Model Driven Engineering

William MADIE
Chadi GROLLEAU-RAOUX
Yann JEANMAIRE dit CARTIER

Table of contents

1. Project Overview
2. MDE Pipeline & Tools
3. Computational Independent Model
4. Platform Independent Model
5. Platform Specific Model
6. Demonstration

Project Overview

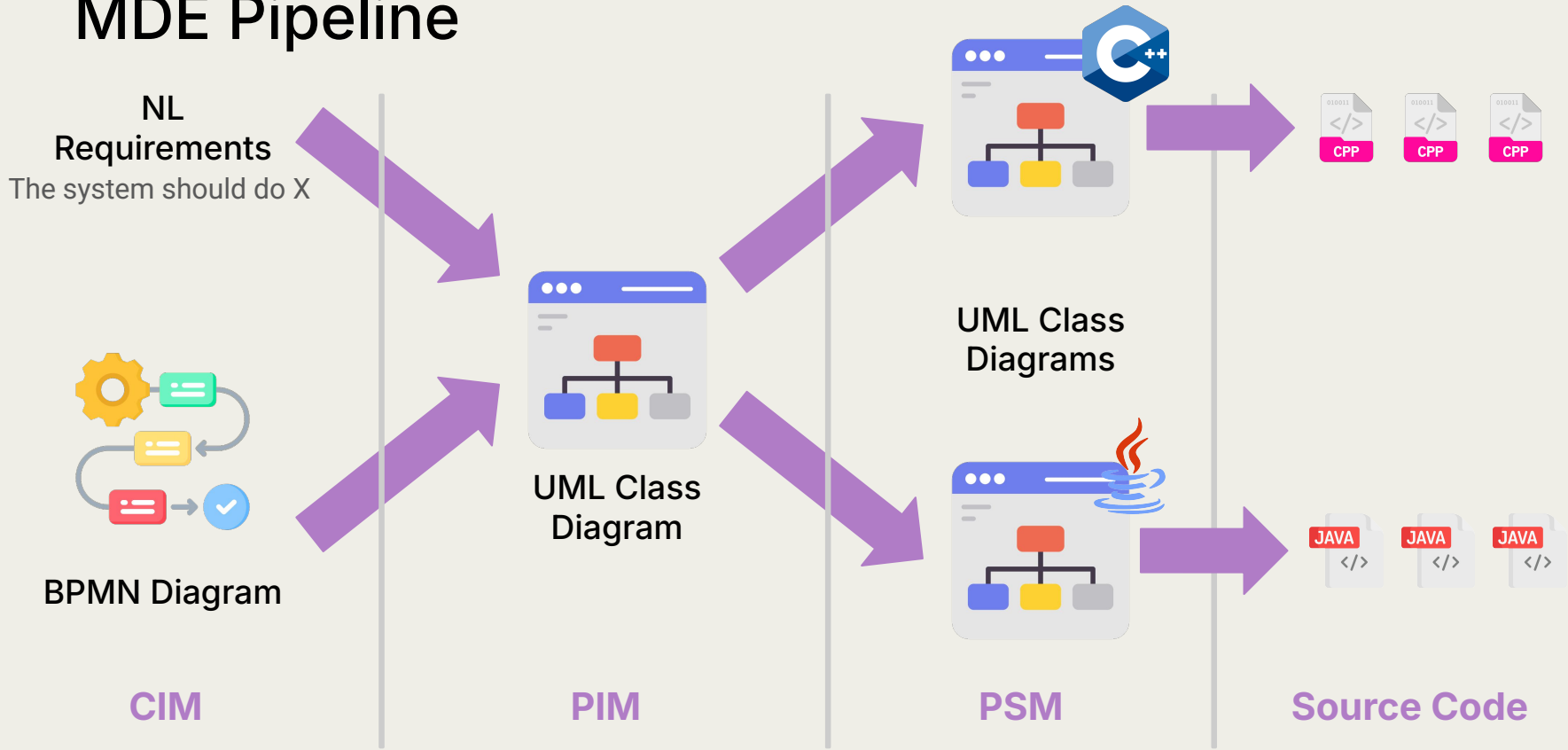
Implement the Order Process

- **Client Management** (personal information)
- **Product Management** (stock, auto-reordering on low stock)
- **Payment Management** (credit card details and bank communication)
- **Order Receipt Management**

