



In-Memory Performance  
Durability of Disk





# Meeting the Challenges of Fast Data in Healthcare with In-Memory Technologies



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# Agenda

- Introduction
- Fast Data in Healthcare
- Case studies
  - e-Therapeutics
  - Primary PPO
- Q&A

# Introduction



the **in-memory** computing platform  
that is **durable**, **strongly consistent** and **highly available**  
with powerful **SQL**, **key-value** and **processing** APIs



# Apache Ignite In-Memory Computing Platform



Financial  
Services



Telco



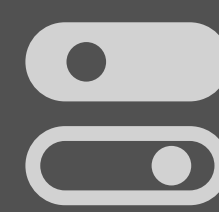
Travel &  
Logistics



E-Commerce



Pharma &  
Healthcare



IoT

SQL

Key/Value

Transactions

Compute

Services

Streaming

ML

**Memory-Centric Storage**

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

**Third-Party Persistence**  
(RDBMS, HDFS, NoSQL)

# Apache Ignite Users

## Financial Services



## Software



ADVENT



Microsoft

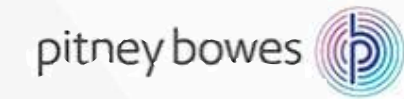


Siemens PLM Software

SIEMENS



## Logistics & Travel



## E-commerce



JacTravel

## Telco



RingCentral



intelligentpipe

## FinTech



THE GLUE  
FINTECH SOLUTIONS



## Pharma & Healthcare



## IoT



## Adtech



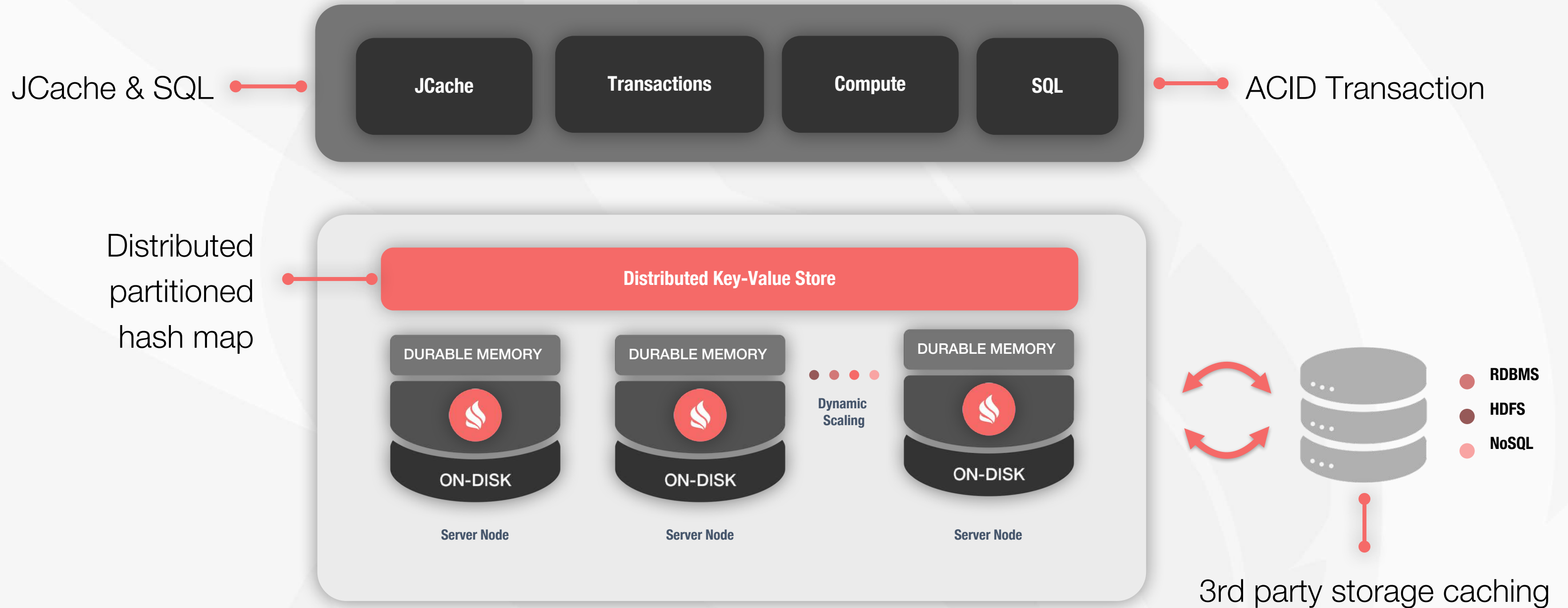
# **Fast Data in Healthcare**

# Precision Medicine and Clinical Research

- Personalized therapies
  - Oncology, neurology, cardiology
  - More accurate diagnostics
  - Collaborative clinical decision support tools
- Genomic sequencing
  - Tumor patients
  - Speedier drug discovery
  - Treating complex or rare diseases

Source: “Harnessing the Power of Data in Health”, Stanford Medicine 2017 Health Trends Report

# Solution: Distributed Storage



# Patient Interactions

- Patient-specific data
  - Health wearables (pedometers), home monitors, smartphones
- Internet of Things (IoT)
  - Chronic disease management, engagement, open communication
- Personalised data will improve patient experience



Source: “Harnessing the Power of Data in Health”, Stanford Medicine 2017 Health Trends Report

