Fast Data for Today’s Architectural Patterns

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Abstract:
Today’s digital business requires a new set of architectural approaches and patterns for solving business problems at “Internet” scale and speed. Traditional approaches must be augmented with new techniques to derive value from the data explosion, and to handle the challenges associated with areas such as Big Data, IoT, and Cloud. Attend this session to learn more about architecture frameworks such as Lambda, Reactive Applications, and 12-Factor Applications, and learn how TIBCO’s Fast Data platform can assist in building solutions that utilize these patterns.

What You Will Learn:
• Understand the challenges associated with traditional application architectures, and the forces driving organizations to adopt new approaches and methods.
• Understand how architectural approaches such as Microservices, Lambda, Reactive Applications, and 12 Factor Applications can be used to help solve today's business application challenges.
• Understand how TIBCO's Fast Data Platform may be applied to build solutions that utilize these approaches.
Agenda

1. Industry Trends Driving These Approaches
2. Lambda Applied to Big Data
3. Microservices and Cloud Native Applications
4. IoT: From the Edge to the Data Center
5. Summary
Consumer Expectations Have Changed
Fourth Industrial Revolution

The frontiers between digital and physical are blurring
Massive Data Volumes: “Big Data”

- The growth of “Big Data” is resulting in a number of industry trends, including:
  - New emerging architectures for handling the volume, velocity, and variety of data.
  - Growth of Data Lakes.
  - Accelerated adoption of Big Data Analytics.
  - Development of Deep Learning capabilities.

- There is also an increased interest in shifting from “batch” processing to real-time analytics at the point of decision. 
  - “Fast Data”.

**X as a Service: “Cloud”**

- **PaaS**
  - Platform as a Service
  - Packaged execution platform that provides a bundled set of services for deploying and running microservices.

- **CaaS**
  - Container as a Service
  - Allows one to bundle code, tools, libraries, etc. into a lightweight execution environment that can run on any infrastructure.

- **IaaS**
  - Infrastructure as a Service
  - Virtual datacenter.
  - API managed.
  - Hardware, network, disk, storage...
Evolving Demands from the Business

AGILITY & SPEED

WEB SCALE

REDUCED CYCLE TIMES

LOWER COST

FAIL FAST
Core vs. Edge Project Types

**“Core”**
- Focus: Reliability
- “Run the Business”
  - Big Projects
  - Corporate Standards
  - Platform-Based
  - High Cost of Change
  - Best Practices / COE
  - Enable “Edge” Projects

**“Edge”**
- Focus: Agility
- “Change the Business”
  - Agile, Lightweight
  - Frequent Changes
  - Flexible, Smaller Projects
  - Polyglot, CI, CD, DevOps
  - Low Cost of Change
  - Components

Business Units
/ Organizations

Enable
Lambda Architecture Applied to Big Data
Lambda: Big Data Architectural Approach

- Batch Storage
- Batch Views
- Batch Layer

- Stream Processing
- Delta Views
- Speed Layer

- Merged Views
- Serving Layer

Data Stream

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TIBCO BusinessWorks 6

First Class Developer Tooling
- Eclipse Design Time
- Visual Debugger
- Develop in BW and Java
- Shared Modules
- Admin UI and Scripting
- Multi-Apps Runtime

Simple Sophisticated Modeling
- Multi-Ops Processes
- Conversations
- Stateful Processes
- Event Handlers
- Process Compensation
- Migration Path for BW5

Open Platform Open Ecosystem
- Broad Ecosystem
- BW Plugin Dev Kit
- P2 Plugins Install
- OSGi Components

Cloud, Web and Mobile-Ready
- First Class REST
- Microservices
- Mobile Integration
- FTL / eFTL
- Remote Deployment
- Remote Debugging

Accelerate Time to Results
- Zero-coding Integration
- Zero Resistance to Code
- Non-stop Dev-Deploy
- Continuous Integration / Continuous Delivery
Build Event-Driven Applications with Ease and Speed

Developer Highlights
• Integrated development environment
• Graphic editors and model-driven environment
• Non-linearity in the form of declarative rules

Business User Highlights
• Defining and implementing rules and logic in a web browser
• Decision tables and rule templates

Runtime Highlights
• Multi-protocol channel support
• Event-driven rule evaluation and execution
• Stateful for reasoning across time and space
• Multiple deployment topology options
• Horizontal scalability
• Memory management strategies
• Data grid security
TIBCO StreamBase

Build Streaming Analytics Applications Quickly

Developer Highlights
• Eclipse-based IDE
• Visual programming language
• Integrating predictive models via TERR
• Data connectivity with numerous integration points

Runtime Highlights
• Immense throughput at extremely low latencies
• Increased scalability without programming errors
• Big Data connectivity

StreamBase Studio UI
Provide Insight and Instant Command and Control

Business User Highlights
- On-the-fly action on detected opportunities and threats
- Interacting with live data: ad-hoc queries, alerts
- Live drill down with preferred visualizations
- Multiple client options: desktop, web, custom UIs

TIBCO LiveView Server Highlights
- Ultra-fast, continuous querying
- IoT ready: OSI Pi, MQTT, ...
- Connectivity via sensors, GPS, and others

Live Desktop UI
Lambda: Big Data Architectural Approach

Batch Layer
- Batch Storage
- Batch Views

Serving Layer
- Live Datamart
- Merged Views

Speed Layer
- Delta Views
- Stream Processing
- Business Events

Business Works
- StreamBase

Data Stream

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LiveView Web

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Microservices & Cloud Native Applications
What Are Microservices?

