Progress on: draft-ietf-keytrans-architecture

Brendan McMillion
IETF 119 / March 20, 2024

Adopted!

Feedback from IETF 118

- How would Sealed Sender work?
- Do we say anything about federation?
- Lifecycle management
- Compliance with privacy laws
- Disagreement about privacy properties

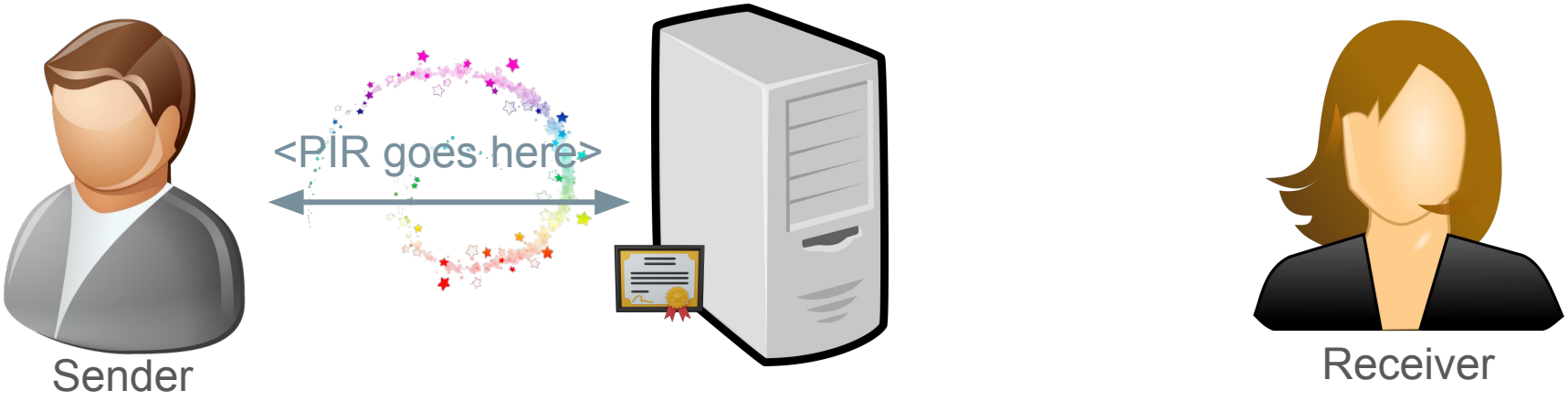
Changes since IETF 118

- ✅ Support for anonymous end-to-end encryption
- ✅ Discussion of federation
- ✅ Recommendations for lifecycle management
- ✅ Compliance with privacy laws
- ✅ New privacy properties

Anonymity

How does anonymous e2ee work?

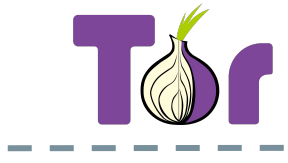
1. Sender gets a receiver's credential (potentially in an expensive way)

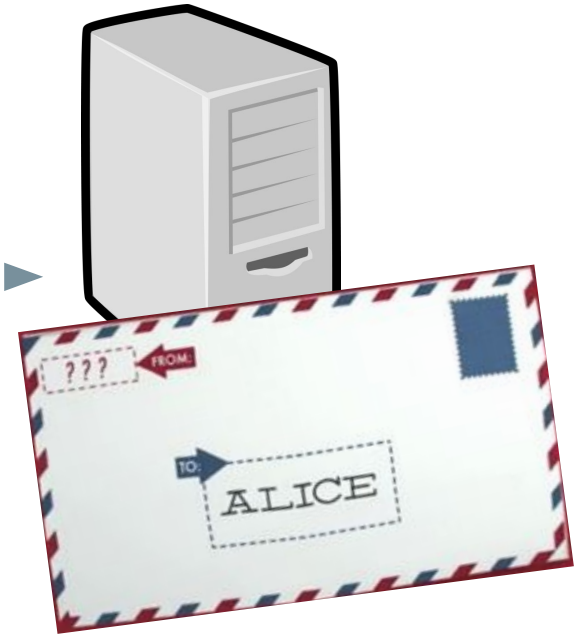


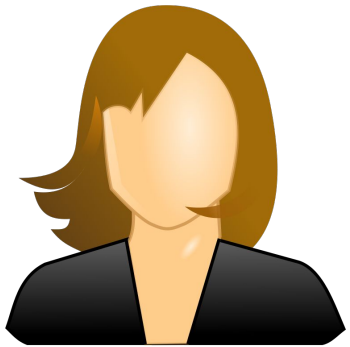
How does anonymous e2ee work?

