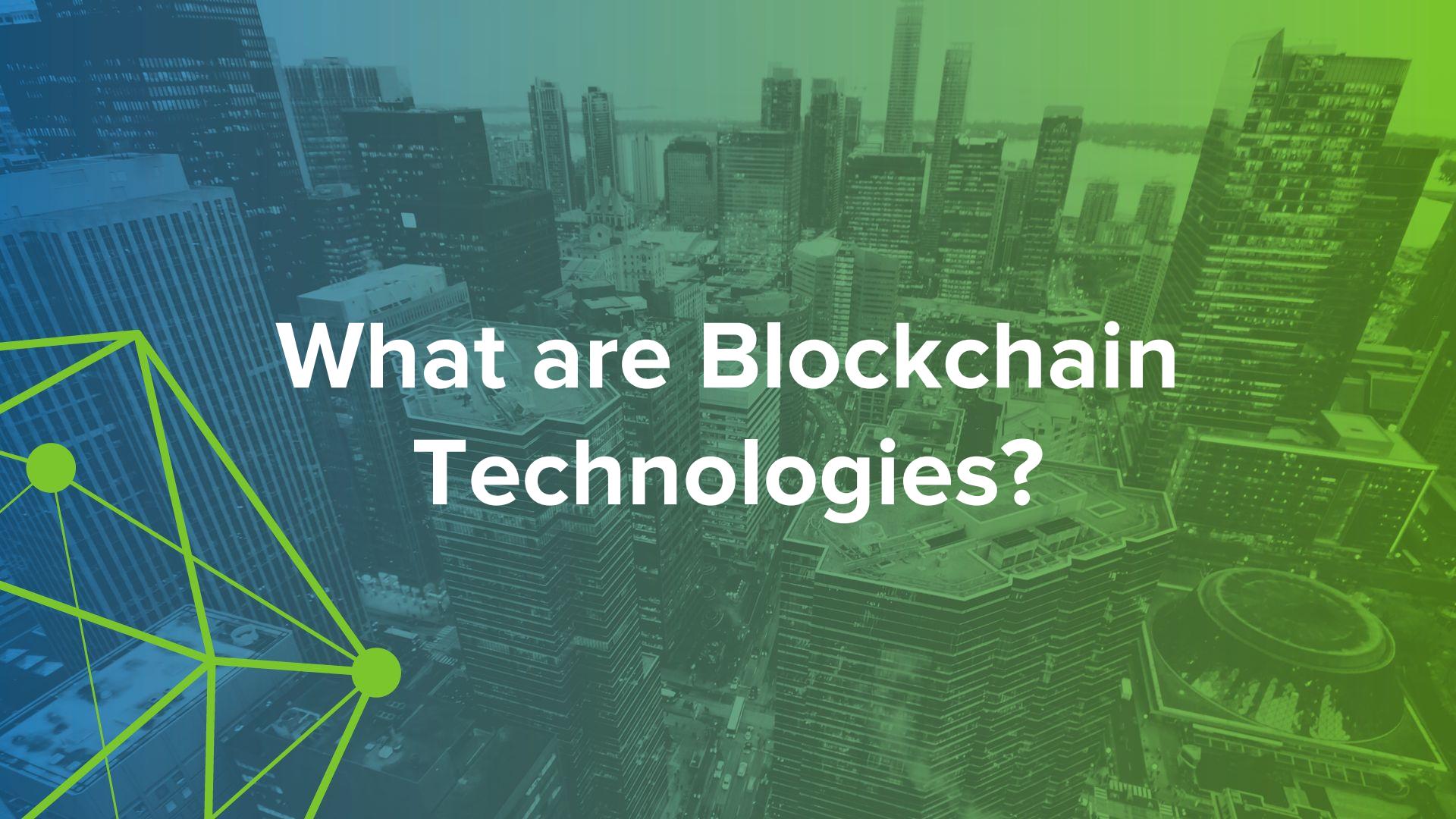




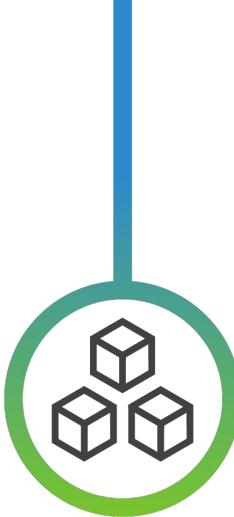
# The Hyperledger Vision

# Blockchain 101





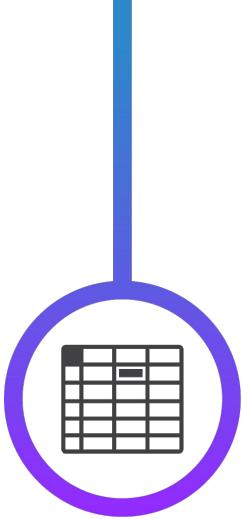
# What are Blockchain Technologies?



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

A photograph of four people in a modern office environment. One person is standing on the left, facing right. Two people are in the center, one holding up a tablet. Another person is on the right, looking towards the screen. They are all looking at a large, blank screen that spans across the middle of the room. The background shows a modern building with glass windows. Overlaid on the bottom right is a teal-colored network diagram consisting of several nodes connected by lines.

# What is a Distributed Ledger?

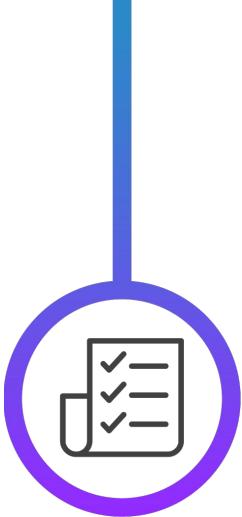


An **append-only system**  
of record or log of transactions.



