



# **AUTOMATED PROCUREMENT MANAGEMENT FOR EFFICIENT SUPPLY CHAINS**

# DESCRIPTION

This project introduces an innovative approach to procurement management by leveraging decentralized, autonomous agents (uAgents) to automate and streamline key tasks within the supply chain. Traditional CRUD-based systems often suffer from centralization and manual bottlenecks; in contrast, our platform employs autonomous uAgents to handle tasks such as supplier selection, quality checks, and logistics coordination autonomously and securely. Each uAgent operates independently, ensuring reduced manual effort, enhanced operational efficiency, and robust error handling through decentralized verification. The user-friendly interface provides real-time updates and transparent tracking, empowering procurement managers to make data-driven decisions swiftly. This approach not only enhances agility and responsiveness but also ensures compliance with procurement policies, delivering a superior and more reliable procurement management system.

# OBJECTIVE

The objective of this project is to transform procurement management by leveraging decentralized, autonomous technologies to address the limitations of traditional supply chain systems. By utilizing uAgents, the project aims to automate and optimize procurement processes, ensuring best-value sourcing, enhanced supplier relationships, and strict adherence to quality and compliance standards. This decentralized approach mitigates common issues associated with centralization, such as single points of failure and data integrity risks. Our solution focuses on enhancing efficiency, reducing costs, and ensuring timely delivery of goods through a secure, transparent, and decentralized framework. Ultimately, the project contributes to a more resilient and adaptable supply chain, enabling organizations to proactively respond to dynamic market demands and mitigate risks.









# AGENTS

## SUPPLIER AGENT

Selects top suppliers, coordinates final selection, and confirms order based on inventory availability.

## QUALITY AGENT

Shortlists final supplier and transporter based on quality criteria for procurement.

## TRANSPORT AGENT

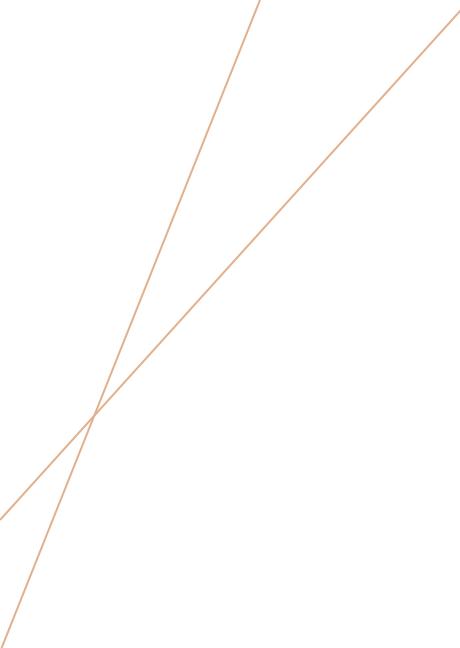
Chooses top transporters, confirms final selection, and arranges logistics for goods delivery.

## IMPLEMENTATION

Oversees the deployment of procured items, ensuring they are correctly integrated into the supply chain.

# SOLUTION OVERVIEW

Our solution revolutionizes procurement management by employing decentralized uAgents from Fetch.ai, designed to autonomously execute and manage critical supply chain tasks. Unlike traditional CRUD operations, which are prone to centralization issues and require significant manual intervention, our approach leverages autonomous agents to handle tasks such as supplier selection, quality assurance, and logistics coordination. This decentralized model significantly reduces manual workload and human error, while also enhancing data integrity and security through cryptographic protocols. The system provides real-time, peer-verified updates, ensuring accurate and timely procurement actions. By automating these processes, the solution improves decision-making efficiency, reduces operational costs, and strengthens compliance with procurement standards, thereby fostering a more agile, responsive, and secure supply chain management environment.



# FRONT-END

## REACT.JS

A JavaScript library for building user interfaces. It helps create a dynamic and responsive user experience by efficiently updating and rendering components.

## MATERIAL UI

A React component library that provides pre-designed UI components, ensuring a consistent and professional design.

## GLASSMORPHISM

A design trend involving frosted glass effects for a modern, sleek look, implemented through CSS for a visually appealing UI.

# BACK-END



A lightweight Python framework for building web applications and APIs. It handles routing, data processing, and integrates with UAgents.



A framework for building multi-agent systems. It manages the different roles (Supplier, Manufacturer, Distributor, Retailer) and their interactions through HTTP endpoints.



For integration and features related to decentralized systems

# DESIGN & DEVELOPMENT

## Back-End

The backend, developed with Python and Flask API, is designed to manage all critical functionalities such as API services, data processing, and agent interactions. It employs robust authentication mechanisms to ensure secure access and real-time job management.

## Integration

Utilizes REST APIs to seamlessly connect the frontend with backend services. This integration ensures smooth communication and data flow between user actions, backend processes, and agent functionalities.

## Front-End

The frontend is built using React, styled with HTML/CSS, with Material UI for a consistent, professional design. The use of Glassmorphism gives the interface a modern look while maintaining clarity and focus on essential data points.

