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[#Copy link](https://ida.interchain.io/academy/1-what-is-cosmos/2-cosmos-ecosystem.html#the-interchain-ecosystem) **The Interchain Ecosystem**

synopsis

**The Interchain** is a network of independent blockchains, which are:

* All powered by consensus algorithms with Byzantine Fault-Tolerance (BFT).
* All connected through the Inter-Blockchain Communication Protocol (IBC), which enables value transfers, token transfers, and other communication between chains, all without the need to involve exchanges or make compromises regarding the sovereignty of each chain.

The Interchain is also **a blockchain ecosystem** complete with protocols, SDK, tokens, wallets, applications, repositories, services, and tools.



In this section, you will get an introduction to:

* The Interchain Ecosystem
* The Cosmos SDK
* The Inter-Blockchain Communication Protocol
* The Cosmos Hub
* The Ignite CLI
* CosmWasm

[#Copy link](https://ida.interchain.io/academy/1-what-is-cosmos/2-cosmos-ecosystem.html#a-whole-universe-to-discover-tokens-wallets-apps-and-services) A whole universe to discover - tokens, wallets, apps, and services

The Interchain is an ever-expanding ecosystem of tokens, wallets, and tools, as well as interconnected applications and services, all built for a decentralized future.

In 2022, almost **$100 billion in digital assets** are under management and secured by the Interchain. Digital assets on the Interchain include fungible and non-fungible tokens (NFTs). You can issue in-application tokens to conduct settlements, bespoke issuance, handle inflation/deflation, and much more.

Among the fungible tokens secured by the Interchain are the [Binance Coin (opens new window)↗](https://www.binance.com/en/bnb) and [ATOM (opens new window)↗](https://cosmos.network/learn/faq/what-is-the-atom). Remember that because the tokens are defined on application-specific blockchains their developers are free from the constraints of a hypothetical general-purpose blockchain.



For an overview of the tokens the Interchain secures across applications and services, see the [Interchain market capitalization overview (opens new window)↗](https://cosmos.network/ecosystem/tokens/).

In addition to the vast number of tokens, a variety of applications, services, wallets, and explorers are Interchain-based.

**Hundreds of applications and services** build on the Interchain. Currently most applications and projects deal with finance, closely followed by infrastructure-related applications. Applications and projects in areas such as privacy, marketplace, and social impact are also emerging.



Do you want an up-to-date list of all the applications and services built on the Interchain? Go to the [Interchain Ecosystem overview (opens new window)↗](https://cosmos.network/ecosystem/apps/?ref=cosmonautsworld).

While most applications and projects are deployed on the mainnet, some are currently either in proof of concept, still in development, or have been deployed to a testnet only.

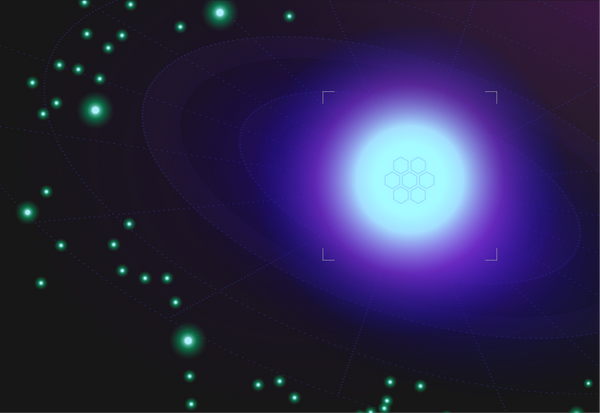
Moreover, [**33 wallets** (opens new window)↗](https://cosmos.network/ecosystem/wallets) and block explorers for the Interchain are part of the ecosystem. Most are for Android, such as the [Atomic Wallet (opens new window)↗](https://atomicwallet.io/) and [Coinex (opens new window)↗](https://www.coinex.com/), or for iOS, like [AirGap (opens new window)↗](https://airgap.it/) and [Wallet.io (opens new window)↗](https://walletio.io/), but you can also find a number of web wallets like [Exodus (opens new window)↗](https://www.exodus.com/) and [Keplr (opens new window)↗](https://wallet.keplr.app/).



Do you want to find out more about the wide variety of wallets in the Interchain Ecosystem? We recommend looking at the [wallets and block explorers for the Interchain (opens new window)↗](https://cosmos.network/ecosystem/wallets).

