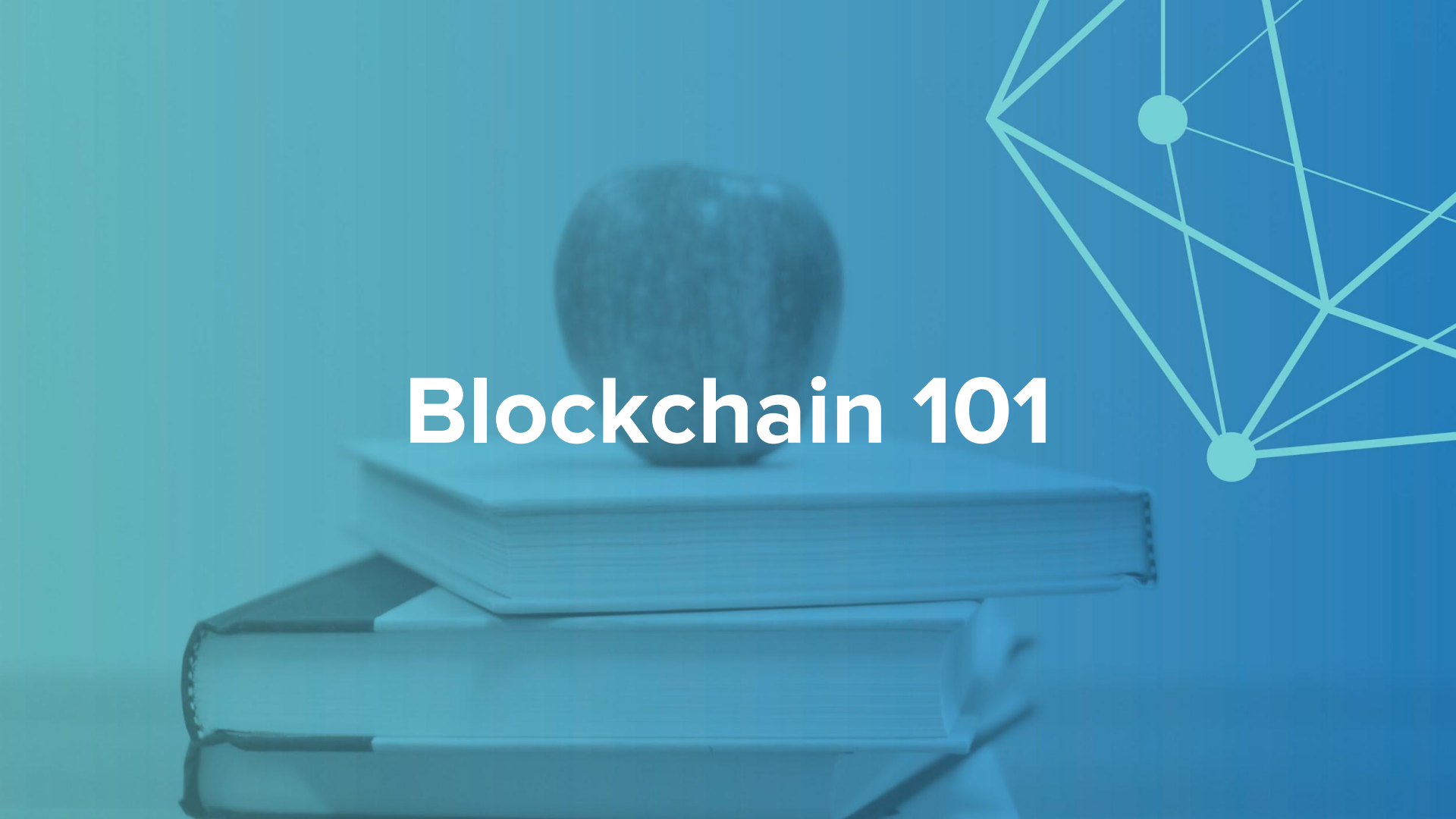
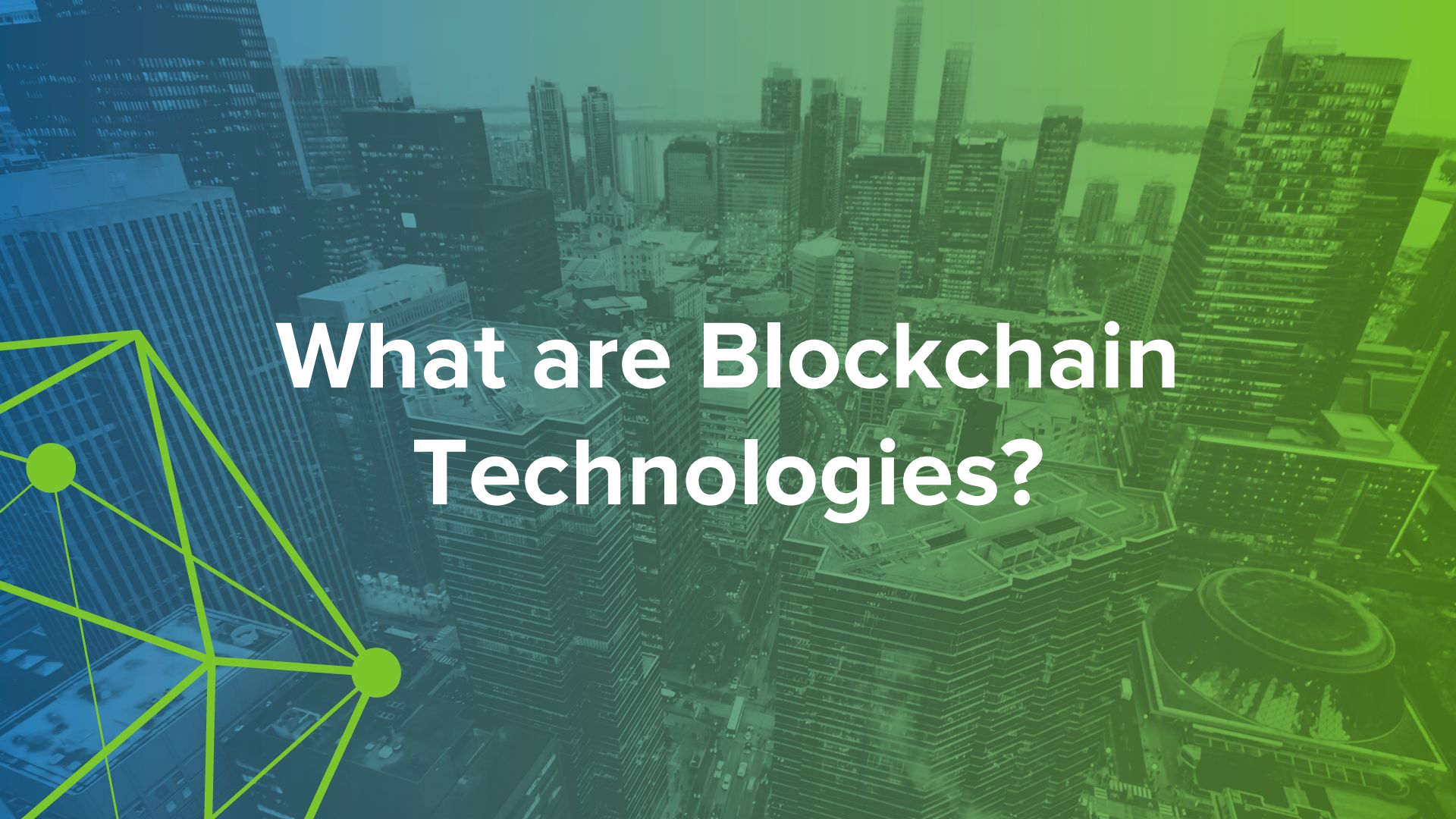
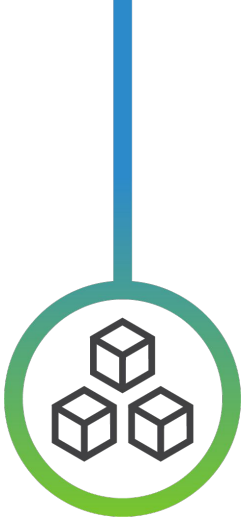
The Hyperledger Vision