Use of MDE

- Maintain alignment between codebase and requirements.
- Reduce complexity by focusing on high-level models.
- Enhance maintainability, consistency and evolvability.
- Provide a support for decision-making (future design and architecture choices)

MDE Pipeline



MDE Tools

CIM >> PIM

ChatGPT

Draw.io

Google Docs

Enterprise Architect

PIM >> PSM

Enterprise Architect

PSM >> Source Code

GitHub

GitHub Actions

C++

Java

VSCode

Enterprise Architect

Generative AI in our project

ChatGPT

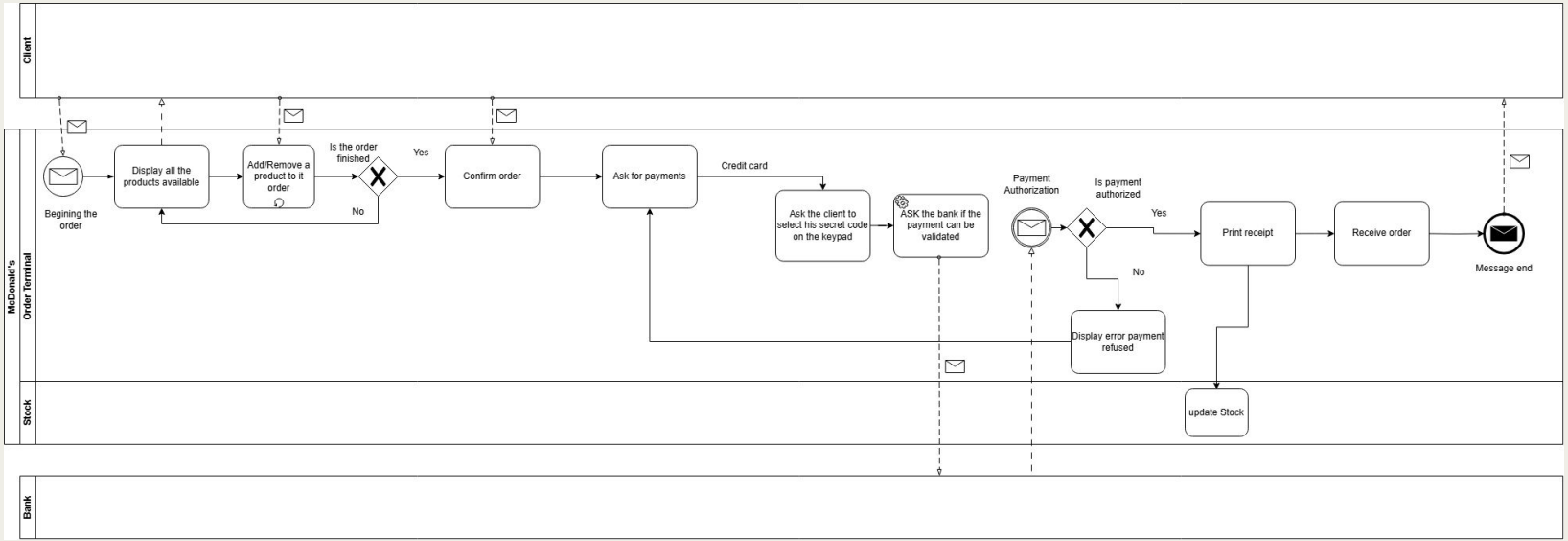
We leveraged generative AI as a supportive tool throughout the duration of our project in several key areas:

- **Software Requirements Definition:** Generative AI assisted in drafting and refining our software requirements. It helped with sentence construction and served as a reviewer against various quality criteria, including clarity, ambiguity, redundancy, and overall understandability.
- **BPMN Diagram Development:** AI supported the creation of our BPMN process diagram by determining which elements were essential to represent and which could be omitted.
- **Code Implementation in Java and C++:** We utilized generative AI to assist with writing and troubleshooting code in both Java and C++, streamlining development across both languages.
- **Navigation of the C++ Tooling Ecosystem:** The AI proved especially valuable in helping us understand and effectively use C++ tools that were previously unfamiliar to us.
- **Project Structure and Tool Integration:** Generative AI also helped us integrating tools such as Enterprise Architect with Java and C++ command-line interfaces, as well as version control systems like Git and GitHub.

