Elevating Decentralized Trusted Computing to a T

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The missions

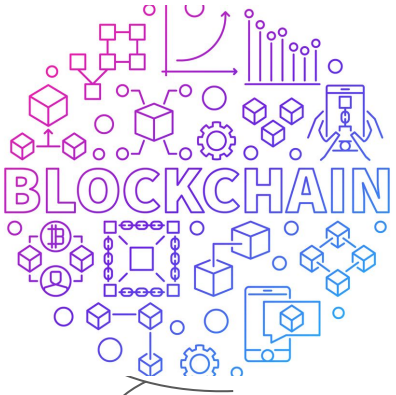
- A decentralized trusted cloud computing DAO, miners run the nodes
- A programming model that cloud apps can run decentralized
- A 2-layers consensus that blockchain dapps can be rich in UX
- Trusted and secure computation environment that protects privacy
- Censorship resistance

Decentralized but

- Hardly run rich applications
- Need special protocol for privacy
- Poor performance

Run rich application with high performance but

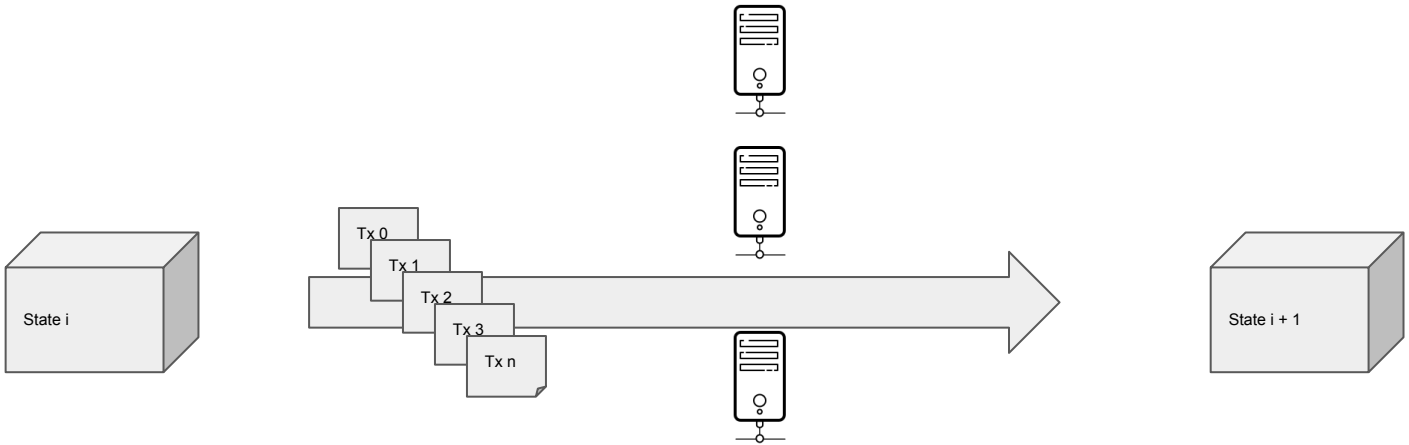
- Centralization
- Privacy breach
- Censorship



+Rich Application

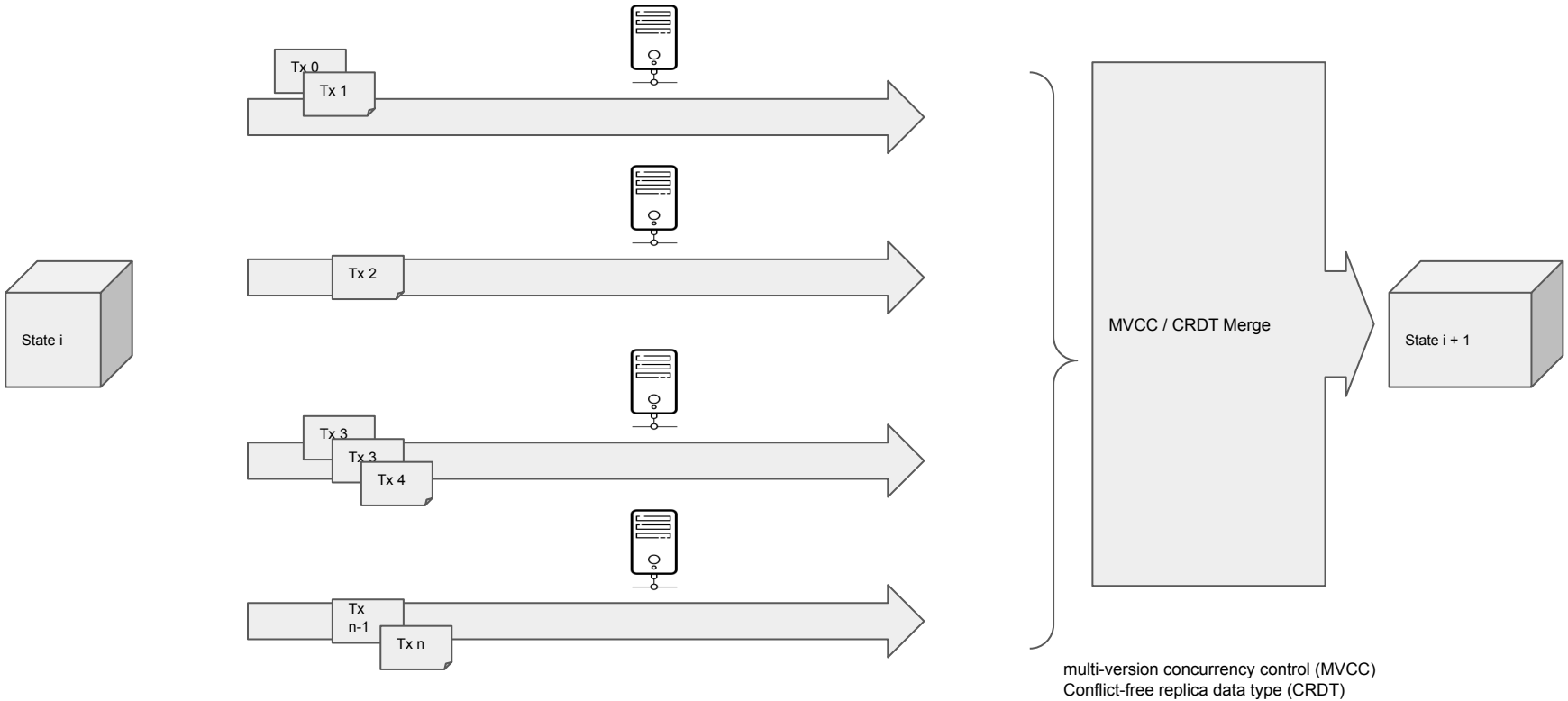
+Decentralization

Existing blockchains...

