

View The Email to Get Hacked: Attacking SMS-based Two-Factor Authentication

[Philipp Markert](#), [Florian Farke](#), and [Markus Dürmuth](#)

Two-Factor Authentication

1

Illustration of a login form with a dark blue header bar. Below the header, there are two input fields: the first is labeled 'Username' with a person icon, and the second is a password field with a lock icon and ten dots. A 'Sign in' button is located below the password field.

2

Illustration of the Google Authenticator app interface. The app title 'Google Authenticator' is in a blue header. Below it, the verification code '137 130' is displayed in large blue text, followed by the email address 'alice@gmail.com'. A physical security key is shown to the right of the code. A speech bubble at the bottom contains the text: 'G-123456 is your Google verification code'.

**2FA
Adoption**

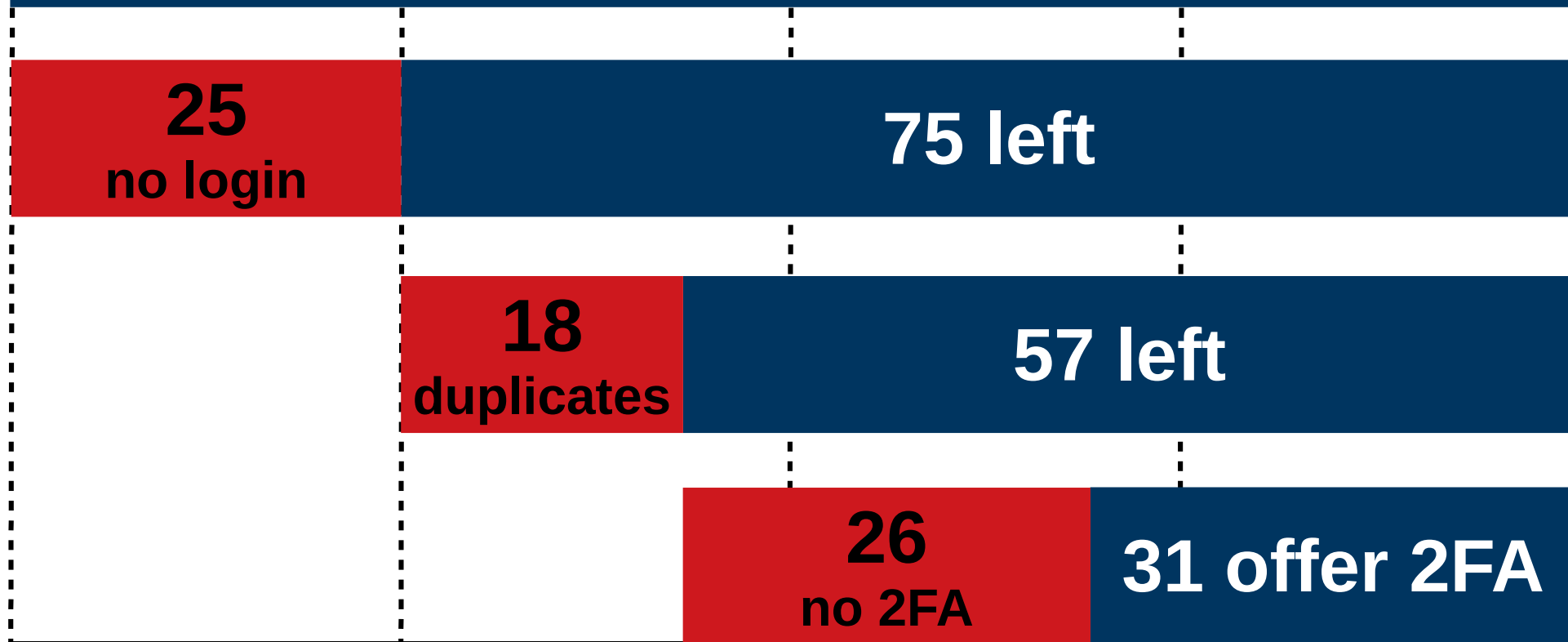
**Gmail
Confidential
Mode**

**Attacking
Google's
2FA**

**Are there
alternatives?**

2FA Adoption

analyzed top 100 websites*



31 websites offer 2FA

25 (81%)

Google Authenticator

137 130

alice@gmail.com

24 (77%)

[G-123456](#) is your Google verification code

7 (23%)



Gmail Confidential Mode

New Message



florian.farke@rub.de

Tonight's door code:

long long short long

Turn confidential mode on / off

Send



Confidential mode

SET EXPIRATION

Expires in 1 day ▼ Mon, Aug 12, 2019

REQUIRE PASSCODE

All passcodes will be generated by Google. (?)

