Feature Overview

# **Technical Architecture**

- ✓ Cloud + API-first
- Platforms and Languages
- / Data Stores



Banno has been engineered for innovation and user experience. Priority lies in solving the industry's problems in a way that 1) allows community financial institutions to leverage their traditional strengths on the digital channel and 2) give users the digital experience they've come to expect from their favorite apps. Read on to learn about the foundations established at the engineering level to serve these priorities.





#### The Cloud

### what is the cloud?

### The reliable and secure expressway to innovation

As intangible as the cloud may seem, it's actually a physical, vast network of remote servers. These servers are methodically dispersed to achieve reliability and to make disaster recovery and data backup possible in the event that some are destroyed in a natural disaster.

The cloud's infrastructure is made up of data centers, availability zones and regions. Here's how each builds upon the other:



### why is Banno in the cloud?

The cloud makes it easier for Banno to produce relevant and modern digital banking solutions for community financial institutions. There are three callout reasons why we see being cloud-based as crucial:

#### 1. We can scale our hardware to meet demand

Our KPIs are written around app speed and agility—we eagerly anticipate large influxes of users simultaneously accessing data stores.

Being on the cloud allows for a programmatic approach to running and scaling our solutions while achieving a higher level of regulatory excellence. It gives us all the data servers we could ever need for our products to stand strong, even when millions of users (or credential stuffing attacks) come at them. To ensure no individual ever reaches capacity, the load is shared across data centers, availability zones, & data regions—and there's virtually no limit to our server access.

#### 2. We can innovate faster

Since the cloud gives us access to more server space than we could ever use, Banno's innovation potential is never capped by infrastructure limitations. Coupled with our tech knowledge and the industry insights we glean from you, the cloud's perceivably limitless capacity allows Banno to keep pace with—even outpace—the evolving challenges faced by community financial institutions.

At a more granular level, the cloud frees our engineers from thinking about the operational complexities of deploying software—like which server can best handle the computing load—so they can focus on features and improvements.

#### 3. The cloud is ultra-reliable

Having access to a network of data centers in regions scattered across the country means that Banno applications are essentially always up and running. There are multiple availability zones in a single region, and data is always being backed up from one region to another. This is all to ensure the availability of Banno products should 1) there be an influx of demand or 2) a primary availability zone go down because of a natural disaster.

#### Platform as a Service (PaaS)

Another major score in the game of reliability is our full adoption of the leading PaaS platform Kubernetes, which gives us elasticity to be able to instantly scale our microservicesbased architecture.

In fact, our entire service platform can be rebuilt on a new cloud network extremely fast and at a moment's notice. How fast? Our recovery time objective (RTO), or our time threshold set for IT and business activities to be recovered in the event of a disaster, is set at four hours for all offerings. This ensures that our operations can continue and that the impact felt by clients is minimal in disaster recovery scenarios.



#### 4. The cloud is impressively secure

Being on the cloud gives us (and you) another leg to stand on when it comes to the responsibility of security. Much of a cloud network provider's business rides on security. In fact, Google Cloud Platform (GCP)—the public cloud platform we routinely use at Banno—has advanced security software that we use to monitor Banno apps. It shows us potential threats across the cloud, actionable recommendations to mitigate those risks and it even automates mitigations for detected vulnerabilities.

Just as impressive as the digital security tools GCP provides is the physical security, which meets and exceeds international and industry standards.

### where does Banno run its services?



#### API / Platform

### one user experience, many tools

From day one, we have been API-first—meaning Banno is built on our own API (Application Programming Interface). Development of every feature and integration you see begins with establishing and documenting the API's interface and data communication protocol to simplify implementation and maintenance—and 100% REST/JSON, (renowned data formats used for data interchange on the web) to do it. Our API libraries and documentation are all publicly available on jackhenry.dev, if you're interested in exploring what's available that's a great place to start!

It's one of the ways we're able to give financial institutions flexibility to differentiate themselves with fintechs of their choice on the Banno platform. Essentially, we're authenticating users into third-party systems and passing user context in a secure way—think customer identifier, accounts and your financial institution's theme color values.

Once features and integrations are enabled on the API, our iOS, Android and Web applications call the API directly. It's the reason why each tool and feature, no matter where it originates, delivers a Banno user experience.

As an example, Banno supports five different RDC providers through our API, but each provider shows up and acts the same on the Banno platform.



And this single, unified user experience spills over to back office Banno products. People, Content & Marketing, and Support are entirely API-enabled as well.

Any consumer-facing fintech solutions that partner with Banno are also serviceable by your financial institution's team from within Support, so your team doesn't have to stay familiar with the 50 different back-end tools that go along with all of your favorite products.

What's more? The API matches components in the back office to how they're experienced across our digital banking solutions, so your team doesn't have to guess what it is that your accountholders are describing.

