Real World Deniability in Messaging

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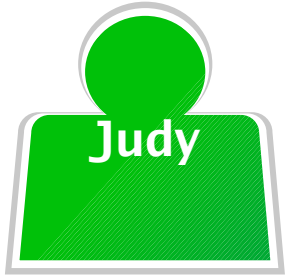
Deniability?

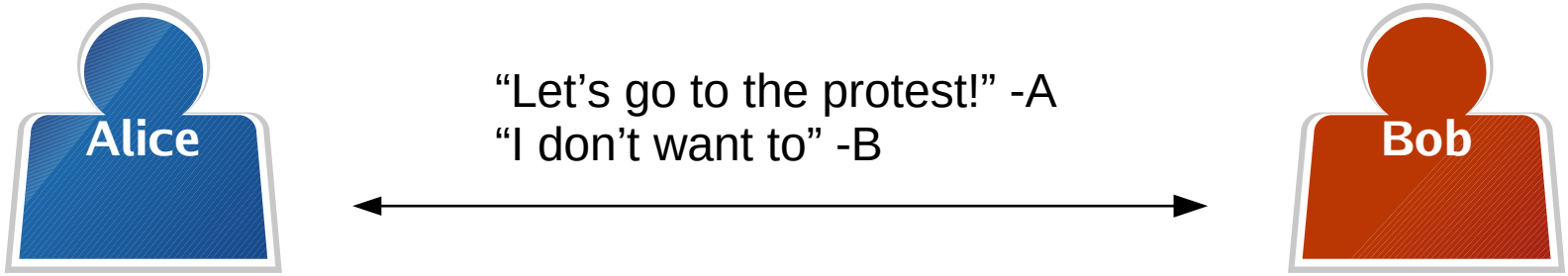
Moxie Marlinspike: "If someone receives an OTR [Off–The–Record] message from you, they can be absolutely sure you sent it (rather than having been forged by some third party), but *can't prove to anyone else that it was a message you wrote*."

Reference: https://signal.org/blog/simplifying–otr–deniability/

Deniability?



Deniability?



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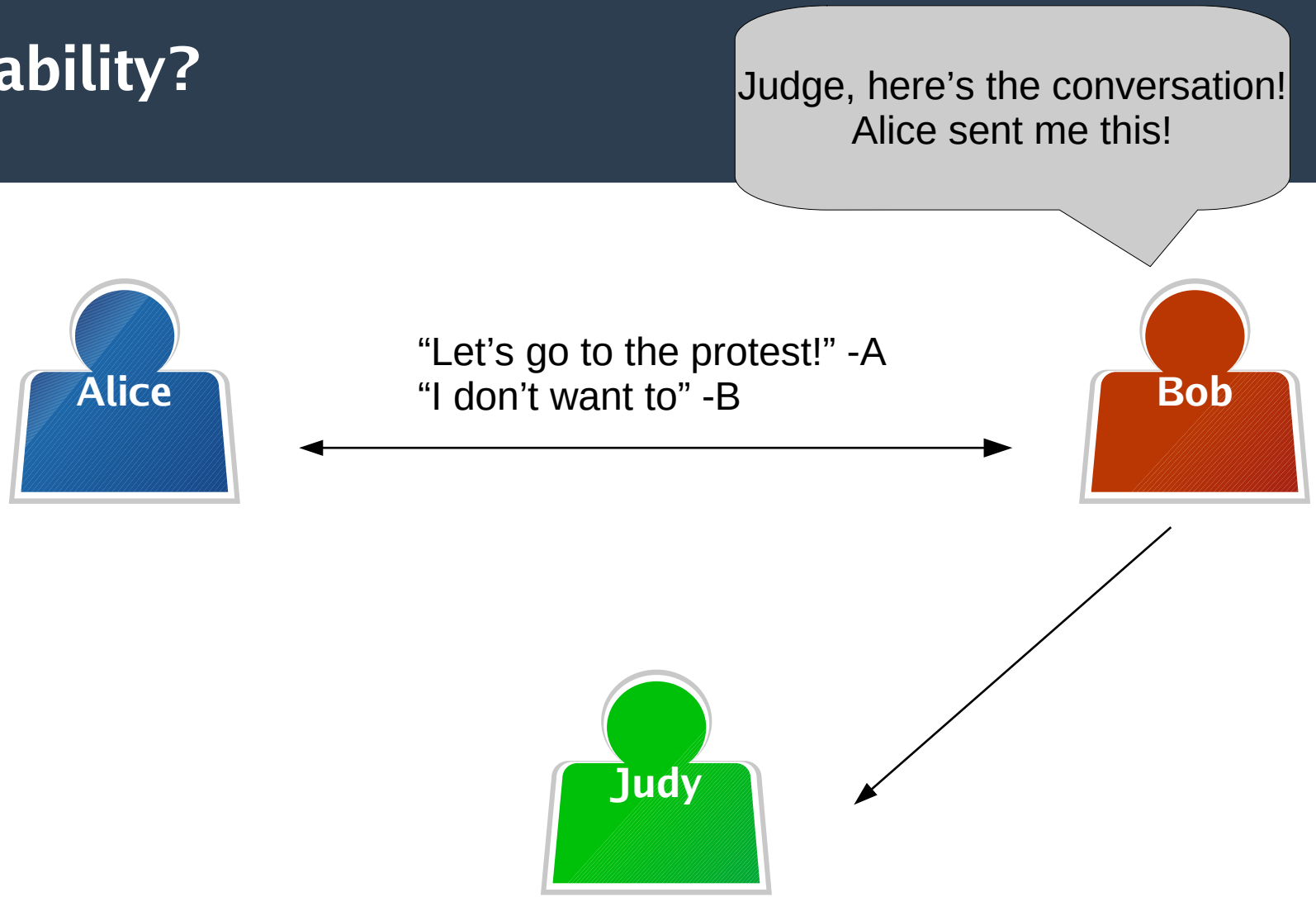