- No SMS passcode
- SMS passcode

Cancel

Save

Confirm phone number

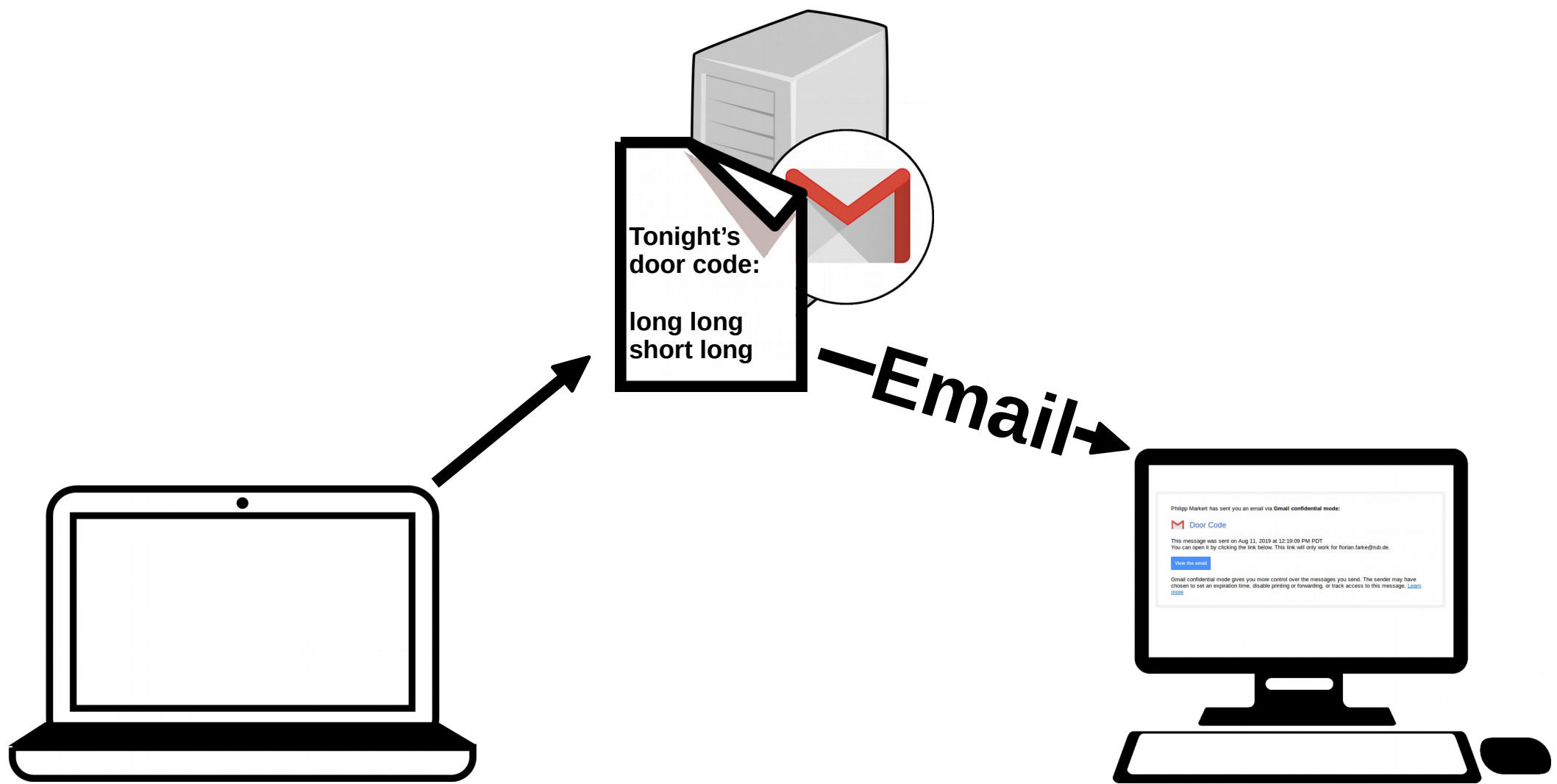
A phone number is required so recipients can verify their identity using an SMS passcode

florian.farke@rub.de



Cancel

Send



Philipp Markert has sent you an email via **Gmail confidential mode**:



This message was sent on Aug 11, 2019 at 12:19:09 PM PDT
You can open it by clicking the link below. This link will only work for
florian.farke@rub.de.

