Algorithmic Operations: Integrating Real-Time Analytics into your Business

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Macro Trend: Digital Business Transformation

- Changing Consumer Expectations
- Internet Connected Devices
- Machine Learning and Predictive Analytics
- Empowered Super Users
- Disruptive Full Stack Startups
- Technology Initiatives Outside IT
- Mobile Devices and Apps
- API Economy

How will you transform into a digital business?
To automate your business with analytics, you must give the business visibility and control.
Agenda

- Digital Business: From Big Data to Fast Data
- Operational Intelligence and Algorithmic Operations
- Lessons Learned from Key Fast Data Use Cases
- TIBCO Event Processing
Big Data: There can be an overwhelming volume
Most solutions focus on accumulating and analyzing.
Especially analyzing things which already happened
But how will you access the data when you need it?
Fast Data

Fast data is processing big data in real-time to gain instant awareness and instant action.
To automate your business with analytics, you must give the business visibility and control.
Digital Business: From Big Data to Fast Data

Operational Intelligence and Algorithmic Operations

Lessons Learned from Key Fast Data Use Cases

TIBCO Event Processing
The Problem: 40 Years of “The Too Late Architecture”

“Who cares if we find out we lost a customer after he left?”
The Algorithmic Enterprise: Fast Data at Work

Integration Bus

External Events

Internet of Things

Event Processing

Enterprise Integration

Alerting and Visualization

Business Processes

Automated Reaction

Events

Streaming Analytics & Event Driven Rules
Controlling Algorithmic Operations: Business Rules

Events
- Integration Bus
- External Events
- Internet of Things

Event Processing

Automated Decisions
- Enterprise Integration
- Alerting and Visualization
- Business Processes

Event Rules
The LiveView Datamart – Operational Intelligence

Integration Bus
External Events
Internet of Things

Live Datamart
Event Processing

Enterprise Integration
Alerting and Visualization
Business Processes
Automated Decisions

Events
Beyond Big Data: Algorithmic Operations

- App
- Sensors
- Social

Fast Data

- Live Datamart
- Streaming Analytics

Big Data

Externalized Rules
- Business Rules Logic

Automation

Event Analytics (LiveView)

Historical Analytics (Spotfire)
Operational Intelligence

Human decisions in real time informed by up to date information

The Challenge: The right information, ready to be used by the right people at the right time.

Algorithmic Operations

Automated action based on analytic models of history combined with live context and business rules

The Challenge: Empowering business stakeholders to understand and control the selection of models.
To automate your business with analytics, you must give the business visibility and control.
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TIBCO Event Processing
Key Fast Data Use Cases

- Trading: Execution Optimization
- Telco: Customer Churn Prevention
- Banking: Real-Time Compliance
- Marketing: Real-Time Campaign Attribution
- Dealing: Counterparty Behavioral Analysis
- Manufacturing: Yield Improvement and Cost Reduction
Execution Optimization
“With StreamBase & Spotfire, we can analyze everything that impacts trade performance, and adjust to it on-the-fly.”

- Head of IT, Asset Management
• **Situation: Major asset manager needs more insight**
  – Which trades are slipping? How close to target are we for participation rates? How can we adjust our trading in the market now?

• **Problem: How to get better price discovery?**
  – Need real-time analytics using market data, interface to OMS, EMS (Portware), and internal systems

• **Solution: StreamBase, LiveView, and Spotfire**
  – Developed a live visualization system with StreamBase CEP, LiveView, a custom .NET visualization front end for traders & PMs, and Spotfire for historical analytics

• **Impact: Improved trading performance**
  – Solution allows traders and PM’s to understand where their trade performance is going, and adjust trading strategies during the day
StreamBase CEP
  Trading Analytics

StreamBase LiveView
  LiveView Aggregation

.NET GUI

OMS

EMS

Spotfire

FIX

FIX

MQ

DBMS

Traders & Portfolio Managers

Alerts
Lesson #1

Identify opportunities being missed by operational staff because they are too small or too hard to optimize, and automate those first for quick wins.
Telecommunications: Customer Churn Prevention
“If I can see network issues in the moment, I can fix them before my customer notices, and automatically improve call center efficiency by letting customers proactively know we’re working on the problem.