2. Sender sends their own credential, encrypted, over a much cheaper anonymous channel

Sender







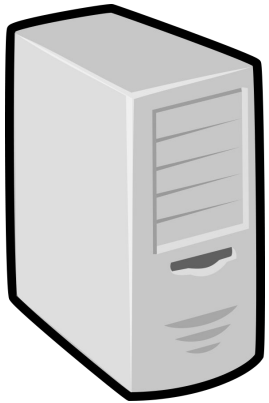
Receiver

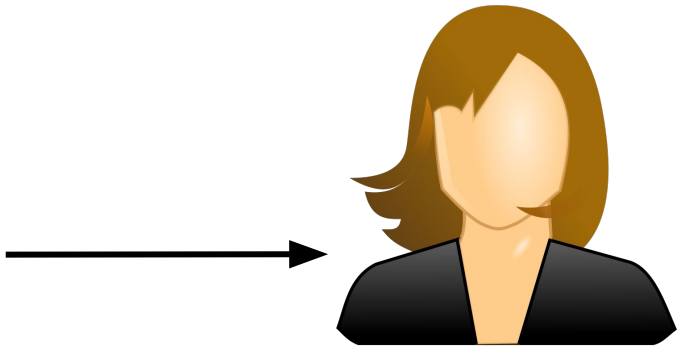
Encrypt( ,  || “Hi!”)

How does anonymous e2ee work?

3. Receiver downloads and decrypts (no anonymous channel needed)

Sender





Receiver

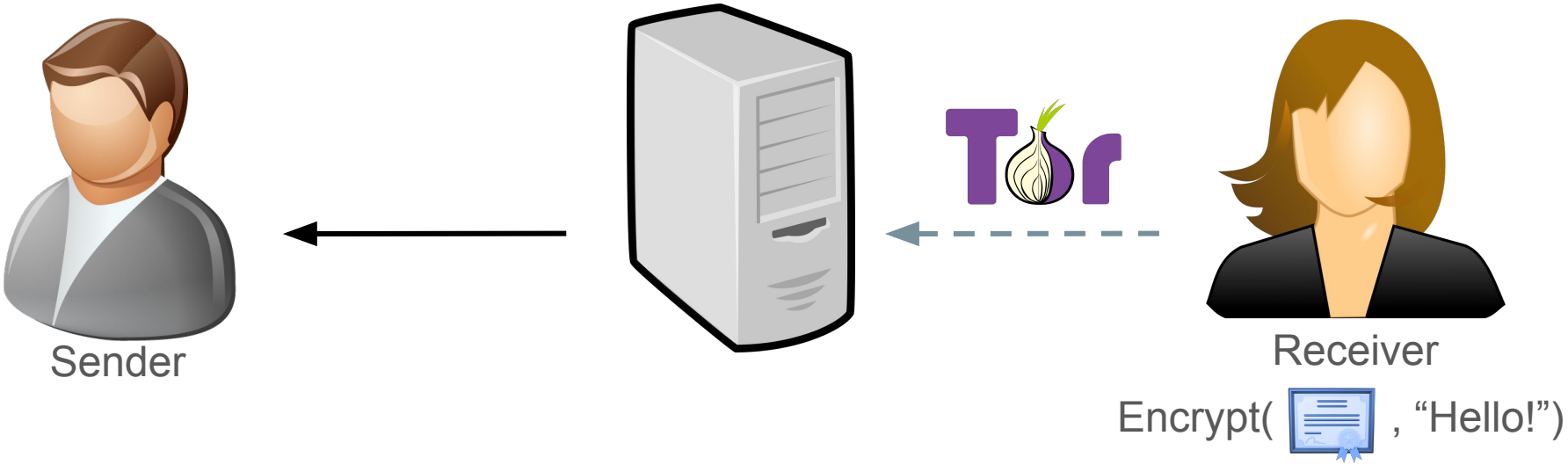
|| “Hi!” = Decrypt(

,

)

