



HYPERLEDGER
FOUNDATION

**INTRODUCTION TO
BLOCKCHAIN AND NFT
CONCEPTS**

Workshop # 1

CHAINYARD



Agenda

- Welcome & Introductions
- Background
- What are blockchain technologies?
- What are Tokens? What is an NFT?
- Enterprise Technology Landscape Overview
- Use Cases & Production Networks
- Obstacles
- What does this mean to you?
- Q&A session



Welcome & Introductions



Isaac Kunkel

SVP Consulting Services

CHAINYARD



Gigo Joseph

VP Blockchain Services

CHAINYARD



Ry Jones

Hyperledger Community Architect /
Open Source Evangelist

CHAINYARD SNAPSHOT

CHAINYARD

20+ YEARS

of operations in the IT industry as a North Carolina registered corporation that is certified as a woman-owned, minority owned company.

50+ BLOCKCHAIN

projects using Hyperledger Fabric, Ethereum, Quorum and Corda. Top 10 contributor to Hyperledger Fabric Open Source. Infrastructure Member of OpenIDL consortium.

36+ FORTUNE 500

organizations and multiple technology start-ups as clients with long term engagements including turn-key & full project execution capabilities.

PART OF  **itpeople**

IT People – Workforce Solutions

Chainyard – Digital Transformation

TYS – Trust Your Supplier (Platform & Consortium)

KEY ALLIANCES

Linux Foundation Hyperledger

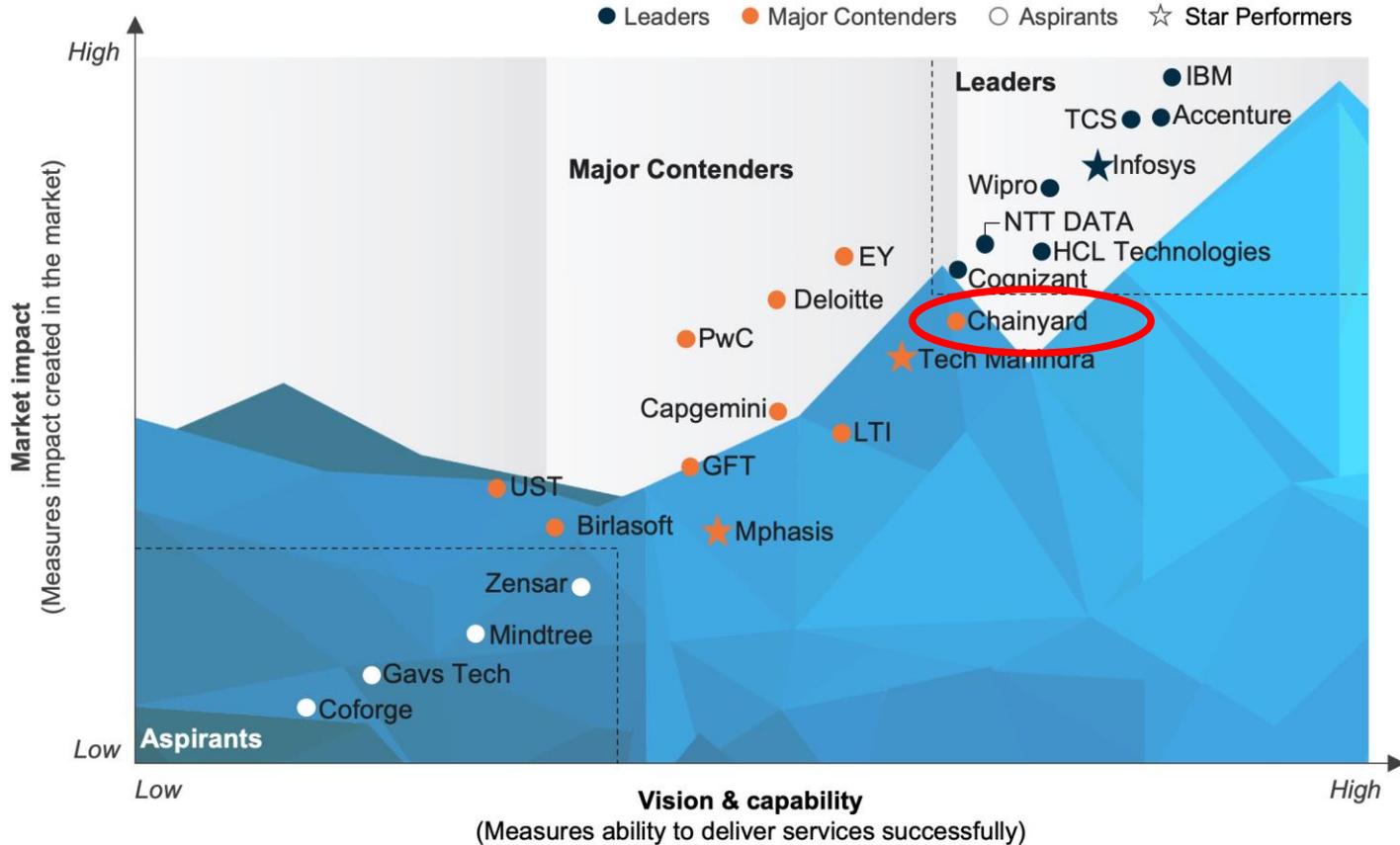
- Hyperledger Fabric Certified Service Provider

- openIDL Infrastructure Member

ConSensys Development Partner

IBM Silver Business Partner/IBM Blockchain Ecosystem Partner

Everest Group Enterprise Blockchain Services PEAK Matrix® Assessment 2022¹



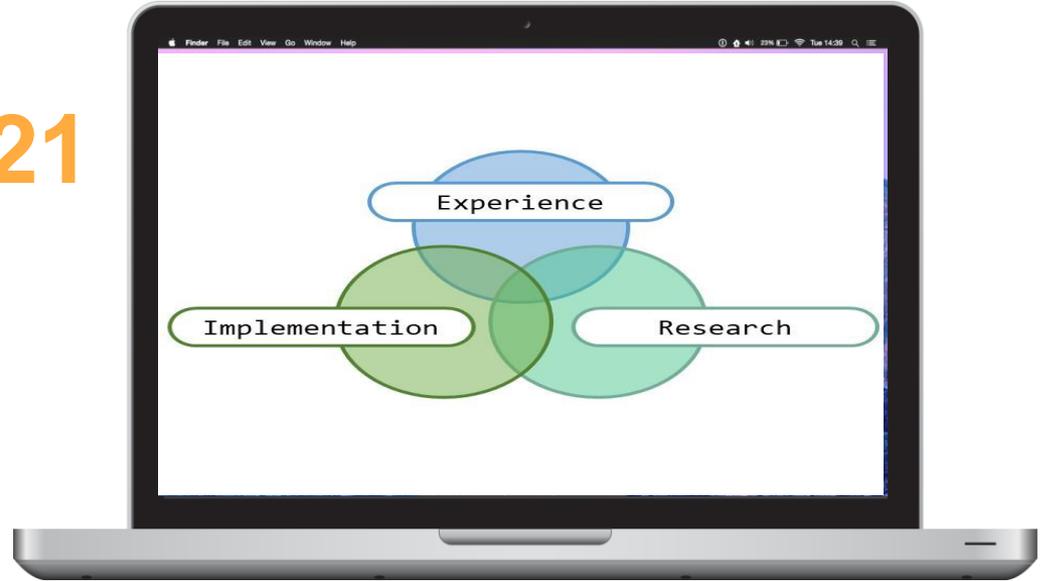
1 Assessments for Capgemini, Coforge, Deloitte, EY, PwC, and LTI of service provider inputs and are based on Everest Group's proprietary Transaction Intelligence (TI) database, service provider public disclosures, and Everest Group's interactions with insurance buyers.



Background

PLANNING STARTED IN 2021

to develop a hands-on technical workshop to focus on blockchain and NFTs



EDUCATION –
WHAT IS
BLOCKCHAIN?
WHAT IS AN
NFT?



USE CASES –
WHERE ARE
BLOCKCHAIN
AND NFTS
BEING USED?



SO WHAT –
WHAT DOES IT
MEAN TO YOU?

Blockchain is Happening

- Gartner estimates blockchain will generate \$3.1 trillion in new business value by 2030”
- PwC surveyed 600 executives, 84% said their companies are involved with blockchain
- WEF forecasts spending on blockchain solutions around the world surge to \$12.4 billion in 2022

Gartner®



WORLD
ECONOMIC
FORUM

NFT Market Predictions

Gartner[®]

By 2026, non-fungible token (NFT) gamification will propel an enterprise into the top 10 highest valued companies.

