GridGain In-Memory Data Fabric:

Empowering Asset and Wealth Management
With In-Memory Computing

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www.gridgain.com   #gridgain

Gartner. 2014
CoolVendor

AlwaysOn
TOP 100
WINNER
ONCLOUD 2015

AlwaysOn
GLOBAL 250
WINNER
SILICON VALLEY
INNOVATION SUMMIT 2015

AlwaysOn
GLOBAL 250
WINNER
SILICON VALLEY
INNOVATION SUMMIT 2014

BIG DATA 50

Current Industry Trends

- Changes in demographics
  - Entrance of non-traditional players
  - Shift from institutional investment to individual
  - Multi-asset strategies
  - Multiple sources of advice
  - Goals-based solutions vs benchmarks
  - Social investing
  - Increased competition
  - Economies of scale
  - New distribution channels
  - Fees and margins pressure
  - Market volatility
- Regulatory oversight
  - Enhanced hedging and risk management
  - Operational changes
  - Approved Reporting Mechanism (ARM)
- Technology
  - Outsourcing
  - Digital innovation
  - Mobility
  - Real time

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Demographics and Expectations

- Longevity
- Younger and technology empowered
- From accumulation to decumulation of wealth
- High asset attrition rate
- Innovative ideas
- Personalization of effortless advice
- More risk diversity
- Global growth
- 24/7
- Customer-centric business model

"Generation X and millennials will control more than half of all investable assets or about US$30 trillion by 2020" – PWC 2016 Wealth Management Trends Report

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Regulatory Changes

- UCITS
- Dodd-Frank
- FATCA
- MiFID
- Market Abuse Directive
- Short Selling Regulation
- Solvency
- Transparency and Reporting
- KYC and AML
- Tax Information Exchange Agreements

Technology Used in Asset and Wealth Management

- Digital channels
- Big Data and data management
- Cloud
- Distribution platforms
- Social media
- Content automation
- Robo-advisor
- Advanced analytics
- Scenario analysis
- Low latency
- Behavior analysis, neural networks, heuristics
- Complex event processing
- Integrated digital experience
- Mobile technology
- Open source and open architecture
- Cybersecurity
- Blockchain

Evolution of In-Memory Grid Computing

- Move from Disk to 100% In-Memory (RAM)
- Leverage Clustered Memory and Parallel Distributed Processing
- Results: 100x Faster, 10x ROI Improvement
- Making "Big Data" Fast

"In-memory will have an industry impact comparable to web and cloud."

"RAM is the new disk, and disk is the new tape."

Gartner

In-Memory Computing Market:
- $10B in 2019
- CAGR 22%

Gartner

Financial Customer Use Cases

Data Velocity, Data Volume, Data Consistency, Real-Time Performance and Analysis

- **Trading Platforms**
  Order Management and Execution Management Systems, algorithmic trading, high volume transactions, ultra low latencies.

- **Risk Management**
  Modeling, financial engineering, pricing, hedging, what-if analysis.

- **Financial Analytics**
  Real time analysis of trading positions, trending, market data analysis, sentiment analysis, complex event processing, hedging, transaction cost analysis, time series, volatility analysis, Monte Carlo simulations, Black-Scholes, derivatives pricing.

- **Big Data Analytics**
  Customer and counter party 360 view, master data management, securities masters, reference data, real-time analysis of P&L, up-to-the-second operational BI.

- **Compliance and Monitoring**
  Fraud, AML, KYC, market manipulation and abuse, pre and post trade compliance modeling.

- **Financial SaaS Platforms**
  High performance next-generation architectures for Software as a Service Application vendors.