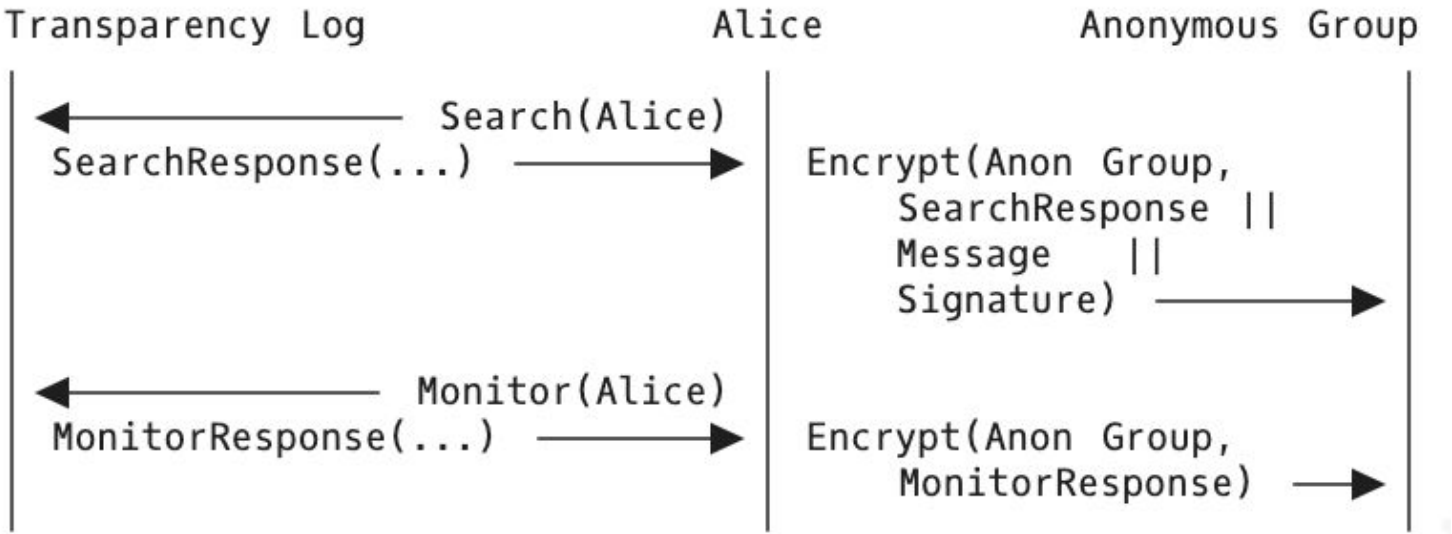
How does anonymous e2ee work?

4. Receiver responds (optional)



Adjusting KT to fit this pattern

- **Problem:** KT is an interactive protocol.
- **Solution:** Make users an anonymizing proxy for looking up their own public key



Federation

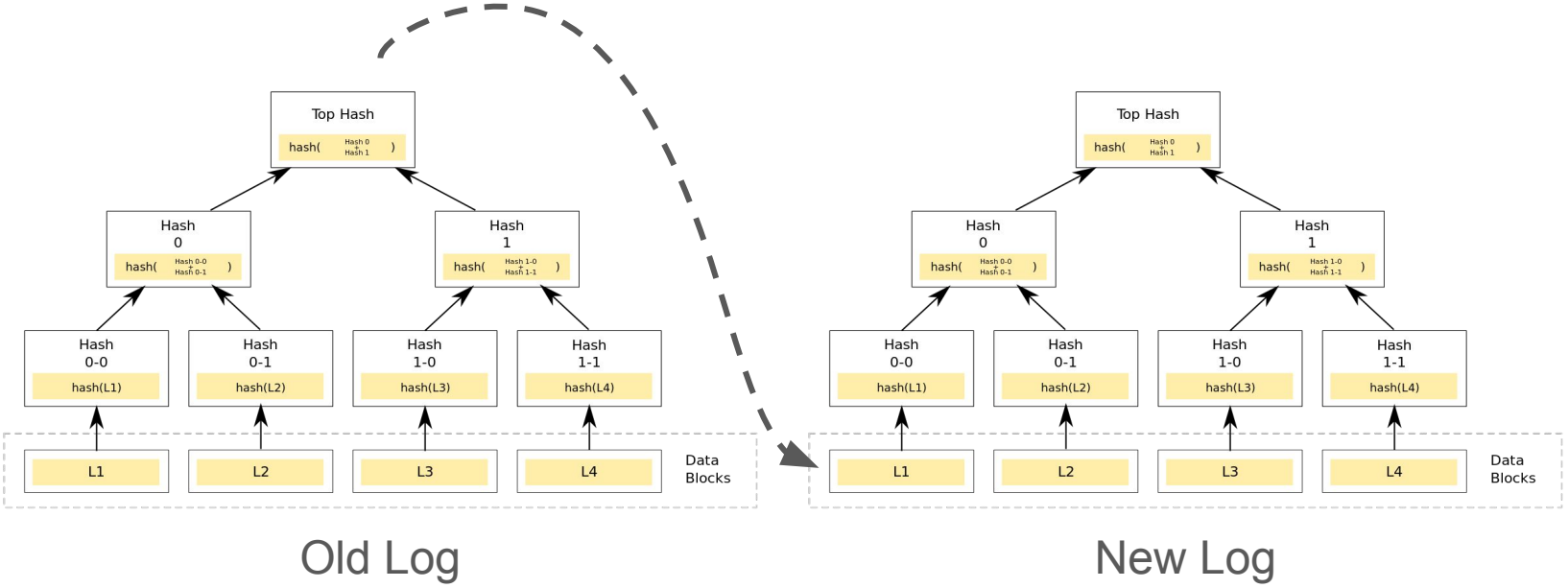
Rules for Federation?

