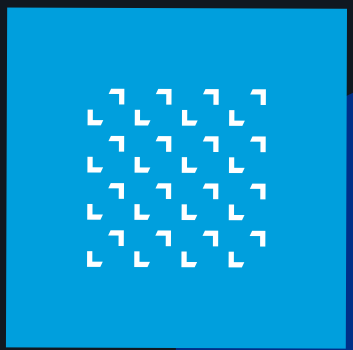
entando

Accelerating UX innovation with micro frontends on Kubernetes



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Executive Summary

As your business looks to win and retain more customers, the online experience your brand provides is a key differentiator. If the UX of your app, site, or portal is dated or if it performs poorly, it will cost you sales and hurt your brand's credibility. So in order to remain competitive, you need to focus on continual innovation, providing UX that's intuitive and responsive.

But as your business grows and your needs become more complex, bottlenecks in your development processes can begin to plague your progress, leaving you vulnerable to competitors who are seeking to assume your position of leadership in your industry.

So in order to maintain speed of innovation, you need to empower your development teams to release UX feature updates independently, rather than waiting to update your entire application frontend at once.

The best way to accomplish this is by using a micro frontend architecture for independent release cycles, and by deploying in containers to keep your applications running in an effective and resource-conscious manner at scale.

Furthermore, as you manage the complexity that comes with developing applications in micro frontends and deploying them in containers, your enterprise will benefit greatly from utilizing a micro frontend platform built specifically for Kubernetes-native development.

This white paper outlines how your organization can accelerate UX innovation by developing with micro frontends on Kubernetes, as well as how a micro frontend platform can help you execute this methodology more effectively.

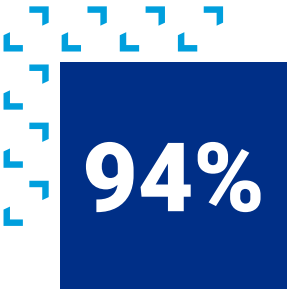
The companies that are the most successful in driving innovation aren't necessarily the ones who come up with an innovative idea first. They are, however, often the first ones to implement those game-changing innovations at scale.

Deciding to implement a revolutionary idea is only the beginning. Turning that idea into reality is what separates industry leaders from mere dreamers. By and large, your success is determined by the rate at which you can successfully develop and deploy new experiences to your customers.

When it comes to UX, the rate of change can be staggering. Customers are looking for brands to deliver online experiences that are lightning fast, ultra responsive, and incredibly intuitive. Research indicates that customers have a high bar for quality, and they'll quickly become fickle if you can't deliver the kinds of experience they're looking for.

According to MyTechlogy, 94 percent of people distrust a website that's outdated, and 90 percent of users have stopped using an app due to poor performance, according to Toptal. If your user experience feels old, it hurts your credibility. And if it doesn't load quickly enough, users simply won't return.

What's more is that dissatisfied users aren't typically quiet about how your site or app makes them feel. According to Neil Patel, 44 percent of shoppers will tell their friends about a bad online experience. This kind of negative word of mouth can absolutely kill the growth of your business.



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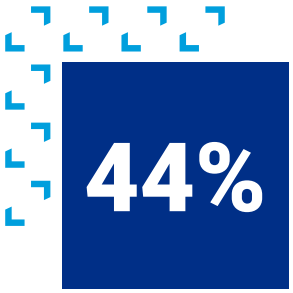

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In light of these realities, your enterprise needs to be able to innovate UX quickly. Because if your customers, employees, or partners have a bad user experience, it's costing you money. But conversely, if you're able to continually improve your user experience, you greatly increase your chances of winning over and retaining more customers.

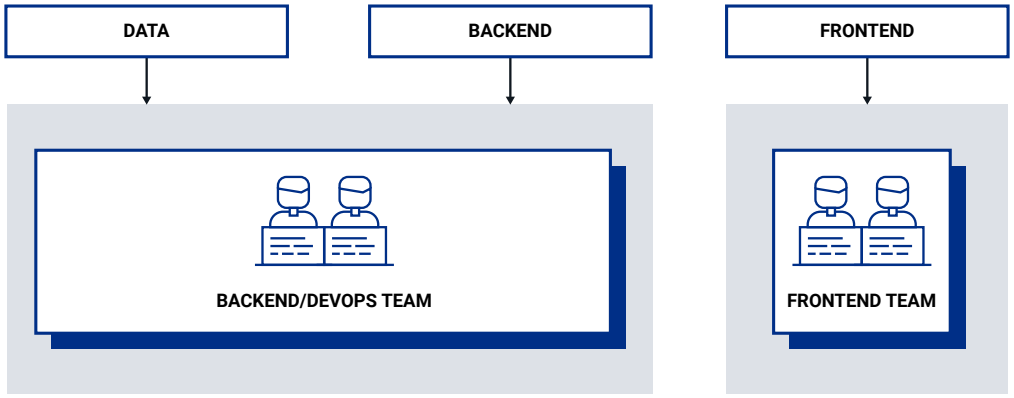
To ensure that your business innovates as quickly as possible, you need to make strategic decisions regarding your development processes and the technologies you use, as well as how you position your teams around those tools and methods. And as your business grows and your needs become more complex, you'll need to ensure that the decisions you make allow you to maintain your rate of innovation as you scale.

