Servers can't be trusted, and thanks to tamper-proof journals EteSync doesn't need to!

stosb.com/talks

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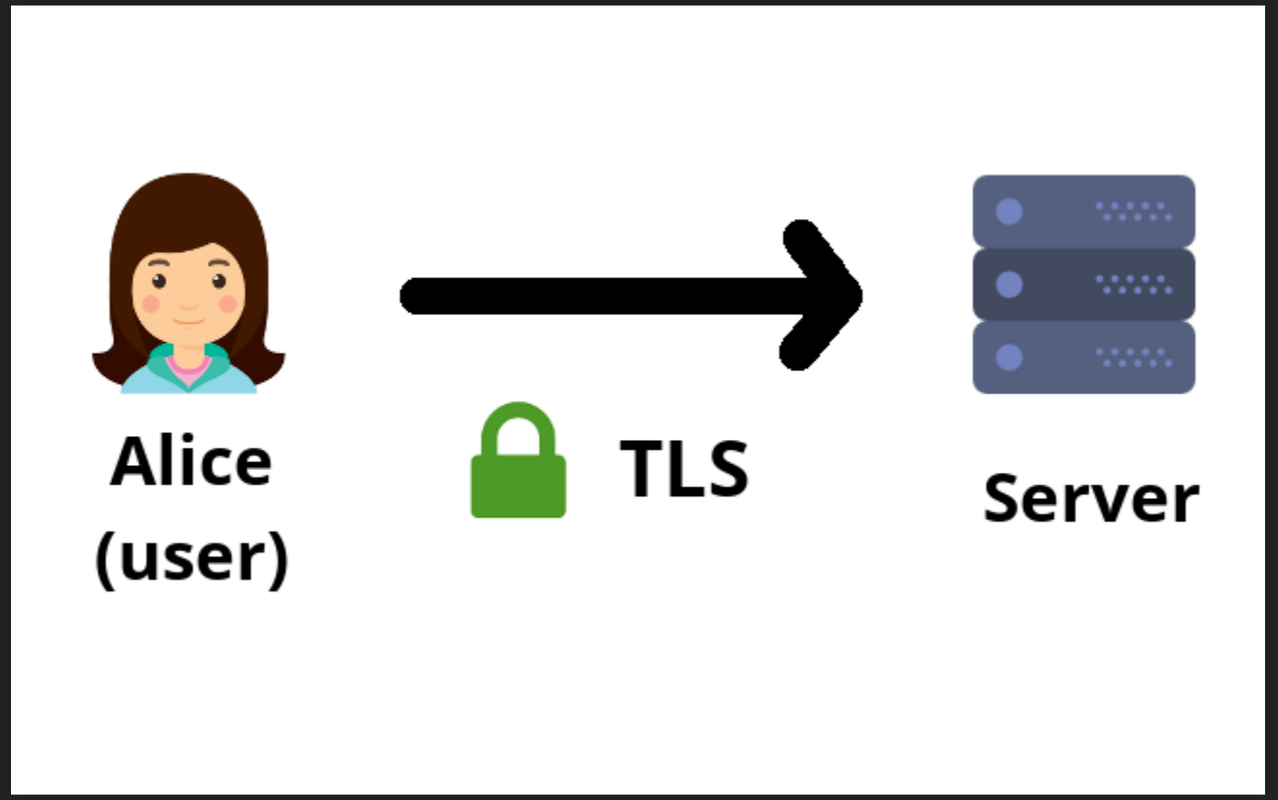
Simple Server Communication



What Are We Leaking?

