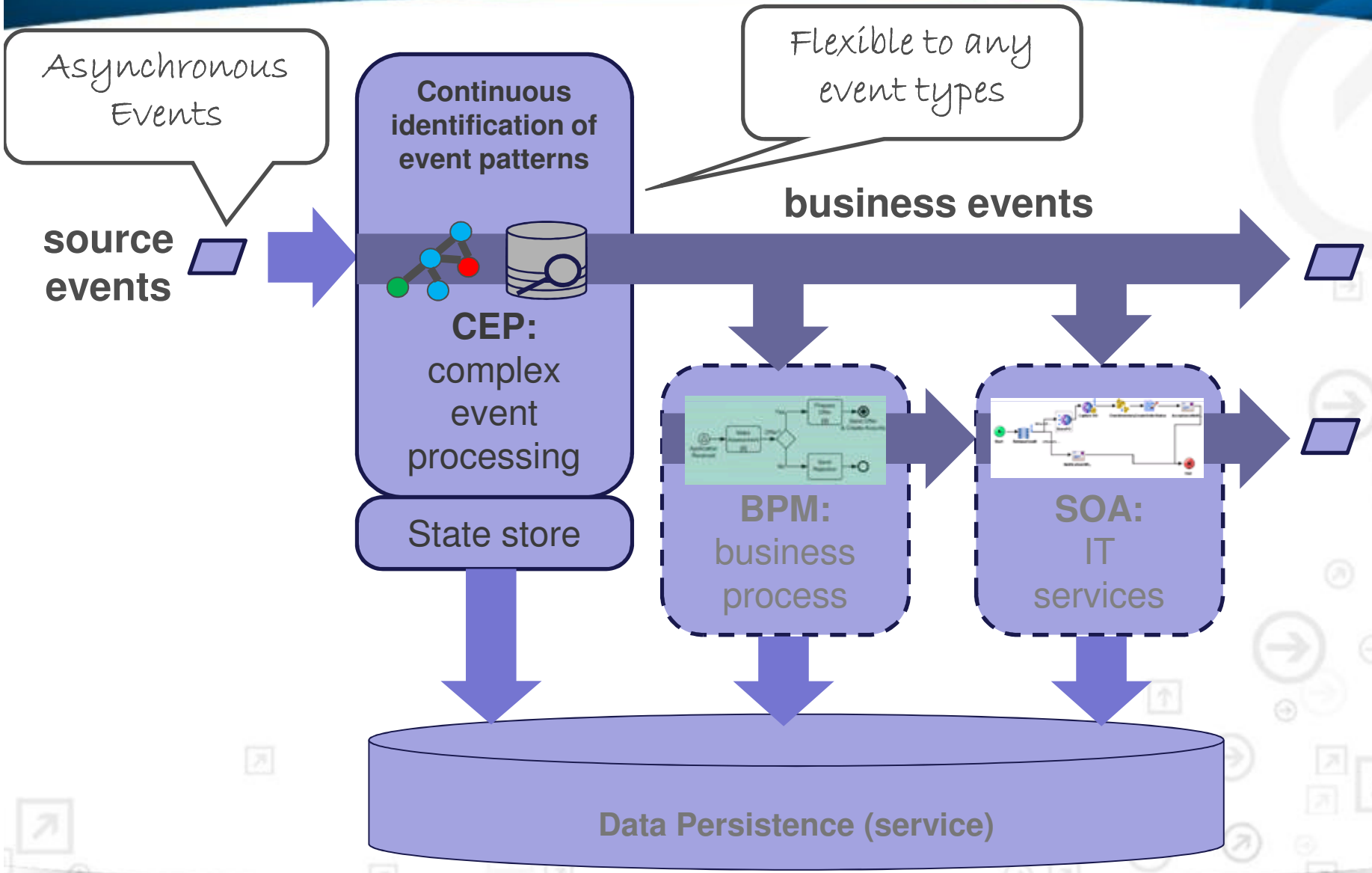
Oktober Rules Fest 2009

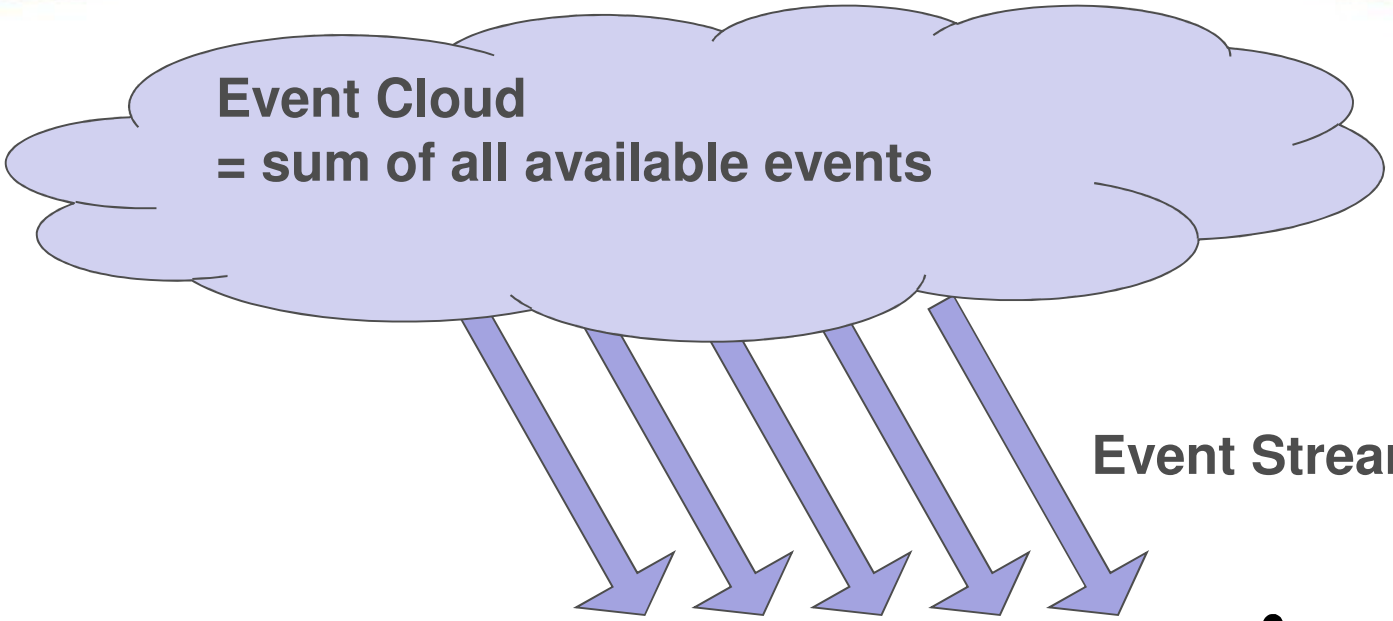
What's Different About Rules in CEP?

Paul Vincent, TIBCO Software – a CEP Company

Complex Event Processing



CEP's terminology

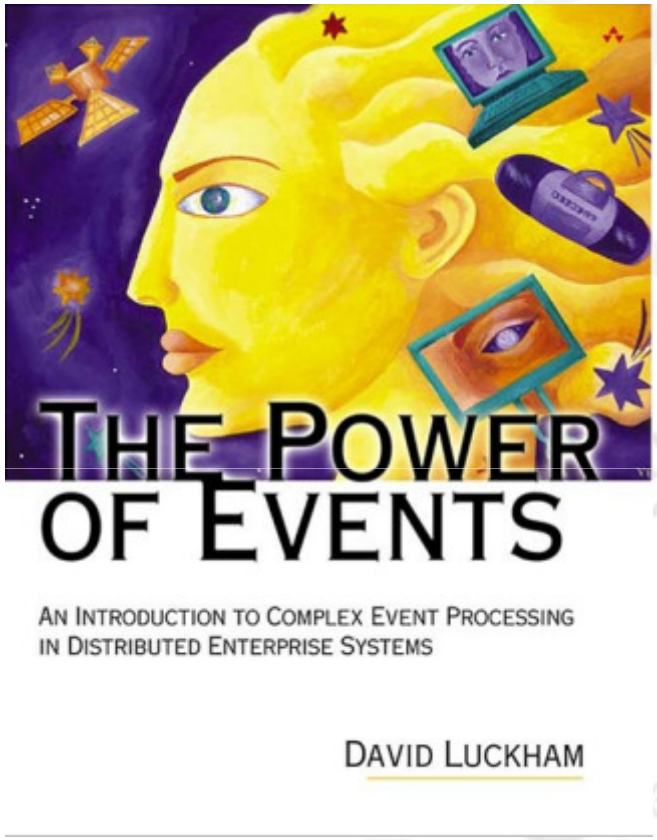


- CEP uses pattern detection to the event clouds & streams, and their histories
- Multiple modelling + execution paradigms available for pattern detection
- Problems solved: situation awareness, sense and respond, track and trace

What does CEP cover?

