
OWASP GLOBAL AppSec
VIE '26
NNA JUN
25-26
25
years
of open source security

OWASP GLOBAL AppSec

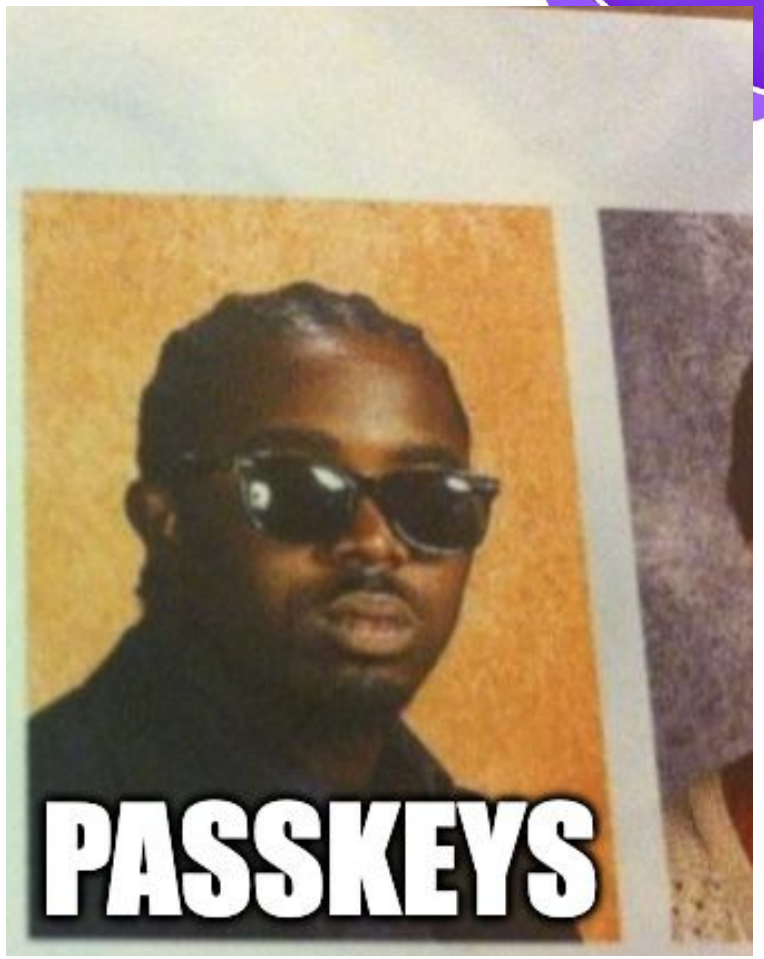
VIENNA '26 JUN 25-26

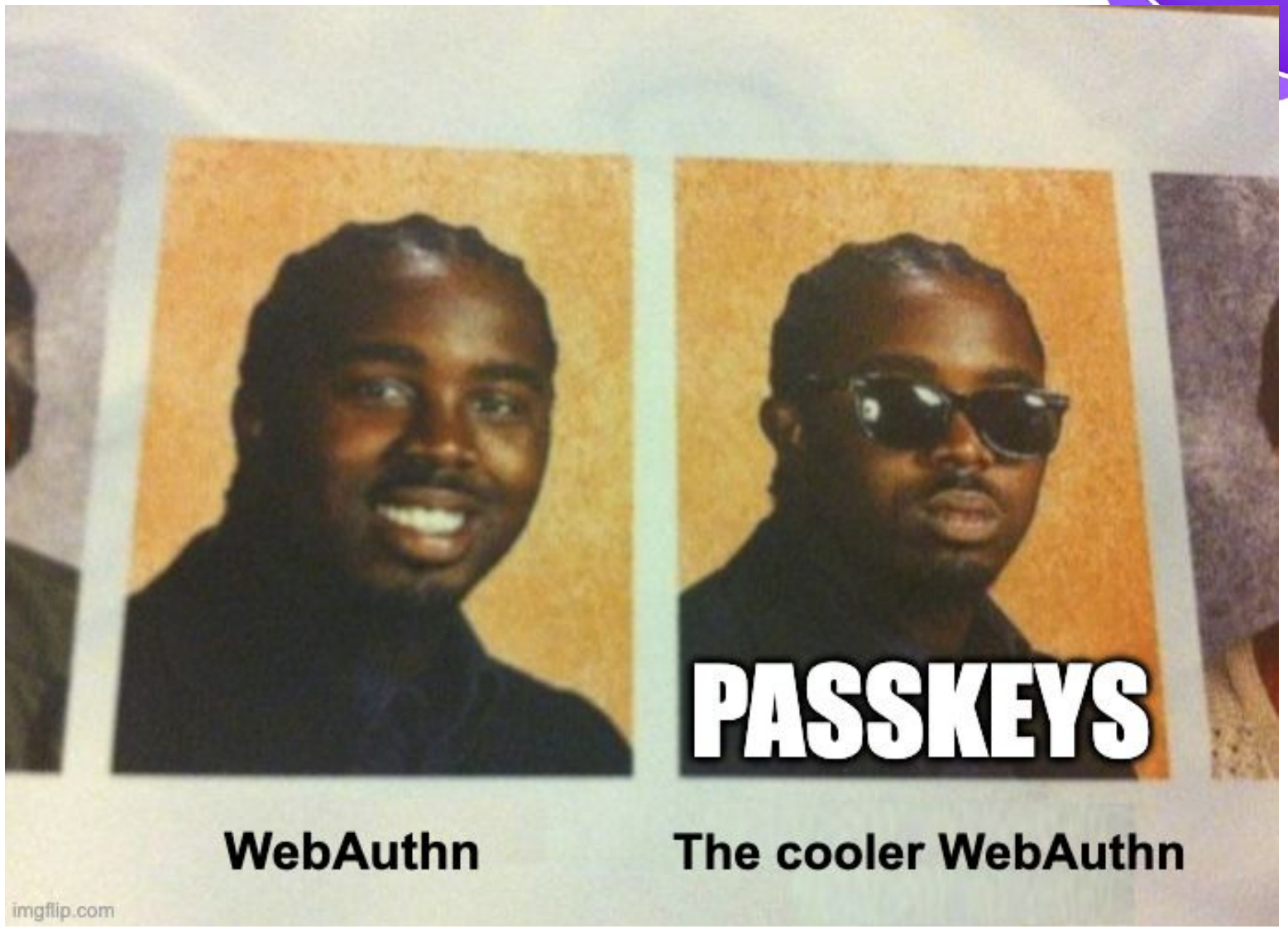
25 years of open source security

Phishing for Passkeys - An Analysis of WebAuthn and CTAP

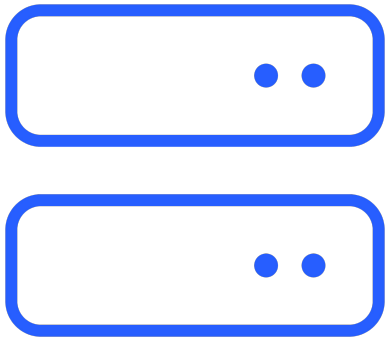
Michael Kuckuk

PHISHING FOR PASSKEYS




PASSKEYS
WebAuthn
The cooler WebAuthn
imgflip.com

Relying Party (RP)



- Creates crypto challenge etc.
- Stores public keys
- Verifies login
- 🤨 *Declares RP ID*

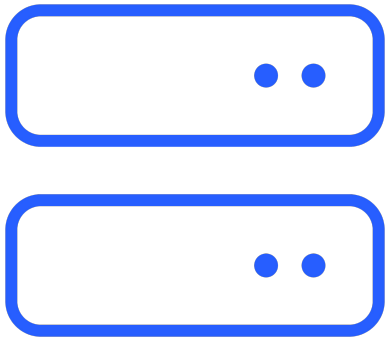
Client

- "Forwards" messages ↔
- 🤨 *Gatekeeper*

Authenticator

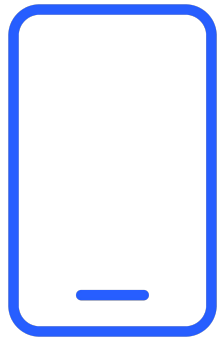
- Creates & stores keys
- Signs challenge
- Performs 2nd factor

Relying Party (RP)



Client

Authenticator



Relying Party (RP)

Client

Authenticator

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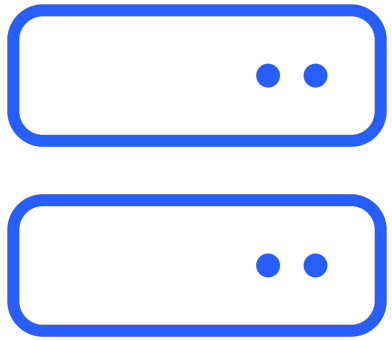
Authenticator



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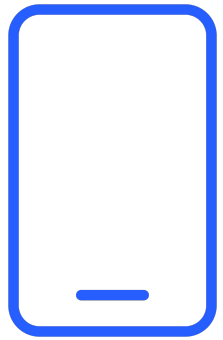
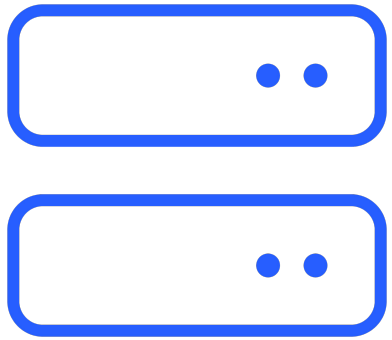


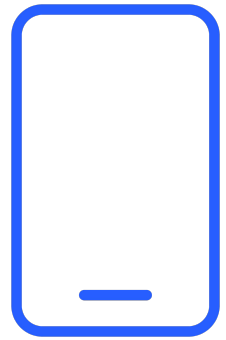
"Platform-attached Authenticator"

Relying Party (RP)

Client

Authenticator





Relying Party (RP)

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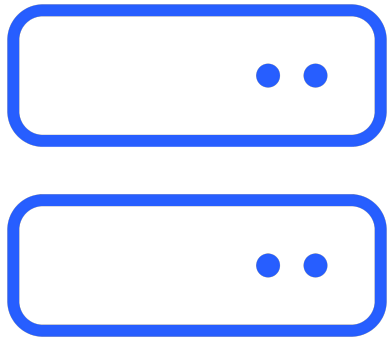

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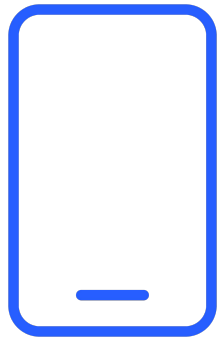
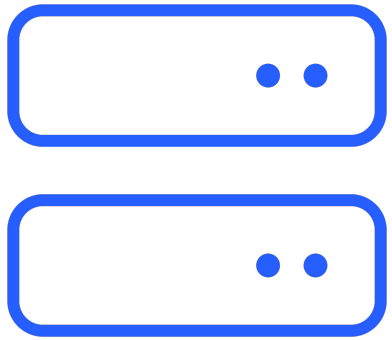


"Cross-platform-attached Authenticator"

Relying Party (RP)

Client

Authenticator



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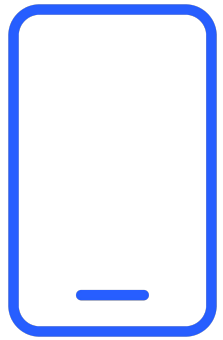
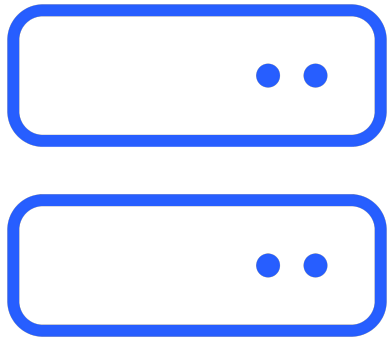


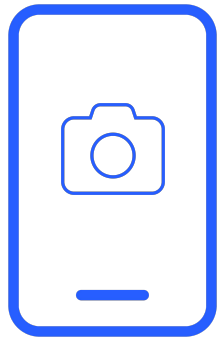
Cross-Device Authentication (CDA)

Relying Party (RP)

Client

Authenticator





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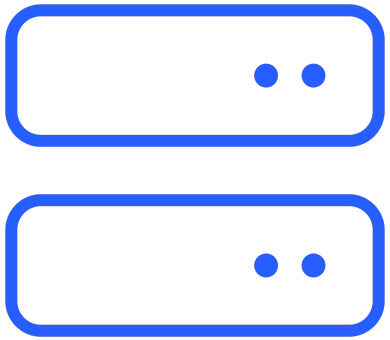

"Cross-platform-attached Authenticator"

PHISHING FOR PASSKEYS

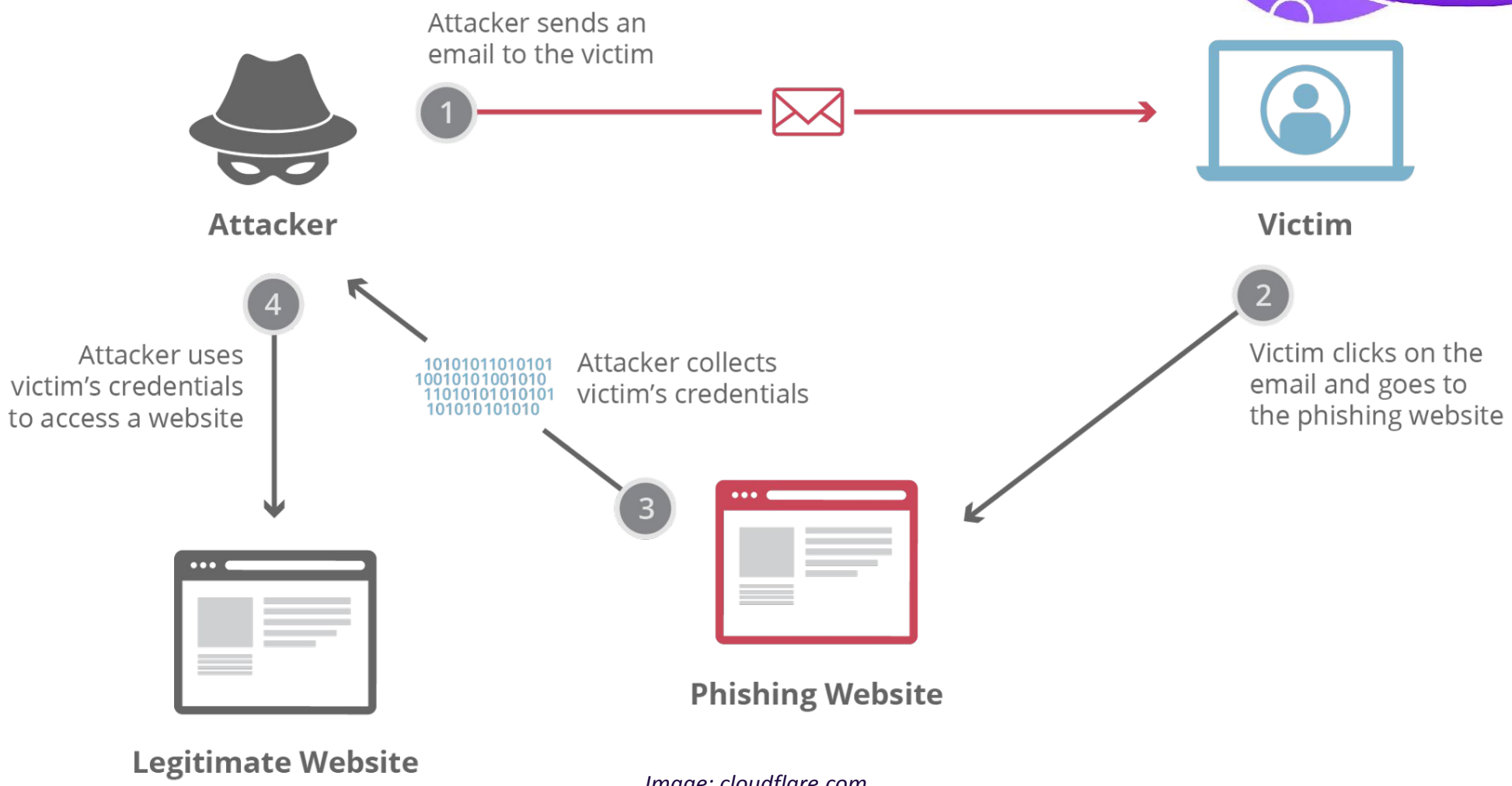

Image: cloudflare.com


Regular Page
Phishing Page
Corporate needs you to find the differences between this picture and this picture.
Humans
They're the same picture.
imgflip.com

PHISHING FOR PASSKEYS

Have I Been Pwned: Project operator Troy Hunt pwned

The operator of Have I Been Pwned was himself the victim of a phishing attack. The emails from the newsletter mailing list were stolen.

