

**White Paper**

# Modernize the Monolith

**A Guide to Using Composable  
Commerce to Modernize  
Legacy Systems in Supply  
Chain Management**



## Executive Summary

Digital commerce has gained tremendous momentum in the past two decades largely owing to technological advancements and the impetus of evolving customer expectations. Companies, under extreme pressure to keep pace, face a critical issue: they are forced to operate with legacy systems that were expensive to implement, expensive to maintain, and difficult to abandon, yet are inherently unable to meet customers' growing requirements for speed and agility.

Given the large capital expense of these systems and current economic conditions, a systemic overhaul of the monolith is not a feasible option for most.

The good news is there's another option. With the emergence of composable commerce microservices and integrated solutions, it is now possible to modernize your solution without having to get rid of your legacy system.

The growing recognition of the importance of modernizing existing monolithic systems with integrated solutions is evident through the increasing adoption of advanced supply chain solutions in the advent of projected market growth. This approach affords organizations the opportunity to drive agility and responsiveness in their supply chains, without undergoing costly and disruptive overhauls. By gradually replacing outdated functionalities with modernized counterparts that align with current objectives, businesses can harness the benefits of a modernized monolithic system powered by composable commerce. The integration of these systems within the modernization process empowers organizations to enhance operational efficiency, improve customer experiences, and remain competitive in today's dynamic business landscape.

**Modernizing existing systems allows companies to drive agility and responsiveness in their supply chains, without high costs and disruption.**

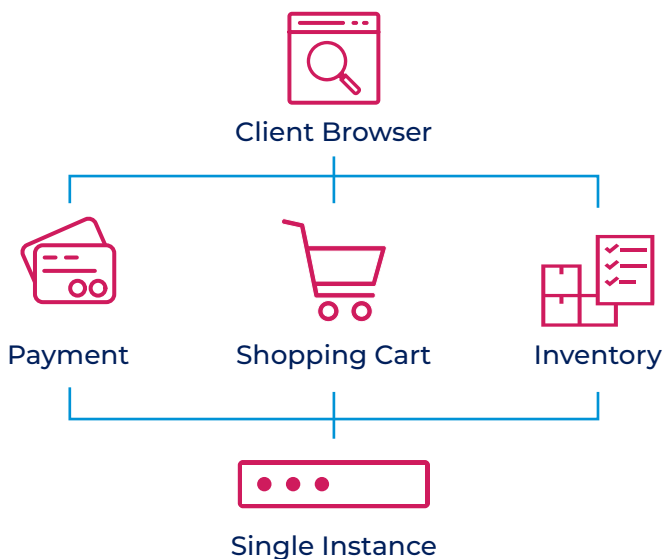


# Defining the Monolith

## What is Monolithic Architecture?

Monolithic architecture refers to the traditional software model that is built as a single “monolithic” unit that is independent of other applications. A monolith is large, glacial, indivisible, and singular. Monolithic systems are pretty much the same – large computer networks built on a single code base that addresses multiple business objectives in a single system. Making changes to any aspect of these systems requires the entire stack to be updated by tweaking the code base, building in the changes, and deploying the update on the service side. In simple terms, any change to be made in the system requires the whole machinery to stop, rebuild, and reboot.

### MONOLITHIC ARCHITECTURE



As a recent Forrester report states, “Most legacy core software systems are too inflexible, outdated, and brittle to give businesses the flexibility they need to win, serve, and retain customers.” The leading cause of this inflexibility and brittleness that plagues most legacy systems is the use of monolithic architecture. These systems are characterized by millions of lines of code with multiple interdependencies therein. These applications pose a few fundamental challenges that make it challenging for businesses to adapt to evolving customer needs.

## The Challenges of Managing a Monolith

- ✓ These systems get too large with time and become increasingly difficult to manage
- ✓ Even a small change requires the redeployment of the whole application
- ✓ As the application size increases, the time to start up and deploy also tends to increase
- ✓ New developers find it hard to understand the architecture and logic of the application, even if their responsibility is limited to a single functionality
- ✓ Increased load or traffic on any single facet of the application, instances of the entire application are deployed across multiple servers. This is inefficient and resource sensitive
- ✓ Adoption of new technology is challenging as it impacts the entire application in terms of cost and time
- ✓ A single bug in any module can negatively impact the entire application

### The Monolith Conundrum:

- ✓ Customization creates complications
- ✓ Slow response to market trends
- ✓ A single point of failure due to high dependency
- ✓ Endless testing before taking updates live

Add all the above complications to the supply chain, and you have a big hindrance in delivering on the customer promise. Even one of these elements can lead to delays and inaccuracies that, in turn, can lead to higher product returns and decreased customer retention.