## Implementation

The project development involved setting up a robust backend infrastructure with UAgents to automate various procurement tasks and establishing a responsive frontend interface using React and Material UI.

# FEATURES

## Agent-Based Automation

The platform leverages specialized uAgents (Supplier Agent, Quality Agent, Transport Agent) to autonomously manage distinct procurement tasks such as supplier selection, quality assurance checks, and logistics coordination.

## Real-Time Order Tracking

The platform provides real-time tracking capabilities, offering instant updates on order status from initial supplier confirmation through to final delivery. This functionality empowers users to monitor and manage the entire supply chain process.

## Dynamic Inventory Management

The system incorporates a dynamic inventory management module that autonomously checks inventory levels against pre-defined client criteria and automatically confirms orders when conditions are met.

## Interactive User Interface

The user-friendly frontend, developed with React, allows seamless interaction with the system, enabling users to manage jobs, communicate with agents, and access real-time data easily. The intuitive design promotes ease of use and enhances the overall user experience.

# UI/UX

## REACT.JS COMPONENT

Modular components for different functionalities (order placement, status checking).

## MATERIAL UI INTEGRATION

Consistent styling with pre-designed components for buttons, input fields, and containers.

## GLASSMORPHISM

Achieved using CSS, creating a frosted glass effect for a modern and visually appealing look.

# UI/UX

## RESPONSIVE DESIGN

Ensures compatibility with different devices and screen sizes.

## INTERACTIVE ELEMENTS

Includes buttons, input fields, and dynamic charts for enhanced user interaction.

## CHARTS AND GRAPHS

Interactive charts for visualizing data (e.g., order history, material status).

# BACKEND IMPLEMENTATION

The backend implementation automates supply chain processes by integrating multiple agents to streamline procurement, supplier classification, and quality checks, ensuring efficient order fulfillment and real-time status updates.

## **Key Features:**

**Automated Supplier Classification:** Efficiently classifies suppliers based on predefined criteria like price, quality, and delivery time.

**Real-Time Quality Assurance:** Verifies supplier quality through a dedicated agent to ensure compliance with standards.

**Inventory and Order Management:** Confirms inventory availability and automates order processing and acknowledgment.

# APPROACH AND METHODOLOGY

## Requirement Analysis

Conducted an in-depth analysis of supply chain requirements with a specific focus on procurement management challenges and opportunities.

## Frontend with React

Built a React-based frontend with interactive elements, providing a user-friendly interface for order placement and real-time procurement tracking.