# Cryptography for Integrity & Privacy

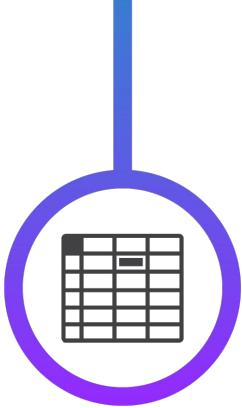




Software standards keep everyone in the  
shared ecosystem in sync.

A woman with curly hair, wearing a white shirt and dark pants, is smiling and looking towards the camera. She is standing in an office environment with other people visible in the background. A large, semi-transparent network diagram is overlaid on the right side of the image. The diagram consists of several blue nodes connected by lines, forming a complex web. One node is labeled 'BEX'. There are also some handwritten notes and a graph with axes and numbers like 100, 50, and 75.

# Distributed Ledgers in Action



All businesses participating in a commercial ecosystem need a ledger to contain a record of transactions. **It is vitally important to know that your copy of the ledger is identical to others' in the network.**

# Example Scenario

1

Everyone in a room has a book with the instructions to write down entries as they get called out.

2

Someone calls out item number one and everyone writes it down.

3

Then two people call out item number two at the same time, but the item number differs.

4

There needs to be a process for who wins, and the loser gets to try to call out item number three.

5

When all agree on the outcome of an entry, the next link in that ledger can be written.

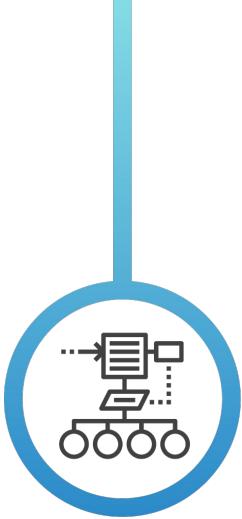
6

Whether this happens in a small scale or the size of the internet, that is the spectrum for how a distributed ledger can work.



A person in a suit is holding a tablet and a pen, appearing to work on it. A network diagram with two nodes and connecting lines is overlaid on the bottom left.

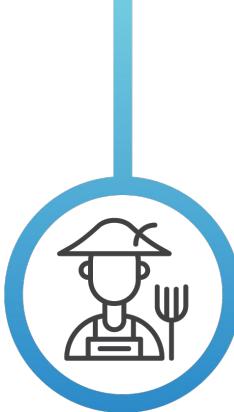
# What is a Smart Contract?



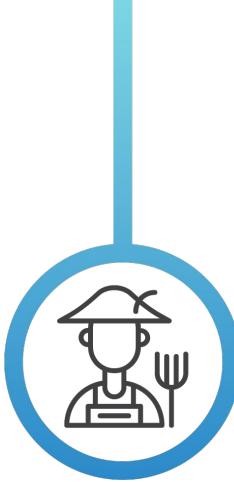
The **code** or any complex program  
stored and executed on a blockchain.



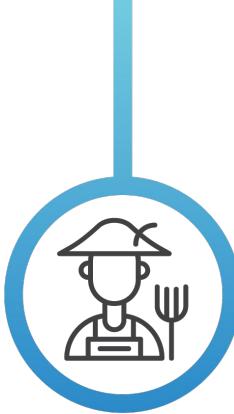
# Smart Contracts in Action



**Imagine a farmer** based in Sacramento, California buys an insurance agreement that protects them from extreme weather condition. If temperatures reach more than 100 degrees for 100 days, they get reimbursed 10,000 USD.



**With manually-triggered contracts/ledgers** widely operated today, the insurer might find a way to back out of, procrastinate or dispute this agreement.



If a Smart Contract is in place, the script in the ledger would rule that on that 100th day of 100+ degrees, the 10,000 USD would be automatically withdrawn. With an automated process, like it or not, the insurer cannot back out.

# Myth Debunked: Blockchain ≠ Cryptocurrency



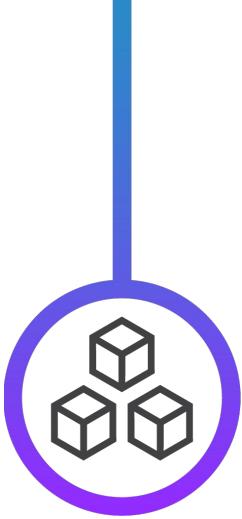


Cryptocurrency is an **application**  
**that sits on top of blockchain.**

Not the other way around.



# Why Business Blockchain Technologies



**All over the global market** there  
are ledgers that organizations and  
individuals alike must trust.

# Early Adopter Industries



Financial Services



Supply Chain



Healthcare



# TRUST: The Deciding Factor in Whether a Society Can Function





## The Need for Trust

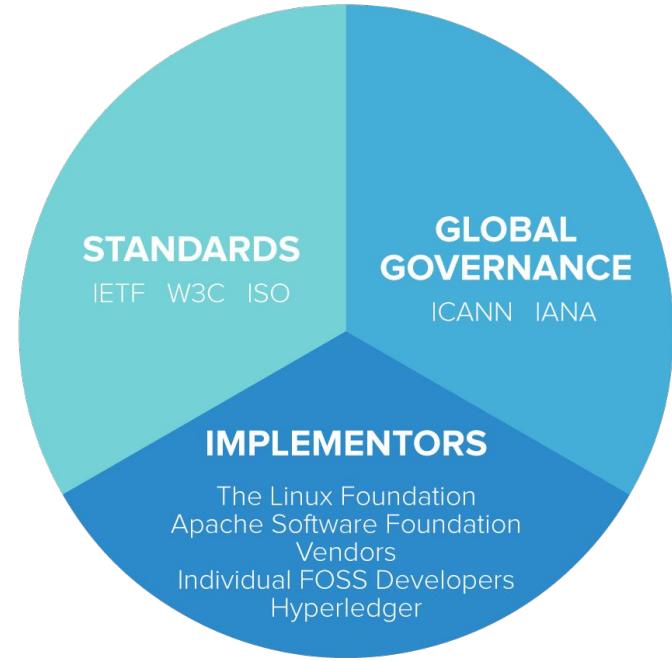
The *2018 Edelman Trust Barometer*, an annual survey of 33k people in 28 countries, reveals that the trust in key institutions continues to decline. For blockchain, 2018 needs to be the year of scale done well.

