DecisionCAMP 2017

Patterns for Business Logic in Modern Technical Architecture

Sapiens DECISION

www.sapiensdecision.com
Decision Management is ABSENT from Most Architectures

- Wikipedia describes DM as “Decision management is an ‘emerging important discipline, due to an increasing need to automate high-volume decisions across the enterprise and to impart precision, consistency, and agility in the decision-making process.’ Decision management is implemented ‘via the use of rule-based systems and analytic models for enabling high-volume, automated decision making’

- Decision Management has won a battle and is now recognized as a principle component of the business architecture, but hasn’t begun the critical battle which is its place in technical architecture

- Our thesis is that technical architectures have to be re-imagined to promote Business Logic as a first-class component in order to enable Decision Management
Decision Management Scope: Established Usage

- Traditional: Business logic prescribed by policy or operational considerations
- Contained and integrated within discrete applications and seen as an integral component of these applications
- Traditional Analytics: Transactional data provides fodder for machine learning or classical statistical techniques producing predictive models that are incorporated into traditional decision models
Emergent Technologies Impacting Decision Management

Failure of these emerging technologies to recognize in their stack the role of Decision Management impacts DM’s ability to deliver on its promises to the Enterprise:

- **Big Data** – The scale of execution throughput requirements exceed the capacity of traditional decision architectures; Architectures increasingly bring business logic to the data in a distributed computing environment over Data Lakes

- **Streaming Analytics** – The size and nature of real-time data streams coupled with the perishable nature of the insights has created a myriad of new architectures

- **API Economy** – The discoverable nature of business logic where the boundaries of usage are not prescribed beforehand and are opened to 3rd-parties to creatively integrate has similarly required architectural innovation
Where is the Business Logic Represented?

Graphics are hyperlinked
Why is this a problem?

- Allowing the business logic to remain buried in idiosyncratic architectures reduces its visibility and agility, and raises cost and risk
- DM requires basic characteristics on a consistent basis:
  - Visibility of logic to the business
  - Business control of logic lifecycle including validation and governance
  - Re-use requires common representation
- The representation of the business logic in the technical architecture in an explicit and consistent manner carries with it a particular set of capabilities needed to realize the vision of Decision Management
Solution: Common Ground Across Architectures

1. Establish common patterns to represent business logic across architectures

2. Establish core features that Decision Management provides across architectures through tooling and methodology
1. Establish Common Patterns to Represent Business Logic Across Architectures

One place to create, validate, test, manage and govern the business logic, many different architectures and methods to deploy the executable logic.

**Logic**
- Deployed Decisions

**Driver**
- User Interface
- Process (online or batch)
- Events (Streaming Analytics, Big Data)

**Piping**
- Service-based solution (e.g. SOAP/REST)
- Embedded in Application (e.g. POJO)
- Micro-Services/API based (e.g. MuleSoft, Apigee)
- fPaaS based (e.g. AWS & Lambda)
1.1 Decision Logic Embedded into JVM based Apps

Drop existing business logic managed in Java, for logic managed by the business and embedded into Java.

Replacing hand-crafted business logic code with reliably-generated code.

Reference Architecture Example 1
1.2 Decision Logic in Traditional Service Oriented Architecture

Invoke decision logic from any application in the organization as a service through a scalable centralized decision execution server.
1.3 Bringing Decision Logic to Big Data

Model-to-Code

Deployable Assets

Divide and conquer: Bring the decision computations to the data

Reference Architecture Example 3
1.4 Decision Logic in Event Processing/Streaming Analytics

Decisions can be embedded as Bolts in a Storm topology, allowing distributed processing of data streams and making Decisions based on a continuous stream of data.

Reference Architecture Example 4
1.5 Decision Logic a Critical Component of the API Economy

**Model-to-Code**

**Domain-driven Design**
- Containerization
- Container: Deployable Unit
  - Business Logic
  - Data
  - ETL
  - Framework

**Discoverable Service**
- APaaS / UI / Process
- API Gateway

Framework: Technology stack to support capabilities such as an API Gateway wrapper for discovery, data access (e.g. Hibernate), data persistence (e.g. DB, file, XML), security, ETL

Small, deployable components are assembled to create run time applications accessible through an API Gateway

**Reference Architecture Example 5**
2. Establish Core Features that Decision Management Provides Across Architectures

- Provide Rigor in Models: *The Model is the Code* and thus creates a link in the technical tool-chain

- **The Decision Model (TDM)** is a way of representing business logic that is platform and technology independent. It models logic based on the inherent structure of that logic, eliminating style and other subjective preferences, ensuring a consistent and stable representation

- TDM, as implemented in Sapiens DECISION, requires that models follow rigorous requirements that ensure they are executable when valid

- DECISION is a tool that provides the Business with visibility into the Enterprise business logic and treats it as an Asset

- DECISION supports a full lifecycle wherein the business can model, validate, test, deploy, and manage these assets within a governance framework

“The Decision Model: A Business Logic Framework Linking Business and Technology” (von Halle & Goldberg) © 2009
1. Establish a common way to represent business logic across architectures

2. Establish core features that Decision Management provides across architectures through tooling and methodology
Appendix A: Technical Architecture Sampling
Streaming Analytics: Where is the Business Logic?