At Entando, we believe that the best way to ensure fast UX innovation is by structuring your organization around cross-functional teams that have end-to-end control over individual UX features within your website, application, or portal--from design to development and deployment.

The best way to achieve this goal is by developing applications in micro frontends on Kubernetes. Here's how that works.

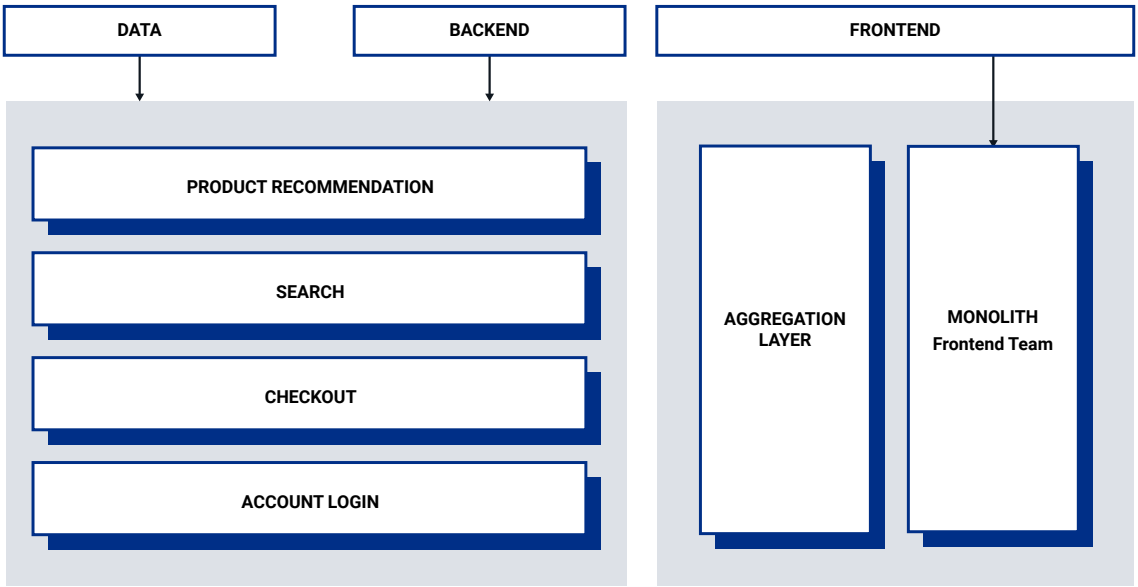
Developing in Micro Frontends

Micro frontends serve as the natural evolution of microservices. Before the advent of microservices, developers would create applications as backend and frontend monoliths. That method works well for simpler applications, but as the size of codebases and the demand for more complex functionality increases, the backend monolith can become too cumbersome to manage. This is the problem that microservices were introduced to solve.



By decoupling different functionalities and assigning them to various backend teams, you're able to eliminate bottlenecks, more easily manage codebases, and push updates more quickly. For larger organizations, microservices enable you to scale your development teams without having your organization, your code, or both become bloated and unwieldy.

