IBM Blockchain 101: Quick-start guide for developers

How to set up a blockchain network and start coding

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August 01, 2017  
(First published October 23, 2016)

Join the blockchain revolution! This developerWorks quick-start guide is for application developers who are new to blockchain technology and want to quickly start building and interacting with blockchain networks. Simple instructions show you how to set up a blockchain network using the latest Hyperledger Fabric v1.0 framework, deploy chaincode (business rules for your network), and write client applications to streamline your business processes and digital interactions.

Join the blockchain revolution! This developerWorks quick-start guide is for application developers who are getting familiar with blockchain technology and want to quickly try building and interacting with blockchain networks. We show you how to set up a blockchain network using the latest Hyperledger Fabric v1.0 framework, deploy chaincode (business rules for your network), and write client applications to streamline your business processes and digital interactions.

Concepts

Let's start with a quick review of what a blockchain network is and the role of Hyperledger Fabric.

Why blockchain for business?

Learning the lingo as you go?

Check out the extensive Glossary of blockchain and Hyperledger Fabric terminology.

Simply put, a blockchain network is a decentralized system for the efficient and secure exchange of business assets. It uses a shared, distributed ledger for recording the history of asset transactions between
members in the network. And instead of relying on a third-party financial institution or actor to mediate the transactions, it uses a consensus mechanism as a basis of trust, accountability, and transparency for all participants in the network.

A blockchain network for business is collectively owned and operated by a group of identifiable and verifiable business entities. In other words, it's a permissioned network, where the participants are known to each other. It's widely known that the first implementation of blockchain technology was the bitcoin network. But the bitcoin network is non-permissioned, and thus poorly suited to business use cases. It has no identifiable ownership structure and is operated by a community of participants that may or may not be identifiable.

• Introduction to distributed ledgers
• Blockchain essentials (free course for developers)

Why Hyperledger Fabric?

To meet the demands of modern markets, IBM and other companies are collaborating to develop an open source, industry-focused implementation of blockchain technology for business use, called Hyperledger Fabric, hosted by The Linux Foundation's Hyperledger Project. Hyperledger Fabric is a framework for distributed ledger solutions on permissioned networks. Its modular architecture maximizes the confidentiality, resilience, flexibility, and scalability of your blockchain solutions.

• Welcome to Hyperledger Fabric (full documentation)
• Key concepts
• Top 6 technical advantages of Hyperledger Fabric

Watch how Hyperledger Fabric supports a blockchain for business:

To view this video, Building a blockchain for business with the Hyperledger Project, please access the online version of the article. If this article is in the developerWorks archives, the video is no longer accessible.

1. Build a blockchain network

With concepts under your belt, the first step is to build a blockchain network where you can practice developing, testing, and deploying your code. You can build a blockchain network in several ways: with IBM Blockchain on Bluemix®, with the Hyperledger Fabric code base on GitHub, or with the IBM-signed Docker images (with IBM support available for purchase).

Option 1: IBM Blockchain on Bluemix

This fully managed blockchain-as-a-service on Bluemix is free (a limited beta for non-production use) and uses the latest Hyperledger Fabric v1.0 architecture. It provides an easy mechanism to quickly spin up a business network on the IBM Cloud in minutes.

The network you build runs in a highly secured environment on IBM LinuxONE™. The network peers and resources (orderers, Certificate Authority, source code, and ledger) are all contained in an IBM Secure
Service Container (SSC). You can immediately write and test chaincode applications (business rules) without having to design and configure a private blockchain network. Members in the network can provision their own peers and resources, and create various channels of communications with other members.

To sign up for the beta of IBM Blockchain on Bluemix:

1. Visit the IBM Blockchain page in the Bluemix catalog.
3. Click Create. On the form, sign up with your company name and reason for giving the beta a try.

Learn more:

- Top 6 reasons to use IBM Blockchain on Bluemix
- Build your network

**Option 2: Hyperledger Fabric code base on GitHub**

Alternatively, if you prefer to work locally, you can clone the Hyperledger Fabric code base directly from GitHub and expedite the startup, configuration, and testing process with Docker scripts. Following these instructions will lead to a fully functional blockchain network:

- Getting started
- Build your network

**Option 3: IBM-signed Hyperledger Fabric images on Docker Hub**

A third option is to use the Docker images for Hyperledger Fabric that are signed, certified, and supported by IBM (for purchase). These images are based on Hyperledger Fabric v1.0 and include enhancements for serviceability. The images undergo rigorous testing for functionality, stability, and performance on z Systems and LinuxONE (s390), Power (ppc64le), and x86. Technical support from IBM is available for purchase when using these images.