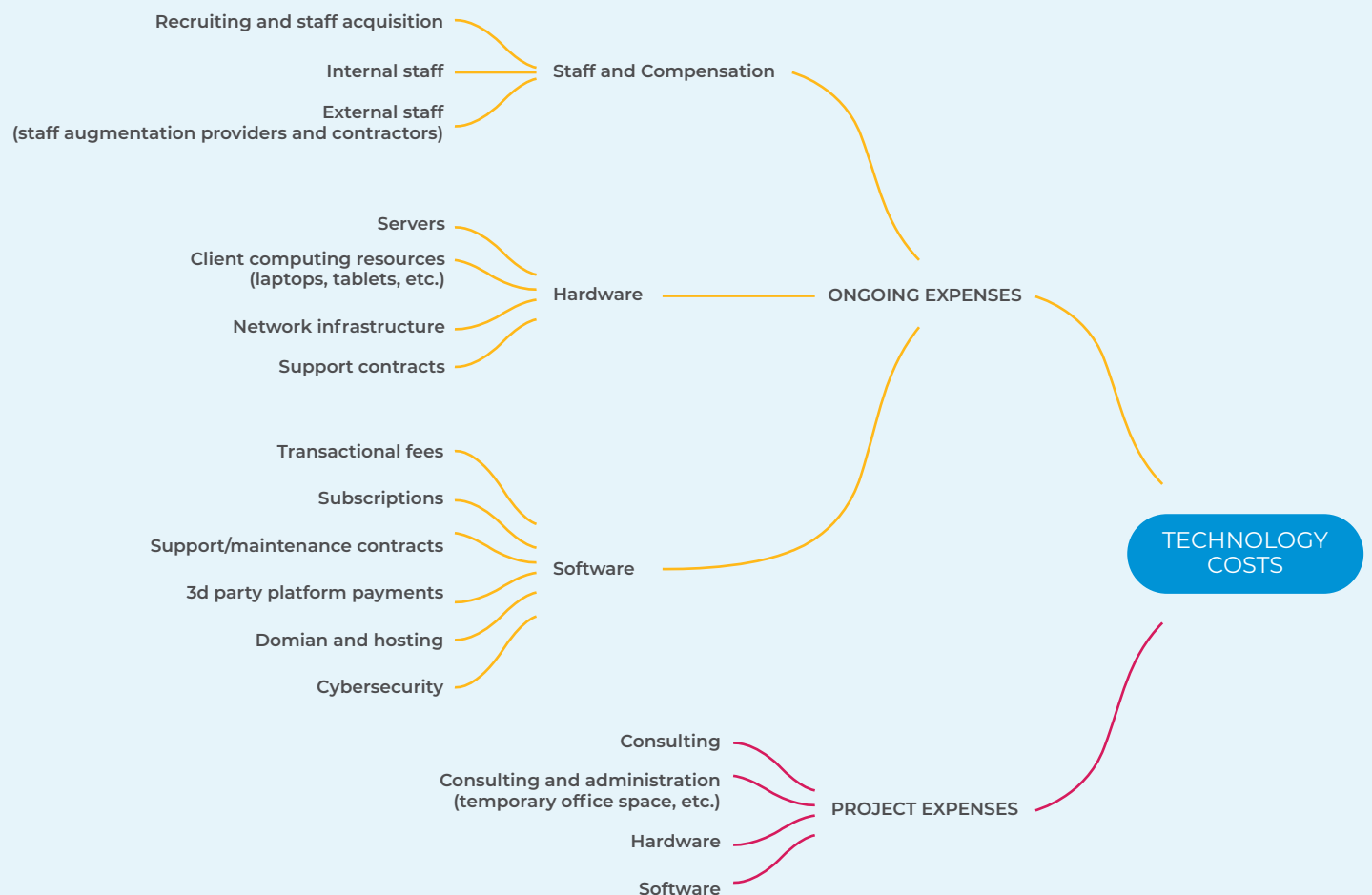
# Why Modernize?

Although initially appealing for its ability to expedite application development, a monolithic architecture eventually presents challenges. As businesses expand and user demands evolve, customers anticipate enhanced user experiences, while integration needs intensify. Unfortunately, the monolithic approach hinders growth by creating bottlenecks. Common problems associated with monolithic applications involve extended time to market, a steep learning curve for new developers, excessive dependencies, and protracted deployment periods.

