WGSigma Systems

Architecting intelligent real-time systems processing billions of events a day

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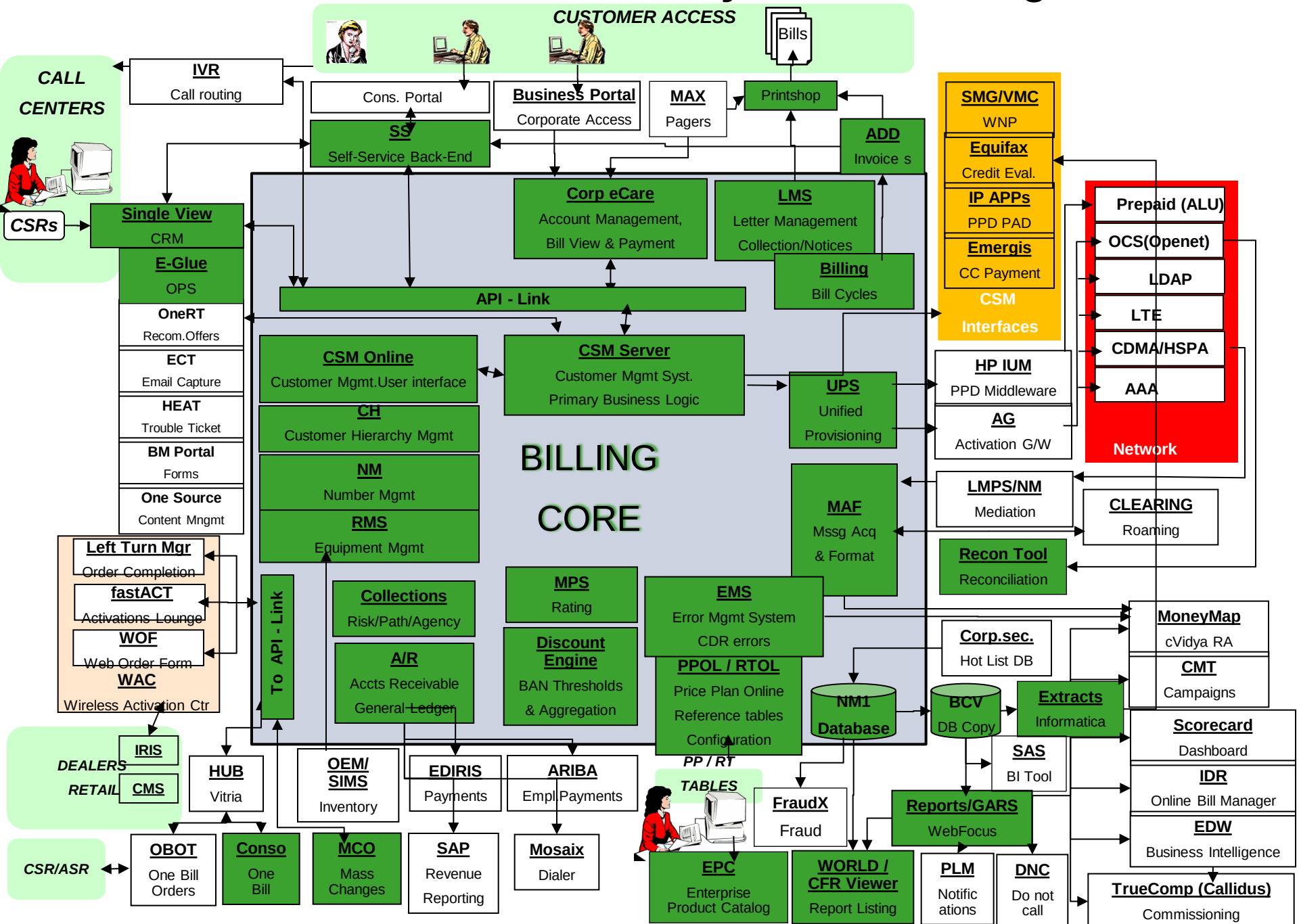
The Universal Corporate Challenge:

Hundreds or thousands of systems performing transactions in silos with no collective intelligence

About 20% of the Customer Systems in a large Telco



The Goal:

Create a collective knowledge of the operation where processing decisions are holistically optimized

