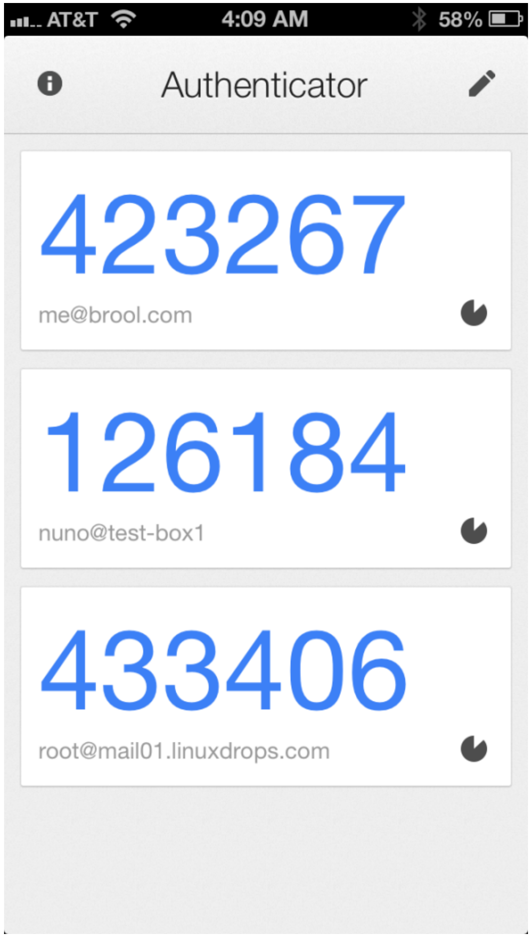


AT&T 4:09 AM 58%

Authenticator

423267
me@brool.com

126184
nuno@test-box1

433406
root@mail01.linuxdrops.com

Second Factor Authentication (2FA)

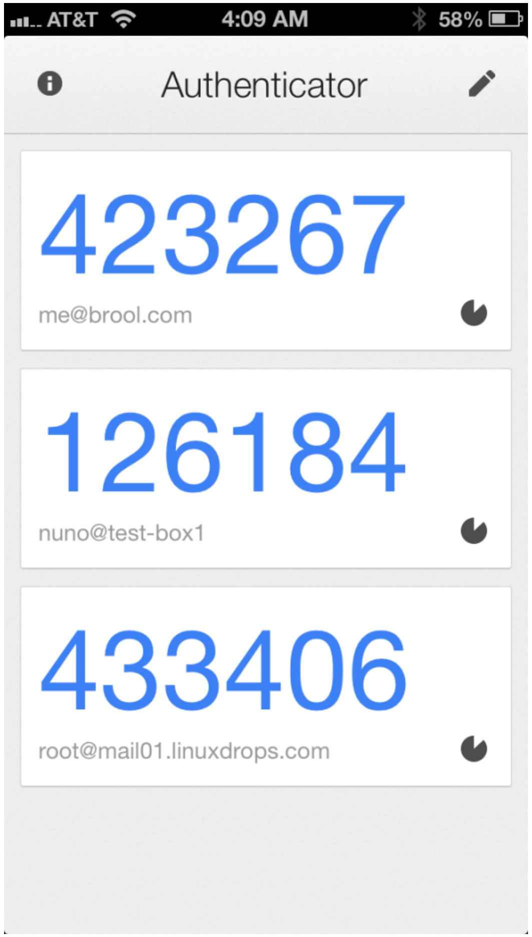
Second Factor Authentication (2FA)

- SMS verification
- Time-based One Time Password (TOTP)
- Universal 2nd Factor (U2F)

SMS Messaging

- Service provider texts client a code to enter after username/password stage
- Advantage
  - Simple! Convenient for all users!
- Disadvantage
  - SIM swapping – attacker convinces phone company they are *you* and purchased a new phone
  - Your phone number goes to their phone now
  - Discouraged in 2017 NIST guidelines https://pages.nist.gov/800-63-3/

Time-based One Time Password (TOTP)