Monolithic systems for supply chain management vary in capabilities, functionalities, and size, but the one thing that's common with all monolithic systems is cost. The huge investment in monolithic systems usually takes a while to yield a return on investment (ROI), and this is the reason why it doesn't make sense for businesses to consider ditching monolithic systems that they have already spent a considerable amount on.

Then again, the cost implications of monolithic systems in the supply chain are not restricted to the initial investment alone. Overhauling a monolithic system also leads to the need for a restructuring of the smaller moving parts that drive the larger machine. The below mindmap is a great example of this. Change the existing system, and the trickle-down effect means that you will have to once again spend time and resources finding the right talent and training the team. Similar impacts may also manifest in hardware and software requirements, and project expenses.

## The Costs of System Overhaul



## Leveraging Composable Commerce with Integration Solutions

According to Microsoft, “A microservices architecture consists of a collection of small, autonomous services. Each service is self-contained and should implement a single business capability.” While the definition refers to these applications as “small,” this may not always be the case. The key characteristic of microservices-based applications is that they are independent and coupled with specific functionality to cover. The codebase for each microservice is different to perform only a single task, with each microservice communicating with the other through APIs (application programming interfaces).

The key characteristic of microservices-based applications is that they are independent, making your system architecture more agile, scalable, and improving time-to-value.

## What You Get with Microservices-Based Composable Architecture

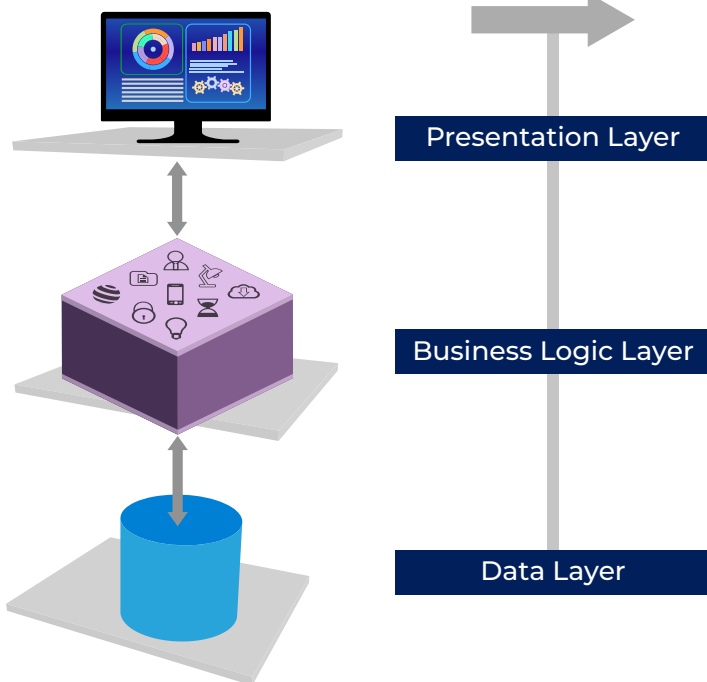
**AGILITY:** The agility of microservices lies in their small and independent nature, allowing for swift updates to address new requirements without impacting the entire application. This agility also enables businesses to solve point problems with point solutions without the baggage of unneeded technical debt.

**SCALABILITY:** Microservices offer independent scalability. Each microservice can be scaled individually, providing cost savings in cloud environments by avoiding the need to scale the entire application.

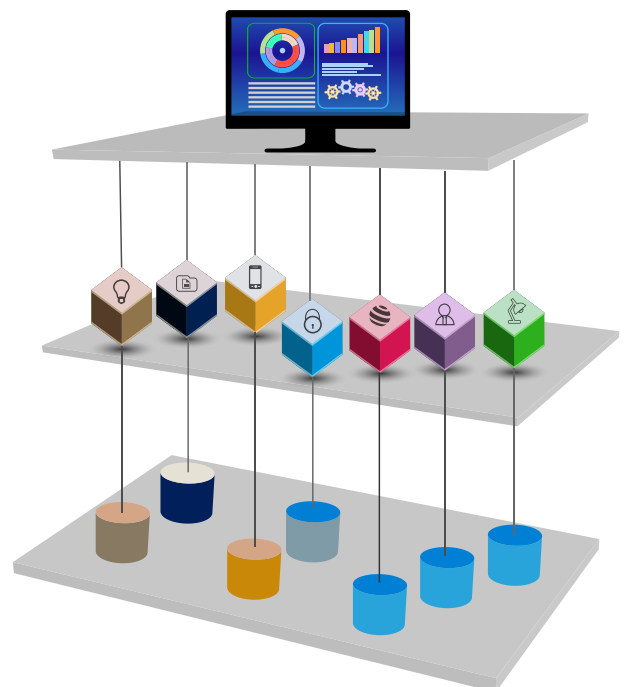
**EASY MAINTENANCE:** Microservices' small and specialized nature makes maintenance significantly easier. This simplicity enables a small team of developers to handle the maintenance tasks effectively.