[View the email](#)

<https://confidential-mail.google.com/msg/...>

Gmail confidential mode gives you more control over the messages you send. The sender may have chosen to set an expiration time, disable printing or forwarding, or track access to this message. [Learn more](#)

2FA

Confidential Mode

[G-123456](#) is your Google verification code

Your Google verification code is [654321](#)



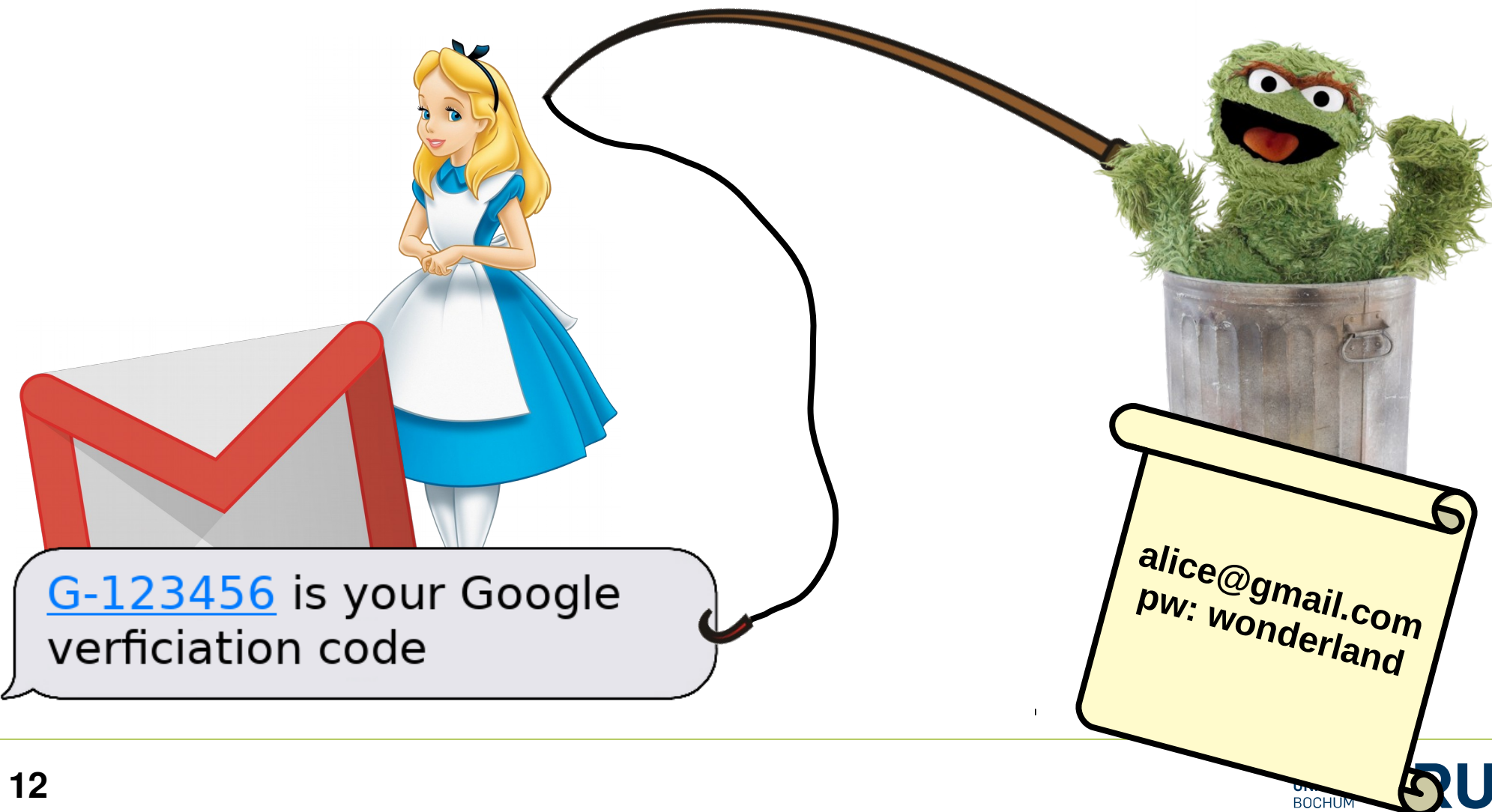
Enter passcode

Passcode was sent to09.

Submit

Resend passcode

Attacking Google's 2FA



[G-123456](#) is your Google verification code

alice@gmail.com
pw: wonderland



1. Email



