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Tradeweb: Revolutionizing the Financial Marketplace with Oracle Event-Driven Architecture Suite

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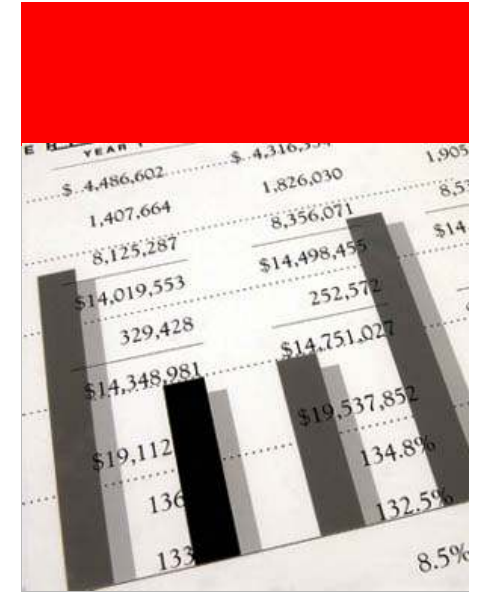
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Tradeweb Revolutionizing the Financial Marketplace

TODAY'S AGENDA

- The Event Driven Application Platform
 - The World Today
 - Benefits of the Event-Driven Approach
 - The Evolution of the EDA Market
- Tradeweb's Industry leading approach
 - Tradeweb Builds Markets
 - Tradeweb Equities
 - Financial Industry (Equities, Trading)
 - More Information -> More Electronic Data
 - Build Products – Abstract View
 - SMARTIoI
 - Common Problems Leads to 'Servers'
 - Evolution of a 'Server'
 - Thinking Beyond 'Server'...
- Summary
 - Why Oracle is leading in the EDA Market





The World Today

The problem: proliferation of *data*

- The reality of today's needs:
 - Better data
 - Conversion of “data” to “information”
 - Making information *actionable* so as to make better decisions
 - ...all in “real time”
- The challenges of today's reality
 - Proliferation of “things coming online”
 - Legacy systems being interconnected as never before
 - New systems being built
 - Service enabled
 - Devices ranging from RFID to cell phones being brought into the fold
 - Complexity increasing exponentially
 - Old model and technologies can't keep up



Benefits of the Event-Driven Approach

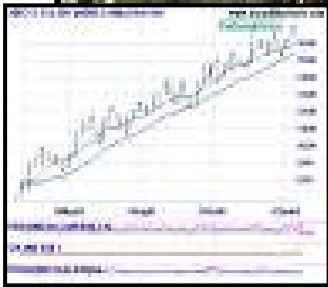
- By
 - Factoring out events
 - Representing events in a standard way
 - Routing, filtering, aggregating, and correlating events intelligently
- You can better
 - View
 - BAM that show the right events at the right level of detail
 - Gain intuitions about interesting/relevant patterns for automation
 - Control
 - Easily use simple events to trigger other events, processes, alerts
 - Define (and process in real time) complex event patterns as triggers
 - Adapt
 - Easily add new event types, sources, consumers, rules, and patterns
 - Quickly add or change what is viewed or controlled with minimal impact



The Evolution of the EDA Market

- The Late Nineties – Event'ing features emerge
 - Database: Oracle DML Triggers
 - Database: Oracle Advanced Queuing
- Early 2000's – Complex Event processing Appears
 - Database: Oracle Data Streams
 - Middleware: Oracle Business Activity Monitoring
 - CEP Vendors, Service Bus Companies validate market potential
- Now
 - Middleware: Event-Driven Architecture Suite **10.3g**
 - Middleware: BEA Event Server → Oracle Complex Event Processing
 - **Coming Soon: Oracle Event Processing 11g**
 - Java based Oracle Business Activity Monitoring (BAM)
 - Oracle Complex Event Processing with SOA integration
 - Oracle ADF: Integrated development environment

Event-Driven Applications



Algorithmic trading



Asset management

Distributed order orchestration



Need to support one or more of:

- High volume
- Continuous streaming
- Sub-millisecond latency
- Disparate sources
- Time window processing
- Complex pattern matching

Financial Services
 Transportation & Logistics
 Telecommunications
 Manufacturing
 Insurance
 Public Sector & Military

'Negative Working Capital' inventory management



- Intrusion detection systems
- Military asset allocation



Reponses to calamities – earthquake, flooding



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Focus on Event-Driven Architecture (EDA)

Lightweight, Low Latency, Extreme High Throughput, and Java-based Application Container