HYPERLEDGER
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS

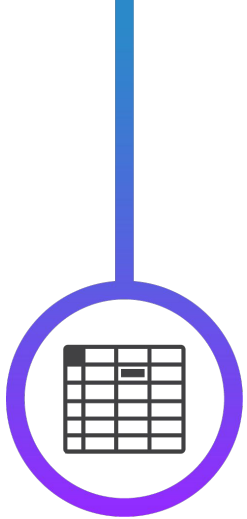

Blockchain 101


What are Blockchain Technologies?



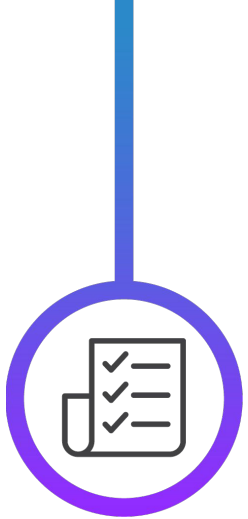
Encompasses both **distributed ledgers** and **smart contracts**.


What is a
Distributed Ledger?



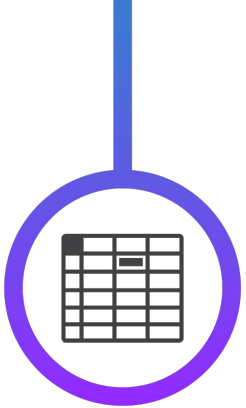
An **append-only system**
of record or log of transactions.


Cryptography for
Integrity & Privacy



Software standards keep everyone in the shared ecosystem in sync.


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

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

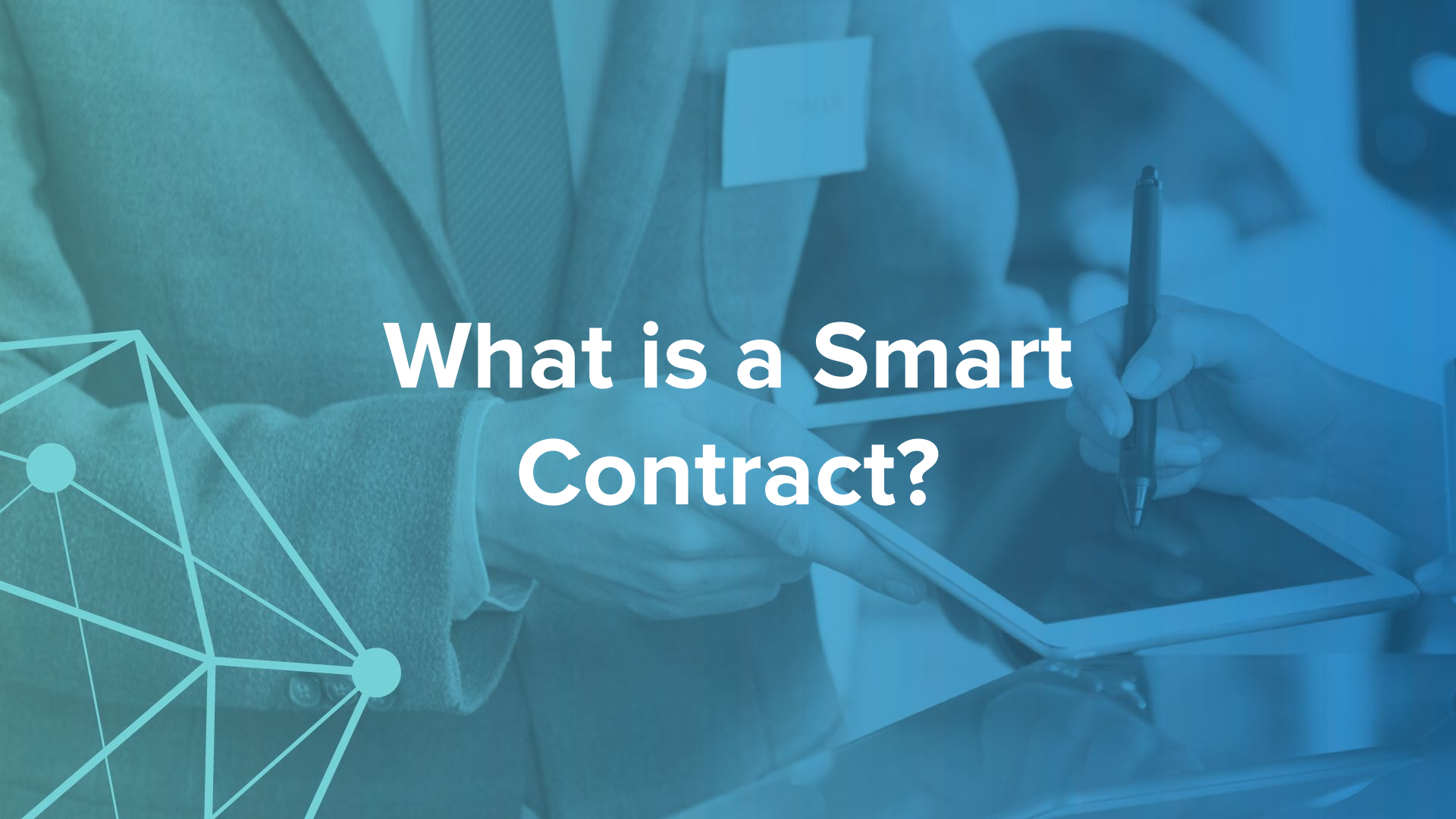
Someone calls out item number one and everyone writes it down.

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

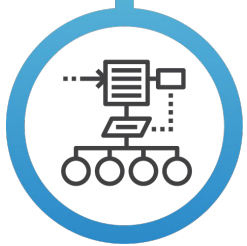
There needs to be a process for who wins, and the loser gets to try to call out item number three.

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

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



What is a Smart Contract?



