



Supply Chain Optimization

Business scenarios and architecture

ARB-1399



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Supply Chain Optimization

Executive summary

Retailers, manufacturers, and organizations are exploring ways to better able to understand and act on changes in the market as they occur – to balance protecting margins, utilizing store and warehouse capacity and meeting delivery expectations. These sourcing decisions can dramatically increase profits, especially during peak periods.

In addition, organizations are exploring how to provide a more sustainable footprint. Organizations are looking to redefine an enterprise-wide approach to sustainability.

In this overview, we will discuss the business challenges, business value, and business outcomes and then provide automation and modernization actionable steps organizations can take to drive innovation and move toward a digital supply chain. Actionable steps will be developed through the lens of use cases on how the main risk factors can be transformed into opportunities.

To further describe the business problems and possible solutions a number of scenarios will be introduced.

- Demand risk
- Loss and waste management
- Product timeliness
- Perfect order
- Last mile delivery
- Sustainable supply chain

- Supply chain returns
- Disaster readiness

Fulfilment is the process of exceeding customer expectations when the customer receives their requested products, goods or services. The items must be made available in a suitable timeframe, at the correct location and in an acceptable condition.

Fulfilment optimization takes the fulfillment process a step further by using information and knowledge about the supply chain, inventory and stock positions to ensure any promises made to the customer are met or exceeded.

Inventory optimization is a collection of best practices for ensuring the retail organization maintains complete and accurate stock levels whilst balancing customer demand against current and future stock levels.

Sustainability in business refers to a company's strategy to reduce negative environmental impact resulting from their operations in a particular market. An organization's sustainability practices are typically analyzed against environmental, social, and governance (ESG) metrics.

The business goal is to balance the long-term imperative to protect the planet with the immediate need to preserve the bottom line.

Supply chain business challenges

Challenges, business value, and business outcomes

Chief Supply Chain Officers (CSCOs) face issues related to supply chain disruptions, technology infrastructure, sustainability, and market shifts as their greatest challenges. Yet when addressed with an open mindset, challenges create opportunities within the enterprise.

Enhanced customer experiences, improved profitability, and more predictive forecasts are high on CSCOs' priority lists according to a report by **IBM Institute for Business Value**, [Own your transformation: Data-led innovation](#) for the modern supply chain.

Challenges / Business Drivers

Challenges

- Addressing supply chain disruptions, technology infrastructure, sustainability and market shifts
- Using an open mindset to address challenges thereby create opportunities

Drivers

- Resilient inventory management systems handle unexpected events and disruption to ensure business success
- Right product at the right time, matching customer expectations
- Enhanced customer experience with inventory matching customer demand

“CEOs need to invest in risk intelligence and strategic foresight, creating a team of procurement super-forecasters equipped with the latest artificial-intelligence (AI)-powered sensing technology.”

Harvard Business Review

[Three steps to prepare your supply chain for the next crisis](#)

- Increased margins and improved net zero benefits due to reduce food waste and spoilage
- Perfect product delivery delighting customers

Business outcomes

- Business responds to unexpected changes in supply chain
- Increased customer satisfaction by meeting customer expectation for goods and delivery
- Profit, revenue increases due to reduce waste and spoilage
- Meets sustainability commitments reflected in brand awareness

Business value

Getting the inventory balance correct against current and future inventory across the enterprise leads to a successful and profitable retail business. Getting the balance wrong leads to failure and, in the worst case, the eventual collapse of the business.

Impact on KPIs

Innovators track well ahead of their peers when it comes to AI-enabled workflows for risk management and handling other predictions. And they expect continued development of these workflows and other capabilities over the next three years. [Innovator CSCOs report](#) developing digitized workflows and leveraging AI automation a full 95% more than their peers.

Innovators also stand out by leveraging data with AI and advanced analytics in demand management. CSCOs are applying AI and machine learning to the critical and strategic continuous planning elements of demand management and forecasting. A full 90% of Innovators use AI and advanced analytics in demand management and predictive forecasting, 18% more than their peers (76%).

Directly influence the following KPIs:

- Improve lost sales from stock out 4-8%
- Solution cost savings of 10%
- Increase stock turnover
- Reduce days on hand
- Manage lead time (maybe leading indicator of stock overage)
- Reduce holding cost
- Manage product risk/perishability/age
- Improve gross margin return on investment
- Reduce return rate
- Manage unusual events regarding weather, natural disaster, supply chain interruption
- Improve customer satisfaction

↑ 14%

of companies increased their sales and their profit margin during the past found US downturn, since 1985.

9 out of 10

investors found it is important for healthy companies to prioritize the building of business capabilities — even if it means lowering earnings-per-share guidance or delivering below consensus.

↑ Recovery

Companies that are well-prepared and as a result prosper in a crisis can expect to recover more quickly than their competitors.

Harvard Business Review

[Three steps to prepare your supply chain for the next crisis](#)

Solution overview

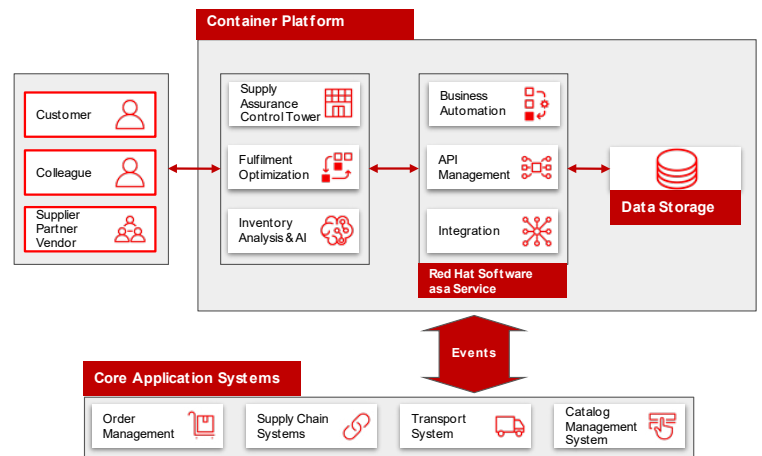
High level view and logical view

This solution combines existing systems with state-of-the-art offerings to:

- Create a world-class sensing and risk-monitoring operation
- Accelerate automation in extended workflows
- Amplify AI to make workflows smarter
- Modernize for modern infrastructures, scale hybrid cloud platforms

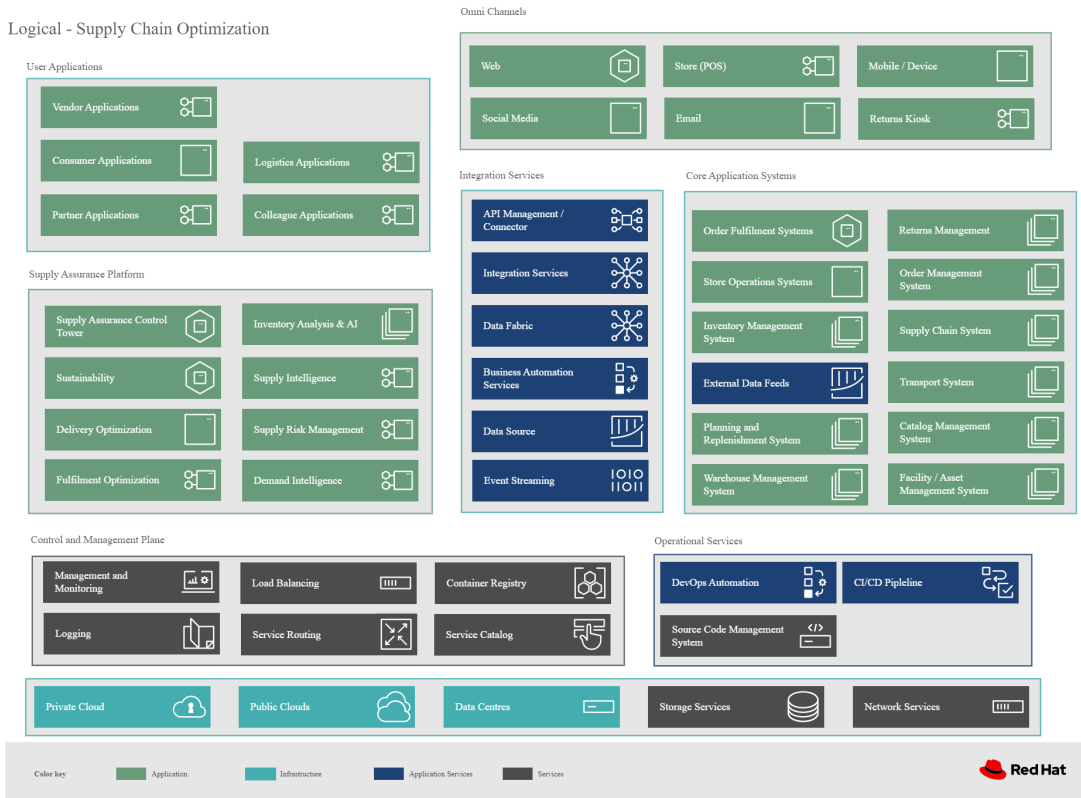
The solution uses the technologies, which can be grouped into three main categories as shown in the diagram:

- Core application systems. Often customer-provided technologies, such as order management, facilities management. These systems can be stand-alone applications, on premises and cloud services, databases
- Foundational infrastructure. The Red Hat®/IBM® solution is built on **Red Hat OpenShift®**. Data is routed through API management. Events are routed through business automation and integration tooling
- Inventory Optimization platform that includes a control tower, fulfillment optimization, and inventory analysis with AI



[This view of the high level system](#) addresses the business drivers

Logical - Supply Chain Optimization



Logical view

The technologies can be grouped into main categories.

User applications

Applications where supply chain activities are reported and used by customers, colleagues, suppliers, and logistics. In particular, the inventory controller interacts with the Inventory Optimization Platform, described in a following section.

Core application systems

Often customer-provided technologies, such as order management, facilities management. These include services, data, and systems currently used within the organization, such as:

- Point of Sale systems
- Store Operations Systems
- External Data Feeds
- Planning and Replenishment system
- Warehouse management
- Order management
- Supply chain system
- Transport system
- Catalog Management system
- Facility Asset Management system

Integration Services

Manages the events and data between systems, and includes:

- Integration services
- Data fabric
- Business automation
- DevOps
- API Management

Supply Assurance platform

Includes systems supporting:

- Supply assurance control tower
- Fulfillment optimization
- Inventory analysis and AI
- Supply intelligence
- Supply risk management
- Demand intelligence
- Sustainability

Omni Channels

- Web applications for users
- Point of sale applications in stores
- Mobility and device applications
- Social media
- Email
- Partner applications

Personas

The following stakeholders are example titles within the organization that are significant to Supply Chain Optimization.

Executive sponsors

- Global Supply Chain VP/Officer
- VP Global Supply Chain Operations
- IT Innovation
- eComm Inventory Controller
- Merchandize Logistics Manager
- Store Operations VP/Lead

Influencers

- Inventory Control Specialists
- Inventory management director
- Supply chain professional
- Store inventory manager
- Fulfillment manager
- Inventory analyst
- Financial control officer/controller
- Demand forecaster analyst
- Inventory planner

Operations

- Warehouse managers
- Logistics managers

The following represent users of the system outside of the organization.

- Customers
- Business partners
- Vendors
- Suppliers
- Transportation/logistics providers



Demand risk

Understock, overstock scenarios

To demonstrate the importance of inventory optimization for any business, we will focus on one of the main demand risk use cases: understock and overstock.

Use cases

Two main issues are represented by demand risk.

Understock refers to not holding sufficient inventory to meet current demand. This includes not having enough inventory today but also, not having enough inventory in the very near future that could be used to meet the demand. The end result is disappointed customers who order but don't get fulfillment or can't order due to lack of product. This "stock out" position often represents between 4-8% of total sales lost, but can also be a failed opportunity to satisfy customer in other ways, through up-sell and cross-sell. KPIs that can help avoid an under stock or stock-out position. include inventory turnover rate, days on hand and lead time (how long it takes to get more inventory from a supplier).

Overstock refers to holding more stock than required to meet current and future demand. This results in additional costs to store then dispose of overstocked items via discounts, selling at a loss or destruction. Whilst understock is measured in customer satisfaction and loss of future opportunity, overstock has direct impact on the bottom-line costs and profitability of the business.

KPIs relevant to overstock include, holding costs, dead stock (in-stock items failing to sell) and inventory turnover rates.

