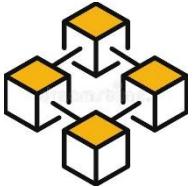




UNIT 5

DECENTRALIZED APPLICATIONS

Lecturer: Ph.D Lê Quang Huy



CONTENT

1. INTRODUCTION

2. DECENTRALIZED APPLICATIONS

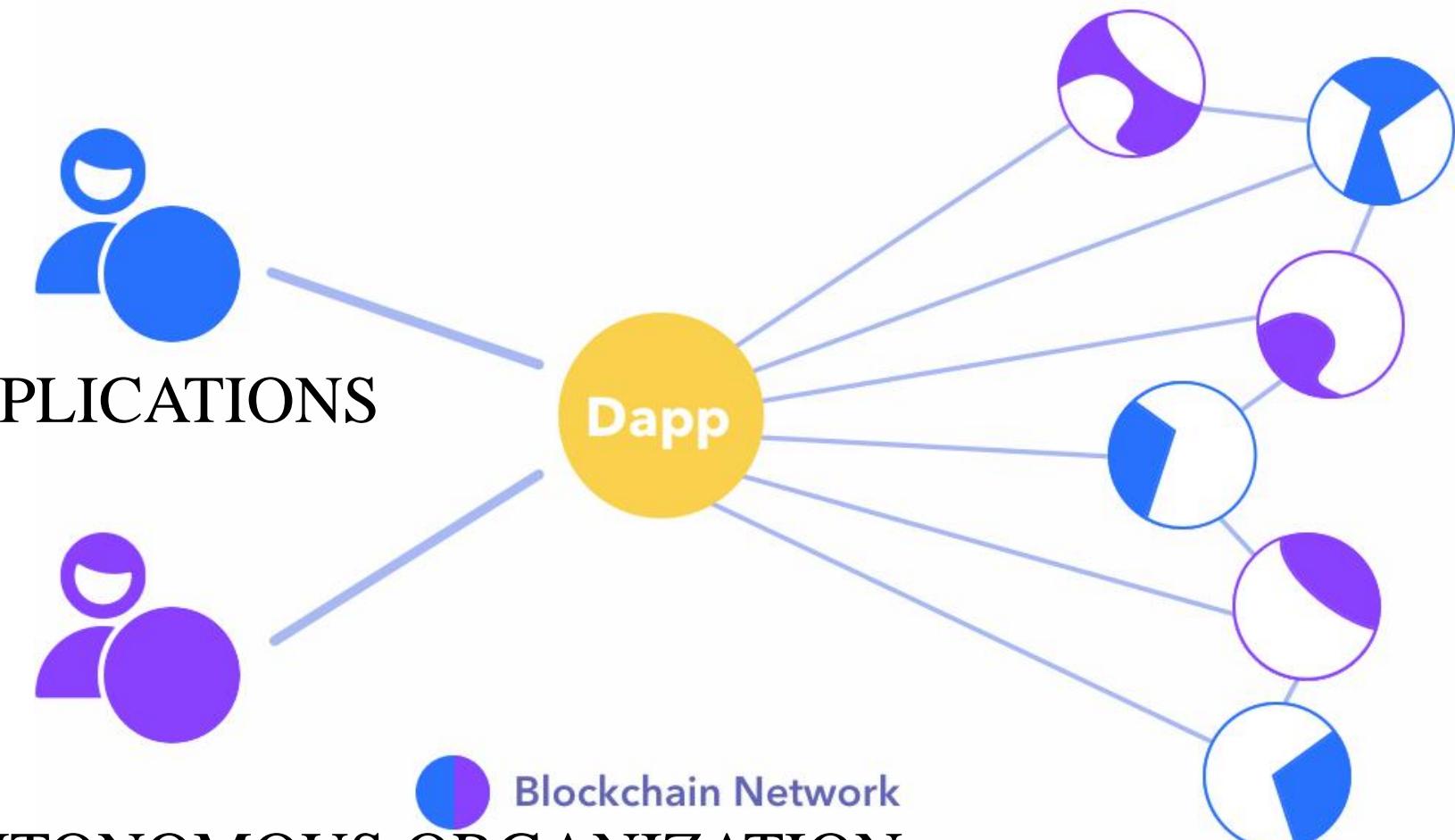
3. SMART CONTRACT

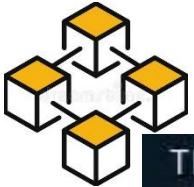
4. CRYPTO WALLET

5. DECENTRALIZED AUTONOMOUS ORGANIZATION

6. SUMMARY

7. DISCUSSION





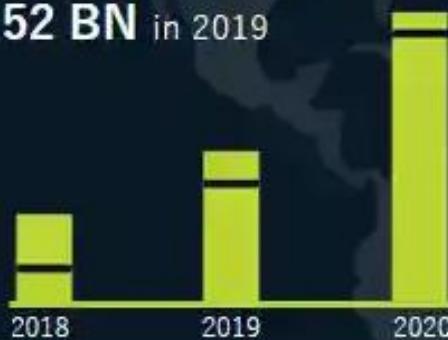
1. INTRODUCTION

The market will be
REGISTERING
a **CAGR** of over

56.1%



The market was valued
\$10.52 BN in 2019



36.8%

of the growth
will come from
North America



The year-over-year growth
rate for 2018 is estimated at
54.97%

The market is **FAIRLY FRAGMENTED** with
numerous players occupying the market share



One of the **KEY DRIVERS** for this
market will be the increasing
demand for fast transaction
process and low development cost

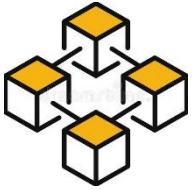
READ
THE
REPORT:

GLOBAL DAPPS MARKET 2017-2027

Trends & Latest Highlights



EMERGEN
RESEARCH



2. DECENTRALIZED APPLICATIONS

2.1. D-APP DEFINITION

2.2. D-APP COMPONENTS

2.3. D-APP ARCHITECTURE

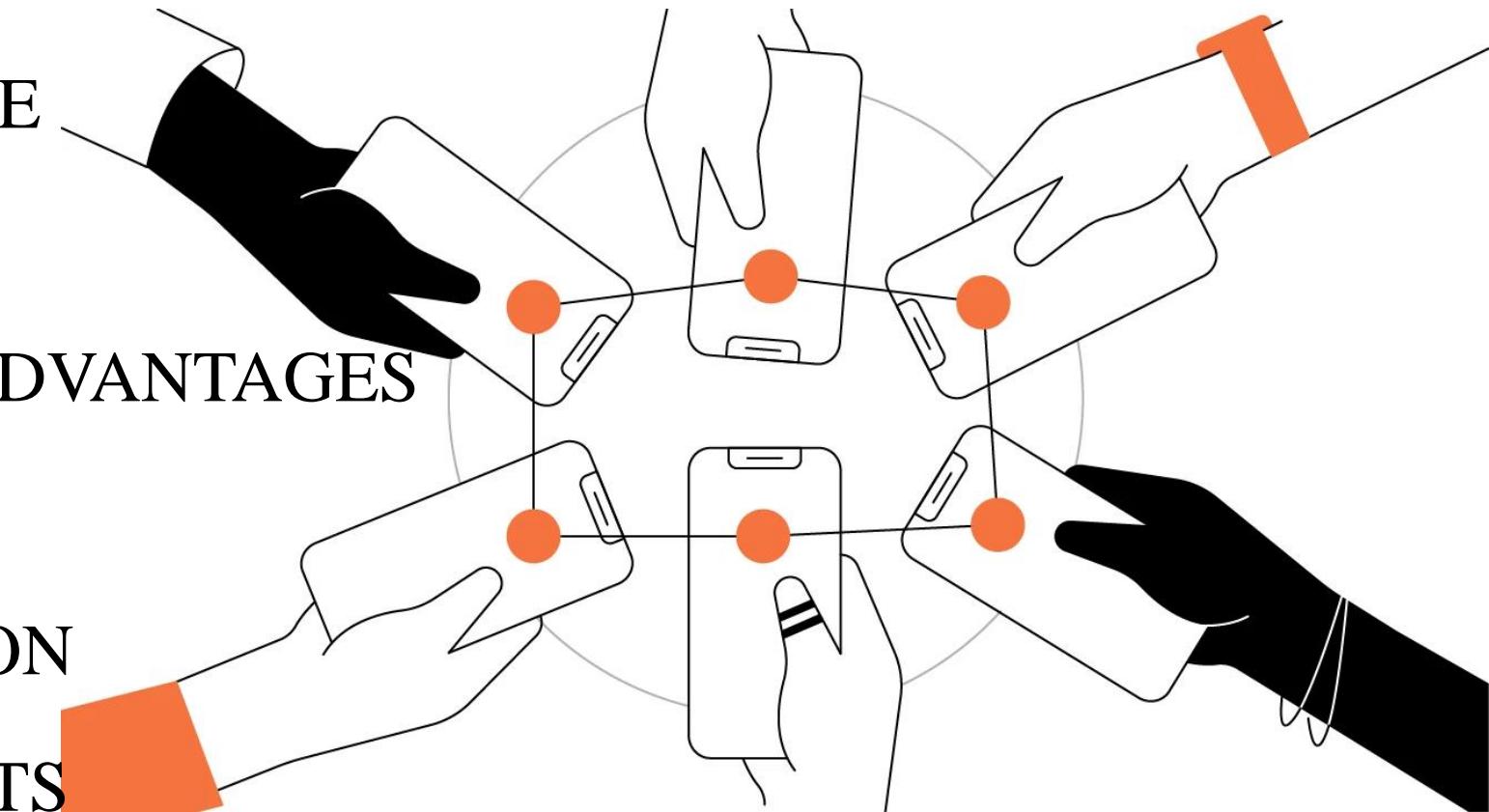
2.4. D-APP ACTIVITIES

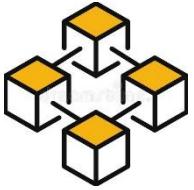
2.5. D-APP FEATURES & ADVANTAGES

2.6. D-APP VS C-APP

2.7. D-APP CLASSIFICATION

2.8. D-APP DEVELOPMENTS





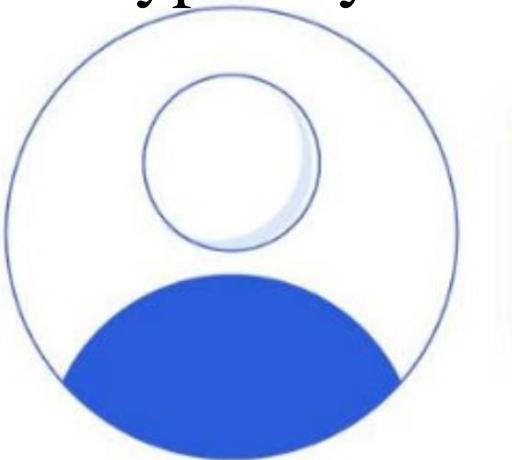
2.1. D-APP DEFINITION

Applications: program (software)

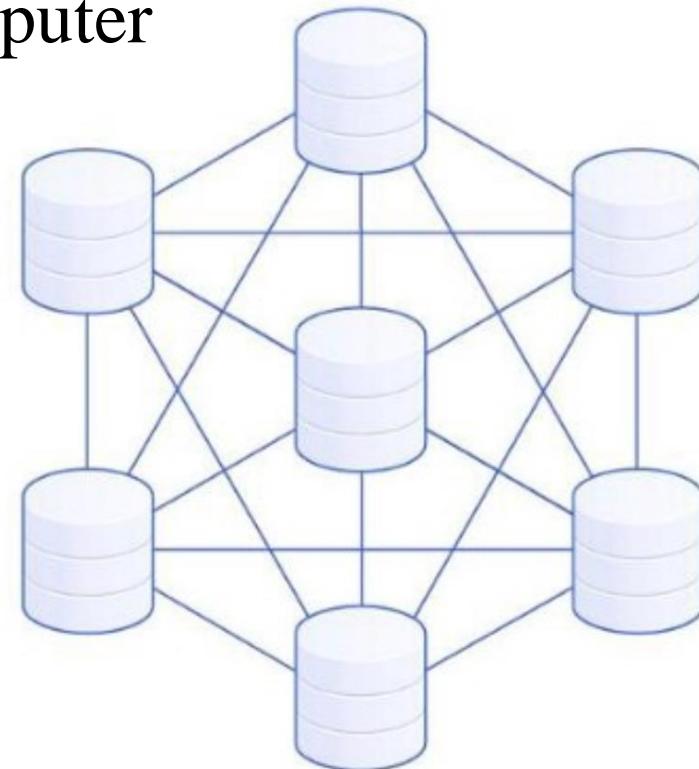
User

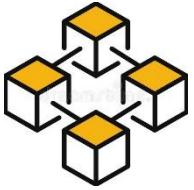
Client

- carry out a specific task, difference from operation of computer
- typically to be used by end-users.



Block Producers

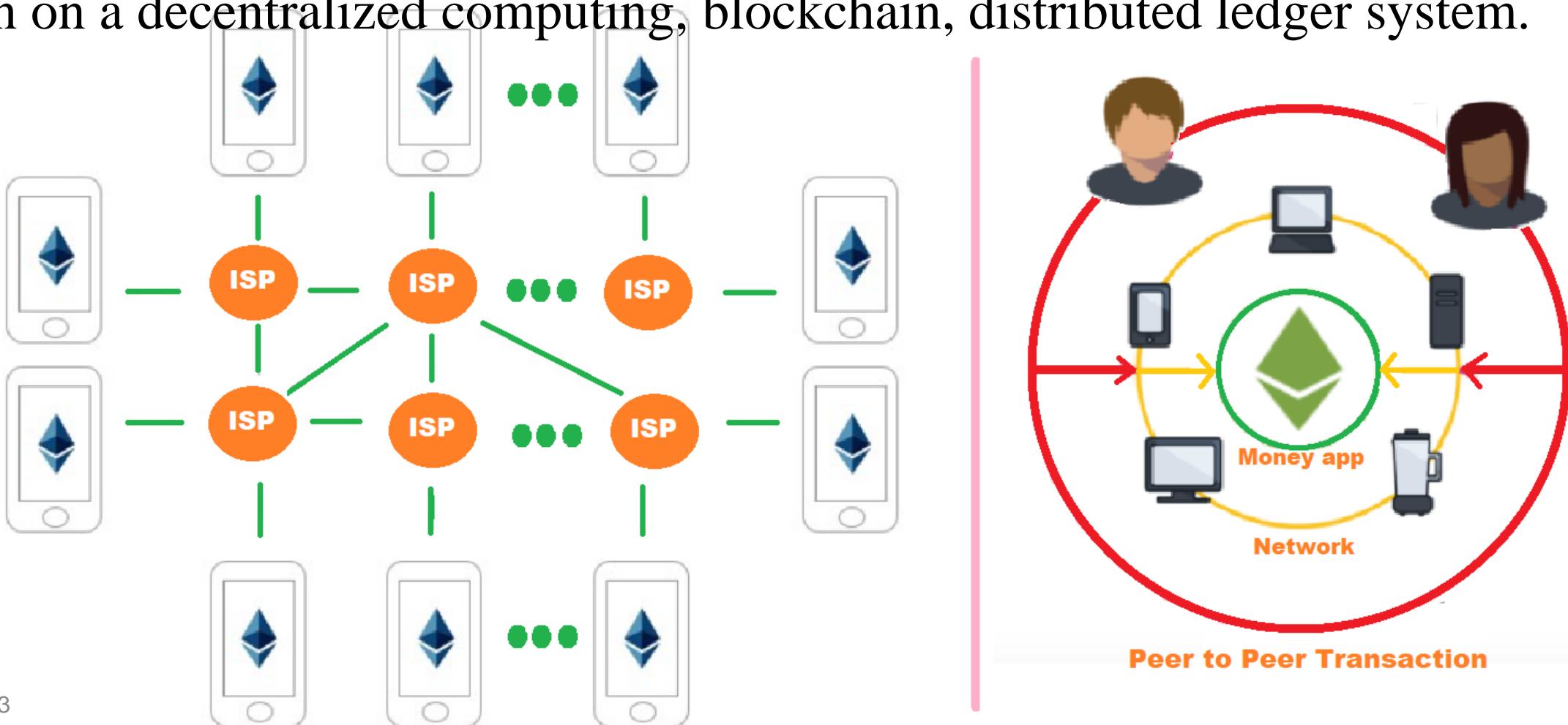


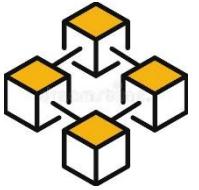


2.1. D-APP DEFINITION

Decentralised application (DApp): digital application can

- Operate autonomously, through smart contracts.
- Run on a decentralized computing, blockchain, distributed ledger system.





2.2. D-APP COMPONENTS

**Smart
Contracts**

**Frontend
Interface**

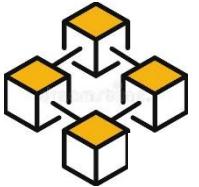
**Blockchain
platform**

Decentralized applications components:

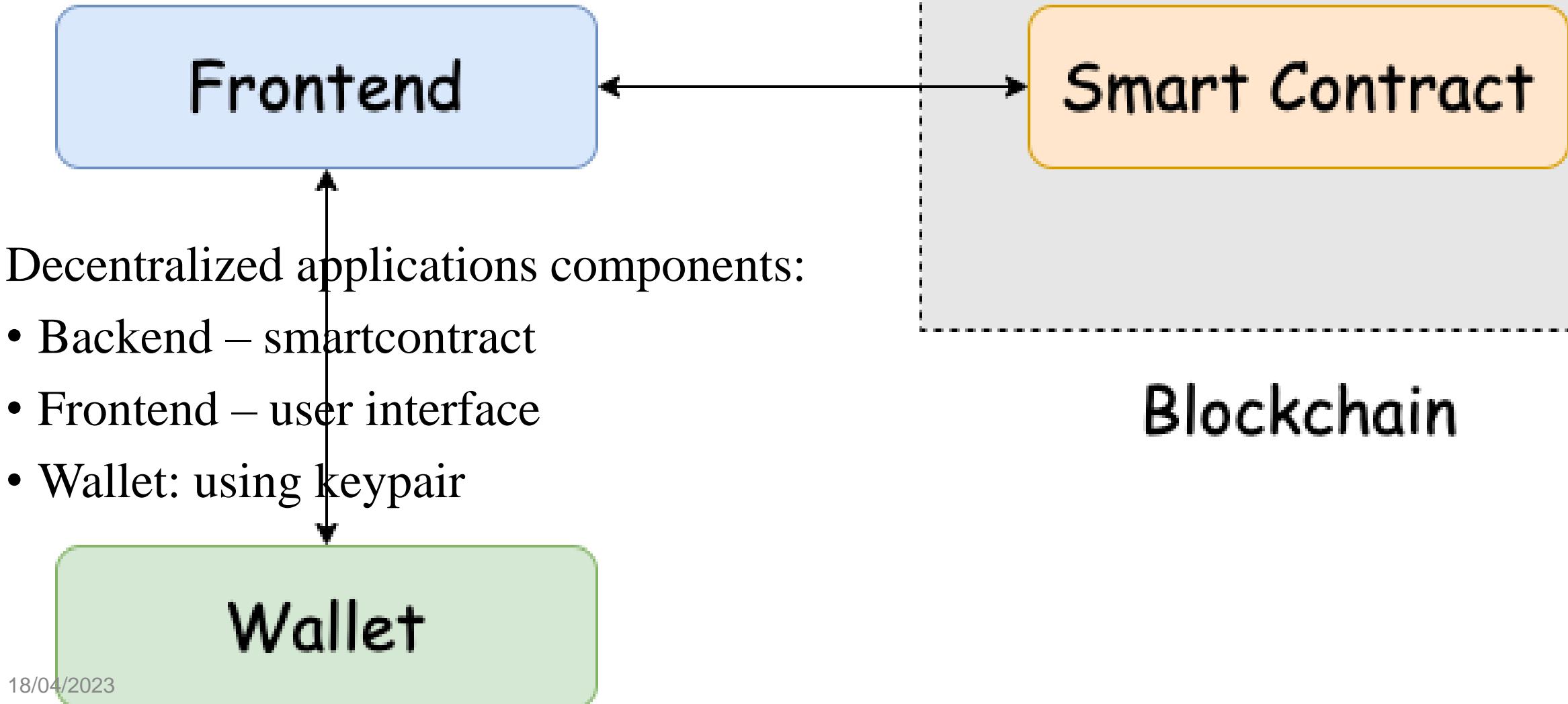
- Backend – smartcontract
- Frontend – user interface