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

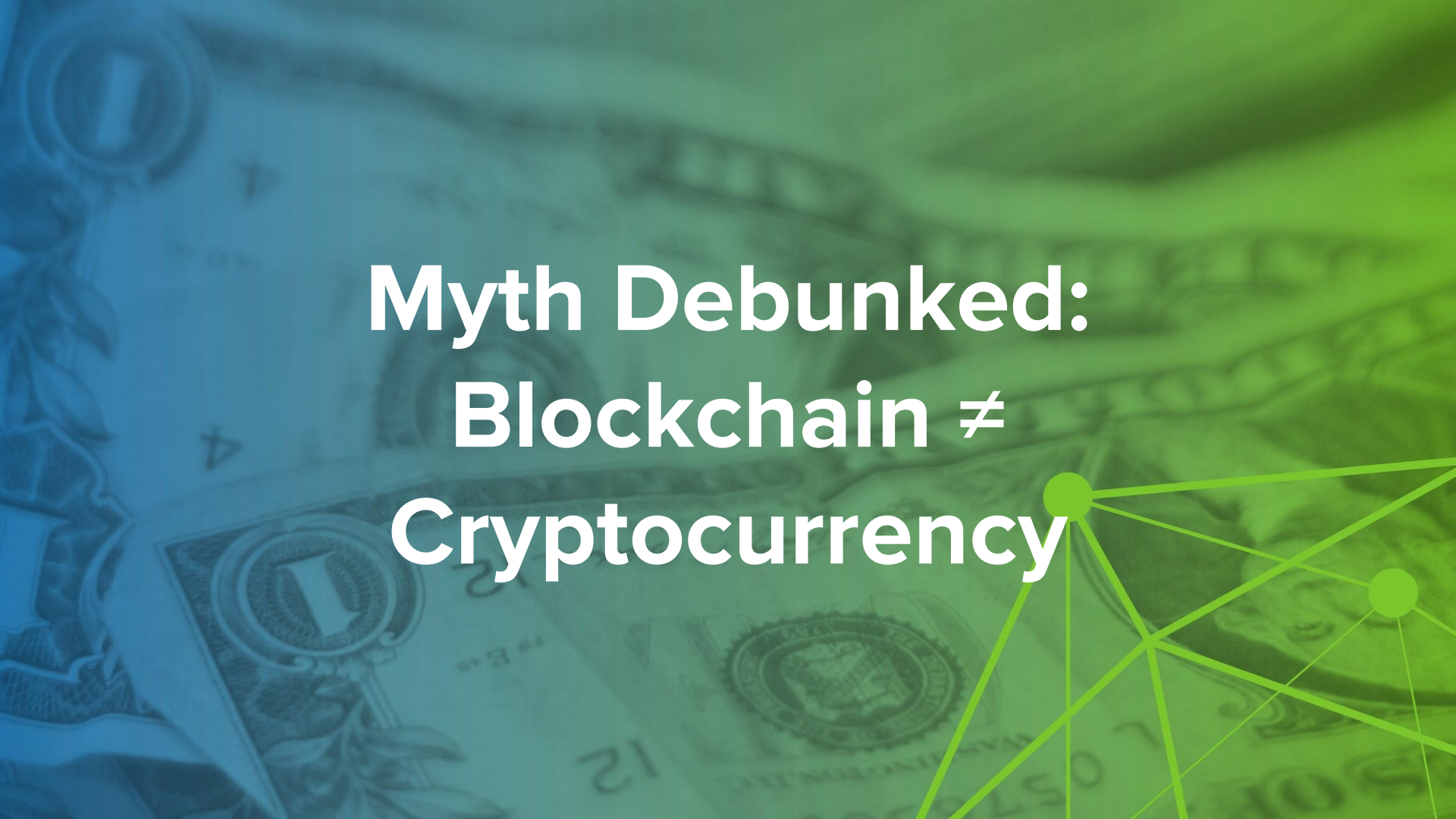

Smart Contracts
in Action

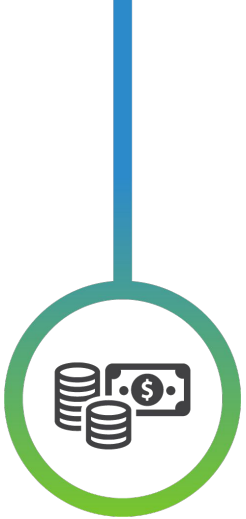
Imagine a farmer based in Sacramento, California buys an insurance agreement that protects them from extreme weather condition. If temperatures reach more than 100 degrees for 100 days, they get reimbursed 10,000 USD.

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.

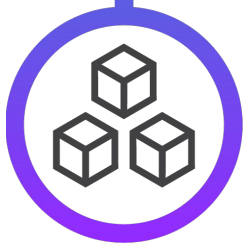
Myth Debunked: Blockchain ≠ Cryptocurrency





