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Ecommerce Infrastructure: The Ultimate Guide to Revamp for Growth



Your homepage is the front door to your online store. It should be easy to update with fresh products, announcements, and resources that resonate with your customers.

But design alone doesn't drive performance. If site speed, integrations, and checkout functionality lag behind, customers leave (and may not come back to shop again). That disconnect between appearance and infrastructure directly impacts revenue.

Modern ecommerce requires more than surface-level updates. Brands are investing in marketing, automation, AI, and scalable infrastructure to improve efficiency, security, and long-term growth.

At the center of this transformation is ecommerce infrastructure, i.e., the systems that support integrations, payments, customer data, and uptime reliability.

What is ecommerce infrastructure?

Ecommerce infrastructure is the framework that makes online sales possible. On platforms like BigCommerce, it combines the hardware, software, and integrations required to process transactions, manage inventory, protect customer data, and support site performance at scale.

The setup spans from the homepage that buyers see to the backend systems that process payments, manage inventory, and implement security measures. In a perfect world, this framework operates as one.

Evolution of ecommerce infrastructure

If you can think back to the early days of the internet, ecommerce infrastructure has come a long way.

Ecommerce infrastructure has since evolved from simple hosted storefronts to complex, cloud-based ecosystems that support global sales, real-time integrations, and enterprise-grade security. What once required custom servers and manual updates now relies on scalable SaaS platforms, API-first architecture, and streamlined automation to power seamless customer experiences.

As digital commerce has matured, its infrastructure has shifted from a technical afterthought to a strategic growth driver. Let's learn about the evolution of ecommerce infrastructure, from monolithic commerce to headless commerce to composable and API-first commerce.

Monolithic commerce.

Monolithic commerce uses a single, tightly coupled technology stack where the frontend, backend, and database operate as one unified system. In this model (which was common in early ecommerce platforms and pure SaaS solutions) infrastructure, application logic, and presentation layers are bundled together.

This structure simplifies setup and maintenance, making it well suited for smaller or less complex stores with standard functionality needs. However, because all components are interconnected, customizing or scaling individual parts of the system can require broader changes across the entire stack.

Advantages of monolithic architecture:

- **Simple implementation and maintenance:** All core commerce functions operate within a single system, which streamlines development, deployment, and ongoing maintenance.
- **Lower integration complexity:** With fewer external dependencies, teams reduce the risk of integration conflicts and synchronization issues.

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- **Faster feature rollout:** Housing functionality in one codebase allows teams to develop, test, and release updates more quickly.
- **Cost efficiency:** Monolithic systems typically require fewer infrastructure and integration investments, making them practical for smaller or less complex stores.

Disadvantages of monolithic architecture:

- **Scalability constraints:** As traffic and operational demands increase, scaling a tightly coupled system can introduce performance bottlenecks.
- **Limited flexibility:** Adapting to new business models, channels, or third-party tools often requires significant system-wide changes.
- **Complex updates and modifications:** Because components are interdependent, altering one area of the system can affect the entire application, increasing testing requirements and deployment risk.
- **Higher systemic risk:** A failure in one part of the application can impact the entire platform, making issue isolation and resolution more challenging.

Headless commerce.

Headless commerce separates the frontend presentation layer from the backend commerce engine, allowing each to operate independently. This decoupled architecture gives brands full control over the customer experience while the backend continues to manage products, pricing, checkout, and order processing through chosen APIs.

Because the frontend is no longer tied to a single system, businesses can deliver consistent commerce experiences across multiple touchpoints, including web, mobile apps, point-of-sale (POS) systems, and IoT devices. This flexibility supports true omnichannel strategies, enabling teams to launch new digital experiences faster without disrupting core ecommerce operations.

Advantages of headless architecture:

- **Greater technological flexibility:** Teams can choose the frontend frameworks and backend services that best fit their business needs rather than relying on a single, bundled system.
- **Stronger integration capabilities:** API-driven architecture enables seamless integration with CMS, CRM, ERP systems, payment providers, and other third-party tools.
- **Optimized performance:** Separating frontend and backend systems allows teams to optimize customer-facing experiences for speed while independently scaling backend services for reliability and security.

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- **Long-term adaptability:** Headless architecture supports emerging channels and technologies, including PWAs, mobile apps, voice commerce, and other digital touchpoints.

Disadvantages of headless architecture:

- **Greater implementation complexity:** Decoupled systems require more planning, coordination and ongoing oversight, particularly for organizations without dedicated development resources.
- **Increased system orchestration:** Because frontend and backend systems communicate through APIs, teams must manage additional integration layers and monitor performance across services.
- **Higher total investment:** Custom frontend development, integration management, and ongoing optimization can increase initial and long-term costs compared to traditional architectures.
- **Specialized expertise required:** Successful headless deployments depend on strong frontend development skills and disciplined API management to maintain system stability and performance.