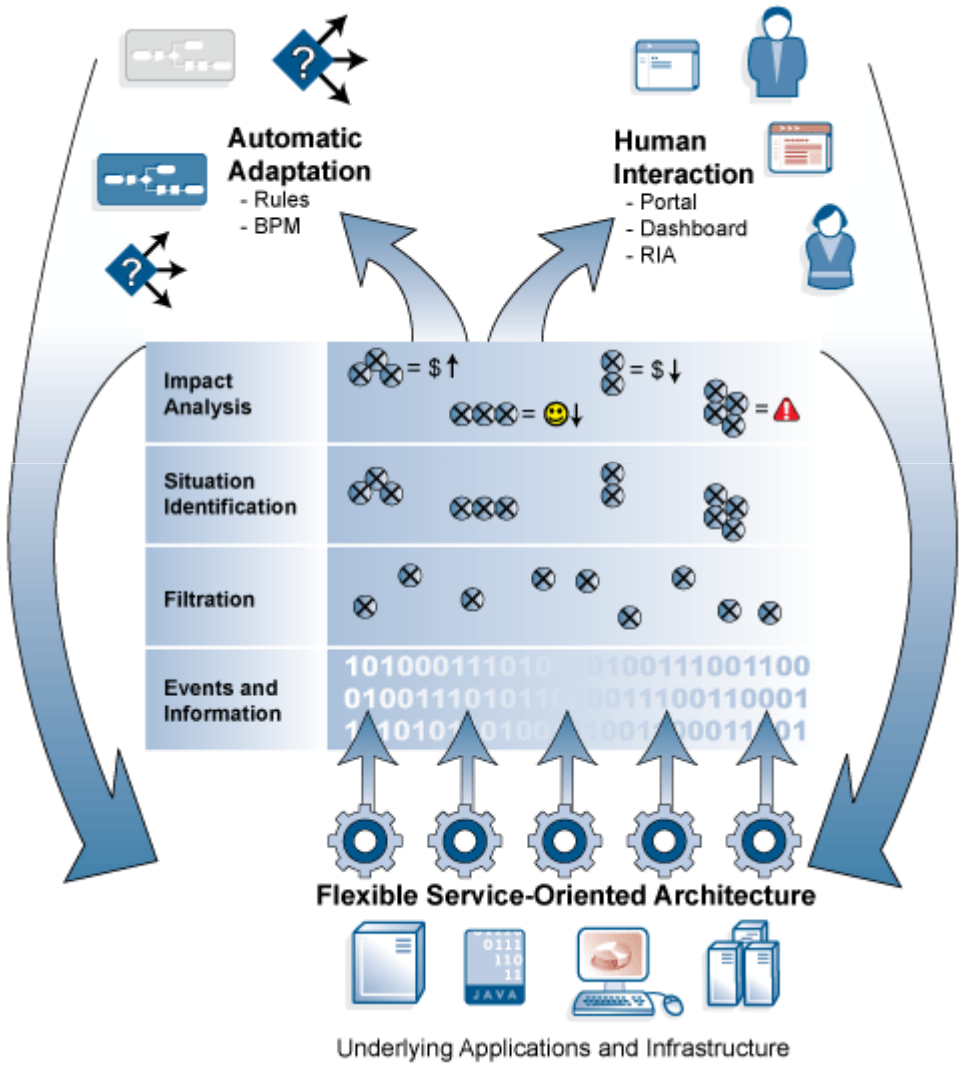
"CEP applies to a very broad spectrum of challenges in information systems"
e.g.

- Business process automation
- Service routing and coordination
- SLA, Policy fulfillment and breach checking
- Security and fraud detection
- Activity Monitoring

