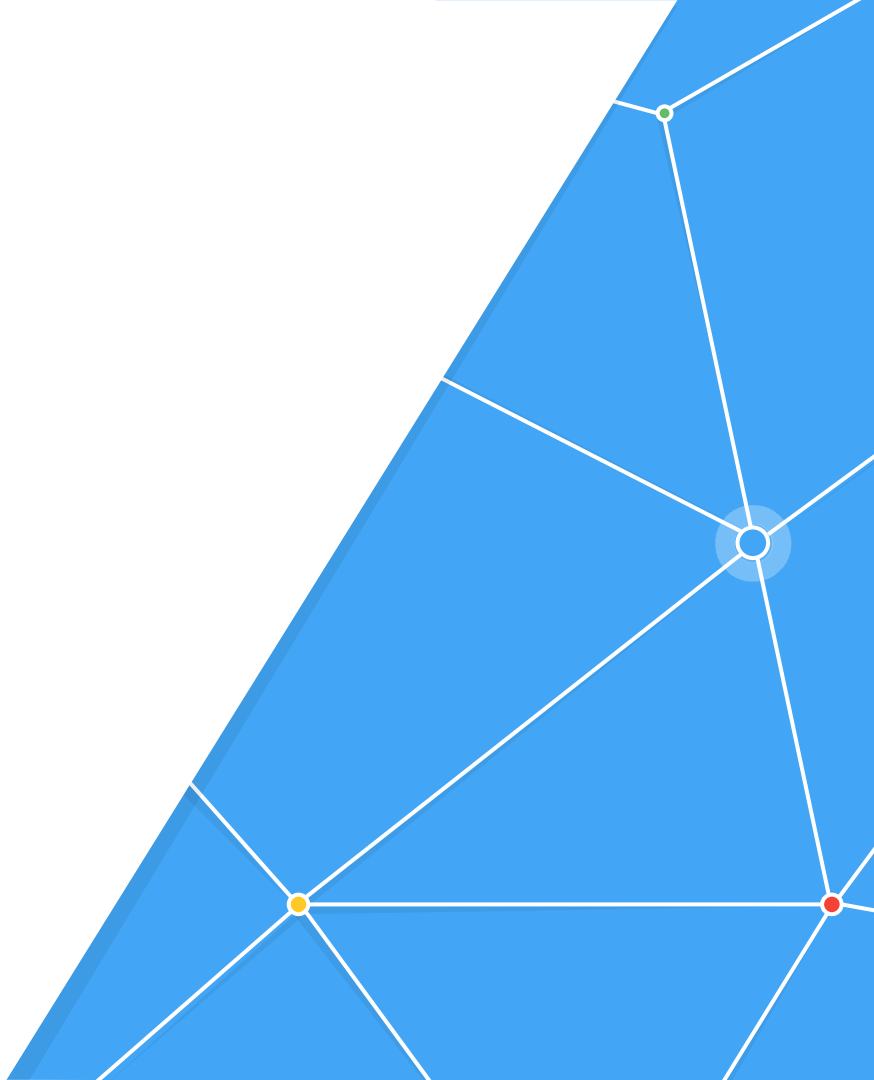
Google

WebAuthn 101

Demystifying WebAuthn

Christiaan Brand

Blackhat 2019



Agenda

01

Passwords aren’t enough

02

MFA - a spectrum of assurance

03

Enter WebAuthn

Passwords aren’t enough

Google Cloud

4.3B+

Credentials leaked in dumps

17%

Minimum password reuse rate

110M

Accounts proactively re-secured

Data breaches, phishing, or malware? Understanding the risks of stolen credentials (Thomas et al.)
ai.google/research/pubs/pub46437

Source: Google

Sources of stolen passwords

Phishing

Keyloggers

Data breach

Stolen credential origin

Password reuse is the largest source

Password breach is the main purveyor of stolen credential with hundred of millions new credential every year

Phishing is the most dangerous source

Phished victims are at the highest risk to get their account compromised

The black market fuel account compromise

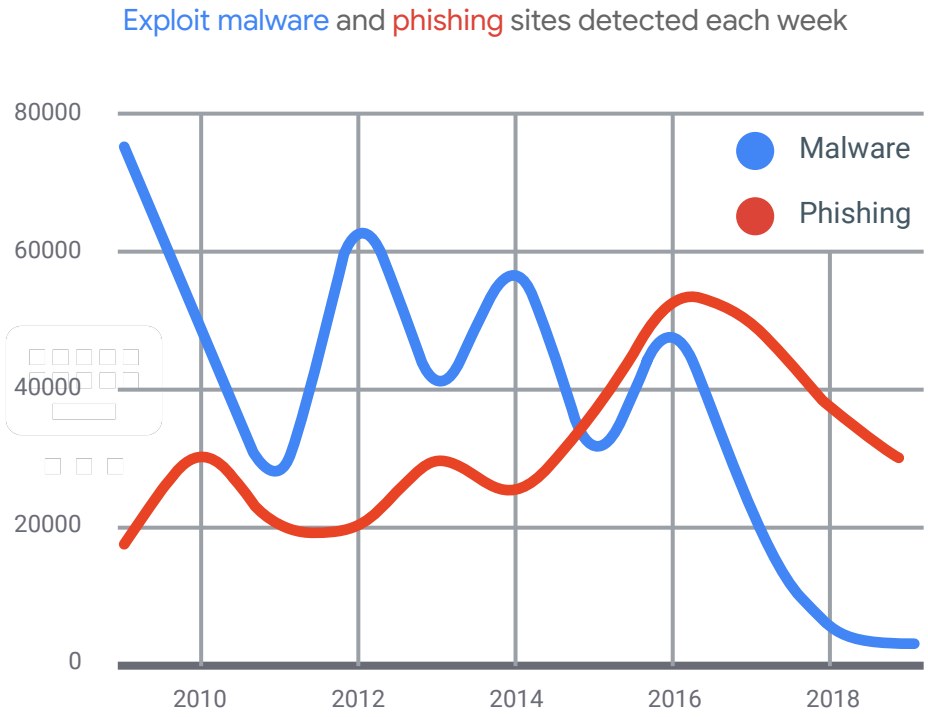
There is a whole shadow ecosystem that makes compromised accounts a commodity

91% of information security attacks start with phishing

80% of attacks on businesses include phishing

Source: PhishMe study, **cofense.com/enterprise-phishing-susceptibility-report/**
Source: UK govt, The Cyber Security Breaches Survey 2019

Phishing overtook exploit-based malware in 2016



Source: Safe Browsing (Google Transparency Report)

43%

success rate for a well designed phishing page*

76%

of account vulnerabilities were due to weak or stolen passwords**

*Data Breaches, Phishing, or Malware? Understanding the Risks of Stolen Credentials, 2017