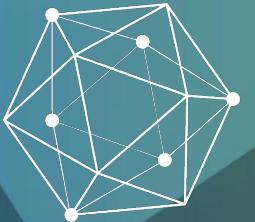


**Without trust, the system fails.** The onus is on businesses to prove that it is possible to act in the interest of shareholders and society alike and show that free markets can succeed for all if businesses work with the people.

## The Trust Protocol

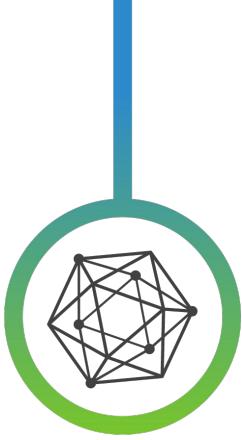
The way internet technologies tend to get developed is a partnership between three organizations: standards, global governance and implementors, like Hyperledger.





# HYPERLEDGER

BLOCKCHAIN TECHNOLOGIES FOR BUSINESS



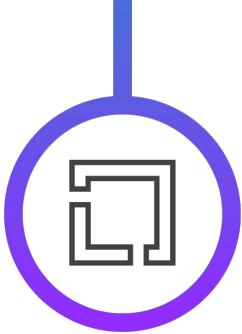
## Introducing Hyperledger

A global, cross-industry consortium  
of communities advancing business  
blockchain technologies.

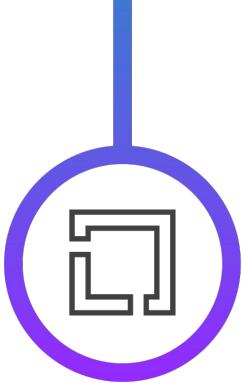


Hosted by





Dedicated to building sustainable ecosystems around open source projects, The Linux Foundation is working with the global technology community to solve the world's hardest problems through open source and **creating the largest shared technology investment in history.**



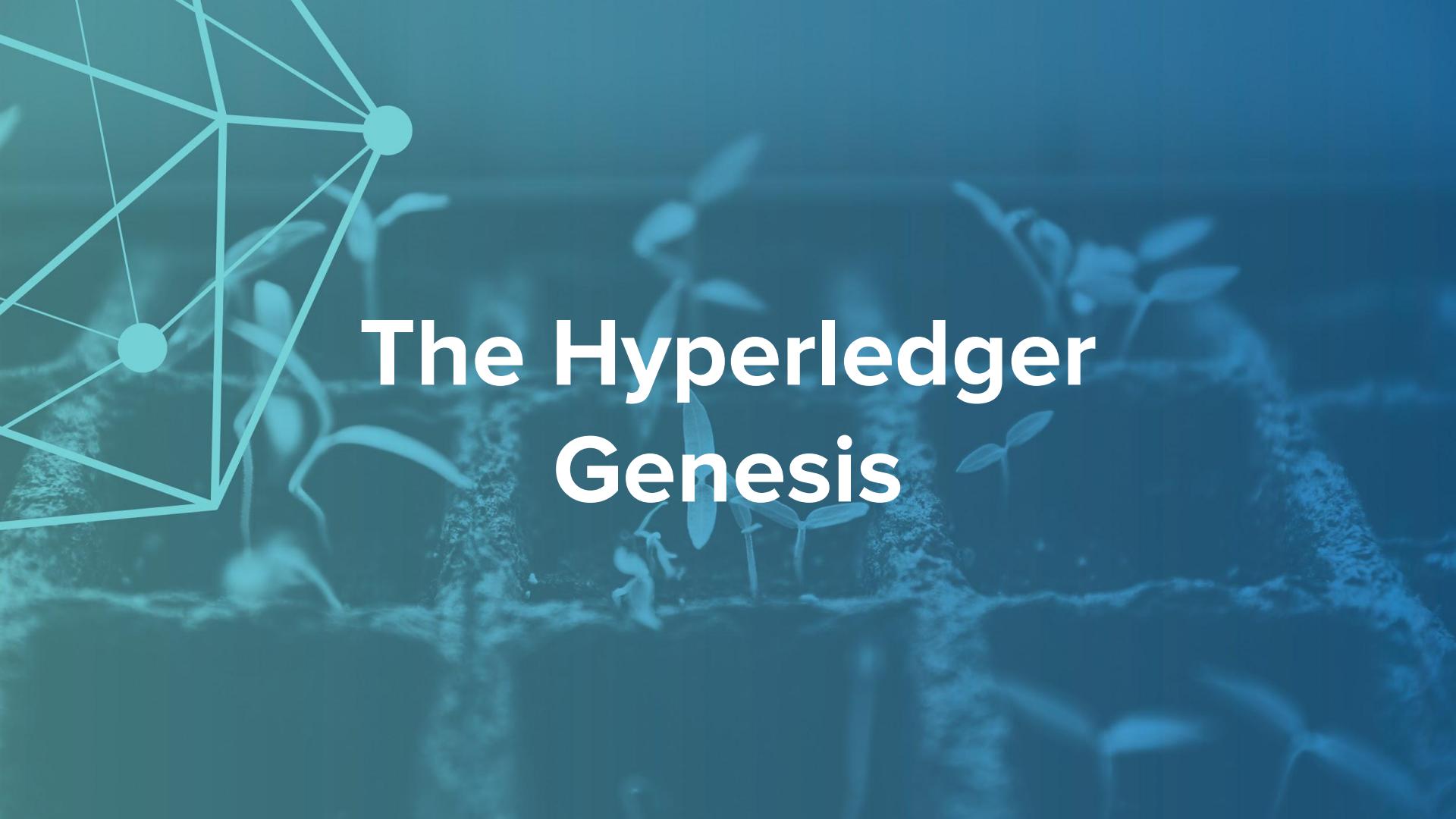
Some of the game-changing initiatives hosted by  
The Linux Foundation include:

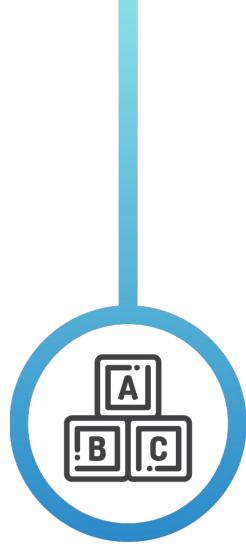


**HYPERLEDGER**  
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS



# The Hyperledger Genesis





This technology is young.  
It is still early days.