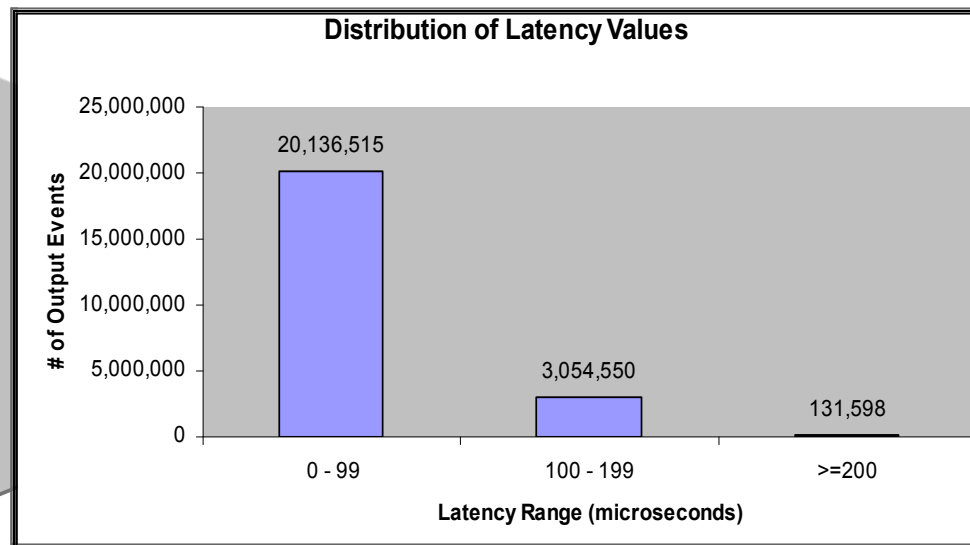
Oracle Complex Event Processor

▶ Enriched Streams

- From any source: data streams, web services, Java, Database

▶ Adapters

- Translate external events/data into java objects for processing



▶ Processors

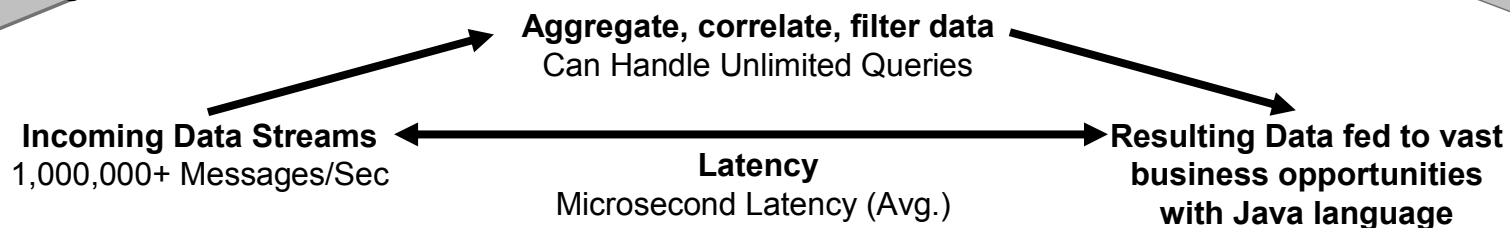
- Set of queries applied to the streams

▶ Listeners

- Handle triggers raised by the processors

▶ Events

- Implemented as JavaBean or Map



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Tradeweb Builds Markets

“Tradeweb is a leader in the over-the-counter multi-asset class online marketplace and a pioneer in the development of pre-trade liquidity discovery, electronic trading and trade processing.”

- Historically – TradeWeb Fixed Income & Derivatives online marketplace and Equities AutEx & Tradeweb Routing Network (TRN)
- In 2008, strategic partnership with 10 leading global broker dealers



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Tradeweb Equities

- Tradeweb Routing Network
 - Largest market-neutral global hub-and-spoke network in the world
- AutEx
 - The pulse behind equity block trading for 39 years
- *(New)* - Smart IOI powered by Oracle CEP
 - An exciting new product this year utilizing technology based upon the industry's first and only low-latency deterministic Java Container and Runtime for EDA



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Financial Industry (Equities, Trading)

- Fragmentation Markets
- Opening of International Markets, MiFID
- Cross Asset Class
- Many more... News, Major Holdings, earnings estimate changes, and so on...