[#Copy link](https://ida.interchain.io/academy/1-what-is-cosmos/2-cosmos-ecosystem.html#the-cosmos-sdk-modular-and-customizable) The Cosmos SDK - modular and customizable

The Interchain network focuses on an ecosystem for easy blockchain development that provides customizability and interoperability. It establishes a stable universe determined by rules that apply to the whole ecosystem equally.



Before the Interchain came along, developing a whole new chain was much more difficult and expensive than building a smart contract. Now, with the Cosmos SDK, entirely flexible, secure, high performance, and sovereign **application-specific blockchains** can be developed. To allow this, building modular, adaptable, and interchangeable open-source development tools is at the center of the Interchain's mission.

The main aim of the Interchain network is to provide an **ecosystem for easy blockchain development** based on CometBFT, the Tendermint BFT for the Interchain Stack, and the Inter-Blockchain Communication Protocol (IBC) with the so-called [Cosmos SDK (opens new window)↗](https://v1.cosmos.network/sdk).

Each chain in the Interchain Ecosystem relies on the Tendermint **fast-finality BFT consensus algorithm**. This ensures a common consensus mechanism at work in all chains of the network. Next to its use in the Interchain, the Tendermint consensus mechanism is also utilized in the [Binance Chain (opens new window)↗](https://www.binance.org/en), [Kava (opens new window)↗](https://www.kava.io/), and more.



If you want to dive deeper into application-specific blockchains, look at the section [A Blockchain App Architecture](https://ida.interchain.io/academy/2-cosmos-concepts/1-architecture.html).

The Cosmos SDK is a generalized framework to build secure blockchain applications on the Tendermint BFT in Golang. It is a modular framework for application-specific blockchains. The design is based on **two major principles**: modularity and capability-based security. The Cosmos SDK was envisioned to be an npm-like framework for secure applications on top of Tendermint. Over time it has become an advanced framework for custom application-specific blockchains.

The ready-built modules of the Cosmos SDK are easy to import, adapt, and use. Developers can create their own modules to introduce specific functionalities. With the growth of the ecosystem, the number of modules will grow, facilitating the development of more complex applications.



*Building on modular components, many of which you did not write yourself* - does this increase the potential for attacks, and faulty or malicious nodes operating undetected? No need to worry.

The Cosmos SDK is built on the [object-capability model (opens new window)↗](https://docs.cosmos.network/main/core/ocap.html). It not only favors modularity but also encapsulates code implementation. An object-capability model ensures that:

* There is no way for objects in the memory to be discovered just by going through the composed objects of others.
* The only way to have references to objects or to access services is to have been passed the relevant object references.



The default consensus mechanism available when developing with the SDK is CometBFT, which is based on [Tendermint Core (opens new window)↗](https://docs.tendermint.com/v0.34/tendermint-core/).



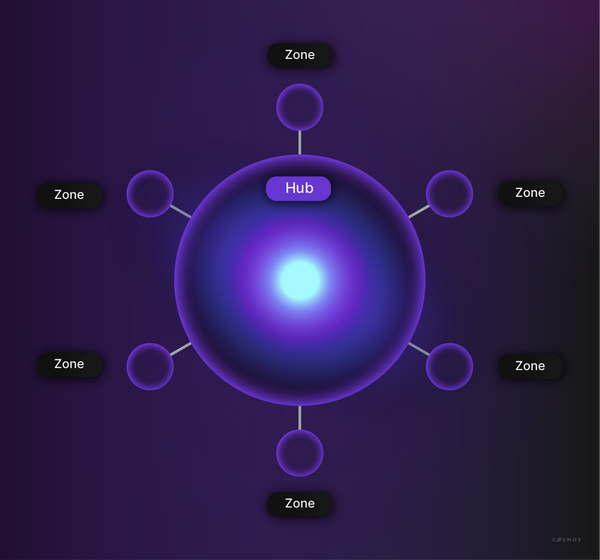
If you are interested in hearing more from the Cosmos SDK team itself, in the following video Marko Baricevic, Cosmos SDK Project Lead at Interchain, delivers a comprehensive breakdown of the Cosmos SDK.

