Distributing Authenticated Mappings

Keys, policies, binaries, and more

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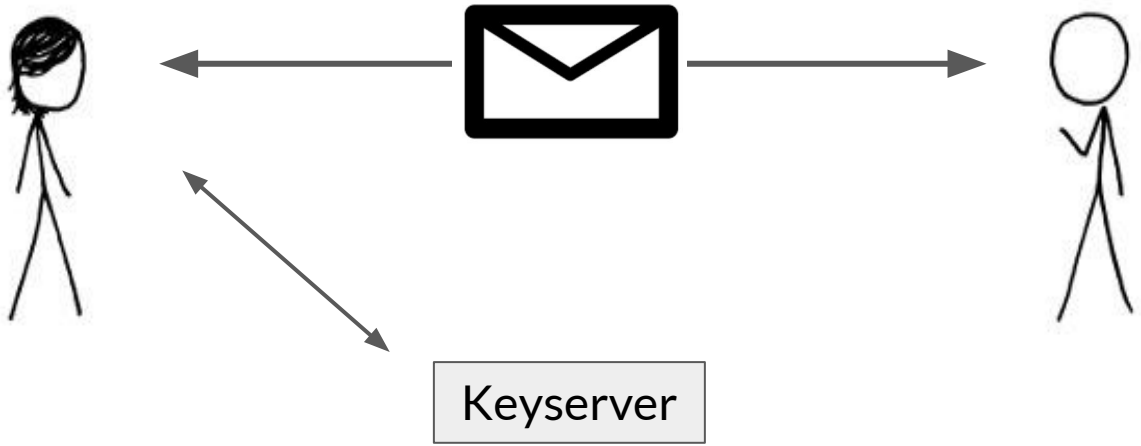

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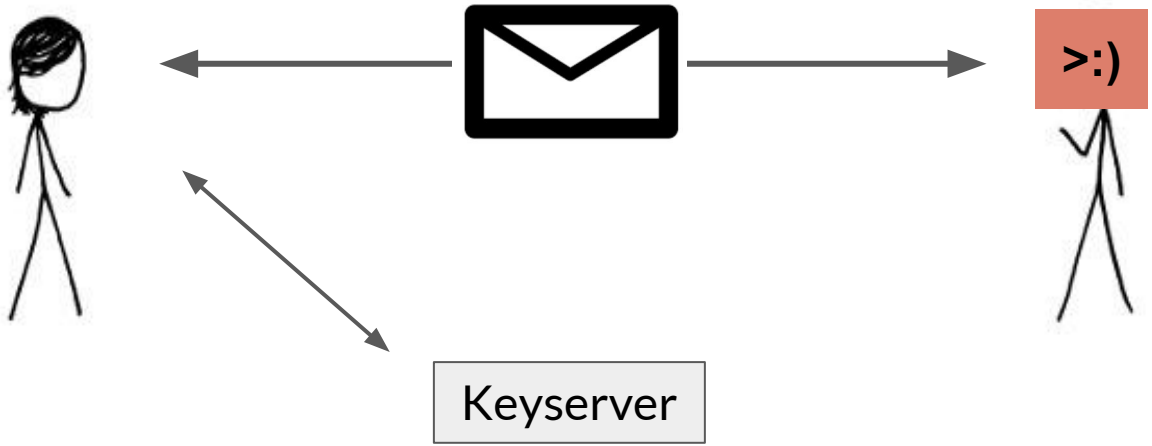

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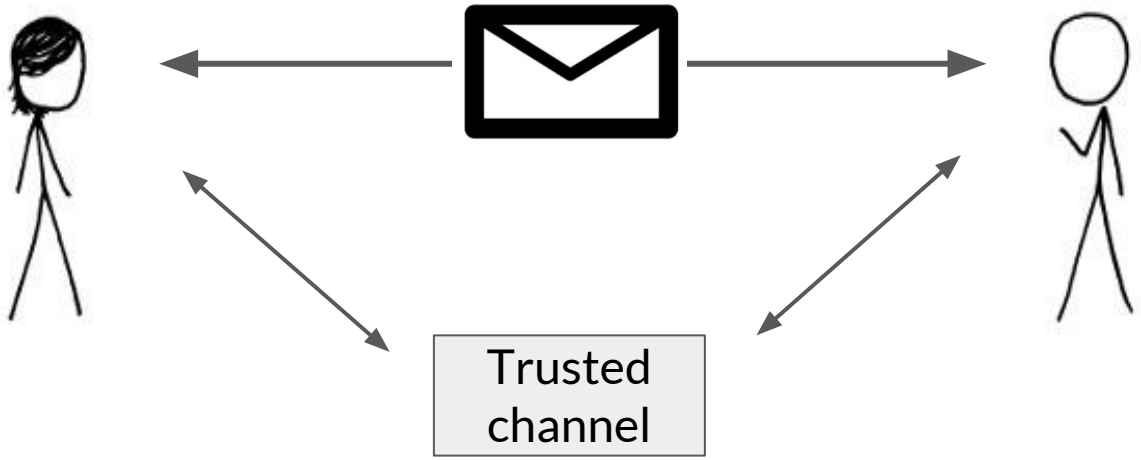