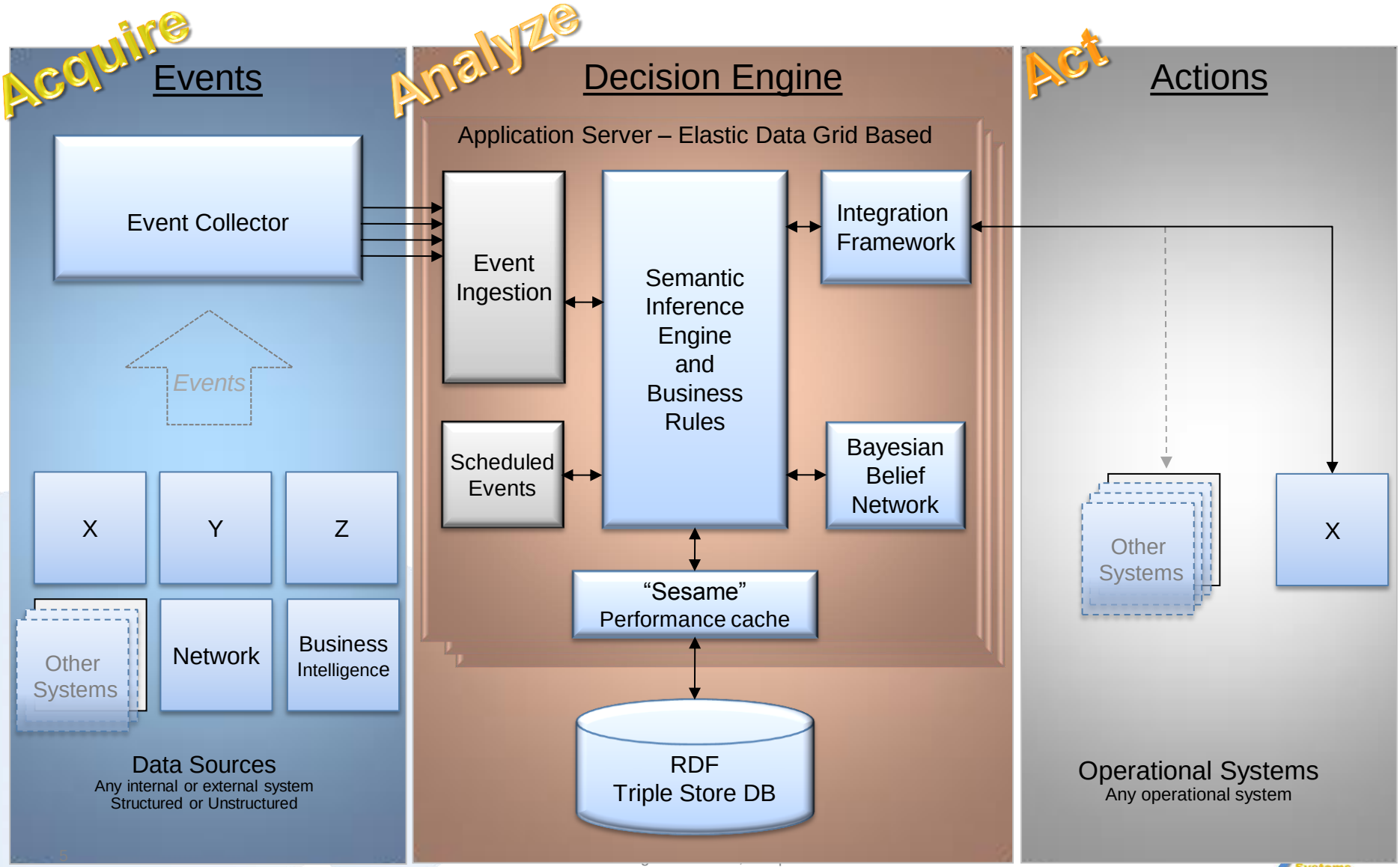
….Patients

….Customers

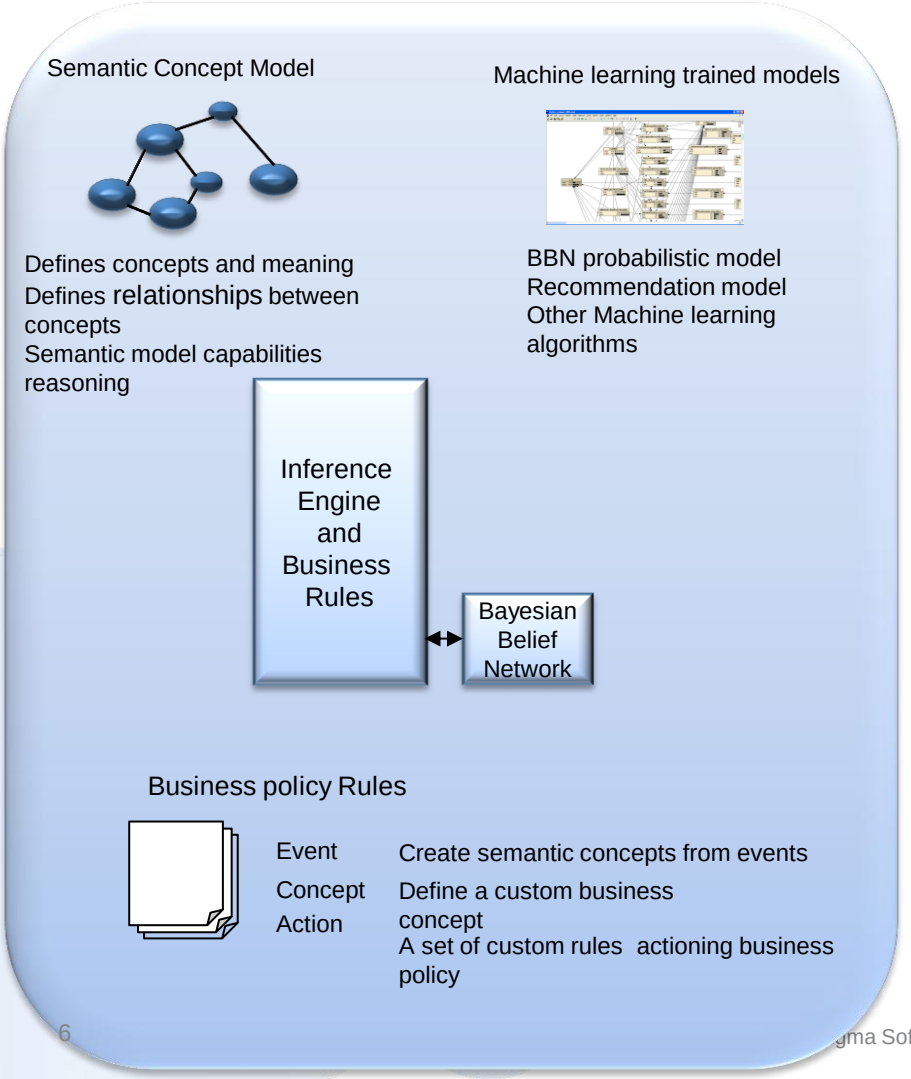
…Subscribers

….Account Holders

Closed Loop Event – Condition – Action



Inferencing



Semantic Concept Model

The model defines the concepts including the high level business concepts

The model contains the relationship between concepts including the dependencies

Inference

When an event occurs the event handler rule fires for that event

- Evaluates the event message
- Evaluates the existing ontology