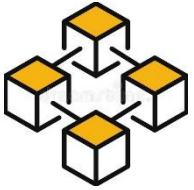
DApp



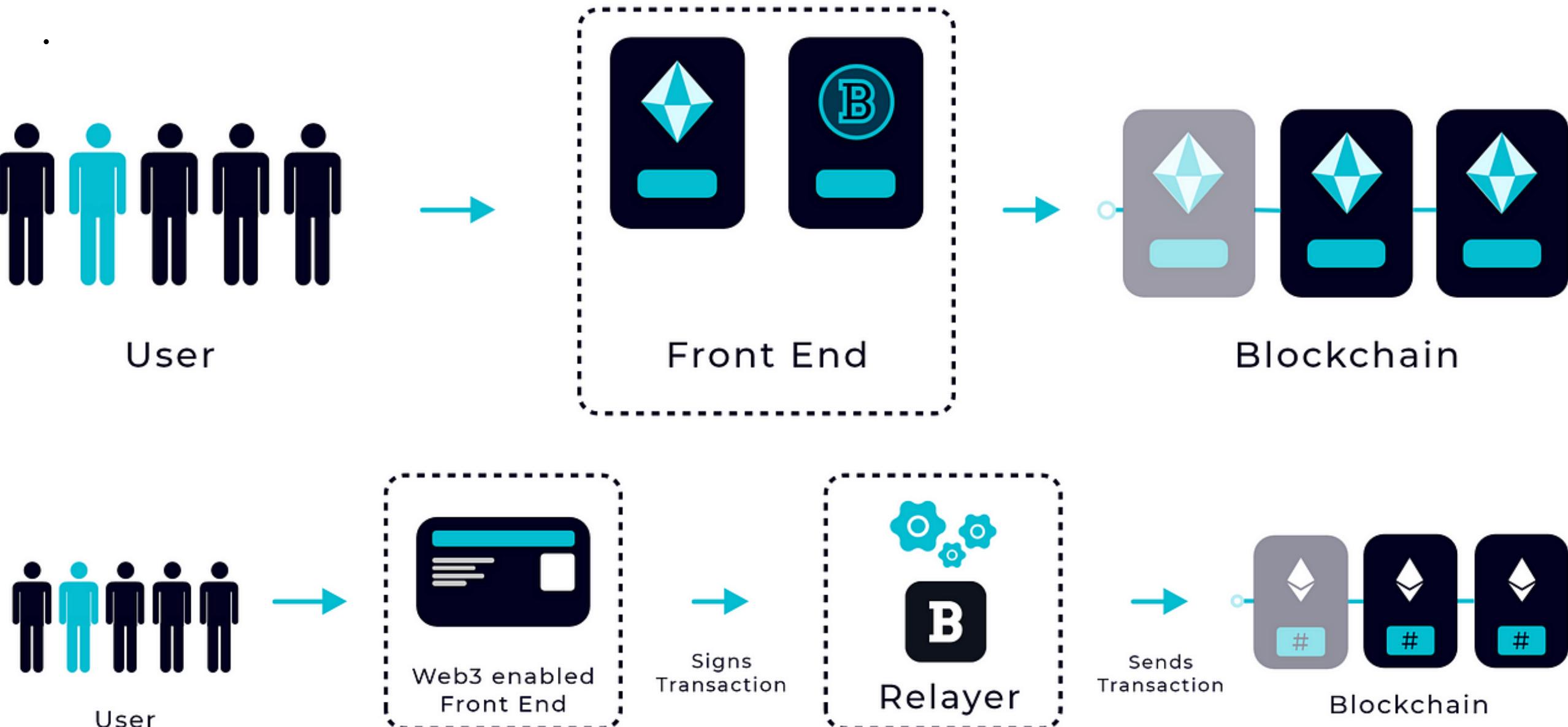


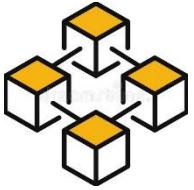
2.2. D-APP COMPONENTS



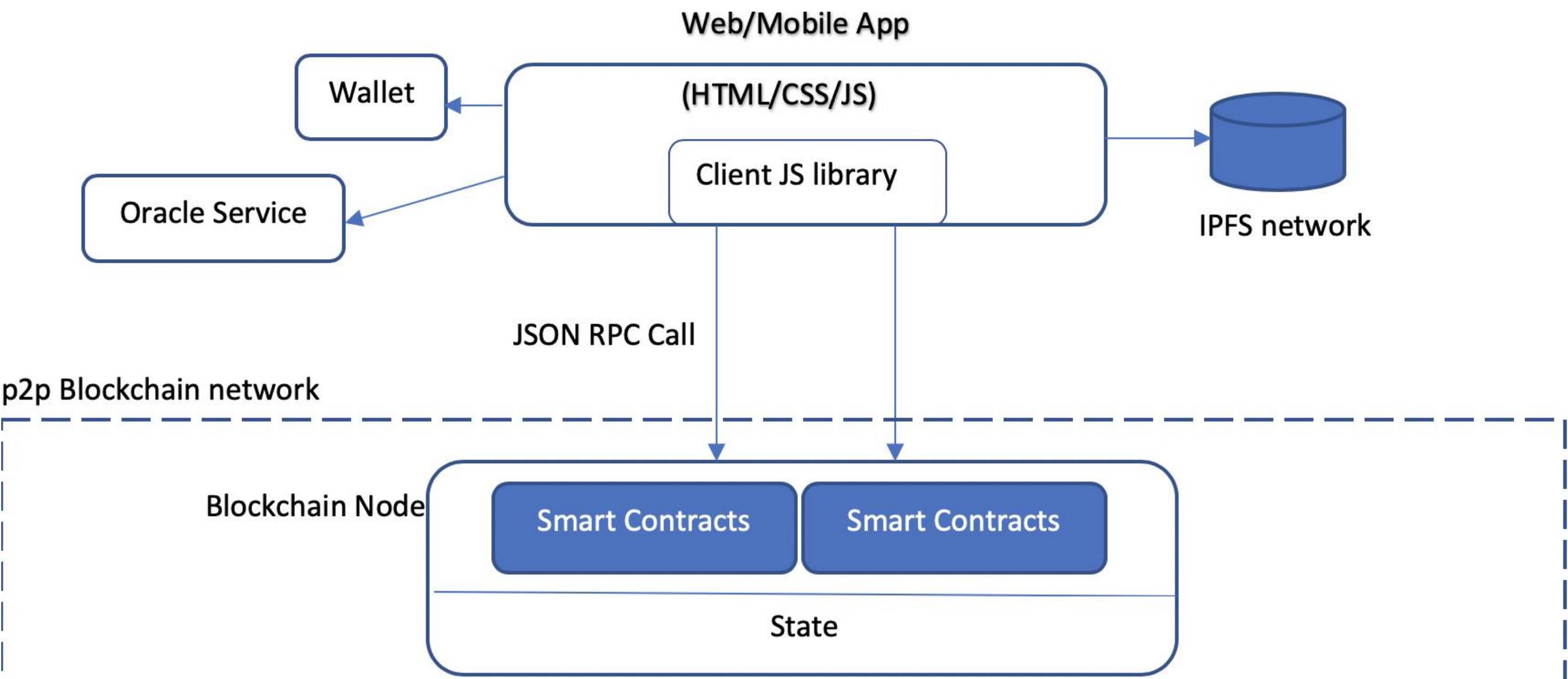


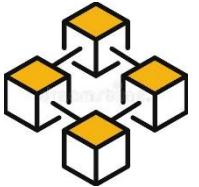
2.3. D-APP ARCHITECTURE



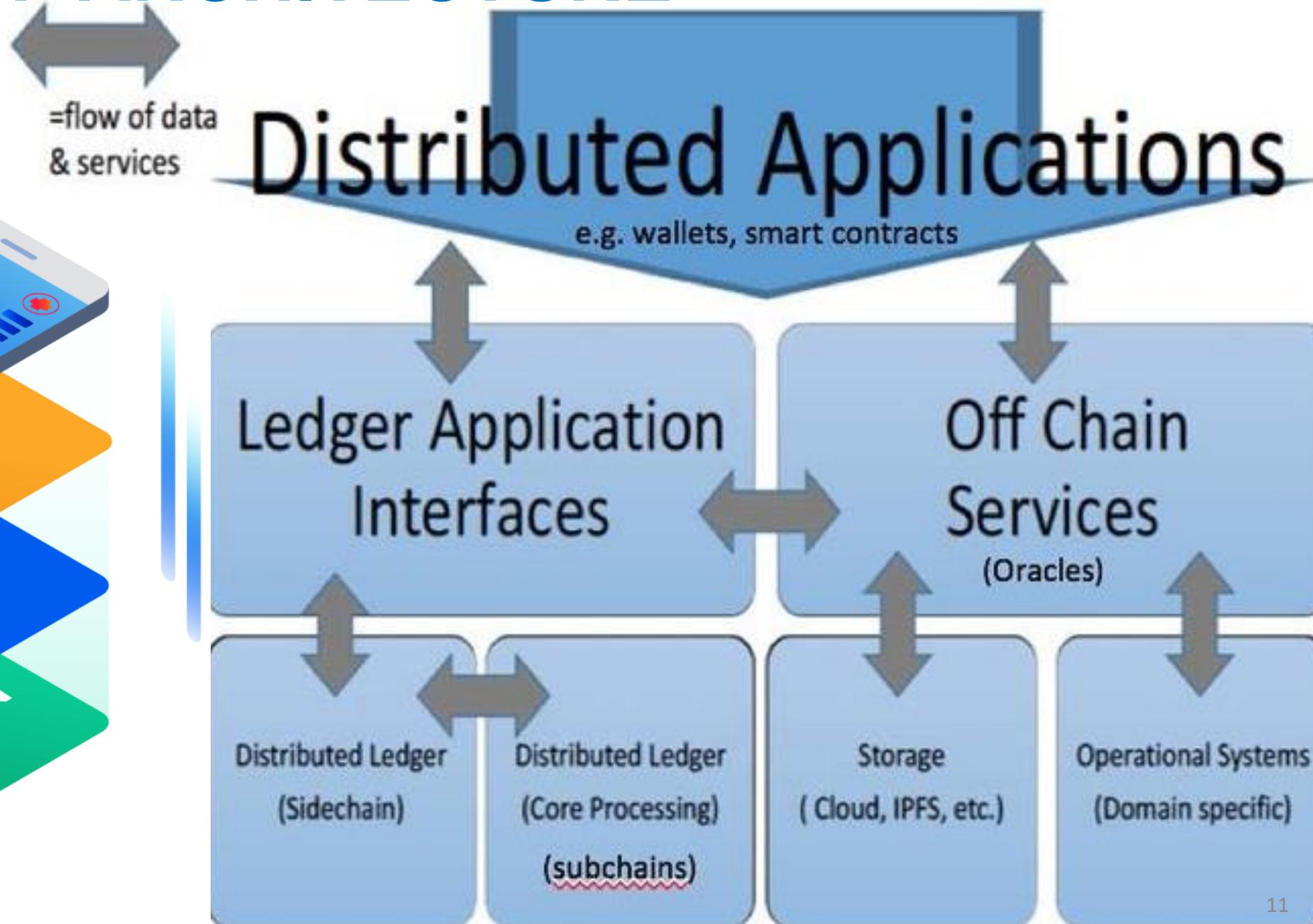


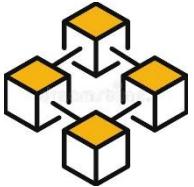
2.3. D-APP ARCHITECTURE





2.3. D-APP ARCHITECTURE

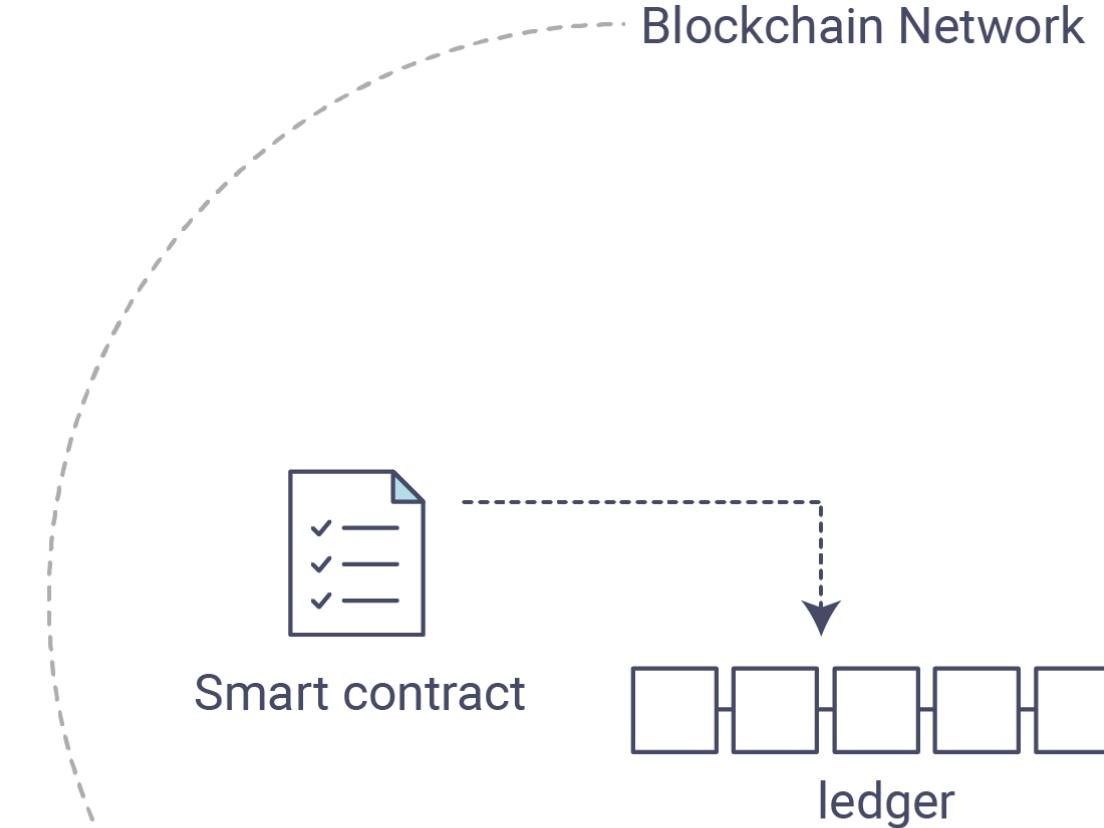
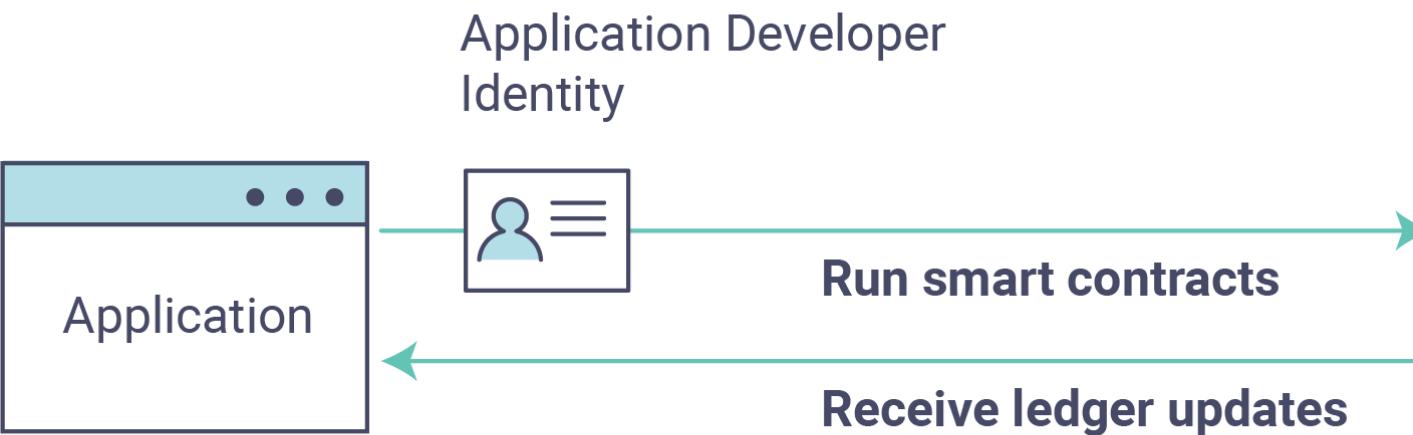




2.4. D-APP ACTIVITIES

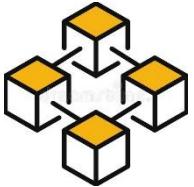
Dapp activities:

- Get data from blockchain network.
- Publishing transactions.



Both activities:

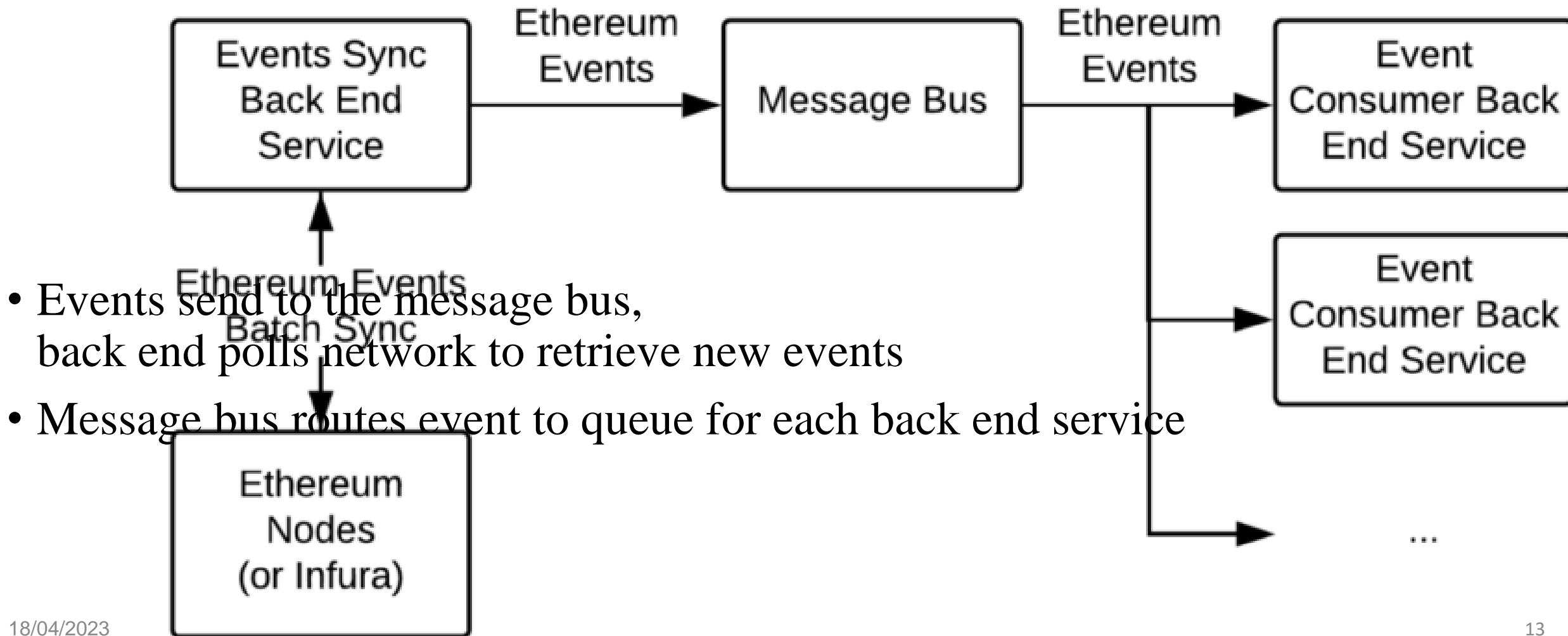
- User call a function (smart contract).
- Back end response: listens event/publishes transaction.
- Once transaction is ordered, back end receives event from network, performs logic

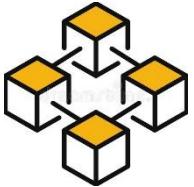


2.4. D-APP ACTIVITIES

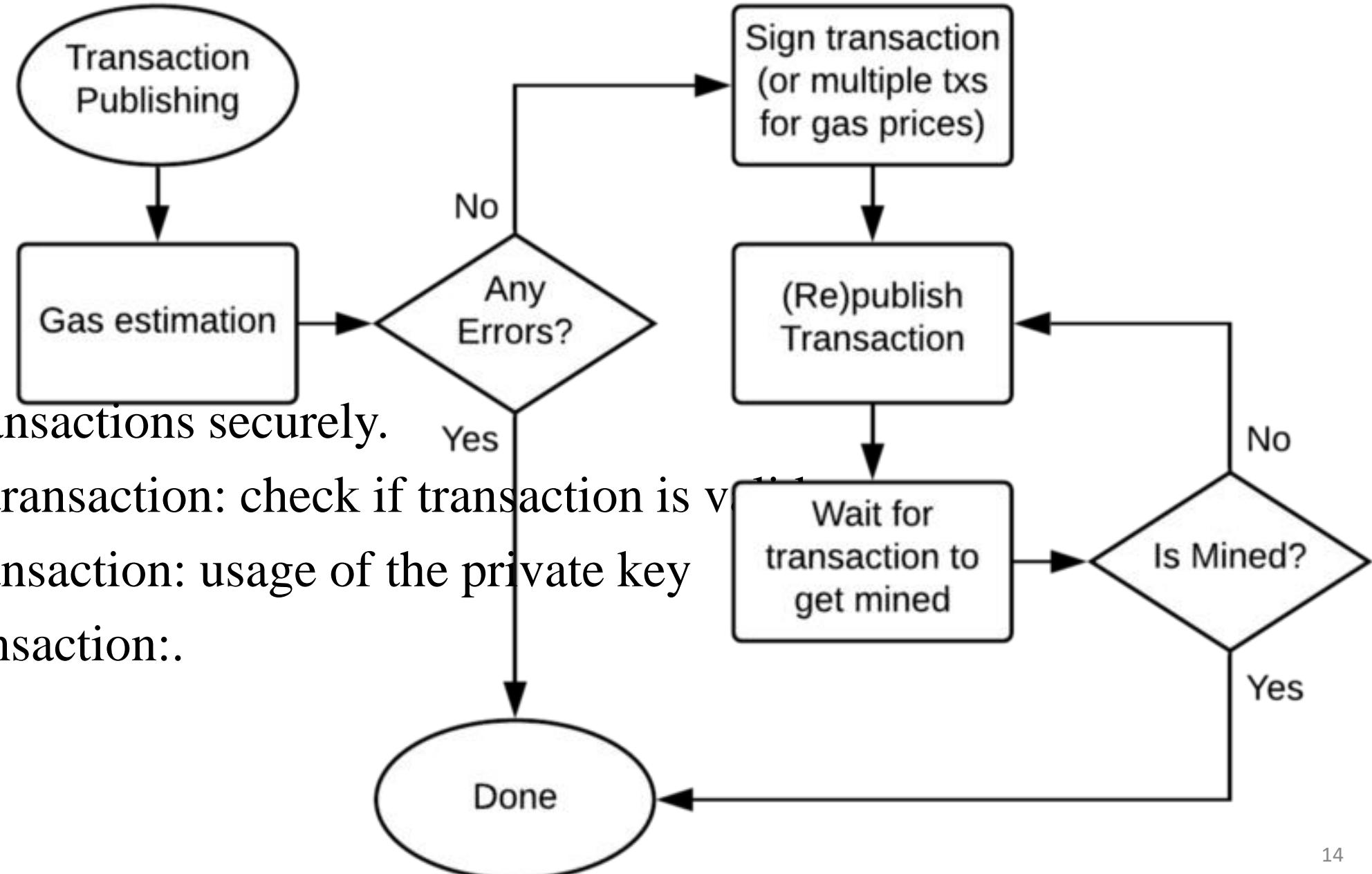
1A. Listening network events

1B. Reading data from the network



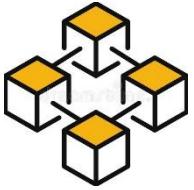


2.4. D-APP ACTIVITIES



2. Publishing transactions securely.

- Preparing the transaction: check if transaction is valid
- Signing the transaction: usage of the private key
- Publishing transaction:..



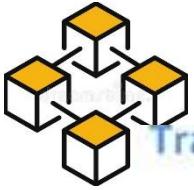
2.5. D-APP FEATURES & ADVANTAGES

KEY FEATURES OF DECENTRALIZED APPLICATIONS



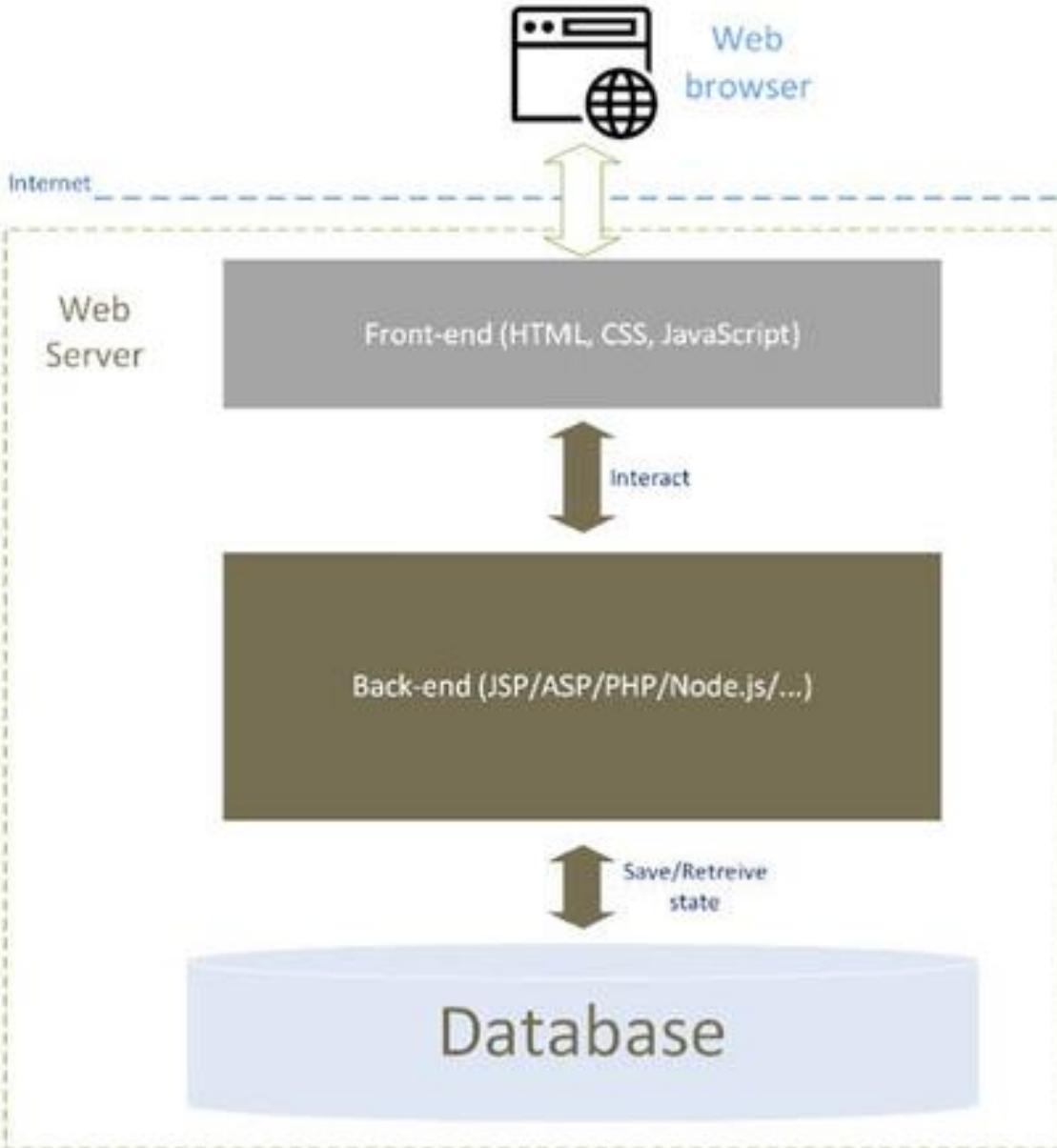
ADVANTAGES OF DECENTRALIZED APPS



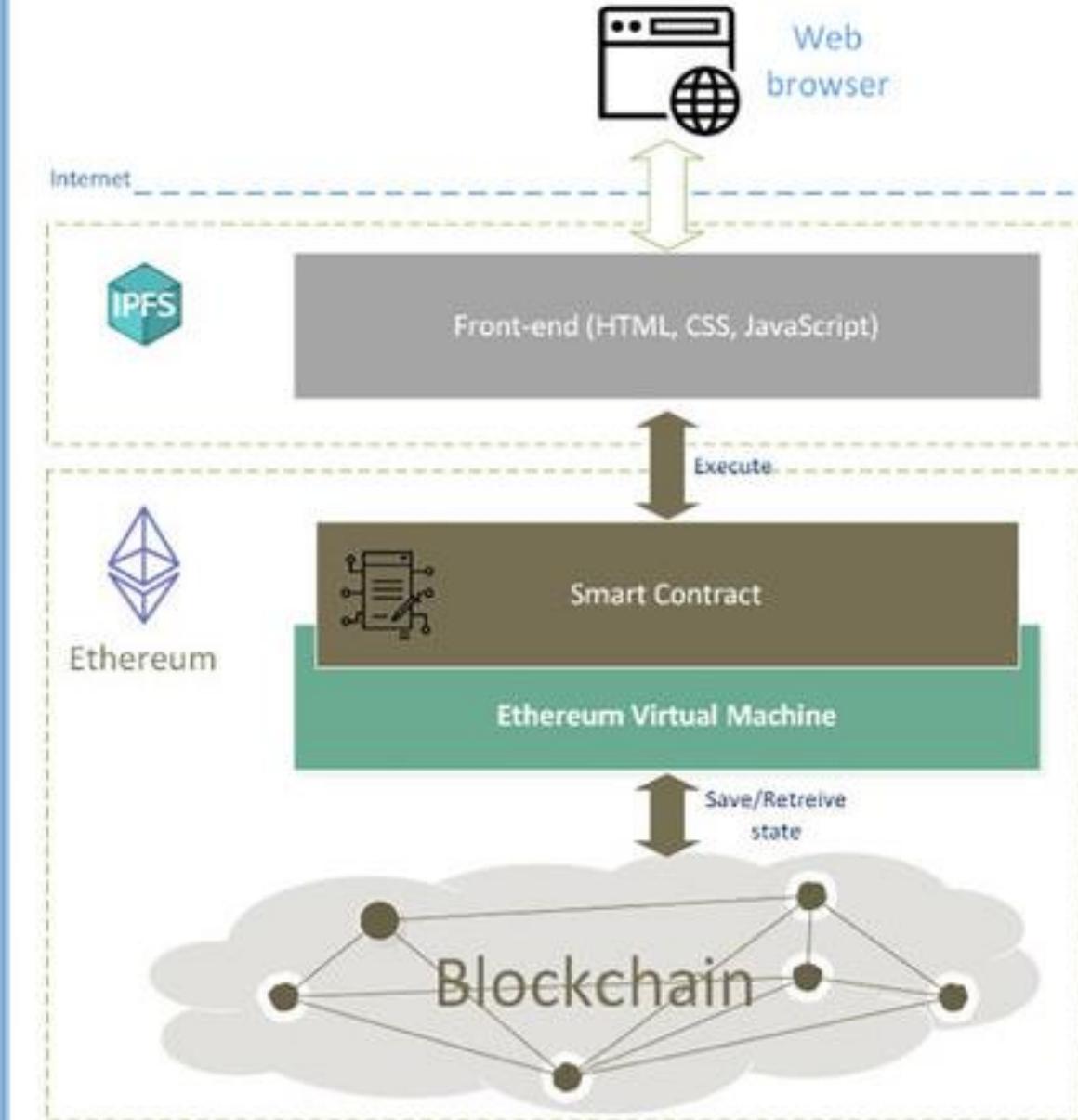


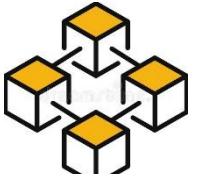
2.6. D-APP VS C-APP

Traditional Web Application



Decentralized Application (DApp)





