

# Polkadot.

NETWORK

BUILDER'S  
DECK •

# BUILDING ON POLKADOT

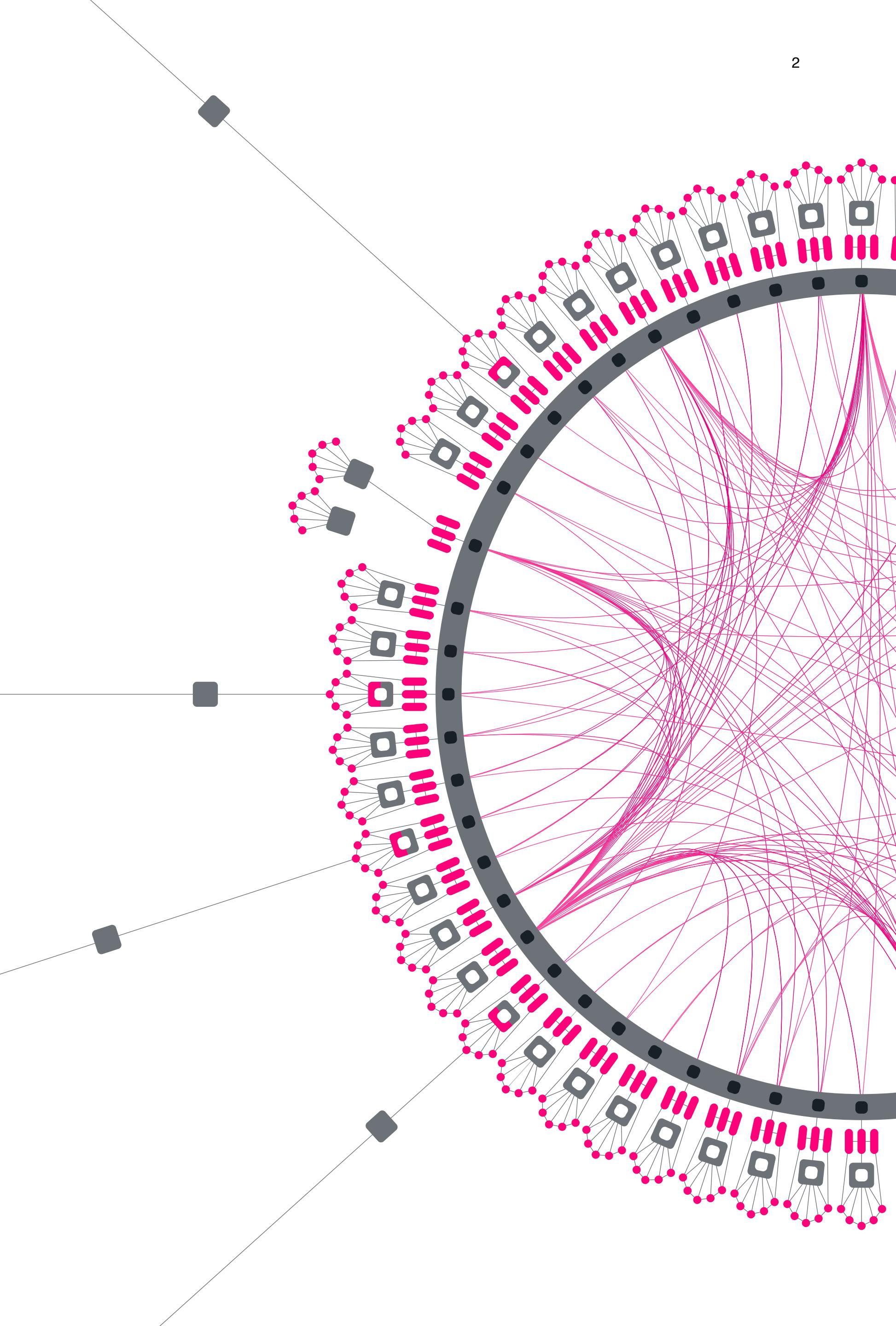
*There are several ways to build in the Polkadot ecosystem:*

## BUILDING ON SUBSTRATE

- 1 Build a **parachain** for maximum security, connectivity, and throughput (Slide 4).
- 2 Build a **parathread** for maximum security and connectivity, but lower economic barriers to entry (Slide 5).
- 3 Build an **independent Substrate chain** and connect to Polkadot over a bridge (Slide 6).

