Red Hat
Process Automation

Business Automation in a Nutshell

PV207 BPM

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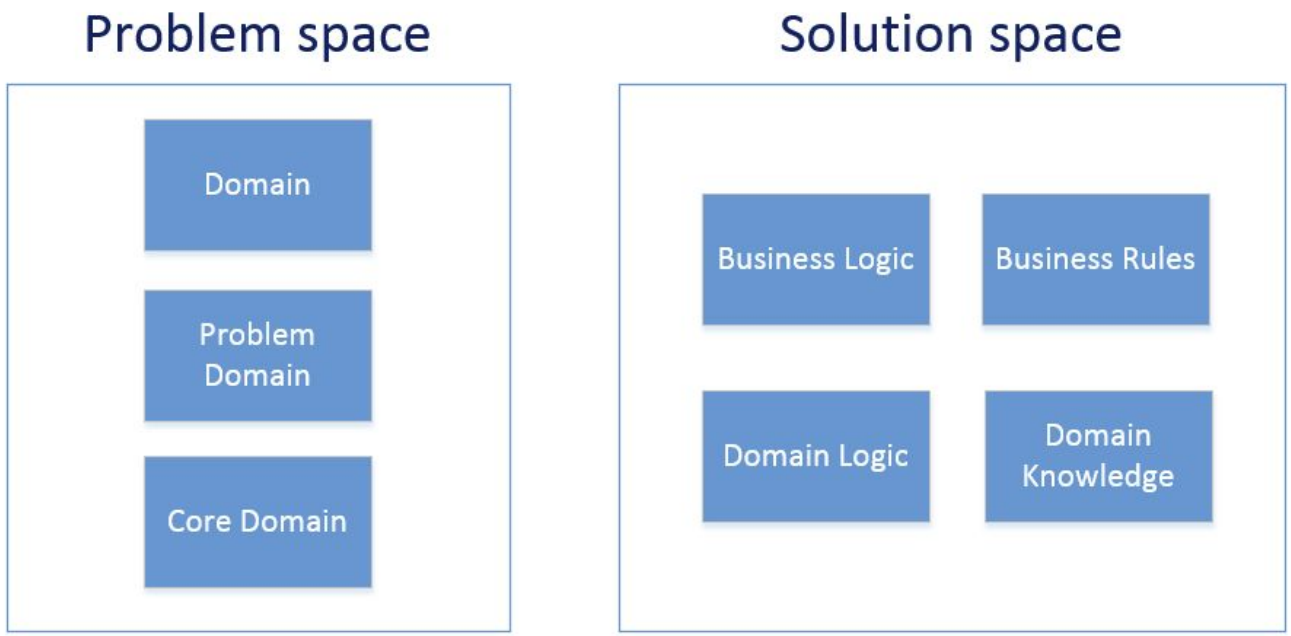
DOMAIN-DRIVEN DESIGN (DDD)

Concept that the structure and language of software code should match the business domain.



- Eases communication
- Improves flexibility
- Emphasizes domain over interface
- Requires robust domain expertise
- Encourages iterative practices
- Ill-suited for highly technical projects

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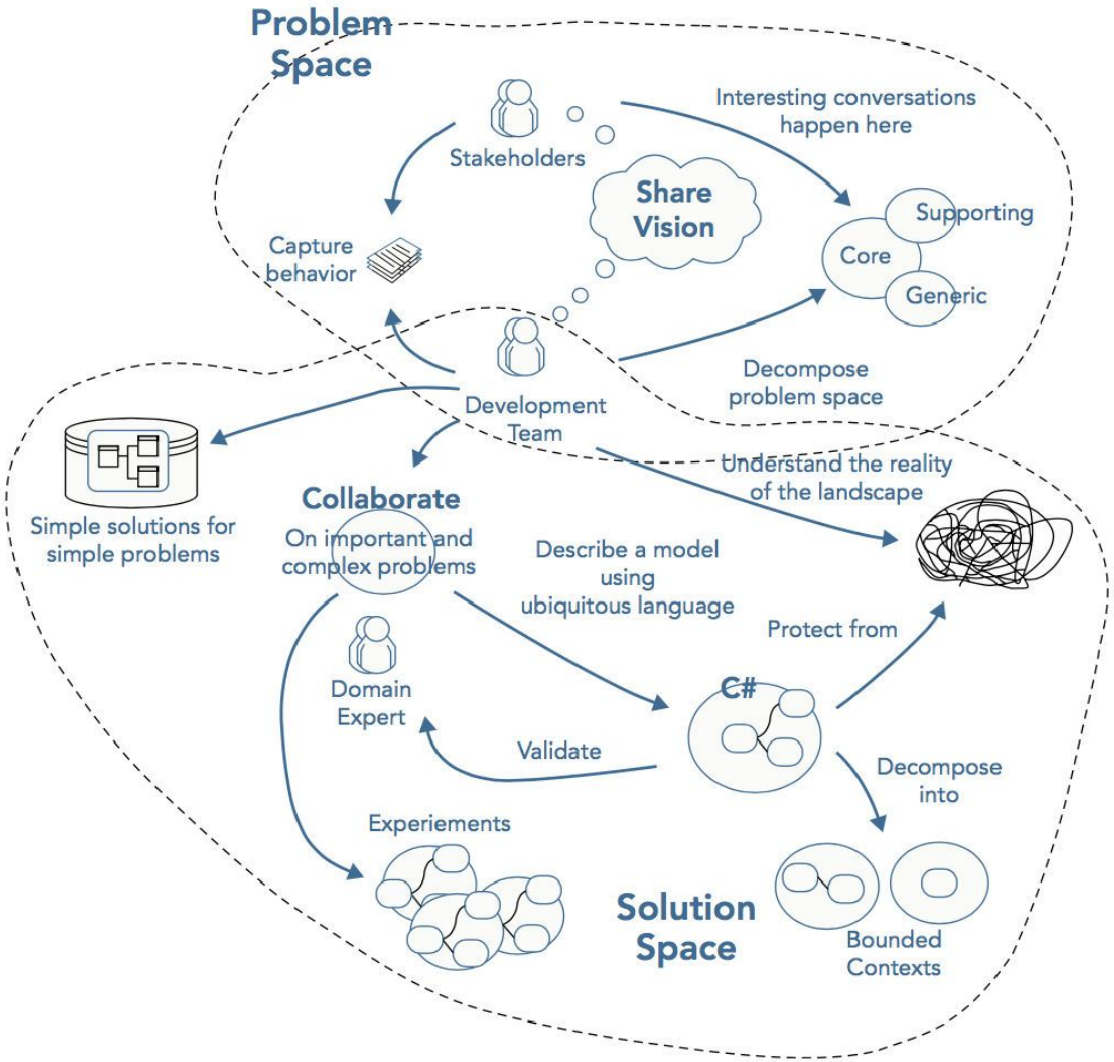
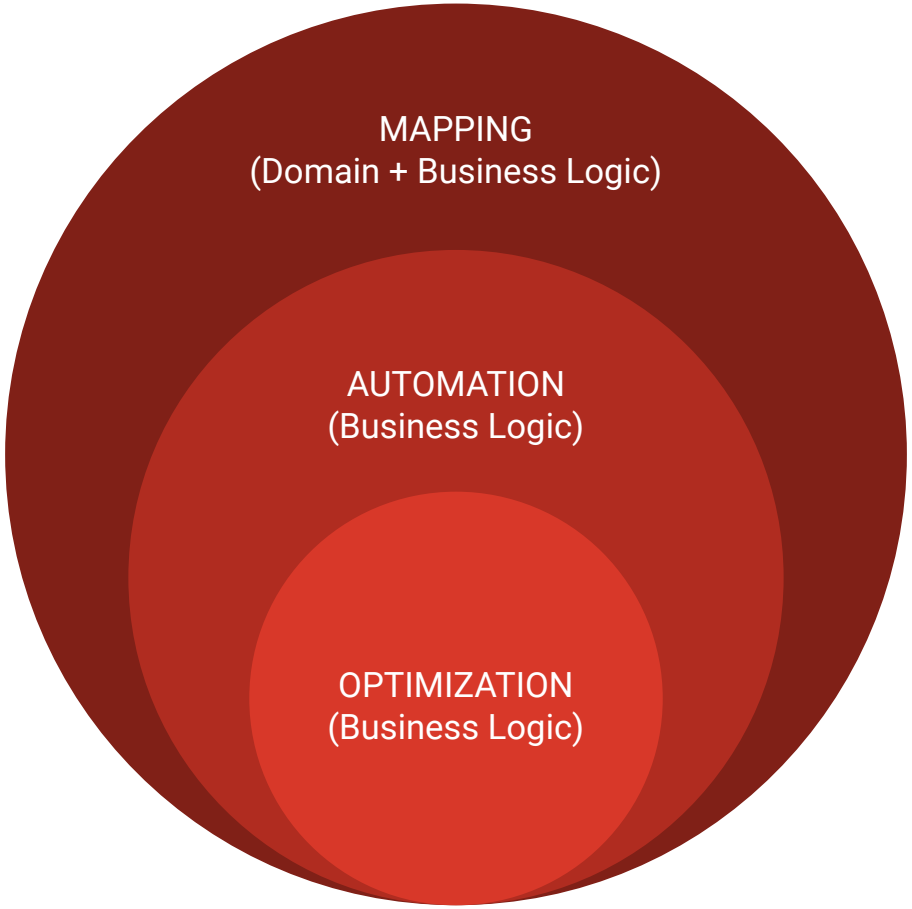
DOMAIN-DRIVEN DESIGN (DDD)