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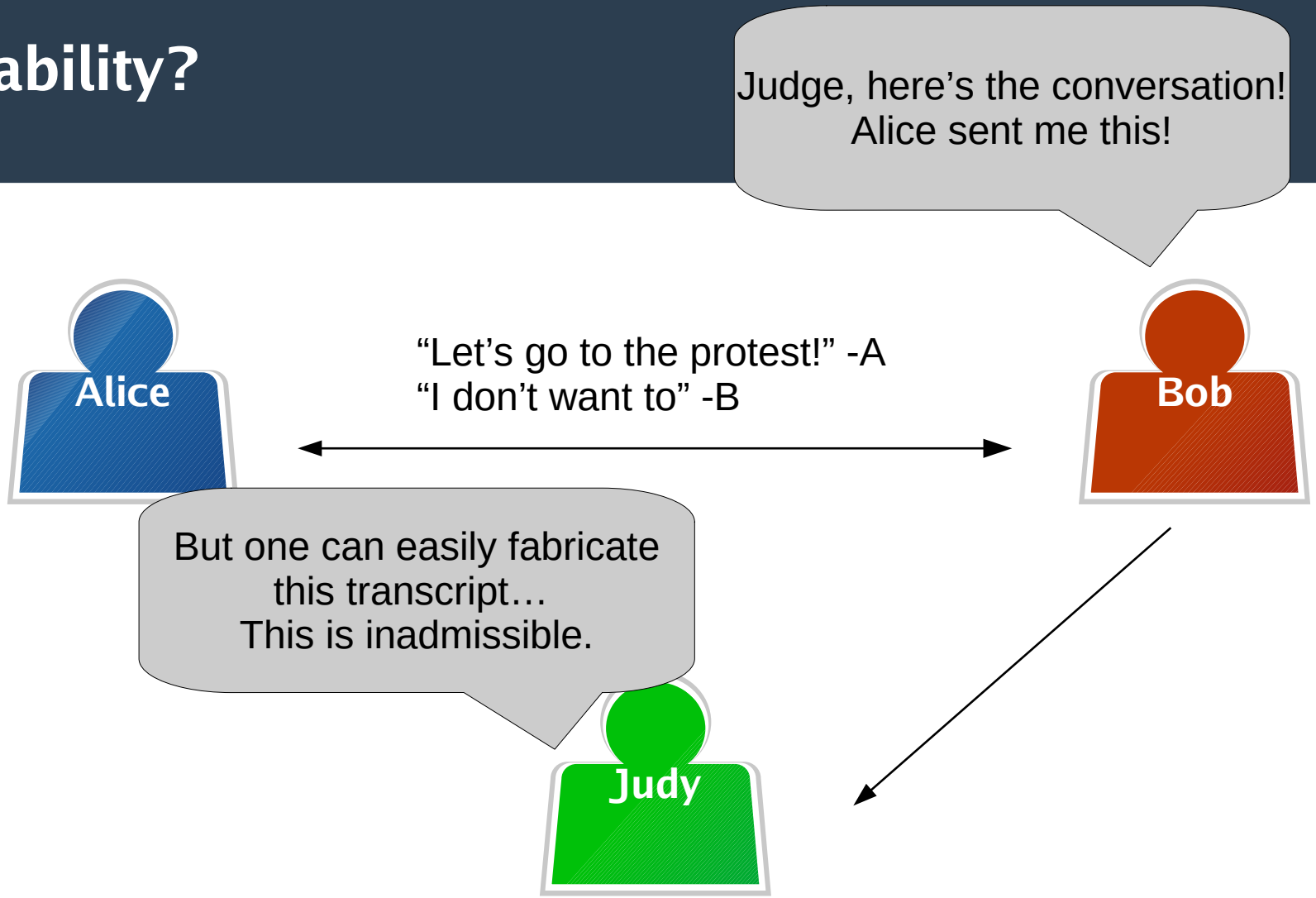

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- Many flavours (online/offline, honest/malicious, ...)
- Ongoing (long–term) debate in the community on its relevance.

