Demystifying the Hyperledger Greenhouse

CROSS 2019
Release
Open source is one of the most successful enablers of global innovation in history
Linux Foundation: More Than Linux

› **1500+** Members
  From 40+ Countries

› **100%** of Fortune100
  Tech & Telecom

› **30000+** Developers
  Contributing Code

› **200+** Open Source
  Projects

› **$16B+** Shared Value

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**Security**

**Networking**

**Cloud**

**Automotive**

**Blockchain**

**Edge/IoT**

**Web**

**AI**

**Film**
Linux has grown into the most important software platform in the world

100% Supercomputer Market
82% Smartphone Market Share
2nd To Windows in Enterprise
90% Mainframe Customers
90% Public Cloud Workload
62% Embedded Systems Market
#1 Internet Client

Linux eventually dominates every market it enters
The Linux Foundation is a critical part of the tech ecosystem

1320+
Members From 41 Countries

100%
of Fortune 100 Tech & Telecom

30,000+
Developers Contributing Code

150+
Open Source Projects

$16B+
Shared Value

A new member joins the Linux Foundation every day
Today the Linux Foundation is much more than Linux

**Security**
We are helping global privacy and security through a program to encrypt the entire internet.

**Networking**
We are creating ecosystems around networking to improve agility in the evolving software-defined datacenter.

**Cloud**
We are creating a portability layer for the cloud, driving de facto standards and developing the orchestration layer for all clouds.

**Automotive**
We are creating the platform for infotainment in the auto industry that can be expanded into instrument clusters and telematics systems.

**Blockchain**
We are creating a permanent, secure distributed ledger that makes it easier to create cost-efficient, decentralized business networks.

**Web**
We are providing the application development framework for next generation web, mobile, serverless, and IoT applications.

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We are regularly adding projects; for the most up-to-date listing of all projects visit tlfprojects.org
So what Is Hyperledger?

Open source collaborative effort to advance cross-industry blockchain technologies

Hosted by The Linux Foundation

Global collaboration spanning developers and employers in finance, technology, supply chain, healthcare and more
CAN YOU SEE IT?

BLOCKCHAIN EVERYWHERE...
Everyone wants their own DLT

Worldwide spending on blockchain solutions is forecast to be nearly $2.9 billion in 2019, before surging to $12.4 billion in 2022.

Report by WEF 2019
Spectrum of Blockchains

**Permissioned vs. Permissionless:** Who can write to a Blockchain (i.e., accessibility)

**Public vs. Private:** Who can read from a Blockchain (i.e., visibility)

- **Permissionless Public:** Bitcoin, Ethereum
- **Permissionless Private:** Public Polls
- **Permissioned Public:** Land titles, University degrees
- **Permissioned Private:** Medical records
A Network of Ledgers - Networks of Networks

**Financial Services**

**Supply Chain**
Provenance tracking. Trade Finance. Cutting bureaucracy at ports and customs. IoT to detect poor shipping conditions. Title tracking for high value goods.

**Healthcare**
Trust networks need open source
Hyperledger Momentum

- 3.5 Years since launch
- 5 Libraries
- 4 Tools
- 6 Distributed Ledgers
- 3 1.0+ Production Releases
- 280+ Members (50+ in China)
- 15 Active Community Working Groups & Special Interest Groups
- 175+ Meetups Worldwide (75+ countries)
- 62K+ Meetup Participants
- 2,000+ Media Clips Per Month
Open Source Collaboration

The Hyperledger technical community is 100% open.

It is never pay-to-play at Hyperledger. Anyone can participate whether your company is a member or not. Our collaborative software development approach ensures the transparency of the process, and a market focus required to bring blockchain technology forward to commercial adoption.

Hyperledger is led by a diverse group of technical contributors.

