

What is a DApp?

Agenda

- Traditional vs Decentralised Apps
- Examples
- App Development
- Exercise















Traditional Applications

- Centralised databases
 - Trusted
 - Hacks and server downtimes
- Not anonymous
- Easy to use
- Advanced tools

Fundamental DApp Architecture

- Blockchain-based application
 - Front end plus smart contract allowing human interaction
 - API accessed by a program with a smart contract to perform the calculations/storage
 - Query routing doesn't have to be decentralised - often is not
- Smart contract - program running on a blockchain
- API - Application Programming Interface
 - Weather
 - Movie
 - 'GET' examples to try out:
 - `curl https://jsonplaceholder.typicode.com/posts`
 - `curl https://jsonplaceholder.typicode.com/posts?userId=1`

Popular DApps

1		Uniswap V3	DeFi	ETH	\$3.57B	203.67k -4.29%	\$51.16B	
2		Uniswap	Exchanges	ETH	\$10.19B	313.52k -9.25%	\$46.74B	
3		Fei Protocol	DeFi	ETH	\$236.42M	1.52k +35.15%	\$25.04B	
4		SushiSwap	Exchanges	ETH	\$4.38B	76.91k +39.12%	\$14.58B	
5		Compound	DeFi	ETH	\$7.51B	3.98k -27.78%	\$12.34B	
6		Curve	DeFi	ETH	\$8.94B	7.17k -8.31%	\$11.69B	
7		dYdX	DeFi	ETH	\$427.15M	15.65k +21.60%	\$9.09B	

<https://dappradar.com/rankings/protocol/ethereum>

UniSwap V3 = Concentrated Liquidity, Active Liquidity, Range Orders, Non-Fungible Liquidity, Flexible Fees, Advanced Oracles, License

<https://uniswap.org/blog/uniswap-v3/>

Finance - DeFi: UniSwap

- Decentralised crypto trading protocol
- Exchange and liquidity pool
- Governed by UNI token holders
- Open protocols for developers to integrate

PROTOCOL ANALYTICS →



\$386B

Trade Volume

1.5M+


All Time Users

61M

All Time Trades

8,400+

Community Delegates



Finance - DeFi: AAVE

- Liquidity/staking pool
- Depositors provide liquidity to the market to earn a passive income
- Borrowers are able to borrow in an overcollateralised (perpetually) or undercollateralised (one-block liquidity) fashion

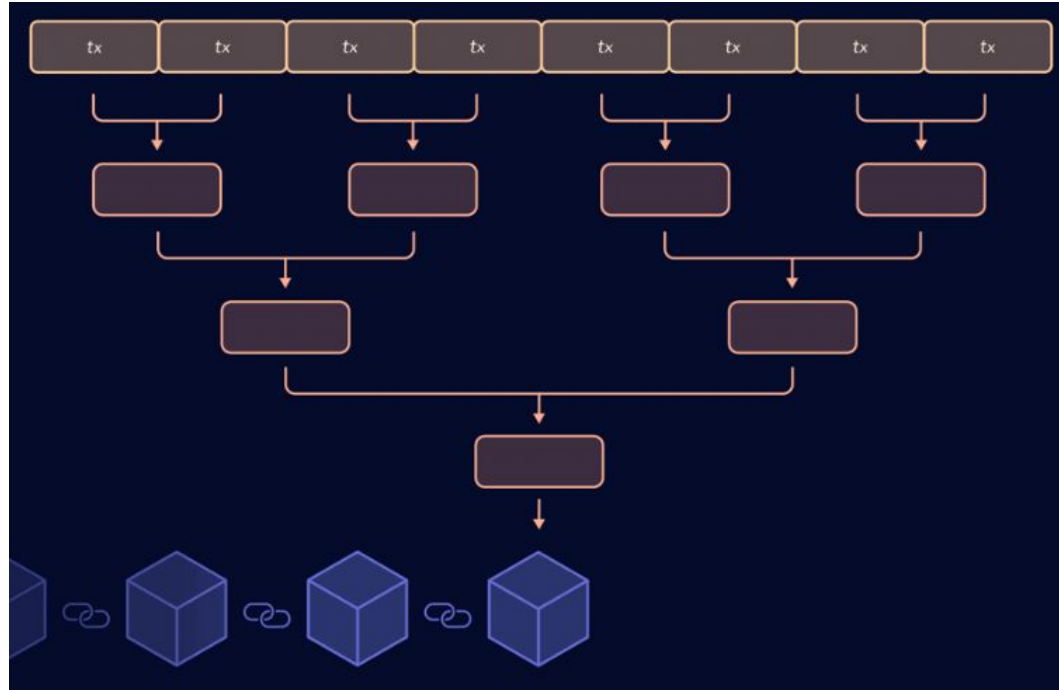
THE LIQUIDITY PROTOCOL

\$ 25,186,536,504.82

Aave is an open source and non-custodial liquidity protocol for earning interest on deposits and borrowing assets.

