Circumventing online censorship with biton

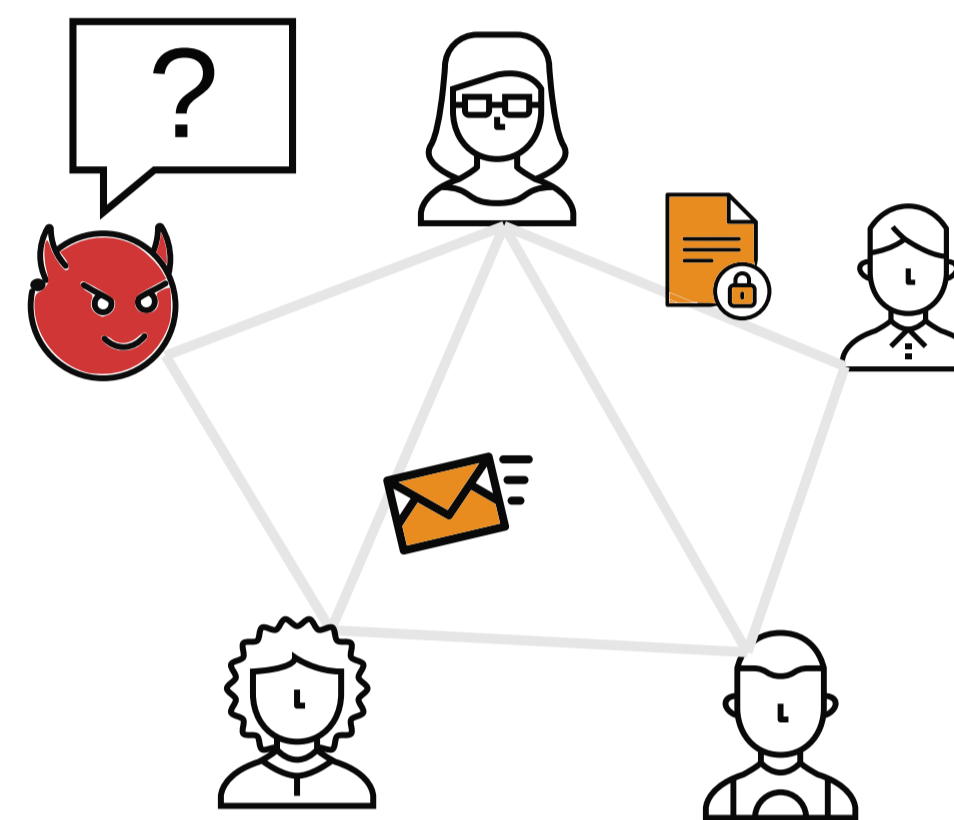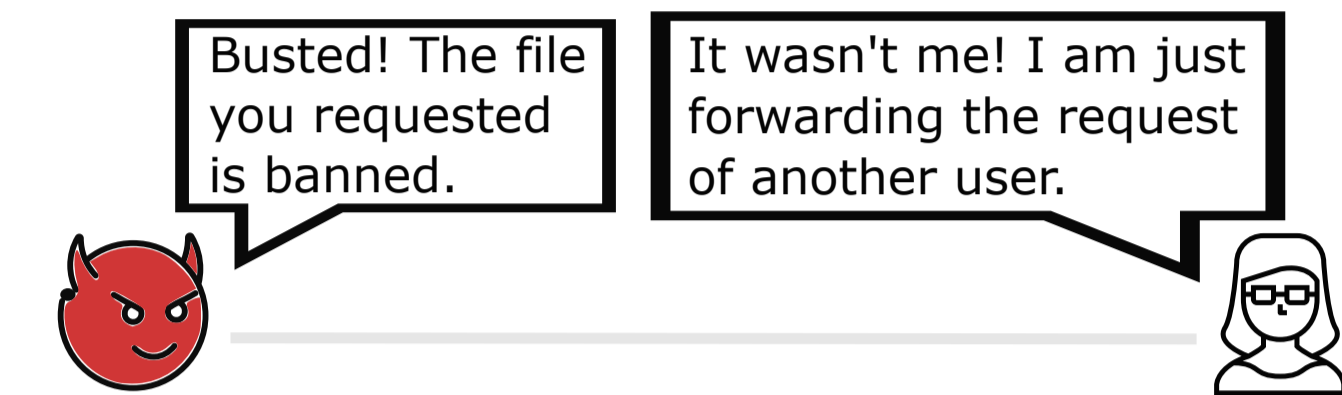Marios Isaakidis   Ian Goldberg   George Danezis

biton is a decentralized network against censorship and surveillance of our online activity.