- Business logic (and Decisions) are not represented in most architectural diagrams as an identifiable element.
- There is no designated layer or component that provides visibility into the business logic that leads to system actions.
- Business logic is not treated as an asset that is created, validated, tested, managed, and governed.
Streaming Analytics: Where is the Business Logic?

- Clue: the term ‘Decide’
Streaming Analytics: Where is the Business Logic?

- **Clue:** the term ‘Analytic Operators’

### Linear Scalability
- Clustered deployments – unlimited scalability

### Automated Deployment
- Automatically optimize operator deployment across nodes

### Performance Optimization
- Parallel & pipeline operations
- Efficient multi-threading

### Analytics on Streaming Data
- Analytic accelerators for a variety of data types
- Optimized for real-time performance

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**Massively scalable stream analytics**

- **Business Logic**

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*Information On Demand 2013*
Streaming Analytics: Where is the Business Logic?

- Clue: A person looking pensive
API Economy (MuleSoft): Where is the Business Logic?

- Clue: ‘Service’ in layer referencing the actor ‘LoB Dev’
Streaming Analytics: Where is the Business Logic?

- Clue: Red alarm

Canonical Stream Processing Architecture

Streaming Analytics: Where is the Business Logic?

- Clue: The term ‘Analyze’
Streaming Analytics: Where is the Business Logic?

- Clues: Bolts, batch

Streaming Analytics: Where is the Business Logic?

• Clue: The term ‘Action’

Introducing Azure Stream Analytics

Event producers → Collection → Ingestor (broker) → Transformation → Long-term storage → Presentation and action

Applications
Legacy IOT (custom protocols)
Devices
IP-capable devices (Windows/Linux)
Low-power devices (RTOS)
Cloud gateways (web APIs)
Field gateways
Stream Analytics
Stream processing
Storage adapters
Service bus
Azure DBs
HDInsight
Web/thick client dashboards
Search and query
Data analytics (Excel)
Devices to take action

http://www.jamesserra.com/archive/2015/06/what-is-microsoft-azure-stream-analytics/
Streaming Analytics: Where is the Business Logic?

- Clue: The term ‘Rules’

https://www.slideshare.net/LeiXu8/event-driven-streaming-analytics
Streaming Analytics: Where is the Business Logic?

• Clue: The term ‘Actionable Insight’
Big Data: Where is the Business Logic?

- Clue: The term ‘Business Users/Applications’
2.1 Decision Services the Business wants to Maintain

Can a loan be approved without accessing a credit bureau for a credit score? A Decision Service is called to find out.

Can a loan be auto-approved without human intervention? A Decision Service is called to find out.

DRD Bureau

DRD Routing
2.2 Define Business Glossary Capabilities

- The glossary contains an entry and metadata about every attribute in a community of decision models. This ensures consistency of terminology across decision models and maximum reuse of business assets.

- There may be multiple glossaries in an enterprise and they are arranged hierarchically so as to afford re-use but also distinctions between the terms used by different organizations within the enterprise.

- Glossaries capture the business-friendly attribute names, business-friendly attribute types, and business-friendly, not technical, allowed values for these attributes. Technical resources may map the business-friendly names and values to one or more technical models.

- The attributes in a particular glossary are organized by Business Concepts such as Applicant, or Application.

