Blockchain Developer

Job Kit

CONSENSYS

Introduction

Welcome to the Blockchain Developer Job Kit, the best resource to learn about the skills that it takes to become a blockchain developer.

ConsenSys is a blockchain company dedicated to transforming the world's digital architecture toward a more open, inclusive, and secure internet of value, commonly called Web3.

ConsenSys is a leading blockchain software company building infrastructure and enterprise products on the Ethereum blockchain. We've been around before Ethereum launched, possess foremost experts in every blockchain sub-discipline, and created some of the fundamental infrastructure and tools for the Ethereum ecosystem, including Truffle, Infura, MetaMask, Alethio, PegaSys, and more! As a result, we employ hundreds of developers and have extensive knowledge of what it takes to be successful in the blockchain ecosystem.

We recently developed the ConsenSys Academy Blockchain Developer On Demand Program, which guides existing developers to learn the skills they need to get their first job as a blockchain developer.

While many people will have different recommendations and opinions on what the exact skills are to become a blockchain developer, we're certain that if you possess the following skills you will be able to get a job in the crypto/blockchain world.

In this guide, you'll find the information about the skills you need to get a job as a blockchain developer, as well as resources where you can get started.

Congratulations on taking a step towards entering the most exciting field in the world!

Why Should You Become a Blockchain Developer?

The Blockchain Industry is Intellectually Stimulating

There are many reasons to enter the blockchain industry. It happens to be one of the most intellectually stimulating fields that combines a multitude of disciplines such as cryptography, economics, philosophy, finance, and software development just to name a few.

Blockchain is Still an Emerging Technology

The blockchain and crypto field has only existed since Bitcoin's inception in 2009, meaning that there are relatively few experts and lower barriers to entry compared to other fields. While the crypto industry has taken off, it's still relatively easier to find a job compared to traditional industries such as enterprise SaaS or large technology companies.

Recommended Reading: Why Decentralization Matters by Chris Dixon, General Partner at Andreessen Horowitz

Feel Passionate About Your Work

Ask most people if they believe they make a difference in their day to day job and the answer can often end with a resounding "no". As a developer in the blockchain industry you will be advancing life-changing technology by literally building the future.

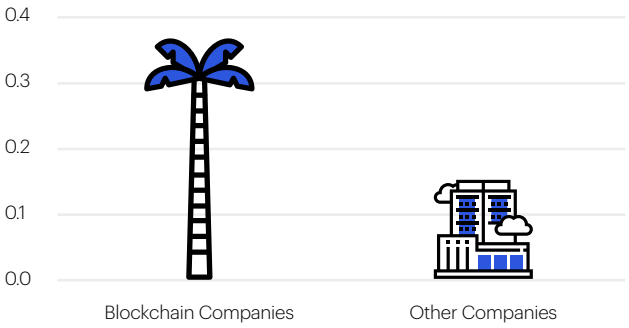
29.2%

of developers think blockchain technology is useful across many domains and could change many aspects of our lives

According to a Stack Overflow's 2019 Developer Survey, 68% of web developers have a positive opinion on blockchain tech, with 30% seeing it as having a 'life-changing' effect.

Many Blockchain Companies Offer Remote Work

Percent of Jobs Tagged Remote Friendly



Source: AngelList Data

What's The Industry Growth Rate for Blockchain Developers?

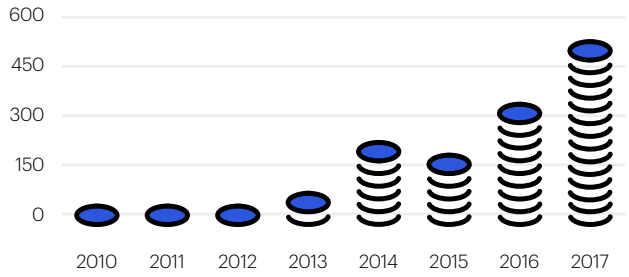
2018's TOP FIVE EMERGING JOBS

33x

Blockchain Developer

In fact, Linkedin's 2018 U.S Emerging Jobs Report shows that blockchain developer is topping the list, having grown 33 times over the previous year.