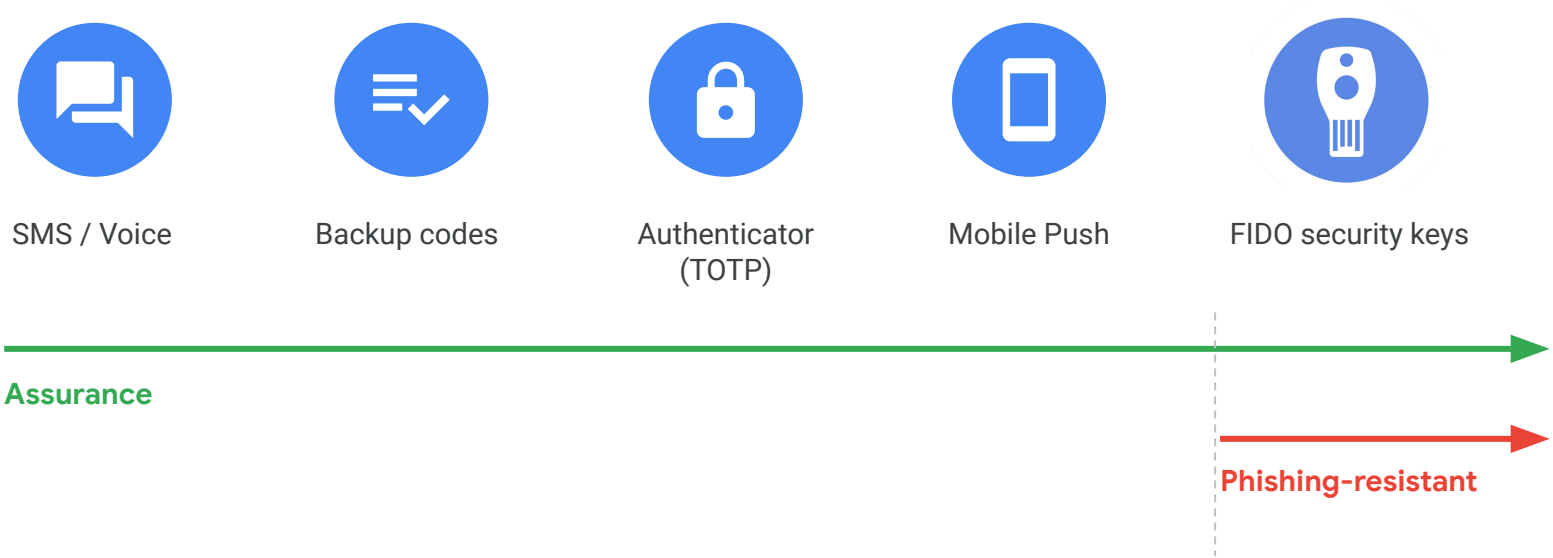
**Verizon 2015 Data Breach Investigations Report

MFA - a spectrum of assurance

Google Cloud

MFA It's a spectrum of assurance

Many different types of MFA exist, all providing different levels of assurance and convenience



Titan Security Key

Enhanced account protection

Phishing-resistant 2nd factor of authentication that verifies user's identity and sign-in URL

Trusted hardware

Includes a secure element with firmware written by Google to verify the key's integrity

Open ecosystem

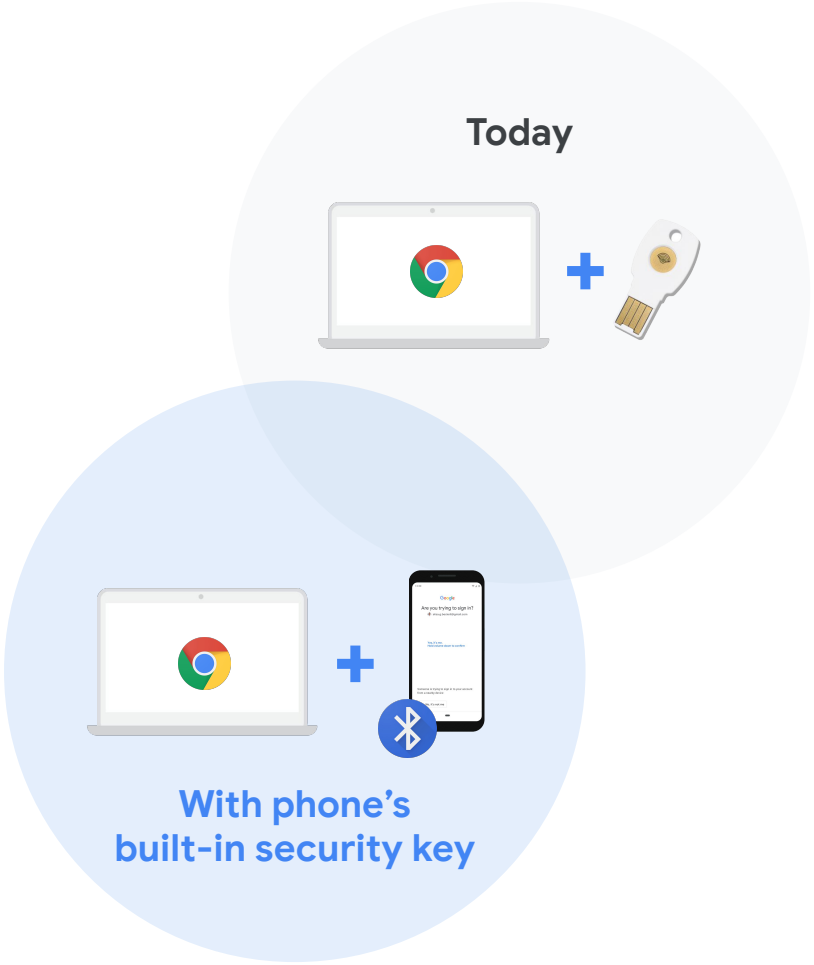
Works with popular browsers and a growing ecosystem of services that support FIDO