BUSINESS AUTOMATION



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PROCESS MODELS

MAPPING

Process models

Process mining

Triggers

Participants

Inputs and outputs

Domain model

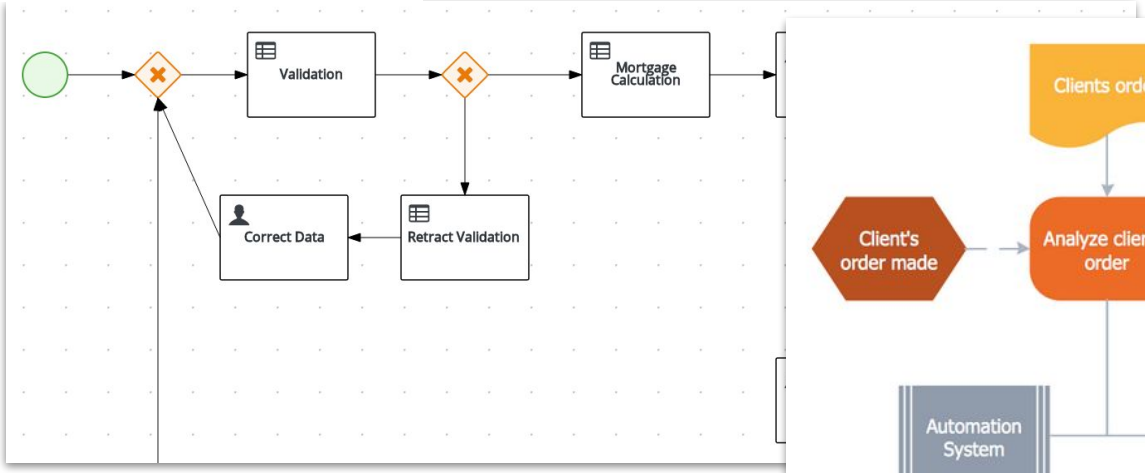
DSL

Business rules

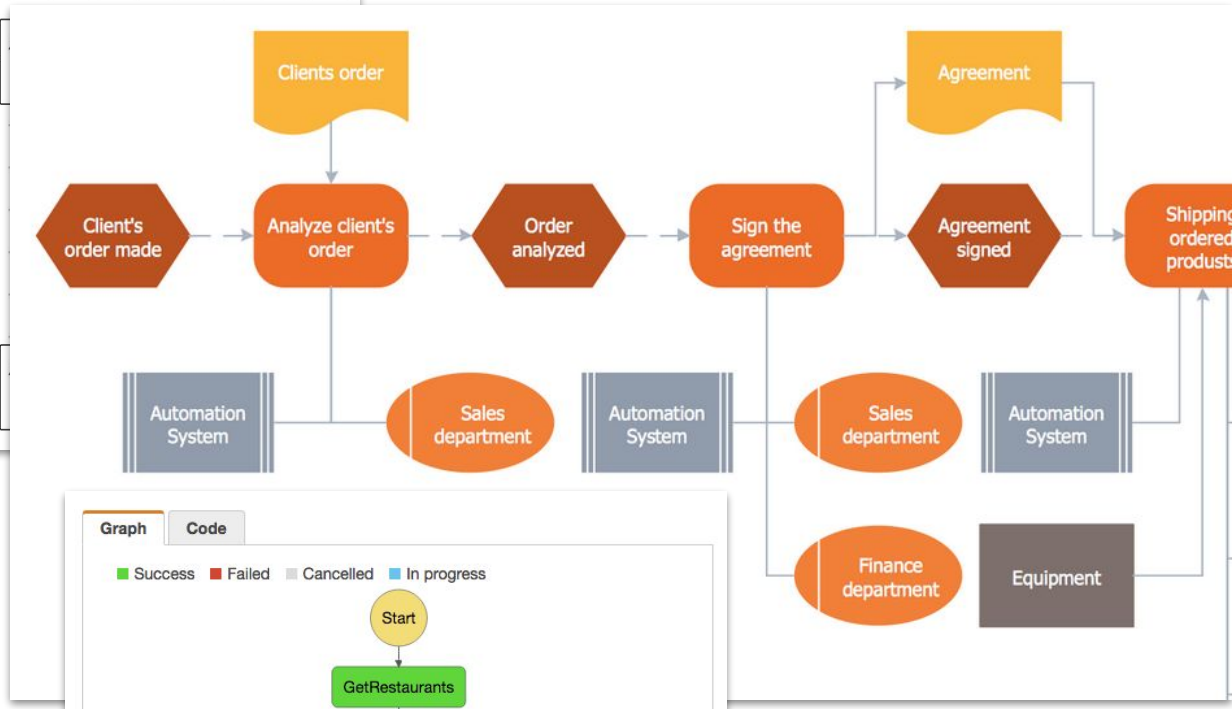
Decision tables

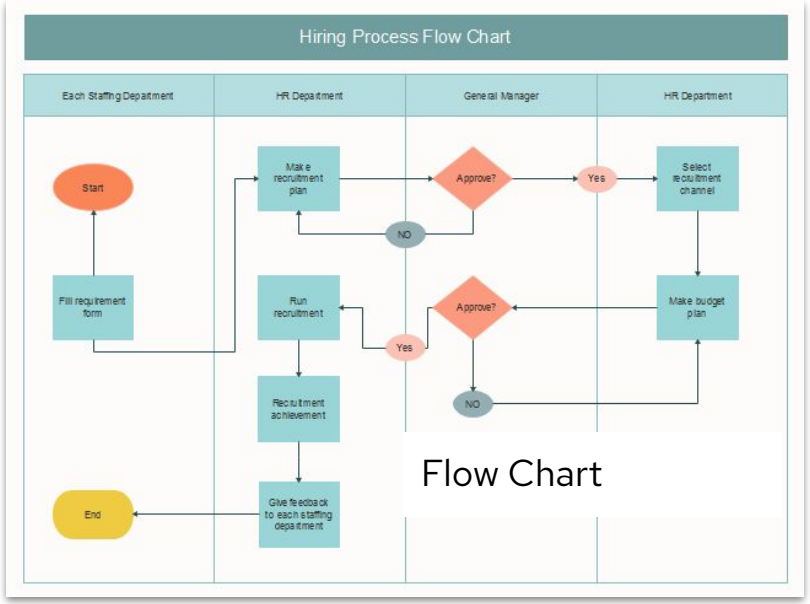
Decision models

BPMN model

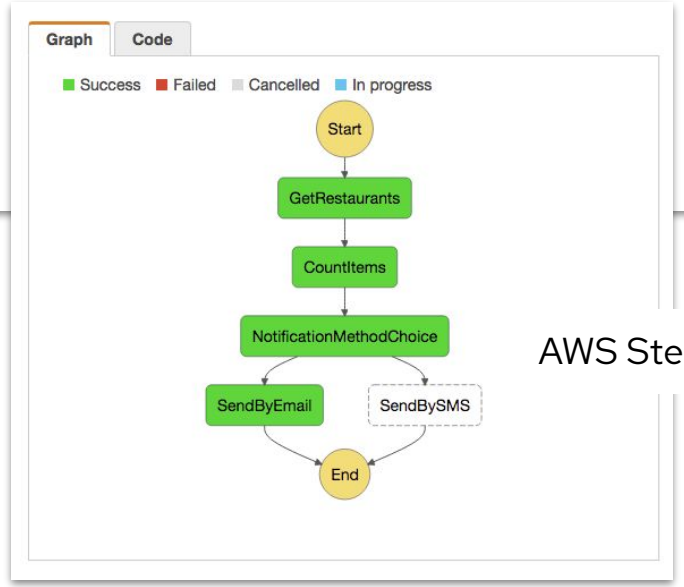


Event-driven process chain diagram





Flow Chart



AWS Step Function

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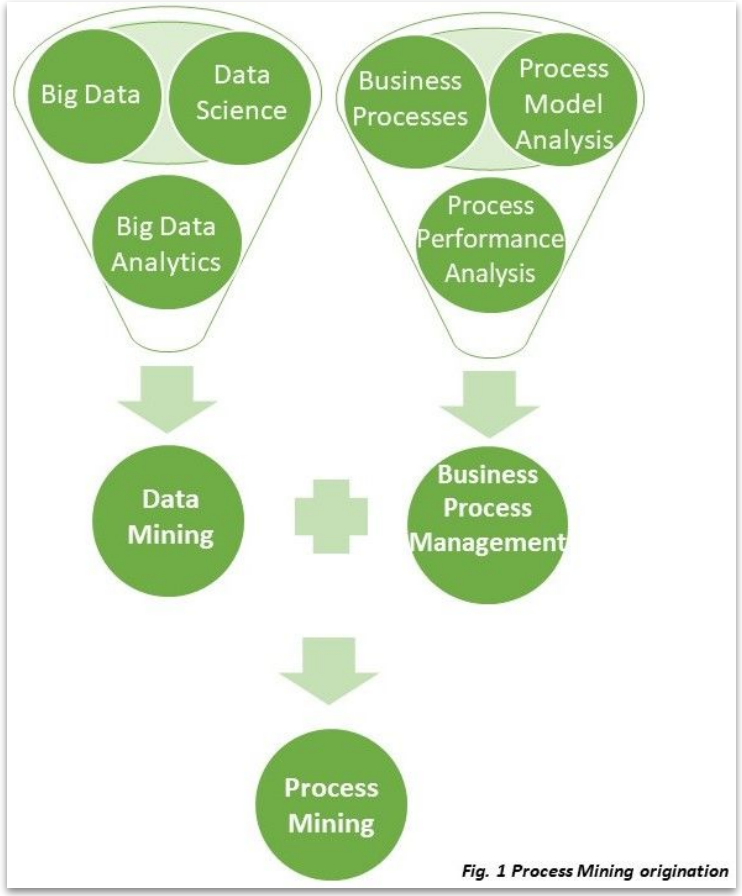
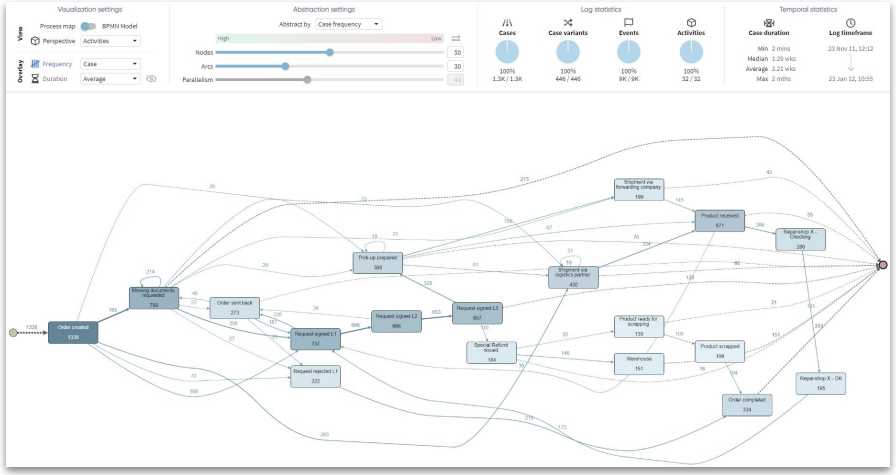
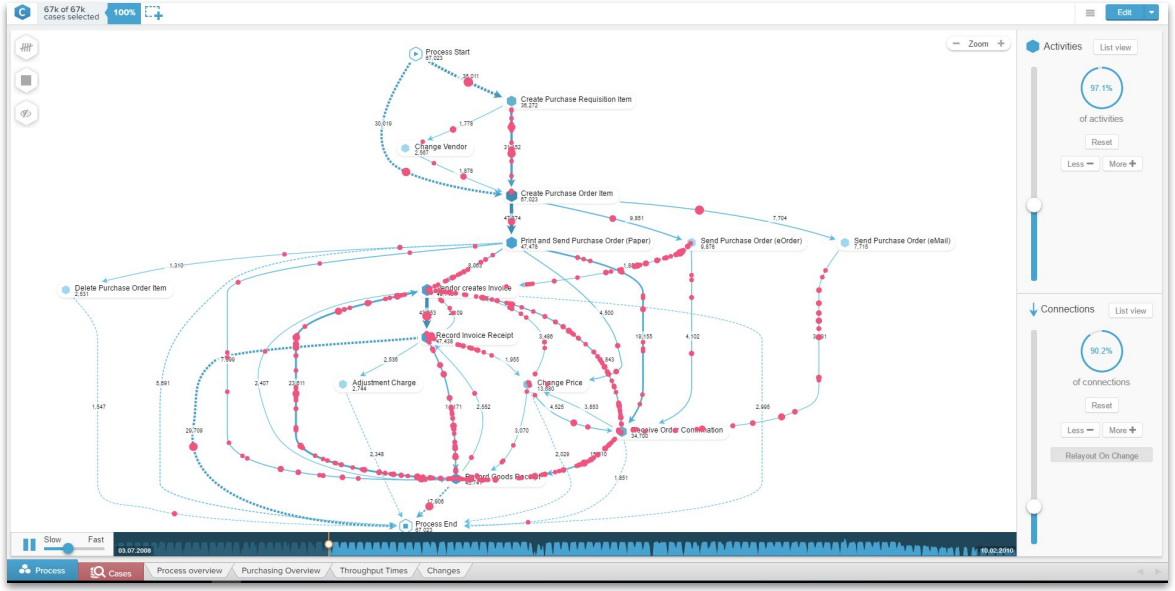


Fig. 1 Process Mining origination

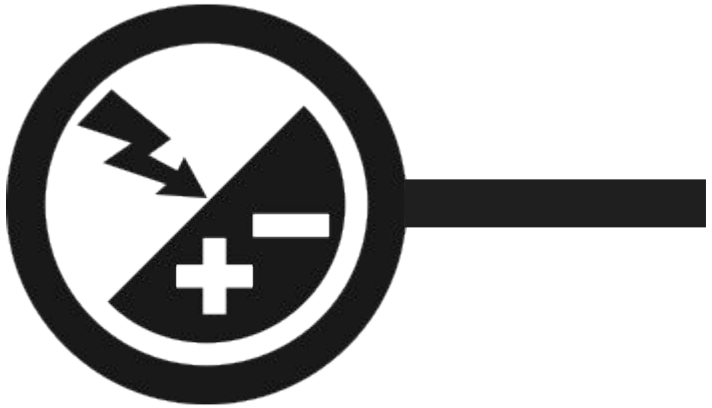




TRIGGERS

A trigger is the initial stimulus that initiates the subsequent steps of the process.

- Manual
- Scheduled
- Form
- Webhook
- Email
- Callable (subprocess)
- Alert (error)
- App-specific (from CRM, helpdesk, ...)



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PARTICIPANTS

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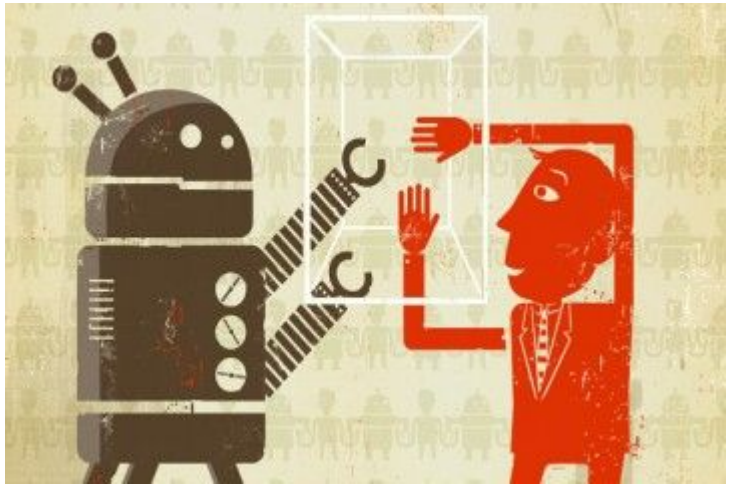
Participants are the main entities involved in a business process.

- People - individuals, groups, employees, customers, suppliers, partners, ..
- Robots
- Smart things
- Systems
- etc.



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INPUTS AND OUTPUTS

MAPPING

Process models

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Triggers

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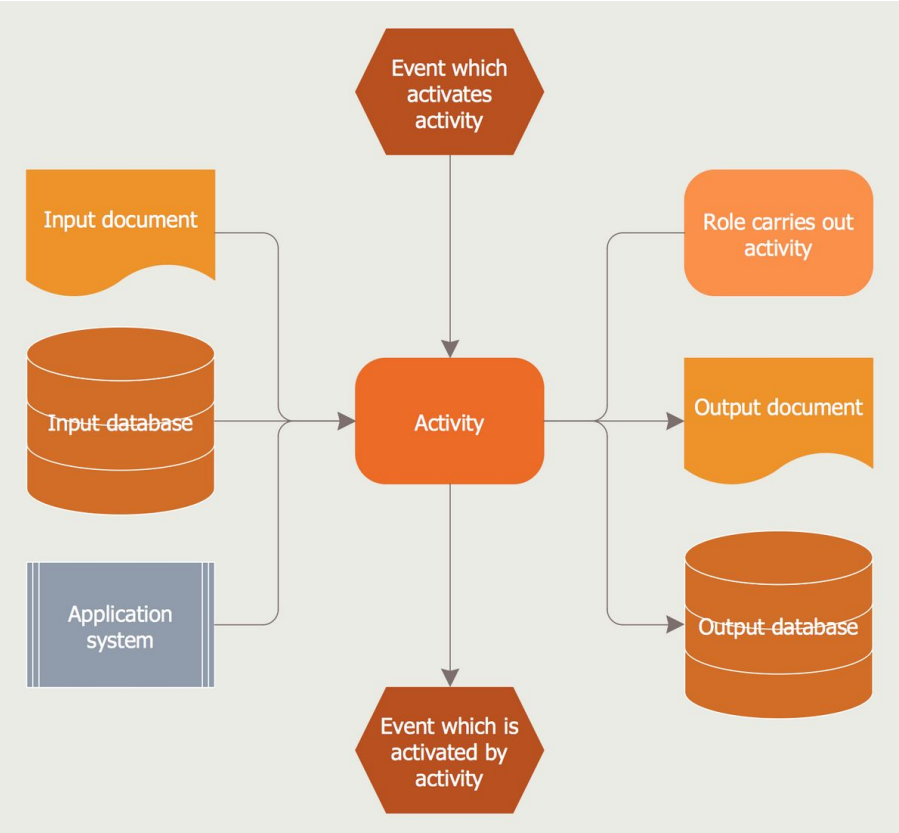
Processes, tasks and decisions require input data objects to be processed and produce results as their output.