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

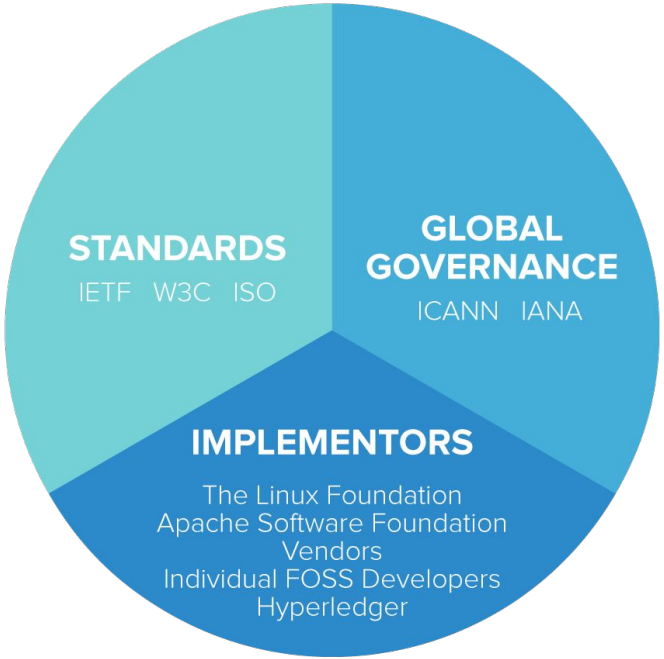
The Need for Trust

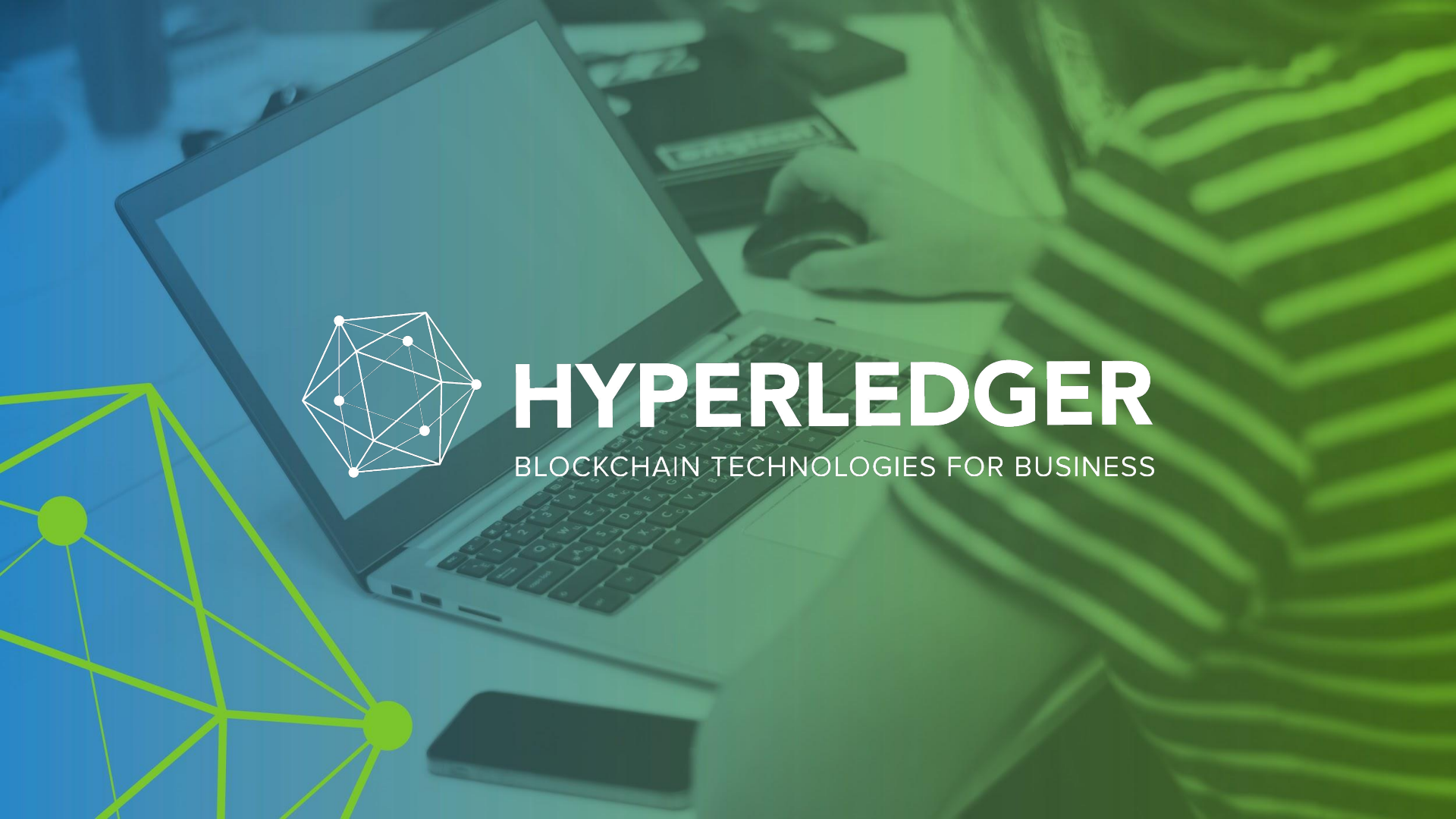
The *2018 Edelman Trust Barometer*, an annual survey of 33k people in 28 countries, reveals that the trust in key institutions continues to decline. For blockchain, 2018 needs to be the year of scale done well.

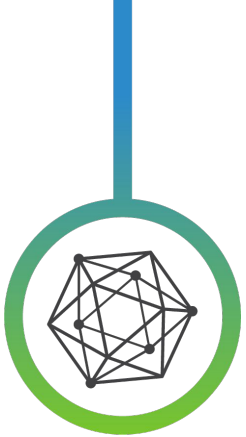
Without trust, the system fails. The onus is on businesses to prove that it is possible to act in the interest of shareholders and society alike and show that free markets can succeed for all if businesses work with the people.

The Trust Protocol

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



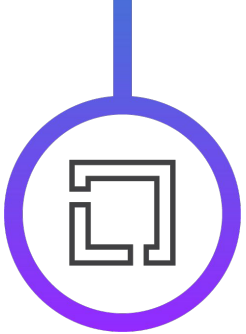

HYPERLEDGER
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS



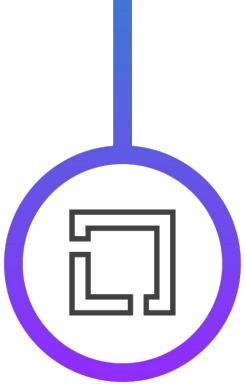
Introducing Hyperledger

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


Hosted by
THE
LINUX
FOUNDATION

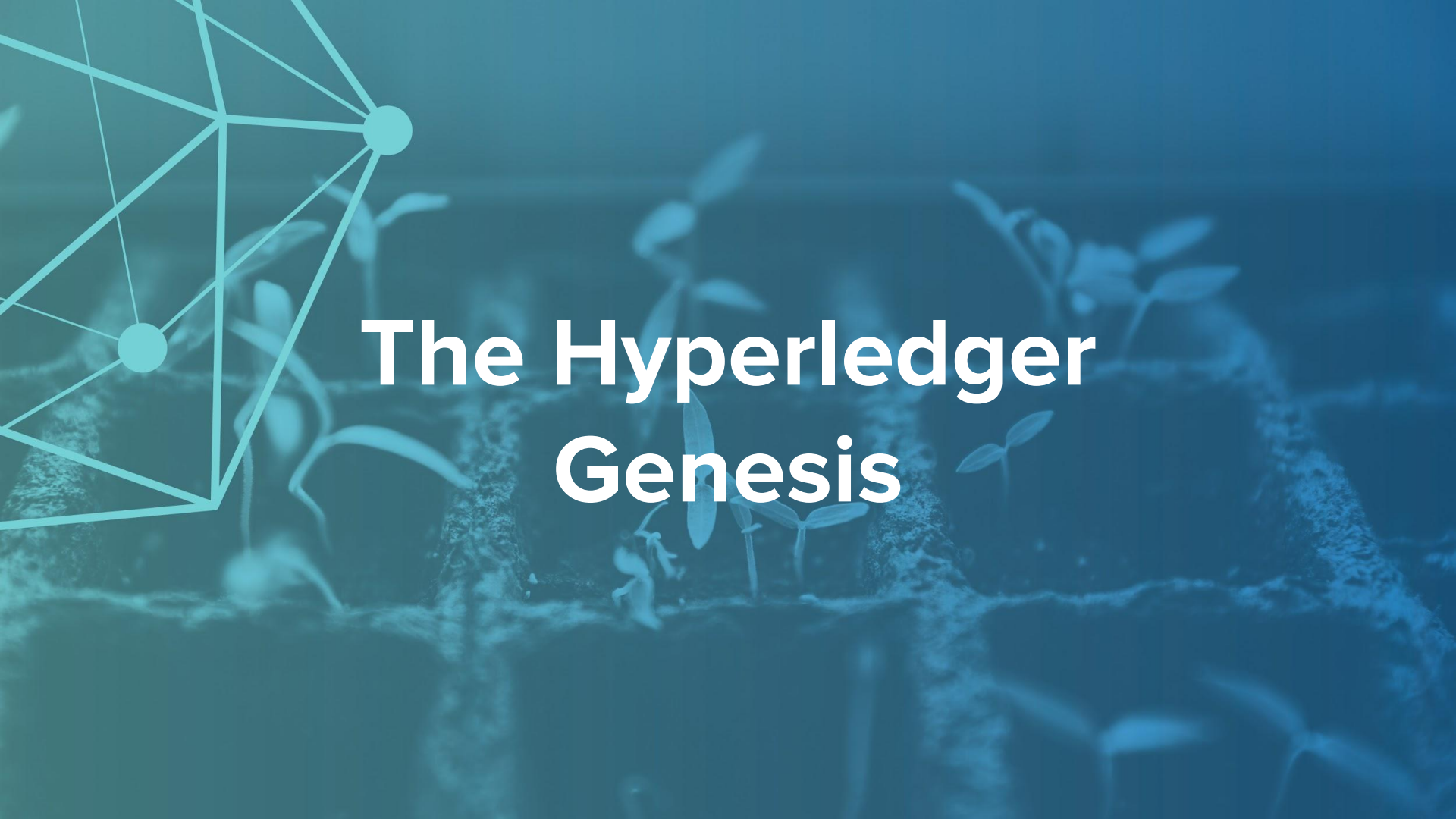


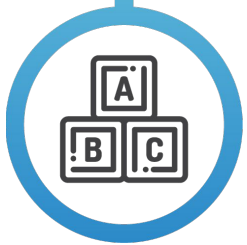
Dedicated to building sustainable ecosystems around open source projects, The Linux Foundation is working with the global technology community to solve the world's hardest problems through open source and **creating the largest shared technology investment in history.**