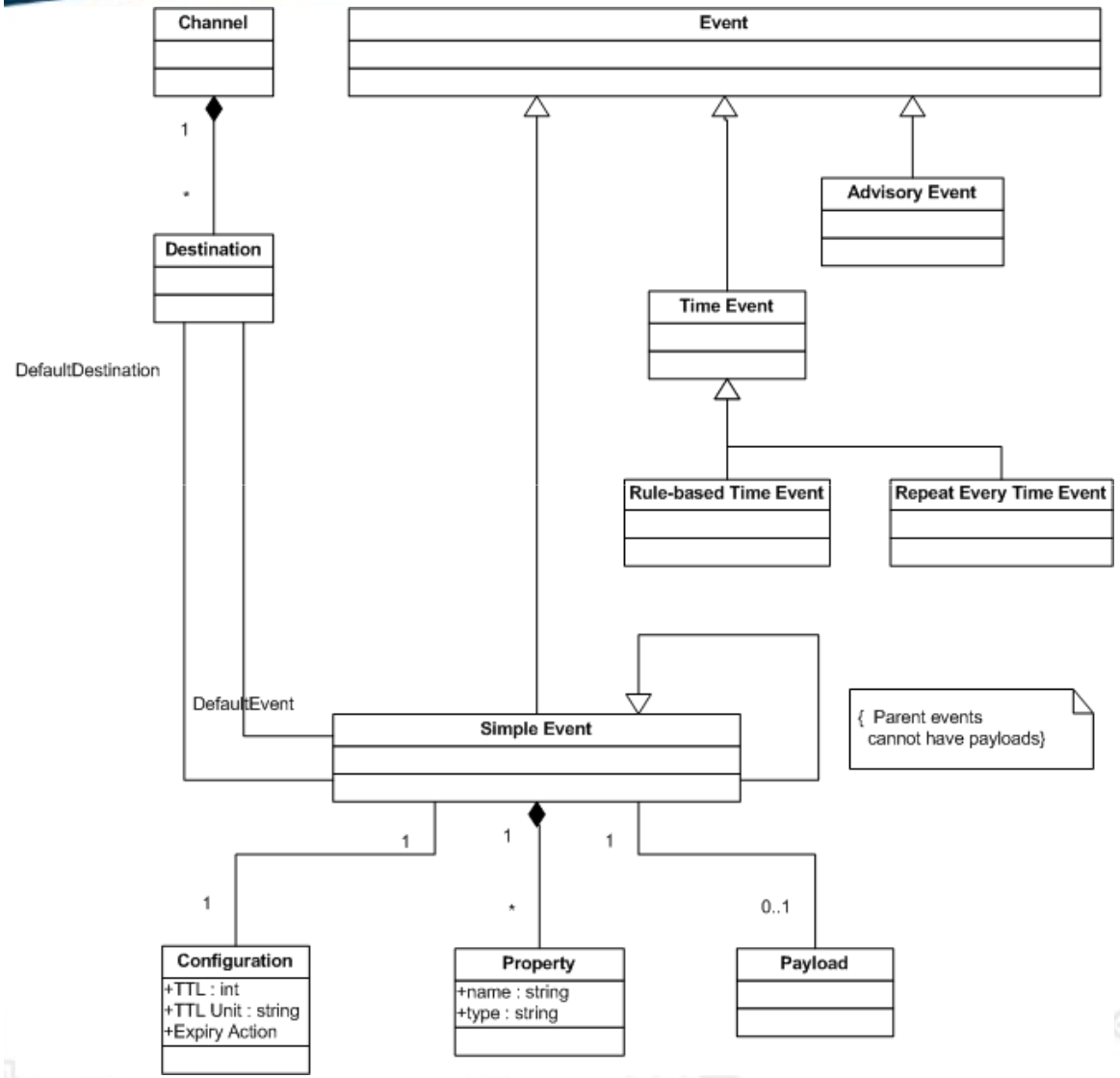


The Power of Events, Addison Wesley, ISBN: 0-201-72789-7, 2002

Complex Event Processing



What does CEP Need? 1. Events



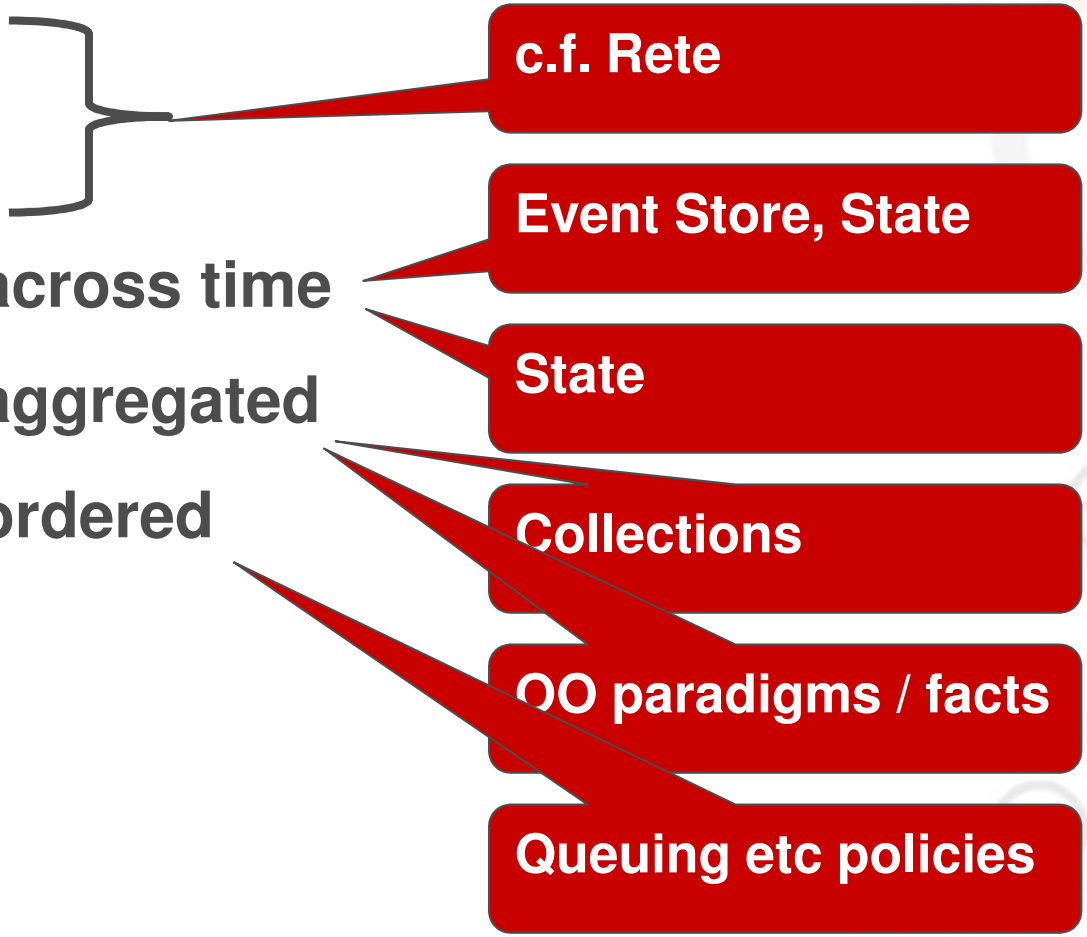
- **Event** is sourced from **Channel** via address **Destination**
- Events can be **modelled hierarchically**
- Event metadata includes **Time To Live, Payloads** like XML, etc
- Events are **immutable** (except when...)
- Expected events may **not occur**

Event examples

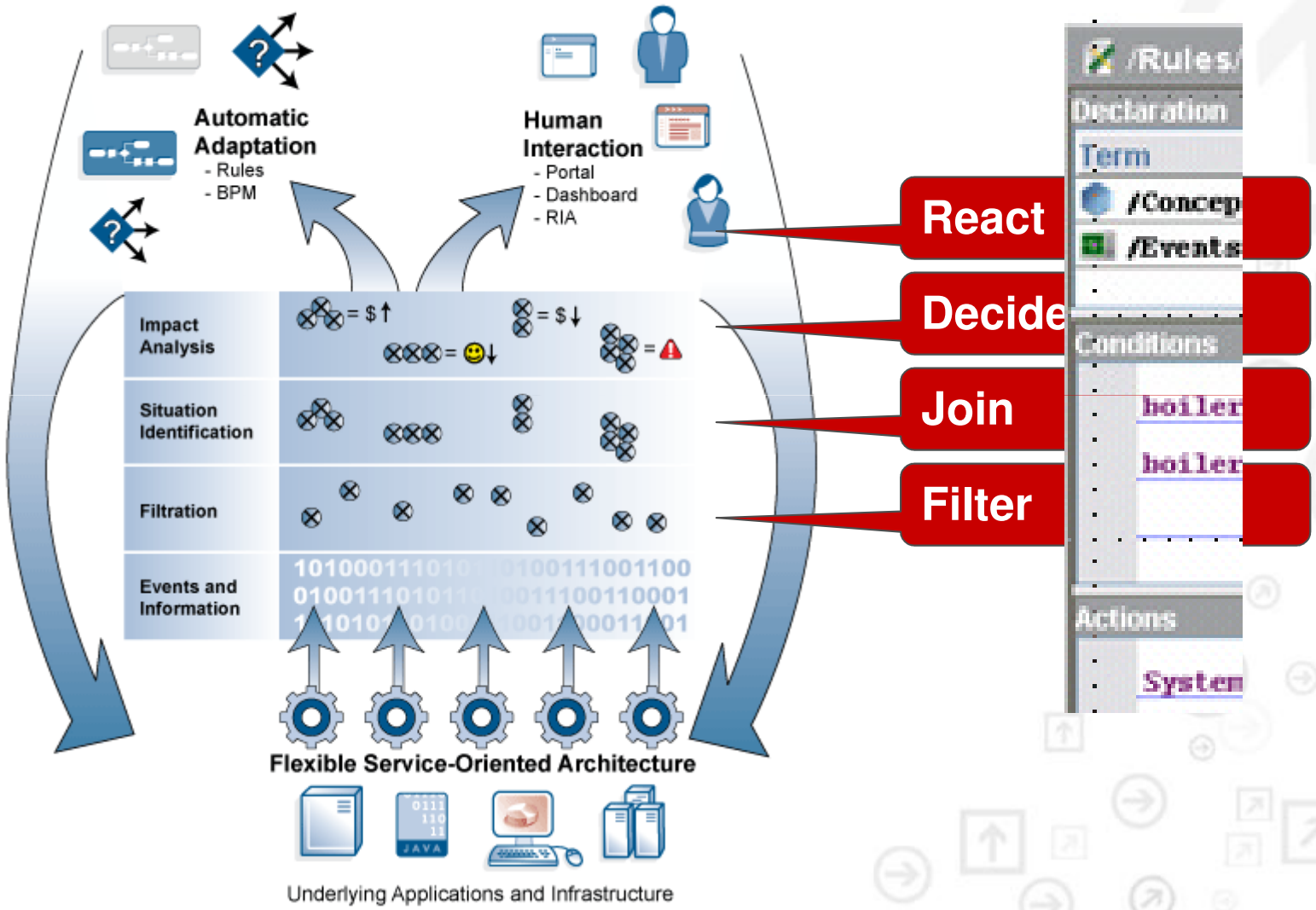
- **SOA service requests**
  → time, destination, payload
- **Scans (parcel, baggage, RFID, production line...)**
  → location, time, payload
- **Web requests**
  → source IP, destination, payload, frequency
- **Messages / packets (telco, smartgrid)**
  → source, destination, time, location
- **Data streams (data feeds)**
  → payload, time, source