Need to consume more and more information



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More Information → More Electronic Data

- Trader's Desktop changing
- Decision Time periods shorter
- Low Latency data feeds – depth of data expanding
- Not just RT data, historical data too

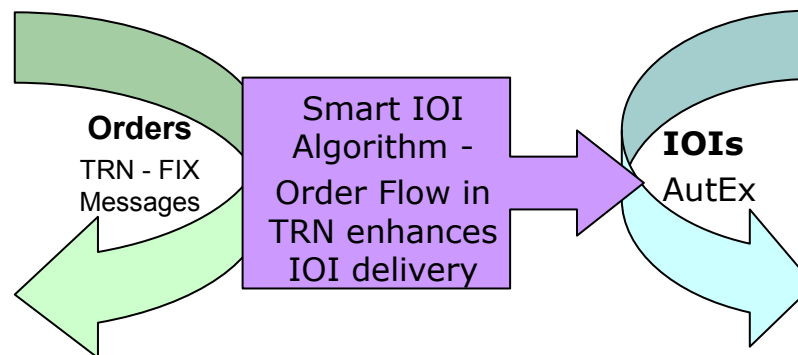
Quantitative Change has led to a
Qualitative Change in the nature of the problem...



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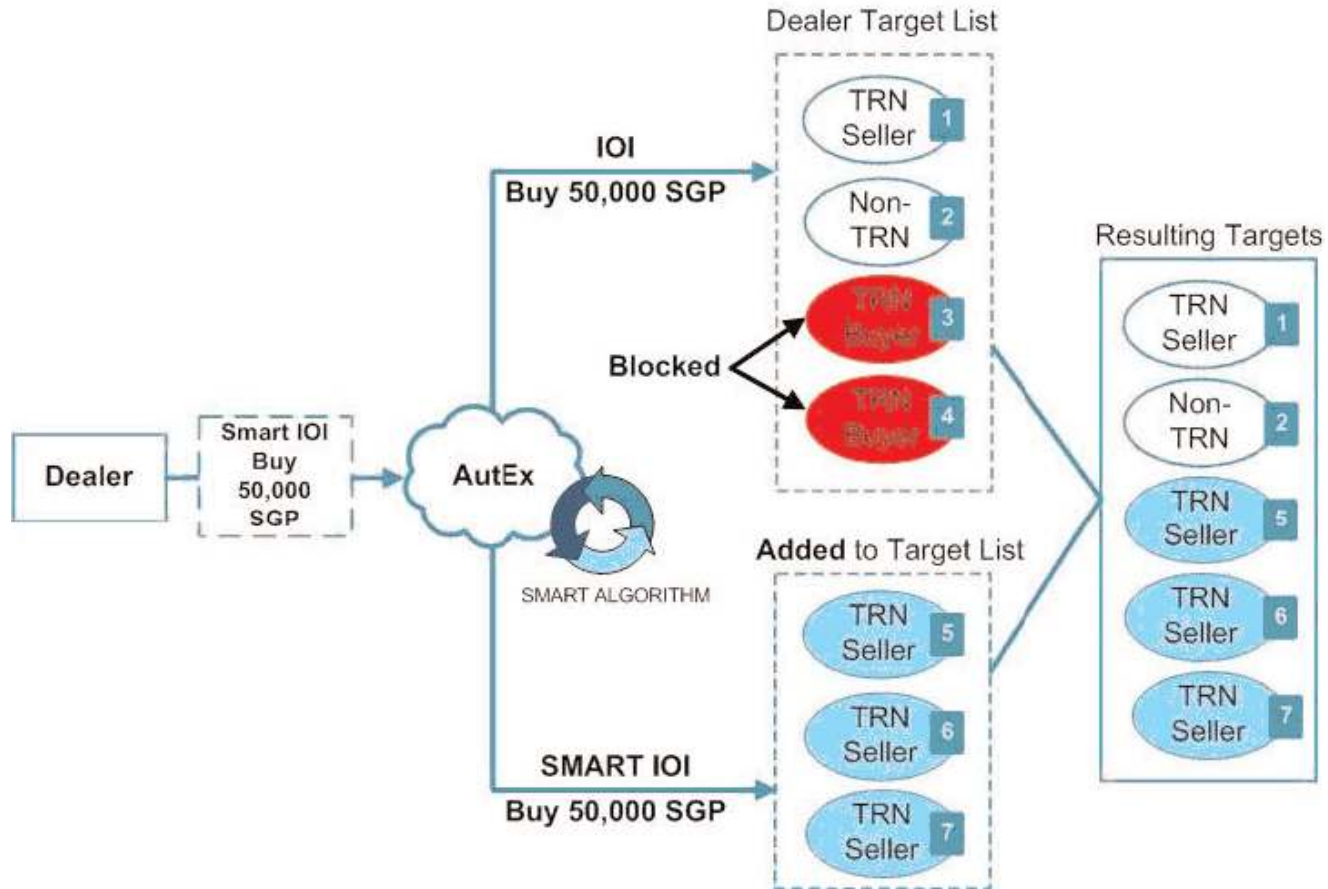
Build Products – Abstract View