Have I Been Pwned? Yes! (Image: heise online / dmk)

Mar 26, 2025 at 9:18 pm CET 3 min. read | Security

By Dirk Knop


NOWASP.ORG
OWASP.ORG
PASSWORD MANAGERS
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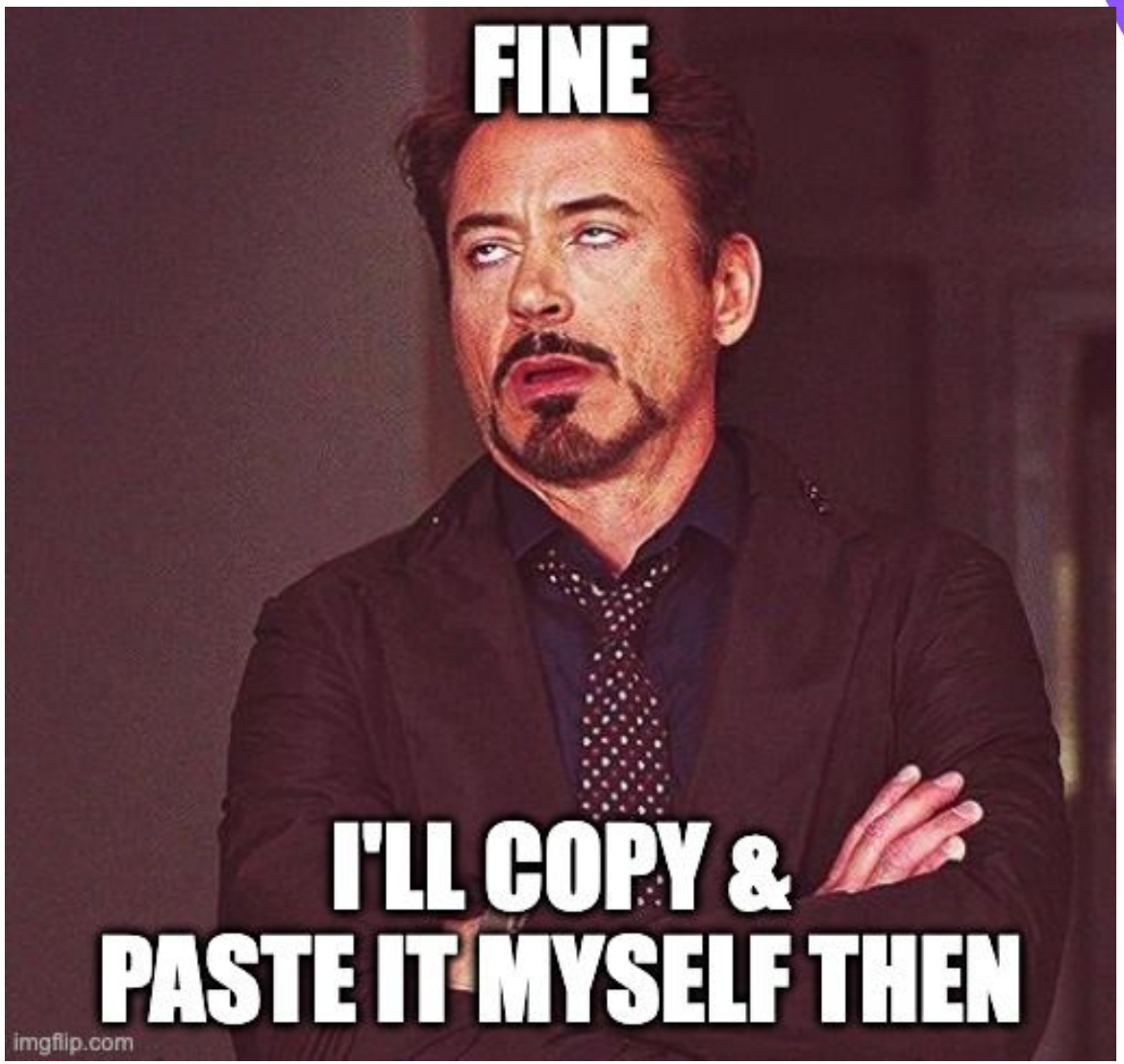
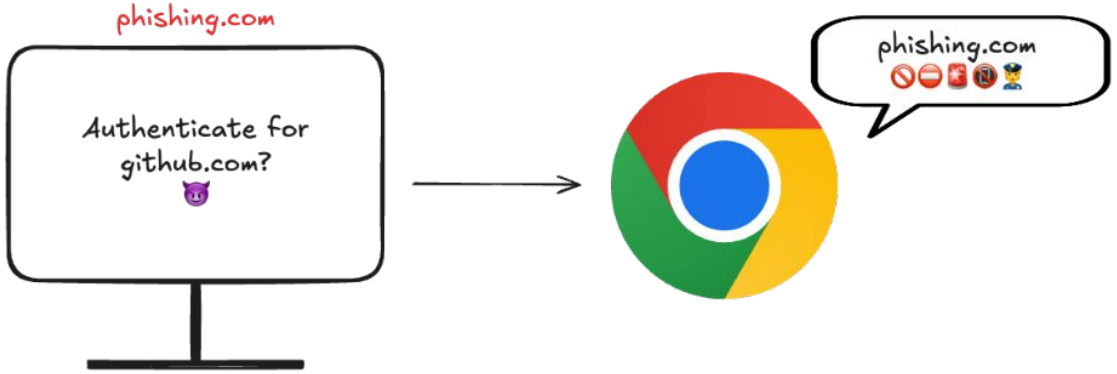
PHISHING FOR PASSKEYS



Resistance against phishing

- Server declares its Relying Party ID (RPID, usually the website's domain or superdomain)
- Browser checks if current origin matches that RPID
- Authenticator ignores credentials that belong to other RPIDs
- ‼️ RP verifies origin (provided by client, signed by authenticator)

→ Users cannot use credentials on unintended (= phishing) websites!



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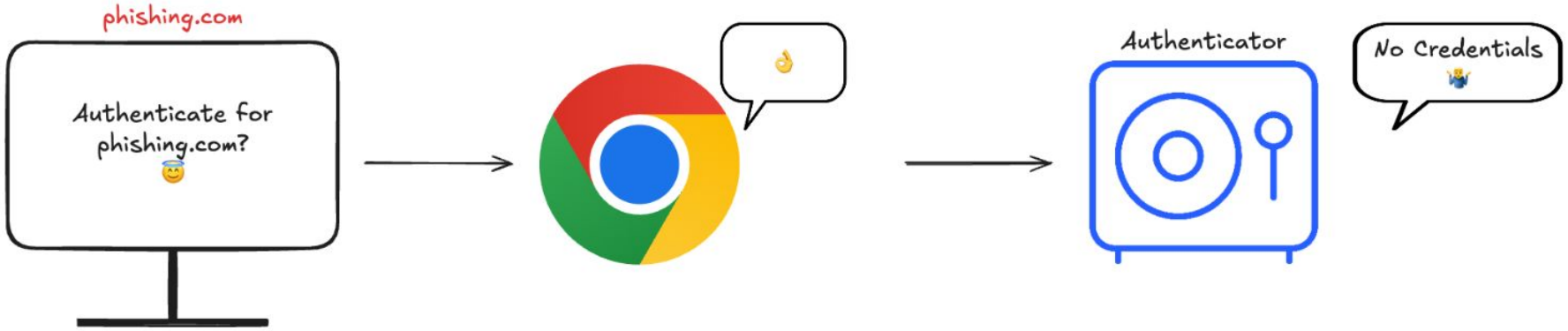

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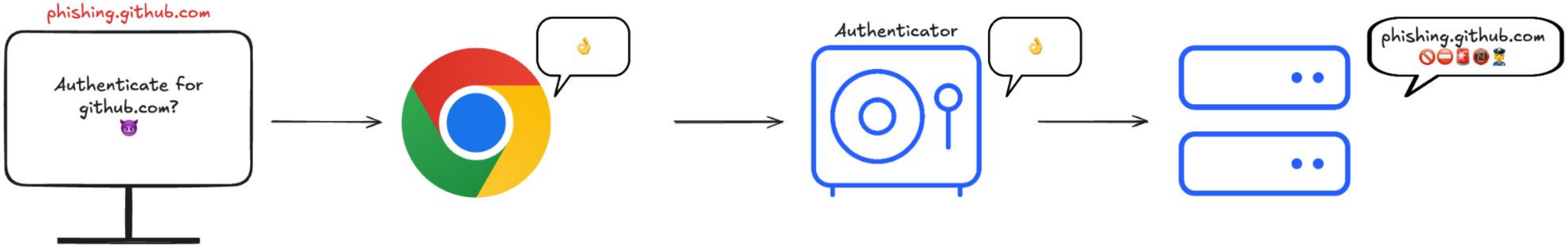


PHISHING FOR PASSKEYS

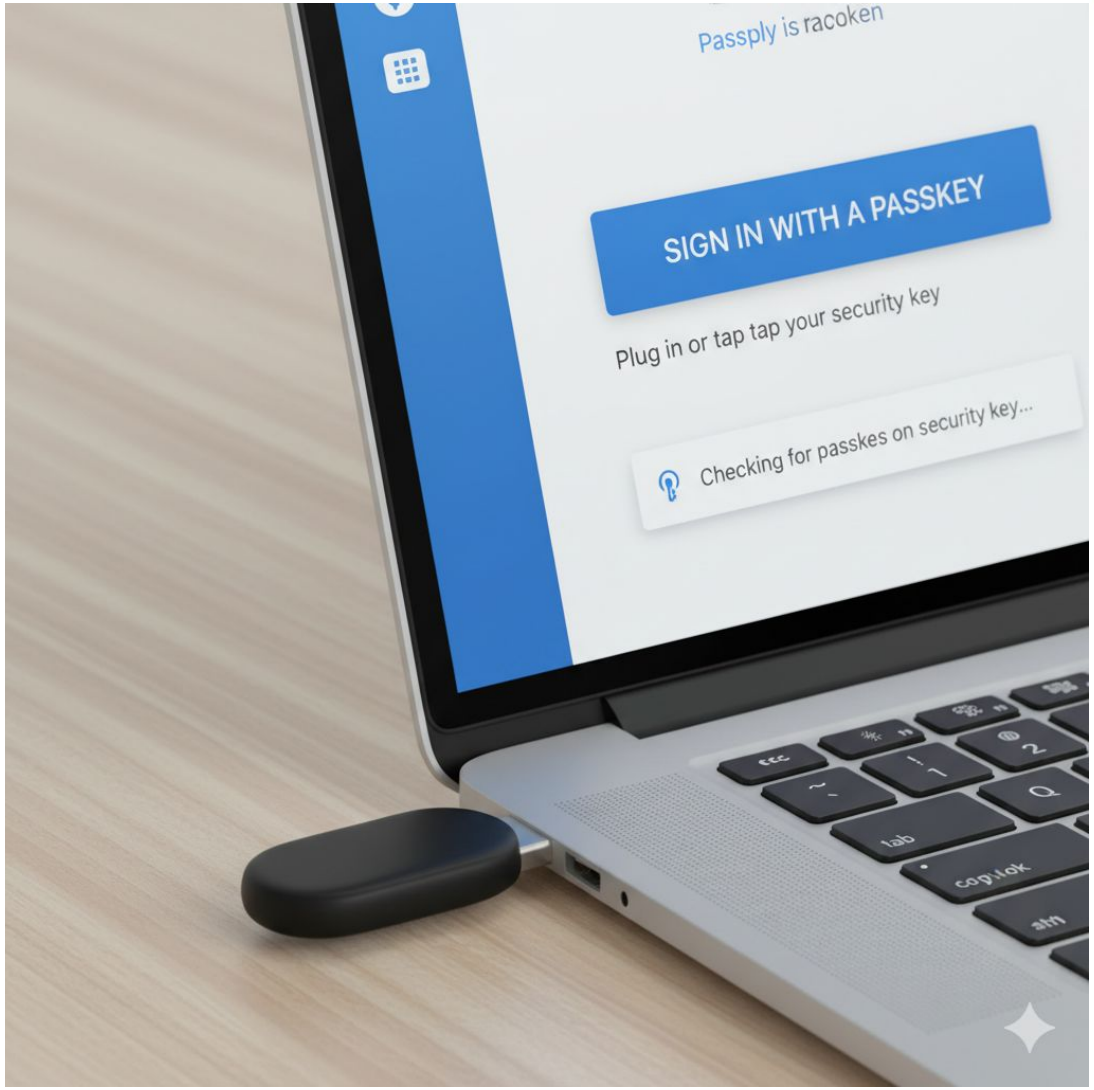
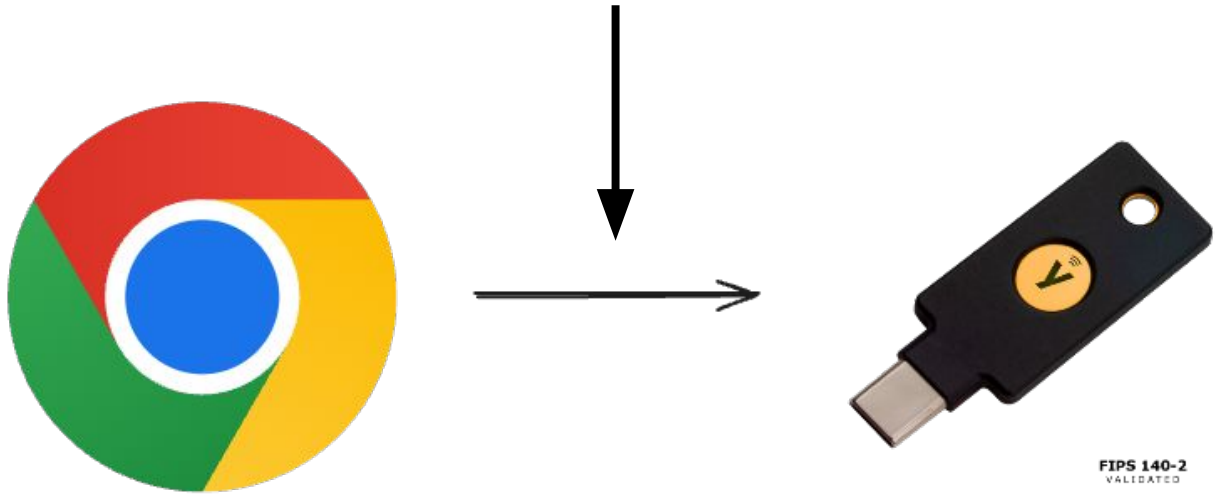


Image is AI generated

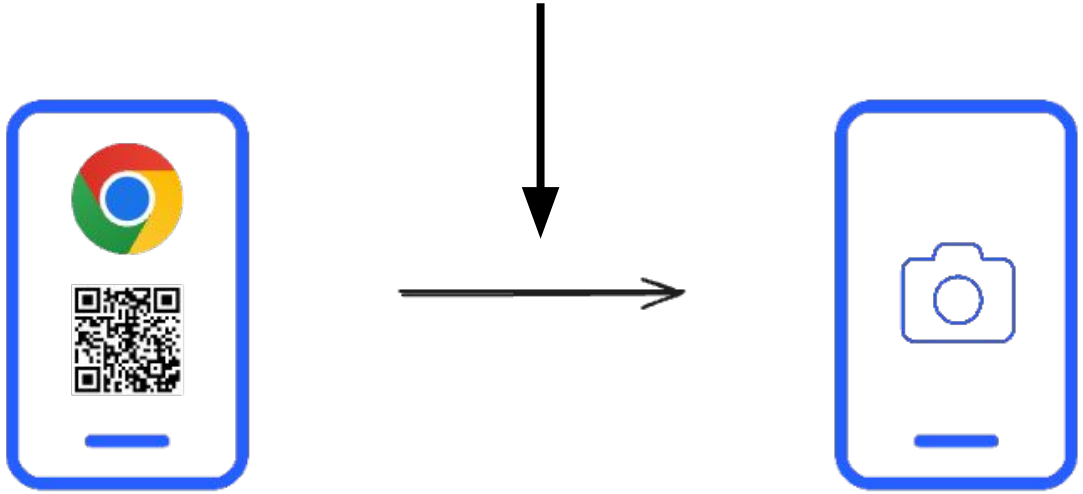
User can visually verify connection



PHISHING FOR PASSKEYS

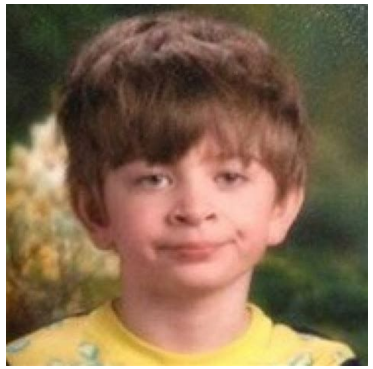
Image is AI generated

Is this magic?
Can we mess with it?