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

OPENCHAIN
Let's Encrypt
JS Foundation
OPEN CONTAINER INITIATIVE
CLOUD NATIVE COMPUTING FOUNDATION
Xen Project
Core Embedded Linux Project
AUTOMOTIVE GRADE LINUX
LF NETWORKING
CORE INFRASTRUCTURE INITIATIVE
OPNFV
CLOUD FOUNDRY
node JS
yocto PROJECT


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

270+

Members

9

Active Community Working Groups

140+

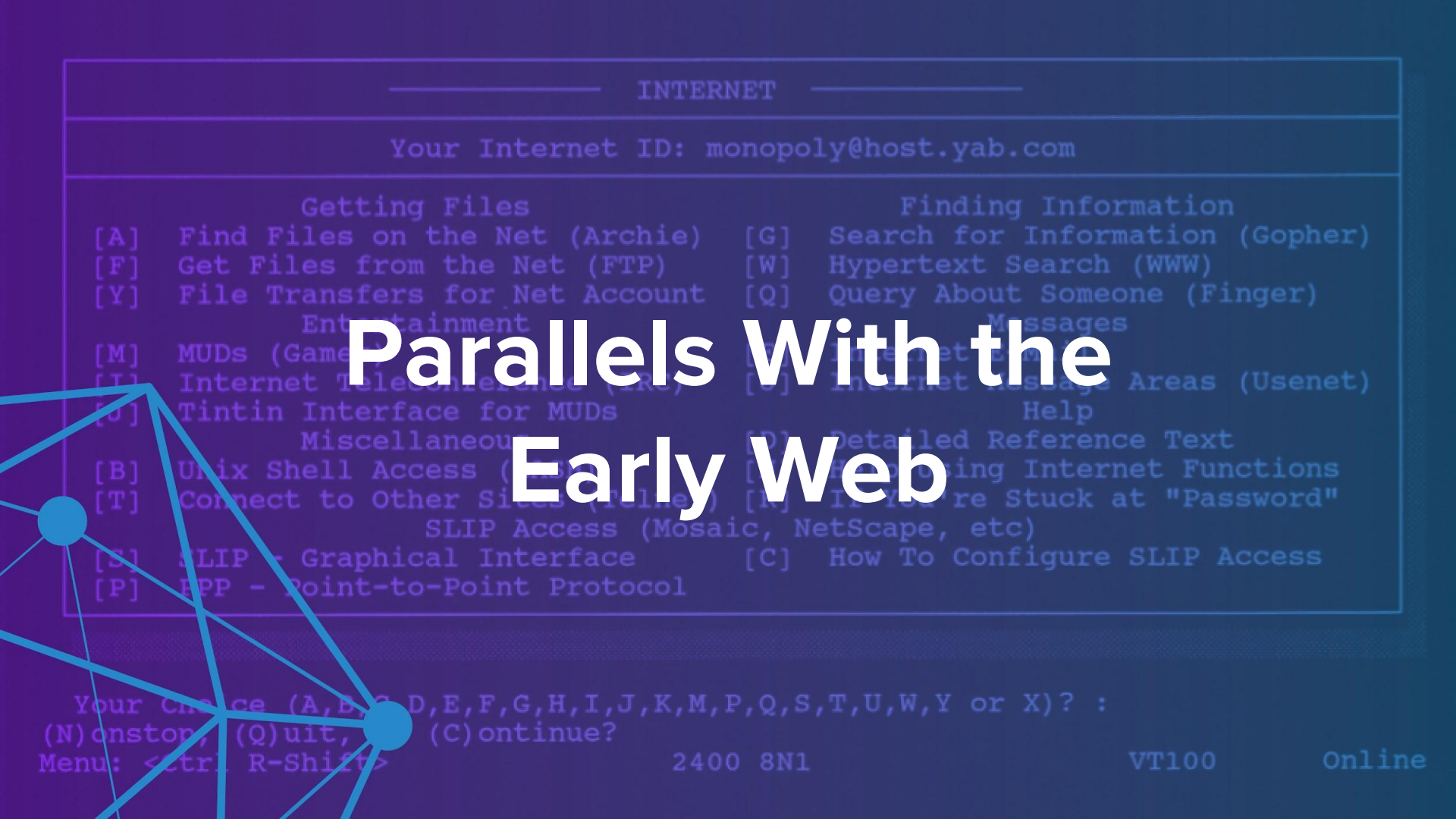
Meetups Worldwide

730+

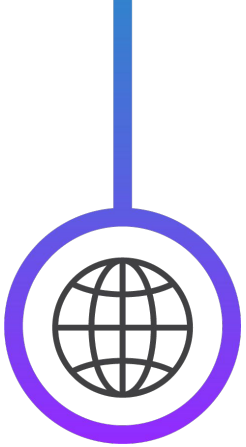
Contributors

11.2M+

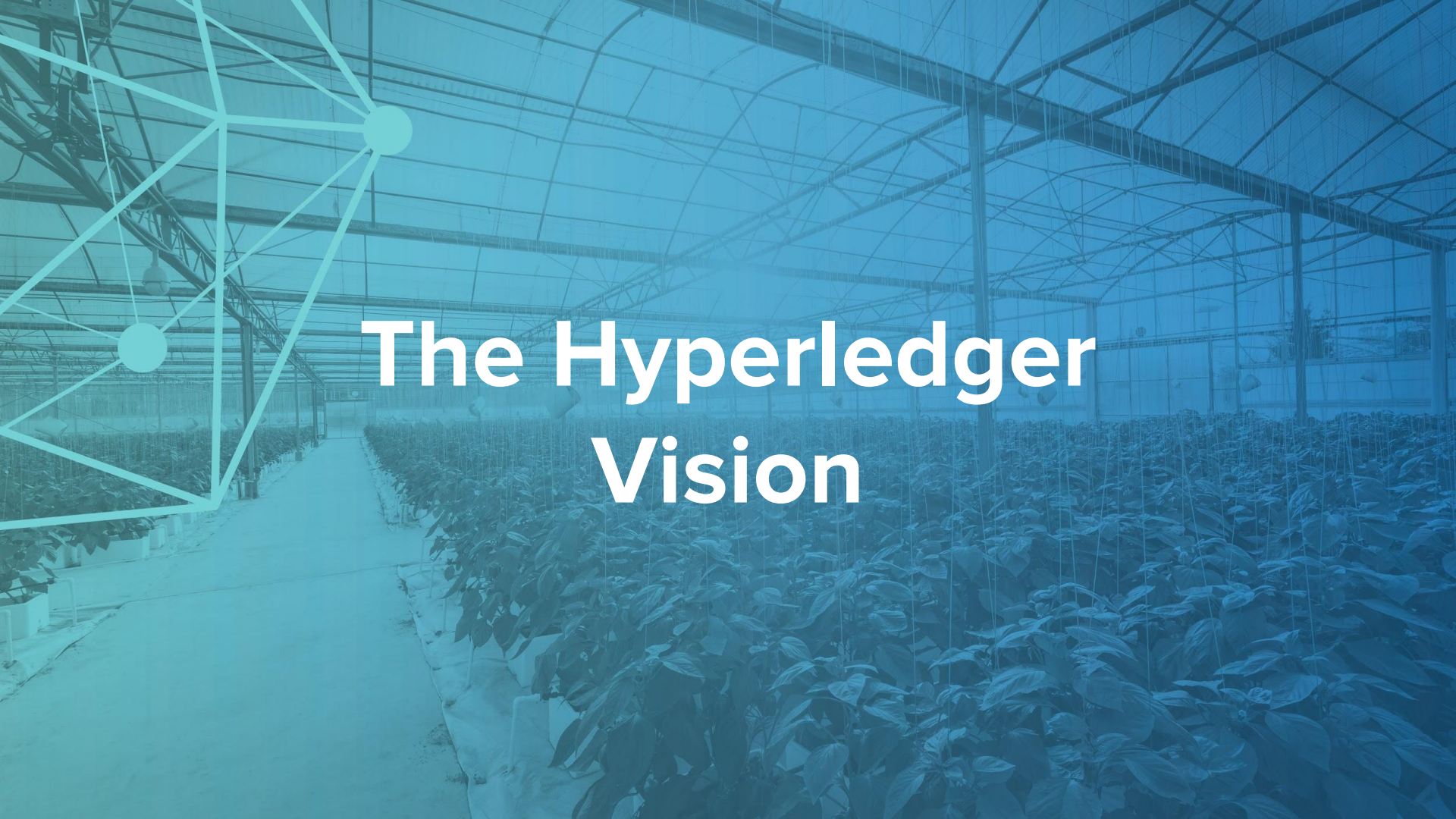
Lines of code across Hyperledger projects



