Memory-Centric Architecture
In Financial Institutions

Agenda

- Financial Services Overview
- Ignite Overview
- Storage Comparison
- Sberbank Use Case
- 5 Main Challenges
- Q & A

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Financial Services: Use Cases

- **Straight-Through Processing (STP)**
  - Same day reconciliation
  - No more t-plus-3 method
- **High-Frequency Trading**
  - Algorithmic Trading
- **Real-Time Compliance**
  - Fraud Detection
- **Retail Banking**
  - Moving Online
- **Real-Time Risk Management**

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Financial Services: Requirements

- **Time is Money**
  - Performance is paramount
- **Millions of Transactions**
  - Throughput and latency
- **ACID Consistency**
  - Deposits cannot be eventually consistent
- **Durability**
  - No data loss at any cost
- **Familiar APIs**
  - SQL, DML, DDL

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Financial Services: Status Quo

- **Two-Tier Architecture**
  - SQL-centric
- **RDBMS Limitations**
  - Very expensive
  - Vertical scalability
  - Failover only
- **Cannot Support Growing Data Load!**

Scale-up

Scale-out

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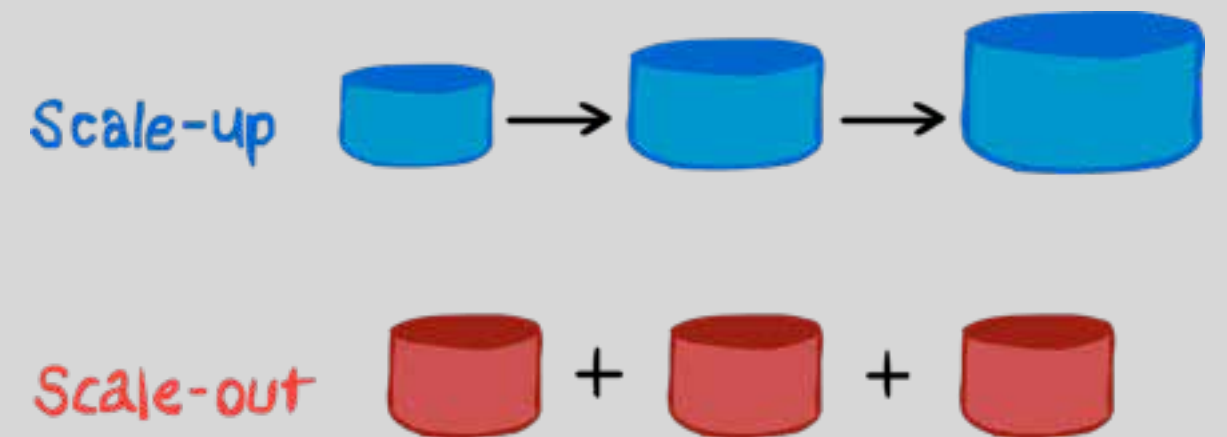
Need a New Approach