- **Suite of small services running in its own process.**
- **Communication via lightweight mechanisms.**
- **Built around business capabilities.**
- **Independently deployable, written in different languages and using different data stores.**
- **Bare minimum of centralized management.**

* [http://martinfowler.com/microservices/](http://martinfowler.com/microservices/)
Why Microservices?

Benefits

*Monolith is initially simple to develop, test, deploy, & scale.*

Challenges

*Eventually the monolithic becomes complex, “all or nothing”, and tied to a technology.*
Why Microservices: Reactive Applications

- Coherent **approach to systems architecture** to meet today’s demands.
- Reactive systems are **flexible, loosely coupled, and scalable**.
- Rely on **asynchronous message passing** to establish a boundary between components.

*http://www.reactivemanifesto.org/
## Why Microservices: 12 Factor Apps

<table>
<thead>
<tr>
<th>Codebase</th>
<th>Dependencies</th>
<th>Config</th>
<th>Backing Services</th>
<th>Build, Release, Run</th>
<th>Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>One codebase</td>
<td>Explicitly declare and isolate dependencies.</td>
<td>Store config in the environment.</td>
<td>Treat backing services as attached resources.</td>
<td>Strictly separate build and run stages.</td>
<td>Execute the app as one or more stateless processes.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Port Binding</th>
<th>Concurrency</th>
<th>Disposability</th>
<th>Dev / Prod Parity</th>
<th>Logs</th>
<th>Admin Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export services via port binding.</td>
<td>Scale out via the process model.</td>
<td>Maximize robustness with fast startup and graceful shutdown.</td>
<td>Keep dev, staging, and prod as similar as possible.</td>
<td>Treat logs as event streams.</td>
<td>Run admin/mgmt tasks as one-off processes.</td>
</tr>
</tbody>
</table>

* [http://12factor.net/](http://12factor.net/)
For Cloud Native Integration Apps

Build Microservices with fastest time to results

Visually integrate APIs with zero lines of code

Deploy manage & scale apps on Cloud Platforms

Essential Requirement for Any Enterprise Platform as a Service
Pattern: Cloud to Cloud Integration

API Modeler (optional)

BusinessStudio

EAR + Manifest

cf push

PaaS

BusinessWorks Container Edition

BuildPack

Private or Publicly Hosted (e.g. Pivotal Cloud Foundry)

API

salesforce

API

workday

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Pattern: Hybrid Integration (SaaS to On-Premise)

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Pattern: API Choreography and Composition

API Modeler (optional)

BusinessStudio

API Management (Mashery)

publish

PaaS

BusinessWorks Container Edition

Buildpack

Private or Publicly Hosted (e.g. Pivotal Cloud Foundry)

EAR + Manifest
cf push

cf push

API

salesforce

workday

Microservice

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IoT: From the Edge to the Data Center
IoT: Hierarchical Event Handling

- Execute event processing logic at multiple levels within edge processing “pods”.
  - Integration, rules, analytics...
- Raw and derived events bubble up to the enterprise domain.
- Enterprise domain may push new knowledge to the lower levels.
- View processing results at all levels in real-time.

Level 1
- EPP “Pod”
  - Messaging
  - Event Processing
  - RT Analytics
  - Context

Level 2
- EPP “Pod”
  - Messaging
  - Event Processing
  - RT Analytics
  - Context
IoT: Messaging at the Edge

- As a lowest common denominator, lightweight edge processing may be executed as part of a **peer-to-peer, distributed (broker-less) messaging fabric**.

- **No broker involved**; any edge micro-app that wishes to participate in the messaging fabric simply embeds an API and becomes part of the fabric.

- Distributed processing with **centralized configuration, administration and monitoring**.
IoT: Messaging at the Edge

**TIBCO FTL**
- Ultra low-latency, peer-to-peer.
- Centralized administration and management.
- Guaranteed and/or reliable message delivery.
- Dynamically pluggable delivery transports.

**TIBCO eFTL**
- Extend messaging to web and mobile.
- HTML5 and web sockets.
- Android/Java, Objective-C, Javascript.
- Support for both EMS and FTL.
- May be deployed standalone.

**TIBCO EMS**
- Industry leader for JMS-based store and forward messaging.
- Server based authentication and authorization.
- Available as an appliance.
- Typically used in the enterprise domain.
IoT: Edge Processing

- TIBCO Messaging
- BusinessWorks
- BusinessEvents
- StreamBase
- Live Datamart
- ...

EPP "Pod"
- TIBCO FTL/eFTL
- Flogo
- MQTT, etc.

Level 1

Level 2

Enterprise Domain
IoT: Edge Processing

• For levels in the hierarchy that support JVMs, the **traditional TIBCO Fast Data product stack may be utilized** for processing.

• Typically **located one or two “levels” away** from the edge devices themselves.
  • Used to receive forwarded events, and to perform more complex / value-added integration, event processing, and analytics functions.

• Often **tied to a Big Data architecture** for event storage and deeper analytics.
Today’s problems require utilizing patterns such as **Lambda, Reactive, Cloud-Native, and Edge** processing.

**TIBCO provides the tools necessary** to build solutions that support these architectural patterns.

By utilizing these techniques and tools, organizations can **move to the next stage of digital business**.