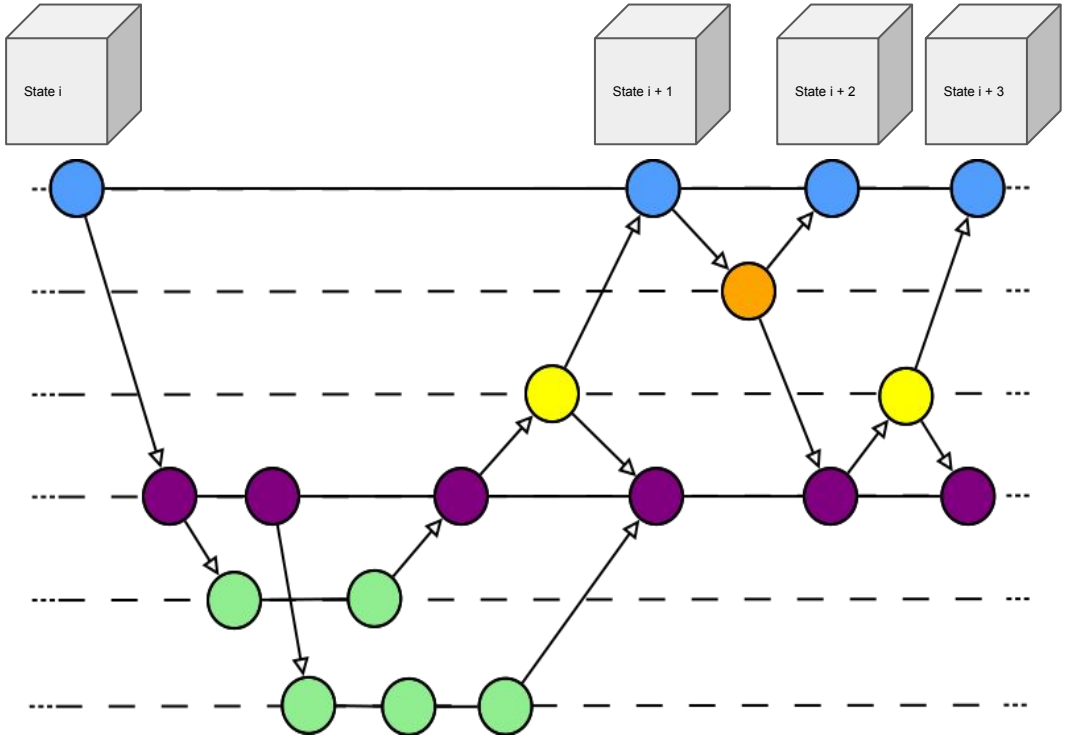


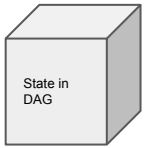
No matter how many nodes are running in a typical blockchain system, due to the existing consensus, it works as if a single slow computer processing all transactions one by one

Can we run blockchain as if it is a distributed cloud?



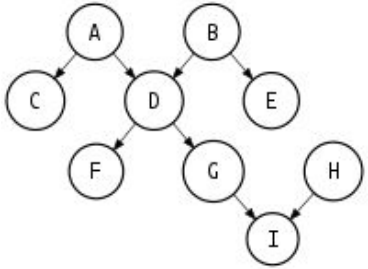
multi-version concurrency control (MVCC)
Conflict-free replica data type (CRDT)





State is actually DAG powered by IPLD

Sync, Diff, Update, Merge made easier



Full decentralized parallel execution, continue integration can make a dApp runs as rich as existing centralized cloud apps

But why did not this happen yet?

Because blockchain needs consensus to fight against trustless environment, while cloud computing requires an assumption of trust …

...What if the trust is taken care by someone else?

2

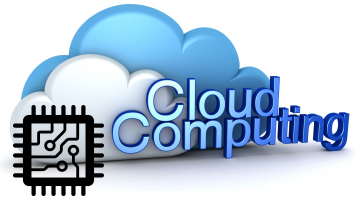
- Execute dApps without trust concern
- Eg. Agents inside a highly secured office can trust each other when work together

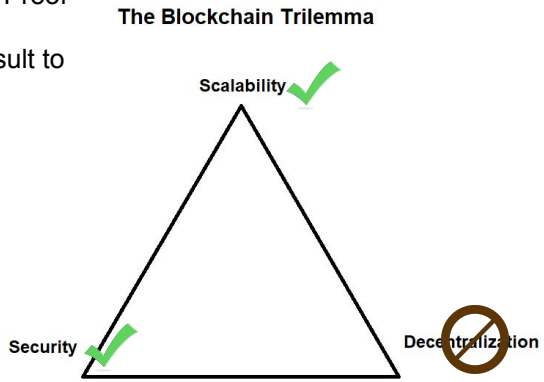
1

- Handle trust concern without running dApps code
- Eg. Security guards know nothing about business domain but check badges at the gate

- Rich Applications run on Decentralized Nodes
- Secure Logic and Data inside Hardware Protected Enclave
- Security Chip as Root of Trust (RoT) Generates Proof of Trust (PoT)
- Verify other nodes' PoT and send verification result to Layer 1

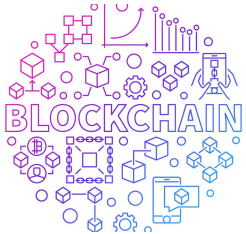
2

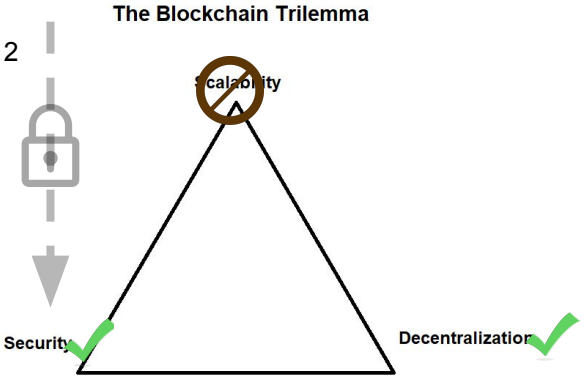




- Immutable Data Storage
- Consensus on the verification result from Layer 2
- Managing Remote Attestation
- Token Economy
- Verify block

1





Our basic assumption is that:

If the execution environment, code, and input data are trusted,

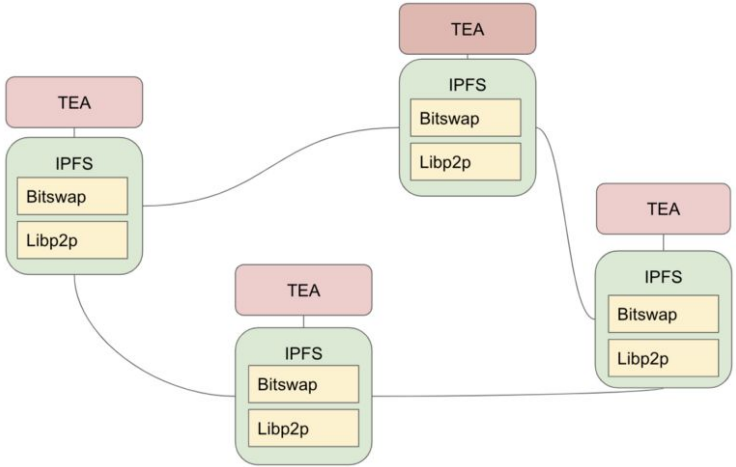
then the execution result can be also be trusted.

```
pub fn verify_computing_result(pot: POT) -> bool{
    if pot.verify_execution_environment() &&
        pot.verify_code_hash() &&
        pot.verify_input_param() {

        return true
    }
    else{
        return false
    }
}
```

IPFS uses *content addressing* to identify content by what's in it rather than by where it's located

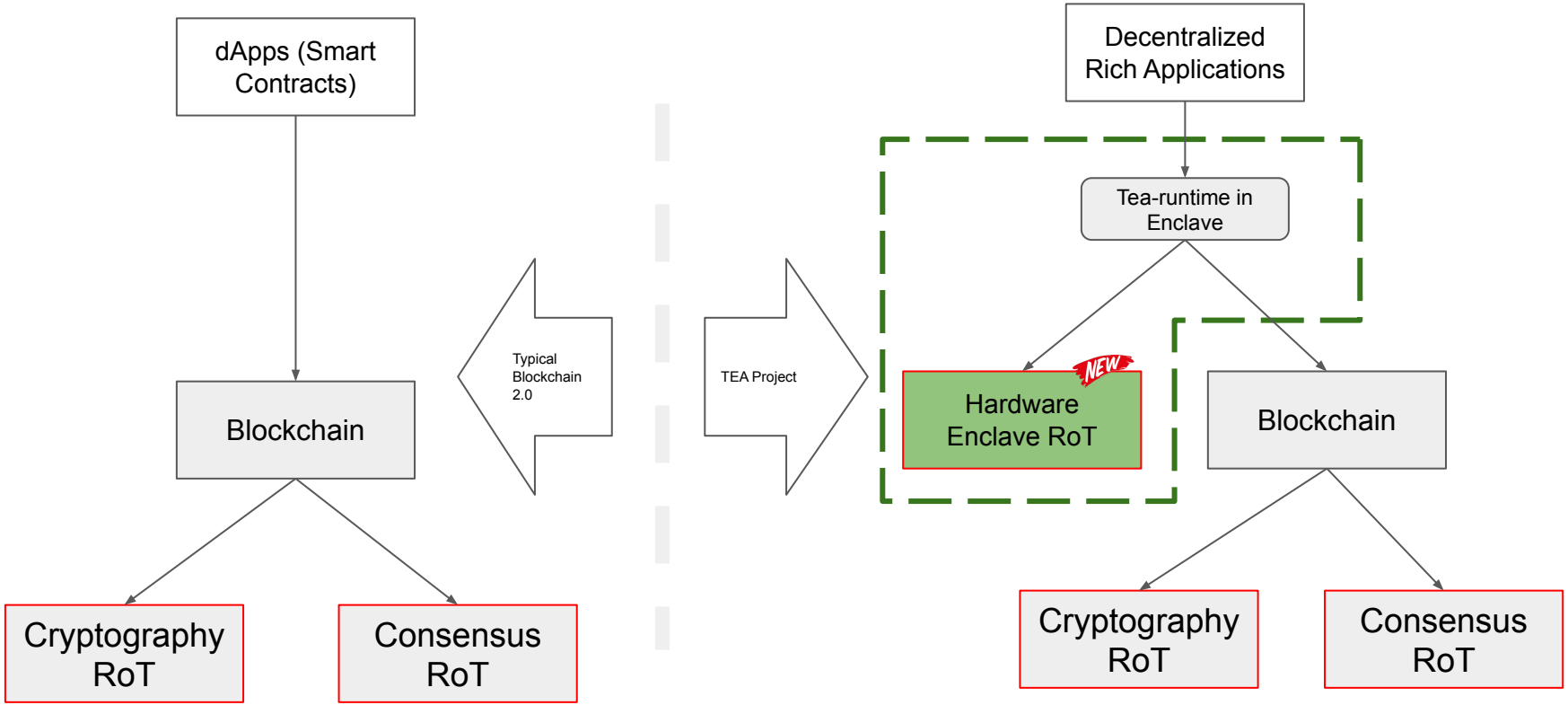
TEA uses Proof of Trust (PoT) to execute code and data by how trust is the execution environment rather than by where (or who) it's executed



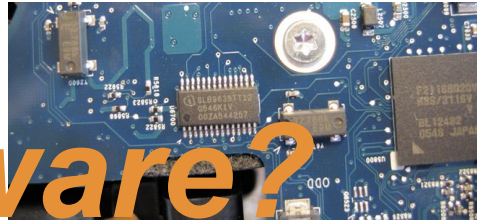
IPFS

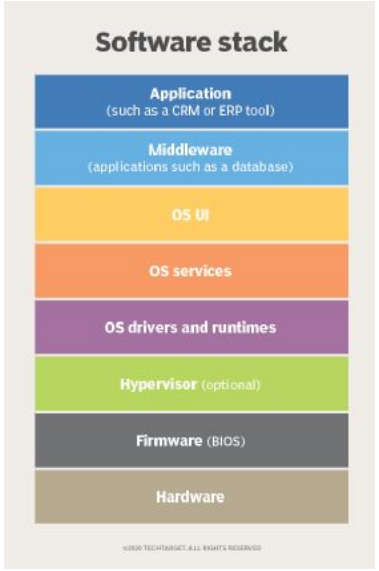
Inter Planetary Function as a Service

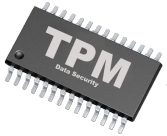
Dependencies of RoT



WHY Hardware?