- **In-Memory Computing Architecture**
  - In-Memory Performance
  - Horizontally Scalable
  - Always Available
  - Durable
  - ACID Compliant
  - SQL, DDL, DML
  - Collocated Processing
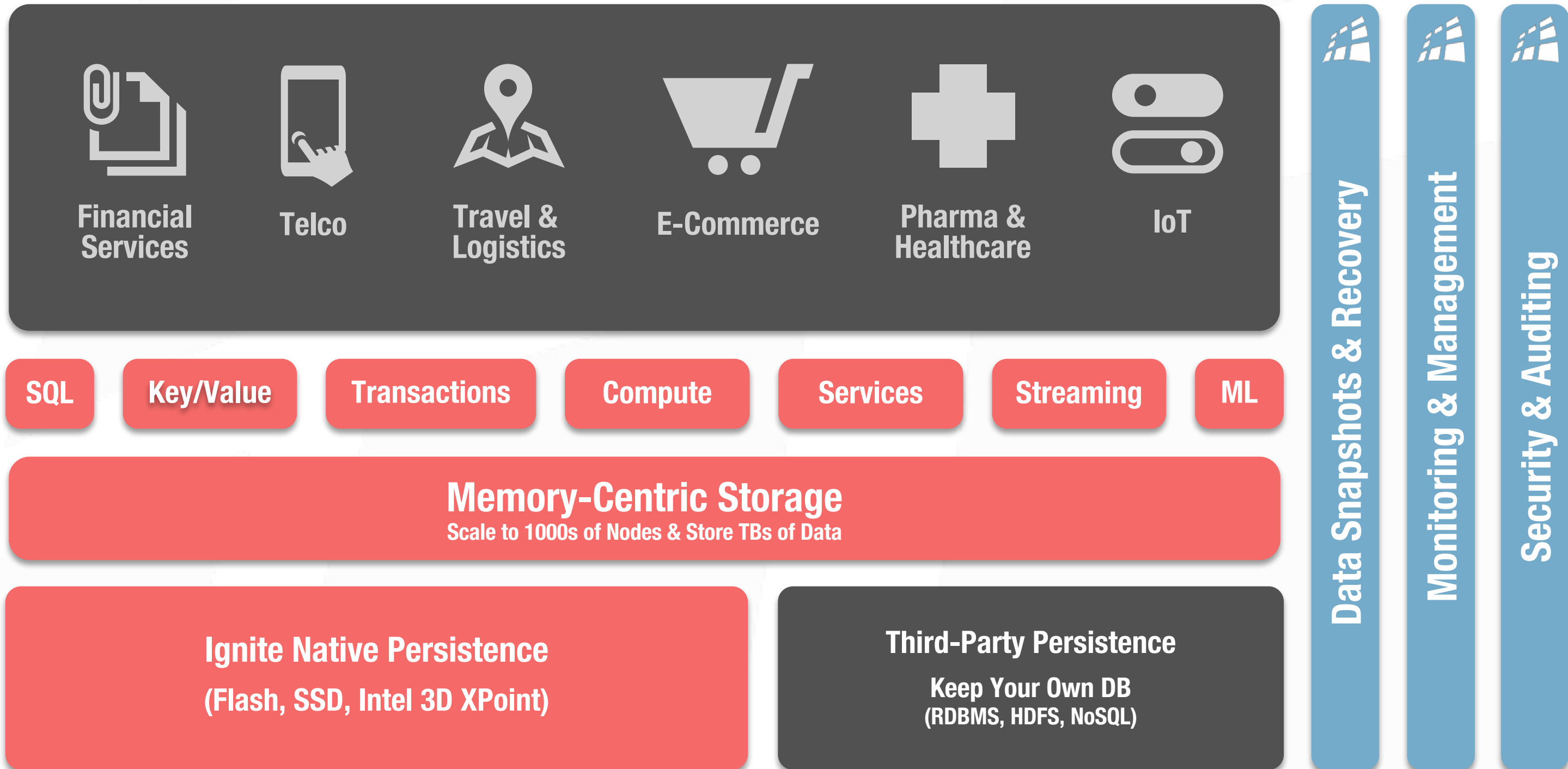- **Apache Ignite?**