Data

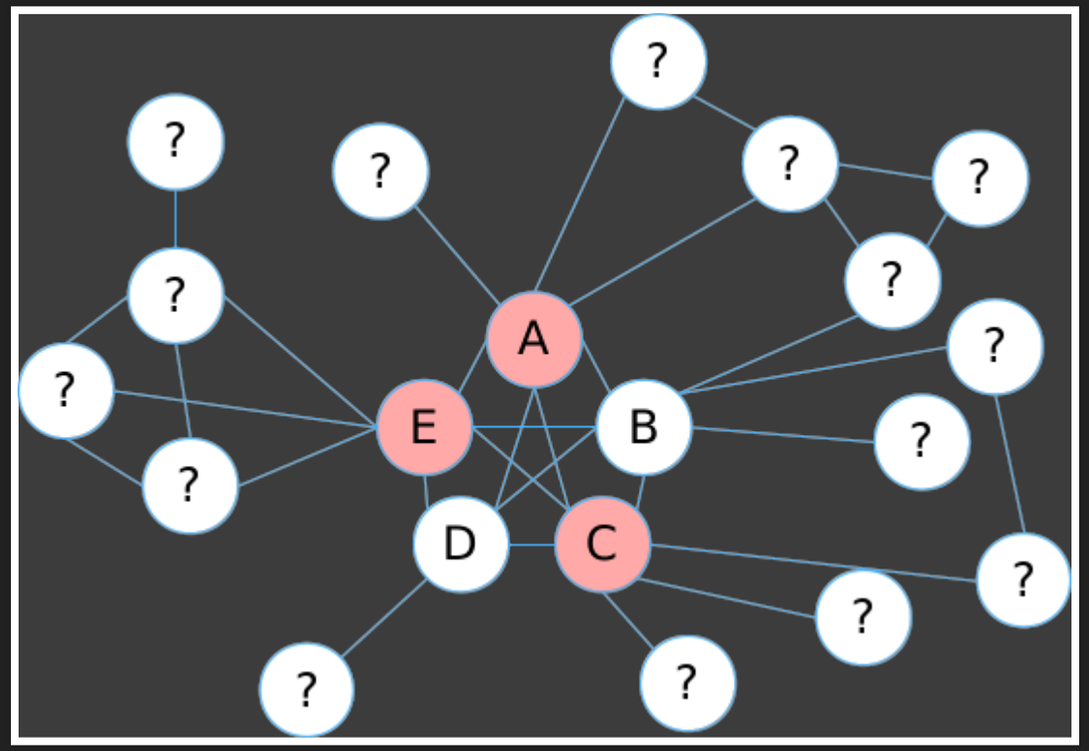
- Emails
- Calendars
- Personal notes
- Secret business information

Metadata

- IP address
- Social graph
- Time of access
- What data is used and how often
- When specific data is accessed

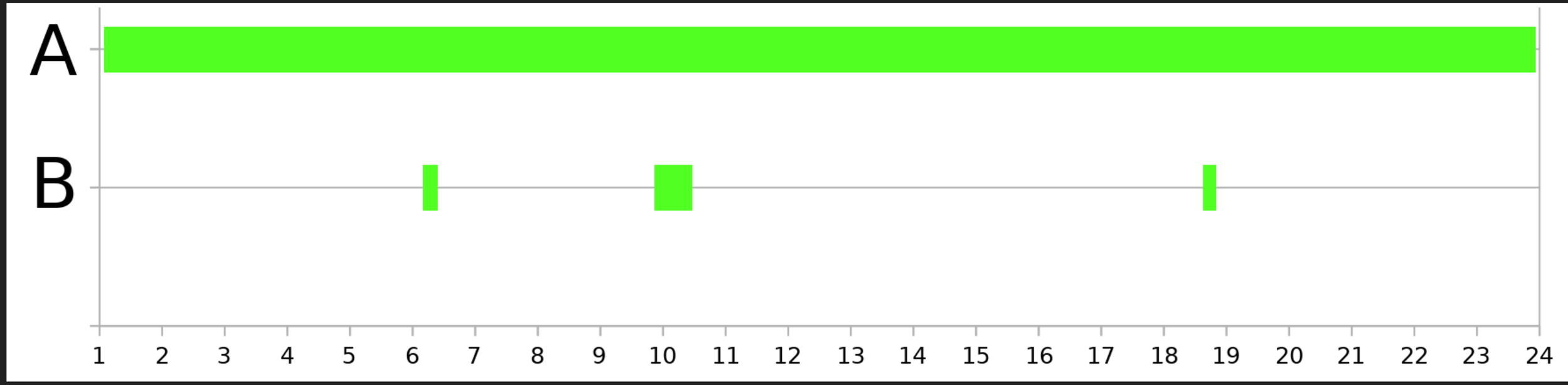
Metadata Is Data!