Finance - DeFi: IDEX

- Cryptocurrency exchange
- Promises solutions to failed trades, slippage and front-running
- V2 will operate with lower fees by using rollups on layer 2



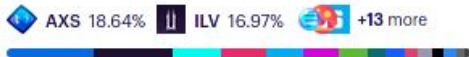
Finance - Asset management: TokenSets

- Ethereum and Polygon used for storing assets
- Yield farming
 - Generate yield by depositing assets into yield generating positions.
- Multi asset support
- Flexible trade execution



Metaverse Index

The Metaverse Index captures the trend of entertainment, sports, and businesses shifting to virtual environments.



DeFi Pulse Index

The DeFi Pulse Index is a capitalization-weighted index that tracks the performance of decentralized financial assets across the market.



ETH 2x Flexible Leverage Index

The ETH Flexible Leverage Index lets you leverage a collateralized debt position in a safe and efficient way, abstracting its management into a simple index.



Finance - Reward schemes: BAT

- Basic Attention Token
- Reward ad views with a token
- Seamlessly integrated into Brave browser crypto wallet

BRAVE WALLET



The foundation for mass adoption of **crypto** and **DeFi**



DeFi and **NFT** support



Buy crypto with credit and debit cards, crypto assets, and more



Manage fiat and crypto payment options on **desktop** and **mobile**

BRAVE DEX AGGREGATOR



DeFi for everyone



Multi-chain support and the **best price** with the lowest fees



Hold BAT and save. Receive **discounts** when using BAT for transaction fees.

DECENTRALIZED WEB



BAT utility for **search engines**



Utilize BAT with **eCommerce**



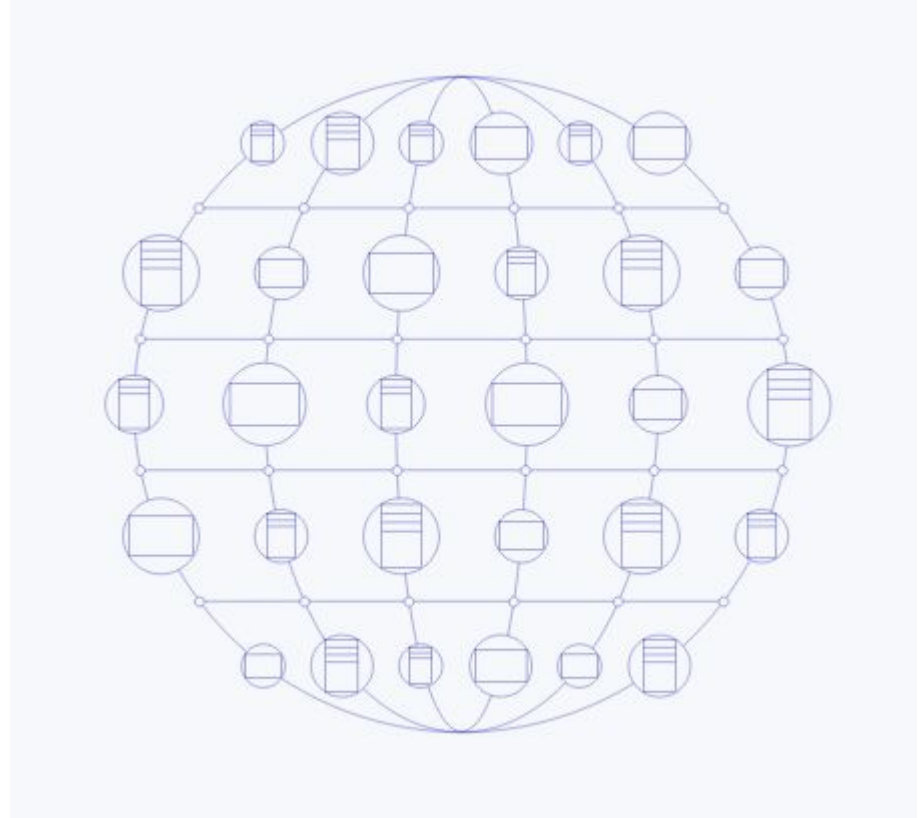
Rewards for **IPNS** verified content



Utilize BAT for content pinning and file sharing with **IPFS**

IT / Software: Golem

- Share unused computing power
- Unrestricted, proxy-free network
- Programmable platform to allow development
- Rewards in GLM token
- Network settlement built on Ethereum Layer 2 for cheaper transactions