- Documents - paper, electronic, ...
- Form data
- Events - signals, messages, errors, timeout, ...
- Sensitive data
- Data transformations should be done outside of a business process / decision



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DOMAIN MODEL OF BUSINESS OBJECTS

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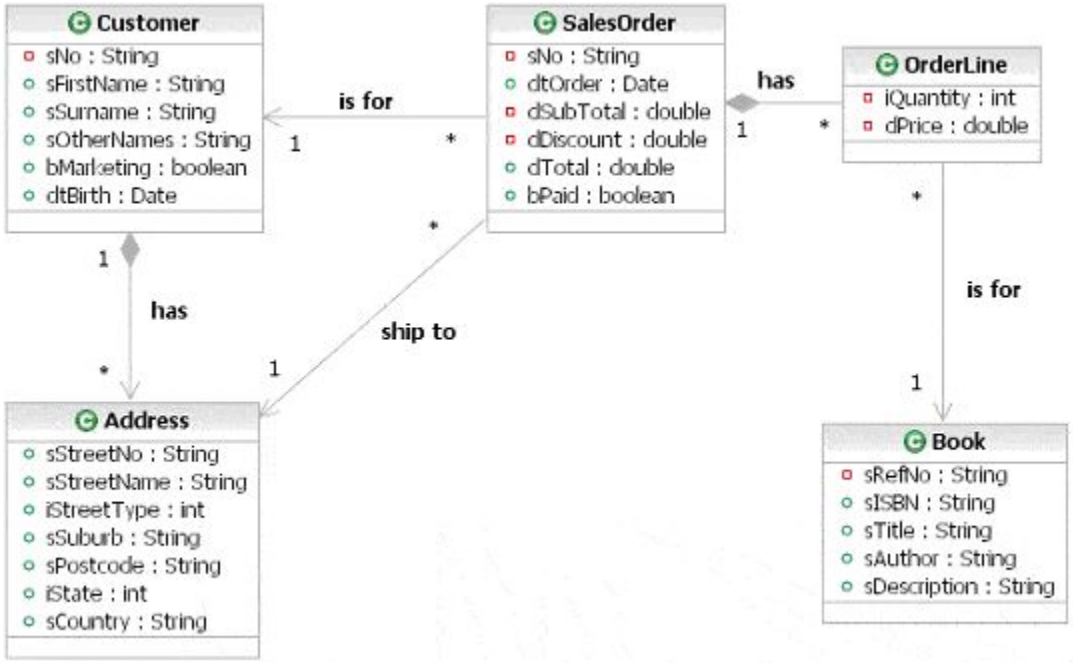

Translates to domain-specific APIs

GET	/onboarding	Returns a list of onboarding
POST	/onboarding	Creates new instance of onboarding
GET	/onboarding/{id}	Returns information about specified onboarding
DELETE	/onboarding/{id}	Cancels specified onboarding

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DOMAIN SPECIFIC LANGUAGE

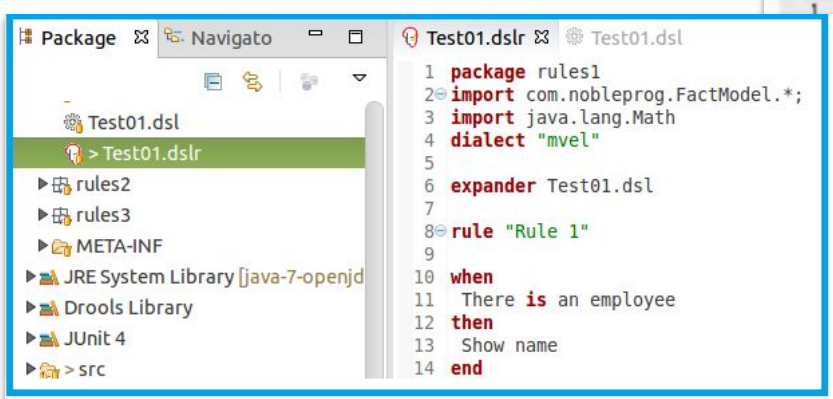
MAPPING

- Process models
- Process mining
- Triggers
- Participants
- Inputs and outputs
- Domain model
- **DSL**
- Business rules
- Decision tables
- Decision models

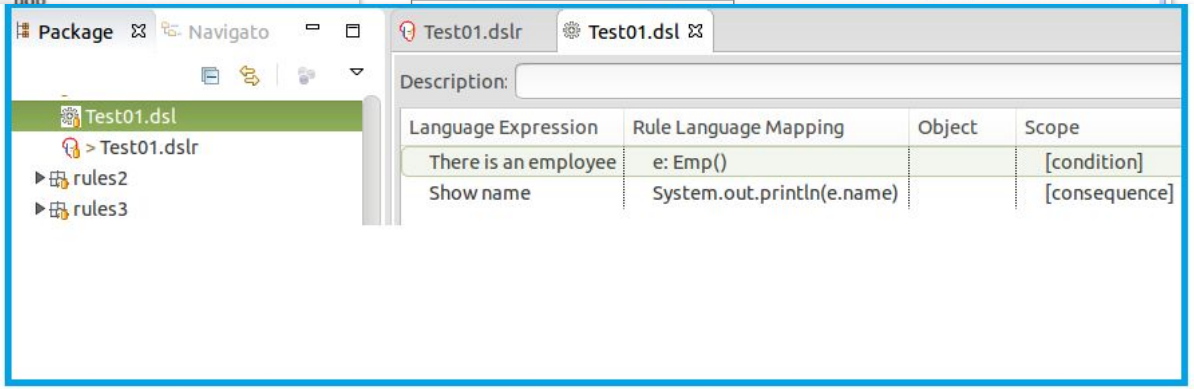
A computer language specialized to a particular application domain.

By hiding technical details, DSLs can empower users by giving them ability to set feature requirements and verify system behaviour.

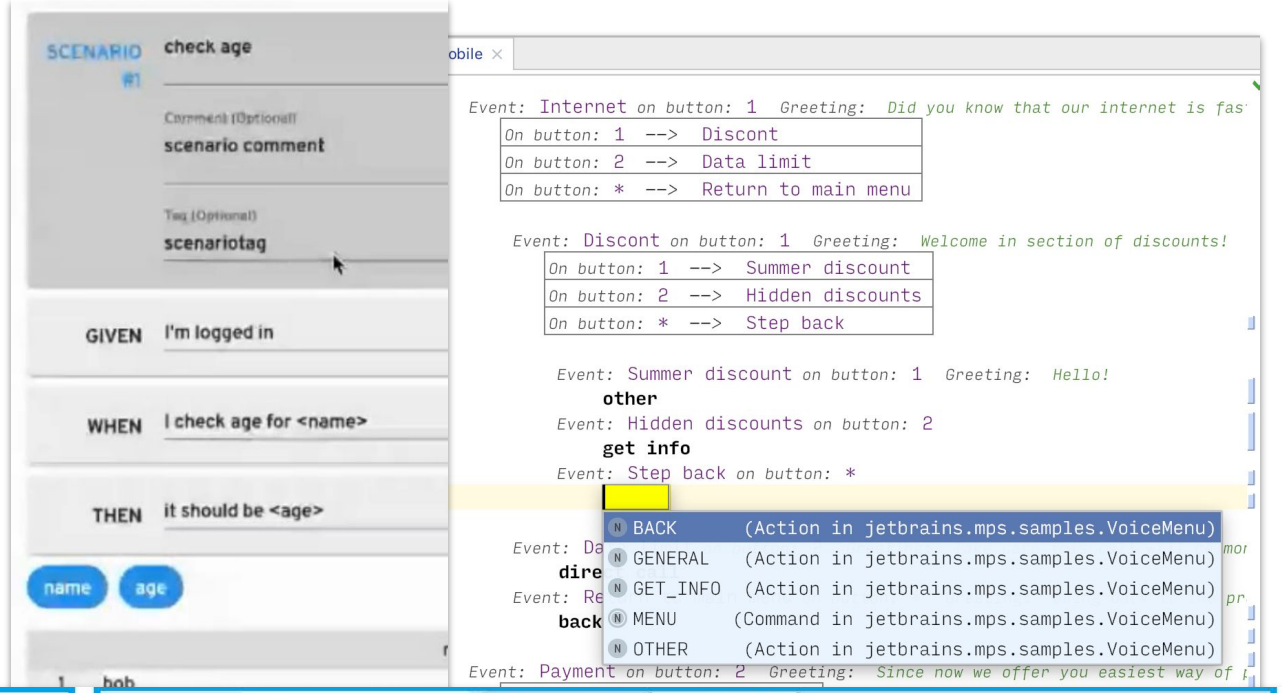
Open up a functionality to internal users without having to prematurely build out a super complex, much more rigid GUI



dslr file



dsl file



BUSINESS RULES

MAPPING

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DSL

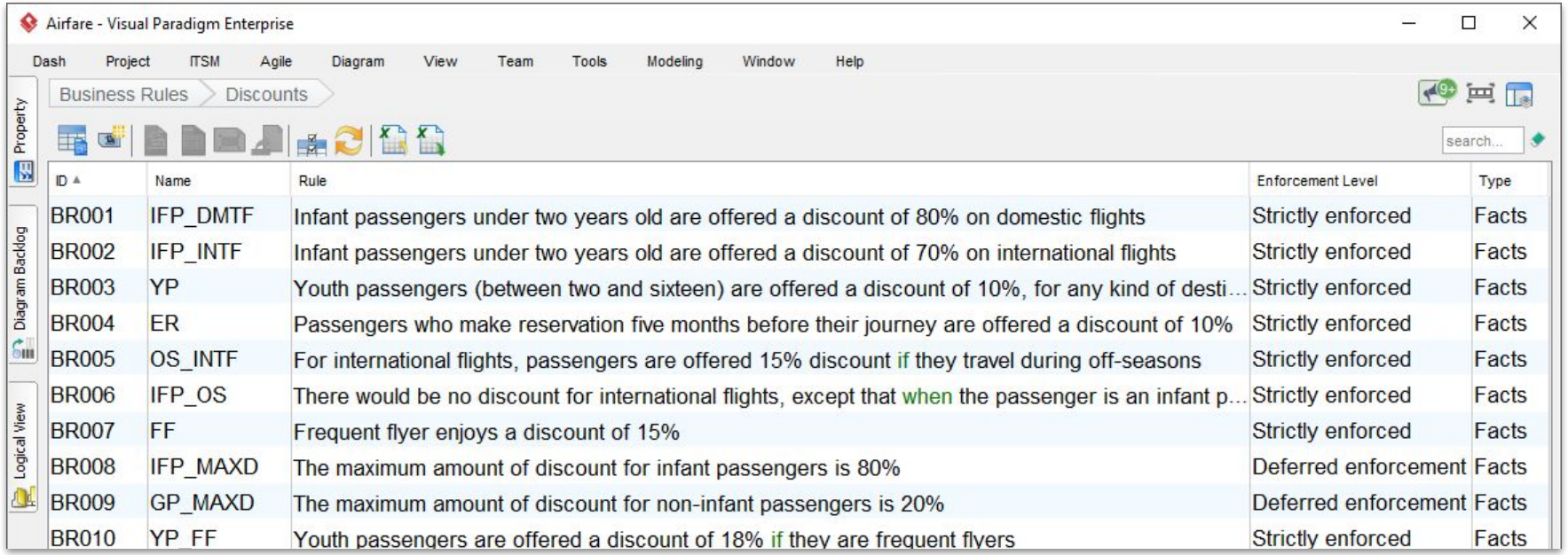
Business rules

Decision tables

Decision models

Business rules are directives that define an organization's business activities.

