



Transforming Retail in the Cloud: A CIO's Handbook

| CONTENTS

Abstract	3
The future of retail IT	4
A new IT paradigm for retail	6
Introducing the Retail Cloud Services Technology Framework	8
Getting started	17



Abstract

Retail CIOs and CTOs are facing a crucial question: How can they mobilize their technological wherewithal to capture emerging growth opportunities while competing in a rapidly changing market landscape featuring everything from personalized shopping to the perfect delivery of any product, anywhere, any time.

This handbook proposes a new IT paradigm for retail – a Retail Cloud Services Technology Framework that provides IT leaders with the structure, tools, and strategies they need to strengthen IT agility, drive innovative and profitable new products and services, and sustain a competitive edge in an evolving marketplace.

The book presents a multi-layered IT architecture approach that covers key components of the framework, from core compute, database and networking services to innovative retail applications like voice ecommerce, mobile, and cashier-less checkout systems that enable retailers to create differentiated, pathbreaking offerings.

Retailers will also learn about Amazon and other leaders that have pioneered the use of cloud services and perfected the use of microservices, APIs and other technologies to transform the retail industry. Finally, the handbook offers strategies and best practices for moving retail businesses to the cloud and ensuring a successful journey.

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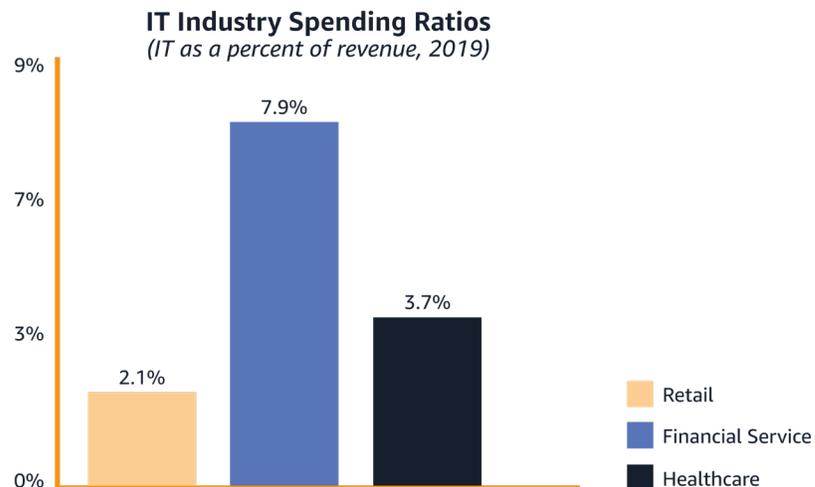
The future of retail IT

Retail's IT legacy

As the economy gears up for what's next, CIOs and CTOs in the retail industry are in a quandary: How to seize the rich opportunities ahead when they're stuck with yesterday's technologies and tools? How do we reframe IT as a strategic asset instead of a back-office cost center?

First, retailers must first confront the key legacies of their technology environment:

- **Low levels of IT investment.** Compared to other industries, IT investment in retail is significantly lower (see chart below). In fact, despite ecommerce growing by 250% over the past decade, IT spend is only expected to grow at a 6.5% CAGR for the next 5 years.¹
- **Operational silos.** Retail businesses are replete with operational silos — separate business systems and data stores serving multiple parts and processes of the business. The fragmented IT landscape forces retailers to build redundant applications and fragile system integrations that are both costly and prone to disruption.
- **Significant technical debt.** Decades of customizing large commercial ERP and ecommerce applications coupled with countless integrations have left retailers struggling to manage a collection of bespoke, brittle and batch-oriented systems.
- **Organizational challenges.** Too frequently retailers are hampered by a legacy of inefficient organizational structures and culture inertia, which can act as a barrier to business agility and innovation.



Retail's coming demand surge

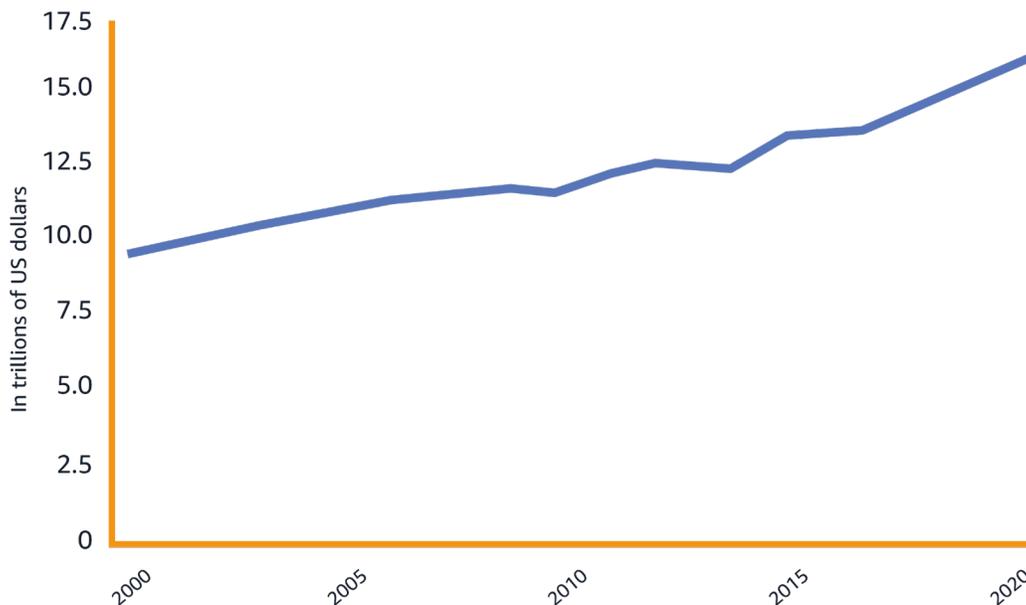
Propelled by strong revenue growth, the retail industry is poised for a renaissance.