Overview

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  – Technical perspective; and a
  – Legal and social perspective.
- Can we fix this? A potential solution.

Case Study: Signal

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- Many recent works consider X3DH's deniability [UG15, UG18], [VGIK20], [HKKP21, HKKP22], [BFGJS22].

Case Study: Signal

- Vatandas et al. [VGIK20] show that:
  - X3DH is “deniable”.
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- Great!

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- Signal has two authentication modes: ”regular” and “sealed sender”.
- These render Signal fairly *undeniable* in practice.

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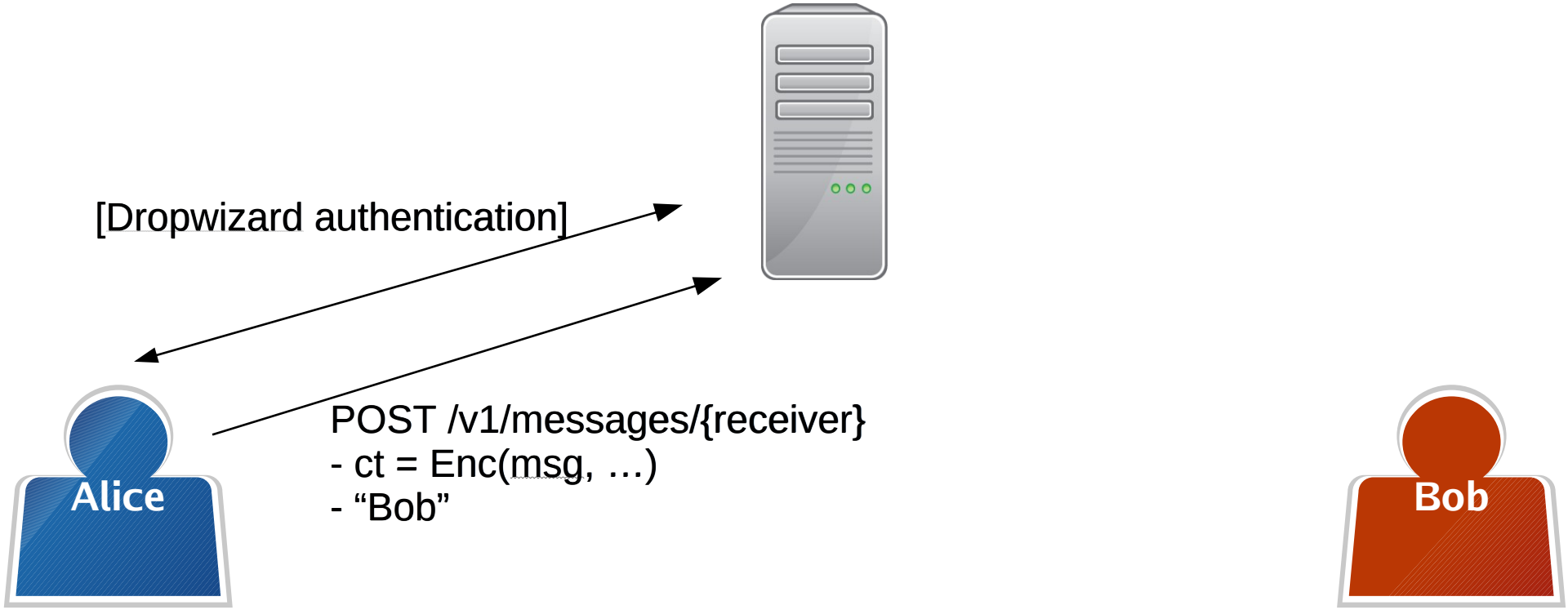