- Influence business processes
- Apply to people, processes, corporate behavior and computing systems in an organization
- Legal constraints and obligations



ID	Name	Rule	Enforcement Level	Type
BR001	IFP_DMTF	Infant passengers under two years old are offered a discount of 80% on domestic flights	Strictly enforced	Facts
BR002	IFP_INTF	Infant passengers under two years old are offered a discount of 70% on international flights	Strictly enforced	Facts
BR003	YP	Youth passengers (between two and sixteen) are offered a discount of 10%, for any kind of desti...	Strictly enforced	Facts
BR004	ER	Passengers who make reservation five months before their journey are offered a discount of 10%	Strictly enforced	Facts
BR005	OS_INTF	For international flights, passengers are offered 15% discount if they travel during off-seasons	Strictly enforced	Facts
BR006	IFP_OS	There would be no discount for international flights, except that when the passenger is an infant p...	Strictly enforced	Facts
BR007	FF	Frequent flyer enjoys a discount of 15%	Strictly enforced	Facts
BR008	IFP_MAXD	The maximum amount of discount for infant passengers is 80%	Deferred enforcement	Facts
BR009	GP_MAXD	The maximum amount of discount for non-infant passengers is 20%	Deferred enforcement	Facts
BR010	YP_FF	Youth passengers are offered a discount of 18% if they are frequent flyers	Strictly enforced	Facts

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DECISION TABLES

MAPPING

Process models

Process mining

Triggers

Participants

Inputs and outputs

Domain model

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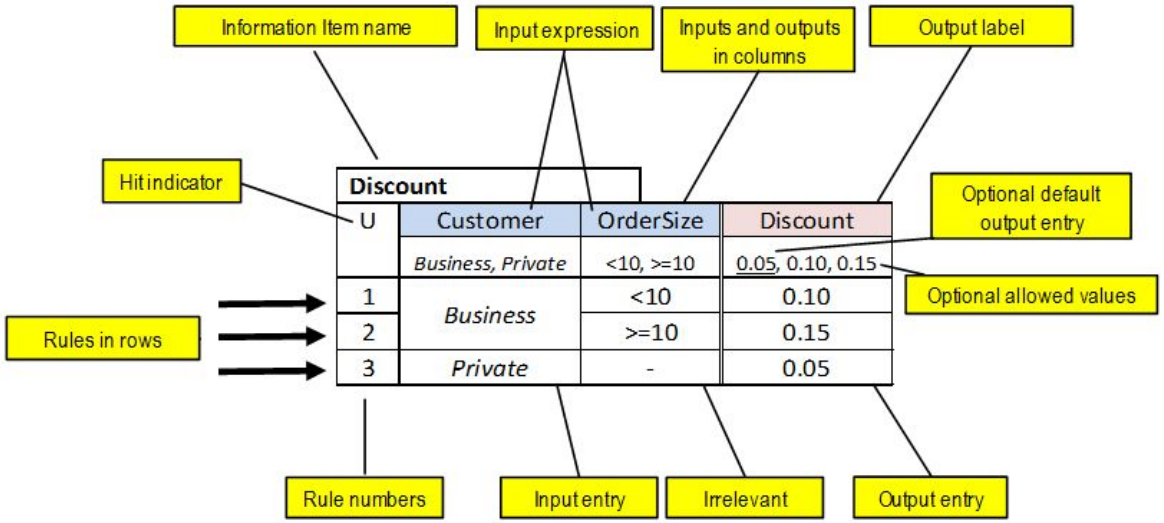
Decision tables

Decision models



Types of decisions

- Selection (routing)
- Scoring
- Categorizing

The decision doesn't take an action (no side effect), just determines a data value

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DECISION MODELS

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Inputs and outputs

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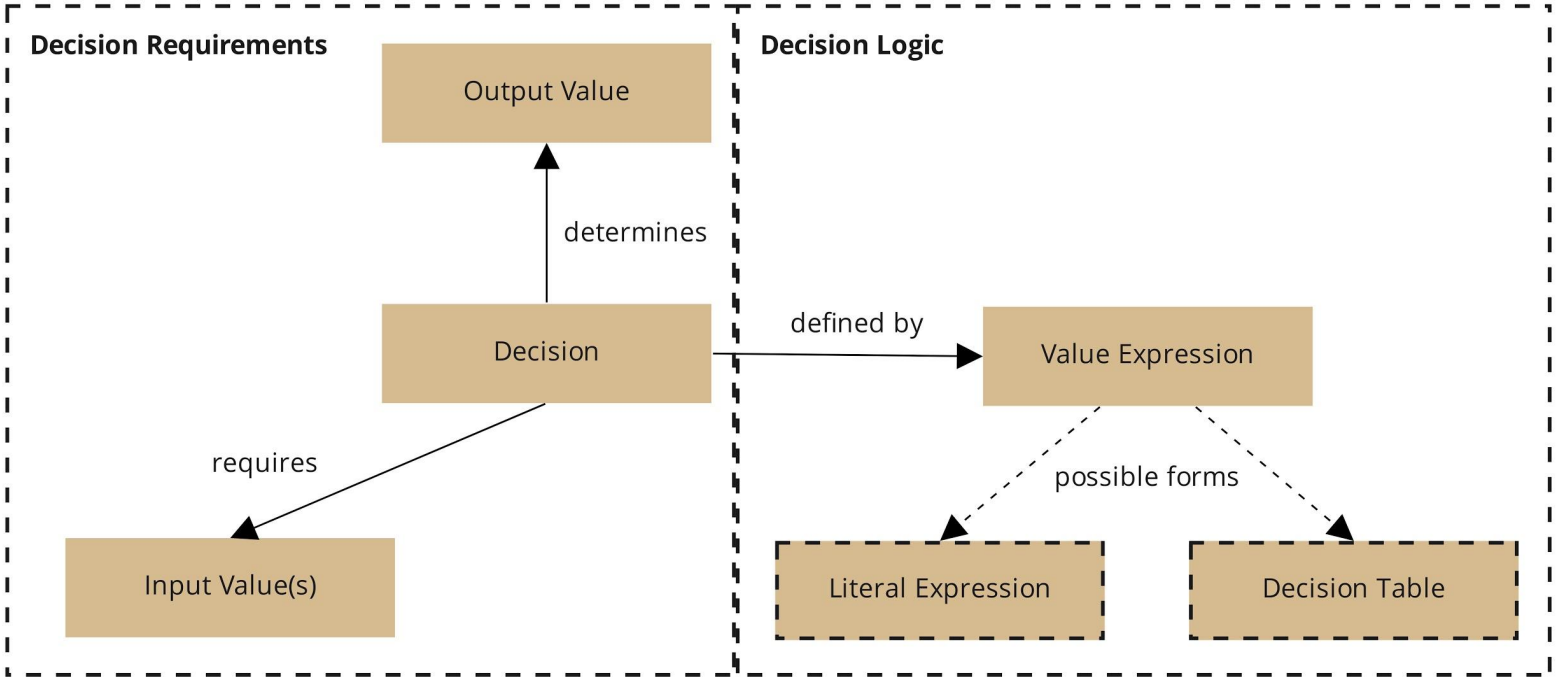

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DECISION MODELS

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Process models

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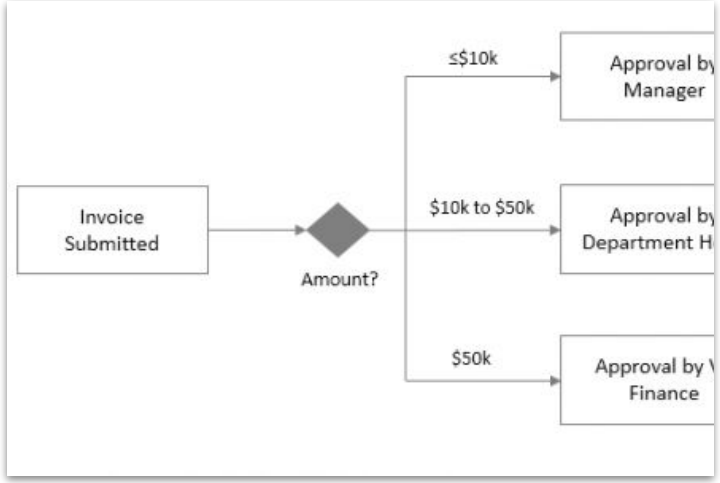
Inputs and outputs

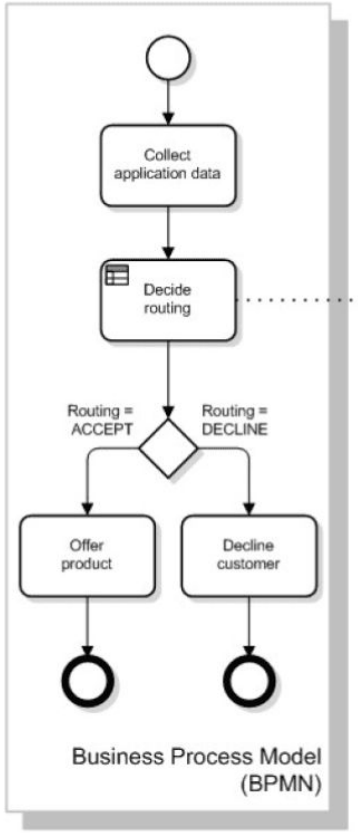
Domain model of business objects

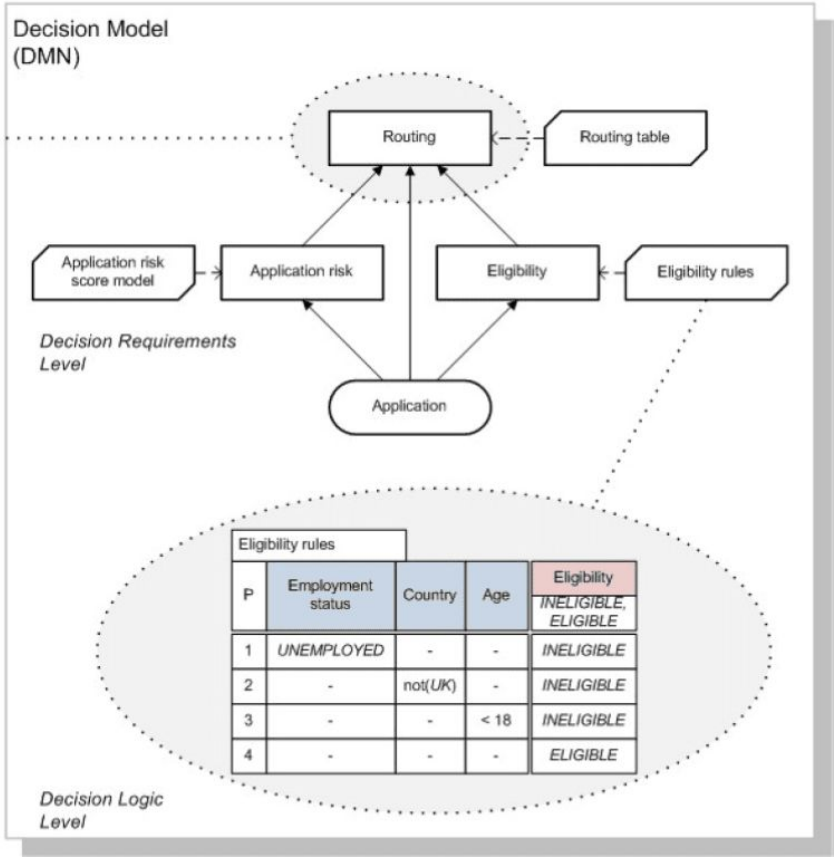
Business rules

Decision tables

Decision models







Learn DMN in 15 minutes

DMN and Kogito presentation

DMN.new editor

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AUTOMATION

Processes

Rules

Decisions

Service orchestration / choreography

Event-driven processes

Decision streaming

Scheduled jobs

State machine

Serverless workflow

FaaS

Pipelines

Compensations

PROCESSES

System-centric processes
- Straight-through processes (request-response)
- Asynchronous processes - with wait states

Human-centric processes
- Escalation processes
- Collaboration processes

Adhoc processes (cases)
- Dynamic processes
- Data-heavy processes

Event-driven processes
Serverless workflows

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RULES

Kogito DRL Rules language

IBM Action rules express business policy statements using a predefined business vocabulary that can be interpreted by a computer.