What WebAuthn specifies

- Client and Authenticator must exchange certain information
- Authenticator must be able to execute `user verification`
- The *how* is "intentionally unspecified" and "outside the scope of this specification"



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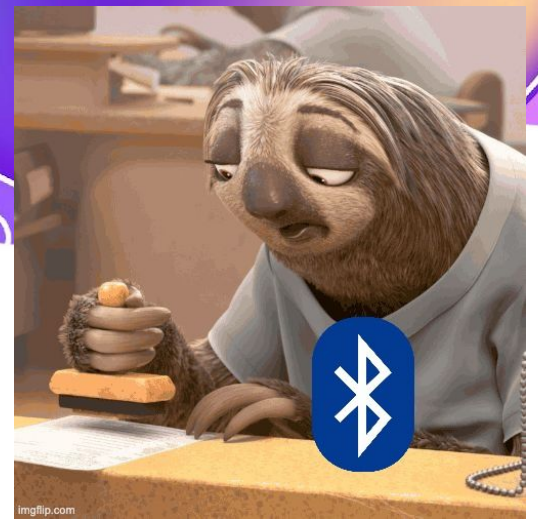


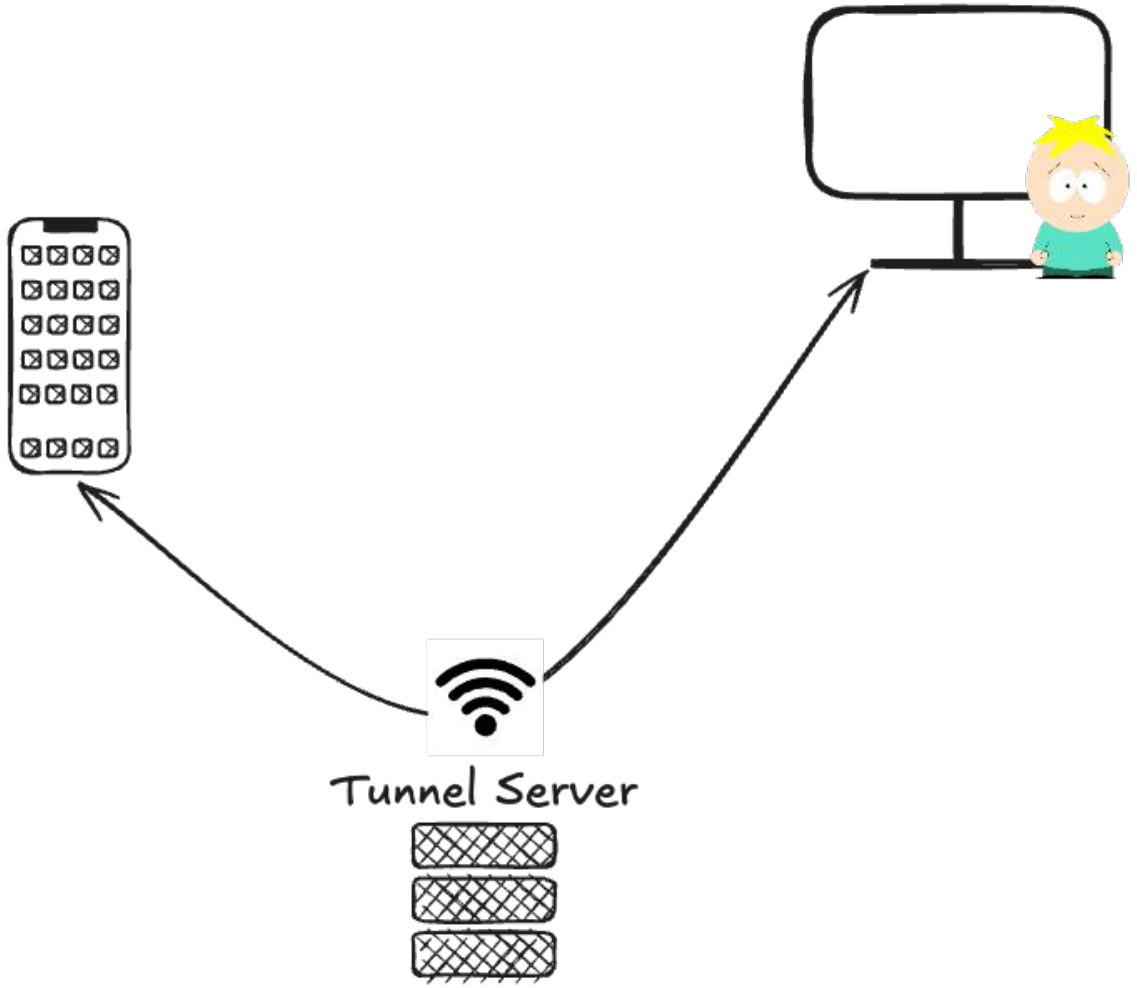
Client To Authenticator Protocol (CTAP)

- Only applies to Cross-Device Authentication
- Application level (what)
  - Many messages mirror WebAuthn (e.g. `authenticatorGetAssertion`)
  - Additional messages for implementing other requirements
- Transport level (how)
  - Specifies encoding
  - Ensures correct devices are communicating with each other
  - Transports*: USB, NFC, Bluetooth Low Energy (BLE)
    - ➢ Guarantees physical proximity

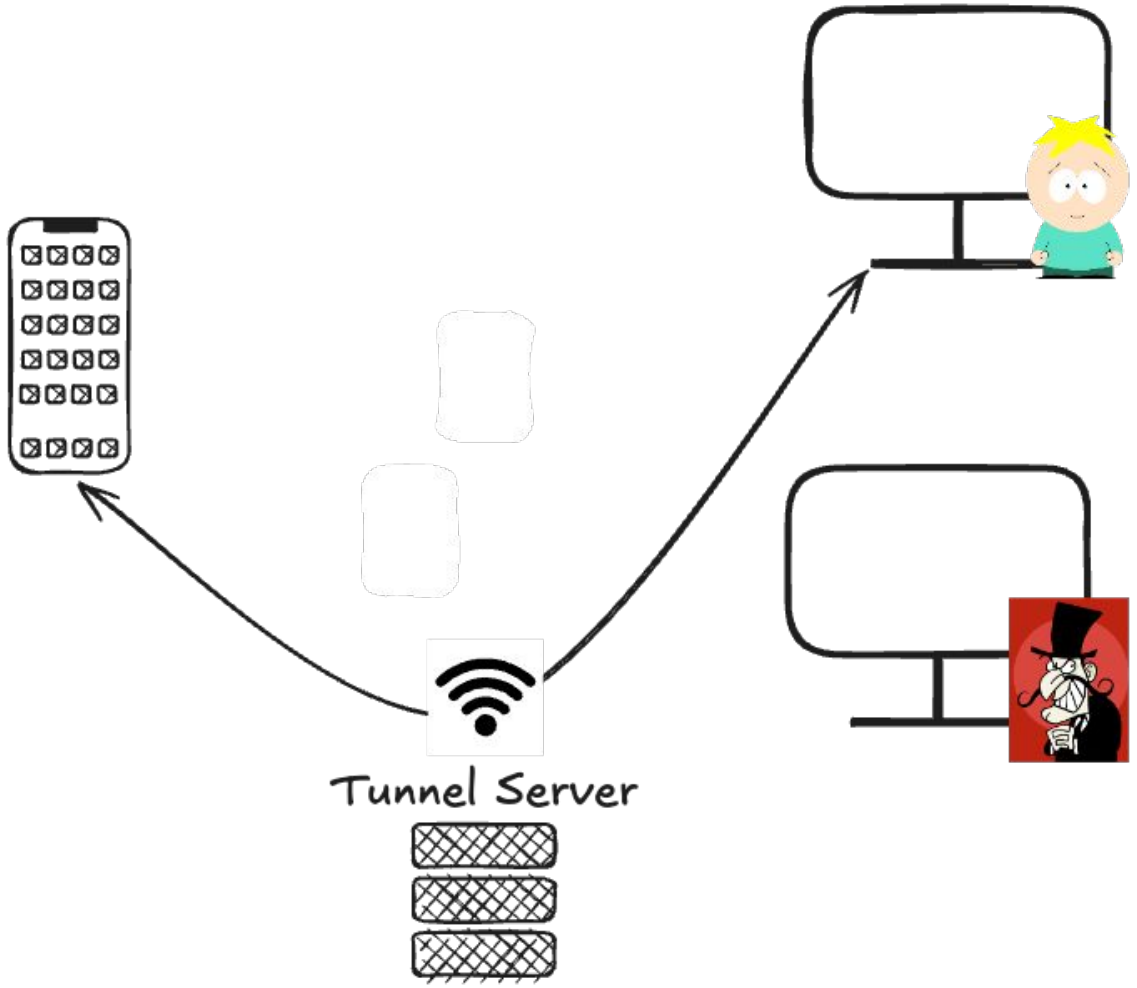
Image is AI generated

Re-inventing QR-initiated Hybrid Transport

Re-inventing QR-initiated Hybrid Transport



Re-inventing QR-initiated Hybrid Transport



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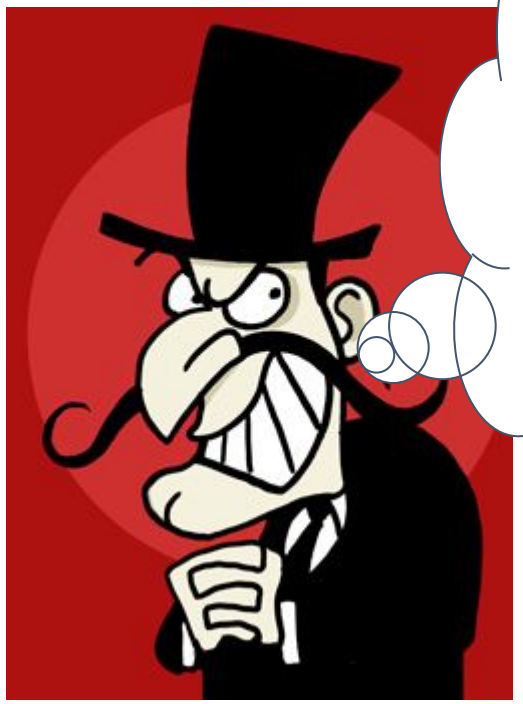

I'll pretend to be the client through the Tunnel Server!

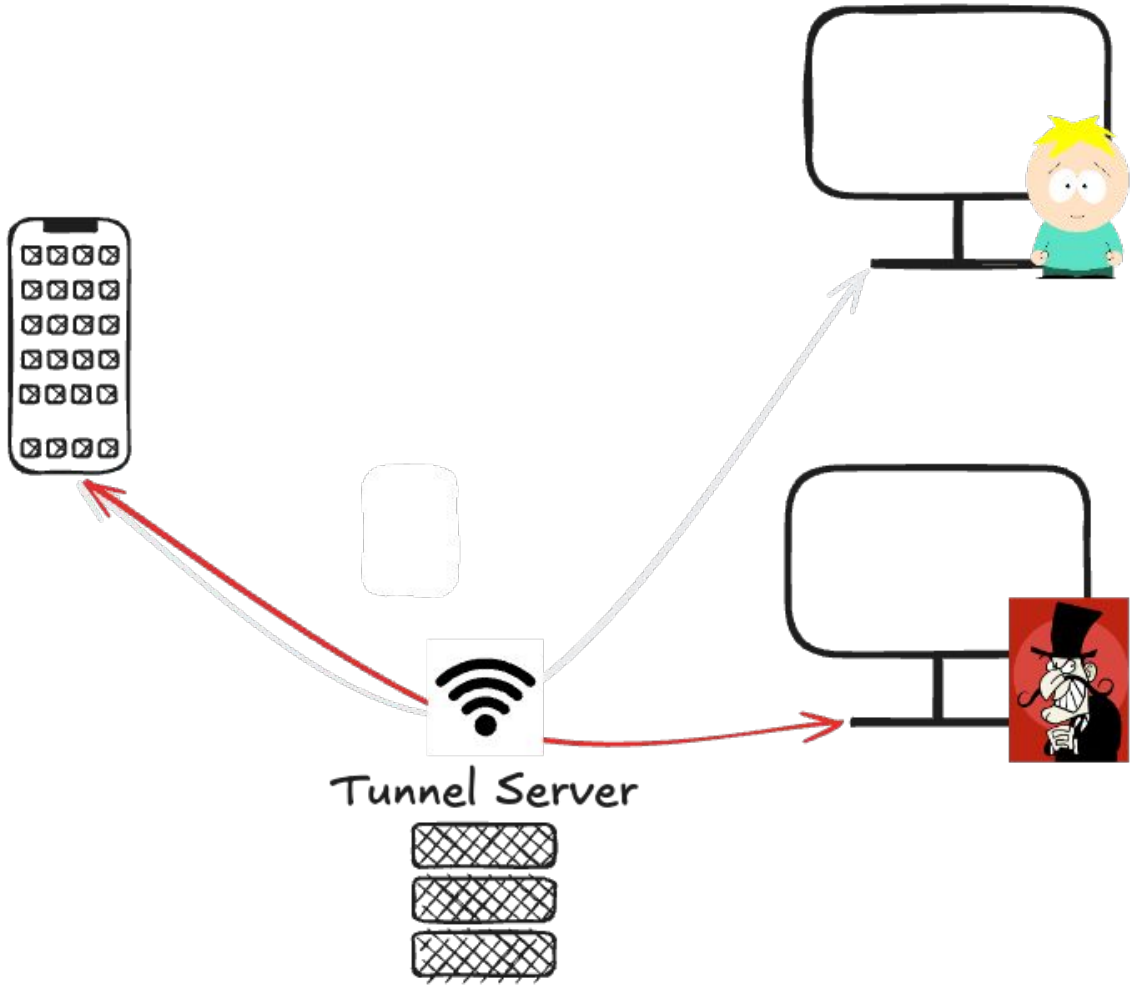

Image: J.J. at the English-language Wikipedia

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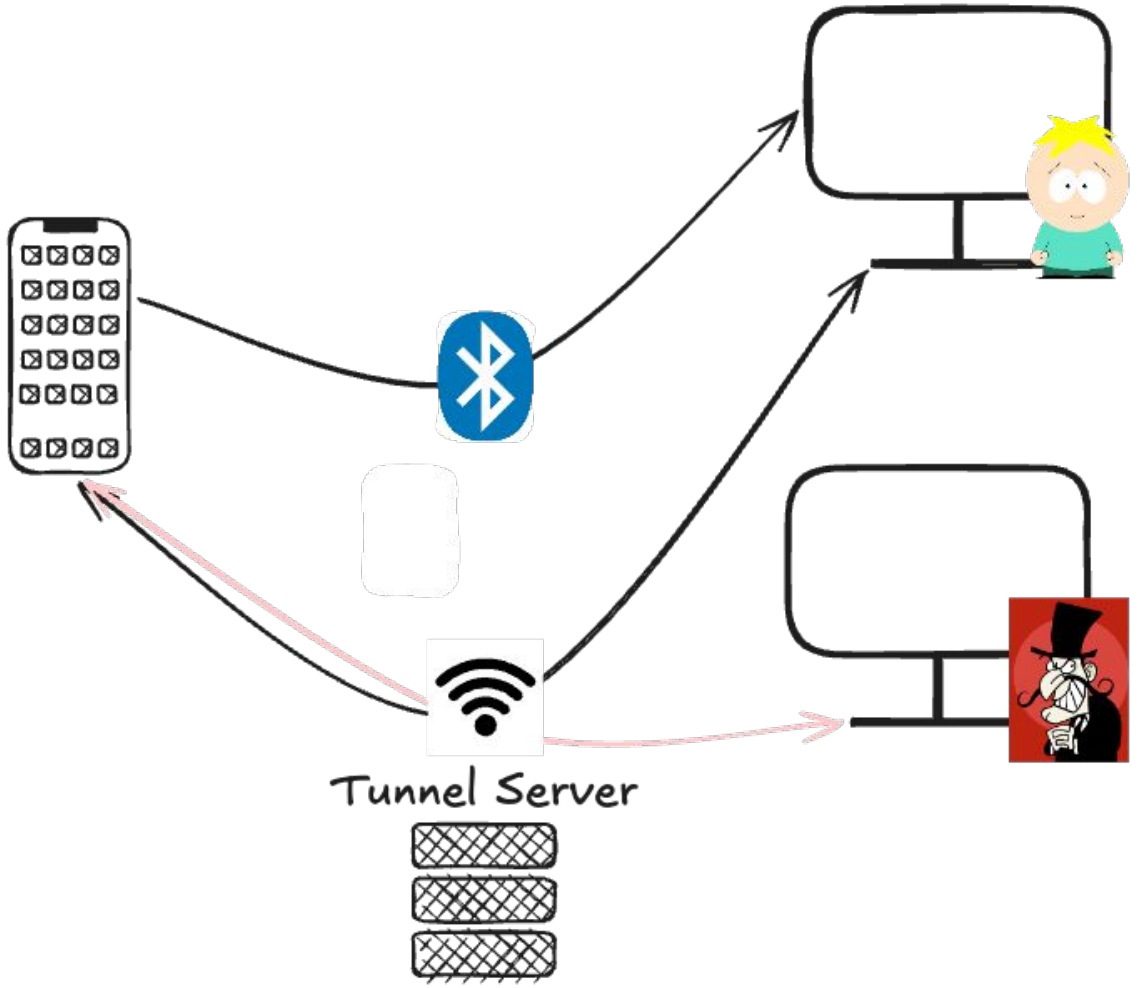

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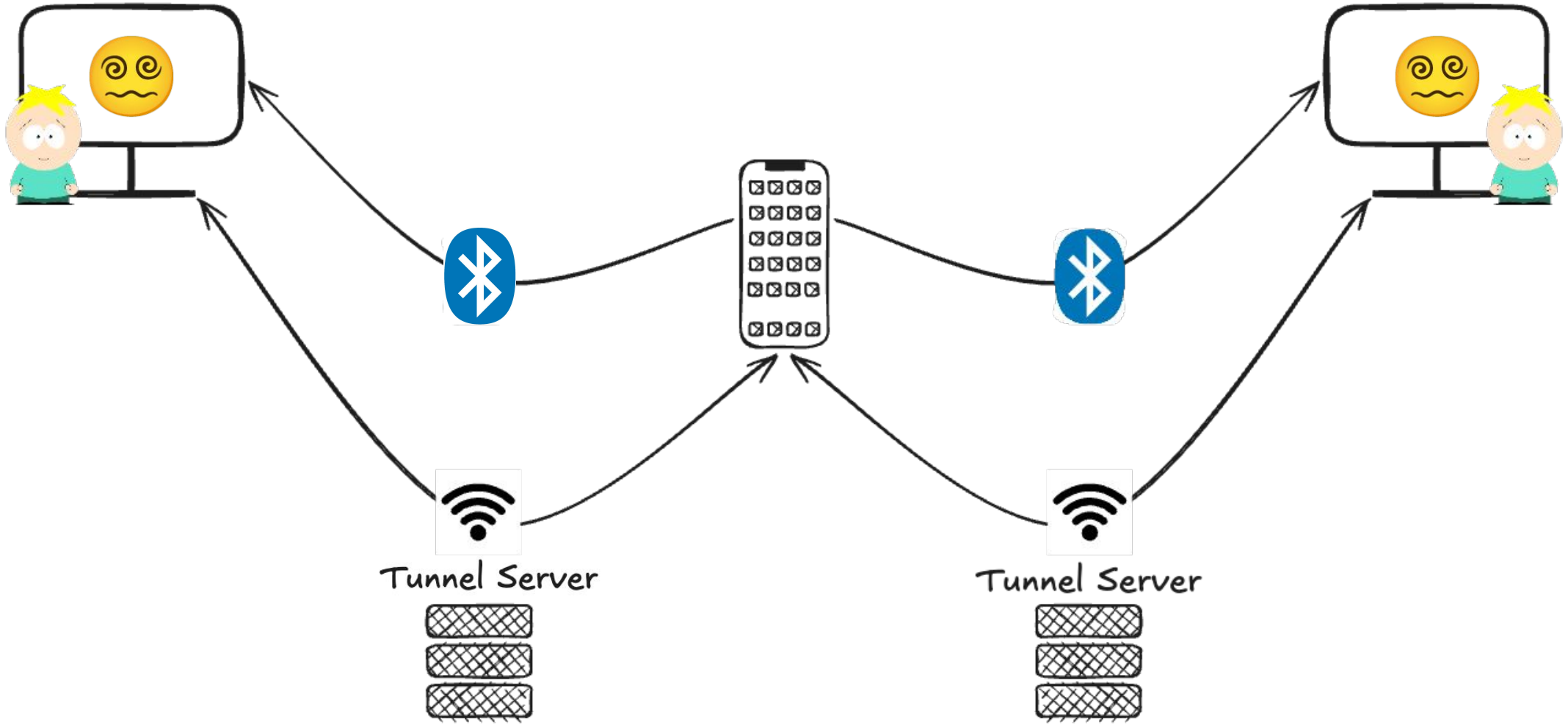