- Flows & Pools Data
 - ✓ Single Data Source
 - RT versus Historical
 - static, changes (1st derivative-velocity), etc.
 - ✓ Cross/Compare Multiple Data Sources
- Build Products
 - example: Smart IOI



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Smart IOI



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Common Problems Leads to 'Servers'

- Storing/Organizing Data
 - Databases (1960/70, RDMS 1980)
- Internet Based Services
 - (web) Application Servers (2000)
- Real Time Data Streams
 - Complex Event Processors (2007)



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Evolution of a 'Server'

- Closed Box Solutions
- 'Flexible' Solutions
 - – rules/scripting, user functions
- Beyond Scripting... CEP Server
 - ✓ Helps automate CEP tasks
 - ✓ 100% CEP \Leftrightarrow CEPs within larger programs
 - ✓ High Throughput/Low Latency



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Thinking Beyond ‘Server’...

- Event Driven Architecture – think of problems different way
- “How fast can you go?”
 - ❖ horizontal: x86 hardware
 - ❖ Linux OS vs. Windows OS
 - ❖ C/C++ vs. Java: Realtime JVM
 - ✓ Important how fast change products
 - ✓ Vendor Owned JVM
 - ✓ Near pauseless – to pauseless GC



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JRokit Real Time **Benefits**

- **Guaranteed millisecond application response times**
 - Restrict GC pause times based on application SLA
- **Lower development & maintenance costs**
 - Replace native code with Java
 - Avoid costly JVM tuning
- **Improve application performance & latency**
 - Performance on par with standard JRokit JVM!
 - Use tools to identify & fix latency issues
- **Expand use of Java to new areas**
 - Financial front office: trading, pricing, foreign exchange
 - Telco core network: billing, IP telephony etc
 - RFID, sensor networks, command & control, manufacturing etc