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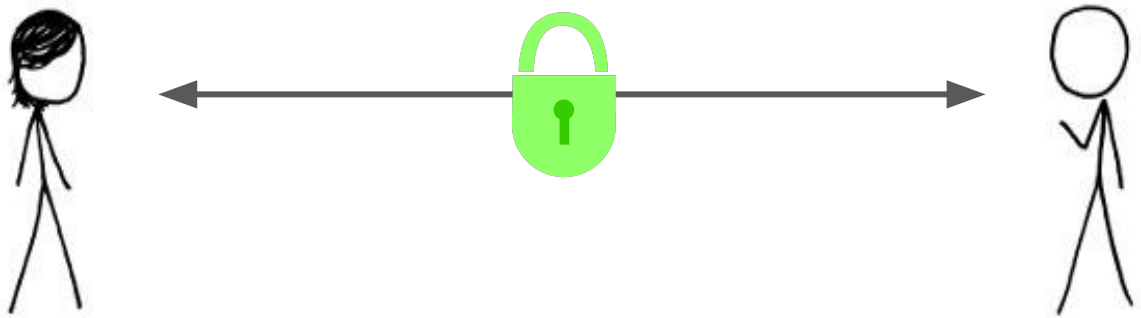

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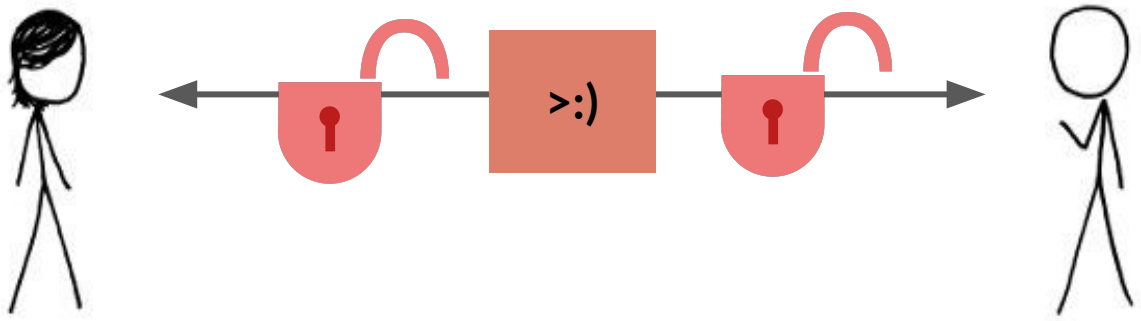

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- DNS
  DNSSEC yet to see widespread adoption

What the Internet needs

Authenticated mappings!

Problem

Name mappings

Policy mappings

Certificate mappings

Binary distribution

Public key mappings

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Problem	**Solution**
Name mappings	DNS (+ DNSSEC)
Policy mappings	HSTS preload lists
Certificate mappings	CA trust chains + CT
Binary distribution	package lists / bin. transparency
Public key mappings	Trusted keyservers

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Authenticated mappings!

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Many solutions based on *incorrect assumptions of trust*, *aren't scalable*, or *aren't generalizable*.

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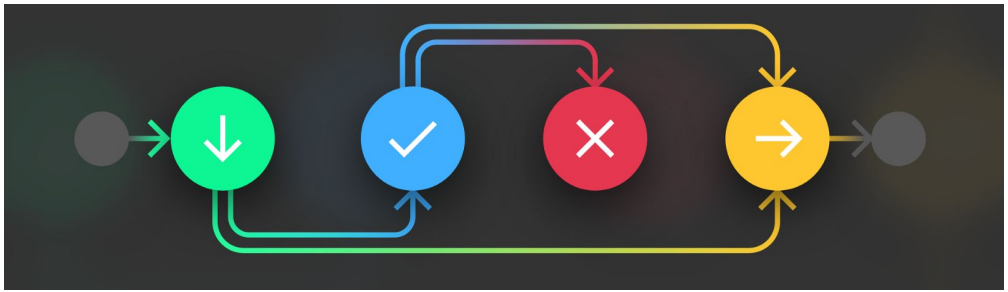