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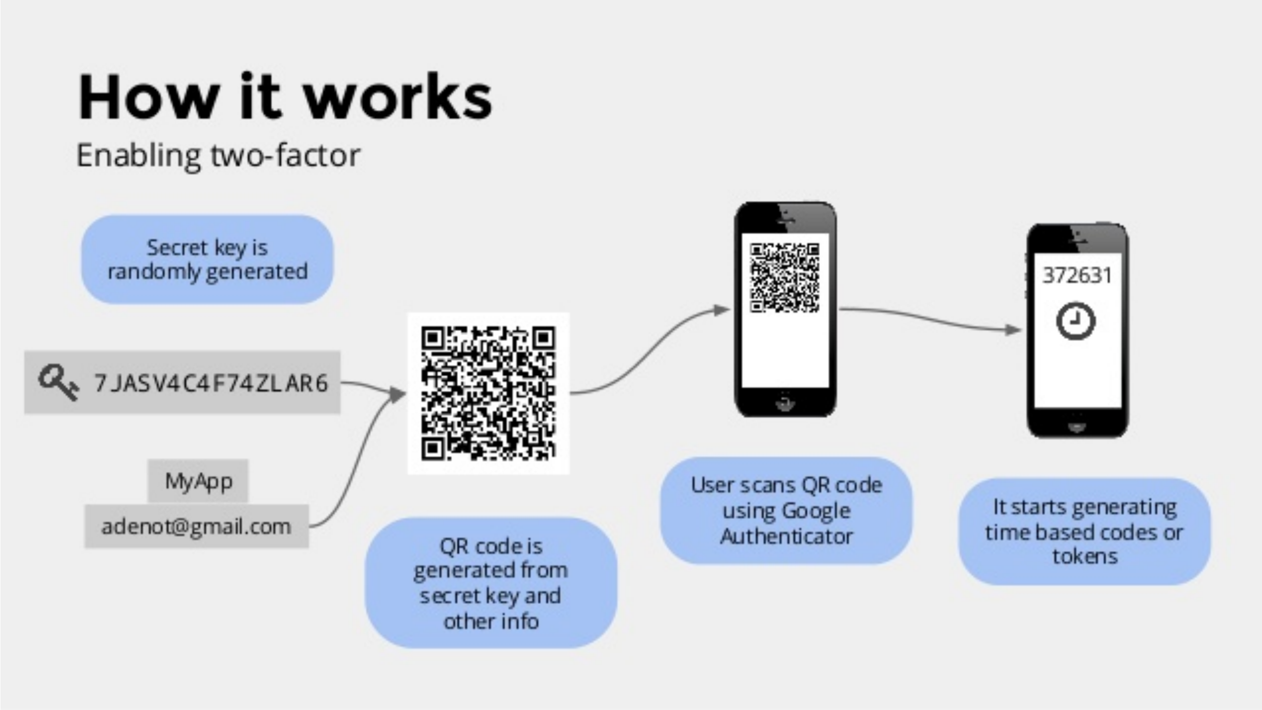


