PROCESS and SERVICE DESIGN PROJECT

a.a. 2021-2022

SmartPharma

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01 CONTEXT

TOPIC: Healthcare

SOCIAL CHALLENGE: Allows everyone to get the needed medicines

MISSION: Simplify the medicine order process

SERVICE: Automate and simplify the process of providing medicines

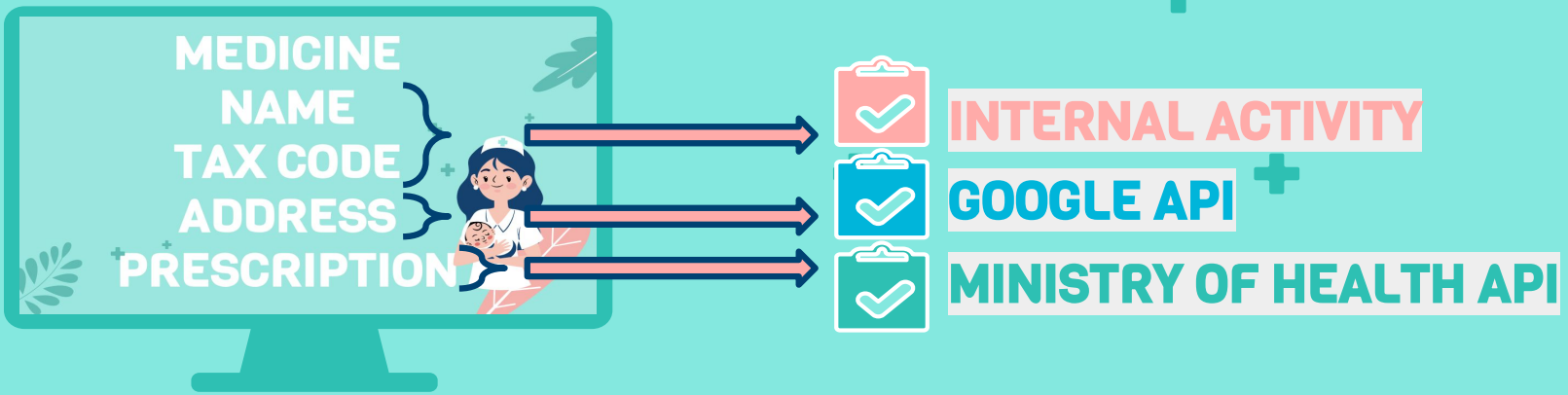
02 PROCESS DESCRIPTION 1/3

SmartPharma service allows to automate and simplify the process of providing medicine. The service is provided from a pharmacy to a common customer. It simplifies the process of ordering any medicine from the pharmacy.

When a customer wants to order a certain medicine, she/he will connect through a Web Application to submit a new order request. Once the request was submitted, the information provided by the customer is automatically checked. The information should include personal data (name, tax code), the delivery address, the name of the medicine and, optionally, the prescription.

02 PROCESS DESCRIPTION 2/3

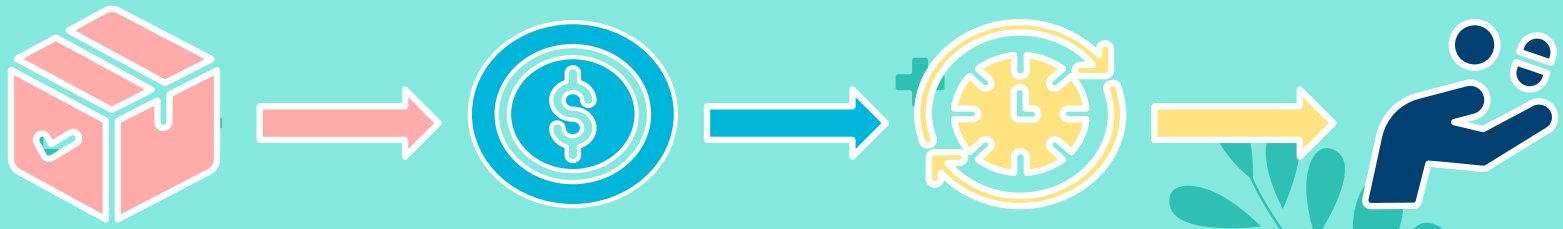
The personal data consistency is automatically checked by SmartPharma. The delivery address is checked by contacting google api and receiving back the map's information. The prescription is also checked automatically by requesting a confirmation from the ministry of health.