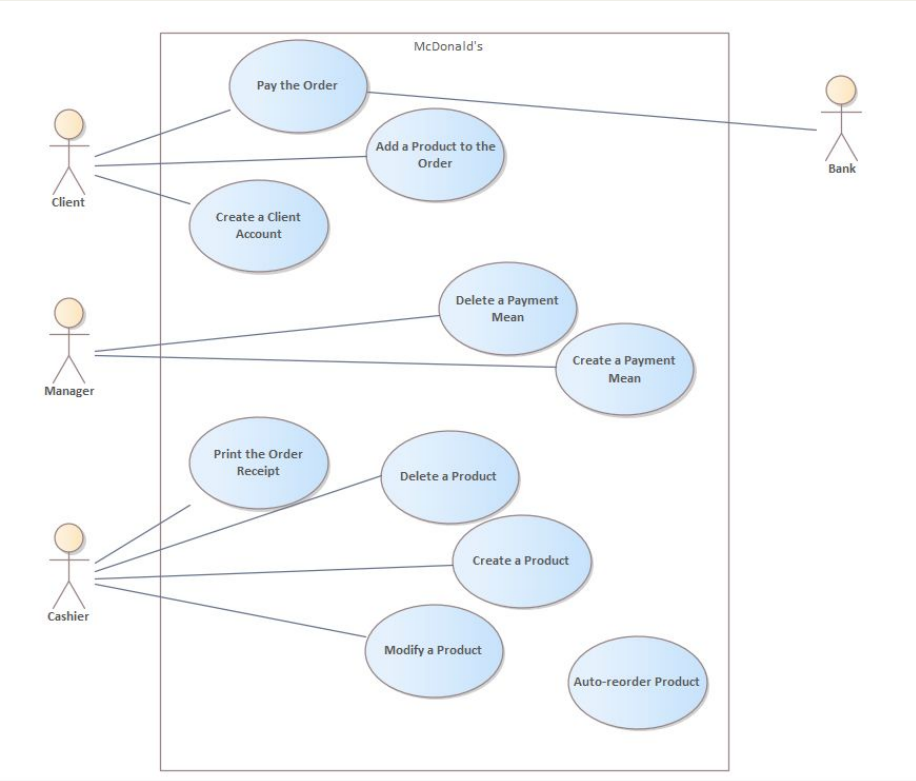
Computational Independent Model - Natural Language Requirements

ID	Description
1	The system shall let a client order from an order terminal.
2	The order shall contain at least one product and at most 4 products to its order.
3	The order is identified by a unique number
4	The system shall let a client add a product in its order.
5	The system shall verify if a payment is authorized
6	The system shall produce the receipt of the order
7	The system shall allow the user to remove a product from his order
8	The system shall track the stock of each product
9	The system shall display if the product is out of stock
10	The system shall send valid orders to the kitchen.