- Determines which semantic instances to create or update

When any data changes, the inference engine fires in a “When - Then” style of computing, updating all “Automatic” concepts. Custom concept rules are fired if necessary. This creates a chain of updates

When a “on demand” concept is needed the inference engine finds and computes all of the dependant concepts

Machine learning

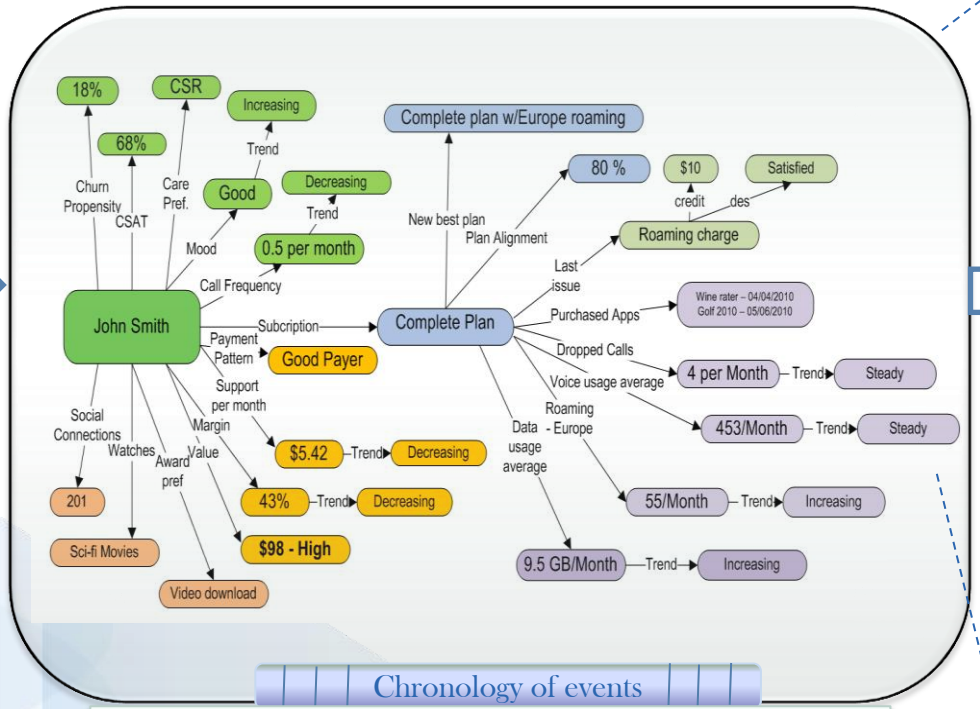
When a concept is dependent on “machine learned” information the inference engine manages the invocation and timing of interfacing