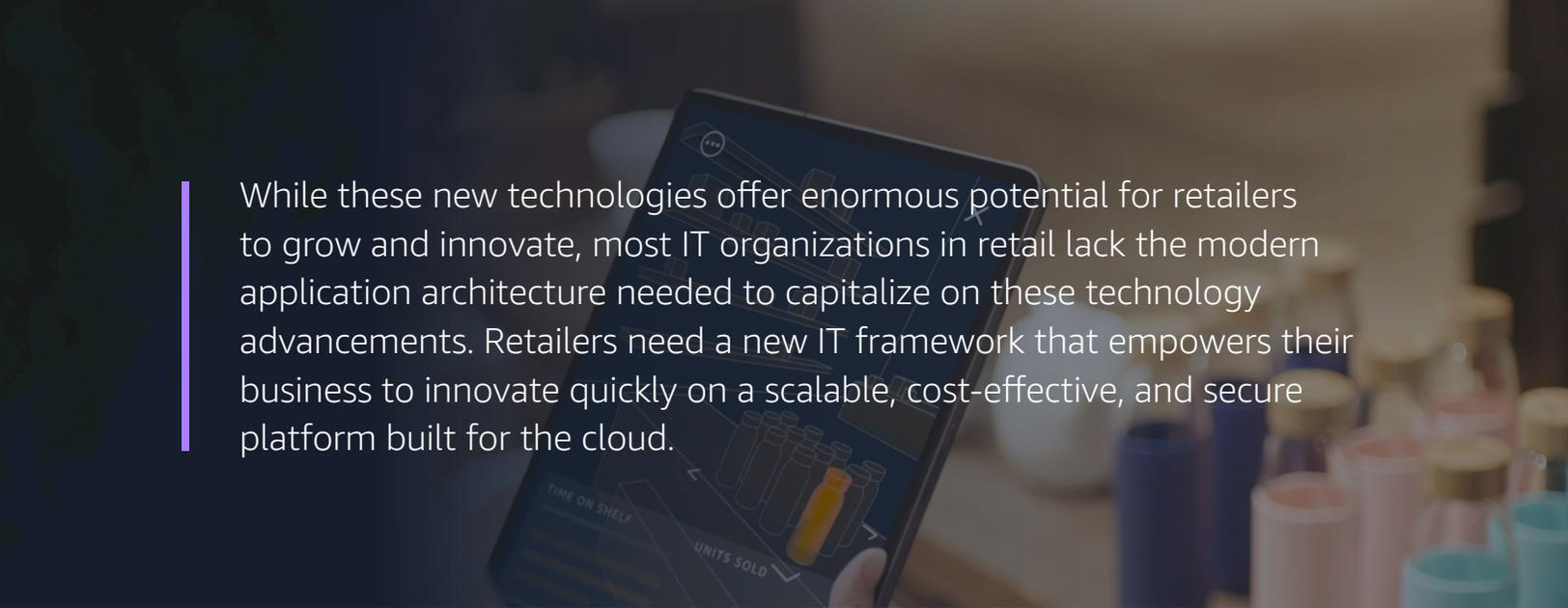
Analysts predict that much of the momentum in retail sales will come from a rising tide of household savings that surged in 2020 as people reined in consumption in response to the pandemic.

As retailers enter the next leg of the economic cycle, technology will be an indispensable tool for capturing the eyes and pocketbooks of consumers. The winners in this contest to capture market share and reignite growth will likely be the retailers that possess the ability to:

- Deliver a **differentiated and compelling customer experience** and continually adapt to their customers' engagement preferences.
- **Optimize operations** – in their stores, supply chains, and ecommerce channels – and reduce friction across the value chain.
- Create a technology-powered **innovation engine** to stay ahead of changing consumer preferences, savvy competitors, and shifting market dynamics.
- Create a **retail data platform** to proactively respond to customer needs.

US Disposable Income 2000-2020²





While these new technologies offer enormous potential for retailers to grow and innovate, most IT organizations in retail lack the modern application architecture needed to capitalize on these technology advancements. Retailers need a new IT framework that empowers their business to innovate quickly on a scalable, cost-effective, and secure platform built for the cloud.

A new IT paradigm for retail

Why change now?