Users connect directly with each other over encrypted BitTorrent connections. They can share files and route traffic through other users, while network operators cannot identify or block their requests.
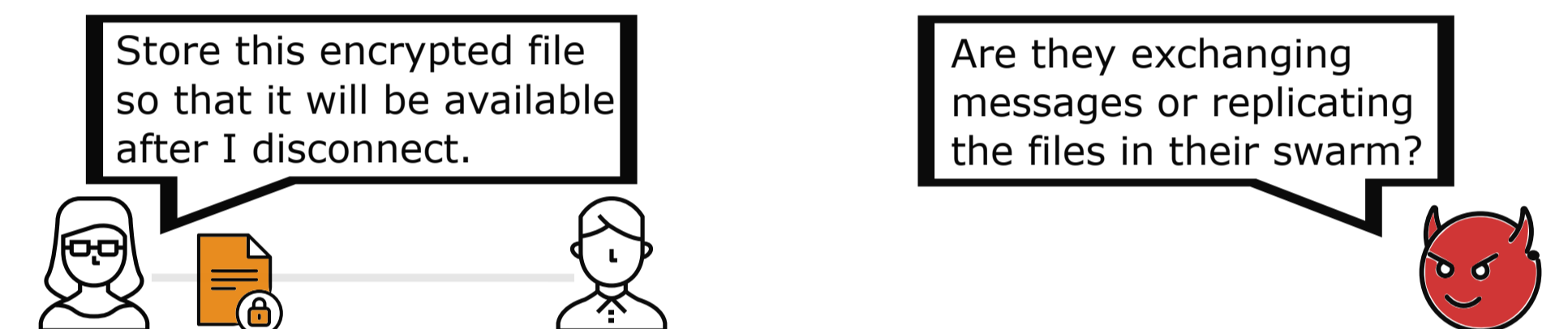
- Static content is retrieved from the decentralized cache
- Replication protects metadata about user activity
- Routing messages and traffic through others,
  e.g. through users with access to the uncensored Internet,
  does not expose the identities of the sender or recipient
- biton can be deployed over community networks,
  and in that way function during Internet shutdowns

The biton overlay network

We consecutively split the biton address space and map each partition at each level to a BitTorrent swarm. Users connect to swarms that match a prefix of their biton address. Routing across swarms follows the Content Addressable Network design.

BitTorrent swarm
(users sharing a torrent)

Users connect to swarms that match
a prefix of their biton address

biton address space
at three levels of partitioning

- Same addressing mechanism for storing content and proxying traffic
- The overlay can scale, as users connect to swarms matching longer prefixes
- Direct connections to friends across remote swarms improve routing efficiency

Caching and proxying with plausible deniability

> Busted! The file you requested is banned.

> It wasn't me! I am just forwarding the request of another user.

Adversaries cannot eavesdrop on peer-to-peer links, and therefore cannot trace requests back to the original sender.

> Store this encrypted file so that it will be available after I disconnect.

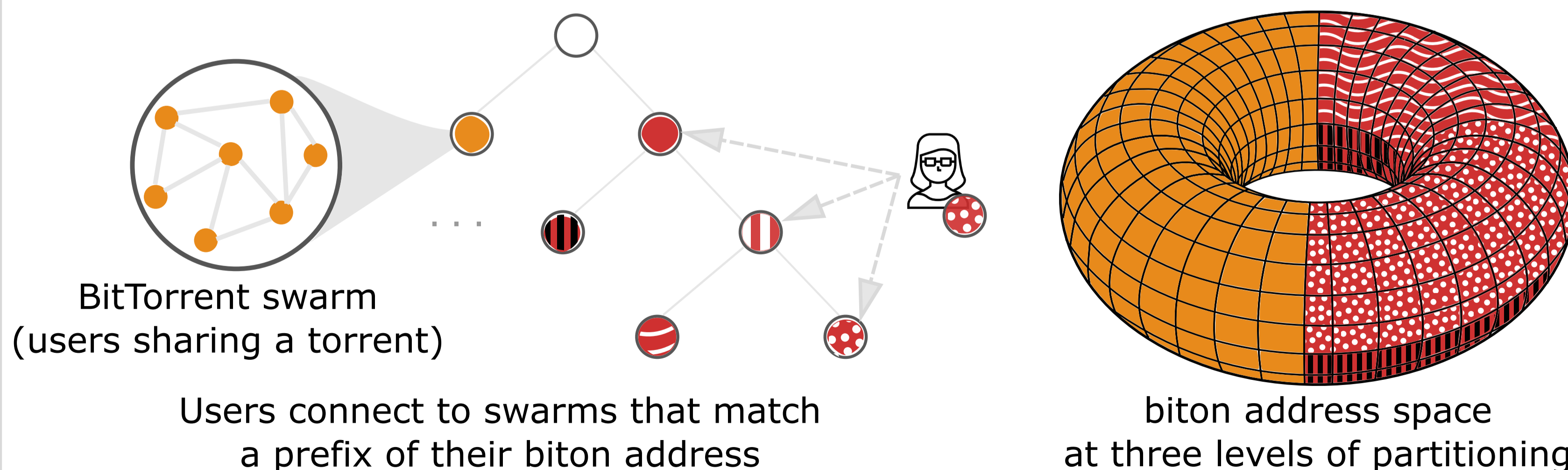> Are they exchanging messages or replicating the files in their swarm?

Storage replication serves as cover traffic. Files are stored with redundancy within the swarms that match their biton address prefix.

> Forward this message to a swarm that is closer to the recipient's biton address.

Users are reachable by their biton address.
biton provides a scalable strategy for handling incoming requests.

Why BitTorrent connections?

- Long-lived, encrypted, high speed connections
- Incentives for contributing resources, prioritzing rare files etc.
- Facilitates decentralized peer discovery
- Wide adoption means high collateral damage if censored
- Supernodes improve performance and cached content lifetime

https://bitonproject.org

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