## BUILDING ON TOP OF A SUBSTRATE-BASED CHAIN

- 4 Deploy a **smart contract** or **runtime pallet** on another parachain (Slide 7).



# BUILDING ON SUBSTRATE

Your framework for building blockchains

*The Substrate runtime is the best interface to use for Polkadot integration.*

- Highly **extensible and composable**, **Substrate** allows you to build custom blockchains with maximum control and freedom while saving you time and resources.
- **FRAME**, a set of pre-built modules (“pallets”) and supporting libraries to simplify development, provides **customization and composability** to your blockchain logic. 80+ pallets have been built by Parity and the Substrate community.
- **Choose your consensus.** Substrate comes with a suite of consensus algorithms and author selection mechanisms including BABE, Aura, GRANDPA, and Proof of Stake and Work.
- **Runtime Upgrades** allow you to fix important vulnerabilities, change core rules in the protocol, add new functionality, and repair the chain state without the need for a hard fork.
- **Bridge pallets & smart contracts** allow you to gain interoperability with other chains without having to build this functionality from scratch.
- The **off-chain worker** subsystem allows execution of long-running and possibly non-deterministic tasks directly within your blockchain node to make data integration with the real world as seamless as possible.

# BUILDING ON POLKADOT

## Build a Parachain

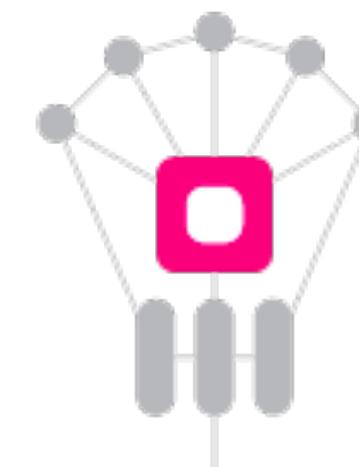
*If you build a blockchain with Substrate, connecting to Polkadot as a parachain is simple using the Cumulus library.*

### PARACHAINS BENEFIT FROM:

- + **High transaction throughput.** A parachain can submit a block to the [Relay Chain](#) for every Relay Chain block.
- + **Maximum security.** Parachains are a shard of the Polkadot network, giving them economic security guarantees equivalent to Polkadot itself.
- + **Maximum connectivity.** Parachains can exchange arbitrary data with other parachains in the network.
- + **Upgradeability.** Just like an independent Substrate-based blockchain, a parachain can perform forkless upgrades.

### SECURING A PARACHAIN SLOT:

Parachain slots are allocated to the winners of an [on-chain auction process](#). As such, it is difficult to predict the final cost of a parachain slot. The winner of a parachain slot auction locks the amount of DOT corresponding to the size of their winning bid for the duration of slot lease. These DOT are then returned to the lessee when the slot is given up meaning that contributors don't lose their principal.



# BUILDING ON POLKADOT

## Build a Parathread

*Parathreads have the same API as parachains, and can easily connect to Polkadot using the Cumulus library.*

### PARATHREADS BENEFIT FROM:

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- + **The exact same API as parachains**, meaning that your parachain can seamlessly be converted to a parathread and vice versa.
- + **Maximum security**. Parachains are a shard of the Polkadot network, giving them economic security guarantees equivalent to Polkadot itself.
- + **Maximum connectivity**. Parachains can exchange arbitrary data with other parachains in the network.
- + **Upgradeability**. Just like an independent Substrate-based blockchain, a parathread can perform forkless upgrades.

### SECURING A PARATHREAD SLOT:

Parathreads can be thought of as pay-as-you-go parachains. Many different parathreads will share a single parachain slot and only require a small, fixed DOT deposit to secure their position. As opposed to parachains, which get unlimited transaction throughput on the network, parathreads must pay per-block transaction fees, similar to Ethereum's gas model.