$ Invested into Cryptocurrency Startups ($M)

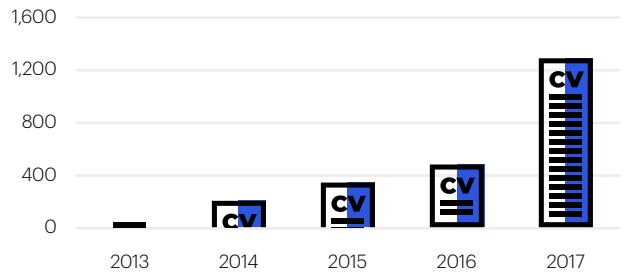


Source: AngelList Data

The amount of capital invested in cryptocurrency and blockchain startups means more developers will be needed and that startups are well funded to pay them.

Jobs related to cryptocurrency and blockchain are rapidly increasing

Number of Cryptocurrency Related Job Postings



Source: AngelList Data

The amount of firms using blockchain is still relatively low, meaning the industry is still emerging and will continue to grow over the next decade.

How Are Organizations Using Blockchain Technology?

80% Not at all

12.7% Non-currency applications of blockchain

4% Implementing cryptocurrency-based products

2.1% Accepting Bitcoin or other coins and tokens as payments

1.3% Imlementing our own cryptocurrency

What's the Typical Salary of a Blockchain Developer?

There are often many factors that determine the typical salary of a blockchain developer. For instance, job location, seniority, experience, employment scarcity, and the individual company all determine the salary level of a developer. The ranges shown are broad and may be specific to the factors previously listed. It's worth noting that for junior developers the range is likely to be lower with the potential to increase over time.

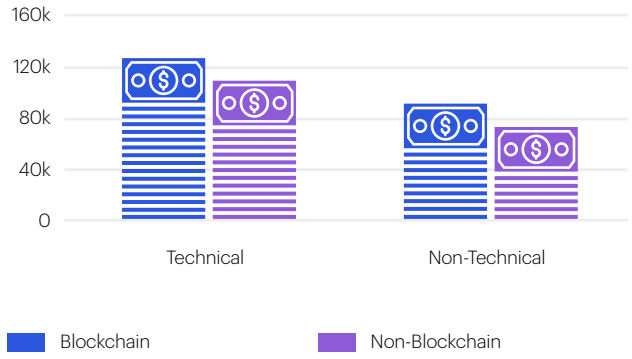
> ***"Blockchain engineers are making between $150,000 and $175,000 in annual salaries on average"***
>
> CNBC

> ***"The median salary for a blockchain developer is now $127,000, with experienced individuals commanding upwards of $172,000 when they move to new organizations"***
>
> Janco Associates

> ***"The median advertised salary for Software Developers requiring blockchain is $125,000 to $150,000"***
>
> Burning Glass

AngelList, a website for startups, angel investors, and job-seekers looking to work at startups released a report about obtaining a job at a crypto startup.

Posted Median Salary for Jobs at Cryptocurrency and Non-Cryptocurrency Companies (USD)



Source: AngelList Data

What Firms are Hiring Blockchain Developers?

facebook IBM CONSENSYS EY

Deloitte. KPMG accenture JPMorganChase

Microsoft CISCO amazon

The following companies have public job postings related to blockchain development. Such companies are not affiliated with and this is not an indication of their endorsement of this product.

Where to look for Blockchain Developer Jobs?

AngelList

LinkedIn

indeed

CRYPTO JOBS LIST

BLOCKTRIBE™
RECRUITMENT SERVICES

GITCOIN

CONSENSYS

Blockchain Knowledge

In order to become a blockchain developer, you obviously need to know a lot about how different blockchains work. Focusing on Ethereum, it's important to be familiar with the basics of how Ethereum works, its different use cases and the challenges that lie ahead in its development.

On the right is an overview of the most important terms and topics that you should have a full understanding of before diving into the programming languages involved. Click on each word or phrase to learn more about the topic.