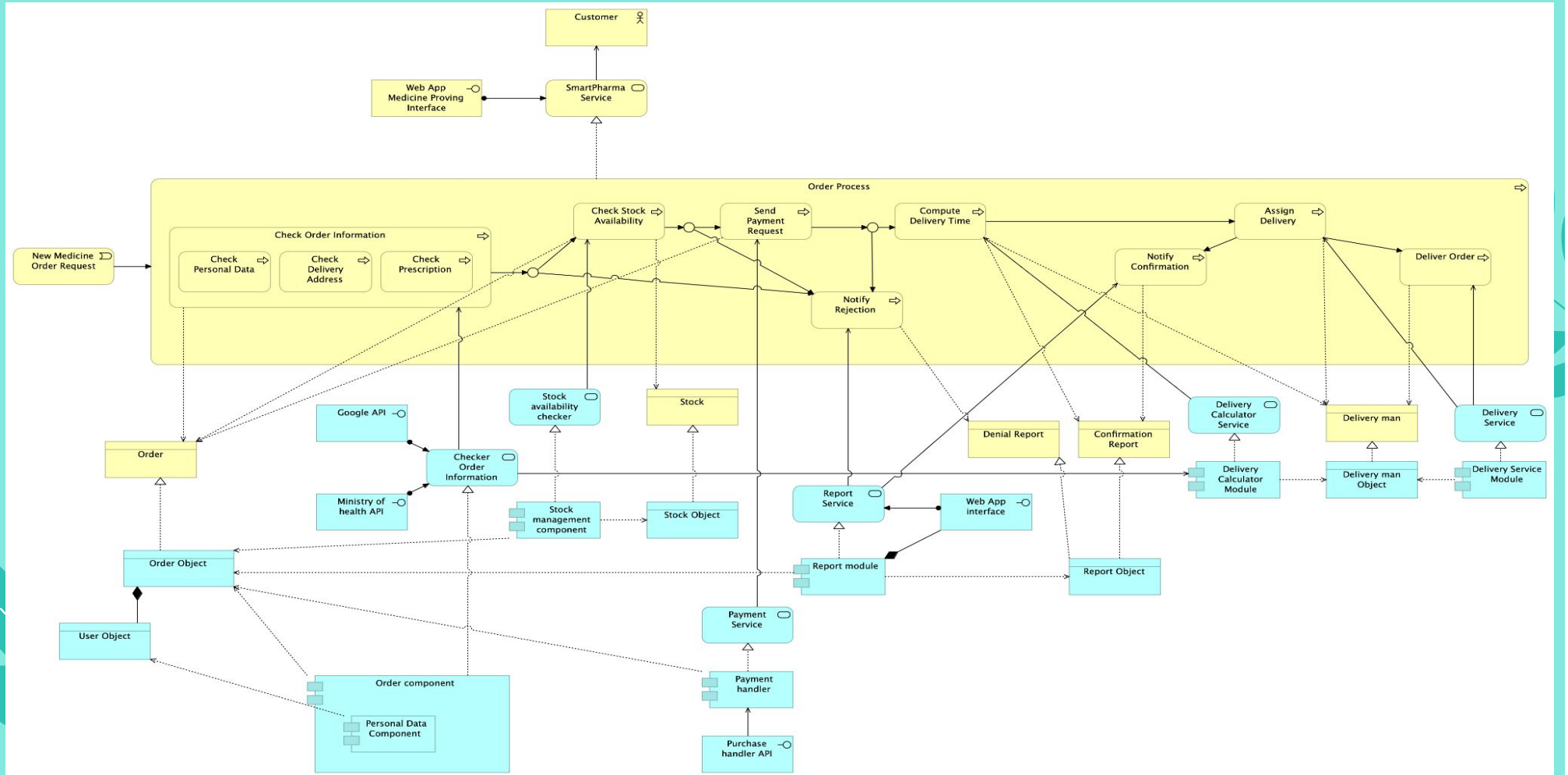
The provided information will be either approved or denied. In case of approval the requested medicine is automatically checked for availability in stock by SmartPharma. In case of denial or stock unavailability a notification is sent to the customer with the denial reason.