Since parachains and parathreads share a common API, a Substrate-based chain can move seamlessly between functioning as a parachain or a parathread. Parathreads that need more transaction throughput can easily upgrade to a parachain and parachains that lose a slot auction can easily change to a parathread.

# BUILDING ON POLKADOT

## Build an Independent, Substrate-Based Blockchain

*Independent chains can still interact with Polkadot, and have an easy path to becoming a parachain if desired.*

### INDEPENDENT, SUBSTRATE-BASED BLOCKCHAIN

- + Some chains may decide to remain an independent blockchain. An independent blockchain will **have its own finality guarantees** and may be preferable for certain use cases.
- + For example, **Kusama is an independent Substrate-based blockchain** that is configured as a Relay Chain to host parachains. It can still connect to Polkadot via a Substrate-to-Substrate bridge.

#### SECURING AN INDEPENDENT BLOCKCHAIN:

Securing a blockchain requires a robust validator or miner community and a well designed economic model. Some projects can attract and sustain such infrastructure, or need to be an independent chain for certain reasons, but most will find that a parachain or parathread is the cheaper and more secure option.

# BUILDING ON TOP OF A SUBSTRATE-BASED CHAIN

## DEPLOY AS A RUNTIME MODULE ON A PARACHAIN

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Applications that are willing to trade some amount of customizability compared with building their own Substrate-based chain can deploy their logic to other parachains that agree to host them. This method will allow for quicker deployment, lower costs, and the ability to leverage complimentary applications being developed on that platform. Deployment in this way will require close collaboration with the parachain team and/or a governance vote to integrate the runtime module into the chain.

## DEPLOY AS SMART CONTRACTS ON PARACHAINS (eg. [Edgeware](#), [Acala](#), [Moonbeam](#), [Plasm](#))

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Applications that want to be able to deploy quickly, without the cooperation of the parachain team they are deploying on, can deploy as a set of smart contracts. Project teams can either deploy to platforms such as Plasm that implement ink!, a Rust-based smart contract language, or to platforms such as Moonbeam, which will support Solidity-based smart contracts.

# INTEGRATION OPTIONS

## Comparison Matrix

	INDEPENDENT SUBSTRATE-BASED CHAIN	PARACHAIN	PARATHREAD	RUNTIME ON PARACHAIN	SMART CONTRACT ON PARACHAIN
Speed of development				✓	✓✓
Allowed logic complexity	✓✓	✓✓	✓✓	✓	
Maintenance overhead		✓	✓	✓✓	✓✓
Scalability	✓✓	✓✓	✓	✓	✓
Possible cost to deploy	✓		✓	✓✓	✓✓
Throughput	✓✓	✓✓	✓	✓	
Guaranteed Inclusion		✓✓	✓✓	✓✓	✓✓

\*More checks are better

# PATH TO INTEGRATION

## Life of a Para{chain,thread}

1

Build a Substrate-based blockchain and test it locally.

2

Deploy your Substrate-based chain as a para{chain, thread} on a public valueless testnet, [Rococo](#). This will allow you to verify the soundness of the technology before deploying it to a platform with real economic consequences.

### PARACHAIN



### PARATHREAD

3

Win a parachain slot auction and deposit your DOT to become a parachain for the duration of the lease.

3

Deposit a small amount of DOT to secure the parathread slot.

4

Once the lease is over, if you do not win an adjacent parachain slot auction then you can seamlessly transition your chain to a parathread and continue to operate indefinitely. Parachains can also transition into a parathread by giving up their slots early.

4

Parathread slots can be occupied indefinitely. If the project needs higher throughput and wins a future parachain slot auction then they can seamlessly transition their parathread to a parachain for the duration of the lease

# PARACHAIN SLOT ALLOCATION

- DOTs allocated to the auction will be locked, but **will be given back** at the end of the parachain lease if the competing chain wins the auction. They will be given back at the end of the auction if the competing chain does not win.
- On-chain auctions for slots will be conducted gradually.
- There will be 100+ parachain slots and thousands of parathread slots in Version 1 of Polkadot

## MECHANISM

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- Parachain slots will be sold at an **unpermissioned Candle auction**.
- Rather than auction parachain slots in large blocks, it's likely that slots will be **auctioned off one-by-one** so that there is only a single parachain auction occurring at any given time.

