

Digital Sovereignty

Collective + Personal

Autonomy + Control
over

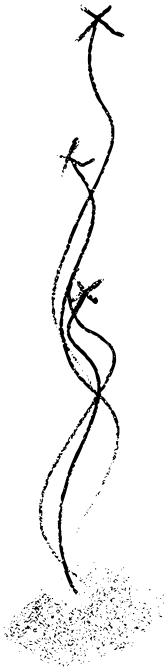
Technologies = open hw+sw - study+modify
bounding complexity } composable+reusable

Infrastructure - autonomous { servers, networks

Data { replication for offline access
sync+merge for collaboration

Algorithms - search+sort+display data

Identities - self-sovereign



Unikernels

unikernel.org

specialised single address-space machine images

constructed by

library operating systems

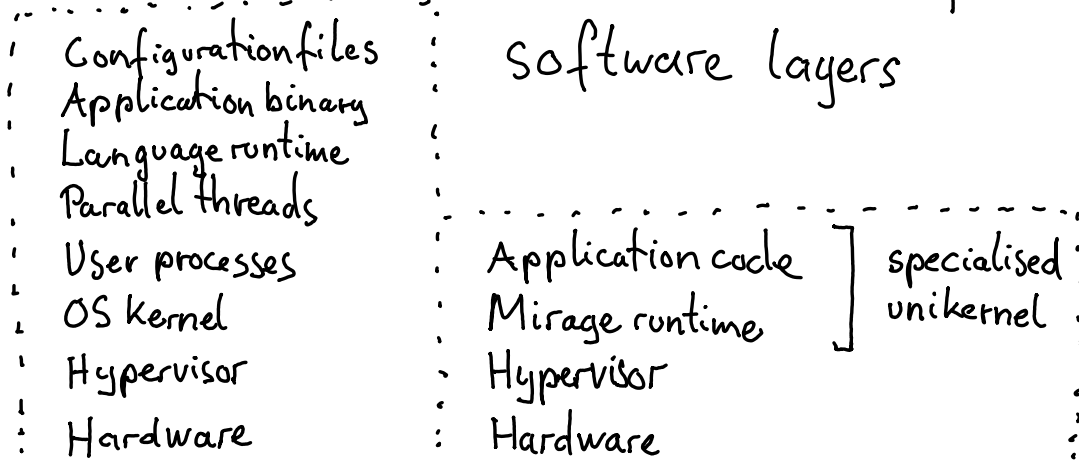
such as

MirageOS (OCaml)

mirage.io

reduced complexity, attack surface, resource footprint

solos - sandboxed execution environment for unikernels



Irmin

irmin.io

distributed database based on the principles of Git
implemented as
OCaml library
for building
mergeable persistent data structure stores
accessible via HTTP and GraphQL
with
Mirage OS compatibility

key-value store - content-addressable block store + mutable tag store
history, branches, trees - like Git

built-in + custom data types + 3-way merge functions

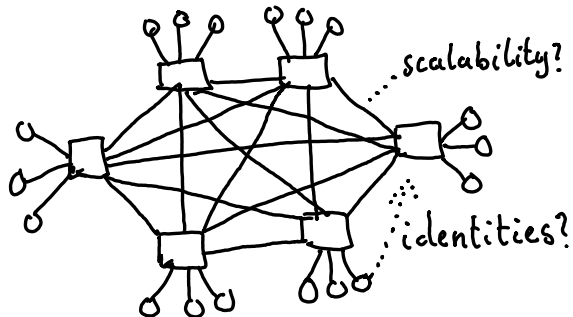
counter, multi-set, set, map ↓

↳ CRDTs - conflict-free merge

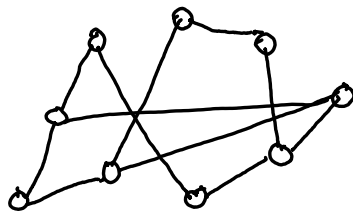
backends: mem, chunk, git

Network Architecture

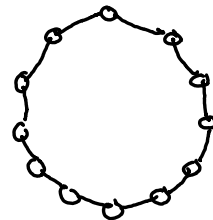
Federated servers



P2P network



unstructured
e.g. gossip



structured
e.g. DHT

NAT?
resources?