# Solution: Streaming and CEP

Application APIs



IMC Platform



Data Collection and Enrichment



Device OS/Real-Time OS

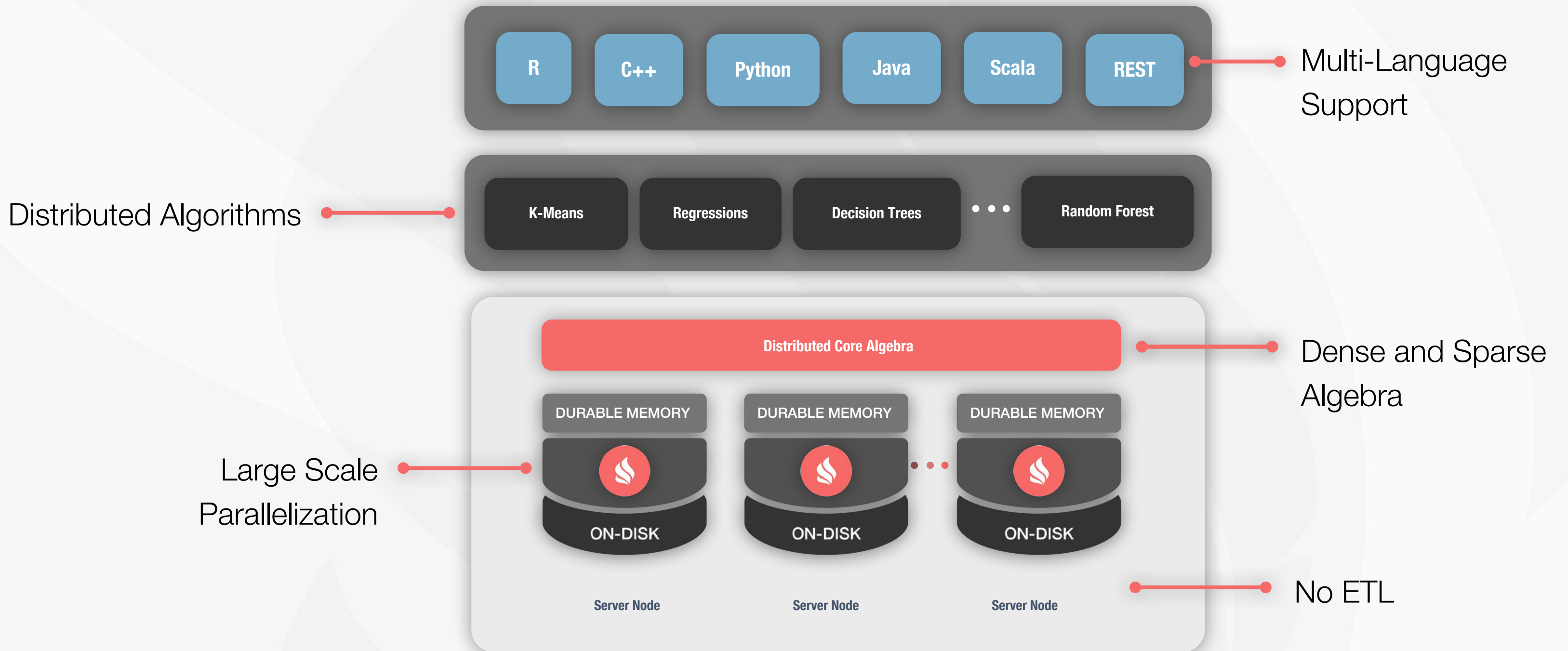


# Predictive Analytics and Machine Learning

- Predictive models
  - Anticipate, diagnose and treat diseases
  - Earlier detection of diseases
- Machine learning
  - Detailed risk profiles
  - Easier detection of emerging health concerns
  - More personalised treatments for acute conditions

Source: “Harnessing the Power of Data in Health”, Stanford Medicine 2017 Health Trends Report