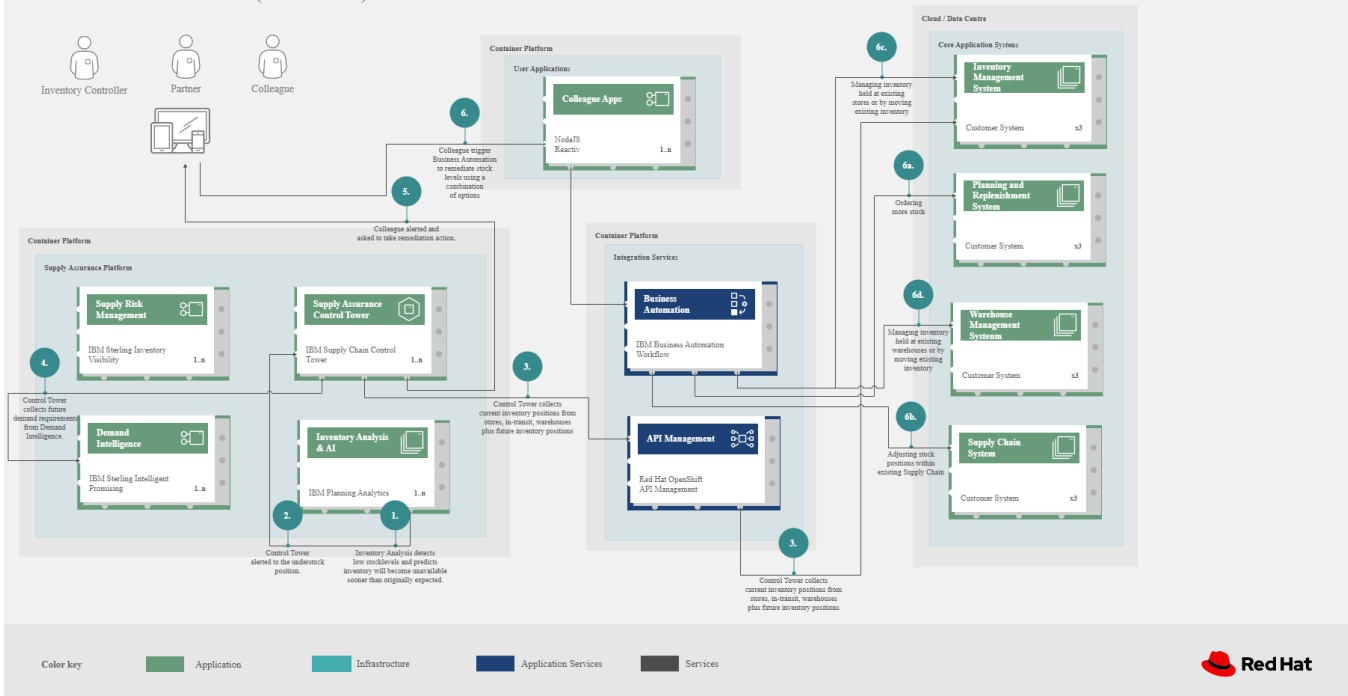
Challenges

- Maintaining inventory control of high value items to minimize loss and associated cost
- When stores receive inventory from warehouse or direct from suppliers, how to manage direct ship is a real challenge for each store as it has to be managed at the store level
- Forecasting inventory levels intelligently to meet customer demand
- Efficiently handle overstocking and understocking events

Drivers

- Inventory turnover - if improved by 2 or 3 times then will drive bigger profit
- Managing capacity - across the enterprise and with suppliers
- Enhanced customer experience with inventory matching customer demand
- Handling overstock and understock events

Schematic - Demand Risk (understock)



The [schematic](#) shows the set of workflow steps for understock scenario.

Understock schematic

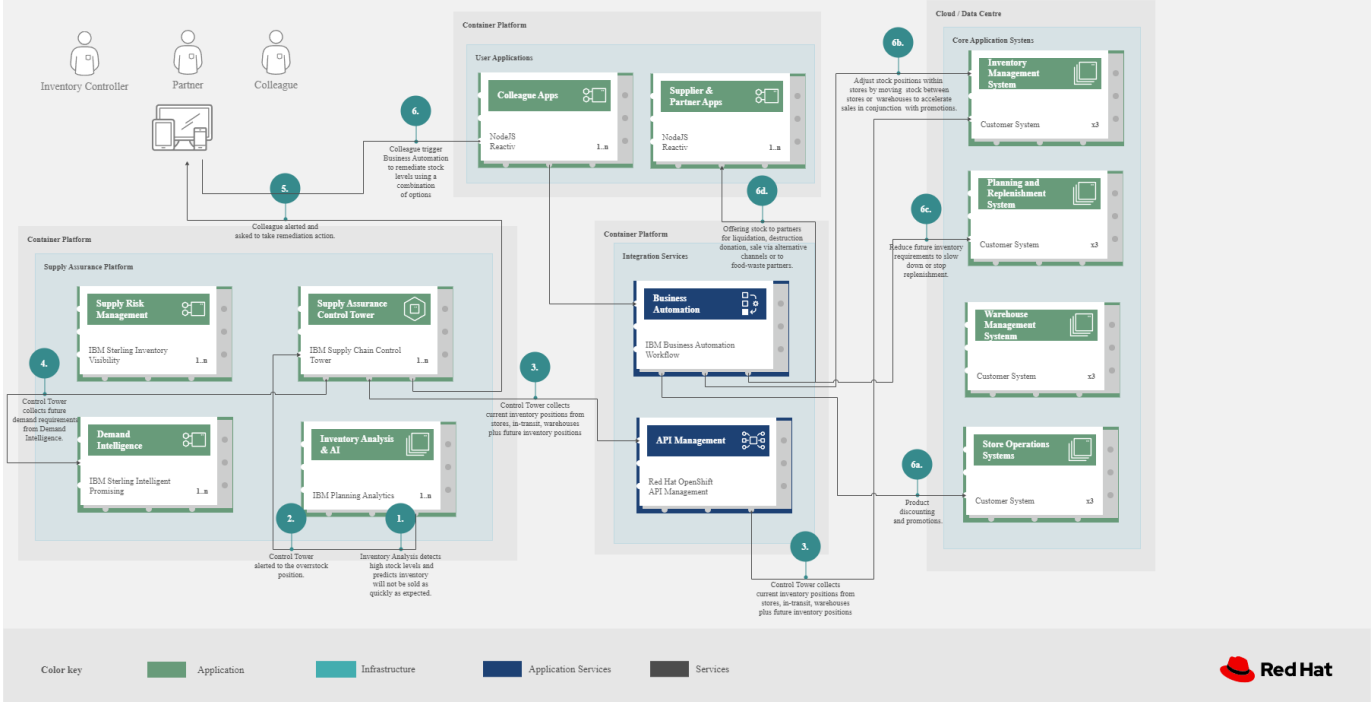
Understock workflow, where the lead time for supply is considered, such as:

order date - requirement date = order date + lead time to deliver + transit duration + customs clearance

The workflow steps:

1. Inventory Analysis detects low stock levels and predicts inventory will become unavailable sooner than originally expected
2. Inventory Control Tower alerted to the understock position
3. Inventory Control Tower collects current inventory positions from stores, in-transit, warehouses plus future inventory positions
4. Inventory Control Tower collects future demand requirements from Demand Intelligence
5. Colleague alerted and asked to take remediation action
6. Colleague triggers Business Automation to remediate stock levels using a combination of options, including:
 - a. Ordering more stock
 - b. Adjusting stock positions within existing Supply Chain
 - c. Managing inventory held at existing stores or by moving existing inventory
 - d. Managing inventory held at existing warehouses or by moving existing inventory

Schematic - Demand Risk (overstock)



The [schematic](#) shows the set of workflow steps for overstock scenario.

Overstock schematic

Overstock workflow steps:

1. Inventory Analysis detects high stock levels and predicts inventory will not be sold as quickly as expected
2. Inventory Control Tower alerted to the overstock position
3. Inventory Control Tower collects current inventory positions from stores, in-transit, warehouses plus future inventory positions
4. Inventory Control Tower collects future demand requirements from Demand Intelligence
5. Colleague alerted and asked to take remediation action
6. Colleague triggers Business Automation to remediate stock levels using a combination of options, including:
 - a. Product discounting and promotions
 - b. Adjust stock positions within stores by moving stock between stores or warehouses to accelerate sales in conjunction with promotions
 - c. Reduce future inventory requirements to slow down or stop replenishment
 - d. Offering stock to partners for liquidation, destruction, donation, sale via alternative channels or to food-waste partners

Business outcomes

- Improve inventory demand and forecasting
- Automated processes updating inventory in closer to real time
- Efficient, consistent decision making of overstock and understock

Action guide

From a high-level perspective, there are several main steps your organization can take to drive innovation and move toward a digital supply chain:

- Automation
- Sustainability
- Modernization

	Actionable step	Implementation details
Automation	Create a world-class sensing and risk-monitoring operation	Integrate data from multiple systems to get enterprise-wide view of changes in inventory demand. Monitor and analyze near real-time data
	Accelerate automation in extended workflows	In the Reduce out of stock (OOS) or approaching out of stock (AOOS) conditions, a SCIS Control Tower monitors inventory levels at all locations in a client's network and creates items in the work queue when revenue is at risk
	Amp up AI to make workflows smarter	When users are inspecting inventory items by drilling down on the item, users see where they have available inventory and receive recommendations about how much inventory can and should be transferred to the OOS / AOOS locations. These recommendations are based on adding automation and AI to make workflows smarter
Sustainability	Include sustainability commitments in decisions	Integrate sustainability metrics in overstock and understock decision making
Modernization	Modernization for modern infrastructures, scale hybrid cloud platforms	The decision for a future, Kubernetes-based enterprise platform is defining the standards for development, deployment and operations tools and processes for years to come and thus represents a foundational decision point

Loss and waste management

Environmental exceptions and product contamination or recall scenarios

A key focus when dealing with loss and waste management in relation to inventory optimization is how to handle unplanned or unforeseen situations causing an inventory item be considered damaged or spoiled. If the situation or problem is rectified within a well defined time window, there is a possibility of salvaging the product. In some cases once the incident occurs, there is no possibility of salvage and the product is considered damaged. Typically these events are external factors forced upon the business and cannot always be planned or predicted.

Use cases

The main use cases represented by loss management are:

Environmental Exceptions. An environmental issue or problem places the food product at risk. If the issue is not dealt with quickly and efficiently, the product will be spoiled making unavailable for sale to a consumer. Typically this would be a failure of refrigeration equipment or a loss of power to refrigeration equipment. If the temperature can be kept within a specific range, the product will remain suitable for sale to a consumer. If the temperature moves beyond the specified range for a set period of time, the product will be considered spoiled and no longer suitable for sale to a consumer.

Product contamination or recall. A contamination or recall requires the food product to be removed immediately from the inventory and supply chain. The contamination issue or recall

notice can come from external parties such as suppliers or food standards agencies, or through the retailer identifying an issue. Once the issue has been identified, the retailer must immediately remove all affected products from their own inventory and supply chain, then destroy or pass the product to a third party. The issue can be caused by foreign objects or the detection of selected bacteria in the product.

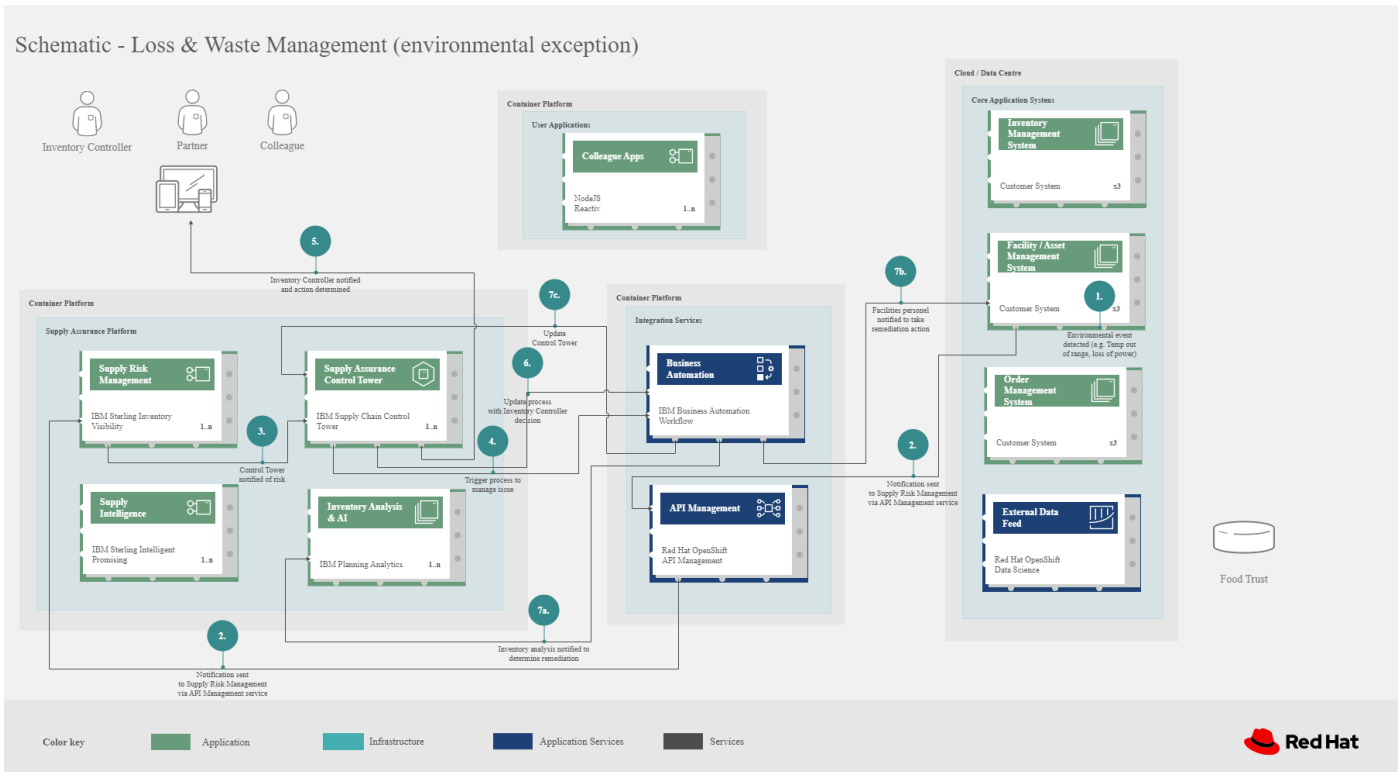
Challenges

Protect public health. Businesses that sell consumable products are expected to protect the public health by implementing specific processes to address food safety. Maintaining equipment that refrigerates or freezes food or pharmaceutical products for storage until purchase or combined into a recipe and responding to and documenting actions taken to a food safety recall notification by either the supplier or regulatory body are key challenges.

