



The Hyperledger Vision

January 2020



HYPERLEDGER
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS

The image features a blue gradient background. In the center, the text "Blockchain 101" is written in a bold, white, sans-serif font. Behind the text, there is a stack of three books. A dark, textured sphere, possibly a globe or a coin, sits on top of the books. In the upper right corner, there is a white geometric network diagram consisting of interconnected lines and circular nodes.

Blockchain 101



What are Blockchain Technologies?

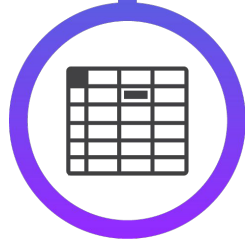


Encompasses both **distributed ledgers** and **smart contracts**.





What is a Distributed Ledger?



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





Cryptography for Integrity & Privacy

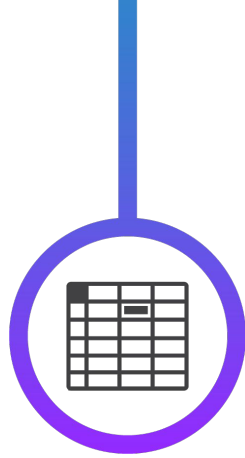


Software standards keep everyone in the shared ecosystem in sync.



A woman with dark curly hair, wearing a light-colored top and a dark skirt, stands in the center of a meeting room, smiling and looking towards a group of people. The room has a whiteboard in the background with some faint diagrams and numbers. In the foreground, the backs of several people's heads are visible, suggesting they are listening to the woman. A large, stylized network diagram with blue lines and circular nodes is overlaid on the right side of the image. The entire scene is tinted with a blue and purple gradient.

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.

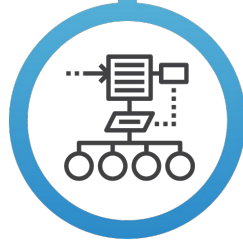
6

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



The background of the slide is a blurred photograph of a business meeting. A person in a suit is holding a tablet, and another person is using a stylus to interact with it. The entire image is overlaid with a semi-transparent blue filter. On the left side, there is a white geometric network diagram consisting of interconnected lines and circular nodes.

What is a Smart Contract?



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



The image features a person's hands holding a credit card over a laptop keyboard, with a network diagram overlay on the left. The background is a blurred image of a person's hands holding a credit card over a laptop keyboard, with a network diagram overlay on the left. The text "Smart Contracts in Action" is centered in the image.

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.





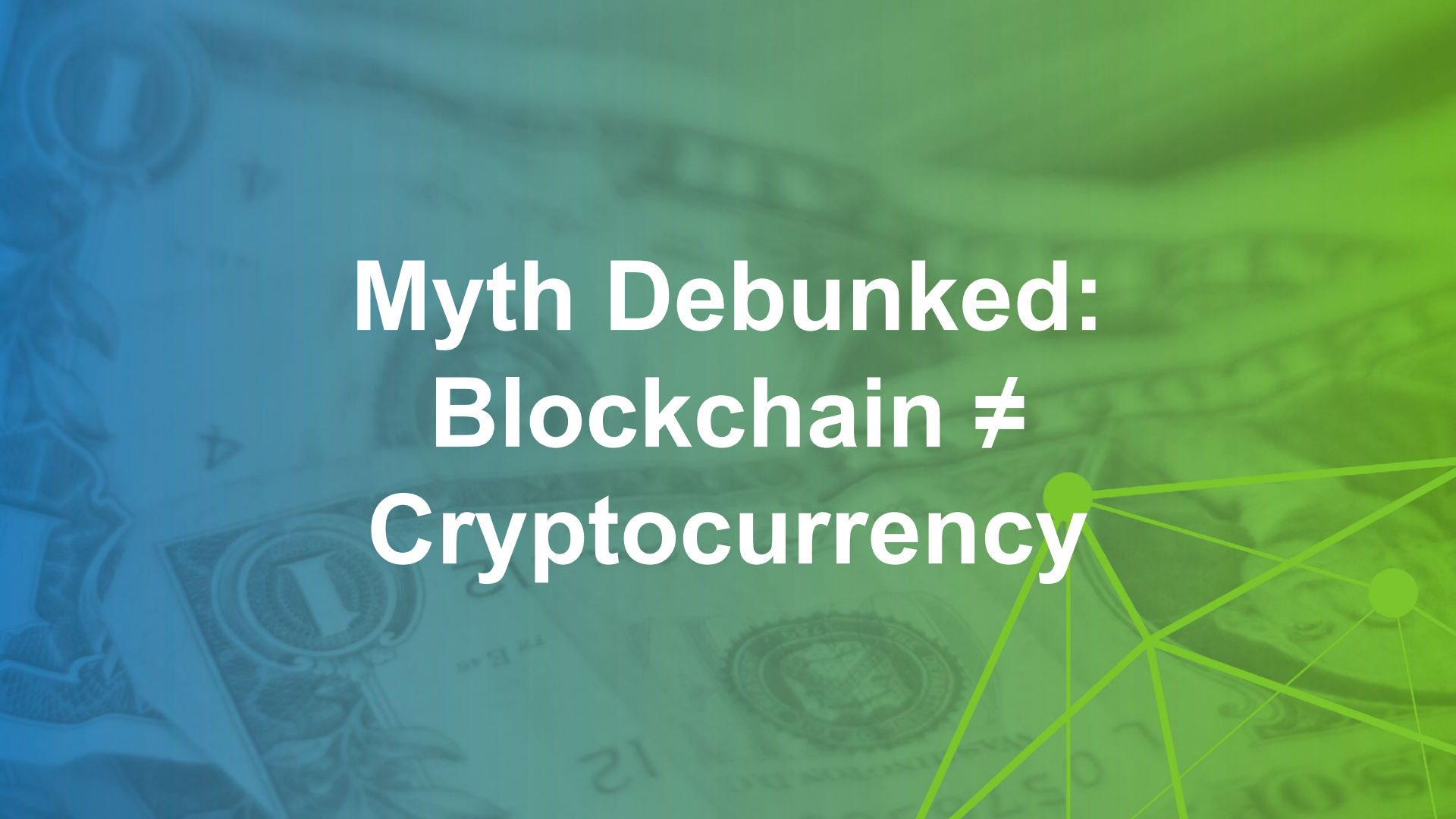
With manually-triggered contracts/ledgers widely operated today, the insurer might find a way to back out of, procrastinate or dispute this agreement.