2.6. D-APP VS C-APP

Centralized Application VS Decentralized Application

Centralized

Transportation costs relatively high

Low-quality compost

Need advanced technology

Large facilities

High treatment cost

Decentralized

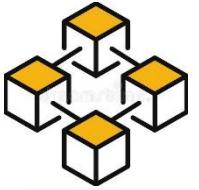
Transportation costs relatively low

High-quality compost

Simple technology needed

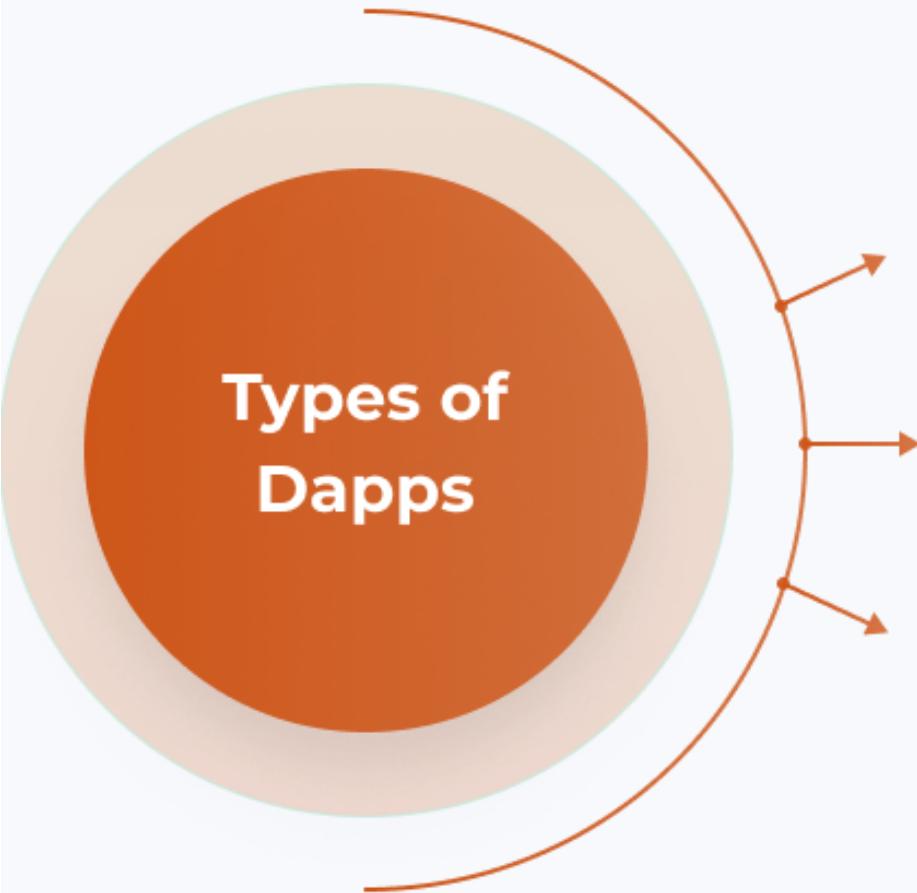
Small facilities

Low treatment cost



2.7. D-APP CLASSIFICATION

-



One method to classify dApps is based on whether they have their own blockchain or they use the blockchain of another dApp

Type I

dApps that have their own blockchain

1

Type II

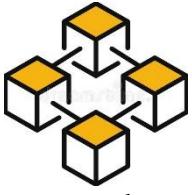
dApps that use the blockchain of type I dApp. Type II d Apps are protocols and have tokens that are necessary for their function (i.e. Omni Protocol)

2

Type III

dApps that use the protocol of a type II dApp. Type III dApp are protocols and have tokens that are necessary for their function (i.e. the SAFE Network uses the Omni Protocol to issue 'safecoins' that can be used to acquire distributed file storage)

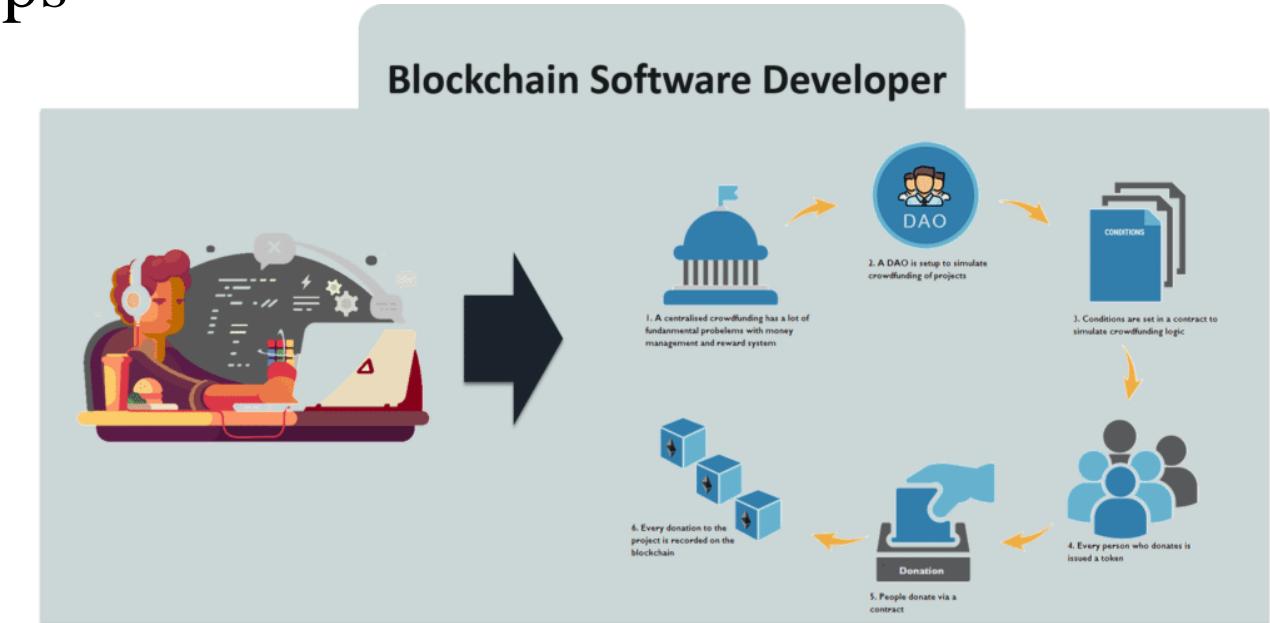
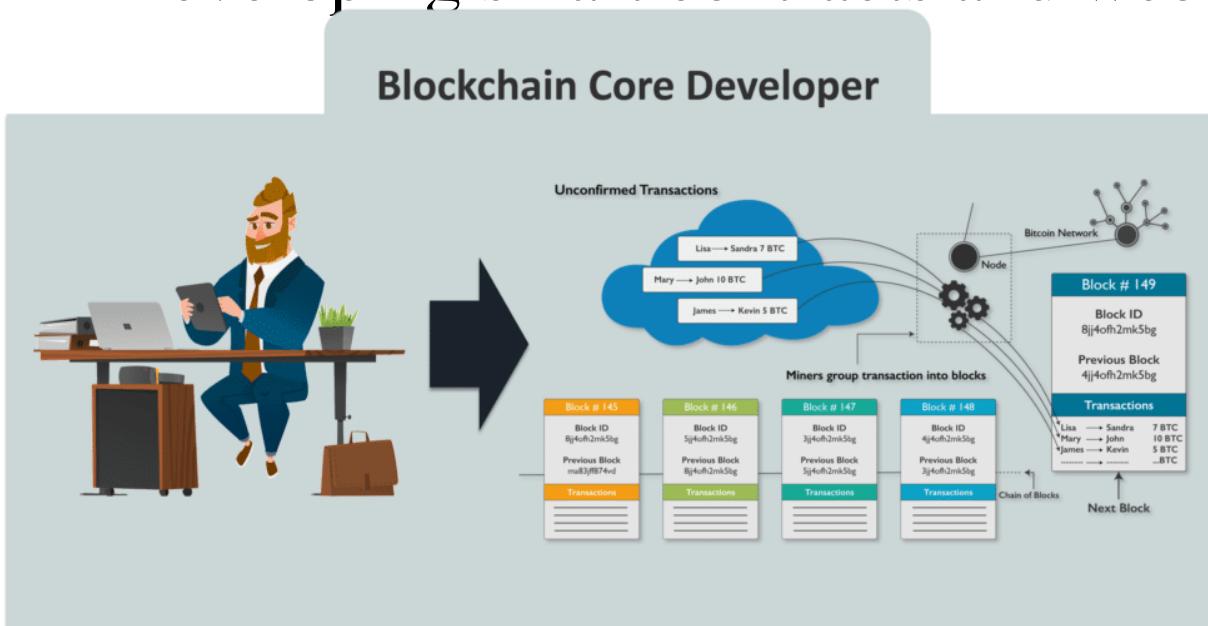
3



2.8. D-APP DEVELOPMENTS

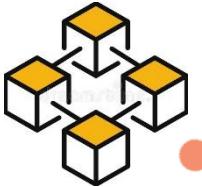
Blockchain developers:

- Developing and optimizing blockchain protocols
- Crafting architecture of blockchain systems
- Developing smart contracts and web apps



Core blockchain developer handles the design architecture of blockchain technology

Blockchain software developer use this architecture to create blockchain applications



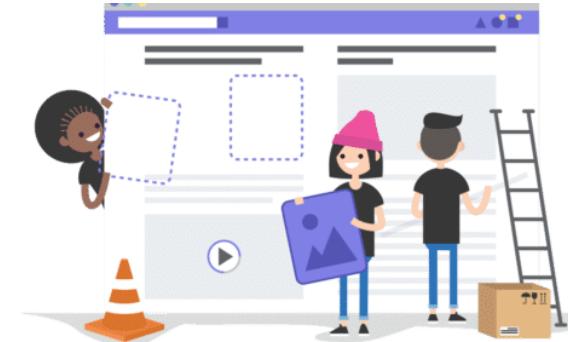
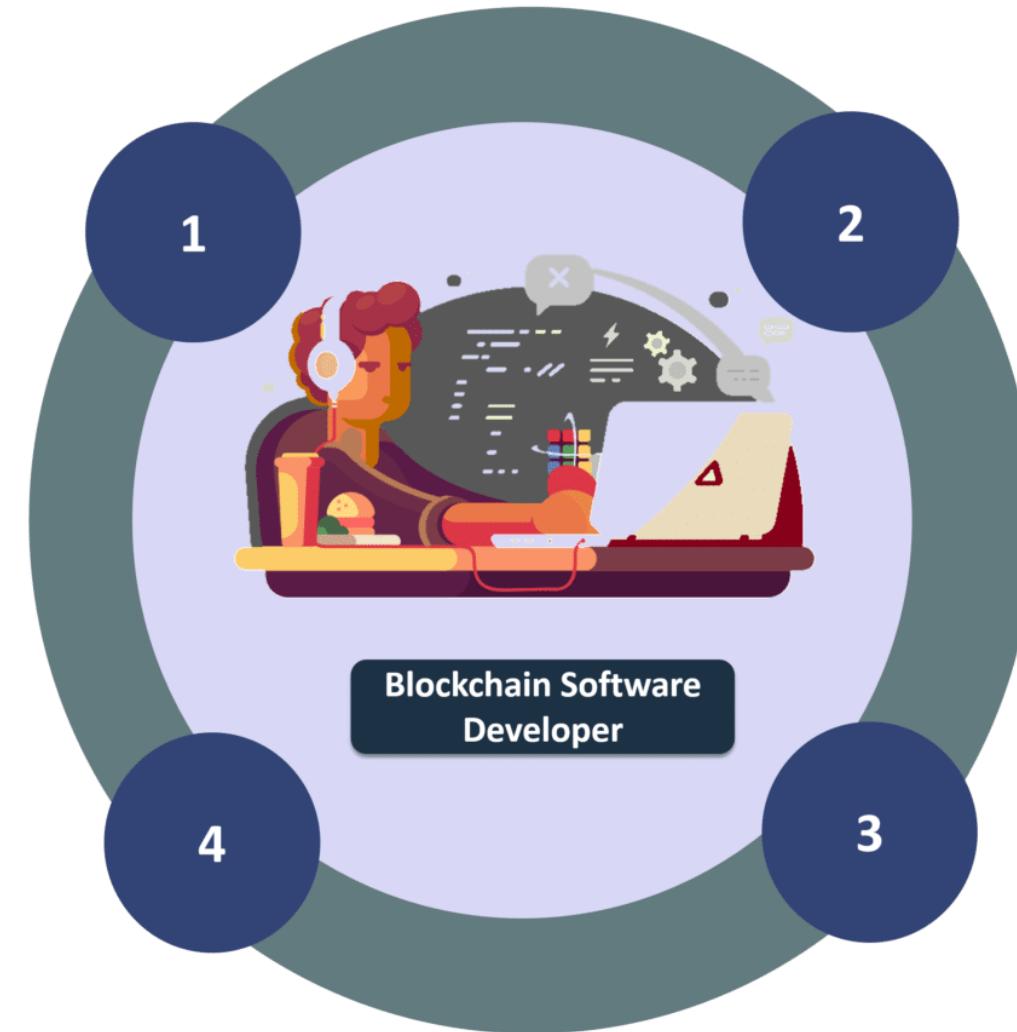
2.8. D-APP DEVELOPMENTS



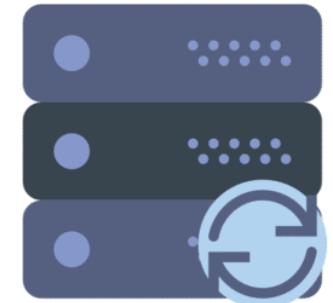
Smart contract
development



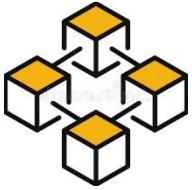
API INTERFACE
Supervision of full stack



Front end development
of application



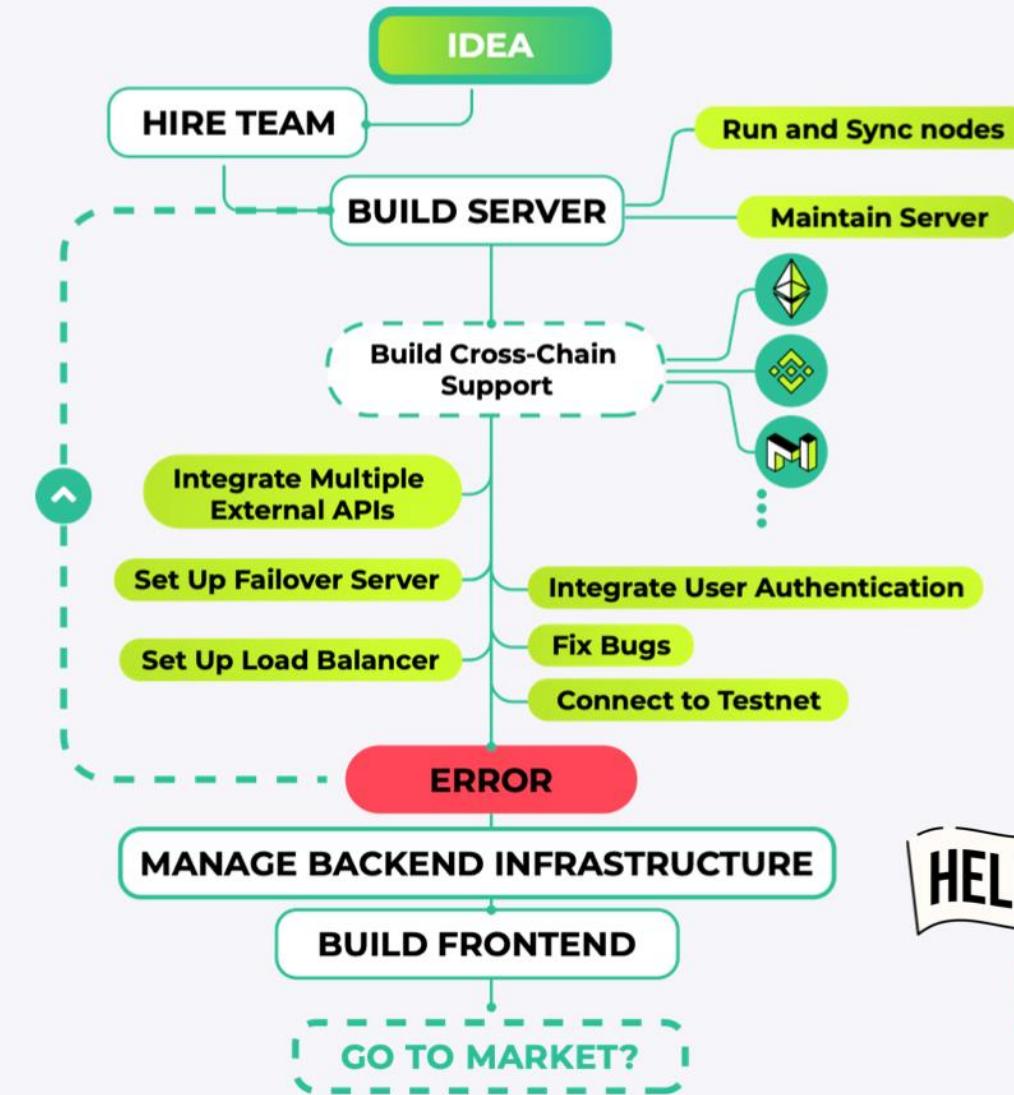
Backend development

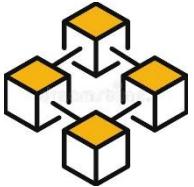


2.8. D-APP DEVELOPMENTS

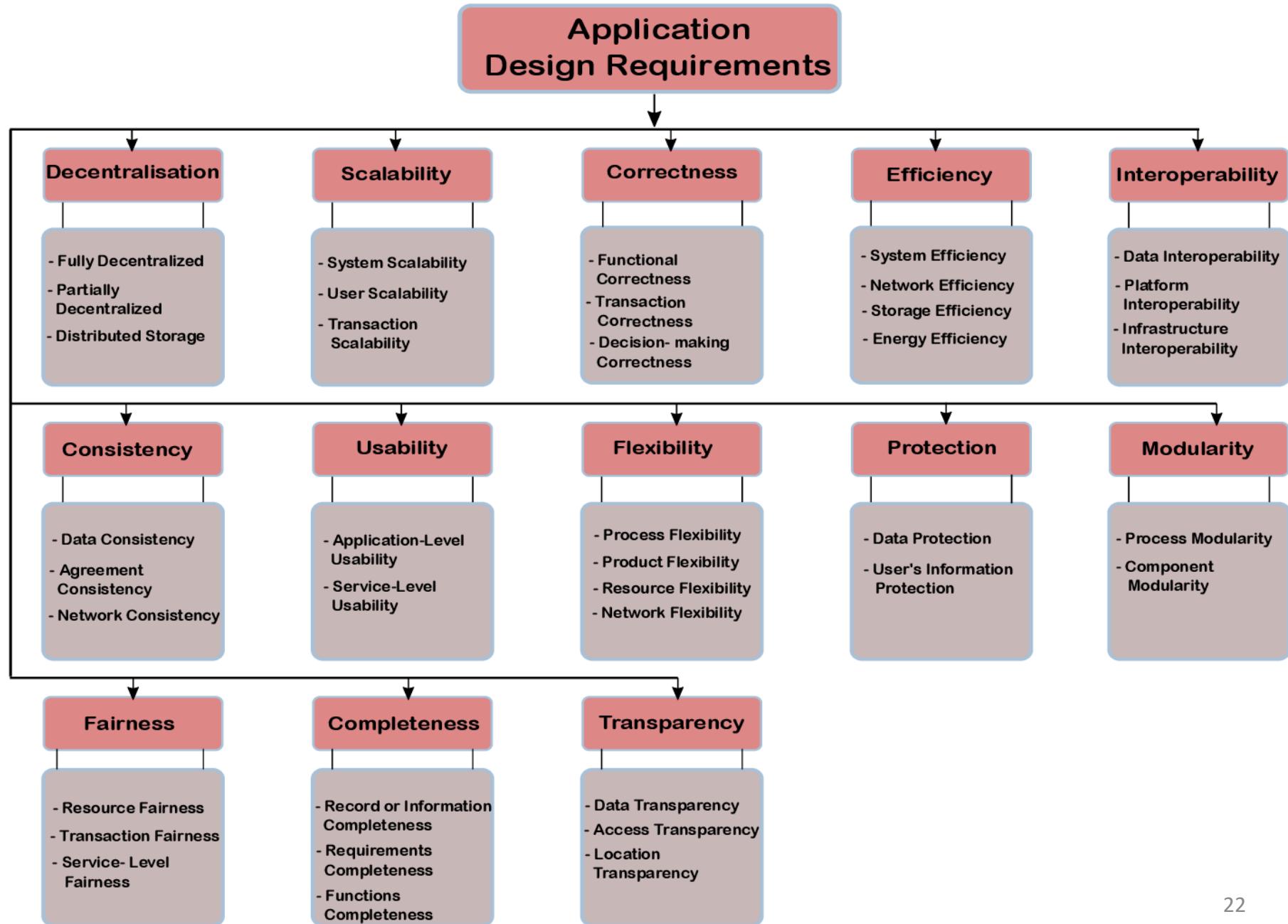
Current Development Process

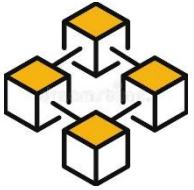
Dapp Development stages





2.8. D-APP DEVELOPMENTS





3. SMART CONTRACT

3.1. SMART CONTRACT DEFINITION

3.2. SMART CONTRACT ARCHITECTURE

3.3. WORKFLOW OF SMART CONTRACT

3.4. CREATE & DEPLOY SMART CONTRACT

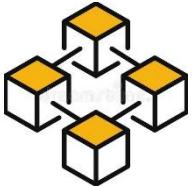
3.5. INVOKE SMART CONTRACT

3.6. SMART CONTRACT EVENTS

3.7. TYPE OF SMART CONTRACT **PARTIES**

3.8. TRADITIONAL CONTRACT VS SMART CONTRACT



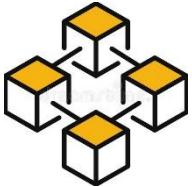


3.1. SMART CONTRACT DEFINITION

Contract:

- a written agreement between two parties
- creating legal binding while performing individual acts/transactions





3.1. SMART CONTRACT DEFINITION

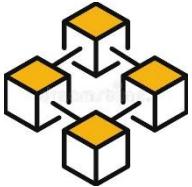
Smart contract:

- computer program/transaction protocol
- execute, control according to the terms of a contract

Smart contracts:

- Digital transaction protocols
- verify, control, self-execute an agreement (computerized codes)
- if parties meet predefined rules
- specific set of coded rules
- execute predefined actions once the predetermined conditions are met

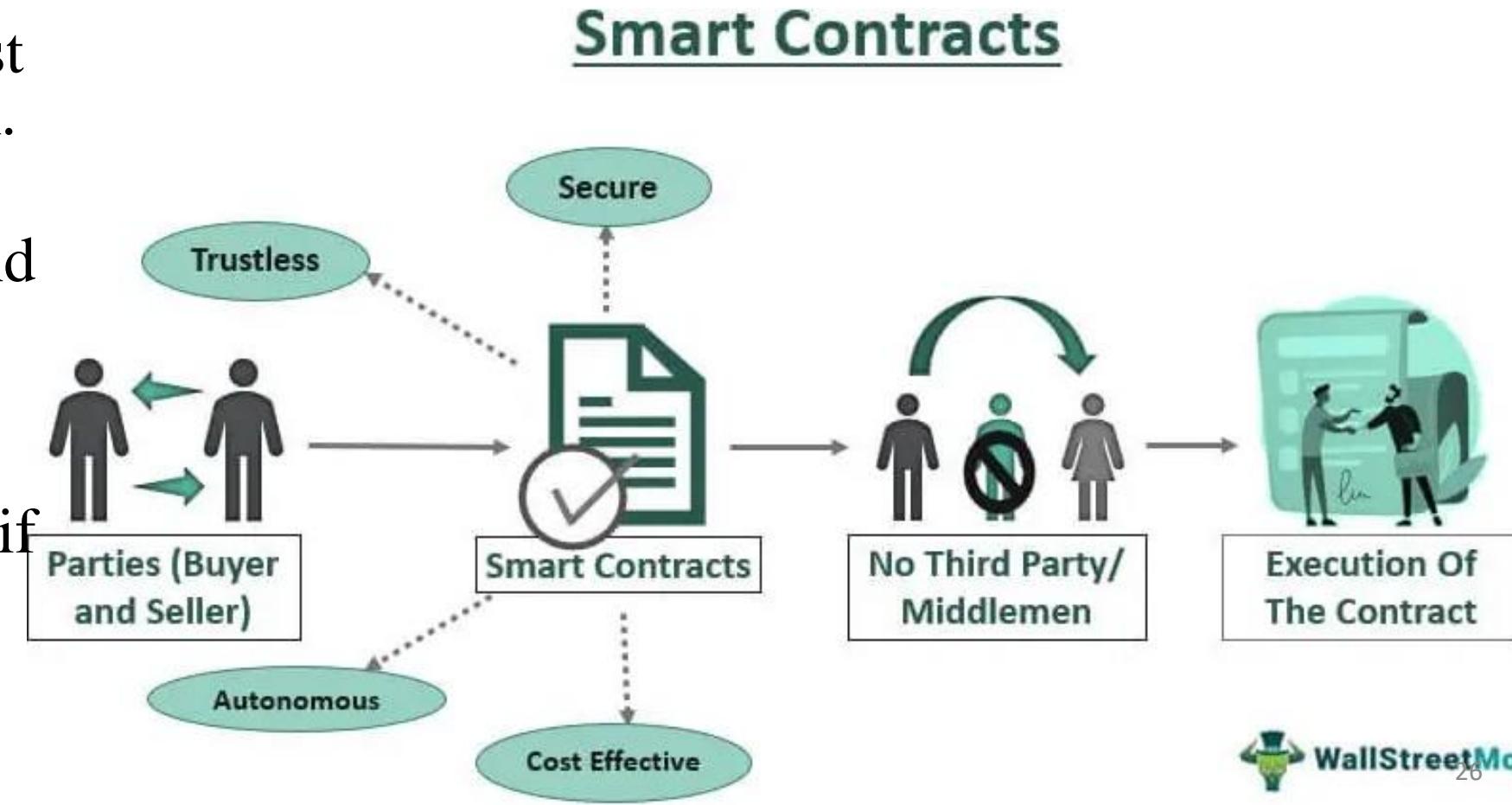


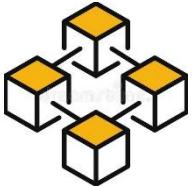


3.1. SMART CONTRACT DEFINITION

Smart contracts properties:

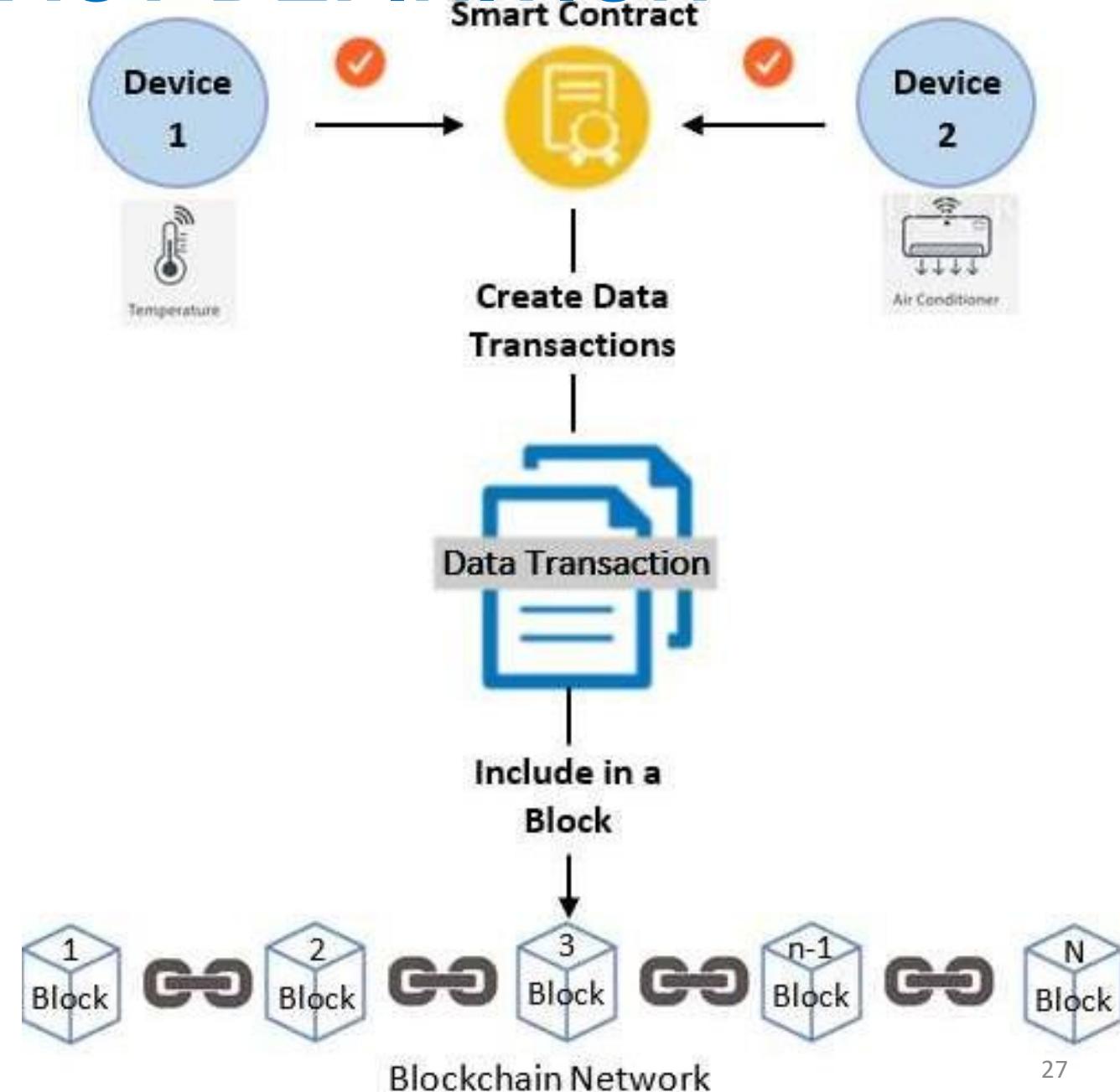
- 2 parties of contract in digital agreement
- The contract code exist in blockchain network.
- Smart contract execution trackable and irreversible.
- self-execute an agreement (computerized codes) if meet predefined rules

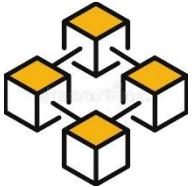




3.1. SMART CONTRACT DEFINITION

Smart contract:



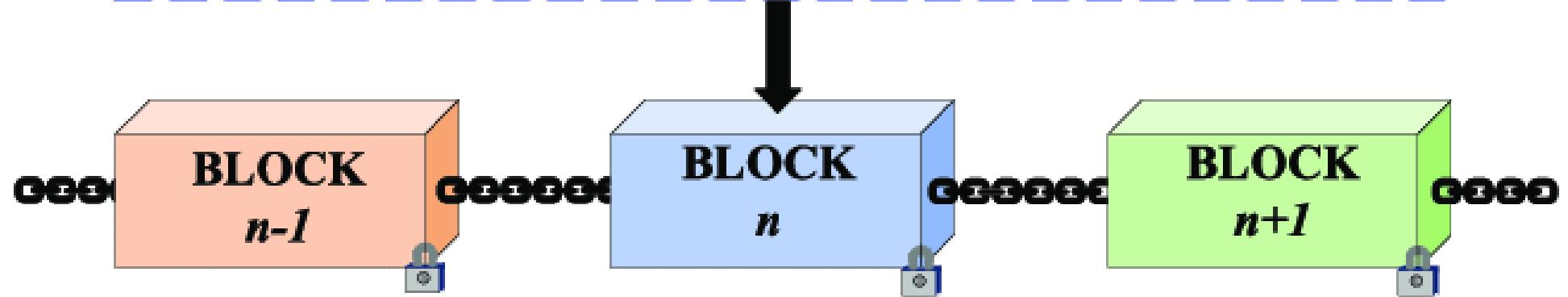
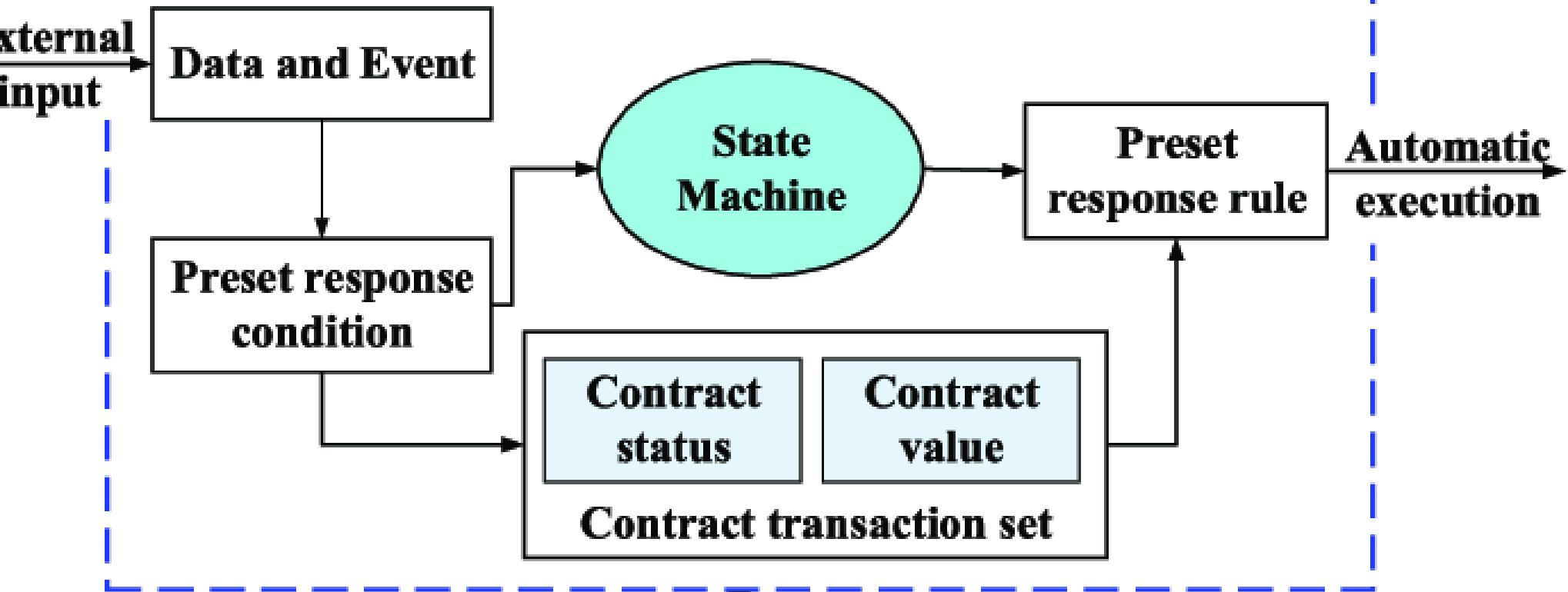


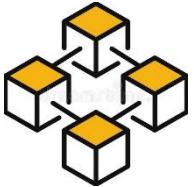
3.2. SMART CONTRACT ARCHITECTURE

Smart contract:

- Architecture
 - Components
- External input

Smart Contract

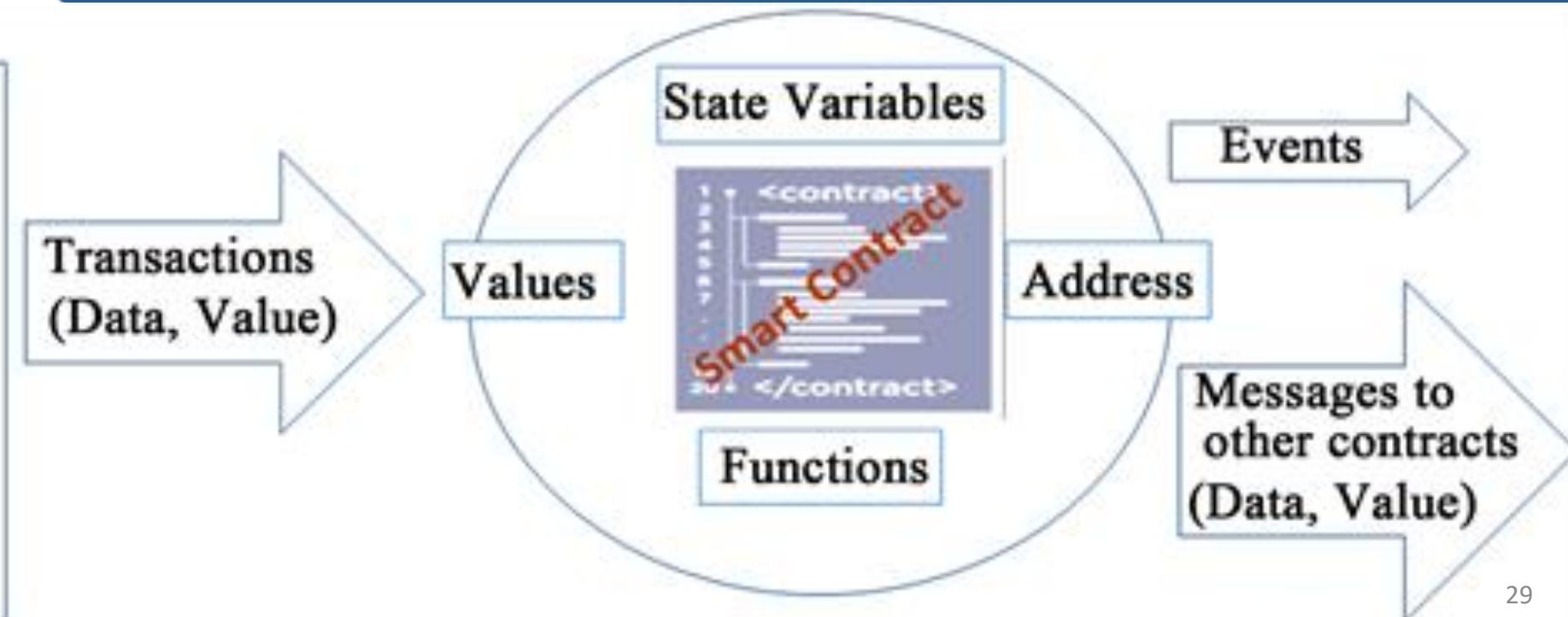
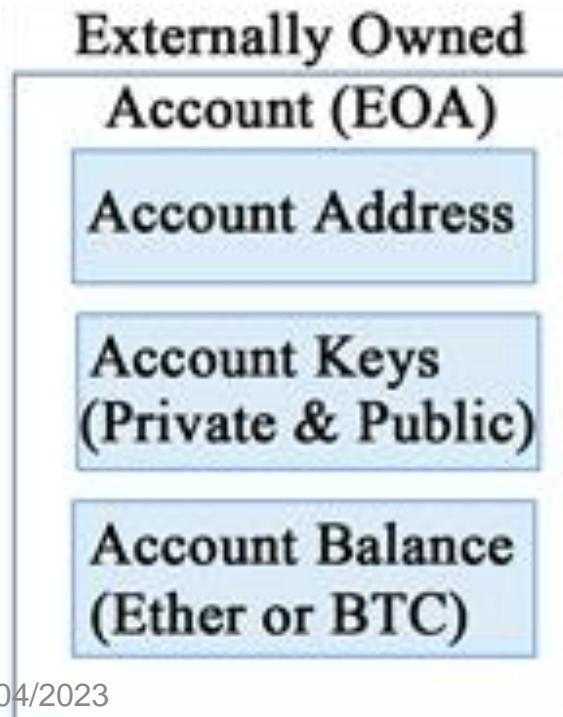
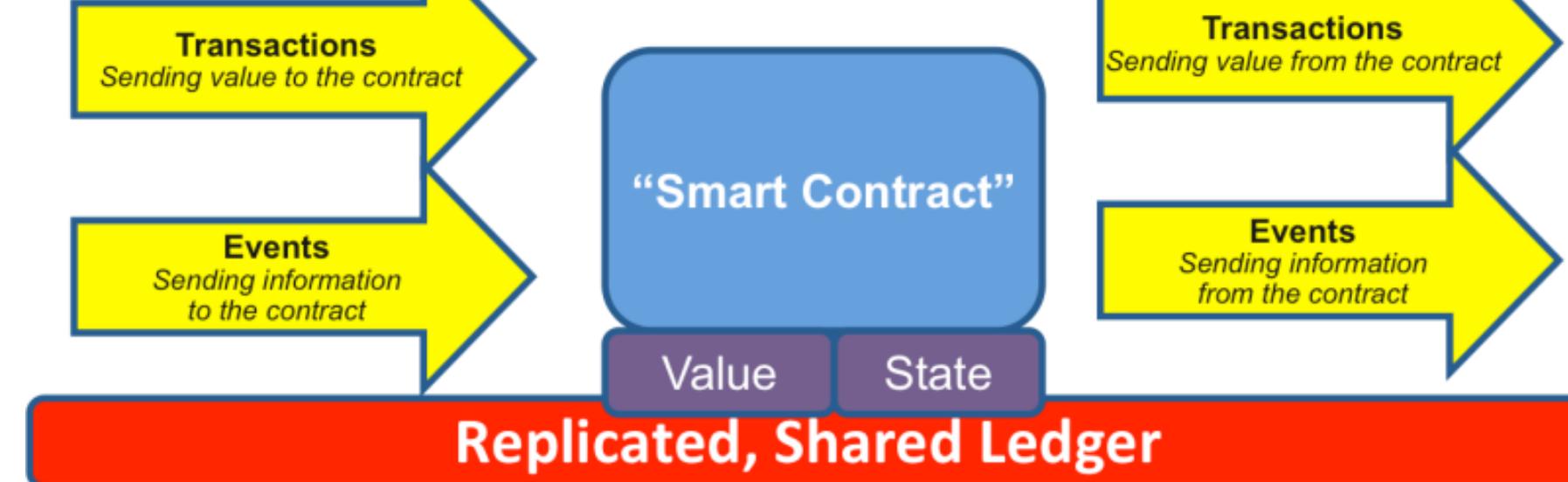


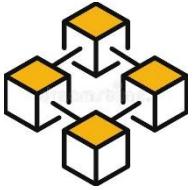


3.2. SMART CONTRACT ARCHITECTURE

Smart contract:

- Architecture
- Components

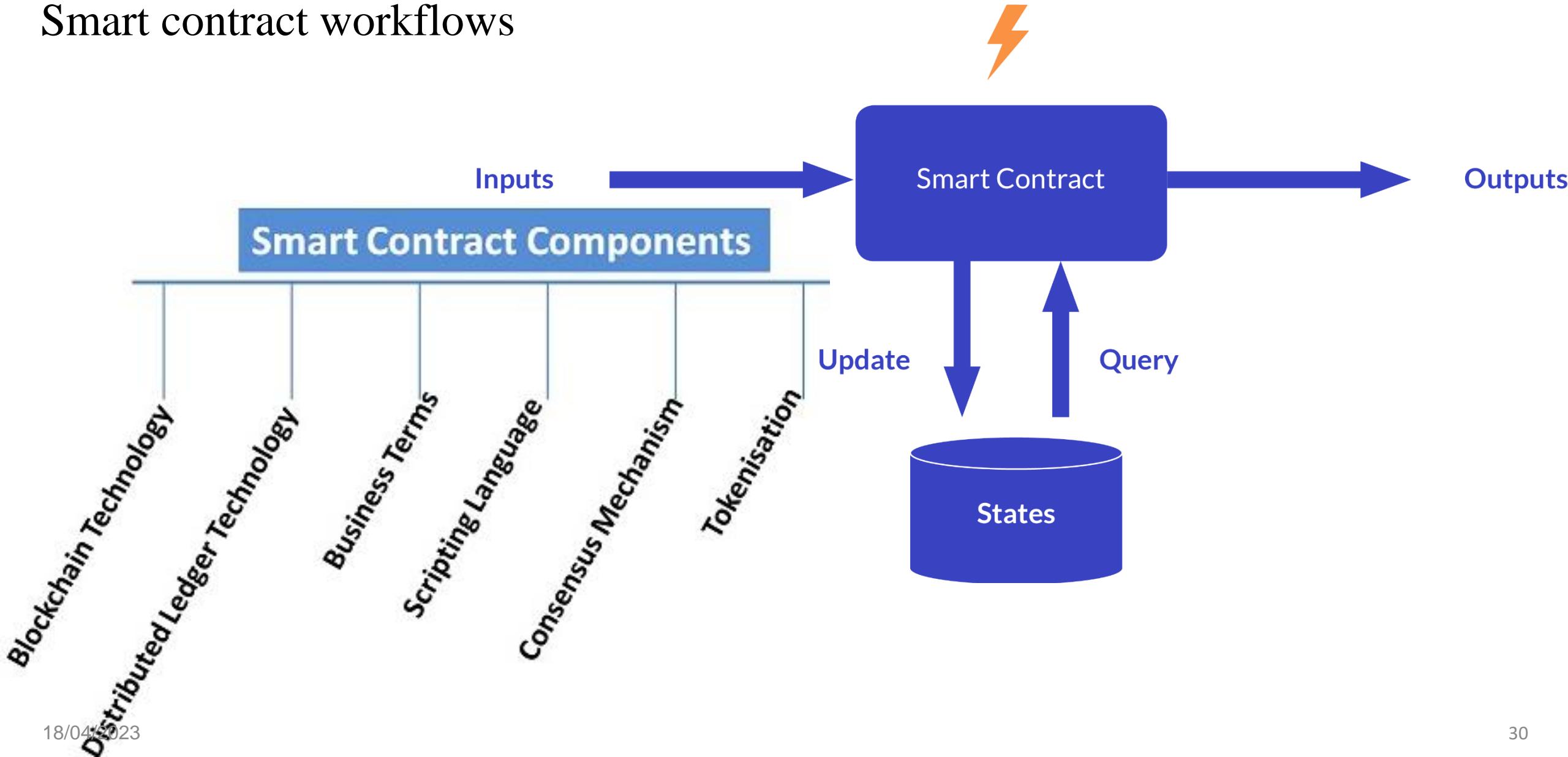


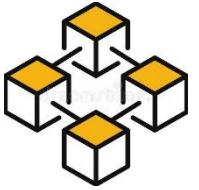


3.2. SMART CONTRACT ARCHITECTURE

Events

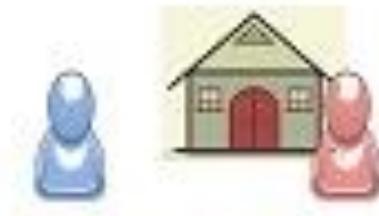
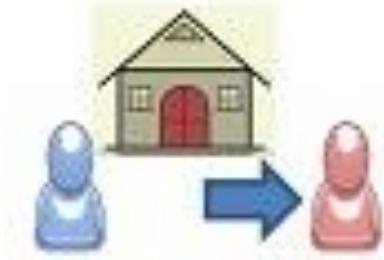
Smart contract workflows

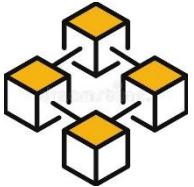




3.3. WORKFLOW OF SMART CONTRACT

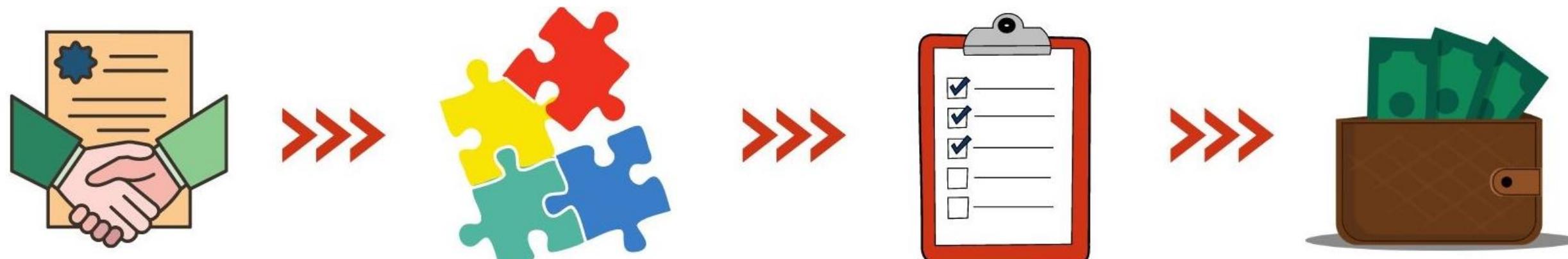
Smart contract workflows





3.3. WORKFLOW OF SMART CONTRACT

Smart contract workflows



Pre-defined Contract

Business Logic

Execution

Settlement



Pre-Defined Contract

Events

Execution

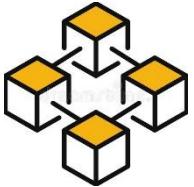
Settlement

Terms and conditions are agreed by all the parties involved.
18/04/2023

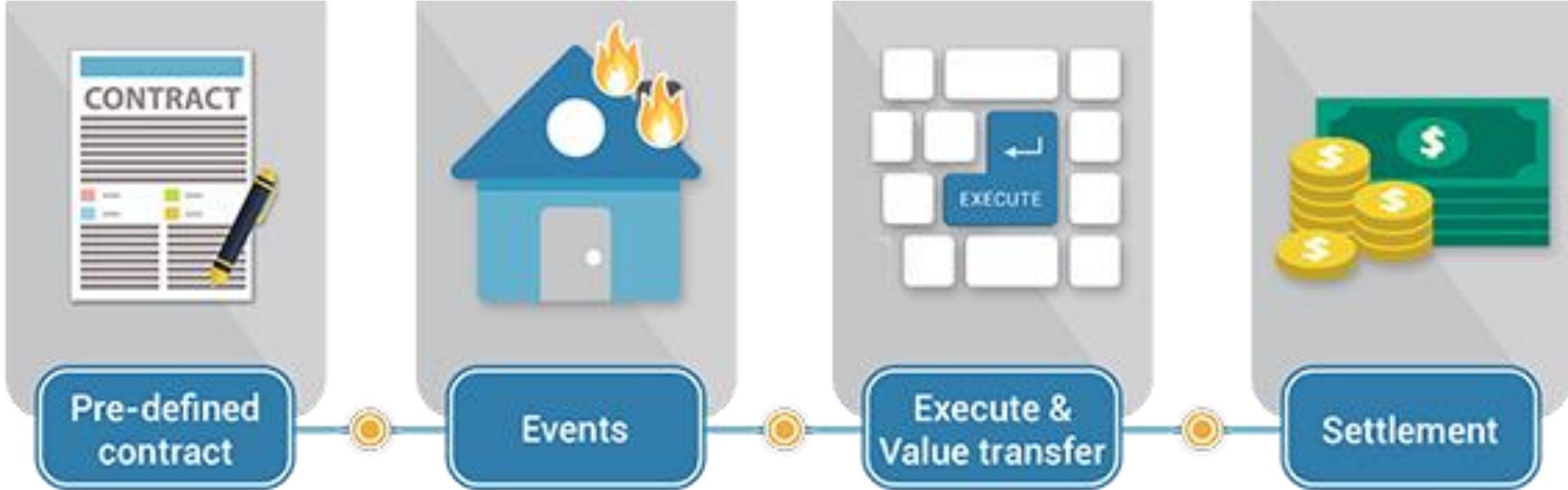
Execution of the contract is triggered by an event.

The smart contract is executed automatically.