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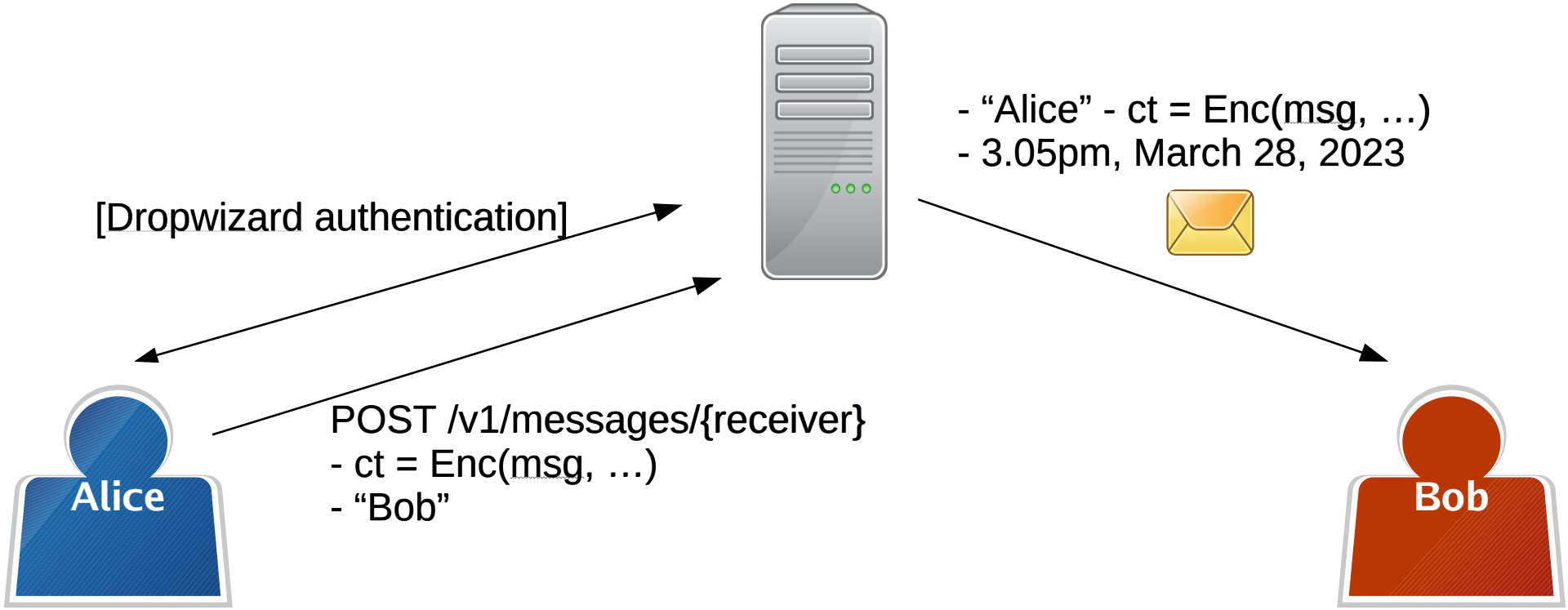

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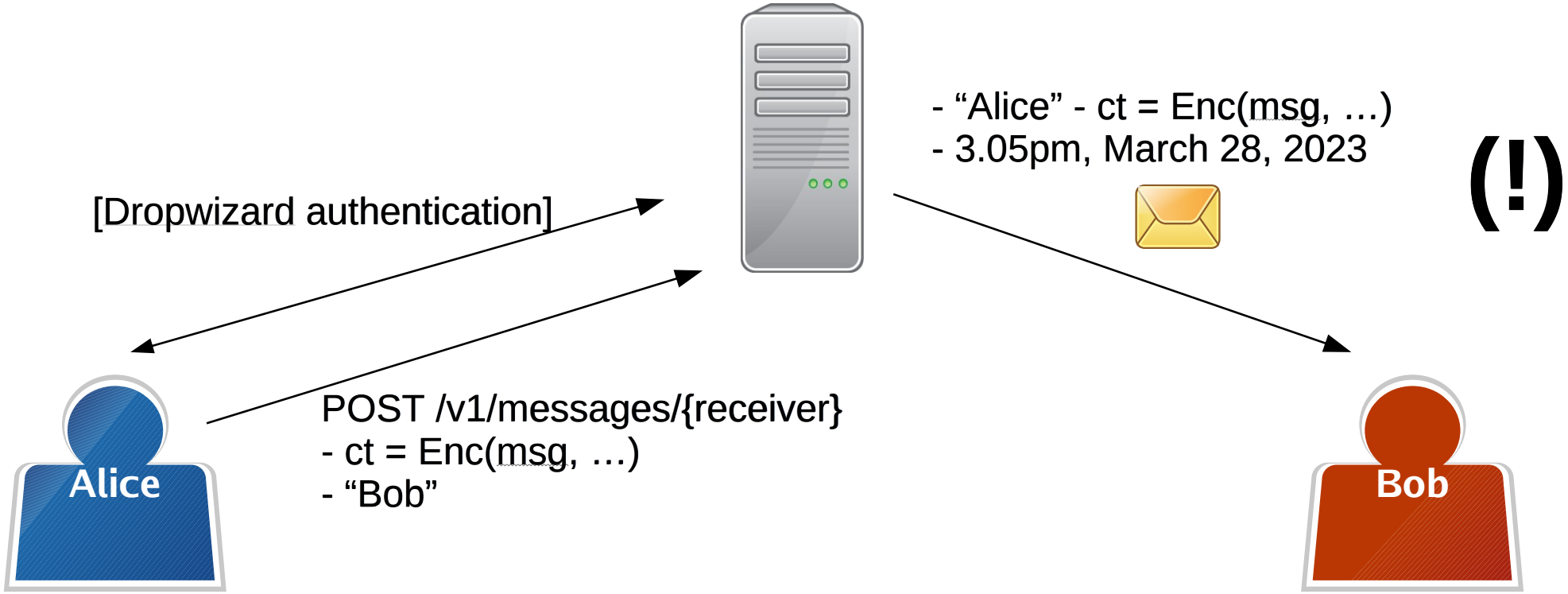

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- (Even worse if the server stores logs).