**TIME TO VALUE:** These capabilities can be implemented and utilized incrementally as opposed to the Big Bang approach, ensuring that businesses can derive maximum value from the get-go.

### Monolithic Application



### Microservice Application



## A Planned Approach to Migration

Composable architecture gives businesses the flexibility to gradually cycle out pre-existing functionalities for modernized ones that are better suited to your business objectives. Migrating to these solutions, however, is an incremental process rather than a one-and-done overhaul.

### GAIN A THOROUGH UNDERSTANDING OF THE EXISTING SYSTEM

Begin by thoroughly analyzing the existing monolithic system. Gain a clear understanding of its architecture, components, dependencies, and data flows. This step is crucial to identify potential integration points and challenges.

### DEFINE INTEGRATION GOALS

Determine the specific objectives you want to achieve through the integration. This could include improving scalability, agility, or flexibility, as well as enabling new features or capabilities. Clearly define the desired outcomes to guide the integration process.

### IDENTIFY SERVICE BOUNDARIES

Identify potential boundaries within the monolithic system where you can extract discrete functionalities or modules that can be encapsulated as services. This step involves breaking down the monolithic architecture into more granular components that can be independently managed and deployed.

### DESIGN COMPOSABLE ARCHITECTURE

Define a composable architecture that aligns with your integration goals. This architecture should include the core building blocks of a composable solution, such as modular services, API contracts, event-driven communication patterns, and a central integration layer.

### PRIORITIZE INTEGRATION POINTS

Determine which components of the monolithic system should be integrated first based on their criticality, complexity, or potential business value. Start with smaller, less complex modules that can be more easily extracted and decoupled from the monolith.

### EXTRACT SERVICES

Extract the identified components from the monolithic system and convert them into modular services. Containerize these services to facilitate independent deployment and scalability.

### IMPLEMENT API CONTRACTS

Define clear API contracts for the services to ensure compatibility and consistency. This allows different components to communicate effectively and enables loose coupling between services.

### LEVERAGE DATA AS A SERVICE

Rather than data working across silos and serving different functions independently, leverage data as a service to ensure a centralized source of truth – where data, itself, is what systems depend on rather than the other way around.

### ESTABLISH INTEGRATION LAYER

Set up an integration layer or service bus that facilitates communication between the monolithic system and the newly created services. This layer can handle message routing, event-driven communication, and data transformation between the legacy system and the composable components.

### IMPLEMENT INTEGRATION PATTERNS

Apply appropriate integration patterns to enable seamless communication and synchronization between the monolithic system and the composable components.

### TEST AND VALIDATE

Thoroughly test the integration to ensure proper functionality, performance, and reliability. Use both unit tests and end-to-end tests to validate the integration and identify any issues or bottlenecks.

### PLAN A PHASED APPROACH

For migrating functionality from the monolithic system to the composable solution start with less critical or standalone features and gradually move towards more complex modules. Monitor the migration process closely to mitigate any potential risks or disruptions.

### MONITOR AND ITERATE

Continuously monitor the integrated system and collect feedback from users and stakeholders. Iterate and improve the composable solution based on insights gained, addressing any performance or functionality issues that arise.



# Modernize and Drive Supply Chain Excellence With WMS and OMS

## Streamline Operations With a WMS

While warehouse management systems (WMS) and order management systems (OMS) have been around ever since large-scale commerce itself, their composable commerce avatars are what are really driving the evolution of monolithic systems. According to Gartner, approximately 83% of companies are adopting advanced supply chain solutions as a part of their digital strategy to improve customer experience. Given the ease of integration with existing monolithic systems and the sheer impact on customer experience, it comes as no surprise that an increasing number of companies are investing in advanced and integrated WMS and OMS solutions.

A warehouse management system (WMS) is a software solution that optimizes and streamlines warehouse operations. It serves as a centralized platform to manage inventory control, order fulfillment, logistics, and other similar tasks. Additionally, a WMS also facilitates the efficient utilization of space, goods movement tracking, and process automation, resulting in improved accuracy and productivity. With real-time visibility of inventory levels, WMS plays a crucial role in enhancing overall operational efficiency and makes it integral to the modern-day supply chain. It comes as no surprise that leading companies use warehouse optimization software 75% of the time to improve results.