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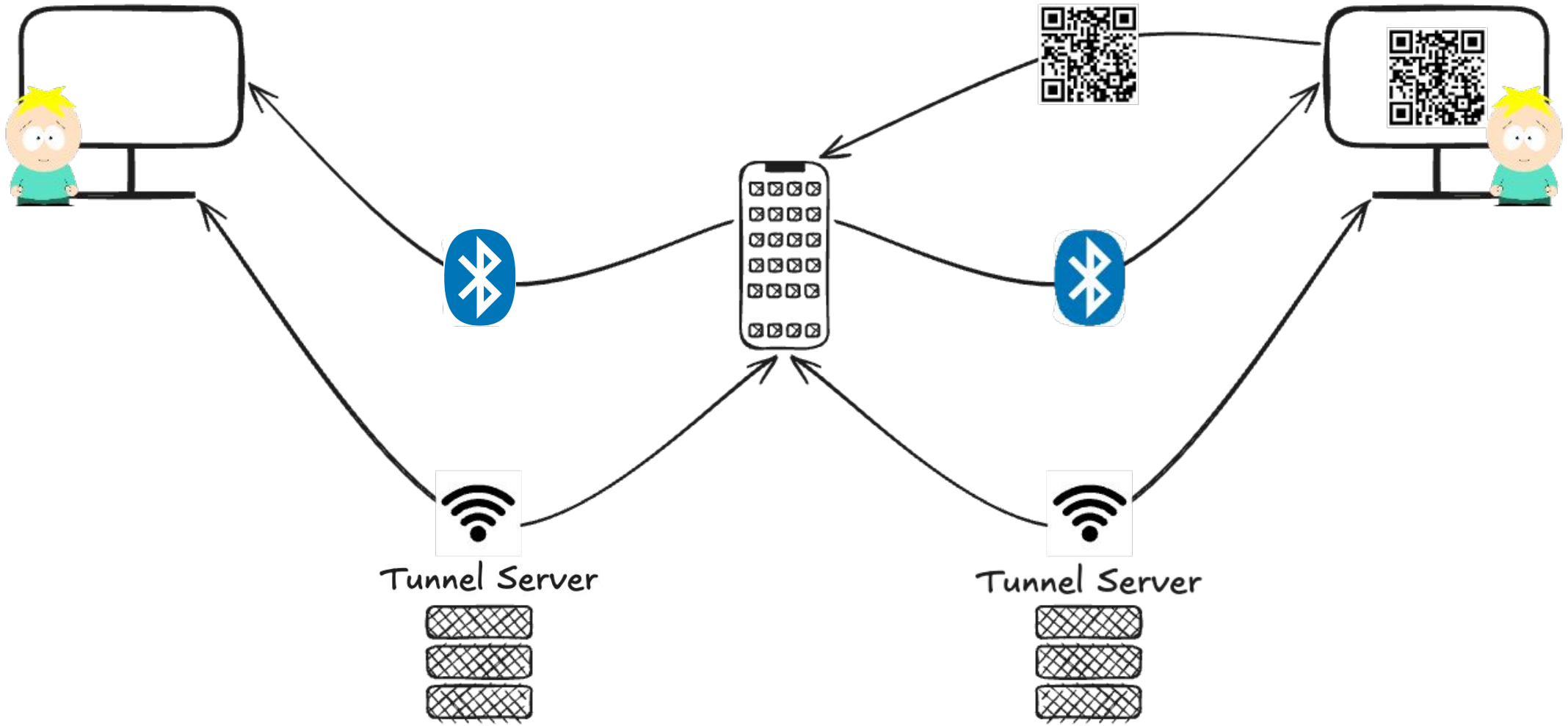

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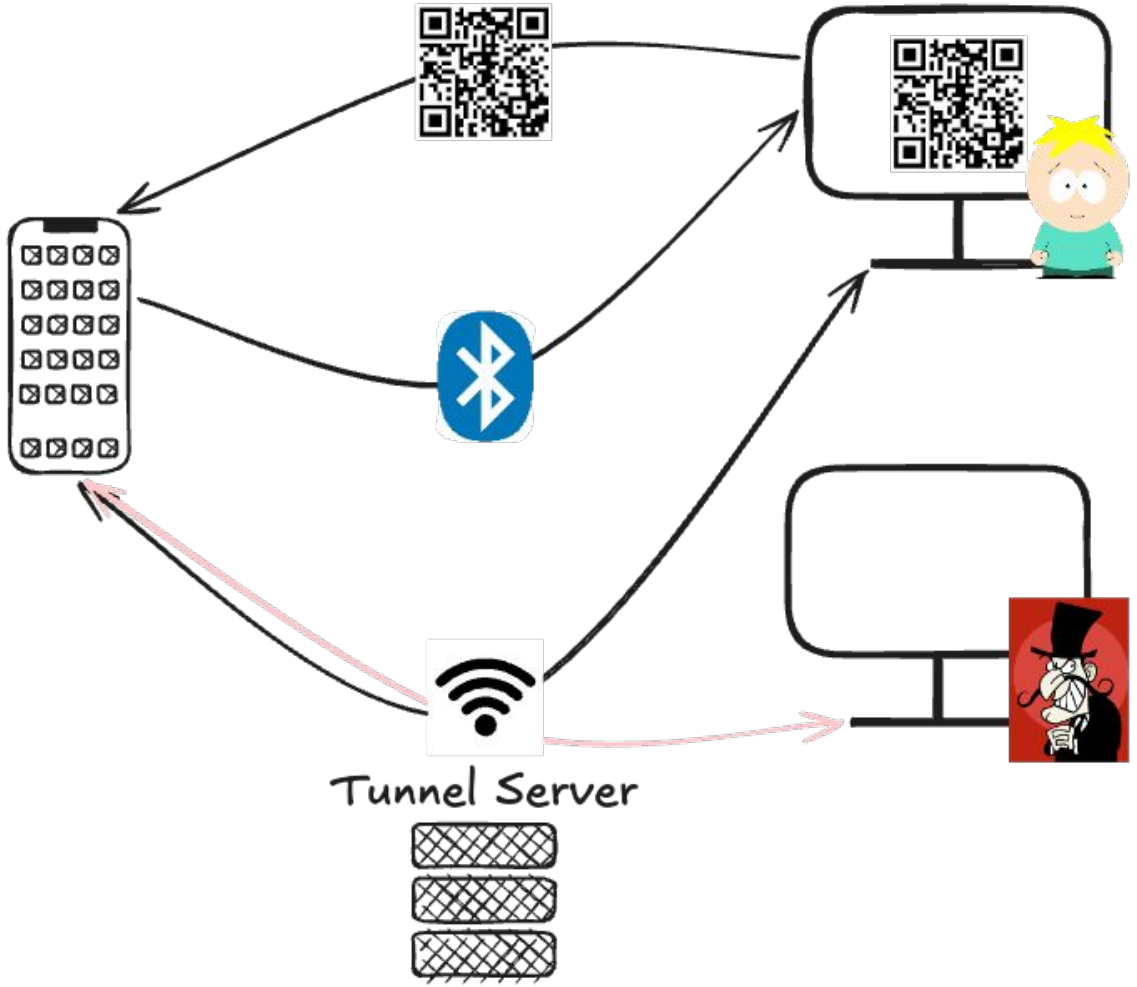

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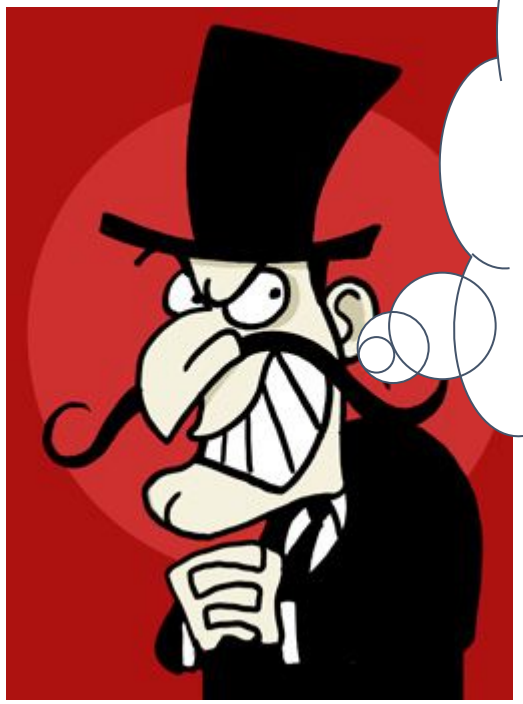
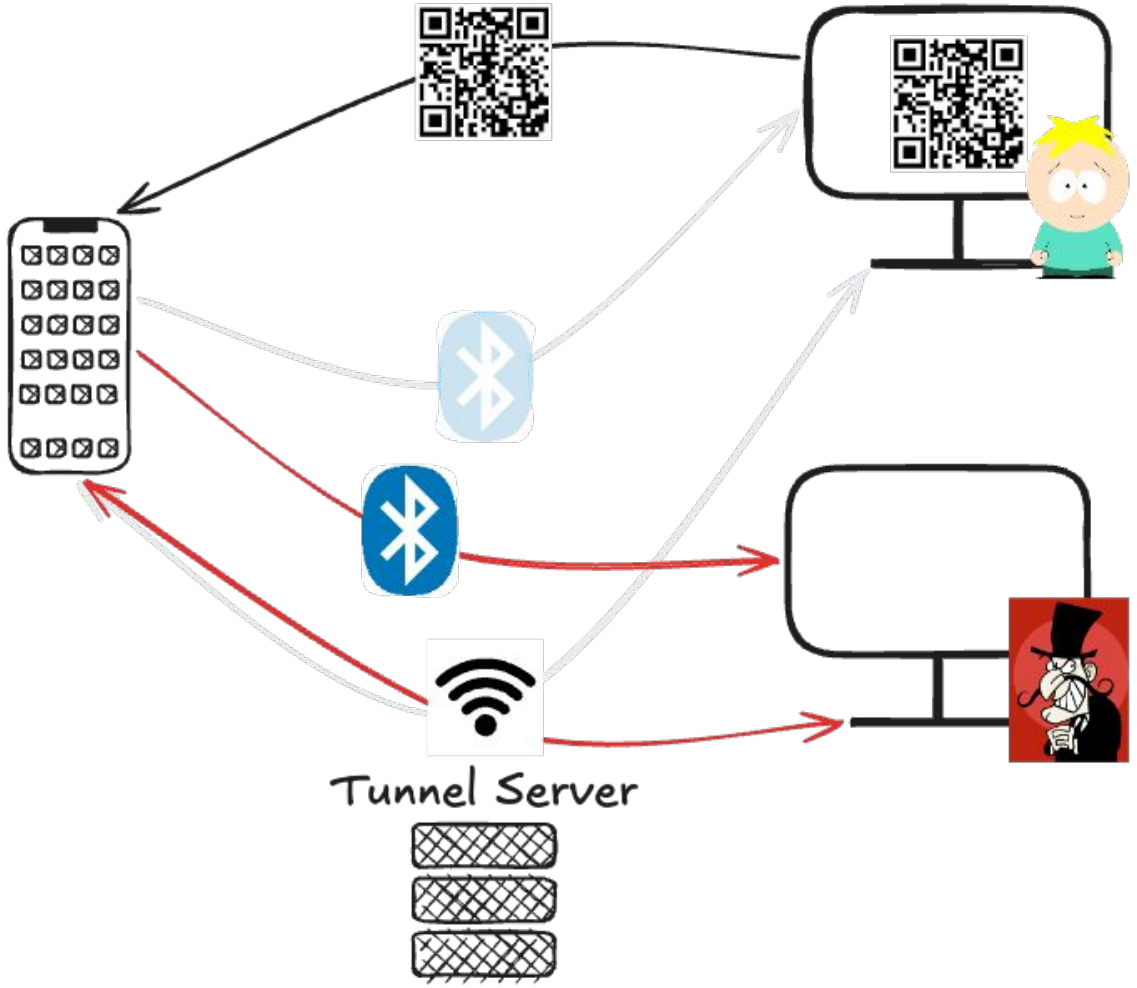


I'll place a BLE beacon & listen to advert as well!