Policy

"change customers in the `Gold` category to the `Platinum` category when they spend more than `$1,500` in a single transaction"

Action Rule

If All of the following conditions are true:

- the customer category is `Gold`
- the value of the shopping cart is more than `$ 1,500`

Then Change the customer category to `Platinum`

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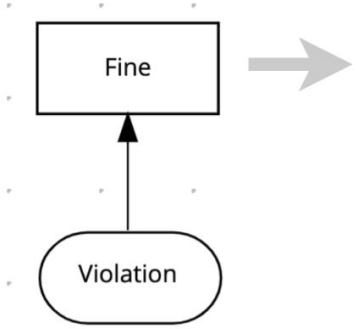
DECISIONS

Executing decision logic in DMN models



Fine *(Decision Table)*

U	Violation.Type *(string)*	Violation.Actual Speed - Violation.Speed Limit *(number)*	Fine *(tFine)*		Description
			Amount *(number)*	Points *(number)*	
1	"speed"	[10..30)	500	3	
2	"speed"	>= 30	1000	7	
3	"parking"	-	100	1	
4	"driving under the influence"	-	1000	5	

```
/* = Actual input data = */
"Violation": {
  "Type": "speed",
  "Speed Limit": 60,
  "Actual Speed": 100
}
```

```
/* = Expected output data = */
"Fine": {
  "Points": 7,
  "Amount": 1000
}
```

DMN with Kogito on Quarkus

DMN FEEL Cheatsheet

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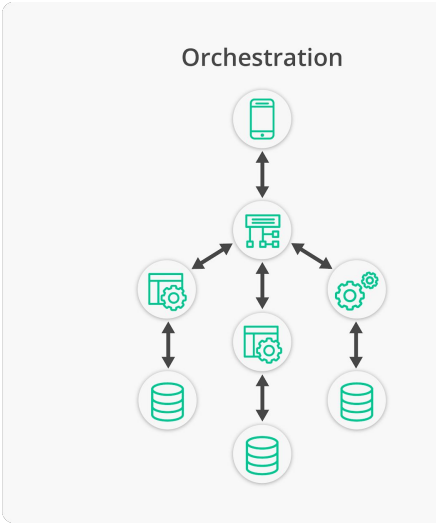
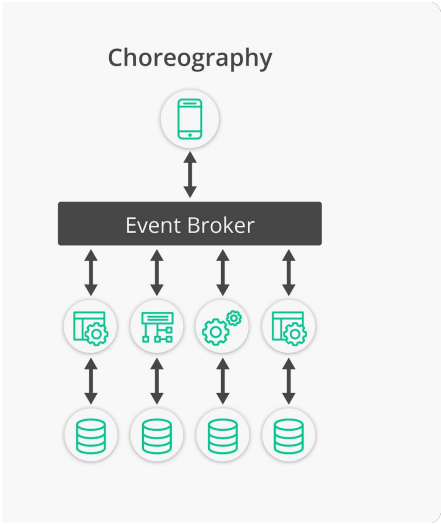
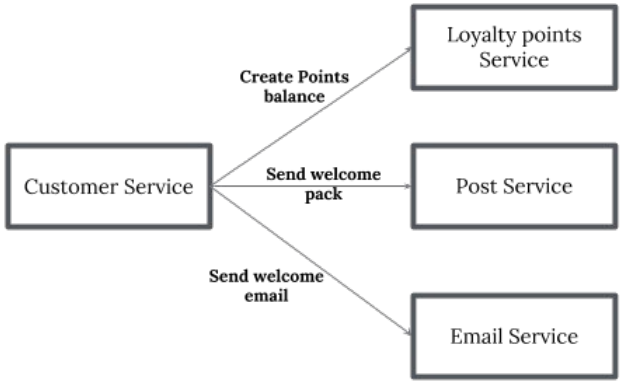
SERVICE ORCHESTRATION / CHOREOGRAPHY

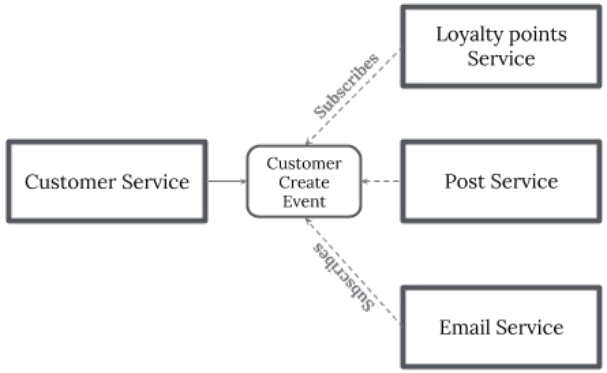




Orchestration Example



Choreography Example



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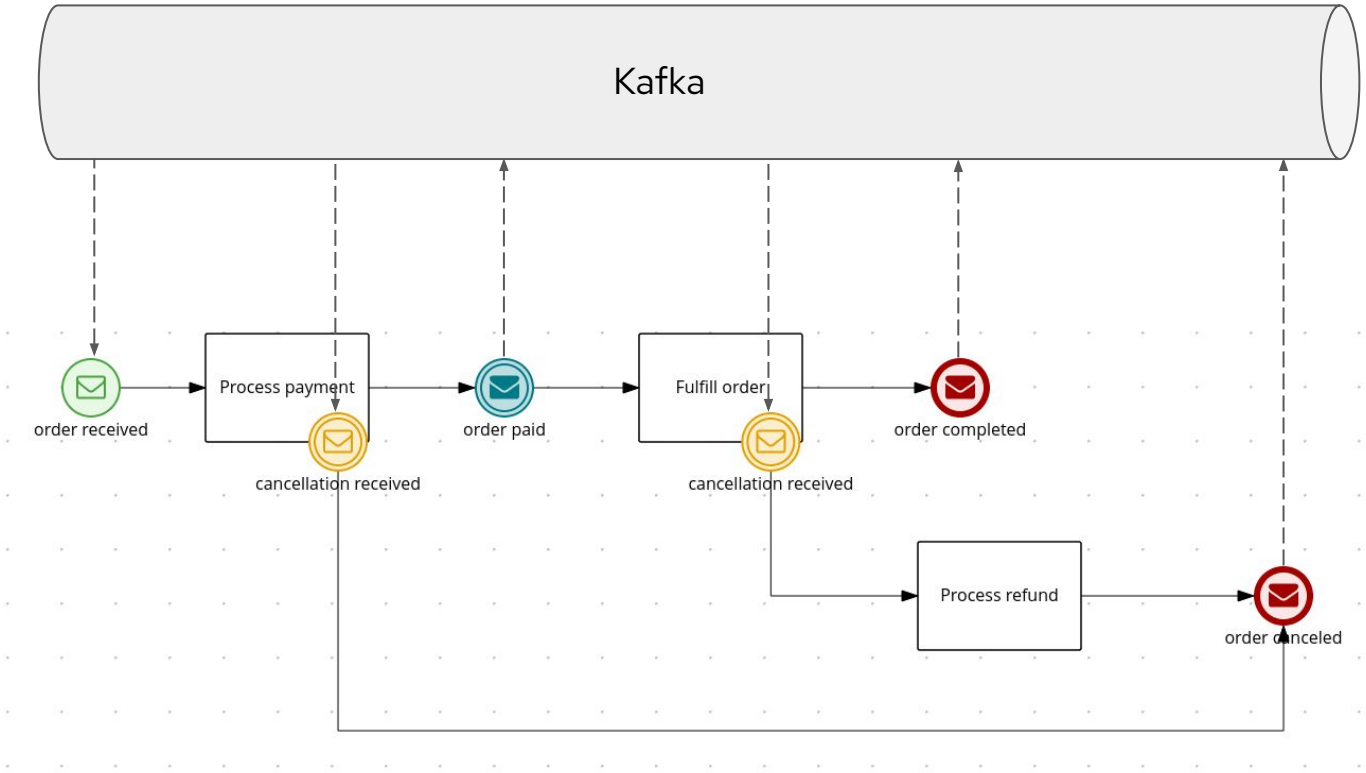
EVENT-DRIVEN PROCESSES



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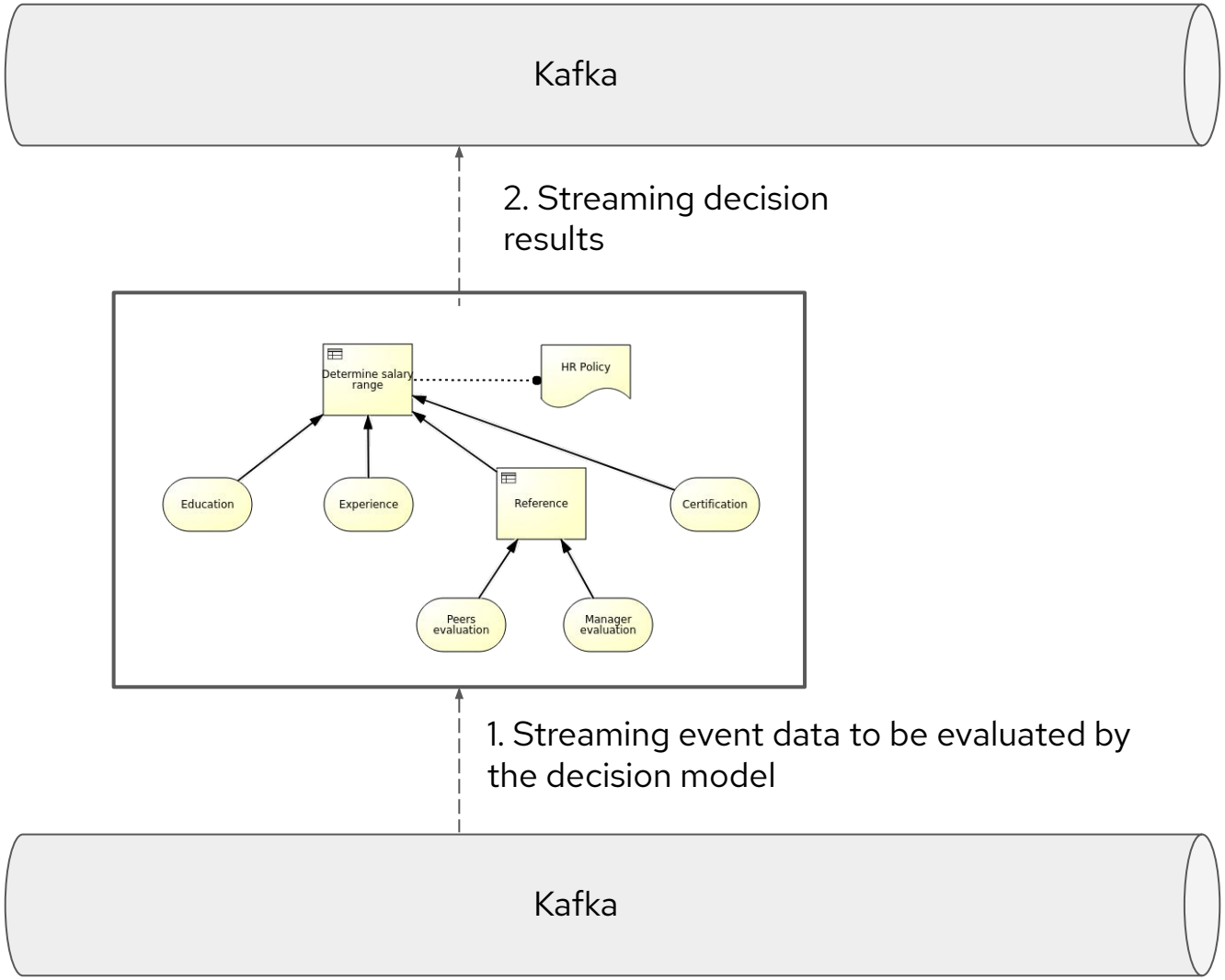
DECISION STREAMING



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SCHEDULED JOBS

- Repetitive tasks - every day, every hour, at the end of each month, etc. - avoid peak loads by distributing load throughout the period of time
- Timouts, reminders
- Retries after failures - delay, max attempts

Retries in Serverless Workflows

Timers in jBPM

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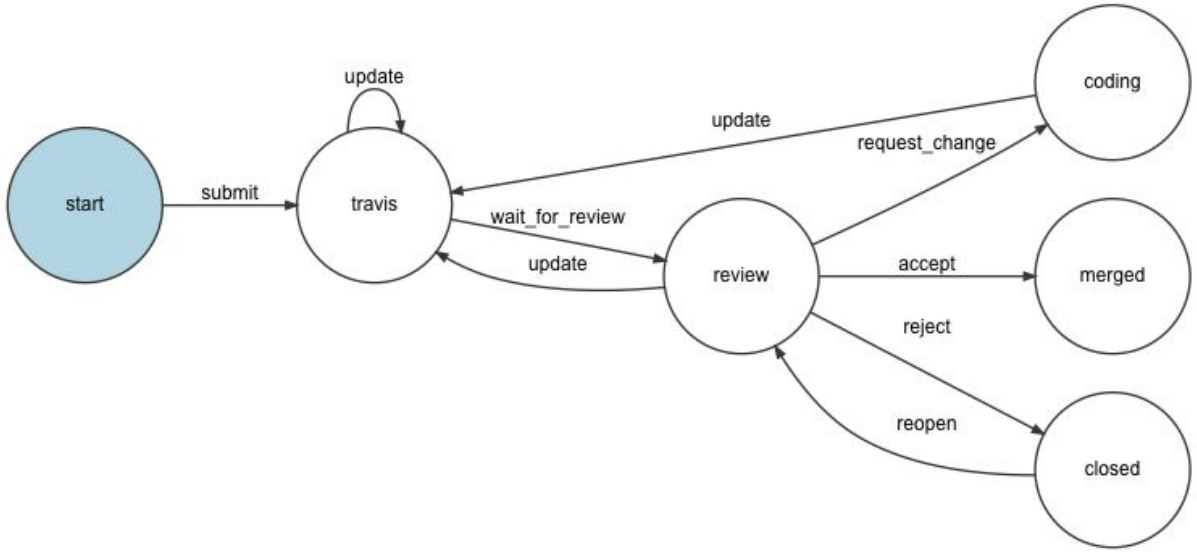
STATE MACHINE



Not a domain logic

States in processes are moments when a process persists its state to the database

- When waiting on asynchronous task to receive a response to continue - for example waiting for form data from a user, waiting for an external system to finish processing, etc.
- When a process starts / finishes

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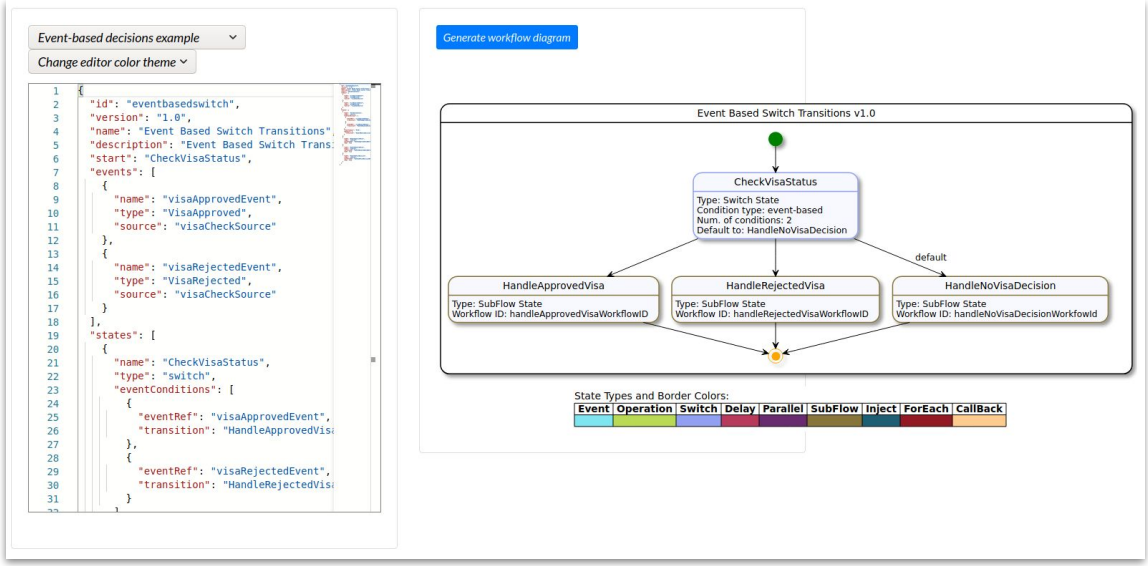
SERVERLESS WORKFLOW

Workflows which do not actively wait to be triggered.