# Hyperledger Momentum





**2**

Years since launch



**88K+**

Commits



**5**

Tools



**5**

Frameworks



**2**

1.0 Production Releases



**250+**

Members



**9**

Active Community  
Working Groups



**140+**

Meetups  
Worldwide



**730+**

Contributors



**11.2M+**

Lines of code across  
Hyperledger projects

INTERNET

Your Internet ID: monopoly@host.yab.com

Getting Files

- [A] Find Files on the Net (Archie)
- [F] Get Files from the Net (FTP)
- [Y] File Transfers for Net Account

Finding Information

- [G] Search for Information (Gopher)
- [W] Hypertext Search (WWW)
- [Q] Query About Someone (Finger)

Entertainment

- [M] MUDs (Games)
- [I] Internet Teleconference (IRC)
- [U] Tintin Interface for MUDs

Messages

- [U] Internet Message Areas (Usenet)

Miscellaneous

- [B] Unix Shell Access (Bash)
- [T] Connect to Other Sites (Telnet)
- [S] SLIP - Graphical Interface
- [P] PPP - Point-to-Point Protocol

Help

- [D] Detailed Reference Text
- [H] Help on Using Internet Functions
- [N] If You're Stuck at "Password"
- [C] How To Configure SLIP Access

SLIP Access (Mosaic, Netscape, etc)

Your Choice (A, B, C, D, E, F, G, H, I, J, K, M, P, Q, S, T, U, W, Y or X) :  
(N)onstop, (Q)uit, (C)ontinue?

Menu: <ctrl R-Shift>

2400 8N1

VT100

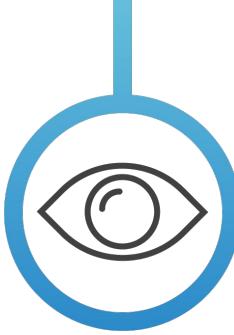
Online



Blockchain technologies are in the early stages of a 20-year, if not a 50-year, adoption and maturation cycle. **Many compare blockchain today with 1995 and the Web.**