Now, your Android phone is also a security key

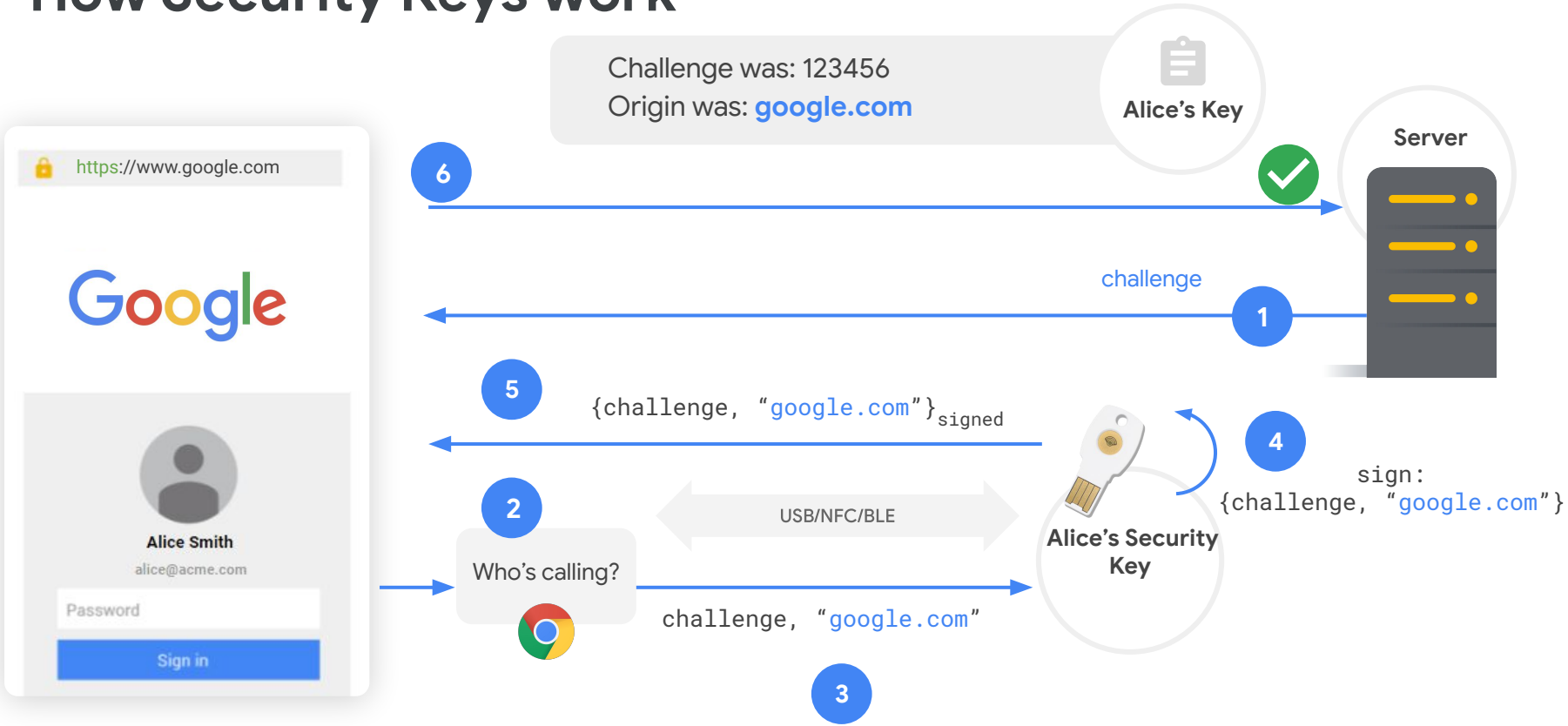
Enhanced account protection
Strongest 2FA protection against phishing

Easy to use
Simple, one-time enrollment process, no app required

Convenient for users
Use the phone which is already in your pocket



How Security Keys work



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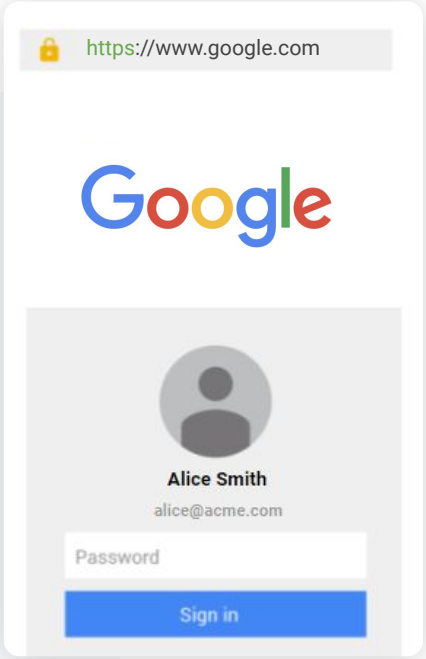

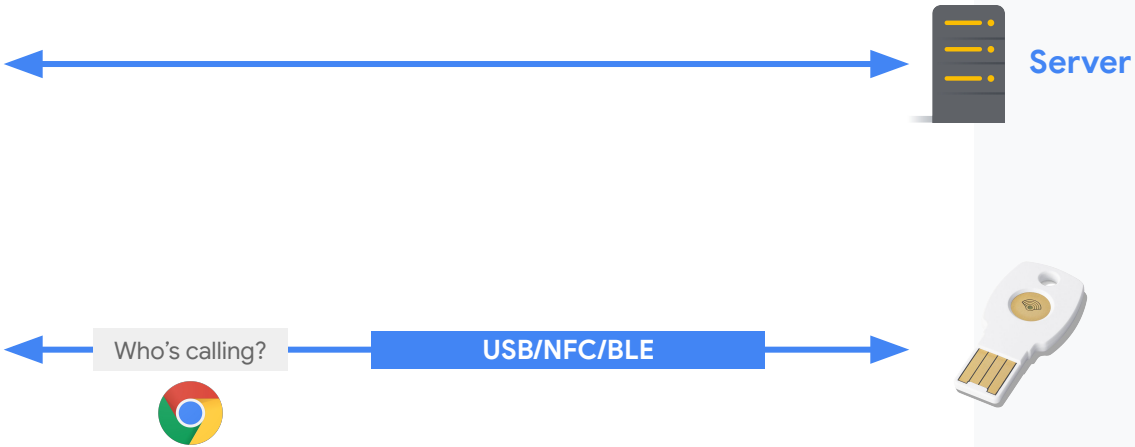

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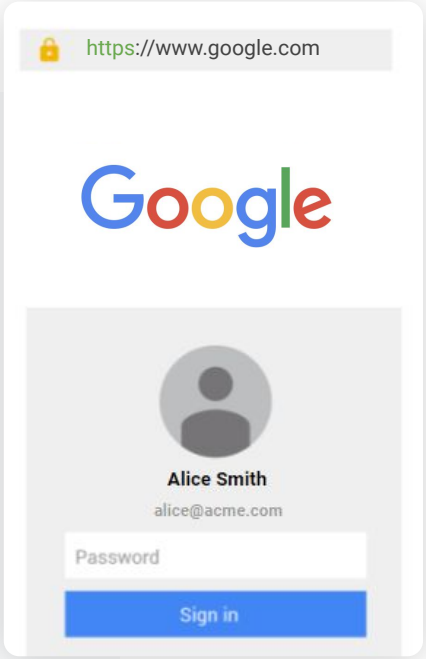