The White Rabbit has sent you an email via **Gmail confidential mode**:



Way to Wonderland

This message was sent on Aug 11, 2019 at 12:19:09 PM PDT

You can open it by clicking the link below. This link will only work for alice@gmail.com.

[View the email](#)

~~<https://confidential-mail.google.com/msg/...>~~

<https://confidential-mail.oscar.com/msg/...>

Gmail confidential mode gives you more control over the messages you send. The sender may have chosen to set an expiration time, disable printing or forwarding, or track access to this message. [Learn more](#)



Enter passcode

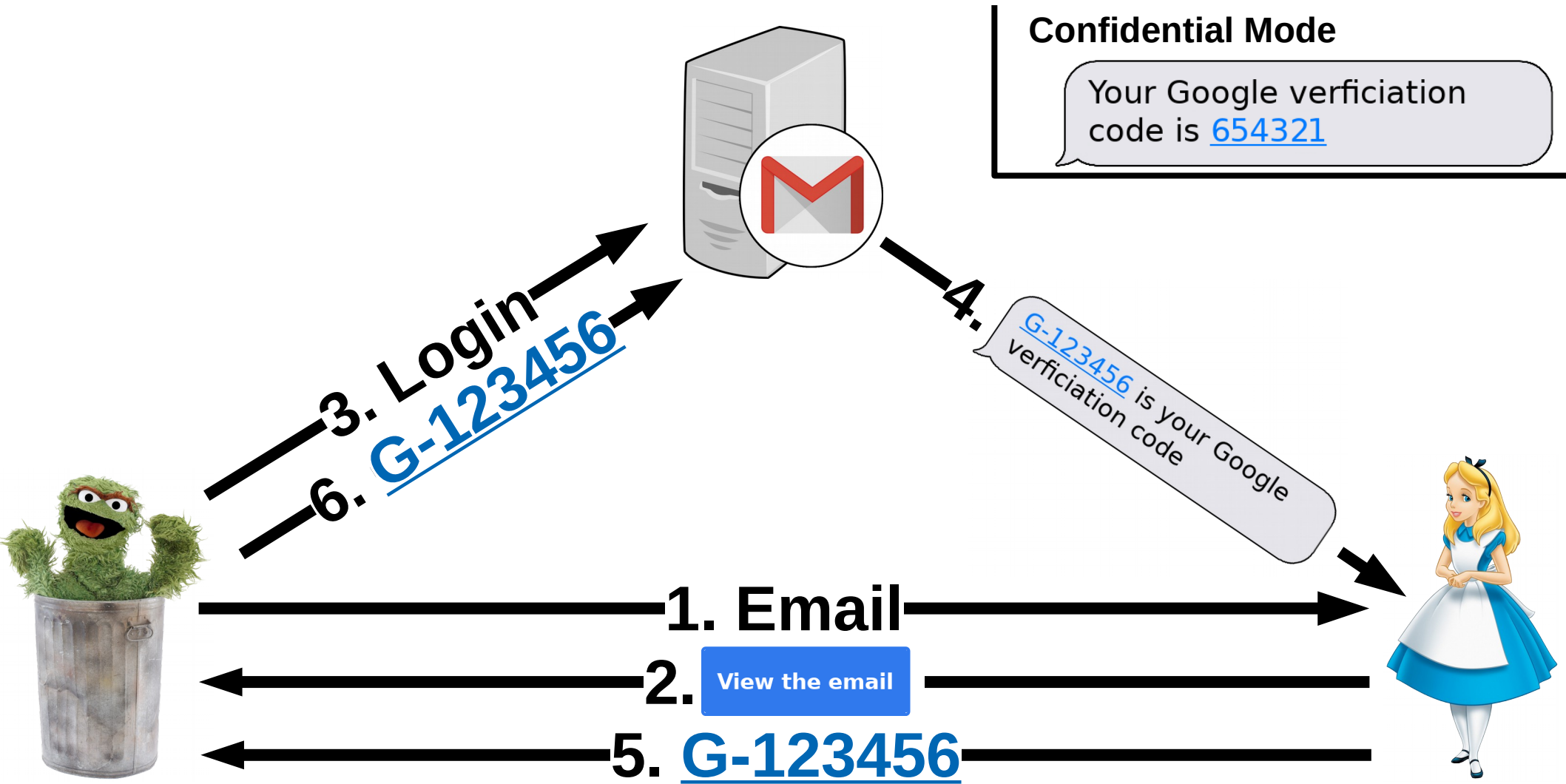
Passcode was sent to •••• ••••••89.