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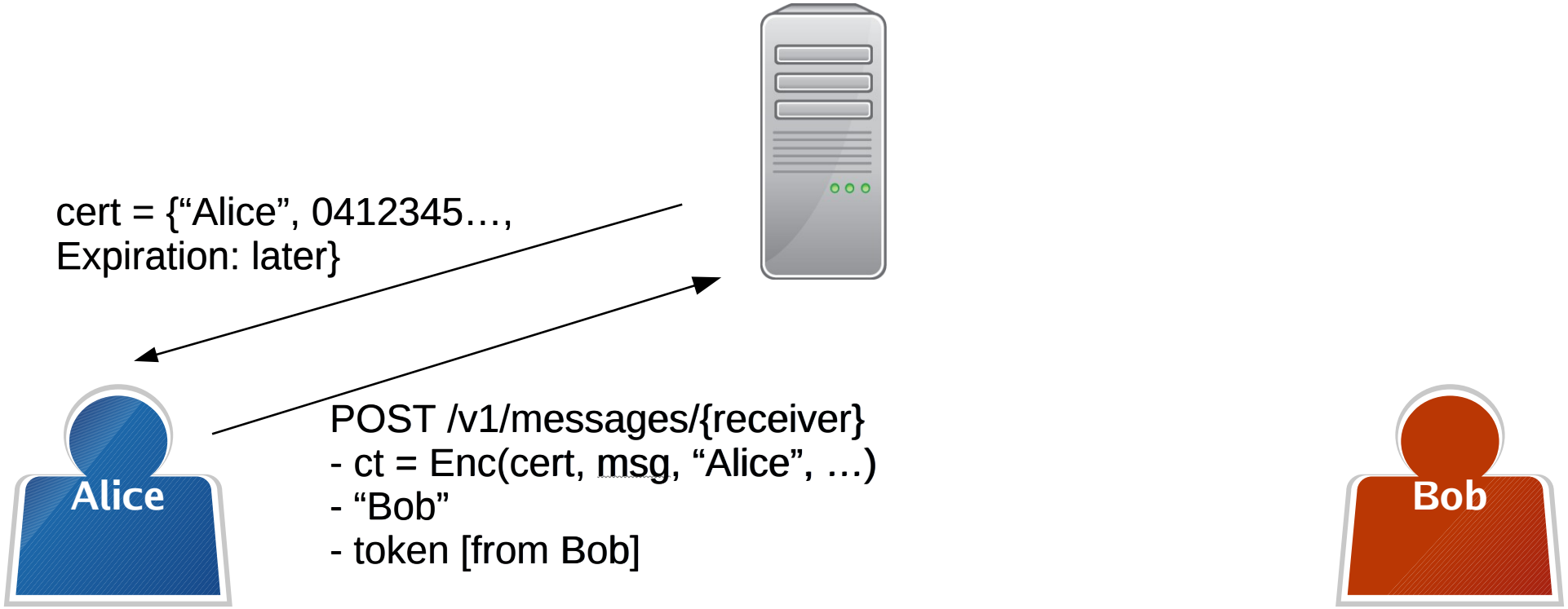
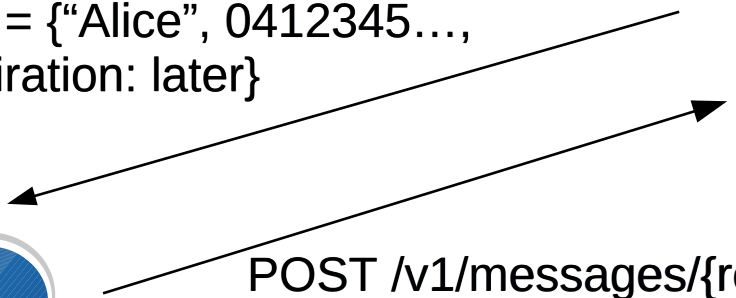


Signal with “sealed sender” authentication

(No sender authentication)

cert = {“Alice”, 0412345…, Expiration: later}



POST /v1/messages/{receiver}
- ct = Enc(cert, msg, “Alice”, …)
- “Bob”
- token [from Bob]

Signal with “sealed sender” authentication

(No sender authentication)

Message for Bob?
Token looks ok!

cert = {“Alice”, 0412345…,
Expiration: later}

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- token [from Bob]