[#Copy link](https://ida.interchain.io/academy/1-what-is-cosmos/2-cosmos-ecosystem.html#the-inter-blockchain-communication-protocol) The Inter-Blockchain Communication Protocol

The [Inter-Blockchain Communication Protocol (IBC) (opens new window)↗](https://ibcprotocol.org/) is the basis for **interoperability** in the Interchain. It leverages the instant finality of Tendermint to allow for the transfer of value (token transfers) and communication between heterogeneous chains. Blockchains with different applications and architecture specifications become interoperable whether or not they share a validator set.

Without IBC, the interoperability of heterogeneous chains is difficult to achieve because they may implement the consensus, networking, and application layers in different ways. As soon as a blockchain is compatible with IBC, it becomes interoperable with other blockchains.

The Interchain implements a **modular architecture with two blockchain classes**: **hubs** and **zones**.



**Zones** are heterogeneous blockchains carrying out the authentication of accounts and transactions, the creation and distribution of tokens, and the execution of changes to the chain. **Hubs** are blockchains designed to connect the so-called zones. Once a zone connects to a hub through an IBC connection, it gets automatic access to the other zones connected to that hub. At this point, data and value can be sent and received between the zones without risk of, for example, double-spending tokens. This helps reduce the number of chain-to-chain connections that need to be established for interoperability.

There is no enforcement of an actual topology. A hub can be understood as a zone with many connections to other zones. Application zones can be expected to join the hubs in the ecosystem, but they are free to coalesce into any topology the developers find appropriate.



If you want more detailed information on hubs and zones on the mainnet and in the testnet, see this [map of zones (opens new window)↗](https://mapofzones.com/).

[#Copy link](https://ida.interchain.io/academy/1-what-is-cosmos/2-cosmos-ecosystem.html#the-cosmos-hub) The Cosmos Hub

The [Cosmos Hub (opens new window)↗](https://hub.cosmos.network/main/hub-overview/overview.html) was the first blockchain built with the Interchain Stack. It is a public Proof-of-Stake (PoS) blockchain with a native token, ATOM. ATOM is used to secure the network and pay for transaction fees, but is also the token that has funded the development of the Interchain Stack and other projects in the wider ecosystem.

The Cosmos Hub can be understood as a router facilitating transactions between the chains connected to it. For example, the Cosmos Hub allows for transaction fees to be paid in different tokens, as long as the zone trusts the Cosmos Hub and the other zones connected to it.

*How do you connect your chain to a non-Tendermint (non-CometBFT) chain?* The IBC connection is not limited to Tendermint-based chains. If another, non-Tendermint blockchain uses a fast-finality consensus algorithm, a connection can be established by adapting IBC to work with the non-Tendermint consensus mechanism.

If the other chain is a **probabilistic-finality chain**, a simple adaptation of IBC is not sufficient. A proxy chain called a **peg-zone** helps establish interoperability. Peg-zones are fast-finality blockchains which track chain states to establish finality. The peg-zone chain itself is IBC-compatible and acts as a **bridge** between the rest of the IBC network's chains and the probabilistic-finality chain.



A peg-zone implementation exists for Ethereum and is named the [Gravity Bridge (opens new window)↗](https://github.com/cosmos/gravity-bridge). For more information on bridges and the Gravity bridge, see the section [Bridges](https://ida.interchain.io/academy/2-cosmos-concepts/14-bridges.html).

[#Copy link](https://ida.interchain.io/academy/1-what-is-cosmos/2-cosmos-ecosystem.html#ignite-cli-building-application-specific-blockchains-with-one-command) Ignite CLI - building application-specific blockchains with one command

[Ignite CLI (opens new window)↗](https://ignite.com/cli) is a developer-friendly, command-line interface (CLI) tool for application-specific blockchains which builds on Tendermint/CometBFT and the Cosmos SDK. The CLI tool offers everything developers need to build, test, and launch a chain. It accelerates blockchain development by scaffolding and assembling all components needed for a production-ready blockchain. Ignite CLI makes the process from initial idea to production 95% faster. This lets developers build a blockchain in minutes, and frees them to focus more strongly on the business logic of their application.

With Ignite CLI, developers can:

* Create a modular blockchain written in Go with a single command.
* Start a development server to experiment with token creation and allocation, as well as module configuration.
* Allow for inter-chain token transfers by using a built-in IBC relayer to send value and data to different chains.
* Benefit from a fast-developed frontend with automatically generated APIs and web pages in JavaScript, TypeScript, and Vue.