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.



The background features a blue-to-green gradient. On the left, there are faint, overlapping images of US dollar bills. On the right, there is a green network diagram consisting of several circular nodes connected by thin lines, representing a blockchain or digital network structure.

Myth Debunked: Blockchain ≠ Cryptocurrency

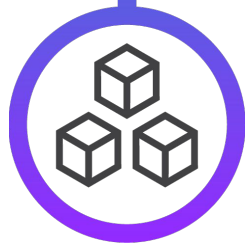


Cryptocurrency is an **application
that sits on top of blockchain.**
Not the other way around.





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



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TRUST:
The Deciding Factor
in Whether a Society
Can Function

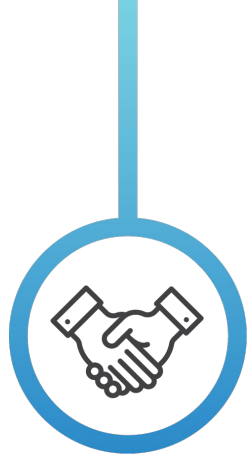


The Need for Trust

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, 2019 needs to be the year of scale done well.



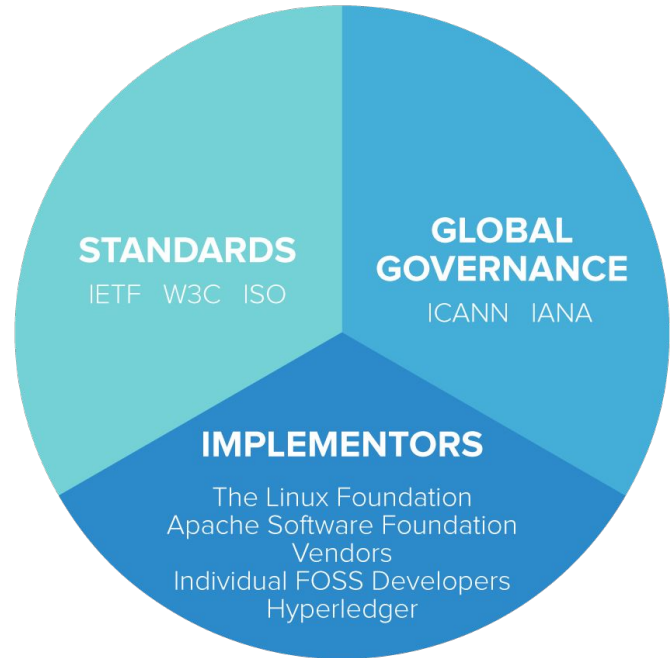


Without trust, the system fails. The onus is on businesses to prove that it is possible to act in the interest of shareholders and society alike and show that free markets can succeed for all if businesses work with the people.