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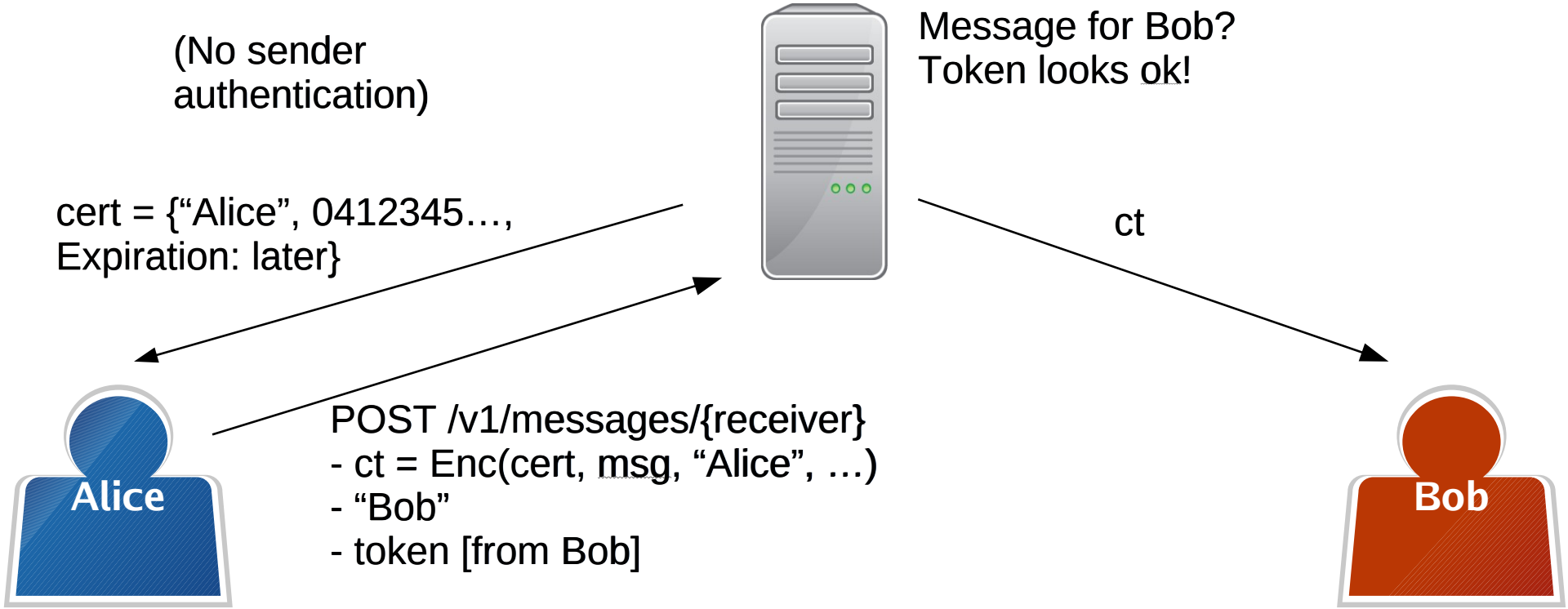

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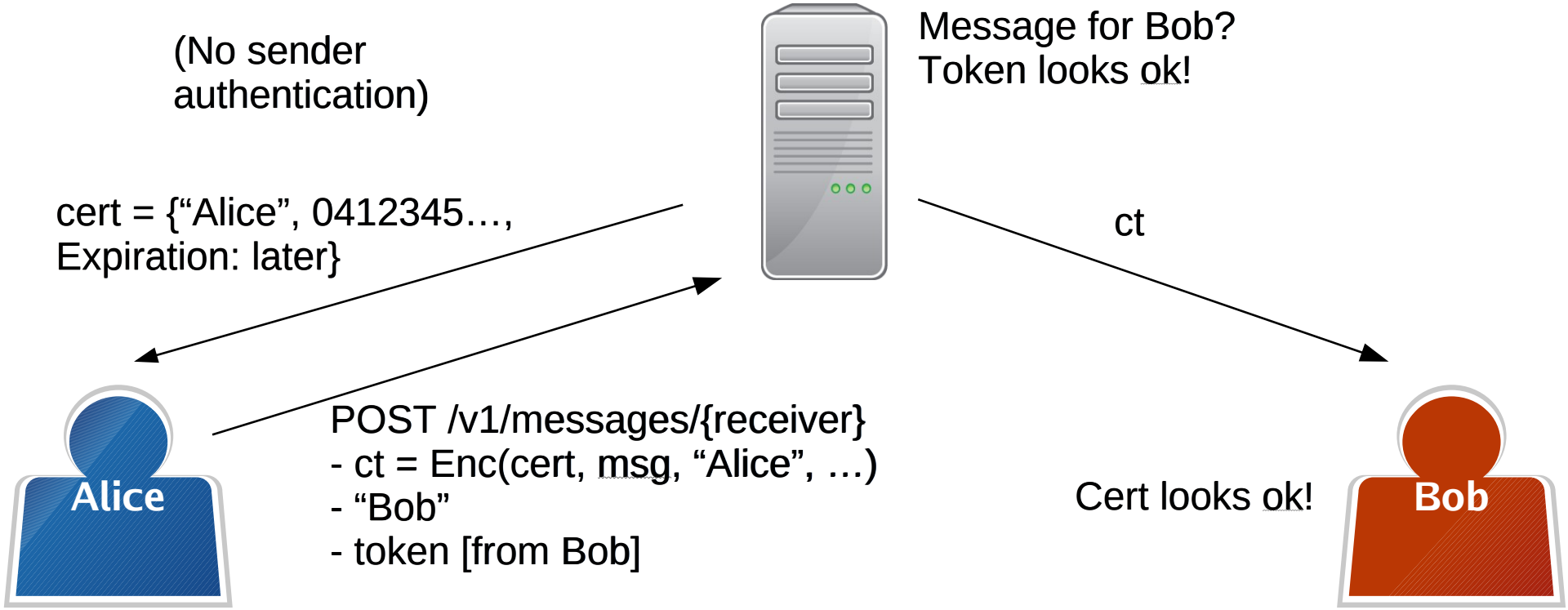