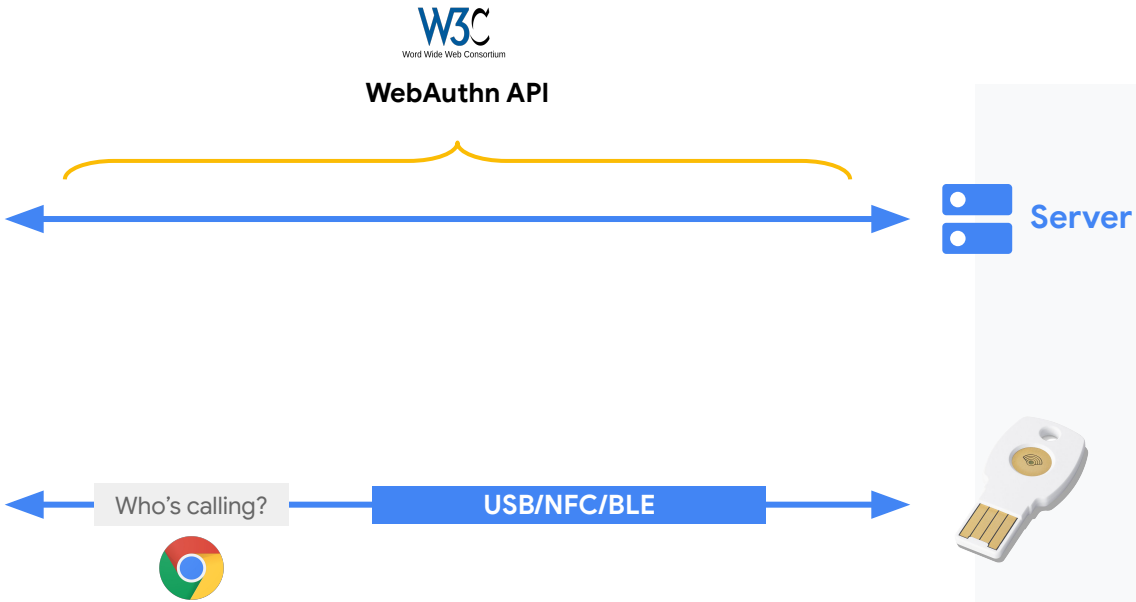

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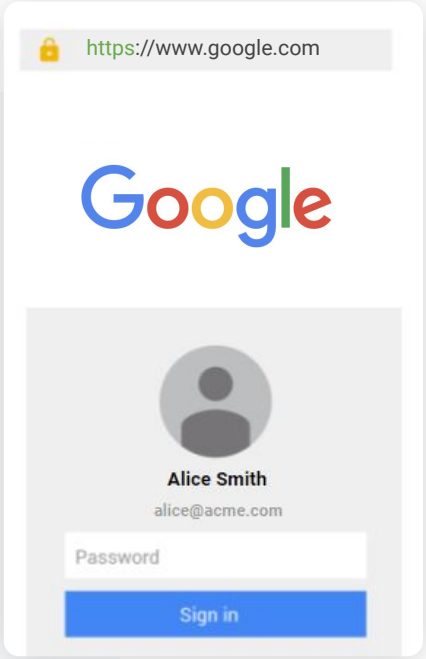

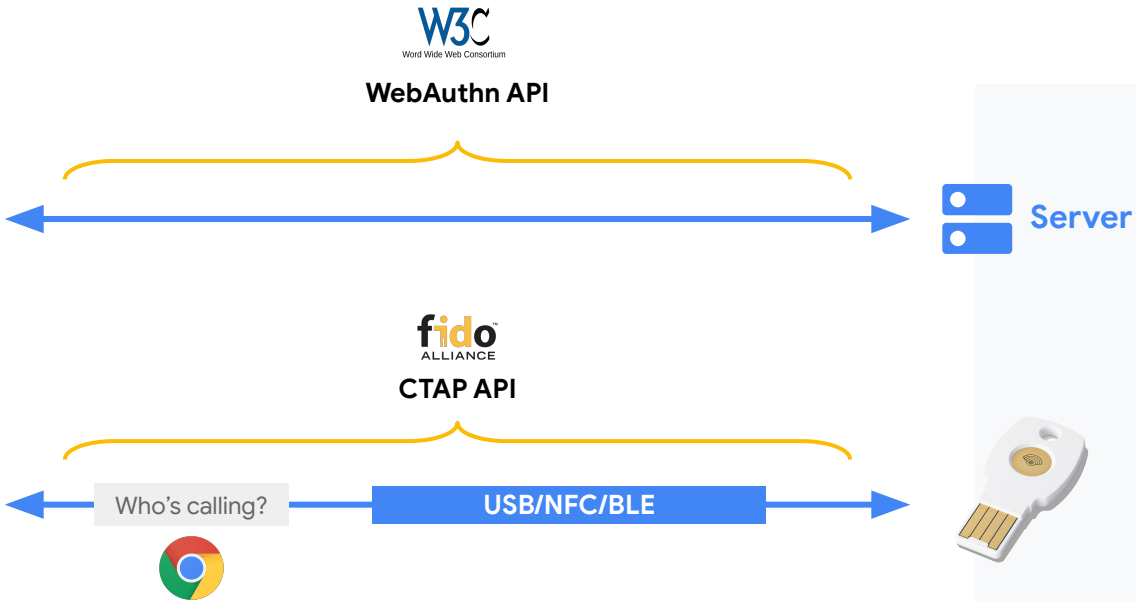

Enter WebAuthn

Google Cloud

Introducing WebAuthn

A W3C specification* (Web API) that allows websites to interact with authenticators

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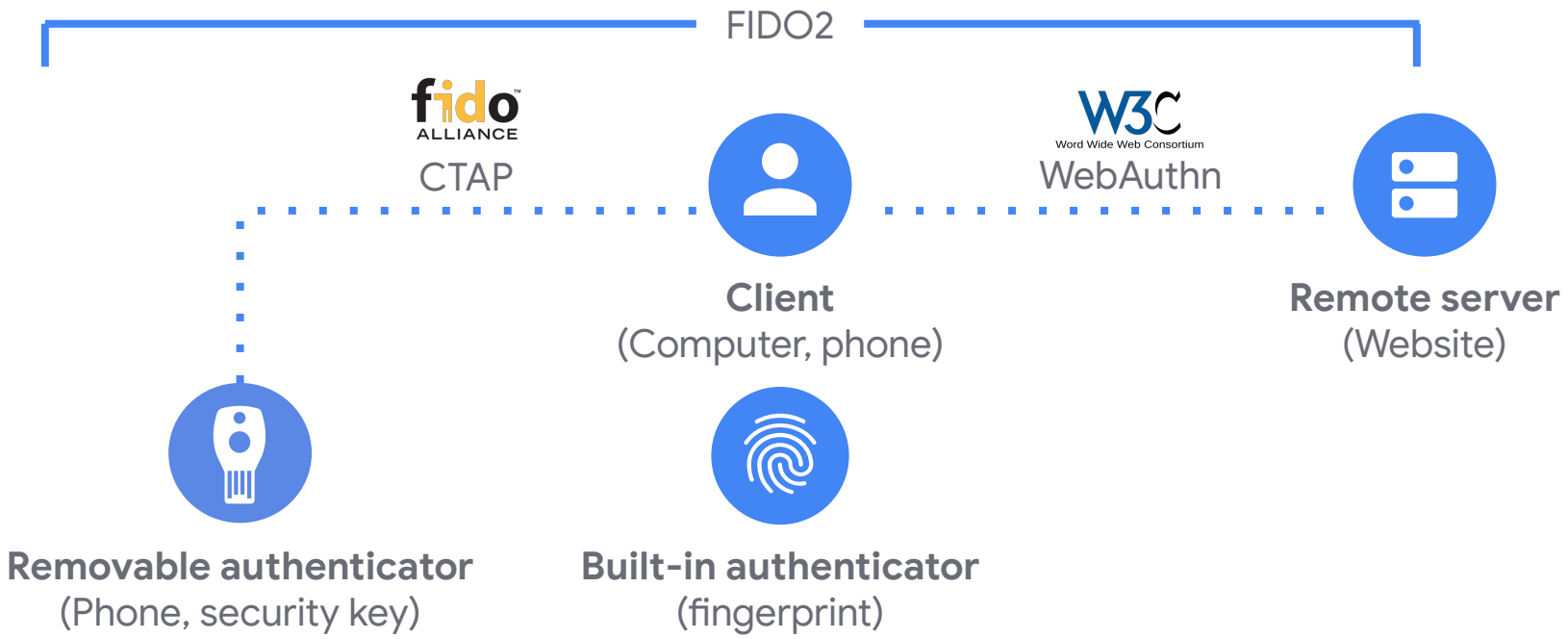
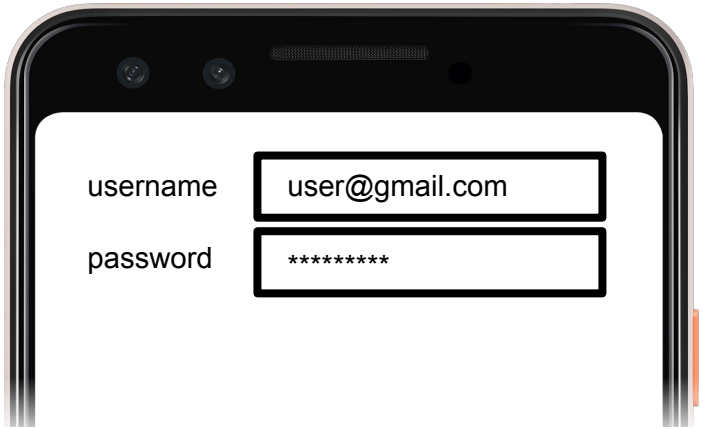
* https://github.com/w3c/webauthn

