



Global Office of Supply Chain Technology

## **Dynamic End 2 end Supply Chain Optimization**

### **ASN - Product Outline**

*By OSCT of Capgemini...*



**Office of Supply Chain Technology (OSCT)      e2e SC OPTIMIZATION –  
Product Outline**

**Introduction**

OSCT of Capgemini is assessing and partnering with vendors to identify emerging technologies used in reference architectures and innovative offerings like Capgemini's Networked-Value-Chain, eFulfillment, Strategic Sourcing & eProcurement solutions. These innovative offerings identify comprehensive network business models, process models and enabling technologies. Based on these models, conceptual and logical application and technical infrastructures blueprints are designed. During the solution development up to three levels of technology evaluation and business concept validation are performed and documented in L1 GAD's and L2 Pattern documents. L3 system and logic architectures and tests are produced for the main breakthrough technologies. The business concepts featured in these architectures are tested with clients and through field research. All information and documentation is available through the OSCT.

The purpose of this document is to **provide a description** of the e2e Supply Chain Optimization solution developed by the Global Office of Supply Chain Technology team in alliance with Adaptive Agent Technology providers.

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## **End 2 end Supply Chain Optimization for Adaptive Enterprises**

### ***The evolving need for adaptive solutions***

Increasing event-level volatility has become a permanent fact of business life. The biggest challenge organizations face is transforming processes, systems, policies and priorities so they are capable of rapidly reconfiguring supply chains to holistically tackle the key issue of demand/supply balancing in fulfillment networks. The goal is to help enterprises feel comfortable and confident in conditions of constant change by becoming permanently adaptive. In this world of market volatility, adaptability is the key to surviving and thriving.

Besides organizational change to continuous inter enterprise collaboration, the answer lies in a new generation of software based on distributed, agent technology, which is able to optimize and automate eg. Supply Chain Execution processes — in real time — of complex networked business models. Capgemini is partnering with leading providers of multi-agent-based software platforms - to build software based on Capgemini's vision of end 2 end (e2e) Supply Chain Optimization. Capgemini provides the product strategy, new algorithms and proven delivery methodologies from a process, technology and organizational perspective to jointly develop the agent products and supply chain solutions, such as e2e Supply Chain Optimization.

### ***Order-level Dynamic Supply Chain integration of business units, channel partners and suppliers***

Sales orders rarely refer to one single product but usually affect several products and/or services, especially in highly complex manufacturing industries such as e.g. automotive, high-tech, and electronics. Also while previously a single manufacturer handled the whole order fulfillment process, nowadays a network of channel partners, business units and suppliers are involved. This is the result of an increasing tendency towards product bundling and customization. **As a consequence, optimization and control of a network of channel partners, business units and suppliers has become just as important as mastering one's own processes.**