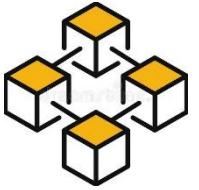
All the settlements are executed quickly and efficiently.
32



3.3. WORKFLOW OF SMART CONTRACT

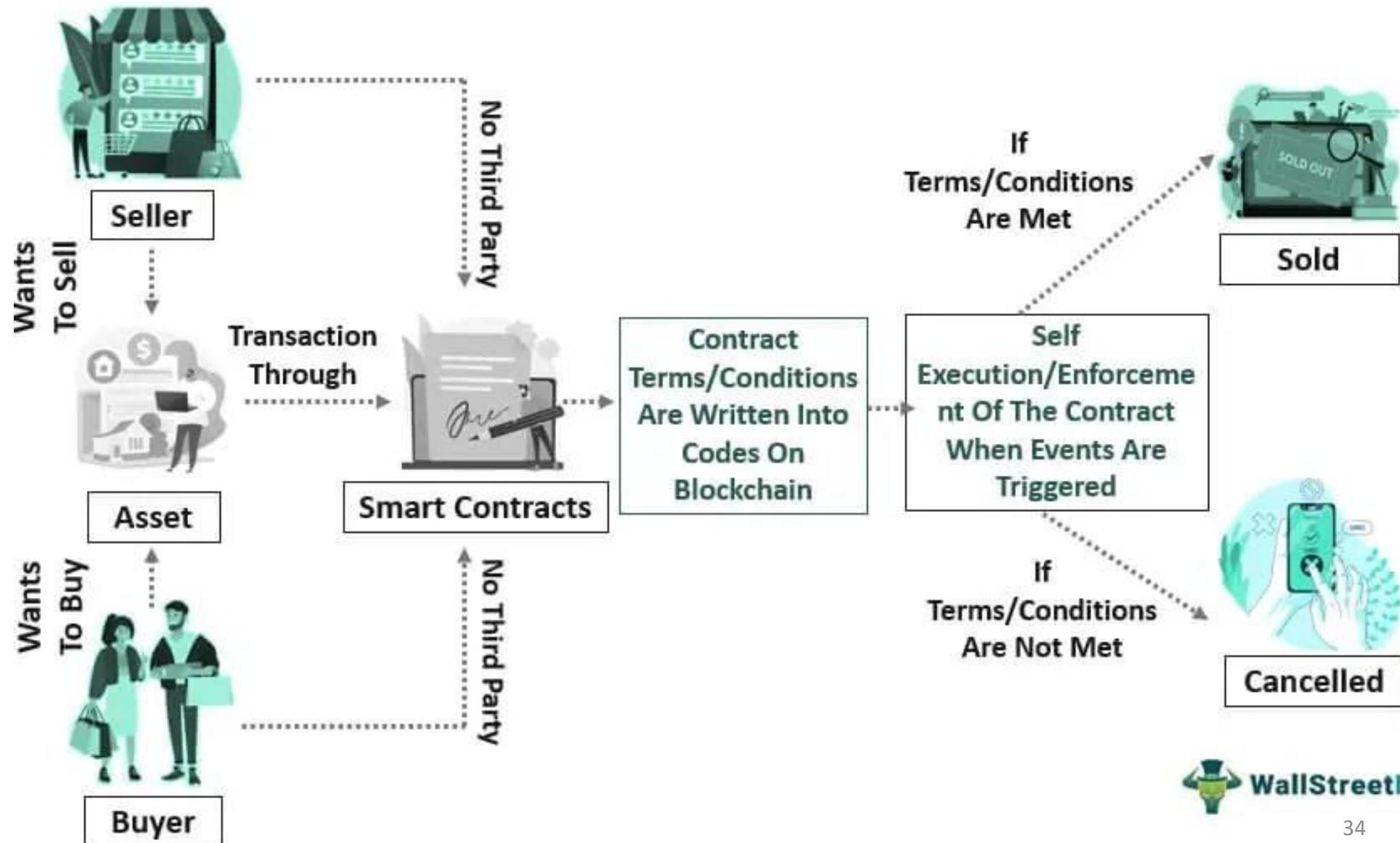


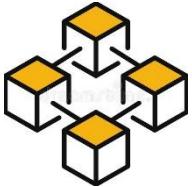
- Terms of the policy are agreed by all counterparties
- These are hard coded into the smart contract and cannot be changed without all parties knowing
- Event triggers insurance policy execution
- The smart contract policy is automatically executed based on the pre-agreed terms
- Payout / other settlement completed instantly and efficiently



3.3. WORKFLOW OF SMART CONTRACT

Smart Contracts Functioning

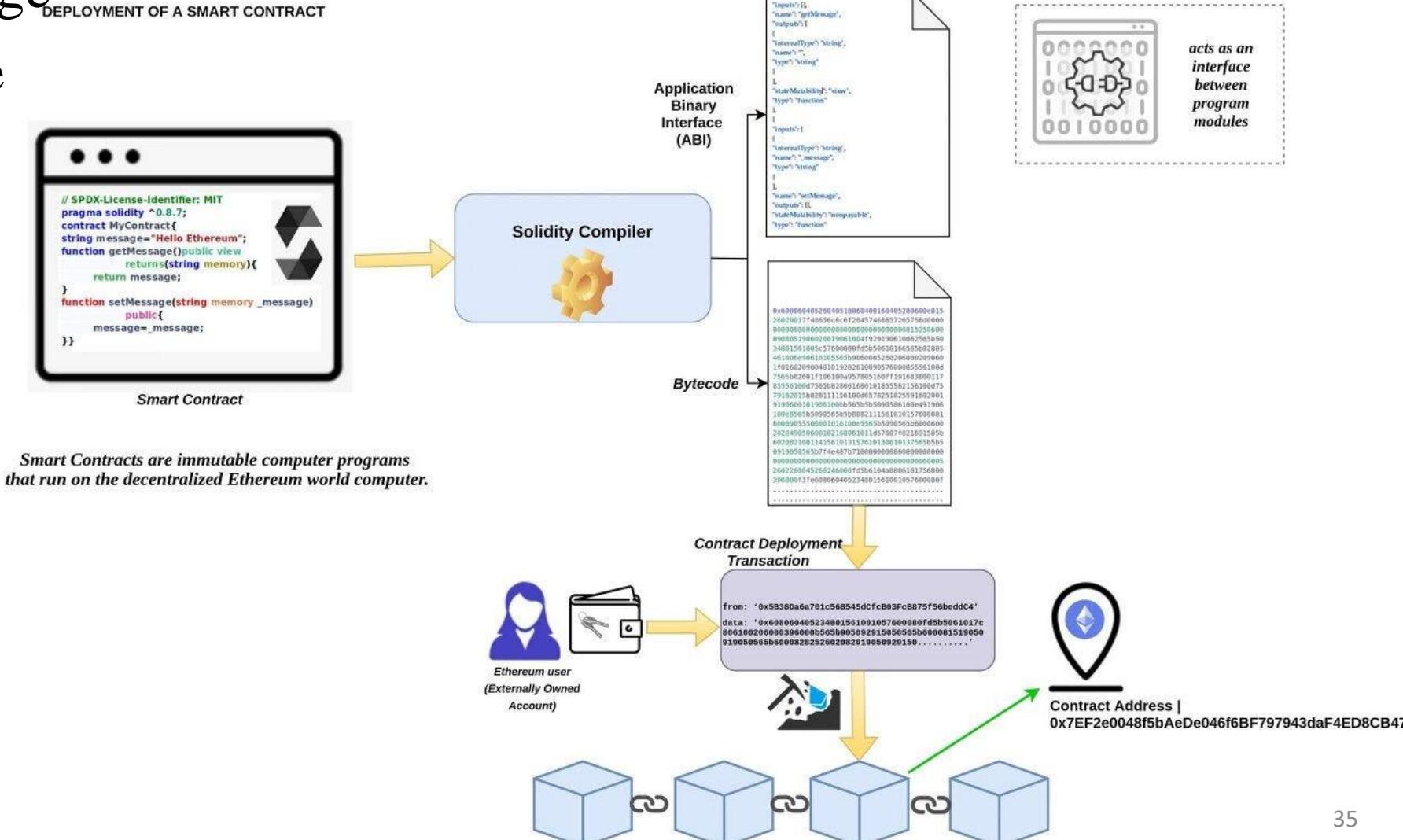


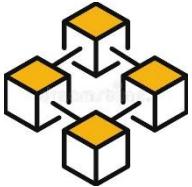


3.4. CREATE & DEPLOY SMART CONTRACT

Create: smartcontract

- Programming: language
- Compile: to byte code

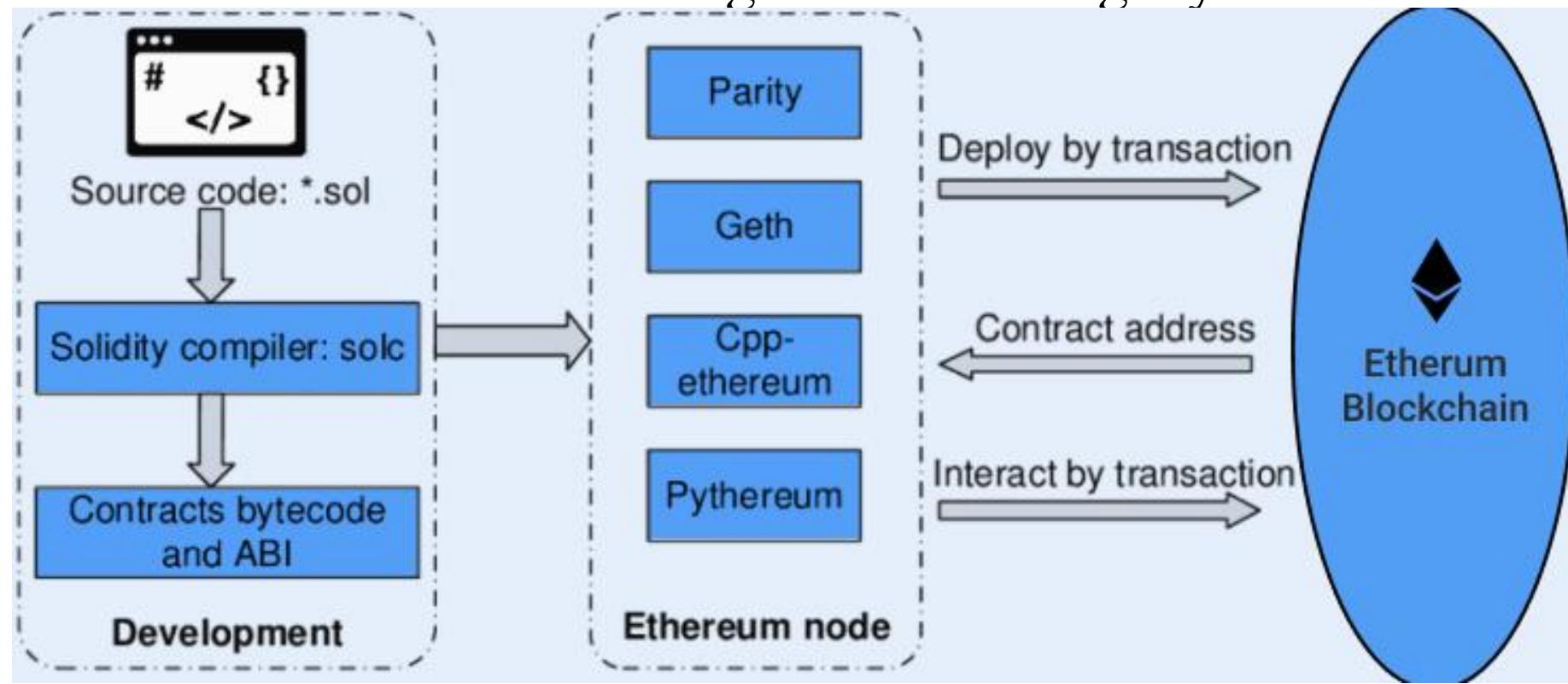


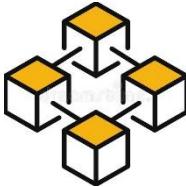


3.4. CREATE & DEPLOY SMART CONTRACT

Deploy: Contract

- on-chain deploy: save the contract code itself in the blockchain which guarantees global consensus
- off-chain deploy: node have code installed locally, and use a hash-based commitment as reference for validating the code integrity.



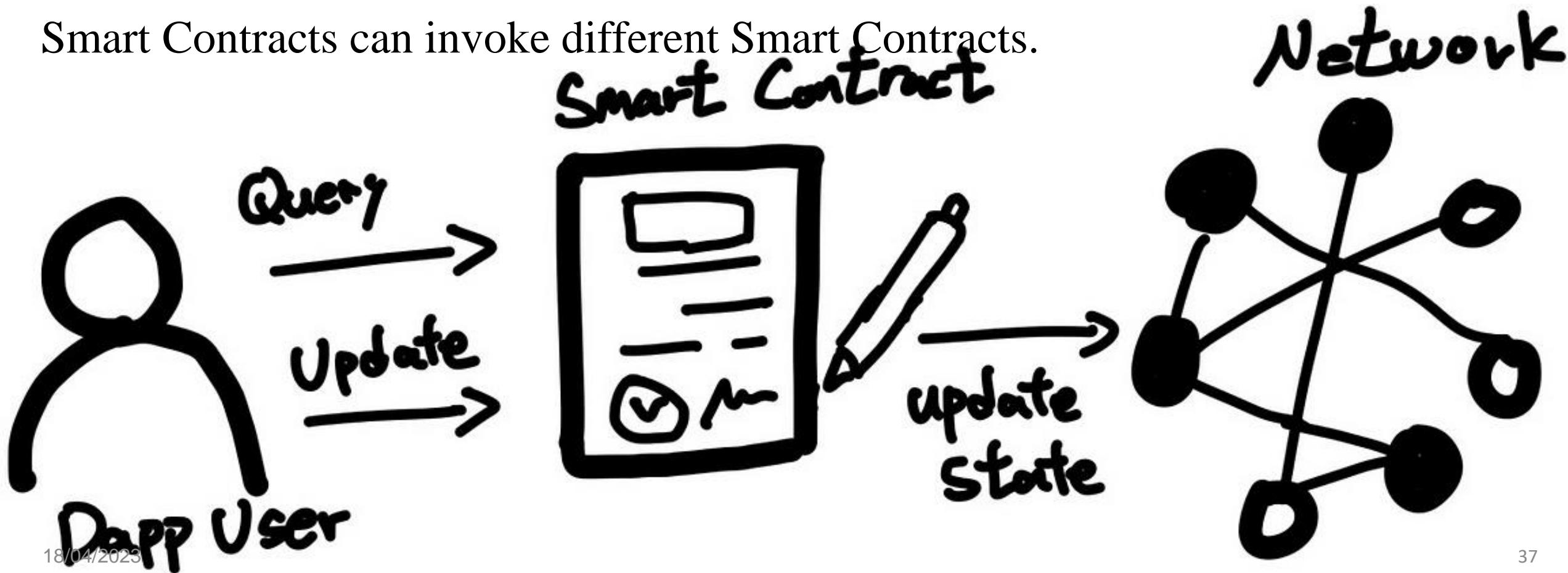


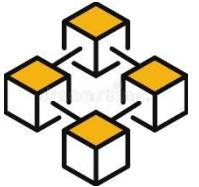
3.5. INVOKE SMART CONTRACT

Invoke (call): send a Transaction (Address, parameters); returns the results.

- Query: (no state change): query requests are not recorded on blockchain
- Update: modification (state change): Transaction is recorded on blockchain.

Smart Contracts can invoke different Smart Contracts.

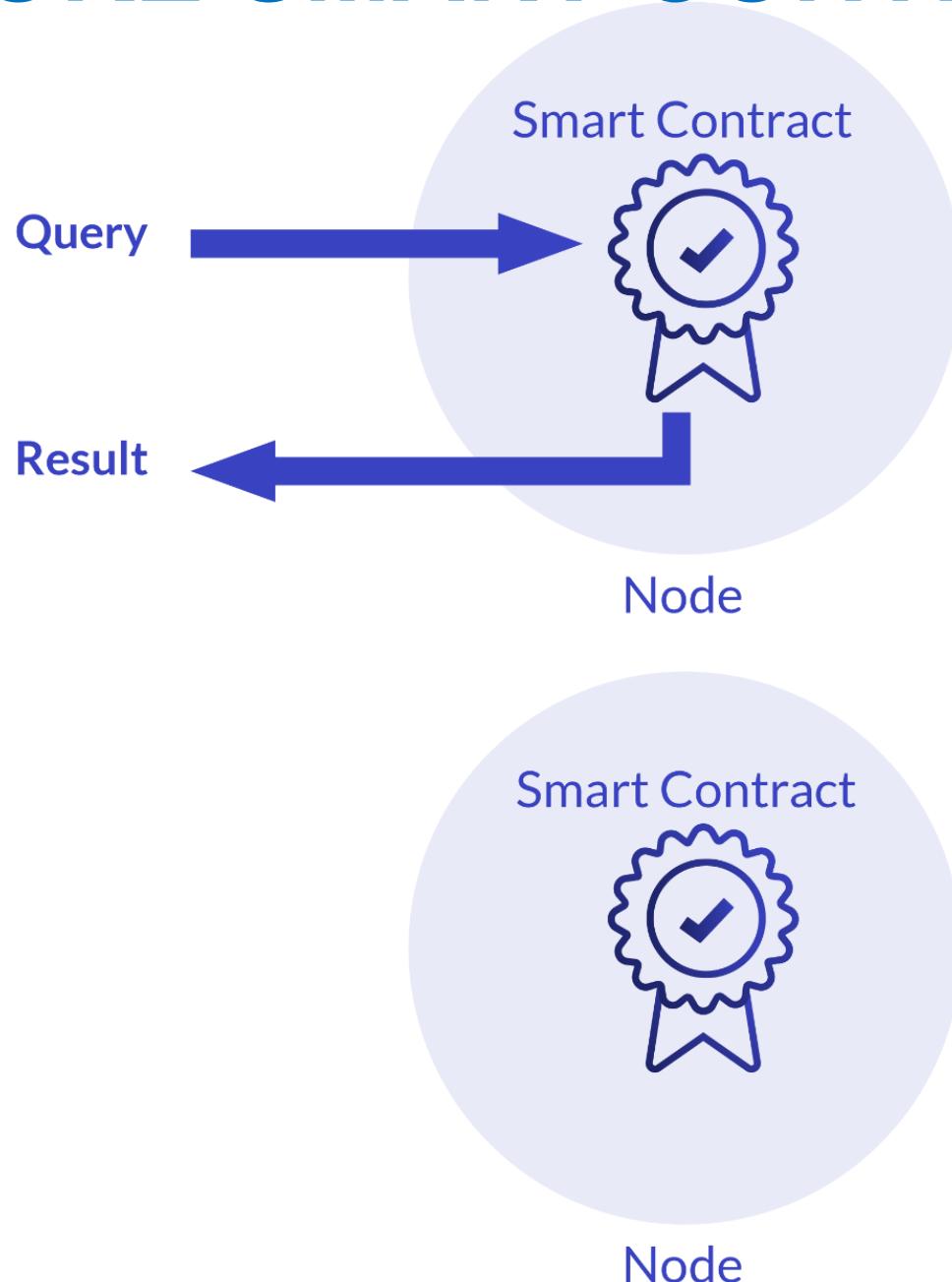


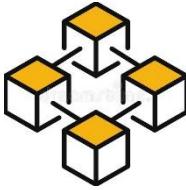


3.5. INVOKE SMART CONTRACT

Query: (no state change):

- Involves only a single node in network
- Locally execute requests and return results

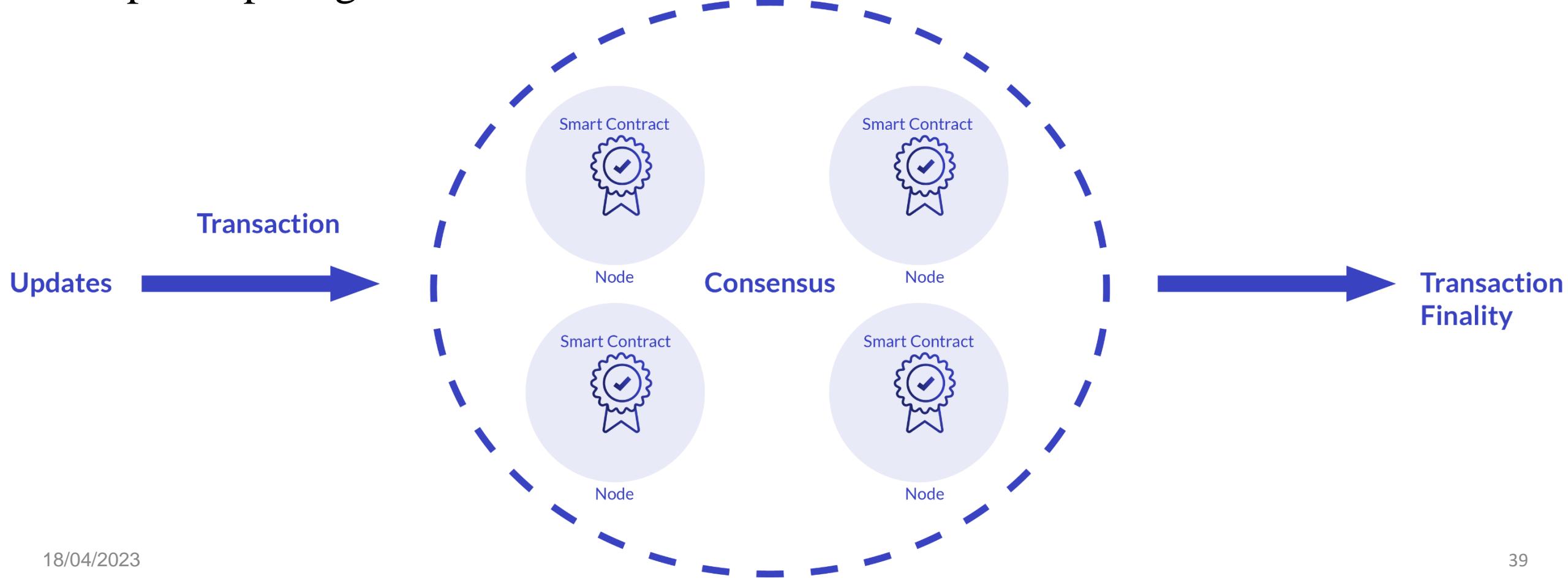


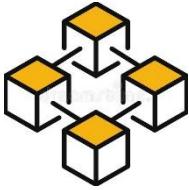


3.5. INVOKE SMART CONTRACT

Update: (state change):

- transactions must be handled by a consensus mechanism
- all participating nodes have identical records.





3.6. SMART CONTRACT EVENTS

Smartcontract event:

- registration of content that receive notifications on Smart Contract.

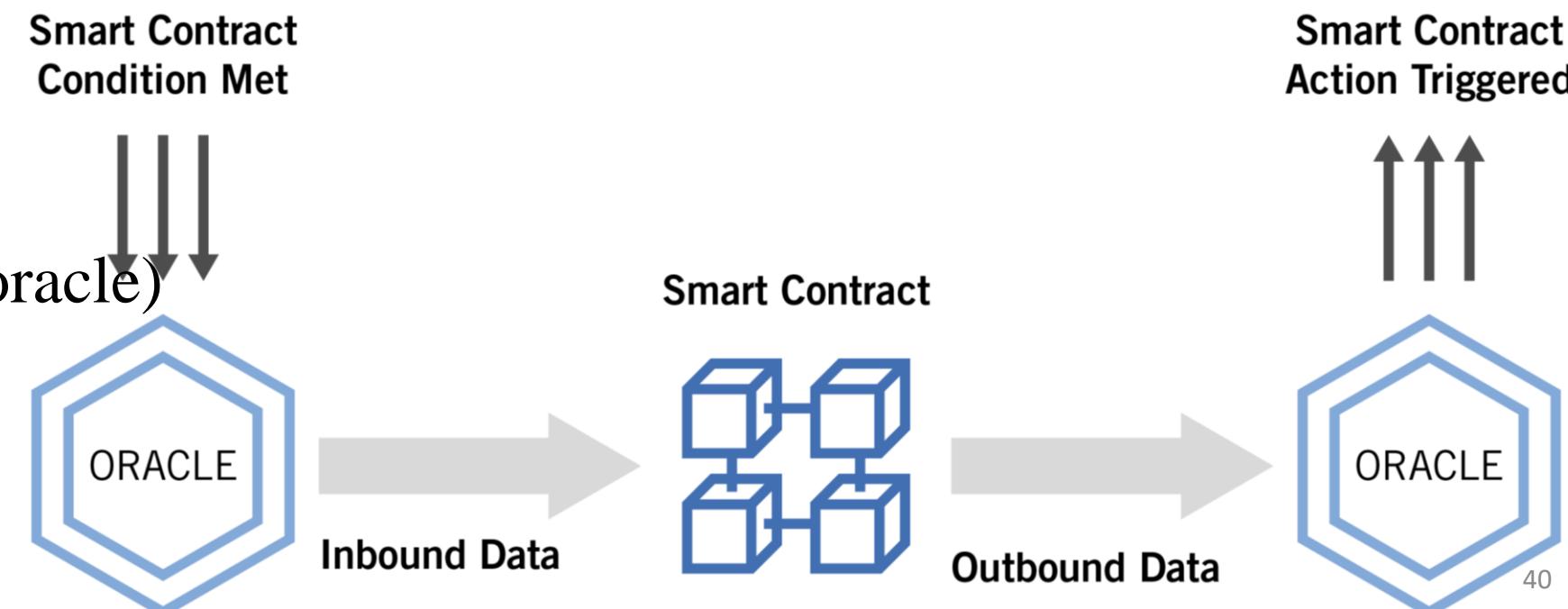
Smart Contract Process with Inbound and Outbound Oracles

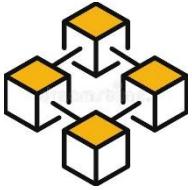
Event Registration:

- define Event and conditions to trigger.

Listen events: from

- external application (oracle)
- other Smart Contract.

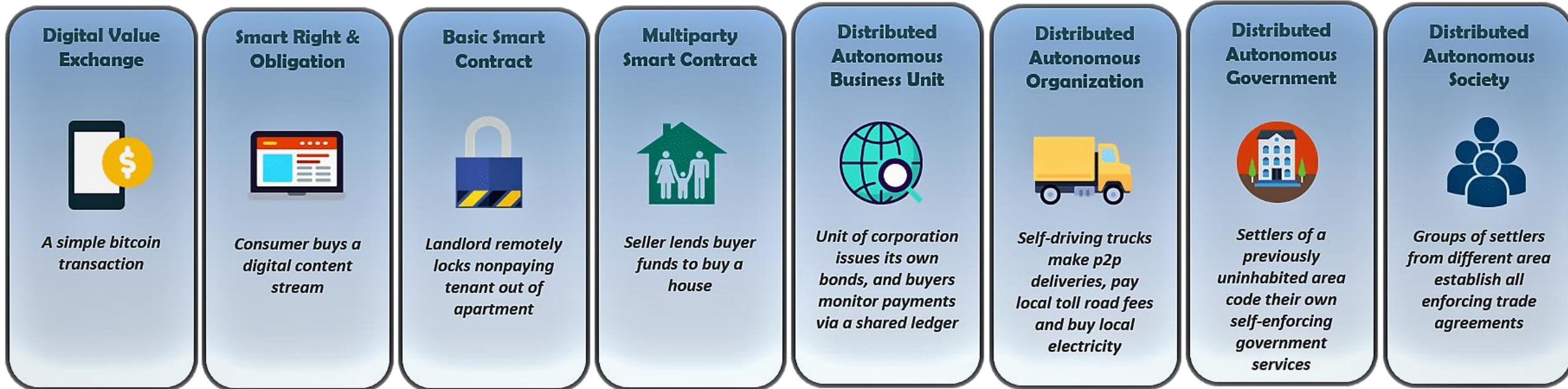


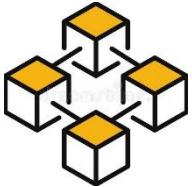


3.7. TYPE OF SMART CONTRACT

- Smart Legal Contracts: legally enforceable require the parties to fulfill their contractual obligations.