With the renaissance in retail at our doorstep, it's truly an exciting time to be a retailer. From a technology perspective, advances in cloud services provide retailers with a great opportunity to overhaul their IT architecture and unleash new levels of business innovation. The good news is these technologies are proven, scalable, and ready to drive retailers forward. They include:

- *Fully matured cloud computing platforms.* Retailers have access to more reliable and scalable services in the cloud than ever before. They have more providers to choose from, and wider coverage around the globe. In 2021, cloud infrastructure services are expected to grow by almost 27 percent in 2021.³
- *Better network connectivity.* Stores today have access to more reliable infrastructure for connecting to networks (including 5G) and can deploy new edge technologies that easily integrate with low-latency cloud services. From 2021 to 2028, the global 5G services market is expected to grow at a compound annual rate of 46.2%.⁴
- *Access to modern app development tools.* Retailers are embracing flexible new microservices technology that help retailers quickly create innovative next-gen apps. Microservices are an IT architecture approach that creates applications from a suite of small services. Each service runs its own process and communicates with lightweight mechanisms. The services are built around business capabilities and independently deployable by fully automated processes.⁵



Microservices: Pioneered by Amazon

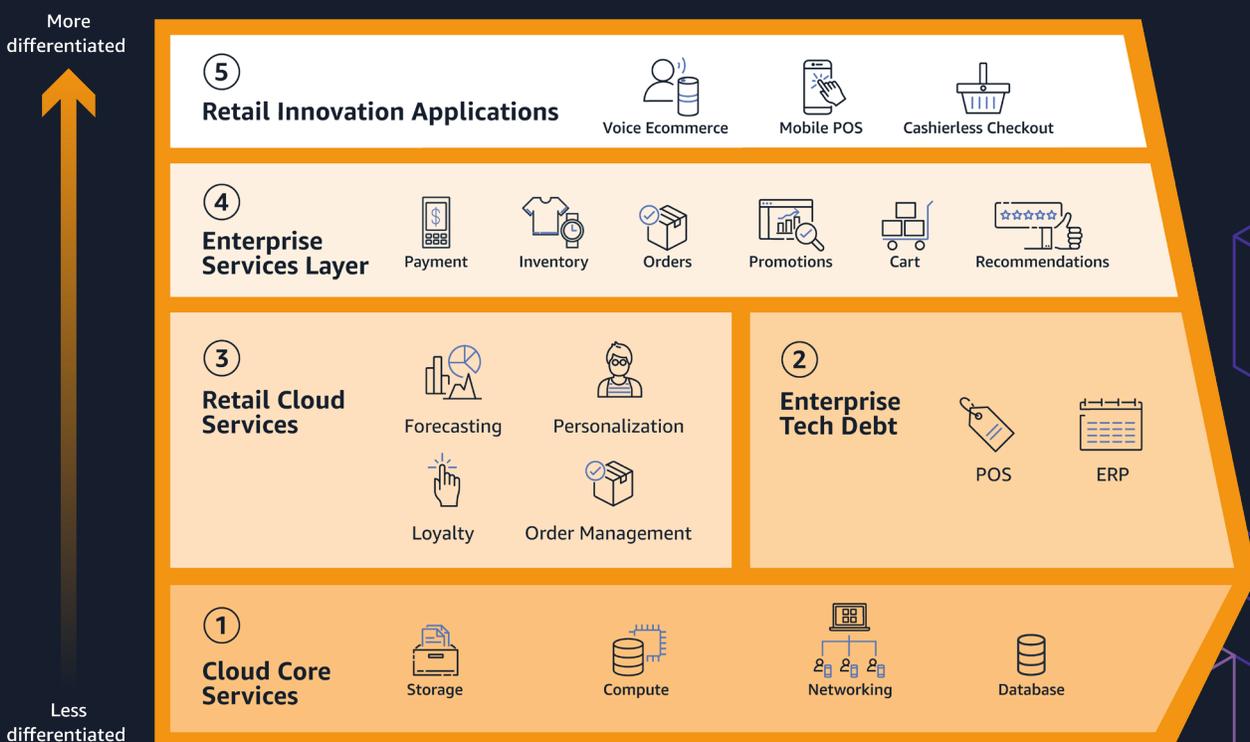
In recent years, microservices have become the go-to IT architecture for enterprises large and small. It's an approach that was largely pioneered by Amazon in the early 2000s, when its leadership made the companywide decision to move to a microservices approach to technology. Amazon's execution success has largely been attributed to organizing its resources to take full advantage of this approach. The use of microservices and an API-driven open data approach was mandated across the enterprise. Only service calls could be utilized to access other group's data; no direct links or backdoors were permitted. And to maintain its nimbleness as it grew, Amazon stuck to its knitting and mandated "2-pizza teams." This meant small, highly empowered development teams limited in size to what the team can consume for dinner – two pizzas.



Introducing the Retail Cloud Services Technology Framework

CIOs in retail must embrace an entirely new way of thinking about IT. We call it the **Retail Cloud Services Technology Framework** and it revolutionizes the architectural standards that companies have relied upon for the last two decades. Simply put, these older architectures can no longer keep up with the demands of the fastest moving retailers.

Retail Cloud Services Technology Framework





The end of monoliths

Before Amazon adopted microservices in the early 2000s, the company ran monolithic applications that required developers to carefully untangle dependencies every time they wanted to upgrade or scale its systems.⁶

This new Framework is not just about moving to the cloud to cut costs. In practice, migrating your existing operations to the cloud only results in shifting your current tech rigid, debt-laden legacy systems from your data center to a public cloud.

The Framework's strategic advantage over traditional IT architectures rests on the principal of technology abstraction. This approach decouples the business and customer-facing applications from the underlying business logic that drives these applications. This lets front-end developers spend less time on managing backend services and more time on transforming the customer experience. Modern application interfaces (APIs) allow developers to seamlessly incorporate these services while conforming to the company's existing enterprise schemas and security standards (authentication and authorization).

Let's take a look at the whole retail cloud Framework, layer by layer, starting with the core services and ending with retail innovation.