Composable & API-first commerce.

Composable and API-first commerce takes flexibility further by allowing businesses to assemble a best-of-breed technology stack tailored to their exact needs. Instead of relying on a single vendor for every function, brands select specialized solutions for search, payments, content management, personalization, and more — all connected through APIs.

This approach is typically powered by microservices, where each commerce function operates as an independent service. Teams can deploy, update, or scale individual components without disrupting the broader system. This modularity accelerates innovation, reduces system-wide risk, and supports continuous improvement.

Composable architectures are especially best for enterprise organizations with complex operational requirements, multiple brands, or global storefronts. They provide the agility to adapt quickly to market changes while maintaining the performance, scalability, and governance standards large businesses require.

Advantages of composable architecture:

- **Modular design:** Commerce capabilities are built as independent services, allowing teams to replace or upgrade individual components without overhauling the entire system.

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- **Independent scalability:** Each service scales based on its own demand. High-traffic components, such as search or checkout, can expand without affecting other parts of the platform.
- **Deep customization:** Businesses gain granular control over their technology stack, enabling them to tailor commerce experiences to specific operational and customer requirements.
- **Development efficiency:** Reusable services and APIs reduce redundant work, accelerate deployment cycles, and support continuous innovation across brands or regions.

Disadvantages of composable architecture:

- **Greater architectural complexity:** Designing, orchestrating, and maintaining multiple services requires disciplined governance and experienced technical teams.
- **Increased integration management:** API-driven communication between services introduces additional monitoring and performance oversight requirements.
- **Higher operational investment:** Composable environments often require expanded infrastructure, ongoing optimization, and specialized talent, increasing total cost of ownership compared to simpler architectures.

Components of an ecommerce infrastructure

A healthy IT ecosystem is a complicated network of disparate parts working as one. Ecommerce platforms have additional components and APIs unique to your business needs.

Web server architecture.

Web servers store website data and deliver it to users in real time. They host content, manage operating systems, and support content management systems that shape the customer experience.

API management and integration.

Modern ecommerce platforms rely on various third-party integrations, and effective API management ensures smooth communication between services, e.g., payment gateways, shipping services, and marketing tools.

Comprehensive shipping and order fulfillment solutions.

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These are relatively unique to ecommerce companies. A robust shipping and fulfillment solution is complex and involves integrations with multiple systems. However, the result means that products are delivered quickly and sales are completed.

Efficient inventory management systems.

It's important to know what the business has on hand and when new products must be ordered — something that realistically can't be done manually. A well-integrated inventory management system pays for itself by maximizing warehouse and storage costs.

Database management systems.

As ecommerce businesses grow, their databases expand in size and complexity. Centralized database management systems optimize storage, speed up data retrieval, and keep sites performing efficiently.

Shopping cart systems.

Friction in the online shopping cart experience can mean the difference between making a sale and a customer abandoning their cart. A quality solution that provides transparency around shipping times and total cost can improve conversion rates.

Secure and scalable payment processing.

Limiting the ways customers can pay reduces the chance of completing a sale. Having a payment service provider that makes it easy to securely pay how they wish increases revenue. Payment solutions must meet industry security standards and scale automatically during high-traffic events, such as Black Friday.

Reliable backup systems.

Backups are an insurance policy. You hope you don't have to use it, but you'll be thankful to have it if you do. Backup solutions protect you in case of malware, ransomware, or even human error.

Common ecommerce infrastructure roadblocks

Building an IT ecosystem is highly complex, not to mention the unique aspects of ecommerce that bring different challenges. These are common roadblocks that can slow down your project:

Integration challenges with other systems.

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An ecommerce website is typically integrated with multiple other SaaS systems, from payments to logistics to social media. Sometimes, these systems work harmoniously together, and everything works as it should (that's the goal, right?).

But in reality, things don't always go as planned. For instance, a payment system might not sync properly with your inventory management system, leading to discrepancies in stock levels. Developers must find workarounds and patches to get everything working when this happens.

Scalability issues.

If a site succeeds and experiences customer and traffic growth, it must have infrastructure capable of load balancing to meet that demand. The alternative is an ecommerce website that's slow, unresponsive, and makes it harder to complete sales.

Technical debt.

Builders have a saying: Measure twice, cut once. This sentiment also applies to technical debt. Making compromises for short-term gain is like stacking code on top of outdated code. It will eventually catch up with you, and will become expensive the longer it goes untended.

Technical debt can also lead to bugs, crashes, and poor performance, impacting customer satisfaction. As your website's business operations expand, paying attention to compounding technical debt will reduce these negative impacts. That's why you should audit your ecommerce infrastructure regularly.

Security challenges.