Use Case: SBERBANK

Largest bank in Russia and Eastern Europe, and the third largest in Europe

- **Sberbank Requirements**
  - Migrate to data grid architecture
  - Minimize dependency on Oracle
  - Move to open source

- **Why GridGain Won**
  - Best performance
    - 10+ competitors evaluated
  - Demonstrated best
    - Fault tolerance & scalability
    - ANSI-99 SQL Support
    - Transactional consistency
  - Strict SLAs
    - Less then 5 min cluster restart
    - Fully Operational from disk & memory

1 Billion Transactions per Second
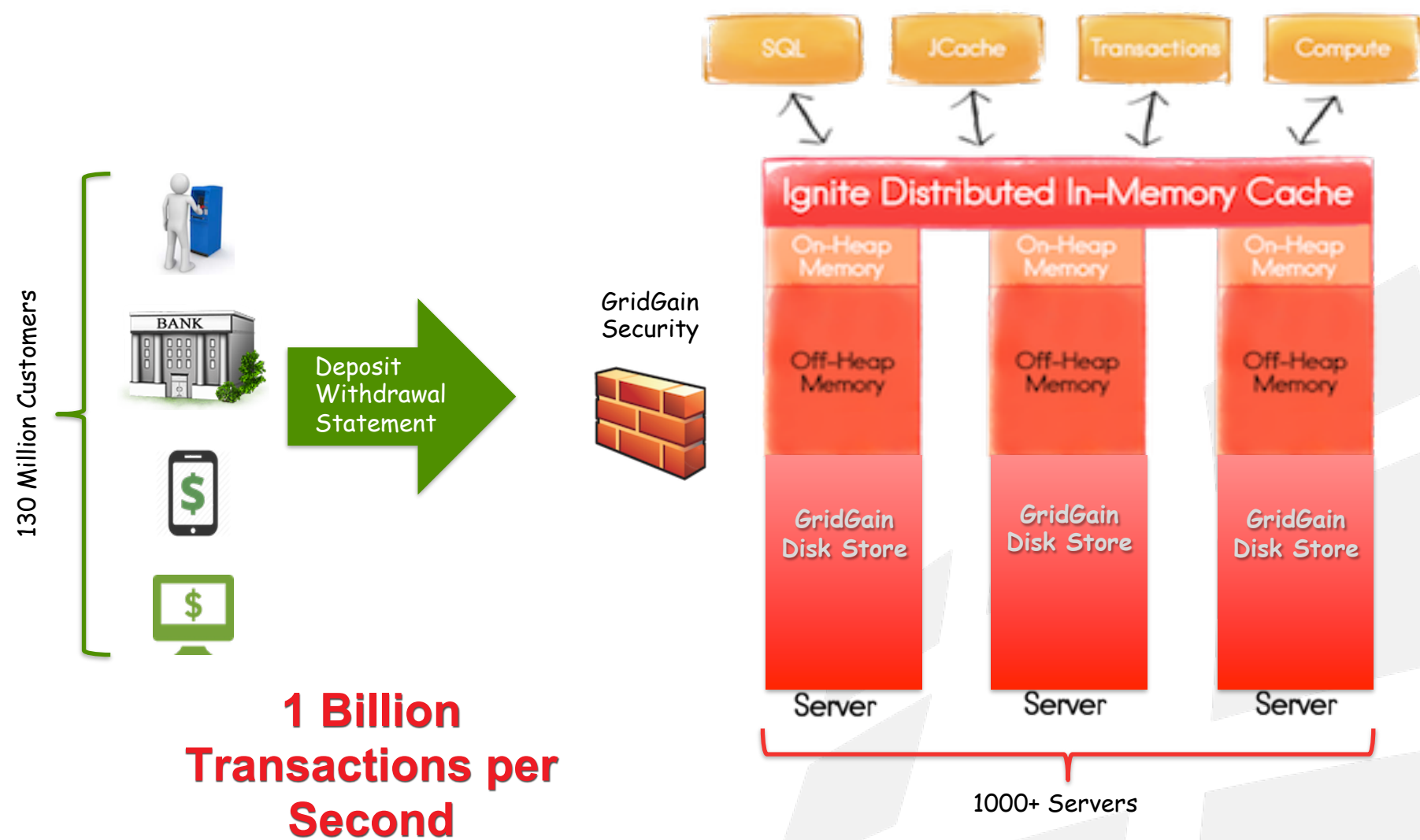
10 Dell R610 blades 1 TB Memory = **$25K**

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From ◢RBC article – January, 2016

Herman Gref
CEO & Chairman, Sberbank

"The new Sberbank IT plan is to create a platform that enables the bank to introduce new products in hours, not weeks. The platform will have virtually unlimited performance and very high reliability. It will be much cheaper and will significantly reduce human interaction during customer transactions. The system will use machine-learning, flexible pricing, and artificial intelligence," said German Gref, head of Sberbank.