Regulatory compliance: Business that sell consumable products are expected to comply with local, state, and federal regulatory requirements for food and pharmaceutical products. Automated documentation of compliance is preferred over manual, error-prone documentation.

Drivers

- Inventory turnover - if improve by 2 or 3 times then will drive bigger profit
- Managing capacity - across the enterprise and with suppliers
- Enhanced customer experience with inventory matching customer demand
- Handling overstock and understock events



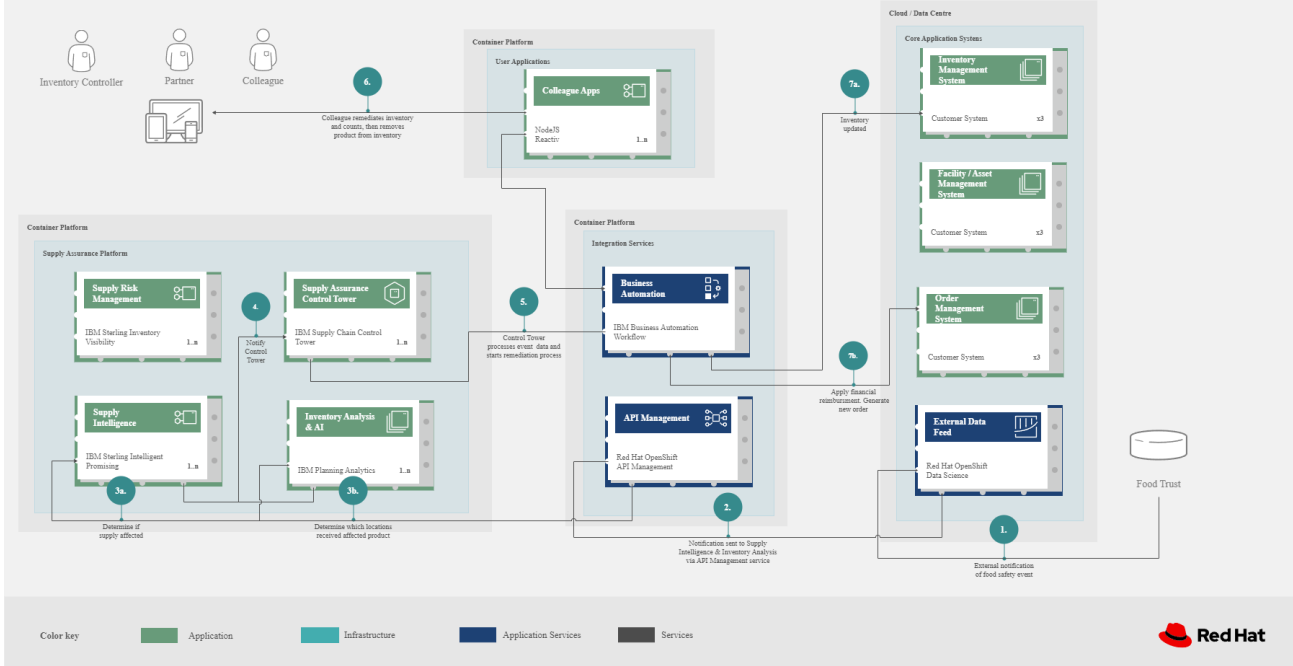
The [schematic](#) shows the set of workflow steps for environmental exception scenario.

Environmental exception schematic

Food Loss - Environmental Exception steps:

1. Environmental event detected (e.g., Temperature out of range or loss of power)
2. Notification sent to Supply Risk Management via API Management service
3. Inventory Control Tower notified of risk
4. Inventory Control Tower triggers process to manage issue
5. Inventory Controller notified and action determined
6. Update process with Inventory Controller decision
7. Remediation:
 - a. Inventory analysis notified to determine remediation
 - b. Facilities personnel notified to take remediation action
 - c. Update Inventory Control Tower

Schematic - Loss & Waste Management (contamination/recall)



The [schematic](#) shows the set of workflow steps for contamination/recall scenario.

Contamination/recall schematic

Food Loss - Contamination recall workflow steps:

1. External notification of food safety event
2. Notification sent to Supply Intelligence & Inventory Analysis via API Management service
3. Determine scope stock
 - a. Determine if supply affected
 - b. Determine which locations received affected product
4. Notify Inventory Control Tower
5. Inventory Control Tower processes event data and starts remediation action
6. Colleague remediates inventory and counts, then removes product from inventory
7. Remediation
 - a. Inventory updated
 - b. Apply financial reimbursement. Generate new order

Business outcomes

- Respond to unexpected events quickly
- Automated processes provide up-to-date transparently into inventory
- Risks mitigated

Action guide

From a high-level perspective, there are several main steps your organization can take to drive innovation and move toward a digital supply chain:

- Automation
- Sustainability
- Modernization

	Actionable step	Implementation details
Automation	Create a world-class sensing and risk-monitoring operation	Leveraging IOT/Edge devices, implement the ability to detect abnormal variations in temperature, power, water, machinery, and transportation to quickly react and correct
	Accelerate automation in extended workflows	Business automation provides a systematic way to notifications, documentation of notifications, and creation of work orders
	Amplify AI to make workflows smarter	For Damaged or potential issues products, Control Tower monitors inventory connections to multiple core application systems foster visibility, create items in the work queue when revenue is at risk. When drilling down on the item, users can see where they have available inventory and receive recommendations about how much inventory can and should be ordered for replacement based on demand
Sustainability	Include sustainability commitments in decisions	Integrate sustainability metrics in decision making, including waste disposal
Modernization	Modernization for modern infrastructures, scale hybrid cloud platforms	The decision for a future, Kubernetes-based enterprise platform is defining the standards for development, deployment and operations tools and processes for years to come and thus represents a foundational decision point

Product timeliness

Shelf life and product relevance scenarios

Foods and ingredients expire or become unusable at some point. Manufactured parts and goods also experience decay and deterioration. Each of these may be measured. Other products, particularly pharmaceuticals, must be used within specific time frames to be warranted or to be considered safe and effective.

Manufactured parts may be warranted for specific periods or number of uses. For example, manufactured parts must be replaced when outside of certain tolerances.

Use cases

How should a business track and respond to issues?

- Responding to Shelf life defines a set of actions to be taken with products that expire on specific dates and must be removed from use or sale. For example, food can expire and need to be removed from shelves
- Relevance defines a set of actions that can be taken when products are no longer relevance, possibly due to seasonality, but that may be still have some benefit. For example, seasonality of clothing can be warehoused until the following year

In both shelf life and relevance, you will want to plan and to take proactive steps in anticipation of product expirations.

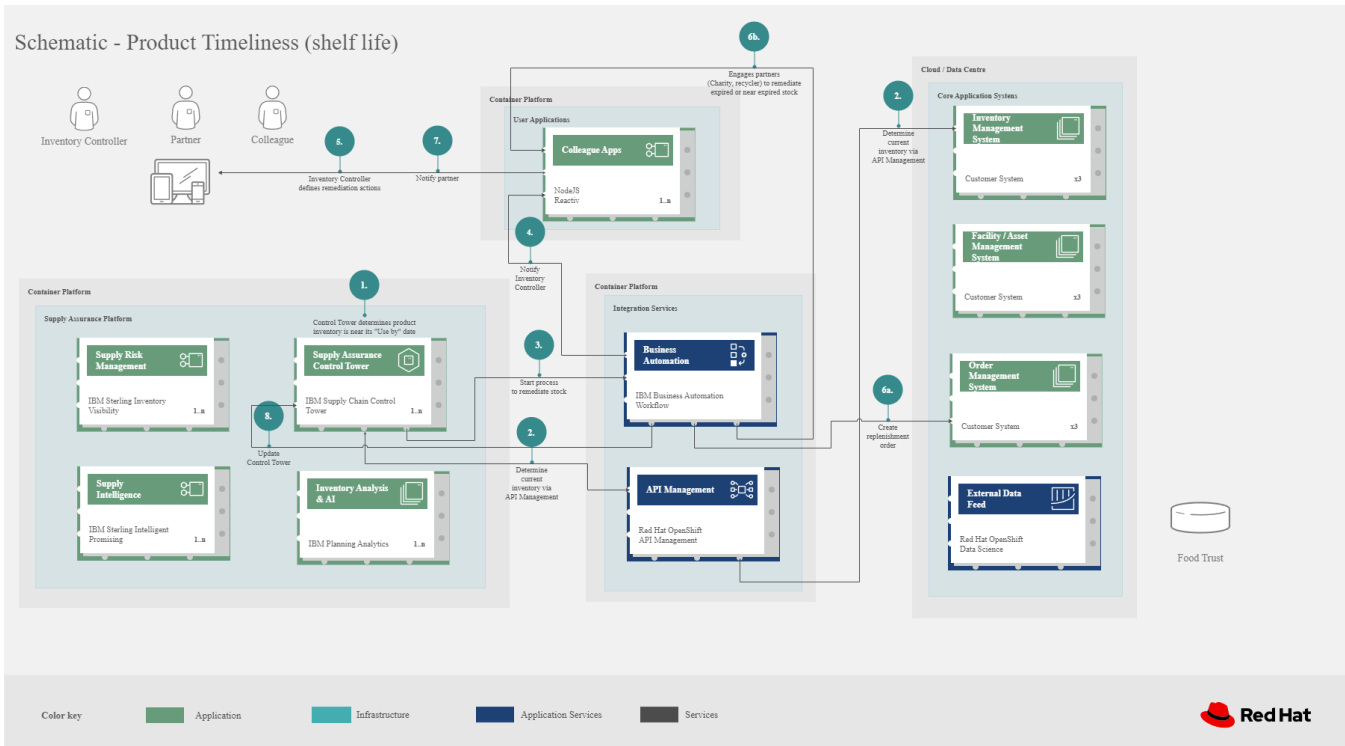
Challenges

Protect public safety by automating tracking and remediating items for shelf life and relevance

Mitigate risks through specific actions, such as product removal, replacement, work order tracking to demonstrate the product is handled with due care.