# The Hyperledger Vision

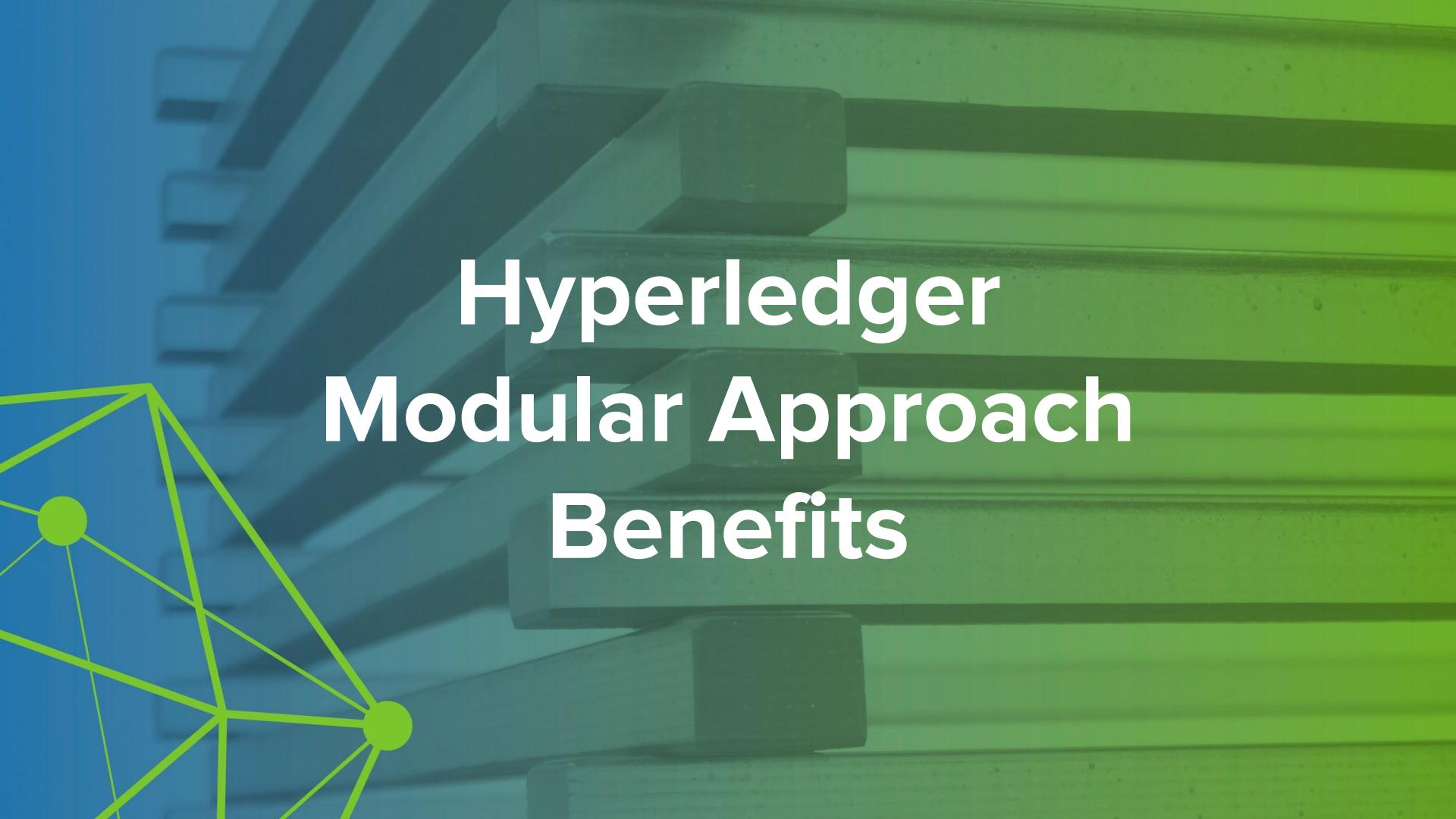


Blockchain promises to change the way business is conducted and transactions are executed across industries. Precisely how, and the pace at which, each of these industries adopts blockchain will surely vary.

**There will never be one global chain-of-all chains that all industries convert to.**



**Similar to The Linux Foundation, Hyperledger also has a modular approach to hosting projects.** Think of Hyperledger as a **greenhouse** for developing business blockchain projects from Hyperledger Labs (seed) to stable code ready for production (fruition). All are invited to contribute to the greenhouse; collectively advancing industry goals of distributed ledger and smart contracts.



# Hyperledger Modular Approach Benefits



**Flexible** Modification  
of Any Component



**Common** Functional  
Modules and Defined  
Interfaces



**Re-use** of Common  
Building Blocks



**Extensible**  
Codebases



**Diverse** Developer  
Community



**Rapid**  
Experimentation



## HYPERLEDGER

BLOCKCHAIN TECHNOLOGIES FOR BUSINESS

*Community Stewardship and Technical, Legal, Marketing, Organizational Infrastructure*

### Frameworks



Permissionable smart contract machine (EVM)



Permissioned with channel support



Decentralized identity



Mobile application focus



Permissioned & permissionless support; EVM transaction family

### Tools



Blockchain framework benchmark platform



As-a-service deployment



Model and build blockchain networks



View and explore data on the blockchain



Ledger interoperability



**HYPERLEDGER**  
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS

# Hyperledger Blockchain Frameworks



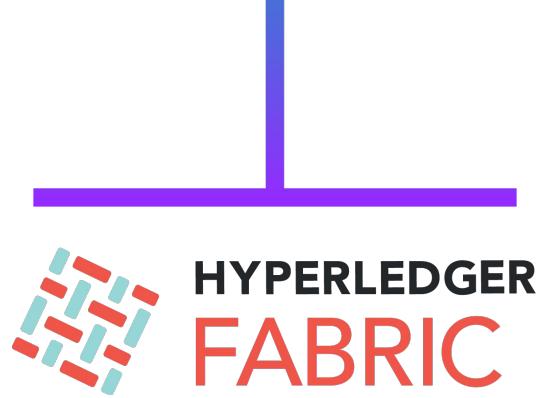


HYPERLEDGER  
**BURROW**

A permissionable smart contract machine. The first of its kind when released in December, 2014, Burrow provides a modular blockchain client with a permissioned smart contract interpreter built in part to the specification of the Ethereum Virtual Machine (EVM).



**HYPERLEDGER**  
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS



Intended as a foundation for developing applications or solutions with a modular architecture, Hyperledger Fabric allows components, such as consensus and membership services, to be plug-and-play.

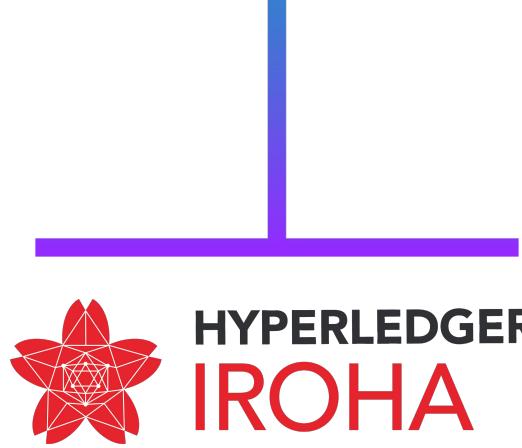


HYPERLEDGER  
INDY

Tools, libraries, and reusable components  
for providing digital identities rooted on  
blockchains or other distributed ledgers so  
that they are interoperable across  
administrative domains, applications, and  
any other silo.



**HYPERLEDGER**  
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS



A business blockchain framework  
designed to be simple and easy to  
incorporate into infrastructural projects  
requiring distributed ledger technology.