Enter passcode

Submit

Resend passcode





**Are there
alternatives?**

1. Improve the text of the SMS

[G-123456](#) is your Google verification code

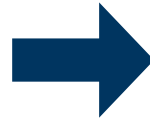
2FA

Your Google verification code is [654321](#)

Confidential Mode

1. Improve the text of the SMS

[G-123456](#) is your Google verification code



Your second-factor code to log into your Google account is [G-123456](#).
This code is not intended for Gmail confidential mode.

Your Google verification code is [654321](#)

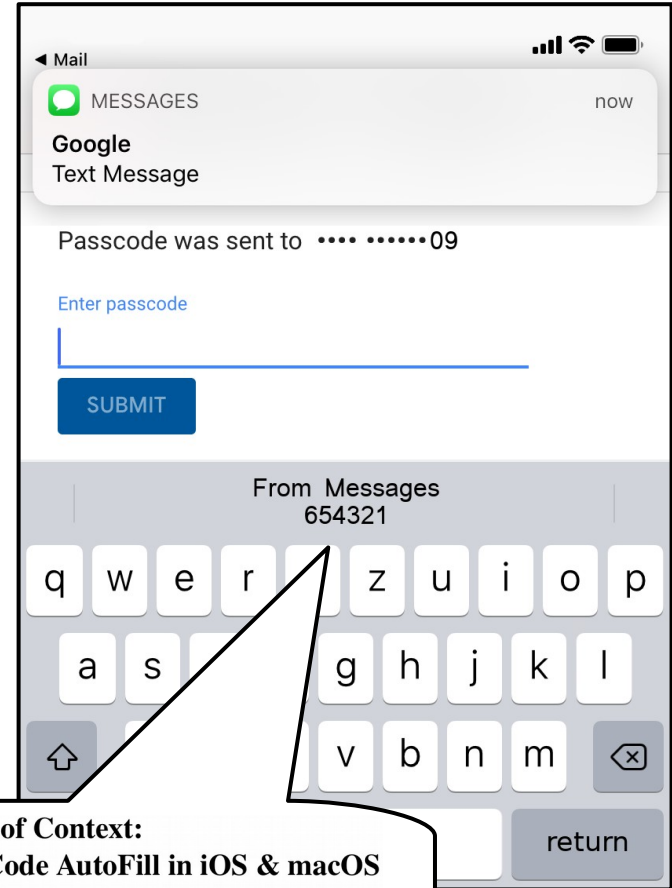


Your verification code to read the text of your Google confidential email is [654321](#).
This code is not intended for Google account login.