Drivers

- Improve public safety through automated shelf life tracking and management
- Reduce product liability claims through automation and AI
- Demonstrate due diligence for safety
- Identify and manage stock with reducing relevance to reduce monetary loss



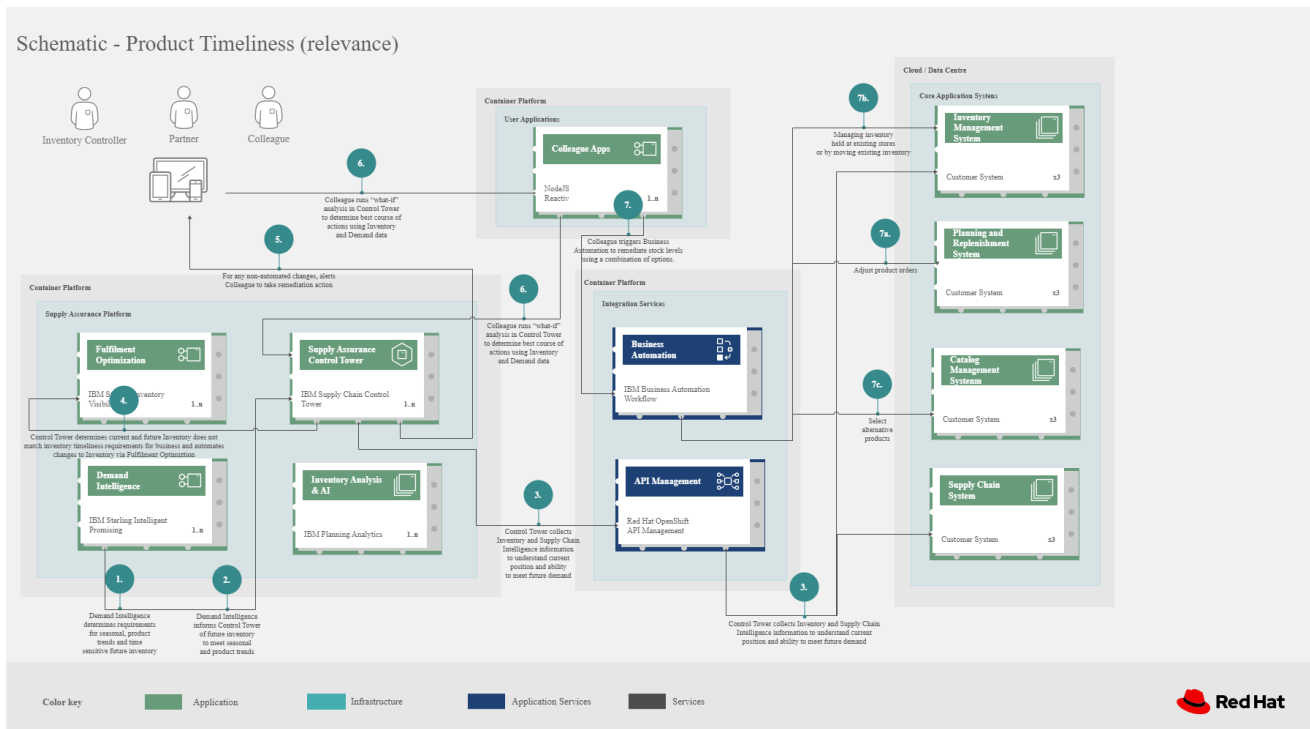
The [schematic](#) shows the set of workflow steps for shelf life scenario.

Shelf life schematic

Workflow for shelf life scenario:

1. Inventory Control Tower hueristics determines product inventory is near its “Use by” date
2. Inspects current inventory
3. Notifies the Inventory Controller to take action
4. Creates replenishment order
5. Engages partners (charity, recycler) to remediate expired or near expired stocks process to manage issue

Schematic - Product Timeliness (relevance)



The [schematic](#) shows the set of workflow steps for the product relevance scenario.

Product relevance schematic

The workflow steps for product relevance:

1. Demand Intelligence determines requirements for seasonal, product trends and time sensitive future inventory
2. Demand Intelligence informs Control Tower of future inventory to meet seasonal and product trends
3. Control Tower collects Inventory (3a) and Supply Chain Intelligence (3b) information to understand current position and ability to meet future demand
4. Control Tower determines current and future Inventory does not match inventory timeliness requirements for business and automates changes to Inventory via Fulfilment optimization
5. For any non-automated changes, alerts Colleague to take remediation action
6. Colleague runs “what-if” analysis in Control Tower to determine best course of actions using Inventory and Demand data
7. Colleague triggers Business Automation to remediate stock levels using a combination of options, including
 - a. Adjust product orders
 - b. Managing inventory held at existing stores or by moving existing inventory
 - c. Select alternative products

Business outcomes

- Proactively protect public safety
- Mitigate product liability claims
- Demonstrate due diligence for safety
- Reduce monetary loss due to reduced relevance

Action guide

From a high-level perspective, there are several main steps your organization can take to drive innovation and move toward a digital supply chain:

- Automation
- Sustainability
- Modernization

	Actionable step	Implementation details
Automation	Create a world-class sensing and risk-monitoring operation	Integrate data from multiple systems to get enterprise-wide view of changes in inventory demand. Monitor and analyze near real-time data
	Accelerate automation in extended workflows	Provide actionable tasks, work orders, visibility for workers and supply chain partners to remove end of life items. Proactively replace items in response to product timeliness
	Amplify AI to make workflows smarter	For expiring products, Control Tower monitors inventory levels at all locations in a client’s network and creates items in the work queue when revenue is at risk. When drilling down on the item, users can see where they have available inventory and receive recommendations about how much inventory can and should be ordered for replacement based on demand
Sustainability	Include sustainability commitments in decisions	Integrate sustainability metrics in handling goods removed from stock
Modernization	Modernization for modern infrastructures, scale hybrid cloud platforms	The decision for a future, Kubernetes-based enterprise platform is defining the standards for development, deployment and operations tools and processes for years to come and thus represents a foundational decision point

Perfect order

Shelf life and product relevance scenarios

Managing inventory efficiently is critical to any business that sells physical goods, is responsible for maintenance, repair and operations (MRO) supplies.

Inventory management encompasses procedures and processes that directly or indirectly affect the bottom line — ordering, receiving, storing, tracking and accounting for all of the goods a business sells. It is a key element of supply chain management.

Business problem

Inventory visibility. Multichannel order fulfillment operations typically have inventory spread across many places throughout the supply chain. Inventory visibility is knowing what inventory you have and where it is located. Businesses need an accurate view of inventory to guarantee fulfillment of customer orders, reduce shipment turnaround times, and minimize stockouts, oversells and markdowns.

Orders may not match available inventory. Inventory may not be on hand or in a different location than expected. Multiple and partial shipments may be able to solve many customer requests.

Challenges

Inventory visibility. Multichannel order fulfillment operations typically have inventory spread across many places throughout the supply chain. Inventory visibility is knowing what inventory you have and where it is located. Businesses need an accurate view of inventory to guarantee fulfillment of customer orders, reduce shipment turnaround times, and minimize stockouts, oversells and markdowns.

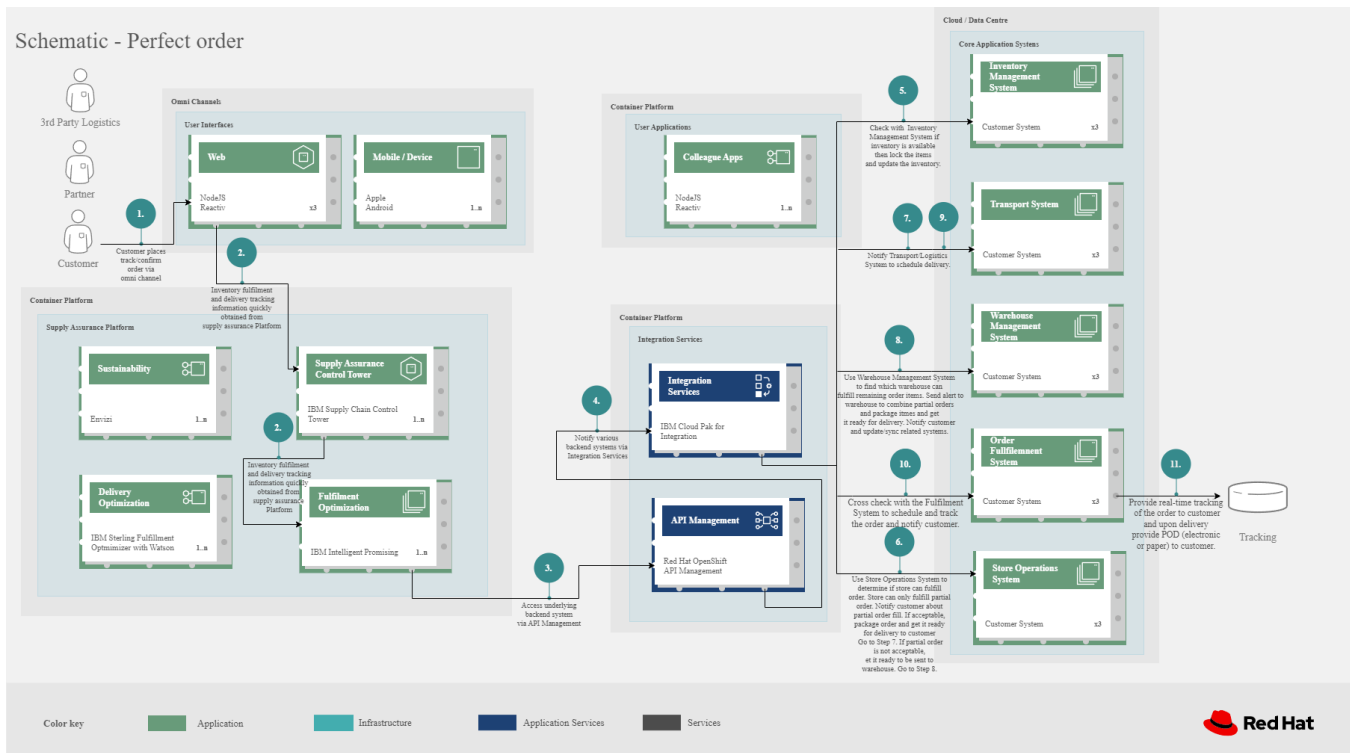
Orders may not match available inventory. Inventory may not be on hand or in a different location than expected. Multiple and partial shipments may be able to solve many customer needs.

Spreadsheets, hand-counted stock levels and manual order placement have largely been replaced by advanced inventory tracking software. An inventory management system can simplify the process of ordering, storing and using inventory by automating end-to-end production, business management, demand forecasting and accounting.

Drivers

- Supply chain operators will use technologies that provide significant insights into how supply chain performance can be improved
- Eliminate “out of stock” occurrences

- Optimizes inventory costs by balancing inventory to operational demand
- Improve stock allocation to improve space utilization
- Reduce dormant/non-moving inventory
- Have an accurate assessment of critical spares and the money invested in those parts
- Deliver transparency and visibility to critical and non-critical spares inventory for the organization
- Reduce time spent looking for and ordering parts
- Accelerate disposal of obsolete materials



The [schematic](#) shows the inventory management scenario for a perfect order with responses for cases where the order is not perfect.

Perfect order schematic

Workflow for shelf life scenario:

1. Customer places/track/confirm order thru omni channel
2. Inventory fulfilment, and delivery tracking information is quickly obtained from supply assurance platform
3. Access underlying backend system via API Management
4. Notify various backend systems via the Integration Services
5. Check with the Inventory Management System if inventory is available then lock the items and update the inventory
6. Use Store Operations System to determine if store can fulfill order. Store can only fulfill partial order. Notify customer about partial order fill. If acceptable, package

- order and get it ready for delivery to customer. Go to Step 7. If partial order is not acceptable, get it ready to be sent to warehouse. Go to Step 8
7. Notify Transport/Logistics System to schedule delivery
8. Use Warehouse Management System to find which warehouse can fulfill remaining order items. Send alert to warehouse to combine partial orders and package items and get it ready for delivery. Notify customer and update/sync related systems
9. Update Transport/Logistics System to schedule delivery
10. Cross check with the Fulfillment System to schedule and track the order and notify customer
11. Provide real-time tracking of the order to customer and upon delivery provide POD (electronic or paper) to customer

Business outcomes

- Proactively protect public safety
- Mitigate product liability claims
- Demonstrate due diligence for safety
- Reduce monetary loss due to reduced relevance

Action guide

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- Sustainability
- Modernization

	Actionable step	Implementation details
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	Accelerate automation in extended workflows	Provide actionable tasks, work orders, visibility for workers and supply chain partners to remove end of life items. Proactively replace items in response to product timeliness.
	Amp up AI to make workflows smarter	For expiring products, Control Tower monitors inventory levels at all locations in a client's network and creates items in the work queue when revenue is at risk. When drilling down on the item, users can see where they have available inventory and receive recommendations about how much inventory can and should be ordered for replacement based on demand
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Modernization	Modernization for modern infrastructures, scale hybrid cloud platforms	The decision for a future, Kubernetes-based enterprise platform is defining the standards for development, deployment and operations tools and processes for years to come and thus represents a foundational decision point

Last mile delivery

Intelligent order and delivery optimization scenarios

Last mile delivery, also known as last mile logistics, is the transportation of goods from a distribution hub to the final delivery destination — the door of the customer. The goal of last mile delivery logistics is to deliver the packages as affordably, quickly and accurately as possible.

The last mile describes the difficulty of getting goods (especially large and bulky ones) from a transportation hub to their final destination. Delivery might include installation and configuration while providing an excellent experience at the same time.

Intelligent order is a process that uses inventory management systems and AI to provide effective last mile delivery.

Business problem

If the last mile promise to delivery or tracking information is incorrect and a product arrives late, there is a good chance that the customer will shop with a competitor next time.