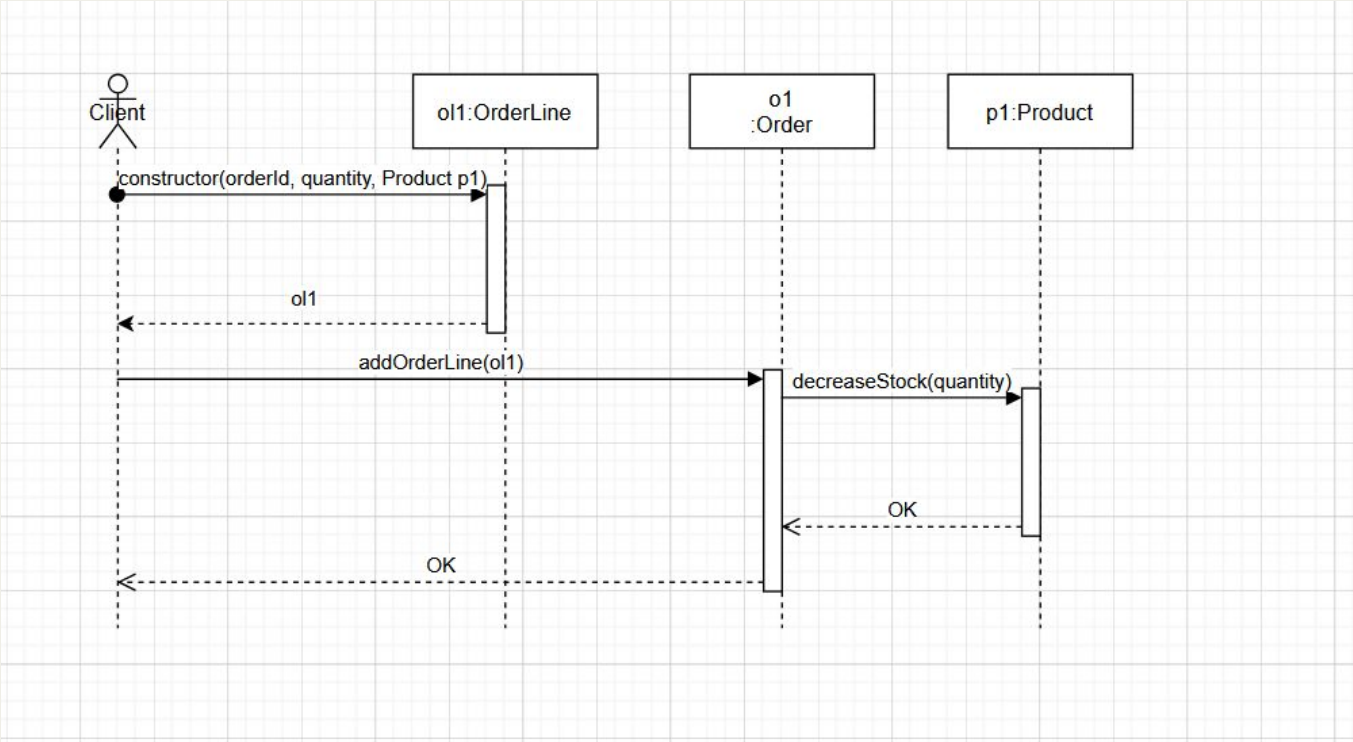
Computational Independent Model | BPMN



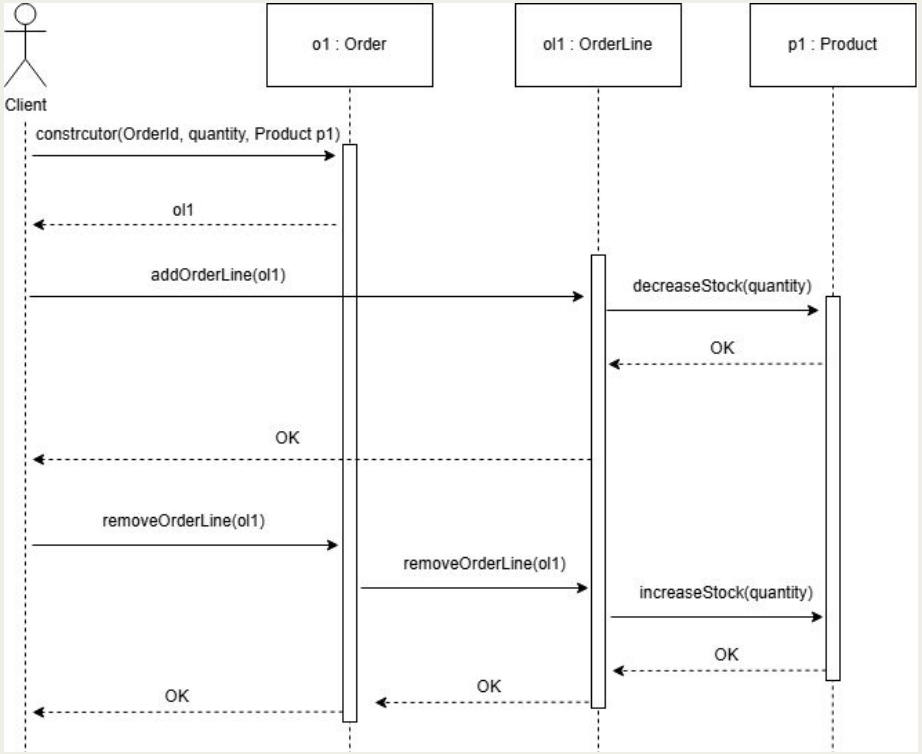
Platform Independent Model | Use Case Diagram