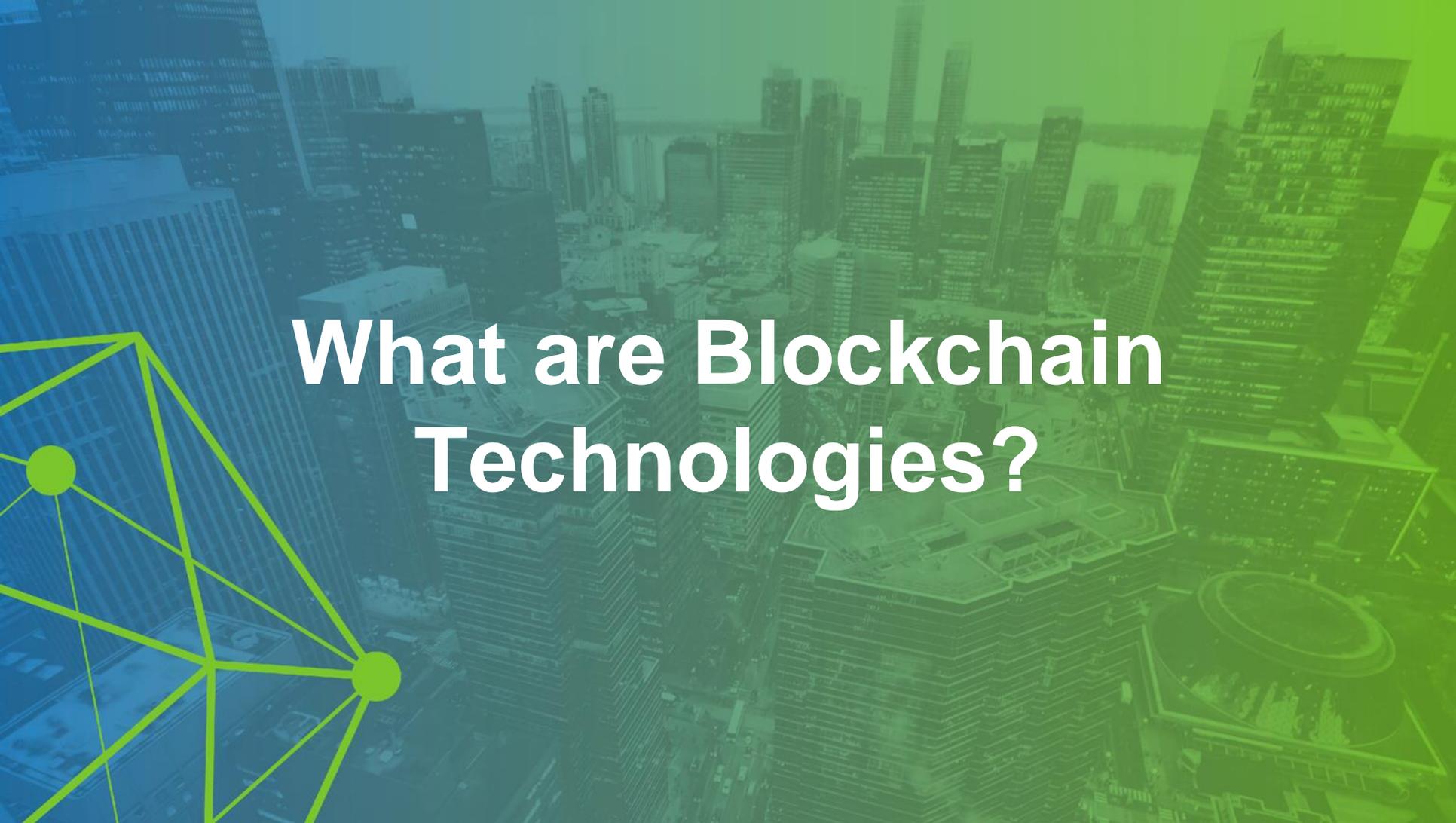
By 2024, Gartner predicts that 50% of publicly listed companies will have some sort of NFT underpinning their brand and/or digital ecosystem presence.

Jefferies

Jefferies Sees the NFT Market Reaching More Than \$80B in Value by 2025.

RESEARCH AND MARKETS By 2026, Research & Markets projects NFT market reaching \$82.43 Billion

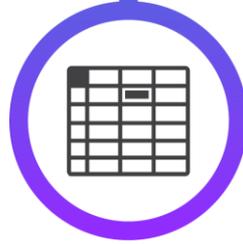
SOURCE: <https://www.gartner.com/en/newsroom/press-releases/2021-10-19-gartner-unveils-top-predictions-for-it-organizations-and-users-in-2022-and-beyond>



What are Blockchain Technologies?



What is a Distributed Ledger?



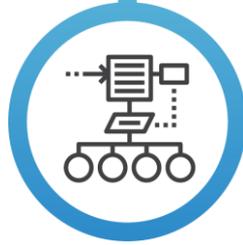
An **append-only system**
of record or log of transactions.



Software standards keep everyone in the shared ecosystem in sync.



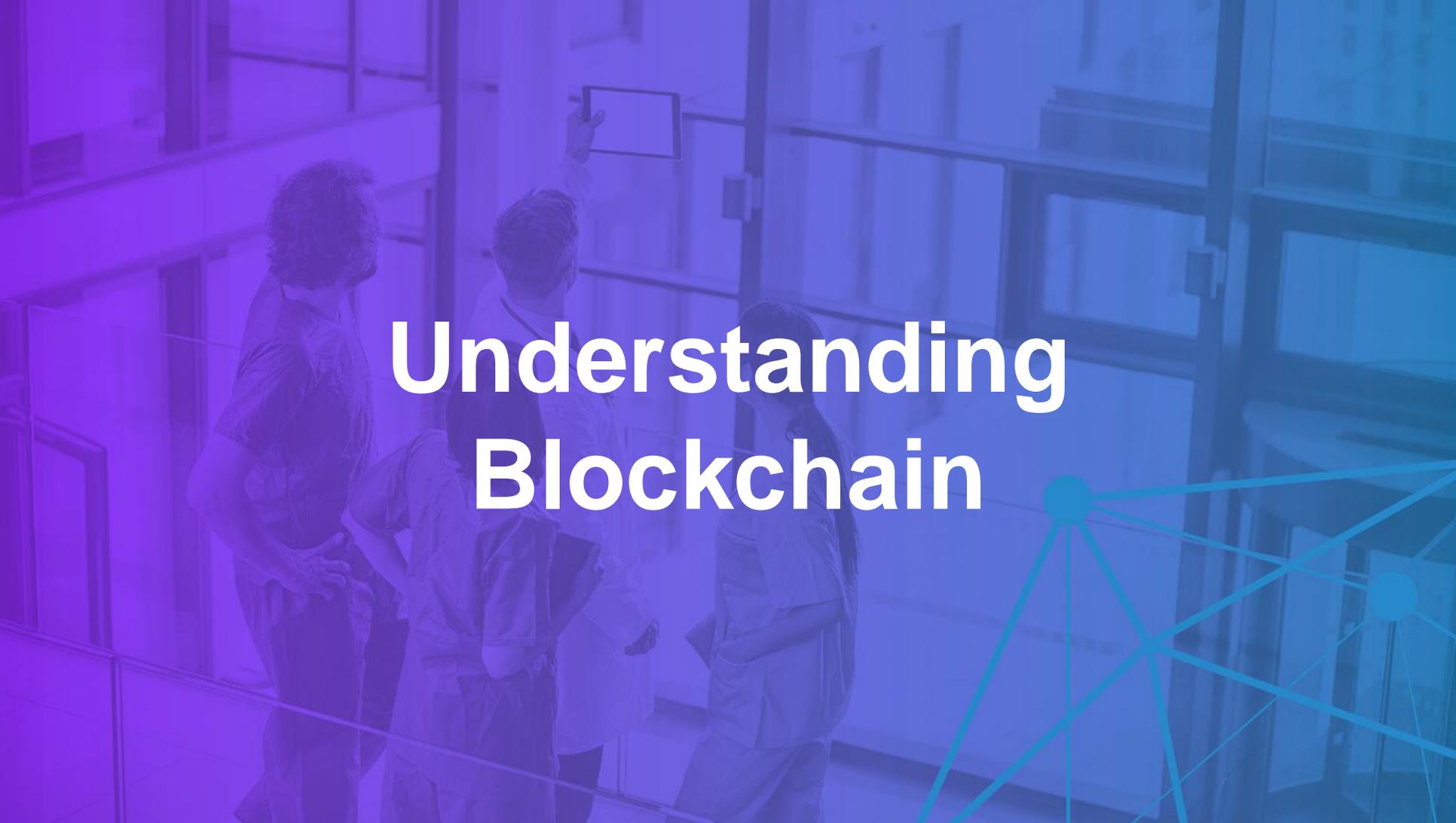
What is a Smart Contract?



The code stored and
executed on a blockchain.