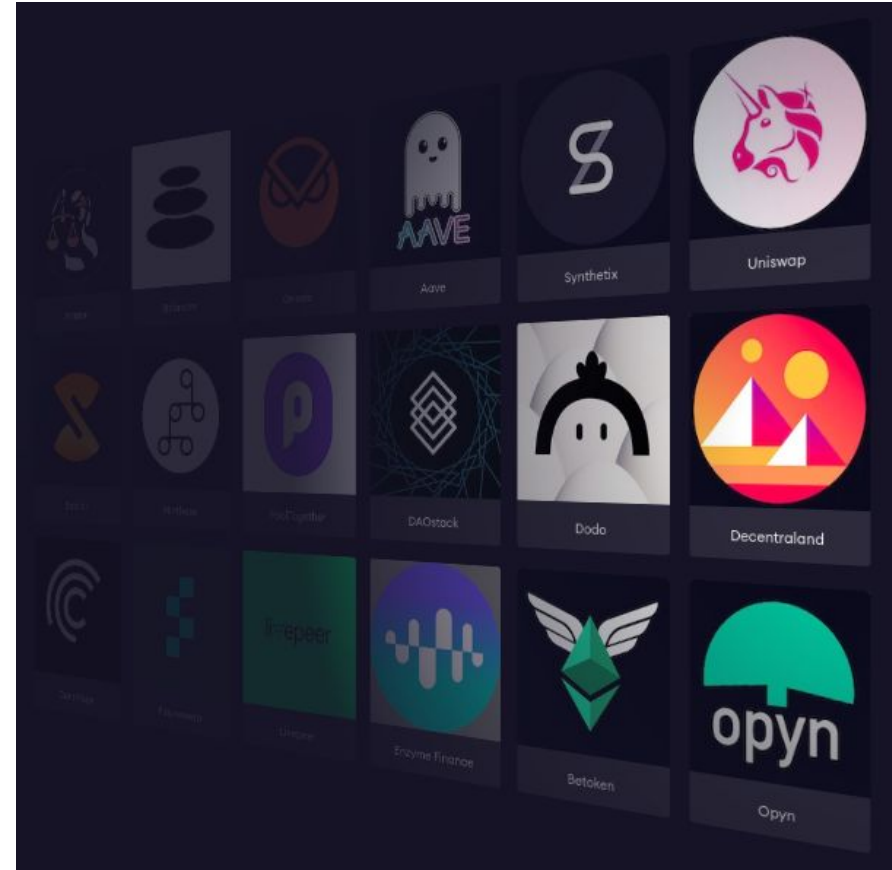
IT / Software: Unstoppable Domains

- Blockchain domains
- Buy-once, forever owned
- Multi-use:
 - Universal username across apps and websites
 - Website URL
 - Payment address for wallets
- Domains included:
 - .zil
 - .crypto
 - .coin
 - .wallet
 - .bitcoin
 - .x
 - .888
 - .nft
 - .dao
 - .blockchain*




Data Visualisation: [The Graph](#)


- Indexes protocols like Ethereum and IPFS to provide datasets for analysis and visualisation








Social media: Steemit


- Blogging site
- STEEM token earned by posting, commenting or upvoting
- STEEM can be staked to influence the platform


**disconnect (64)** in #contestalerts • 2 days ago








Contest Alerts: Active Contest List on 07th September 2021 - Win 2700+ STEEM
Contests are flooding in again. The list is about to exceed a century of contests once again. You can check all the...


  \$0.32  33  5 


**pennsif (77)** in #steem • 4 days ago








The Steem News @ 4 September 2021 - Steem Keeps on Powering Up
Steem keeps on Powering Up with Minnows, Dolphins and Orcas all growing. And the total Powered Up STEEM continues to...

  \$31.13  373  14 

**veronicalee (81)** in #photography • 31 minutes ago



강릉 오죽헌 관광
그저께 큰아들이 목요일 바람 쐬겸 강릉 가서 구경하고 하룻밤 묵고 오자 해서 오늘 따라 나섰다 강릉 가는 강원도 길 차창에 보...