Serverless Workflow

Intro to CNCF Serverless Workflow

AWS Step Functions

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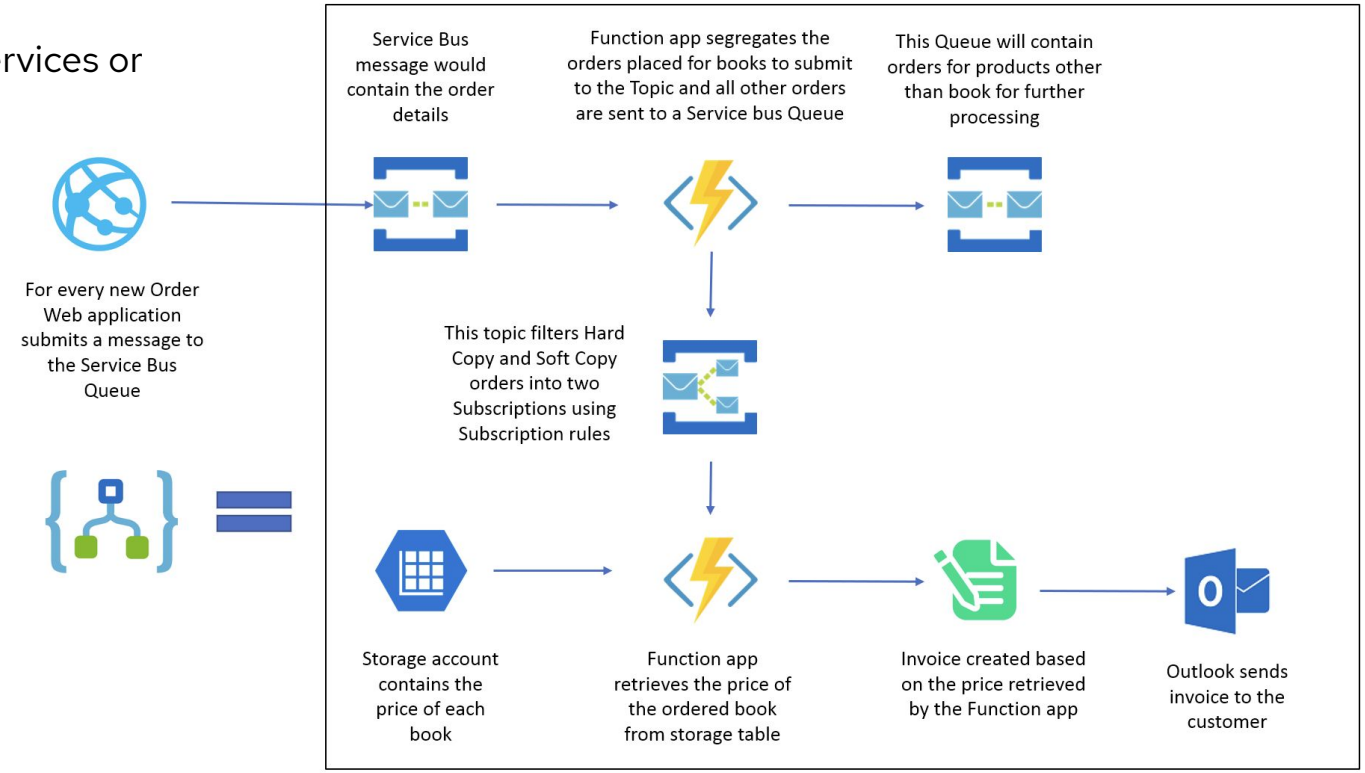
FAAS = Function as a Service

A serverless function is a small, discrete, and reusable chunk of code that:

- Is short-lived
- Is not a daemon (long-running)
- Does not publish TCP services
- Is not stateful
- Makes use of your existing services or third-party resources
- Executes in a few seconds



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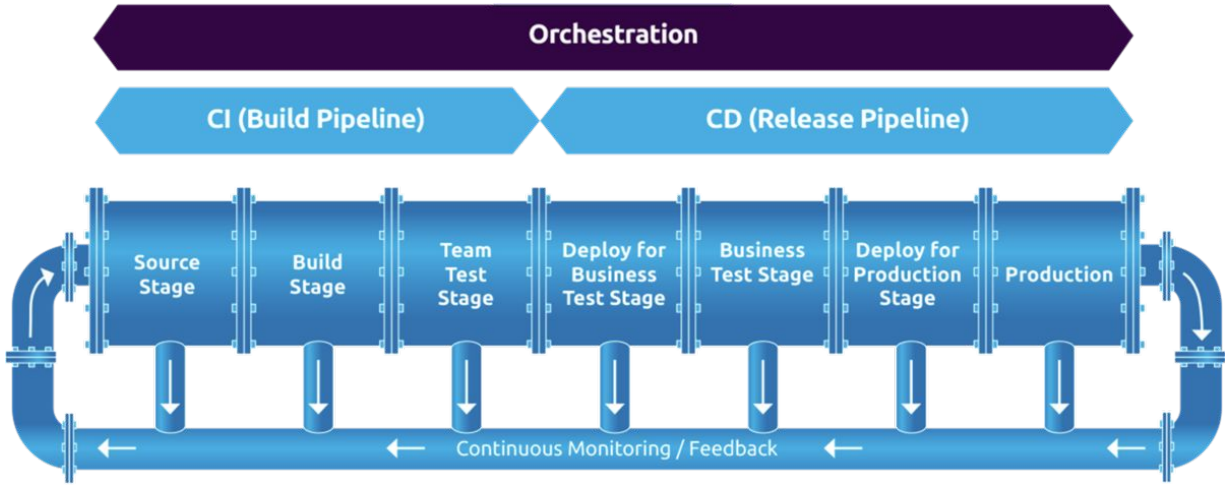
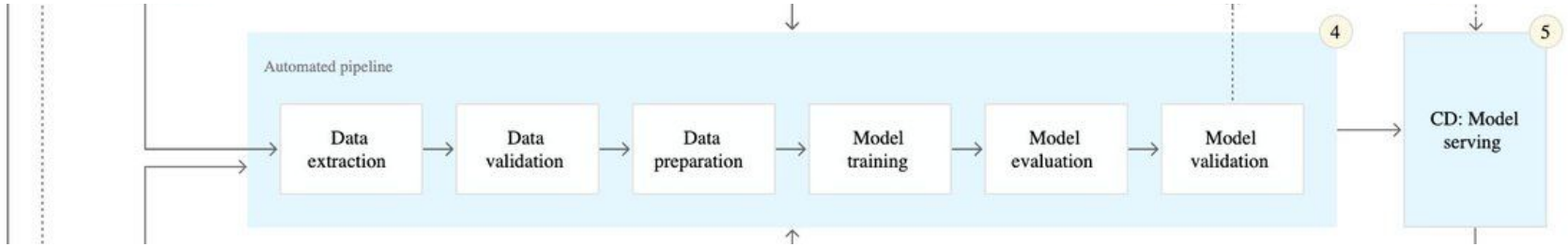


Automation pipelines in Machine learning



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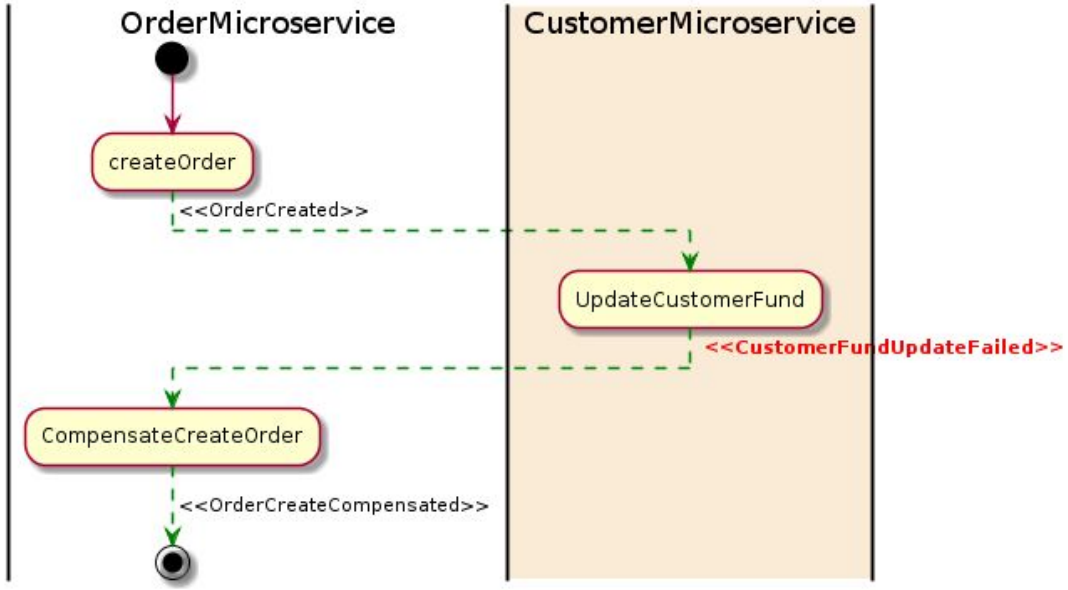
COMPENSATIONS

Saga pattern for microservice architectures



Simple Kogito BPMN example

Saga pattern powered by Kogito

If any microservice fails to complete its local transaction, the other microservices will run **compensation** transactions to rollback the changes.

Advantages

- support for long-lived transactions
- other microservices are not blocked if a microservice is running for a long time
- there is no lock on any object

Disadvantages

- difficult to debug
- difficult to maintain if the system gets complex
- does not have read isolation

Adding a **process manager** addresses the complexity issue of the Saga pattern when it becomes responsible for listening to events and triggering endpoints.

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BPI AND BPR

OPTIMIZATION

BPI and BPR

RPA

Chatbots

Business activity monitoring

Process simulation

Task assignments

Constraint planning

Machine learning

Scorecards

Business Process Improvement

- On-going effort
- Improvement of existing process
- Limited organizational change
- Requires an incremental change in mind-set

Business Process Reengineering

- Project-based effort
- Build process from scratch (whiteboard)
- Greater organizational change
- Requires a fundamental change in mind-set

Use BPI when:

1. As-is process is already mapped/documented
2. As-is process fundamentally works but not well enough with some areas in need of improvement
3. Your focus is the process – not on implementing an overarching business strategy.

Use BPR when:

1. As-is process is redundant or in need of a rethink and redesign
2. The as-is process fundamentally no longer works and a major overhaul is required.
3. The company focuses is the overall strategy to be achieved, rather tasks or process optimization

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RPA = Robotic Process Automation