1. Improve the text of the SMS

[G-123456](#) is your Google verification code

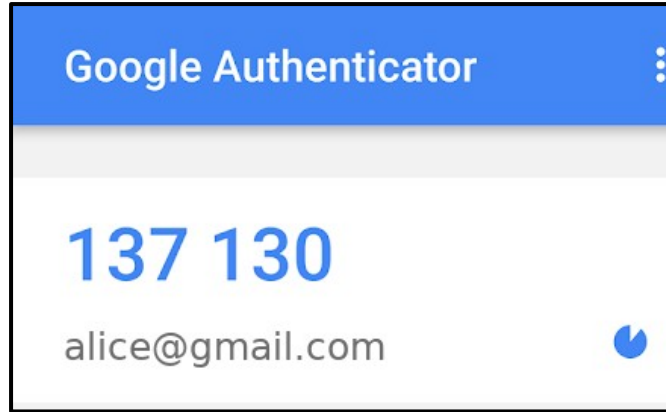
Your Google verification code is [654321](#)



**Taken Out of Context:
Security Risks with Security Code AutoFill in iOS & macOS**

2. Use a Software Token

[G-123456](#) is your Google verification code



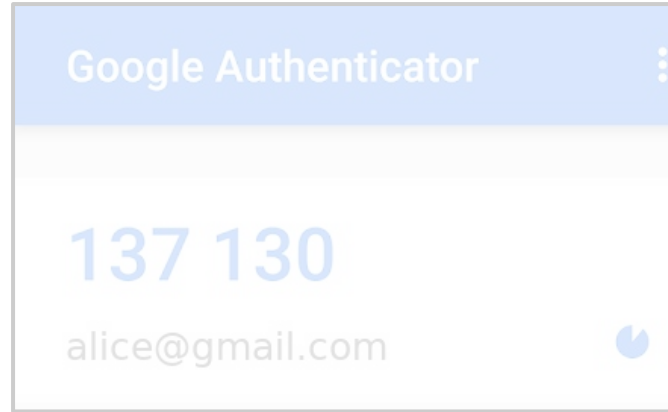
3. Use a Hardware

Towards Implementing Inclusive Authentication Technologies for Older Adults

Sanchari Das
Indiana University Bloomington
Ben Jelen
Indiana University Bloomington
L. Jean Camp
Indiana University Bloomington

Andrew Kim
Indiana University Bloomington
Joshua Streiff
Indiana University Bloomington
Lesia Huber
Indiana University Bloomington

[G-123456](#) is your Google verification code

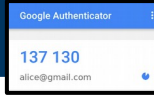


**Evaluating the Android Security Key Scheme:
An Early Usability, Deployability, Security Evaluation with Comparative Analysis**

Robbie MacGregor
Dalhousie University

31 websites offer 2FA

25 (81%)



7 (23%)



24 (77%)

G-123456 is your Google verification code

Confidential mode

SET EXPIRATION

Expires in 1 day Mon, Aug 12, 2019

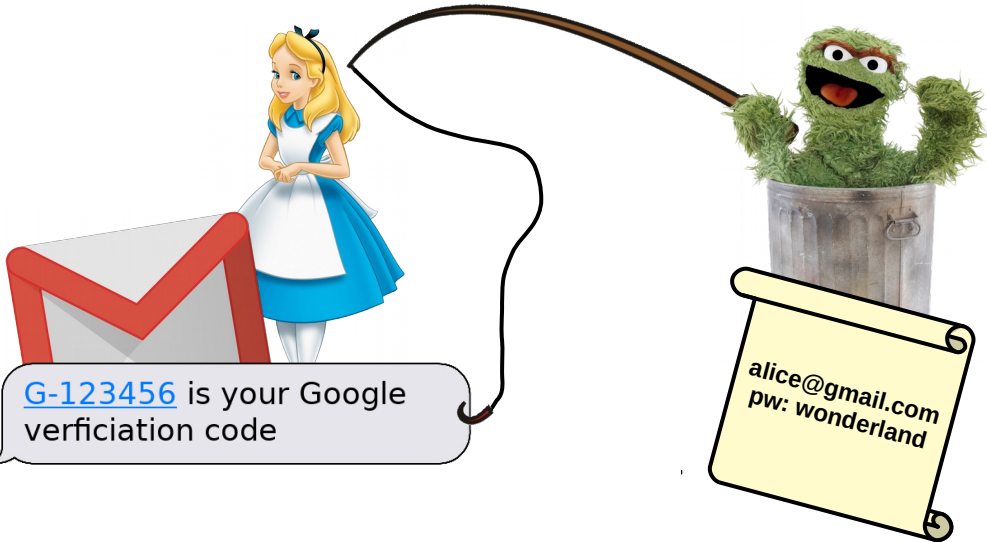
REQUIRE PASSCODE

All passcodes will be generated by Google. ?

