Decentralised Storage

Agenda

- Decentralisation
- Offerings
- Practical

Decentralisation

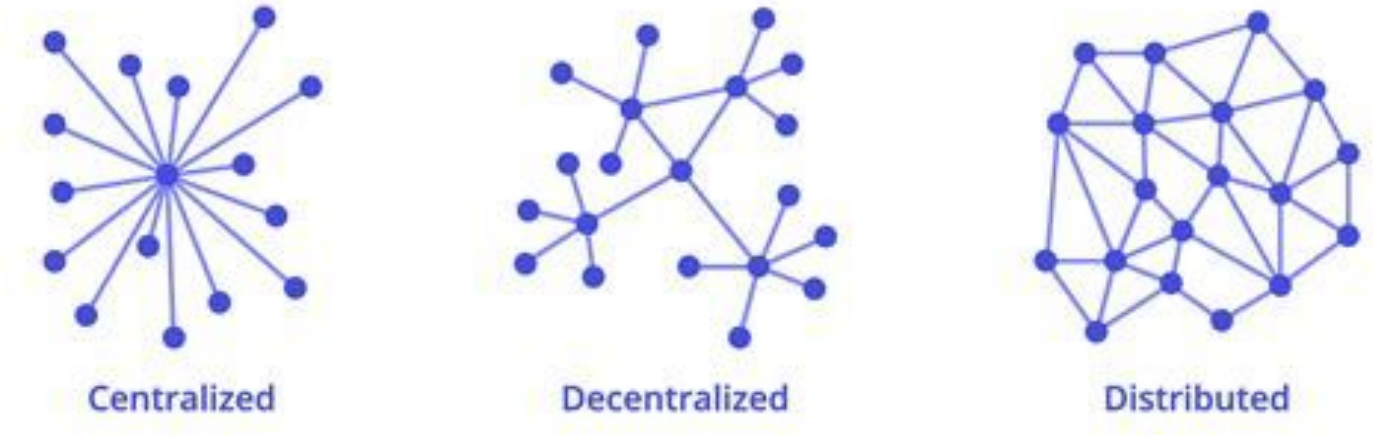
- Transfer of authority from a central entity to a more distributed system.
  - Social e.g. board of directors, shareholders
  - Economical e.g. Crypto
  - Computational e.g. Cloud computing

Decentralisation

- Term used and applied liberally in blockchain technologies and applications.
  - Decentralised...
    - Finance (DeFi)
    - Computing power (Ethereum)
    - Storage (Storj, IPFS)

Decentralisation

- Decentralised != Distributed
- Decentralised systems still contain some ‘gatekeepers’
  - Oracles
  - Bootstrap nodes



Decentralisation - Distributed systems

- CAS (complex adaptive systems)
- ‘Self-aware’
- Swarm robotics
- Prevalent in nature
  - Beehives
  - Ant colonies
  - Flocking birds

Decentralisation Benefits

- Reduced honeypot
  - Facebook Cambridge Analytica (Up to 87M user data leaked)
- More reliable access to data
  - P2P file sharing (BitTorrent, LimeWire, Pirate Bay)
- Shared governance to prevent benefitting the few
  - Open-source software projects e.g. Bitcoin, Ethereum, VLC media player, Linux...

Decentralised Storage

- Several competing technologies
  - Similar in end goal
  - Differentiating mainly by:
    - Incentivisation schemes
    - Platform and language implementation (mobile / browser / NodeJS / Go...)
    - Pricing
- Relatively new field
  - Use cases still being discovered (https://nft.storage/)
  - Financial models still being trialled
  - Projects may not be reliable for long-term business use
  - Space for new concepts

Offerings

SAFE NETWORK	0CHAIN	Ocean	Swarm	STORJ
- Developed by MaidSafe - 14 years in development - Will run from home computers - Safe Network Tokens used for incentives - Still a way off full release: https://safenetwork.tech/roadmap/ - More info: https://safenetwork.tech/	- 0Stor for private sharing - 0Box for anonymous sharing - Focus on privacy compliance - More info: https://0chain.net/	- Compute-to-data model to keep data private - Data marketplaces to buy/sell data - ERC20 tokens used as basis for Ocean datatokens - More info: https://oceanprotocol.com/	- Decentralised storage and communication built directly into Ethereum - Uses smart contracts for incentive system - Under development - More info: https://swarm.ethereum.org	- Defaults to encrypted storage - 80% cheaper than “big cloud storage providers” - Token on Ethereum - More info https://www.storj.io/

Offerings

Sia	Filecoin	IPFS	More...
- Decentralised storage network on underutilised hard drive capacity - Data storage marketplace using Siacoin for incentives - Proof of Work and Proof of Storage algorithms used to validate stored data - Custom ASIC chips - Rules and requirements defined with file contracts (akin to smart contracts) - 3 PB of storage, about 30% utilised - 90% cheaper than AWS - More info: https://sia.tech/	- Decentralised storage network using the IPFS protocol - ICO September 2017 - $250 million - Incentivise with unused storage to participate with FIL token - Proof of Space and Proof of Replication - Price ~90% cheaper than AWS - More info: https://filecoin.io/	- InterPlanetary FileSystem by Protocol Labs - Hash addressing of content instead of location based addressing (IP) - Reduces bandwidth by collecting content from multiple nodes - Online and local/offline storage - Public/private - Censorship resistant - Completely free - More info: https://ipfs.io/	- Archon Cloud https://archon.cloud/ - TrustSQL https://trustsql.qq.com/ - Lambda https://www.lambdastorage.com/ - OneThing Cloud https://wky.onethingcloud.com/uk/site/index.html - TOP Network https://www.topnetwork.org/ - Internxt https://internxt.com/

IPFS - Further information

- Public or private networks
- Suite of tools
  - E.g. gateways https://ipfs.github.io/public-gateway-checker/
- Pinning services act as decentralised serverless storage
- Database available in the form of OrbitDB (https://orbitdb.org/)

Similarities to permissionless blockchain:

- Decentralised*
- Immutable
- Consensus-driven
- Open (-source, -access)

Differences:

- Different storage (data stored locally will differ)
- All submissions are valid (CID might match, but addition of file still logical)

EXTROPY.IO

Practical Section

- NodeJS functions to store and retrieve some text using IPFS.
- NodeJS Express web with above functionality.
- Additional image add/removal.

- IPFS can run in a browser or locally making it very flexible. We are looking at the NodeJS implementation.
- Using IPFS in NodeJS requires the ‘ipfs’ dependency.
- A local node is initialised, creating a gateway to the IPFS network.
- It’s possible to retrieve and store data to the network immediately - no registration or keys required other than those auto-generated on startup.
- Data are uniquely represented by their hashed content ID, which is referred to as a CID (**c**ontent **id**entifier).

Practical

See: **Homework 7 - Decentralised Storage**