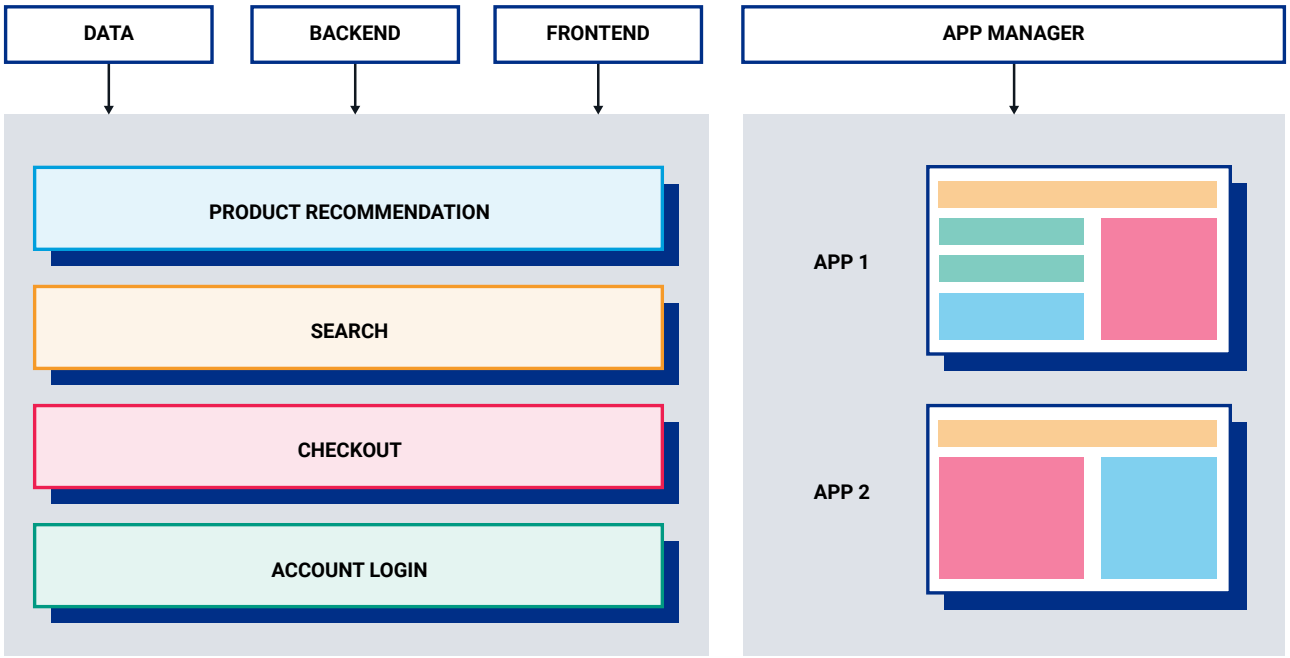
Nevertheless, while the benefits of microservices have been well demonstrated, until recently, frontend monoliths have largely remained unchanged.



The frontend team has become the new bottleneck, trying to effectively interface with a number of different backend teams, but ultimately hindering them from pushing their updates until the entire frontend monolith can be updated. As your business continues to scale, having a single frontend team manage the UI layer for all your microservices becomes a growth barrier, which will frustrate your dev teams as well as hamper your ability to continue innovating.

On the other hand, a micro frontend architecture models itself after microservices, which break up larger monolithic structures in favor of more loosely coupled services that your teams of developers can work on and update independently from the rest of the site, app, or portal.

This kind of flexibility is likely why micro frontends are becoming a growing trend. According to the 2020 State of Microservices report, 24 percent of developers have used them.



From a business perspective, micro frontends do for the frontend what microservices do for the backend. By decoupling frontend functionality in a way similar to how microservices decouple backend codebases, you're able to structure your teams vertically around a specific business goal (such as search functionality or product recommendations on an ecommerce site), rather than horizontally around a particular technical expertise at one given layer of the stack.

This allows a team to focus not only on achieving a technical objective, but to work holistically toward the business function--providing modern user experiences.

Containerized Deployment on Kubernetes

With Kubernetes, developers can determine the desired state for their containerized application, and Kubernetes is able to automatically manage containers to maintain that desired state. This includes the automated creation or removal of containers, as well as balancing workloads across pods according to traffic. All of this optimizes infrastructural resources to maintain cost-effectiveness.

Operations is able to set up Kubernetes to do automatic health checks that ensure all the instances of an application are running properly. Furthermore, if an issue does arise, Kubernetes is able to diagnose it and bring your application back to a healthy state.

If a particular instance of your pod fails, Kubernetes has the ability to sense the error and implement a correction, which makes your applications highly resilient, so that users are less likely to experience a break in service due to connection issues with your application.

Kubernetes can also deploy rolling updates in order to avoid any interruption to the user experience by updating pod instances incrementally.

The Combined Benefits of Micro Frontends and Kubernetes

By using this development methodology, you can maintain a high rate of innovation within your organization, even as you add more staff and products. Here are a few key ways your organization will benefit from developing in micro frontends on Kubernetes.