Use cases

- Consumers are purchasing more products online
- Consumers are placing more emphasis on after sales services

- New service providers are entering the market; reshaping the landscape
- Logistics costs are increasing, while product prices are eroding
- Proof of delivery

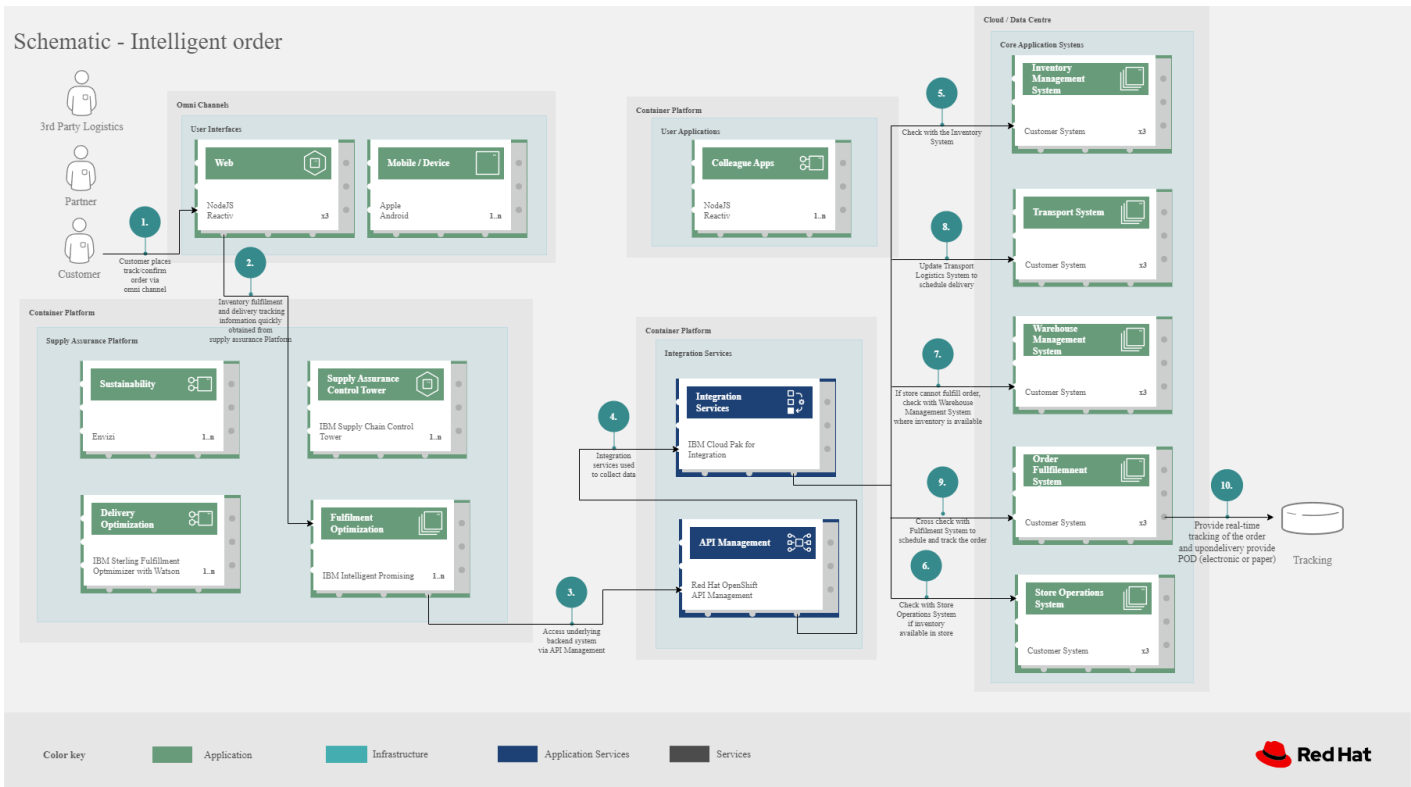
Challenges

- Consumer demand for delivery as promised
- Consumers wanting control of delivery and return processes
- Logistics costs in providing last mile delivery
- Logistics ecosystem complexity

Drivers

- Increasing deliveries direct to consumer
- Need for delivery price-point optimization and improvement
- Customer satisfaction to drive repeat business

Schematic - Intelligent order



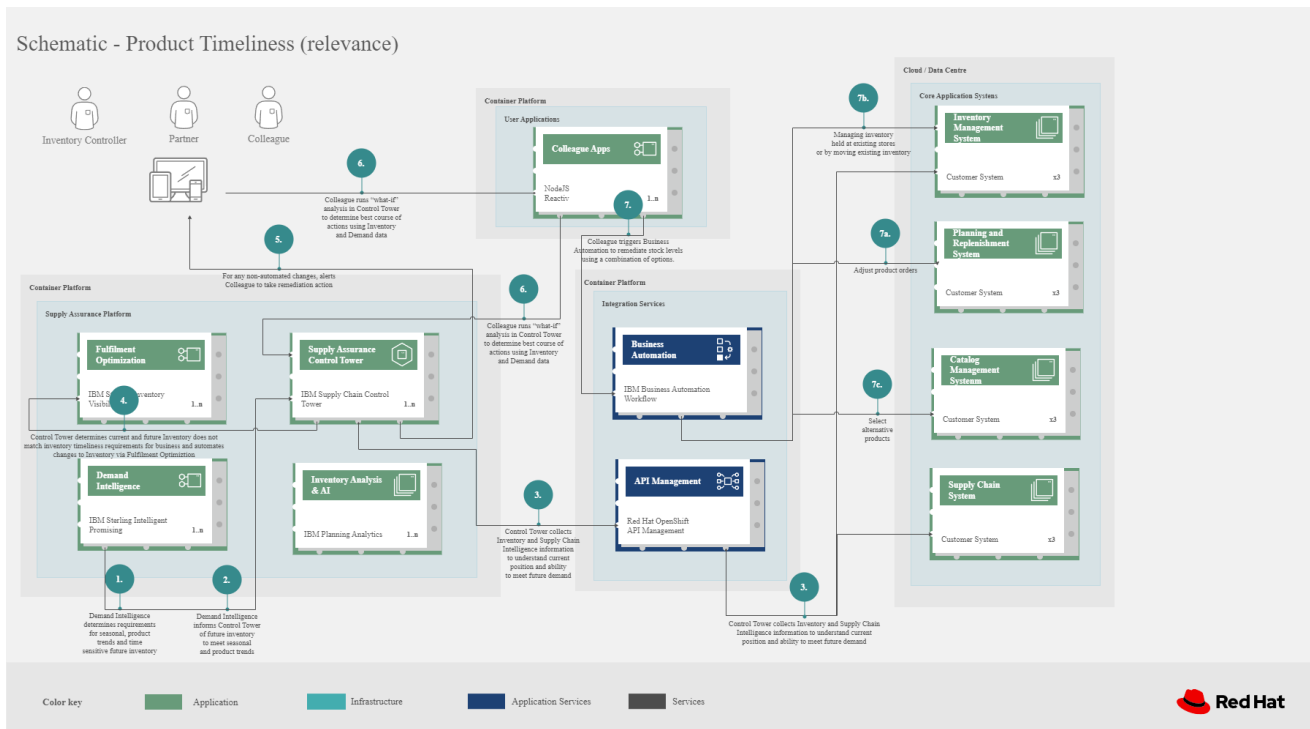
The [schematic](#) shows the last mile delivery scenario that includes AI that defines *intelligent order* scenario.

Intelligent order schematic

Workflow for intelligent order scenario:

1. Customer places/track/confirm order thru omni channel
2. Inventory fulfilment, and delivery tracking information is quickly obtained from supply assurance platform
3. Access underlying backend system via API Management
4. Integration services
5. Check with the Store Operations System if inventory available in store
6. If store cannot fulfill order, check with Warehouse Management System where inventory is available
7. Update Transport/Logistics System to schedule delivery
8. Cross check with the Fulfillment System to schedule and track the order
9. Provide real-time tracking of the order and upon delivery provide POD (electronic or paper)

Schematic - Product Timeliness (relevance)



The [schematic](#) shows the set of workflow steps for the delivery optimization scenario.

Delivery optimization schematic

The workflow steps for delivery optimization:

1. Customer chooses items to buy online using the business app
2. Determine sustainability posture by determining ESG indicator values
3. Before providing cost and delivery options, provide customer sustainability options – equivalent greener items, later delivery day, pickup option, etc. If customer opts into sustainability option order is tagged so Supply Assurance Platform can honor that request
4. Inventory fulfilment system updates inventory data
5. Delivery Optimization system plays a key role in sustainability play. It determines whether to contact 3PL or if in-house Route Optimization can fulfill the requirements
6. If 3PL is the only option, contact the sustainability approved 3PL company to fulfill the order. 3PL company takes over the delivery flow from here. If business has the means to fulfill the order continue with next Step 6a
 - a. Access underlying backend system via API Management
7. Alert the Order Fulfilment System (OFS) this special order via system APIs
8. OFS notifies the Warehouse Management System to package and get it ready for delivery
9. The Transport/Logistics System is alerted to schedule delivery
 - a. Track the order, notify customer and provide real-time tracking
 - b. Delivery department maintains the sustainability posture and upon final delivery provides POD (electronic or paper) to customer
10. All sub-systems are updated via the data fabric that helps maintain a consistent view

Business outcomes

- Decrease waste. Decrease order fragmentation and waste with decrease in packages per order
- Order optimization. In-stock improvement through holiday season using Order Optimizer
- Reduce costs. Reduced costs and emissions by housing software on the cloud more efficiently than on-premises
- Minimize disruption. Gain visibility to minimize disruption to business despite supply and demand shocks
- Returns optimization. Returns refurbished to create a revenue stream by re-circulation, refurbishment, repairs thereby reducing disposal and recycling costs

Action Guide

From a high-level perspective, there are several main steps your organization can take to drive innovation and move toward a digital supply chain:

- Automation
- Sustainability
- Modernization

	Actionable step	Implementation details
Automation	Create a world-class sensing and risk-monitoring operation	Delivering greater certainty, choice and transparency to shoppers to enhance shopping experiences, improve digital and in-store conversion, and increase omnichannel revenue
	Accelerate automation in extended workflows	Combine inventory and capacity visibility with sophisticated fulfillment decisioning to maximize inventory productivity, make reliable and accurate order promises, and optimize fulfillment decisions at scale
	Provide visibility across multiple systems	Build a global view of real-time inventory, including available-to-promise (ATP) inventory, capacity to process orders at different location, and transportation availability
	Amp up AI to make workflows smarter	Optimize fulfillment execution and inventory levels to improve cost-to-serve and balance operations with industry-leading machine learning technology. Use AI with learned sell-through patterns to understand potential stockouts, demand shifts, markdowns, shipping costs, labor costs, and capacity so that retailers can make sourcing decisions that balance costs and service
Sustainability	Include sustainability commitments in decisions	Include sustainability KPIs in the selection of delivery methods
Modernization	Modernization for modern infrastructures, scale hybrid cloud platforms	The decision for a future, Kubernetes-based enterprise platform is defining the standards for development, deployment and operations tools and processes for years to come and thus represents a foundational decision point

Sustainable supply chain

Customer return to inventory scenarios

A common definition of *environmental sustainability* is meeting the resource and services needs of current and future generations without compromising the health of the ecosystems that provide them. In addition to ongoing discussions around government regulation, investors and asset managers are increasingly demanding carbon disclosure from their portfolio companies.

Business problem

Meet consumer demands by modernizing IT for the retail and consumer packaged goods (CPG) industry.

Use cases

Provide sustainable product and delivery options for customers as part of building sustainability into the supply chain more broadly.

Challenges

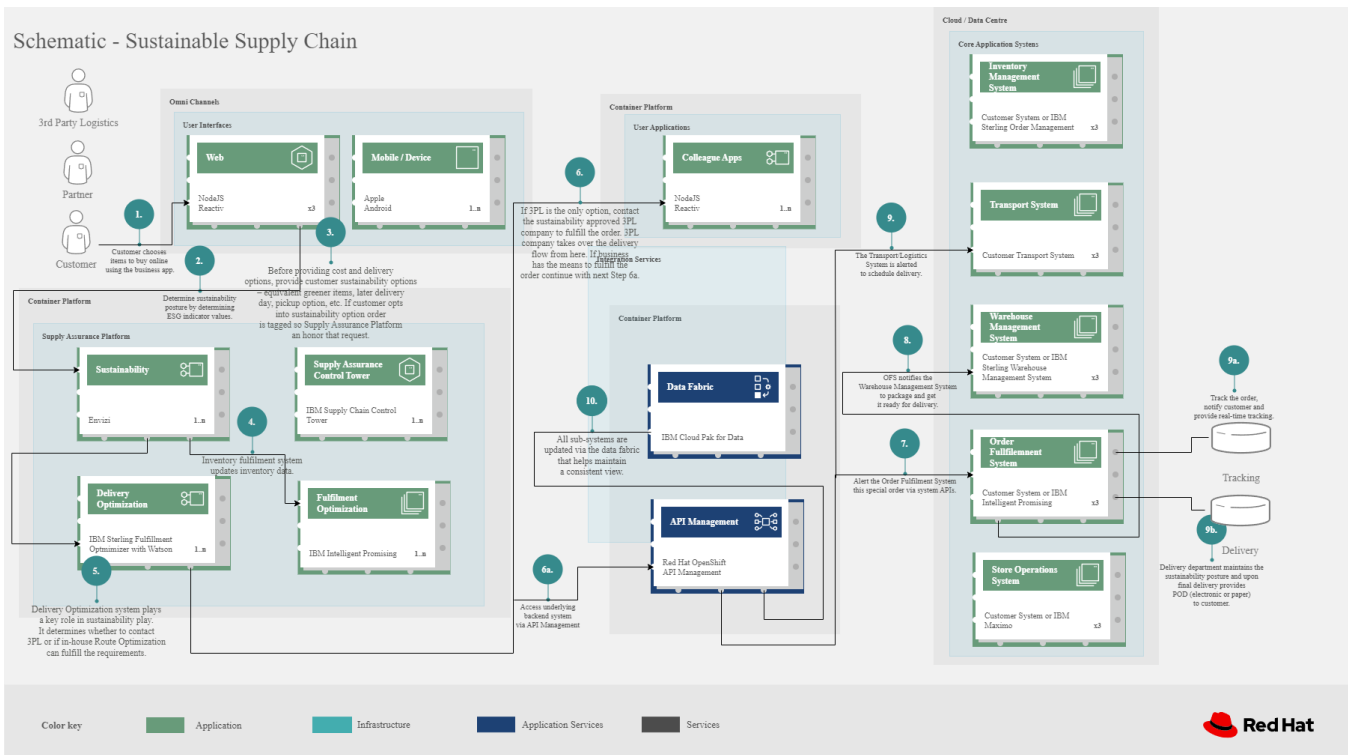
Becoming a truly sustainable business isn't easy. But simply ignoring sustainability is increasingly no longer tenable. Four challenges are:

- Upfront costs to becoming a sustainable business
- Difficulty in measuring and demonstrating that you are lowering greenhouse gas emissions
- Customers may not be willing to pay a potential premium for sustainable products
- Creating a lower emissions business given it affects all business processes and departments

Drivers

Several business drivers encourage businesses to become more sustainable—not least of which is that it can be good for the bottom line. These include:

- Increase the creation and use of sustainable products and provide sustainable customer choices
- Eliminate wasteful processes that don't deliver value to the business or customers
- Identify and monitor energy and emissions savings opportunities to accelerate decarbonization
- Enhance the customer experience with eco-friendly packaging
- Improve brand awareness by being known as a sustainable business
- Meet customer requirements for environmental sustainability and reporting—for example with green-energy delivery fleets



The sustainable supply chain [schematic](#) shows the flow of a typical sustainability use case. While the customer is the main focus, partners or suppliers and third-party logistics (3PL) companies could be involved.

Sustainable supply chain schematic

A customer kicks the process off by choosing items to buy online through a channel of their choosing. Before providing cost and delivery options, the business may provide the customer with sustainability options such as equivalent greener items, a later delivery day or batching with other orders, pickup options, and so forth. If a customer opts for any of these options, the order is tagged so the Supply Assurance Platform can honor that request. The Inventory Fulfillment System updates inventory data.

The Delivery Optimization System plays a key sustainability role. For example, it determines whether to contact 3PL (Third Party Logistics) or if in-house Route Optimization can fulfill the requirements. If 3PL is the only option, contact the sustainability-approved 3PL company to fulfill the order. 3PL company takes over the delivery flow from here. If the business has the means to fulfill the order, access the underlying backend system via API Management.

Otherwise, the Order Fulfillment System (OSF) is alerted of this special order via system APIs. OSF then notifies the Warehouse Management System to package and get it ready for delivery and the Transport/Logistics System is alerted to schedule delivery. The order is tracked in real-time and the customer is notified. Upon final delivery, proof-of-delivery is provided to the customer and all subsystems are updated via the data fabric to help maintain a consistent view of the supply chain and inventory.

Business outcomes

Environmental sustainability in organizations takes many forms including power consumption and using renewable sources where possible, deploying infrastructure that reduces greenhouse gas emissions, preserving water resources, and eliminates waste, and generally balances the environmental costs associated with changes to processes and technologies with the benefits delivered.

The business can determine its sustainability posture by determining the appropriate ESG indicator values. ESG metrics are indicators of a company's overall performance and risk profile across important environmental (E), social (S), and governance (G) criteria. ESG metrics can be based on ESG and sustainability reporting standards, ESG rating frameworks from investors or analysts, or regulations like the European Union's Corporate Sustainability Reporting Directive (CSRD).

Operating dynamic and efficient supply chains to empower a circular economy, encourage reuse and recycling, design out waste, promote sustainable consumption, and protect natural resources is of particular relevance to the use case covered by this portfolio architecture.

Action Guide

From a high-level perspective, there are several main steps your organization can take to drive innovation and move toward a digital supply chain:

- Automation
- Sustainability
- Modernization

	Actionable step	Implementation details
Automation	Integrate suppliers in business-sustainable commitment	Integrate data from multiple systems to get enterprise-wide view of returns of items in inventory demand. Monitor and analyze returns in real-time
	Improve decisions using AI for greener outcomes	Incorporate sustainability considerations into automated workflows, including product ordering, delivery, supply replacement, and timeliness
Sustainability	ESG data collection, analysis, and reporting	Maintain data-driven view into both sustainability progress towards goals and problem areas.
Modernization	Build cloud-native infrastructures and scalable hybrid cloud platforms	The decision for a future, Kubernetes-based enterprise platform is defining the standards for development, deployment and operations tools and processes for years to come and thus represents a foundational decision point

Supply chain returns

Customer return to inventory scenarios

Evolving customer expectations have forced retailers to figure out how to better manage the ripple effects that the current global crisis has created. This includes the realm of returns.

Business problem

Meet consumer demands by modernizing IT for the retail and consumer packaged goods (CPG) industry.

Use cases

- Manage return policies and manage customer expectations.
- Minimizing return losses
- Categorize return items for recycle, dispose, or return for sales
- Determine fraudulent returns
- Identify and track returns items with hazardous materials

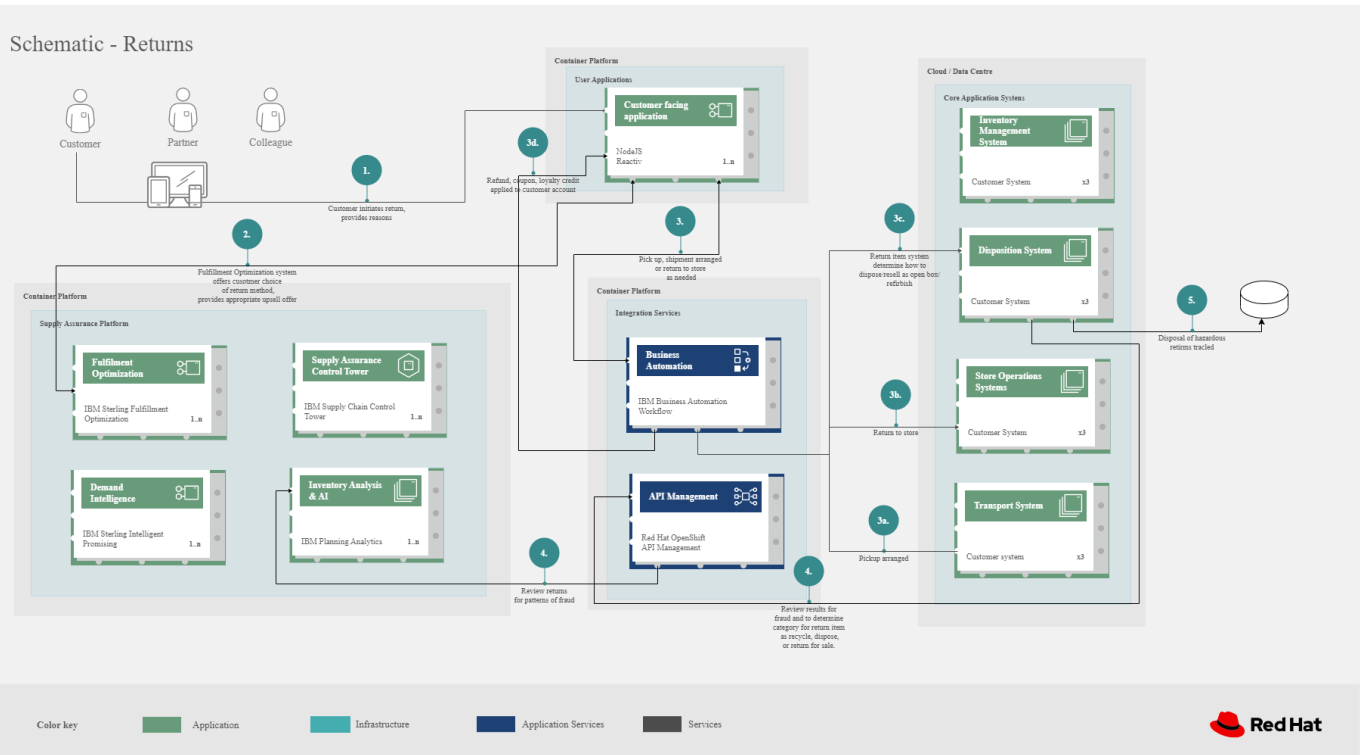
Challenges

- Making returns easy for consumers is a way to create a loyal customer.
- Minimizing returns losses by:
 - Sell the right item
 - Save the sale
 - Smart returns

- Predict returns
- Buy online, pick up (or return) in-store
- Virtual or personal shopping
- Process returns quickly and efficiently, reducing the amount of time and employee hours spent
- Identify fraudulent returns:
 - Returning stolen merchandise
 - Receipt fraud
 - Employee fraud
 - Price switching
 - Price arbitrage
 - Switch fraud
 - Bricking
 - Cross-retail return
 - Open-box fraud
 - Wardrobing

Drivers

- Increase customer loyalty with appropriate returns policies
- Minimizing returns losses
- The return process is an opportunity to upsell
- Identify fraudulent returns
- Provide sustainable transport of returned items
- Demonstrate proper disposal of hazardous material returns



The [schematic](#) shows a returns scenario.

Returns schematic

Returns workflow steps:

1. Customer initiates return, provides reason at a kiosk, store, or mobile application
2. Set customer expectation of refund, store credit, or upsell
3. Business automation orchestrates, return item process
 - Item is picked up and returns to a warehouse or store location
 - The item is returned to a location
 - Disposition system determines whether item is for disposal, resell as open box, refurbish based on business rules
4. Review return for fraudulent return patterns
5. Track hazardous material disposal

Business outcomes

- Determine return policy suitable by item
- Setting and meeting customer expectations on returned items
- Enhance loyalty of customers
- Minimize losses by having fewer returns
- Identify items for resale, open box, refurbish, resale, donation to charity
- Hazardous materials handled properly

Action Guide

From a high-level perspective, there are several main steps your organization can take to drive innovation and move toward a digital supply chain:

- Automation
- Sustainability
- Modernization

	Actionable step	Implementation details
Automation	Create a world-class sensing and risk-monitoring operation	Integrate data from multiple systems to get enterprise-wide view of returns of items in inventory demand. Monitor and analyze returns in real-time
	Accelerate automation in extended workflows	Automate returns policy for consistency across the enterprise and customize based on item
	Amp up AI to make workflows smarter	<ul style="list-style-type: none"> – Use AI to identify product deficiencies that lead to return patterns, generate upsell recommendations, identify fraud patterns, and recommend sustainable transport options for return items – Use AI to determine likely returned items – Use AI to identify fraudulent returns
Sustainability	Include sustainability commitments in decisions	Integrate sustainability metrics in returns decision making, especially return items transport or disposal
Modernization	Modernization for modern infrastructures, scale hybrid cloud platforms	The decision for a future, Kubernetes-based enterprise platform is defining the standards for development, deployment and operations tools and processes for years to come and thus represents a foundational decision point

Disaster readiness

Customer return to inventory scenarios

Companies are facing natural disasters and extreme weather conditions, including those impacted by:

- Climate, such as hurricanes, typhoons, floods, earthquakes, wildfires, droughts
- Acts of terrorism or violence, including active shooter situations; energy shortages
- Public health issues, including pandemics and quarantines
- Each can negatively affect your supply chain operations and financial performance

Business problem

How your organization can prepare for business disruption, including

- Preparations when a weather event is anticipated
- How systems can work together to mitigate the business disruption when facilities become disconnected from corporate data centers.

