Simprints: Making healthcare count for everyone, with Google Cloud

Non-profit Simprints uses Google Cloud to power the infrastructure behind its biometric solution helping patients in the developing world, who often lack proof of reliable ID, to access key healthcare services via their fingerprints.

Google Cloud results

- Scales quickly to provide stable performance to healthcare workers across the world in challenging conditions
- Analyzes large datasets quickly and easily with BigQuery, delivering insight and optimized procedures
- Reduces management overhead, empowering engineers and developers to focus on ambitious projects

Scales to 18,000 sessions a day with App Engine

Many patients in the developing world lack ID cards or other forms of identification to confirm their identity and help them gain access to the care they need. According to Tristam Norman, co-founder and CTO at nonprofit tech startup Simprints, additional complications can pose a barrier. "Not only do people arrive at clinics with no formal ID; in Bangladesh, we found that the same patient might be registered multiple times, leading to a massive archive of duplicates, and in rural projects like in Nepal, ancestral naming tradition means there could be 2,000 patients with the same surname." If healthcare workers can't accurately identify a patient who visits a clinic and then link them to their records, continuity of care is broken, and the patient is at risk of receiving the wrong treatment or no treatment at all. That's where Simprints comes in.

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Initially launched as a research project by Cambridge University students, Simprints has developed into a tech startup that today works with government authorities, NGOs, and healthcare providers worldwide. With a lack of information, and little to no infrastructure, healthcare policies are often determined by estimates and ad hoc methods. To solve the problem of identification, Simprints turned to biometrics, specifically fingerprints, designing its own affordable scanners and new software to go with it. "At the time, biometric products on the market were too complex for our purposes, so we made our own for Android devices," says Tristam. Simprints' solution linked a fingerprint scanner to mobile devices via Bluetooth, making it simple and affordable for NGOs working in all kinds of environments.

In 2016, Simprints launched the system for around 4,000 individuals across Bangladesh and Nepal. However, as a nonprofit startup, the company had to manage its limited resources carefully. When the initial infrastructure quickly began to show issues with scale and availability, Simprints turned to Google Cloud.

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Biometric identification in challenging environments

The Simprints biometrics solution works because of its simplicity and ease of use. With no ID cards or health passes to remember, doctors, nurses, or other healthcare workers simply have patients hold their finger to a scanner. A unique string of data called a "biometric template" is extracted from the image of the fingerprint, then transferred to a worker's Android device. Simprints uses these templates to generate a unique key for each patient, stored in the clinic's systems, which then forms the basis of the electronic records. Whenever a patient comes to a clinic for a session, they scan their fingerprints and workers can quickly access their previous records or treat them as new patients.

For the solution to be effective, Simprints syncs data captured from mobile apps. NGOs often work in areas with poor network connectivity, meaning they need to be able to identify their patients offline using mobile devices. When the day's sessions are completed, the devices are taken to a Wi-Fi hub where the app can sync with Simprints' cloud database. In practice, this means that several devices connect to the cloud at the same time, each one syncing the data from dozens of sessions. Traffic load jumps from almost nothing to several hundred sessions' worth of data in just a few minutes.

When Simprints first launched, coping with these spikes stretched its infrastructure to its limits. "Our first cloud-based back end struggled at scale," says Tristram. "With all these devices syncing at the same time, requests to upload and download new data could take up to 20 minutes to get through."

Since its inception, Simprints has taken great care over data security, given the sensitivity of its operations. Every project Simprints takes on goes through a rigorous process to ensure compliance with stringent privacy standards of the EU's GDPR and proper siloing of data. This means all data is unidentifiable and Simprints don't see anything of the healthcare data, only biometric data, timestamp, and GPS. Simprints owns and manages its data with Google Cloud storing it.

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Google Cloud for stability at scale

In late 2017, Simprints began looking for a more suitable infrastructure solution. After evaluating a range of cloud providers, Google Cloud won out because of its ease of use and seamless integration with Android. "It was the only solution we found that provided mobile and backend tools all under one roof, which made things much simpler for us. We didn't have to worry about different products not working with each other," says Tristram. "It let us cover a lot of ground with a small team."

Simprints' first priority was to replace its existing database with Firebase Realtime Database, which allowed the company to build out its cloud back end while still being able to handle high levels of traffic. Over time, Simprints took on more projects, increasing the load on its system, and looked for a larger-scale data solution. With App Engine and Cloud Endpoints, Simprints can scale horizontally to accommodate heavy traffic loads and automate much of the data collection and delivery to BigQuery.

"BigQuery is probably my favorite of the products we use," says Etienne. "We have almost a million sessions' worth of data, and our researchers can query them in just a few seconds. That kind of seamless, automatic scaling wouldn't have been possible before."

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Managed overheads, tighter focus

With Google Cloud at its core, Simprints has grown from strength to strength in just two years. The biggest change is down to the availability of its new solution and the ability to handle sudden traffic spikes without compromising performance. This has led to the company being able to pursue bigger, more ambitious projects.

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BigQuery has helped Simprints gain valuable insights from the sheer amount of data it collects. For example, when examining fingerprint quality, analysts found that taking two fingerprint scans, instead of one or all ten, provided the best trade-off between time and accuracy. As a result, Simprints' partners on the ground work better and faster than ever before.

With Simprints projects spanning 12 countries across South Asia and sub-Saharan Africa, migrating to Google Cloud has meant widening the scope of its operations without heavy investment in building and maintaining a complex back end. With a managed solution, the company can keep its backend team to a minimum while hiring more staff who can work on the actual product. "We're hiring a lot right now, and it's good to tell people that they can focus on what they're best at instead of managing clusters or any kind of maintenance," says Etienne. "The developer experience is very simple with Google Cloud."

As a nonprofit startup, affordability is very important, and Google Cloud has helped Simprints grow rapidly while keeping infrastructure costs to a minimum. More recently, Simprints has started to move to a microservices-based architecture, using Cloud Functions and Pub/Sub. "Cloud Functions and a more event-driven infrastructure will help us react faster to spikes and drops in traffic," says Tristram. "It'll help us cut costs even further."

Simprints has started projects with large government health ministries, which brings a whole new set of challenges. Data sovereignty comes into play as much as data security, so there's a requirement for on-premises infrastructure. Simprints has also started to explore Anthos as a way to design and manage the company's hybrid infrastructure, which can deliver the benefits of microservices to on-premises systems.

Meanwhile, Simprints continues to grow, planning its biggest project ever. More than 3,000 healthcare workers are expected to use the app, translating to millions of patients. These numbers wouldn't be possible with the previous infrastructure. "Whenever we started a new project with the old infrastructure, we wouldn't know what we would handle the jump in users," says Etienne. "After the migration, when the sales team told me that we would reach 3,000 extra users next year, I could look them in the eye and say, 'Sure, we can do that.' Knowing we could handle that scale without disrupting the customer experience was huge. That was the biggest benefit of Google Cloud for us."

Simprints
every person counts

About Simprints

Simprints uses Google Cloud to power its biometric solution and help patients in the developing world, who often lack proof of legal identity, to access key healthcare services via their fingerprints.

Industries: Non-profit

Location: United Kingdom

`Google Cloud` `BigQuery` `App Engine` `Cloud Endpoints` `Cloud Functions` `Cloud Identity` `Cloud Pub/Sub` `Firebase Authentication` `Firebase Realtime Database`