  \$386.63  115  0 

Social media: Minds

- 'Anti-Facebook' where you get paid for your time
- Get paid for creating content, driving traffic and referring friends
- Receive direct payments in USD, Bitcoin and Ether



**Take back control of
your social media**

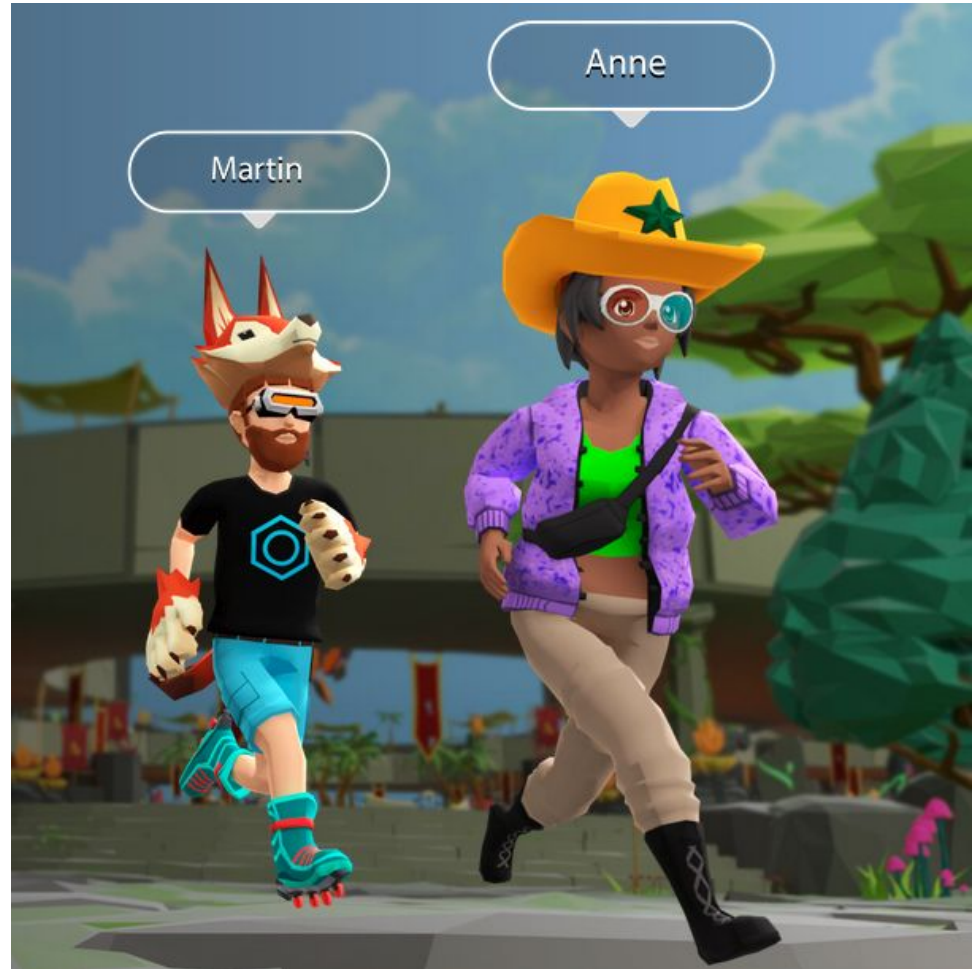
Gaming: Dark Forest

- zkSNARK space warfare
- Initially released on Ethereum
- Pun on the Dark Forest (mempool)



Gaming: Decentraland

- Virtual world
- Buy and sell virtual assets
- Vote on how the platform functions
- Host events



Gaming: [EnjinCraft](#)

- Minecraft blockchain plugin
- Allows linking assets on blockchain to players and vice-versa
 - Wallet balances
 - Tokens / items
- Open source
- Allows developers to develop on top of platform



