Meeting the New Demands of Modern Applications

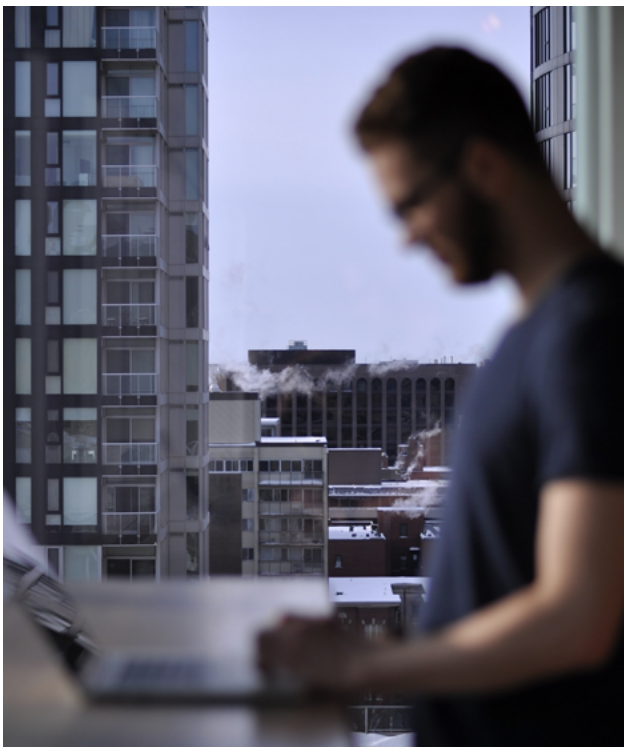How & Why Today's Enterprises are Modernizing Their Digital Experiences

Couchbase

Modern Applications Are Driven by New User Behaviors

Changes in user behavior made new digital transformation initiatives a priority, including:

- Web automation (caching)
- Location awareness & proximity search
- Cloud migration
- Analytics
- User experience (UX)

2021 forced enterprise IT departments to reassess their approach to digital transformation (DX).

During the pandemic, the unexpected in life, work and community led to a dramatic surge in online activity. As a result, consumers of all ages are now willing to switch brands for convenience, availability and value of goods.

These change drivers – such as the need for of low-touch business processes like "curbside pickup" for retailers – became more prevalent than ever. And because consumers were spending more time at home cooking, fixing up the house, consuming and streaming media, and increasing time on mobile devices, these behaviors are likely here to stay, even in the post-pandemic future.

These societal changes have compelled IT organizations to recognize that new digital experiences must be:

- More connected and online than ever before
- More localized, happening in-home, in-venue and in-neighborhood
- More personalized, through constantly evolving, behavior-driven profiles
- More device-aware, including both interaction (mobile) and monitoring (IoT)
- More compliance-sensitive and aware of country- and state-level regulations around consumer data privacy

These characteristics define **the modern application**.

In order to support these application requirements, modern applications need the technological support of cloud, 5G, IoT and distributed data management platforms.

An Overview of Modern Application Use Cases

The use cases for modern applications evolve quickly. Below are some of the most common categories and approaches that enterprise organizations take when it comes to serving today's user needs.

Notice how the above-mentioned application requirements are embedded within the following use cases.

User Profile Applications

Personalized user profiles require application-level control over the structure and attribute lists of the profile.

Modern applications need to augment profiles while interacting with the user, so millisecond-response times are a must. A modern database like **Couchbase** allows your applications to update and modify data structures of a JSON document and deliver incredible response times due to it's in-memory processing speed.

See **why Viber chose Couchbase over Redis and MongodDB to manage nearly 1 billion dynamic user profiles**.

"With less than half the servers, we're able to increase performance and gain a much better, scalable architecture."

— **AMIR ISH-SHALOM,** *Senior Director of Operations and Chief Architect,* Viber

Product & Services Catalogs

Today's product and service catalogs are constantly changing inventory and availability. These dynamic, digital catalogs benefit from application-led control of catalog inventory.