GridGain

the **in-memory** computing platform
composed of a **strongly consistent** distributed database
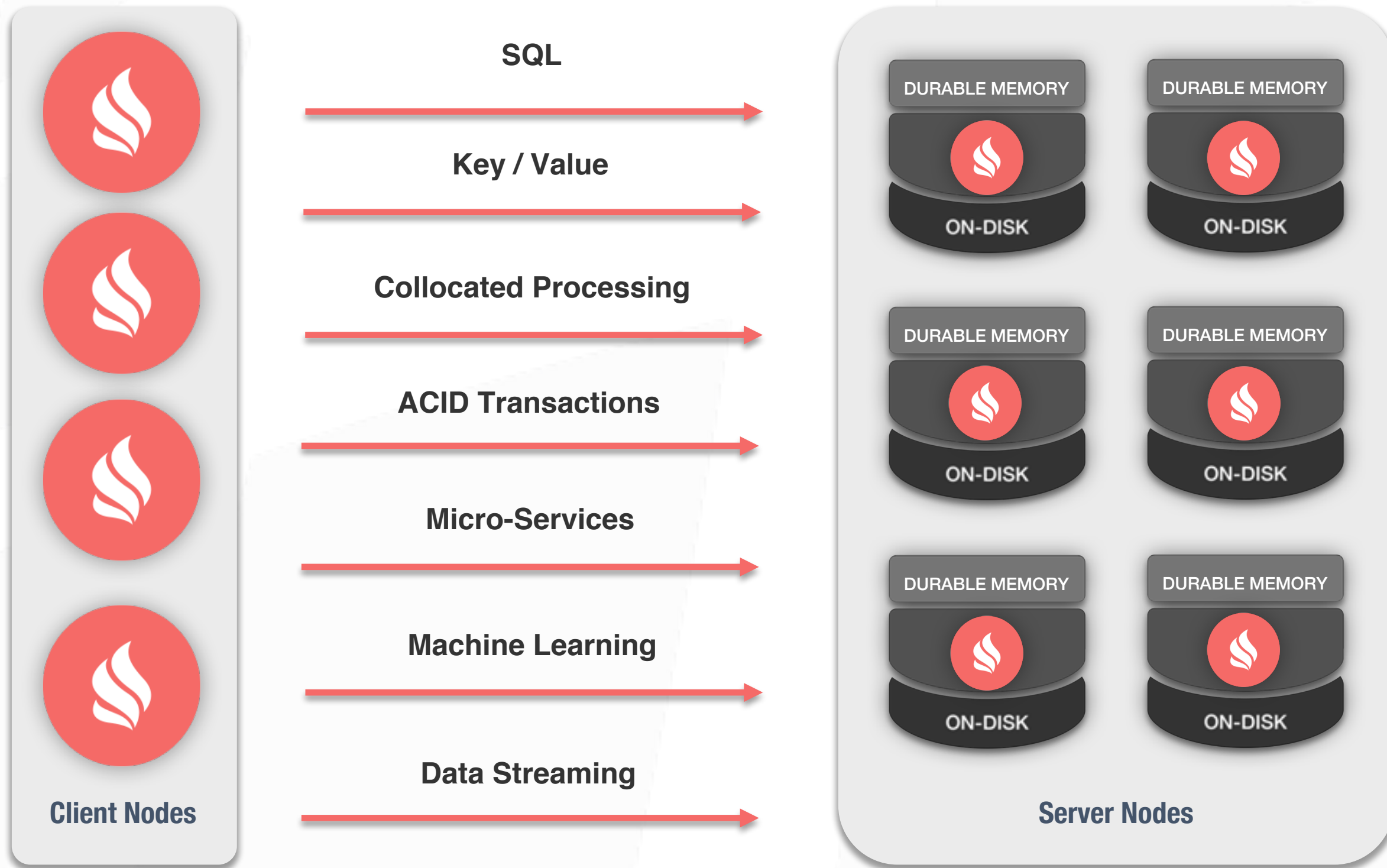with powerful **SQL**, **key-value** and **processing** APIs