02 PROCESS DESCRIPTION 3/3

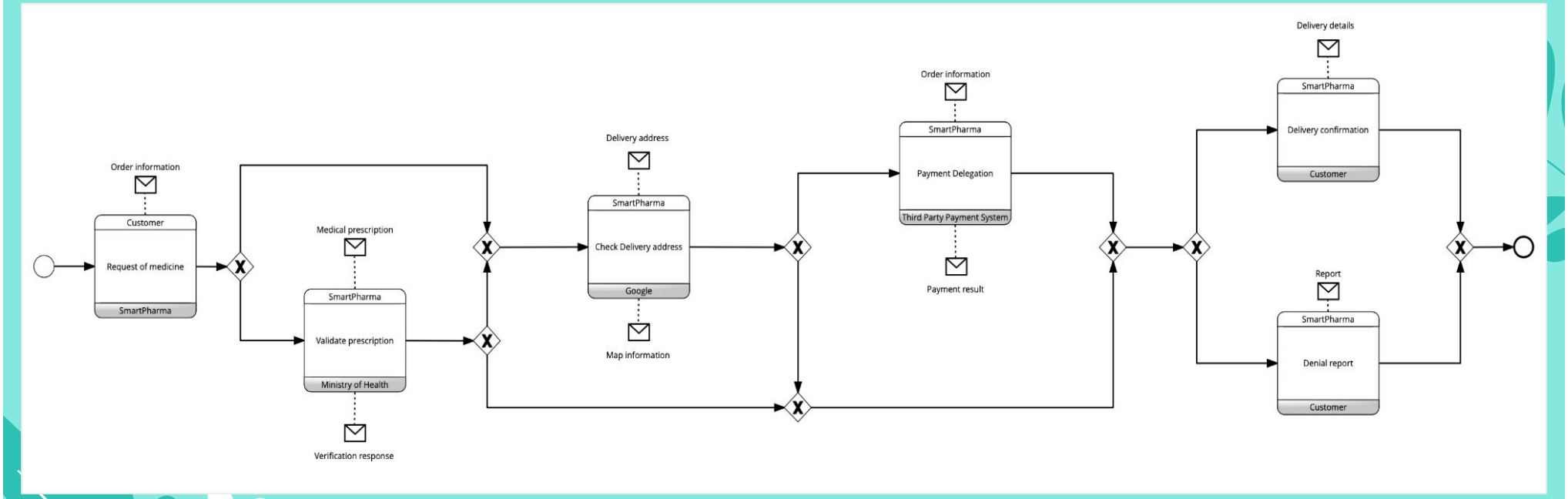
In case of stock availability, SmarthPharma delegates a third-party payment system to finalize the purchase with the customer.
After the payment is confirmed, SmartPharma computes the delivery time by taking into consideration the maps' information and availability of delivery men.
Finally, SmartPharma contacts the selected delivery man sending her/him the order details, and provides a confirmation notification through the Web Application to the customer.



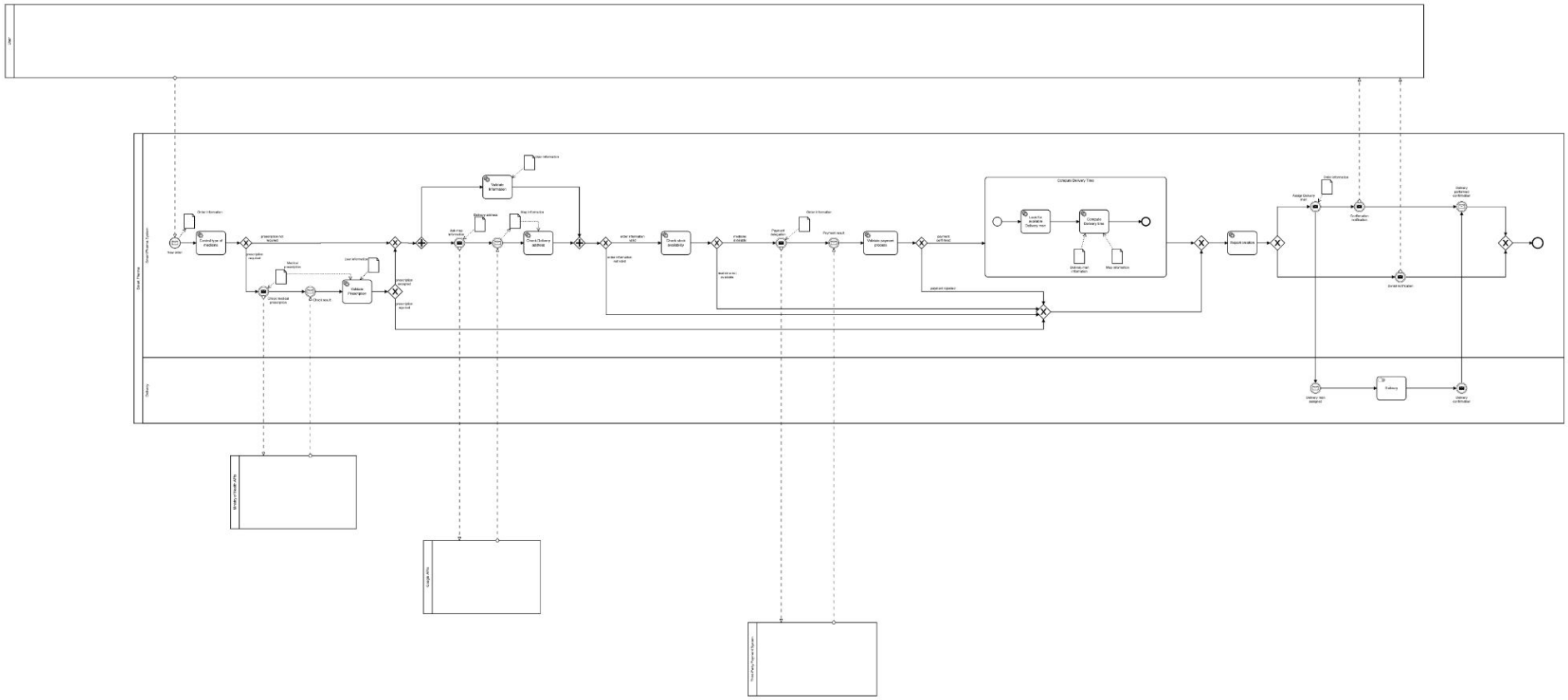
03 ARCHIMATE MODEL



04 BUSINESS PROCESS CHOREOGRAPHY



05 BUSINESS PROCESS ORCHESTRATION



FROM ABSTRACT TO EXECUTABLE MODEL

01 Identify the automation boundaries

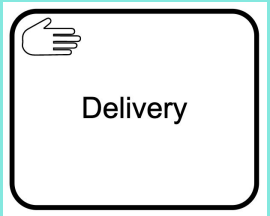
"Delivery" process, both the "Delivery" activity and the message to notify the performed activity

