How In-Memory Computing can Maximize the Performance of Modern Payments

2018
How can in-memory computing maximize the performance of modern payments?

The mobile payments market is expected to grow to over a trillion dollars by 2019.
About GigaSpaces

We provide the leading in-memory computing platforms for real-time insight to action and extreme transactional processing. With GigaSpaces, enterprises can operationalize machine learning and transactional processing to gain real-time insights on their data and act upon them in the moment.

InsightEdge is an in-memory real-time analytics platform for instant insights to action; analyzing data as it’s born, enriching it with historical context, for smarter, faster decisions.

In-Memory Computing Platform for microsecond scale transactional processing, data scalability, and powerful event-driven workflows.

- **300+** Direct customers
- **50+ / 500+** Fortune / Organizations
- **5,000+** Large installations in production (OEM)
- **25+** ISVs
Our Customers Span Across Multiple Industries

FINANCIAL SERVICES  
TELCO  
RETAIL  
TRANSPORTATION  
INSURANCE
Select Customers

Goldman Sachs
FinanceActive
Société Générale
Schneider Electric
Daiwa Capital Markets
Crédit Agricole
NATIXIS
AVANZA
Deutsche Bank
中国银行
CABONLINE
TeliaSonera
UBS
Bank of America
LGI
THOMSON REUTERS
FREQUENTIS
Morgan Stanley
CSX
COMARCH
ERICOM
CLSA
TechData
SIX Group
BARCLAYS
GE
888 Holdings
Bidfood
BlueCross BlueShield
BNP PARIBAS
FIS
Charles Schwab
First Data
DeCare Dental

OEMs / ISVs / Partners

Intel
openway
Gresham
amdocs
SKY ROAD
SOFIT
NICE
magic
mindcurv
AVAYA
marcello
123 Completed
Capgemini
74% want to be data driven, only 23% are successful. Forrester®
Real-time data is highly valuable if you act on it on time.

Old + real-time data is more valuable if you have the means to combine them.
Real-Time Applications

- Smartest Decisions
- Historical Data
- Various Sources
WHY ARE ONLY 23% SUCCESSFUL?

FROM:
- Big Data
- Insights
- Real-Time Insights

TO:
- Insights
- Real-Time Insights
- Real-Time Actions
Challenges of Instant Payment Application Development

**PROCESSING PAYMENT TRANSACTIONS IN REAL-TIME**

Focus on low latency, high throughput and extreme transactional processing (ACID compliant)

**BATCH + REAL-TIME DATA CONVERGENCE ON DATA FROM VARIOUS SOURCES**

Enable scale for large datasets from different sources for smarter and faster insights leveraging Machine Learning models

**ADVANCED ANALYTICS THAT TRIGGER WORKFLOWS**

Ability to trigger workflows for instant fraud detection and regulation support

**ENSURING HIGHEST LEVELS OF RELIABILITY**

Always-on enterprise grade availability
InsightEdge: Unifying Real-Time Analytics, AI and Transactional Processing in One Open Source Platform

- Open Source & Open API
- Rich ML & DL support
- Extreme performance
- Fully Transactional
- ACID Compliance
- Enterprise-grade (Security, High Availability)
- Co-located Apps and Services
- Seamless integration with Big Data ecosystem
  - Data sources (Kafka/Nifi/Talend)
  - Data lakes (S3/Hadoop)
  - BI tools (Tableau/Looker/etc.)
InsightEdge
Unifying Fast Data Analytics, AI and Transactional Processing

Cloud Native Management, Orchestration, and Monitoring

REAL-TIME MICROSERVICES

Analytics and AI
Spark
Real-time Microservices

Search, BI & Query
SQL and BI

In-Memory Data Grid

Multi-Tiered Data Storage and Replication

High Availability and Clustering

Clustering & Service Discovery

On-Premise
Cloud
Hybrid

Security and Audit
Management and Monitoring

REST Orchestration

InsightEdge
Unifying Fast Data Analytics, AI and Transactional Processing
Ultra-low latency and high throughput transactional processing
IMDG

Partitioned In-Memory Grid
Shared-nothing, linear scalability, elastic capacity

Co-Location of Data and Business Logic
Co-located ops, event-driven, fast indexing

Event-Driven Processing and Map/Reduce
Auto-healing, multi-data center replication, fault tolerance

Fast Indexing Multi-Data Model
POJO, .NET, Document/JSON, Geospatial, Time-series

Seamless Integration with Java/Scala ecosystem

Cloud Native

IN-MEMORY DATA GRID
EVENT PROCESSING
DATA MODELS (SPATIAL, POJO, JSON)
RAM
SSD STORAGE
STORAGE-CLASS MEMORY
DATA REPLICATION & PERSISTENCE
WEB CONTAINERS
RPC & MAP/REDUCE
_APPS & MICROSERVICES
.NET
JAVA
MICROSERVICES (REST)
EVENT PROCESSING