... 2. Pattern Matching for events

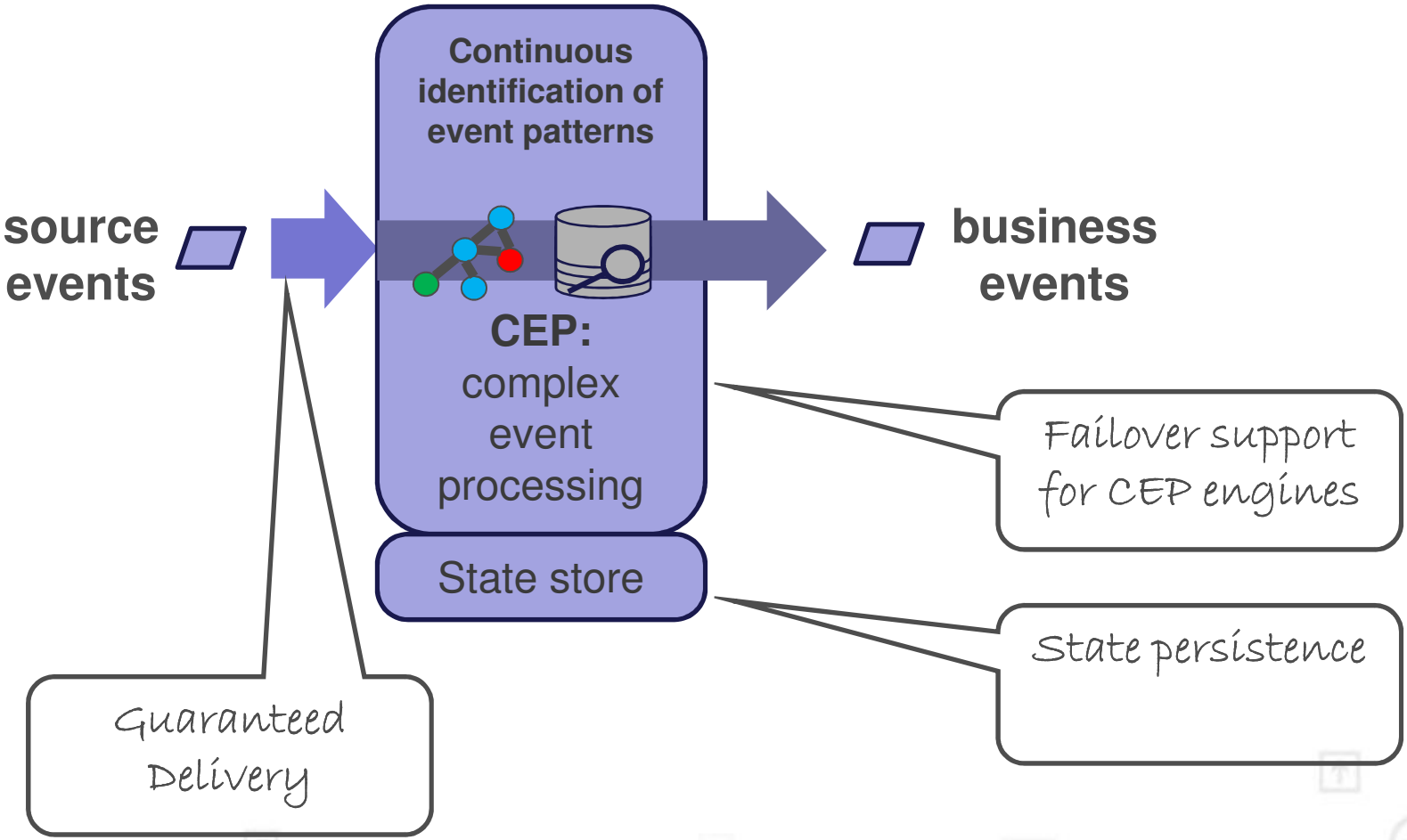
- Filter events
- Join events
- Events can be across time
- Events can be aggregated
- Events can be ordered



… hence Rules for CEP

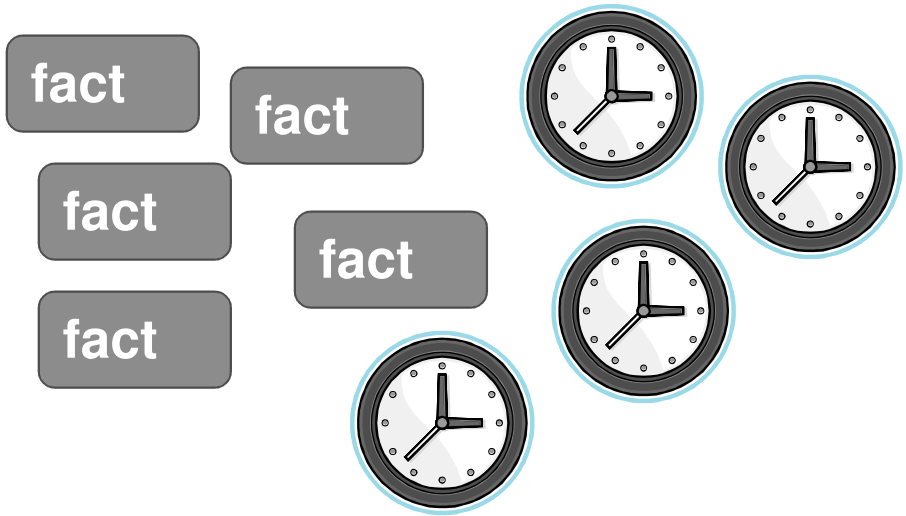


... 3. Stateful Support

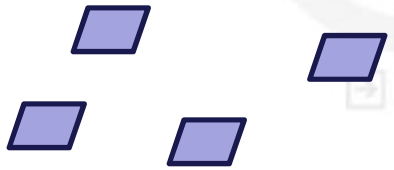


Rules Require: A. Temporal Awareness

- **General "patterns":**
  - Event occurs in time T
  - Event doesn't occur in time T

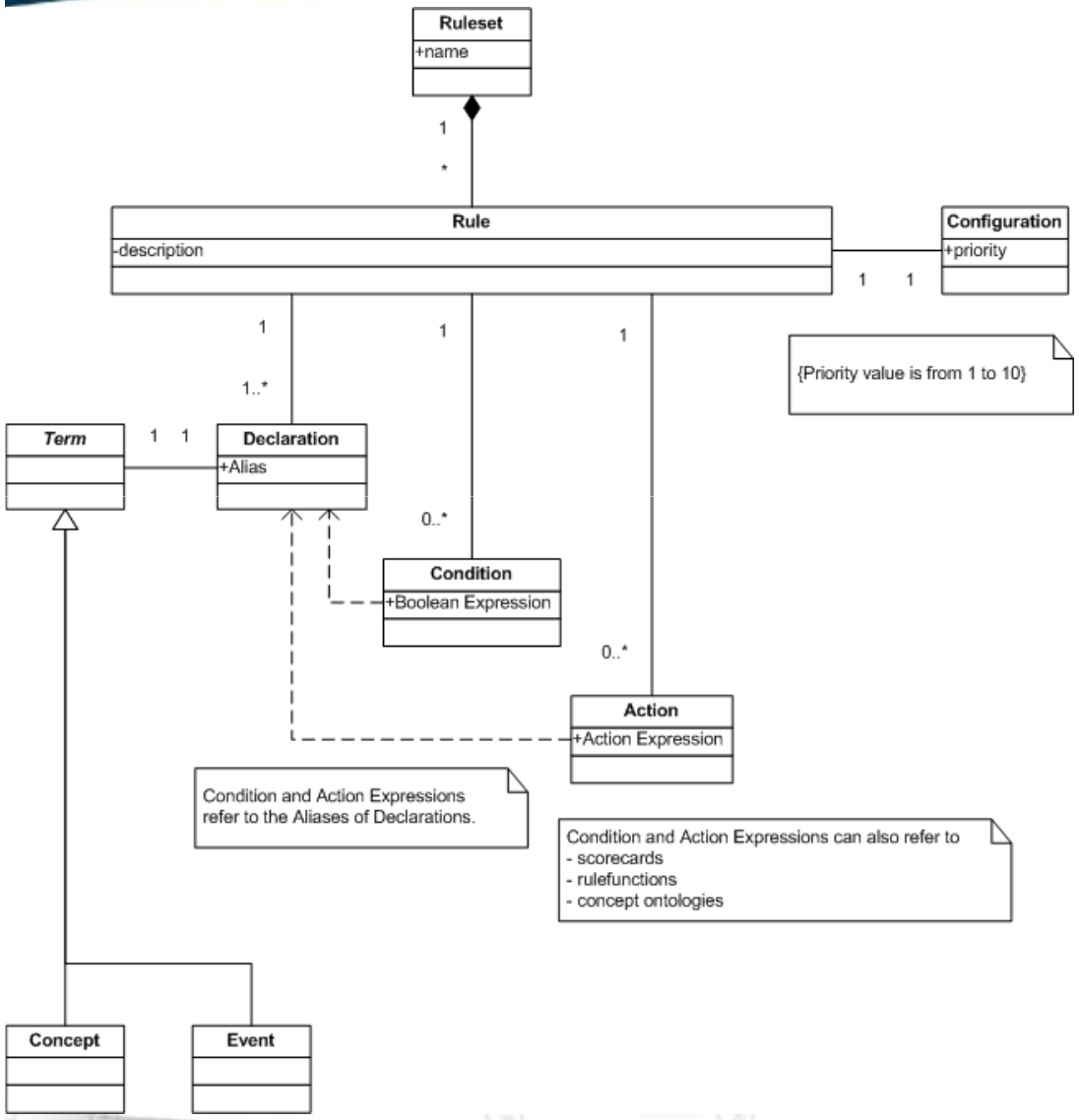


- **Event state "patterns":**
  - Event time-out (via TTL)