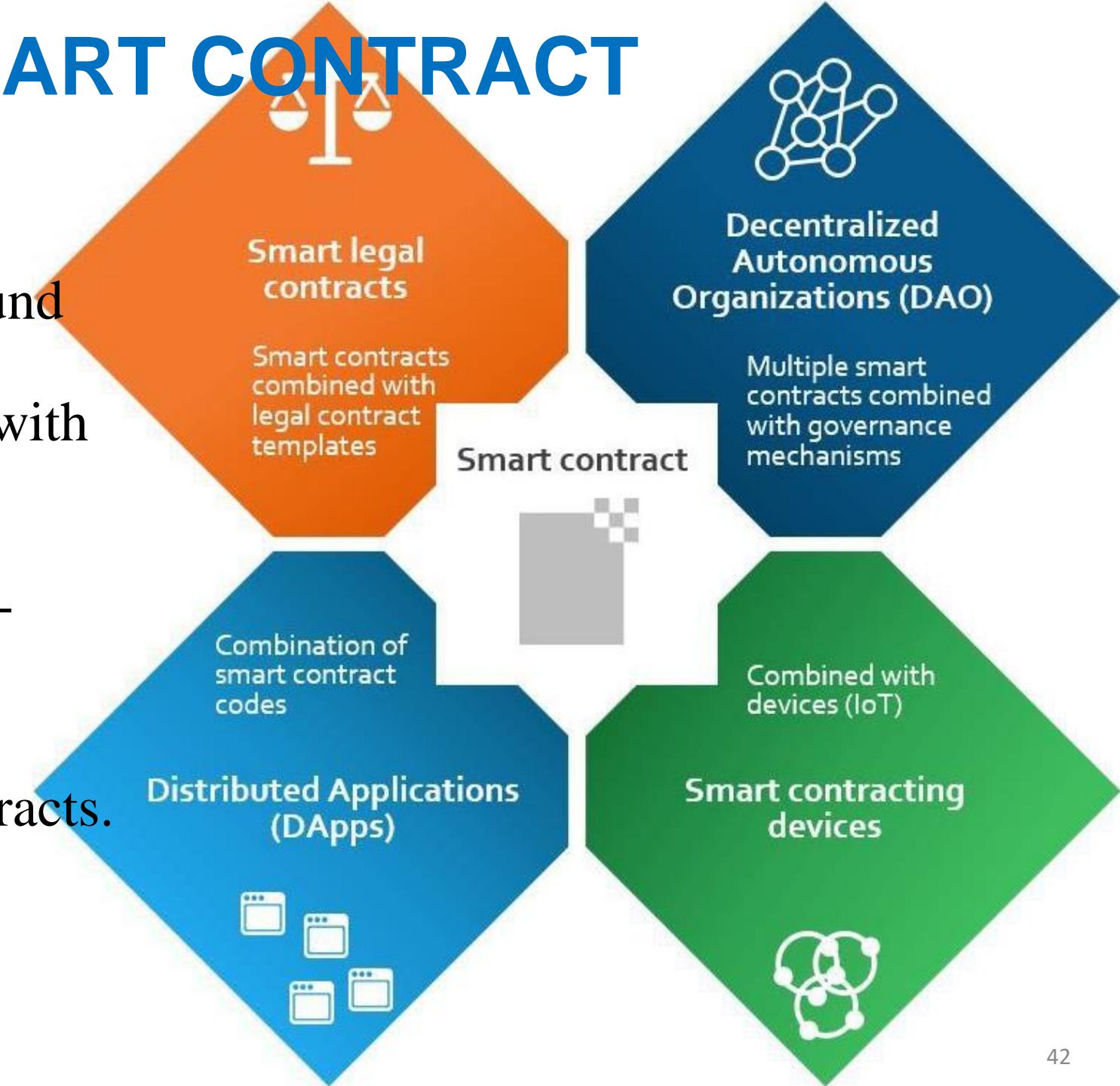
Smart Contracts- Simple to Complex

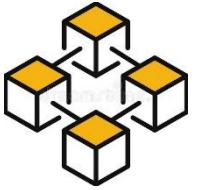




3.7. TYPE OF SMART CONTRACT

- Decentralized Autonomous Organizations:
blockchain communities are bound to specific rules coded into blockchain contracts combined with governance mechanisms.
action taken by the community members gets replaced by a self-enforcing code.
- Application Logic Contracts:
sync with other blockchain contracts.
enables communication across different devices





3.8. TRADITIONAL VS SMART CONTRACT

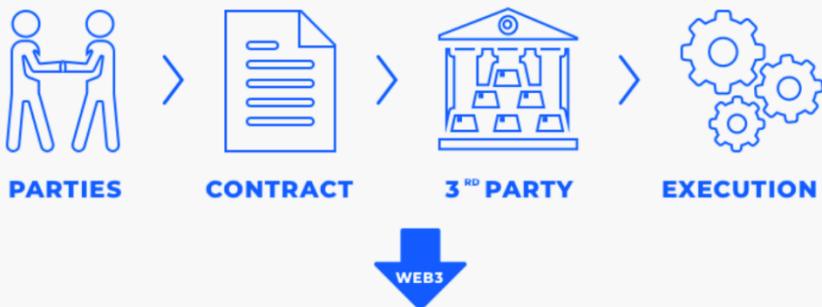
TRADITIONAL CONTRACT



SMART CONTRACT



TRADITIONAL CONTRACT



SMART CONTRACT



Lawyer



Auditor



Loads of paper

Centralized system has its own drawbacks – Many times the offer/acceptance factor is not accurate many times.

SMART CONTRACT

A contract Process with Smart Contract

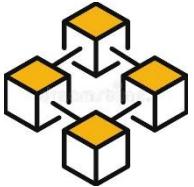
- ▶ A contract to buy
- ▶ A contract to sell
- ▶ A contract to invoice goods sold
- ▶ A contract to receive goods

Process

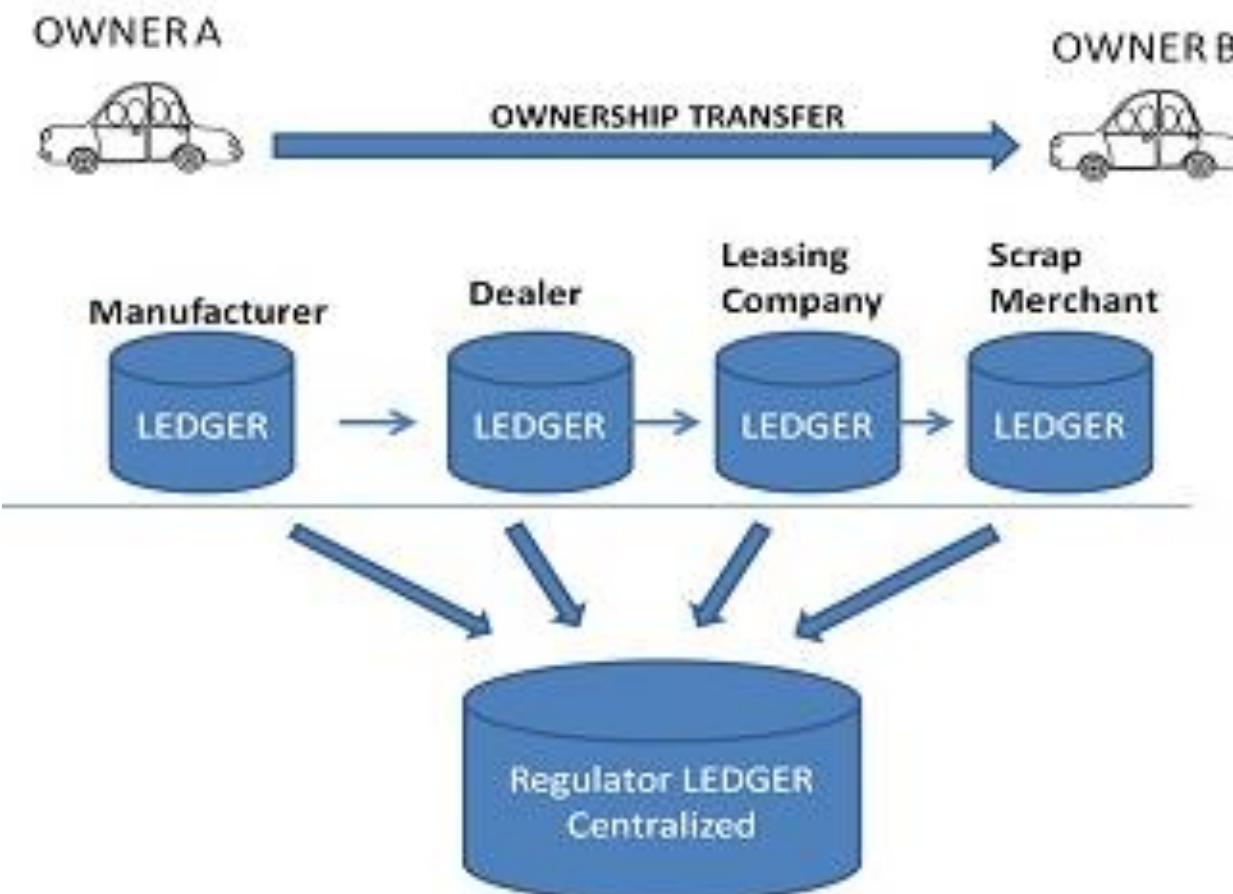
- ▶ No legal spend
- ▶ No lawyer to draft the contract
- ▶ No third party involvement
- ▶ No authority
- ▶ Every step is cryptographically encoded and gets executed automatically

Outcome

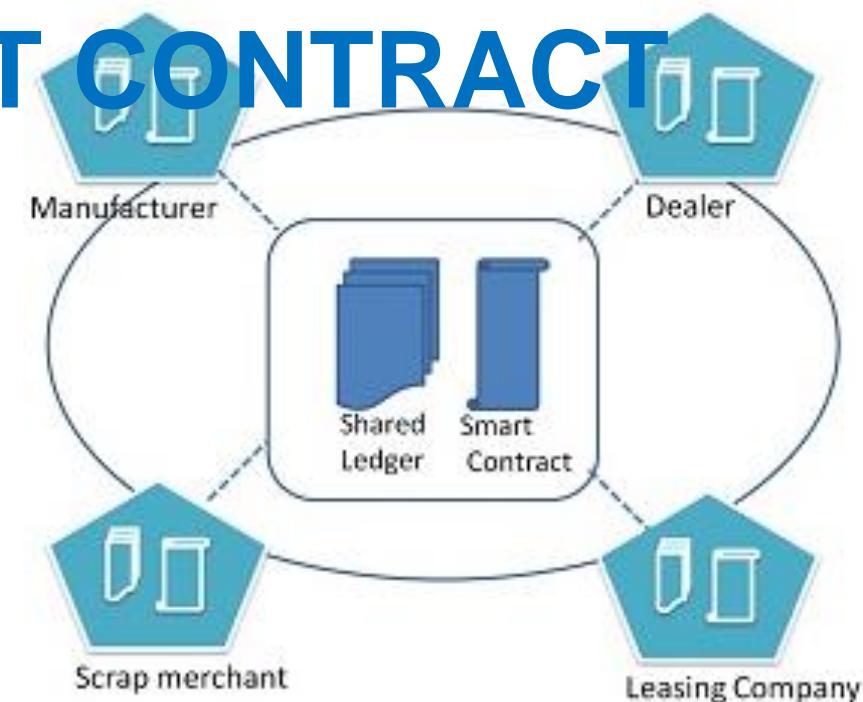
- ▶ Better contract execution
- ▶ Complete control
- ▶ Increased visibility in terms of search, retrieval and management
- ▶ Boost compliance



3.8. TRADITIONAL VS SMART CONTRACT



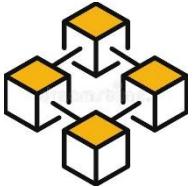
Traditional Transaction



Traditional contracts

Smart contracts
Smart Transaction

	1-3 Days		Minutes
	Manual remittance		Automatic remittance
	Escrow necessary		Escrow may not be necessary
	Expensive		Fraction of the cost
	Physical presence (wet signature)		Virtual presence (digital signature)
	Lawyers necessary		Lawyers may not be necessary

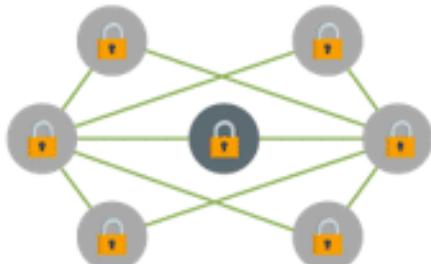


3.8. TRADITIONAL VS SMART CONTRACT

Physical Contracts



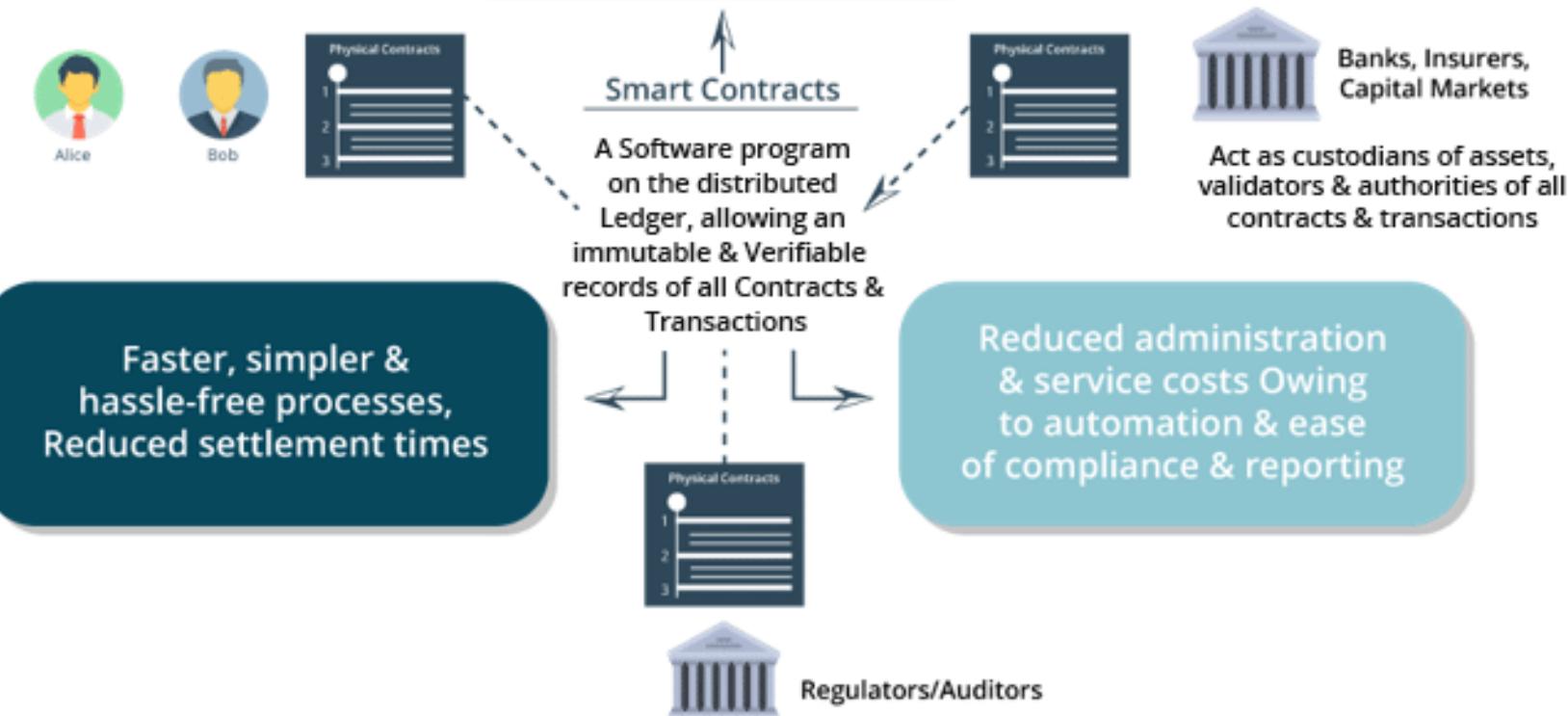
+
Blockchain/permissioned ledger,
programming & encryption



Transacting parties
Individuals or Institutions

Smart Contracts

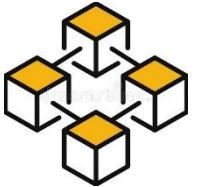
Lower operational
Overheads & costs leading
To economical financial
products



Faster, simpler &
hassle-free processes,
Reduced settlement times

Reduced administration
& service costs Owing
to automation & ease
of compliance & reporting

Central authorities that keep a tab on the system with a wide ranging read-access to blockchain



4. CRYPTO WALLET

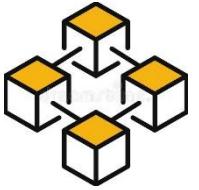
4.1. CRYPTO WALLET

4.2. FUNCTIONS OF CRYPTO WALLET

4.3. TYPE OF CRYPTO WALLET

4.4. WORKING OF CRYPTO WALLET





4.1. CRYPTO WALLET

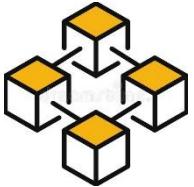
Wallets:

- made of leather or fabrics
- pocket-sized and foldable.

Wallet carry small personal items:

- Paper currency, credit cards
- ID documents: driver's license, identification card, club card;
- Card: business cards, other cards.
- Others: photo, transit pass...



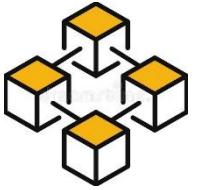


4.1. CRYPTO WALLET

Blockchain wallet: (crypto wallet)

- Digital softwares/programs
- Stores private/public keys.
- User interface to blockchain
- Tracks transactions relating to addresses (public keys)



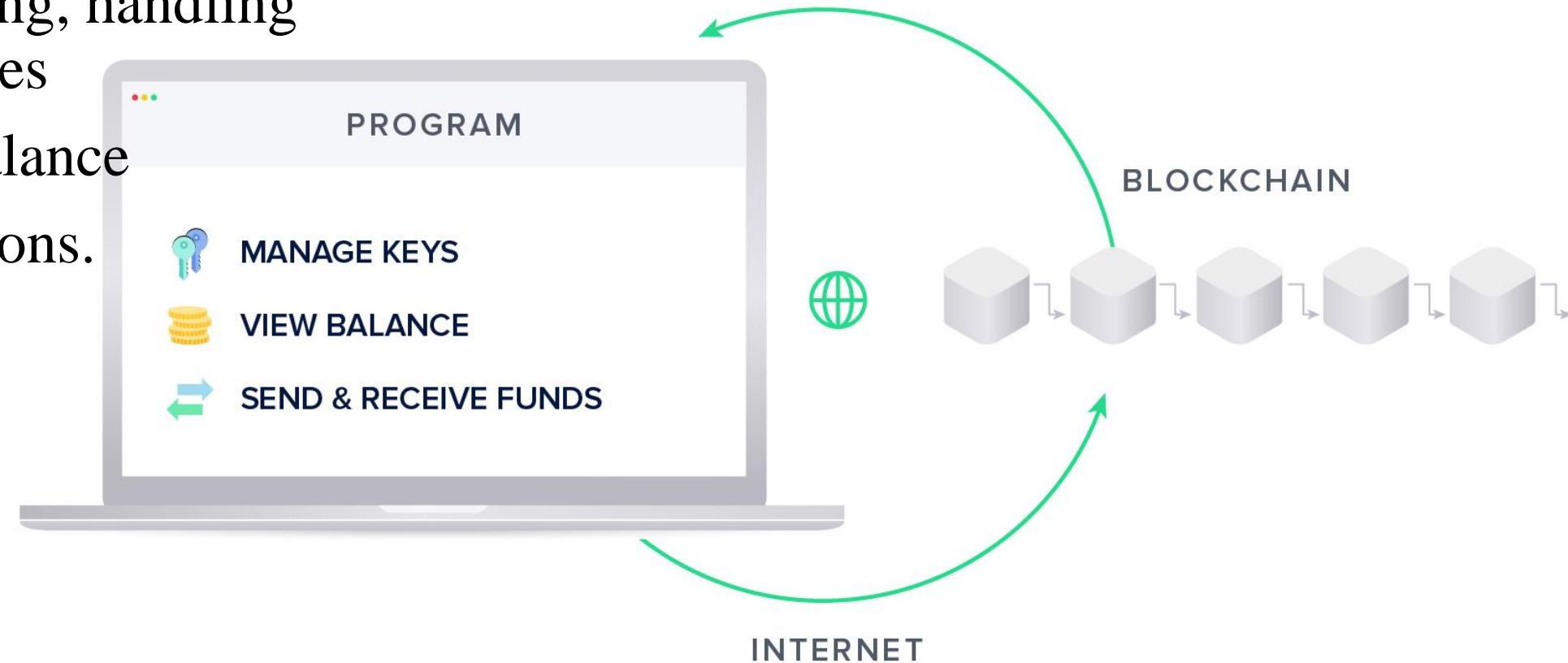


4.2. FUNCTIONS OF CRYPTO WALLET

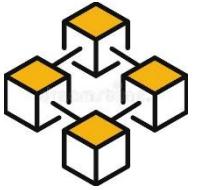
WHAT A WALLET DOES

Wallet's main functions:

- Generating, storing, handling keys and addresses
- Showing your balance
- Signing transactions.



Piece of software that helps you with interacting with Blockchain



4.2. FUNCTIONS OF CRYPTO WALLET

Initiating transactions

Access to accounts

Access to your money

Signing transactions

Management of keys

Interacting with
contract accounts

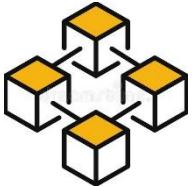
Management of
addresses

Functions of Ethereum Wallet

Tracking and viewing
the user's balance

Secure

Management of
cryptocurrencies



4.3. TYPE OF CRYPTO WALLET

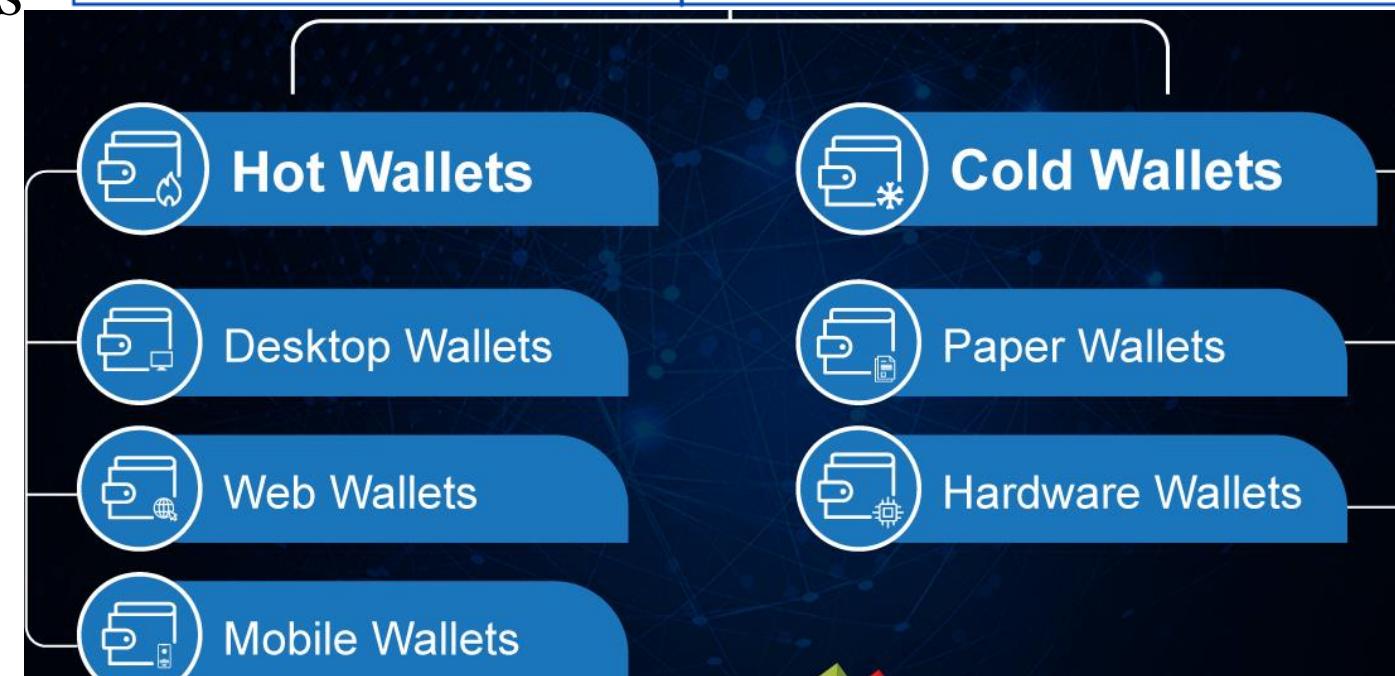


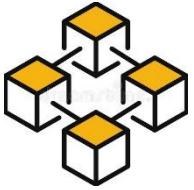
Type of Crypto Wallets

You can Store Your Crypto in a Crypto Wallet

- Hot wallets: online crypto wallets
 - Instantly accessible 24/7, less time
 - User-friendly interface
 - Lesser security, depending on third parties
 - Cheap
- Cold wallets: offline crypto wallets
 - store keypairs physical storage
 - transactions take place offline (requires a signing process), longer time
 - More security, inconvenience.
 - Expensive

Hot Wallet	Types of Hot Wallet Software Wallet Cloud Wallet	Types of Software Wallet Web Wallet Desktop Wallet Mobile Wallet	Examples Exodus, Atomic, MetaMask BitGo, Electrum, Coinbase Jaxx Liberty, Mycelium
Cold Wallet	Types of Cold Wallet Hardware Wallet Paper Wallet	Examples Ledger Nano S, Ledger Nano X, Trezor One, Trezor T, KeepKey, ProKey	
Custodial Wallet	Examples Free Wallet, BitMex	Non-Custodial Wallet	Examples Bitwala, Edge, Wasabi, Zengo

