

# Business Objects Transfer Enablement from Public Cloud to Private ERP System for Replenishment Planning

Kirti Nandan\*, Dr. Krishnappa H K\*\*

\*(Computer Science Engineering, R.V. College of Engineering, Bengaluru, India

Email: kirtinandan.cs18@rvce.edu.in)

\*\* (Computer Science Engineering, R.V. College of Engineering, Bengaluru, India

Email: krishnappahk@rvce.edu.in)

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## Abstract:

Suppliers and consumers form the basis of a business transaction. Various business processes are involved in a supply chain. It is of utmost importance to always maintain sufficient stocks by the supplier to always meet the demand by the consumer. This business process and planning is known as Replenishment. With the advent of very advanced ERP software, the managing of these business processes has become very user friendly. So, more advancements are yet to come into this field which would increase the accessibility, ease and convenience for both the supplier and consumers as the era shifts more and more towards cloud platforms from on-premise suites. Various transactions are involved amongst the business processes. Depending upon the business logic, requirements, constraints and several other factors, the business objects are transformed and passed along the supply chain.

**Keywords — ERP, Replenishment, Business Object transfer, on-cloud, CRON**

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## I. INTRODUCTION

With the advancements in technologies, industries today are managing their day-to-day activities, transactions, working capital, finances, human resources and furthermore, using ERP technology.

ERP stands for Enterprise Resource Planning. Enterprise resource planning (ERP) refers to a type of software that organizations use to manage day-to-day business activities such as accounting, procurement, project management, risk and compliance management and supply chain operations.

A complete ERP suite also includes enterprise performance management, software that helps plan,

budget, predict, and report on an organization's financial results.

Now-a-days, Replenishment is the process of using AI (Artificial Intelligence) to determine demand. Replenishment is the process of using AI to determine demands and optimizing order quantities of re-orderable products in stores and distribution centres, supporting multiple levels in the supply chain as well as multiple channels within a unified commerce business.

Many business objects are involved in the steps and processes of supply chain management. In due course of completion of a business transaction, there is conversion of many business objects into another business objects thereby, continuing the chain.

Since the last decade, there has been a massive shift observed towards the on-Cloud based services from on-Premise services. Benefiting from the fact that this reduces the cost of distribution of software from vendor to customer, easily accessible being independent of the location and other factors. Some downsides are there related to reliability upon which tremendous advancements have been achieved. It benefits the customer to directly purchase the license of the cloud services by the respective vendor and start off with their activities.

## II. RELATED WORK

In Reference [1], there is discussion on the ever-changing customer demands and devising a planned methodology which cater to these demands. FMCG being a big industry, there is hierarchical model for replenishment planning.

In Reference [2], the shift between on-premise to on-cloud architecture is discussed. The pros and cons of this shifts are discussed over the pillars: Accessibility, performance and security - key requirements along with vendor reputation and user community.

References [3], [9] and [10] discusses about the deployment of the application on the Kubernetes platform and IT optimization.

Reference [4],[5] and [6] discusses about the development of the application from front-end perspective using JavaScript (React framework), back-end perspective (Spring Boot framework) and integration using REST APIs. Reference [7] discusses the automated testing using Cypress (integration testing) of the developed application, very essential before customer testing.

Reference [8] is a documentation available open-source by Oracle discussing about the cloud approach for revolutionizing Replenishment and related business processes.

## III. REPLENISHMENT PLANNING

To provide excellent service levels to different sales, the supervisors/planners need to keep an eye

and order the appropriate products at the correct times, in the right quantities and to the right location (distribution centres, retail stores, etc.)

Replenishment Planning is one important block of the supply chain management. The core responsibility of replenishment planning is to ensure that the supplier (distribution centre) carries sufficiently enough stock (supply) to maintain the shelves of the inventory, thereby, always adequately fulfilling the demand by the customers and minimizing wastage or loss of stocks (products of supply).

From manual maintenance and ordering of supplies in old times, technological advancements revolutionized the market with ERP softwares to suite to the customer organization's requirements and help them facilitate their sales, prediction and planning.

Replenishment is about automatically ordering the right quantities and logistical units of tens of thousands of products for thousands of nodes in the supply network at the best source of supply; replenishment is a demand-driven pull process that typically assumes sufficient availability in the supply source - as opposed to push processes, where limited or defined quantities are distributed top-down.



Fig 1: General Planning Layout for Order and Forecasting

Fig 1 illustrates a general planning layout between the customers, stores, suppliers and distribution centers – managing the demand and supply for the transacted goods/services.

The benefits of replenishment planning:

- Increase in service levels
- Optimized range of coverage
- Reduced waste through precise predictions and up to date stock information
- Increased efficiency through high automation and exception-driven processing.