Future Direction

Bigger, Faster, Better

JRockit JVM

Improved performance, diagnostics features

JRockit Mission Control

Always-on performance monitoring
Automated root cause analysis

JRockit Real Time

Pauseless GC

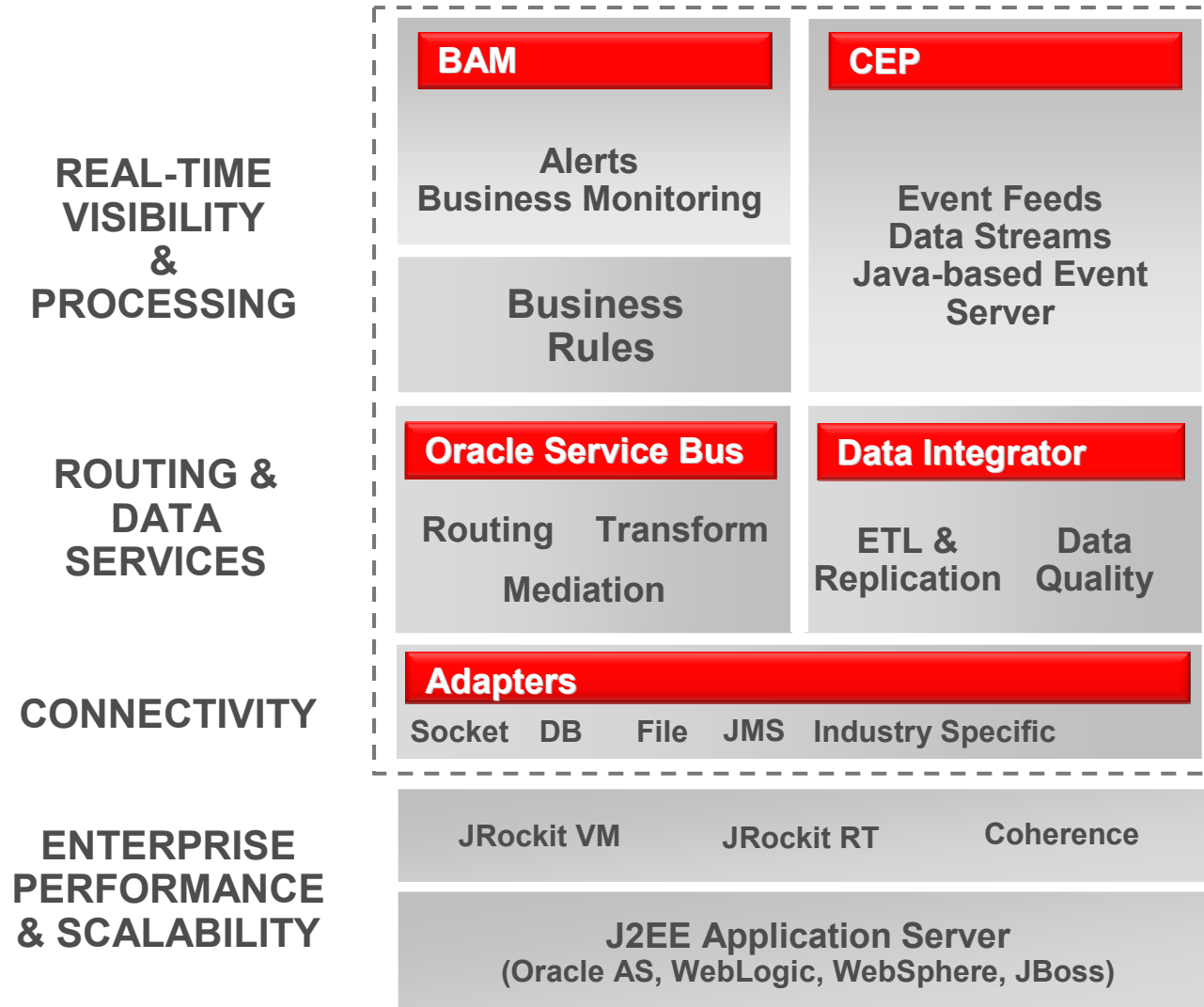
Improved profiling & monitoring

JRockit Virtual Edition

OracleVM integration
Zero-configuration deployment & management

Oracle EDA Suite

Complete Suite for Industrial Event Processing



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Why Oracle is leading the EDA Market

- Deterministic, Real Time EDA Java Application Server
- Event-oriented Application Programming Model
 - Address incredibly complex Event Streaming algorithms
- Business Analyst Oriented Development
- Complete Tooling
 - Pre-packaged Templates
- Low latency Real Time JRockit JVM, In-memory Coherence Data Grid



Industries First and Only Enterprise Strength, Massively Scaleable, Highly Available Event Driven Application Platform

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EDA at Open World

- S299460 – **(Retail Track) Oracle SOA Suite in Retail: Event Processing in the Store, Distribution Center and Central Office**
 - Monday 5:30PM - **Palace Hotel Twin Peaks**
- S298904 – **(SOA and BPM Track) Oracle SOA Suite Process Monitoring: Oracle Business Activity Monitoring Implementation Best Practices**
 - Tuesday 5:00PM - **Marriott Salon 08**
- S299462 - **(Financial Services Track) Oracle SOA Suite in Financial Services: Complex Event Processing and Event-Driven SOA**
 - Wednesday 1:00PM - **Westin SF Market Street, Metropolitan II**
- S298906 - **(SOA and BPM Track) Event-Driven SOA: Real-Time Business Intelligence Situational Awareness Solutions Leveraging the Power of EDA**
 - Thursday 1:30PM - **Marriott Salon 14/15**

DEMOgrounds

Mon. – Thurs. Event Driven Architectures: Complex Event Processing and Business Activity Monitoring - **A33**

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EDA at Open World

- **S298974 – Oracle Business Activity Monitoring, Java Edition: What’s New in Oracle Business Activity Monitoring 11g**
 - Sunday 2:30PM - **Marriott Nob Hill CD**
- **S299013– Oracle Event-Driven Architecture Suite, CEP, SOA, & Web 2.0**
 - Sunday 3:45PM - **Marriott Salon 07**
- **S299043 - Hands-on Lab: Oracle Business Activity Monitoring: Java Edition -- New to Business Activity Monitoring?**
 - Monday 11:30AM & Tuesday 1:00PM - **Marriott Golden Gate C2**
- **Oracle Continuous Query Language for Complex Event Processing**
 - Tuesday 2:30PM - **Marriott Golden Gate C2**
- **S298920 TradeWeb: Revolutionizing the Financial Front Office with Oracle Event-Driven Architecture Suite**
 - Tuesday 4:00PM - **Marriott Salon 06**

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<http://www.oracle.com/technologies/soa/eda/eda-suite.html>

<http://www.oracle.com/technology/products/event-driven-architecture/index.html>