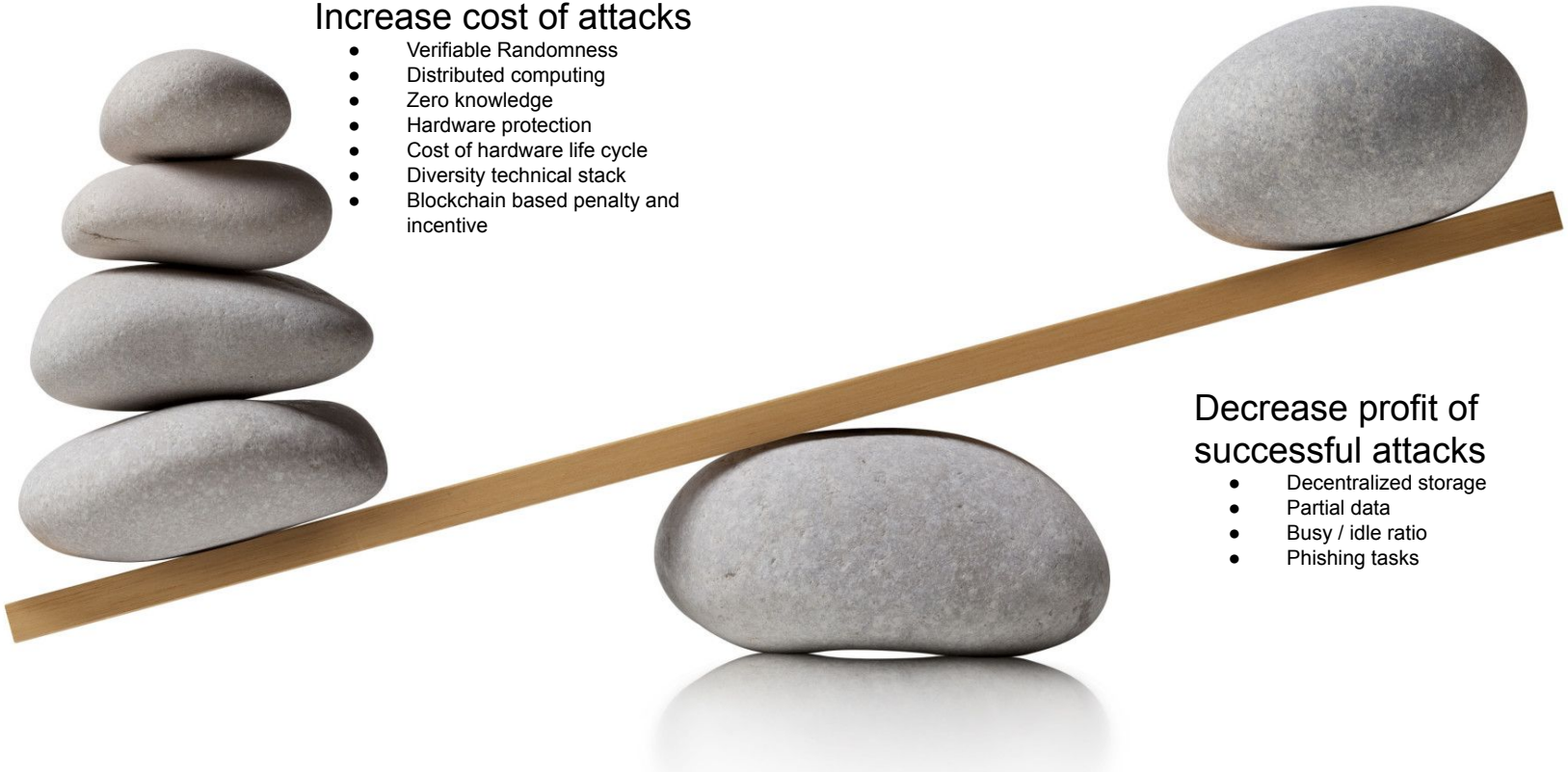
Cryptography options?
SMPC, FHE, ZKP

Hardware options?
CPU-based TEE, TCG-based TPM

	TEA Support	Technology	RoT Verification	Cloud IaaS 4 Rent?
Google Cloud / MS Azure Confidential Computing	On Roadmap	CPU Based (AMD/Intel)	Centralized Cloud	Y
TEE SGX/SEV/TrustZone	On Roadmap	CPU Based	Centralized by CPU manufacturer	N
Amazon Nitro NEW	In Development	TPM Based(?)	Centralized Cloud	Y
Trusted Computing (TPM)	Software Simulator Completed	TPM Based	Decentralized	N