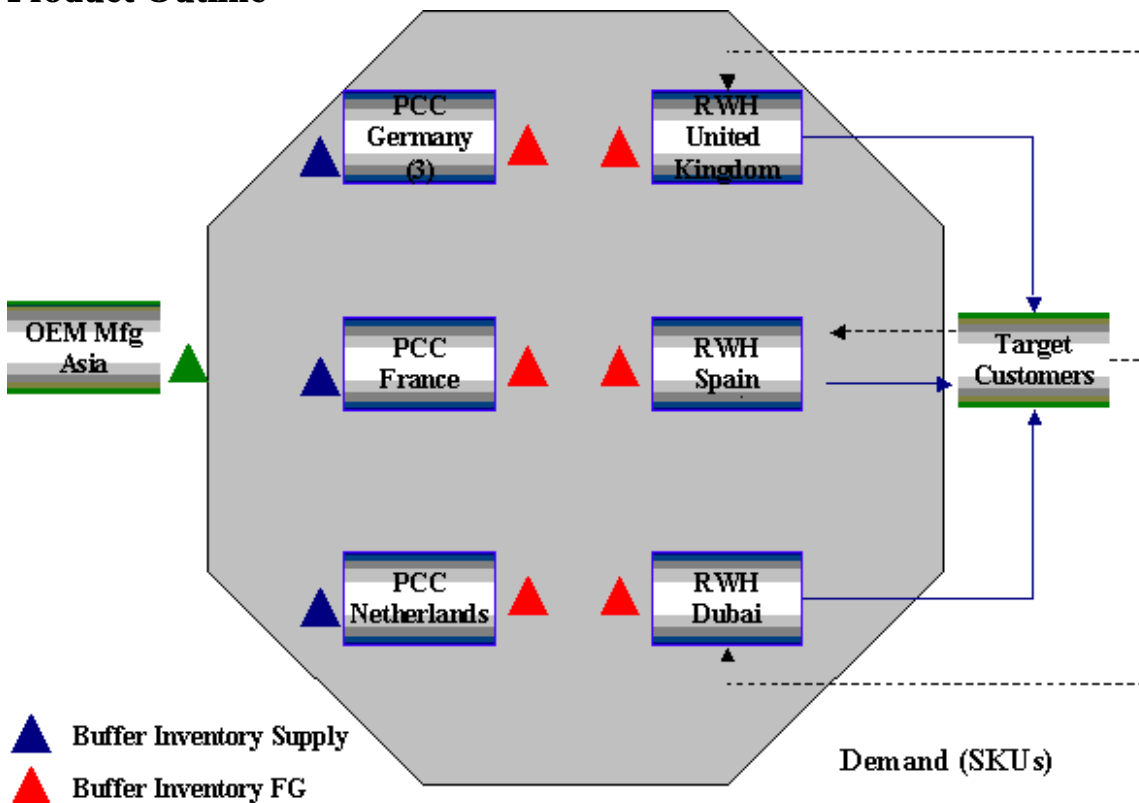


Figure 1: Customer-oriented order fulfillment management as a challenge within a network of companies and business units.

**E2e Supply Chain Optimization synchronizes planning optimization with partner network execution in near real-time**

The customer order is the pivotal point from which all requirements are derived, (i.e. scheduling, production and distribution). To manage these processes most companies utilize separate Enterprise Resource Planning (ERP), Advanced Planning and Scheduling (APS), and Supply Chain Execution (SCE) systems. Planning means collecting historical data, aggregating results into general tendencies (e.g. average), estimating future development (forecasting) and calculating a plan of action. For planning systems, “reality” is based on a series of assumptions and surprising deviations from plan, such as bottlenecks in production or distribution processes, are considered exceptions, which usually are managed via manual processes. However, in dynamic networks, such as order fulfillment networks, reality is a permanent sequence of events and dynamic challenges, which requires immediate adaptation to new situations.

**E2e Supply Chain Optimization is a powerful tool for synchronizing customer service level optimization with network fulfillment optimization**

The objective of dynamic e2e Supply Chain Optimization is to design, build and implement an agent-based solution, which significantly reduces inventory driven costs while controlling service levels and transportation costs. The solution’s functional scope is localized Demand and Price Forecasting and Dynamic Inventory Optimization and Replenishment. The solution forecasts demand and price by SKU (an agent represents a custom and dynamically adjusted forecasting algorithm per SKU) at location level and dynamically calculates supply network target buffer levels at network node levels as well.

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### The global HT-OEM - Capgemini - Agent Project

HT-OEM has selected Capgemini to run a "proof of concept called a Solution Validation Approach, which uses a Dynamic Case Modeling technique. Using Adaptive Agent modeling technology Capgemini simulates HT-OEM 's new networked business model characteristics and critical parts of HT-OEM 's supply chain vision. The project is done as a three-step approach starting with Dynamic Case Specification, which includes the goal and scope definition, as well as the dynamic case design (processes, data, optimization logic and a model). Then the project continues with Dynamic Case Modeling, Refinement and Analysis and closes with providing decision support for the next phase, which is a "Solution Pilot" implementation.

The scope of the project is defined by a combination of product coverage, network coverage and functional depth. Network, product and functional scope have been discussed in an ASE Accelerated Solution Environment in Vienna Austria to further define the solution validation project. The discussed examples for network scope and functional scope are stated below. Definition of the product scope will be done during project set-up. The criteria for the correct definition of the product scope include: multiple sets of SKUs; inventory held at multiple network nodes; time horizon long enough to model live cycle rollover; identified actual forecasting and inventory issues. The project group will finalize the scope during the initial phase of the solution validation. The project group is responsible for managing the complexity of the project so that it doesn't exceed the expected effort and timeframe, while making sure that the optimization potential (significant reduction of inventory) can be identified and evaluated.