Governed by technical merit and a principle of “do-o-cracy”, Hyperledger projects see contributions from many different developers and the companies who employ them. Contributions undergo a rigorous peer review process, but are welcome from anyone. Participation is global.
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 has a modular approach to hosting software projects. Think of Hyperledger as a greenhouse for developing business blockchain projects from initial experiment in Labs (seed) to stable code ready for production (fruition).
The Hyperledger Greenhouse

**Distributed Ledgers**

- **Hyperledger Besu**
  - Java-based Ethereum client
- **Hyperledger Burrow**
  - Permissionable smart contract machine (EVM)
- **Hyperledger Fabric**
  - Enterprise-grade DLT with privacy support
- **Hyperledger Indy**
  - Decentralized Identity
- **Hyperledger Iroha**
  - Mobile application focus
- **Hyperledger Sawtooth**
  - Permissioned & permissionless support; EVM transaction family

**Libraries**

- **Hyperledger Aries**
- **Hyperledger Quilt**
- **Hyperledger Transact**
- **Hyperledger UrSa**

**Tools**

- **Hyperledger Avalon**
- **Hyperledger Caliper**
- **Hyperledger Cello**
- **Hyperledger Explorer**

**Domain-Specific**

- **Hyperledger Grid**
- **Hyperledger Labs**
Distributed Ledgers

Frameworks that are basis for products and solutions. Differ in programming and smart contract languages, consensus and governance mode.
Platform for developing blockchain networks with a modular architecture for consensus and membership services. Fabric 1.4.1 and 2.0-alpha released in April. 200+ devs across 100+ companies contributing. ~Hundreds of pilot and production networks deployed.
Hyperledger Fabric: Now Across All Major Clouds
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’s second project, released as 1.0 in January 2018 and 1.1 in Dec 2018. Supports Solidity/EVM smart contracts by linking with HL Burrow.
<table>
<thead>
<tr>
<th>Project</th>
<th>HYPERLEDGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>ACTIVE</td>
</tr>
<tr>
<td>CII Badge</td>
<td>cii_best_practices passing</td>
</tr>
<tr>
<td>Description</td>
<td>Distributed ledger purpose-built for decentralized identity</td>
</tr>
</tbody>
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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. Utilizes zero-knowledge proofs to provide verifiable claims which can be used to prove something about the identity without providing access to the underlying data.
Burrow provides a modular blockchain client with a permissioned smart contract interpreter built in part to the specification of the Ethereum Virtual Machine (EVM). Uses Tendermint as its default consensus mechanism, but has also been ported to Fabric and Sawtooth.
A business blockchain framework designed to be simple and easy to incorporate into infrastructural projects requiring distributed ledger technology. Written in C++ incorporating unique chain-based Byzantine Fault Tolerant consensus. Mobile SDKs. Multisig support for transactions.
Open source Ethereum client written in Java. It can be run on the Ethereum public network or on private permissioned networks, as well as test networks such as Rinkeby, Ropsten, and Görli. Hyperledger Besu includes several consensus algorithms including PoW, PoA, and IBFT, and has comprehensive permissioning schemes designed specifically for uses in a consortium environment.
Libraries

Code basis reusable across different projects, not restricted to Hyperledger only.
Hyperledger: Libraries

**Aries**
Infrastructure for blockchain-rooted, peer-to-peer interactions. It provides a shared, reusable, interoperable tool kit designed for initiatives and solutions focused on creating, transmitting and storing verifiable digital credentials.

**Transact**
Transaction execution platform designed to be used as a library or component when implementing distributed ledgers, including blockchains.

**Ursa**
A shared cryptographic library that would enable people (and projects) to avoid duplicating other cryptographic work and hopefully increase security in the process.

**Quilt**
An interoperability solution for blockchains, DLTs and other types of ledgers.
Our Newest Project- Launched Today

Hyperledger Avalon is a ledger independent implementation of the Trusted Compute Specifications published by the Enterprise Ethereum Alliance. Hyperledger Avalon will realize have different Worker types and include TEE (Trusted Execution Environments like Intel® SGX), MPC (multi-party compute), and ZK (zero-knowledge proofs).
Tools

Application level projects without business logic
Hyperledger: Tools

**Caliper**
Blockchain benchmark framework which allows users to measure the performance of a specific blockchain implementation with a set of predefined use cases.

**Cello**
Deploy, manage and operate blockchains. Support various infrastructures like baremetal, vm platform, and container cloud (e.g., Swarm, Kubernetes). Support advanced operational analytics for the system status and ledger behaviors.