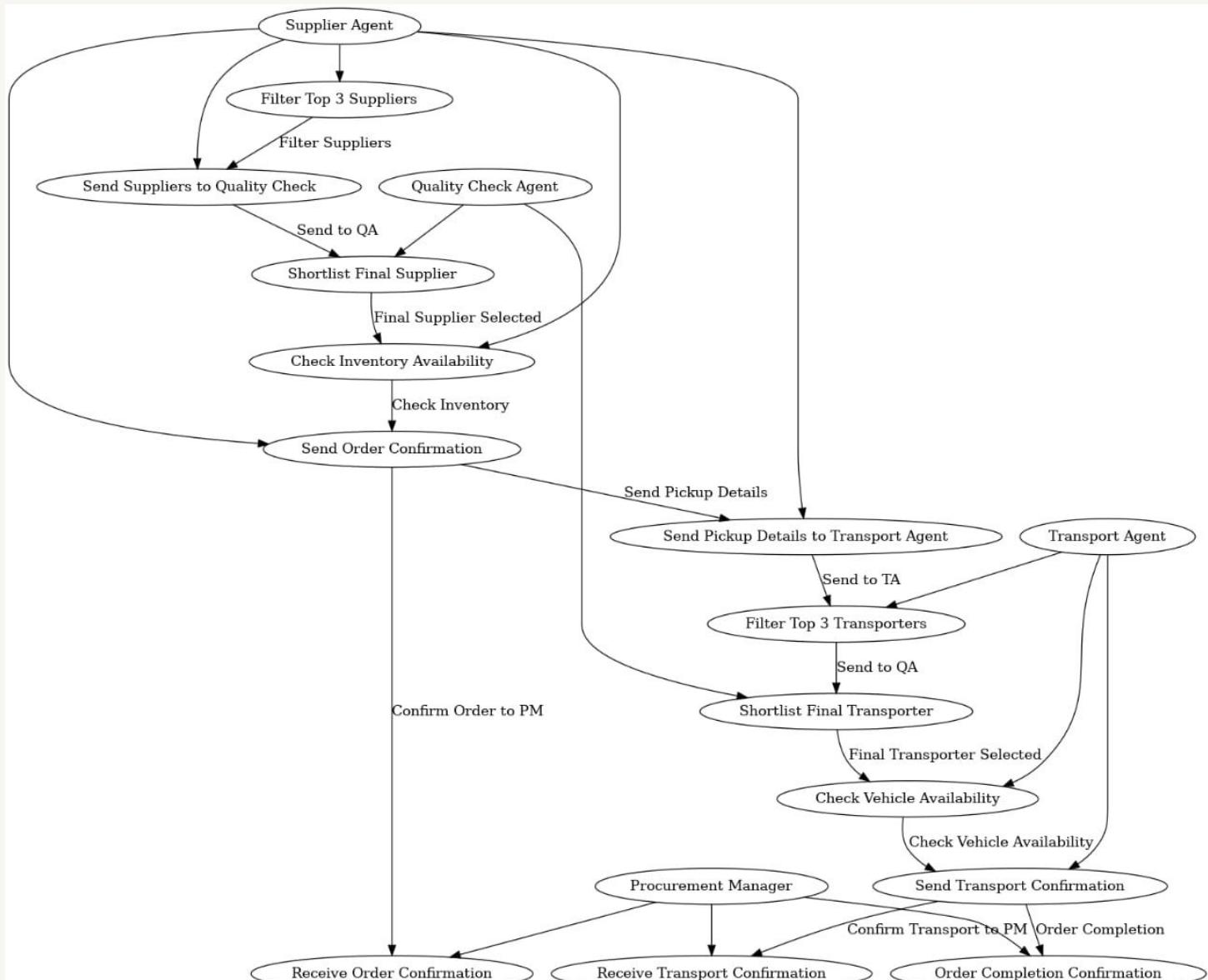
## Backend with UAgents

The backend leverages UAgents to create modular, autonomous agents dedicated to tasks such as supplier classification, quality checks, and inventory management.

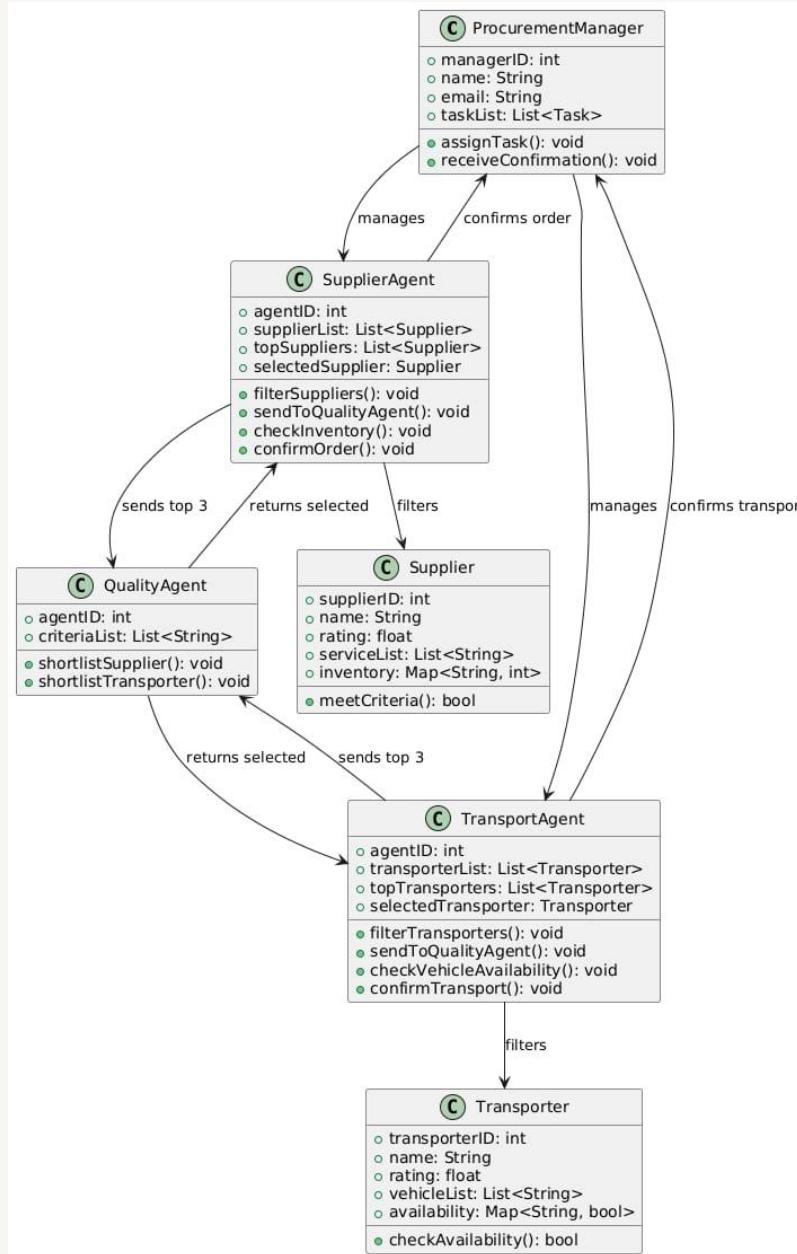
## Integration and Testing

Integrated frontend and backend using API endpoints. Conducted comprehensive testing to ensure functionality, reliability, and performance.