We're working consistently to provide the most modern and secure ways for financial institutions to connect with third party applications. Our platform is one of the first to retire traditional aggregation methods, and instead offer client secret credentials via OAuth. This makes it simple to manage each product relationship, revoke access as needed, and remove the need for screen-scraping technology.

#### Languages & Platforms

## light-weight and scalable engineering

Make no mistake about it: Banno is committed to taking every step necessary to keep our platforms agile.

#### **Banno API**

Banno prides itself on having a beautiful, fluid user experience that meets the expectations set by today's most popular digital products (think Instagram and Netflix). And frankly, we're raising the bar for industry key performance indicators (KPIs) around UX.



This level of user experience is achievable because we write our code in languages that support building software in small, light-weight and scalable building blocks.

For instance, we use the languages Scala, NodeJS, and Go. These are among the most widely used languages for scaling modern internet applications.



#### **Banno Mobile**

In our efforts to build the best digital banking experience possible, we're always keeping a pulse on user expectations. We consider the full spectrum of devices they're using, and ensure our applications adhere to their established best practices, so that we can meet (and even exceed) the best experiences available on each platform. Banno Mobile is 100% native on iOS and Android—we do not run a web application in a "container" and call it native. Does this require more effort? Yeah. But if it means a better experience for end users (which it does), we're all in.

We are aggressive and early adopters of new platform languages such as Kotlin and Swift, languages that promise a long-term lower barrier to innovation on native applications. We're intentional about these decisions because Banno's ability to innovate quickly is a key strategic differentiator for us and for you.



#### **Banno Progressive Web Applications**

Banno Online and Banno People are built as progressive web applications—in fact, Banno Online actually runs as an app on a Chrome Book. What does it mean to be a progressive web app? It means that the fluidity of native applications is mimicked on the web. And progressive web apps are not going away anytime soon. People expect these native-like interactions, no matter what device they're on.

We take a card-based design approach to achieve this smooth experience, and the benefit is two-fold. We'll start with the obvious: it's a light-weight framework which supports the fast experiences we've been talking about. The second is that we can replicate the way a Banno Online user is seeing their accounts or transactions in Banno People. So your support team is seeing exactly what your accountholders are seeing, dramatically speeding up time to resolution.



#### **Data Stores**

### smart data flow

Many types of data behaving in many different ways flow through Banno in order to power your digital banking channel. The system does a lot of work calling each type of data, which in large volumes and without the proper precautions can lead to delayed performance. To ensure this isn't the case, we've worked hard to make sure those precautions are always in place.

We use a variety of different data stores, each of which has different performance and storage characteristics. The way we want to receive the data we're calling and how we want it to behave determines which data store we use. This is key to keeping our platform development lightweight and scalable.



Here are the data stores we access for each type of data:

#### Product Development Life Cycle

### product development and support

"Move fast and break things" works for Facebook, but it doesn't work in banking. While Banno is structured to operate with more than a dozen lines of capacity and velocity, product strategy, and feature prioritization play a big part in when we deliver on new features.

Prioritization drives our roadmap because we're bent on delivering features that will put community financial institutions at the head of the pack on the digital channel. We have a deep and strong design and product team that works ahead to provide prototypes to our customers so we can get early feedback directly from users. This practice gives us unique insight and confidence that we're delivering on the solutions you need most.

Our development cycle is a hybrid approach of agile, lean, and extreme methodologies. While it's very defined, it is just a guide—no two projects are the same.

Here's what it looks like:



#### Support

Once Banno builds a feature, we support it. Only if and when we intentionally decide to phase it out will there be degradation—and you'll know about it well in advance.

Of course, there are times when technology doesn't behave as expected. We call events like these "incidents". To define it further, an incident is an isolated period during which a Banno solution is degraded and has potential to negatively impact your users' experience.

Banno solutions are monitored all hours of the day using both automated checks and proactive human verification. Plus, we have service engineers representing every feature on call 24/7, so when an incident happens, no time is lost in pursuit of resolution.

You'll find that, with Banno as your sidekick, you won't be the last to know about an incident. Usually, we—you and Banno—know before your accountholders do. Here's how we make sure incidents are resolved quickly and completely:



 Incident is uncovered. Service engineer uncovers incident and begins diagnosis.



3. Response team works hard. Response team restores to full service.



 Incident is published.
Status is kept up-to-date status.banno.com.



You are notified of resolution.
Once incident is resolved, an email notification is sent.

#### We use incidents to make your Banno experience better

We believe that, for Banno to be its best, we have to be humble. That's why every incident, and its details, is analyzed, recorded and disseminated internally. In fact, Banno maintains a log of all incident activity. We do this to keep our support engineers informed, knowledgeable, and capable. Banno's incident report process helps us schedule any long-term work required and adjust internal priorities to ensure we're providing you with a consistent and stable service.

### engineering for innovation

Let's talk about this together. digitalexperience@jackhenry.com

For more information about Jack Henry, visit jackhenry.com.