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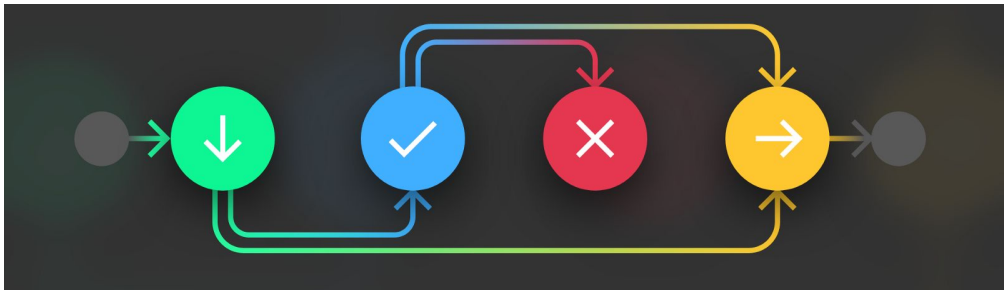
- Well-formed transitions
- Transparent



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Problems

- Why should CAs care about your binaries?
- How do CAs know how to enforce semantics for binaries?

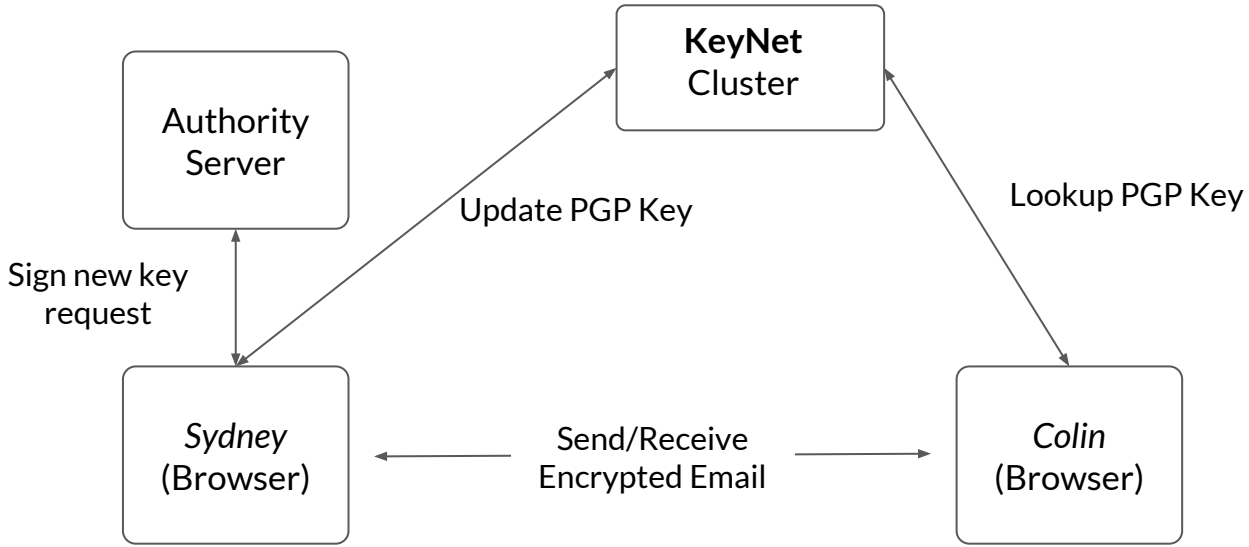
Option 2: Byzantine Fault Tolerant Cluster

Set up a number of PBFT nodes and distribute mapping database.

- Enforce append-only and transition semantics via traditional consensus
- **KeyNet**

KeyNet

- Distributed key-value store for OpenPGP-standard keys
- Rerouted Mailvelope on the front end to sign and send emails