"The new system will use technology from GridGain, which won the tender from Oracle, IBM and others, and turned out to deliver an order of magnitude higher performance than those of the largest companies," he added.

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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

- **Why GridGain Won**
  - Strong compute capabilities
    - Co-located in-memory processing
  - Demonstrated best
    - On-demand elasticity & scalability
    - ANSI-99 SQL Support
   - Transactional consistency
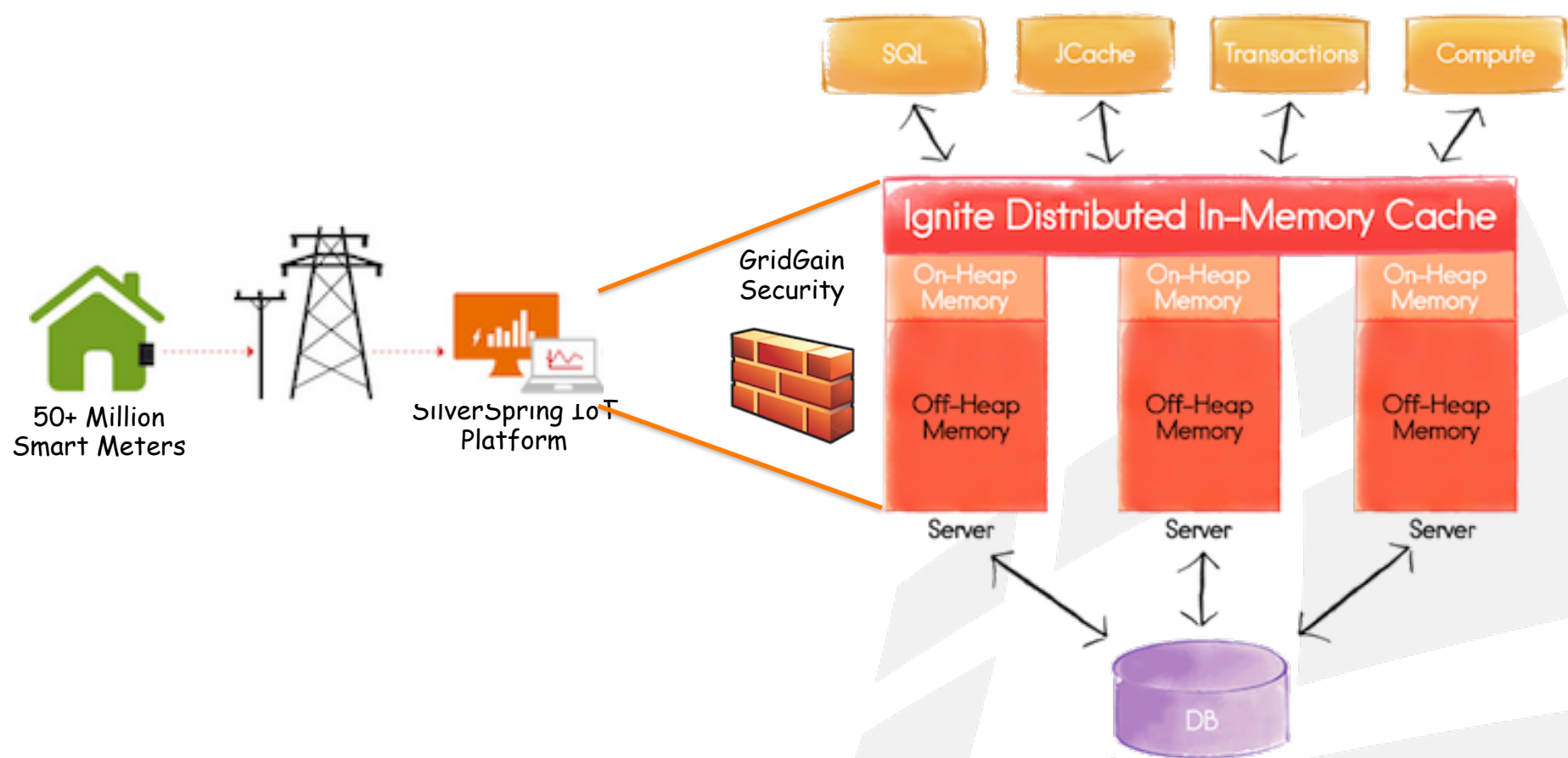
Use Case:

Online consumer electronics store – 11th largest retailer in US

- Newegg Requirements
  - Oracle Coherence replacement
  - Smart in-memory analytics
  - Use open source technologies

- Why GridGain Won
  - Best performance
    - 2x better than incumbent
  - Demonstrated best
    - ANSI-99 SQL Support
    - Resiliency & fault tolerance
    - Transactional consistency
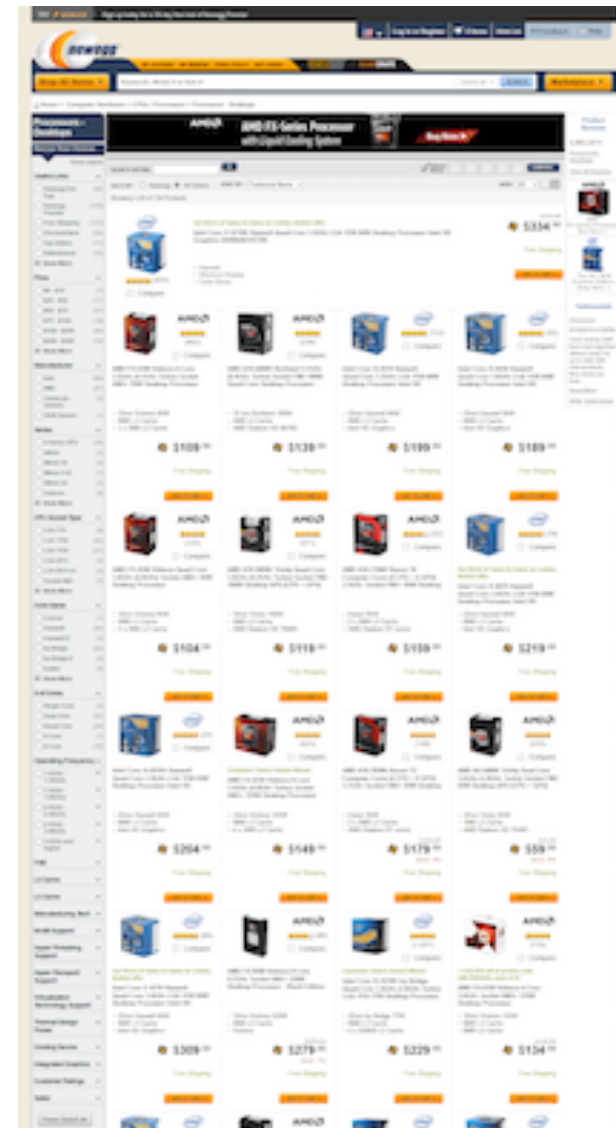
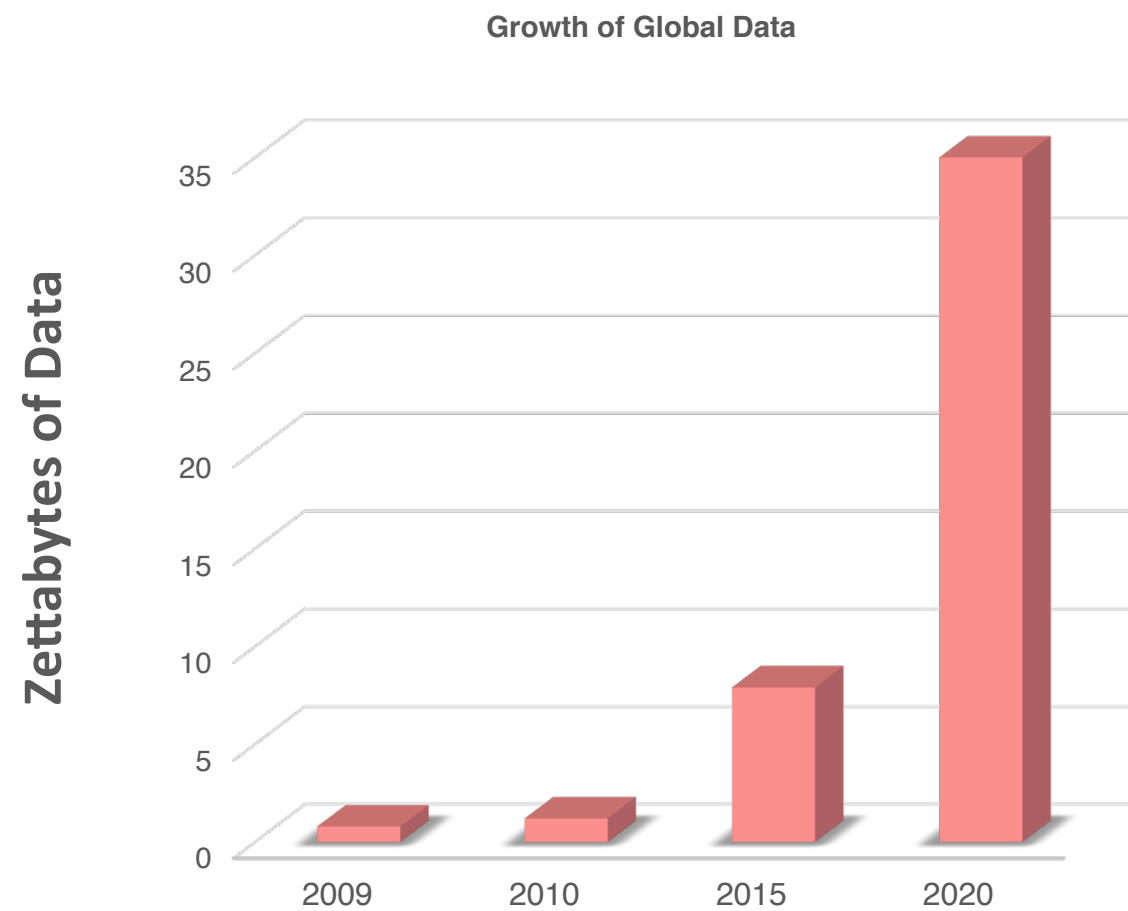NewEgg Ecommerce Site
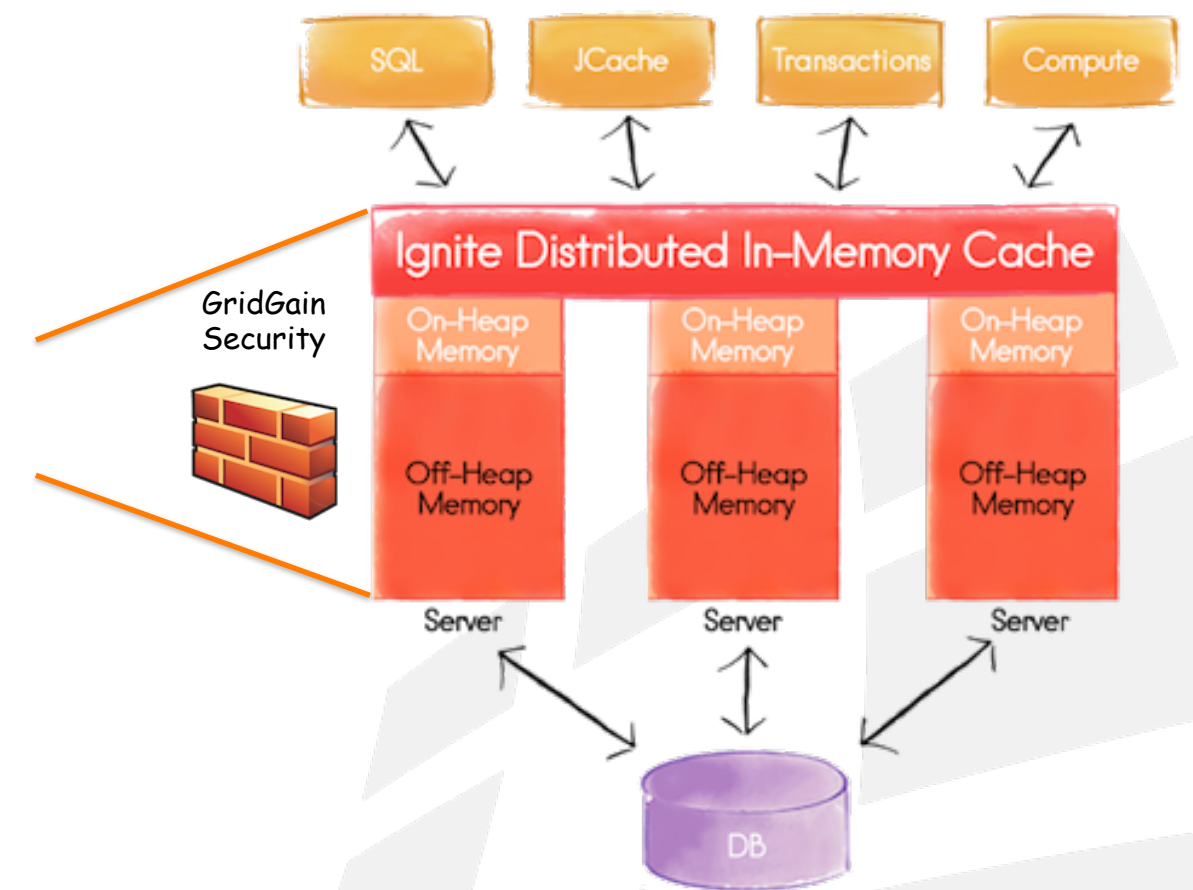
Why Now?

