Gossip is used to disseminate membership changes:

- How can we trust it?
- Can we improve the convergence time simultaneously?

- Node 1 is dead!
- There are 1337 new nodes!

### Crash Faults vs. Byzantine Faults

- Crash faults
- Byzantine faults

#### Byzantines in the cloud?

- Crash faults
- Byzantine faults

- Arbitrary failures, including malicious attackers.

Can We Trust The Proxy?

- Proxy: The answer is [Whatever I want]
- Solvable by applying signatures:
  - Where?
  - Public or Symmetric?
  - RSA or ECDSA?
  - Should the proxy verify them or pass them as-is to the client?

Can We Trust The Clients?

- What can they do?
  - Partial writes
  - Split-Brain-Writes
  - Delete data

- Can we distinguish the good from the bad?

1. Assume no Byzantine clients.
2. Ensure a consistent state.
3. Repair the system when conflicts observed.

Correct clients cannot observe an inconsistent state.

Can We Trust Gossip?

- Gossip is used to disseminate membership changes:
  - How can we trust it?
  - Can we improve the convergence time simultaneously?

- Synchronize periodically in the background (anti-entropy).
- Cross-validate old values. The right to be forgotten!

Can We Trust Deleting?

- 6 6 6

### Correctness

- Open Source
- Distributed
- Highly adopted:
  - NoSQL
  - Very Scalable

- Google BigTable
- Amazon DynamoDB
- Facebook Cassandra
- Apache

- eBay
- Reddit
- Netflix
- Spotify
- GitHub

### Solvability

- Where?
- Public or Symmetric?
- RSA or ECDSA?
- Should the proxy verify them or pass them as-is to the client?

### Correct Clients

- 6 6 4

- Write 6
- Read ?

### Byzantine Quorums

- N=2f+1, W=f+1, R=f+1
- Byronm Quorums: N=3f+1, W=2f+1, R=2f+1

### Can It Be Fast?

- What can they do?
  - Partial writes
  - Split-Brain-Writes
  - Delete data

- Can we distinguish the good from the bad?

1. Assume no Byzantine clients.
2. Ensure a consistent state.
3. Repair the system when conflicts observed.

Correct clients cannot observe an inconsistent state.

- 50% slowdown using ECDSA covered by symmetric signatures vector