Iterative Updates & Independent Deployments

Perhaps the chief benefit of using micro frontends on Kubernetes is your ability to give your teams true end-to-end control over their given function within the application.

And that's because decoupling functionality from the backend all the way up to the UI layer allows you to remove the red tape that often accompanies the decision making and implementation processes within a large organization. Instead, you can empower the people best suited to make a decision--the very people who are tasked with implementing that solution.

By allowing your teams to work independently without fear of negatively impacting the rest of the app or site, you give your teams the ability to move at the pace of their own ideas.

When a team is unable to determine their own sprints, or they have to hold off on new ideas until the entire application can be updated, they will quickly become demotivated. But if your teams know that they won't need to wait on anybody else to push their release, they'll be motivated to update iteratively and experiment continuously.

With the technological barrier to fast innovation removed, your teams will be limited only by their ability to curate ideas, develop them, and deploy them.

2 Technology Agnosticity

Another key benefit related to your teams' end-to-end control is that you don't need to have your entire organization use a standardized set of tools.

This is a particular advantage for larger organizations who are looking to assemble an employee roster of the most talented people across their teams, since they don't all need to have the same level of skill on one particular tool or set of tools. Each team can make these technology decisions internally, based on the skill set of their team members and the overall best approach to solving the problem at hand.

3 Code Reuse & Standardization

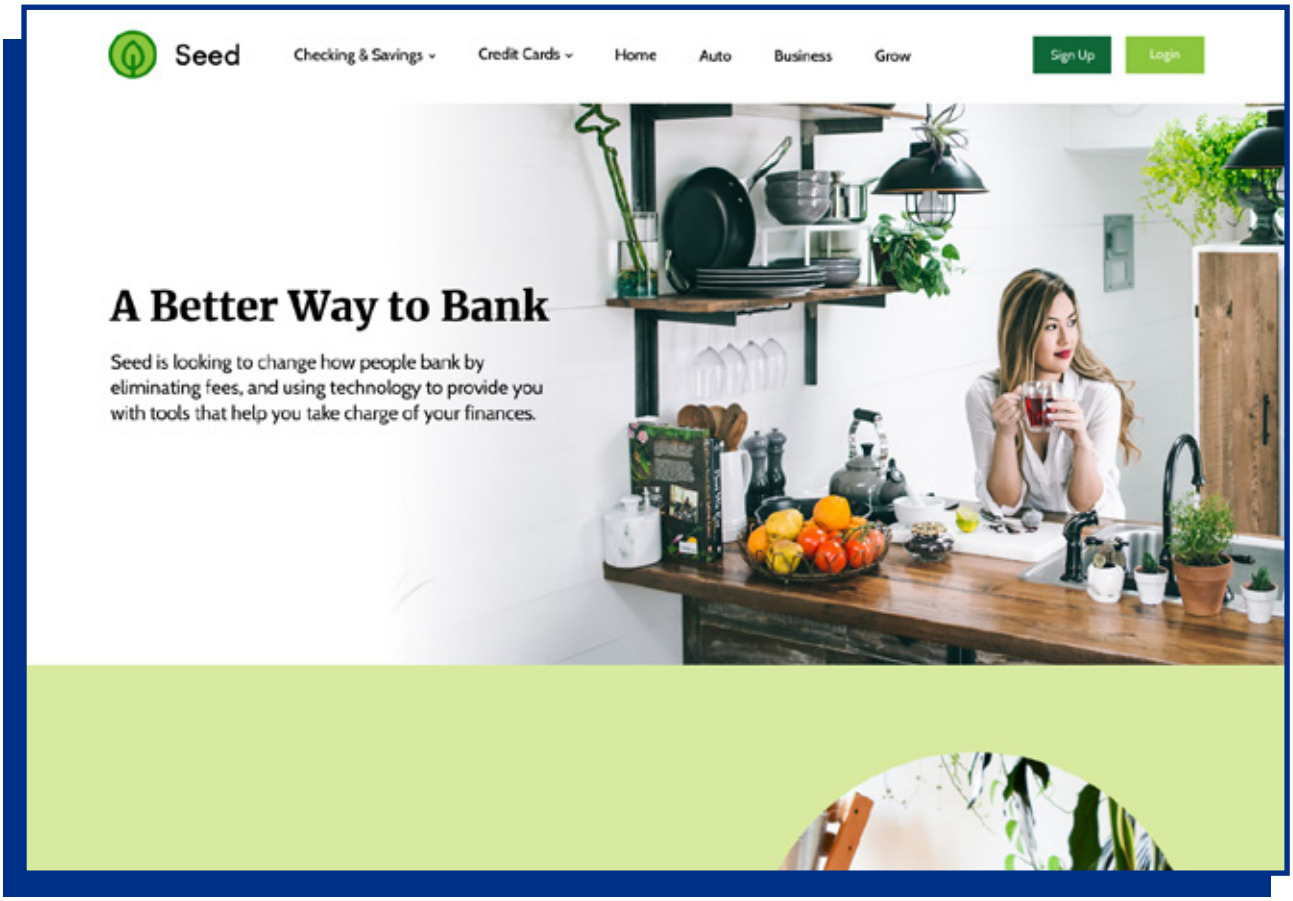
One of the complexities that you'll need to manage when using micro frontends is that your UX will have a tendency toward being inconsistent. While this requirement is almost contrary to the requirement for technology agnosticity, you can achieve both by implementing a robust design language system.