- **State "patterns":**
  - State time-out
- **Object history "patterns":**
  - Prior values

Simple Rule Model

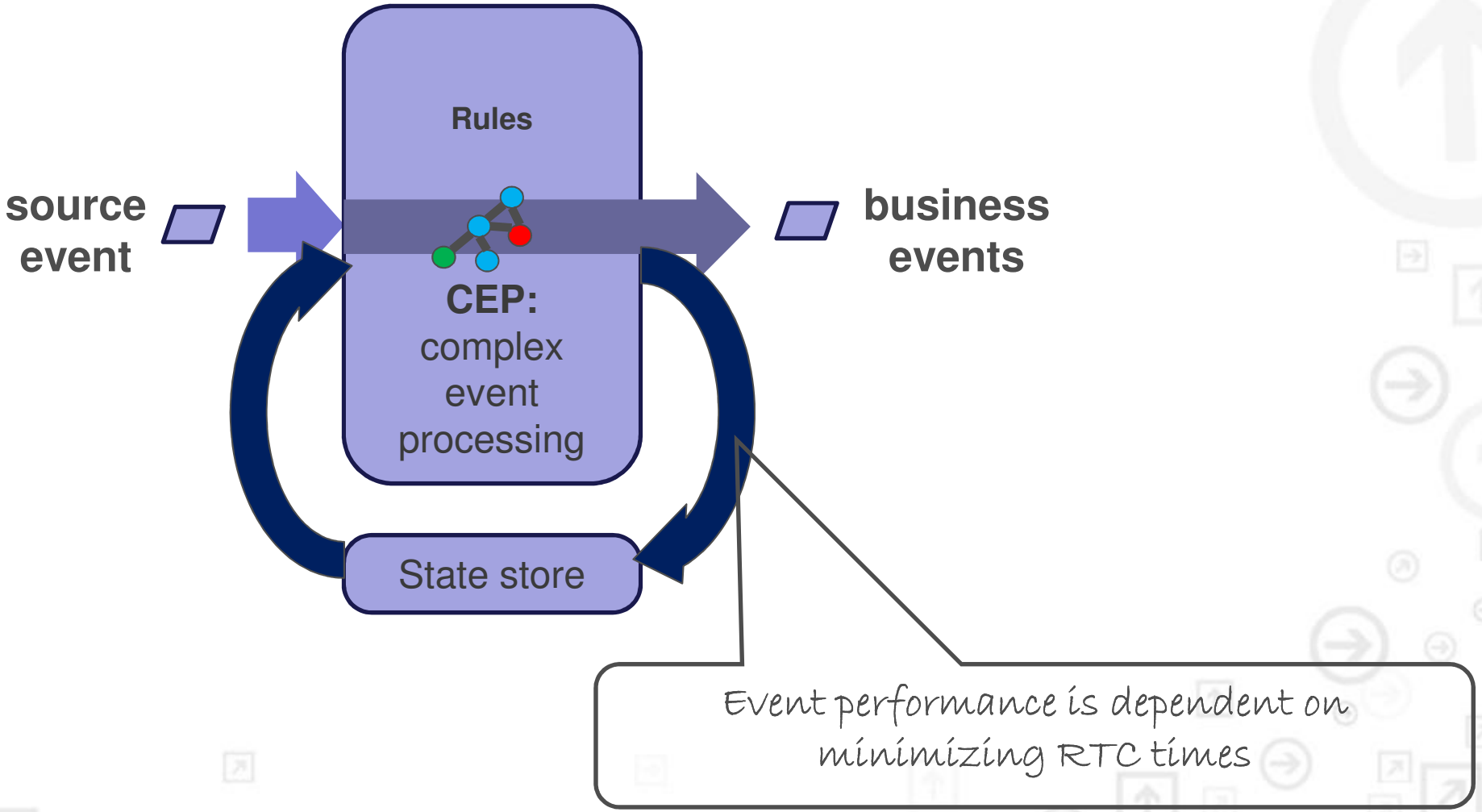


- **Rulesets** contain, organize **Rules**
- Rules are made up of **rule variables, conditions, actions**
- Rules execution context is a **Run To Completion** cycle
- New events can expire after a **single RTC,** or **on demand,** or **after some time**

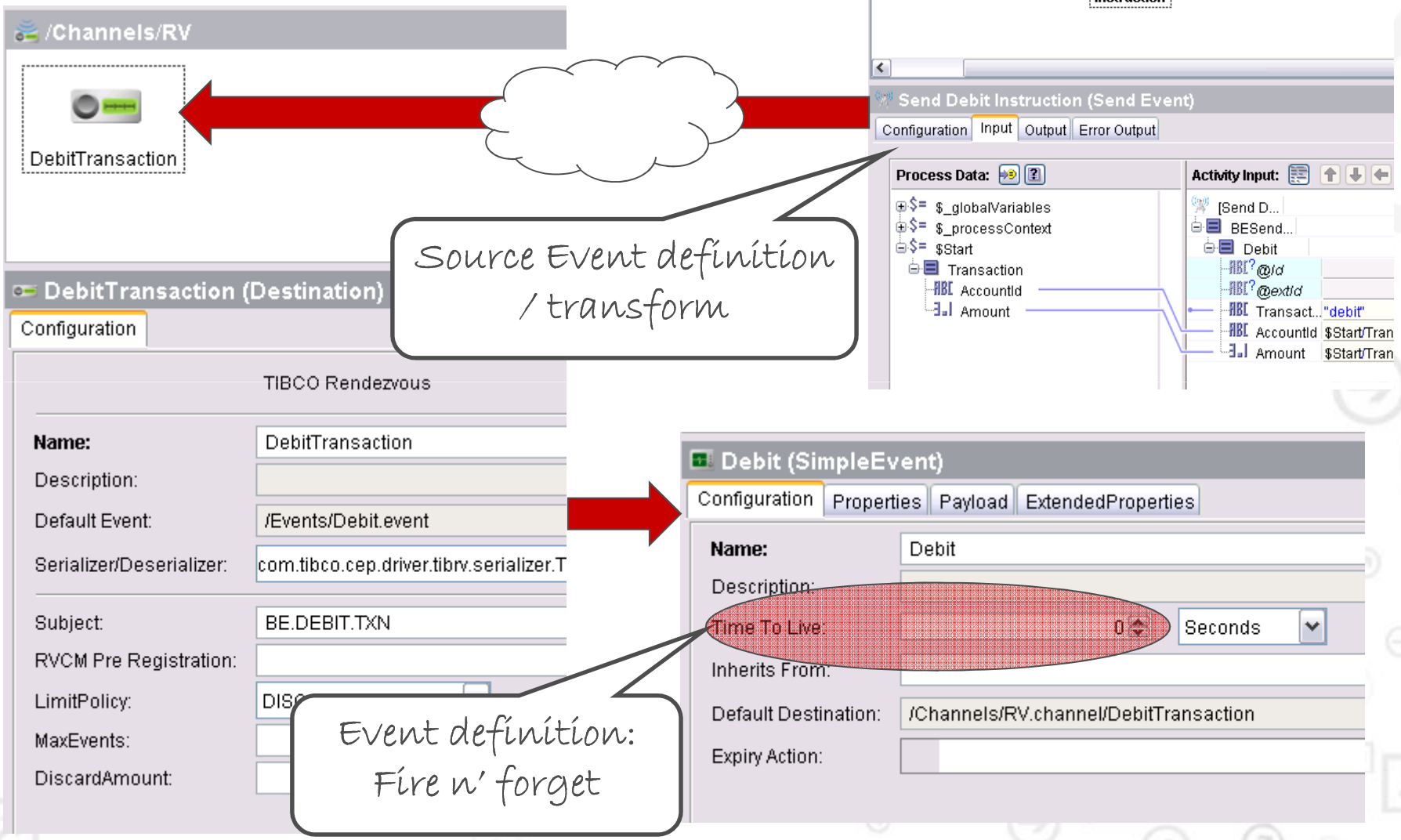
Example Rule Types

- **Basic:**
  Condition-Action
- **Triggers:**
  Event-Condition-Action
- **Timers/schedulers:**
  TimeUp-Action,
  TimeInterval-Action
- **Event lifecycle:**
  TimeToDie-Action