How it works

Enabling two-factor

Secret key is randomly generated

7JASV4C4F74ZLAR6

MyApp

adenot@gmail.com

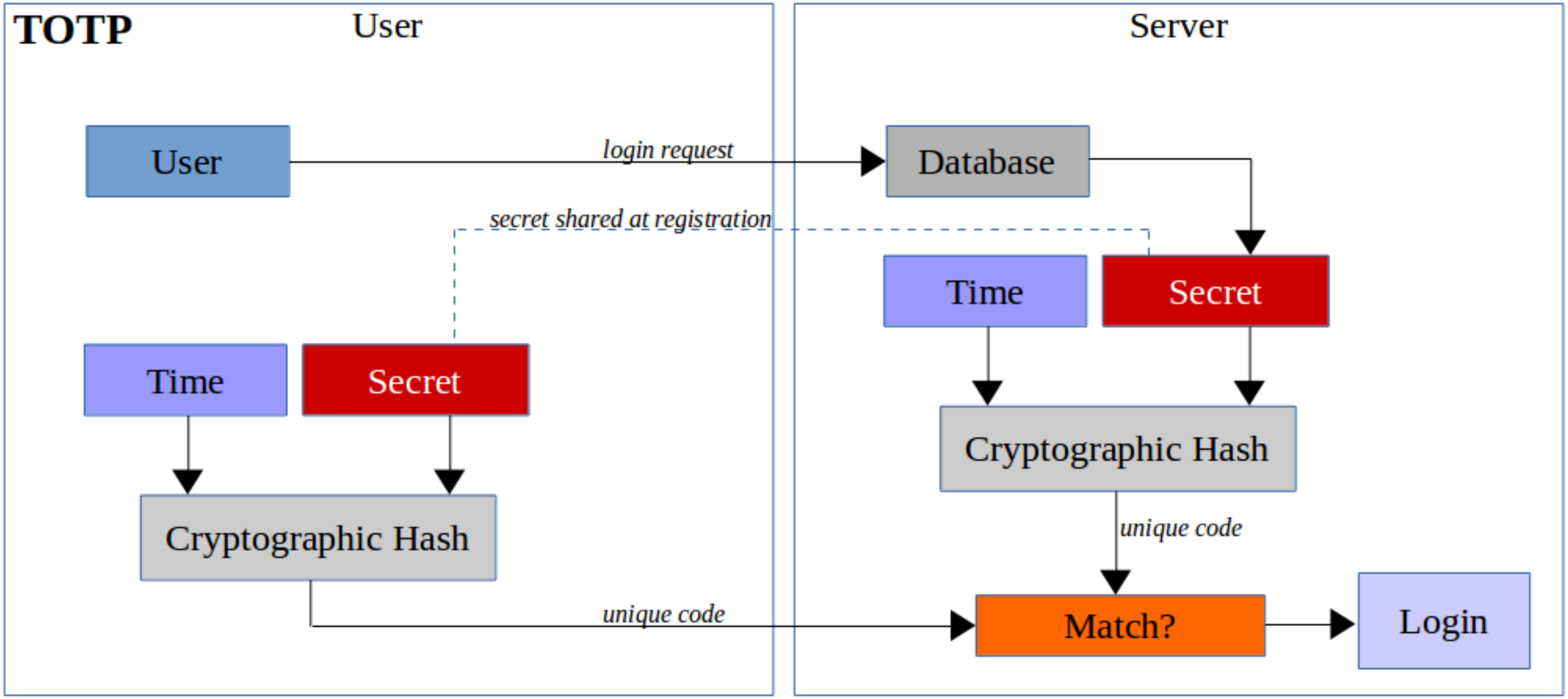
QR code is generated from secret key and other info

User scans QR code using Google Authenticator

372631

It starts generating time based codes or tokens

Time-based One Time Password (TOTP)



https://blog.trezor.io/why-you-should-never-use-google-authenticator-again-e166d09d4324

(Written by vendor of hardware keys…)

Time-based One Time Password (TOTP)