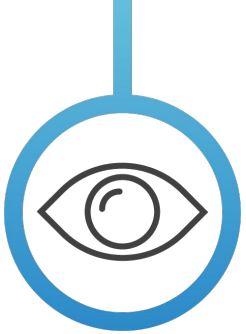
Parallels With the Early Web



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

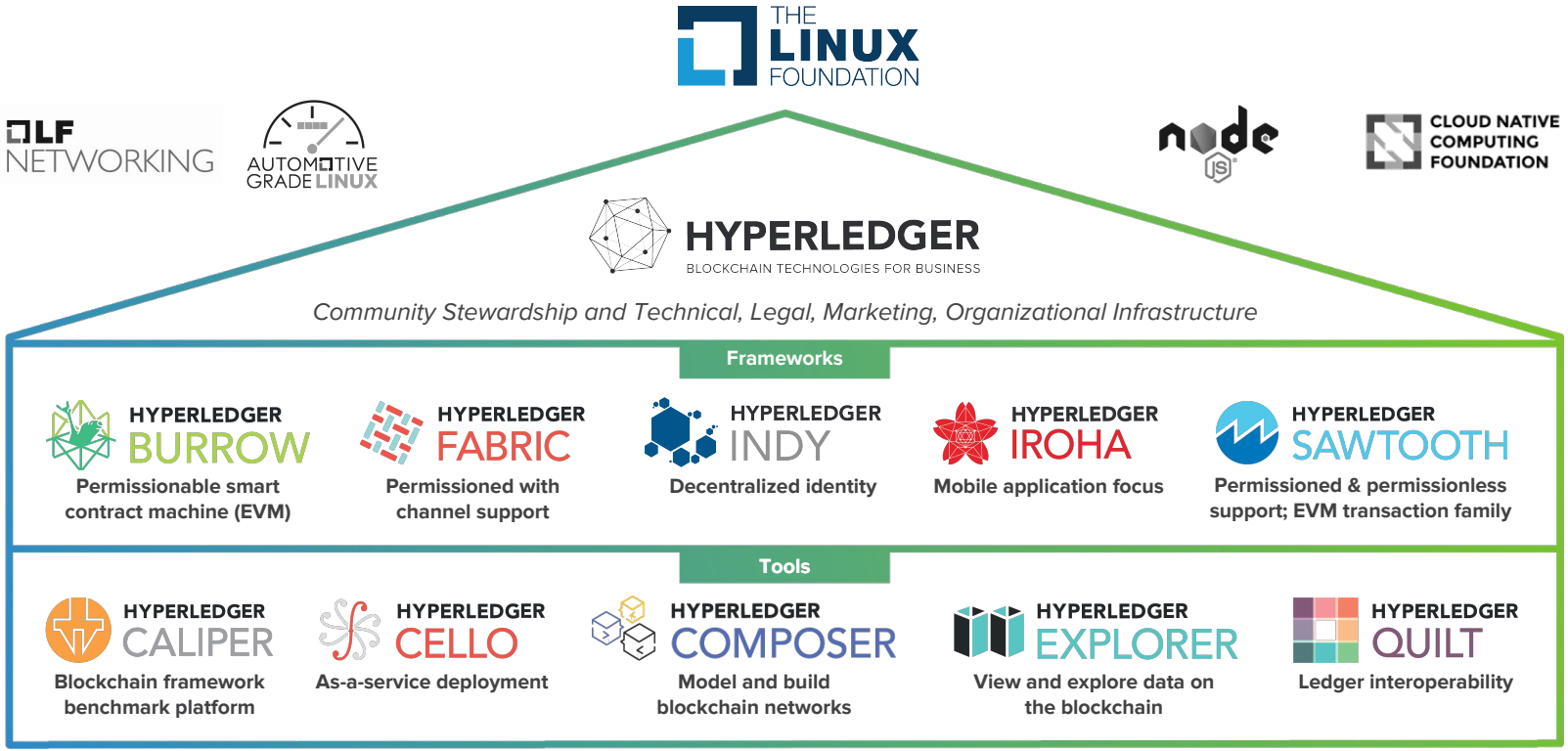
Common Functional Modules and Defined Interfaces