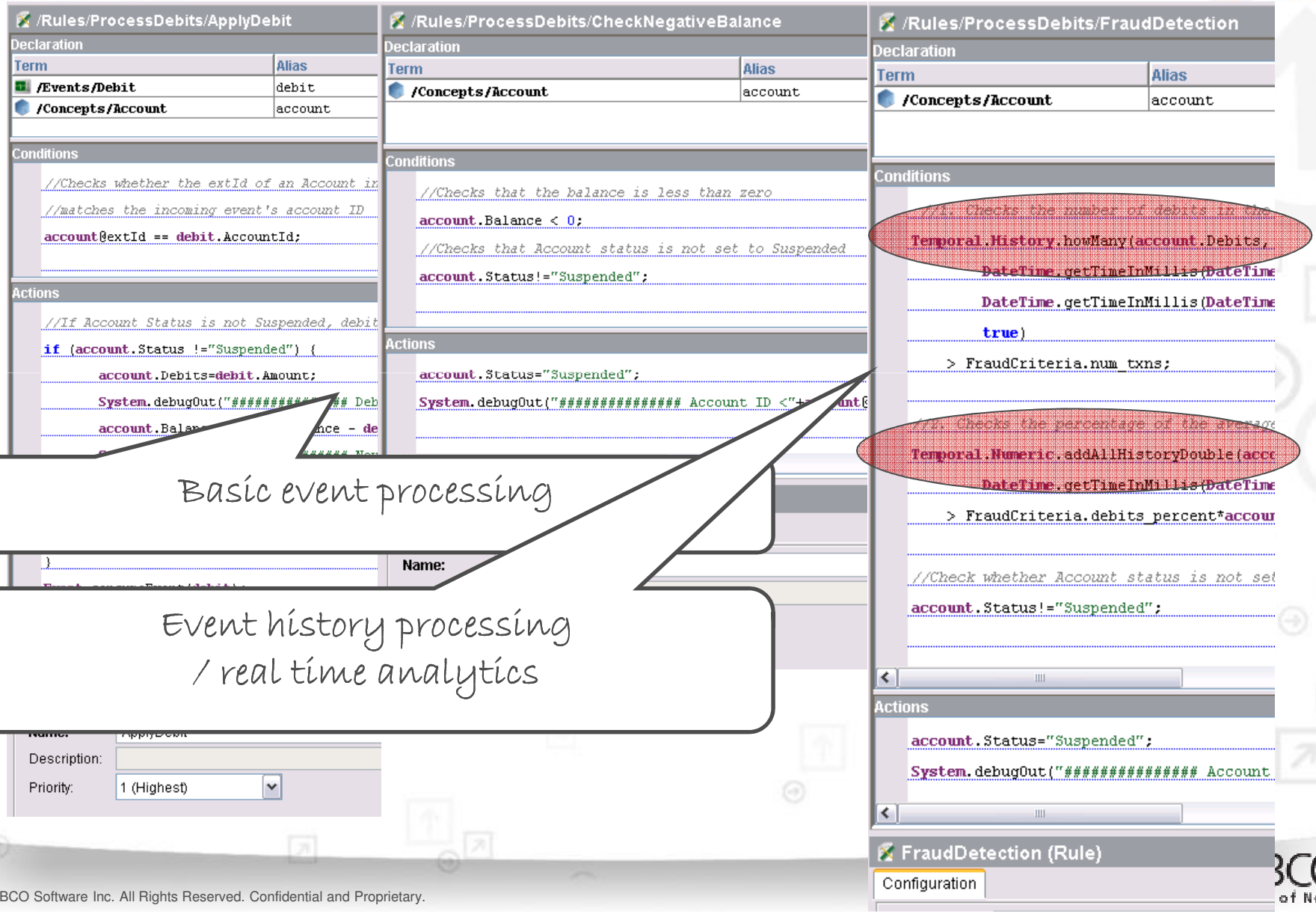
...B. Low latency, scalability



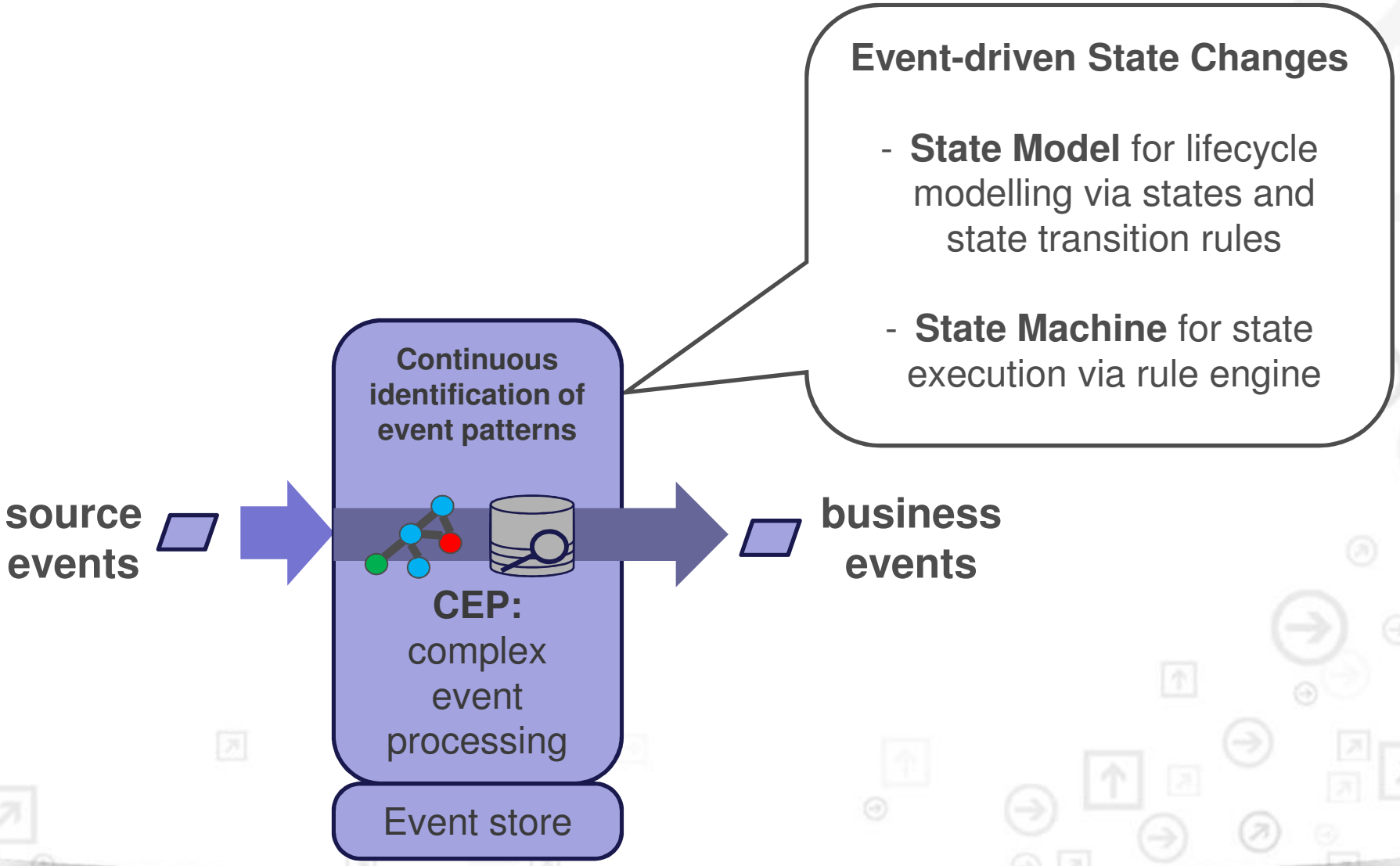
Example: fraud event processing



Example: fraud event processing rules

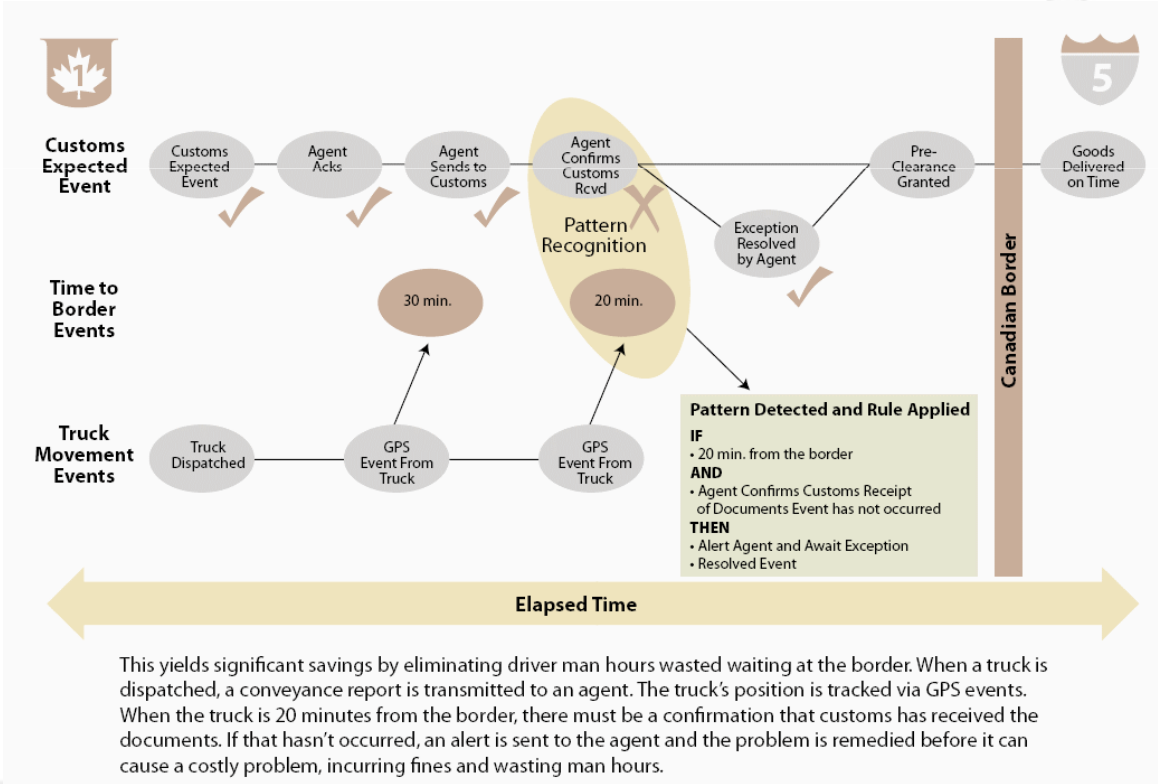


Model for Rule-driven CEP: event lifecycles via states



State Models in CEP

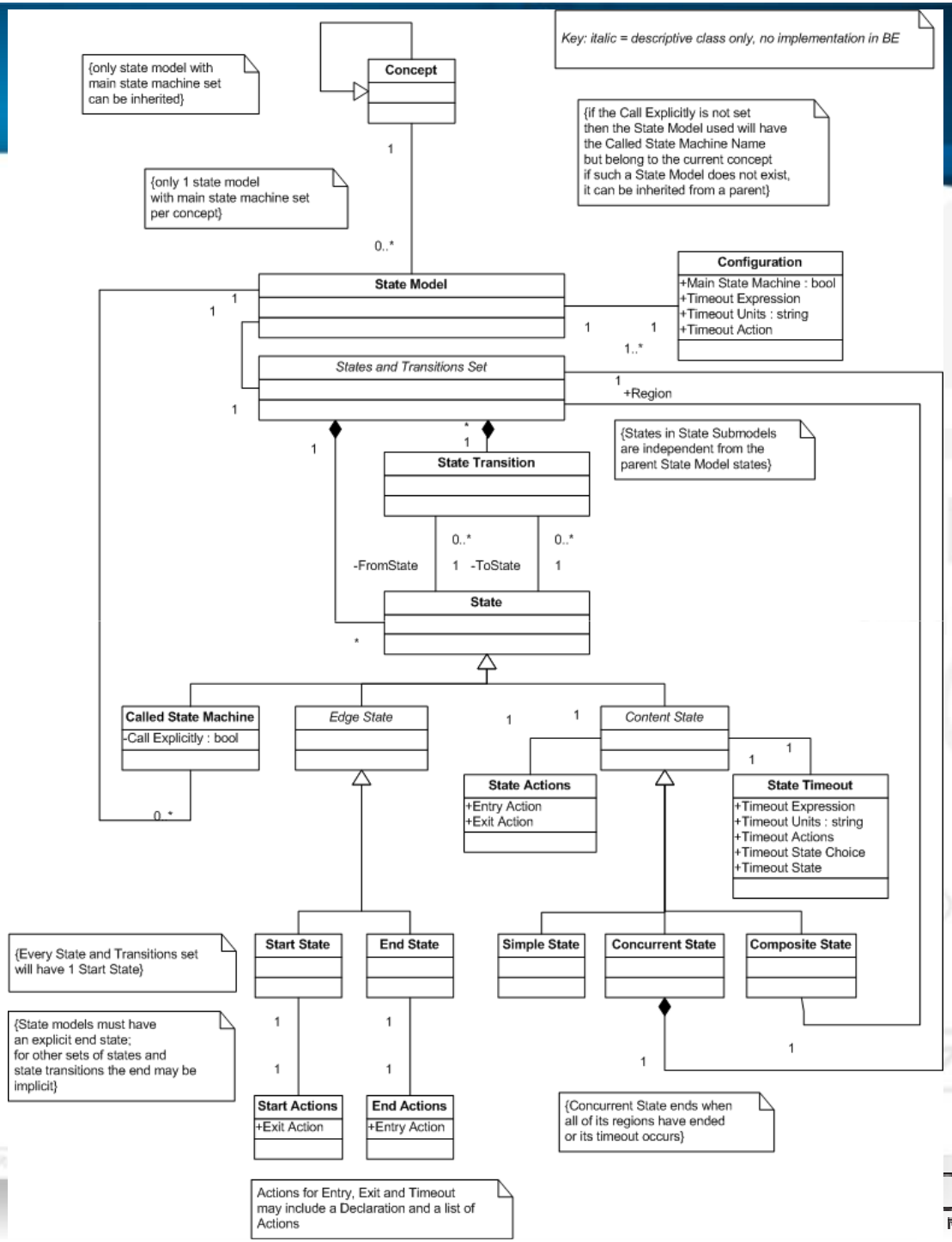
1. **Visual modeling metaphor**
   - State diagram is simple to follow
   - UML standard
2. **State / flow transitions are event or time-related**
   - Lifecycle is a set of states
   - Missing events modelled through time-outs