- Generally just one: ensure lookup keys are properly namespaced (@domain.com)

- Secondarily: If you want to protect the privacy of your users, act as an anonymizing proxy (à la OHTTP) rather than mirror other federation members' logs
  - Minimizes privacy concerns

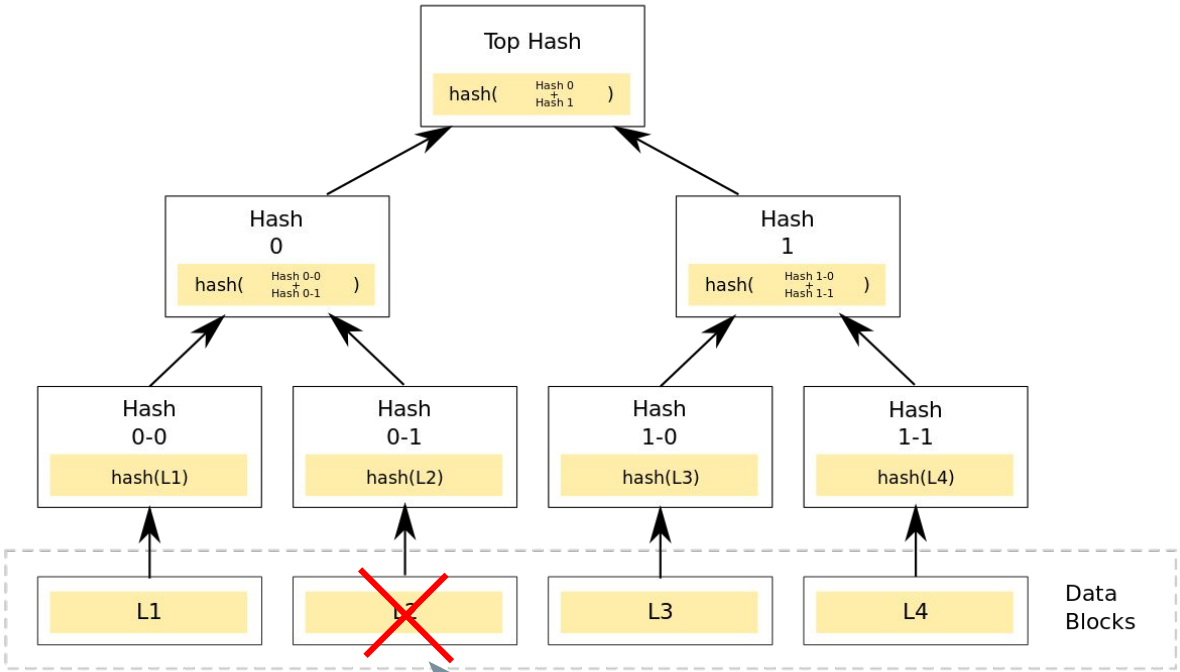
Lifecycle Management

Migration



- Pre-populate new log
- Store final root hash of old log in new log
- Allow clients to finish their monitoring of the old log