Any application that offers calendar-driven, limited-inventory products or services – such as restaurant reservations, airline or hotel bookings, or live event tickets – needs to match inventory availability and selection in real time. In addition, these modern apps need to present a compelling user experience that includes dynamic pricing and personalized options based on the user profile history. And it goes without saying that such applications must operate over mobile and desktop devices and support transactional, real-time inventory updates.

Learn **how Amadeus powers the travel industry's most reliable – and remarkable – customer experiences.**

Mobile Field Service Applications

Field service applications require the same degrees of personalization as retail, travel and media streaming applications except they also add location-based mobile data processing requirements to the mix.

Field service applications are location-aware, run on mobile devices like tablets, phones or custom-built handheld devices such as credit card scanners, mobile package acceptance signature capture. These applications connect to fixed-location network services like routers and cell towers as well as fixed-location IoT sensors that collect and carry data as other devices pass by. Roaming field service applications must anticipate intermittent network connectivity, yet must remain available to the field user at all times. These types of applications are found in telecommunications, healthcare, logistics and retail.

Discover **how BD uses Couchbase to deliver personalized healthcare in real time with IoT**.

Customer 360

Customer 360 applications are developed from the ongoing data collected and assessed from user profiles, their interactions with your inventory control systems, their resulting transactions and time.

While Customer 360 applications may be less "real time" than the other applications, this user profile information is fed to artificial intelligence and machine learning systems in order to create more personalized offers in the future.

Read how Maccabi built a user profile store for mobile customers using Couchbase.

"We wanted a solution that seamlessly works across server and mobile, and that the developers could use without lots of retraining. None of the other solutions came even close to Couchbase's broad enterprise capabilities."

— **AVIRAM AGMON,** *CTO,* Maccabi Health Care

Digital Experience

Digital experience applications are developed by combining user profiles, mobile device applications and locations, with usage and customer 360 data to create incredible, in-the-moment user experiences that drive revenue.

Most applications built on Couchbase evolve into transformative digital experiences for our customers' customers.

Learn how Tommy Hilfiger created immersive digital showrooms for wholesalers powered by Couchbase.

Modern Applications Need a Modern Database

Couchbase Server 7.0 supports the post-pandemic requirements of a new generation of modern applications.

These emerging applications are born from both the need to deliver personalized human experiences while also meeting the information processing demands of the modern enterprise. Modern applications must support traditional, trusted transactionality carried over from relational database platforms. These applications must also simplify the mapping, migration and refactoring of relational database structures into flexible non-relational ("NoSQL") structures.

This balance is important: enterprises need structural consistency such that developers can communicate effectively about their database designs *without* giving up the JSON-based flexibility that allows the applications they build to add or modify data structures as needed, without intervention from DBAs. This flexibility is mandatory in order for modern applications to support hyper-personalization that matches people to the perfect products or offers they seek, as they seek them.

Of course, all of these activities happen in real time and require zero latency. A key reason customers choose Couchbase is its in-memory key-value and indexing speeds.

What's more, modern applications don't exist exclusively on desktops; they're also mobile and IoT-enabled. Mobility creates new, valuable requirements, such as location awareness and the ability to freely search within a locality. We do this every day with Google Maps, but tomorrow's applications will support built-in, geo-location search functionality directly.

The challenge, of course, is that mobile devices and applications exist at the mercy of their wireless networks and their carriers, who are fast at work building out smart, 5G-enabled environments. Unfortunately, wires will always fail, and connectivity issues will need to be both flexible and reliable. Finally, these mobilized 5G-powered, edge-based applications will process data both on the spot and on the server, blending data backbone resources that can glean new information from using large-scale analytic processing, and create new event-based actions based on the insights generated.

These modern applications will be intelligent in their own right and support a variety of machine-learning capabilities, fed by the same distributed data backbone. These are the application requirements for which Couchbase Server 7.0 was designed.

Developer Requirements

Application developers are modernizing their behaviors.

While their experience may be rooted in relational databases, modern developers are adopting new best practices for cloud-based application construction and delivery. They are moving to serverless development for both speedier times-to-market and cost-effective operations post deployment. They are adopting cloud-native best practices like continuous integration and continuous delivery as a result.