Use cases

Events could result in physical damage to our properties, limitations on store operating hours, less frequent visits by members to physical locations, the temporary closure of warehouses, depots, manufacturing or home office facilities,

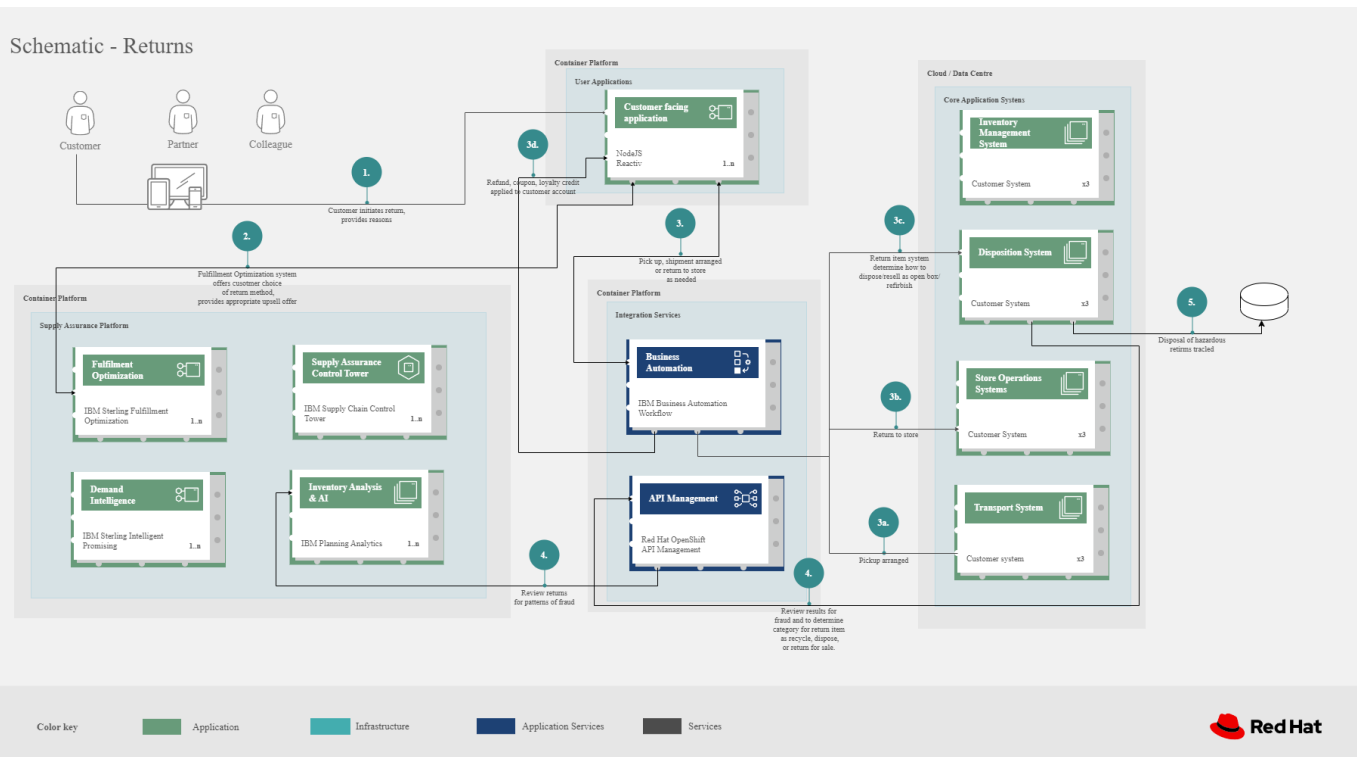
the temporary lack of an adequate work force, disruptions to our IT systems, the temporary or long-term disruption in the supply of products from some local or overseas suppliers, the temporary disruption in the transport of goods to or from overseas, delays in the delivery of goods to our warehouses or depots, and the temporary reduction in the availability of products in our warehouses.

Challenges

- Identify exposure to risk associated with parts and suppliers
- Prioritize and allocate resources effectively
- Invest in mitigation strategies such as booking logistics capacity

Drivers

- Monitor for disruptive environmental conditions
- Predict potential impacts of climate change and weather
- Reconfigure supply chain Some critical but vulnerable suppliers will go out of business
- Reposition inventory
- Route deliveries around impacted areas
- Continuous operation when store are disconnected from corporate data center

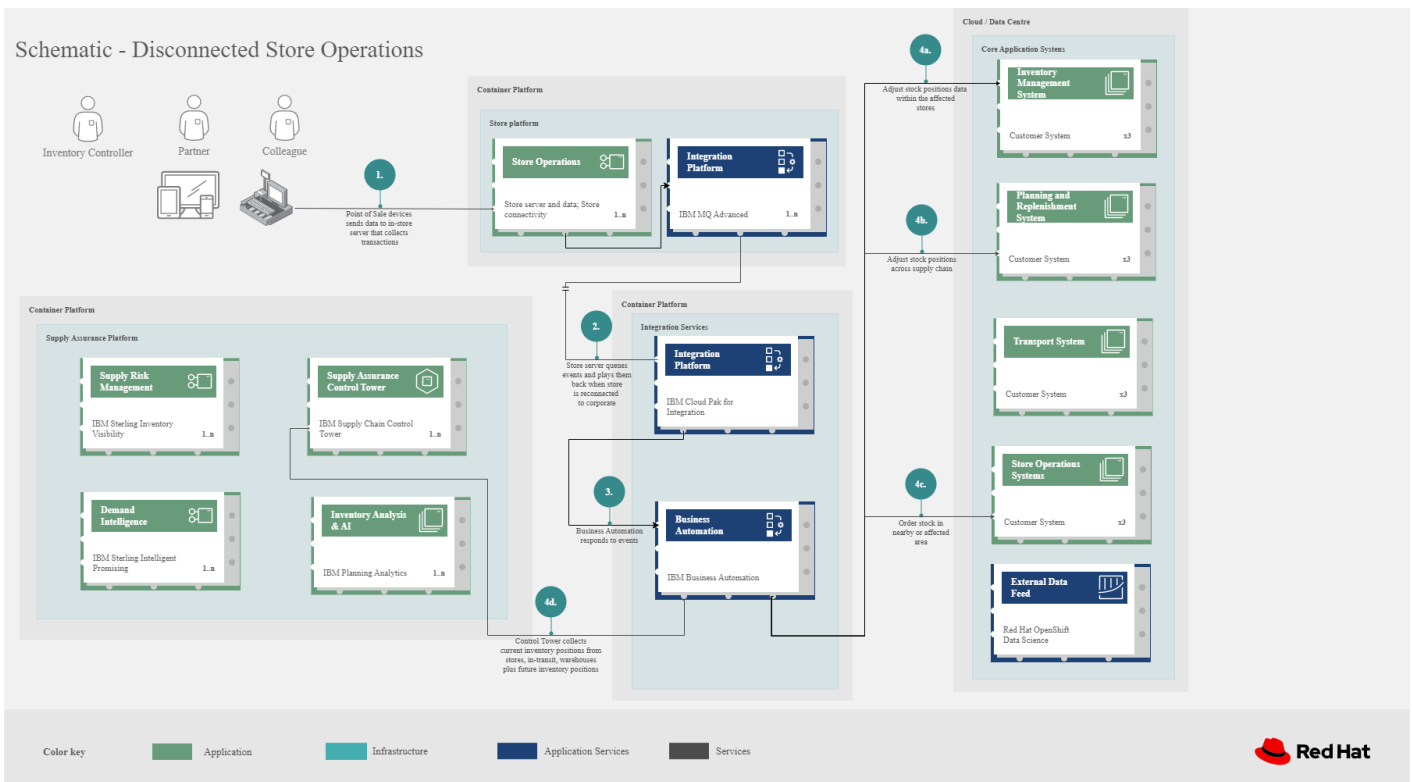


The [schematic](#) shows a scenario to mitigate weather disruption.

Weather disruption schematic

Weather disruption preparation workflow steps:

1. External data feed, such as IBM Environmental Intelligence Suite, anticipated disruptive environmental condition
2. Demand Intelligence system is alerted to the potential disruption
3. Inventory analysis anticipates potential low stock levels and predicts extraordinary demand levels
4. Current inventory levels data collected
5. Control Tower collects current inventory positions from stores, in-transit, warehouses plus future inventory positions
6. Control Tower alerts colleague with a set of work queues to mitigate the disruption Colleague takes remediation action by selecting actions provided by Control Tower
7. Colleague triggers Business Automation to remediate stock levels using a combination of options, including:
 - a. Ordering more stock in nearby and affected area
 - b. Adjusting stock positions within existing Supply Chain
 - c. Plan transport around affected area
 - d. Coordinate with suppliers and vendors to position inventory



The [schematic](#) shows a scenario to disconnected facility disruption.

Disconnected facility disruption schematic

Disconnected store workflow steps:

1. Point of sale devices send information to in-store server that collects transactions
2. Once connection is restored, store server queues events and plays them back as events
3. The transaction events are read, business automation workflows are triggered to update corporate systems
4. Data is updated through business automation to:
 - a. Adjust stock positions data for the affected stores.
 - b. Update replenishment system
 - c. Update store operations data
 - d. Consolidate data for to update work queue in Supply Chain Control Tower.

Business outcomes

- Response to disasters with reduced impact on the organization’s supply chain
- Continued operations that assist the community responding to disasters

Action Guide

From a high-level perspective, there are several main steps your organization can take to drive innovation and move toward a digital supply chain:

- Automation
- Sustainability
- Modernization

	Actionable step	Implementation details
Automation	Create a world-class sensing and risk-monitoring operation	<ul style="list-style-type: none">– Monitor for disruptive environmental conditions such as severe weather, wildfires, flooding, air quality, and carbon emissions– Predict potential impacts of climate change and weather across the business using climate risk analytics
	Accelerate automation in extended workflows	Prepare for severe weather-related shipping and inventory disruptions, or factor environmental risks into future warehouse locations
	Amp up AI to make workflows smarter	Decision makers are armed with recommendations that mitigate potential and actual disasters
Sustainability	Include sustainability commitments in decisions	Integrate sustainability metrics in returns decision making, especially return items transport or disposal
Modernization	Modernization for modern infrastructures, scale hybrid cloud platforms	The decision for a future, Kubernetes-based enterprise platform is defining the standards for development, deployment and operations tools and processes for years to come and thus represents a foundational decision point

Technology

This solution combines existing systems with state-of-the-art offerings to:

- Create a world-class sensing and risk-monitoring operation
- Accelerate automation in extended workflows
- Amp up AI to make workflows smarter
- Modernize for modern infrastructures, scale hybrid cloud platforms

Technology principles

True end-to-end visibility. Remove data silos and create a unified view across supply chain data with a standard data platform. Personalized dashboards and insights provide a 360-degree view of KPIs and significant events.

Manage by exception. Detect, display, and prioritize work tasks in real time. This allows clients to sense and react to issues quickly while managing risks and disruptions in a supply chain proactively.

Intelligent workflows. Actionable workflows can be customized to meet unique requirements and process steps required to automate actions within source transactional systems. Make informed decisions with a supply chain virtual assistant that provides responses to issues based on a client's supply chain data using natural language search.

The technology capabilities

This section provides the logical components of the solution. The solution architecture provides for:

- Independent deployable, scaled business services
- Composable, stateless modular services
- API first approach to building any service
- Inter communication between services asynchronous
- Business functions, API access controls managed independently
- Can be deployed across multiple data centers for HA capable of tenant level failover

Technology overview of the portfolio architecture

The solution uses the technologies, which can be grouped into three main categories:

- Core application systems. Often customer-provided technologies, such as order management, facilities management. These systems can be stand-alone applications, on premises and cloud services, databases
- Foundational infrastructure. The Red Hat/IBM solution is built on Red Hat OpenShift. Data is routed through API management

Events are routed through automation tools such as IBM Cloud Pak® for Integration, IBM Cloud Pak for Business Automation, or IBM Process Automation Manager Open Edition and IBM Decision Manager Open Edition

- Inventory Optimization platform that includes a control tower, fulfillment optimization, and inventory analysis with AI

The following technologies offered by Red Hat and IBM can augment the solutions already in place in your organization.