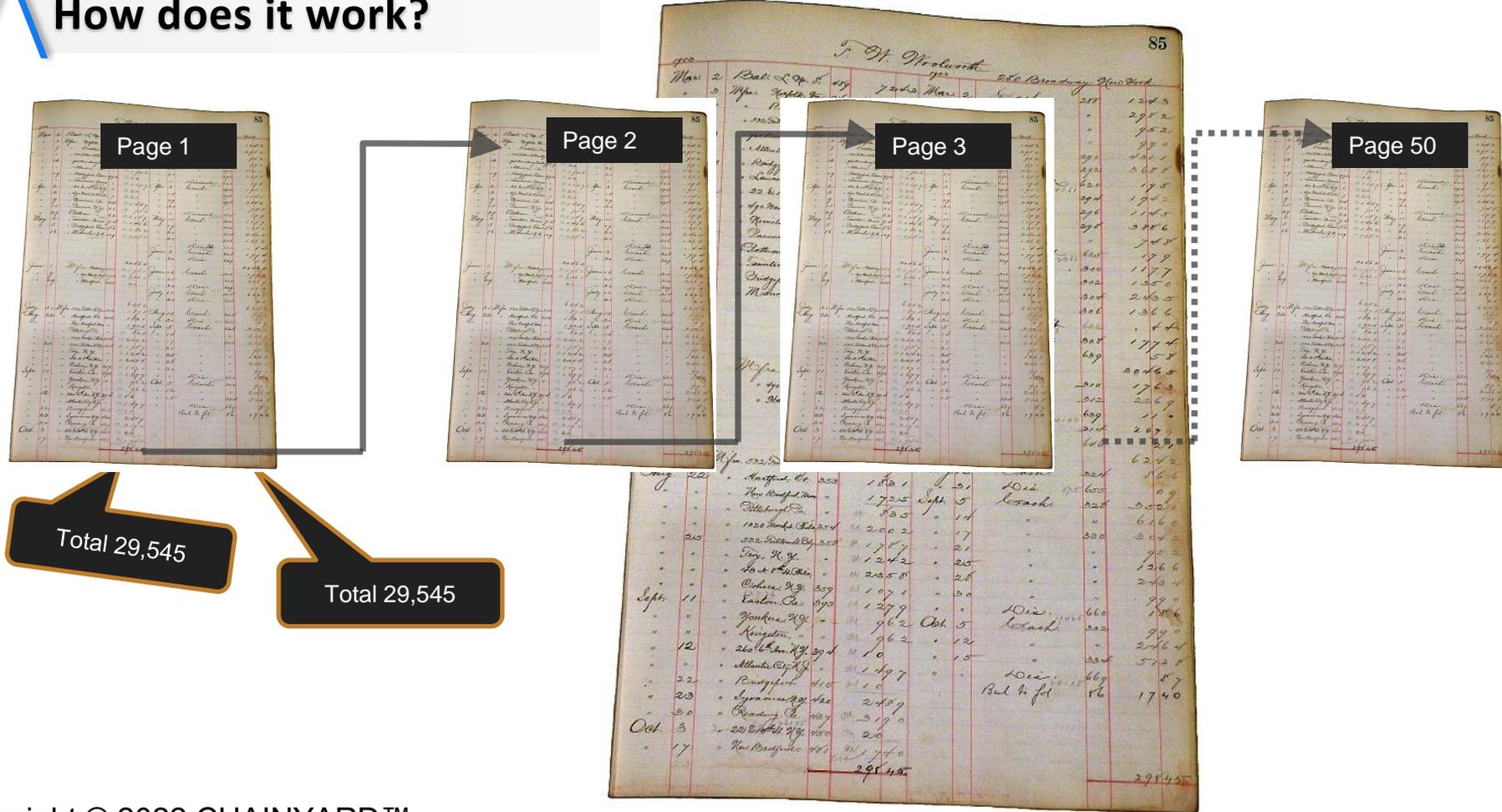


Encompasses both **distributed ledgers** and **smart contracts**.



Understanding Blockchain

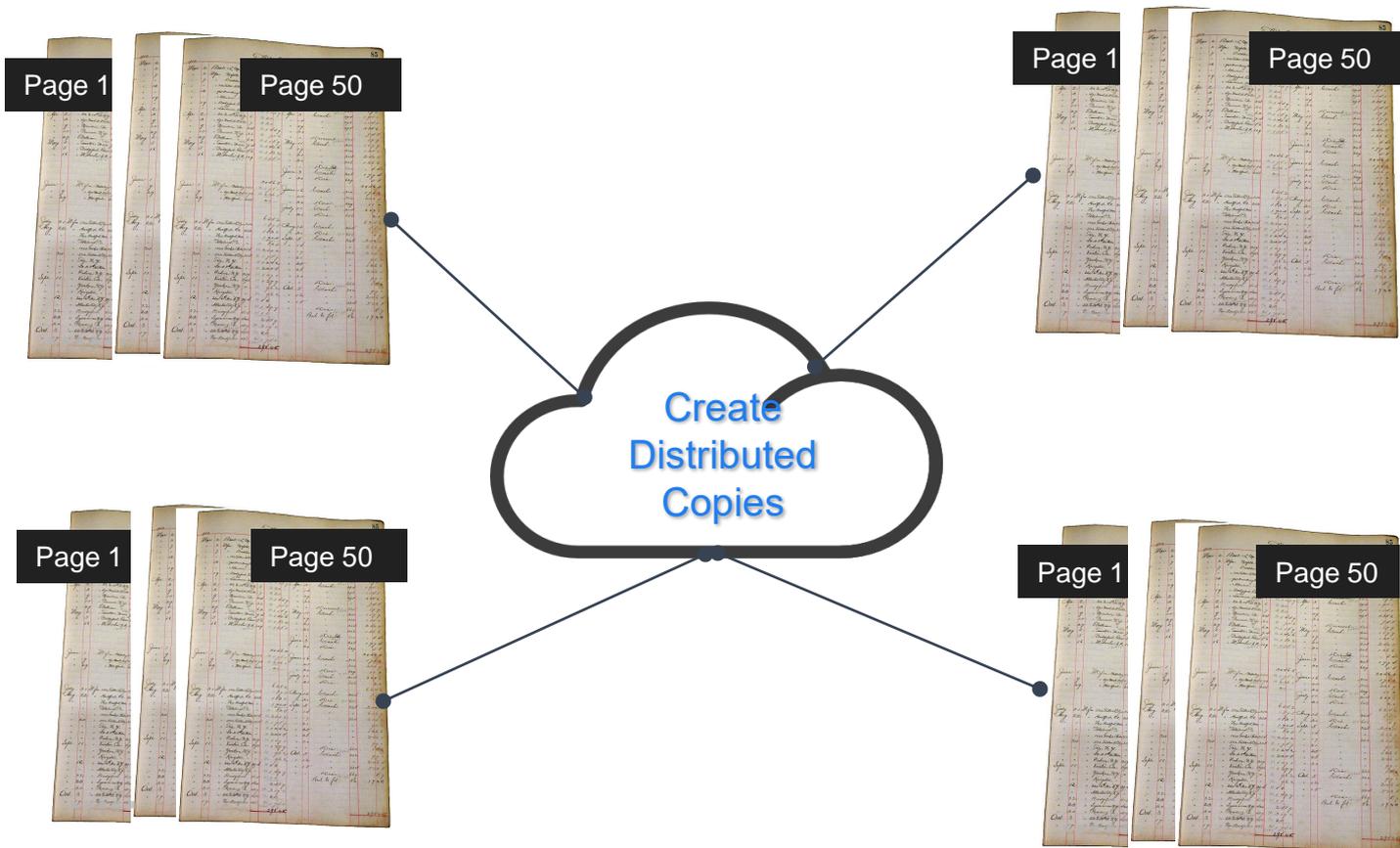
How does it work?



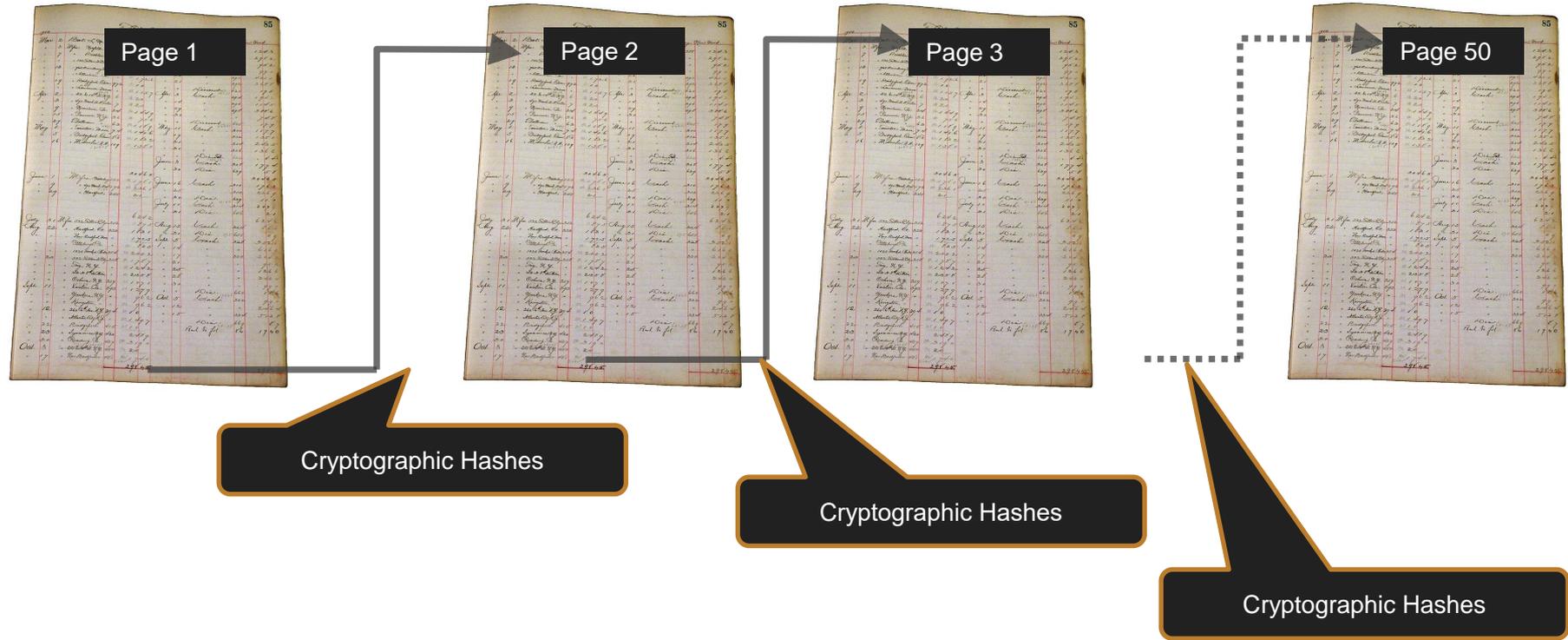
Total 29,545

Total 29,545

How does it work?



How does it work?



KEY BLOCKCHAIN TENETS

- **Decentralized** – no single entity controls all the computers, rules, or information – every node maintains an identical, encrypted copy of the ledger – consensus mechanism executed by each full node verifies and approves transactions
- **Distributed** – physically separate and connected on a network
- **Encrypted** – public and private keys to secure data
- **Consensus** – methods by which peers determine order of transactions in system (e.g., Proof of Work, Proof of Stake, et al)
- **Immutable** – transactions are cryptographically signed, time-stamped, and ordered into the ledger and cannot be corrupted or changed
- **Tokenization** – exchange of value in the form of tokens
- **Smart Contracts** - code stored and executed on a blockchain.