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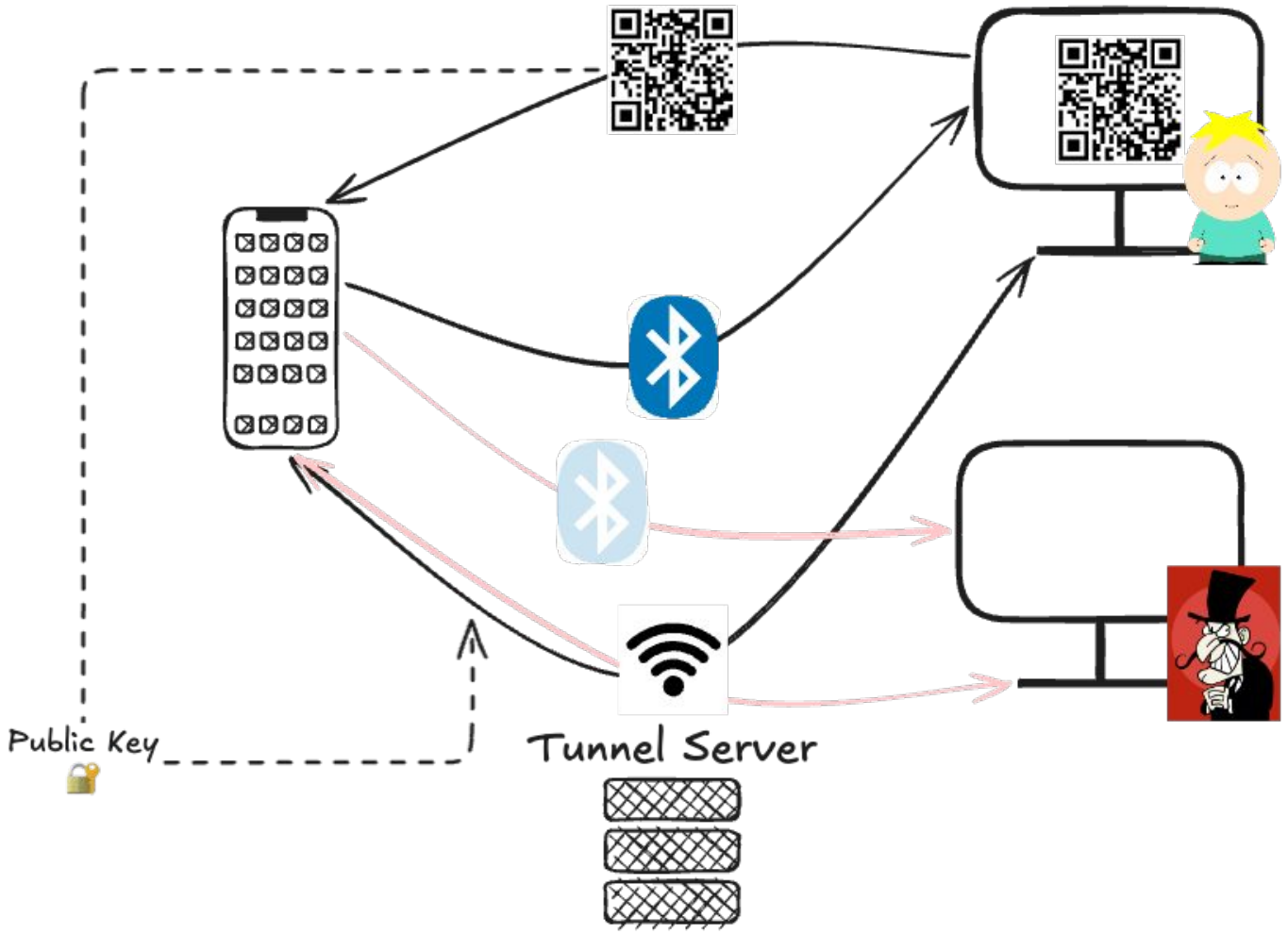
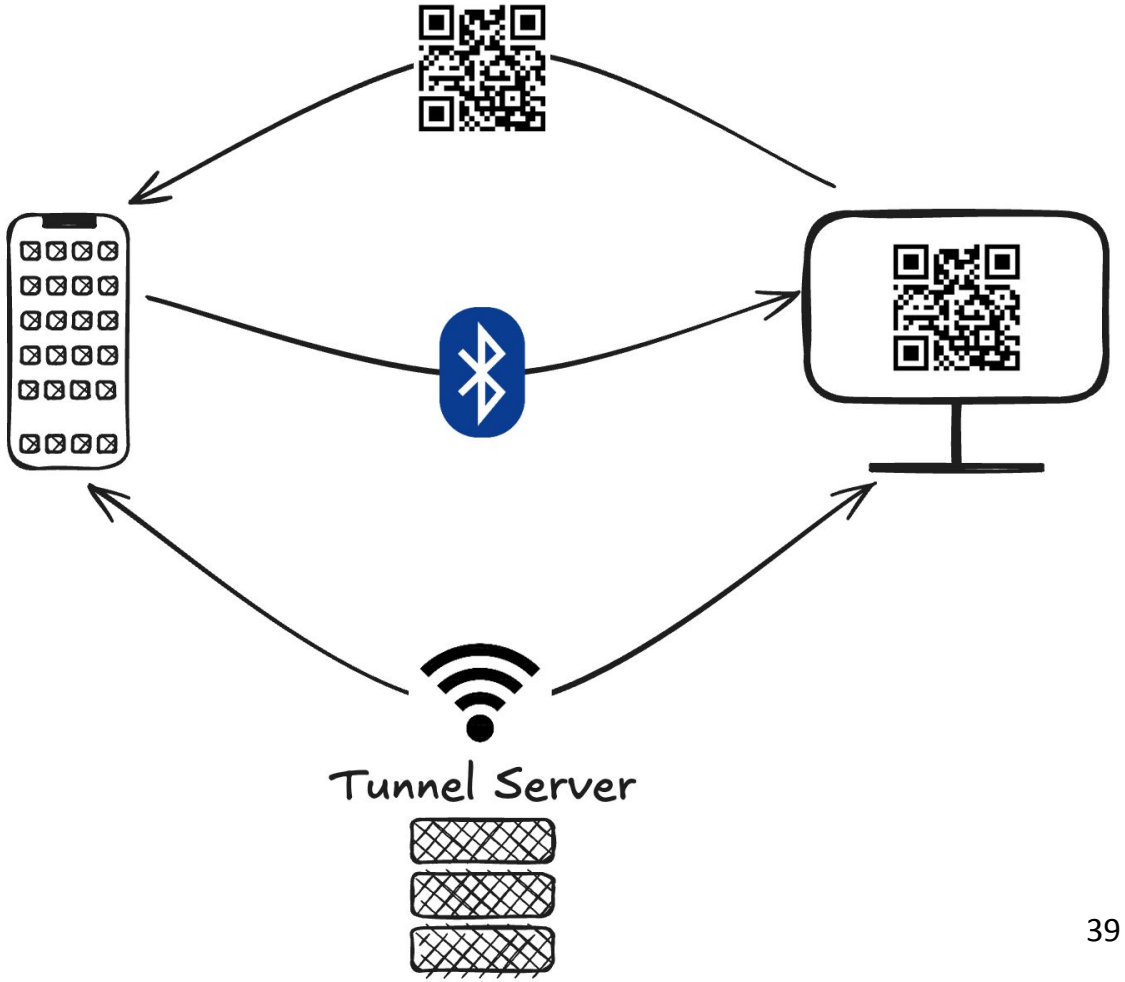
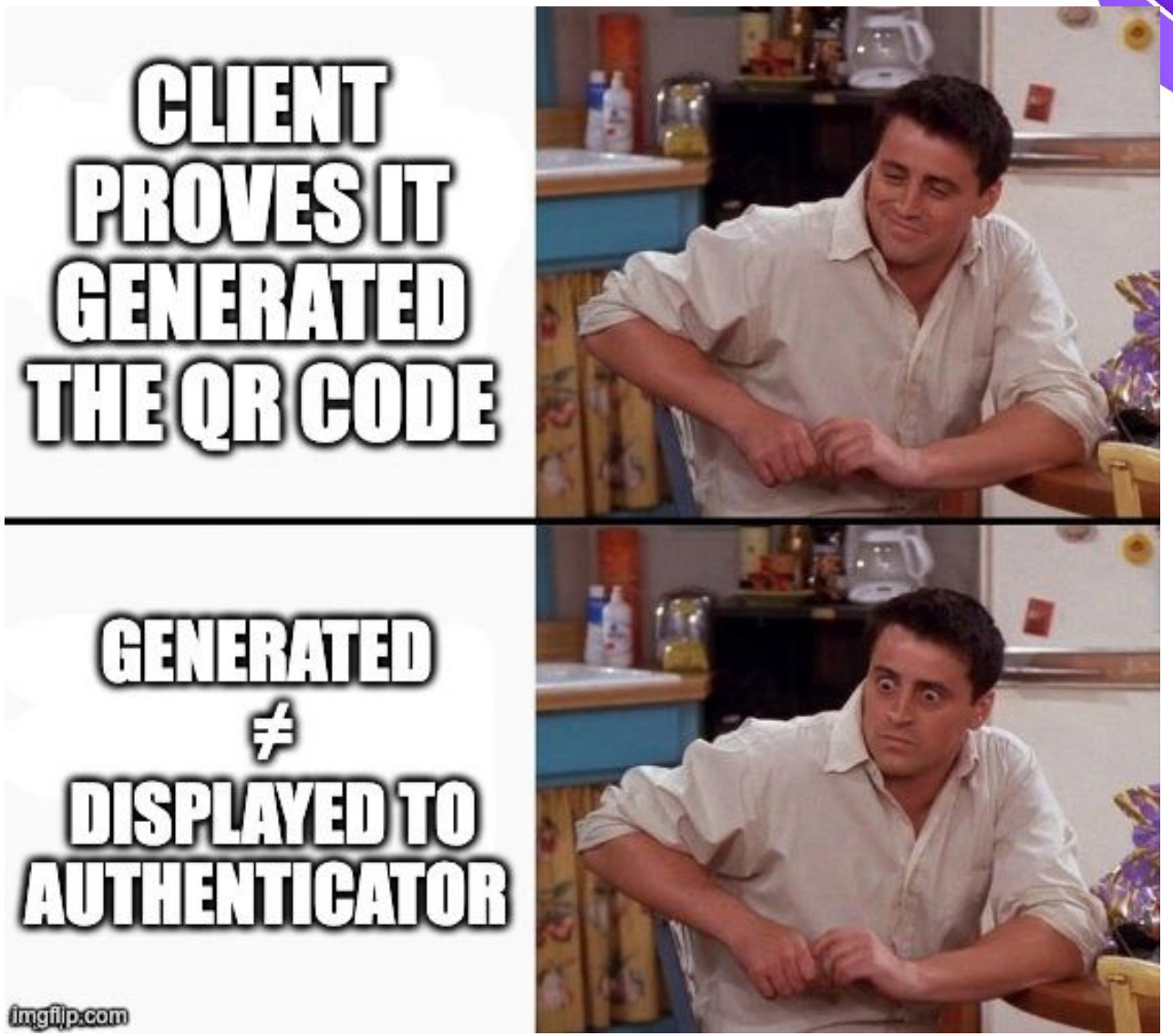


QR-initiated Hybrid Transport as per CTAP

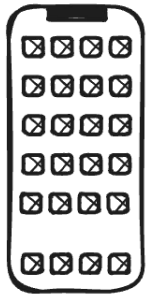
- … and much more
  - Tunnel Server negotiation
  - Encryption of tunnelled messages
  - Info for UI tweaks

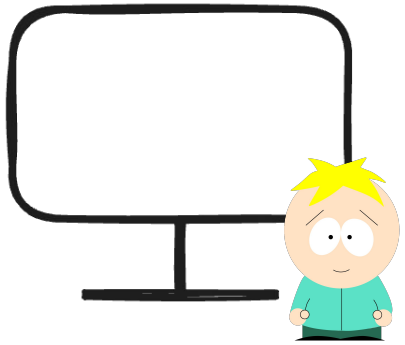


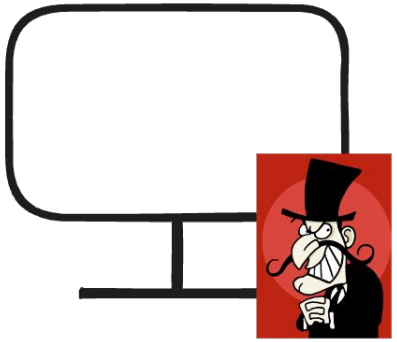

CLIENT
PROVES IT
GENERATED
THE QR CODE


CLIENT PROVES IT GENERATED THE QR CODE
GENERATED ≠ DISPLAYED TO AUTHENTICATOR
imgflip.com

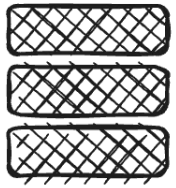
PHISHING FOR PASSKEYS







Tunnel Server



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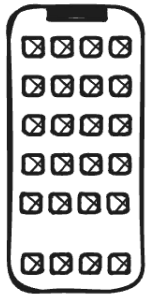

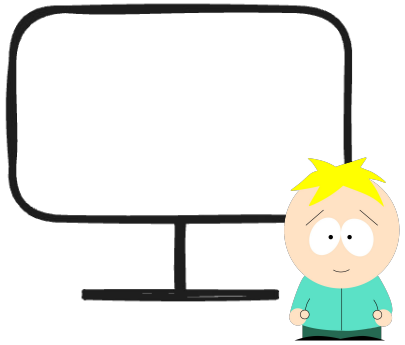

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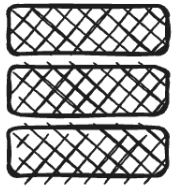

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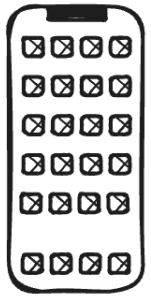

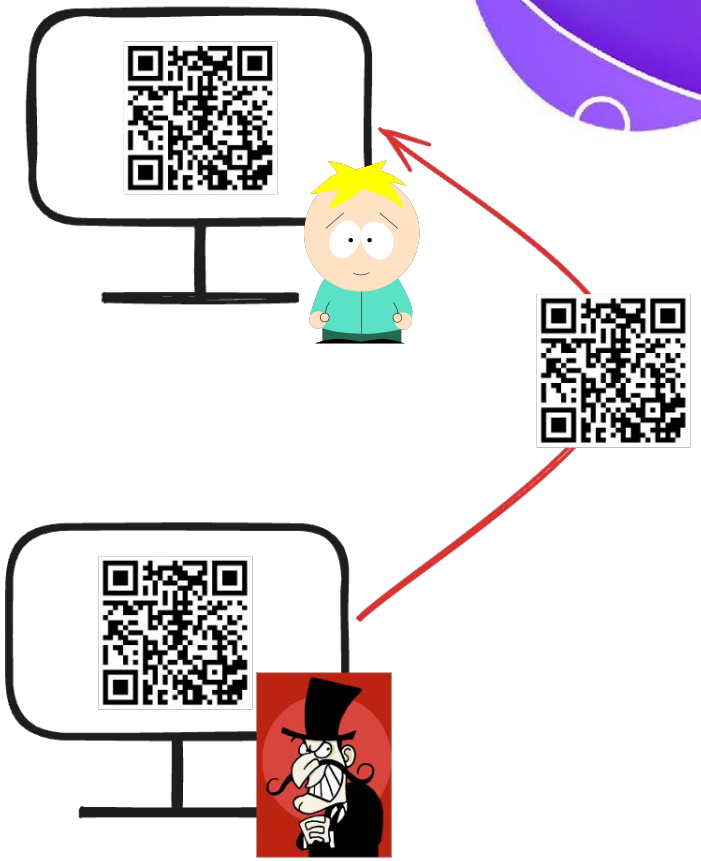

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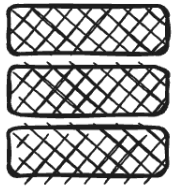
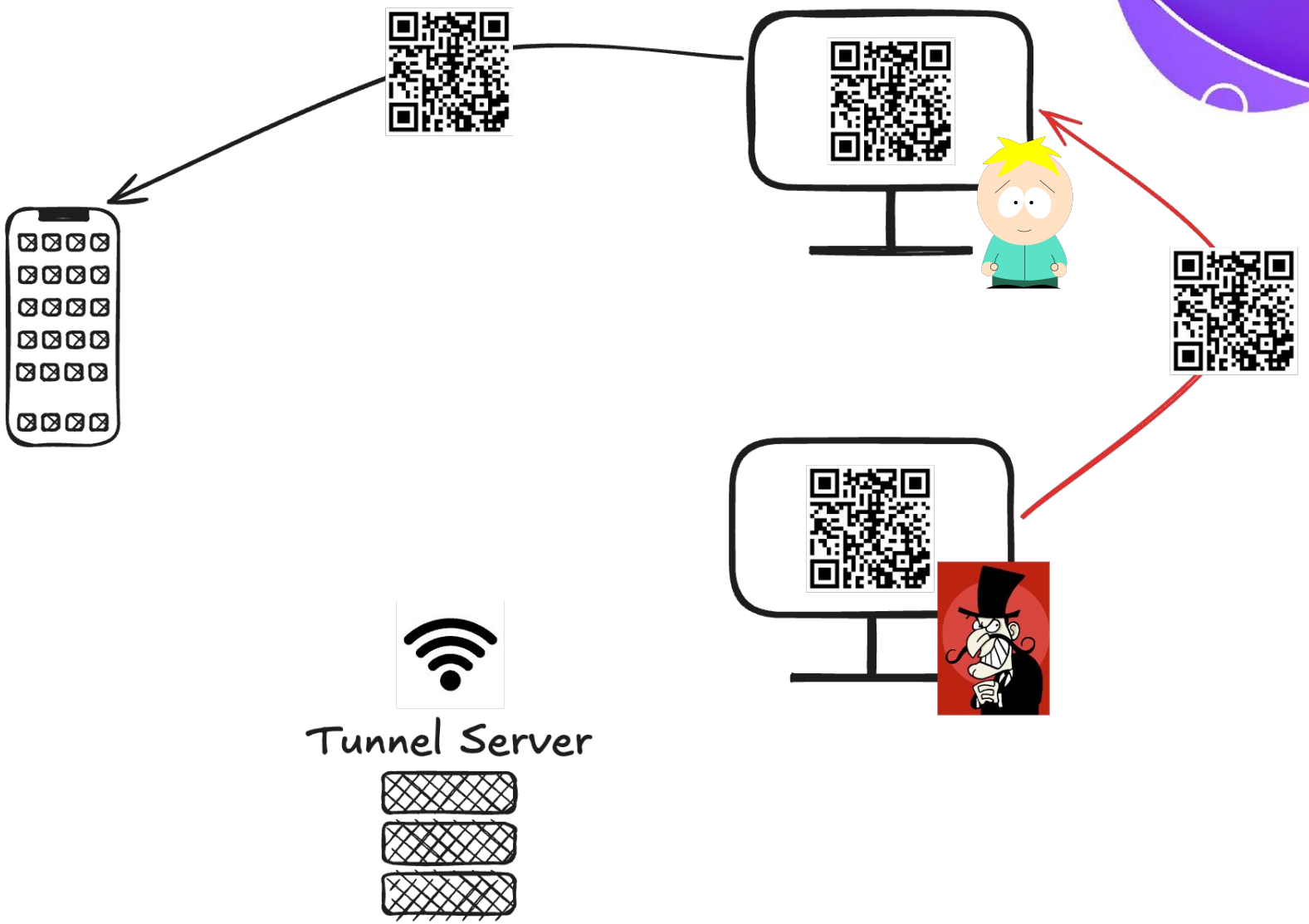
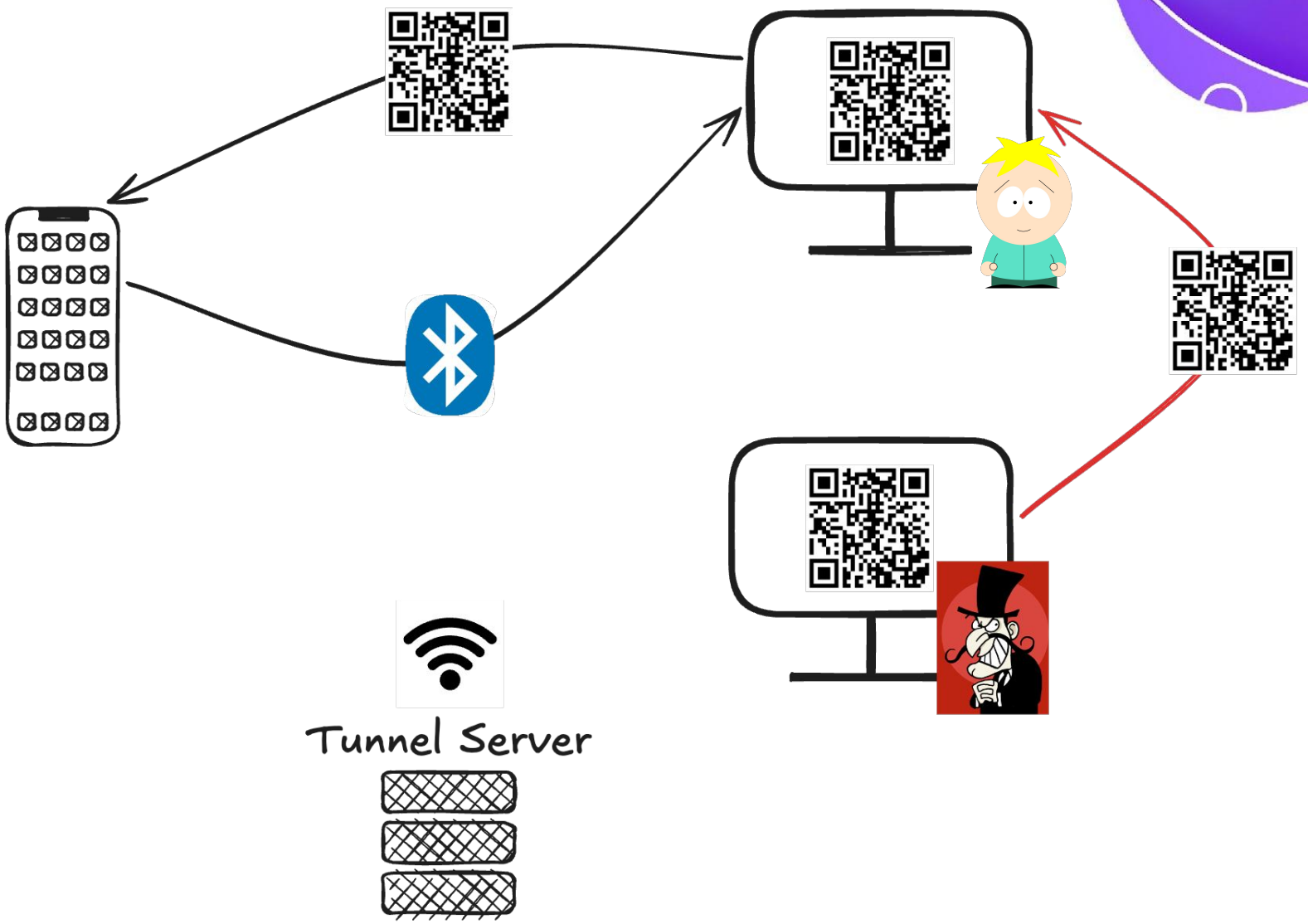
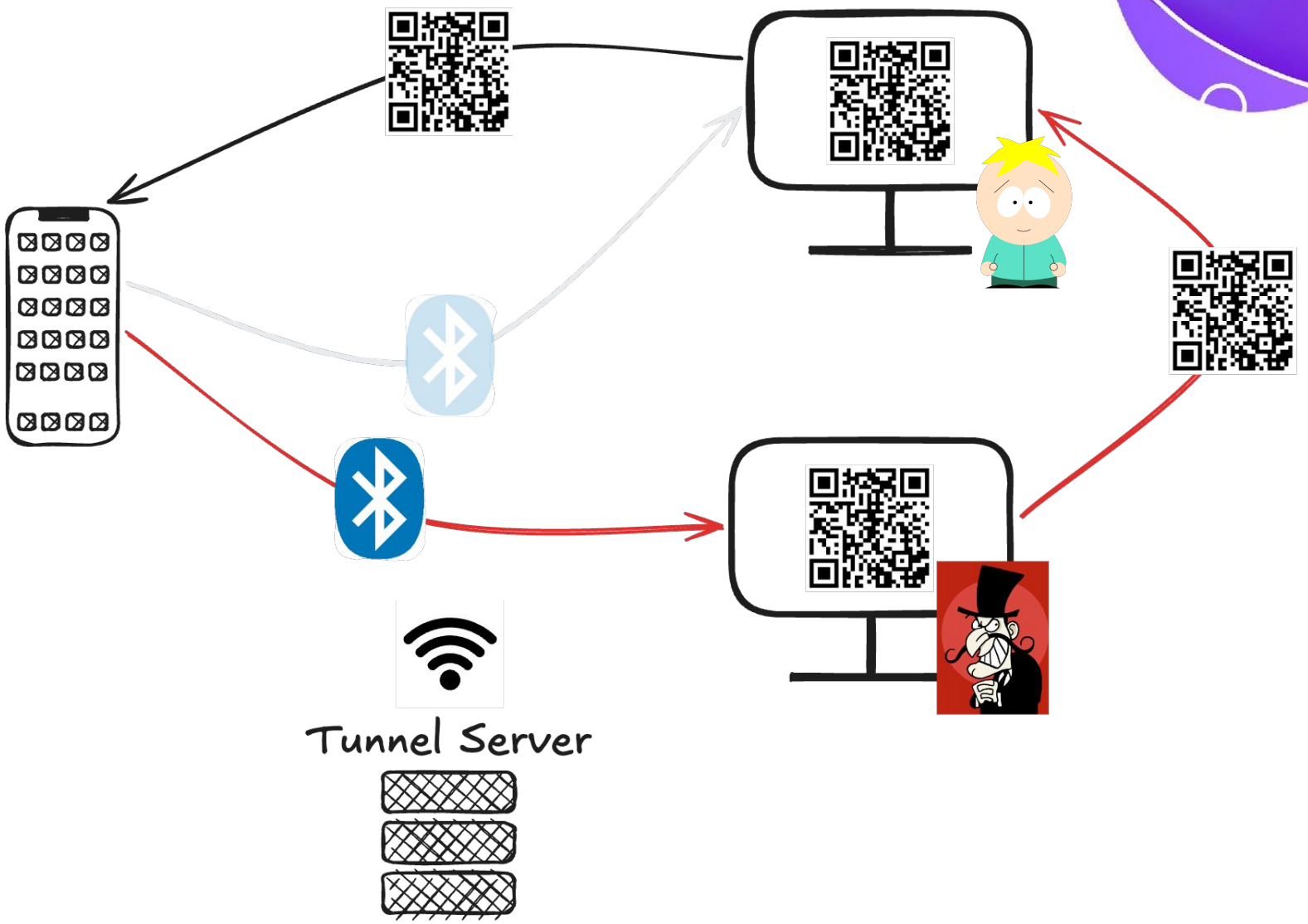