CIO, major telecom
The Situation Before: Customer Churn Projections to Cost $28M+ / Year
- Telecom flying blind in real-time with respect to network outages that can effect valuable customers and social influencers

Negative Consequences: Call Centers Can’t React to Problems in the Network as They Happen
- Systems don’t talk to each other in any way other than batch, so the call center handles calls for network issues that are already identified

Positive Business Outcome: Predictive Real-Time Customer Service
- Call center systems proactively inform effected customers effected by network issues
- Network systems proactively re-route high-value customers around effected network areas in real-time

How We Do It: TIBCO Event Processing for Real-Time Analytics in Telco Networks and Call Center Action
- High-speed network and user event analytics, visualization, alerting, and action to optimize customer call center behavior

“If we detect and correct network problems before the customer notices, we could reduce revenue loss based on churn by as much as $28M a year.”
- Head of IT, major telco provider
• **One Telecommunications Firm Customer Churn Study…**
  - Studied 8M customers, 7 billion service calls for a 3 week sample
  - Found 1M clusters of callers, 120K “Dropped Call Watch List” clusters
  - Identified 40K network influencer “signatures”
  - Found 4000 watch list customers who already cancelled service and can influence others; impacted an additional 18K customers when they cancelled

• **Impaction: Projected $28M in Lost Annual Revenue**
  - Customer loss directly linked to network outages whose impact might have been mitigated if real-time visibility was available
  - By providing influencers better service in real-time, and optimizing call centers to support high-value customers, revenue loss can be dramatically reduced
  - By predicting which customers will call due to service outage and intercepting calls, customers will know immediately that the Telecom is on top of the issue. *Builds trust.*
High priority alerts for Network Operators. e.g., “These 100 high value customers are being effected by these network events. Give them high priority access and fix the network.”

Live aggregation and slice and dice of call hand backs, dropped calls, and Ping-Pong events – all signs of problems.

Real-time analytic allows operators to view in real-time the dropped calls, hand overs between towers – these is critical data to resolve network issues in the moment, in the Network Operations Center.
Lesson #2

Empower operational staff with contextually relevant information, decision making authority and recommended action.

- Understand
- Control
- Automate
Continuous Compliance
“In December 2012, **Knight Capital lost $460M in under 40 minutes.** That changed everything. Now, it’s no longer acceptable to run our business based on end-of-day reports.”

- Head of Risk Management, top 3 bank
“WHEN any security has SIMULTANEOUS TXNS with THE SAME PRICE, within 30 SECONDS, flag the TXN as a potential WASH TRADE”
### Best Practices of Real-Time Compliance

#### Risk Alerts

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<th>Pin Id</th>
<th>Buy-Side Clients</th>
<th>Sell-Side Clients</th>
<th>Large Order</th>
<th>Selling</th>
<th>Ramping On-Close</th>
<th>Ramping On-Open</th>
<th>Hedging The Close</th>
<th>Wash Sales</th>
<th>Leveraging</th>
<th>Speed 1</th>
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#### Alert Count

<table>
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<th>Pin Id</th>
<th>Alert Count</th>
<th>Alerts Assigned to Cases</th>
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</thead>
<tbody>
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<td>54</td>
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</table>

#### Filter Options

- [Filter Options](#)
Lesson #3

Alert and react to operational problems while they are still fresh to prevent risk snowballs and to keep outcomes positive.
Marketing: Real-Time Campaign Attribution
A leading cellular operator in Asia, which serves more than 130 million customers. The operator has experienced double digit growth over the last 3 years in prepaid, postpaid, and value added services.

**The Problem:** Bridging the gap between marketing campaigns launched and potential revenue that is generated
- Complexity of data correlation between current campaign system and surrounding environment meant manually scripting and calculating the potential revenue.