# Solution: Machine Learning Grid



# Case Studies

# Case Study: e-Therapeutics

- Company founded in 2003
- UK drug discovery and development group
- Treatments for biocomplex diseases
  - Cancer
  - Neurodegeneration
- Multiple discovery programs
  - Cancer immunotherapy
  - Treating resistance to “targeted” cancer therapies

# e-Therapeutics

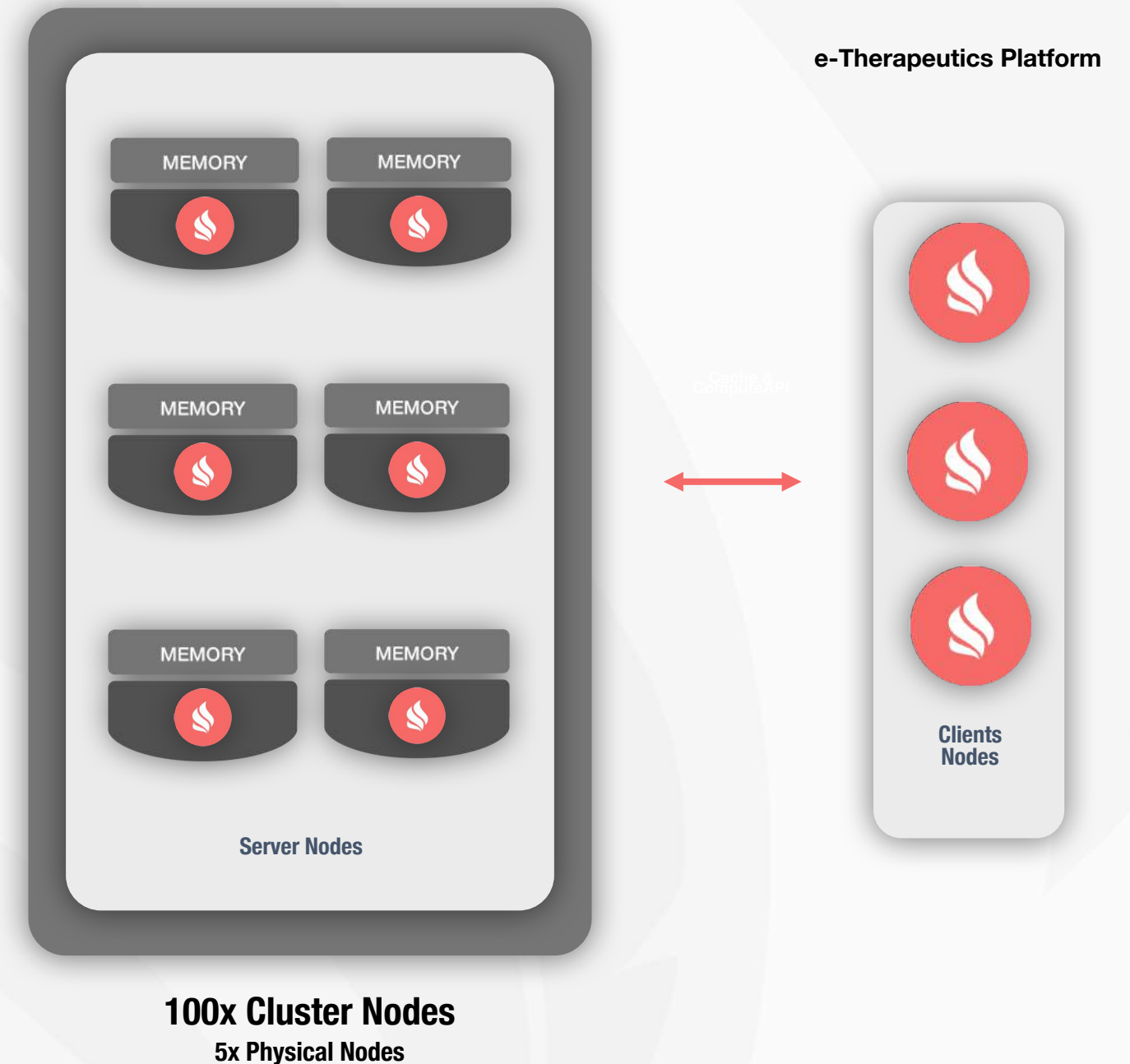
e-Therapeutics provides a computer-based drug discovery platform and a specialized approach to network biology.