GridGain In-Memory Computing Platform

Financial Services | Telco | Travel & Logistics | E-Commerce | Pharma & Healthcare | IoT

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)

Data Snapshots & Recovery | Monitoring & Management | Security & Auditing

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How Ignite™ Compares

Feature	RDBMS	NoSQL	IMDG	Ignite
Scale Out	X	✓	✓	✓
Availability	X	✓	✓	✓
Consistency	✓	X	✓	✓
In-Memory	✓	X	✓	✓
Persistence	✓	✓	X	✓
SQL	✓	X	X	✓
Key-Value	X	✓	✓	✓
Collocated Processing	X	X	✓	✓

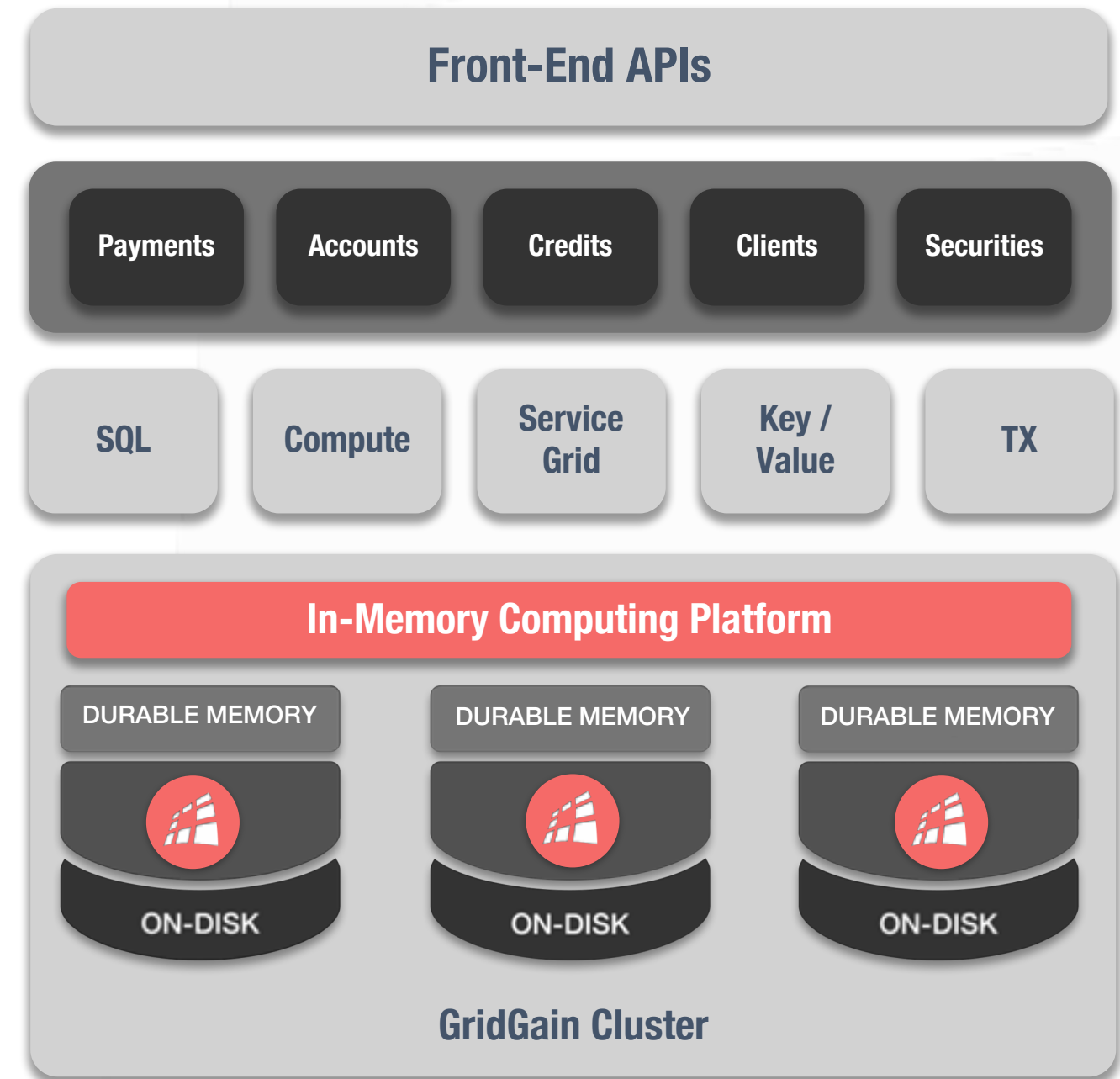GridGain

SBERBANK - Core Banking Services at Scale

Sberbank has over 16,000 branches across 22 countries traversing 11 time zones.

Problem

- Increased transactions load due to online an mobile
- Needed common storage layer across the bank
- High cost of traditional RDBMS systems

GridGain Solution

- Four 9s availability
- State-of-the-art new core banking systems
- Scale-out across 2,000 servers in 3 data centers
- 1.5 Petabytes of data in memory
- Immediate restart from disk (no memory warm-up)

Front-End APIs

| Payments | Accounts | Credits | Clients | Securities |

| SQL | Compute | Service Grid | Key / Value | TX |

In-Memory Computing Platform

| DURABLE MEMORY | DURABLE MEMORY | DURABLE MEMORY |
| ON-DISK | ON-DISK | ON-DISK |

GridGain Cluster

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Cluster Comparable to Cheyenne