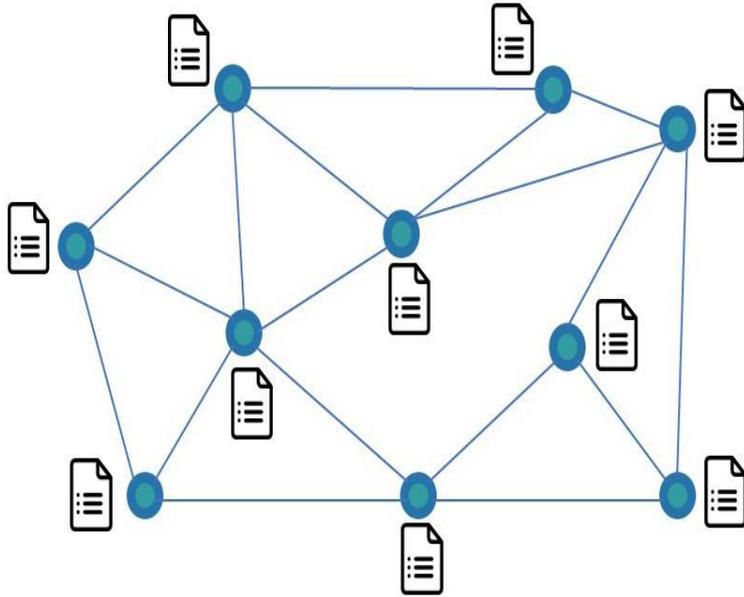
DECENTRALIZED

- **No central authority** and no single honey pot of data for hackers to target
- Enables true peer-to-peer network with no central point of failure
- Consensus protocol is used to validate and agree on blocks



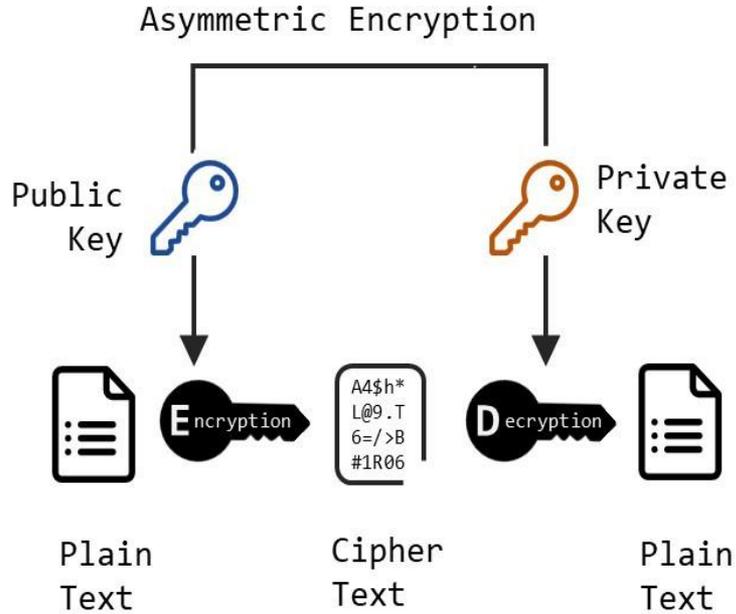
DECENTRALIZED

DISTRIBUTED



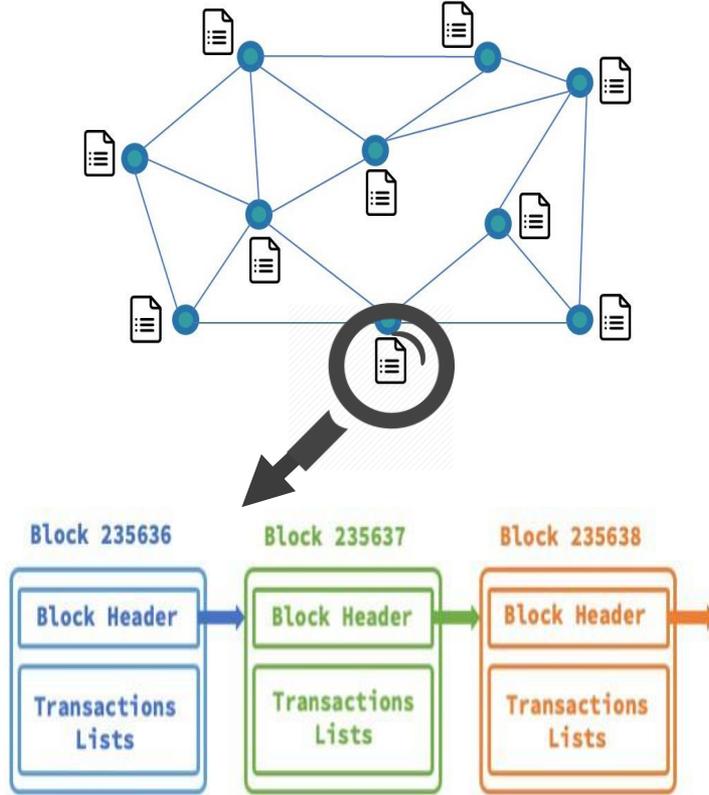
- Copy of data is distributed across multiple nodes
- **No single point of failure or delay bottleneck**
- Enables peer-to-peer network transactions of independent nodes
- **Along with consensus, creates a single source of truth**

ENCRYPTED

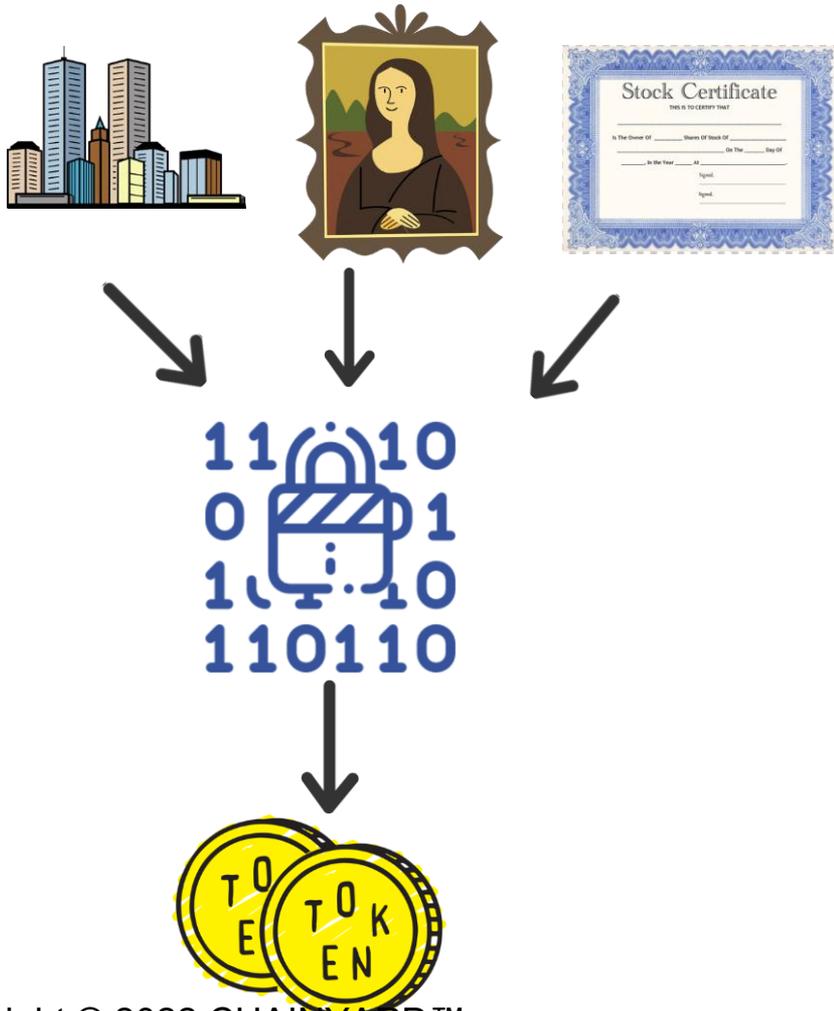


- **Blocks are linked together using cryptographic hash of the previous block**
- Privacy, identity and decentralization uses public-key (Asymmetric) cryptography
- Among many methods PII uses off-chain DB and Asymmetric cryptography

IMMUTABLE



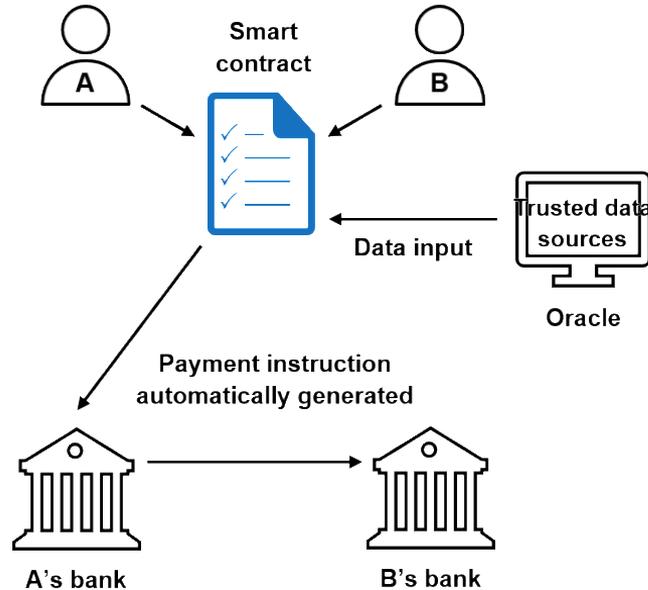
- Blocks are “append only”
- Each sequenced block in the blockchain contains a cryptographic hash of the previous block, a timestamp, and the transaction data
- For a bad actor to tamper with a block, the hacker would need to recompute hashes for all subsequent blocks and get it on every network node
- This gives transactions end-to-end transparency and provenance, facilitating audits.