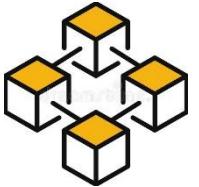




4.3. TYPE OF CRYPTO WALLET

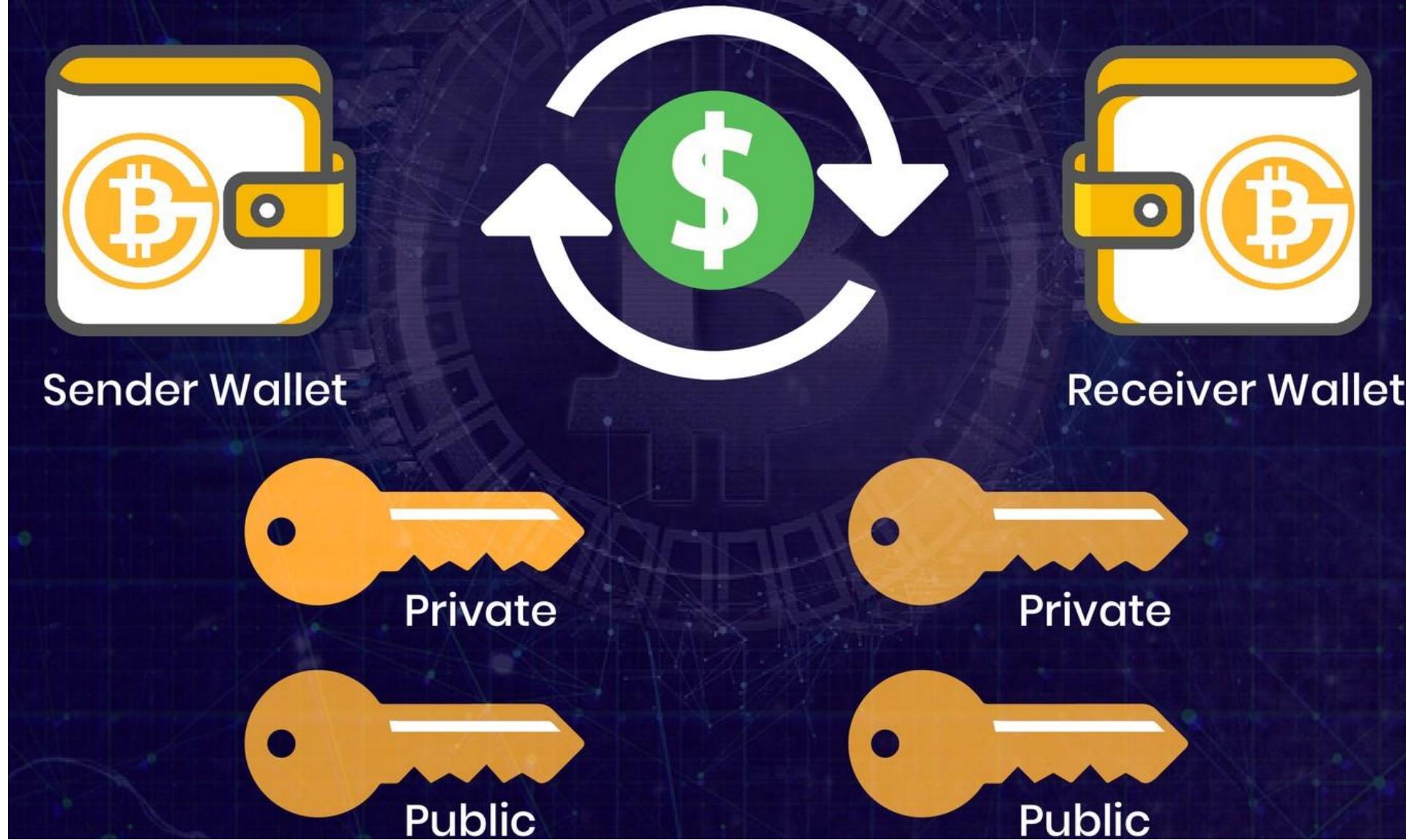
Comparison of different types of crypto wallets

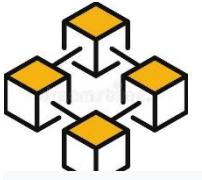
						
	CONNECTION	SECURITY	ACCESSIBILITY	COST	CONVENIENCE	EXAMPLES
HOT WALLET	Any bitcoin wallet that is linked to the internet	Being online subjects it to cyber-attacks and system malware that may be gotten from the internet.	Easily accessible as long as you are online.	Free therefore is an attraction to users who are not yet well-acquainted to cryptocurrency.	Hot wallet is favorable for frequently held transactions by users. It is however, not advisable for long term currency storage.	<ul style="list-style-type: none">• Coinbase• Kraken
COLD WALLET	In comparison to hot wallets, this type is not connected in any way to the internet.	Considered the most secure ways of storing cryptocurrency due to offline properties. There is no risk of hacks or malware from internet connections.	Not easily accessible to anyone.	Purchasable unlike hot wallets and are quite expensive.	Highly appropriate for storage of currency in the long term.	<ul style="list-style-type: none">• Hardware wallets• Paper wallets
HARDWARE WALLET	A type of cold storage wallet that resembles a flash drive that is used to store private keys for users	Secure as the USB device is usually protected from all sort of malware.	Require a device to be connected to another device for access to keys.	Expensive.	Favorable for long term storage of currency	<ul style="list-style-type: none">• Trezor One• CoolWallet• Ledger Nano S• KeepKey
PAPER WALLET	A type of cold storage wallet that involves printing of public and private keys on a piece of paper including	Secure	Easily accessible to anyone who can gain access to the paper	Free since it only requires printing of the public and private keys on a piece of paper.	Favorable for long term storage due to safety	<ul style="list-style-type: none">• BitAddress• Bitcoinpaperwallet



4.4. WORKING OF CRYPTO WALLET

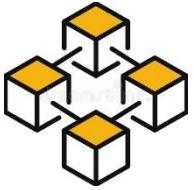
How does a Crypto Wallet work?





4.4. WORKING OF CRYPTO WALLET





5. DECENTRALIZED AUTONOMOUS ORGANIZATION

5.1. DAO DEFINITION

5.2. STRUCTURE OF DAO

5.3. TYPES OF DAO

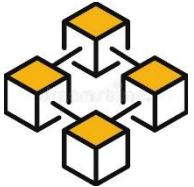
5.4. LAUNCHING DAO

5.5. TRADITIONAL ORGANIZATION VS.

5.6. DAO GOVERNANCE

5.7. USECASE OF DAO



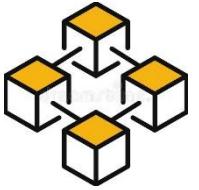


5.1. DAO DEFINITION

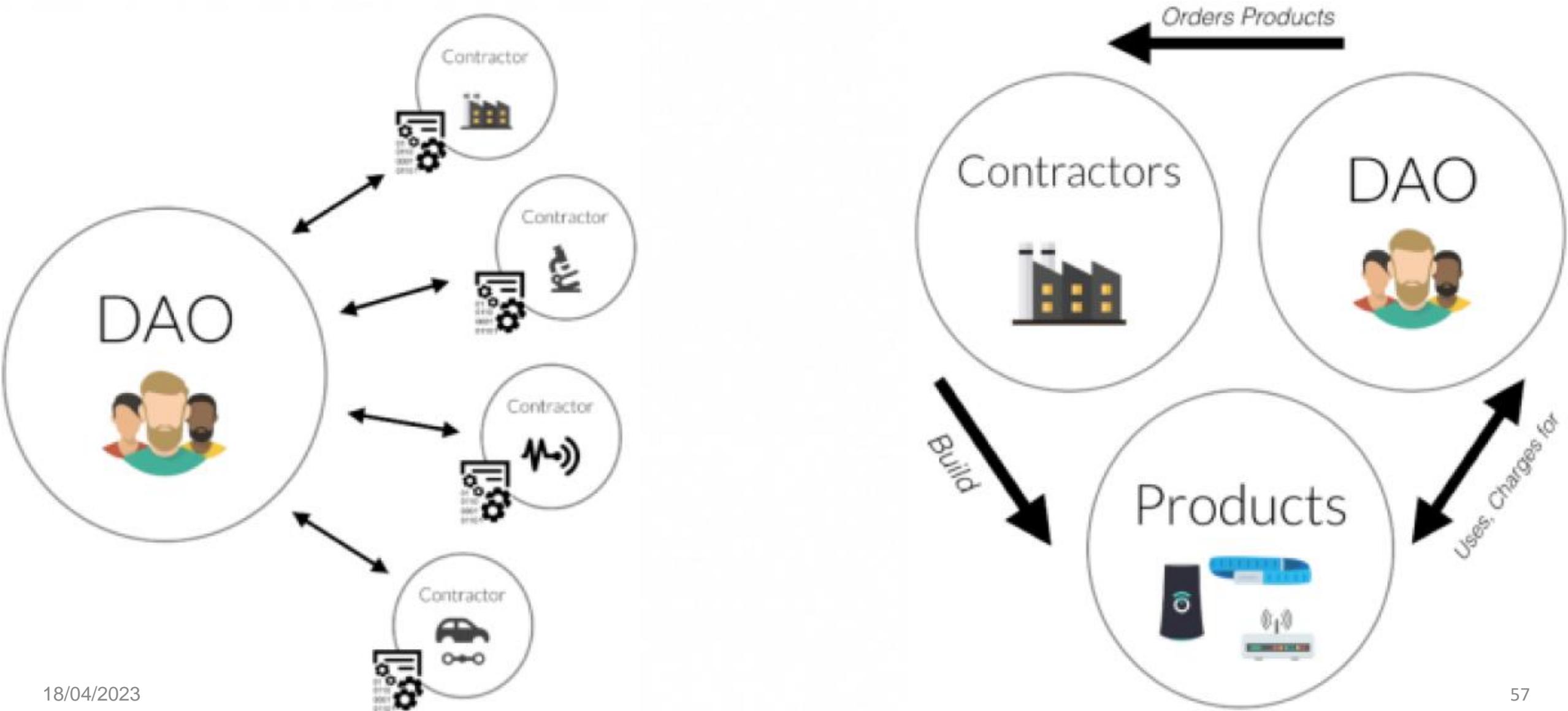
Decentralized Autonomous Organization (DAO):

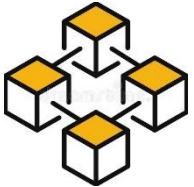
- an organization governed by computer code and programs.





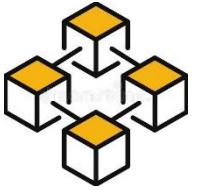
5.2. STRUCTURE OF DAO



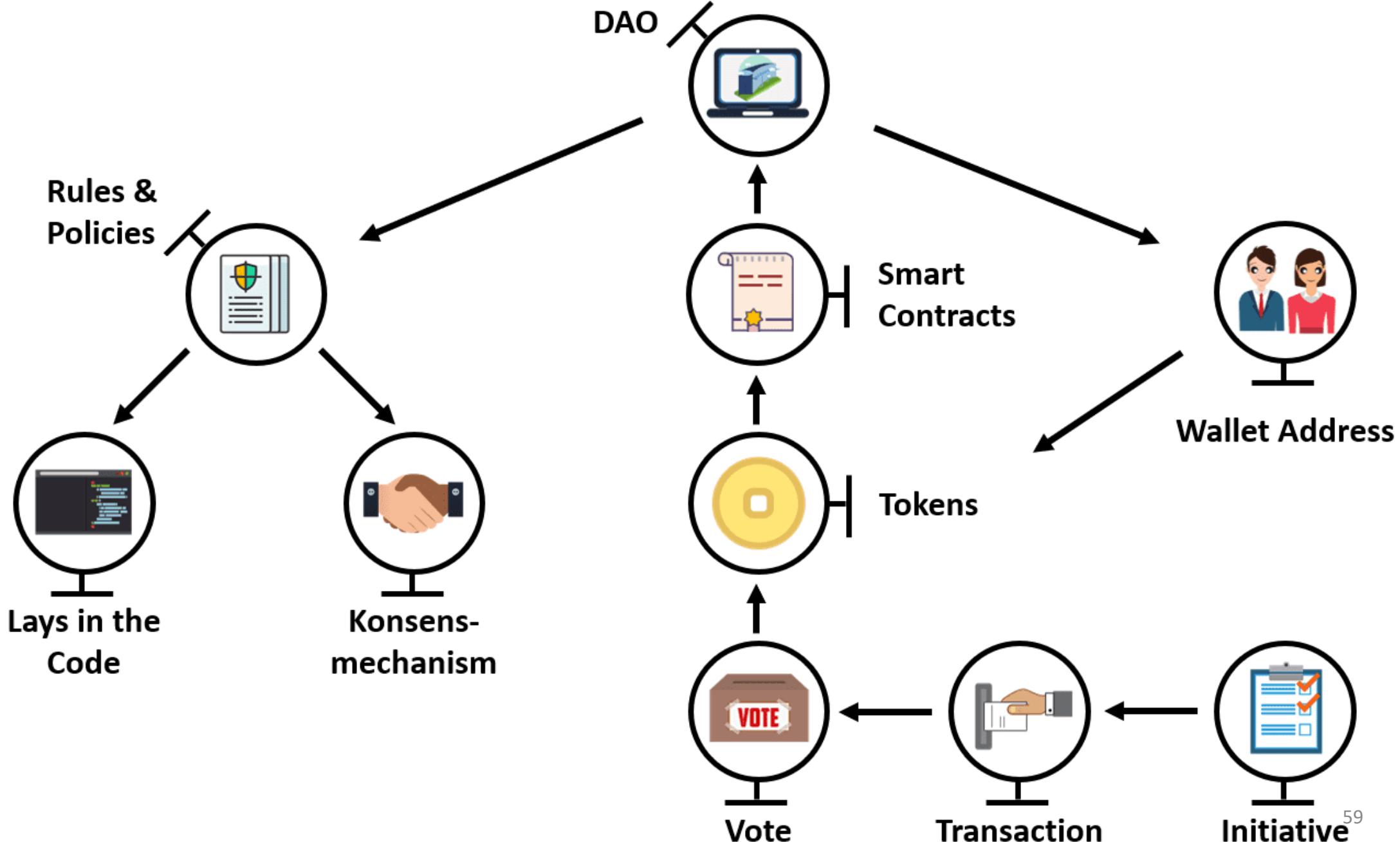


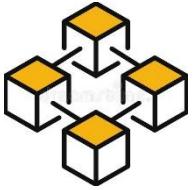
5.2. STRUCTURE OF DAO





5.2. STRUCTURE OF DAO





5.2. STRUCTURE OF DAO

Components of DAOs

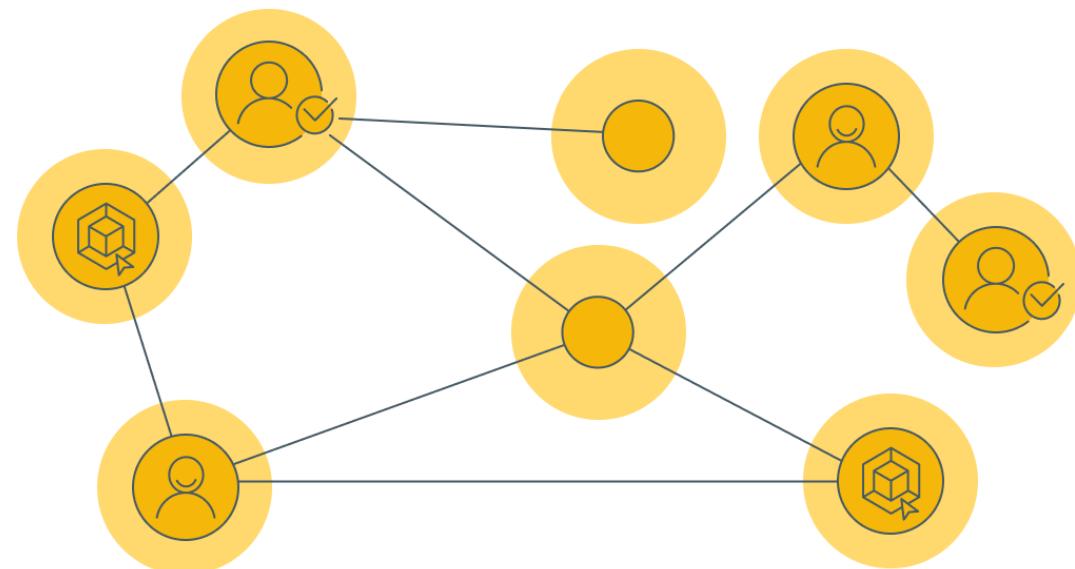
-

Machine consensus around token governance rulesets and smart contracts instead of legal employment contracts.

No centralized legal entity

Self-enforcing code (smart contracts)

Tokens act as incentive for validators



Distributed Network of Autonomous Stakeholders



Exchange



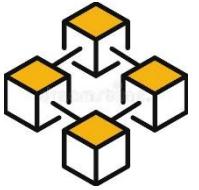
Validator



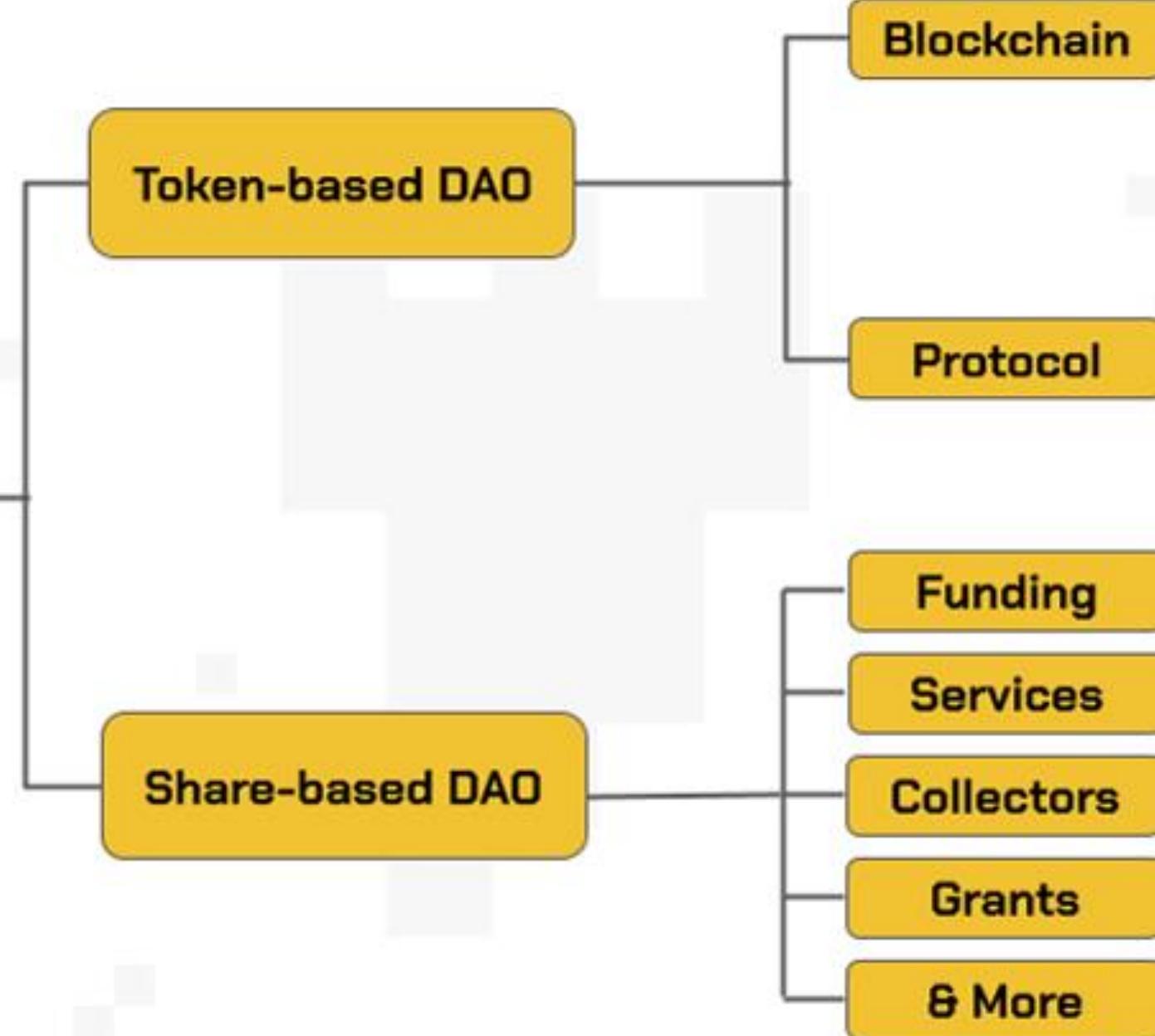
User



Developer

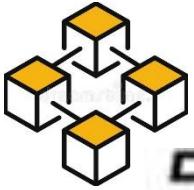


5.3. TYPES OF DAO



Ex:





5.3. TYPES OF DAO

DAO LANDSCAPE

Curated by @Cocoapahroopa • Pixels by Carlos/

De

CO

DAO Operating Systems

- ARAGON
- DaoStack
- DaoHaus
- COLONY
- Syndicate
- Orca
- CW

Investment DAOs

- MetaCartel
- theLAO
- Flamingo
- Komorebi
- UdacityFund
- BitDAO
- Free Company
- Duck DAO

Grants DAO

- MetaCartel Ventures
- MolochDAO
- Audius Grants
- Uniswap Grants
- Mint Fund
- Sevens Foundation
- Compound Grants
- Aave Grants

Collector DAOs

- PleasrDAO
- Flamingo
- SquiggleDAO
- # FingerprintsDAO
- BRRDAO
- Whale
- MUSEO
- herstoryDAO
- BeetsDAO
- J JennyDAO
- MeebitsDAO
- Gremlins

Protocol DAOs

- MAKER
- Compound
- UNISWAP
- AAVE
- Yearn
- Sushi
- SYNTHETIX
- Curve
- Index Coop
- PieDAO
- tornado
- GITCOIN
- LIDO
- pool
- KeeperDAO
- Badger
- RaribleDAO
- Olympus
- hDAO
- Rari Capital
- Balancer
- Cream Finance
- AUDIUS
- Universe
- inverse finance
- Aavegotchi
- INSTADAPP
- OceanDAO

Service DAOs

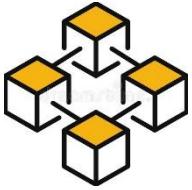
- rGUILD
- DXdao
- PartyDAO
- MetaFactory
- Fire Eyes
- DeepDAO
- Reverie
- NeptuneDAO
- Llama
- MetaverseDAO
- LexDAO
- dOrg
- DaoHaus
- VitaDAO
- ShinyDAO
- OPOLIS
- DoinGud
- YGG
- HoneyDAO
- Myco
- UniWhales
- Yam DAO
- AladdinDAO

Media DAOs

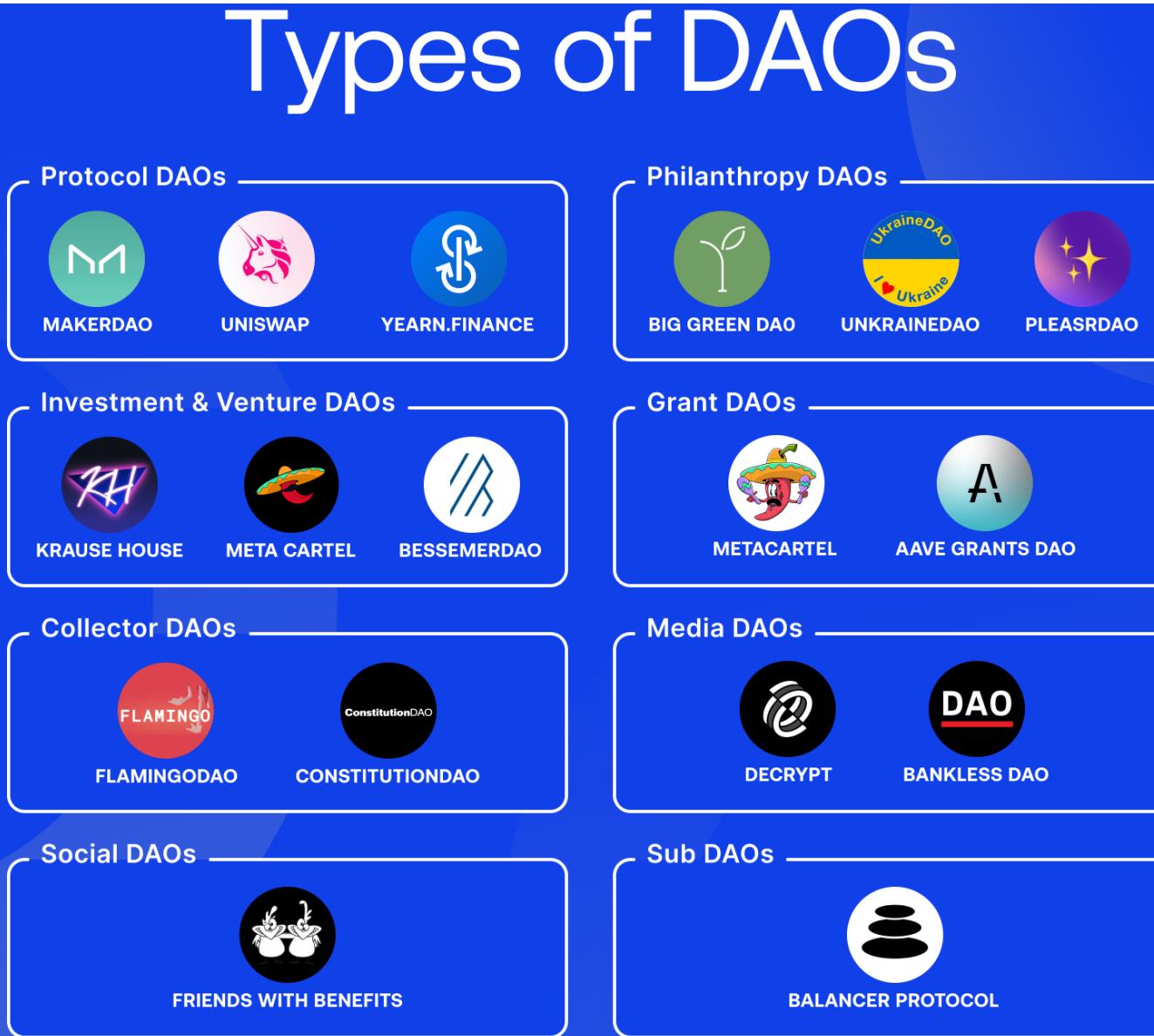
- FOREFRONT
- BanklessDAO
- GCR
- DarkstarDAO
- krekt

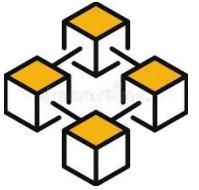
Social DAOs

- FWB
- Seed Club
- Radicle
- FiatLuxDAO
- Metafam
- KrausHaus
- ProsperDAO
- Bright Moments
- Meta Gamma Delta
- SongCamp
- CabinDAO
- PROOF OF HUMANITY
- BAYC
- TheWIPmeetup