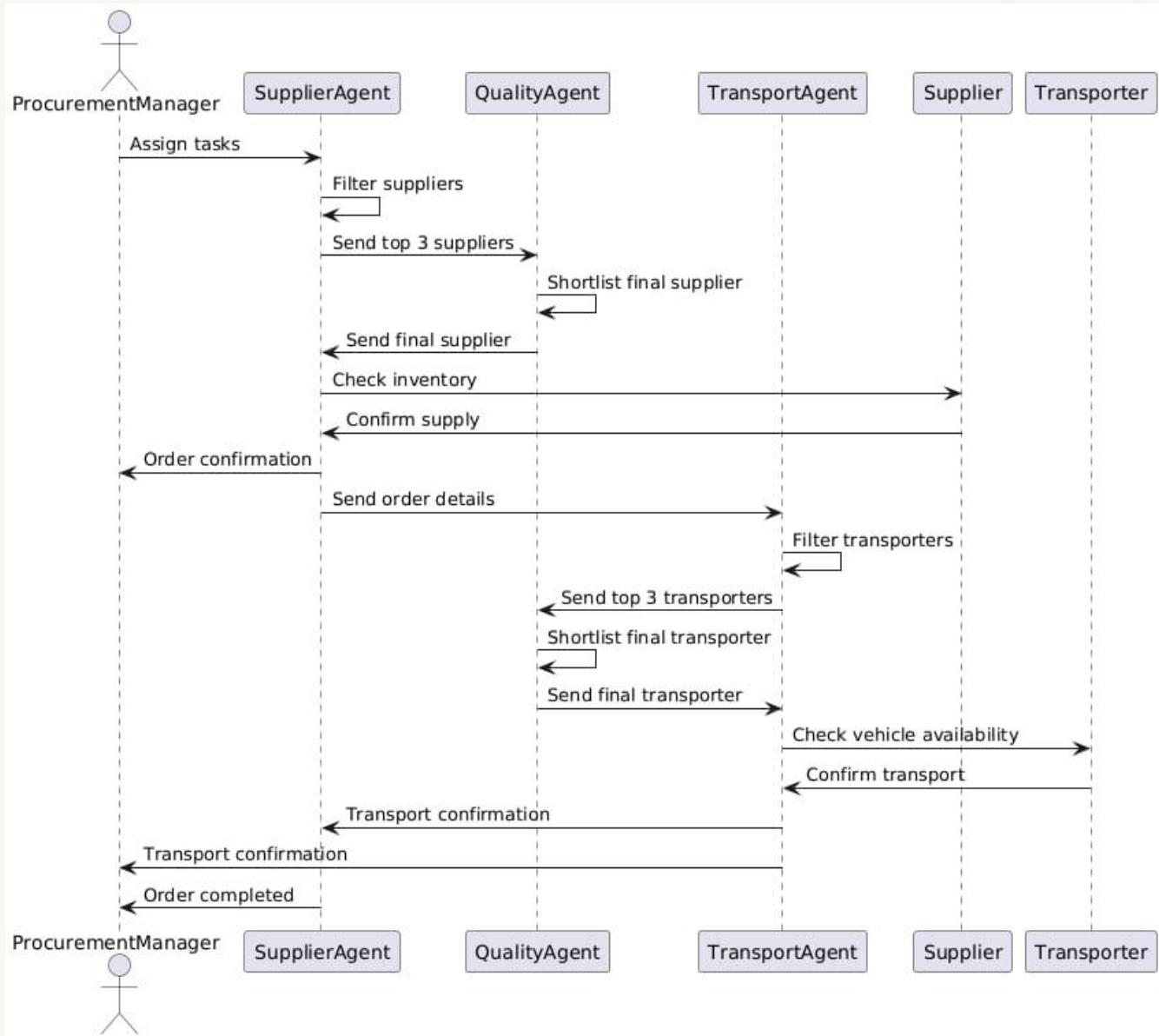
## Data-Flow Diagram



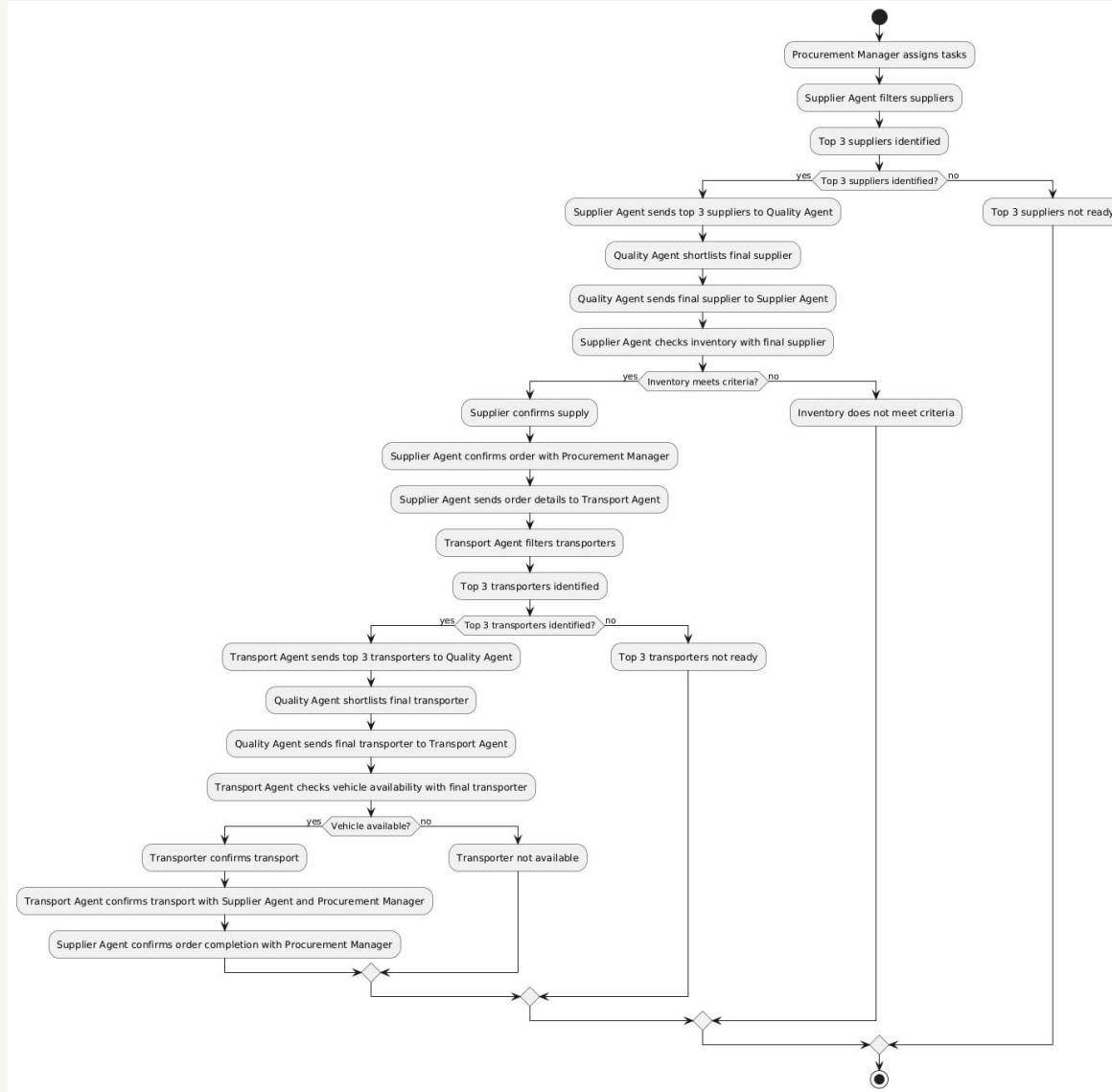
# Class Diagram



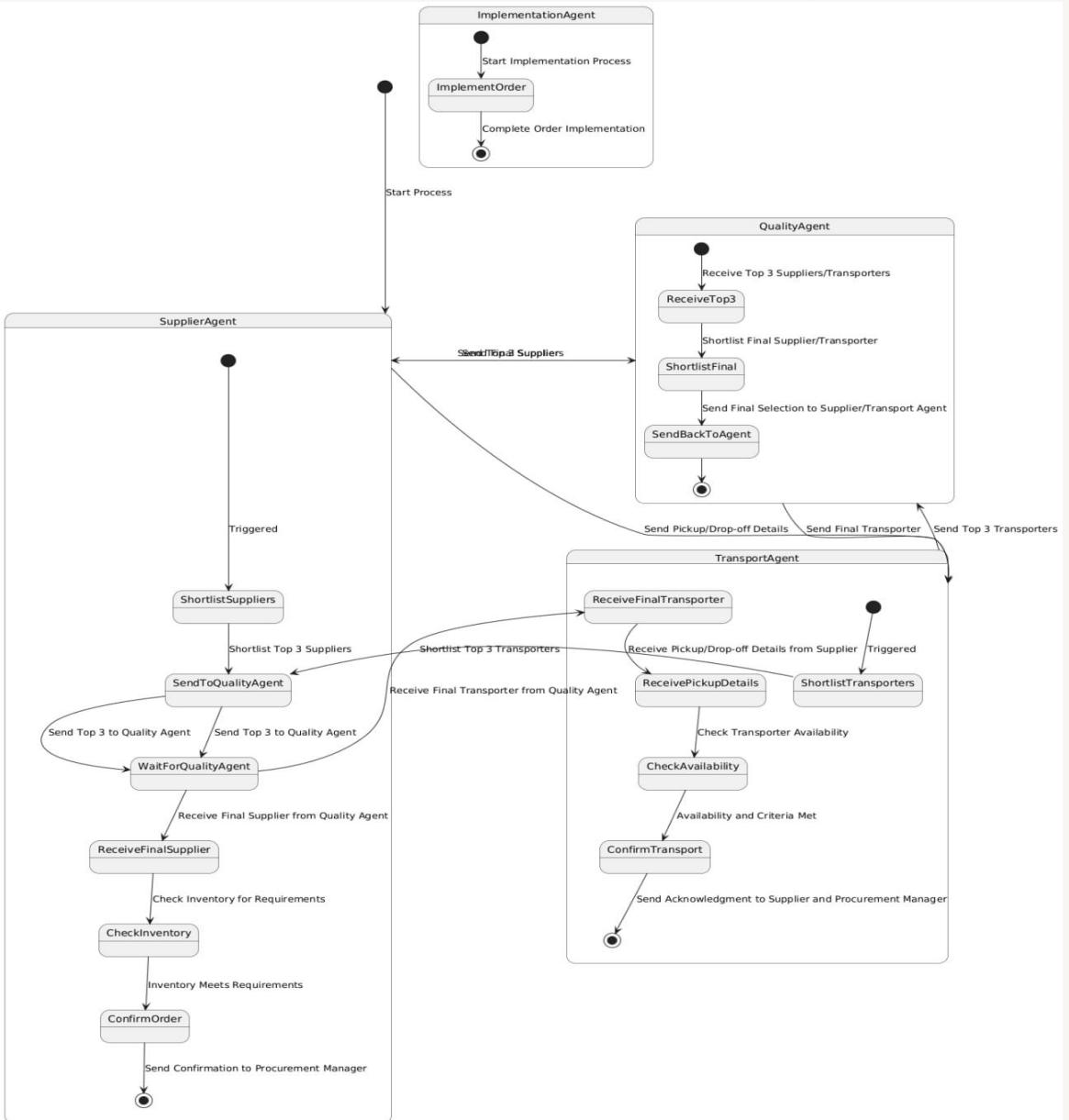
## Sequence Diagram



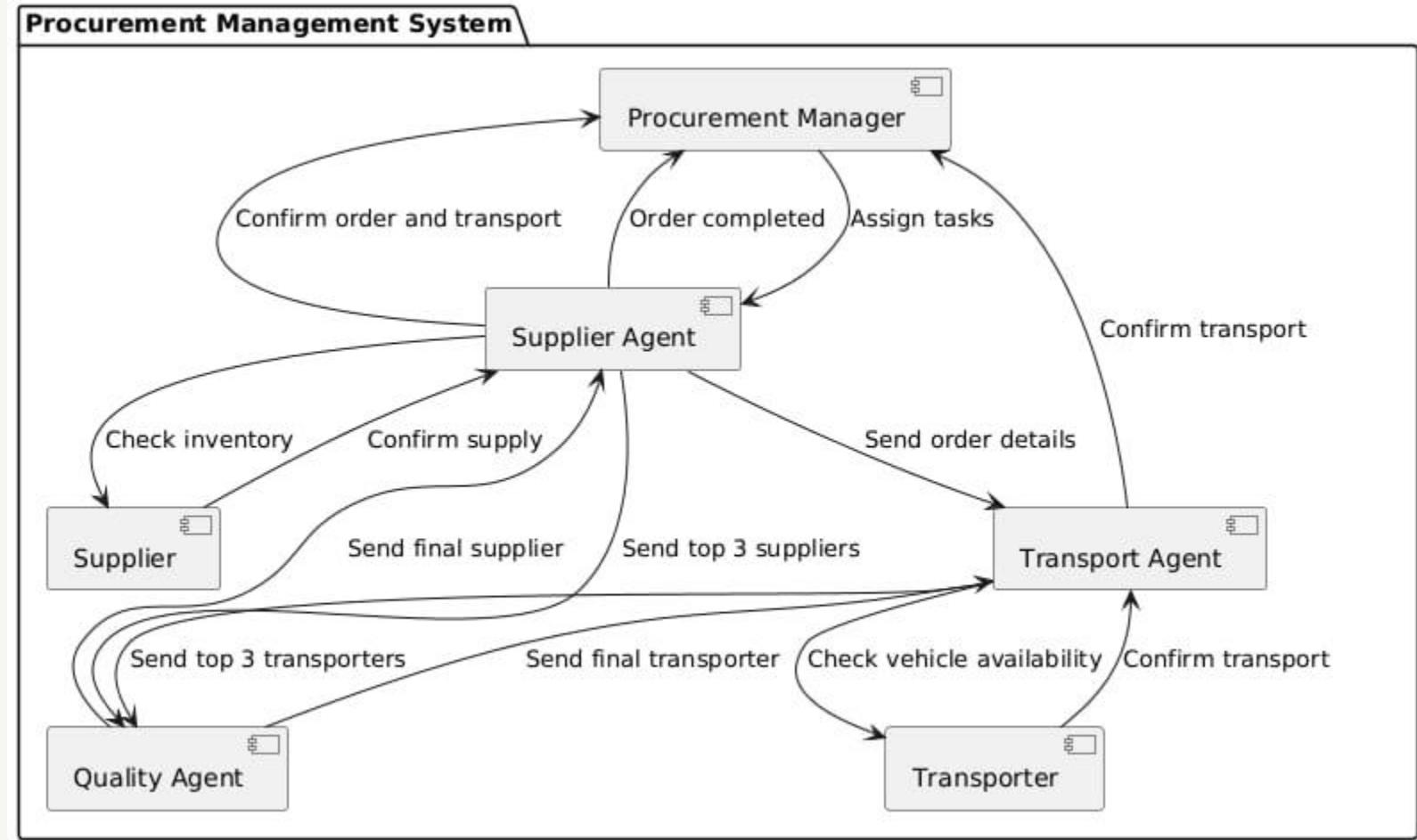
# Activity Diagram



# State Diagram



## Component Diagram



# RESULT

The screenshot displays the Admin Dashboard of the Procurement Management System. At the top, there is a header bar with the title "Procurement Management System" and a "Logout" button. Below the header is a section titled "ADMIN DASHBOARD". This section contains input fields for "Job Name" and "Job Description", and a date input field for "Start Date" with