Exploiting Social Graphs

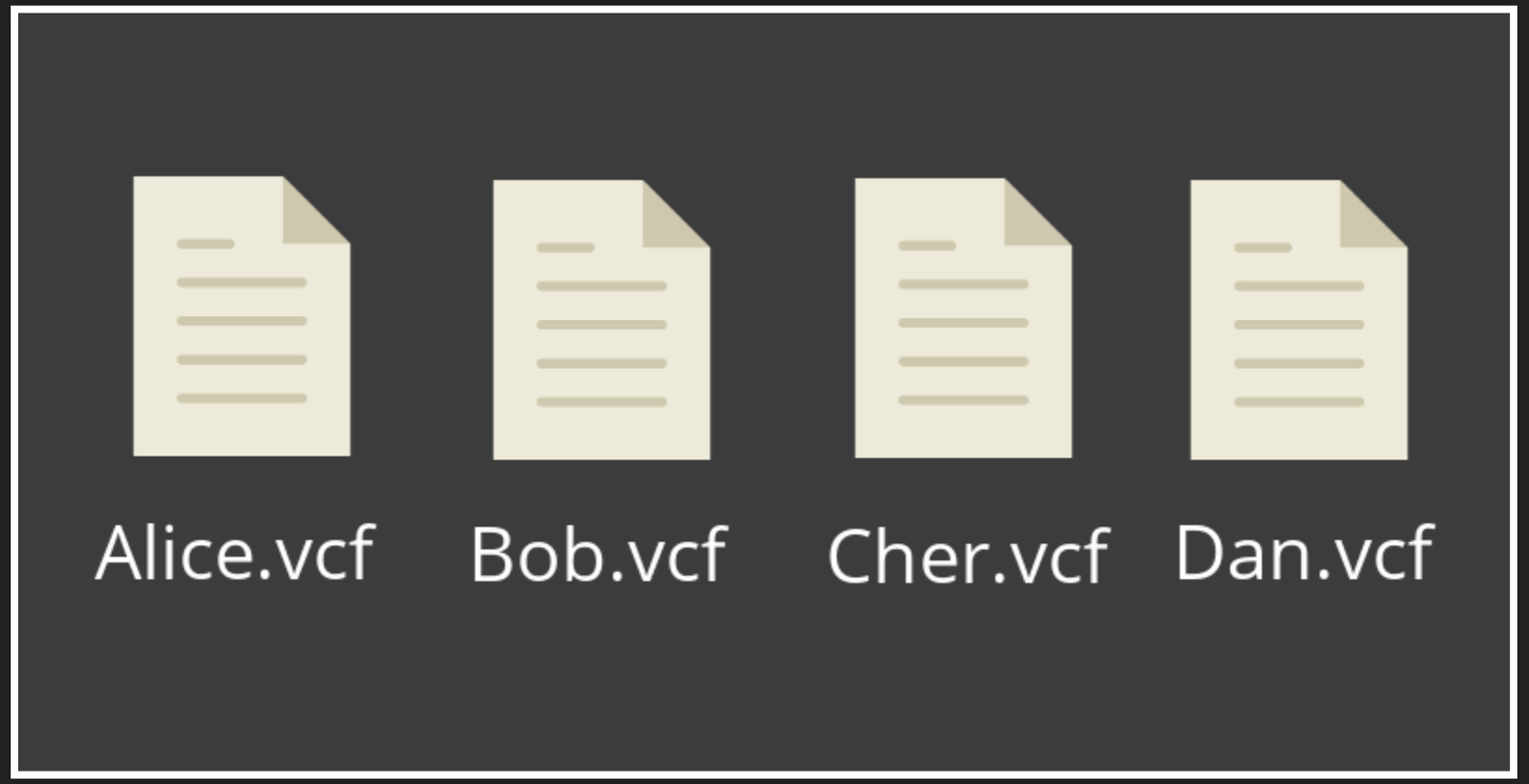


Metadata Is Data!