TOKENIZATION

- Enables new services for exchanging value and representing assets such as real estate, bonds, grants, energy units, products, et al
- natural approach to implementing fractional ownership of assets

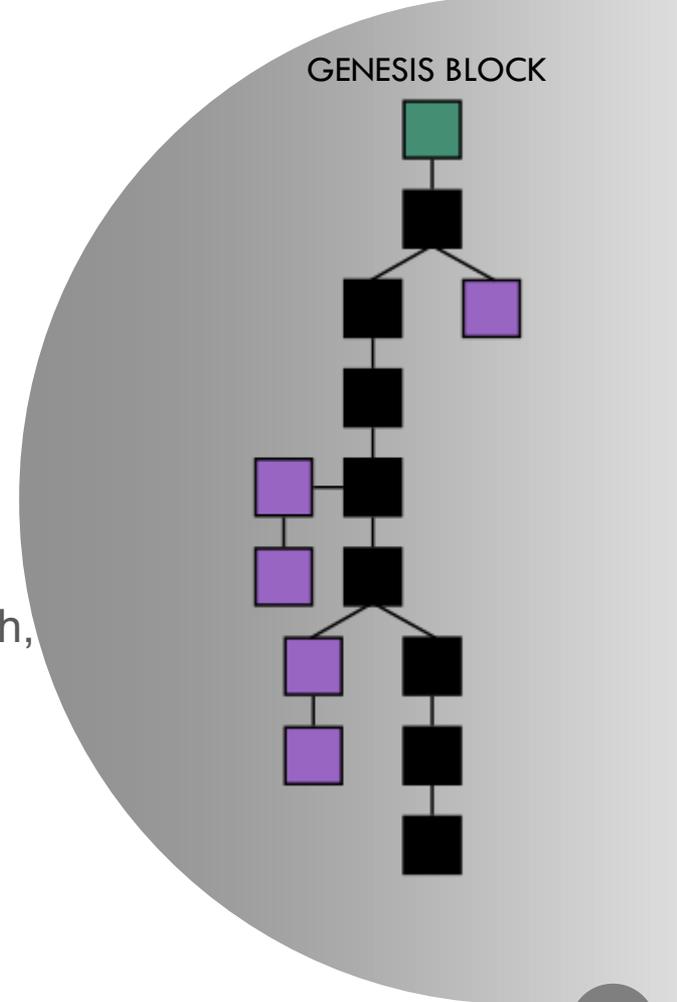
SMART CONTRACTS



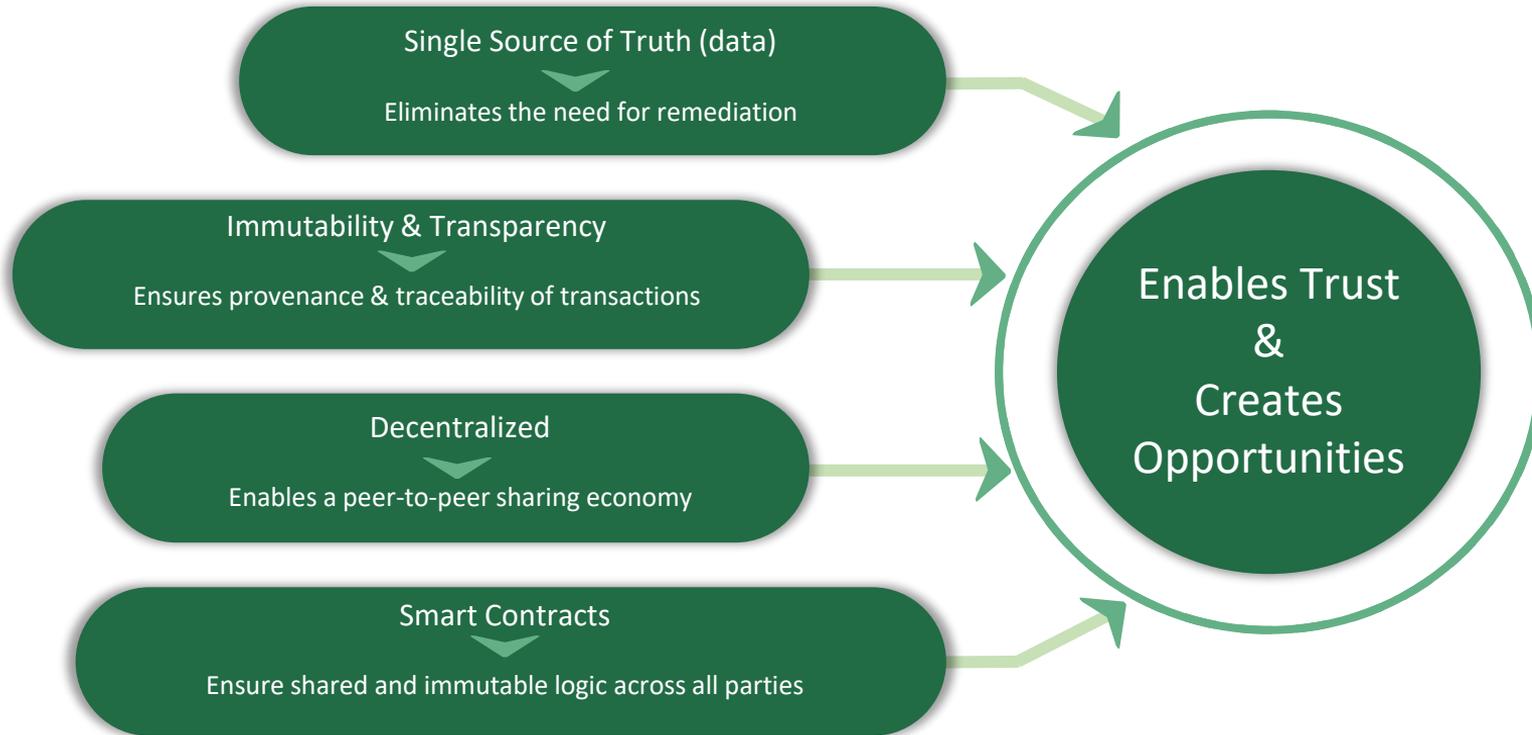
- Computer code that can **automate business actions based on predefined agreements**
- Ensures consistent business logic across peer-to-peer network

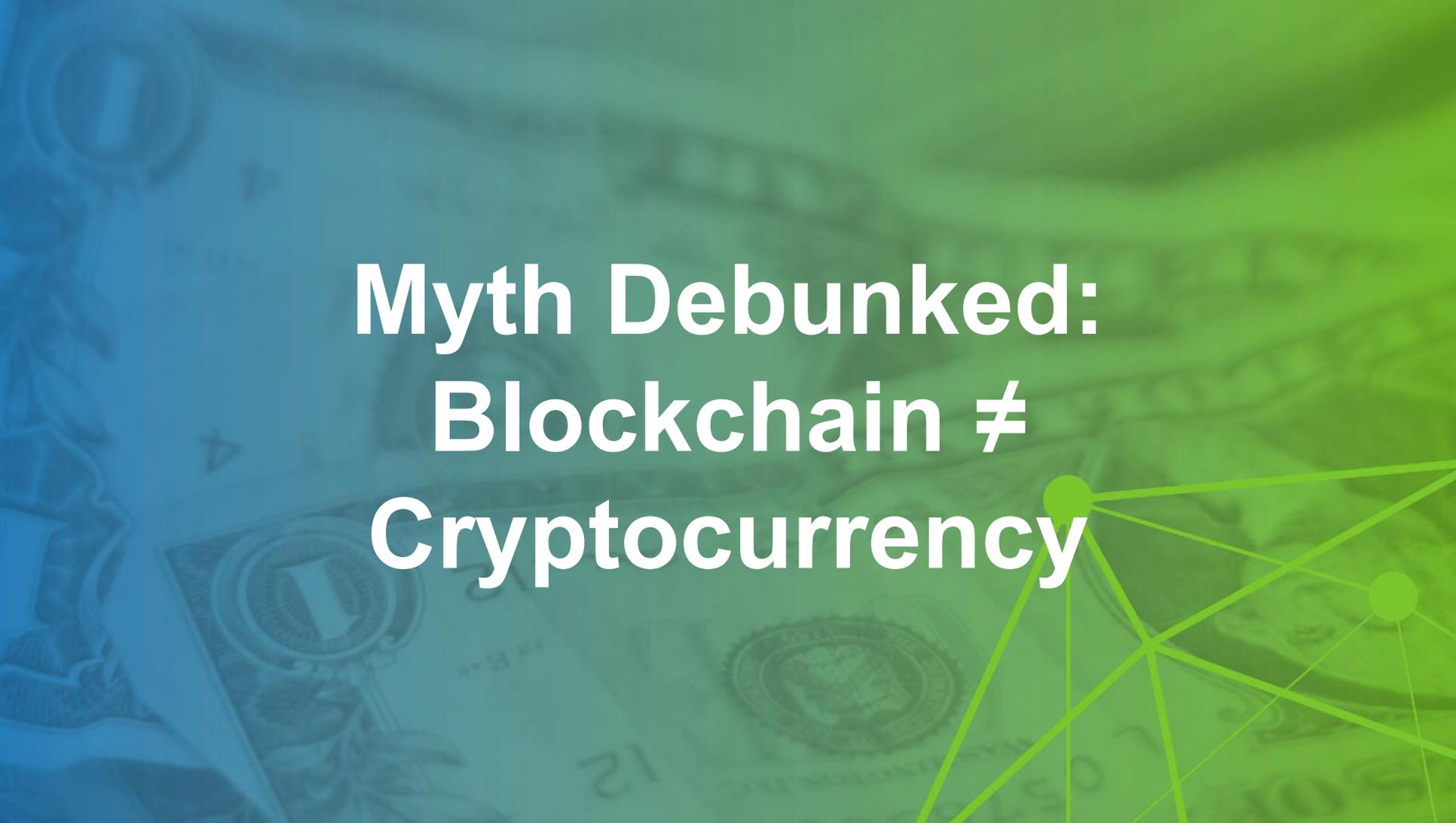
UNDERSTANDING BLOCKCHAIN

- Blockchain is a shared, Distributed Ledger Technology (DLT),
- Transactions are appended as blocks across many distributed computers in a peer-to-peer network after reaching consensus,
- Blocks are cryptographically secured and linked with hash,
- There is no central administrator or centralized data storage,
- Transactions are immutable and append-only (the data cannot be updated in place).