Data Growth and Internet Scale Driving Demand

Growth of Global Data

8 zettabytes in 2015 growing to 35 in 2020

Declining DRAM Cost Driving Attractive Economics
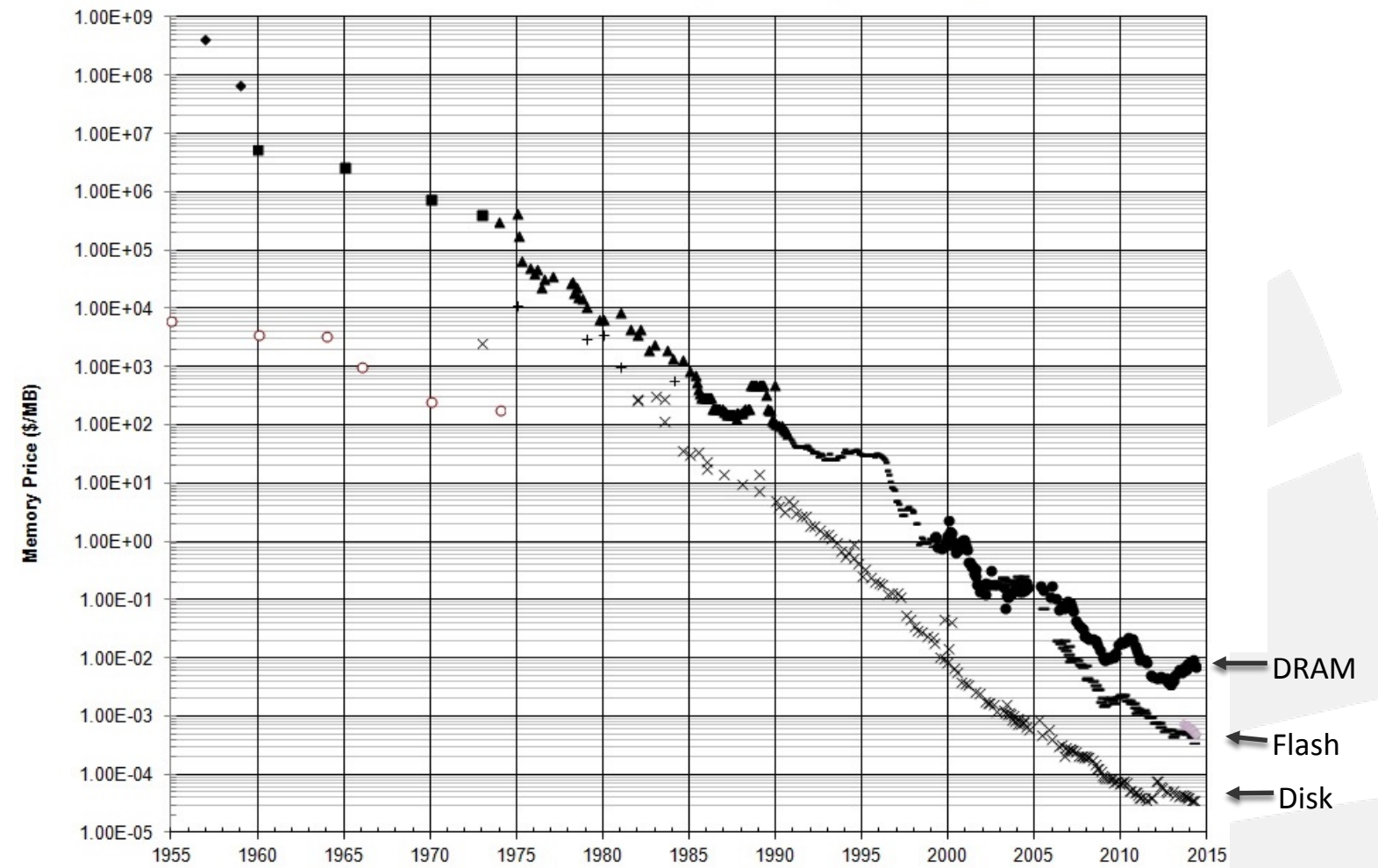
Cost drops 30% every 12 months