PHISHING FOR PASSKEYS




Tunnel Server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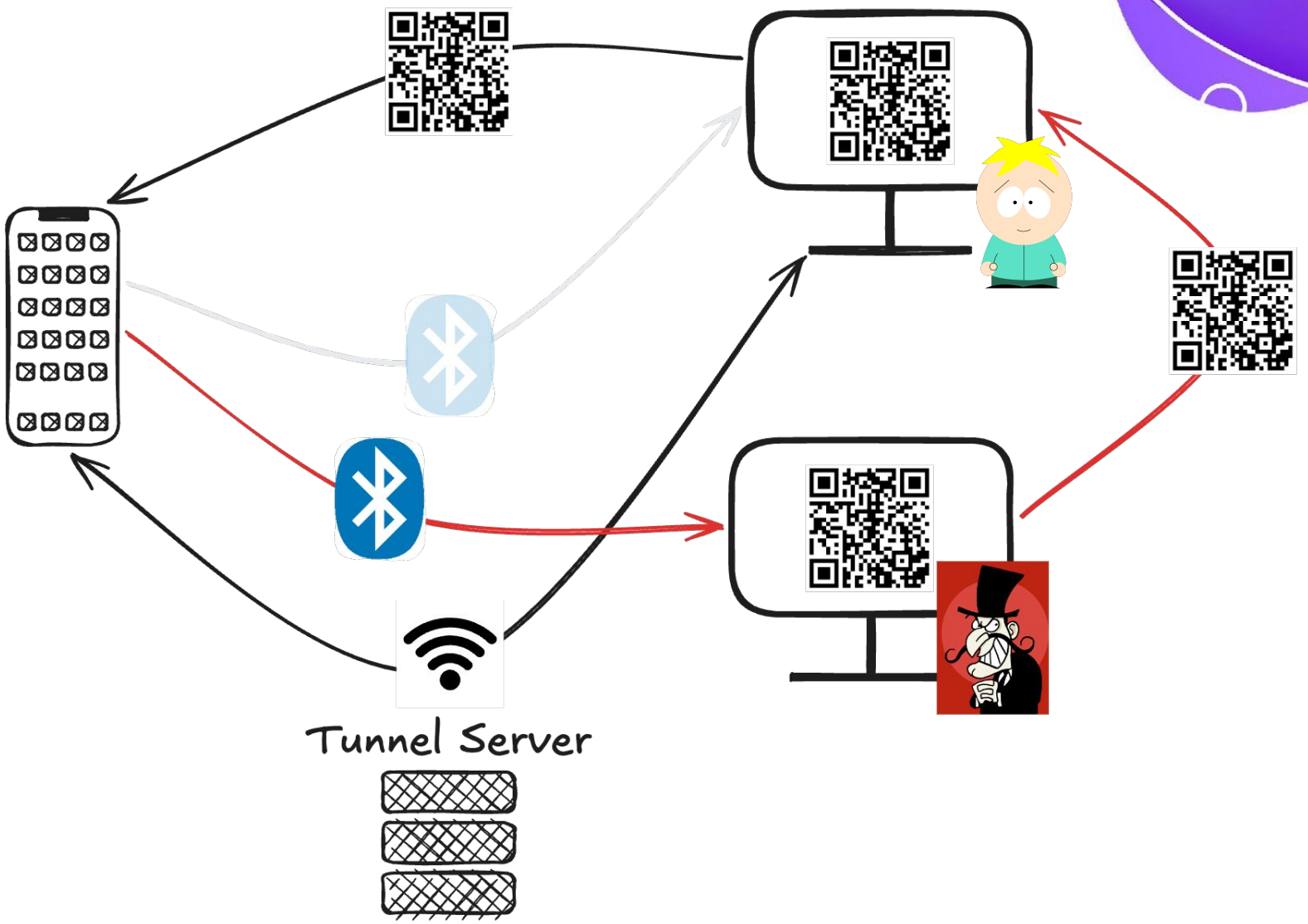
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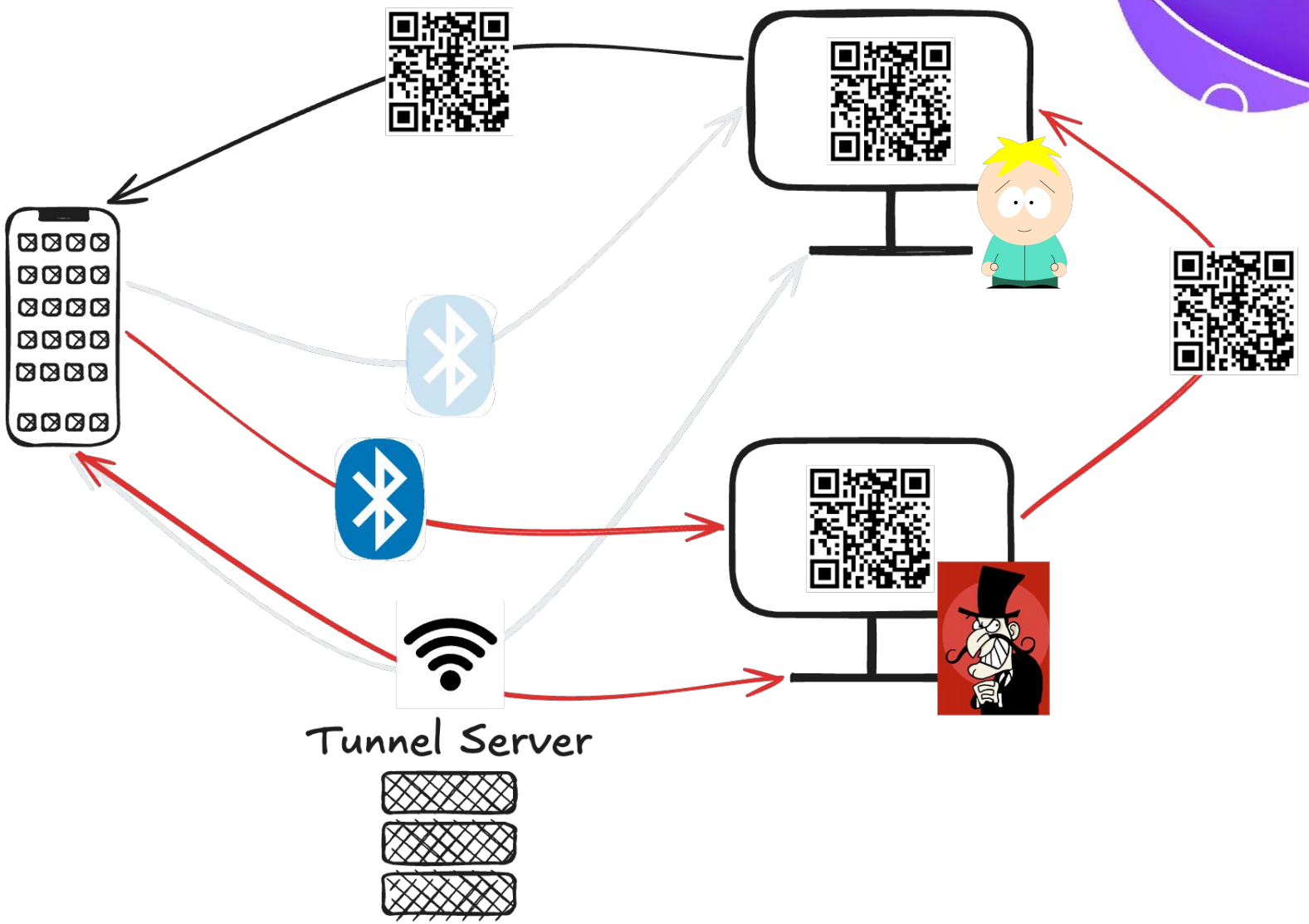
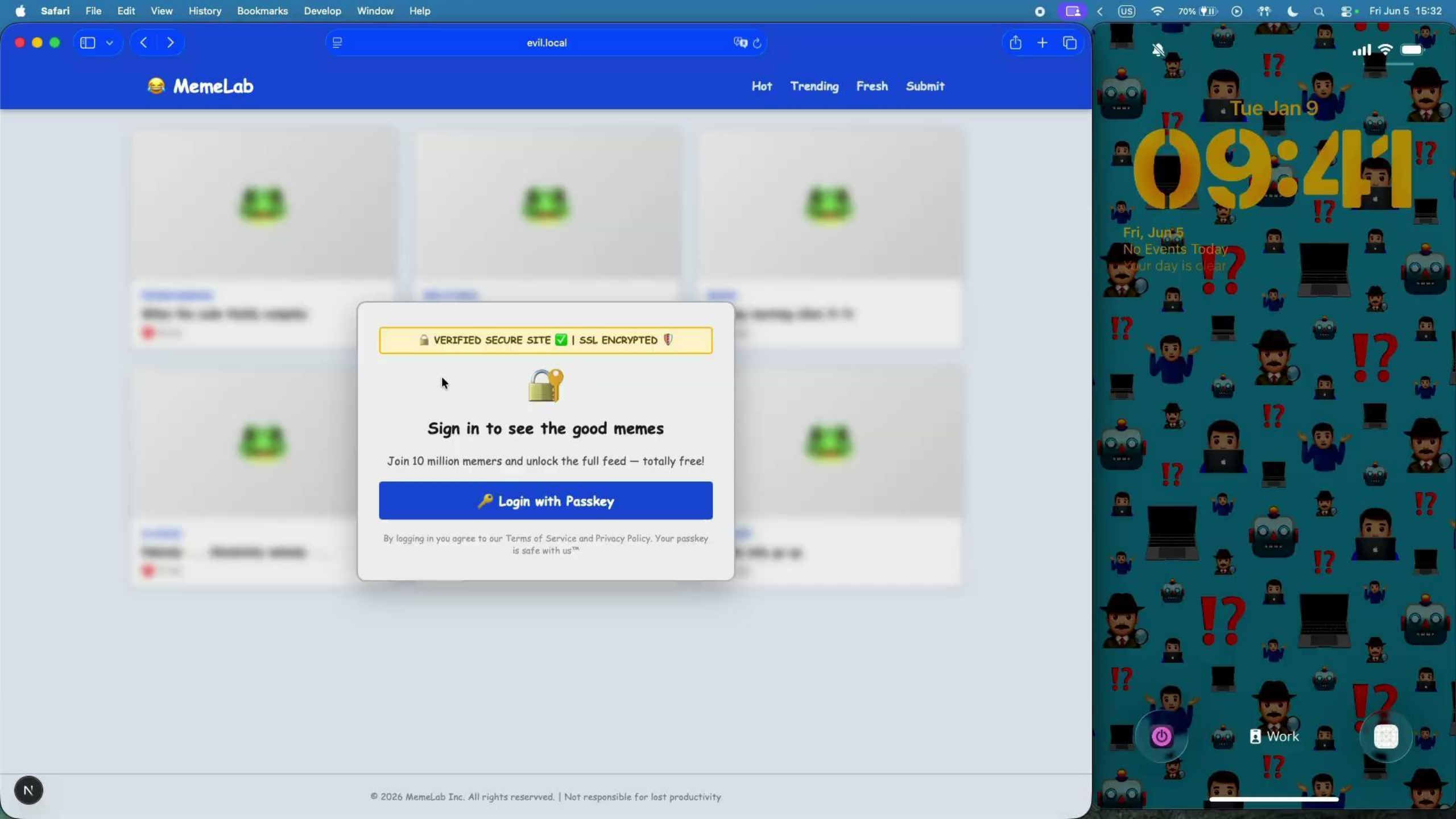