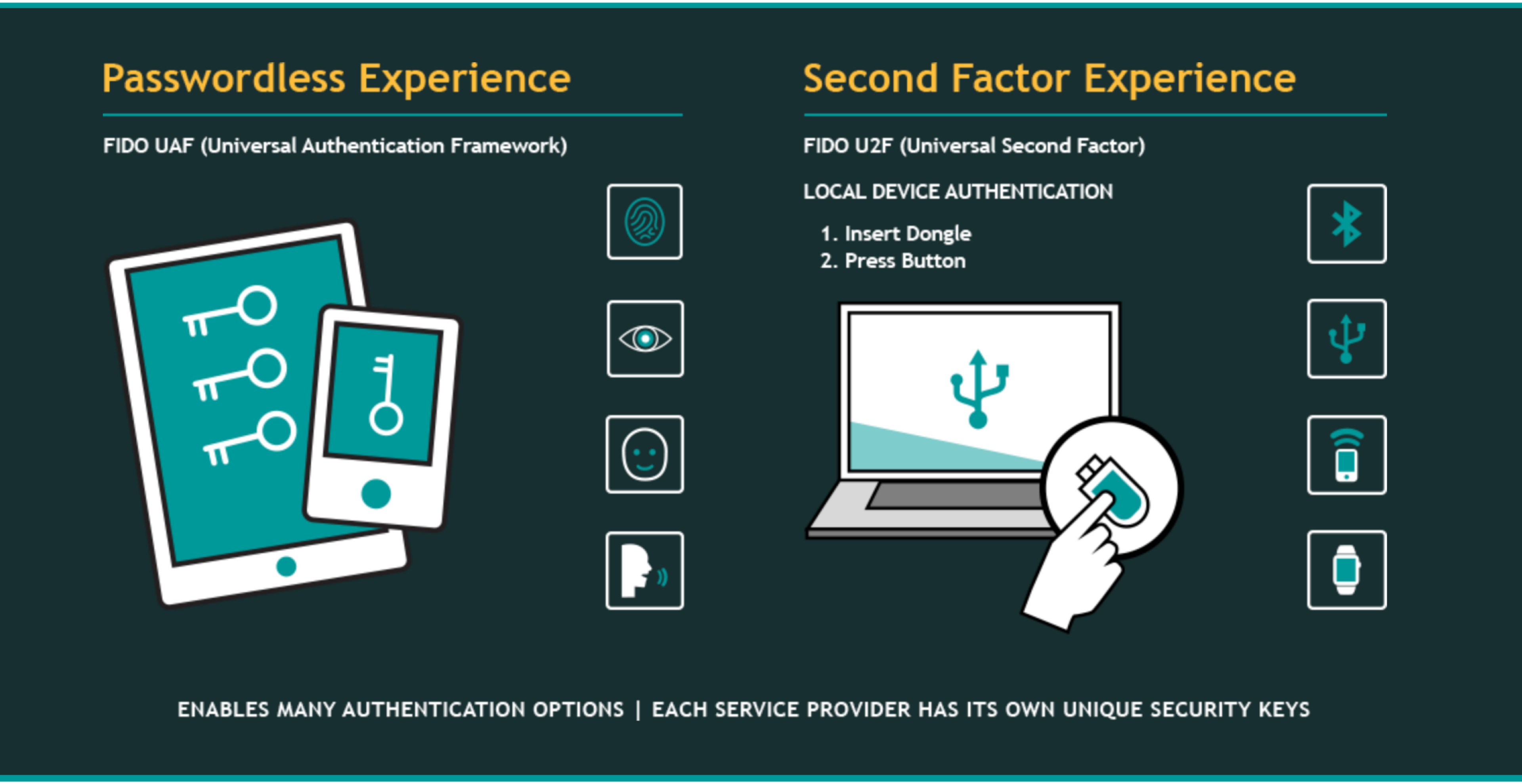
- Strengths
  - Better than only one factor (password)
  - Resistant to replay attacks if password is stolen or guessed
  - Resistant to attackers stealing your phone number
  - Simple / implementable in software apps
- Weaknesses
  - User and service provider share the same secret
  - Secret must be accessible in plaintext to combine with time and compute hash
  - Service provider hacked?
    - Secret lost
    - Second factor for all users lost

FIDO Alliance

- FIDO Alliance
  - Fast IDentity Online (FIDO)
  - Industry consortium
- Interoperability for strong authentication devices

fido™ alliance | simpler stronger authentication

FIDO Alliance



Passwordless Experience

FIDO UAF (Universal Authentication Framework)

Second Factor Experience

FIDO U2F (Universal Second Factor)