- Biggest Supercomputer
- Over 4000 nodes
- About 300 TB of RAM
- About 50 PB of Disk
- https://www2.cisl.ucar.edu/resources/computational-systems/cheyenne
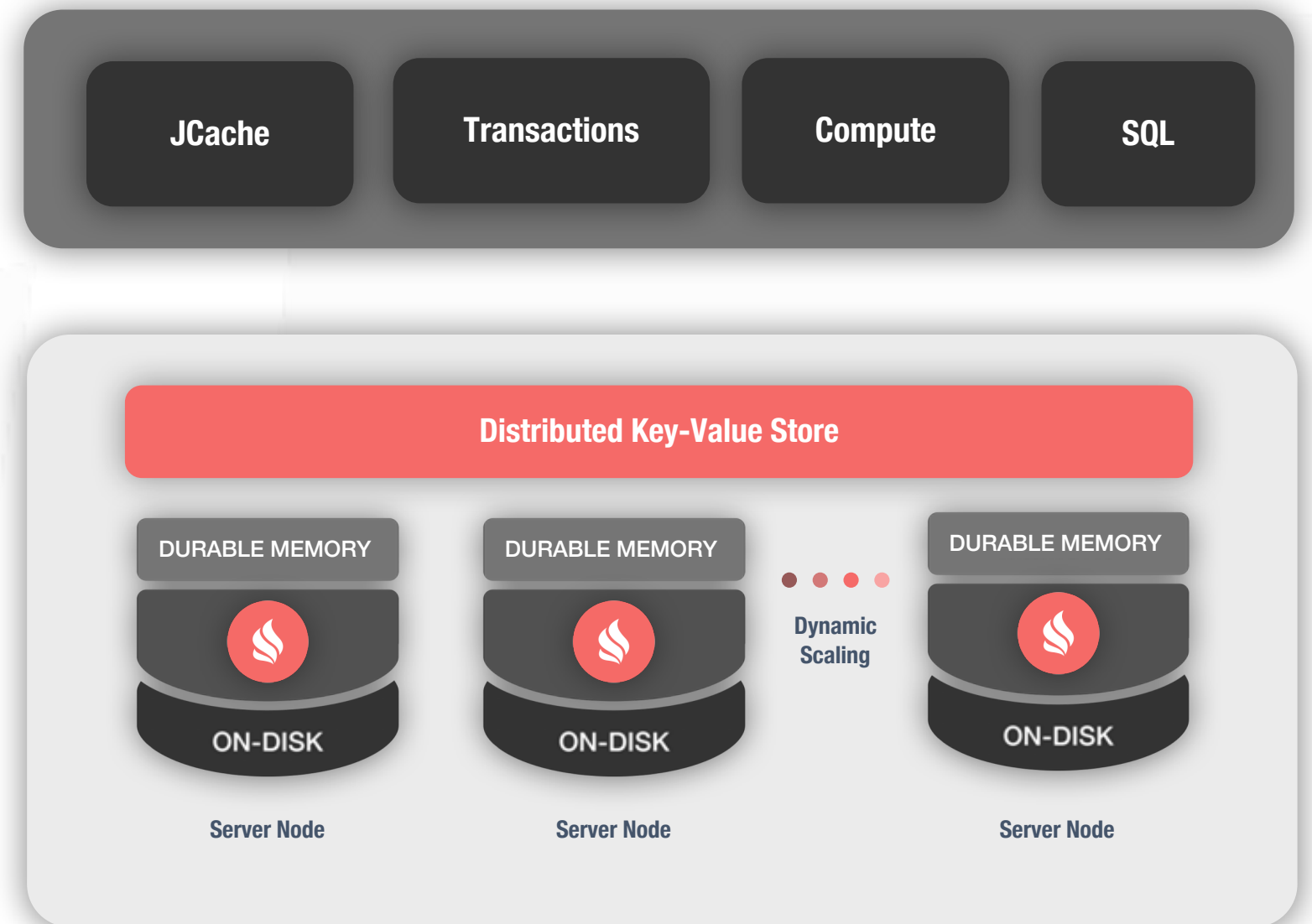
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Challenge #1: Large Memory Size