Cloud Native

ON-PREMISE
CLOUD
HYBRID

Ultra-low latency and high throughput transactional processing
IMDG

Partitioned In-Memory Grid
Shared-nothing, linear scalability, elastic capacity

Co-Location of Data and Business Logic
Co-located ops, event-driven, fast indexing

Event-Driven Processing and Map/Reduce
Auto-healing, multi-data center replication, fault tolerance

Fast Indexing Multi-Data Model
POJO, .NET, Document/JSON, Geospatial, Time-series

Seamless Integration with Java/Scala ecosystem

Cloud Native

IN-MEMORY DATA GRID
EVENT PROCESSING
DATA MODELS (SPATIAL, POJO, JSON)
RAM
SSD STORAGE
STORAGE-CLASS MEMORY
DATA REPLICATION & PERSISTENCE
WEB CONTAINERS
RPC & MAP/REDUCE
_APPS & MICROSERVICES
.NET
JAVA
MICROSERVICES (REST)
EVENT PROCESSING

Cloud Native

ON-PREMISE
CLOUD
HYBRID

Ultra-low latency and high throughput transactional processing
IMDG

Partitioned In-Memory Grid
Shared-nothing, linear scalability, elastic capacity

Co-Location of Data and Business Logic
Co-located ops, event-driven, fast indexing

Event-Driven Processing and Map/Reduce
Auto-healing, multi-data center replication, fault tolerance

Fast Indexing Multi-Data Model
POJO, .NET, Document/JSON, Geospatial, Time-series

Seamless Integration with Java/Scala ecosystem

Cloud Native

IN-MEMORY DATA GRID
EVENT PROCESSING
DATA MODELS (SPATIAL, POJO, JSON)
RAM
SSD STORAGE
STORAGE-CLASS MEMORY
DATA REPLICATION & PERSISTENCE
WEB CONTAINERS
RPC & MAP/REDUCE
_APPS & MICROSERVICES
.NET
JAVA
MICROSERVICES (REST)
EVENT PROCESSING

Cloud Native

ON-PREMISE
CLOUD
HYBRID

Ultra-low latency and high throughput transactional processing
IMDG

Partitioned In-Memory Grid
Shared-nothing, linear scalability, elastic capacity

Co-Location of Data and Business Logic
Co-located ops, event-driven, fast indexing

Event-Driven Processing and Map/Reduce
Auto-healing, multi-data center replication, fault tolerance

Fast Indexing Multi-Data Model
POJO, .NET, Document/JSON, Geospatial, Time-series

Seamless Integration with Java/Scala ecosystem

Cloud Native

IN-MEMORY DATA GRID
EVENT PROCESSING
DATA MODELS (SPATIAL, POJO, JSON)
RAM
SSD STORAGE
STORAGE-CLASS MEMORY
DATA REPLICATION & PERSISTENCE
WEB CONTAINERS
RPC & MAP/REDUCE
_APPS & MICROSERVICES
.NET
JAVA
MICROSERVICES (REST)
EVENT PROCESSING

Cloud Native

ON-PREMISE
CLOUD
HYBRID
Co-located Analytics and AI with Transactional Processing

- Distributed SQL-99
- Real-time integration with Tableau and Business Intelligence tools
- JDBC driver

- Spark for ML and leading DL frameworks
- Push-down predicate for ultra-low latency filter (30x faster)
- Shared RDDs/DataFrames
- Streaming with 99.999% availability
- Deep Learning with Intel BigDL
- Graph processing, text mining, geospatial
ZooKeeper-based clustering for 1000s of nodes
Back-up and auto-healing for each grid container
N + 1 redundancy
Unicast or Multicast discovery
Multi-Tiered Data Storage and Replication for Optimized TCO

In-Memory Data Processing (RAM)

Intelligent Data Tiering between RAM, SSD and Storage-Class Memory such as Intel 3DXPoint - Optane SSD/NVMe and Optane DC Persistence memory. Leverages RocksDB

Multi-Data Center Replication

Asynchronous Persistence to SQL/NoSQL

* Apache Pass support in Q4 2018
Maximize the Performance of Modern Payments: Real-time Analytics for Instant Insights To Action

VARIOUS DATA SOURCES

REAL-TIME LAYER

IN-MEMORY MULTI MODEL STORE

UNIFIED REAL-TIME ANALYTICS, AI & TRANSACTIONAL PROCESSING

APPLICATION

DASHBOARDS

• No ETL, reduced complexity
• Built-in integration with external Hadoop/Data Lakes S3-like
• Fast access to historical data
• Automated life-cycle management