The challenge here is the developer's ability to blend the stateless execution of application microservices with the need to obtain and keep stateful data. After all, modern applications run anywhere, across any cloud and upon any device while supporting these delivery processes.

Without a modern database management platform like Couchbase, these developers face huge challenges in building data processing infrastructures for these modern applications. Keep reading to see how Couchbase Server 7 helps address these requirements.

Transaction Requirements

As mentioned above, modern applications are transactional.

Unfortunately, transactional workloads have been the strong suit of relational databases, and less so for NoSQL systems. This is because NoSQL systems offered scale at the expense of data consistency.

Here is where Couchbase Server 7 ends the debate over using relational or non-relational technologies for transactional workloads. With Couchbase Server 7, developers can confidently include and execute business transactions within their personal experience applications that support transactional use cases like:

- Shopping cart assembly and purchases
- Inventory control systems
- Shipment confirmations
- Billing and payment processing
- Media streaming, with episode progress and bookmarking

Distributed Data Processing and Mobility Requirements

Modern applications will be distributed worldwide and deployed through the cloud out to edge and mobile devices.

The challenges with these distributed applications are that mobile networks are unreliable and lose connectivity frequently. However, this doesn't stop the user requirements for availability and local, on-device data processing. Mobile-powered applications need low latency when they're connected to the network, and offline processing and local storage when they're not.

The Distilled Requirements for Modern Digital Experience Applications

The following attributes are common across this new generation of digital experience applications and can be found across a variety of industries.

These high-level requirements can be summarized as the need for a flexible profile format, mobile devices driving the interface to the backend, performance-driven interaction and engagement with enterprise systems, and a cloud-native distributed, scalable architecture driving the back-office data platform.

Consider the following application requirements:

1. **User profiles must be adaptable and flexible.** It should be easy to add, extend or modify attributes of a user profile. For example, adding information about whether or not a person has been inoculated. This requirement is met by adopting JSON documents to store and modify the attribute list.

2. **Profile construction requires assembly from countless data sources.** These data sources are found throughout the user environment, including capturing edge-device generated information along with application and behavioral data, similar to what browser cookies capture today.

3. **User access to the app must be instantaneous.** It is often advantageous for the systems to cache activities in-memory in order to stabilize writes and reads from legacy systems that would be unable to maintain high levels of availability otherwise.

4. **These applications must support webs of offline-first computing.** Digital experiences must be able to work across webs of disconnected, offline-first computing environments for their user-facing mobile environments.

5. **They must be cloud friendly.** Digital experience apps must support cloud-native deployment options to offer easy, free access to the technology for learning and evaluation, and then support worldwide deployment and lower operating costs.

6. **Everything must seamlessly fit within existing corporate structures.** These applications must integrate new and existing data and data models in order to minimize learning curves for new technology adoption, ideally leveraging as many existing skills as possible.

7. **They must support worldwide distribution and availability.** These applications follow users around the globe, and appear across every continent and country. As such, they must support data replication across geographies, data filtering to accommodate local regulations and hierarchical data synchronization that enables this continuous experience wherever it needs to appear.

New Digital Experiences by Industry

Digital experiences are driving modern application requirements, and they're found in every industry. Consider the types of applications supported by Couchbase in the following industries.

Leisure & Entertainment

On-site entertainment operators (like amusement parks, sports complexes, arenas, cruise ships and casinos) deliver personalized experiences to patrons via wearable IoT devices paired to mobile device applications as well as fixed-location sensors deployed throughout the facility.

These devices act as access keys to attractions, touchless payment facilitators and location-based crowd-capacity-balancing and child safety monitors. They capture and match behavior-based preferences for each user such as, "Dakota likes French Toast," which triggers an offer to the child each morning of their visit. These modern applications help guests find family members, use cashless payment systems, open ships' cabin doors or suggest better times to visit high-traffic areas.

Discover how **CenterEdge uses Couchbase to give amusement park staff real-time customer insights**.

Media Streaming

Music and video streaming providers need to keep track of user preferences such as genre, artist, actor, title, episode, playlists and bookmarks as they are custom matched to albums, live performances, podcasts, TV series, movies, news programs and more.