- About 1 TB per Server
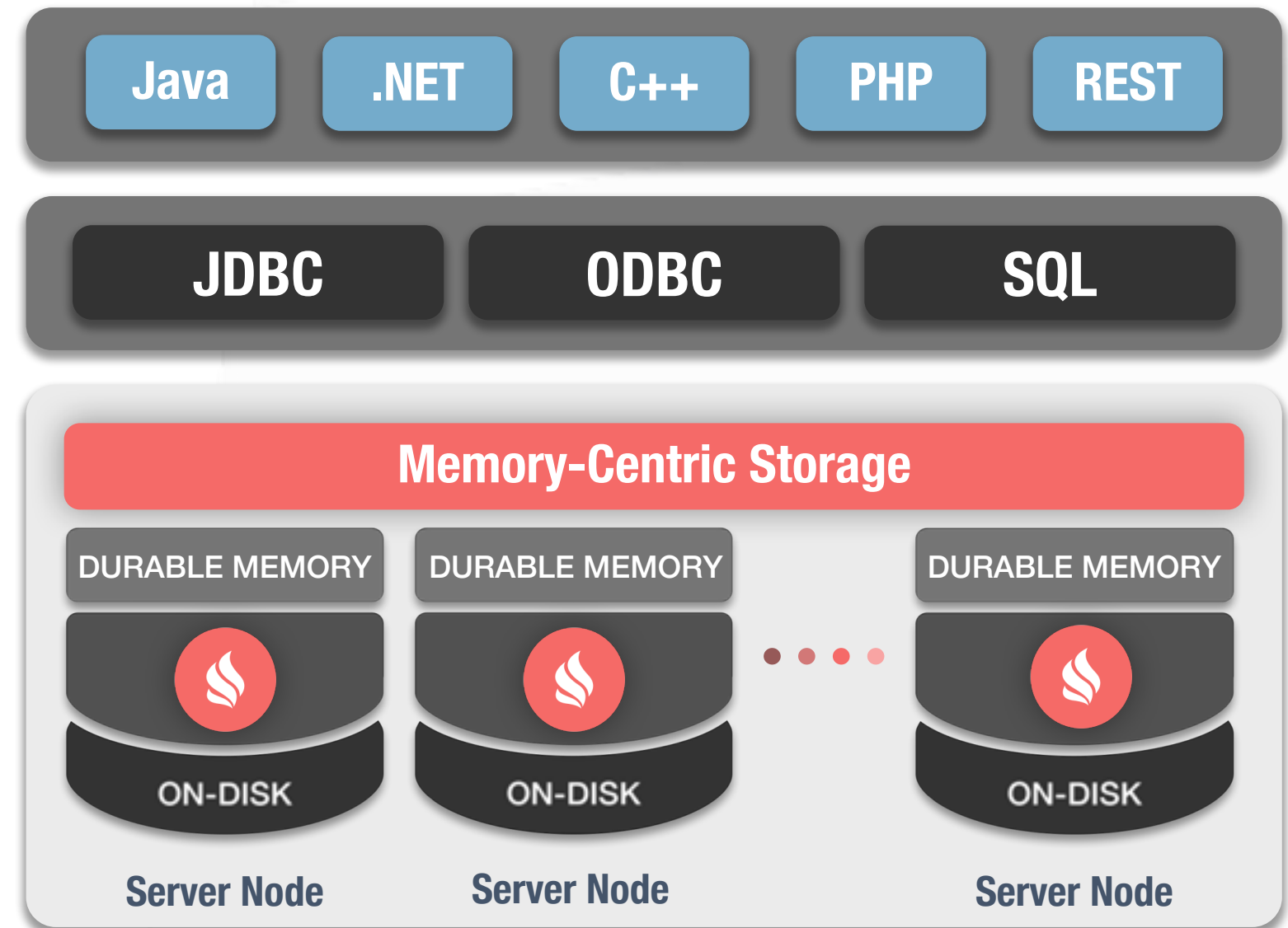- On-Heap is not an Option
- Off-Heap as Primary Storage
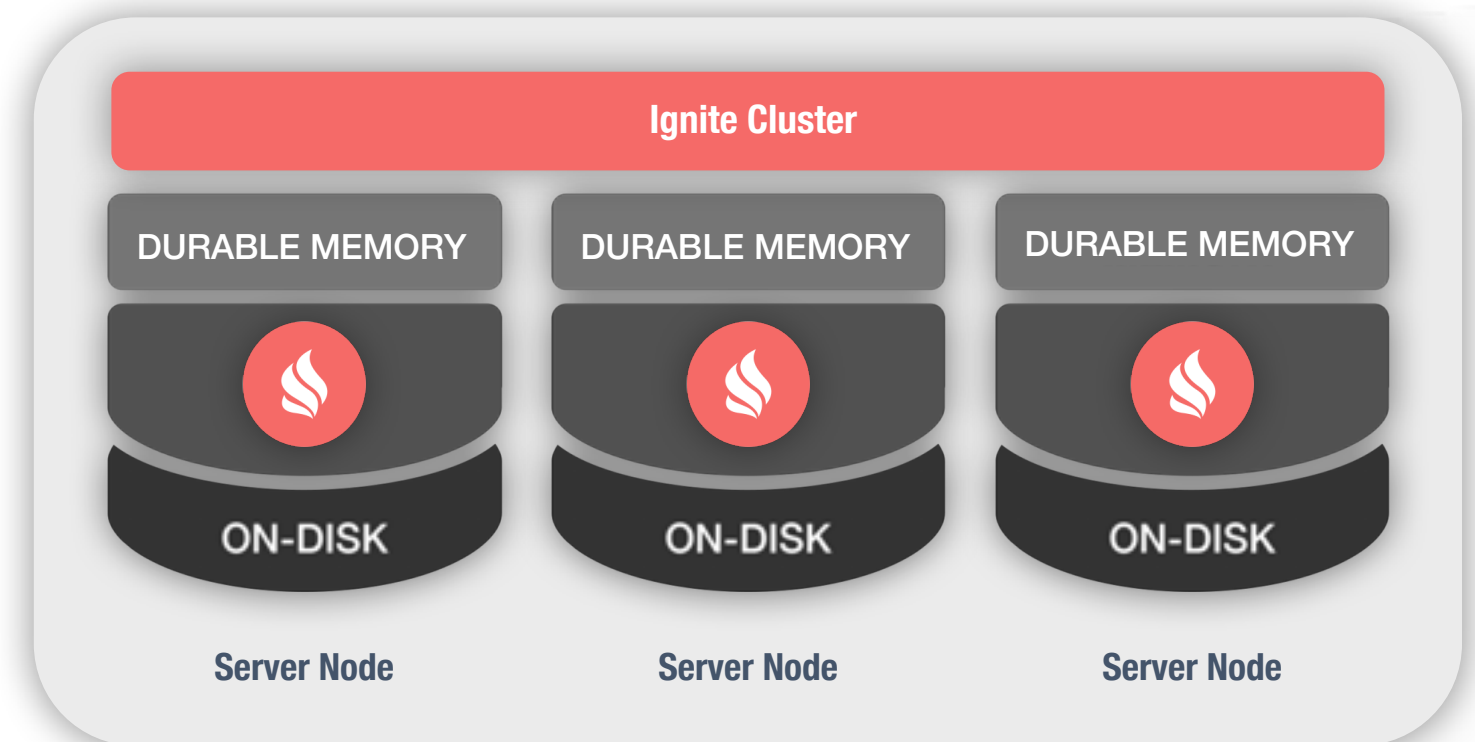
Challenge #2: Instantaneous Restarts