FOR BUSINESS, BLOCKCHAIN IS A TRUST PROTOCOL



The background features a collage of US dollar bills, including a one-dollar bill and a five-dollar bill, overlaid with a green network diagram consisting of interconnected nodes and lines. The text is centered in white.

Myth Debunked: Blockchain ≠ Cryptocurrency



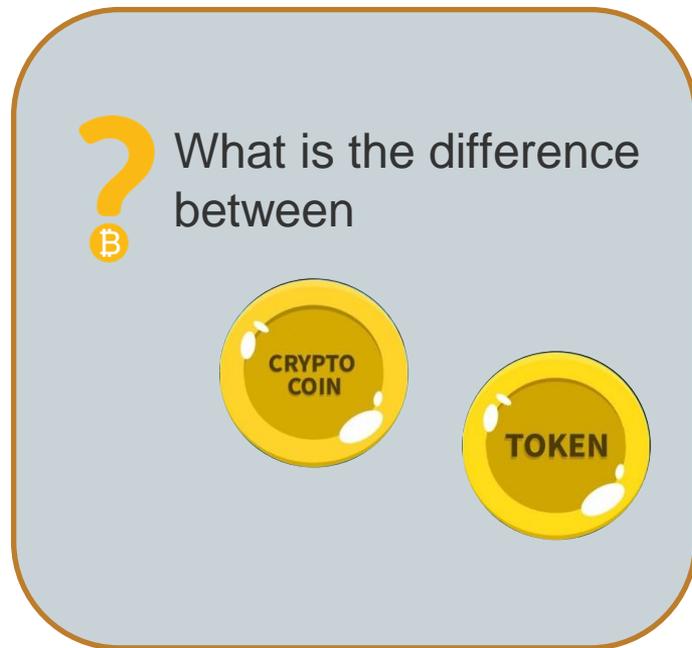
Cryptocurrency is an **application
that sits on top of blockchain.**
Not the other way around.



What are Tokens? What is an NFT?

What is a Token?

- A token is a digital representation of a physical object or service in a blockchain
- It can represent anything – a character in a game, airline ticket, work of art, coins, etc.
- In blockchain it is implemented as a smart contract.

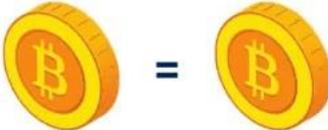


What is an NFT?

“Non-fungible” means that it’s unique and can’t be replaced with something else.



FUNGIBLE



NON-FUNGIBLE



Benefits of NFT

- **NFTs Foster Marketplace Efficiency**
 - **Global Marketplace**
 - **Liquidity**
- **Fractionalize Ownership of Physical Assets**
- **Blockchain Security - authenticity and chain-of-ownership,**

Token Standards

<i>Token standard</i>	<i>Key concepts</i>	<i>Use cases</i>
ERC20	<ul style="list-style-type: none">— Based in balances— Fungible value	<ul style="list-style-type: none">— Initial coin offering, initial exchange offerings, security token offerings— Utility tokens
ERC721	<ul style="list-style-type: none">— Non-fungible value— Each element is unique	<ul style="list-style-type: none">— Real assets tokenisation— Virtual collectibles— ‘Negative value’ assets
ERC1155	<ul style="list-style-type: none">— A mix of the ERC 20 and the ERC 721— Allows different tokens to be configured from a single point	<ul style="list-style-type: none">— Heterogeneous asset portfolio
ERC1450	<ul style="list-style-type: none">— Compliance with Securities Act Regulations CF, D and A— Includes know-your-customer and anti money-laundering mechanisms— Still in a draft state	<ul style="list-style-type: none">— Potentially US compliant security issuing

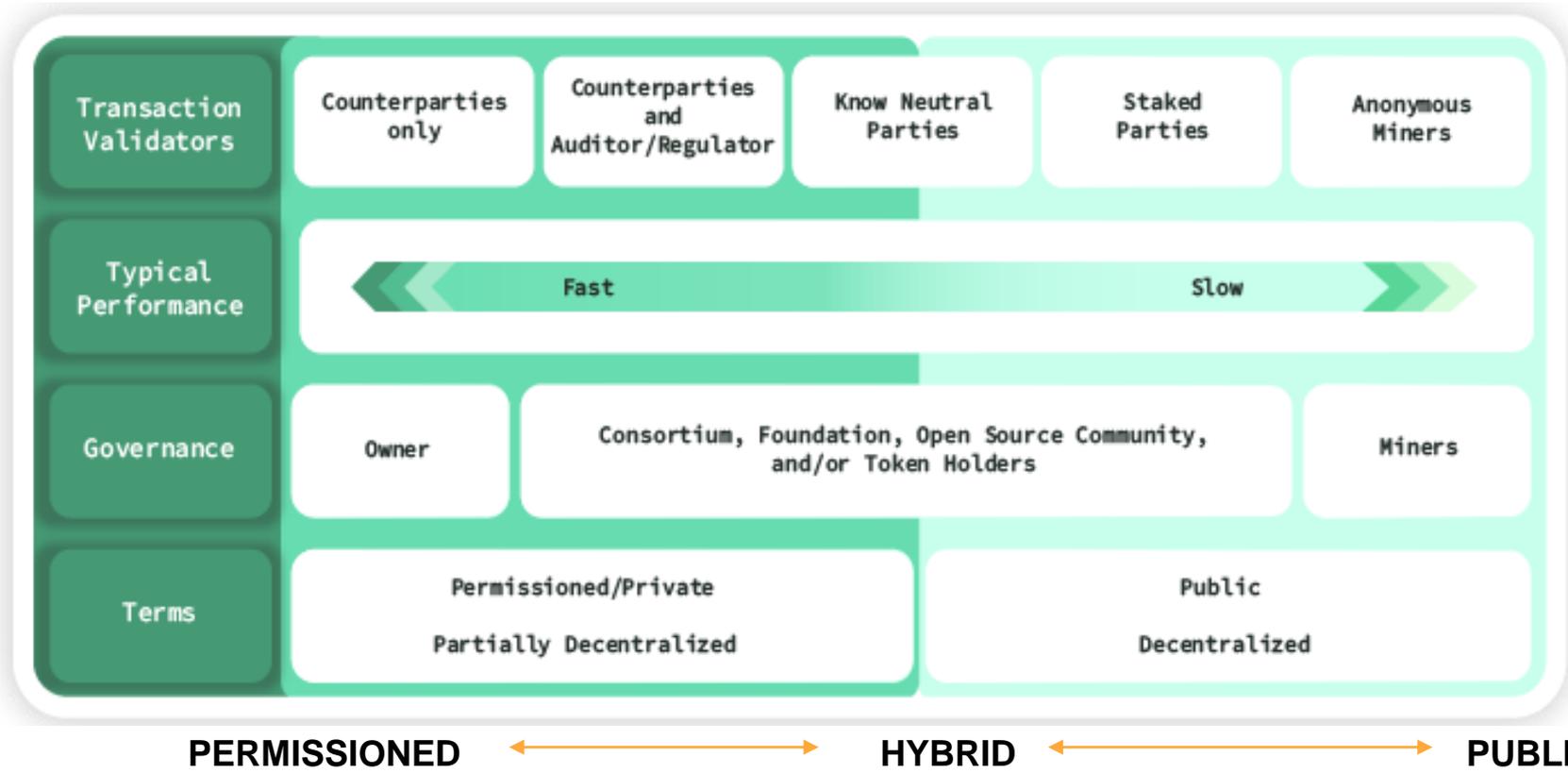
Unique attributes of non-fungible tokens