These applications must also accommodate variations in devices and delivery platforms (phones, tablets, set-top boxes, TVs, computers, etc.) These application requirements apply to telecom and streaming media providers.

Learn how **Sky keeps viewers happy with the high performance and high availability of Couchbase**.

Travel Booking & Loyalty Programs

Modern applications that support booking travel have incredibly challenging tasks to solve. They must offer a dynamic, time-and-inventory-sensitive, digital catalogs of reservation availability to millions of mobile and desktop users, each with preferences and loyalty program interests.

The rise of loyalty programs, which maintain traveler preferences through years of data collection, must be accessed, updated and matched in real time to available travel inventory, based on the travel timeline requested by the user. In these application profiles, catalogs, devices, and locations must be triangulated in real time, in order to expedite booking transactions. Once completed, all profiles, catalogs, inventory and price lists must be updated so as to not misinform the next customer.

Read how **Amadeus processes the majority of worldwide travel bookings through Couchbase with rock-solid reliability**.

Online Gaming

JAMCITY **betfair**

Gaming providers must deliver a highly engaging, progressive user journey during each online experience.

Today's modern gaming applications often group players together as teams or clans, and pit player versus player. This involves matching dynamically changing user profiles in real time at the outset of every game. Games usually include the accumulation of rewards that must persist session after session, requiring application-driven profile updates. Games often include upgrades and purchase transactions as well. They must maintain team information and service millions of users at once.

These attributes can also easily be applied to betting applications, which also include loyalty incentives, rewards and financial transaction debits and payouts.

See how Jam City scaled to meet the demand of 35 million users globally in under 8 months by building on Couchbase.

Discover how Betfair went all-in on Couchbase for easy-to-manage performance and scalability.

Mobile Device Communication

verizon✓ Mobile telecommunications applications are a derivative of field service applications, as they need to store, update and monitor both the user and the systems that they use.

These communication applications are regularly deployed by the user on multiple devices, each of which must maintain up-to-date profile information. Personalized data such as emoji use, common phrases for auto-suggest, or user-built avatars are popular in these modern applications. User profiles, message histories and real-time communications must be delivered and received in milliseconds for millions of users.

Learn how Verizon uses Couchbase to innovate in IoT to better connect the world.

Telecommunications Device Management

BT Similar to communication applications, device management apps must deliver software updates and collect usage statistics per user account and per device often used for consumption-based billing or maintenance scheduling.

Read how BT improves their time to market for new telecom features while lowering costs with Couchbase.

"Couchbase is one of the easiest NoSQL databases to deploy, maintain, and scale out."

— MOHAN UMAPATHY, *Director of System/ Architecture,* Verizon

Online Retail Applications

Online retailers, especially those selling perishable products must maintain strict control over inventory availability. Grocers, for example, receive inventory updates multiple times per day, which affects what can be listed online. Couchbase is used for matching this dynamic perishable inventory to customer orders in real time, resulting in easier accommodation of new requirements such as curbside pickup or scheduled delivery.

See how [Carrefour reduces time to market with flexible ecommerce applications powered by Couchbase](#).

> "Couchbase is easy to manage, you can effortlessly scale horizontally, or build additional machines. We don't have to do anything additional or worry about anything."
>
> **— JESUS DE LOS BUEIS,** *Software Development Manager,* Carrefour

Inventory Management for Durable Goods

Durable good retailers sell products such as electronics, hardware, appliances, furniture and clothing. Their inventories are less time-sensitive than perishable goods, but are much more diverse than grocery inventory.

A grocery store sells thousands of items while a home improvement store sells millions of items, from refrigerators to nuts and bolts of all sizes. This means that their catalogs, albeit large, must be precise with the attributes of the hard goods they represent. They must be transactional in order to match with sales transactions, and they must be regularly updated to accommodate promotions, sales, holidays, etc. These applications must be durable, elastic and highly performant to accommodate spikes in consumer volume such as Black Friday and Cyber Monday.

Discover how [Tesco – the world's third-largest retailer – manages millions of products using Couchbase](#).