- The "Delivery" activity is a manual activity, therefore it can't be handled by the BPMS
- The interaction between the SmartPharma System and the Delivery stops the execution of the process until the delivery man confirms the status of the shipment

FROM ABSTRACT TO EXECUTABLE MODEL

02 Review manual tasks

The “Delivery” activity can be eliminated, since it is outside the control of the orchestrator and its activity is performed by the same actor (the delivery man) that would notify SmartPharma of the performed delivery through a User activity



FROM ABSTRACT TO EXECUTABLE MODEL

03 **Complete the process model**

Control the execution flow

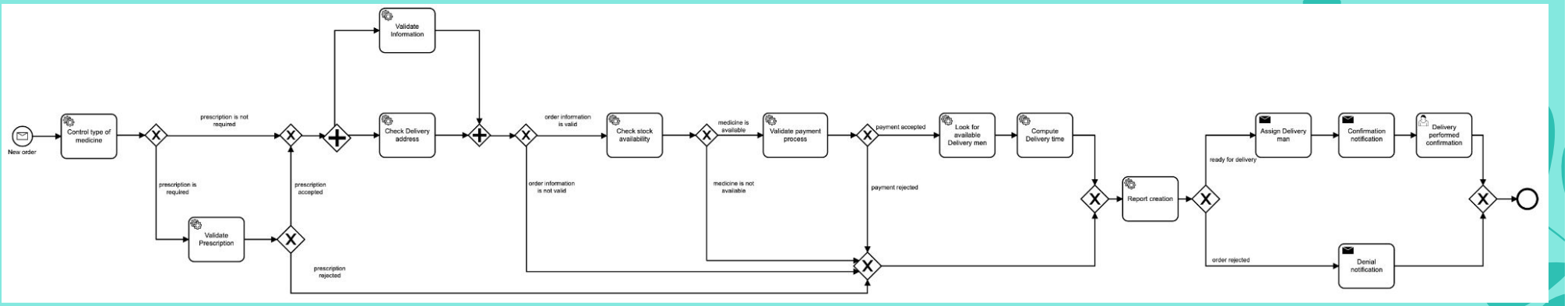
04 **Adjust the model granularity**

In the abstract model, the interactions between SmartPharma and the external actors are highlighted. In the executable model they can be incorporated in the service they enable

05 **Specify execution properties**

Set process variables, messages, forms, service details, code snippets, sequence flow