What is WebAuthn? How does it relate to FIDO2?



WebAuthn: **two** use cases



1. “Bootstrapping” - security key as a 2nd factor

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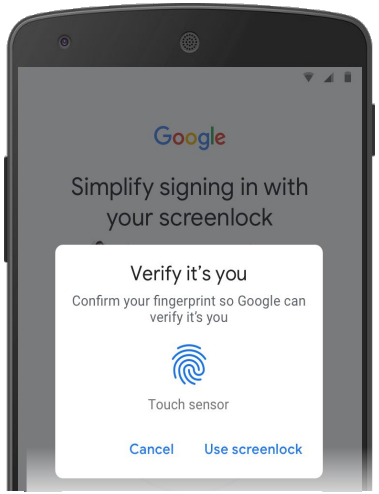


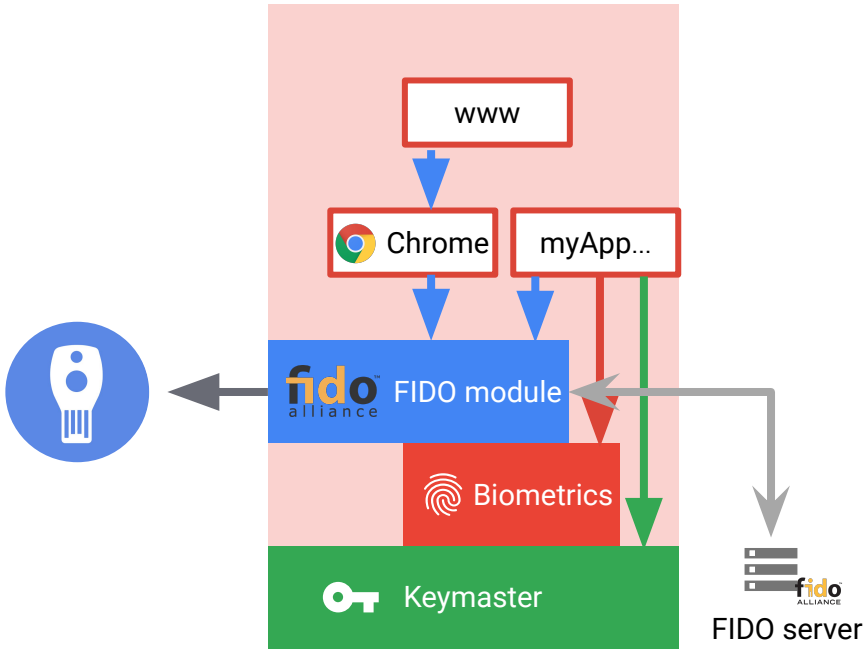
2. “Re-authentication” - biometrics as a way to simplify verifying a returning user

Implemented on Android

Green: Your app can directly talk to the key store to store and use cryptographic keys
Red: Your app can directly talk to the biometric APIs

OR

Blue: Your app and website can talk to the FIDO/WebAuthn APIs that abstracts the keystore and biometric APIs

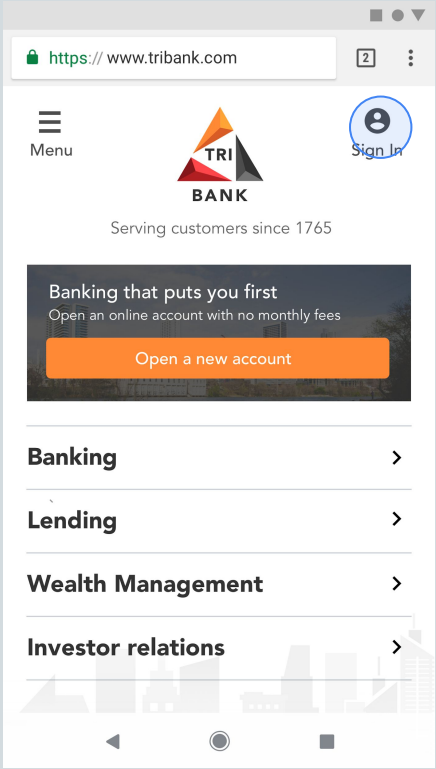


Meet Elisa

Elisa wants to sign in to her bank

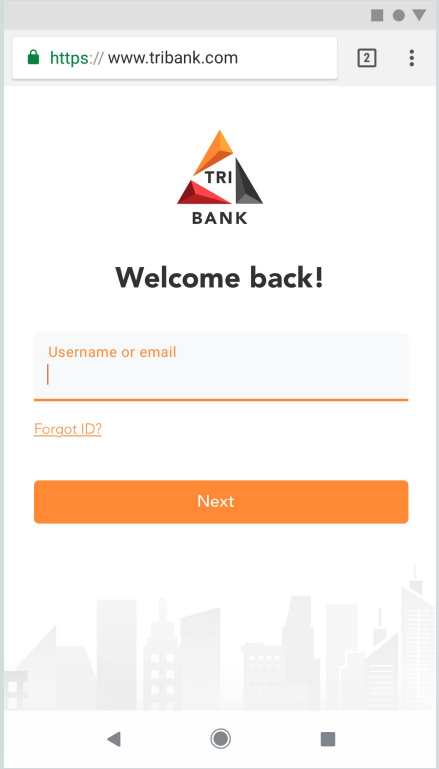
She starts on her mobile browser and enrolls in fingerprint after sign-in

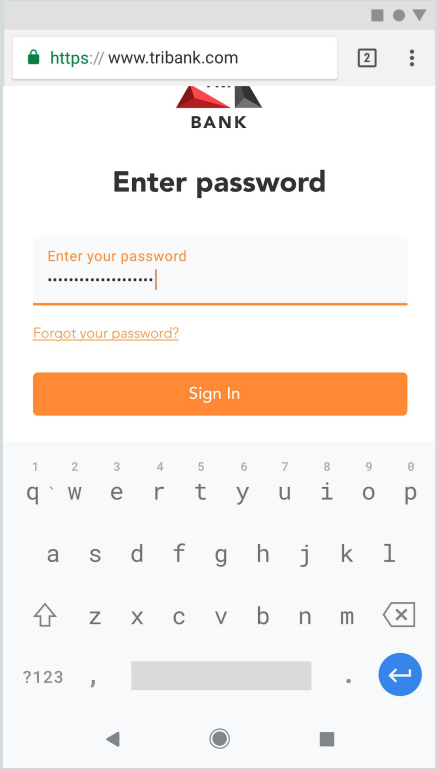
Elisa opens launches her mobile browser, Chrome, and goes to Tri-Bank