Exploiting Access Patterns



Real Example: CardDAV



Information Leaked

- Address Book Information
- IP address
- Social graph
- Time of access
- What data is used and how often
- When specific data is accessed

Potential Solutions

- Using Tor to hide origin
- Controlling access patterns
- Trusting the server:
  - Using a trusted provider
  - Hosting on our own server (*"self host"*)

Should We Trust The Server?

- It could get hacked (remote or physical access)
- Could get stolen (literally someone picking it up and taking it)
- Hosted: a rogue employee could access your data
- Hosted: could be compelled to provide access
- Self-hosted: a lot of work and hard to maintain

Reducing Server Trust

- End-to-end encryption
- Mostly offline operation (if possible)
- Fake access patterns?

Hardened CardDAV

That's It, We Are Safe!

Questions?

Well, actually...

Our Data Can Be Manipulated!

Bit Flipping

Imagine the access level is stored encrypted

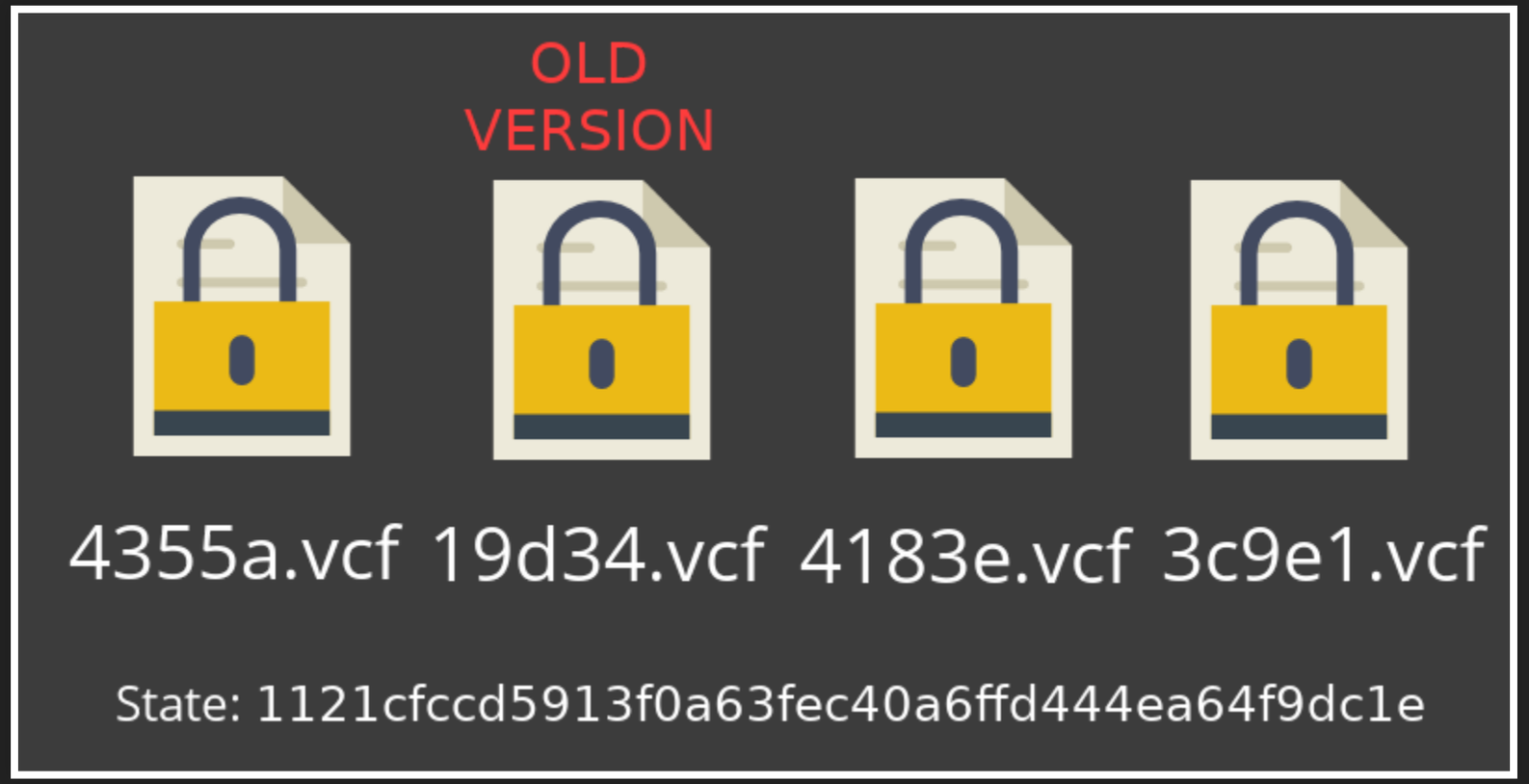
	Original	Modified
Encrypted	0x4a	0x4b
Decrypted	0x00	0x19