- Under 5 Minutes SLA
- Cannot Wait for Data Loading
- Need to Operate From Disk
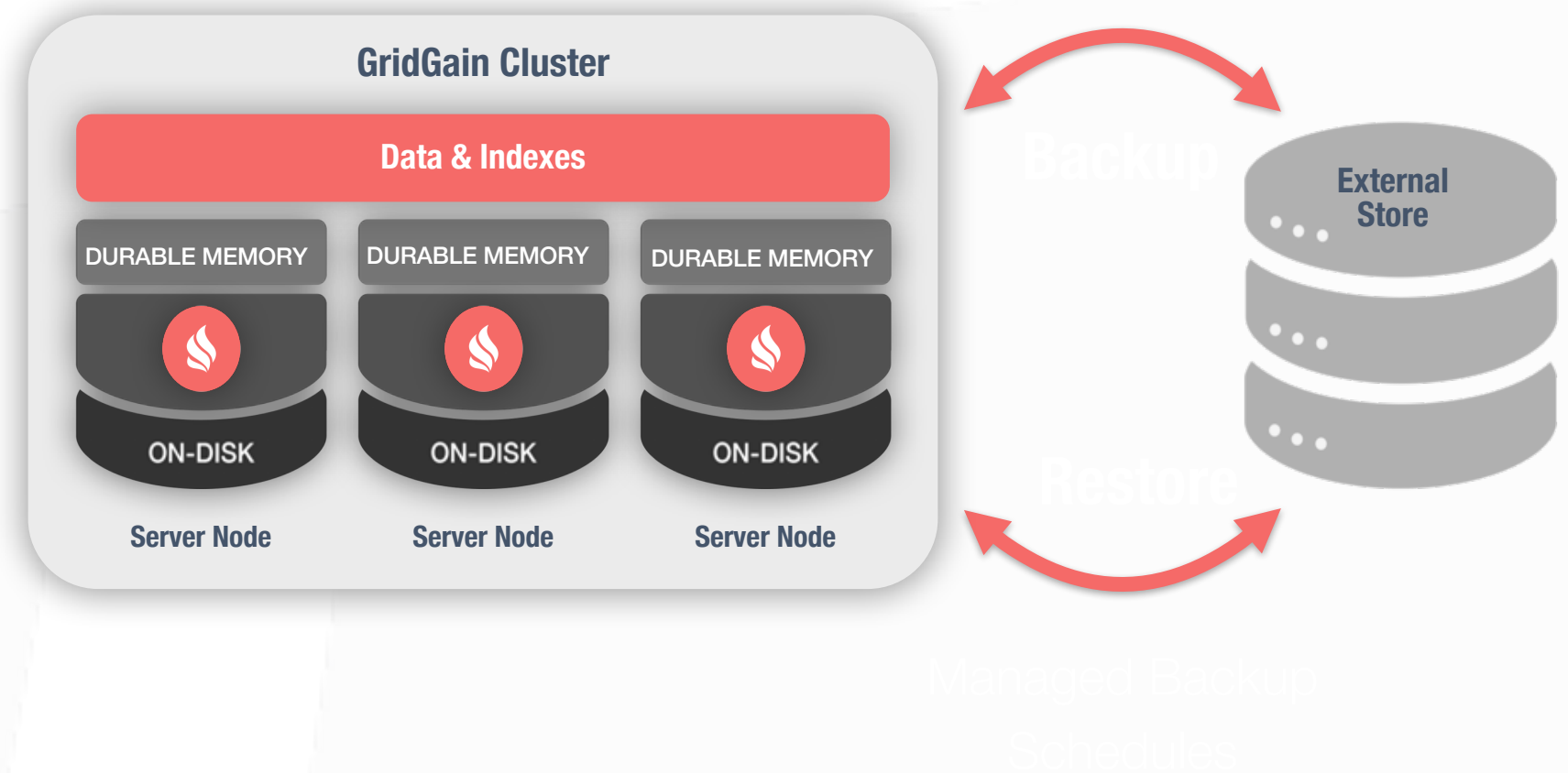
Challenge #3: Huge Data Model