Security challenges are a critical concern for online businesses, as they involve protecting sensitive customer data and financial transactions (including financial data from credit cards and debit cards).

The ever-evolving nature of cyber threats and the potential consequences of security breaches make it essential for ecommerce software to address these challenges effectively through strong firewalls and security standards.

Issues with payment gateways.

Payment gateways that have issues accepting payments encourage customers to visit your competitors. All gateways should take multiple forms of payment, meet industry security standards, and reduce friction in the checkout process.

Complexities of global ecommerce.

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Omnichannel selling across borders can be complicated, with laws and taxes varying from country to country.

Best-in-class payment and logistics solutions remove some of the challenges. However, business owners and leaders still need resources fluent in global ecommerce to help shepherd the business through the process.

Supply chain management issues.

Supply chains are highly complex systems, with multiple parts reliant on each other to operate effectively. An issue with one can impact all. If you're a manufacturer, this impact hits even harder. Having an optimized and efficient supply chain is vital.

Maintaining an ecommerce infrastructure

Maintaining ecommerce infrastructure requires ongoing monitoring, updates, and security management. On managed SaaS platforms like BigCommerce, many of these responsibilities — including patching, scaling, and infrastructure monitoring — are handled automatically, reducing operational burden.

Schedule routine infrastructure checks.

An ecosystem should have end-to-end real-time monitoring to perform regular health checkups. If hardware is near failure or two pieces of software aren't interacting correctly, these checks will catch them before they negatively impact performance for your site.

Necessity of a backup system.

Hope for the best, but be prepared for the worst. Scheduling regular backups will protect web pages in case of emergency.

Maintain compliance with ecommerce regulations.

Laws and regulations related to ecommerce, payment, and other associated functions are in constant flux. From security to privacy, online stores should ensure that their tech stack meets all pertinent standards.

Manage unexpected downtime.

Downtime is deadly to an ecommerce platform, but it's something that could happen. Having automation processes in place to react to an emergency will reduce the time the site is down.

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How to choose the proper ecommerce infrastructure

Choosing the right ecommerce infrastructure starts with understanding your business model, growth trajectory and operational complexity. Leading platforms like BigCommerce provide scalable architecture, API-first flexibility, and enterprise-grade security, but online retailers must evaluate requirements carefully before selecting a solution.

> **Investing in scalable infrastructure today protects performance tomorrow.**

Identify your business needs.

Different ecommerce infrastructures serve various business models, so analyzing your requirements is crucial. Examine your business size and growth goals, and prioritize scalability, security, or speed.

Assess scalability requirements.

Your infrastructure should grow as your business grows. Seek load balancing, auto-scaling, and cloud-based infrastructure to handle traffic spikes and accommodate expanding product catalogs.

Examine security features.

Security plays a critical role in infrastructure selection. Seek PCI DSS compliance, strong firewalls, encryption, real-time threat detection, and automated patching to safeguard transactions and protect your customer data.

Review integration capabilities and API support.

Seamless integration with third-party software is crucial for a functional ecommerce platform. Verify your infrastructure supports API-first architecture to connect with payment gateways, inventory, and order management systems and other tools that streamline operations.

Prioritize performance and speed.

Website performance impacts user experience, particularly during high-traffic events. Consider Content Delivery Networks (CDNs) and caching strategies to guarantee quick load times and enhance mobile responsiveness.

Analyze budget and cost considerations.

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Cost implications shape infrastructure decisions. Compare upfront costs against cloud-based pay-as-you-go models and calculate the total cost of ownership, including maintenance and updates.

Review support for unique use cases.

When your business spans multiple channels or countries, your infrastructure must accommodate these needs. Seek solutions incorporating different sales channels and managing global requirements like numerous currencies and tax laws.

Evaluate vendor reliability and customer service quality.

Select a vendor who demonstrates reliability and exceptional customer support. Research technical support availability and confirm the vendor's experience with businesses matching your size and industry.

BigCommerce supports your ecommerce infrastructure

A partner ecosystem should help you innovate and succeed without limits. That's why we only include best-in-class ecommerce technology providers, designers, developers, and marketers to fill any gaps you may have in teams, time, or tech.

Trusted cloud infrastructure and scalability.

BigCommerce operates on Google Cloud infrastructure to support automatic scaling, load balancing, and infrastructure maintenance. Server updates, security patches, and traffic management occur at the platform level, allowing you to focus on business growth rather than server management. Multi-layer security protections help safeguard stores during high-traffic events.

Google Cloud's built-in multi-layer shields and round-the-clock guards protect against threats. Each ecommerce store gets its own secure data vault, helping block cyber attacks so your site stays online no matter what.

Security and compliance measures.