a placeholder "dd - mm - yyyy". A "Remove" icon is located next to the date input field. A prominent blue button labeled "Add Job" is centered below these fields. Below this is a table listing a single job entry:

JOB NAME	DESCRIPTION	START DATE	STATUS	ACTIONS
set up ML lab	chairs:10,desktops:10	2024-08-30	Available	<a href="#">Remove</a>

# RESULT

The screenshot shows a web-based procurement management system. At the top, a header bar is visible with the text "Procurement Management System" on the left and a "Logout" button on the right. Below the header is a main content area titled "MANAGER DASHBOARD". This dashboard displays a single job entry in a table format. The table has columns labeled "JOB NAME", "DESCRIPTION", "START DATE", "PROCEED", and "DECLINE". The data in the table is as follows:

JOB NAME	DESCRIPTION	START DATE	PROCEED	DECLINE
set up ML lab	chairs: 10, desktops: 10	2024-08-30	<b>Proceed</b>	<b>Decline</b>

# RESULT

Procurement Management System [Logout](#)

## AGENT DASHBOARD

Job Name: set up ML lab  
Job Description: chairs:10,desktops:10  
Start Date: 2024-08-30

[Trigger Supplier](#)

### Agent Decisions

#### Agent Execution Time

The chart displays the execution time for each stage of the procurement process. The Y-axis represents 'Execution Time (r)' from 0 to 8. The X-axis lists the stages: Supplier, Quality, Transport, Implementation, and Business. The curve shows a peak at Quality (~7), a dip at Transport (~3), and another peak at Implementation (~8).

Stage	Execution Time (r)
Supplier	5.0
Quality	7.0
Transport	3.0
Implementation	8.0
Business	6.0



# FEATURES

## Order Management

Users can place orders through the frontend interface. The order details are sent to the backend, processed, and stored. Order history is displayed, showing item names, quantities, and statuses.

## Material Handling

Automated processes for sending and receiving materials between agents, enhancing efficiency and reducing manual effort.