One of the benefits that micro frontends offer is that they can be reused across multiple applications. So if one of your organization's applications has a particular function that was developed as a micro frontend, other teams can leverage that same micro frontend in a new context, sometimes with little to no adjustments needing to be made. This increases the speed with which you can develop that new application, while also helping to ensure that user experience is consistent across every application.

Micro Frontends on Kubernetes in Action

Developing with micro frontends on Kubernetes can be beneficial to large organizations across any number of industries. But for an example, let's take the banking industry. Using this methodology, we have created a fully functioning site for a fictitious banking institution.

Seed is a modern online bank that's looking to change the way people bank. Seed has seen rapid growth with over $2 billion in annual revenue, but that growth has also created new challenges. With their monolithic architecture, releasing a major update can take up to 3 months. And when more than



one line of business needs to roll out an urgent release, tensions flare up, as they will need to wait in line behind one another. Each line of business is looking to innovate quickly, but they each have important initiatives they simply haven't been able to make progress on.

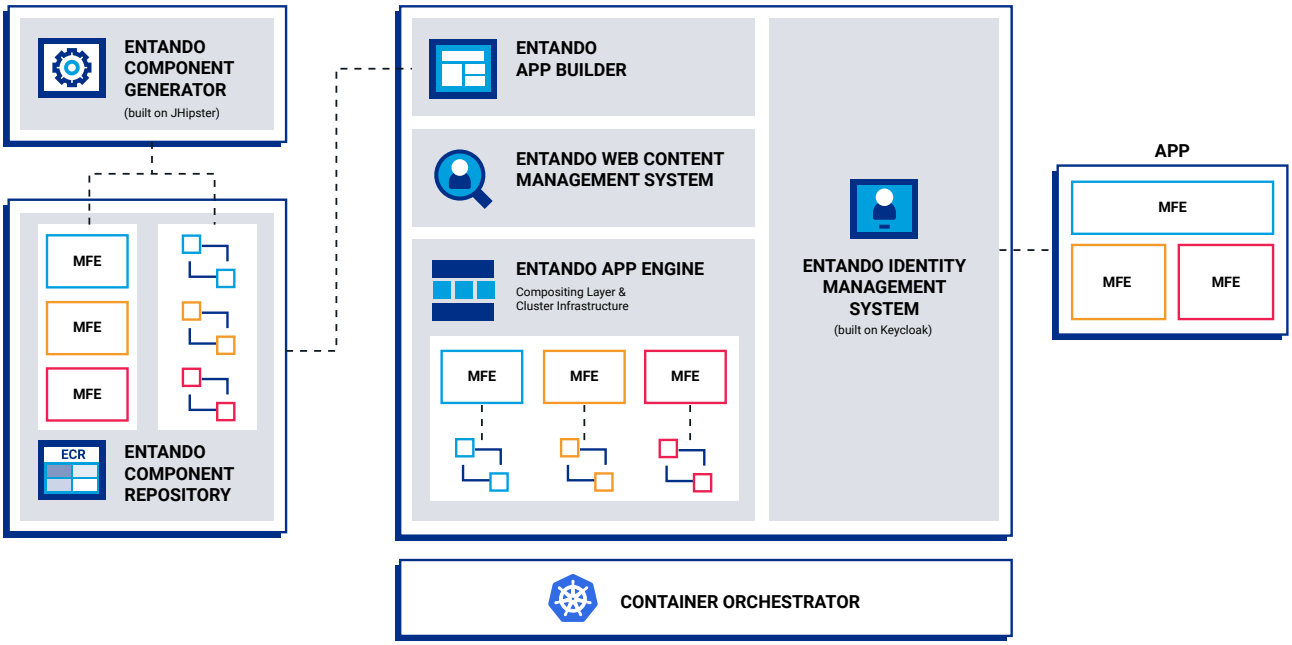
By switching to a microservice and micro frontend architecture, Seed is able to decouple the different functionalities of the site around their various lines of business, including Checking and Savings, Credit Cards, and Business Loans.