### **Customers benefit from e2e Supply Chain Optimization**

e2e Supply Chain Optimization provides better customer service quality at reduced cost

- Higher inventory turns and reduced inventory carrying cost through increased network collaboration
- Reduced lead time and higher on-time delivery performance through flexible sourcing and transportation optimization
- Reduced order-processing cost through online collaboration
- Increased profit through order fulfillment at optimal total cost and required customer service level
- Better customer service through perfect order matching, kitting and locating as well as instant price & delivery time quotation
- Sales increase from dynamic product/service bundling through integration into a fast and highly flexible distribution network
- Improvement of customer relations and loyalty through fast and individual fulfillment of customer needs

e2e Supply Chain Optimization leverages 'Economies of Networks'

- Participation of external business partners in the distribution process
- Shared asset utilization
- Increased speed and reach in combined fulfillment networks
- Higher delivery frequency
- Flexible adjustment of delivery service, late configuration and assembly and supplier component

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- Product demand life cycle portfolio mapped to geographical allocation
- Higher flexibility and higher revenue
- Collaborative and continuous network optimization makes network complexity manageable

### ***E2e Supply Chain Optimization key features and system environment***

#### **Location-based Collaborative Demand Forecasting**

Dynamically calculates order by order demand trends based on macro economic variables (e.g. positive trend in consumer spending that determines by market-share an increment in the demand for product) and micro economic indicators (e.g. projection on conditions in a given region for a given channel such as a temporary promotion and resulting product cannibalization effects).

#### **Price estimates.**

The first step in determining the price estimate consists in identifying the structure of the price functions. For example, to determine the price structure at a given time T, at a given region L for a given channel B, the price  $P(T,L,B)$  is principally basically determined as a function of the demand by product lifecycle at that region and (versus) the available and substitution product.

#### **Network Inventory**

Dynamically calculates target levels for all buffers based on significant changes to demand, demand error, lead-times, service levels and ordering frequencies. Changes are recommended based on overall inventory goals, substitution rules and storage priorities.

#### **Intelligent Replenishment**

Enables and optimizes intra- and inter-nodal direct materials replenishment in the supply network. Supports multiple models of material flow including push (VMI), pull, and mixed replenishment strategies by computing target inventory levels as a function of demand, demand variance, supply lead-time, supply variance, service levels, and order quantity rules. Using the target inventory levels, synchronizes material flows with real-time consumption information, determining what needs to be shipped, from where, to where, and when.

#### **Inventory Shortage Resolution**

The process of optimizing replenishment leads to discovering future shortage situations, thereby triggering shortage events. This invokes inventory resolution agents that evaluate the situation using a rule based reasoning approach.

#### **Material Allocation**

Multi-enterprise supply chain module that synchronizes material flows of individual components throughout the extended supply network. Based on an advanced collaboration model, it continuously reviews and adjusts planned material flows (inputs, outputs and inventories) of all participating key partners in a supply network. Designed to have key partners access via a Web browser and collaborate with their supply commitments in a secure and controlled environment

#### **Dynamic Lifecycle Analyzer**

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Optimization application designed to anticipate changes to the demand forecast in real time. By enabling real-time views and analysis of demand, it helps shape customer demand over a product's lifecycle curve to maximize revenue growth and profitability.

### ***Software Agents as the technological backbone of e2e Supply Chain Optimization***

Capgemini positions Adaptive Agent Modeling and Execution Optimization software as technology to more accurately reflect Capgemini's innovative approach to Adaptive Supply Chain Management. The marketplace has responded very favorably. Synchronizing traditional planning and execution systems through adaptive agent-based software allows companies to go above and beyond simple supply chain event management. By using intelligent agents, supply chain events can be managed real-time, in a flexible and situation-driven way to continuously synchronize demand with supply. A software agent is an intelligent software object that can be programmed to operate proactively to achieve predefined goals autonomously. The agent has sensory capabilities to gather information, logic reasoning to evaluate it and the authority and autonomy to act independently. Thus, it can monitor supply networks, consider new information, identify unexpected events, learn from previous results, and choose over their actions which will bring it closer to achieving its objectives. Deploying these agents throughout a supply-network (within and across companies) provides the means of real-time communication, optimization and execution.