1

Cloud Core Services Layer

Storage
Compute
Networking
Database

The **Cloud Core Services** layer makes up the retailer's underlying information processing components, including data storage, compute, networking, and database systems. These essential cloud-based services provide the raw computing and networking systems that power your strategic business and customer-facing applications.

Because of their fundamental role, core services should be carefully selected based on more than simple cost and performance comparisons. Smart retailers should also look at modern capabilities like *automated infrastructure provisioning* to save time and allow developers to easily stand-up workloads on demand.

Adopting an "infrastructure as code" model can help reduce IT overhead, boost developer productivity, and provision workloads faster in the cloud. Pay close attention to your cloud providers' track record to make sure they meet your need for scalability, geographical flexibility, with robust networking connectivity.



2

Enterprise Technical Debt Layer

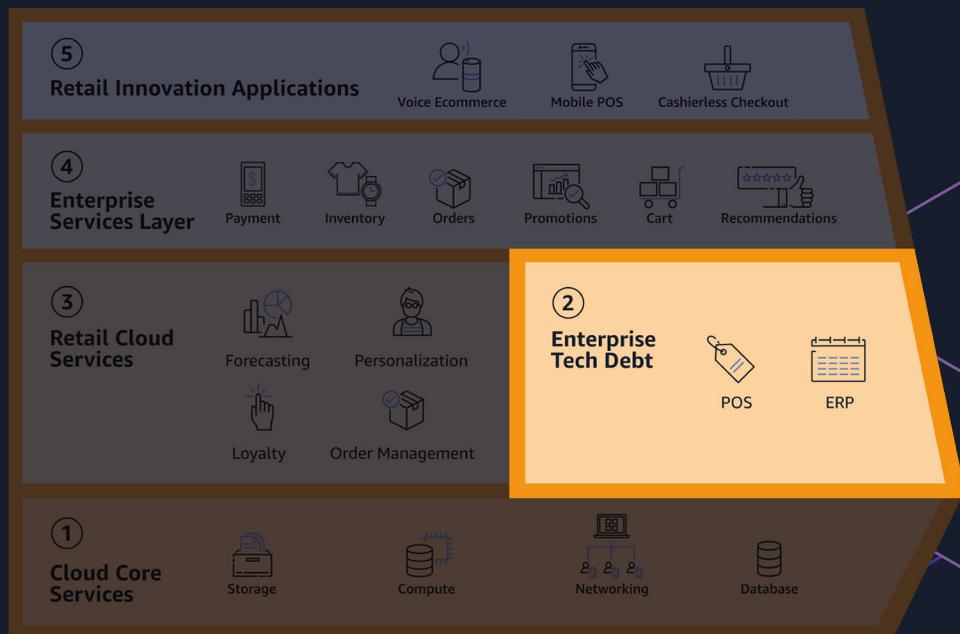
Legacy Point of Sale (POS) systems

Legacy Enterprise Resource Planning applications (ERP)

Most established companies in the retail industry suffer from technical debt – the ongoing cost of maintaining past investments in technology systems. These typically include commercial off-the-shelf (COTS) software, such as legacy POS systems, monolithic ecommerce webstores, and aging enterprise resource planning (ERP) applications.

Retailers' investments in this **Enterprise Tech Debt** layer typically consist of inflexible, monolithic applications with hard-to-maintain customizations, brittle system integrations, and high subscription and support (S&S) fees. Retailers struggle to keep these systems up to date with best-in-class business features and functions.

Retiring technical debt should be one of retailers top priorities as they modernize in the cloud. Start by identifying the “low hanging fruit” of your ERP applications that could be ripe for replacement with microservices. You can also move your consumer-facing content to a new cloud-based content management system (CMS) to begin the transition of your ecommerce user interface away from the monolithic ecommerce platform toward a microservice-based headless ecommerce engine. The **Retail Cloud Services** layer, described in the next section, can provide a wrapper on top of your legacy applications to enhance its operation. Then, over time, these cloud services can fully replace the legacy applications.



3

Retail Cloud Services Layer

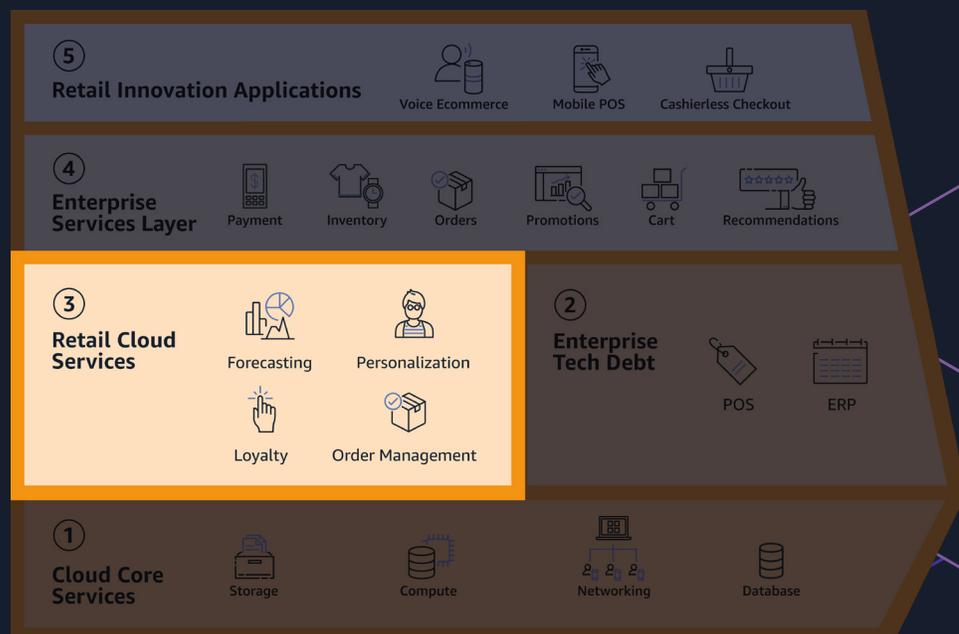
- Forecasting
- Loyalty
- Personalization
- Order Management