1. Registering built-in authenticator for re-auth (mobile web)

She signs in with her username and password

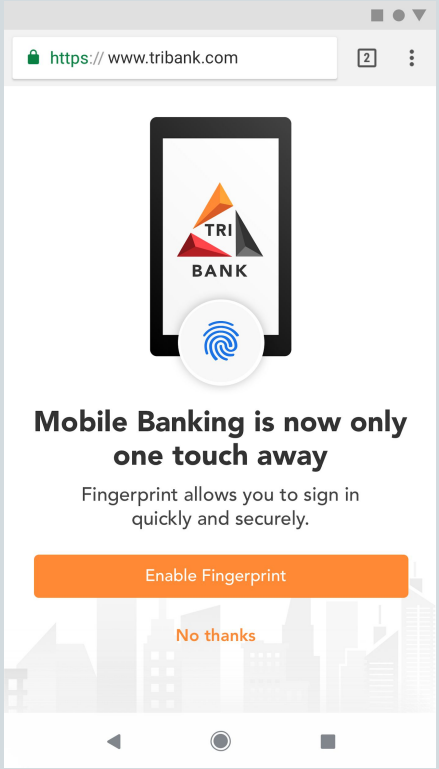


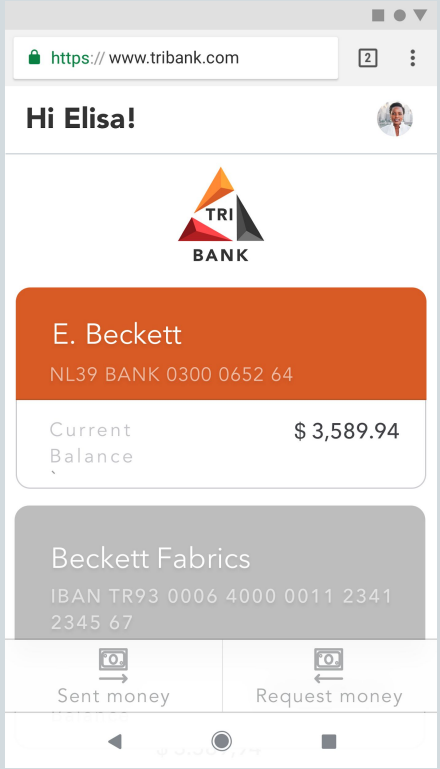


1. Registering built-in authenticator for re-auth (mobile web)

Tri-Bank shows a promo asking Elisa if she wants to opt in to fingerprint to sign in

She opts in and continues to her account





1. Registering built-in authenticator for re-auth (mobile web)

What happened behind the scenes?

Silently determined whether a platform authenticator was available:

```
PublicKeyCredential.isUserVerifyingPlatformAuthenticatorAvailable().then(resp
onse => {
    if (response === true) {
      //User verifying platform authenticator is available!
    } else {
      //User verifying platform authenticator is NOT available.
    }
```

What happened behind the scenes?

Created the credential on the platform authenticator

```
navigator.credentials.create({
     "publicKey": PublicKeyCredentialCreationOptions
   });
```

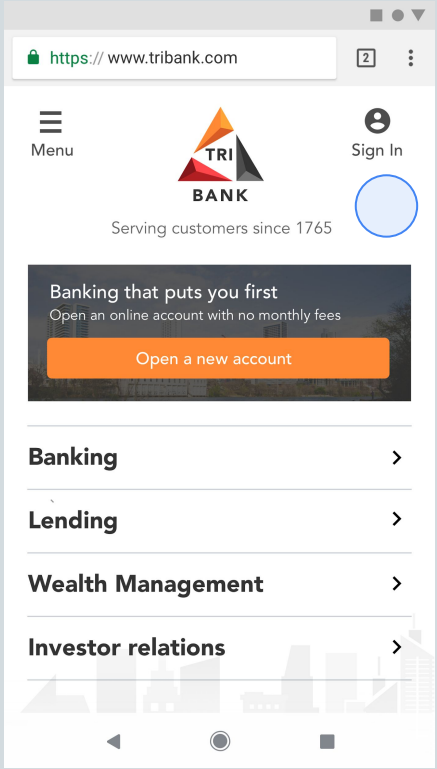
What happened behind the scenes?

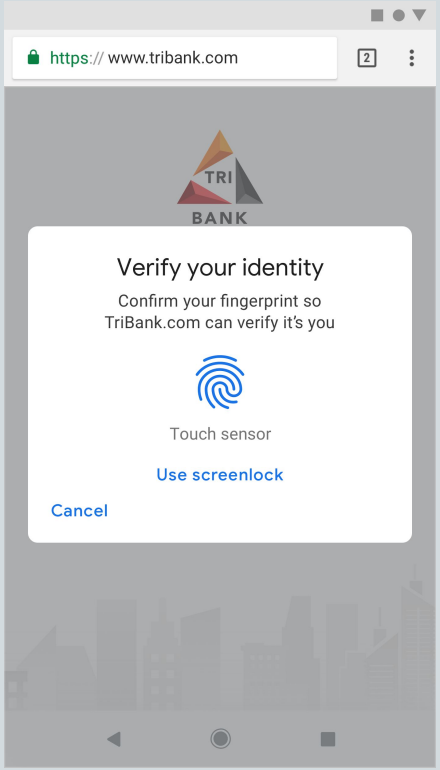
With values for `PublicKeyCredentialCreationOptions`

- `excludeCredentials = [// add any already registered ids ]`
- `authenticatorSelection.authenticatorAttachment = 'platform'`
  `// other options: ‘cross-platform’`
- `authenticatorSelection.userVerification = 'required'`
  `// other options: ‘discouraged’ or ‘preferred’`

Elisa comes back to Tri-Bank
in another session

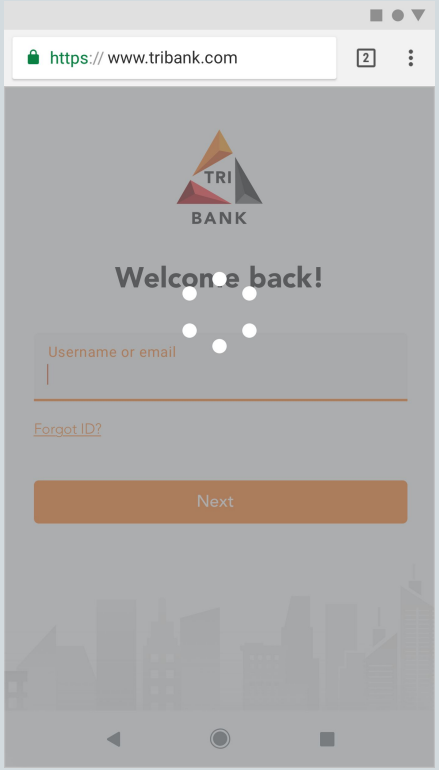
The next time Elisa opens Tri-Bank on mobile browser, she gets a fingerprint dialog