Increase cost of attacks

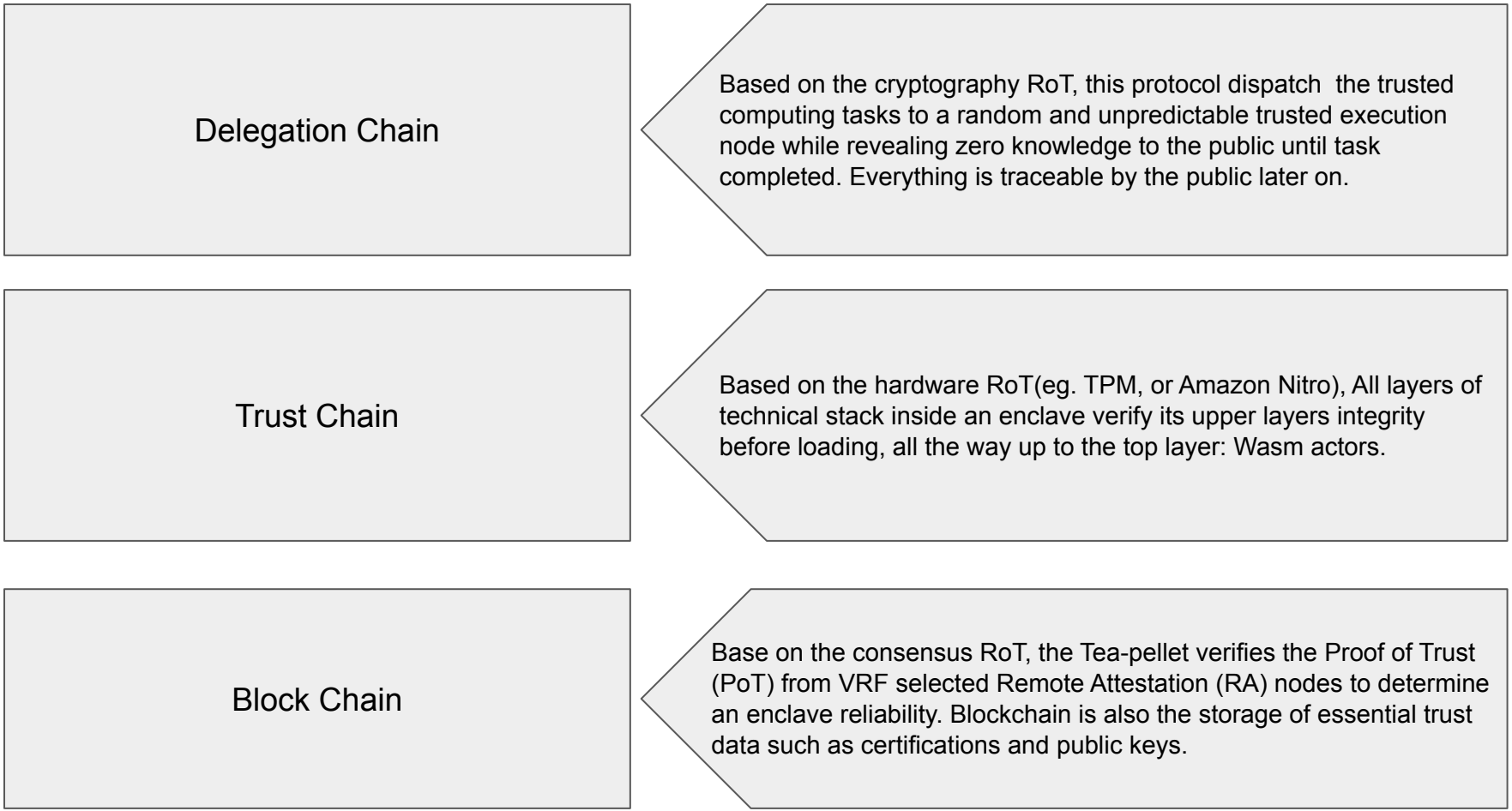
- Verifiable Randomness
- Distributed computing
- Zero knowledge
- Hardware protection
- Cost of hardware life cycle
- Diversity technical stack
- Blockchain based penalty and incentive