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GridGain Enterprise and Open Source Strategy

- GridGain Enterprise Edition is based on Apache Ignite
- Open source is intended to provide an easy entry point for learning, testing and non-critical use
- Enterprise Edition customers benefit from many exclusive enterprise-class features along with support and indemnification

What is an In-Memory Data Fabric?
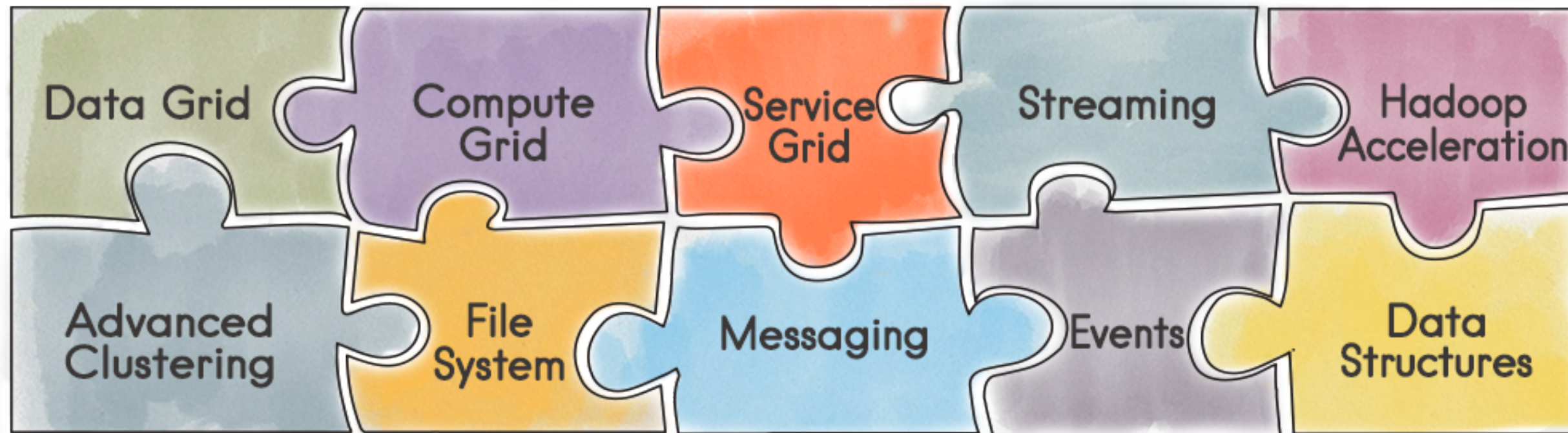
High-performance distributed in-memory platform for computing and transacting on large-scale data sets in near real-time.