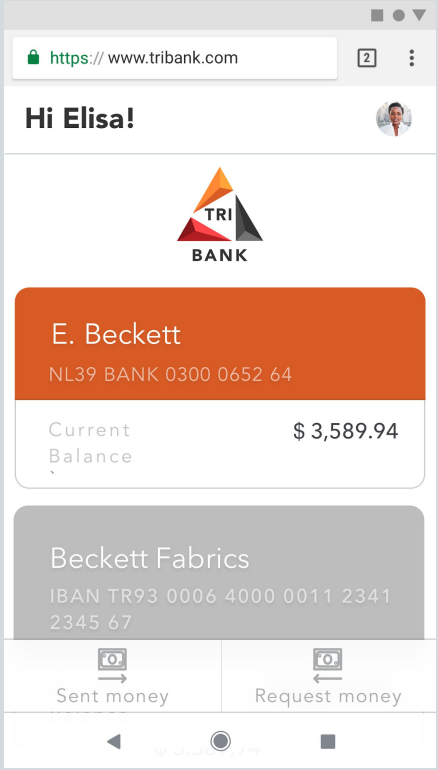




Since the user already signed in on this device, the credential ID is encoded in the cookie and the RP requests the “internal” transport only (since they don’t want the user to see prompts about external authenticators).

Using only her fingerprint, she's able to sign in without using her username + password on mobile web





What happened behind the scenes?

Created a signature using the platform authenticator

```
navigator.credentials.get({
     "publicKey":  PublicKeyCredentialRequestOptions
   });
```

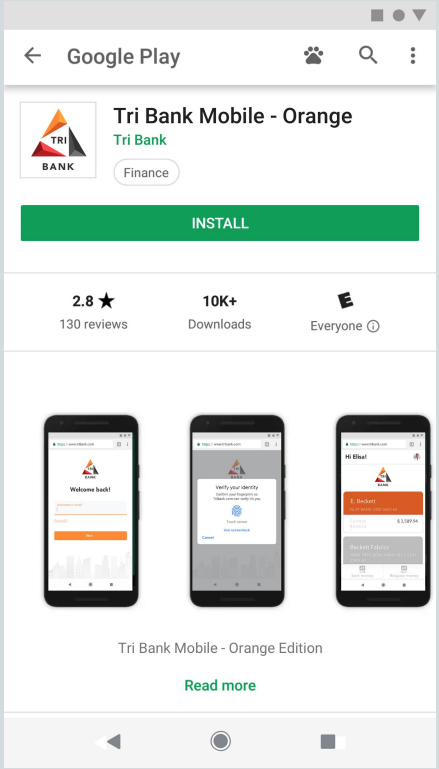
With values for PublicKeyCredentialRequestOptions

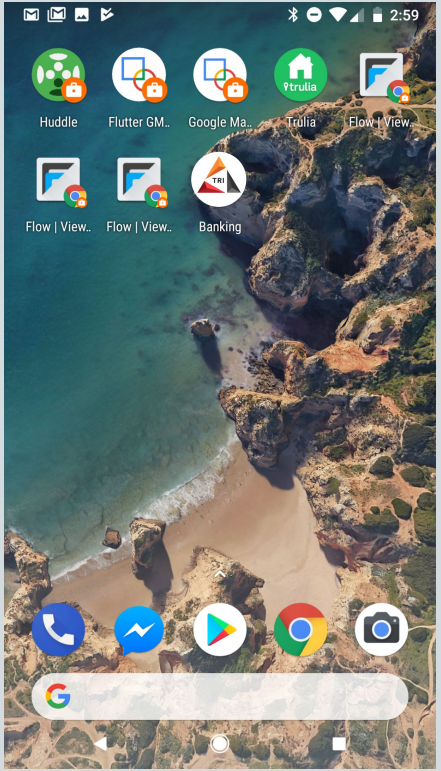
- allowCredentials = [// credential associated with session]
- userVerification = true

Elisa downloads Tri-Bank
from the Play Store

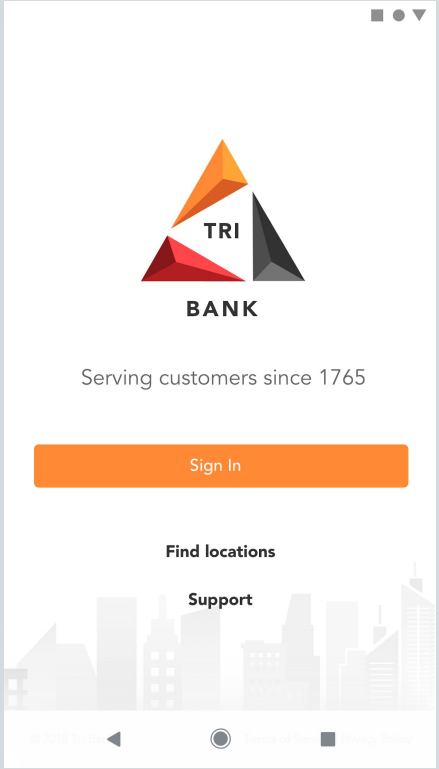
She launches the app for the first time
to sign in to check her funds

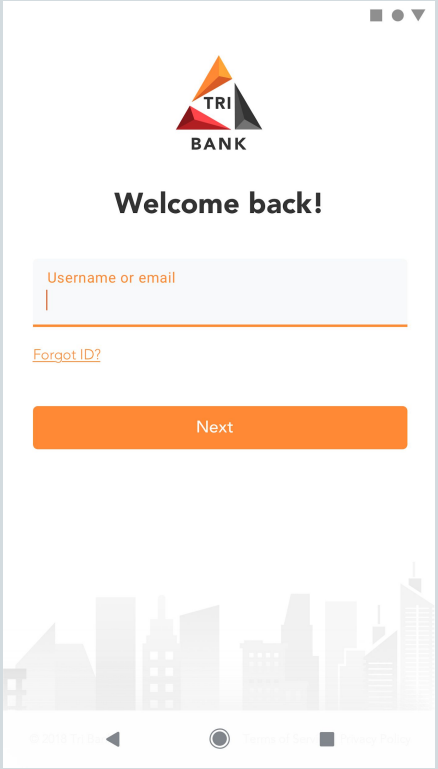
She installs Tri-Bank from Google Play Store and opens the app