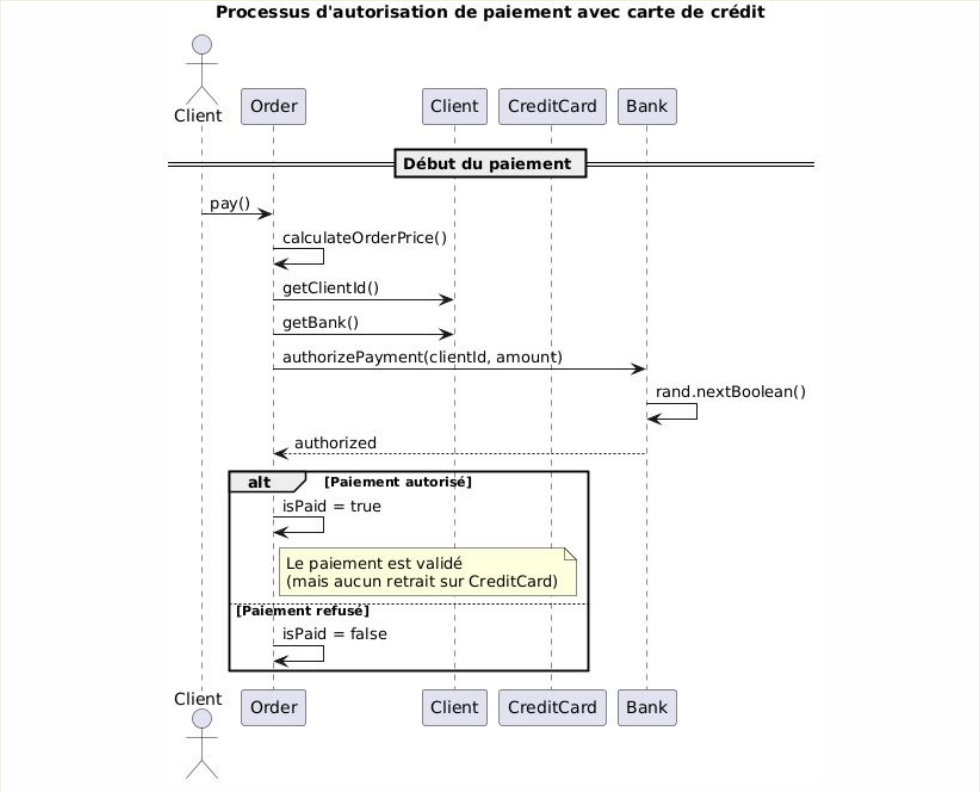
PIM | Sequence Diagram | Add an Order Line