06 BUSINESS PROCESS EXECUTABLE



Medicine

Medicine*

Quantity*

Price*

Prescription

Prescription

Delivery Address

Delivery address

Personal Information

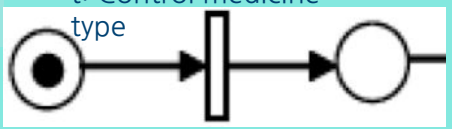
Name

Tax Code

FROM BPMN TO PETRI NET

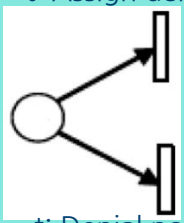
01 Activities become transitions

t: Control medicine type



02 XOR

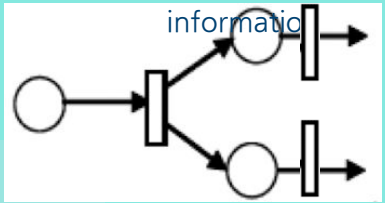
t: Assign delivery man



t: Denial notification

03 AND

t: Validate information

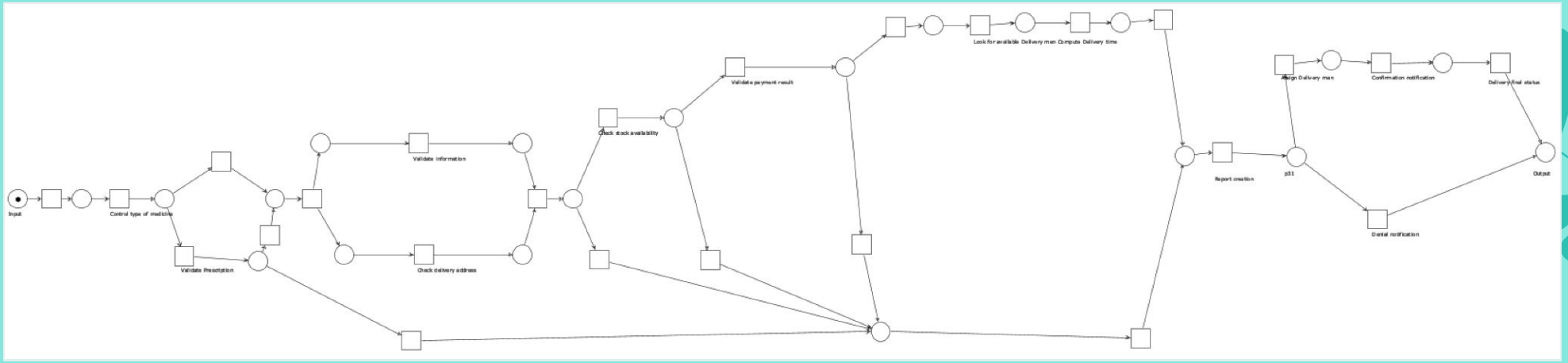


t: Check Delivery address

Workflow Net:

- Only one initial place
- Only one final place
- None of the nodes are not in the path from the initial place to the final place

07 PETRI NET: WORKFLOW NET

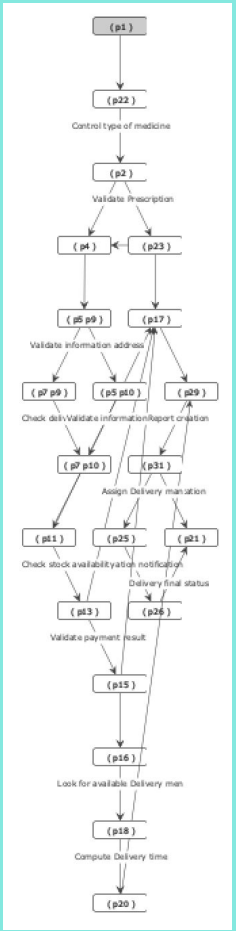


Petri Net is used to validate the semantic of a process, that means to check the absence of behavioral anomalies.
For that reason, we have analyzed two properties of the Workflow Net:

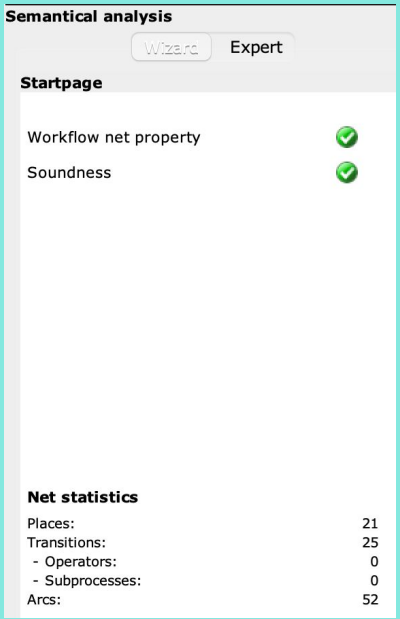
- Boundness
- Soundness
- Liveness

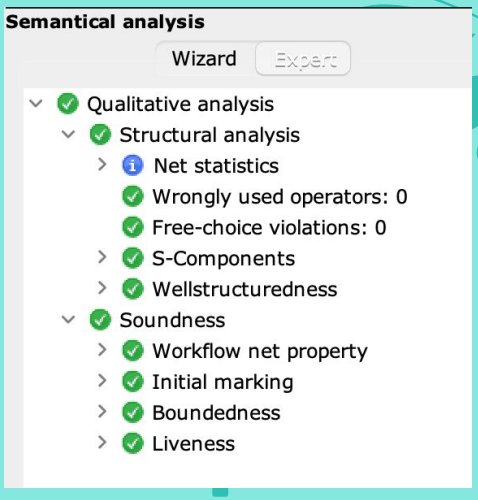
PETRI NET: ANALYSIS

Coverability graph



Semantical analysis





SWAGGER API DOCUMENTATION

SmartPharma API

order Everything about your order

- POST `/order` Create a new order
- GET `/order/{order_id}` Get order information by ID

stock Operations about stock

- POST `/stock/inventory` Check stock availability

report Operation about report

- POST `/report` report information
- GET `/report/{order_id}` report information

delivery Operation about delivery

- GET `/delivery/deliverMan` Get available deliver man information
- POST `/delivery/deliverMan/{deliver_man_id}` Update deliver man status
- POST `/delivery/time` Calculate delivery time
- POST `/delivery/confirm/{order_id}` final delivery complete confirm