Here are 4 key benefits:

### INVENTORY MANAGEMENT AND CONTROL

The implementation of a Warehouse Management System (WMS) enables organizations to enhance order fulfillment, diminish inventory levels, and reduce the cycle time of orders through improved visibility and control. By ensuring real-time inventory visibility and control at the unit level, companies can promptly respond to customer demands and requirements.

### AUTOMATION-DRIVEN EFFICIENCY:

The integration of a WMS empowers organizations to automate a multitude of warehouse processes, including onboarding, picking, packing, and dispatch. By deploying automation and process optimization throughout warehouse operations, teams are equipped to increase productivity within shorter timeframes, as they have immediate access to essential resources.

### IMPROVED TRACKING FOR ENHANCED CUSTOMER SERVICE:

A proficient WMS allows companies to provide customers with accurate stock availability information, enhancing picking accuracy to fulfill customer orders precisely. Additionally, a WMS enables real-time tracking of shipments, ensuring transparency and facilitating effective communication with customers.

### BETTER RETURN ON INVESTMENT (ROI):

Selecting an appropriate WMS solution offers organizations the potential to enhance sales and bolster profit margins by not only increasing sales volume but also accelerating processes and ensuring greater accuracy. Heightened operational speed, improved visibility, and increased precision result in decreased customer queries and streamlined customer support processes, ultimately contributing to improved ROI.



## Gain More Control With an OMS Backbone

An order management system gives organizations end-to-end control over the order-to-cash sales process. As the backbone of all transaction-related operations, the process of managing orders involves multiple moving parts including warehouse accounting, customer support, and delivery partners. By providing a centralized view, an OMS gives control over all these aspects while enabling monitoring of customer orders, stock levels, and sales records. Notably, the market for order management systems is projected to reach USD 1949.6 million by 2030, with a revenue compound annual growth rate (CAGR) of 7.1% (Reports And Data).





# Modernize Through Advanced Supply Chain Solutions

Recent disruptions in supply chains, be it due to the pandemic or geopolitical unrest, are reflections of supply chain disruptions that are going to be the norm. These disruptions put monolithic systems for supply chain management to the test, a test that many legacy systems cant stand up to. With their inherent inflexibility, stretched-out time-to-mark, and high interdependency, these systems hinder growth and adaptability.

However, rather than resorting to a complete overhaul of these systems, it is more prudent for organizations to take up incremental modernization. Why? Because complete overhauls are not just cost-intensive but also highly disruptive.

Composable commerce, particularly through the use of microservices and integrated solutions, offers businesses the flexibility to gradually replace outdated functionalities with modernized ones that align with current objectives. Without making any ground-breaking changes to the monolith, this approach gives organizations scalability, agility, and the luxury of easier maintenance, all of which contribute to a more responsive and efficient supply chain.

Warehouse Management Systems (WMS) and Order Management Systems (OMS) play integral roles in the modernization process. A WMS optimizes your warehouse and an OMS provides end-to-end control over the order-to-cash sales process, allowing centralized monitoring of customer orders, stock levels, and sales records.

With the increasing adoption of advanced supply chain solutions and the projected growth in this market, it is evident that businesses recognize the importance of modernizing existing monolithic systems with integrated solutions. Modernization gives organizations the opportunity to drive supply chain excellence and hit the ground running with improved customer experiences. This results in a supply chain that is not just agile and responsive but also a driving force for organizations to stay competitive in today's dynamic business landscape.

## Pivotree offers a variety of solutions to modernize your supply chain.

### Pivotree™ WMS:

A full SaaS-based ecosystem for warehouse efficiency, automation, and endless optimization.

### Pivotree™ Control Tower:

Allows you to gain control over commerce complexity with real-time views of your entire supply chain.

### Pivotree™ SKU Build:

Provides a fast and cost-effective way to produce, onboard and maintain clean, comprehensive, channel-ready data.



Pivotree™ WMS



Pivotree™ Control Tower



Pivotree™ SKU Build



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## Why Pivotree

Pivotree, a leader in frictionless commerce, strategizes, designs, builds, and manages digital commerce, data management, and supply chain solutions for over 200 major retailers and branded manufacturers globally. With a portfolio of digital products as well as managed and professional services Pivotree provides businesses of all sizes with true end-to-end solutions. Headquartered in Toronto, Canada with offices and customers in the Americas, EMEA, and APAC, Pivotree is widely recognized as a high-growth company and industry leader.