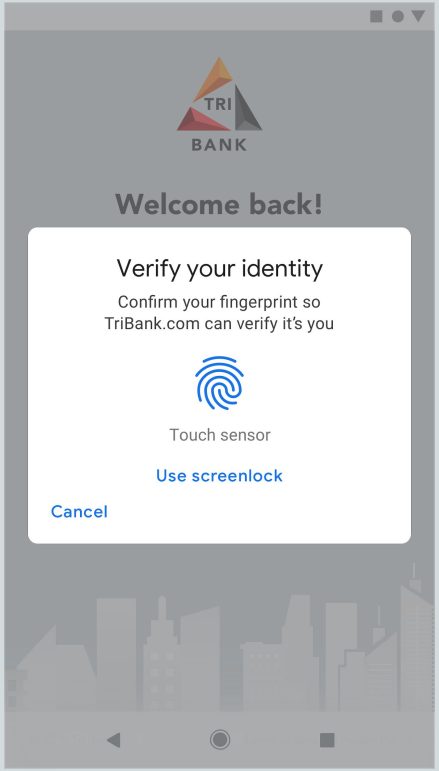


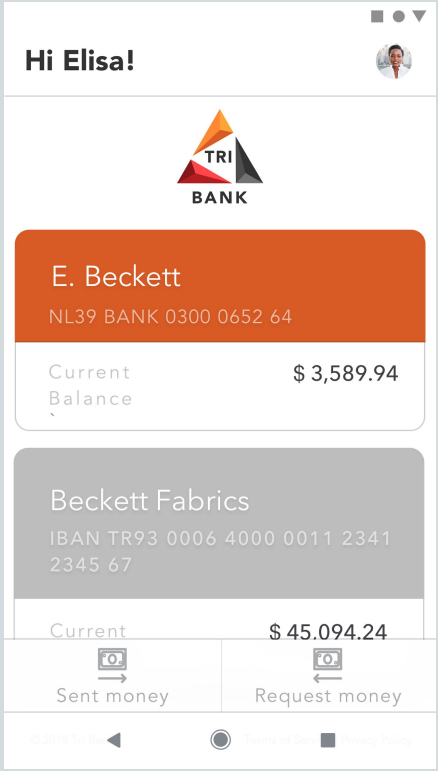
Elisa chooses “Sign In” and enters her username





Elisa is now asked to authenticate with the fingerprint dialog





What happened behind the scenes?

Created a signature using the platform authenticator

```
Fido2ApiClient fido2ApiClient = Fido.getFido2ApiClient(this.getApplicationContext());

Task<Fido2PendingIntent> result = fido2ApiClient.getSignIntent(requestOptions);
```

With values for requestOptions

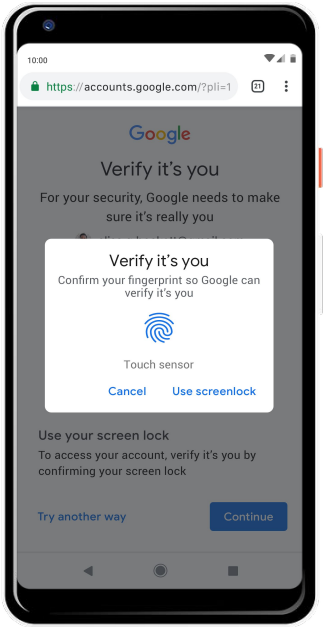
- allowCredentials = [// credential associated with session]
- userVerification = true

Case study: Yahoo! JAPAN

Reauth using fingerprint reduced time to sign-in by ...

37.5%

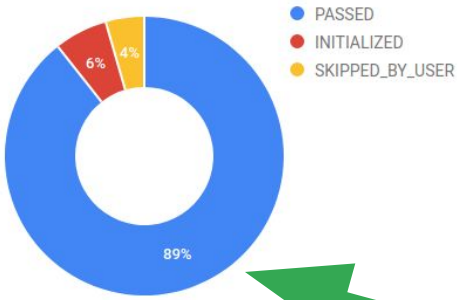
comparing to that of using a password.



Case study: Google

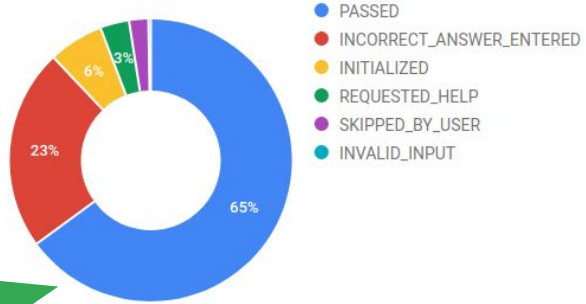
98% of biometric reauth users finish in **38s**

98% of all users enter password in **150s**



Does not exist in biometric

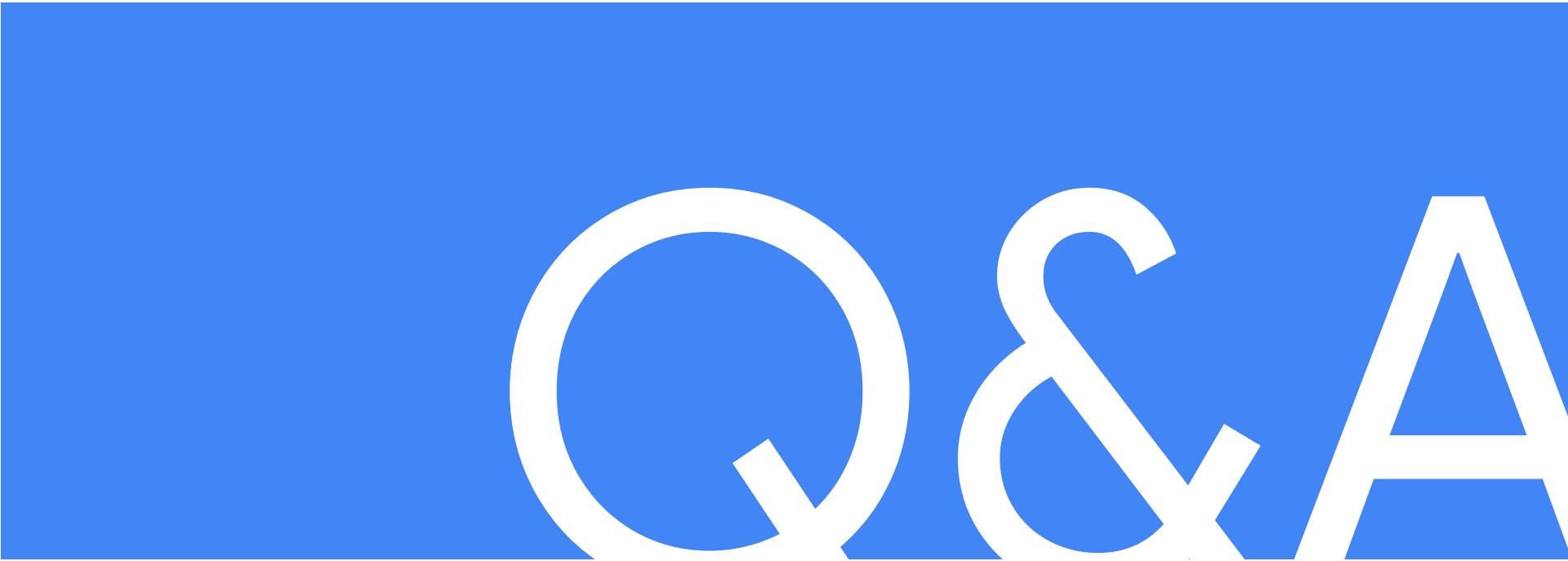
VS



Google Internal Data: 2018

Implement WebAuthn today!

- Play with our FIDO server
  webauthndemo.appspot.com
- Implement WebAuthn Create and Get methods
  codelabs.developers.google.com/codelabs/webauthn-reauth/
- Link your Android app for a seamless login experience
  codelabs.developers.google.com/codelabs/fido2-for-android/


Q&A