**Explorer**
User friendly web application to view/query blocks, transactions and associated data, network information (name, status, list of nodes), chain codes/transaction families (view/invoke/deploy/query) and any other relevant information stored in the ledger.
Domain Specific

Projects with a specific domain focus
Hyperledger: Domain Specific

A platform for building supply chain solutions that include distributed ledger components. It includes a set of libraries, data models, and SDK to accelerate development for supply chain smart contracts and client interfaces. This project will accelerate the development of blockchain-based solutions to cross-industry supply chain problems.
Hyperledger Labs provides a space for **innovation and testing** of ideas where work can easily be started without the creation of an official Hyperledger project.
Hyperledger Goals
Where open source teams build diverse approaches for business blockchain

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

Build the commercial ecosystem
to help ISVs, cloud providers, SIs, and end user organizations all realize commercial benefit from participation in the project, and demonstrate the economic power of this domain
Building the Commercial Ecosystem

85+

Global Vendors across multiple service types, products and industries
“Hyperledger immediately established itself as the gold standard for corporate blockchain projects.” - Forbes

Half of the ‘Forbes Blockchain 50’ is building on Hyperledger
So who’s using what?

Of the Forbes Blockchain 50:

- 23 HL Fabric
  - +5 IBM Blockchain
  - +2 DTCC & Google
  - +1 Oracle Blockchain
  - +1 Samsung Nexledger
- 21 (Public?) Ethereum (how many Besu?)
- 13 Corda
- 12 Quorum
- 3 HL Indy
- 3 HL Sawtooth
Diamond Supply Tracking

In 2003, the Kimberley Process Certification Scheme was established to prevent conflict diamonds from entering the market. However, the current process is complex and there is a history of fraud and “missing paperwork”. Moving to a blockchain, all shipments are recorded and trackable with high integrity.

This system can empower whistleblowers, governments, mining companies, retailers, journalists, and human rights organizations to get specific on tracking where conflict diamonds are entering the supply chain and preventing them from entering the market.

https://www.youtube.com/watch?v=AnLUVKIW9qo&feature=youtu.be
FoodTrust - transparency to the food supply chain

- When an outbreak of a food-borne disease happens, it can take days, if not weeks, to find its source. **Better traceability could help save lives by allowing companies to act faster and protect the livelihoods of farmers** by only discarding produce from the affected farms.
- 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.
- 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.
Trade Finance: we.trade

- we.trade is a blockchain-based international trading system for a consortium of major world banks including: HSBC, Deutsche Bank, KBC, Natixis, Rabobank, Société Générale, Santander, UniCredit and Nordea
- SMEs generate 85% of employment growth in Europe, but only ~50% of them have access to formal credit.
- Went into production July 2018 conducting seven live trade transactions by ten companies via four partner banks
- Enables accurate trading position information, order to settlement control, risk coverage, track and trace options
- Near-real time exchange of information on a secure platform that digitizes transactional financing
- Continual business and compliance readiness in any relevant regulatory environment
- Scalability that allows for rapid international expansion as business, regulatory, and security opportunities converge

https://we-trade.com/
Digital Identity: The OrgBook

- The OrgBook serves as a **trusted digital network of verifiable data** about organizations which is globally connected, **interoperable, secure, and easy to join**
- Why? So business/government can quickly access evidence of that a potential partner is legally incorporated
- The new enrollment experience is **more convenient** and use an open global blockchain registry
- Reduced single point of failure for database, **reduced fraud** from counterfeit IDs, reduces bottlenecks, and **improves privacy** which a complex verification system can expose
- As more businesses establish their Self-Sovereign Identity, more Services will become Self-Sovereign Identity-aware
- **Live**, public, **globally accessible network** using the Sovrin Provisional Network built on Hyperledger Indy.
Kiva: Implementing SSI and a privacy-first credit bureau for Sierra Leone

Challenge:
1. There is no effective digital identity system or credit bureau for SL's 7.5M citizens
2. As a result, Kiva's lending rates are 30%, much higher than in other countries and a blocker to financial participation.

Solution:
1. 2019-Q2 NCRA (SL government ID agency) will issue credentials on a Hyperledger-Indy based network.
2. 2019-Q4 BSL (central bank) will use Hyperledger Fabric for a shared, decentralized credit reporting bureau.