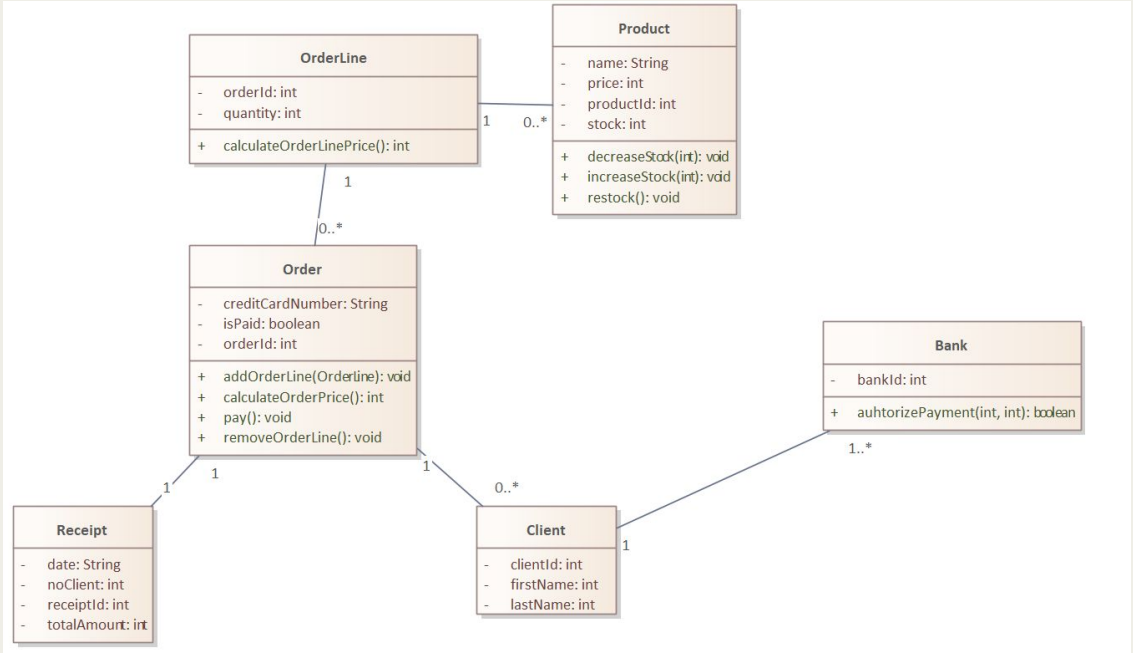
PIM | Sequence Diagram | Remove an Order Line