Consensus Algorithms

Miners & Security Incentivization

Proof of Work vs. Proof of Stake

Smart Contracts

Transactions, Gas, and Gas Prices

Sharding

Scalability Trilemma

Token Standards

Cryptography

To fully understand the capabilities of Ethereum, you need to have a solid understanding of cryptography, as its one of Ethereum's foundational technologies. Cryptography is what allows Ethereum to be secure, and allows for cryptocurrencies to separate itself from fiat.

On the right is an overview of the most important cryptography terms and topics that you should have a full understanding of before becoming an Ethereum developer. Click on each phrase to learn more about the topic.

Public Key Encryption

Private Key Encryption

Key Agreement/Exchange

Digital Signatures

Hash Functions

Ring Signatures

Zero Knowledge Proofs

Encrypted Storage

Elliptic Curve Encryption

Trusted Execution Environments

Programming Languages

Depending on the type of Ethereum developer you want to become, there are several different programming languages that you should be familiar with. Ideally, you should be an object-oriented programming language. And while it's nice if you know multiple languages, as long as you're very comfortable with one of the languages below, you will be able to learn how to build on Ethereum.

If you're wanting to become a dapp developer, then you'll need to have a coding repertoire of:

JavaScript

The main two Ethereum Github repos for JavaScript:

https://ethereumjs.github.io/

https://github.com/ethereum/web3.js/

Python

Here are the two main Python Githubs for Ethereum:

https://github.com/ethereum/web3.py

https://github.com/ethereum/pyethereum

Solidity

Solidity is modeled after Javascript on purpose in order to make it easier for a large number of developers to start building on Ethereum.

Solidity and Javascript have a similar syntax.

If you're interested in doing backend/protocol work on Ethereum, you should have significant experience with the following backend languages:

Go

Go is the language that the Geth (Go-Ethereum) client is written in.

Rust

Rust is the language that the Parity client is written in.

Java

Java is the language that the Pantheon client is written in.

.NET

You can easily integrate Ethereum blockchain into your .NET applications using Nethereum.

C++

If you want to do protocol development in C++, go to the cpp-Ethereum github and follow the build steps. You can also learn more here.

Ruby

Here are some Github's to check out to see how Ruby is used in Ethereum.