As retailers adopt the new Framework, they have the ability to progressively replace their legacy monolithic applications (Tech Debt layer) with a selection of **Retail Cloud Services**. These are market-proven business capabilities offered by the cloud services provider that can jumpstart your cloud transformation with modern retail capabilities, from payments and demand forecasting to personalization.

Designed specifically for the retail industry, these cloud services can initially work in concert with your old ERP systems, allowing you to transition to the Framework at your own pace.

Consider starting with a personalization service. Many retailers are already familiar with this capability from their legacy applications. [AWS Personalize](#) provides an opportunity to bring new data sources – such as omni-channel behavior, weather, and purchase history – powered by ML to help improve your customer experience over time.

Planning and forecasting systems are another opportunity to leverage cloud services. Moving from spreadsheets to a cloud-based forecasting application can eliminate manual processes, improve demand forecasts, and ensure your teams have access to the latest tools and techniques.



4

Enterprise Services Layer

- Payments
- Inventory
- Orders
- Promotions
- Shopping Cart
- Recommendations

The **Enterprise Services** layer takes retailers to the next level. This is where retail technical teams – working in tandem with pre-packaged retail cloud services – build innovative, unique and differentiated business capabilities. Built by and for the company hosting them, these enterprise services make up the digital platform that retailers use to do business with their customers, partners, and suppliers. Retailers create the platform using their own enterprise schemas, API standards, security protocols and other technical components, wrapping it around their best-in-class Retail Cloud Services and traditional cloud services provided by the cloud vendor.

API-based enterprise services make it easy to create new applications without the need for complex integrations with your existing infrastructure. Enterprise services can also be published as private services only available to internal development teams. They can be reused across engineering teams to bring new ideas to market faster and at less cost.

For example, personalization services provided by the cloud provider can provide APIs to your end developers, who can quickly build a customer recommendation capability, saving time and resources. Similarly, you can use pre-packaged, industry-proven AI/ML capabilities to build powerful forecasting services to meet your business needs.



5

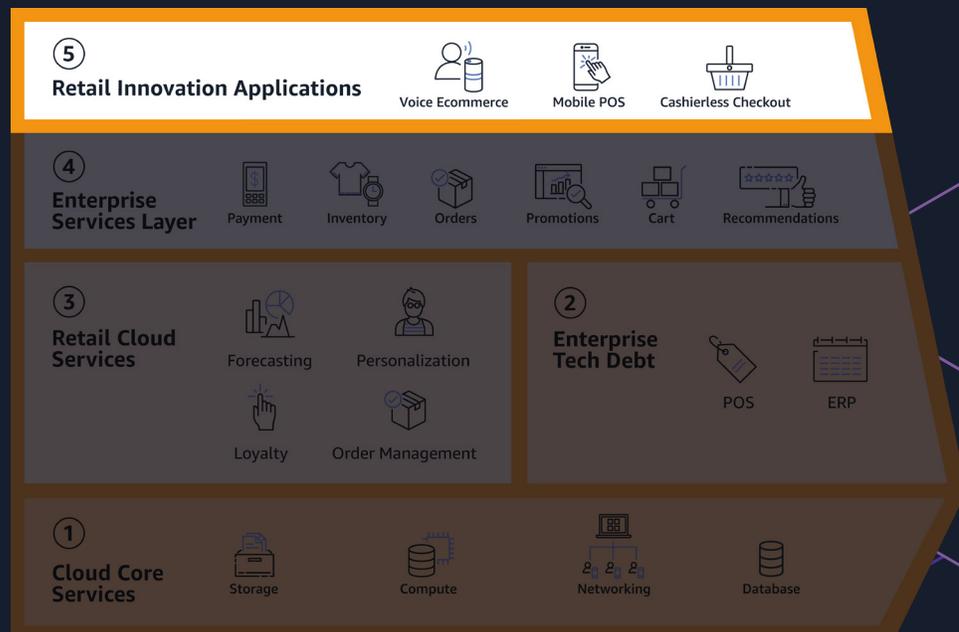
Retail Innovation Applications

Voice Ecommerce
 Mobile POS
 Cashierless
 Checkout

Finally, the Framework offers retailers the power to differentiate in the marketplace with pathbreaking new services and solutions. With access to a broad selection of microservices-based enterprise services, end-user development teams and business partners can now quickly design and build **Retail Innovation Applications**, speeding time to market and ensuring high-quality service.

Today, leading retailers are harnessing the Framework to design and deploy solutions that are transforming the consumer experience with voice ecommerce, mobile point-of-sale systems, advanced cashierless checkout systems, and more.