Use Case: Customer Interaction Prediction and Best Action

Events collected in real time

- Interactions
- Orders
- Bills
- Payments
- Collections
- Charge dispute
- Customer
- Pay instructions
- Individual
- Device Activated
- Device heartbeat
- Subscriptions
- Device changes

Transformed into a connected graph of business concepts



Chronology of events

Subjective	"good payer"
Patterns	"always pays 2 days late"
Trends	"improving payer"
Geospatial	"within 5 miles of the tower"
Time	"within 5 minutes of an outage"
Probability	"probably will call about the bill"
Absence of occurrence	"missed payment"
Relationship between	" friend of a friend"

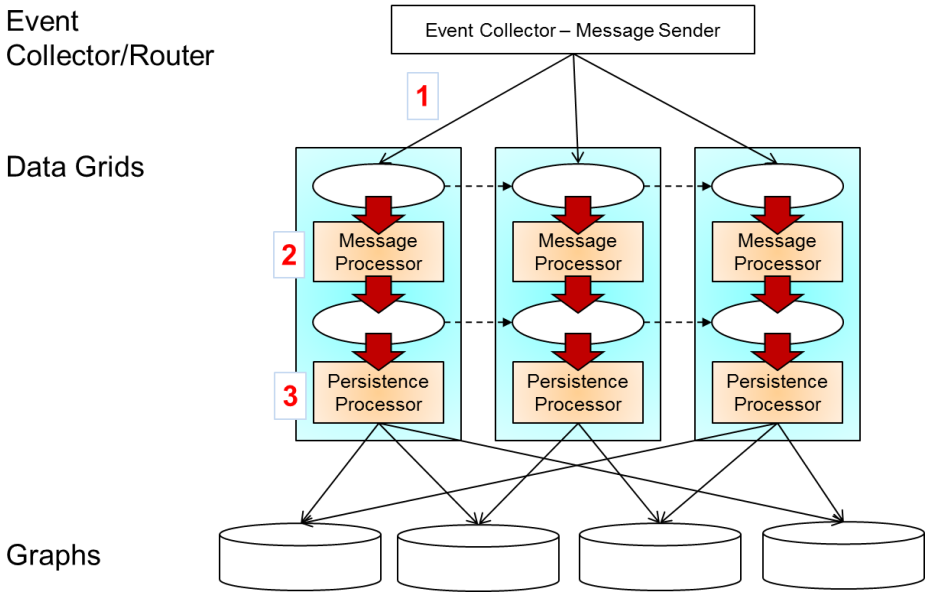
Predictions & Actions

Probability of call motivation

- Plan Overage
- Bill greater than last month
- Prorates
- Roaming charges
- Third Party Charges
- Abnormal fee
- Rate increases
- Charge dispute
- First bill
- Past due amount
- Pay bill
- Customer Cancellation
- Reactivation
- Device activation
- Device education
- Device exchange
- Device Lost
- Device not working
- Device resume
- Service data not working
- Service text not working
- Service voice not working
- Subscription cancellation
- Wrong plan