DEPLOY ANYWHERE CLOUD/ON-PREMISE
LAMBDA ARCHITECTURE IS COMPLICATED

DATA SOURCES
- Files
- Message Bus
- Databases
- Events
- Sensor Data
- Social

DATA CAPTURE/LAYER
- NiFi
- Flume
- Airflow
- Talend
- Informatica
- Attunity
- StreamSets
- Apache Nifi
- Apache Flume
- Apache Airflow
- Talend Data Preparation
- Informatica PowerCenter
- Attunity
- StreamSets

MANAGEMENT LAYER
- Capture
- Files
- Events
- Event Hubs
- Google Pub/Sub
- CDC, Message Bus

SPEED LAYER
- Event-Driven Analytics
  - Serverless, e.g. AWS Lambda
  - Kafka consumers
  - Kinesis Enabled App
- Storage & Cache
  - MongoDB
  - Azure Cosmos DB
  - Amazon DynamoDB
  - Redis

BATCH LAYER
- Batch Analytics
  - Hadoop
  - Cloudera
  - Teradata
  - EMR
  - Spark Streaming

APPLICATIONS
- Public Cloud (GCP)
- Public Cloud (AWS)
- Public Cloud (Azure)
- Private Cloud
- Extreme Performance
- Mission Critical Applications
- Microservices and Event-Driven Architecture
- Open-Source ML & DL frameworks
- No ETL, reduced complexity
- Built-in integration with external Hadoop/Data Lakes S3-like
- Fast access to historical data
- Automated life-cycle management
• Unifying access to hot and historical data - faster time to market
• Agile development
• Easily deploy ML models in production
• Train ML models on continuously updated production data
GigaSpaces is now focused on in-memory data processing... The combination of Spark and XAP will enable GigaSpaces to target the new breed of real-time analytics and hybrid operational and analytic workloads.

InsightEdge contains all the necessary SQL, Spark, Streaming, and Deep Learning toolkits for scalable data-driven solutions... our preferred solution components: the three-tier Kappa model, including Spark and Kafka, as implemented by GigaSpaces, in combination with its commercial InsightEdge platform.

Everyone Wants “Real-time Analytic Insights” But Which Architecture Will Get You There?
CASE STUDY: Fraud and Money Laundering Detection in Real-time

BUSINESS CHALLENGE:
• Detecting fraud on mobile payment applications in real-time
• Detecting the deposit of the same check in multiple accounts at different banks in real-time
• User experience: application availability 24×7
• TCO reduction: reduce dependency on expensive RDBMS (Oracle)

TECHNICAL CHALLENGE:
• IMC Platform to ingest 4 TB of data daily
• Fully consistent transactional In-Memory Map-Reduce
• Millisecond response
• Analyze and validate against a large dataset of live (multiple TB) in memory and archived data (to Cassandra NoSQL and Hadoop)

RESULTS:
• Sub-second response for accurate fraud detection to stop the transaction
• TCO Reduction: RAM and SSD for runtime data compared to Oracle DB or SAN
• Fault-tolerant, highly available, scaling on demand

Ingest 4 TB daily
Handle 1.5M events per second
CASE STUDY: Instant Payments for real-time transactions and high reliability to enhance the overall customer experience

BUSINESS CHALLENGE:
- Enable and accelerate instant payment solutions and meet regulatory requirements on a global scale
- Automatically track purchases and other server-to-server communication in real time
- Store payment transactions, order information and other sales internally

TECHNICAL CHALLENGE:
- Ability to handle added data volumes 15k payment/sec receipts introduced by management of new SEPA European payment regulation
- Assure no-downtime for mission critical service

RESULTS:
- Running low-latency payment and business logic calculations
- No downtime assured
- Real-time analytics and Machine Learning - preventing fraud and adherence to regulations
- Design to deployment in just a few months leveraging microservices architecture

Payment transaction in 500 milliseconds
End-to-end validation in seconds
Faster, Smarter Insights and Actions

STREAMING, REAL-TIME, BATCH

STREAMING, REAL-TIME, BATCH Analytics
(+ co-located apps & services)

Fast Operational Data Lakes
(unstructured + polyglot data processing)

REAL-TIME & EVENT-DRIVEN ANALYTICS

HISTORICAL DATA

Simplified Lambda Architecture
(Real-time + Historical)
INSTANT INSIGHTS TO ACTION

EXTREME PERFORMANCE

TCO OPTIMIZATION

MISSION CRITICAL AVAILABILITY

<1 sec from data to insight to action

millions of IOPS

10X less expensive than only RAM with In-memory performance

No Downtime at leading enterprise customers for YEARS

And still counting
THANK YOU

BUILD IT ›

TRY IT ›

GIGASPACES
innovate with confidence