# FEATURES

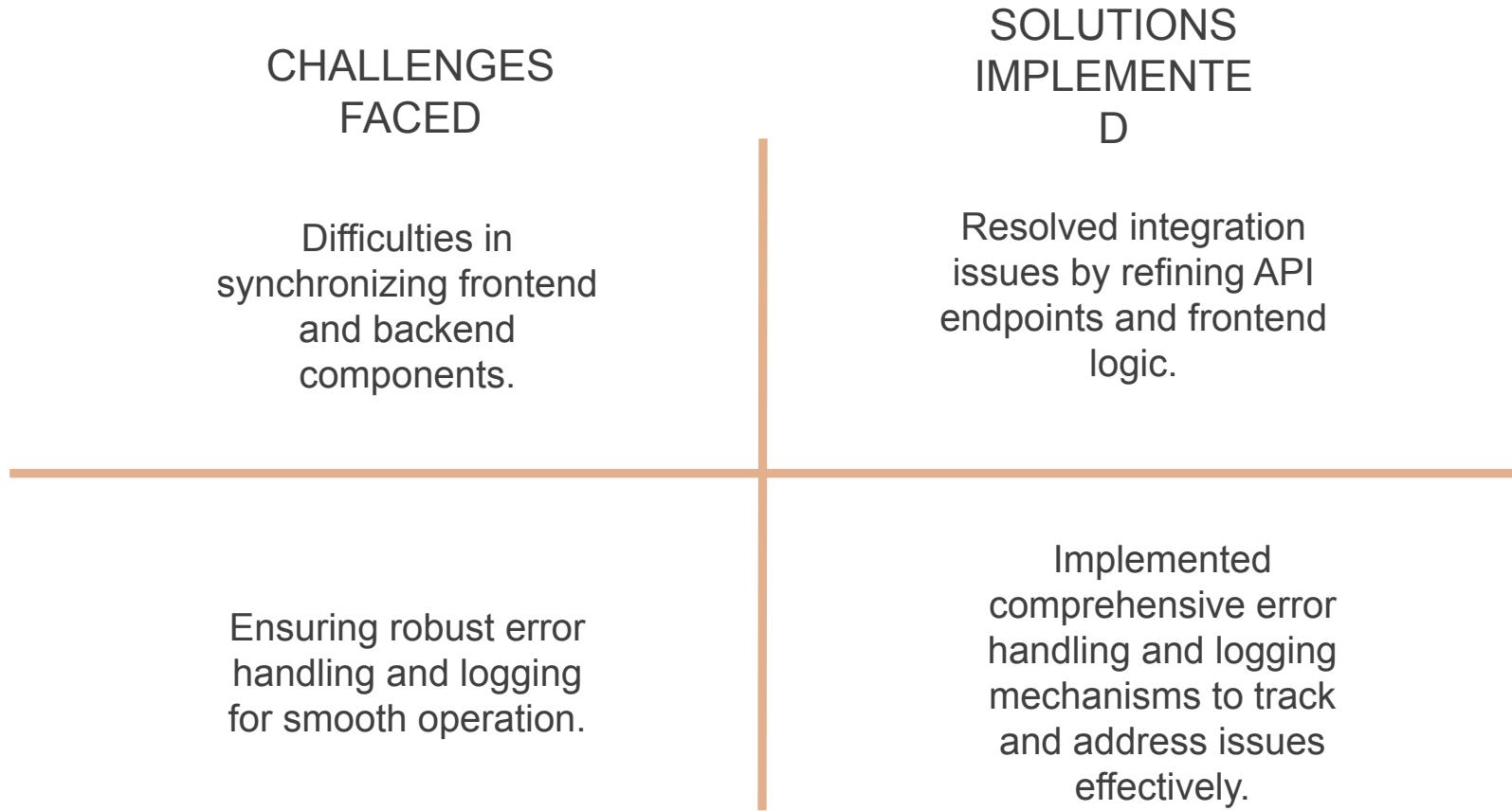
## Manufacturing & Distribution

Agents manage the production and distribution of goods, ensuring timely fulfillment and tracking.

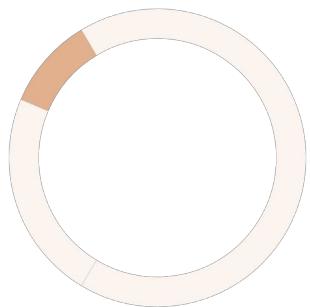
## Real-Time Status

Provides real-time updates on order status, material handling, and other supply chain processes.

# OUR COMPETITION GRAPH

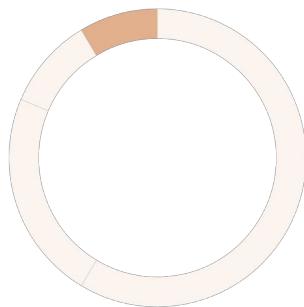


# FUTURE WORK



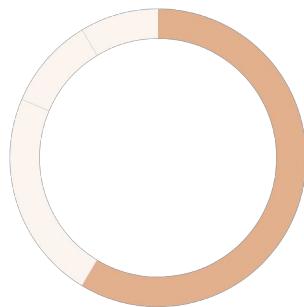
## Enhanced Supplier Analytics

Integrate advanced analytics to assess supplier performance trends and improve decision-making.



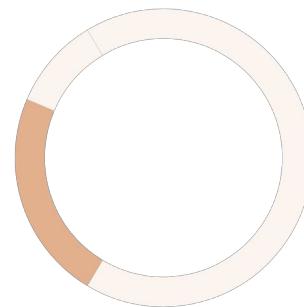
## Machine Learning Integration

Implement machine learning models to predict demand and optimize inventory management.



## Blockchain for Transparency

Incorporate blockchain technology to enhance transparency and traceability across the supply chain.



## Automated Contract Management

Develop automated contract negotiation and management features to streamline procurement processes further.



# SUMMARY

This project successfully developed a comprehensive supply chain management system focusing on procurement. By leveraging modular agents and a user-friendly interface, it enhances efficiency, transparency, and real-time decision-making in the supply chain. Future enhancements will further optimize processes and incorporate advanced technologies for greater reliability and scalability.

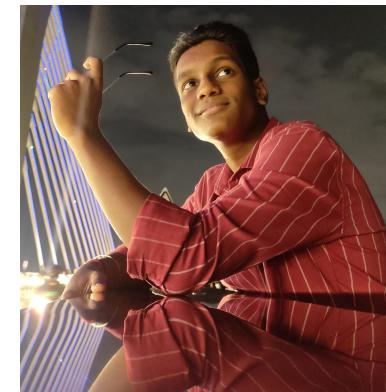
# MEET THE TEAM



M Buddu Uday



N Mahideep



VVS Laxman



M Poojith Chowdary



# THANK YOU

M Buddu Uday

N Mahideep

VVS Laxman

M Poojith Chowdary