Fraud Detection for Financial Services

FICO. **Revolut**

For every purchase of a product or service, there is a financial transaction that is completed between purchaser and seller, sometimes in cash, but more frequently using a credit or debit card. These card accounts numbers, owners, locations and PINs are easy targets for online thieves.

Financial institutions and their suppliers have built real-time fraud protection and detection applications using Couchbase, in order to minimize and fight fraud. These applications monitor card accounts and compare current transactions with existing pattern data to determine if the transaction is suspicious. If it is deemed suspicious, the detection service may notify the card holder and block the transaction in real time.

Fraud behavior profiles are stored and updated in Couchbase and track such data as the time and location of the transaction, amount of the transaction or type of purchase. Couchbase-powered fraud prevention applications are award winning and used by a majority of financial institutions worldwide.

Learn how **FICO runs the world's #1 fraud detection platform on Couchbase**.

Read how **Revolut strengthens fraud detection using machine learning and Couchbase**.

Credit Monitoring

EQUIFAX Credit monitors evaluate the likelihood of timely online payments from an account or loan holder. These applications are used by financial services institutions and other credit providers to determine loan eligibility, often in real time.

These systems monitor billions of accounts held by millions of users, and update their profile scores in real time as well. The financial world depends on the predictive accuracy of these systems, and they are run with Couchbase.

See how **Equifax uses Couchbase multi-dimensional scaling to provide agile services and dependable data to lenders.**

"We looked at Couchbase, we looked at Cassandra, we looked at Mongo. We found that the replication technology across data centers for Couchbase was superior, especially for the large workloads."

— **CLAUS MOLDT,** *CIO, FICO*

Financial Transaction & Trade Processing

Billions of online payments occur every day. These systems must deliver transaction results in real time, and maintain very high degrees of availability, especially when stressed.

Discover how [Wells Fargo protects 100% of transactions from fraud in real time using Couchbase](#).

Shipping, Logistics and Package Tracking

Shipping and logistics requires matching millions of in-transit packages to their destination and owner. This is a complex, real-time process that requires live, dynamic updates to the package profile record, such as where it is currently located along its physical journey. These locations could be warehouses, sorting facilities, trucks, trains, planes or delivery vehicles.

Often the application must provide proof of delivery such as a photograph or a signature, which can be captured via mobile device. Addresses, packages, shippers and recipients can easily run into the millions of real time records.

Learn how [Doddle uses Couchbase Mobile to power logistics solutions for retailers](#).

Healthcare Electronic Medical Records Management

Electronic Medical Records (EMRs) are documents that represent the current and past treatments and advice (orders from the doctor), in the administration of medical care to a patient. These are living documents and must be updated frequently and be available among a large number of care providers and services, such as pharmacies.

Couchbase is used to manage, update and maintain these sensitive records. Couchbase Mobile is especially useful when patient care is being delivered in remote locations that do not have reliable internet service.

Read how [BackpackEMR brings modern medical care to remote patients using peer-to-peer sync powered by Couchbase](#).

> "Oftentimes, these clinics have limited or no internet access. The peer-to-peer synchronization in Couchbase Mobile enables patient data to be shared across the clinic seamlessly in real time."
>
> — **LORI MOST,** *CEO,* BackpackEMR

Why Choose Couchbase to Build Your Modern Application

There are five core principles upon which Couchbase was built:

- Multimodel data access support
- Performance at massive scale
- Structural flexibility
- Operational ease
- The ability to run anywhere, from the cloud to the edge

These are challenging data processing problems.

Multi-Model Data Access

The Couchbase platform brings multiple data processing engines into one platform.

Couchbase includes a key-value engine, support for relational structures, a full SQL query engine, a complete text-processing engine, an eventing engine and an analytical engine. Its unique architecture allows you to combine operations that require microsecond response times to support interactions and transactions which require full ACID guarantees. This eliminates the need for enterprises to choose different systems for different workloads and deal with all the data movement and integrations. This approach contains organizational data sprawl and allows enterprises to derive more value from their data in near real-time.