AWS Smart Store, for example, provides retailers with in-store capabilities to deliver AR/VR tools to create virtual product exploration experiences for its customers, fast checkout via mobile applications, and healthy and safe store solutions that leverage smart cameras and robots.



Empowering retail's technology future

We are on the cusp of a new era in retail as consumers worldwide return to stores and shopping centers with renewed vigor and embrace new ways of buying goods and services, from mobile sales and cashierless checkouts to AI/ML-powered product recommendations.

As the retail renaissance unfolds, the most ambitious retailers will invest in the latest technology tools and architectures – powered by cloud services – to outpace the competition and invent the next great customer experience.

To stay on the front line of the revolution, CIOs in the retail industry will need the help of a powerful ally: A new technology framework that empowers them to reinvent the customer experience – in the stores, online, and over mobile devices. This is where the Retail Cloud Services Technology Framework, presented above, will be a critical strategy for successful retailers in the new era.

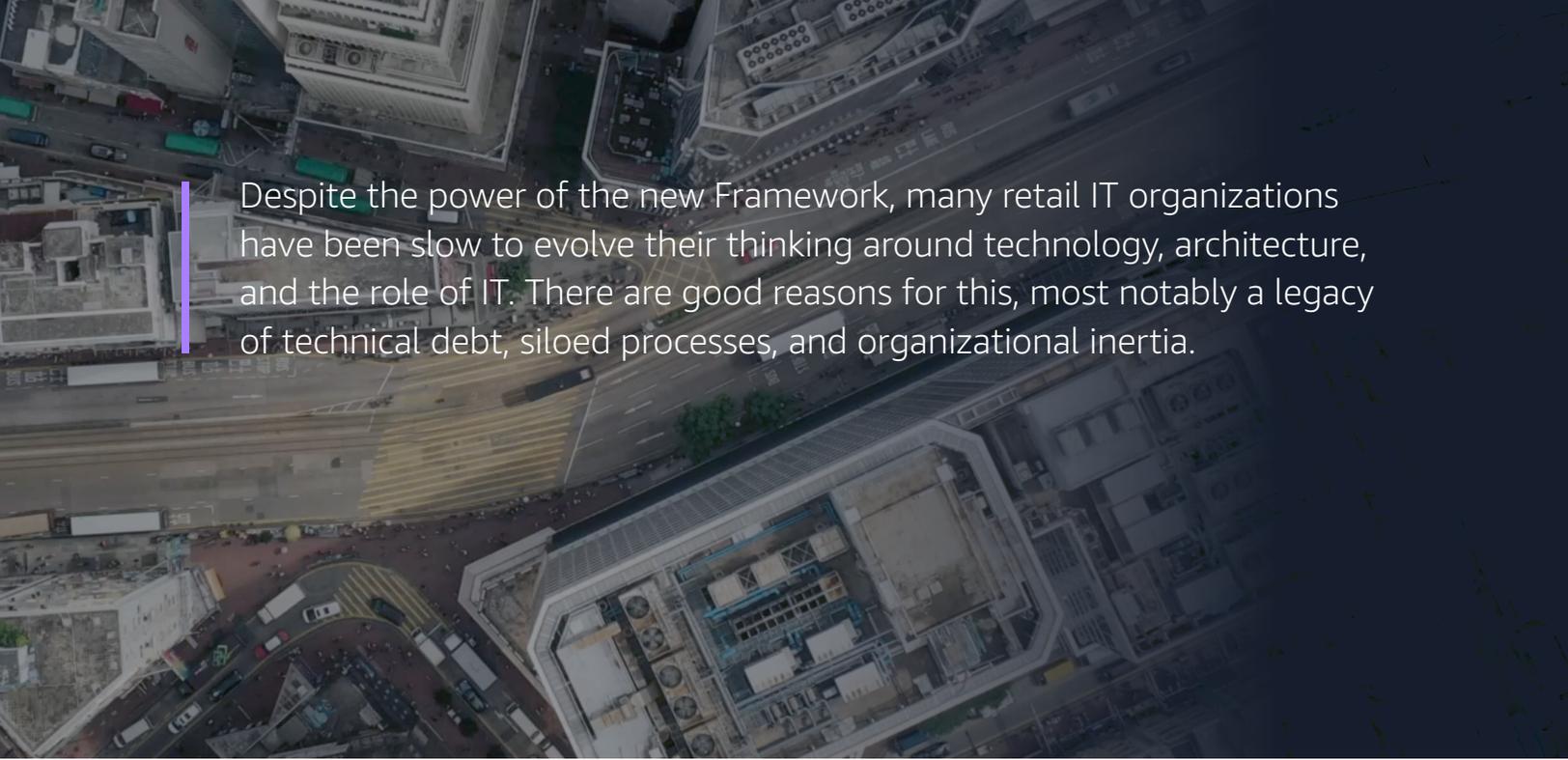
Rewriting IT and the business relationship

The Framework rewrites how retail CIOs manage their IT organizations and their relationship with the business. By adopting the Framework, IT no longer concentrates its budgets on lower-value activities, such as maintaining data center hardware and constantly updating legacy applications,

which offers little in the way of competitive advantage or business innovation.