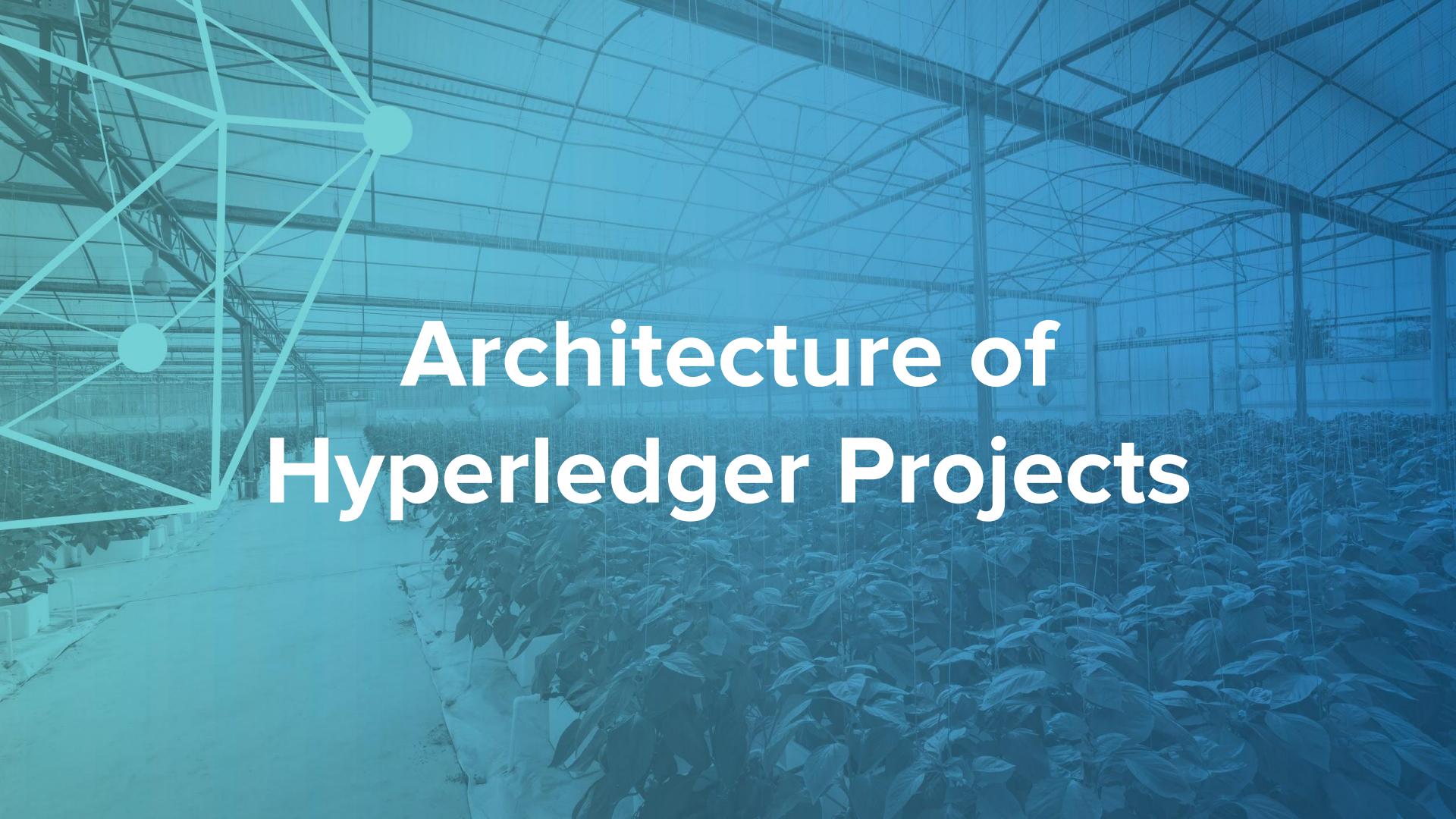


**HYPERLEDGER**  
**SAWTOOTH**

A modular platform for building, deploying, and running distributed ledgers. Hyperledger Sawtooth includes a novel consensus algorithm, Proof of Elapsed Time (PoET), which targets large distributed validator populations with minimal resource consumption.



**HYPERLEDGER**  
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS



# Architecture of Hyperledger Projects

# Architecture of Hyperledger Projects



## Available Tools

- Common software license: Apache v2
- Common IP framework: the Developer Certificate of Origin
- Collaboration tools (Gerrit, Jira, Chat, email)
- Promotion and branding
- Security processes and practices for bugs



## A Team of Developer Volunteers

- Build code in the open
- Manage individual roadmaps and release schedules
- Responsible for following Hyperledger policies and requirements
- Align modular code with other projects



## Infrastructure from The Linux Foundation

- Executive Director
- Business Operations
- Technical Staff for Security, Ecosystem and Community Development
- Communications Staff for Marketing, PR and Events
- Legal Counsel
- Membership Sales





# Hyperledger Goals



**Create enterprise grade software**  
open source, distributed ledger  
frameworks & code bases  
to support business transactions



**Provide community-driven  
infrastructures**  
that are open, neutral and  
supported by technical and  
business governance



**Build technical communities**  
to develop blockchain and shared  
ledger POCs, use cases, field trials  
and deployments



**Educate the public**  
about the market opportunity  
for blockchain technology



**Promote our communities**  
taking a toolkit approach with  
many platforms and frameworks

# Industry Use Cases





**Hyperledger embraces the full spectrum of industry use cases**, especially enterprise scenarios with widely varied requirements for decentralization, trust, continuity and confirmation times. Each represents a potentially unique optimization point for the technology.

# Cross-Border Payments



# Cross-Border Payments



## The Challenge

Transferring money across international borders is still complicated, time consuming and expensive.



## The Collaboration

A global team of developers from Hyperledger members SWIFT, ANZ, BNP Paribas, BNY Mellon and Wells Fargo create a cross-border POC. built with Hyperledger Fabric.



## The Technology

The blockchain trial was built on Hyperledger Fabric and is now ready for its next phase of testing.



A photograph of three surgeons in full operating room attire (scrubs, masks, and caps) focused on a procedure. The background is a clinical operating room setting with medical equipment and monitors.

# Healthcare Records



# Healthcare Records



## The Challenge

Blockchain could be used to provide patients' with more control over their healthcare information and who it is shared with.



## The Collaboration

Members like Change Healthcare, Gem, Hashed Health, Patientory and Kaiser Permanente are leading the open Hyperledger Healthcare Working Group to bring commercial blockchain adoption to the healthcare industry.