External API

https://maps.googleapis.com/ Operations about get google maps info

- GET `/maps/api` get map information

https://www.salute.gov.it/ Operations about validate prescription

- POST `/validatePrescription` validate prescription information

https://api-m.sandbox.paypal.com/ Operations about payment by paypal

- POST `/v2/payments/authorizations/{authorization_id}` payment operation

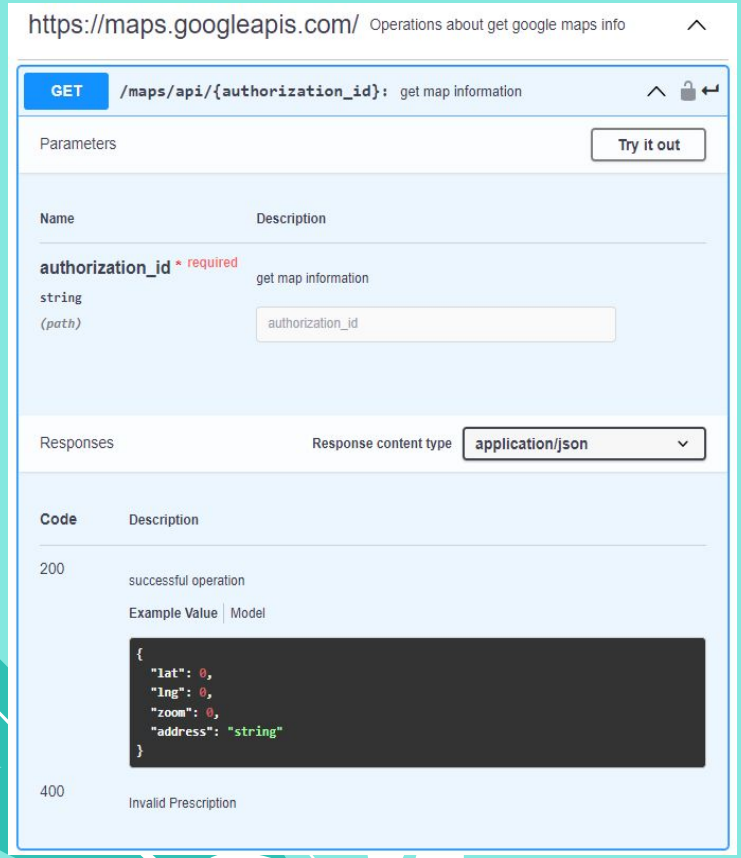
SWAGGER API DOCUMENTATION

API in yaml format

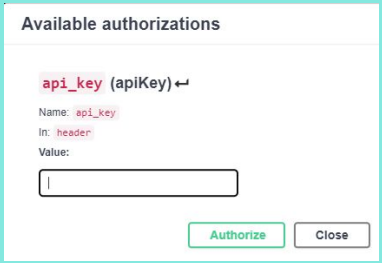
```yaml
swagger: '2.0'
info:
  description: Smart Pharma
  version: 1.0.0
  title: Smart Pharma
  termsOfService: http://swagger.io/terms/
  contact:
    name: Aida Gasanova; Matteo Makovec; Xiaoyu Luo
  license:
    name: Apache 2.0
    url: http://www.apache.org/licenses/LICENSE-2.0.html
tags:
- name: order
- name: stock
- name: report
- name: delivery
- name: https://maps.googleapis.com/
- name: https://www.salute.gov.it/
- name: https://api-m.sandbox.paypal.com/
paths:
  /order:
  /order/{order_id}:
  /stock/inventory:
  /report:
  /report/{order_id}:
  /delivery/deliverMan:
  /delivery/deliverMan/{deliver_man_id}:
  /delivery/time:
  /delivery/confirm/{order_id}:
  /maps/api:
  /validatePrescription:
  /v2/payments/authorizations/{authorization_id}:
```

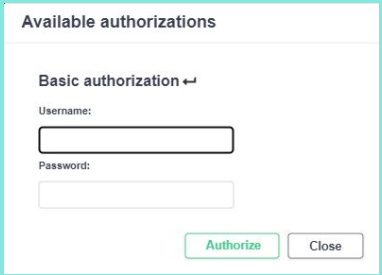
```yaml
security:
  - smartPharm_auth: []
securityDefinitions:
  smartPharm_auth:
    type: basic
  api_key:
    type: apiKey
    name: api_key
    in: header
definitions:
  Order:
  Prescription:
  Medicine:
  Map:
  ApiKey:
  DeliveryMan:
  DeliveryTime:
  Report:
  PayPalRequest:
  PayPalResponse:
schemes:
 - https
 - http
basePath: /PSD/SmartPharma/1.0.0
```