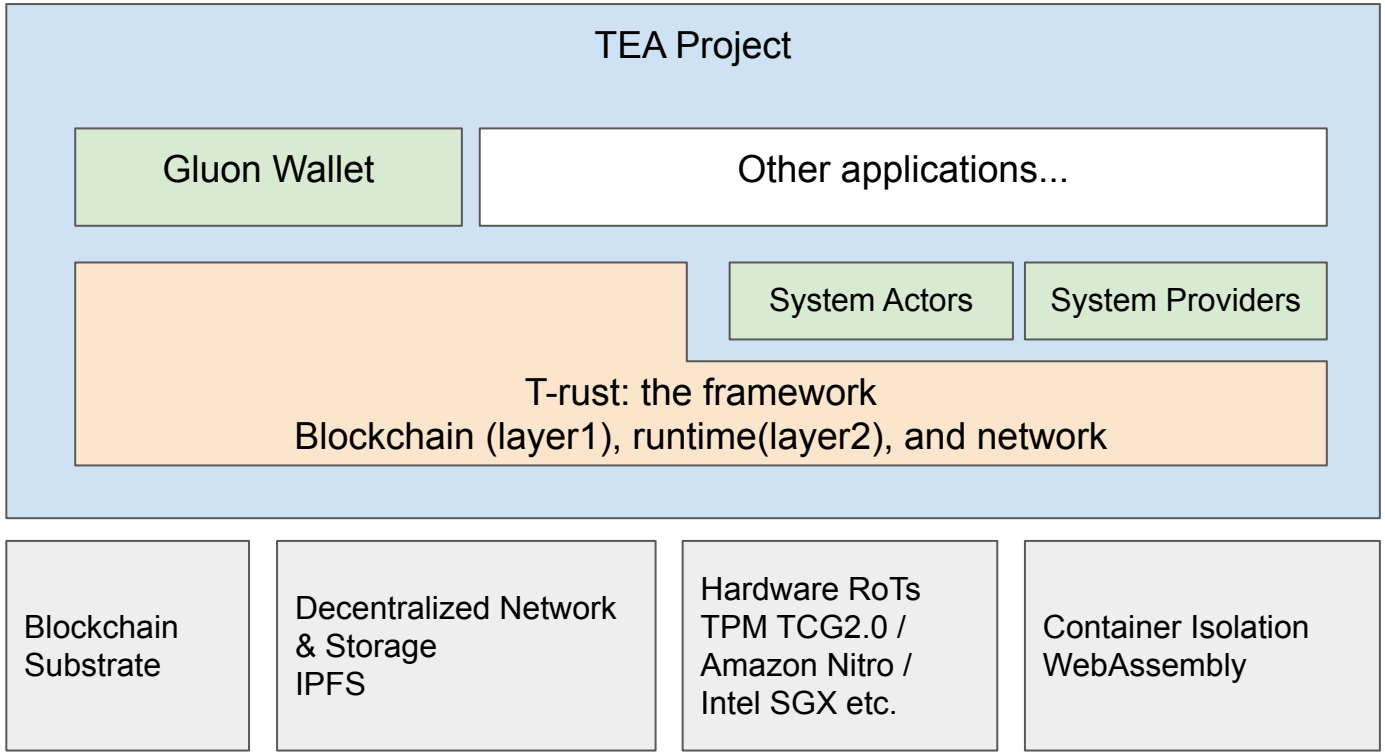


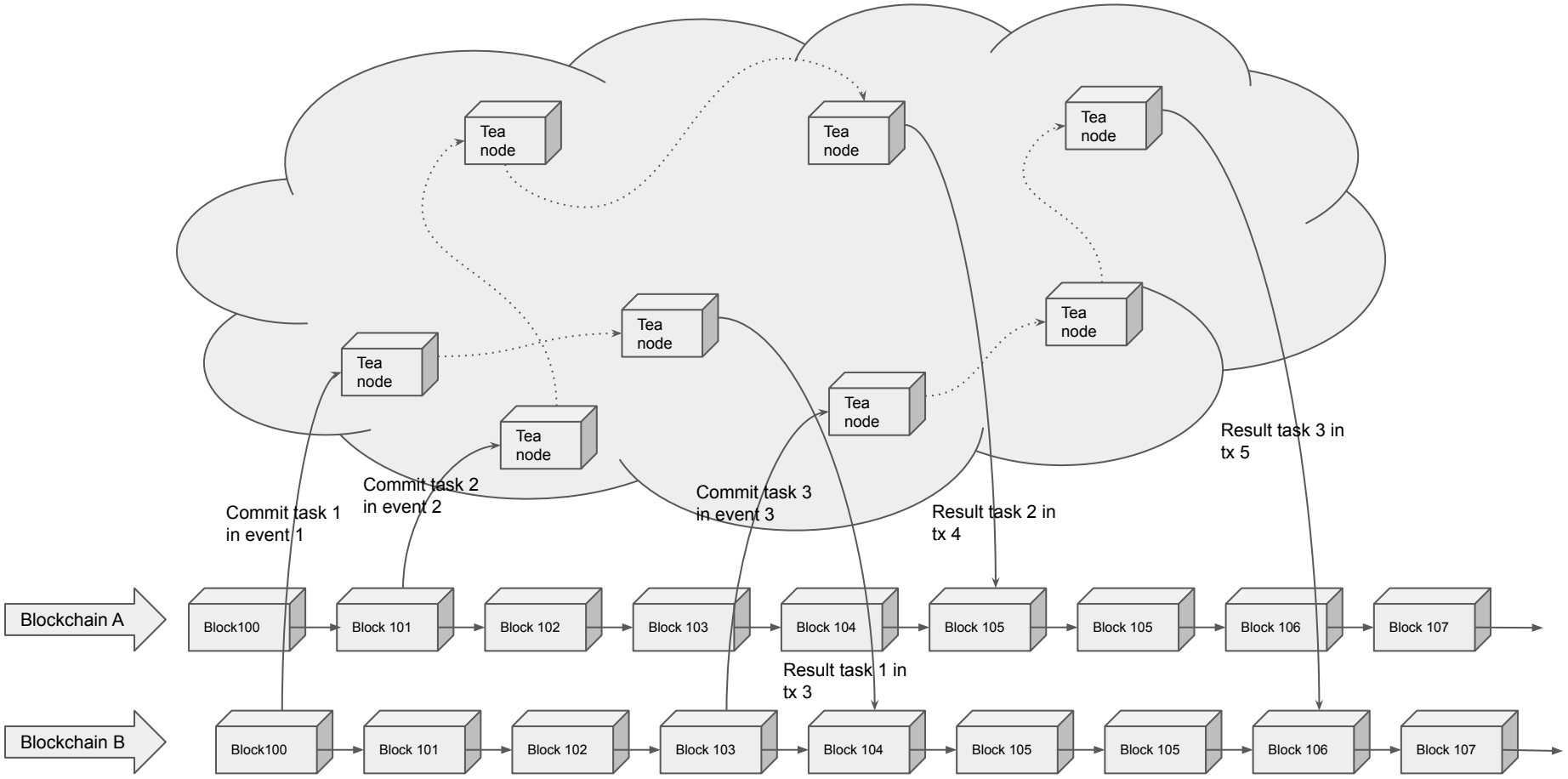
Decrease profit of successful attacks

- Decentralized storage
- Partial data
- Busy / idle ratio
- Phishing tasks

Three logical chains rooted from three RoTs




TEA Project
Gluon Wallet
Other applications...
System Actors
System Providers
T-rust: the framework
Blockchain (layer1), runtime(layer2), and network
Blockchain
Substrate
Decentralized Network
& Storage
IPFS
Hardware RoTs
TPM TCG2.0 /
Amazon Nitro /
Intel SGX etc.
Container Isolation
WebAssembly


Tea node
Tea node
Tea node
Tea node
Tea node
Tea node
Tea node
Commit task 1 in event 1
Commit task 2 in event 2
Commit task 3 in event 3
Result task 2 in tx 4
Result task 3 in tx 5
Result task 1 in tx 3
Blockchain A
Block100
Block 101
Block 102
Block 103
Block 104
Block 105
Block 105
Block 106
Block 107
Blockchain B
Block100
Block 101
Block 102
Block 103
Block 104
Block 105
Block 105
Block 106
Block 107


Alice: I took a picture of a wild animal. I do not know what it is, but I know it has value to others. I hope to get paid from the usage of my picture but technically have my copyright protected

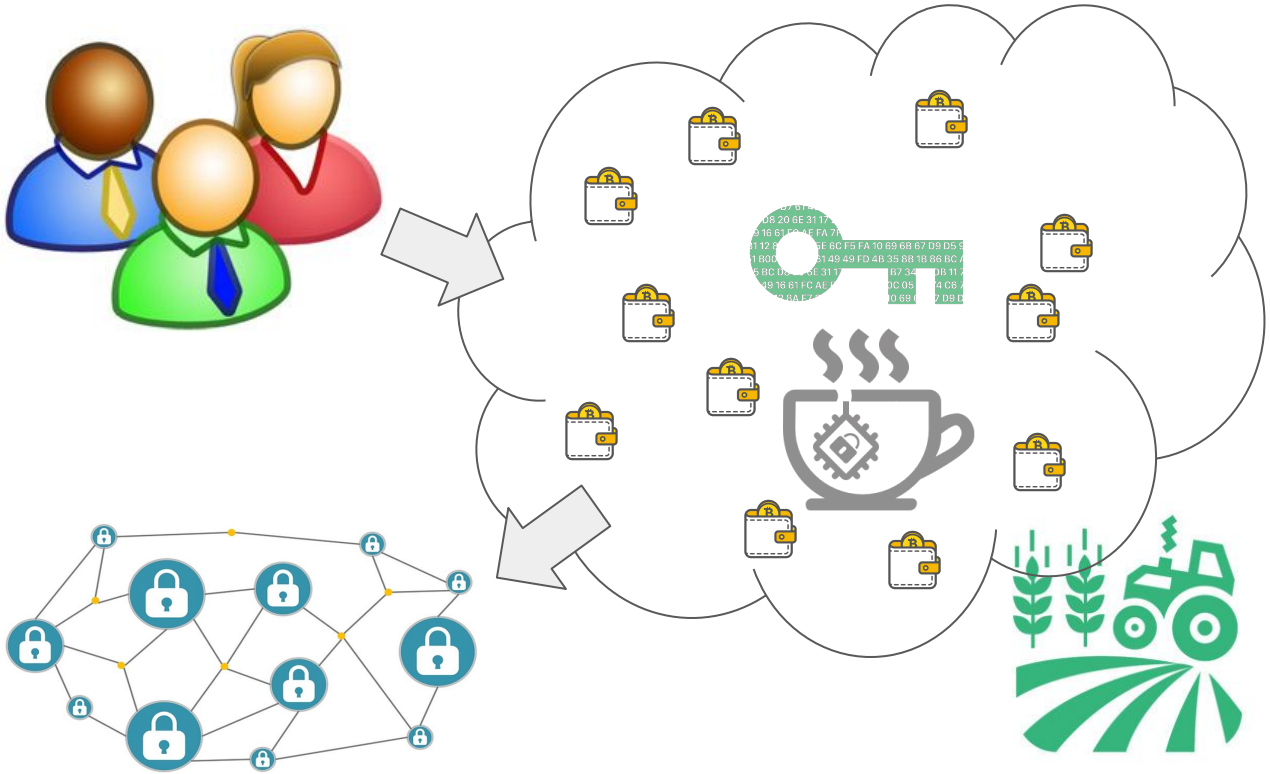


Bob: I wrote a Tensorflow image recognition model and compile to webassembly as an application. It can determine what is on a picture. I hope to get paid by the usage of my application, but no one can steal my code.