## Problem

- Analysis of a network of proteins influencing a disease and drugs discovery could be measured in weeks
- Could not parallelize existing algorithms

## Apache Ignite Solution

- 80x speed increase over the non-parallelized environment
- Analysis projects completion in hours and minutes
- Computational resources for abandoned research projects



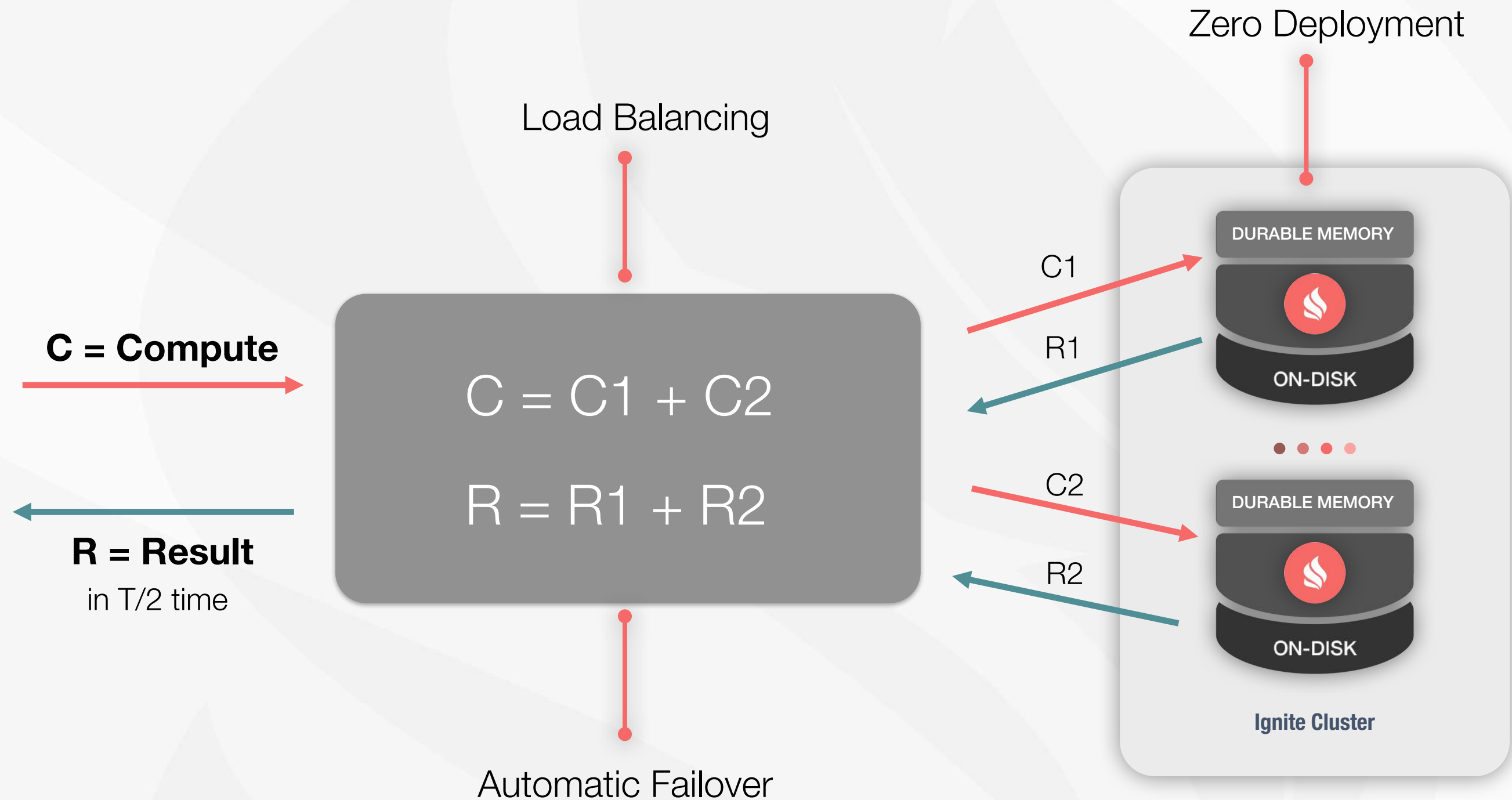
# Challenge #1: Network Pharmacology

- Identification and analysis
- Identify multiple interventions
  - Disrupt a network of proteins
  - Best overall impact

# Challenge #2: Computational Analysis

- Single analysis
  - Relatively straightforward
  - Does not take a lot of time
- Multiple analyses
  - Large number of analyses
  - Multiple parameters and assumptions
  - Compute-intensive
- Need to parallelize

# Solution: Compute Grid



# Benefit #1: Improved Performance

- GridGain powers e-Therapeutics' Network Pharmacology platform
  - 20 nodes on one 20-core commodity server
  - Grown to 100 nodes on 5 servers
  - 80x speed increase over non-parallelized environment

“GridGain has allowed us to complete in just a few hours or even minutes analysis projects that used to take weeks. Just as important, we’ve been able to launch initiatives that were simply computationally infeasible before.”

**Dr John Wray, Head of Discovery Informatics, e-Therapeutics**



# Benefit #2: Increased Productivity

- Disease biology specialists
- Web interface to micro-service
  - High-level interface
  - No need to consult IT specialists
- Multiple biologists, multiple projects
- More discovery projects

# Benefit #3: Peace of Mind

- GridGain based on Apache Ignite
- Strengths of Apache Software Foundation
  - Stability
  - Longevity