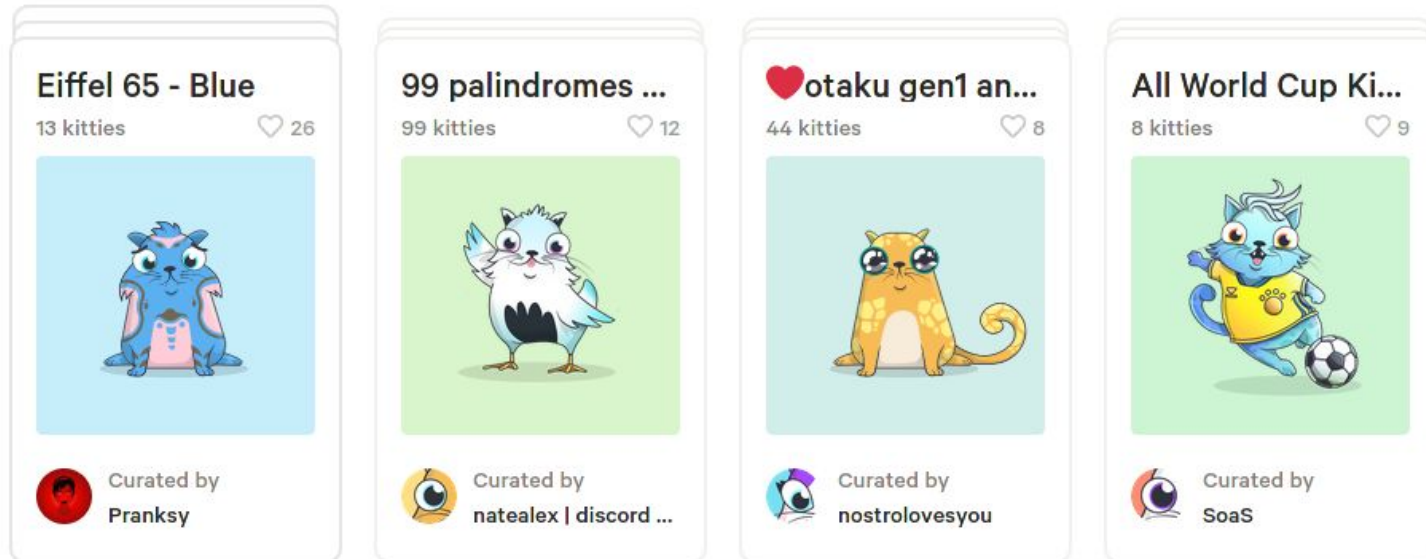
Gaming: Rabona Soccer Manager



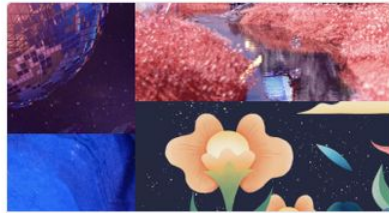
Manage your soccer club
Scout, train, and trade players
Build and expand your stadium
Become the champion

Gaming: CryptoKitties

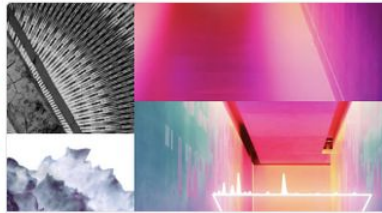
- Collect cat NFT's
- Allows breeding of cat items, mixing features
- One of the first/most famous examples of gaming on a blockchain