PIM | Sequence Diagram | Pay the Order

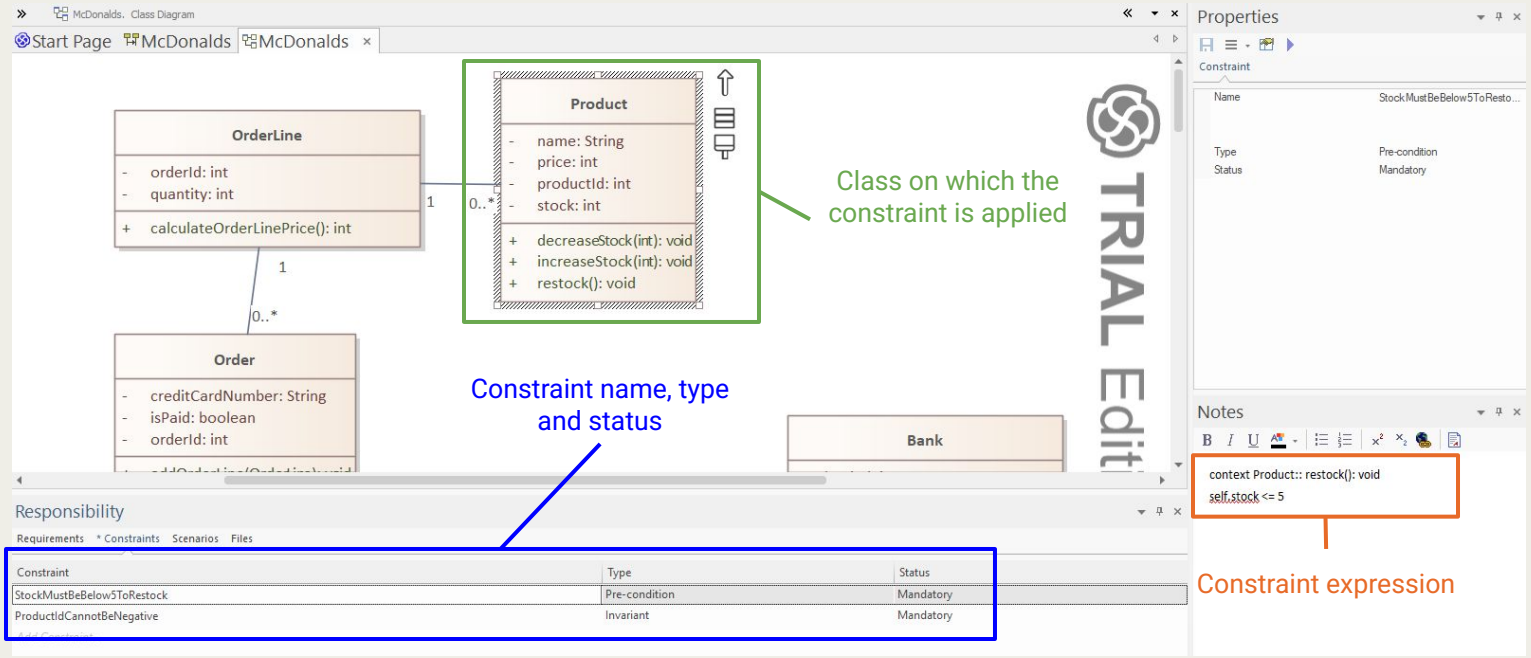


Platform Independent Model | Class Diagram



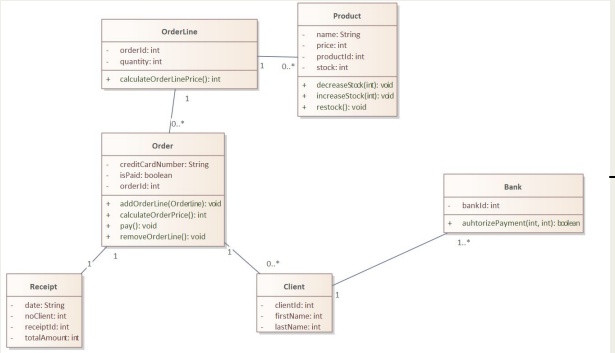
Class Diagram

Platform Independent Model | OCL Constraints



Class Diagram

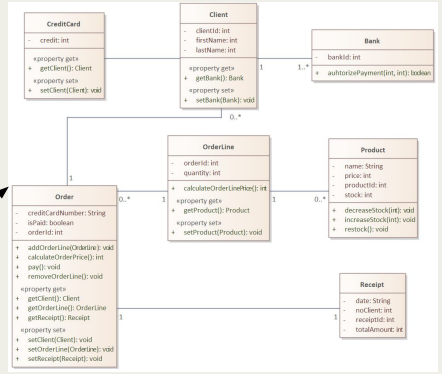
Platform Specific Model



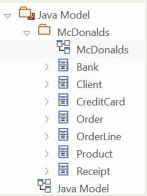
Platform Independent Model

ENTERPRISE ARCHITECT

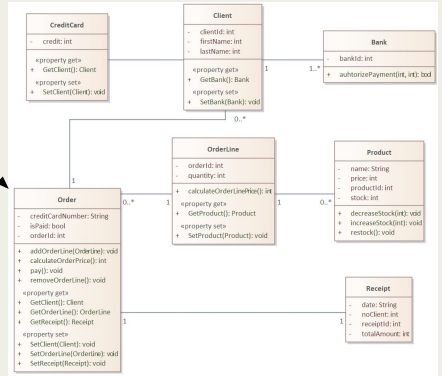
Java



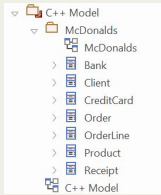
PSM
+
Java class



C++



PSM
+
.cpp and .h files



Code & Project Structure

Enterprise Architect generated file

Implemented file

8
Demonstration

Our Experience

William	**Yann**	**Chadi**
Many open source tools are not updated anymore	Most of the open-source tools are outdated or deprecated, and the generated code often fails to compile due to broken or obsolete dependencies.	Almost all the tools are deprecated or not usable
Generated code contains deprecated code parts	While the code sometimes reflects the UML structure, it's rarely clean or production-ready, leading to significant manual corrections and increased project costs.	The file generated are almost empty and we have to download one by one every files
Different levels of support depending on target language		
Round-trip mechanism broke several times		

Thanks!

Do you have any questions?

8
Demonstration