**The Solution: Automated Campaign Tracking**
- Integrate data from four systems
- Campaign provision report
- Campaign spikes: Alert on spikes in offer provisioning
Automated Campaign Tracking: The Outcome

- Replacing manual work with automated process
- Campaign revenue visualization by mapping campaign data to multiple sources
- Streambase provides a expandable platform for correlating different streams
- Live view provides source for tracking data movement in real time
- Spotfire can be used for war room reports
- Why TIBCO?
  - TIBCO solution will help view campaign flowing data (LiveView) and also correlate multiple streams in StreamBase (4 sources of data) and view revenue reports in Spotfire (Data to be made available in DB)
  - The existing campaign solution cannot provide reports. TIBCO can handle both the live view and historical – which will help Telkomsel understand data and spikes in a much better fashion
  - Live view will also help in raising alerts whenever campaign systems breach the threshold of bonus provision (This can be extended to multiple sources)
Lesson #4

Use event processing and rules to correlate events in real time to build context from data in decoupled or siloed systems.
Counterparty Behavioral Analysis
Identify customers acting on superior information
Route trade flow elsewhere

At 8:31:21 AM, client sells 7 times in 10 seconds. At this moment, the firm made money.

35 seconds later, the firm has lost over $10,000 on these trades because the client had better market data.
Internet / Customers
Real-Time Applications
Log Files
Historical Analysis
Teradata
Historical Analysis
Operational Staff
Risk Analysts
Fraud & Risk Management
Outlet
Metrics
Operationalize Insight
Operational Staff
Live Analysis
StreamBase LiveView
Operational Staff
Operational Staff
Operational Staff
Operational Staff
Brick & Motor / Sensor
Machine Generated Data
Hadoop
HDFS
Map Reduce
Aggregation, Logging
Automated Response
TIBCO EMS, TFL, etc.
Batch Processing
Event Processing
Correlate
Aggregate
TERR
Automate
Alert
Real-Time Applications
Active Spaces
Fraud & Risk Management
Historical Analysis
Operational Staff
Operational Staff
Operational Staff
Operational Staff
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Operational Staff
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Lesson #5

Understand your data analytics pipeline and make the same data available to operational intelligence and algorithmic operations
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Understand your data analytics pipeline and make the same data available to operational intelligence and algorithmic operations.
Manufacturing: Yield Improvement and Cost Reduction
• About The Customer
  – Solar Panel Manufacturer
  – One of many manufacturing facilities

• Manufacturing Yield Management and Optimization
  – Spotfire & LiveView for manufacturing process yield management and optimization
  – Monitor temperature, moisture reading sensors in real-time with LiveView
  – Real-time predictive detection of manufacturing problems
IF avg (temperature) in the LAST 5 MINUTES > 100C
AND avg (pressure) in the LAST 10 MINUTES > 1000 PSI
THEN RAISE ALERT (“DANGER: Maximum Operating Parameters Exceeded”)
**Example:**
At POCL stage we can predict probability of the final product quality.
Real Time Close Loop: Understand – Anticipate – Act

UNDERSTAND: Normal patterns of effective manufacturing processes analyzed

CORRELATE: Real-time factory behavior compared to the model

ACT: Shut down equipment, schedule additional measurements,
Lesson #6

Follow up on automated problem detection with not only automated action, but also root cause analysis using historical data tools.

Understand → Control → Automate
1. Optimize and automate small decisions first, for quick wins
2. Resolve problems while they are fresh to prevent snowballs
3. Understand your analytics pipeline and have the same data in real time
4. Use event processing to correlate events from multiple systems
5. Empower staff with decision making authority and information, and also provide recommended action
6. Follow up not only with automated action, but root cause analysis
To automate your business with analytics, you must give the business visibility and control.
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Lessons Learned from Key Fast Data Use Cases

TIBCO Event Processing
Streaming Analytics & Event Rules

Event-driven rules and streaming analytics for automated, event-driven business decisions and processes

Users: Developers, IT and Data Scientists

Discovery & Live Insight

LiveView: Discover new patterns via human expertise, graphing, real-time stream aggregation, and real-time alerts

Users: Operations (network & business), Customer Support, Network Operations Center, Marketing operations
TIBCO Event Processing Platform