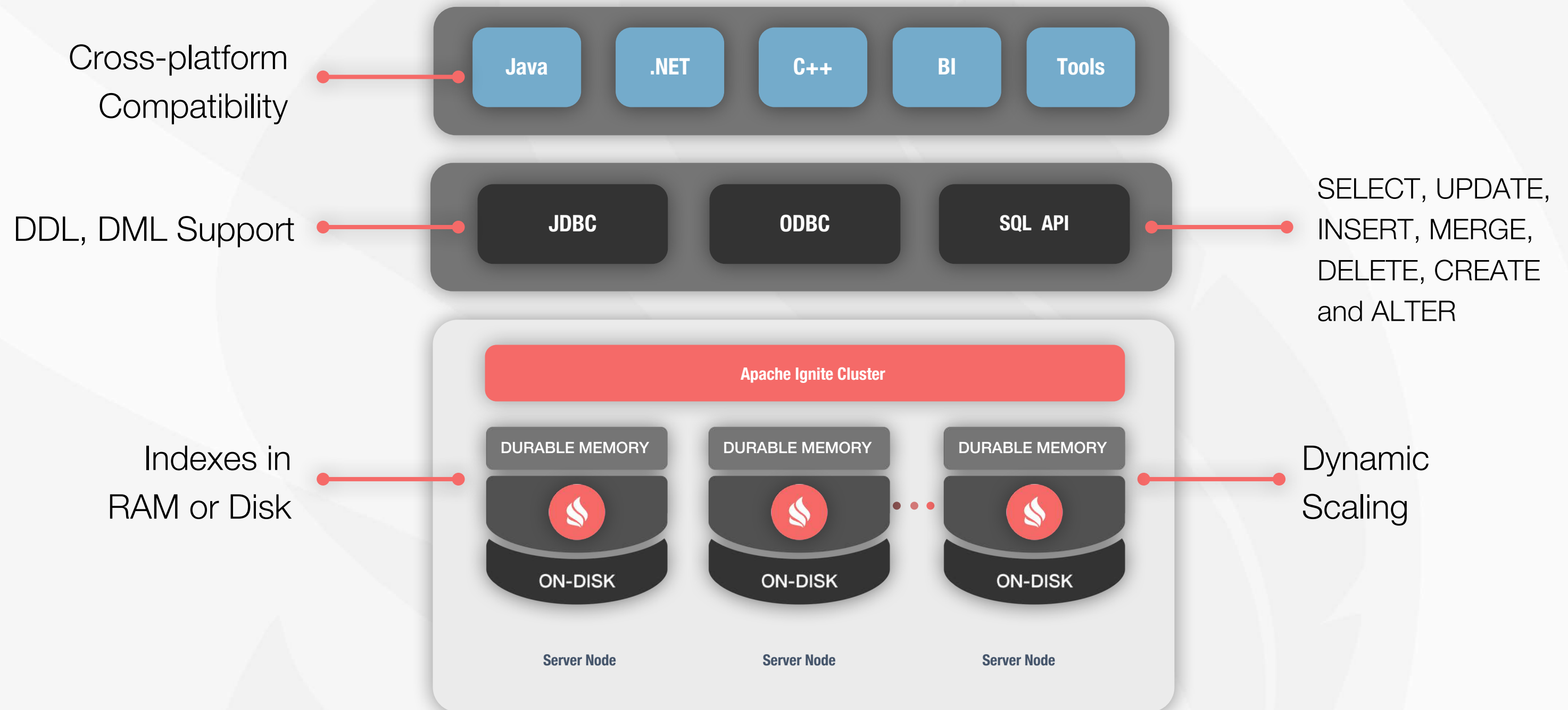
# Case Study: Primary PPO

- Company founded in the 1980s
- US healthcare cost management
- Primary Preferred Provider Organization (PPO)
  - Tens of thousands of doctors and hospitals
  - Insurance claims paid at highest level
- Tens of millions of customers
- Tens of millions of insurance claims processed

# Challenge #1: Consolidation

- Competitor IMDG with custom façade
  - Apache Ignite to consolidate and save cost
- Web application on JEE stack using SQL SPs
  - Port data and processing to Apache Ignite
  - Reduce response from 15 secs to 1 sec
  - Request/response synchronous service

# Solution: Distributed SQL



# **Challenge #2: Medical Process Audit System**

- Claims matching
- Accuracy and integrity
- Use Apache Ignite for faster decisions
- Request/response service with a 5 sec SLA

**Any Questions?**

# Resources

- Apache Ignite at Apache Software Foundation
  - <https://ignite.apache.org>
- e-Therapeutics Case Study
  - <https://www.gridgain.com/customers/case-studies/e-therapeutics>
- IoT Demo Code
  - <https://github.com/dmagda/igniteSparkIoT>
- Stanford Medicine 2017 Health Trends Report
  - <https://med.stanford.edu/school/leadership/dean/healthtrends.html>



Thank you for joining us. Follow the conversation.  
<http://ignite.apache.org>



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