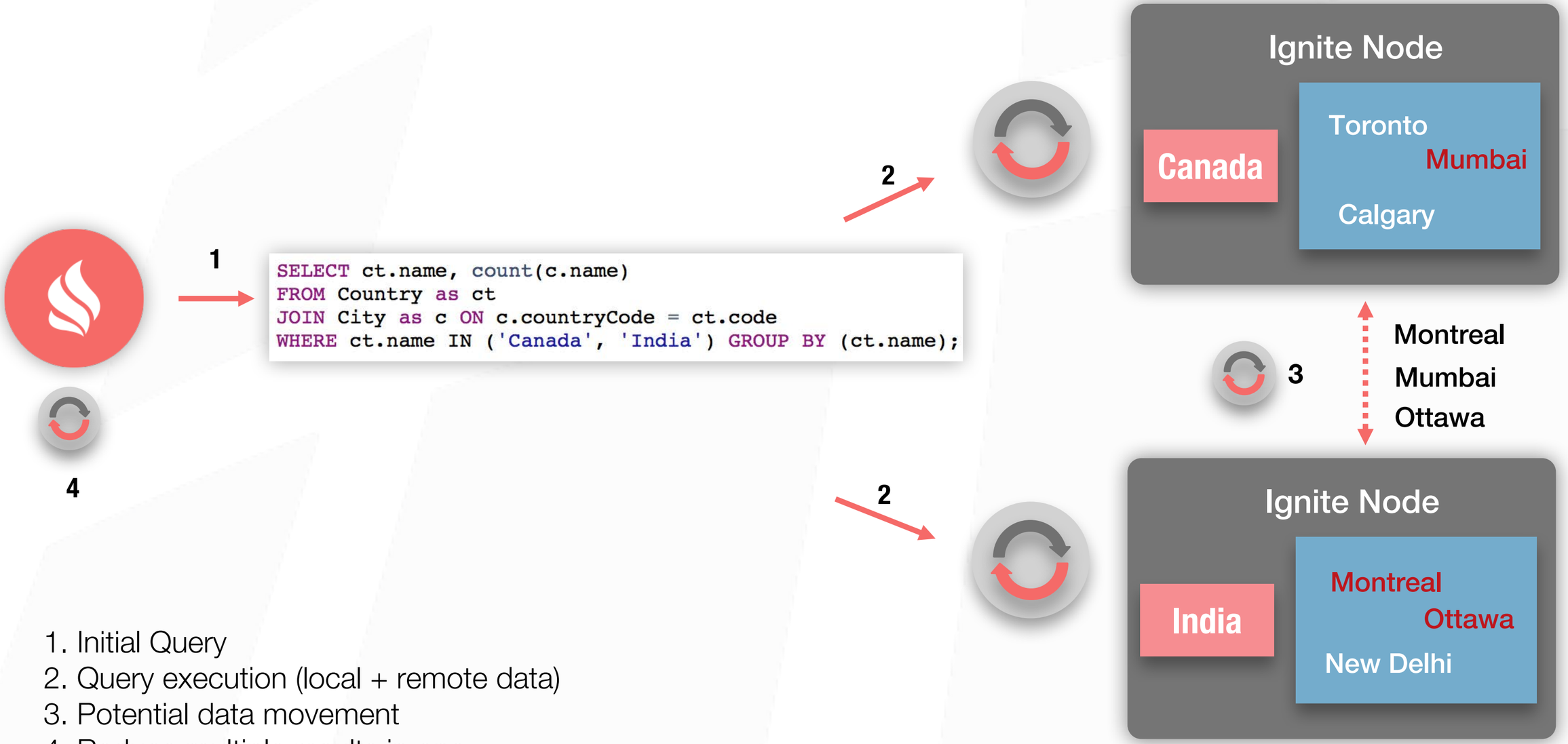
1. Initial request
2. Co-locate processing with data
3. Reduce multiple results into one