The Framework all but eliminates technical debt so you can redirect resources behind value-producing activities and initiatives. By reducing the cost and accelerating the speed of innovation, CIOs can experiment with bold new services and make rapid course corrections without breaking their budgets. As IT becomes a reliable innovation engine for the business, leaders can confidently embrace a risk-on culture that rewards experimentation and speed. The new paradigm has the advantage of allowing retailers to move to the cloud and add innovations in measured steps, without disrupting the business. This means you don't need to wait for a big bang to get started on your cloud transformation journey.

By offloading technical debt, the Framework unlocks IT to focus on the **Retail Innovation Applications** and **Enterprise Services** layers. This is where you unleash your engineering and product teams to attract new customers (and employees), cement their loyalty, and separate your business from everybody else. Meanwhile, the Framework's foundational layers – the pre-built **Cloud Core Services** and **Retail Cloud Services** – provide IT with the flexibility to quickly improve your underlying business systems, helping you keep up with evolving industry standards while streamlining your cost structures.



Despite the power of the new Framework, many retail IT organizations have been slow to evolve their thinking around technology, architecture, and the role of IT. There are good reasons for this, most notably a legacy of technical debt, siloed processes, and organizational inertia.

Learning from pioneers

For years, cloud services pioneers like Amazon have relied on the Retail Cloud Services Technology Framework to decouple, reuse, and expose APIs to rapidly develop a succession of retail innovations that propelled their growth and industry leadership.

One subscription-based online fashion retailer, for example, recently adopted a cloud services Framework strategy to boost the speed and ability of its development teams and foster a product mindset. By integrating an array of microservices and AI algorithms, the company delivers a unique fashion experience, including a “virtual

closet” suited to the customers’ tastes. And it’s using the same technology strategy to create and market other retail services.

Microservices offer retailers a bridge to the next era of cloud-native services, and leading retailers like Nike have enthusiastically endorsed the approach within its engineering organization. The shift can take place systematically, with companies starting from a solid base of traditional – though inflexible – ERP platforms. Retailers can then add modern microservices to extend and steadily replace earlier ERP functions and accelerate modern user experiences.

Getting started

Moving your retail business to the cloud can be a daunting assignment. But the good news is you have proven best practices and a history of successful journeys to learn from. Here are some tips from others who have traveled that path.

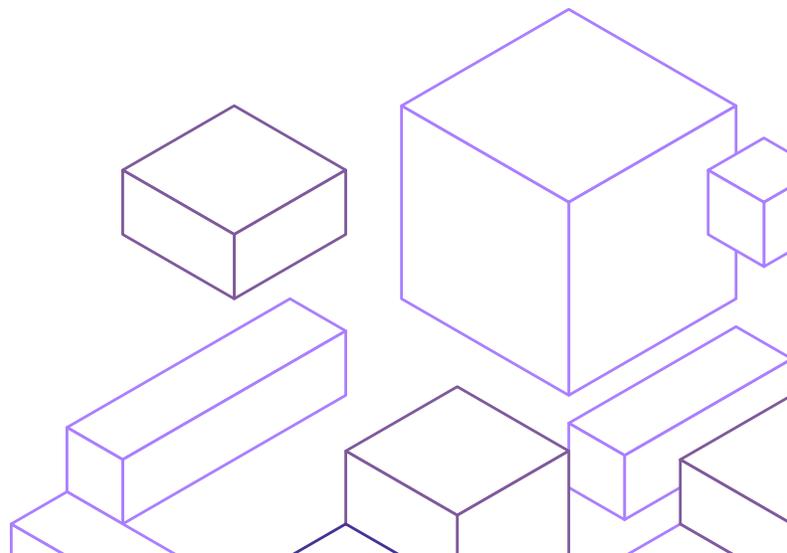
Define your cloud services strategy

Adopting a new IT paradigm built on cloud services requires a clear idea of where your business is going. Start by establishing a vision of what's core to your brand, then translate that into a set of services that will form your new enterprise "platform." These are the services you will want to "own" and

develop in your Enterprise Services layer; they are your competitive edge in the marketplace.

You can distinguish these high-profile services from other components of your platform that you could acquire from partners, freeing up resources to focus on what differentiates your business.

Finally, establishing achievable milestones and setting goals that inspire the whole organization will help people build confidence as you migrate to cloud-native services over time.





