**Blockchain Layers:**

Primarily, blockchain is composed of **five layers**:

* hardware infrastructure layer,
* data layer,
* network layer,
* consensus layer,
* application layer.

**Every layer has a distinct function**. Together, these layers make the blockchain a comprehensive solution for everything from back-end data administration to front-end application development.

A screen shot of a computer

Description automatically generated

Let’s take a deep dive into the layers of blockchain:

**Hardware layer:**

* Blockchains are predicated on peer-to-peer sharing of data.
* This layer **consists of the physical components that support the blockchain network**, such as **computers and servers**.
* **A node is a computer or network of computers that decrypts transactions,** and a blockchain is the sum of all nodes.

**Data layer:**

* Following the hardware layer is the data layer, where **transaction details are stored**.
* The transaction information recorded on a block (the basic unit of a blockchain) includes **information about the sent crypto, the public key of the recipient, and the private key of the sender**.
* Each data-containing block is connected to the block that came before it and the block that will be generated next. Only the first block of the network, **the genesis block, is connected forwards and not backwards.**

**Network layer:**

* This layer **handles the communication between blockchain nodes**.
* It **connects nodes, propagates transactions, and distributes data throughout the network**.
* Since blockchain is an open system, **each node must be aware of the transactions being validated by other node**s. The network layer facilitates this communication.

**Consensus layer:**

* This layer **guarantees that all nodes in the network concur on the validity of each transaction**.
* It **uses a consensus mechanism**, such as Proof of Work (PoW) or Proof of Stake (PoS), **to validate and add transactions to the blockchain**.

**Application layer:**

* The Application layer in the blockchain is the one **on which apps are built**.
* This layer **includes smart contracts, decentralized applications (dApps), and other software that run on top of the blockchain network**.
* It **allows developers to create new applications and services** that leverage the security and transparency of the blockchain.
* These implementations may consist of anything, like **wallets, social media Apps, browsers, Defi Apps, and NFT platforms**, to name a few.
* While the UI/UX of the app is identical to that of any other standard application, the backend data storage of these applications is decentralized.

***Each layer of the blockchain system is integral to assuring the security, transparency, and efficiency of transactions.***

The layers of the blockchain are:

**Layer 0:**

* **The blockchain itself is referred to as layer zero**.
* Internet, hardware, and a variety of other connections are required to implement blockchain technology.
* **Layer zero blockchain is the initial stage of blockchain** that enables Bitcoin, Ethereum, and other networks to function.
* Layer 0 also **facilitates cross-chain interoperability communication** **from the top layer to various layers**.
* Layer 0 **provides the blockchain’s fundamental infrastructure, including the protocols and standards that govern the blockchain network**.

**Layer 1:**

* Layer 1 blockchain **represents an improvement over layer 0**.
* Under this layer, the blockchain **network’s functionality is maintained**.
* **Scalability is however a limitation in the layer one blockchain**.
* Any modifications to or problems with any new protocol at layer 0 will also affect layer 1.
* This layer is also **known as an implementation layer**.
* Layer 1 blockchains include Bitcoin, Ethereum, Cardano, and Ripple, among others.

**Layer 2:**

* Layer 2 has **eliminated numerous interactions from Layer 0**.
* **For specific blockchains, the scaling solution is layer 2 blockchain**.
* It is **compatible with third-party integration and eliminates layer 1’s restrictions**.
* It is the most common method for resolving proliferation issues in POW networks. Various industries have recently begun to implement layer two technologies.

**Layer 3:**

* Layer 3 is also known as the “application layer.” This layer’s primary responsibility **is to host DAapps and numerous other protocols that facilitate other apps**.
* In this section, the blockchain protocol is divided into **two significant sub-layers, namely** **application, and execution**.
* It is the **most effective solution for separating blockchains with cross-chain capabilities in order to achieve the goal of genuine interoperability.**

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| **Layer 0** | This layer has the hardware, protocols, and other foundational elements. |
| **Layer 1** | Maintains dispute resolution, consensus mechanism and programming of the blockchain. Examples: Bitcoin blockchain, Ethereum Blockchain |
| **Layer 2** | Has better scaling capabilities than Layer 0 and 1. It has the capability to be integrated with third-party solutions. |
| **Layer 3** | This layer is used to host dApps and other user-facing applications. |