Data Omission

Data Omission: Solution

Verify the state

Data Rollback

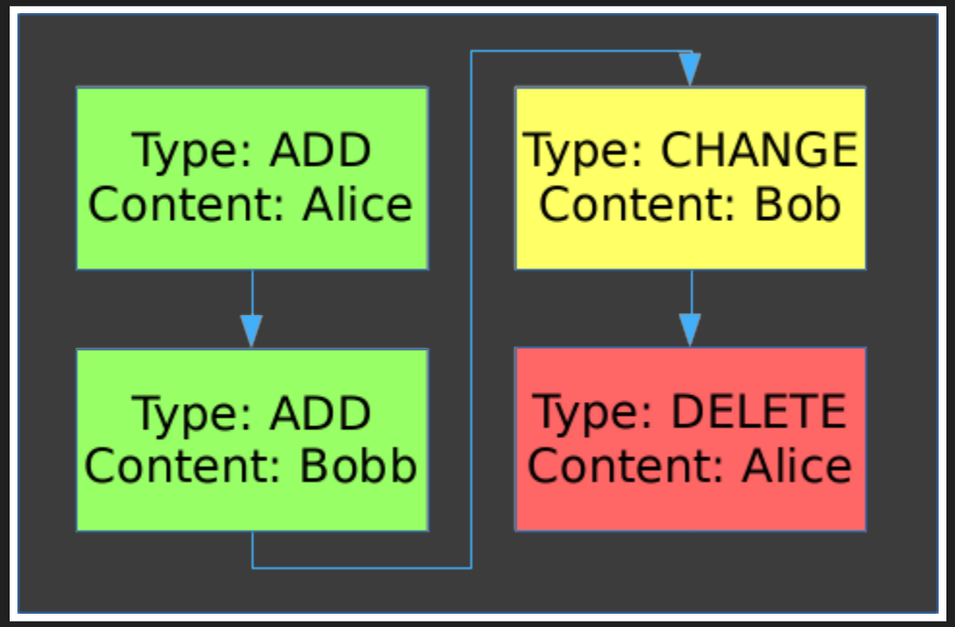


The Solution:

Tamer-proof journals!