In-Memory Data Fabric Use Cases

- Web-session clustering
- Distributed caching
- In-Memory SQL

- HPC
- Machine learning
- Risk analysis
- Grid computing

- HA API Services
- Scalable Middleware

- Real-time Analytics
- Big Data
- Monitoring tools

- Big Data
- Realtime Analytics
- Batch processing

Data Grid · **Compute Grid** · **Service Grid** · **Streaming** · **Hadoop Acceleration**

Advanced Clustering · **File System** · **Messaging** · **Events** · **Data Structures**

- Fault Tolerance
- Multiple backups
- Cluster groups
- Auto Rebalancing

- Distributed In-Memory File System

- Node2Node & Topic-based Messaging

- Complex event processing
- Event driven design

- Distributed queues
- Atomic variables
- Dist. Semaphore

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Flexibility and Enterprise Breadth of In-Memory Data Fabric

cloud/saas

mobile

social

IoT

enterprise applications

APP — JAVA

APP — .NET

APP — C++

APP — SQL

APP — HADOOP MapReduce

GRIDGAIN IN-MEMORY DATA FABRIC

Streaming

Data Grid

Clustering & Compute

Hadoop Acceleration

SQL — Structured OLTP

NoSQL — Unstructured

HADOOP — Analytics/BI OLAP

- Supports Applications of various types and languages

- Open Source – Apache 2.0
- Simple Java APIs
- 1 JAR Dependency
- High Performance & Scale
- Automatic Fault Tolerance
- Management/Monitoring
- Enterprise Security
- Runs on Commodity Hardware

- Supports existing & new data sources
- No need to rip & replace

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In-Memory Data Fabric: Main Benefits

- Performance
  - High Throughput
  - Low Latency
  - Load Balancing
  - Caching
  - In-Memory Indexing
  - Eliminate Java Garbage Collection Pauses
- Scalability
  - Add Cluster Members (cores)
  - Unlimited Vertical Scale
  - Add Memory (RAM)
- High Availability
  - Data Backups
  - Datacenter Replication
  - Automatic Failover
  - Persistence
  - Fault Tolerance
  - Fast Recovery

- Transactions
  - Fully ACID Compliant
  - Optimistic & Pessimistic
  - Data Streaming
- Persistence
  - SQL, NoSQL, Hadoop
  - Tiered Memory: On-Heap ->
- Security
  - Auth & Auth
  - Encryption
  - Tracing & Auditing

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GridGain's In-Memory Data Fabric Enterprise Edition

GridGain Enterprise Subscriptions include:

> Right to use GridGain Enterprise Edition

> Bug fixes, patches, updates and upgrades

> 9x5 or 24x7 Support

> Training and Consulting Services from GridGain

Features	Apache Ignite	GridGain Enterprise
In-Memory Data Grid	✓	✓
In-Memory Compute Grid	✓	✓
In-Memory Service Grid	✓	✓
In-Memory Streaming	✓	✓
In-Memory Hadoop Acceleration	✓	✓
Distributed In-Memory File System	✓	✓
Advanced Clustering	✓	✓
Distributed Messaging	✓	✓
Distributed Events	✓	✓
Distributed Data Structures	✓	✓
Portable Binary Objects	✓	✓
Management & Monitoring GUI		✓
Enterprise-Grade Security		✓
Network Segmentation Protection		✓
Recoverable Local Store		✓
Rolling Production Updates		✓
Data Center Replication		✓
Integration with Oracle GoldenGate		✓
Basic Support (9×5)	✓	✓
Enterprise Support (9×5 and 24×7)		✓
Security Updates		✓
Maintenance Releases & Patches		✓
	Free **w/ optional Paid Support**	**Annual License** **Subscription**

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THANK YOU