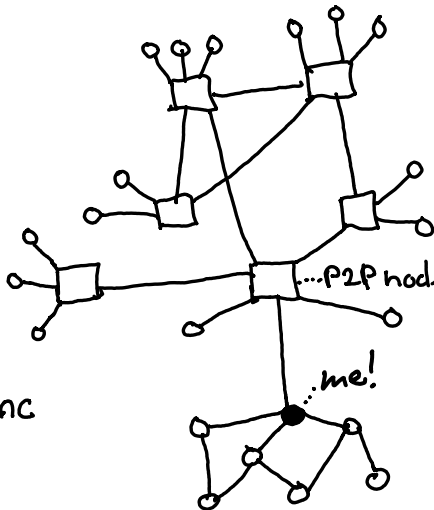
Two-tier P2P

resilient,
autonomous
infrastructure

replication

offline/local use

opportunistic sync



P2P among proxy servers

- pub/sub + data replication
- search + discovery
- collaborative filtering
- news dissemination

...P2P node + proxy
inbox + storage - encrypted

P2P among local nodes

P2P network

P2P Proxy

encrypted content-addressed object store

DB: sync+pubsub encrypted access control

Apps: self-contained sandboxed local offline access+search

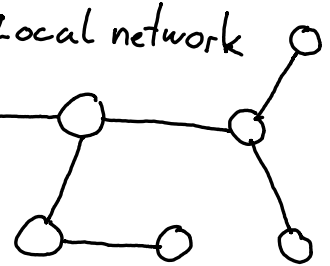
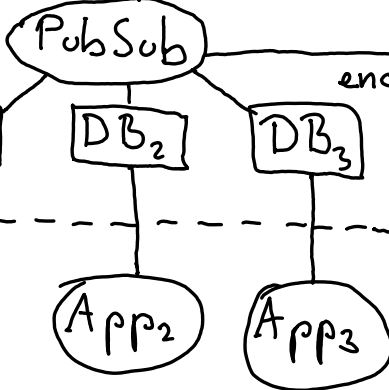
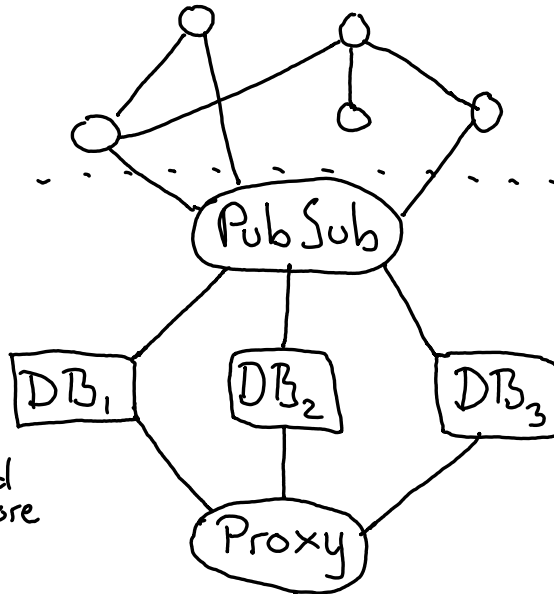
User device

Irmin + App Graph QL

UI

encryption keys

Local network



P2P Publish-Subscribe

Poldercast

Uniform Random Peer Sampling

CYCLON+URPS

Interest-based clustering

VICINITY+BFPSI

Group dissemination

Ring Cast

P2P Search+Discovery

Personalized
Interest-based

Collaborative Filtering

Tagging, Rating

News Dissemination

Search

user/item profiles

privacy

References

p2pcollab.net { research
development
discussion
contact

mirage.io

irmin.io

unikernel.org

Technological sovereignty

Review Article:

What does the notion of "sovereignty" mean
when referring to the digital?
S. Couture, S. Toupin - 2019

Book:

gitlab.com/sobteclib