The Trust Protocol

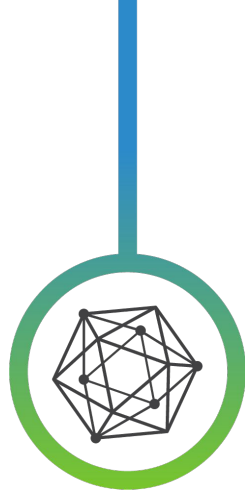
The way internet technologies tend to get developed is a partnership between three organizations: standards, global governance and implementors, like Hyperledger.





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Introducing Hyperledger

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

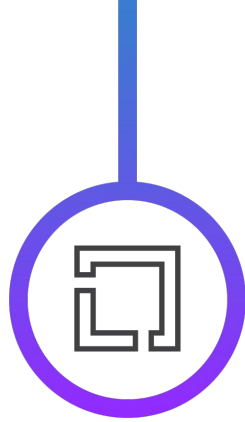


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Hosted by

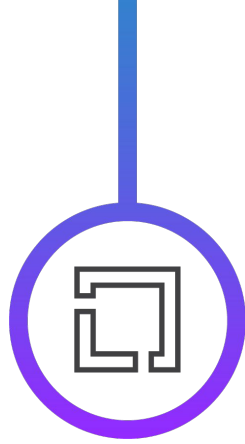


THE
LINUX
FOUNDATION



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.**





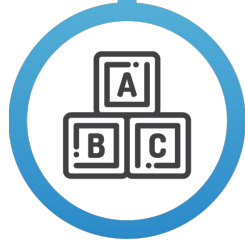
Some of the game-changing initiatives hosted by The Linux Foundation include:



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The Hyperledger Genesis



This technology is young.
It is still early days.





Hyperledger Momentum



4

Years Since Launch



15

Projects



3

1.0 Production Releases



1

2.0 Production Releases



14

Active Community Working
Groups & SIGs



170+

Meetups Worldwide



67K

Meetup Participants



250+

Members
(50+ in China)



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INTERNET

Your Internet ID: monopoly@host.yab.com

Getting Files

Finding Information

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

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

Entertainment

Messages

- [M] MUDs (Games)
- [I] Internet Teleconferencing (irc)
- [U] Tintin Interface for MUDs

- [I] Internet Teleconferencing (irc)
- [U] Internet Message Areas (Usenet)

Miscellaneous

Help

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

- [R] Detailed Reference Text
- [K] How To Configure SLIP Access
- [C] How To Configure SLIP Access

Parallels With the Early Web

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

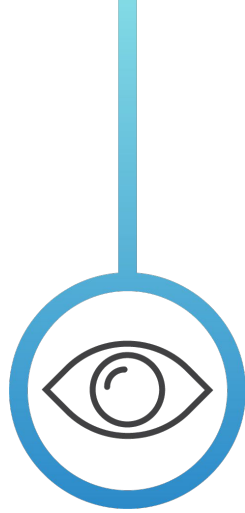


Blockchain technologies are in the early stages of a 20-year, if not a 50-year, adoption and maturation cycle. **Many compare blockchain today with 1995 and the Web.**