This is what's called a vertical split. In other situations, an organization might decide to arrange their micro frontends horizontally around functions like search or login. These micro frontends cut across departments or lines of business. However, given Seed's particular challenges, it makes much more sense to arrange their micro frontends vertically around their lines of business.

Now Seed can assemble cross-functional teams around each business unit, those teams are able to push important updates more quickly and without needing to wait on one another.

Managing Complexity with a Micro Frontend Platform

So far, we've been discussing all reasons why developing with micro frontends on Kubernetes is a good idea. And while this methodology does bring many benefits, it also presents some considerable challenges. Because the fact of the matter is that when you develop in micro frontends that will need to be composed into a single application and deployed on Kubernetes, you introduce an incredible amount of complexity into your application architecture.



> A micro frontend platform provides developers with tools to rapidly build, design, and assemble applications from micro frontends, microservices, and web content in a Kubernetes environment.

In order to accommodate these complexities, you can build your own framework, or you can leverage a micro frontend platform like Entando.

But what is a micro frontend platform?

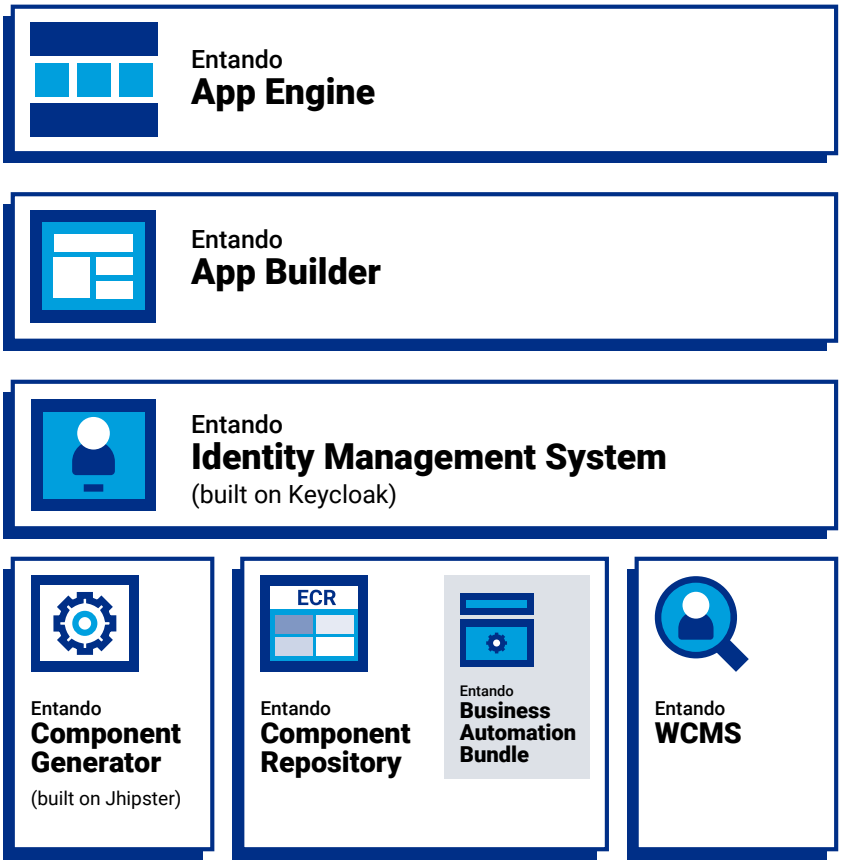
One of the tools a micro frontend platform provides is a component generator, which enables you to rapidly generate customized micro frontends and microservices. You can also do this via the command line. These components are then made available to be installed in your application in a shared component repository, which facilitates reuse across multiple projects.

A micro frontend platform also provides a UI interface to lay out and assemble your micro frontends into an application, portal, or website. You can pull micro frontends and microservices from the component repository, deploy them to your server cluster, and then have them wired together by the cluster infrastructure.