High Performance at Massive Scale

Performance can't be bolted on later. It has to be in the DNA of a database from day one. The memory- and network-centric architecture of Couchbase allows it to deliver blazingly fast performance. This performance is near linear as it is built on a shared-nothing architecture that allows the platform to maintain the throughput and latencies as compute, storage and network resources are scaled.

This architecture is typically called horizontally scaling. Think of a train – as you need more capacity, you add more cars. The uniqueness of Couchbase is that it isolates the different processing engines that allow it to scale in a different dimension as well.

Couchbase also scales at a functional level. In this example, think of adding different types of cars to the train – baggage cars, pantry cars, passenger cars – based on the route or other unique needs. This is known as multi-dimensional scaling. The benefit is cost, as you only need to scale for resources you need. To contrast this, relational systems are vertically scaling. Think of an airplane. If you need more capacity, you simply need a bigger plane.

Structural Flexibility

In the database world, one of the most important problems to solve is "rigid schema". In fact, the entire NoSQL movement started to solve this limitation.

Couchbase is a schema-flexible database that removes the strict schema limitations that relational systems impose. By using JSON as the data model, Couchbase removes this limitation. Furthermore, SQL is the programming and query language for Couchbase. For enterprises this means they don't have to find someone with rare or expensive skills to start using the database. They already have the skills in house. This eases and speeds the digital transformation process.

Operational Ease

Couchbase is designed to eliminate some of the classic database administrator tasks.

By eliminating the need for fixed schema at the database tier, Couchbase introduced a dynamic data containment model to offer both flexibility and structure; by enabling auto-sharding and rebalancing of data, by separating index management from data management – Couchbase automates many of the administration tasks.

By leveraging Kubernetes, the Couchbase Autonomous Operator enables many administrative tasks to be programmable. With this innovation, we have brought databases into the CI/CD pipeline for the first time. This allows you to code your database changes along with the application changes and deploy the platform across private and public clouds.

Run Anywhere

Enterprises need a distributed database that can span physical servers, virtual machines, containers and cloud instances as well as any device on the edge. This is because today's cloud, mobile, IoT and other modern applications run on a distributed basis, often interacting with millions of users and devices around the world.

Moreover, the ability to run in multi-cloud environments allows enterprises to avoid cloud vendor lock-in. Add to this the Database-as-a-Service (DBaaS) and you get a platform that not only runs anywhere but is also hosted and managed by Couchbase.

These five principles are compelling differentiators for Couchbase customers. Some of the world's largest enterprises run some of their most mission-critical applications and architect their applications on Couchbase as it offers the comprehensive capabilities of an enterprise-class database.

Couchbase offers customers a modern database for enterprise applications that they need today, and for what they will need tomorrow through our carefully architected progressive cloud strategy for the enterprise. As more enterprise customers move workloads to the cloud, we are well positioned to address the growing cloud database market.

Conclusion

Couchbase Server 7.0 is a modern database that is designed to help enterprises adapt to the needs of an evolving data landscape.

The Couchbase Data Platform is built for a world where the applications may be delivered as a service from the cloud with high availability and consumed at the edge on occasionally connected mobile applications. These applications are developed in a new paradigm of continuous integration and delivery (CI/CD) using a DevOps model.

Couchbase empowers enterprise applications to handle the realities of a post-pandemic world where digital, touchless interactions across a network that is 5G powered will come first and augment humanity's physical experiences. The applications will come to you, rather than needing invocation by you, which is the paradigm shift that illuminates modern application behavior. This is much needed now as the relational systems were designed in an era when there was no public internet, no cell phones and "cloud" was just emerging.

Couchbase enables enterprises to move from legacy IT systems to a modern infrastructure that is virtualized in private and public clouds, that can be orchestrated from end to end, and can deliver these applications securely at the edge.

Couchbase

At Couchbase, we believe data is at the heart of the enterprise. We empower developers and architects to build, deploy, and run their mission-critical applications. Couchbase delivers a high-performance, flexible and scalable modern database that runs across the data center and any cloud. Many of the world's largest enterprises rely on Couchbase to power the core applications their businesses depend on.

For more information, visit www.couchbase.com.