Enterprise Technology Landscape Overview

BLOCKCHAIN CONTINUUM

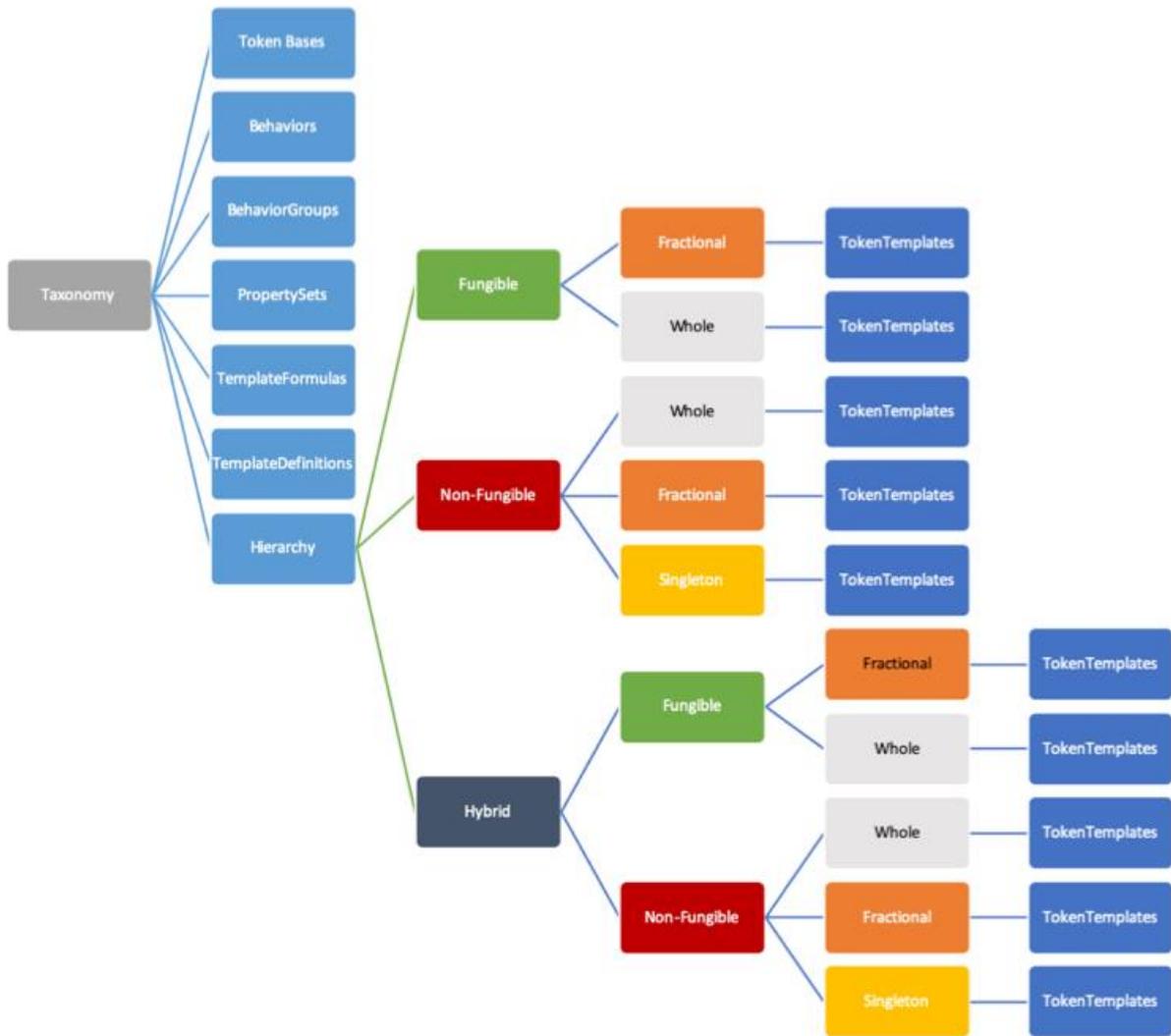


SELECTED ENTERPRISE PLATFORMS

Hyperledger Fabric		Open Source	Enterprise	Cross Domain
Quorum		Open Source (Ethereum)	Enterprise	Cross Domain
Corda R3		Hybrid (based on Fabric)	Enterprise	Cross Domain
Stellar		Public	Enterprise	Payments
Ripple		Public	Enterprise	Payments
Hyperledger Indy		Open Source	Enterprise	Digital Identity



Enables multiple parties to define a common language, behaviors, and properties for a token of value that can be used or exchanged.



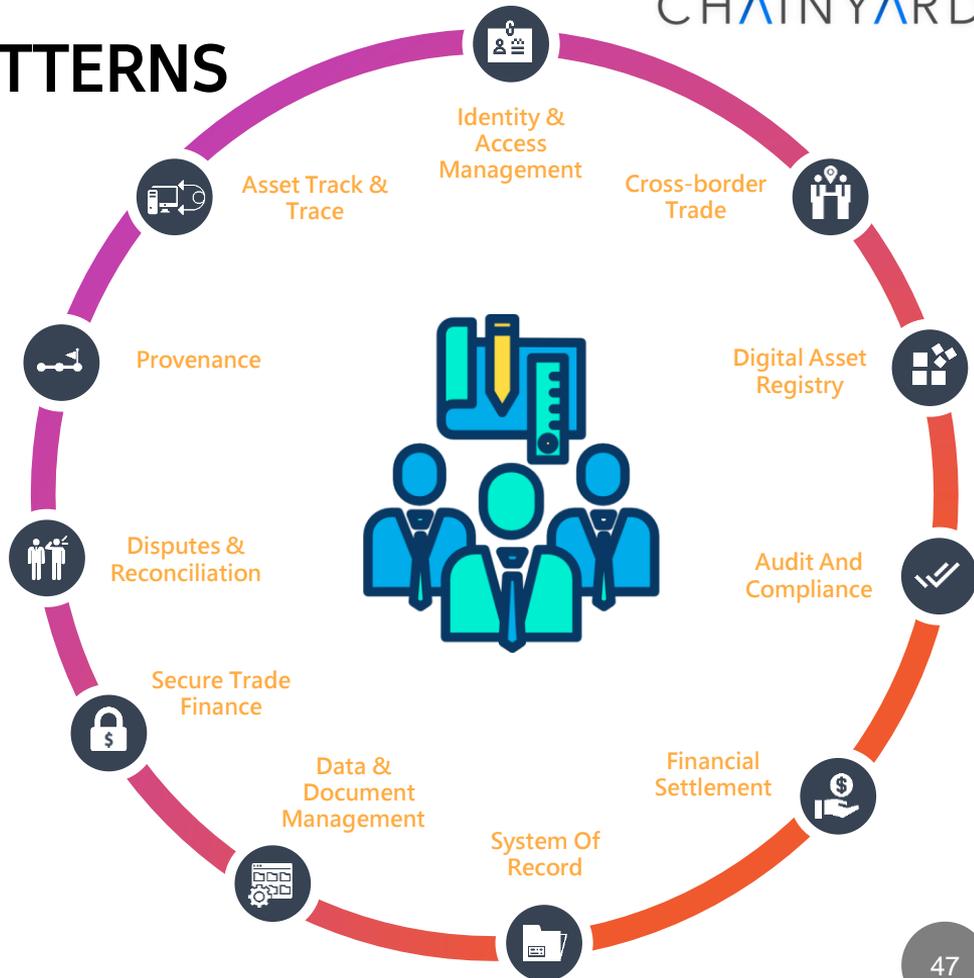


Use Cases & Production Networks

BLOCKCHAIN BUSINESS PATTERNS

Most Blockchain opportunities fall into certain business process patterns

- ❖ Business Patterns help in quickly narrowing down opportunities within a potential business domain
- ❖ Patterns can enable better discussion with the business and eliminate false blockchain positives
- ❖ Patterns can help identify internal process or data quality issues versus real blockchain opportunities



Comprehensive supply chain platform

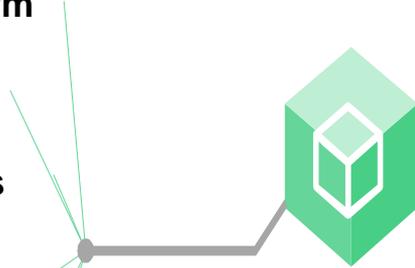
Provenance and quality

Streamlining transportation systems

Integrity in the information supply chain, construction project management

End-to-end supply chain integrity, and product authentication

Trusted business partners



Trust Your Supplier™



2018



Fabric



Production



- Hazardous materials**
- Tracking raw materials for regulatory compliance**
- Creating a regenerative, inclusive, and circular plastic economy**
- Compliance tracking raw materials in sustainable supply chain**



2018



Hyperledger
Fabric



Production



PRODUCT QUALITY & SAFETY

Provenance of product and components

Tracing product certifications and approvals

Verifying conditions during transport
Air quality compliance

Construction industry supply chain and project management



IBM Food Trust™



2018



**IBM Blockchain
(Hyperledger Fabric)**



Production



2019



Ethereum



Pilot

Smart contracts for automated payments, reducing settlement times and costs

Digitizing and sharing product shipping data; automating payments

Letters of credit

International trade



The Challenge*

Today, banks live in a competitive world. Small and mid-sized businesses generated 85% of employment growth in Europe in recent years, but only ~50% of them have access to formal credit. The Digital Trade Chain exemplifies how blockchain can bring the required trust and transparency to a new business network and



The Collaboration*

A consortium of major world banks including: Deutsche Bank, HSBC, KBC, Natixis, Rabobank, Société Générale, Santander, UniCredit and Nordea

The Technology*

we.trade is a Hyperledger Fabric blockchain-based international trading system that enables accurate trading posture information, order to settlement control, risk coverage, track and trace options

* Reprinted from Hyperledger Foundation



- Electronic health records (EHR)**
- Medical imaging, healthcare, radiology**
- Sharing medical images for AI/ML**
- Tracking data use permissions for privacy regulations compliance**
- Smart contracts for expediting claims processing**

CHANGE HEALTHCARE



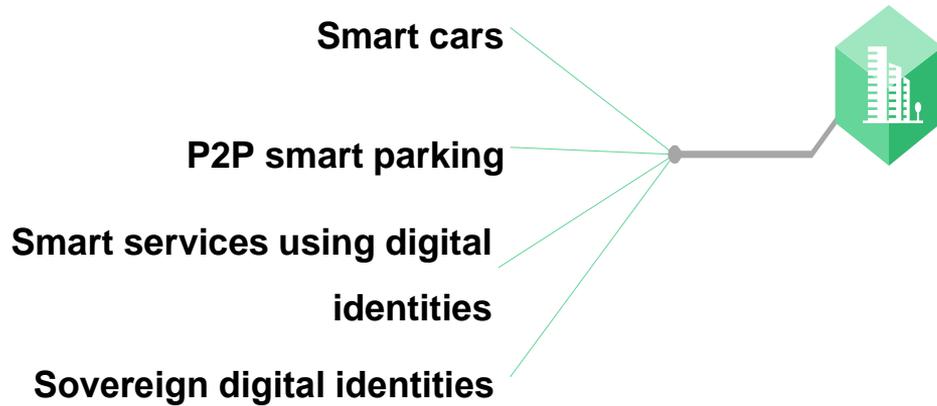
2017



Hyperledger
Fabric



Production



2019 - 2020



Undisclosed



Pilot

Use cases of NFT

DIGITAL ART

Tokenizes real-world artworks to promote authenticity and offer ownership to the artist



FASHION

Helps to verify the ownership information of luxury items and accessories digitally to reduce counterfeit



LICENSES AND CERTIFICATIONS

Tokenizes licenses and certifications to authenticate and preserve the ownership of these documentations



COLLECTIBLES

Offers various unique collectibles that feature unique algorithms and identities with added value



SPORTS

Offers tokenized sports game tickets issued on blockchain and prevents counterfeit merchandises



NAME SERVICE AND DOMAINS

Offers crypto addresses as NFTs where users can buy and sell Ethereum Name Service