The ability to wire micro frontends and microservices deployed in containers together is one of the key elements that a micro frontend platform provides, the main benefit being that it simplifies the life of the enterprise on Kubernetes.

The next step before the application is displayed to the end user is the compositing layer, where micro frontends are dynamically assembled together.

A micro frontend platform also comes with a web content management system so you can create web content in your application along with your micro frontends. Having a WCMS enables the non-technical members of your organization to have control over the content for your site, app, or portal without needing help from your developers.



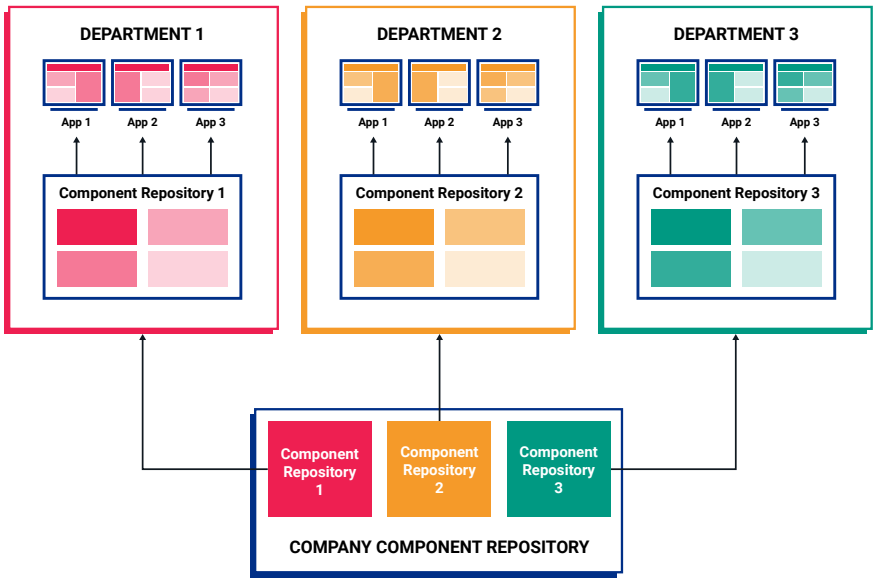
It's certainly true that you can develop in micro frontends without a micro frontend platform, but you'll need to weigh the costs of creating your own framework, as opposed to leveraging a pre-existing platform. While you maintain complete control over your architecture by building everything yourself, you can get to market much more quickly by leveraging a micro frontend platform, which is why you wanted to build in micro frontends in the first place--faster time to market.

For example, if you build your own framework, you'll be able to compose micro frontends into a single application by leveraging iframes, custom routes, or custom elements. But that architecture doesn't come with out-of-the-box support for web content management. And it can be painful to not have basic web content management features when you want to create a page or if you need to add or regularly modify web content alongside your application functionality within the same page or pages.

Built-in web content management also prevents bottlenecks and conflicts between marketing and development teams, so each team can focus on delivering their primary roles and responsibilities.

Additionally, having a component repository will help you implement code reuse, which can be incredibly advantageous. Let's say that 10 percent of a team's development for an application is reusable across the company. This can include standard UX designs or UI components that support a consistent or standardized user experience, common frontend elements or services, as well as integrations with different data sources.

For each subsequent project, the ability to reuse micro components that have already been developed means time savings, lower cost, and faster time to market. And the benefits begin to compound the more applications you build using the platform and leverage within a single shareable repository.



With a micro frontend platform, your teams are able to shift effort away from writing boilerplate code or duplicating effort in developing the same UX/UI components across different projects, focusing more time rather on creating new ideas and solving new problems.

Again, these challenges certainly aren't insurmountable without a platform. However, you must weigh whether they are worth the time and effort of continuing to manage them manually rather than through a micro frontend platform.