## The Technology

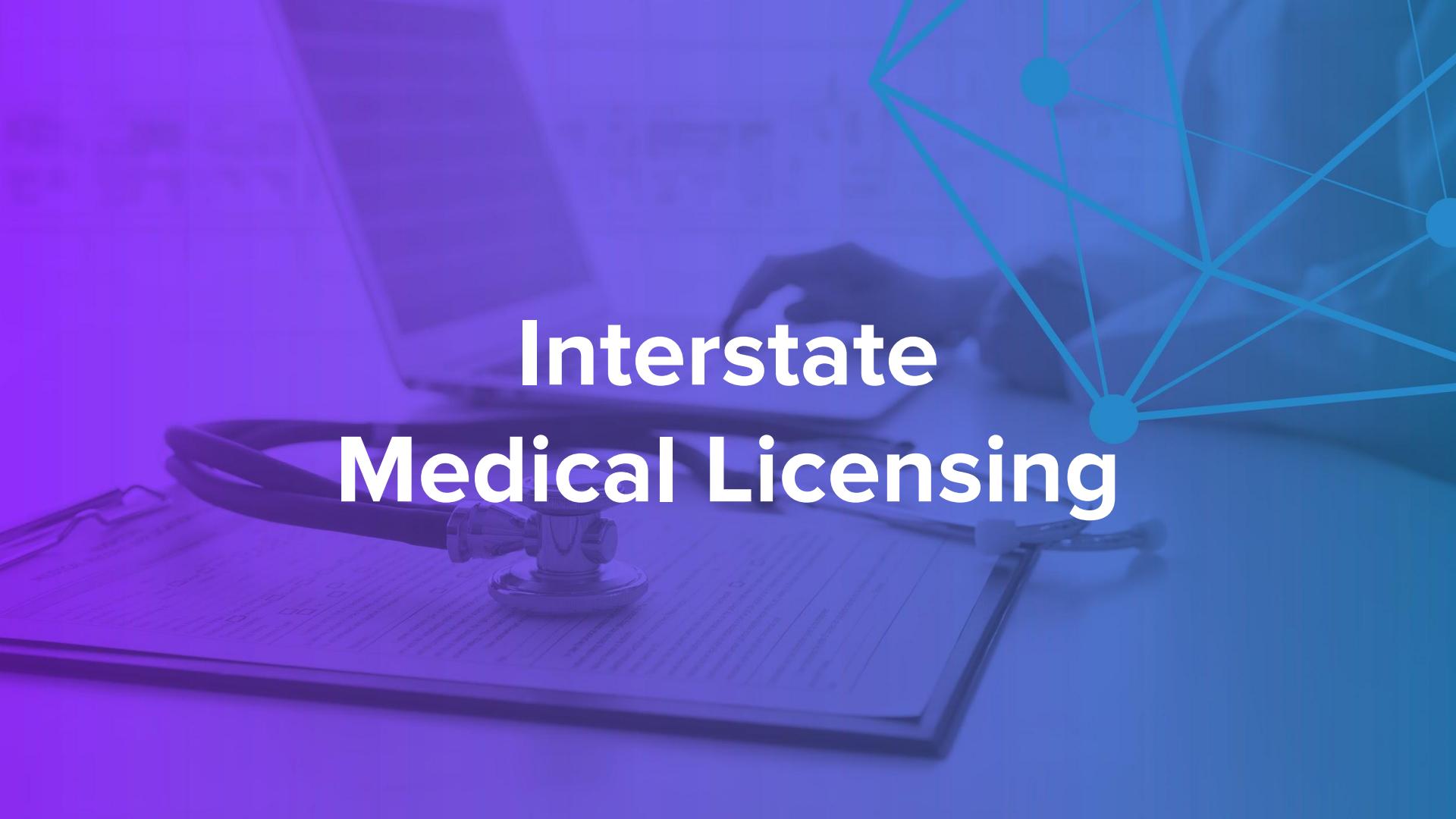
Hyperledger Composer offers a set of APIs, a modeling language and a programming model to quickly define and deploy business networks and applications that allow participants to send transactions that exchange assets.



HEALTHCARE BLOCKCHAIN INNOVATION



**HYPERLEDGER**  
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS



# Interstate Medical Licensing

# Interstate Medical Licensing



## The Challenge

Interstate medical licensing is complex, and the provider directories and claims adjudication processes need increased trust and transparency.



## The Collaboration

Hyperledger members Hashed Health and the State of Illinois have implemented a pilot program to identify opportunities to improve the efficiency and accuracy of these processes in Illinois.



## The Technology

A blockchain-based registry, built using Hyperledger Fabric, streamlines the sharing of smart contracts and medical credential data to automate workflow associated with interstate and multistate licensure.



**HYPERLEDGER**  
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS





# Seafood Supply Chain Traceability



# Seafood Supply Chain Traceability



## The Challenge

Blockchain technologies are being used in the fishing industry to drive fish catch towards more ethical practices.



## The Collaboration

Hyperledger member Intel is collaborating with the broader community to implement a modern approach to seafood traceability.



## The Technology

Leveraging Hyperledger Sawtooth, IoT sensors attached to any object (like fish) can trace ownership, possession, and telemetry parameters to record the seafood journey from ocean to table.





# Diamond Supply Chain



# Diamond Supply Chain



## The Challenge

The Kimberley Process Certification Scheme established in 2003 to prevent conflict diamonds is a long, paperwork-heavy process with a history of fraud from missing documents.



## The Collaboration

Hyperledger members SAP Ariba and IBM are collaborating with Everledger on a pilot to prevent blood diamonds from entering the supply chain.



## The Technology

The distributed ledger diamond track and trace system using Hyperledger Fabric v1.0 allows everyone in the industry to write to it, from miners, distributors and retailers, using the light pattern that is unique to every diamond to create an ID.





# Digital Identity

# Digital Identity



## The Challenge

As of 2017, only 44% of Filipinos were utilizing bank accounts, hampered by inefficient "Know Your Customer" laws.



## The Collaboration

The Bankers Association of Philippines (BAP), in partnership with Hyperledger member Amihan and a coalition of major banks, undertook a POC to test a nation-wide self-sovereign ID system.



## The Technology

The POC used Hyperledger Indy to develop a platform that streamlines new account onboarding, allowing consumers to enter information once in a digital and privacy-preserving way.