VIRTUAL WORLDS

Allows users to own, create and monetize virtual land and various virtual world elements



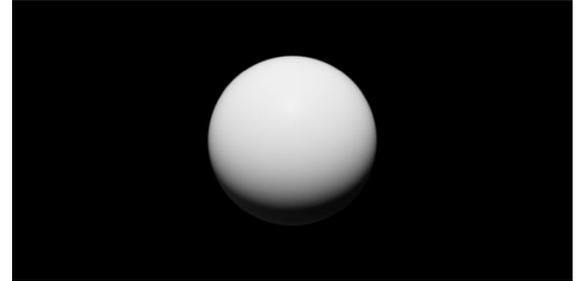
GAMING

Allows in-game elements or items to be tokenized and exchanged with other peers



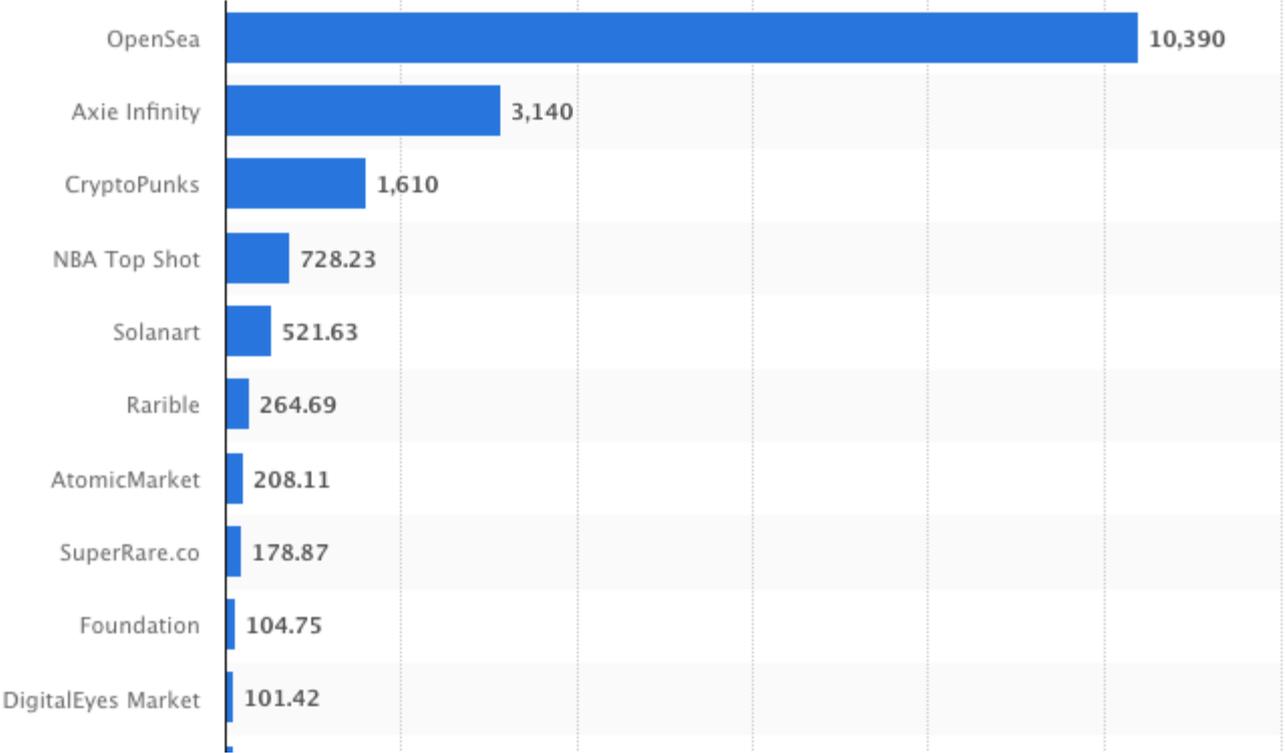
NFT Examples

- Collectibles
- Digital Art

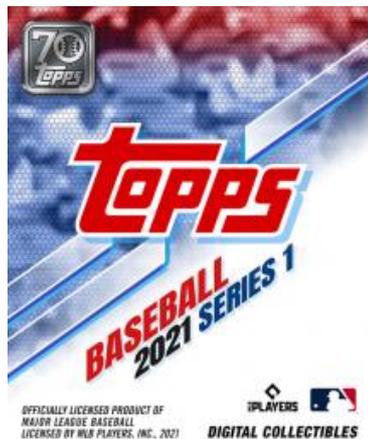


Collectibles NFT Market Places

(in million U.S. dollars)

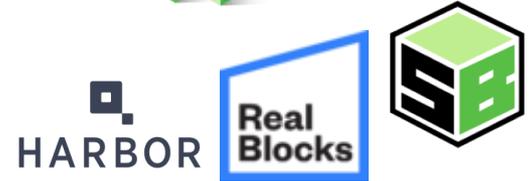


NFT Examples – Sports & Gaming



NFT Examples – Real Estate

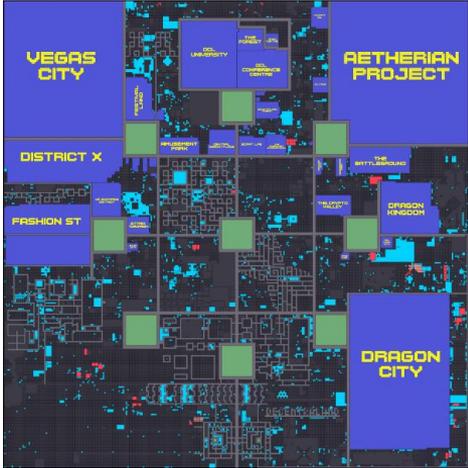
- **Real Estate Assets**
 - Fractional ownership
 - Entire asset



NFT Examples – Real Estate

Digital Real Estate

NFT in Mortgages



NFT Examples - IP, License & Certifications



VitaDAO



Source: <https://medium.com/molecule-blog/molecules-biopharma-ipnfts-a-technical-description-4dcfc6bf77f8>

An aerial view of a city skyline, likely New York City, with a green overlay. In the bottom left corner, there is a yellow network diagram consisting of several nodes connected by lines. The word "Obstacles" is written in white, bold, sans-serif font in the center of the image.

Obstacles



OBSTACLES TO ADOPTION

- **Understanding** – not well understood in many executive suites
- **Incorrect Assumptions / Myths** – impacts on environment (mining), scalability, only good for nefarious transactions, participants are anonymous
- **Technical Skills** – no in-house skills; hard to acquire and develop without investment
- **Wrong Use Cases** – bad use cases lead to failures
- **Integration** – integration can be difficult, time consuming and costly
- **Priority** – hard to justify relative to other strategic initiatives
- **Determining ROI** – is difficult since developing in a consortium has many unknowns
- **Legal Compliance** – agreements, data storage responsibility, integration ownership



**What Does This
Mean To You?**

^ GET INVOLVED

HYPERLEDGER FOUNDATION (Open Source) [Hyperledger.org/participate](https://hyperledger.org/participate)



Improve the
documentation and
training material



Get involved with
coding

NEFERTI

Hyperledger labs is an open-source code community with a low barrier to entry. Any, and all, are welcome to join and contribute to the lab. The lab maintainers will be the governors.

NEFRTI:

- is a Hyperledger lab.
- plans a low-code and highly secure implementation to issue and trade NFTs, in a protocol agnostic way.
- code will address marketplace utilities for issuance and trading of NFTs.
- implementation will allow for extensibility and openness. An initial reference Hyperledger Fabric implementation is planned.
- welcomes you to join and contribute to the lab.

CONSENSYS Developers Portal

<https://consensys.net/developers/>



QUICK START



TUTORIALS



General Technical:

- Linux OS (Linux, et al)
- Blockchain Understanding (Hyperledger Fabric, Ethereum, Corda, Quorum, et al) *
- Programming (NodeJS, GoLang, Solidity, Parity, Web3.js, Truffle, Metamask, et al) *
- Scripting languages (JavaScript, Python, Ruby, bash, et al)
- Database technologies (SQL, NOSQL)
- Cloud Technologies (Amazon, Azure, GCP, IBM Cloud, CloudFoundry, et al)
- Build/Deploy Automation, CICD pipelines and test automation tools (Git, GitHub, Jenkins, Travis, Gerrit, Bamboo, et al)
- Container technologies and orchestration tools (Docker, Kubernetes, Ansible, et al)
- Network Topology and Configuration (load balances, proxies, firewalls, et al)
- Security Knowledge (development, deployment, monitoring best practices)

* Some are blockchain specific



Hands-On Workshop Details

WORKSHOP # 2

HYPERLEDGER FOUNDATION

Build Your Own NFT with Hyperledger Fabric

1st session: March 24 @ 11 AM Eastern
2nd session: March 31 @ 11 AM Eastern

WORKSHOPS Co-developed for HBCU faculty with: CHAIN YARD MORGAN STATE UNIVERSITY

Instructors:

- Isaac Kunkel
- Mohan Venkataraman
- Gigo Joseph
- Puneet Singh
- Aashish Shrestha

Make sure:

- you are signed up for Workshop # 2.
- browser is installed on your laptop (Chrome, Firefox, Safari).
- your connection allows you to connect to open internet; hands-on session will be hosted on a public address.
- you have a jpeg or gif file (<2Mb) that you would like to have represented as an NFT.
- you check for an email ahead of workshop # 2 with URL information to use during the workshop

Make sure you are registered on Discord, and have access to the following thread which will be used for Q&A during the workshop:

<https://discord.com/channels/905194001349627914/949057804050780181>

Review this Hyperledger Foundation page for all the details:

<https://wiki.hyperledger.org/display/events/Build+Your+Own+NFT+with+Hyperledger+Fabric>

Question & Answer





INTRODUCTION TO BLOCKCHAIN AND NFT CONCEPTS

Thank You!