OPTIMIZATION

BPI and BPR

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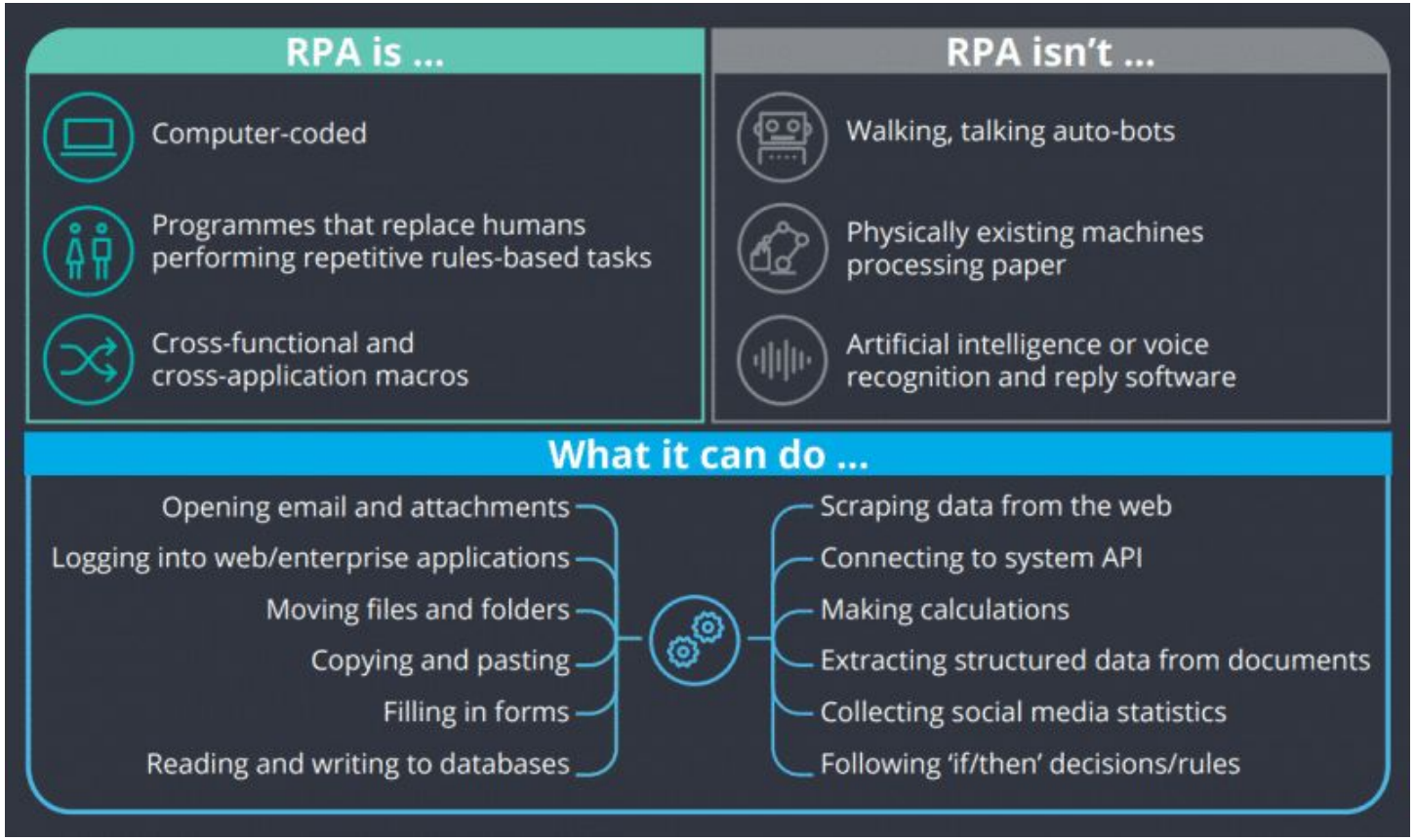
Machine learning

Scorecards



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CHATBOTS

OPTIMIZATION

BPI and BPR

RPA

Chatbots

Business activity monitoring

Process simulation

Task assignments

Constraint planning

Machine learning

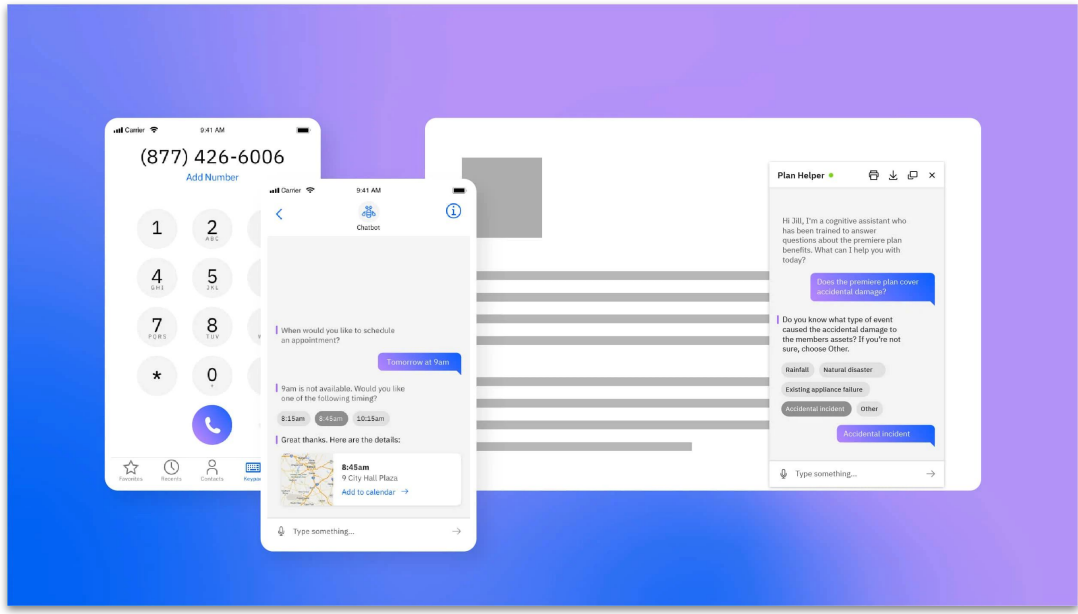
Scorecards

A chatbot is software that simulates human-like conversations with users via text messages on chat or text-to-speech.

- Customer self-service - call centres, scheduling doctor appointments
- Employee self-service - HR assistants, meeting and scheduling, expenses, people finder

Omnichannel - communication is done on all kinds of channels - phone calls, chat and email on computers, sms messages, ...

Watson Assistant - COVID-19 response automation



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BUSINESS ACTIVITY MONITORING

OPTIMIZATION

BPI and BPR

RPA

Chatbots

Business activity monitoring

Process simulation

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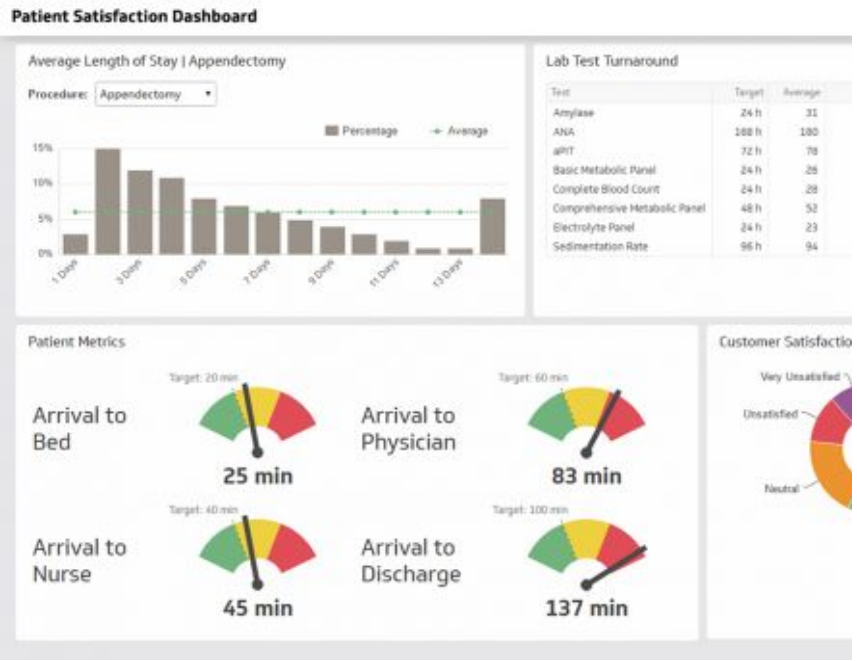
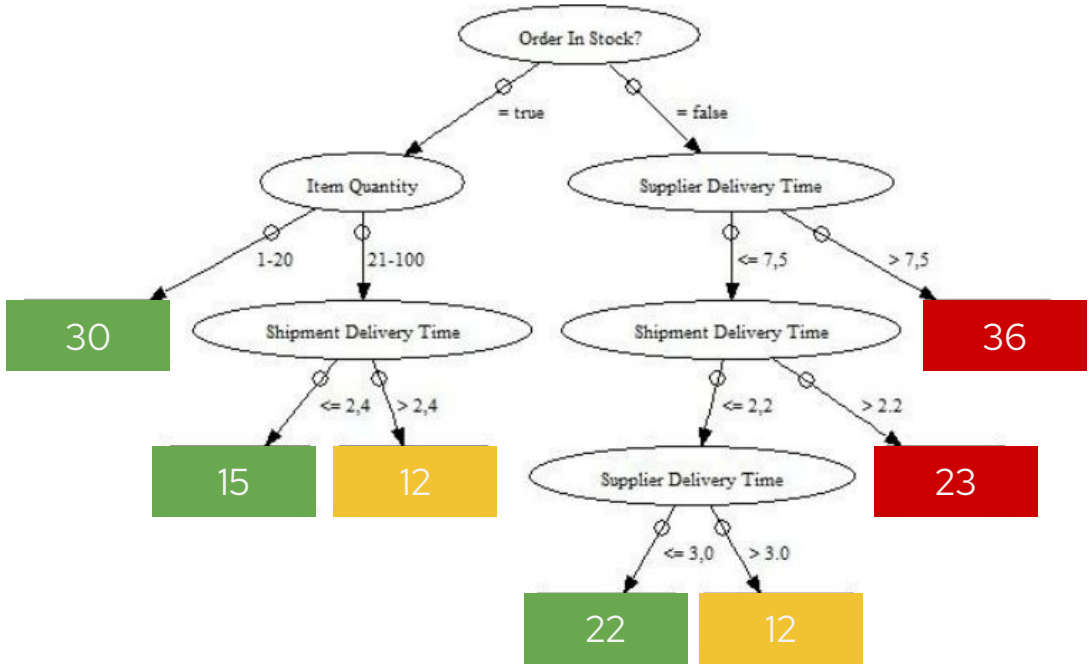


KPI Dependency Tree



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PROCESS SIMULATION

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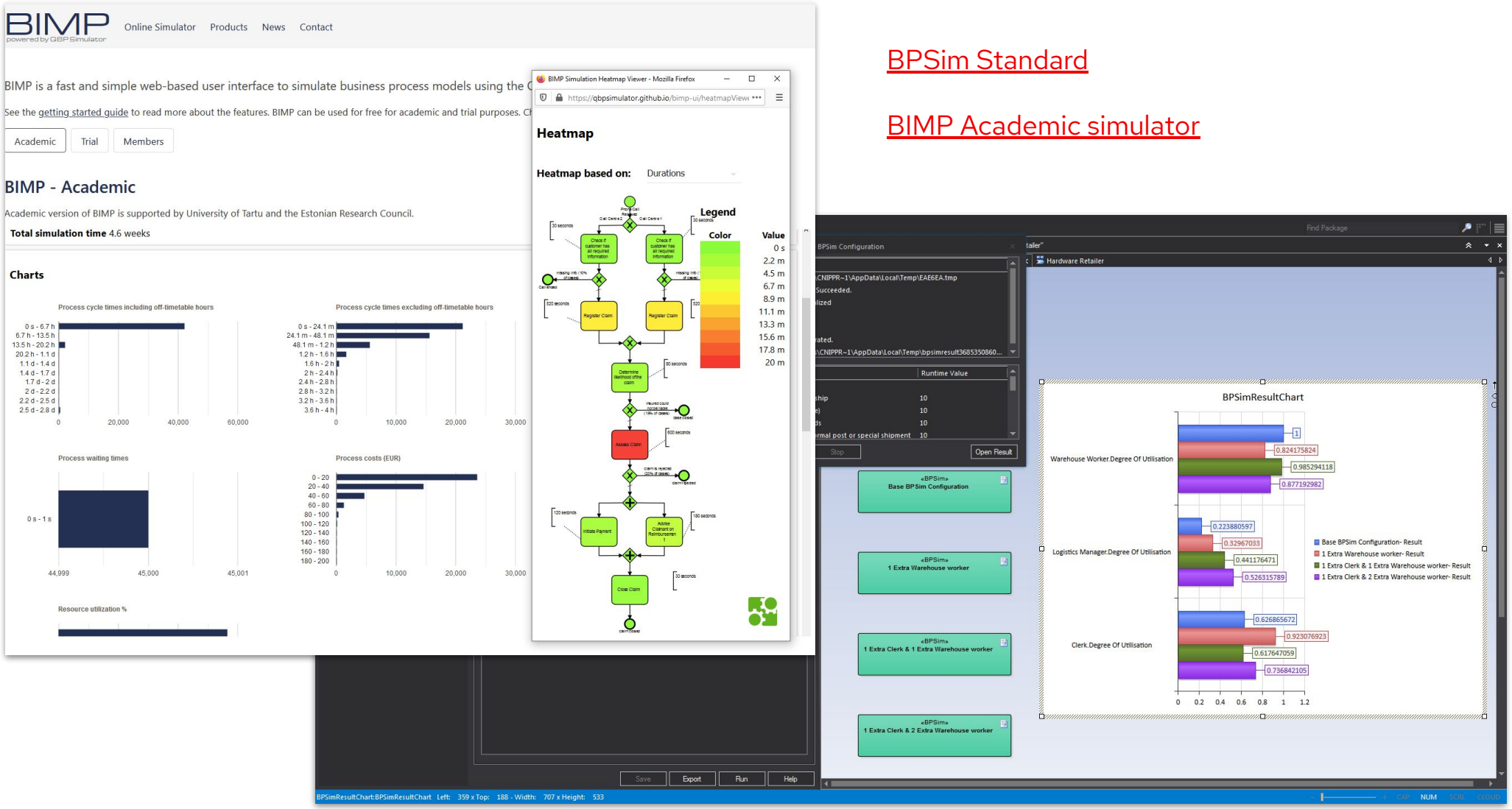