5.3. TYPES OF DAO

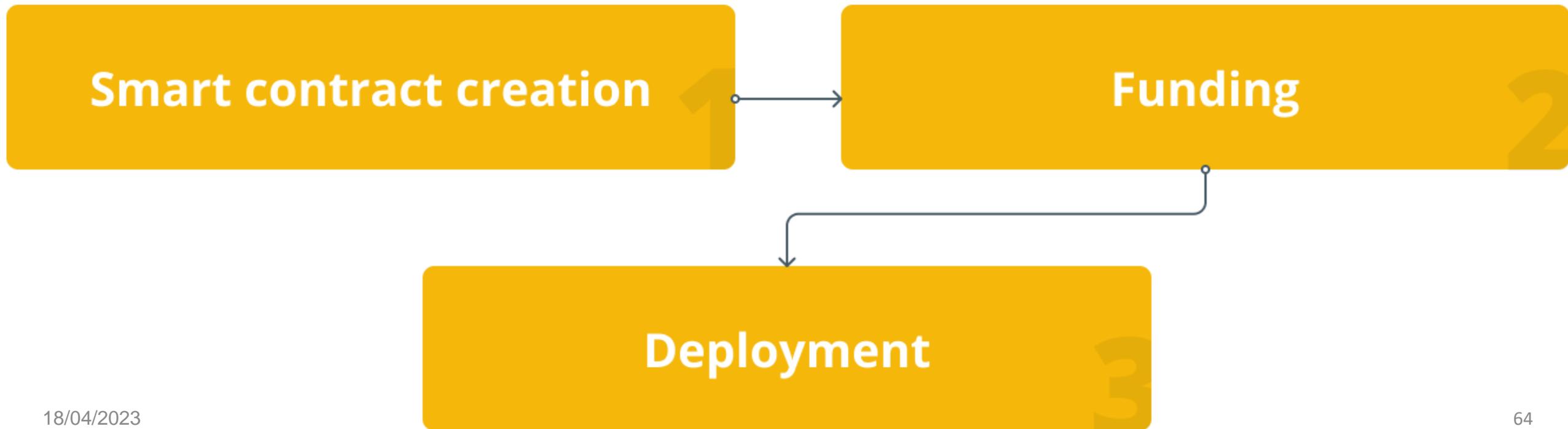


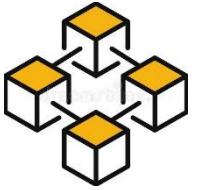


5.4. LAUNCHING DAO

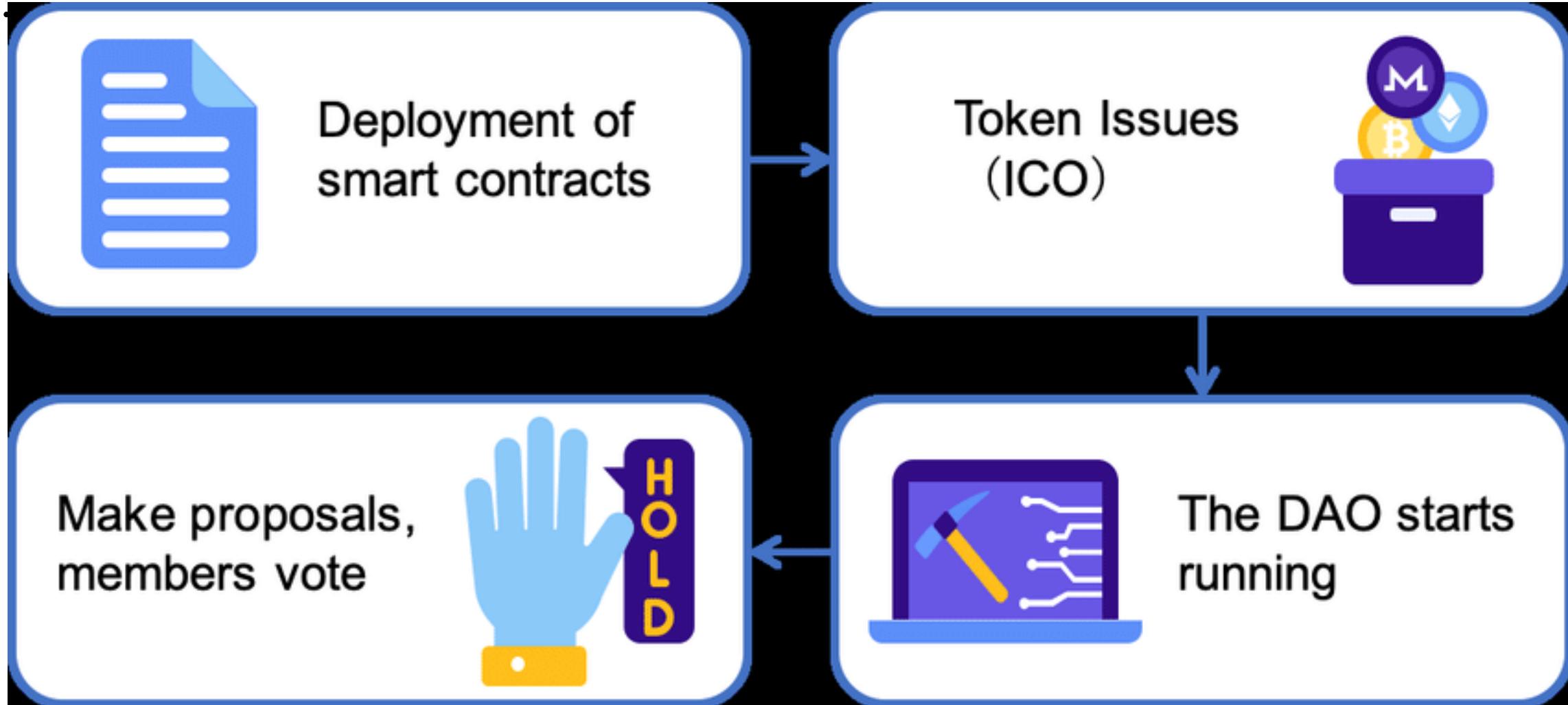
- Mission Community
- Treasury
- Governance Ownership.

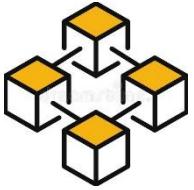
Steps for launching a DAO





5.4. LAUNCHING DAO



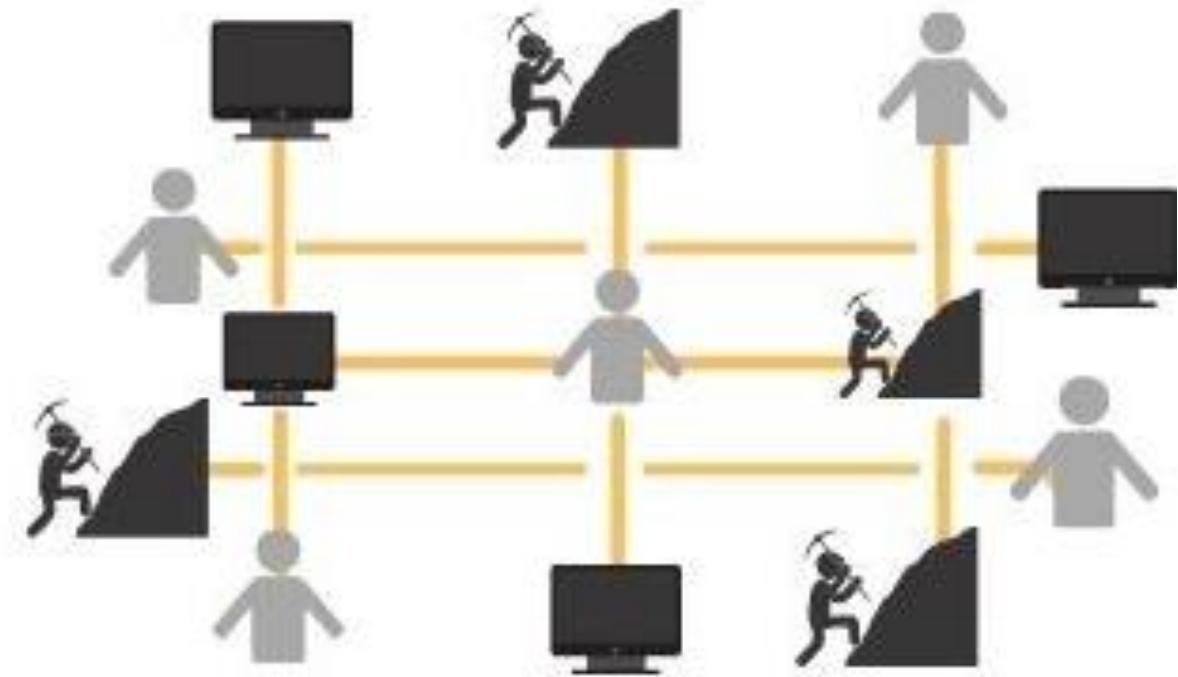
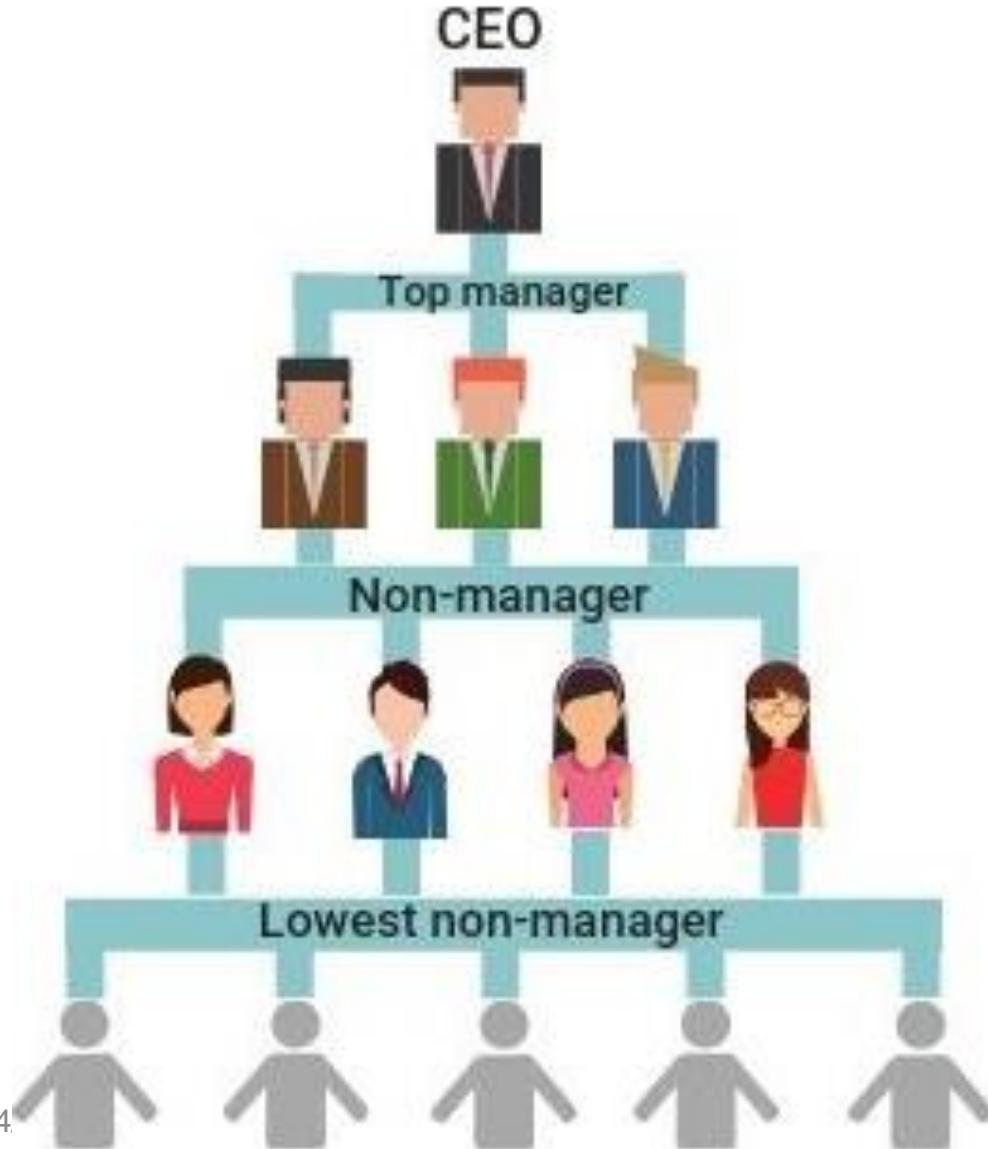


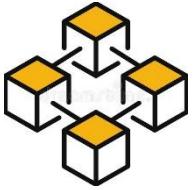
5.5. TRADITIONAL ORGANIZATION VS DAO

Traditional centralized system

Decentralized Autonomous
Organization

.

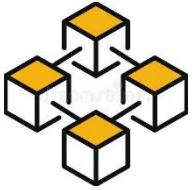




5.6. DAO GOVERNANCE

Decentralized Autonomous Organization (DAO): an organization governed by computer code and programs.





5.6. DAO GOVERNANCE

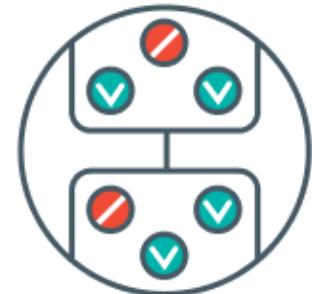
A three-layer approach that controls the ENS governance process



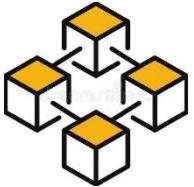
The discourse of proposals
18/04/2023



Off-chain voting used by delegates

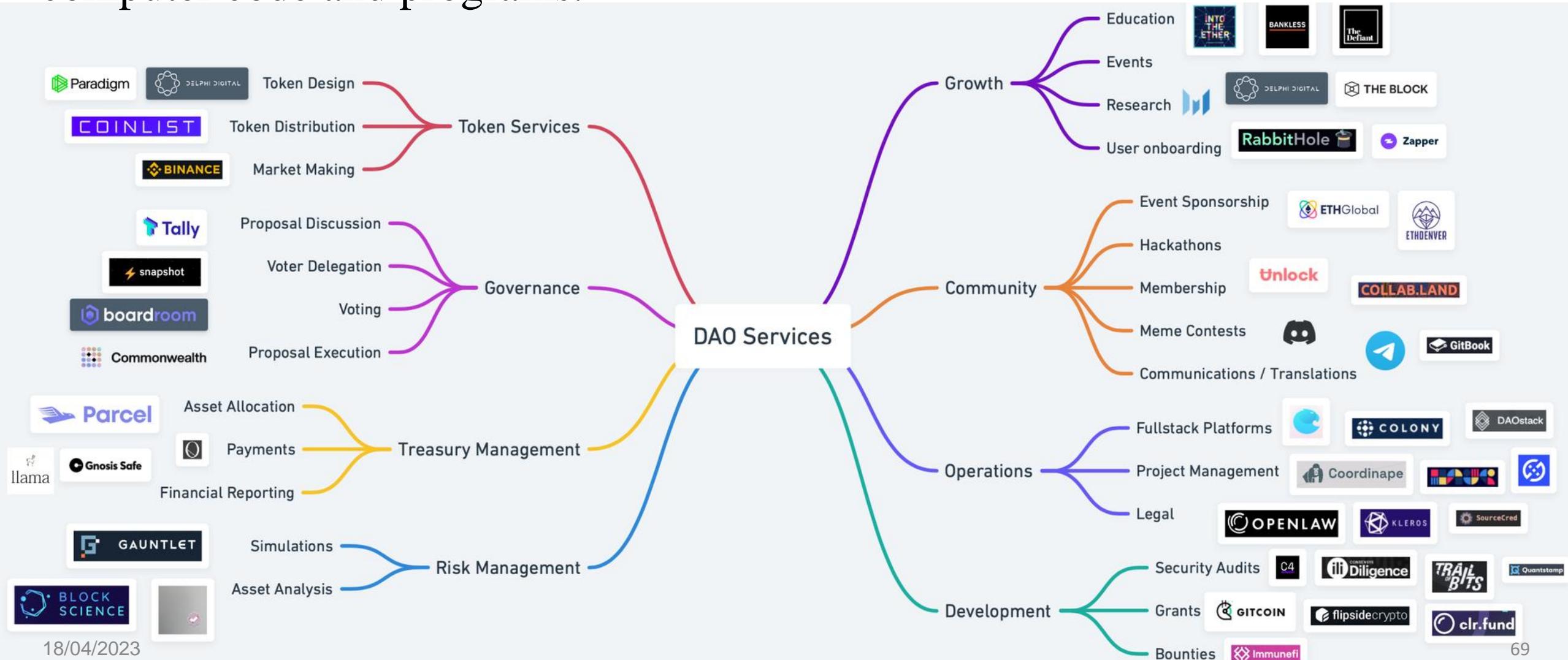


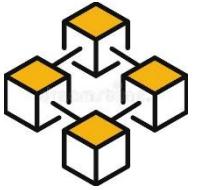
Voting on the blockchain
68



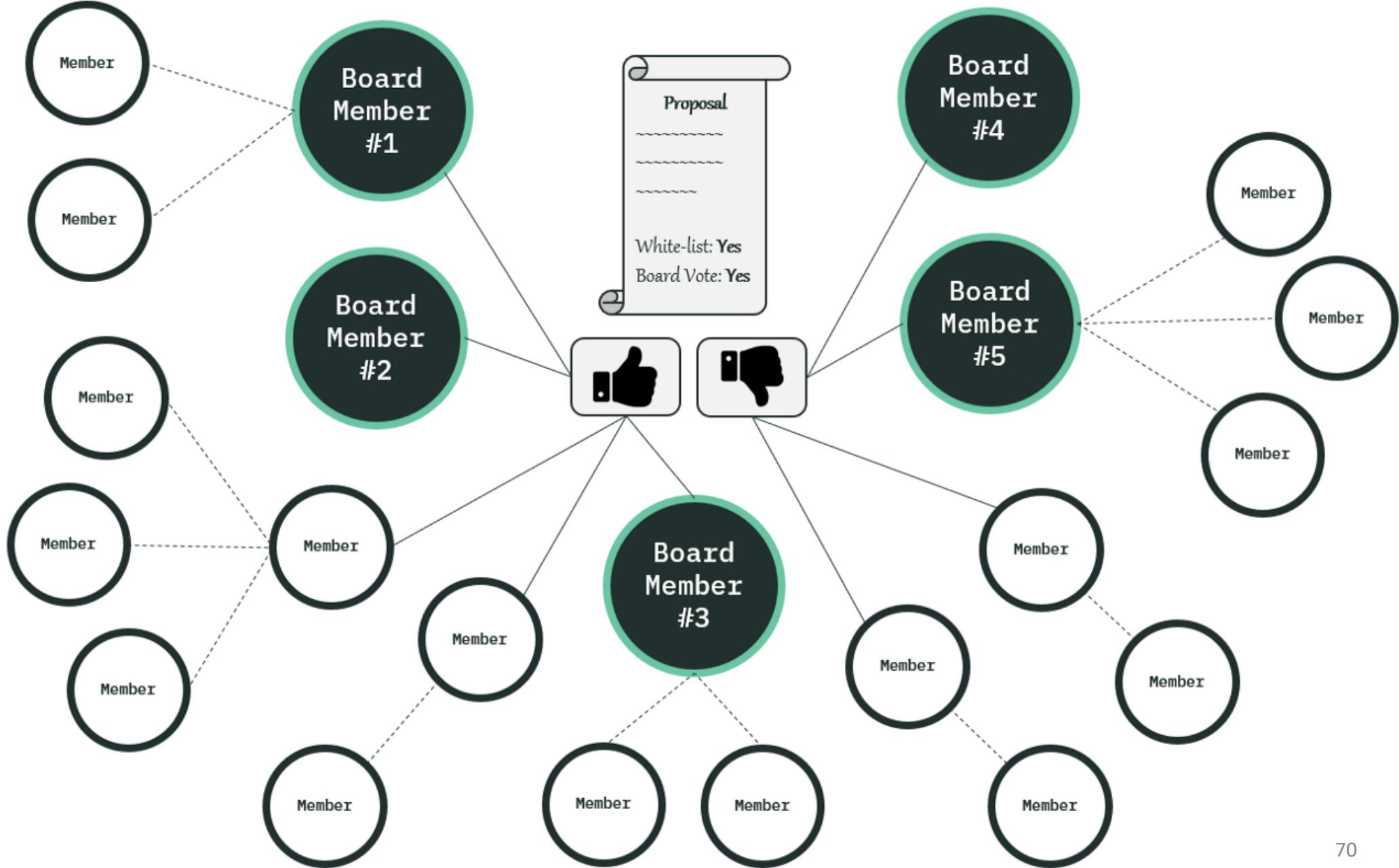
5.7. USECASE OF DAO

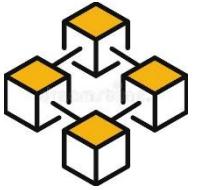
Decentralized Autonomous Organization (DAO): an organization governed by computer code and programs.





5.7. USECASE OF DAO





5.5. USECASE OF DAO

Three types of proposals that can be launched in the ENS DAO

Social proposal

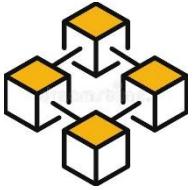
Modifications that do not need on-chain activity such as fee changes or petitions to root holders, or the owners of a multisignature wallet located at multisig.ens.eth.

Executable proposal

Smart contract execution through the DAO's wallets

Constitution amendment

Proposed modifications to the DAO constitution



5.5. USECASE OF DAO

Benefits of DAOs



Decentralization

No single person or group can influence the organization's future to serve its own interests.



Transparency

DAOs can be audited anytime as all transactions are verifiable through a public ledger, thus building trust and preventing corruption.



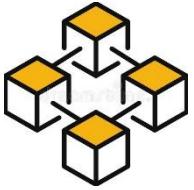
Security

A DAO's smart contract code undergoes testing and validation before deployment, and all transactions are recorded on a public ledger. This makes them less vulnerable to malicious attacks and fraud.



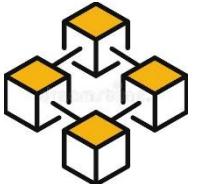
Efficiency

Automation and smart contracts help lower costs and speed up decision-making by eliminating paperwork and reducing human intervention.

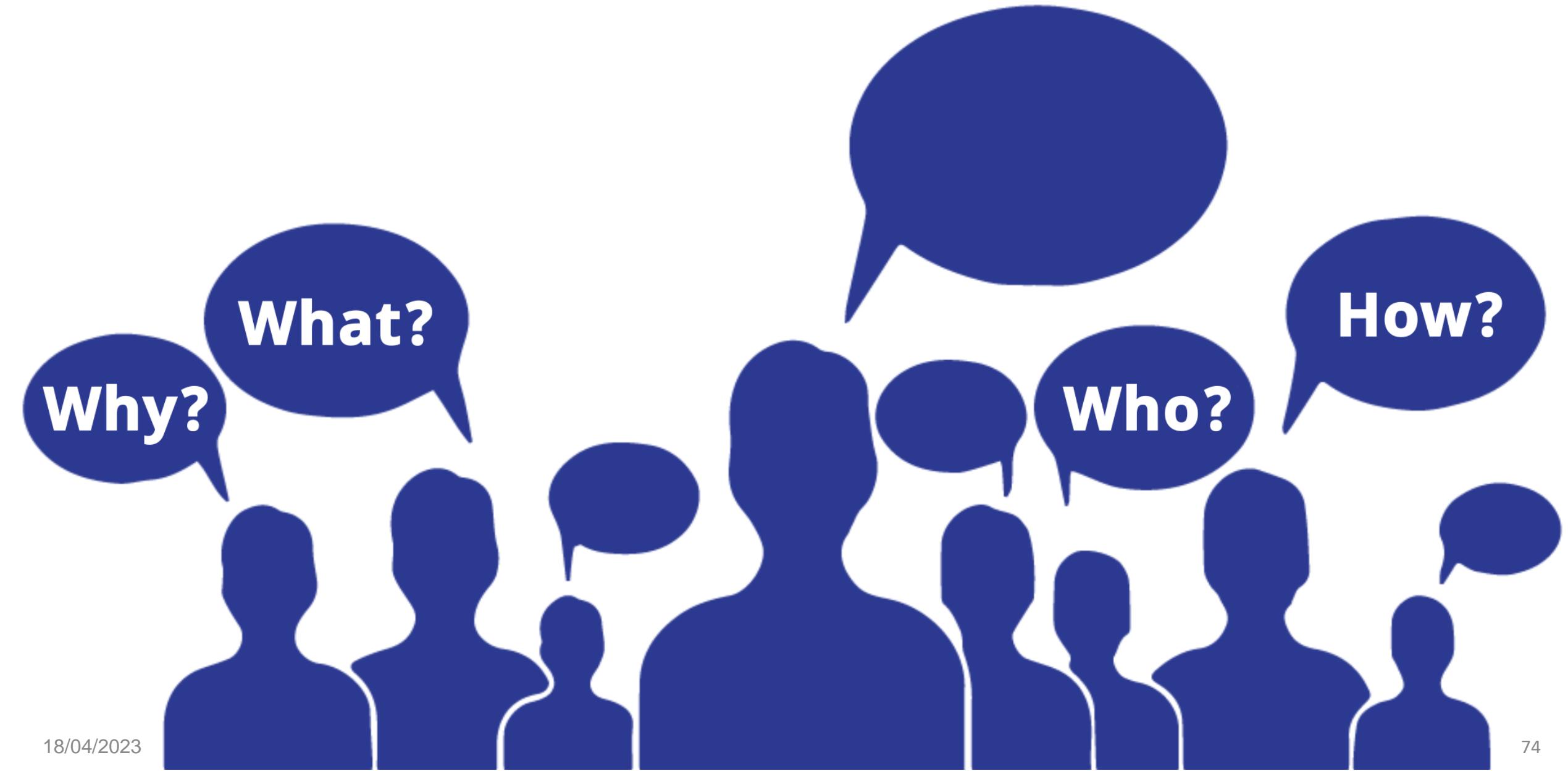


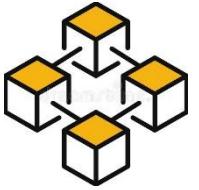
6. SUMMARY

- Decentralized applications: applications run on blockchain network, component, architecture, activities, classification.
- Smartcontract: execute predefined actions once the predetermined conditions are met.
- Blockchain wallet: programs manage keypairs.
- DAO an organization governed by computer code and programs.



7. DISCUSSION





FINISH

Thank You