Foundational technologies – Hybrid Cloud Platform

The decision for a future, Kubernetes-based enterprise platform is defining the standards for development, deployment and operations tools and processes for years to come and thus represents a foundational decision point. Key client value areas include:

- Platform for Digital Transformation and Modernization
- Accelerated application development for faster go-to-market and innovation
- Engineering excellence through an enterprise grade open source container platform

- Self-service transformation with DevOps/SRE and automated operations

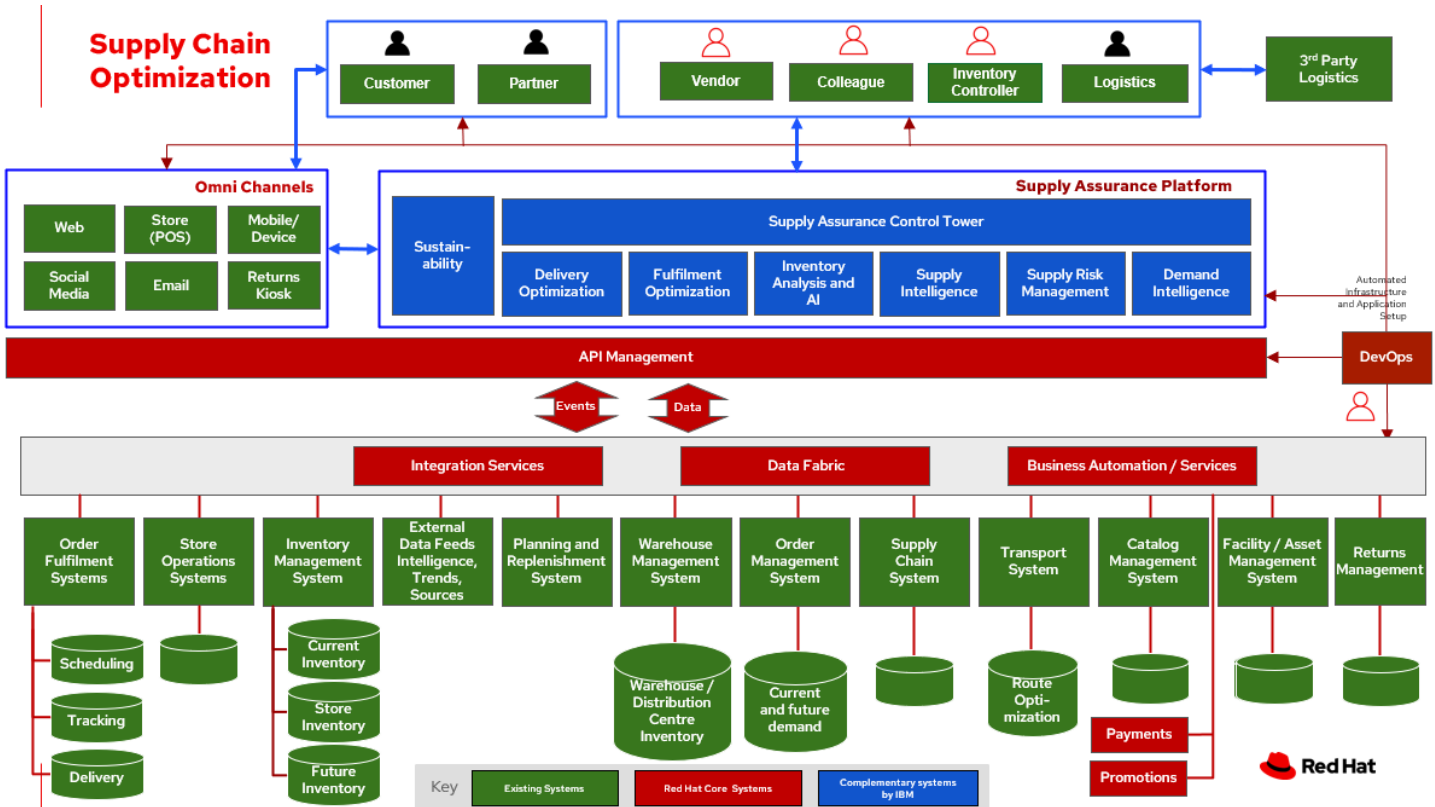
Specifically, the recommended platform includes:

Red Hat Enterprise Linux is the world’s leading enterprise Linux platform. It’s an open-source operating system (OS). It is the foundation from which you can scale existing apps—and roll out emerging technologies—across bare-metal, virtual, container, and all types of cloud environments.

Red Hat OpenShift is a unified platform to build, modernize, and deploy applications at scale. Work smarter and faster with a complete set of services for bringing apps to market on your choice of infrastructure. You can manage clusters and applications from a single console, with built-in security policies with:

- **Red Hat Advanced Cluster Management**
- **Red Hat Advanced Cluster Security**

Business Automation Workflow unites information, processes and users to help you automate digital workflows on premises or on cloud. Create workflows that increase productivity, improve collaboration between teams, and gain new insight to resolve cases and drive better business



The [portfolio architecture](#) shows the major systems and supply assurance platform can add functionality to existing systems.

outcomes. [IBM Cloud Pak® for Business Automation](#) provides a comprehensive solution. For companies embracing open source, [IBM Process Automation Manager Open Edition](#) and [IBM Decision Manager Open Edition](#) provides a cost-effective solution for developers who want control and flexibility to author, test, deploy, and monitor custom BPMN2-based processes and CMMN-based case management solutions for departmental use.

[Red Hat Ansible Automation Platform](#) operate, scale and delegate automate IT services, track changes and update inventory, prevent configuration drift and integrated with ITSM.

[Red Hat OpenShift API Management](#) managed API traffic using control and program management to secure, manage, and monitor APIs at every stage of the development lifecycle.

[Red Hat Integration](#) and [IBM Cloud Pak for Integration](#) provide is a comprehensive set of integration and messaging technologies to connect applications and data across hybrid infrastructures. It is an agile, distributed, containerized, and API-centric solution. It provides service composition and orchestration, application connectivity and data transformation, real-time message streaming, change data capture, and API management.

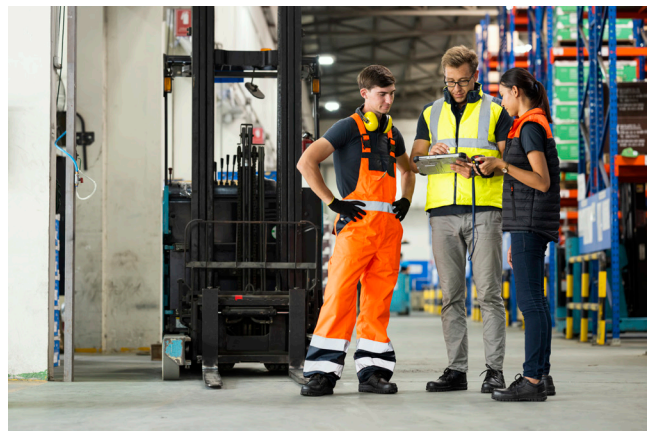
[Red Hat OpenShift DevOps](#) reopresents an approach to culture, automation and platform design intended to deliver increased business value and responsiveness through rapid, high-quality service delivery. DevOps means linking legacy apps with newer cloud-native apps and infrastructure. A DevOps developer can link legacy apps with newer cloud-native apps and infrastructure.

[IBM Data Fabric](#) empowers your teams and works across the ecosystem by connecting data from disparate data sources in multicloud environments. In particular:

- [IBM Watson® Knowledge Catalog](#) provides you users with a catalog tool for intelligent, self-service discovery of data, models.
- [Watson Query](#) provides data consumers with a universal query engine that executes distributed and virtualized queries across databases, data warehouses, data lakes, and streaming data without additional manual changes, data movement or replication.

Core application systems

The core application systems can be in-house applications, cloud services, IBM or competitive applications. The core applications provide data through the foundational technologies (such as API management that provides monitoring and security). They can also respond to automated actions based on business rules or from other layers in the system.



Supply Assurance Platform

Each of the core application systems provides data and responds to events through the foundational technologies.

Supply assurance control tower

[Gartner describes supply chain technology](#) as a central hub as an integrated part of a broader SCM platform using these building blocks: people, process, data, organization and technology. The idea is to capture and use data to provide enhanced real-time visibility and in-depth analysis. [IBM Supply Chain Control Tower](#), powered by industry-leading AI, provides actionable visibility to orchestrate your end-to-end supply chain network, identify and understand the impact of external events to predict disruptions, and take actions based on recommendations to mitigate the upstream and downstream effects.

Fulfillment optimization

[Gartner describes the fulfillment forecasting](#) approach, which provides a more accurate view of consumer fulfillment choices. This approach enables retailers to accurately gauge the right amount of inventory required to meet demand in stores, distribution centers and other inventory holding notes throughout the retailer's network. IBM offers [IBM Sterling® Intelligent Promising](#) provides shoppers with greater certainty, choice and transparency across their buying journey.

Inventory analysis and AI

This cognitive analytic engine enhances existing order management systems. It determines the best location from which to fulfill an order, based on business rules, cost factors, and current inventory levels and placement. IBM includes [IBM Sterling Fulfillment Optimizer with Watson](#) as a component of [IBM Sterling Intelligent Promising](#).

Supply risk management

Gartner describes the key tenets of supply chain risk management enhance resilience and improve competitiveness.

- Market disruptions include: natural disasters, pandemics, political uncertainty, economic upheaval, cyber and terrorist attacks, third-party or supplier threats, and rapid swings in consumer preferences and demand.
- Supply chain transformation also complicates supply chain risk management — lean, but complex and globally dispersed operations add risks, and the supply chain risk management process is vital in wringing out efficiencies and costs.

Inventory visibility

This processes inventory supply and demand activity to provide accurate and real-time global visibility across selling channels. For this solution, IBM offers [Sterling Inventory Visibility](#), which is included with **IBM Sterling Intelligent Promising**.

Planning and analytics

Businesses need to evolve their planning and analysis strategies to include continuous, integrated planning. This means creating a single source of truth to streamline planning, manage performance and build alignment across the enterprise. In this category IBM offers:

- [IBM Planning Analytics with Watson](#) to streamline and integrate financial and operational planning across the enterprise.
- [IBM Maximo MRO Inventory Optimization](#) to help you optimize your maintenance, repair and operations (MRO) inventory by providing an accurate, detailed picture of performance.

Sustainability

To put your sustainability goals into action, you need a strategy and solutions that are specific to your needs. Businesses can approach sustainability initiatives by:

- Strategic partnership with Red Hat and IBM.
- Using environmental, social and governance (ESG) reporting to integrate data silos. Find new opportunities to drive positive change across your operations with [Envizi™](#)
- To manage assets, you can create a lower-emissions business. Use automation to track resource usage, reduce costs and improve services with [IBM Maximo® Application Suite](#).

Why IBM

Since its inception nearly a century ago, IBM has defined itself not only through its leaders, products, technologies and services - but by its fundamental values. IBM's values serve as the foundation of our culture and brand, and ensure that we deliver innovations that matter for our company and the world.

We're not only leading the way in developing "green technology," but leading a revolution in corporate responsibility - and citizenship. Our employees have dedicated over eight million hours through our award-winning Corporate Service Corps global volunteer program.

With solutions ranging from supply chain partner data exchange, inventory planning, end-to-end supply chain visibility, transparency and orchestration to intelligent omnichannel order fulfillment optimization, IBM offers a complete portfolio of next-generation products and services to solve your supply chain management needs. Make your supply chain smarter, resilient and more sustainable with our state-of-the-art solutions.

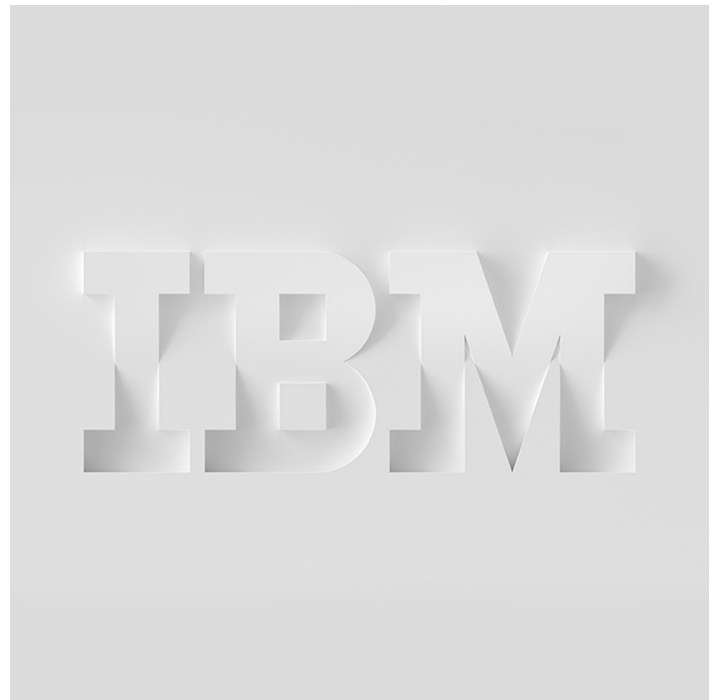
Investing in our clients' success

IBM has helped companies implement the strategies that are explained in this document. IBM can help yours too.

IBM Client Engineering delivers meaningful and scalable business outcomes across all industries. With our deeply skilled multi-disciplinary squad and human-centered approach, we provide value-based experiences and solutions catered to your organization's needs.

Whether a custom demo in your environment or an MVP to prove value, we meet you where you are and work with your organization at any stage of its digital transformation journey. Client Engineering is an investment in you to co-create and innovate leveraging IBM technology and methodologies.

[Learn more about IBM](#) →



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- Red Hat Portfolio Architecture.** [Loss & Waste Management](#)
- Red Hat Portfolio Architecture.** [Product Timeliness](#)
- Red Hat Portfolio Architecture.** [Perfect Order](#)
- Red Hat Portfolio Architecture.** [Intelligent Order](#)
- Red Hat Portfolio Architecture.** [Sustainable Supply Chain](#)
- Red Hat Portfolio Architecture.** [Supply Chain Returns](#)
- Red Hat Portfolio Architecture.** [Disaster Readiness](#)

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Mike is a 30+ year veteran in IT, having worked in various roles from data center management, operations, software development, software architect, and management. Most recently, Mike was General Manager for a small technology firm servicing the food service industry and led them through their infrastructure and application modernization efforts.

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Account Technical Leader
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Rajeev joined IBM Global Markets as an Account Technical Leader focusing on distribution and communication sectors in the industry market. Rajeev has been a Client Facing Architect for the last 17 years serving various organizations like IBM Expert Services Lab and IBM Global Services.

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