In April, the National Civil Registration Authority (the gov't identity agency in Sierra Leone) issued 5.2M DIDs using Indy, which are being used to bring broad financial inclusion in the country.
Government Procurement: GSA

- Today’s procurement processes take up to 35 days even when the requirements are very clear.
- The General Services Administration designed a FAST Lane process for IT Schedule 70 contracts.
- Blockchain-based software layer over the agency’s existing infrastructure that aims to make the GSA Schedules review process transparent and automate financial reviews and processes, creating savings in fixed costs.
- Vendors’ financial information is analyzed through a “smart contract” that compares their financial ratios to the average of companies with the same NAICS code.
- Agency estimates that the blockchain pilot will save a financial analyst 10 to 15 days when it comes to reviewing each proposal. Lowering the OpEx costs by 80-90%.
Letters of Credit

- China Minsheng Bank and China CITIC Bank jointly developed an open, standard and regulatory compliant domestic L/C transmission platform using blockchain
- Banks involved include China Minsheng Bank, China CITIC Bank, Bank of China and Suning Bank
- Completed 100 million RMB letter of credit transaction
- Removes need for SWIFT in China domestic L/C settlement and enables creation of an independent and domestic-controlled L/C exchange system
- Improved user experience, supporting a Chinese UI tailored to domestic business requirements
- Incorporated the whole L/C process, shortening delivery time, with improved efficiency and security
BBVA: Corporate Loan Deals

- A EUR 75 million corporate loan deal--using Hyperledger Fabric and ETH--with Indra, performing the complete process from negotiation to the signing of the loan over a mix of different public and private blockchain-based platforms.
- **Reduction of time** taken to complete the deal from days to hours by recording and tracking interactions, reviews and iterations on Hyperledger Fabric.
- Once finalized the **contract's hash or unique ID is recorded to the Ethereum network**, ensuring an immutable record of the loan deal.
Join us!
It’s a wild adventure
A Few Ways to Participate & Tools

- **Subscribe** to Hyperledger Mailing Lists
- **Attend** Hyperledger bootcamps and upcoming events
- Get the latest **development updates** from the wiki
- Engage in the discussion on **Chat**

- Search for Open Bugs, or Report a New One, in **Our Bug Database**
- Start or join a local Hyperledger **Meetup**
- **Participate** in the Working Group meetings
- Check out all the Hyperledger business blockchain technologies and **download our codebases**

**On-demand Webinar:** Get Involved! How to get started with Hyperledger
Community Working Groups (WGs)

Technical Working Groups are open to the public

- **Technical Steering Committee**
- **Architecture Working Group**
- **Identity Working Group**
- **Performance and Scalability Working Group**
- **Smart Contracts Working Group**
- **Technical Working Group China**
- **Learning & Materials Development Working Group**
- **Diversity, Civility and Inclusion Working Group (DCI)**

Visit: [https://wiki.hyperledger.org/display/HYP/Working+Groups](https://wiki.hyperledger.org/display/HYP/Working+Groups)
Community Special Interest Groups (SIGs)
Sector Groups are open to the public

- HYPERLEDGER Healthcare
  SPECIAL INTEREST GROUP
- HYPERLEDGER Telecom
  SPECIAL INTEREST GROUP
- HYPERLEDGER Trade Finance
  SPECIAL INTEREST GROUP
- HYPERLEDGER Capital Markets
  SPECIAL INTEREST GROUP
- HYPERLEDGER Public Sector
  SPECIAL INTEREST GROUP
- HYPERLEDGER Social Impact
  SPECIAL INTEREST GROUP
- HYPERLEDGER Supply Chain
  SPECIAL INTEREST GROUP
- HYPERLEDGER Education Architecture
  SPECIAL INTEREST GROUP

Visit: https://wiki.hyperledger.org/display/HYP/Special+Interest+Groups
Training and Certifications

Technical training courses and professional certifications to get up-to-speed on Hyperledger Fabric or Sawtooth. (more projects to follow)

Professional Certifications

- Certified Hyperledger Sawtooth Administrator (CHSA)
- Certified Hyperledger Fabric Administrator (CHFA)
- Certified Hyperledger Fabric Developer (Q1 2020)

Visit: https://www.hyperledger.org/resources/training
Save the Date!

PHOENIX, AZ
MARCH 3-6, 2020

https://events.linuxfoundation.org/events/hyperledger-global-forum-2020/
Thank you!

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Join us!

www.hyperledger.org