- Get the images from the IBM Blockchain Docker Hub repo
- Learn more about the IBM Blockchain Docker images
- Build your network
- Purchase technical support through Passport Advantage

**2. Write and test a simple chaincode application**

Chaincode is a piece of code that is deployed into a network of peer nodes to enable interaction with that network's shared ledger according to the business rules established in the chaincode. Whenever you invoke a transaction on the network, you're calling a function in chaincode that reads and writes values to the ledger. Chaincode is written in Go (GoLang), and is installed and instantiated through an SDK or CLI onto the network of peer nodes.

- Chaincode for developers
- Testing new chaincode
3. Write and deploy client-side apps that invoke chaincode

Once you have a blockchain network with registered chaincode, you can build client-side applications that will read, write, and invoke the business rules you have written into the chaincode. Applications on a blockchain network enable users to query the ledger (ask for specific records it contains) and update it (add records to it).

The Hyperledger Fabric Client SDK provides a powerful and easy way to use APIs that allow applications to interact with a Hyperledger Fabric blockchain. Node.js applications that leverage the HFC SDK can be used to perform the following network tasks:

- Securely register and enroll users. A web application administrator with registrar authority can dynamically register and enroll users who have authenticated to the web application.
- Submit transactions to the blockchain network (deploy, invoke, and query). All transactions are anonymous, confidential, and unlinkable without auditor authority.
- Store sensitive private keys and certificates in any location, such as an off-blockchain database. This requires implementing a simple key-value store interface.

Option 1: Writing and deploying client apps to Bluemix

Follow these instructions to use the Hyperledger Fabric Client SDK APIs to interact with a blockchain network on Bluemix:

- Application development
- Hyperledger Fabric application samples
- Installing the samples

Option 2: Writing and deploying client apps against a Hyperledger Fabric network

Alternatively, follow these steps to use the Hyperledger Fabric Client SDK to write an application against a Hyperledger Fabric network on your local machine.

- Write your first application
- Hyperledger Fabric application samples
- Installing the samples

4. Monitor and manage your blockchain network and apps on Bluemix

With IBM Blockchain on Bluemix, a built-in dashboard provides a friendly tool to keep tabs on your blockchain network and applications. See an overview of your blockchain environment, including performance data, deployed chaincode, and network resources. Use the monitor to manage your network components.

- About the dashboard monitor
• Using the dashboard monitor

5. Get help and support

There are lots of ways to get support and answers to your questions.

1. For help with IBM Blockchain on Bluemix:
   Start at the Getting support page. From there, the Service status page will help you investigate known issues and find release notes for new commits of the Hyperledger Fabric code. And GitHub issues will help you reach the Blockchain development team so you can share details and code snippets from your specific Bluemix instance.

2. For general blockchain questions:
   Search dW Answers. Browse questions that have already been asked, or submit a new question (include the keyword blockchain).

3. For specific Hyperledger Fabric implementation questions:
   The Hyperledger Rocket.Chat channels and Stack Overflow are your best bets.

4. For more help with Hyperledger:
   Browse the Hyperledger Channel Guide and join the discussion group suited to your question.

6. Help build the Hyperledger Fabric

Get involved! Your contribution to the Hyperledger Fabric is welcome. Rocket.Chat is used for communication, and longer running discussions and decisions go to the mailing list.

Hyperledger Fabric's maintainers are responsible for reviewing and merging all patches submitted for review. They guide the overall technical direction within the guidelines established by the Hyperledger Project's Technical Steering Committee (TSC).

• Learn how you can contribute

Next steps

We'll conclude this quick-start with two great ways to continue your blockchain odyssey:

• Stay in know with the Blockchain Newsletter from developerWorks. Check out the current issue and subscribe.
• Stop by the Blockchain Developer Center on developerWorks. It's your source for free tools and training, along with code and community support, for developing with IBM Blockchain and Hyperledger Fabric.
Related topics

- IBM Blockchain on Bluemix
- Blockchain Developer Center
- Blockchain essentials (free course for developers)
- Blockchain videos on developerWorks TV
- Hyperledger Fabric documentation
- Hyperledger Fabric application samples
- Hyperledger community

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