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

Philipp Markert, Florian Farke, and Markus Dürmuth

Santa Clara, California, USA | WAY 2019 | August 11, 2019
Two-Factor Authentication
**1**

**Username**

Sign in

**2**

**Google Authenticator**

137 130
alice@gmail.com

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*

25 no login

18 duplicates

26 no 2FA

75 left

57 left

31 offer 2FA

* Le Pochat et al. Tranco: A Research-Oriented Top Sites Ranking Hardened Against Manipulation. NDSS ’19
31 websites offer 2FA

25 (81%)

24 (77%)

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

Save
Cancel
Confirm phone number

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

florian.farke@rub.de
Tonight's door code: long long short long
Philipp Markert has sent you an email via **Gmail confidential mode**:

**Door Code**

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](https://www.google.com/settings/security/eam_settings/)

G-123456 is your Google verification code

Tonight’s door code:
long long
short long

Your Google verification code is 654321

Enter passcode
Passcode was sent to ••••••••••09.

Enter passcode
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
1. Email

2. View the email

3. Login G-123456

4. G-123456 is your Google verification code

5. G-123456

6. G-123456

Confidential Mode

Your Google verification code is 654321
Are there alternatives?
1. Improve the text of the SMS

**G-123456** is your Google verification code

Your Google verification code is **654321**

**2FA**

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**
2. Use a Software Token

G-123456 is your Google verification code

Google Authenticator

137 130
alice@gmail.com
3. Use a Hardware Token

Google Authenticator

G-123456 is your Google verification code

137 130
alice@gmail.com

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

Philipp Markert, Florian Farke, and Markus Dürmuth

Santa Clara, California, USA | WAY 2019 | August 11, 2019