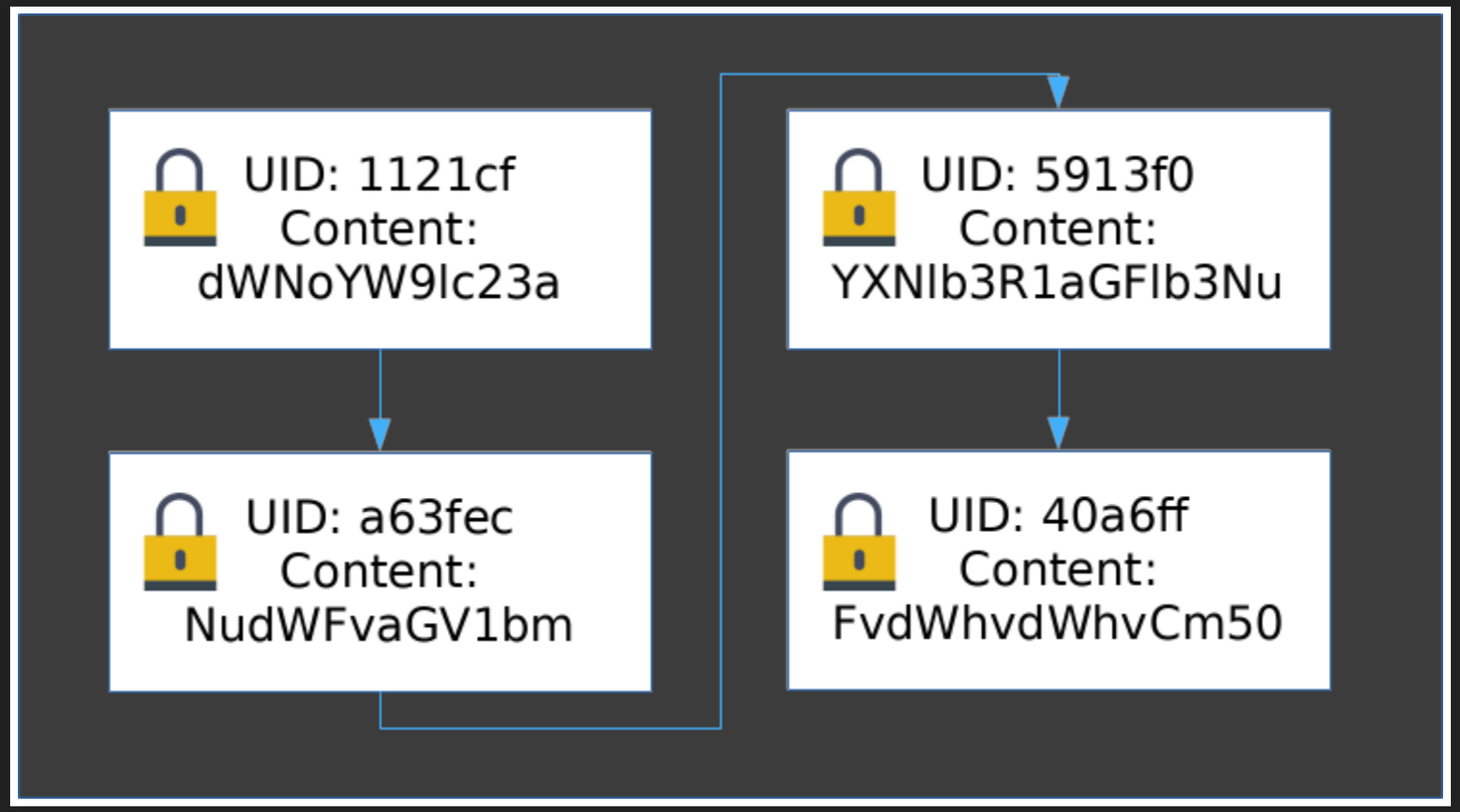
What Is It?

Change Journal



What Is It?

Immutable And Tamper-Proof



UID is a HMAC of content + previous UID

Protections Against Tampering

- Immutable, so data can only be appended
- Signed, so data can't be manipulated or faked
- Prev UID is signed, no omission or reordering
- Verified on each client

Previously Unsolved Attacks

- Which data is accessed and modified
- Data Omission
- Data Rollback

EteSync

Secure, end-to-end encrypted and journaled personal information cloud synchronization for Android, the desktop and the web.

A real-life example.