LOCAL DEVICE AUTHENTICATION

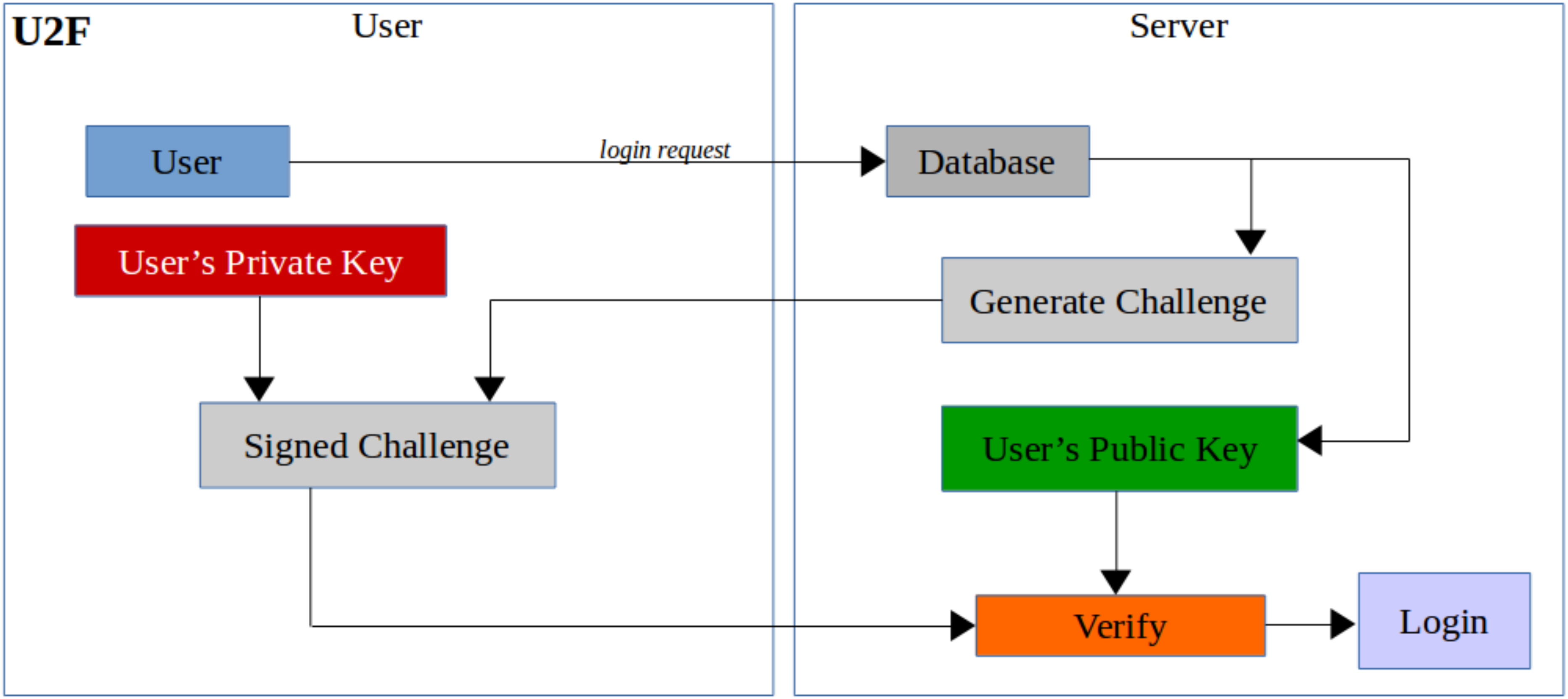
1. Insert Dongle
2. Press Button

ENABLES MANY AUTHENTICATION OPTIONS | EACH SERVICE PROVIDER HAS ITS OWN UNIQUE SECURITY KEYS

Universal 2nd Factor (U2F)

- Open standard for USB or NFC security devices
  - Developed by Google and Yubico
  - Multiple vendors of hardware devices
- Use cases
  - Computer login (Windows, OS X, Linux)
  - Second factor login for online services supporting U2F protocol
    - Websites: Google, Dropbox, GitHub, Bitbucket, Facebook, Salesforce
    - Browsers: Chrome, Firefox, Opera

Universal 2nd Factor (U2F)