Tunnel Server

Live Demo 🤞


Safari File Edit View History Bookmarks Develop Window Help
Fri Jun 5 15:32
evil.local
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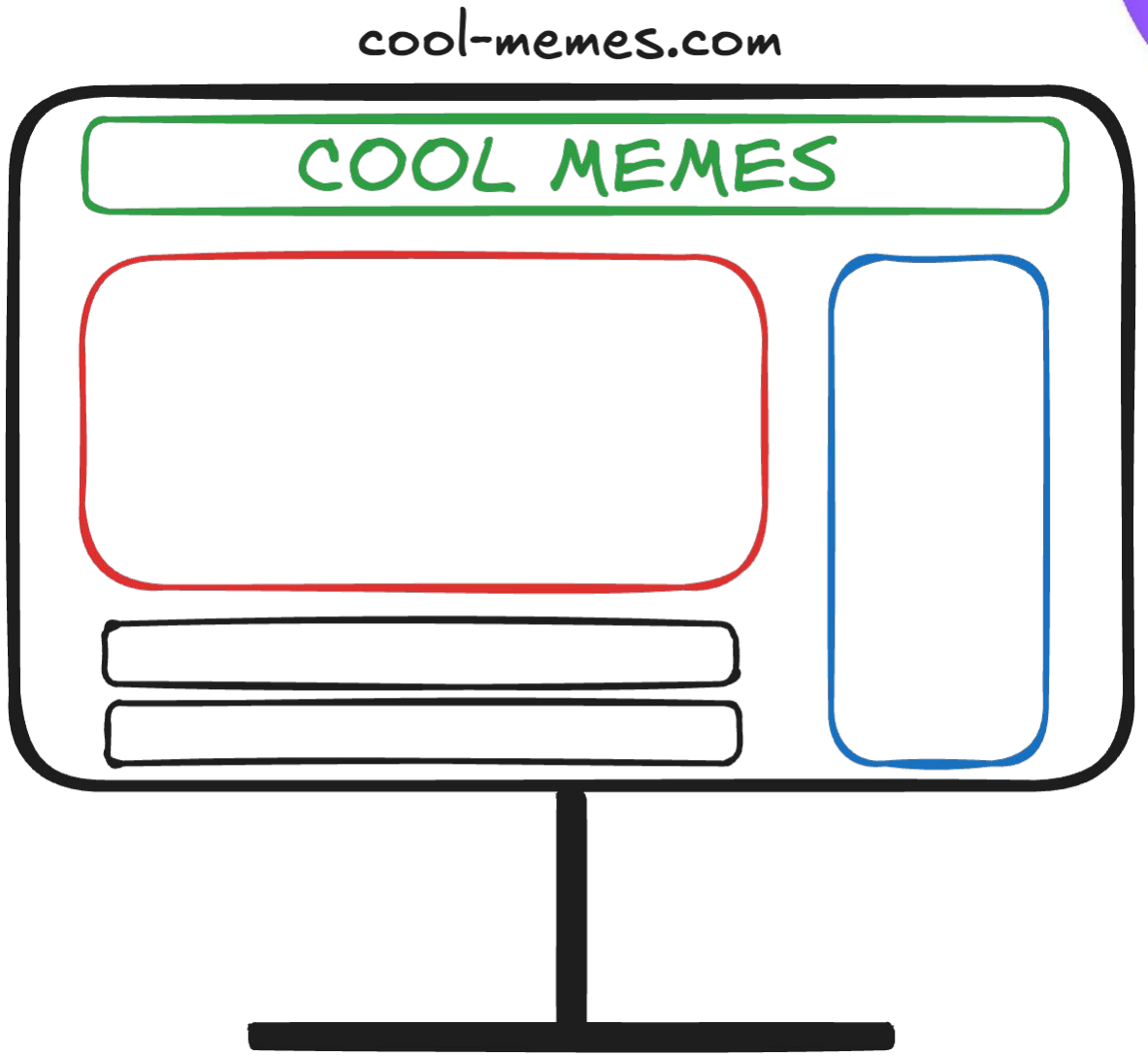
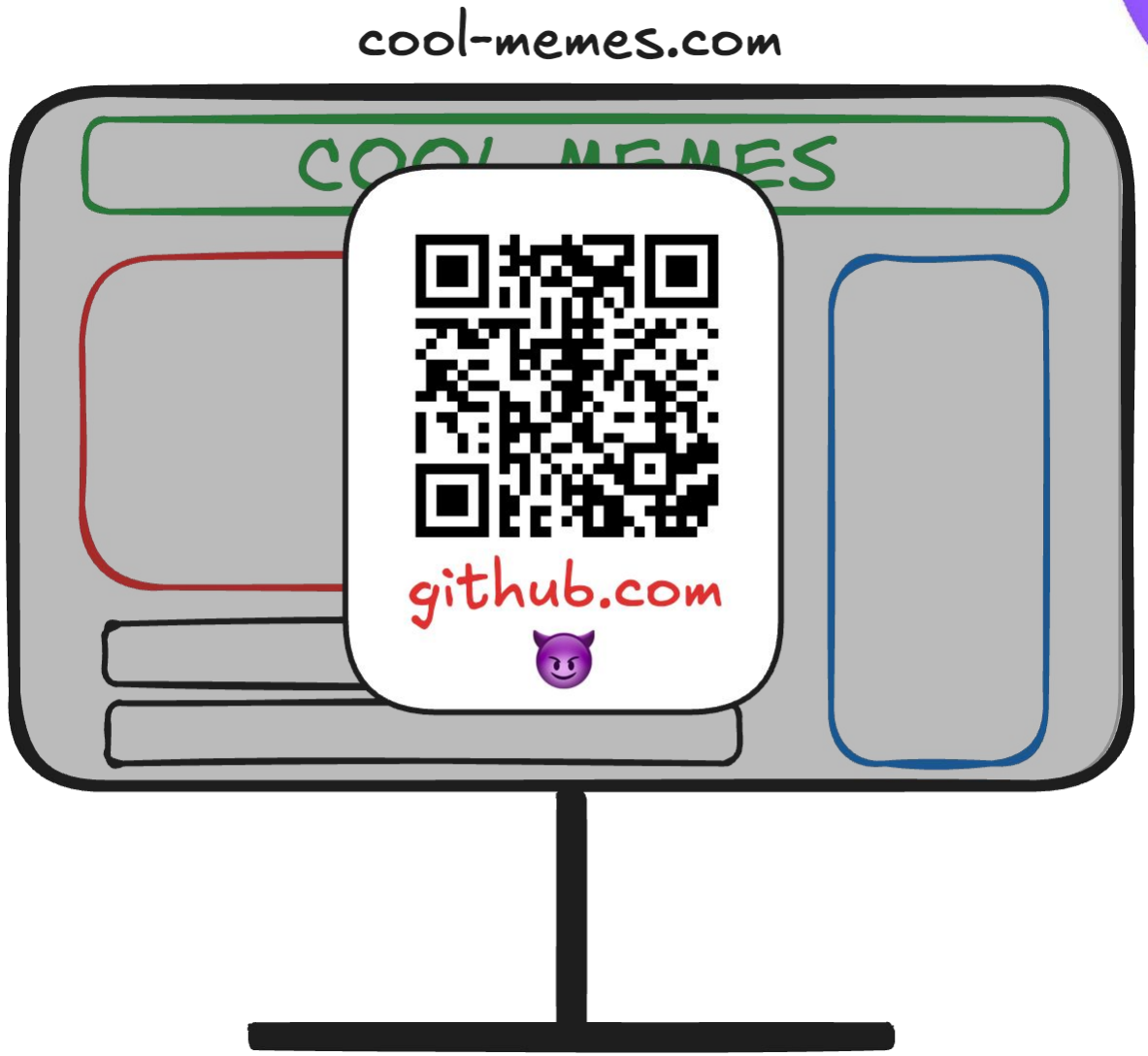
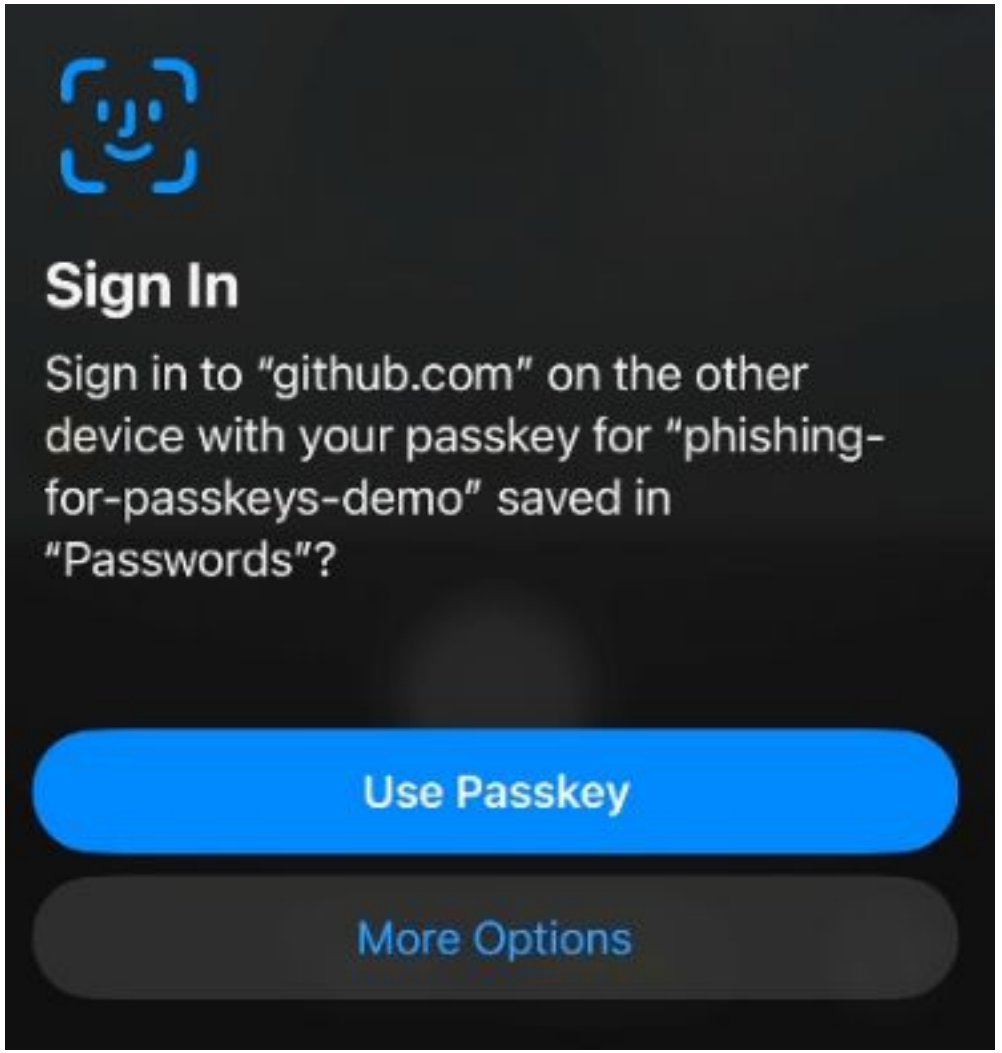
© 2026 MemeLab Inc. All rights reserved. | Not responsible for lost productivity
Tue Jan 9
09:41
Fri, Jun 5
No Events Today
Your day is clear
Work


cool-memes.com
COOL MEMES


cool-memes.com
COOL MEMES
github.com

PHISHING FOR PASSKEYS



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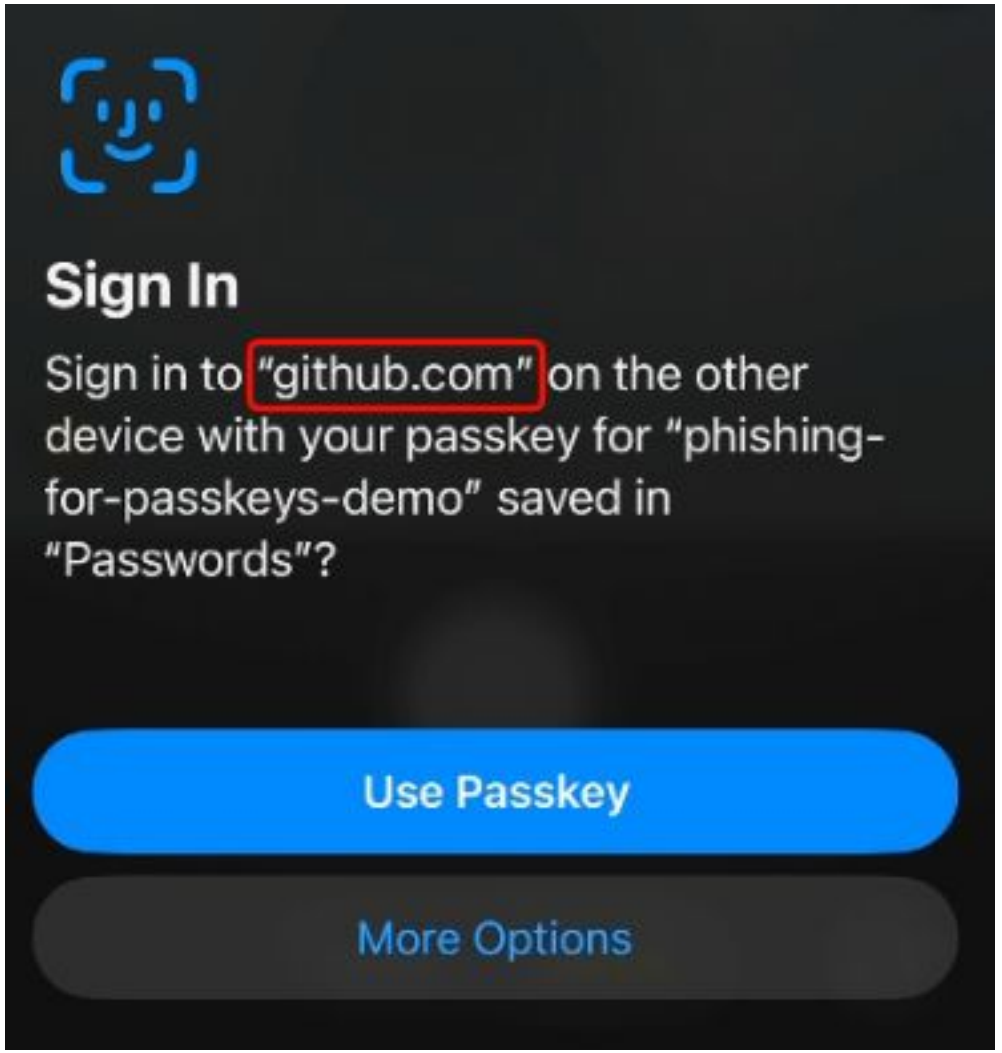
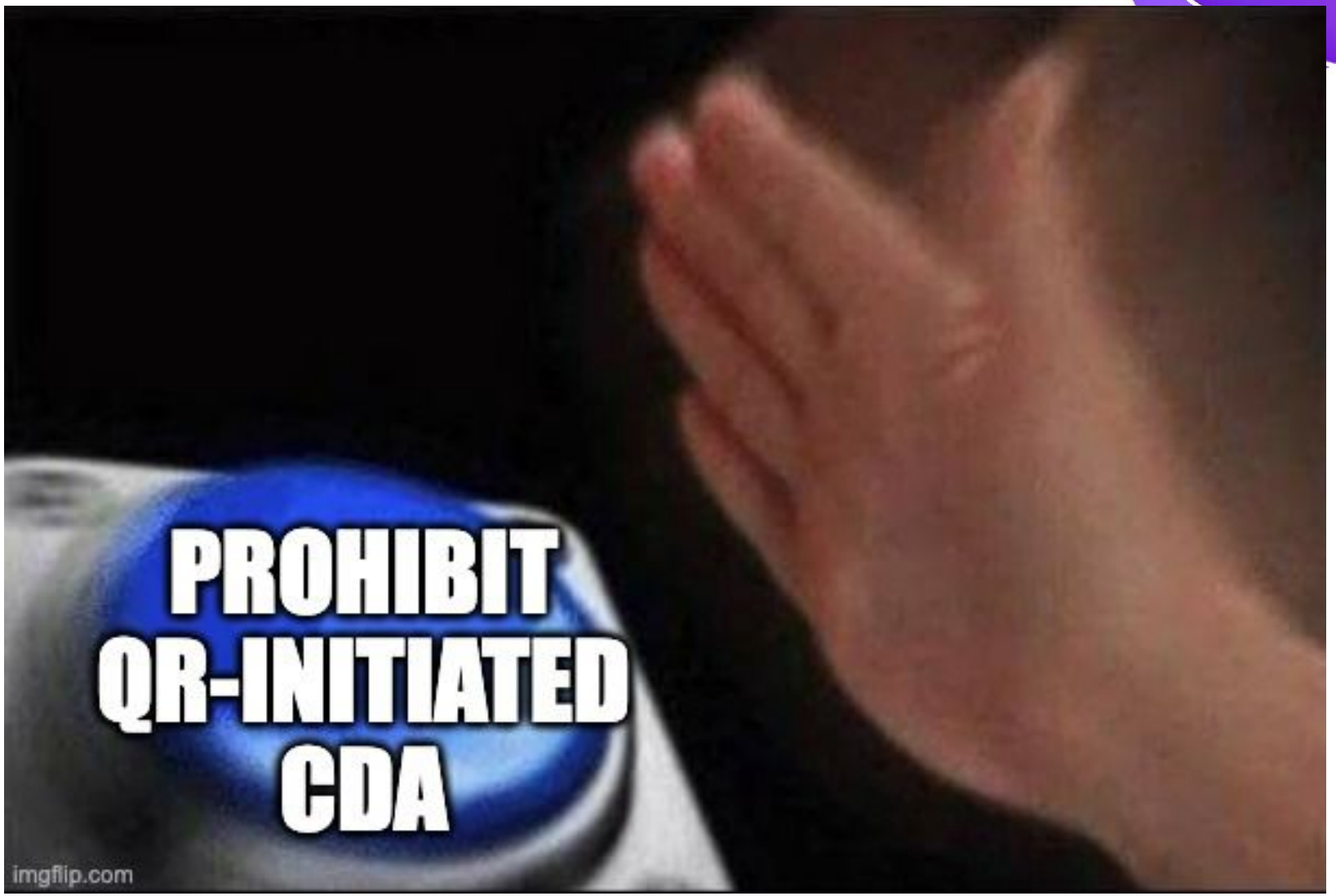


Threat Model

- Victim must be tricked into not noticing
  - Spear phishing attack & fake website
  - Fake authentication UI (usually rendered by browser, not website!)
  - Forced QR-initiated CDA
- Attack requires user interaction (open phishing page, scan QR code, complete authentication)
- Attacker must have device within BLE range of victim **while the victim's trying to authenticate**
- Successful attack → attacker gains session token

You should care if you...

- ... support passkeys for authentication
- ... expect highly motivated and technically skilled attackers
- ... expect attackers that can get within BLE range (up to ~100m) of users (e.g. parked in front of office, travelling on the same train)

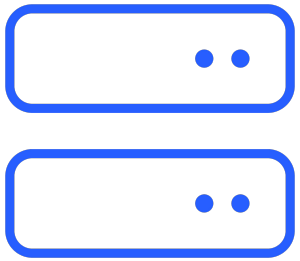

PROHIBIT
QR-INITIATED
CDA
imgflip.com

Can RPs prohibit QR-initiated CDA?