Collectibles: OpenSea



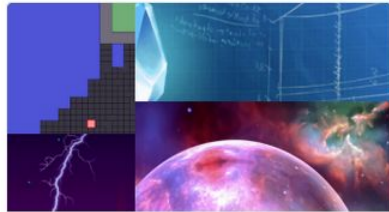
Art



Music



Domain Names



Virtual Worlds



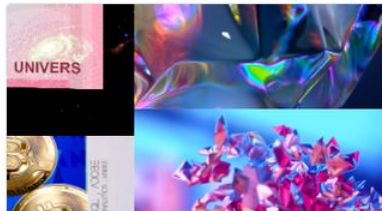
Trading Cards



Collectibles



Sports



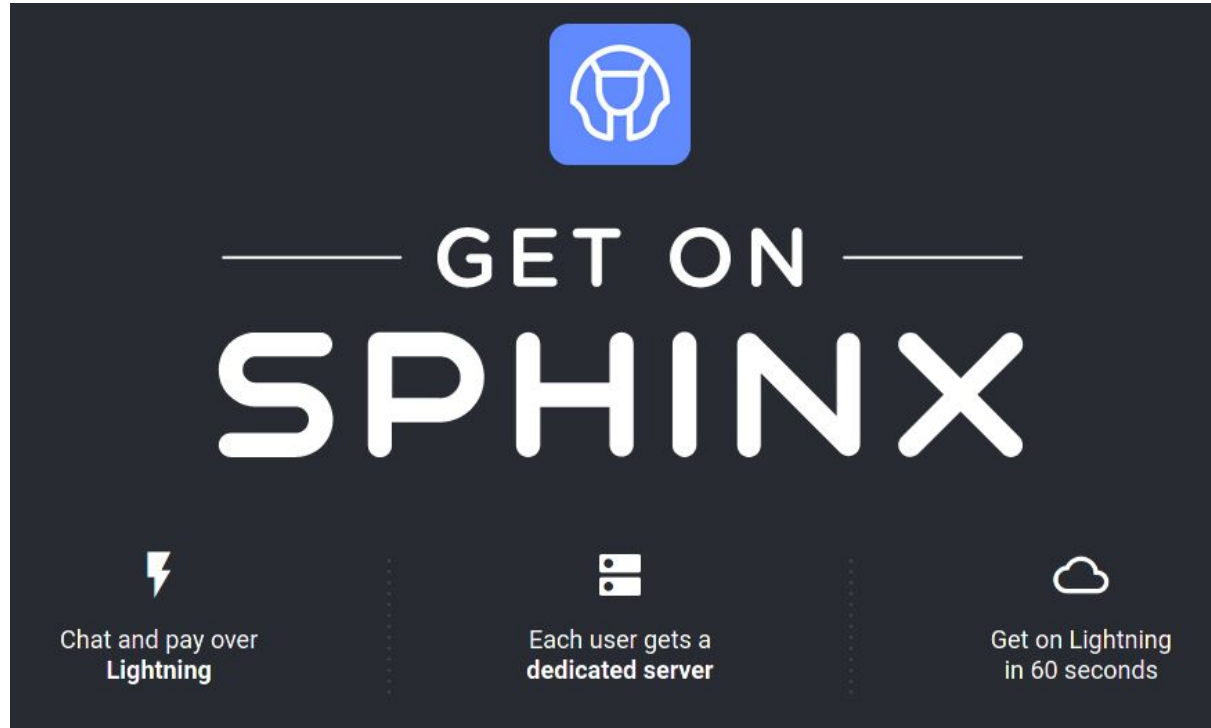
Utility



All NFTs

Entertainment: [Sphinx](#)

- Podcasting 2.0
- Stream sats to content creators
- Tip creators
- All on Lightning network



Insurance

- [B3i](#)
 - Alliance of companies promoting the use of blockchain in insurance.
- [Etherisc](#)
 - Decentralized insurance protocol to collectively build insurance products.
- [FidentiaX](#)
 - A trading marketplace and repository of insurance policies for the masses by leveraging blockchain technology.
- [Lemonade](#)
 - An AI-powered insurance claim process.
- [Blue Cross](#)
 - Blockchain will help to save costs on data verification across its network of clinics and customers.
- [Insurwave](#)
 - Blockchain-enabled marine insurance.

Supply Chain

- [Provenance](#)
 - Provenance is the software solution for sustainability communications with proof.
- [Tomcar](#)
 - 2% of components bought using Bitcoin.
- [Hyperledger](#)
 - Multiple use cases... [PlasticCoin](#) and [TradeLens](#)
- [Everledger](#)
 - Initially diamonds, now also full lithium-ion battery life cycle traceability across the supply chain, supporting responsible and efficient re-use and recycling of electric vehicle and portable electronics batteries.
- Food supply...

Smart Cities: [Blockchain4Cities](#)

- Research / study to determine how blockchain can be used in smart cities
- Urban management via DApps and DAOs
- Focussing mainly on cybersecurity



Internet of Things: IOTA

- Designed for frictionless data and value transfer
- Built for the “Internet of Everything”
- Feeless system ‘paid for’ by validating 2 transactions for every 1 submitted



Highly scalable

IOTA uses a DAG data structure allowing transactions to be added in parallel, unlike blockchain alternatives.



Low resource requirements

Designed for devices, such as sensors, to participate in a low-energy network.



Zero-fee transactions

Send 1 cent, receive 1 cent. Send \$1,000,000, receive \$1,000,000.



Fast transactions

IOTA transactions are confirmed within minutes.



Finality Within Seconds

Honest messages are approved very quickly and efficiently.