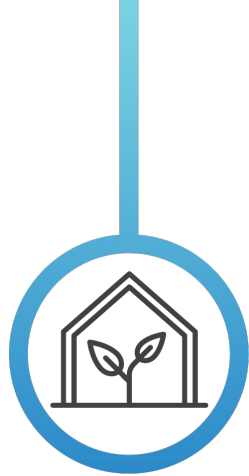
The Hyperledger Vision



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



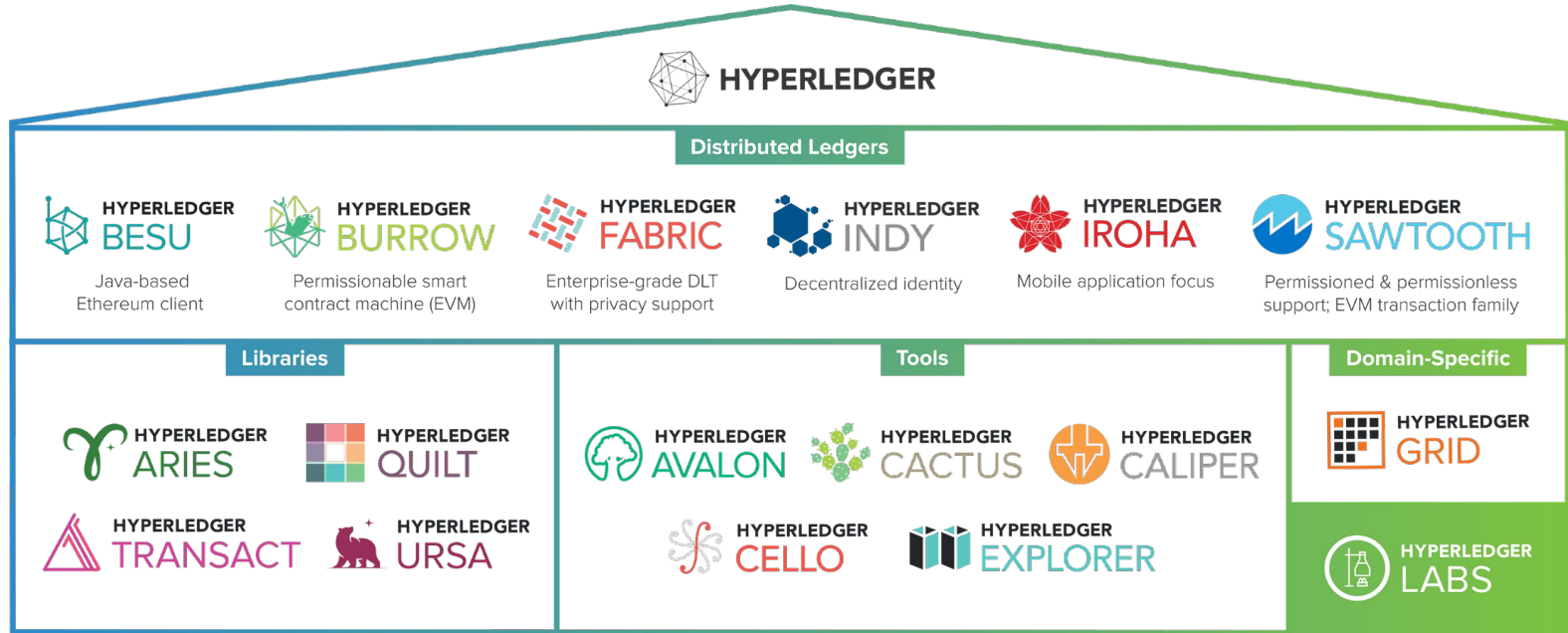
Diverse Developer
Community



Rapid
Experimentation



Hyperledger Modular Approach



Hyperledger Blockchain Frameworks





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).



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.





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.





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



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 Grid is a supply chain focused solution that provides reference implementations of supply chain-centric data types, data models, and smart contract based business logic. Second it showcases how to combine components from the Hyperledger stack into a single, effective business solution.





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

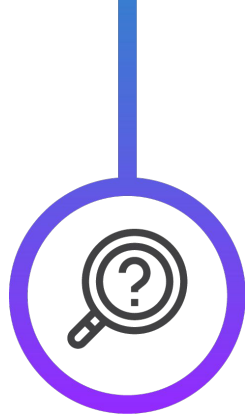


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Industry Use Cases





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.



The background features a collage of various international banknotes, including a 100 Euro note, a 100 US Dollar note, and a 1000 Thai Baht note. A light blue network diagram with circular nodes and connecting lines is overlaid on the right side of the image. The text 'Cross-Border Payments' is centered in a large, white, sans-serif font.

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.



The image shows a surgical team in an operating room, with several surgeons in scrubs and masks. The scene is overlaid with a blue-to-green gradient. In the bottom right corner, there is a network diagram consisting of yellow nodes connected by lines. The text "Healthcare Records" is centered in white.

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



HEALTHCARE BLOCKCHAIN INNOVATION



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The background features a blurred medical setting with a stethoscope on a clipboard, a laptop, and a hand on a mouse. A blue network diagram with nodes and lines is overlaid on the right side. The text is centered in white.

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.



HEALTHCARE BLOCKCHAIN INNOVATION



The Illinois
BLOCKCHAIN
Initiative



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A blue-tinted photograph of fishermen at a pier. In the foreground, a man in a striped shirt is looking at a fish held by another man. A third man in a hooded jacket is also visible. The background shows a long pier structure extending into the water. A white network diagram with nodes and lines is overlaid on the right side of the image.

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.



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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

The image features a pair of black headphones with a silver-colored ear cup. The ear cup has a mesh grille and text that includes "GRADO LABS", "THE BRIDGE SERIES", and "R325". A network diagram with blue lines and nodes is overlaid on the right side of the image. The background is a gradient from purple on the left to blue on the right.

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.



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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.



A hand is shown using a rubber stamp on a document. A pen and a calculator are also visible on the desk. The background is a gradient of blue and green.

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



Learn the Basics
about Hyperledger
projects



Start or join a
Hyperledger
meetup



Spread the word
about Hyperledger



The image features a person's hands typing on a laptop keyboard, which is partially visible in the lower half. The entire scene is overlaid with a semi-transparent green and blue gradient. In the upper left corner, there is a network diagram consisting of several green circular nodes connected by thin green lines, forming a web-like structure. The text 'Advanced Contribution Opportunities' is centered in the middle of the image in a large, white, sans-serif font.

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

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.