BPSim Standard

BIMP Academic simulator

TASK ASSIGNMENTS

OPTIMIZATION

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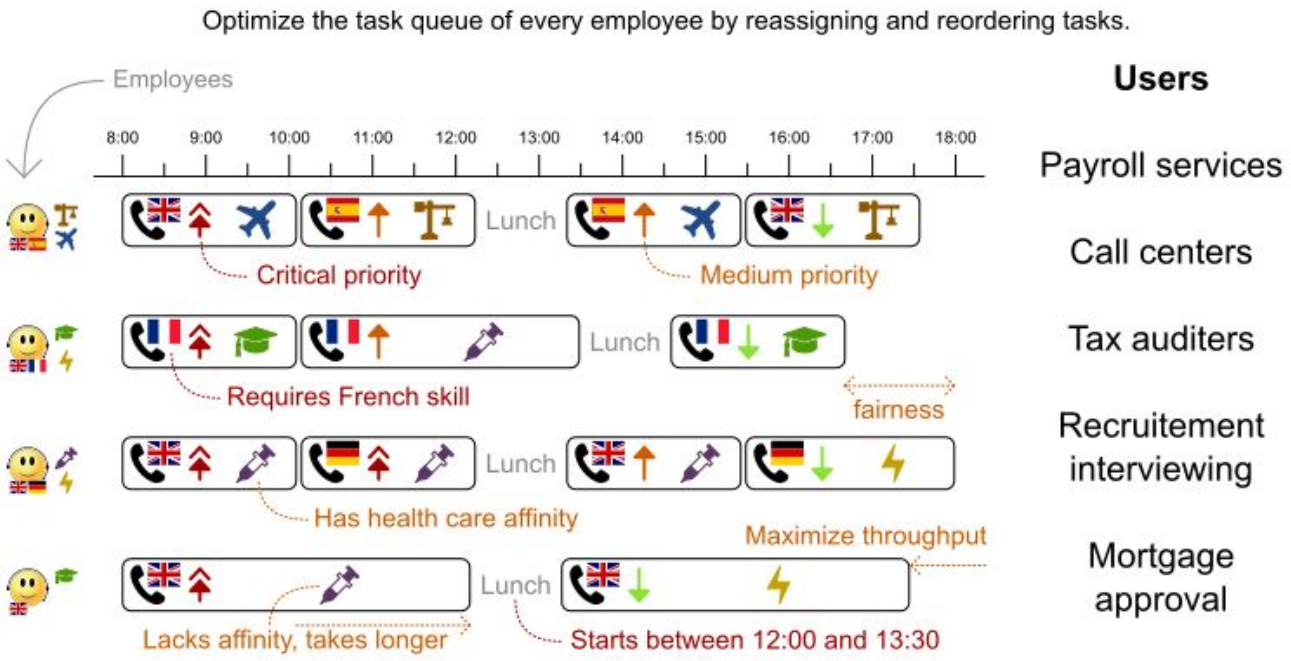

Assigning jBPM human tasks with OptaPlanner

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CONSTRAINT PLANNING

OPTIMIZATION

- BPI and BPR
- RPA
- Chatbots
- Business activity monitoring
- Process simulation
- Task assignments
- **Constraint planning**
- Machine learning
- Scorecards

Optimize goals with limited resources under constraints

Optimize goals

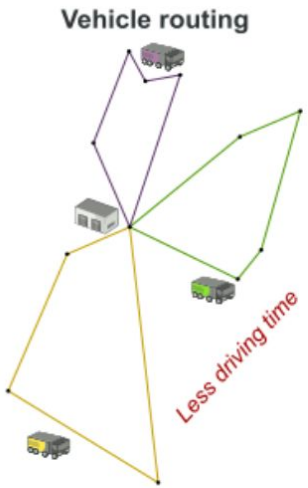
- Maximize profit
- Minimize ecological footprint
- Maximize happiness of employees / customers
- ...

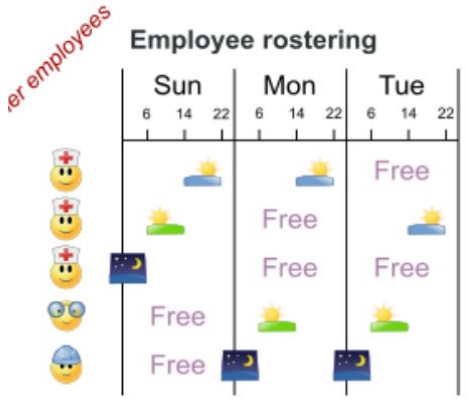
With limited resources

- Employees
- Assets (machines, buildings, vehicles, ...)
- Time
- Budget

Under constraints

- vs Working hours
- vs Skills / affinity
- vs Logistic conflicts
- ...





OptaPlanner Constraint satisfaction solver

Vaccination appointment scheduling optimization with OptaPlanner

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MACHINE LEARNING

OPTIMIZATION

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RPA

Chatbots

Business activity monitoring

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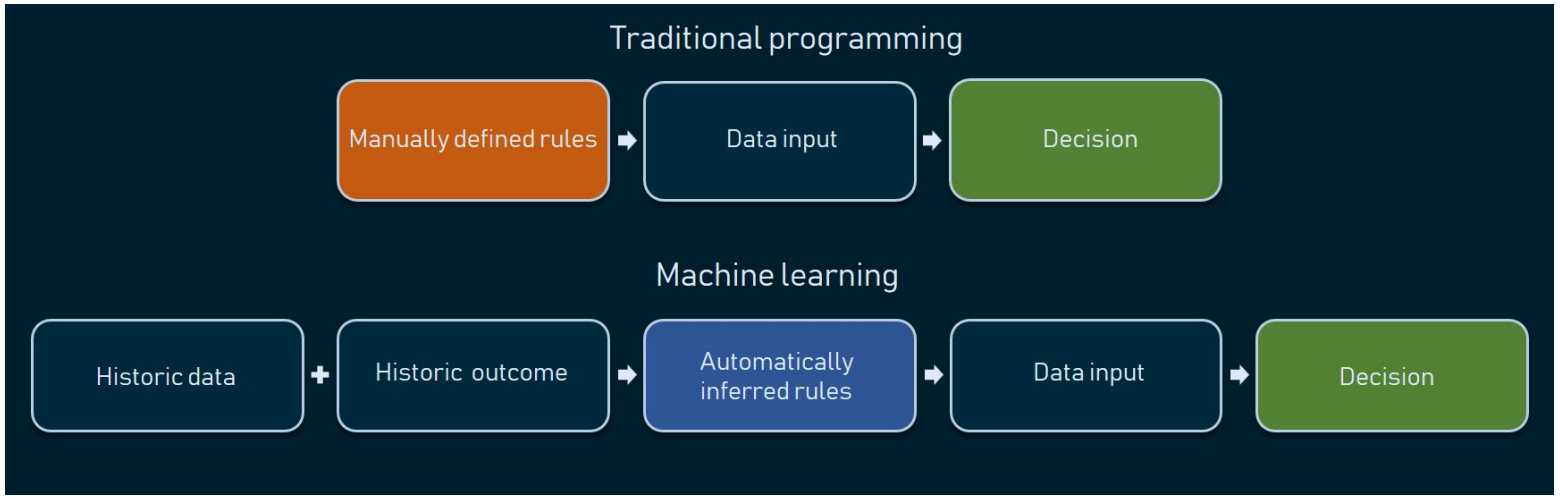

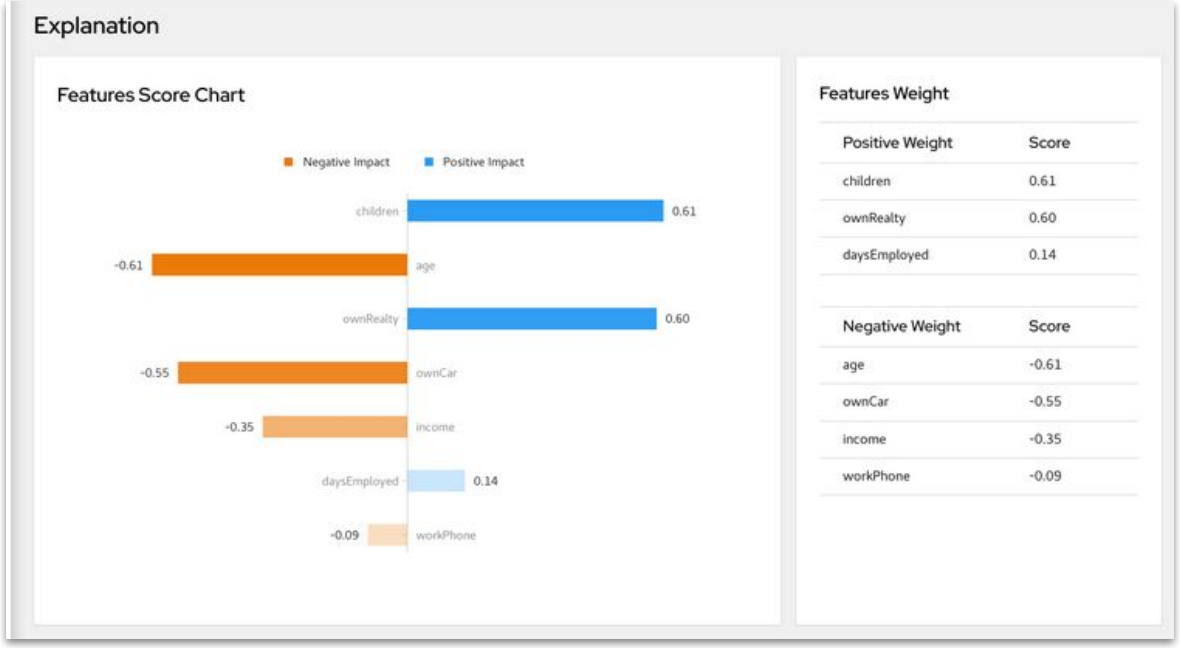

TrustyAI

Can you trust AI? - presentation

Red Hat

SCORECARDS AND PREDICTIONS

OPTIMIZATION

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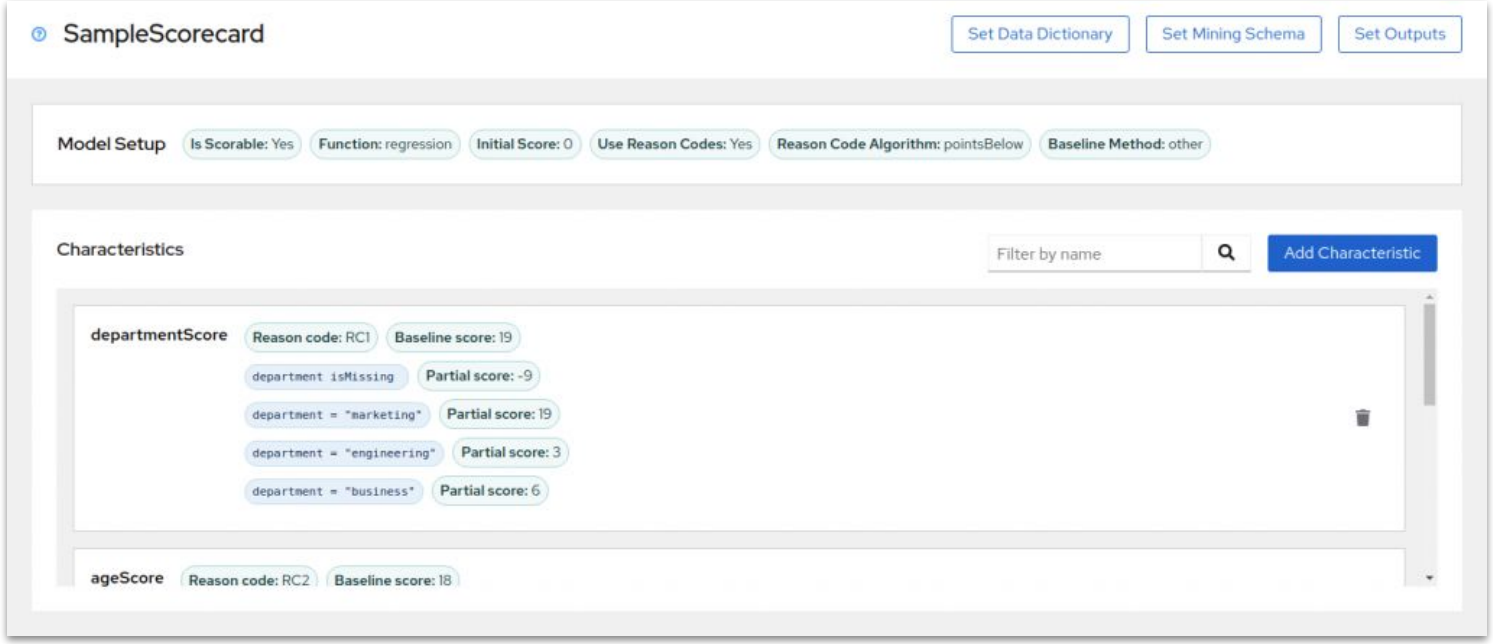
Scorecards

Scorecard is a risk management tool used mostly by banks to calculate the risk they take by selling you one of their products.

How risky is a customer?
What are the changes the customer might default on payment?

Based on the customer score we may adapt the product offer - a better interest rate, a higher credit limit, etc.

PMML Scorecard Editor in VS Code



Kogito

Cloud-native business automation for building intelligent applications, backed by battle-tested capabilities.

Red Hat

KOGITO

https://kogito.kie.org/

- Domain-Driven Development
- Generated Domain-specific APIs from your BPMN and DMN models
- Lightweight orchestration microservices
- Event-driven business logic
- Dev-mode hot reload
- Distributed sagas for microservices
- Serverless workflows
- Polyglot programming

More info at
- Blogs
- Youtube

KOGITO DEMO

- Available on GitHub
  - git clone https://github.com/MarianMacik/sample-kogito.git
- Contains BPMN and DMN integration
- Development mode with hot reload
  - mvn clean compile quarkus:dev
- Compile
  - mvn clean install
- Domain-specific API available at http://localhost:8080/q/swagger-ui/
  - OpenAPI specification

Thank you, questions?

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