BigCommerce maintains PCI DSS Level 1 compliance and holds multiple ISO certifications, including ISO/IEC 27001 and ISO 22301. These certifications validate adherence to global security and data protection standards, helping businesses simplify compliance requirements.

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Let’s get even more granular: we've earned PCI DSS 4.1 Level 1 Attestation of Compliance, ISO/IEC 27001:2022, ISO/IEC 27701:2019, ISO 22301:2019, ISO/IEC 27017:2015, ISO/IEC 27018:2019. This gold standard proves our continuous commitment to keeping your store safe through constant testing and updates to stay ahead of new risks.

Seamless API integrations and customization.

You can build your new functionality with an API architecture that allows developers to create custom solutions to complex problems. Experience remarkable flexibility, allowing for custom checkout solutions, inventory management, and integrations with third-party tools.

Regardless of how complex your infrastructure setup is, we can help you tailor a solution together. It's like having the keys to a powerful toolkit that can adapt to your unique needs, giving you the control and power to shape your online store as you see fit.

Headless commerce for flexibility and customization.

BigCommerce supports headless commerce through its API-driven architecture, allowing teams to manage frontend experiences independently from backend systems. This separation enables faster frontend innovation without disrupting core commerce functionality.

Your marketing team can update web copy and upload product images from an easy-to-use dashboard, and the inner workings of all your infrastructure remain untouched. Businesses can plug and play custom storefronts without the risk of anything breaking.

The final word

Ecommerce infrastructure determines long-term scalability, reliability, and operational efficiency. Backend systems — including databases, APIs, and security frameworks — support every customer interaction.

Strategic architectural decisions reduce technical debt, prevent costly migrations, and position brands for sustainable growth, today and into the future.

At the end of the day, it’s not just a platform you’re choosing; it’s an investment in your business’s future.

Learn more about what capabilities are available when you build your site on BigCommerce, and get a demo with our team to get started.

FAQs about ecommerce infrastructure

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Can legacy systems be integrated with a modern ecommerce infrastructure?

Yes, you can integrate legacy systems with a modern business infrastructure. Integrating legacy systems with modern ecommerce platforms allows the ecommerce business to leverage existing functionalities and data while taking advantage of advanced features. But this integration can be complex, and requires careful planning and execution.

What are the advantages of a good ecommerce infrastructure?

Scalability: A robust system empowers businesses to scale smoothly, handling higher web traffic, more extensive product lines, and growing customer needs. These capabilities will prove vital during peak sales periods and flash deals. Cloud systems enable you to scale up or down without significant hardware costs. Better Security: A solid system incorporates critical safety features like banking-level rules, data protection, network guards, and current updates. This reduces the risk of data leaks, fraud, and cyber threats, protecting business and customer data. Improved Performance and Runtime: A robust system ensures that ecommerce sites remain fast and responsive, reducing load times and enhancing customer satisfaction. Features like load balancing, CDNs, and real-time monitoring maintain website performance during peak times. Seamless Integrations: A well-built infrastructure integrates smoothly with other business tools, like payment systems, shipping tools, CRMs, and sales platforms. This eliminates busy work and provides firms with one place to manage vital tasks. Cost Efficiency: Cloud systems help organizations slash expenses by eliminating the need for big hardware spending and upkeep costs. Firms can implement a pay-as-needed plan, purchasing only the tools they require when they need them.

What factors should I consider when choosing between cloud-based and on-premise ecommerce infrastructure?

There are several factors to consider when deciding between the two. While most businesses seem to have some operations functioning in the cloud, others prefer to manage hardware and software with a dedicated in-house IT team. The choice depends on budgets, growth stage, and business needs. Here are some factors to consider: Cost: Cloud-based solutions require an ongoing subscription, whereas on-premise solutions require a significant upfront investment in software, hardware, and IT staff skilled in maintaining and upgrading your infrastructure. Control: With a dedicated IT team, you ultimately control the on-premise infrastructure, which gives you free rein on customization. You are limited by what the cloud solution provider allows, so keep that in mind. Scalability: How much monthly traffic does your website attract? Are your products seasonal with known traffic spikes? The answers will determine if you would benefit from the superior scalability cloud platforms offer or the less flexible on-premise option. Your IT team must buy and configure additional hardware to ramp up. Time-to-market: Cloud solutions can be

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deployed quickly, allowing for faster time to market. On-premise infrastructure typically takes longer to set up and configure.

How can businesses ensure their ecommerce infrastructure is scalable for peak traffic?

To ensure ecommerce infrastructure handles peak traffic, businesses should adopt cloud-native solutions with auto-scaling capabilities (like Azure or AWS), implement database optimization, and use content delivery networks (CDNs) for speed. Key strategies include load balancing to distribute traffic, implementing microservices to separate functions, performing regular load testing, and using asynchronous queues to manage backend tasks.

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