Distributed

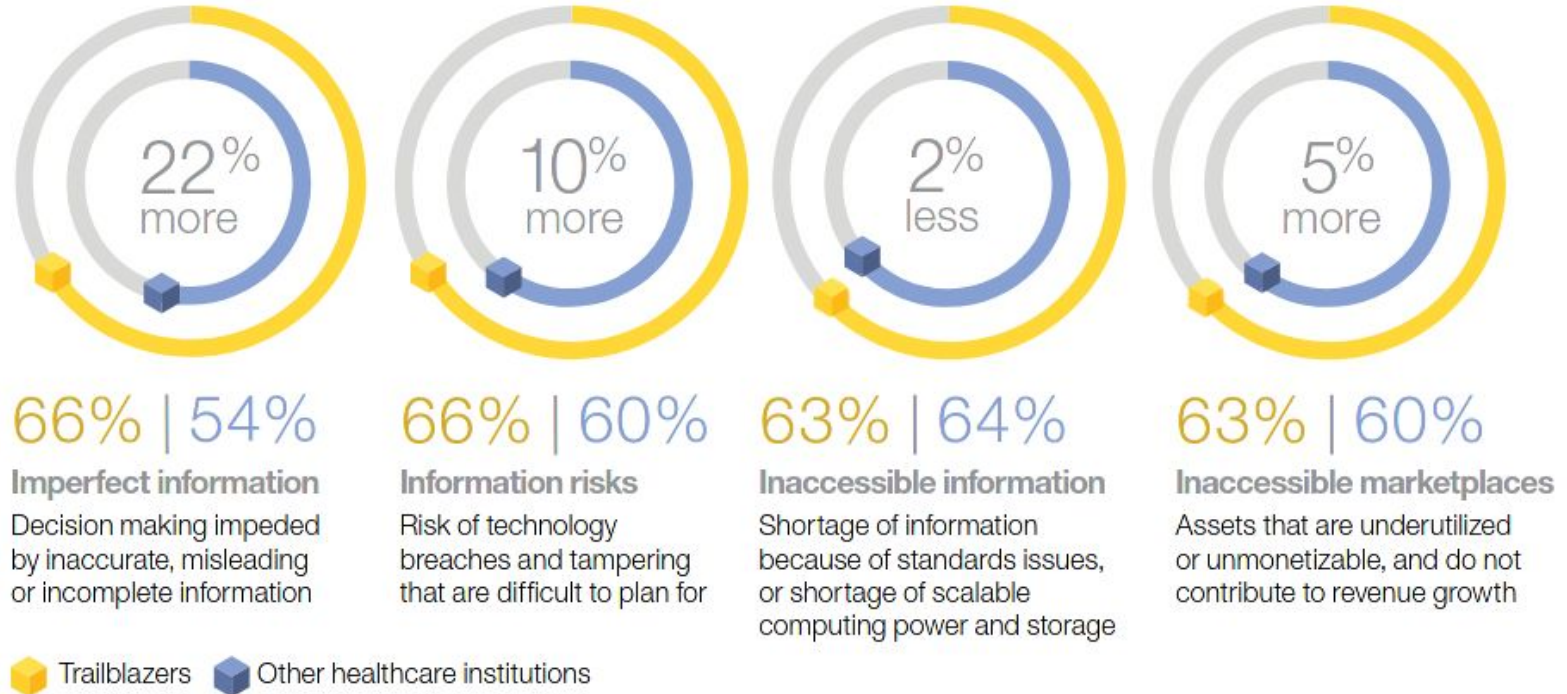
A globally distributed network, IOTA is resilient and robust against attacks.

Healthcare

<https://www.ibm.com/downloads/cas/BBRQK3WY>

Figure 3

Top frictions that Trailblazers expect to reduce using blockchains



Healthcare

From [Blockchain: the trust solution for the healthcare industry](#)

Proposed benefits of blockchain in healthcare:

- Establishing a trust network
 - Empowering patients to view data and allowing them to decide who they share their health data with.
- Reduced transaction costs
 - The cost-effectiveness of data storage. In cloud computing, the use of blockchain can be an important tool for data transactions.
- Standardised data fields
 - Blockchain standardises the format and stimulates interoperability.
- Real-time data management
 - Data can be analysed in real time – tracking medicines and reports, personal subscriptions...

Healthcare: Data and privacy

From [Blockchain and Healthcare](#) - HIMSS

On-Chain:

- High level data (metadata, transactional information, audit records, pointers and hash codes).