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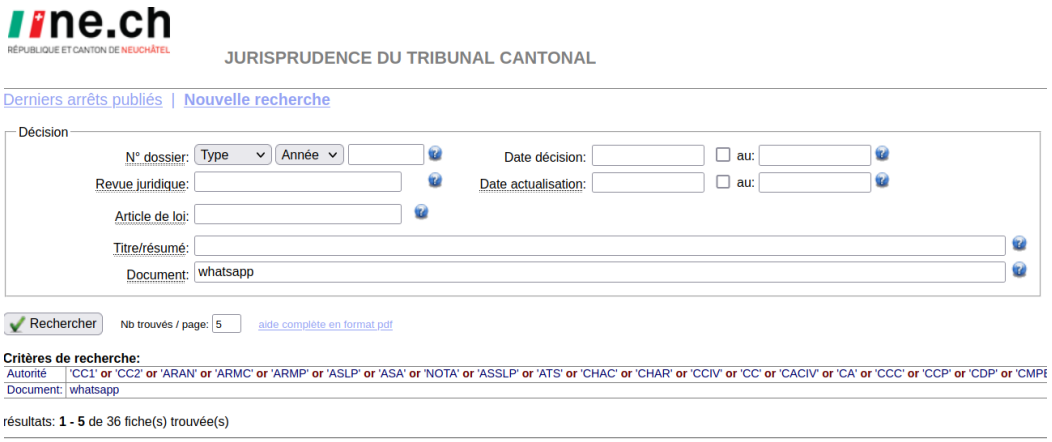
- Alice’s certificate must have been recently sent to Bob or someone Bob knows! Unlikely.

Is deniability used?
Court cases in French-speaking Switzerland

- Openly accessible case data.



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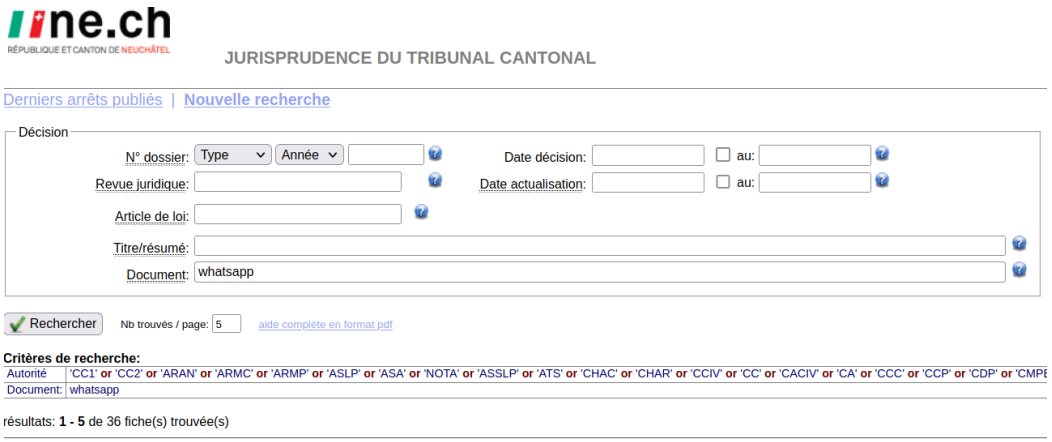
- Openly accessible case data.
- No mention of Signal.