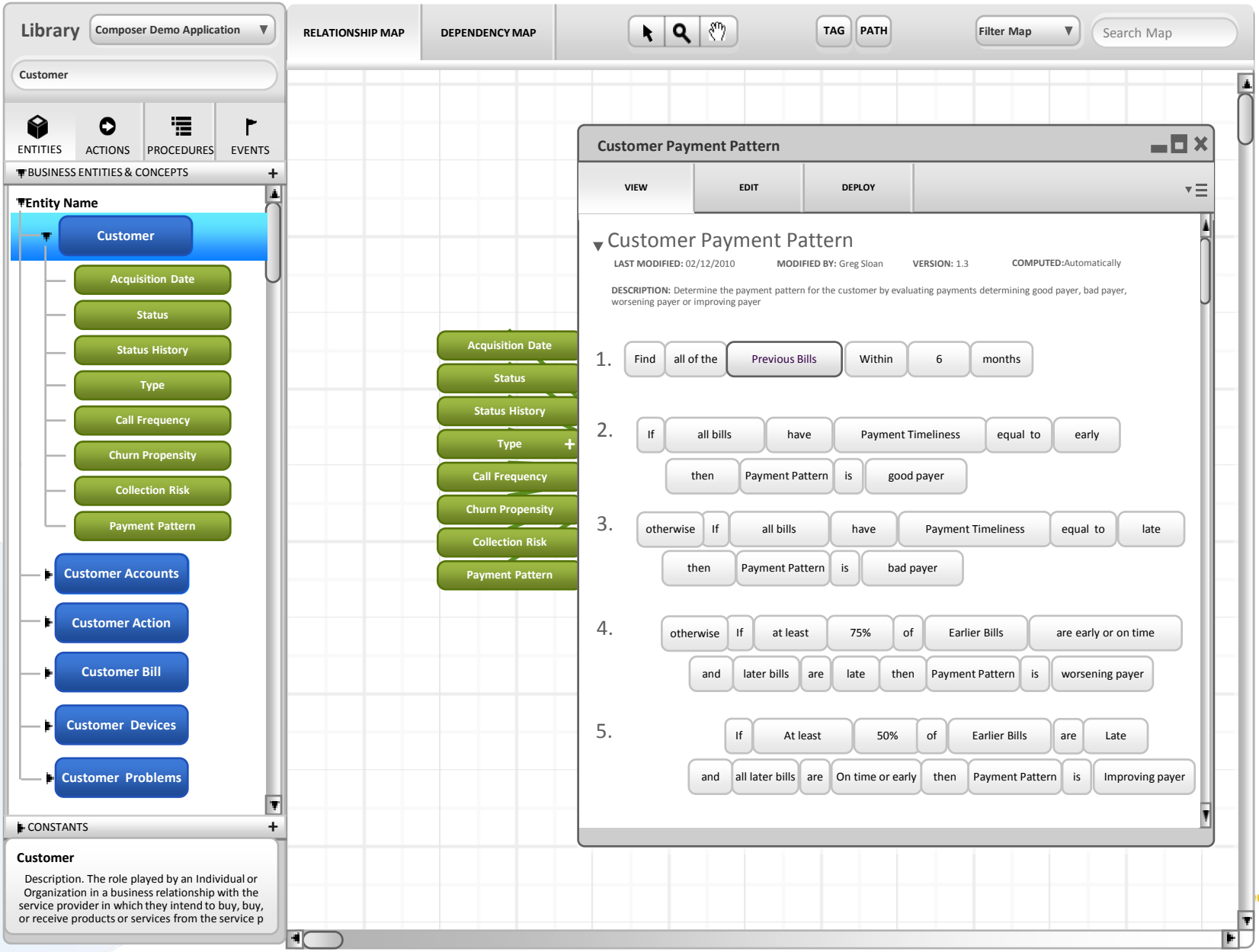
Scalability & Resilience

- Use in memory elastic data grid
  - New hardware nodes can be added and removed dynamically
  - Data is replicated to one other node (no single point of failure)
  - If a server fails, the backup becomes the primary seamlessly



- Partition grid across objects
- Graphs are partitioned across multiple triple store instances
  - A single index instance defines the location of each graph
- Historical data is subdivided into graphs by timeframe (e.g. quarters)

Make it Business Friendly



Technology Stack

Technology	Purpose
TopBraid Composer	Ontology Modeling
Java	Event Pipeline, Decision Engine, Integrations
R	Statistical and Predictive Modeling
ETL	Event ingestion - Extract, Transform, Mapping Relational to Graph
Red Hat BPMS & Drools	Forward and backward chaining rules, process definition and control
Red Hat HornetQ	JMS Queue persistent multi-threaded input and output (publish-subscribe)
Gigaspaces	Data Grid
Apache UIMA + Solr	Natural Language Processing, Semantic Searches, Content Analytics
Norsys Netica	BBN
Franz Allegrograph	Triple Store (RDFS)
Apache Cassandra	Time series data store