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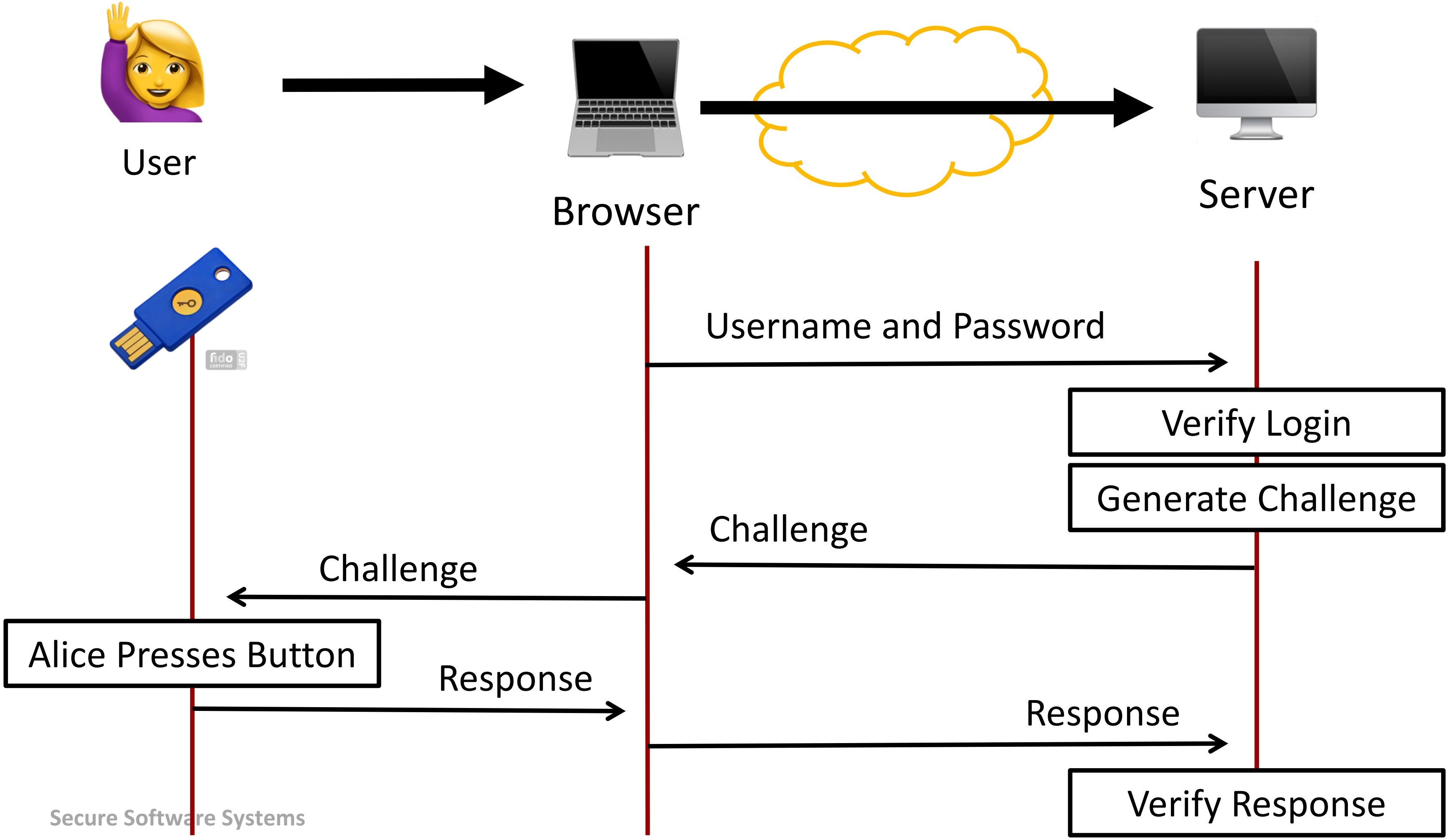
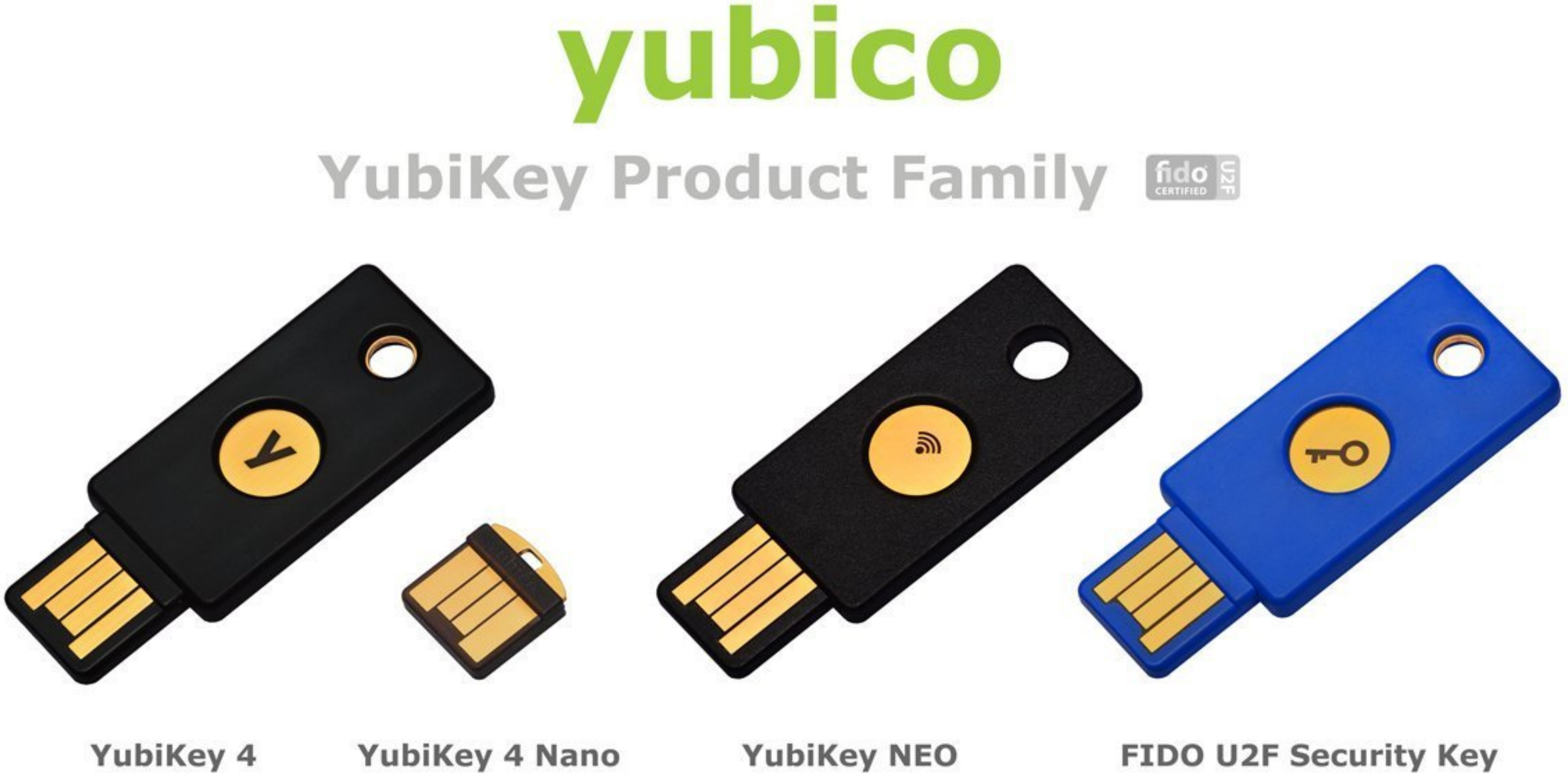
Universal 2nd Factor (U2F)