https://github.com/DigixGlobal/ethereum-ruby

https://github.com/cryptape/ruby-ethereum

https://github.com/rexmadden/rails_eth_api

https://github.com/EthWorks/ethereum.rb

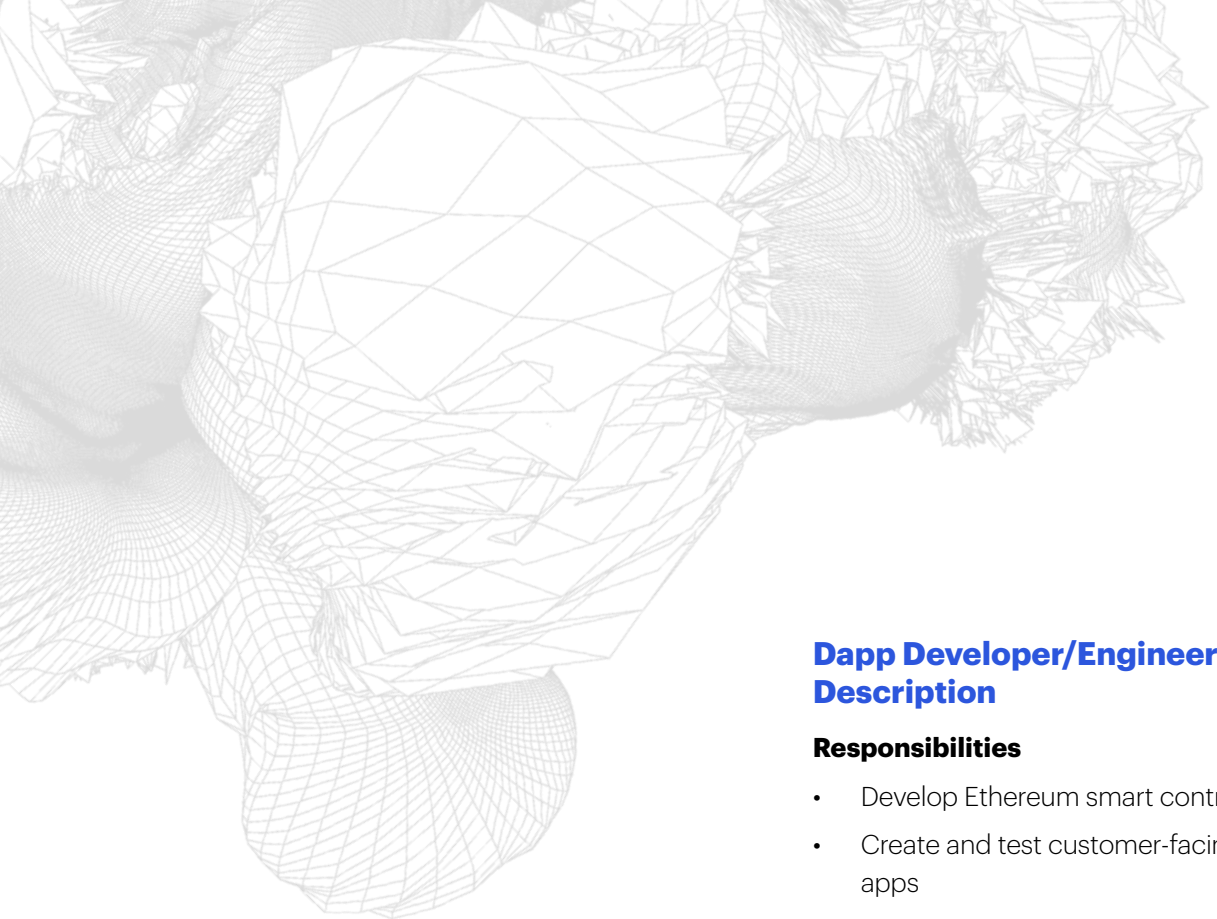
Example of Blockchain Or Dapp Developer Job Description

Below is an example of a typical job description for a blockchain developer and dapp developer. While they do not specifically mention every skill in this list, they are good examples of the skills a standard blockchain developer or dapp developer may require.

ConsenSys Blockchain Protocol Engineer Job Description

Requirements

- Strong back-end development experience using one of GO, Rust or Java
- Hands on experience in basic cryptography such as digital signatures, encryption based on asymmetric or symmetric keys, key agreement, etc.
- Being able to explain consensus algorithms like Raft or Paxos, PBFT
- Node.JS and Javascript programming skills
- Fast learner excited to develop new skills
- Excellent communicator who works well in extremely fast-paced team environments
- Thrives in chaos and is comfortable with the uncertainty and the rapid change of R&D projects
- Self-starter who can define and execute tasks with minimal guidance



Dapp Developer/Engineer Job Description

Responsibilities

- Develop Ethereum smart contracts in Solidity
- Create and test customer-facing decentralized apps
- Help build the smart contract and dapp development squad
- Coordinate work with contractors and partners

Skills

- Understanding of blockchain technology, especially Ethereum
- Experience in developing Ethereum smart contracts written in Solidity
- JavaScript
- Experience in developing dapps that communicate with the Ethereum blockchain
- Familiarity with web3.js and Metamask
- Experience with agile and test driven development
- Experience in collaborating with UI developers
- Experience with Agile development (Jira)
- Experience with Test Driven Development (TDD) (Mocha, Chai, Jenkins)
- Self-starter with the ability to define and run with tasks with minimal oversight
- Experience of full-stack development, especially with Angular and Node, is an advantage.
- Experience of incident and problem resolution in production environments.
- Teamwork, flexibility, initiative, communication and organization competencies