Charlie: I am an IPFS miner. I recently add a TEA module to my mining machine. I am now a IPFS + TEA miner so that I can min both Filecoin and TEA token. How could my clients trust me and send me sensitive information to compute?


Dave: I am a naturalist and scientist, I have research fund on looking for wild animal behavior by analysing pictures. I cannot analyze every pictures manually, I can pay to run the AI algorithm on wild animal pictures from other paid photographers.

Gluon is NOT a hardware wallet, it is a blockchain powered TaaS(Trust as a Service) so that you do not need to own one

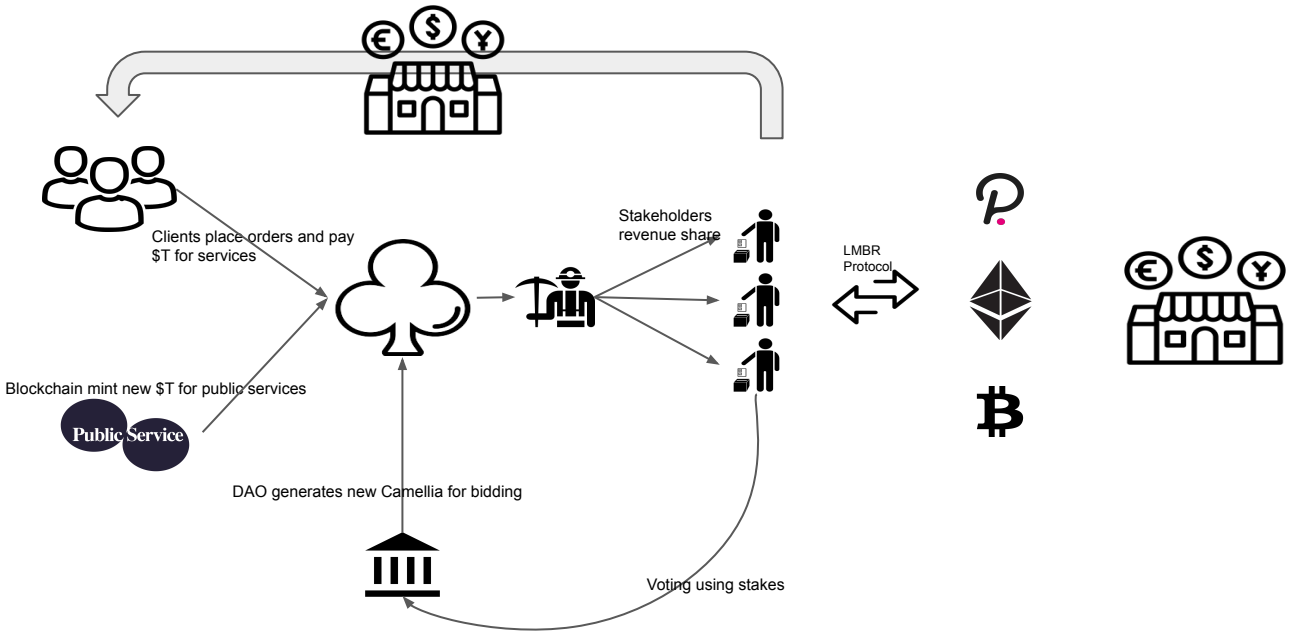


Stable coin: TEA

- Utility token. Stable coin pegging to computing cost not fiat.
- Used as Gas, unlimited supply
- No genesis block supply. Every TEA needs to be mined
- Born from public service rewards burnt by DAO when recycle
- Stake to Camellia for revenue sharing

NFT: Camellia

- TEA Node can be activated when a Camellia associate with it
- Camellias are owned by miners
- Miners buy new Camellia seeds through a Birth Control Bidding
- Camellia has its life cycle. DAO generate it with birth control. DAO burns it when die.
- Camellia has technical stack used in diversity control
- Investors can stake to a Camellia for revenue sharing



TEA can be used

1. Pay for computing services
2. Buy Camellia to be a farmer
3. Stake to others Camellia as an investor, revenue share

TEA born and burn

1. Issued by public service
2. Premining is a special public service
3. DAO burns TEA when bidder pay for Camellia seeds
4. Slash due to illegal behavior

TEA Scarcity

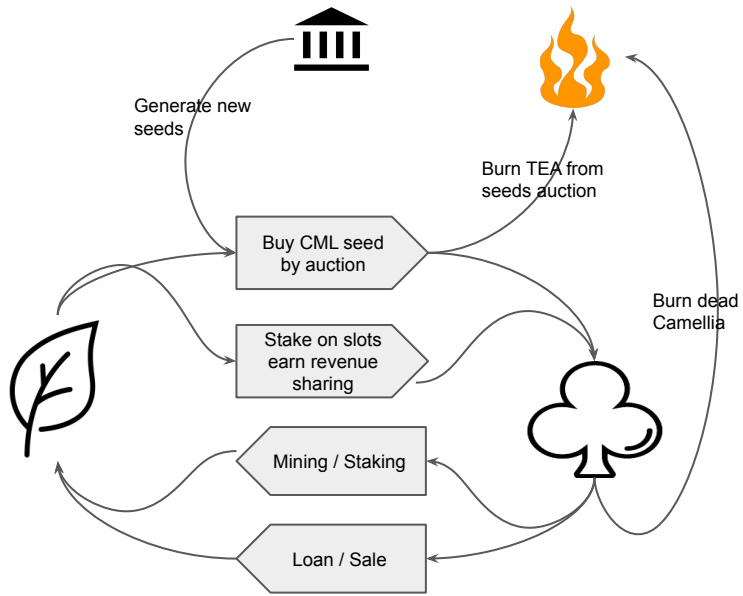
1. Limited public service bonus in every block
2. Shareholders premining TEA need to be locked and release gradually
3. Staking lock
4. Burn and slash

Camellia can be used

1. Plant to mining machine. It is soul
2. Credit loan. Future income as collateral
3. Investment (seed->grow->revenue) Nursery?