Collocated Joins



1. Initial Query
2. Query execution over local data
3. Reduce multiple results in one

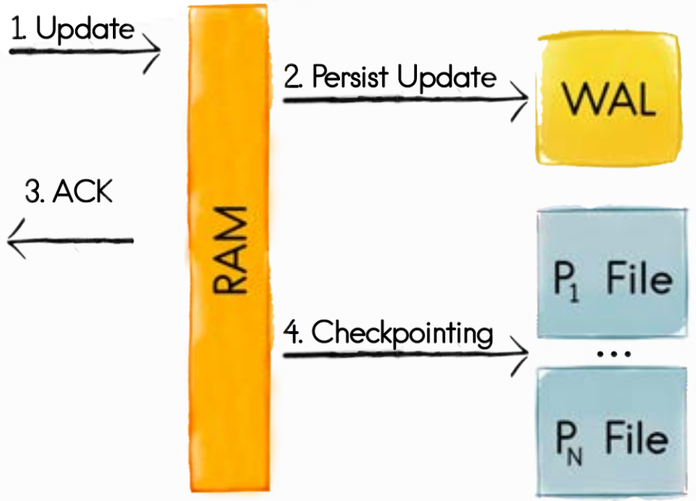
Non-Collocated Joins



1. Initial Query
2. Query execution (local + remote data)
3. Potential data movement
4. Reduce multiple results in one

ACID Transactions

- Distributed ACID Transactions
  - Pessimistic/Optimistic
- 2 Phase Commit
  - From RAM to disk
- Deadlock-free Transactions

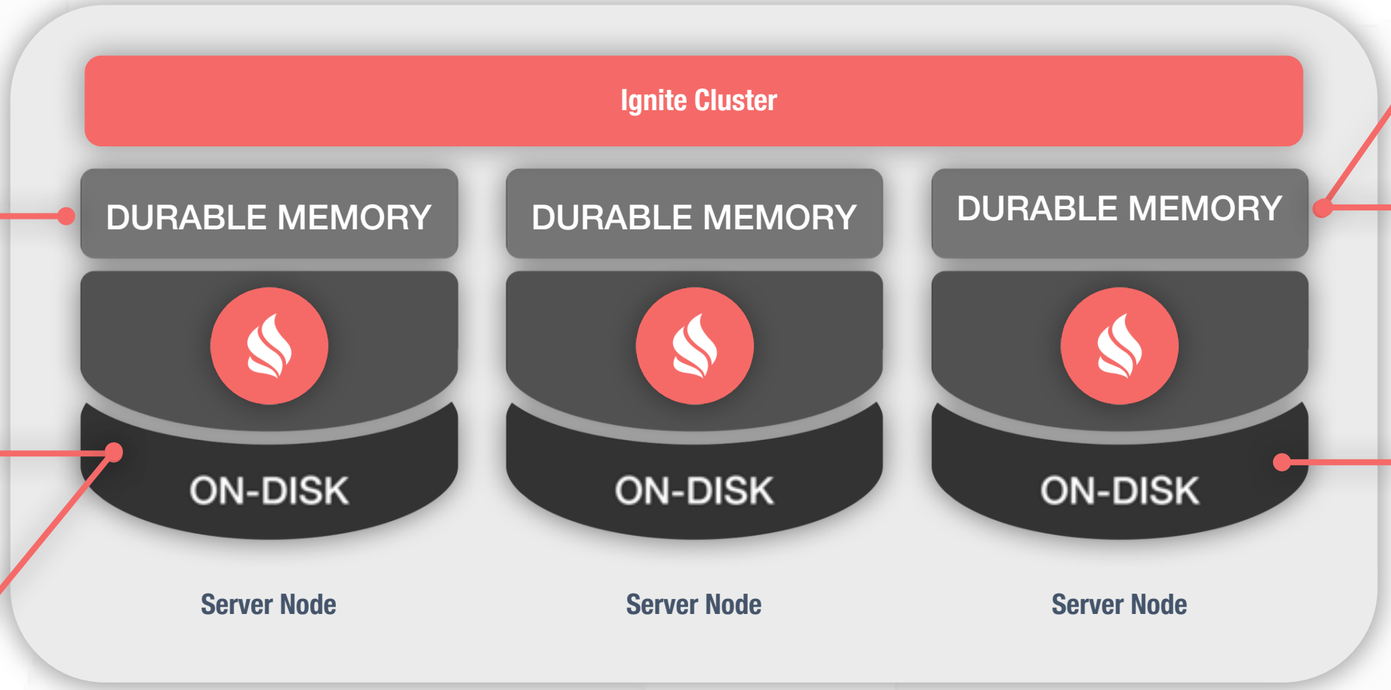


Durable Memory and Persistence

Predictable memory consumption

Fully Transactional (Write-Ahead Log)

Instantaneous Restarts



Automatic Defragmentation

Off-heap Removes noticeable GC pauses

Stores Superset of Data

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Demo

Resources

- Apache Ignite
  - https://apacheignite.readme.io/docs
- In-Memory Computing Essentials
  - https://www.gridgain.com/resources/webinars/in-memory-computing-essentials-architects-and-developers-part-1
  - https://www.gridgain.com/resources/webinars/in-memory-computing-essentials-architects-and-developers-part-2
- Apache Ignite and Redis Comparison
  - https://www.gridgain.com/resources/product-comparisons/redis-comparison

Any Questions?

Thank you for joining us. Follow the conversation.
https://ignite.apache.org

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