

# Modelling, Analysis and Optimisation of BPMN Processes

## Context

- ◇ Companies need ways of designing and modelling the business processes that fit exactly with their needs.
- ◇ Companies want to improve their business processes in order to gain in execution time, optimize the resources usage, or lower the execution cost.

**BUT  
HOW?**

## Solutions so Far

- 1) Companies hire experts to precisely analyse their needs and build the most accurate business process.
- 2) When the needs of the companies evolve, their business processes are subject to changes. These new processes are thus usually optimized by hand.

## Solution for 1): Generating Business Processes from Natural Language

First of all, an employee CollectGoods. Then, the client PayForDelivery while the employee PrepareParcel. Finally, the company can either DeliverByCar or DeliverByDrone (depending on the distance for example).

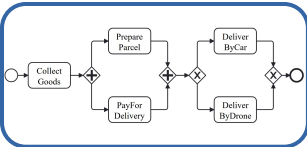
Textual Description of the Process



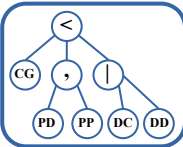
- CollectGoods < (PayForDelivery, PrepareParcel)  
- (PayForDelivery, PrepareParcel) < (DeliverByCar | DeliverByDrone)

$$\langle E \rangle ::= \tau \mid \langle \langle E \rangle \rangle \mid \langle E_1 \rangle \langle op \rangle \langle E_2 \rangle$$
$$\mid \langle ((E_1) +, ((E_2)?)^* \mid ((E_1))^* \rangle$$
$$\langle op \rangle ::= ' \mid ' \& ' \mid ' < ' \mid ' , '$$

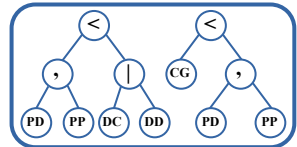
Expressions Following an Internal Grammar



BPMN Process



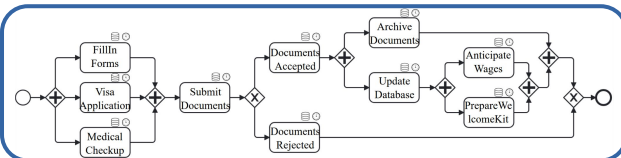
Merged AST



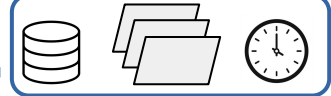
Abstract Syntax Trees (ASTs)



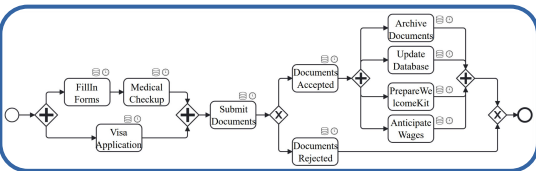
## Solution for 2): Optimizing Business Processes with Refactoring



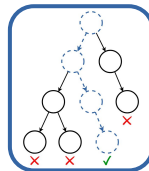
BPMN Process Enriched with Duration and Resources for Tasks



Global Resources Process Instances Inter-Arrival Time (IAT)



BPMN Process Optimized by Refactoring



Heuristic-Based Search



Metrics of Interest



**CONVECS**

Construction de  
Systèmes Concurrents Vérifiés



*Inria*



2023