<table>
<thead>
<tr>
<th>Business Friendly Name</th>
<th>Business Concept</th>
<th>Type</th>
<th>Valid Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicant Affordability Factor</td>
<td>Applicant</td>
<td>AMOUNT</td>
<td></td>
</tr>
<tr>
<td>Applicant Credit Score</td>
<td>Applicant</td>
<td>QUANTITY</td>
<td></td>
</tr>
<tr>
<td>Applicant Eligibility Indicator</td>
<td>Applicant</td>
<td>INDICATOR</td>
<td>Eligible, Ineligible</td>
</tr>
<tr>
<td>Applicant Employment Status</td>
<td>Applicant</td>
<td>CODE</td>
<td>Employed, Self-Employed, Student, Unemployed</td>
</tr>
<tr>
<td>Applicant Loan Data</td>
<td>Applicant</td>
<td>TEXT</td>
<td></td>
</tr>
<tr>
<td>Bankruptcy Indicator</td>
<td>Applicant</td>
<td>INDICATOR</td>
<td>False, True</td>
</tr>
<tr>
<td>Credit Contingency Factor</td>
<td>Applicant</td>
<td>NUMERIC</td>
<td></td>
</tr>
<tr>
<td>Existing Customer Indicator</td>
<td>Applicant</td>
<td>INDICATOR</td>
<td>Existing, Non-Existing</td>
</tr>
<tr>
<td>Loan Applicant Age</td>
<td>Applicant</td>
<td>QUANTITY</td>
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<tr>
<td>Loan Applicant Marital Status</td>
<td>Applicant</td>
<td>INDICATOR</td>
<td>Married, Single</td>
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<td>Loan Application Bureau Call Type</td>
<td>Application</td>
<td>CODE</td>
<td>Full, Mini, None</td>
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<td>Loan Application Bureau Strategy</td>
<td>Application</td>
<td>CODE</td>
<td>Bureau, Decline, Through</td>
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<td>Loan Application Data Acceptance Indicator</td>
<td>Application</td>
<td>INDICATOR</td>
<td>Acceptable, Not Acceptable</td>
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<td>Loan Application Post-Bureau Affordability Indicator</td>
<td>Application</td>
<td>INDICATOR</td>
<td>Affordable, Not Affordable</td>
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<td>Loan Application Post-Bureau Risk Category</td>
<td>Application</td>
<td>CODE</td>
<td>High, Low, Medium, Very Low</td>
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<tr>
<td>Loan Application Pre-Bureau Affordability Indicator</td>
<td>Application</td>
<td>INDICATOR</td>
<td>Affordable, Not Affordable</td>
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<tr>
<td>Loan Application Pre-Bureau Risk Category</td>
<td>Application</td>
<td>TEXT</td>
<td>Decline, High, Low, Medium, Very Low</td>
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<tr>
<td>Loan Application Risk Score</td>
<td>Application</td>
<td>QUANTITY</td>
<td></td>
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<tr>
<td>Loan Application Routing Decision</td>
<td>Application</td>
<td>CODE</td>
<td>Accept, Decline, Refer</td>
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<td>Monthly Disposable Income Amount</td>
<td>Cash Flow</td>
<td>AMOUNT</td>
<td></td>
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<tr>
<td>Monthly Income Amount</td>
<td>Cash Flow</td>
<td>AMOUNT</td>
<td></td>
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<td>Monthly Expense Amount</td>
<td>Cash Flow</td>
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<td>Monthly Fee Amount</td>
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<td>Monthly Payment Amount</td>
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<td>Monthly Repayment Amount</td>
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<tr>
<td>Monthly Required Installment Amount</td>
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<tr>
<td>Loan Product Type Indicator</td>
<td>Product Type</td>
<td>INDICATOR</td>
<td>Special, Standard</td>
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</tbody>
</table>
2.3 Decision Logic Validations Support Executability

- Each Decision is modeled as a Decision Table where the logic adheres to the **15 principles of TDM** (see *The Decision Model: A Business Logic Framework Linking Business and Technology*).
- The DECISION Manager module used for modeling as part of the Sapiens DECISION product suite validates that the logic complies with the principles to ensure that it is executable and can be used to generate code.
2.4 Testing Enhances Business Control

- **Testing by the business modeler is a critical element** of the model development process.
- Testing is performed at the decision table level, for each decision table. Typically, decision table testing is comprehensive for all possible attribute values.
- Next, testing is performed at the decision service level. For complex services, branch testing may also occur.
- Finally, process-level testing is performed.
- Test suites are **typically exported and provided to IT** for acceptance and regression needs.
Appendix C:
Emergent Architecture Detail
Decision Management Emerging Usage: Big Data

• “extremely large data sets that may be analyzed computationally to reveal patterns, trends, and associations, especially relating to human behavior and interactions” (Forester)

• Structured or unstructured data

• Early on, typically processed in batch

• More and more, scale of execution throughput requirements exceeds capacity of traditional decision architectures – business logic must be brought to the data and not the data to the decisions

• Examples:
  • Securities fraud
  • Financial system stress testing/Value at risk (VaR)
  • Margin call collateral and position evaluation
  • Medical assessment – a single full human genome 600GB
Decision Management Emerging Usage: Streaming Analytics

• Real-time action on perishable insights via processing of incoming data streams
• “Streaming analytics filter, aggregate, enrich, and analyze a high throughput of data from disparate live data sources to identify patterns, detect urgent situations, and automate immediate actions in real-time” (Forrester)
• Examples:
  • Security breach detection
  • Network outages detection
  • Sports betting – 80% of sports betting is done after game begins\(^1\)
  • Transportation driver monitoring
  • Retail stock outs
  • Retail pricing opportunities
  • Telecom bandwidth monitoring
  • Medical assessment – sensor data 10GB raw data per second
Decision Management Emerging Usage: API Economy

• “API Economy (Application Programming Interface Economy) is a general term that describes the way APIs can positively affect an organization's profitability”

• Discoverable decision APIs enable users to learn about available decisions and how they are used

• While execution can be anywhere, integration processes are centralized

• Boundaries of usage are not prescribed beforehand and are opened to 3rd-parties to creatively integrate

• Predictions: 50% of business-to-business collaboration will take place through Web APIs by 2017, and by next year 75% of Fortune 1000 firms will offer public Web APIs (Gartner)

• Examples:
  • 3rd-party insurance calculators used by multiple insurers
  • Bank app APIs are used by partners to sign up for services and access information
  • CD rates or other product configurations can be made visible to comparison sites
Thank You

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