Top Ethereum Developer Resources

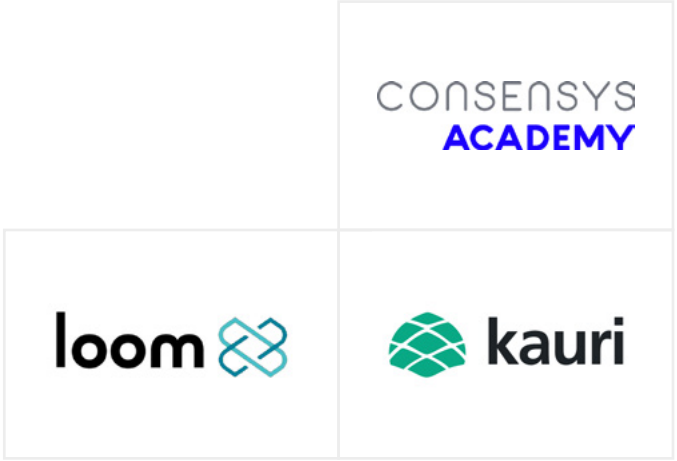
As you start to hone your Ethereum programming skills, there are several resources available to help you along the way.

Teach Yourself to Build on Ethereum

- ConsenSys Academy has a self-paced On Demand Ethereum Developer Program that covers Ethereum concepts, introduces key developer tools, goes over security best practices, and explains the other aspects of smart contract and dapp development.
- CryptoZombies is a free teaching platform to teach existing developers or complete newcomers the ins and out of programming for the blockchain.

Get to Know All of the Different Ethereum Developer Tools

- ConsenSys' Ethereum Developer Portal is the place to get started and find the tools you need to develop and build applications on Ethereum.
- Kauri has all of the articles, tutorials, documentation and best practices for building on Ethereum.



Practice Your Ethereum Programming Skills and Get Paid

- Gitcoin is the place where you can find software development freelance work and get paid immediately in ETH.

Join Ethereum Online Communities

- The Solidity Gitter chatroom
- All the different Ethereum-related Gitter channel can be found here
- Ethereum Stack Exchange
- The main Ethereum Subreddit

Find an Ethereum Developer Job

- ConsenSys is home to several of the top projects in the Ethereum space, and we're always looking for talented developers. Check out the ConsenSys Careers page to see what positions are currently available.

Blockchain Knowledge Glossary

Consensus Algorithms

Blockchains solve for the consensus problem: trying to get all processes or participants in a group to agree on some specific value or result based on the votes of each process or participant. There are two different protocols that work to solve the consensus problem:

- *Paxos* - A family of protocols for solving consensus in a network of unreliable processors. This family makes a number of trade-offs between assumptions about the processors, participants, and messages in a given system. Paxos guarantees safety and is often employed where the durability of large data sets is required.
- *Raft* - Seen as a more understandable version of Paxos, Raft has the same fault-tolerance and performance guarantees but improves on building practical implementations of protocols on top of it.

Miners & Security Incentivization

- In order for blockchains to survive, they need to make sure they are safe from cyber attacks such as DDoS attacks, which is difficult when there is no third-party intermediary. There are two ways that blockchains do this:
- *Proof of Work*: Simply put, members of a given community work to solve a complex puzzle and when they do, a new "block" is created, and the computer that solved the puzzle (the miner) gets rewarded in cryptocurrency for their efforts.
- *Proof of Stake*: The creator of the new block, in this case, is determined (in a random way) and is only available to people (forgers) with a certain amount of cryptocurrency. These forgers are staking their cryptocurrency in order to receive more of it, and if they falter, then they are no longer eligible to be forgers.

Network Peer Discovery and Messaging

- The process of finding nodes for data communication on a distributed network.

Smart Contracts

- Smart contracts help you exchange anything of value in a transparent, trustworthy way without having to use a middleman.
- Your write a contract on the blockchain and it's anonymous but transparent on the public ledger. Once a triggering event occurs, such as a date or a strike price, the contract executes itself based on the terms that were coded into it.

Transactions, Gas and Gas Prices

- Gas is what powers Ethereum. Gas is the unit that measures the amount of computational effort that it will take to execute certain operations on Ethereum.
- Gas prices fluctuate depending on the amount of transactions that are happening on the network at a given time.