This yields significant savings by eliminating driver man hours wasted waiting at the border. When a truck is dispatched, a conveyance report is transmitted to an agent. The truck's position is tracked via GPS events. When the truck is 20 minutes from the border, there must be a confirmation that customs has received the documents. If that hasn't occurred, an alert is sent to the agent and the problem is remedied before it can cause a costly problem, incurring fines and wasting man hours.

State Models

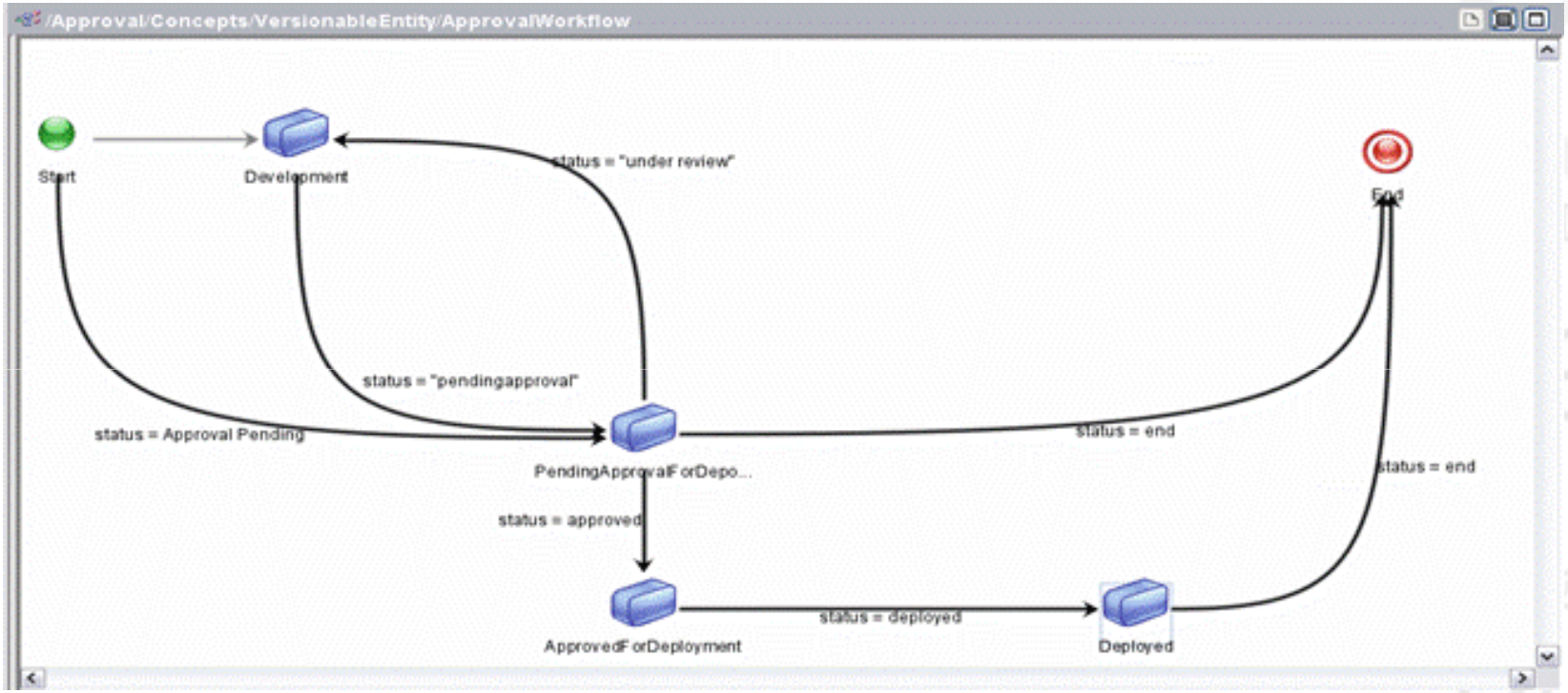
- **States** defined per instance, by type, can be **inherited**
- State transitions are defined by **events**
- Arrival / departure state events drive **actions**
- Multiple **concurrent states** can exist