Relying Party (RP)

Client

Authenticator



Can RPs prohibit QR-initiated CDA?

Based on CTAP

- Relying party is not involved at all

→ ❌

Based on WebAuthn

→ 👀👉👈

PublicKeyCredential RequestOptions

- challenge
- timeout
- allowCredentials
  - id
  - type
  - transports 🔎⛔
- userVerification
- extensions

PublicKeyCredential

- id
- authenticatorAttachment 🔎⛔
- type
- response
  - userHandle
  - signature
  - authenticatorData
    - rpIdHash
    - flags
      - userPresent
      - ...
    - counter
    - ...
  - clientDataJSON
    - challenge
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Can RPs prohibit QR-initiated CDA?

Based on CTAP

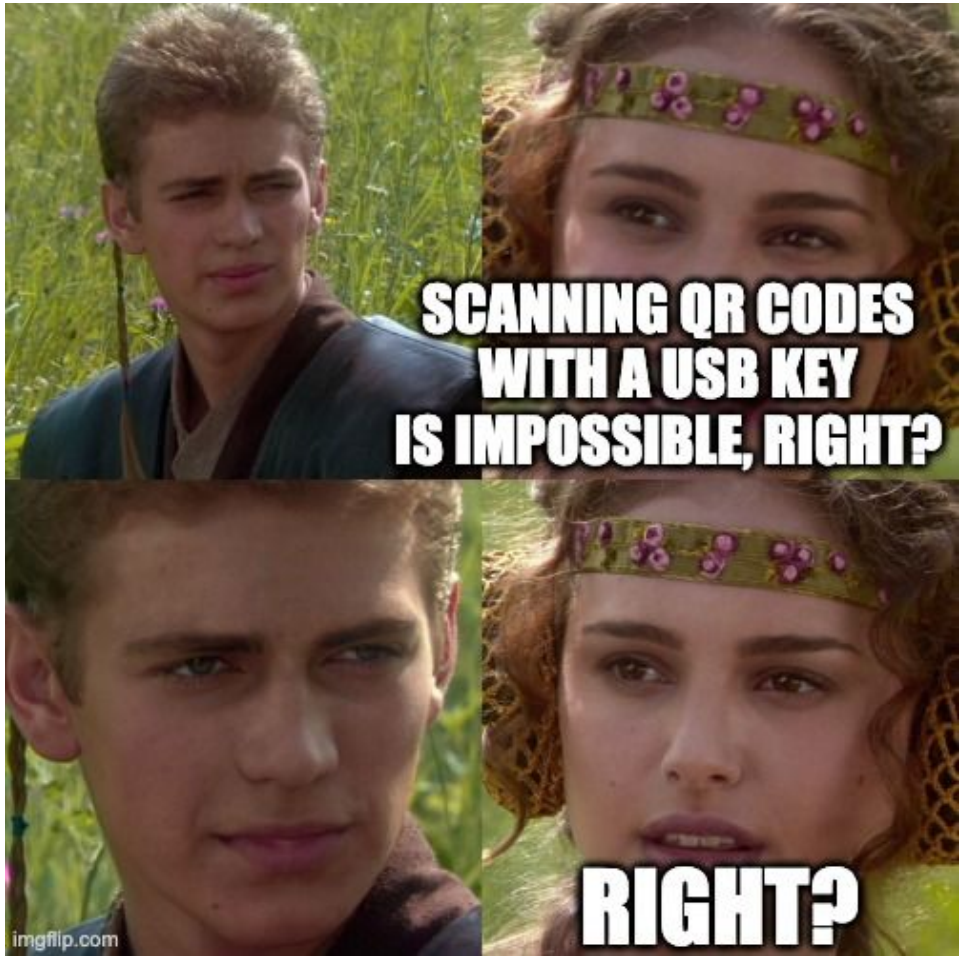
- Relying party is not involved at all

→ ❌

Based on WebAuthn

- Relying Party can ask client to not allow certain transports (e.g. BLE)
- Client specifies authenticator attachment in response (e.g. cross-platform)
- Insufficient integrity protection 🫠

→ ❌



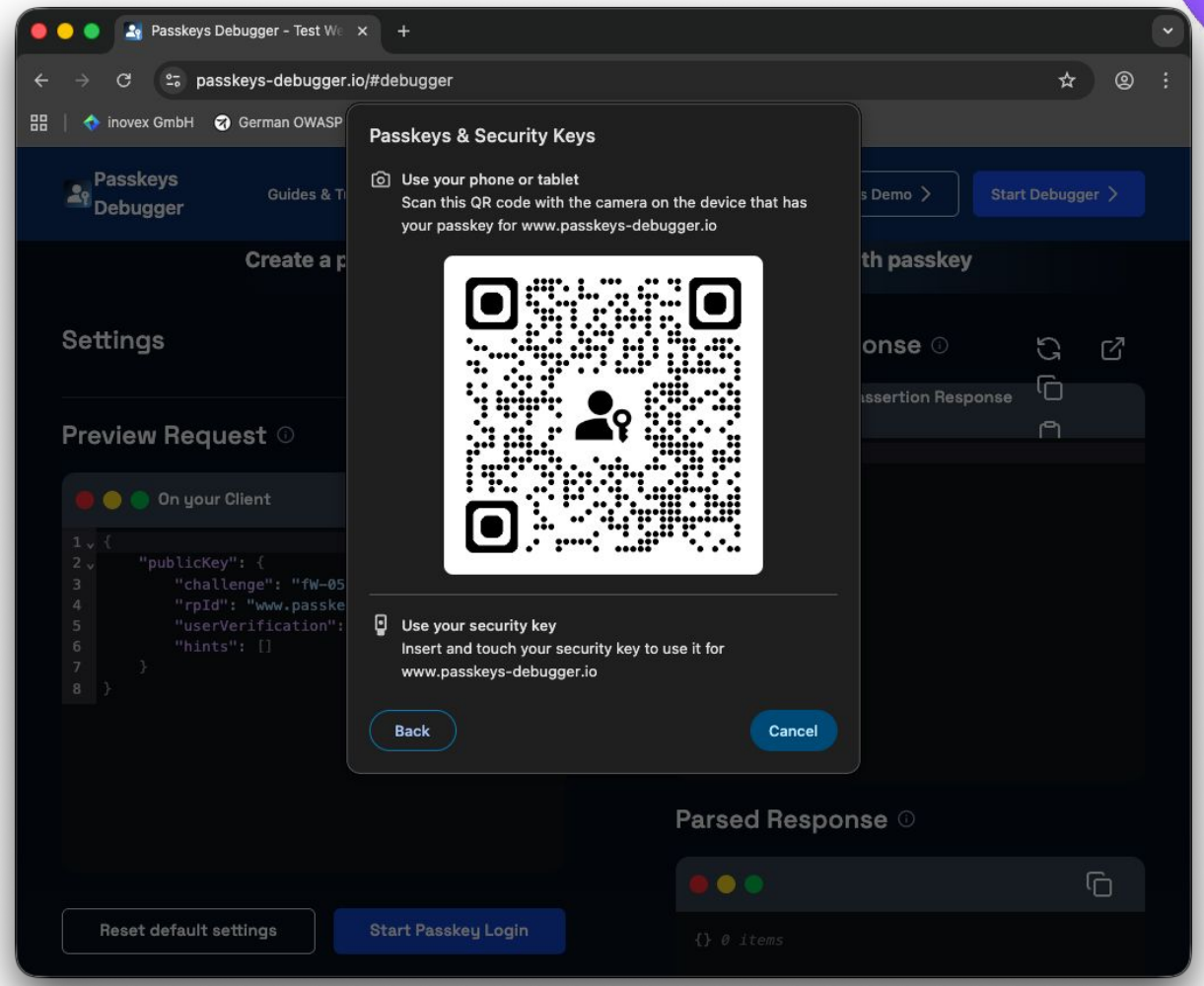
https://denniskniep.github.io/posts/14-fido-cross-device-phishing/

https://github.com/w3c/webauthn/issues/2349

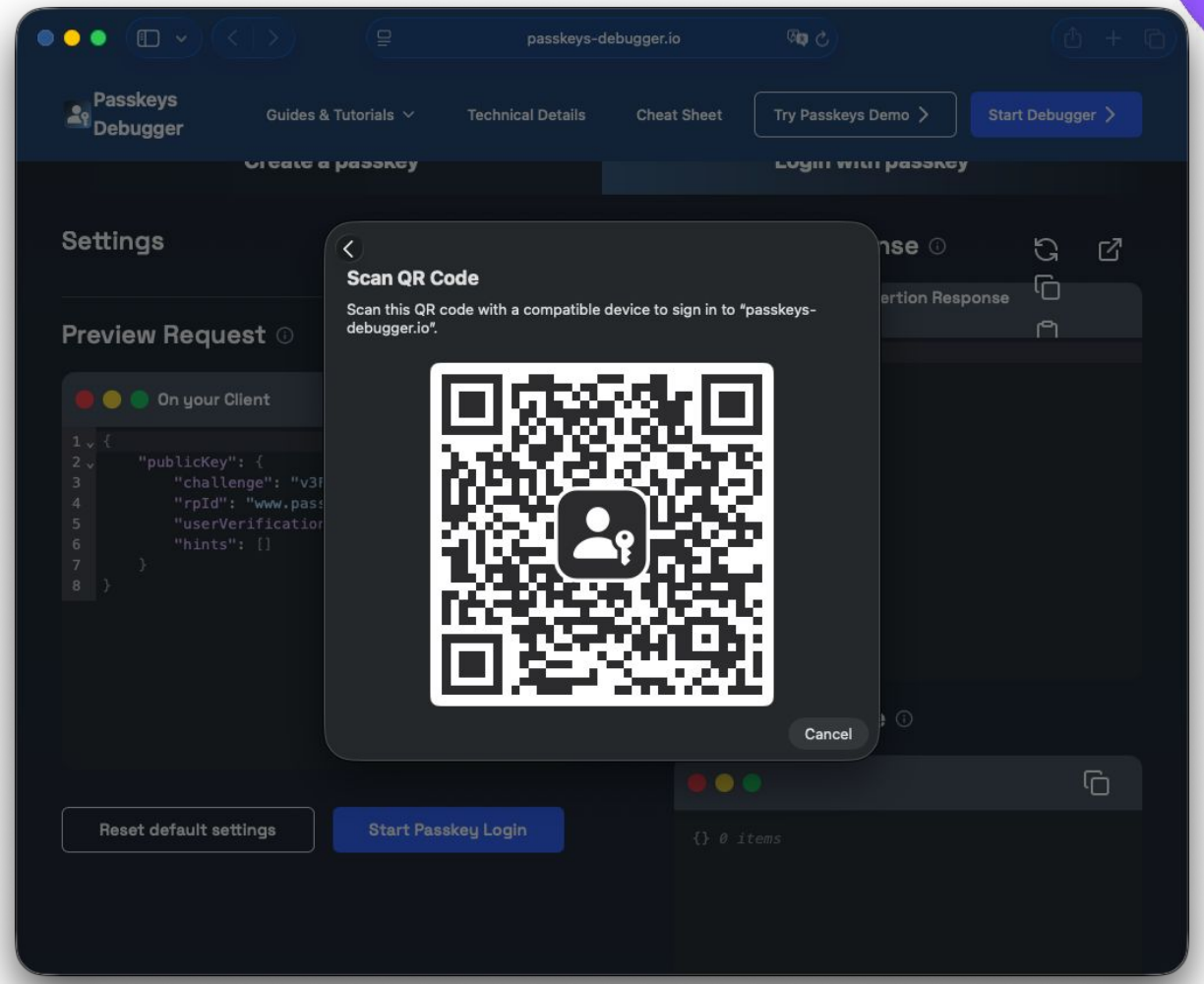
Other prevention methods

- More layers of authentication (e.g. identity managed devices)
- Improve WebAuthn & CTAP
  - Cryptographically protect properties regarding authenticator attachment & transport
  - Not possible short-term
  - W3C seems to consider this outside WebAuthn's threat model
- Educate users
  - Attackers need to force QR-initiated CDA
  - Browsers can render UI in positions unavailable to websites (outside of the website's rectangle)
  - Relying on user vigilance has proven ineffective (see phishing in general)

PHISHING FOR PASSKEYS



PHISHING FOR PASSKEYS



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Conclusion

- Passkeys are still resistant to regular phishing
- Depending on threat model, passkeys may be vulnerable to spear phishing attacks
- Phishing site can imitate other websites than its target
- QR-initiated CDA cannot be prohibited directly by relying parties
- Protection measures are more involved (e.g. adding more authentication layers)

OWASP GLOBAL AppSec

VIENNA'26 JUN 25-26

25 years of open source security

THANK YOU!

Michael Kuckuk

Fullstack Developer @ inovex

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@LBBO@mastodontech.de

@LBBO.de

[Read the full blog post for more details!]

New Tab

Target Website

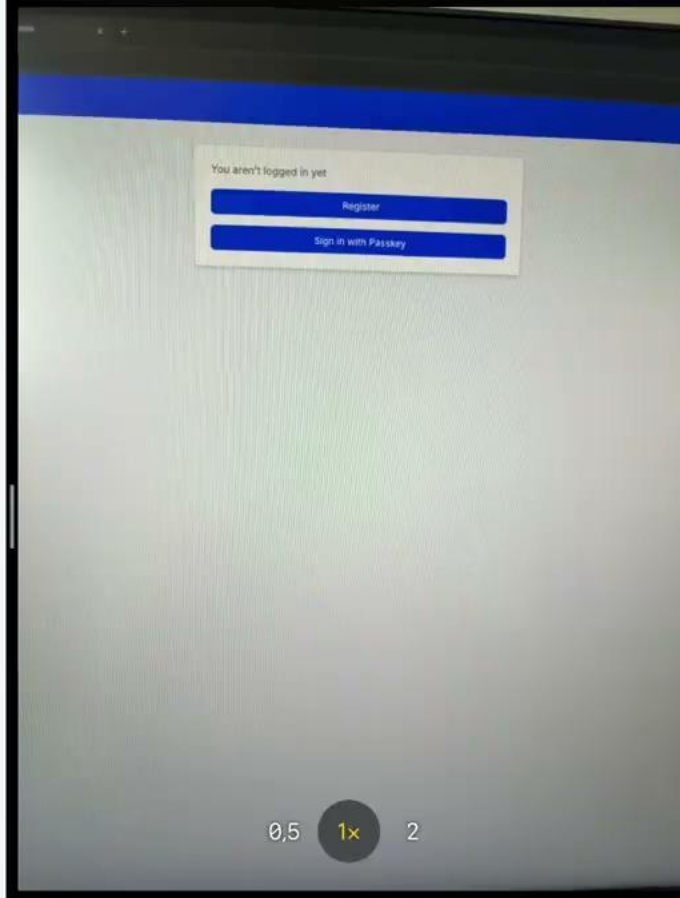
phishing-target.local:3000/demo

Target Website

You aren't logged in yet

Register

Sign in with Passkey



Chrome File Edit View History Bookmarks Profiles Tab Window Help

Wed May 20 16:13

```
mise run create-tmux
/phishing-for-passkeys main 24.15.0 16:13:18
mise run attack
[attack] $ deno run --sloppy-imports --allow-env --env-file=.env.development --allow-read --al…
[16:13:28.329] INFO (#17): Press enter to start the attack
Press enter to continue...
```

0 Chrome 1 DB 2 Apps - 3 Attack * 2026-05-20 16:13

New Tab | Target Website

phishing-target.local:3000

Target Website

You aren't logged in yet

Register

Sign in with Passkey

THIS WINDOW IS CONTROLLED BY:

Image: J.J. at the English-language Wikipedia

evil.local

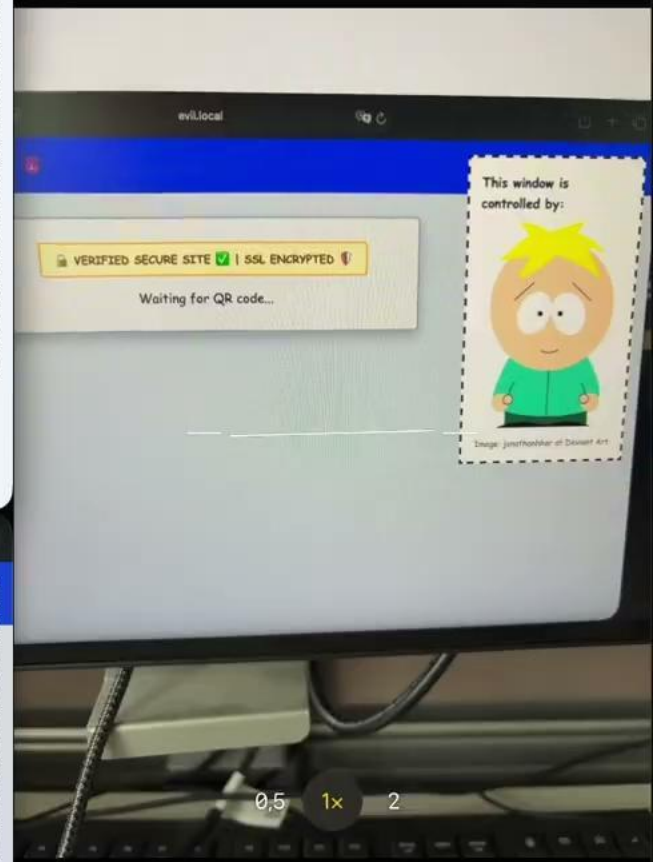
Definitely the target website 😈

🔒 VERIFIED SECURE SITE ✅ | SSL ENCRYPTED 🛡️

Waiting for QR code...

This window is controlled by:

Image: jonathanhher at Deviant Art



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