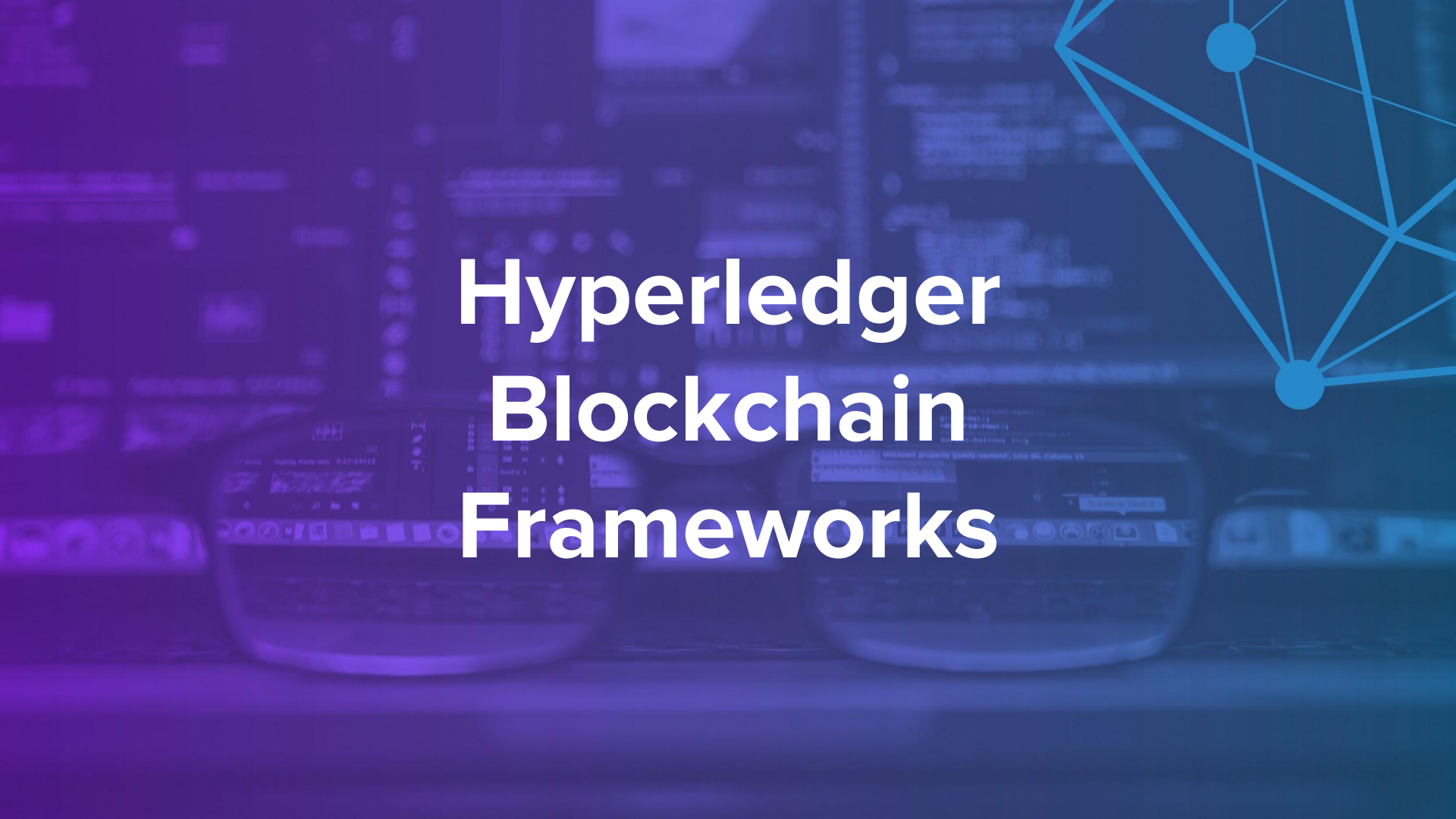
Re-use of Common Building Blocks

Extensible Codebases

Diverse Developer Community

Rapid Experimentation


THE LINUX FOUNDATION
LF NETWORKING
AUTOMOTIVE GRADE LINUX
node JS
CLOUD NATIVE COMPUTING FOUNDATION
HYPERLEDGER
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS
Community Stewardship and Technical, Legal, Marketing, Organizational Infrastructure
Frameworks
HYPERLEDGER BURROW
Permissionable smart contract machine (EVM)
HYPERLEDGER FABRIC
Permissioned with channel support
HYPERLEDGER INDY
Decentralized identity
HYPERLEDGER IROHA
Mobile application focus
HYPERLEDGER SAWTOOTH
Permissioned & permissionless support; EVM transaction family
Tools
HYPERLEDGER CALIPER
Blockchain framework benchmark platform
HYPERLEDGER CELLO
As-a-service deployment
HYPERLEDGER COMPOSER
Model and build blockchain networks
HYPERLEDGER EXPLORER
View and explore data on the blockchain
HYPERLEDGER QUILT
Ledger interoperability


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
FABRIC

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

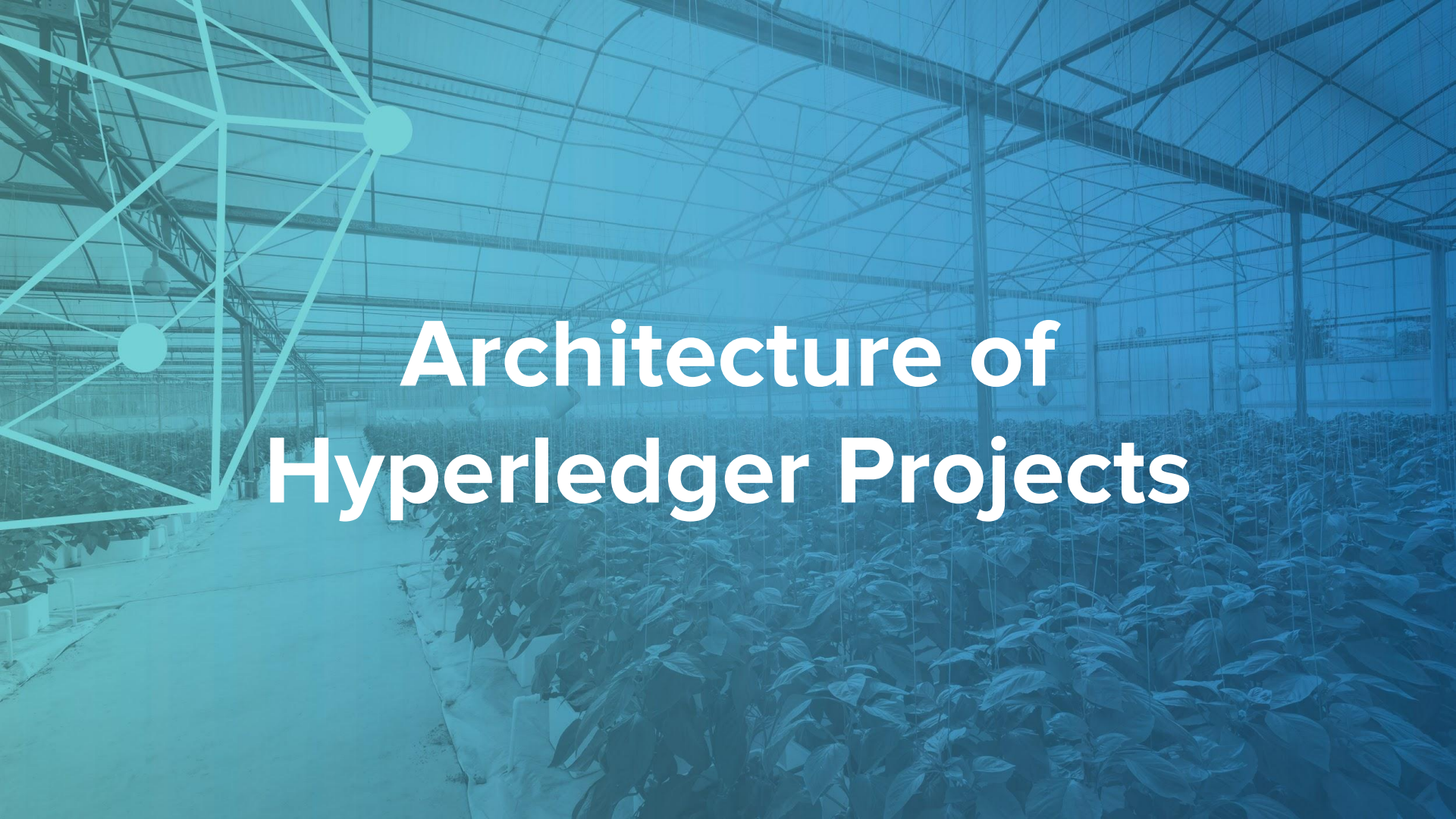
Tools, libraries, and reusable components for providing digital identities rooted on blockchains or other distributed ledgers so that they are interoperable across administrative domains, applications, and any other silo.

HYPERLEDGER IROHA

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.



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.

ANZ BNP PARIBAS BNY MELLON SWIFT WELLS FARGO


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.

CHANGE HEALTHCARE

Gem

HASHED HEALTH

HEALTHCARE BLOCKCHAIN INNOVATION

KAISER PERMANENTE®

patientory


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.