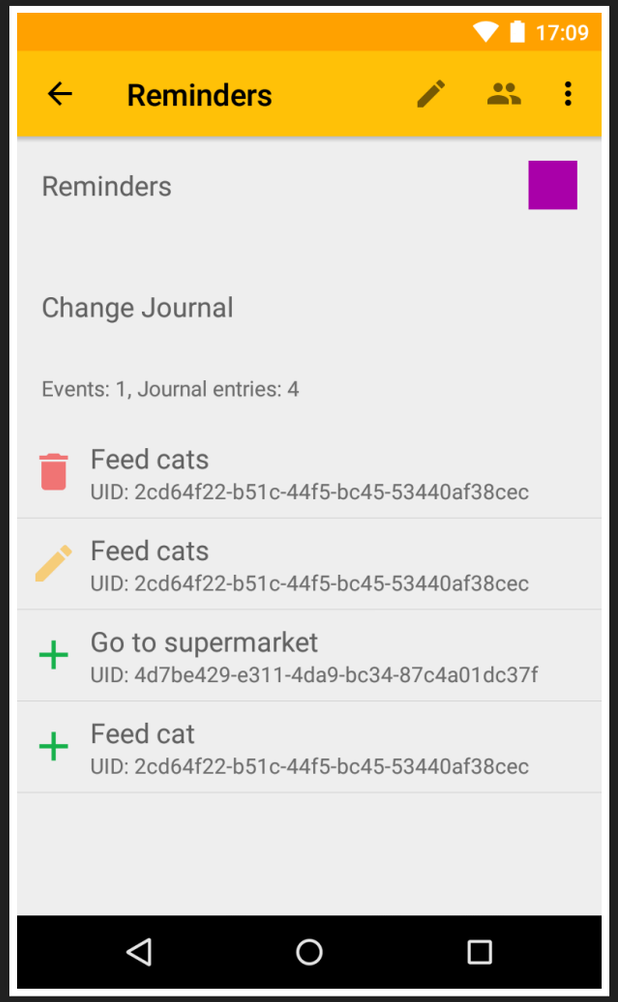
Journal Format

```
UID "7ecda2139a45a1674c1b991760f4ae56718b06c0d0b9ed459eea86f709c6d02b"
CONTENT {"action":  "CHANGE",
         "content": "BEGIN:VCALENDAR\r\n
                    VERSION:2.0\r\n
                    PRODID:-//EteSync//com.etesync.syncadapter 0.16.0//ical4androi
                    BEGIN:VEVENT\r\n
                    SUMMARY:Feed cats\r\n
                    ... snip ...
                    END:VEVENT\r\n
                    END:VCALENDAR\r\n"
        }

UID "513da45c2d6562c511b898f6f191631c56dfa33d789a399000e99df9b6b8e480"
CONTENT {"action":"DELETE","content":"BEGIN:VCALENDAR\r\nVERSION:2.0\r\nPRODID:-//E
```