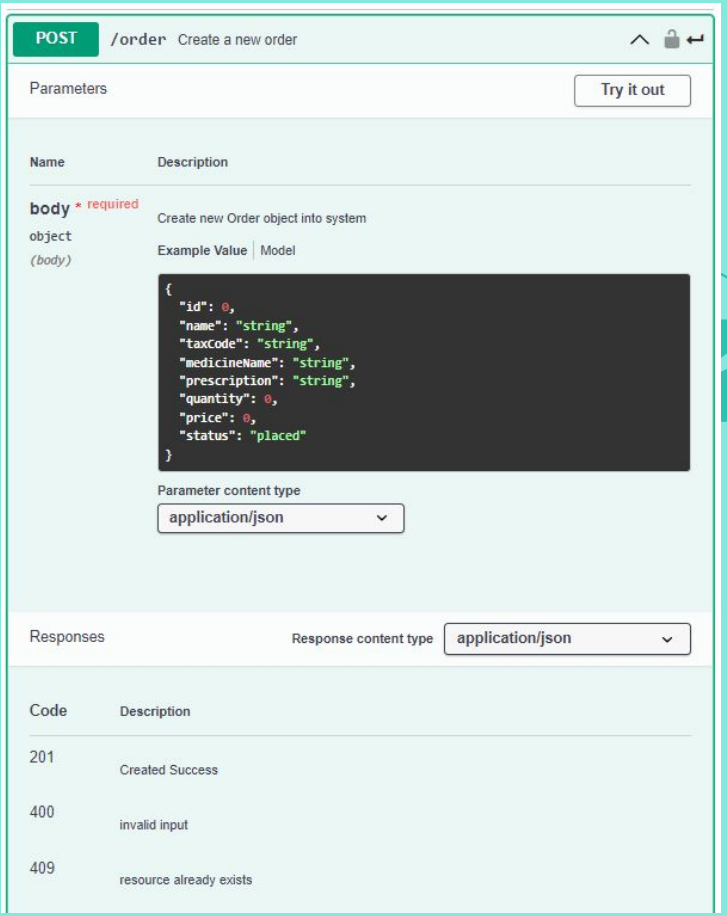
SWAGGER API DOCUMENTATION



Authorization control







Demo: preparation

Start Docker

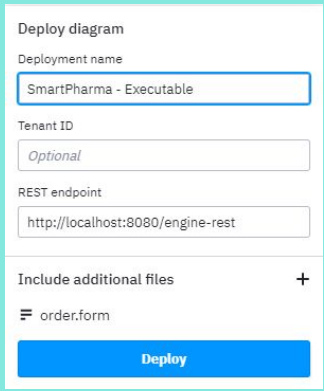
NAME	STARTED	STATUS
camunda/camunda-bpm-platform:run-latest 5eb84cf43f55 (camunda)	less than a mi	running

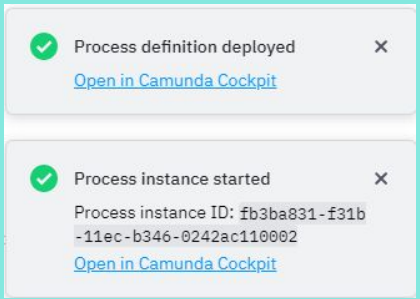
Config and start node js

```
const config = {
  baseUrl: "http://localhost:8080/engine-rest",
  use: logger,
  asyncResponseTimeout: 10000,
};
```

```
PS C:\Users\11945\Documents\GitHub\Published\SmartPharma\5-APIs> node ./worker.js
✓ subscribed to topic control-medicine
✓ subscribed to topic prescription-validation
✓ subscribed to topic validate-information
✓ subscribed to topic check-address
✓ subscribed to topic check-stock
✓ subscribed to topic validate-payment
✓ subscribed to topic look-for-delivery
✓ subscribed to topic compute-time
✓ subscribed to topic report-creation
✓ subscribed to topic assign-delivery
✓ subscribed to topic confirmation-notification
✓ subscribed to topic denial-notification
```