Universal 2nd Factor (U2F)

- No shared secret – Private key is locked in hardware
- Automated – no typing of one-time codes
- Hardware stores private key which can sign challenge message (random number) from service provider, which validates signing with matching public key

U2F Example: YubiKey



U2F Risks

- What if I lose my U2F key?
  - You’ve lost your second factor ☹
  - Account recovery up to your service provider
- Recommendations
  - Register two U2F devices with each service provider so you have a backup
  - Save backup codes (if any) from provider in secure location

YubiKey 4

- Multiple standards supported
  - Touch to trigger FIDO U2F
  - HMAC-SHA1
  - Smart card (PIV)
  - Yubico OTP
  - Code Signing
  - OpenPGP
  - Challenge-Response
  - OATH (TOTP and HOTP)
  - Secure static password

Google Advanced Protection Program

Targeted Attacks on Public Figures

Revealed: Top Hillary aide John Podesta's opened himself to massive Russian hacking effort by using Gmail instead of secure official server

http://www.dailymail.co.uk/news/article-5047471/Inside-story-How-Russians-hacked-Democrats-emails.html

Nov 3 2017

Hacking Coinbase: The Great Bitcoin Bank Robbery

http://fortune.com/2017/08/22/bitcoin-coinbase-hack/

Aug 22 2017

Targeted attack on public figure

- SIM switch via T-Mobile
- Reset Google password
- Two-factor SMS code goes to attacker
- Change Google password
- Reset Coinbase password – email goes to Gmail
- **Profit!**

Security v Convenience

- Google Advanced Protection Program
  - Launched October 2017
  - Free *(after buying hardware)*
  - Favors security over convenience
- 2nd factor
  - No SMS
  - No TOTP / Google Authenticator app
  - **Must have** two FIDO/U2F hardware keys
- Software
  - No non-Google software
  - Only Chrome and first-party apps
  - No third-party site that authenticates via Google account
- Password resets
  - No backup codes
  - No reset via email / SMS
  - Only manual account review - "cooling off" period will take a few days

Google Advanced Protection Program

- Target audience
  - Campaign staffers preparing for an upcoming election
  - Journalists who need to protect the confidentiality of their sources
  - People in abusive relationships seeking safety
  - Human rights defenders, environment campaigners and civil society activists working on any number of sensitive issues
  - High net-worth individuals
  - VIPs
  - Perhaps politicians and company management using a Google account in a personal capacity