Sharding

- The term sharding goes back to database design and simply means creating smaller parts from a larger one. In the context of Ethereum, sharding is what helps Ethereum scale: instead of having every single node on a network validate every transaction; sharding allows a smaller subset of nodes to do the work.

Scalability Trilemma

"The claim that blockchain systems can only at most have two of the following three properties:

- Decentralization (defined as the system being able to run in a scenario where each participant only has access to O(c) resources, i.e. a regular laptop or small VPS)
- Scalability (defined as being able to process O(n) > O(c) transactions)
- Security (defined as being secure against attackers with up to O(n) resources)

In order to actually achieve scalability, we need to achieve all three properties.

Token Standards

- A big part of building on Ethereum is the ability for anyone to create unique tokens that can be used for many different purposes. In order for these tokens to operate effectively, token standards were created.
- ERC (Ethereum Request for Comments) is an application-level standard that can be created by anyone, and it is up to the creator of the standard to foster support for it in the community. Some examples of popular ERCs include:
    - ERC-20: the main standard, proposed by Vitalik that allows for the creation of tokens on Ethereum that can be used in wallets or decentralized exchanges.
    - ERC-721: the token standard for Non-Fungible Tokens, which allow for completely unique tokens to be created. No two ERC-721 tokens are the same.
    - ERC-223: improving upon ERC-20, this standard makes sure that tokens can only be sent to smart contracts that have the functionality to accept them.
    - ERC-1337: a token standard that allows for recurring subscriptions on Ethereum

Cryptography Glossary

Public Key Encryption

A code generated by public key encryption and attached to an electronically transmitted document in order to verify the contents of the document.

Private Key Encryption

A private key is an alphanumeric string of data that corresponds to a single specific wallet or "public address". Private keys can be thought of as a password that enables an individual to access their crypto wallet/account. Never reveal your private key to anyone, as whoever controls the private key controls the account funds. If you lose your private key, then you lose access to your wallet.

Key Agreement/Exchange

Key agreement protocols enable two or more parties to create a shared encryption key that they can use to encrypt or sign data. The data can then be confidentially shared with the corresponding parties without other parties obtaining the information.

Digital Signatures

A digital signature is a method of approving a transaction. In order to send a transaction, a digital, private key must be used to verify true ownership of the wallet or ethereum address. For example, if Alice tries to send Bob ether, she needs to be able to verify that she is sending ether from her specific wallet. She does this by using her private key which acts as a digital signature that approves the transactions, thereby sending the ether to Bob.

Hash Functions

A function that takes an input, and then outputs an alphanumeric string known as the "hash value" or "digital fingerprint." Each block in the blockchain contains the hash value that validated the transaction before it followed by its own hash value. Hashes confirm transactions on the blockchain.

Ring Signatures

A ring signature is a type of digital signature that can be performed by any member who has the keys. For example, a group may have 5 keys that can all be used to send transactions from a specific account. Ring signatures are used because they make it mathematically infeasible to determine which individual of a group produced the signature because nobody would be able to tell which key was used.

Zero Knowledge Proofs

A zero-knowledge proof (ZKP) is a form of cryptography in which an individual can prove to another party that a piece of information is correct without having to disclose the specific piece of information. For example, zero-knowledge proofs can be used to prove to Charlie that Alice sent Bob x amount of money without having to tell Charlie how much money was actually sent. The implications for ZKP cryptography is vast and it is being used in multiple iterations for public blockchains and cryptocurrencies.

Encrypted Storage

A feature of storage security that encrypts data as it is in transit to the files, hard drives or libraries that holds the data.

Elliptic Curve Encryption

Elliptic curve encryption (ECC) is an advanced mathematical category that is based on arithmetic operations on an elliptic curve. In ECC, multiplication modulo a prime is simple but the division is practically impossible, which is referred to as the discrete logarithm problem. This is useful in cryptography because it enables modern computer systems and cryptocurrencies to use private keys and digital signatures.

Trusted Execution Environments

TEE's or trusted execution environments are a secure area of the main processor that enables code and data loaded inside to be protected with respect to the information's confidential and integrity.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