HASHED HEALTH
HEALTHCARE BLOCKCHAIN INNOVATION

The Illinois BLOCKCHAIN Initiative


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.

everledger IBM SAP

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.

HYPERLEDGER INDY

AMIHAN

Real Estate Transactions

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.

dot blockchain media

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.

ENERGY BLOCKCHAIN LABS

IBM

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

we.trade
more trust. more trade.

HYPERLEDGER
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS

Introductory Contribution Opportunities

hyperledger.org/community

Learn the Basics about Hyperledger projects

Start or join a **Hyperledger meetup**

Spread the word about Hyperledger


Advanced
Contribution
Opportunities

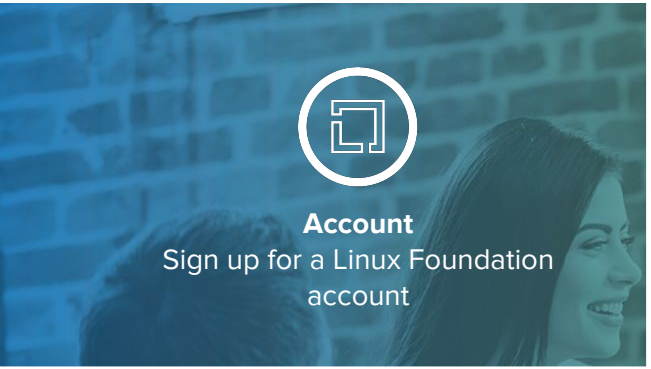
hyperledger.org/community

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

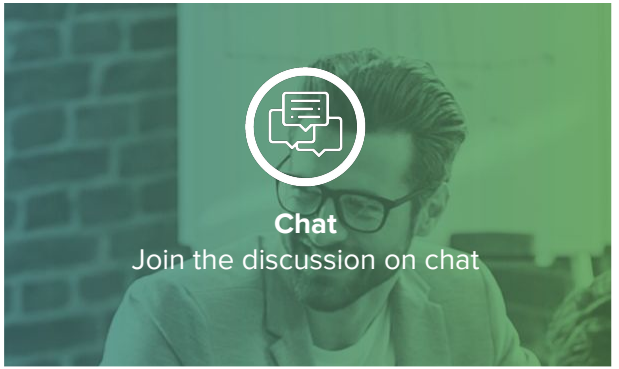
Get involved with **coding**

Take part in the **Ambassador program**

Collaboration Tools

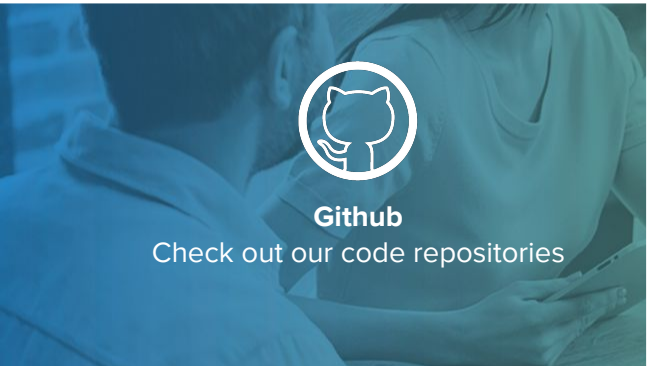


Account
Sign up for a Linux Foundation account



Chat
Join the discussion on chat

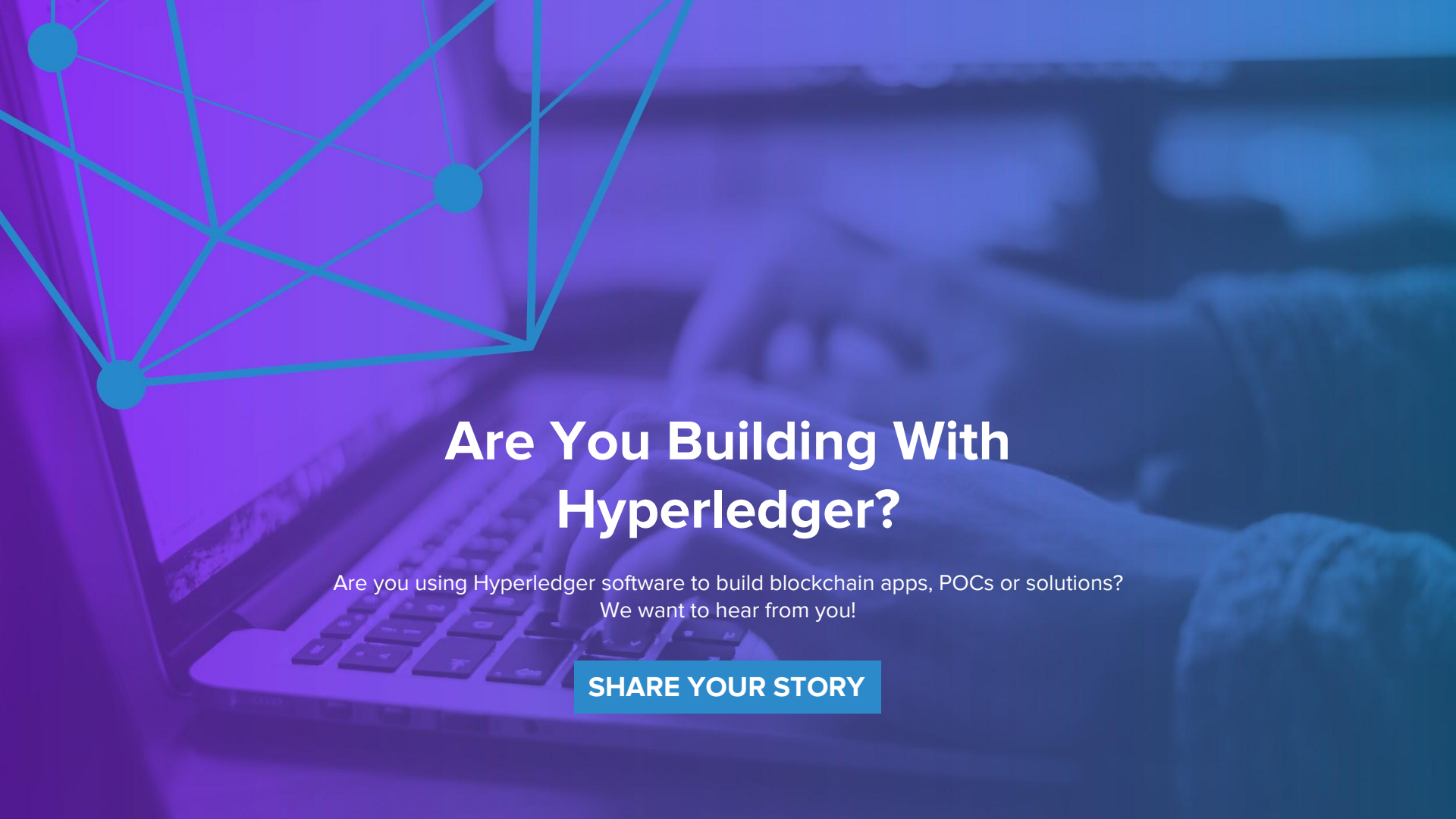
Mailing Lists
Participate on the Hyperledger Mailing Lists



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 interfere to blockchains.

Interoperation
Supports the interoperation between different blockchain instances.