How Entando Can Help

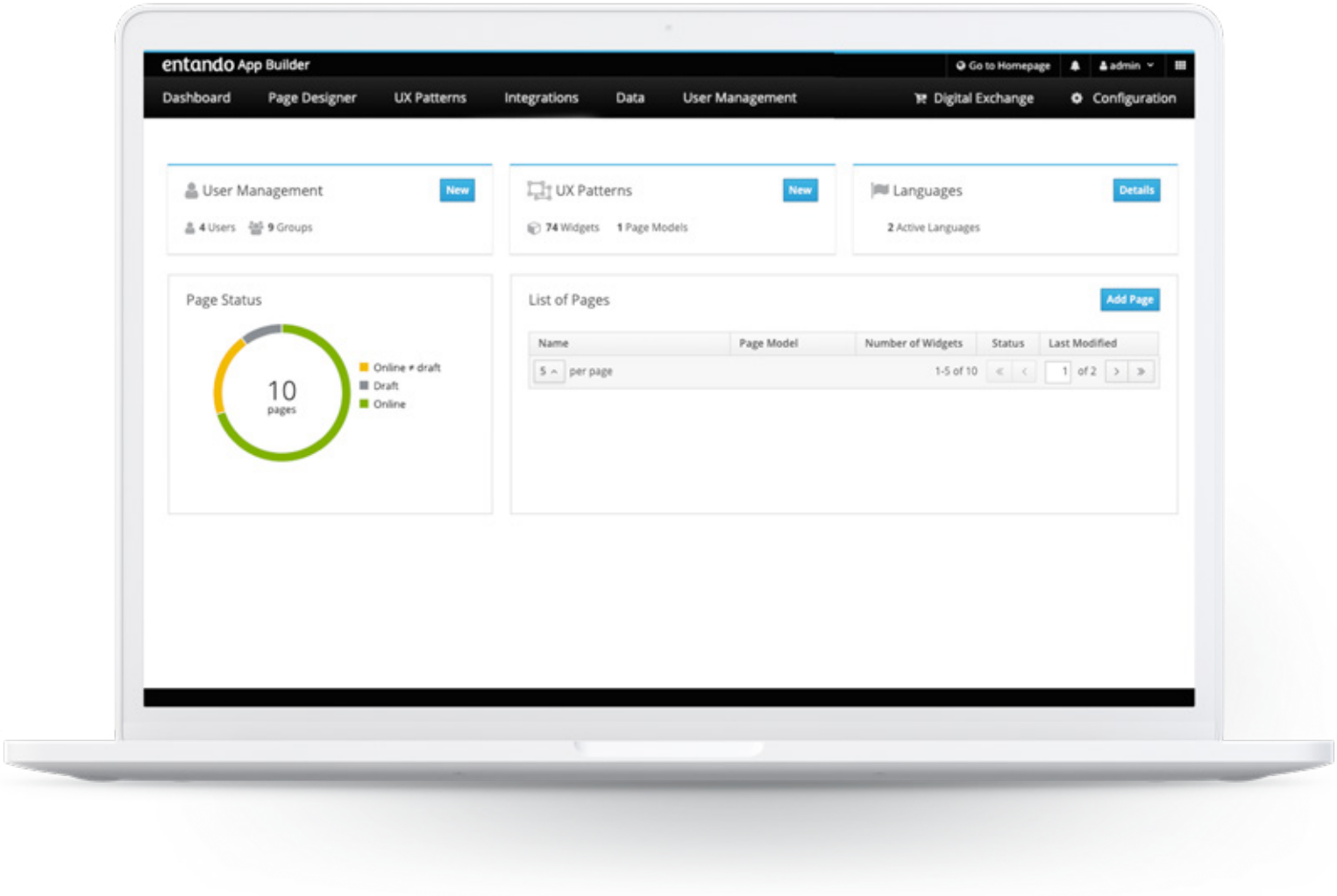
When release cycles take months instead of weeks, your business is left unable to respond to the needs of your customers with the modern online experiences. And bad UX loses customers. So that's why we created a platform to help you get your ideas to market more quickly.

Entando is an open source software company that provides the leading micro frontend platform for building enterprise web applications on Kubernetes.

We want to change the way businesses think about building enterprise software, so that they can empower their development teams to update iteratively and release independently.

By building functionality on top of JHipster, our micro frontend platform helps you innovate more quickly with customized blueprints that enable you to quickly generate micro frontends and assemble them onto a single page. Entando also enables you to manage authentication easily with identity management built on Keycloak and update content quickly with a built-in WCMS.

Reuse components across multiple projects via the Entando Component Repository, and scale applications quickly and effectively with Entando's custom Kubernetes operator, automating the deployment of resilient, self-healing applications.



In addition to our platform, we offer a number of services to enterprises, including subscriptions, professional service packages, partnerships, and training, as well as certification programs.

Here are some of the service packages we offer.

Entando Innovation Labs to get your project up and running quickly

Upgrade Analysis to help you transition to the latest version of the platform

Architectural Review to ensure your project gets started right

UX Standardization to align user experience standards across your organization

Entando is open source and available for you to use. So begin developing on the platform today, and visit entando.com to schedule a call with us and see how we can help you build better apps, websites, and portals--faster.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