Camellia seed to RIP

1. DAO generate seeds based on auction price. Maintain a reasonable scarcity
2. Limited lifetime create additional scarcity
3. Grow and aging vary profitability
4. Diversify and future evolution



Premining

1. Fast initial TEA distribution to early investors
2. Special Camellia during this period
3. Early investors agree on that small portion of premined TEA in free mode. Others either staking or buying seeds only

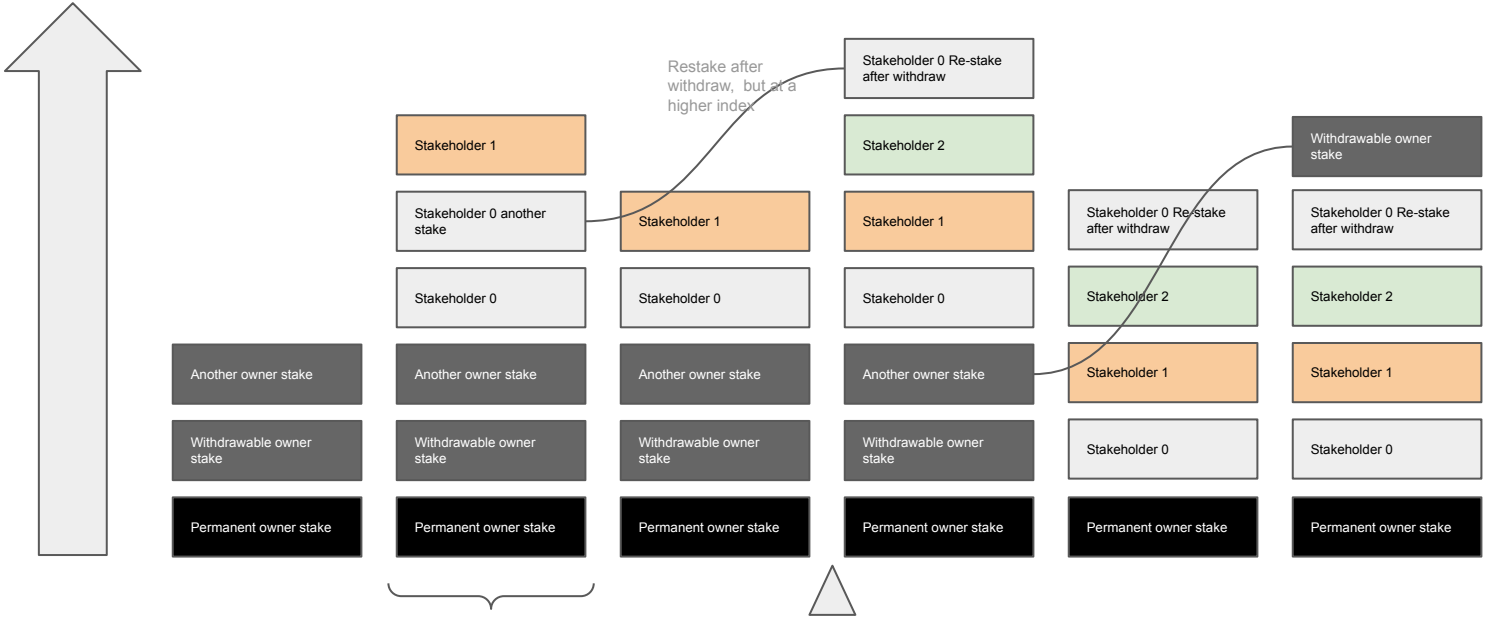
Resilience to Pump & Dump

1. Control the size of private sales
2. IDO at DEX rather than CEX
3. Reserve fund to market making
4. Maintain the scarcity of free TEA by locking staking, seed
5. Fast development to the real use case to consume TEA token

TEA Staking and Camellia Life Cycle

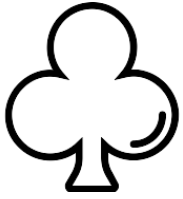
Revenue_share = this_slot_weight X total_revenue / total_slots_weight
this_slot_weight = (this_slot_index + 1).sqrt() - this_slot_index.sqrt()

Slot_index
Weight reduced

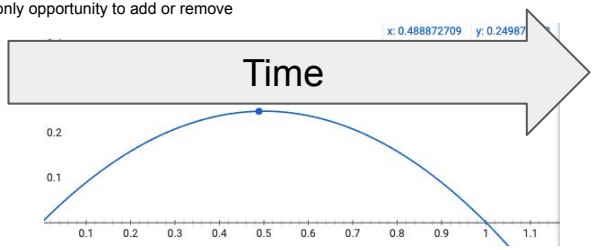


Withdraw Permanent owner stake when die

Every slot is 1000 blocks long



Adjust_time_window every 1000 blocks
This is the only opportunity to add or remove stakes



Core team and milestones

Kevin G. Zhang

- Founder of ELK Insight LLC
- CTO of iHealth Labs US
- https://www.linkedin.com/in/kevingzhang/

Zhijun (William) Zhang

- Lead, Security Architecture at The World Bank Group
- Enterprise Security Architect at The Vanguard Group
- https://www.linkedin.com/in/zhijun/

Yang Li

- Software Engineer of iHealth Labs Singapore
- System Architect of HP Shenzhen
- https://www.linkedin.com/in/jacky-li-4039747b/

Mingzhi Yan

- Software Architect of Cloudwalk Beijing
- Lead blockchain developer of Elastos Beijing
- https://www.linkedin.com/in/mingzhi-yan-7544b9203/

We are here

TEA Projects starts in 2019
Self funded till 2021

First milestone in Nov 2020. Release the AI image recognition demo running in simulator.

Second milestone ongoing in 2021.
Gluon wallet.
Web3 Foundation Open Grant.
Migrating TEA runtime to Amazon Nitro.
Seed round.

Premining ready plan in Q3 2021
TEA token and CML token.

Public mining ready plan in Q4 2021 or 2022
TEA box mining machine ready.
Rich dApp model ready.

TEA Trust-as-a-Service starts serving other blockchains
Rich dApp SDK, Tutorial
TEA DeX
More types of TEA Boxes
In 2022