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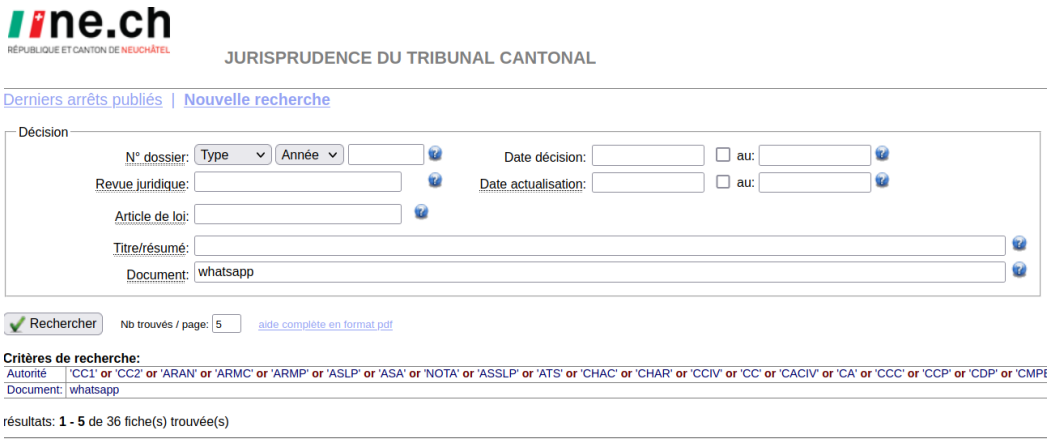

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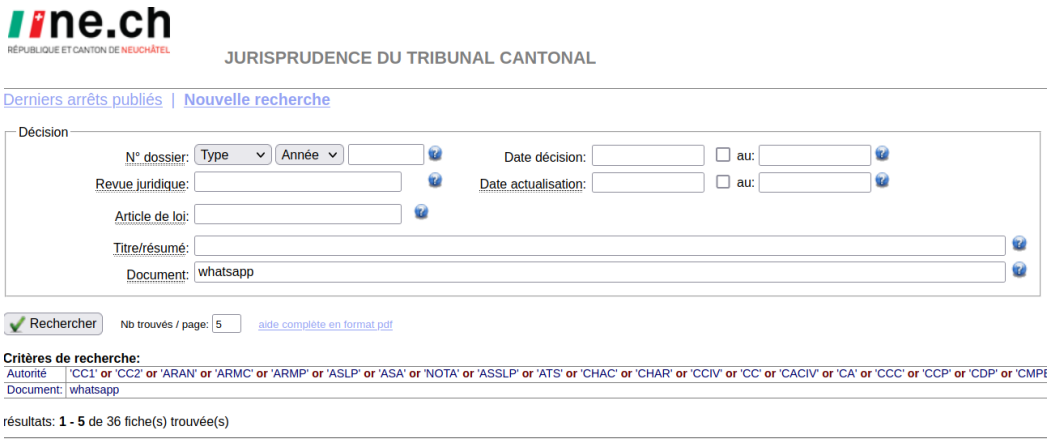
- Lots of mentions of WhatsApp.
- One failed challenge to a transcript's validity.



Is deniability used? Court cases in the US

- Signal in high-profile cases (United States v. Rhodes et al., United States v. Jarret Crisler…)

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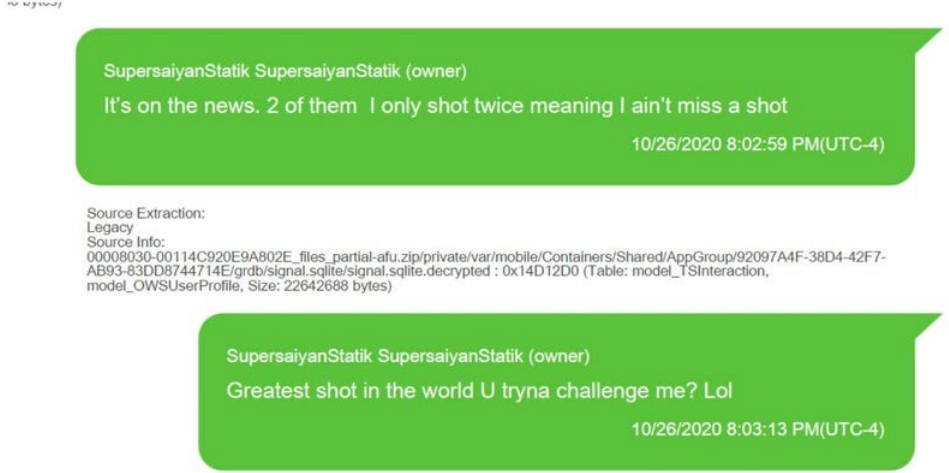
- Signal in high-profile cases (United States v. Rhodes et al., United States v. Jarret Crisler…)
- Seemingly uncontested.



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- Forgeries/false testimony disincentivised due to being illegal.

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- Phones reveal a lot to a judge.
- Parties can claim tampering, but depends on technical ability and not easy to explain.

A possible solution

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- [RMAMM23] suggests it could improve deniability!

Do we even want deniability?

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- Cons: Could protect people.
- Practical deniability amplifies *both* of these aspects.

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- Signal/WhatsApp/...: phone numbers aren't too deniable.
- Practical/explainable deniability is better.
- Minimise metadata/auxiliary information (Signal is the best here).
- Anonymity may be better for some applications.

Let’s continue the debate!
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References

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