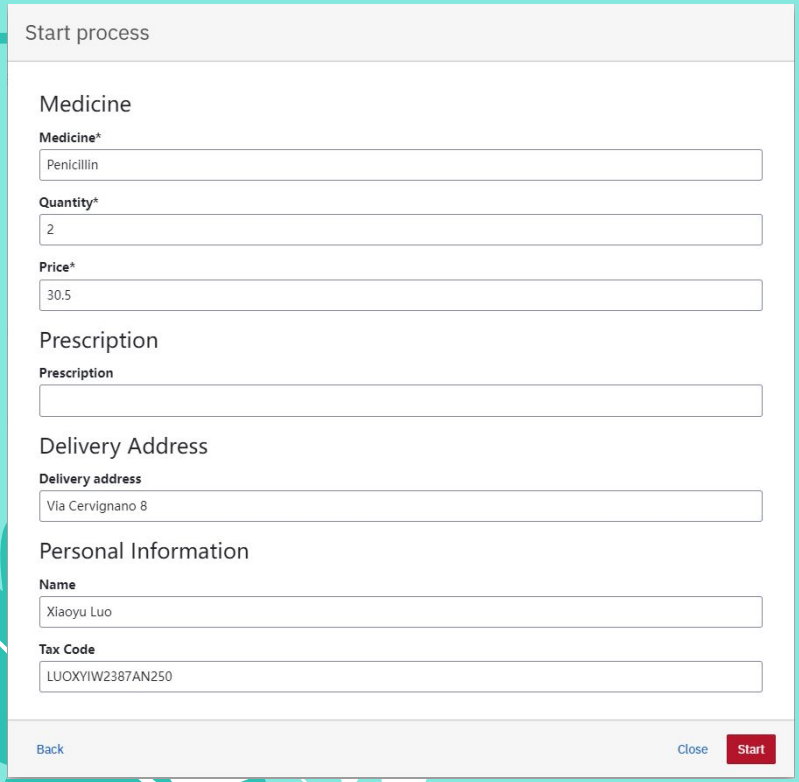
Deployed and start new instance





Demo: execution

Start Process

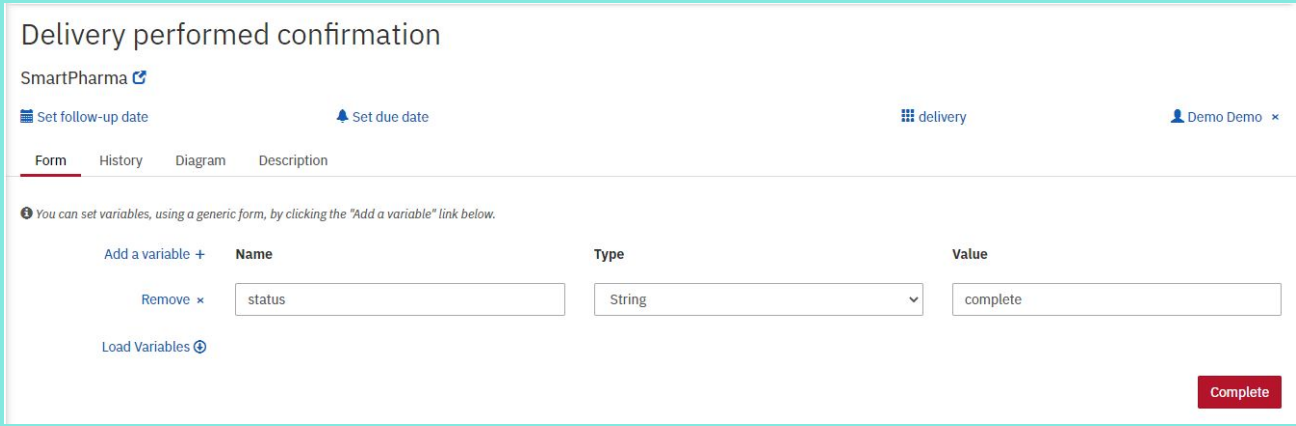


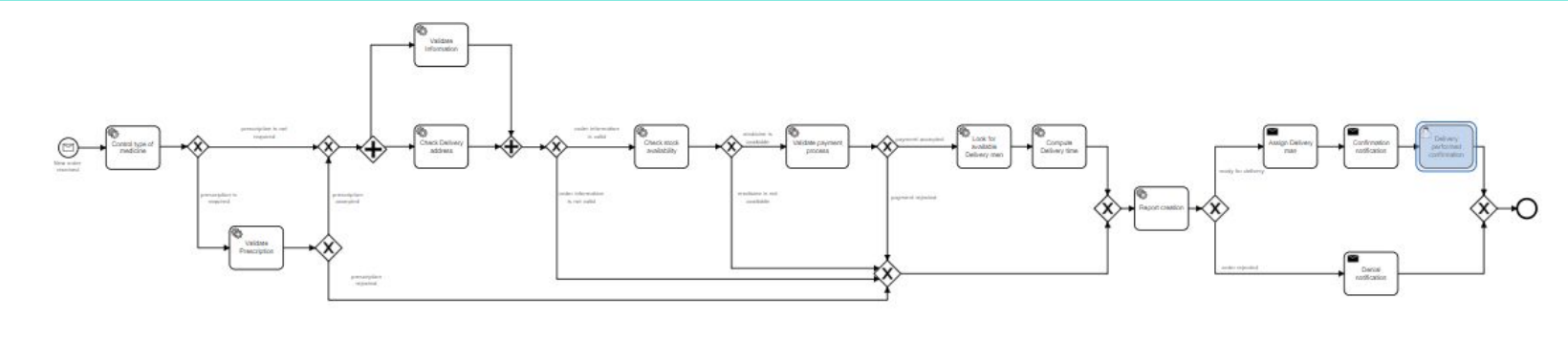
Log of executing

```
PRESCRIPTION IS NOT REQUIRED
✓ completed task 72cbc1df-f397-11ec-b346-0242ac110002
ADDRESS IS VALID
PERSONAL INFORMATION IS VALID
✓ completed task 72d278af-f397-11ec-b346-0242ac110002
✓ completed task 72d2519b-f397-11ec-b346-0242ac110002
Penicillin IS AVAILABLE IN STOCK
✓ completed task 73054891-f397-11ec-b346-0242ac110002
PAYMENT IS VALID
✓ completed task 73346eea-f397-11ec-b346-0242ac110002
DELIVERY MAN FOUND
✓ completed task 7362aae2-f397-11ec-b346-0242ac110002
DELIVERY TIME IS 30 minutes TO ADDRESS Via Cervignano 8
✓ completed task 73924667-f397-11ec-b346-0242ac110002
REPORT CREATED
✓ completed task 73c1badd-f397-11ec-b346-0242ac110002
DELIVERY MAN ASSIGNED
✓ completed task 73f35235-f397-11ec-b346-0242ac110002
THE ORDER CONFIRMED
✓ completed task 7422788a-f397-11ec-b346-0242ac110002
```

Demo: execution

Confirmation user task





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Thanks for your attention!