- 1000s of Data Types
- Data Types Versioning
- Fast Replication and Partitioning
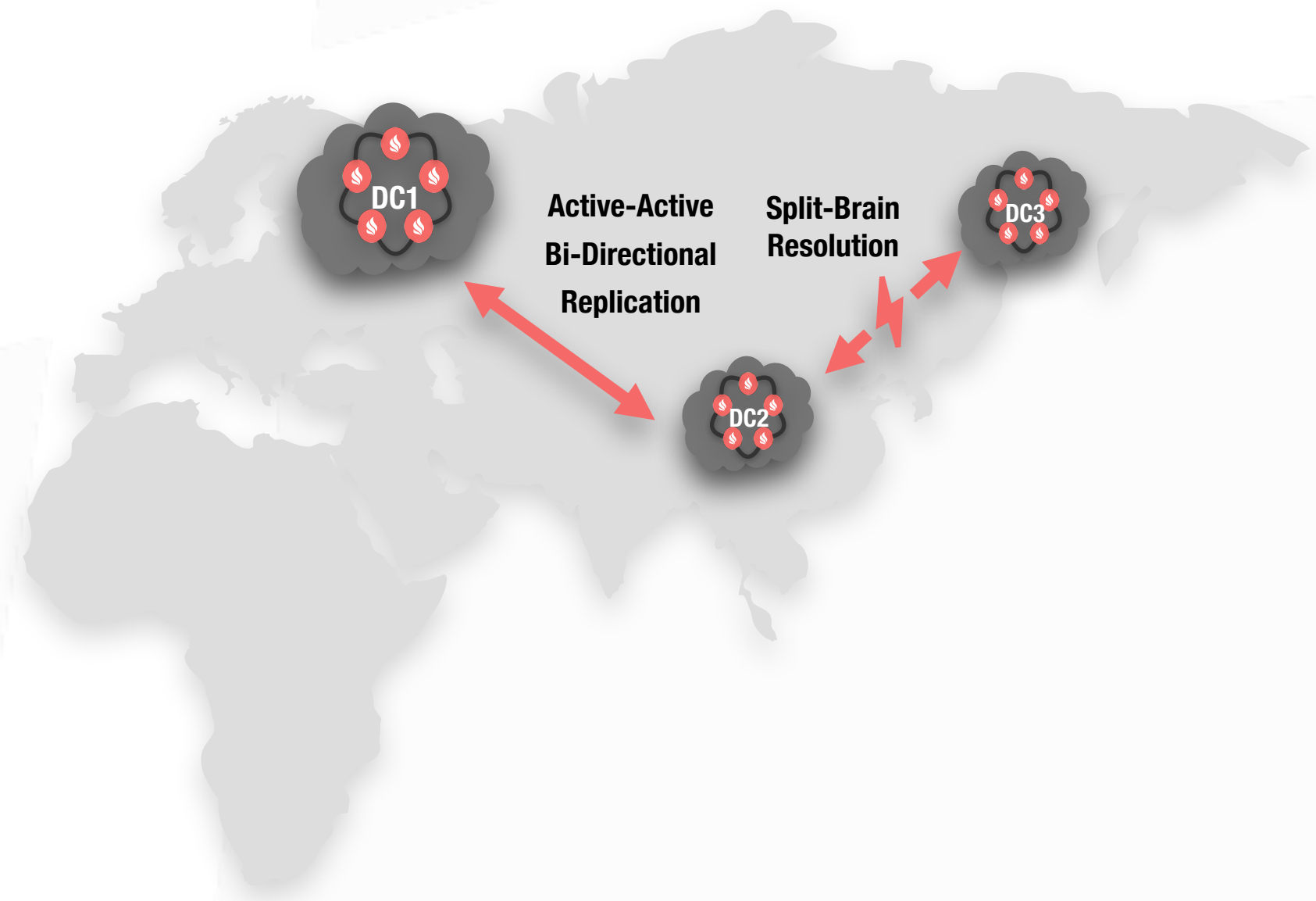- Distributed SQL JOINS

Challenge #4: Backups and Snapshots

- Need to Backup Data
- Consistent Data Restore
- Restore on Different Cluster

Challenge #5: Transactional DR

- Advanced High-Availability
- Minimize Network Overhead
- Minimize Downtime

Active-Active Bi-Directional Replication

Split-Brain Resolution

DC1

DC2

DC3

Any Questions?

Thank you for joining us. Follow the conversation.
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