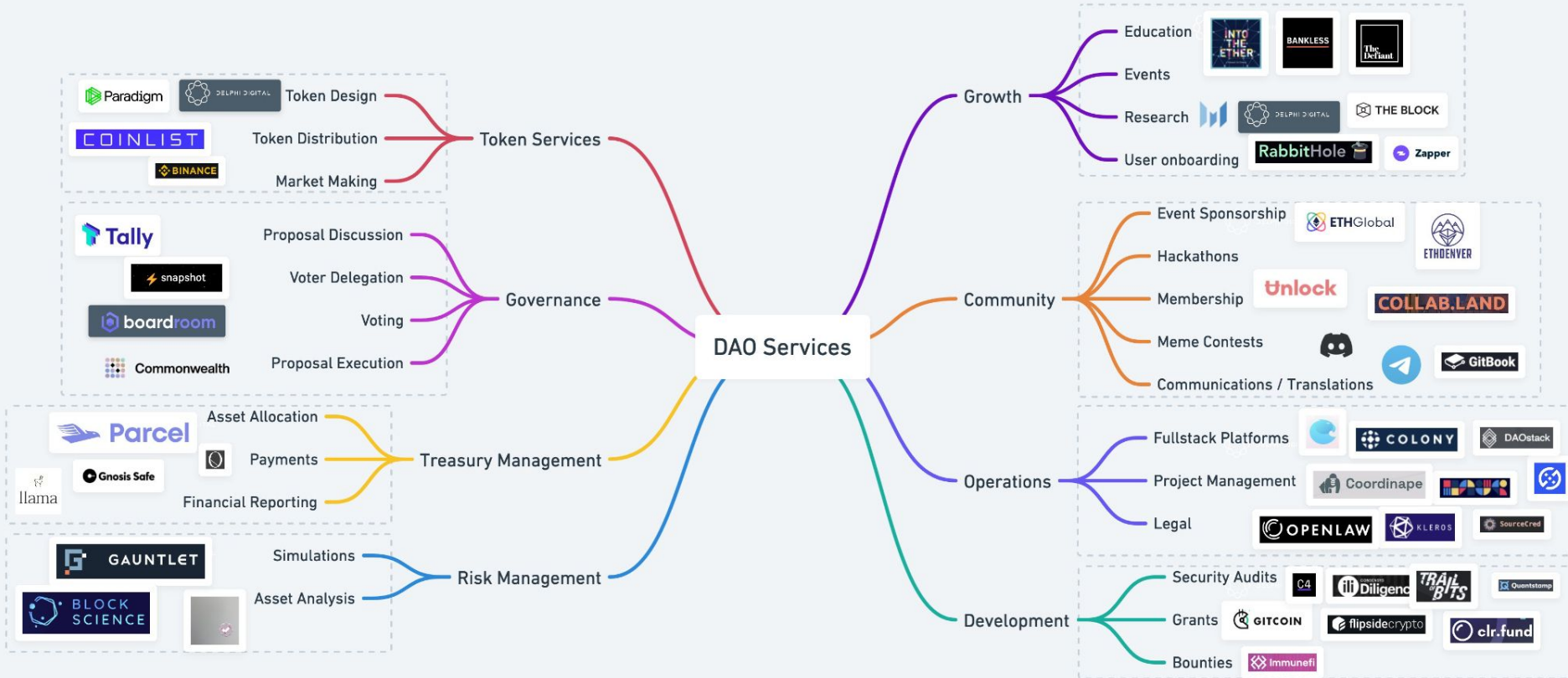
Off-Chain:

- Detailed information (large volumes of clinical information).
- Personal Health Information and Personally Identifiable Information.

When is a DApp a DAO?

- Decentralised Autonomous Organisation
 - Operates using smart contracts
 - Members usually vote using governance tokens
- **The DAO**
 - First ever DAO in April 2016
 - Raised 12.7 million Eth
 - Hacked - 3.6 million Eth moved into 'Child DAO' - stayed for 28 days
 - Caused hard fork in Ethereum (Ethereum Classic was born)
 - The DAO was delisted by major crypto exchanges September 2016
- A DAO is an automated DApp

DAOs



Capabilities 1 of 2

- Deployable by anybody
 - No credentials required to publish app
- (Can be) accessible by anybody
 - Pseudonymity prevents blocking certain people / participants
 - Restrictions can be implemented if required
- Uncensorable
 - Public blockchains + decentralised storage mitigates any blocking by malicious actors
- Immutable
 - Data are stored on open blockchains that cannot be rewritten
- Cryptoeconomics
 - Cryptography, game theory and economics
 - Incentives to play by the rules
 - Staking / running a node

Capabilities 2 of 2

- Open-source
 - Audits performed by a wide range of people
 - No black-box functions
 - Code can be forked to create a different version
- Trustless
 - Designed to make participation fair for all parties
 - Strength in numbers --- Vires in Numeris
- Transparent
 - Full paper trail auditable by anyone

Restrictions

- Experimental
 - Frameworks in development
- Monetary
 - Deploy
 - Run operations (calculations, store/retrieve data)
- Vulnerable to exploits
 - Publicly accessible code opens up opportunities for hackers
 - Large sums of money lost
- User Experience
 - Accessibility issues. Often require basic knowledge (MetaMask or Brave Browser) and the ownership of crypto / tokens.
- Security
 - GDPR
- Scalability
- Regulatory

DApp Development: Planning

- Sketch UI from design spec
- Create flow charts / swim lanes <https://miro.com/>
 - Visualise data flows
 - Build up required functionality
 - Check logic before writing any code
 - Share program flow to managers and other non-developers

DApp Development: Test Driven Development

- One of many development philosophies
 - See:
 - Behaviour Driven Development
 - Acceptance Test Driven Development
- Fairly well documented in JavaScript and Solidity
- Tests should focus on smallest thing possible
- Breaks down development into bite-size chunks
 - Define a single function and create a test
 - Repeat for each additional function until the full functionality is tested
 - Knit together into application
- Can be tricky when developing with unfamiliar frameworks
 - Importance of simple tests

Exercise

- Interact with an ERC721 contract - see Homework 8 .pdf