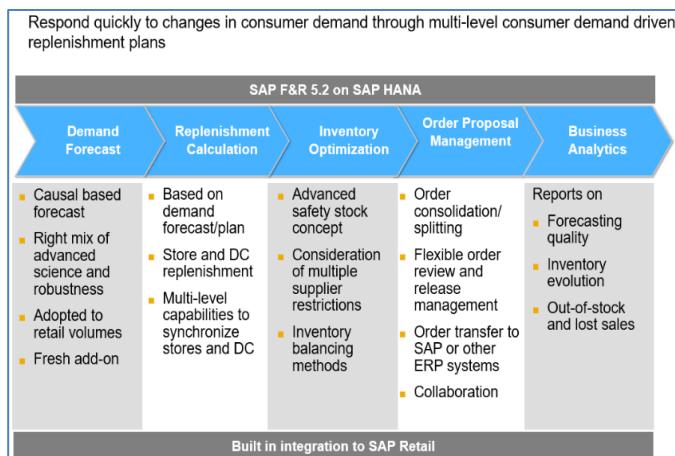


Fig 2: Consumer Demand Driven Planning (by SAP)

Fig 2 illustrates a general planning driven based on consumer demand. It comprises of various processes for forecasting and replenishment planning and calculation.

## IV. TECHNICAL REQUIREMENTS

### A. Front-End Development

#### ReactJS

React is a library for building composable user interfaces. It encourages the creation of reusable UI components, which present data that changes over time. React implements one-way reactive data flow, which reduces the boilerplate and is easier to reason about than traditional data binding. Use of Virtual DOM improves apps performance.

#### SAPUI5 Library

As an enterprise framework, SAPUI5 offers many powerful enterprise features to support the entire app development project.

The various components of the web application are designed from the custom library which are reusable components and modifiable.

### B. Backend Development

#### Spring Boot

Spring Boot is a Java-based open source framework for developing microservices. It is used to create stand-alone and production-ready spring apps. Spring Boot is a good platform for Java developers to create a stand-alone, production-ready spring application that can be run straight-away.

#### Postgres

PostgreSQL, also known as Postgres, is a free and open-source relational database management system emphasizing extensibility and SQL compliance. PostgreSQL is used as the primary data store or data warehouse for many web, mobile, geospatial and analytics applications.

#### Temporal

Temporal is an open source, distributed and scalable workflow orchestration engine capable of running millions of workflows. Workflows can hold state and describe which activities (workflow tasks) should be carried out.

#### Kafka

Kafka is a distributed event store and stream-processing platform. It is an open-source system developed by the Apache Software Foundation written in Java and Scala. The project aims to provide a unified, high-throughput, low-latency platform for handling real-time data feeds.

Kafka is an open source software which provides a framework for storing, reading and analysing streaming data.

### C. Deployment

#### Kubernetes

Kubernetes is an open-source container orchestration system for automating software deployment, scaling, and management.

It orchestrates containerized applications to run on a cluster of hosts. The K8s system automates the deployment and management of

cloud native applications using on-premises infrastructure or public cloud platforms.