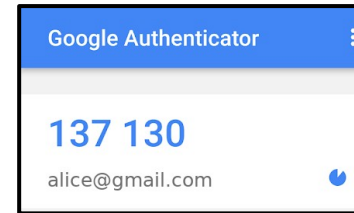
No SMS passcode SMS passcode

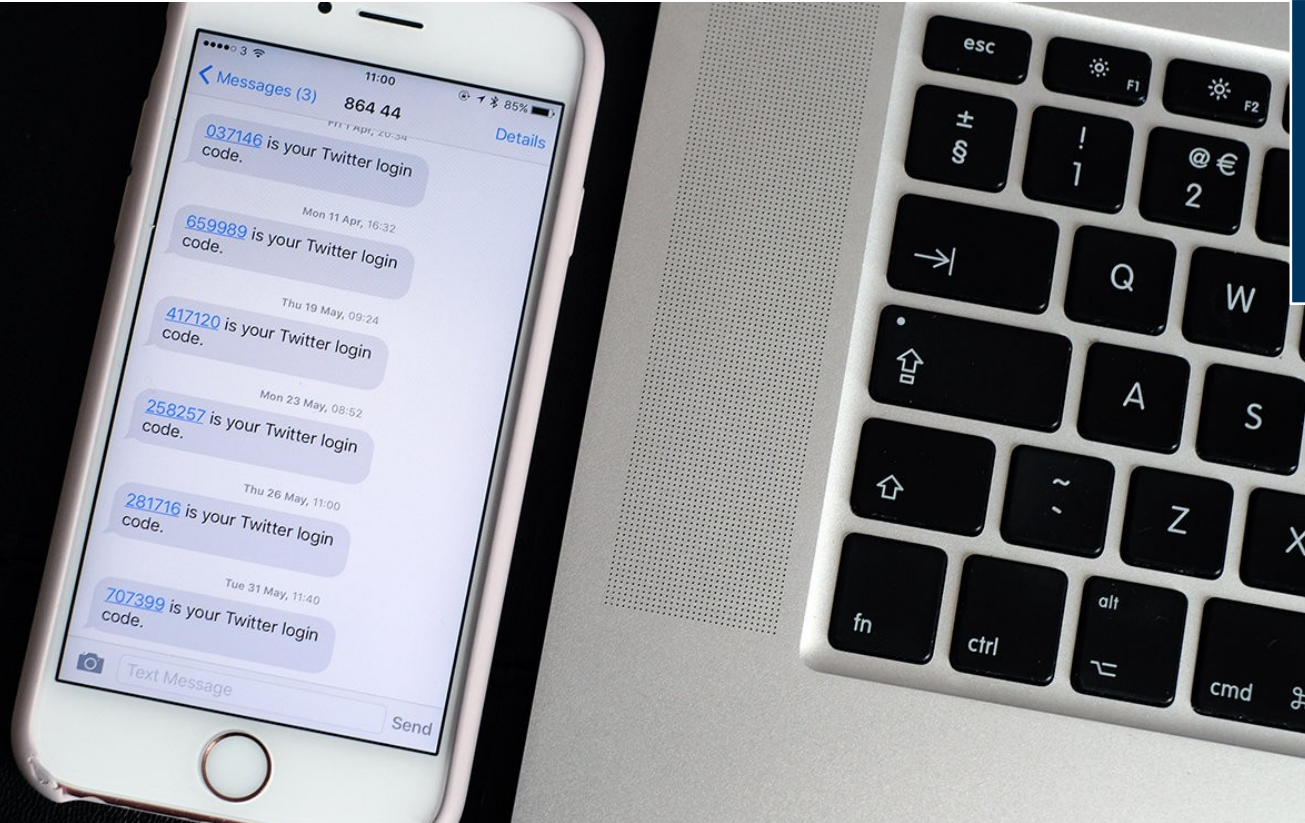
G-123456 is your Google verification code

Your Google verification code is 654321



G-123456 is your Google verification code





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