See the official [Ignite CLI documentation (opens new window)↗](https://docs.ignite.com/), and the section on [Ignite CLI](https://ida.interchain.io/hands-on-exercise/1-ignite-cli/1-ignitecli.html) in the *Run Your Own Cosmos Chain* chapter.

When you scaffold with Ignite CLI, things like key management, creating validators, and transferring tokens can all be done through the CLI.

[#Copy link](https://ida.interchain.io/academy/1-what-is-cosmos/2-cosmos-ecosystem.html#cosmwasm-multi-chain-smart-contracts) CosmWasm - multi-chain smart contracts

[CosmWasm (opens new window)↗](https://cosmwasm.com/) is a multi-chain solution for smart contracts on the Interchain - that is the Cosm part. It is a way of using WebAssembly in the Interchain universe - that is the Wasm part.

With [CosmWasm (opens new window)↗](https://cosmwasm.com/) you can create robust decentralized applications (dApps) for the Interchain using smart contracts and building on Tendermint and the Cosmos SDK. Its key features are:

* Mature tools for the development and testing of smart contracts
* Close integration with the Cosmos SDK and ecosystem
* A secure architecture to avoid attack vectors

CosmWasm's design makes your code agnostic to the details of the underlying chains. It only requires that a Cosmos SDK application embeds the Wasm module.

With CosmWasm, smart contracts can run on multiple chains with the help of the IBC protocol. It adds further flexibility for developers and makes smart contract development faster. CosmWasm is written as a module to be plugged into the Cosmos SDK and leverages the speed of Wasm and the power of Rust. CosmWasm is ideal for Rust developers looking for a blockchain platform with fast transaction finality.



For a deeper dive, read the [CosmWasm documentation (opens new window)↗](https://docs.cosmwasm.com/docs/1.0/).

[#Copy link](https://ida.interchain.io/academy/1-what-is-cosmos/2-cosmos-ecosystem.html#the-possibility-of-using-alternative-blockchain-frameworks-and-sdks) The possibility of using alternative blockchain frameworks and SDKs

As the Cosmos SDK is modular, developers can port existing codebases in Go on top of the SDK. This allows developers to build on the Interchain without having to compromise too much on the toolset and environment used.

For example, with [Ethermint (opens new window)↗](https://github.com/tharsis/ethermint) developers can use the Ethereum Virtual Machine (EVM) from the main Go Ethereum client as a Cosmos SDK module, which is compatible and combinable with existing modules.



Ethermint is a software developed to port the EVM into a Cosmos module. It makes scalable, high-throughput, PoS blockchains possible. These are fully compatible with Ethereum and the Cosmos SDK.   
  
Ethermint is Web3 compatible, and achieves high throughput with Tendermint and horizontal scaling with IBC. It provides a Web3, JSON-RPC layer to interact with Ethereum clients and tooling.



For more on Ethermint, consult the [Ethermint documentation (opens new window)↗](https://github.com/cosmos/ethermint).

All Ethereum tools (such as Truffle and Metamask) are compatible with Ethermint. Developers can even port their Solidity smart contracts to interact with the Interchain Ecosystem. Building a chain is not necessary to develop Interchain-compatible smart contracts, it can be all done with Ethermint. However, while Ethermint allows running vanilla Ethereum as a Cosmos application-specific blockchain, developers benefit from the CometBFT.

synopsis

To summarize, this section has explored:

* The range of applications, services, and projects utilizing the Interchain Ecosystem, and the wallets and block explorers servicing them.
* How the ready-built modular components provided by the Cosmos SDK make developing new projects fast, easy, and reliable.
* How the addition of developer-authored modules and the growth of the ecosystem will support increasingly complex applications.
* The Inter-Blockchain Communication Protocol (IBC), the basis for interoperability between chains on the Interchain, and the distinction between **zones** of heterogeneous blockchains and the **hubs** which provide interoperable communication between them.
* Ignite CLI, a developer-friendly tool that shortcuts the complexities of creating application-specific blockchains.
* The CosmWasm module, a multi-chain platform for developing and testing smart contracts.
* The possibility of using alternative frameworks and SDKs within the Interchain Ecosystem, maintaining a breadth of options for developers to make use of.

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