**Inputs**
- Message Bus
- BPM
- Database
- Twitter
- Machine Data
- ActiveSpaces

**Business Events**

**StreamBase**

**Live Datamart**

**Outputs**
- Automated Action
- Alerts
- Business Processes
- Continuous Analytics

**LiveView Datamart**
- CONTINUOUS QUERY PROCESSOR
- SHARDING
- USER AUTH

**Streaming Analytics**
- RULES
- AGGREGATION
- Distributed Transactional Memory

**ADAPTER**
- **Visual Programming**
  - Visual programming

- **Stream & Database Connectivity**
  - 150 adapters, Event-driven database integration

- **Event-Driven Rules**
  - Business Events

- **Streaming Analytics**
  - StreamBase

- **Integrated Analytics**
  - R, TERR, Matlab

- **Big Data Processing**
  - Data grid (ActiveSpaces), distributed transactional memory

- **Big Data Integration**
  - Hadoop (Flume), Amazon Kinesis, Twitter Storm

- **Social Media Integration**
  - Twitter, GNIP

- **Fault Tolerance**
  - Managed clusters, continuous availability

- **Cloud Deployment**
  - TIBCO Silver Fabric

- **Event-Driven BPM**
  - With AMX-BPM

- **Simulation and Backtesting**
  - Replay / testing

- **Visual Debugging**
  - Trace and break-point debugger

- **Enterprise Testing**
  - Test recording, Junit, Fitness, Continuous Integration

- **Developer Community**
  - StreamBase Component Exchange, certification

- **Language Integration**
  - Java, .NET, HTML5

- **Management Tools**
  - GUI, command line, API, JMX
“Business value doesn’t come from building faster applications; it comes from building applications faster.”
Event Processing Connectivity 2014: 150+ Streaming Source & Sinks

- **Enterprise Messaging**
  - TIBCO Rendezvous
  - TIBCO EMS
  - TIBCO FTL
  - IBM MQSeries
  - Informatica 29West
  - Solace
  - Tervela
  - JMS (publish / subscribe)
  - TCP/IP

- **Big Data**
  - Hadoop (Flume)
  - Amazon Kinesis
  - Twitter Storm
  - **Spark**

- **Data Grid / Cache**
  - ActiveSpaces
  - TIBCO Distributed Transactional Memory
  - **Mongo**

- **Integration**
  - BusinessWorks

- **Internet of Things**
  - OSI Pi
  - MQTT (MQ Telemetry Transport)
  - Insteon
  - X10
  - XBee,
  - Google Glass
  - Live cameras for face detection
  - Beacons
  - SDR (software defined radio) for plane tracking
  - AR Drone quadcopter
  - OBD-II car on-board computer diagnostic adapter
  - Xbox

- **Social**
  - Twitter
  - GNIP
  - TIBBR
  - Jabber / IRC
  - RSS

- **Database**
  - Vertica
  - Oracle
  - SQL Server
  - MySQL
  - IBM DB2
  - Sybase ASE / IQ / RAP
  - Active Oracle log reader
  - Active SQL Server log reader

- **Technology**
  - Binary file (read and write)
  - CSV files and sockets (read and write)
  - Email (read and writer)
  - IP packet capture (HTTP / IRC / POP3 / SMTP)
  - Log files
  - Regular expression file and socket

150+ adapters to Streaming, Social, Hadoop, IoT, Integration, Technology data sources
“The LiveView Datamart is like a data warehouse for data that’s constantly in motion, and changing all the time.”
THE END OF THE END OF DAY REPORT
Fast Geo-Spatial Data
Live Datamart Client APIs

- **Open Client Support**
  - For custom GUI development
  - Allows open partner development
  - Ad-hoc query
  - Notifications

- **HTML5**
  - D3, jQuery, ExtJS, Google Charts, Bing, AngularJS

- **.NET**
  - For custom .NET development

- **Java**
  - For custom Java GUI development
Operational Intelligence

Human decisions in real time informed by up to date information

The Challenge: The right information, ready to be used by the right people at the right time.

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Questions?
How will you automate with analytics?
How will you give visibility and control?
More info at tibco.com
Or at our booth here

Follow me @tibbetts
Follow up with tibbetts@tibco.com