## V. ARCHITECTURE

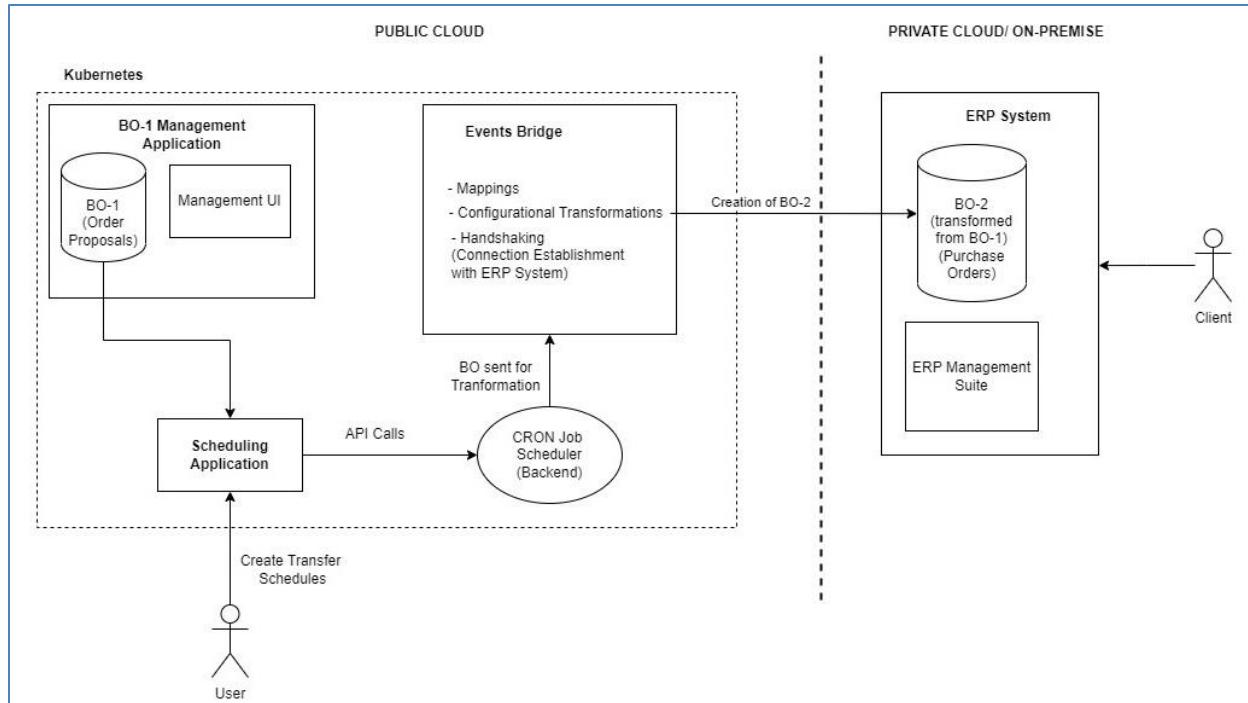


Fig 3: System Design of the Application for Business Objects Transfer

Fig 3. illustrates the end-to-end system design of the application built for enabling transfer of business objects.

As shown in Fig 3., for the discussed use case, two business objects are there: BO-1 (Order Proposal) and BO-2 (Purchase Order). Many applications are there, deployed on the public cloud cluster. The BO-1 Management Application contains the details of the order proposals.

The main objective is to provide to the client, the details of the order proposals along with some configurational transformations, taking care of the requirements, constraints, demand and supply on the given date time and distribution centers.

The scheduling application takes the details from the user about the parameters required for scheduling jobs for the process. It can be a recurring process (say, weekly, monthly, etc.) or can be initiated right away.

The scheduling application passes the details collected from the user to create CRON Jobs. CRON is basically a utility that schedules a command or script on the server to run automatically at a specified time and date. It is the scheduled task itself. It is a very useful way to automate repetitive tasks.

Temporal workflow is triggered when a schedule is created which describes the various stages of transformation of BO-1 to BO-2. The Event Bridge consists of the backend logic integrated the public cloud cluster to the client's private on-premise/on-cloud ERP System such that the transformed business object is passed to the ERP System and stored as BO-2 (i.e. purchase orders). A purchase order is a legal document a buyer sends to a supplier or vendor to authorize a purchase. Purchase orders outline what the buyer would like to purchase and how much of it they would like to receive.

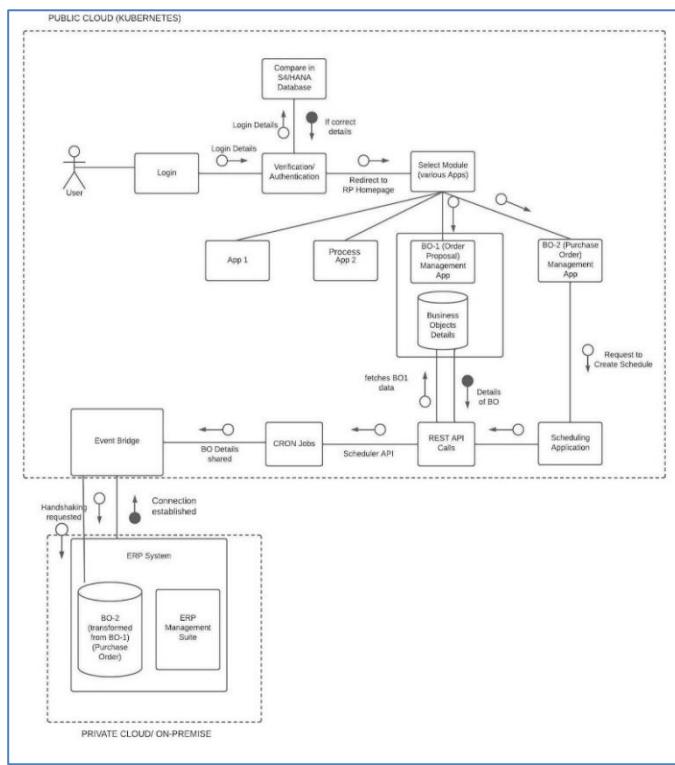


Fig 4: Structure Chart for the BO Transformation Process

Fig 4 illustrates the end-to-end flow for the process of transformation of order proposals to purchase orders. The interactions between different blocks of the application is illustrated showing the work flow with requests and responses.

The automation saves cost and with the help of AI logic in the backend (event bridge), it helps to generate adequate orders leading to optimization of service levels. The business process is facilitated by cloud operations, using the new features without disruption.

## VI. CONCLUSION & FUTURE WORK

Maintaining the balance between demand and supply is the core requirement in the chain of business processes. ERP Systems have facilitated the data maintenance, analysis and statistics since a long time and are getting advanced day-to-day. On-premise software is steadily being shifted to on-cloud to make the software suites more easily accessible and ease the pressure on vendors.

AI logic based algorithms/models are being deployed on the server to do necessary calculations for replenishment planning and other business processes.

Replenishment solutions are the backbone of the operations of a Retailers business. New cloud based services are being built and utilized by various organizations such as SAP, Oracle, Blue Yonder, etc.

This type of application is being built by big organisations with strategies of shifting to cloud paradigm. Many advancements are undergoing and improvements in the ML-models are future work.

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