# Real Estate Transactions

Available

Lot #

# Real Estate Transactions



## The Challenge

In some cases of corruption, the move to government-owned centralized databases backfired, and digital histories of land titles were eradicated, properties seized and handed over to oil companies.



## The Collaboration

The winning team at the Consensus 2017: Building Blocks Hackathon, built an online property banking and acquisition game utilizing Hyperledger Fabric with IBM Bluemix.



## The Technology

HyperProperty shows that Hyperledger Fabric can be used to guarantee who owns what properties. Decentralizing databases and turning to DLTs track land titles could keep governments accountable and create a more trustworthy system, even in instances where the individual actors may not be trusted.



# Music and Media Rights



# Music and Media Rights



## The Challenge

Dot Blockchain Media (dotBC) is building a music content rights registry that will help musicians express their rights and wishes for commercializing their art in an interoperable file format.



## The Collaboration

Although not a member of Hyperledger, dotBC is able to leverage the open source Hyperledger Sawtooth platform for recording its content rights registry for the media industries.



## The Technology

Data is maintained across a distributed network that utilizes Hyperledger Sawtooth. dotBC's blockchain implementation is a foundation for music and media rights expression into the works themselves.



A blue-tinted photograph of a park scene. In the foreground, there's a dark, textured stone wall. Beyond it is a body of water with ripples. A paved path leads through a dense forest of tall trees with thin trunks and green leaves. A small, simple street lamp stands on the path. The overall atmosphere is calm and natural.

# Green Assets Management



# Green Assets Management



## The Challenge

Generating carbon assets more efficiently, helping to build a green, low-carbon and environmentally-friendly future in China.



## The Collaboration

General Hyperledger member Energy Blockchain Labs partnered with Premier member IBM on the world's first blockchain-based green assets management platform, based on Hyperledger Fabric.



## The Technology

Blockchain technology, like the use of Hyperledger Fabric here, is expected to become an important means for effective control of carbon emissions in China, the world's largest source of carbon emissions. Carbon asset development, is one of the most popular ways of encouraging enterprises to decrease emissions and use low carbon emission technology.





# Letters of Credit

# Letters of Credit



## The Challenge

The LOC process is a difficult one to automate due to the sheer number of network participants involved.



## The Collaboration

Institutions in Singapore, including Monetary Authority of Singapore, several banks and Standard Chartered, as well as China CITIC Bank and Minsheng bank have come together to use blockchain to create a LOC system. One of the first transactions of this kind in China saw a 100 million letter of credit transaction be completed without a hitch.



## The Technology

Asian markets have been deploying and developing various solutions for LOC based on Hyperledger Fabric. Blockchain provides a common ledger for LOC and presents a modernized opportunity; the LOC is stored on the blockchain, and once spent, is marked as such so that the value of the letter cannot be spent again.



# Food Trust

# Food Trust



## The Challenge

The food network is a complex distribution and processing ecosystem involving farms, distributors, retailers and consumers, which make it difficult to assure food provenance.



## The Collaboration

Walmart, and a group of retailers and food companies such as Unilever, Nestlé and Dole, have teamed up with IBM to explore how to apply blockchain technology like Hyperledger Fabric to their food supply chain.



## The Technology

By making a shared ledger accessible to each party in the supply chain, all food processing steps can be recorded and stored on the blockchain, including digital compliance documentation, test results and audit certificates to improve transparency and efficiency across the food network.



# Digital Trade Chain



# Digital Trade Chain



## 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 associated business model.



## 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 blockchain-based international trading system that enables accurate trading posture information, order to settlement control, risk coverage, track and trace options



# Introductory Contribution Opportunities

[hyperledger.org/community](https://hyperledger.org/community)



**Learn the Basics**  
about Hyperledger  
projects



Start or join a  
**Hyperledger**  
meetup



**Spread the word**  
about Hyperledger

A photograph of a person's hands typing on a laptop keyboard, set against a background of a green field. Overlaid on the top left is a graphic of three green circular nodes connected by a web of green lines, representing a network or complex system.

# Advanced Contribution Opportunities

[hyperledger.org/community](https://hyperledger.org/community)



Improve our  
**documentation** and  
**training material**



Get involved with  
**coding**



Take part in the  
**Ambassador program**

# Collaboration Tools



## Account

Sign up for a Linux Foundation account



## Chat

Join the discussion on chat



## Mailing Lists

Participate on the Hyperledger Mailing Lists



## Github

Check out our code repositories



## Wiki

Get the latest development updates from the wiki



## Bug Reporting

Search for open bugs, or report a new one, in our bug database



# Are You Building With Hyperledger?

Are you using Hyperledger software to build blockchain apps, POCs or solutions?  
We want to hear from you!

**SHARE YOUR STORY**



**HYPERLEDGER**  
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS

WHO WILL YOU TRUST  
WITH YOUR TRUST  
NETWORK?



# Appendix



# Business Blockchain Components Glossary

## Consensus Layer

Responsible for generating an agreement on the order and confirming the correctness of the set of transactions that constitute a block.

## Smart Contract Layer

Responsible for processing transaction requests and determining if transactions are valid by executing business logic.

## Communication Layer

Responsible for peer-to-peer message transport between the nodes that participate in a shared ledger instance.

## Data Store Abstraction

Allows different data-stores to be used by other modules.

## Crypto Abstraction

Allows different crypto algorithms or modules to be swapped out without affecting other modules.

## Identity Services

Enables the establishment of a root of trust during setup of a blockchain instance, the enrollment and registration of identities or system entities during network operation, and the management of changes like drops, adds, and revocations. Also, provides authentication and authorization.

## Policy Services

Responsible for policy management of various policies specified in the system, such as the endorsement policy, consensus policy, or group management policy. It interfaces and depends on other modules to enforce the various policies.

## APIs

Enables clients and applications to interact with blockchains.

## Interoperation

Supports the interoperation between different blockchain instances.