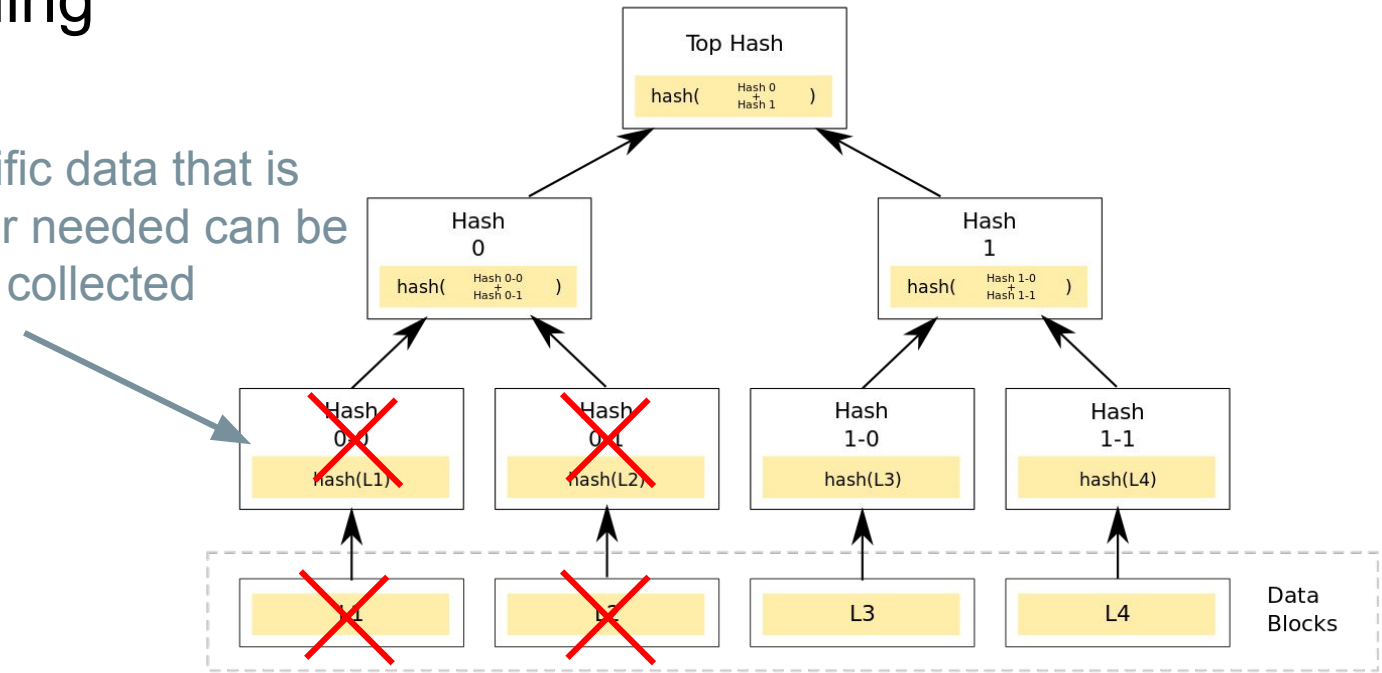
Pruning



User data that is not needed by the application can be deleted freely

Pruning

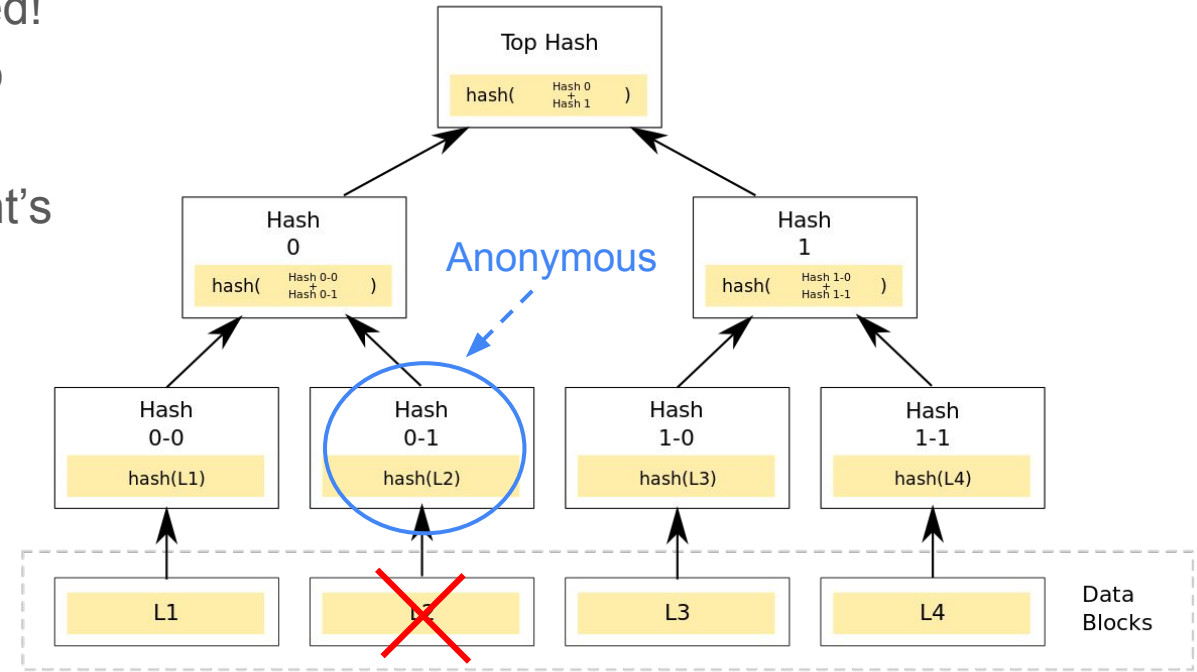
KT-specific data that is no longer needed can be garbage collected