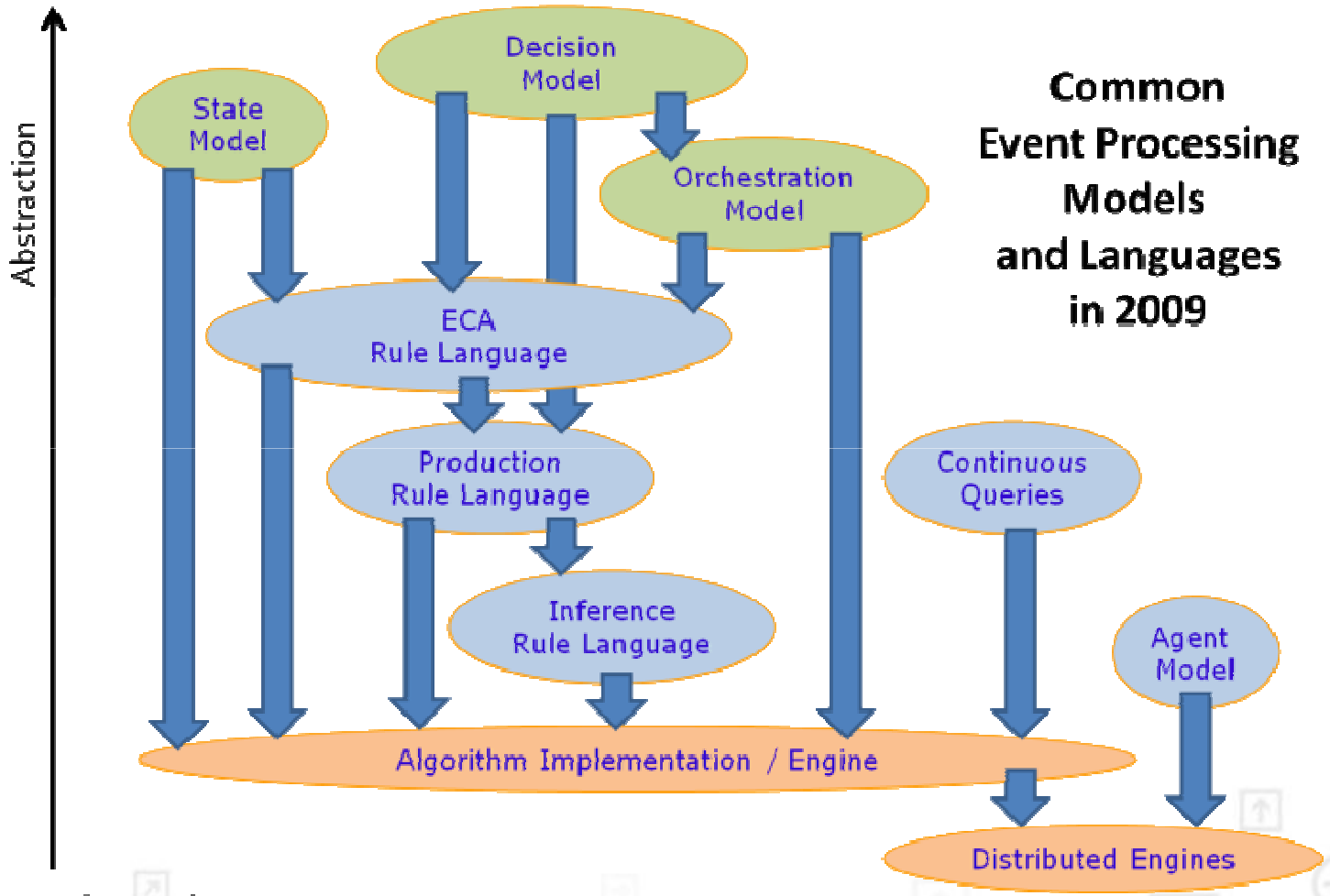
Example Rule Types (continued)

- Basic: Condition-Action
- Triggers: Event-Condition-Action
- Timers/schedulers: TimeUp-Action, TimeInterval-Action
- Event lifecycle: TimeToDie-Action
- **State transition: Event-StateChange, Timeout-StateChange, StateEntry-Action, StateExit-Action**

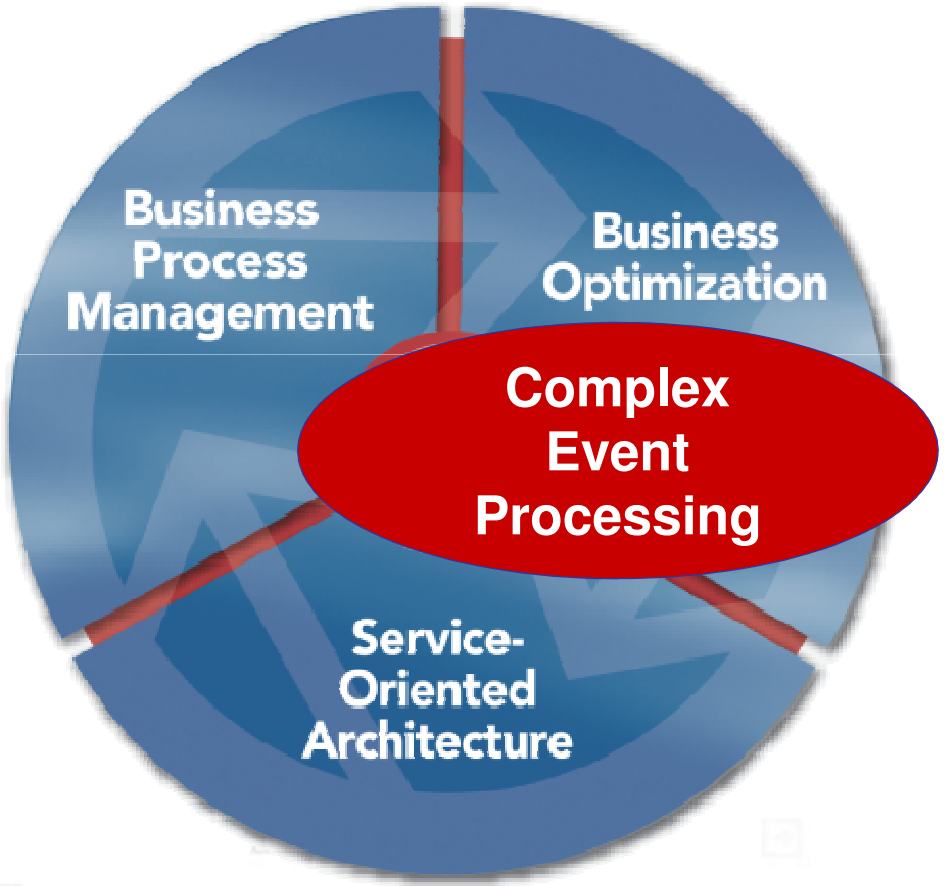
Example: state of rule management...



Basic Rule Types



Summary



- Production Rules are excellent for many types of event pattern matching
- Stateful, event-driven temporal rule processing can provide a common view of events, data, events, state
- Resources:
  www.ep-ts.com
  www.tibcoblogs.com/cep