Start with your shopping cart

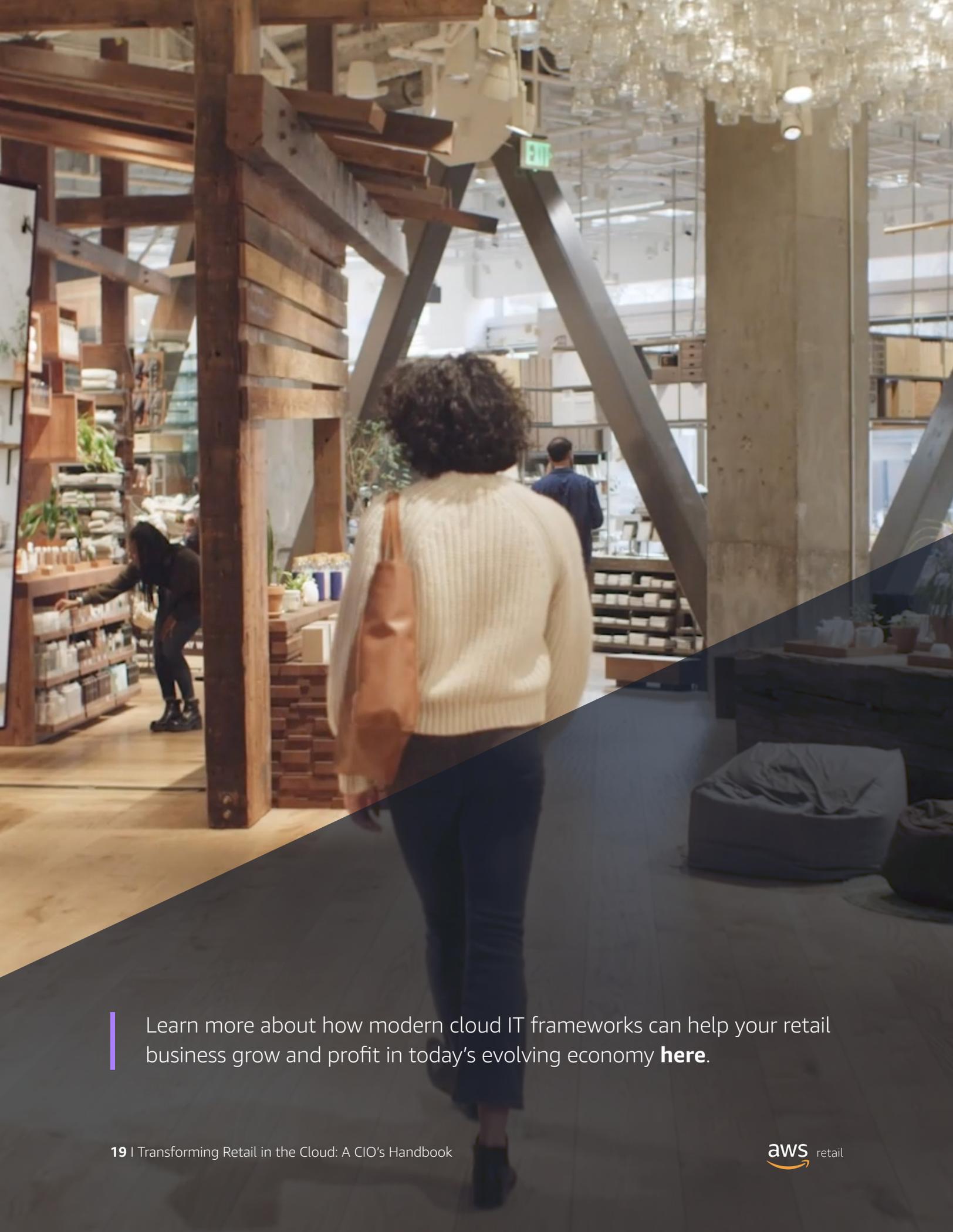
Where should you get started on your migration to a retail cloud services framework? Replacing your existing shopping cart application might be a good place to start. Many retailers find these applications difficult to scale and perform at a high level because they often rely on traditionally slow and inflexible relational databases. By moving to a cloud shopping cart service backed by a fast NoSQL database, you can easily scale to support hundreds of thousands of concurrent sessions with little to no latency. Using reusable microservices, your teams can quickly build shopping cart services for all of your sales channels, including mobile, web, and in-store self-service.

Pick the right cloud partner

What should you look for? Choose a provider with breadth and depth of offerings, so you know your developers will have the tools to build anything the business dreams of. Look for deep expertise in innovation, so you can reap the benefits of their experience without starting from scratch. Pick one with demonstrated operational experience, so you don't repeat the mistakes of your legacy architecture in the cloud. And consider sticking with a single partner – or a select few – so you can tap all of their managed services and maximize your buying power.

Establish a partnership with the business

Innovations aren't built in a vacuum. Building trust and partnering with the business is a key part of the process. Start by engaging with partners outside of IT to address any points of friction and work together on building cloud use cases that could add significant value to the business.



Learn more about how modern cloud IT frameworks can help your retail business grow and profit in today's evolving economy [here](#).

Sources

- 1 "Global IT Spend In Retail Industry Market Revenue." Transparency Market Research, 2018
- 2 Bureau of Economic Analysis, U.S. Dept. of Commerce
- 3 <https://www.statista.com/statistics/258718/market-growth-forecast-of-public-it-cloud-services-worldwide/>
- 4 <https://www.grandviewresearch.com/industry-analysis/5g-services-market>
- 5 For more information on microservices, visit <https://martinfowler.com/microservices/>
- 6 <https://blog.dreamfactory.com/microservices-examples/#examples>

Additional resources

- Reaching cloud velocity: AI leader's guide to success in the AWS cloud
- Future of retail operations: Winning in a digital era
- AWS digital transformation
- Enterprise technology transformation: Going all in on the public cloud
(sponsored by Capital One)
- AWS reinvent 2018: Becoming a Nimble Giant: How Amazon DynamoDB Serves Nike at Scale
- Platform Architecture for Omnichannel Retail *(Target Example)*
- Building Cloud Workflows with AWS Step Functions Part I
- Implementing Microservices on AWS
- The importance of event-driven architecture in the digital world
- Headless commerce: the definitive guide
- The future of cloud computing: strategies and best practices
- Cloud automation: top six benefits
- Three cloud ML approaches for enterprise AI strategy
- 6 steps for planning a cloud strategy
- What is a lakehouse?
- What year did Bezos issue the API Mandate at Amazon?
- Understanding cloud native applications
- Relational Databases Are Not Designed to Handle Change
- 5 reasons why the cloud is environmentally friendly