Privacy Law

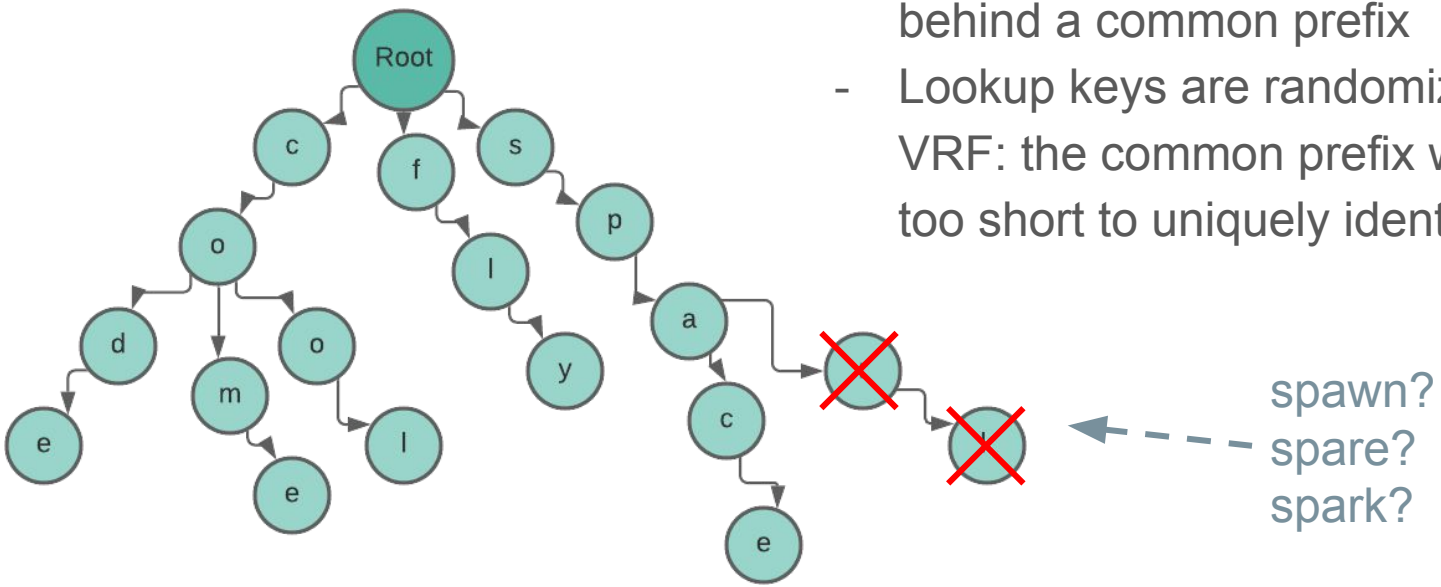
User DATA

- User data can be pruned!
- We will MAYBE need to retain a commitment
- Without the commitment's opening, leaks nothing



User NAMES

- Lookup keys (usernames, phone numbers) will likely be stored in some kind of prefix tree
- This can be pruned as well, but leaves behind a common prefix
- Lookup keys are randomized with a VRF: the common prefix will likely be too short to uniquely identify anyone

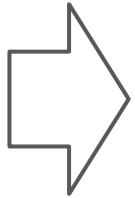


Privacy

Before:

- No padding / storage overhead
- Outside observers see:
  Users < 2^256
- Third-party Auditor CAN tell whether an update creates a *new* lookup key or updates an *existing* lookup key

Better for service operator



After:

- Requires padding initial userbase with fakes (maybe 100GB overhead)
- Outside observers see:
  Users < 2^32 (Maybe 2^31?)
- Third-party Auditor CAN'T tell whether an update creates or changes a lookup key

Better for individual users

The End