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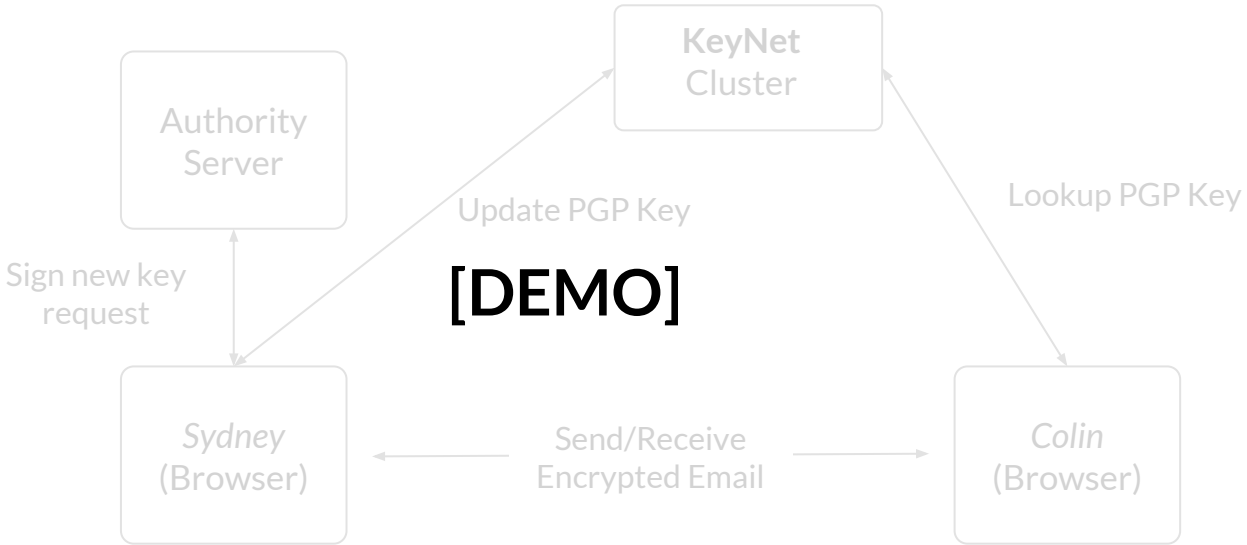

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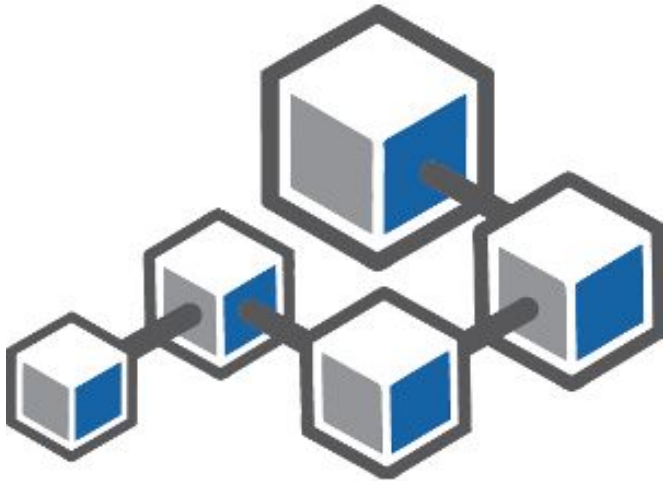
Problem: limited participation

- Uniform set of incentives undermines security

Option 3a: Proof-of-Work

Gets us almost there!

- We can create an append-only log
- Anyone can participate and enforce transition semantics
- Maturing technology



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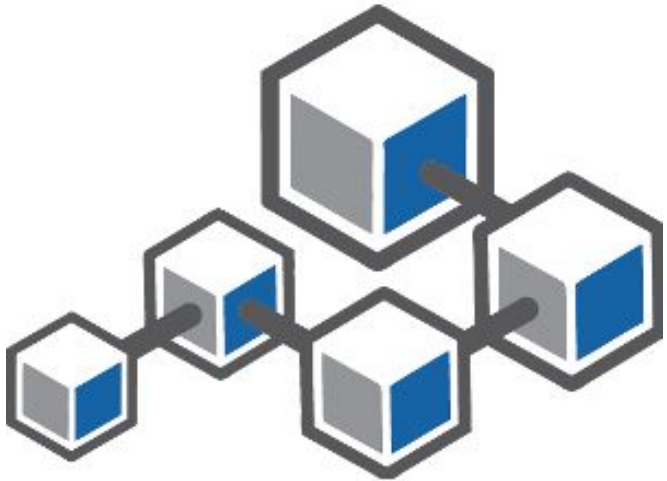
- No accountability
- Trust is tied to hash power
- Environmental cost



Option 3b: Proof-of-Stake

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Problem: Yet another incentive mismatch: trust is tied to money

Option 4: Federated Byzantine Agreement

Combines safety guarantees of BFT with open membership of PoW/S schemes

- Allows actors with different interests to participate and enforce transition semantics
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Trust in the network is tied to real-world relationships

- Rely on interdependence to ensure security
- Malicious behavior risks reputation

Open Problems

Bootstrapping and interoperability

Privacy

Scalable data structures

Defining well-formed updates (contract language)

Next Steps

How can DIN help?

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Let's standardize the way we distribute trust at scale:

1. Specs for describing transition semantics
2. A distributed protocol for enforcing these rules

Questions?