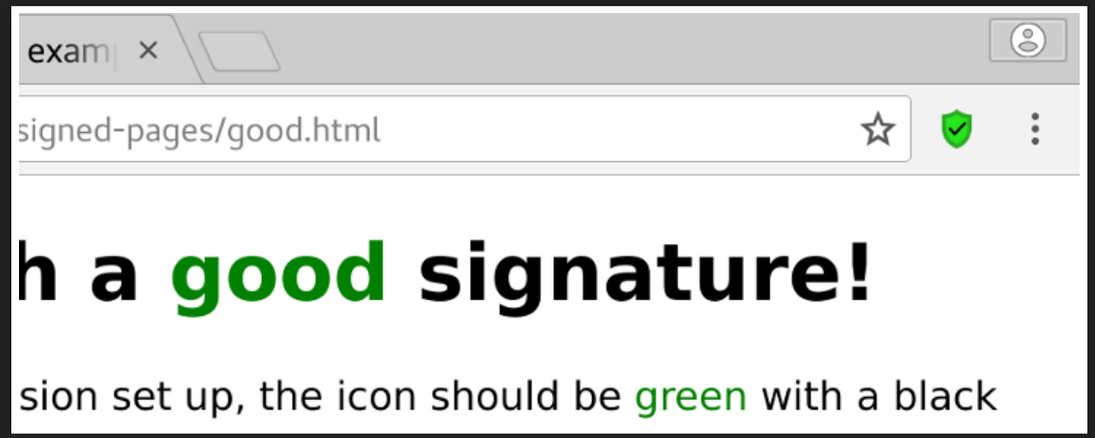
Having A Change History

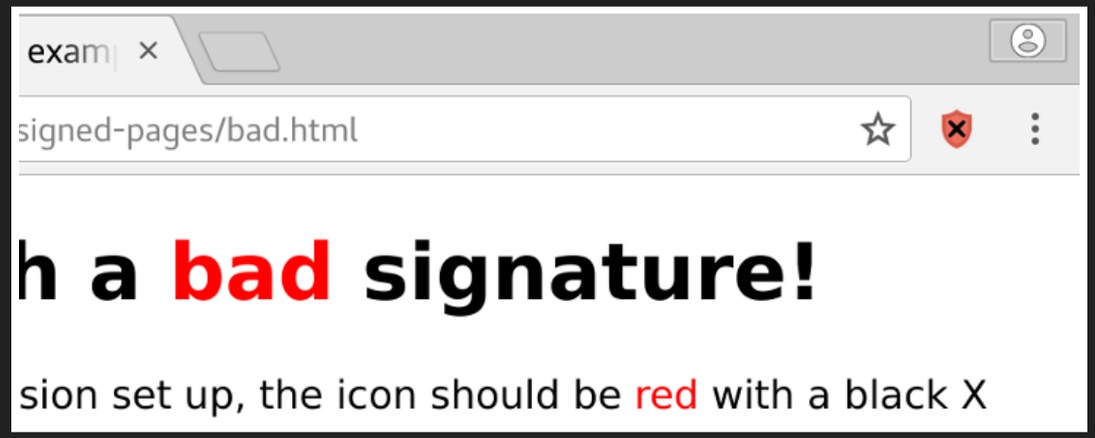
- Auditing changes
- Recovering lost data
- Finding entries based on date



Signed Pages

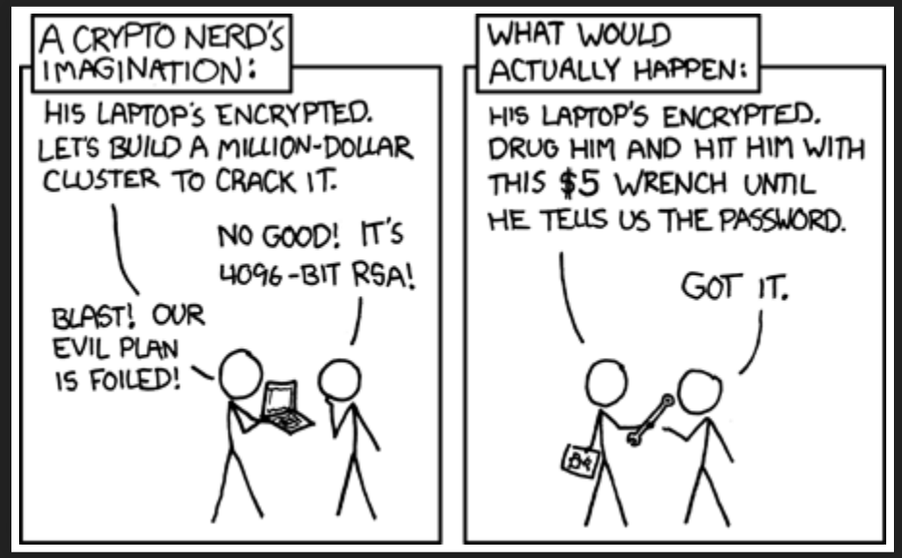
- Devs PGP sign web pages
- Users add website config
- Extension verifies signatures
- Should be used in conjunction with subresource integrity
- Future: signature verifying service workers (collaboration with airborn.io)





Finishing Notes

- Privacy is a sacred right, don't give it up!
- You're the weakest link:



Useful Links

- My blog: https://stosb.com
- EteSync's website: https://www.etesync.com
- EteSync's sources: https://github.com/etesync
- Signed Pages: https://github.com/tasn/webext-signed-pages

Questions?

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