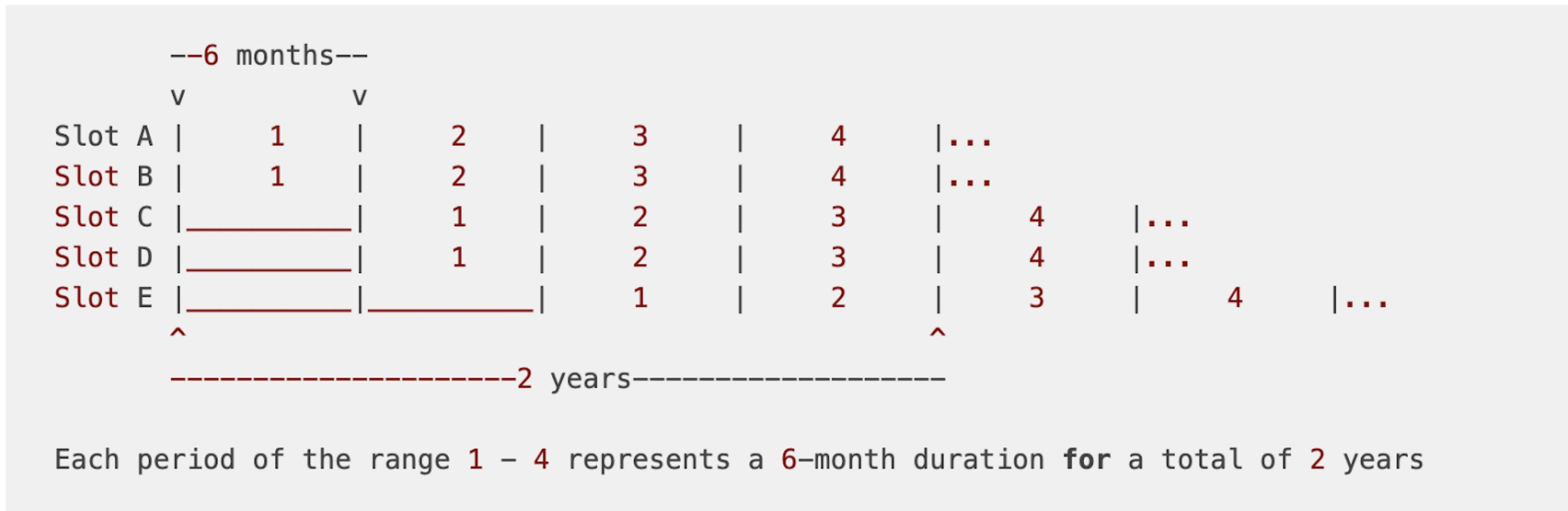
## COST

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- Since parachain lease cost will purely be a function of **market supply and demand**, it's extremely difficult to provide a meaningful estimate as to what the deposit requirement for a parachain lease will be. This amount is entirely dependent on the amount of DOT projects can allocate from internal resources and raise from external parties.

# PARACHAIN ALLOCATION

- The **duration of each lease** is between 6 months and 2 years.
- Projects can **extend their lease** by securing an adjacent slot so that they can have a maximum current lease of at most two years
- The highest bidder for a given slot lease period may not always win, because the selection algorithm will choose the bids that maximize DOT locked over a 2 year period.



# POLKADOT'S WILD COUSIN, KUSAMA



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**Kusama** is a scalable network of specialized blockchains built using Substrate and nearly the same codebase as Polkadot. You can build on Kusama as a standalone product or to prepare for deployment on Polkadot.

Compared to Polkadot, Kusama is likely to have lower economic barriers to deploy a parachain and is ideal for teams that want to deploy a project with fewer security requirements, or who have more constraints on their overall resources.

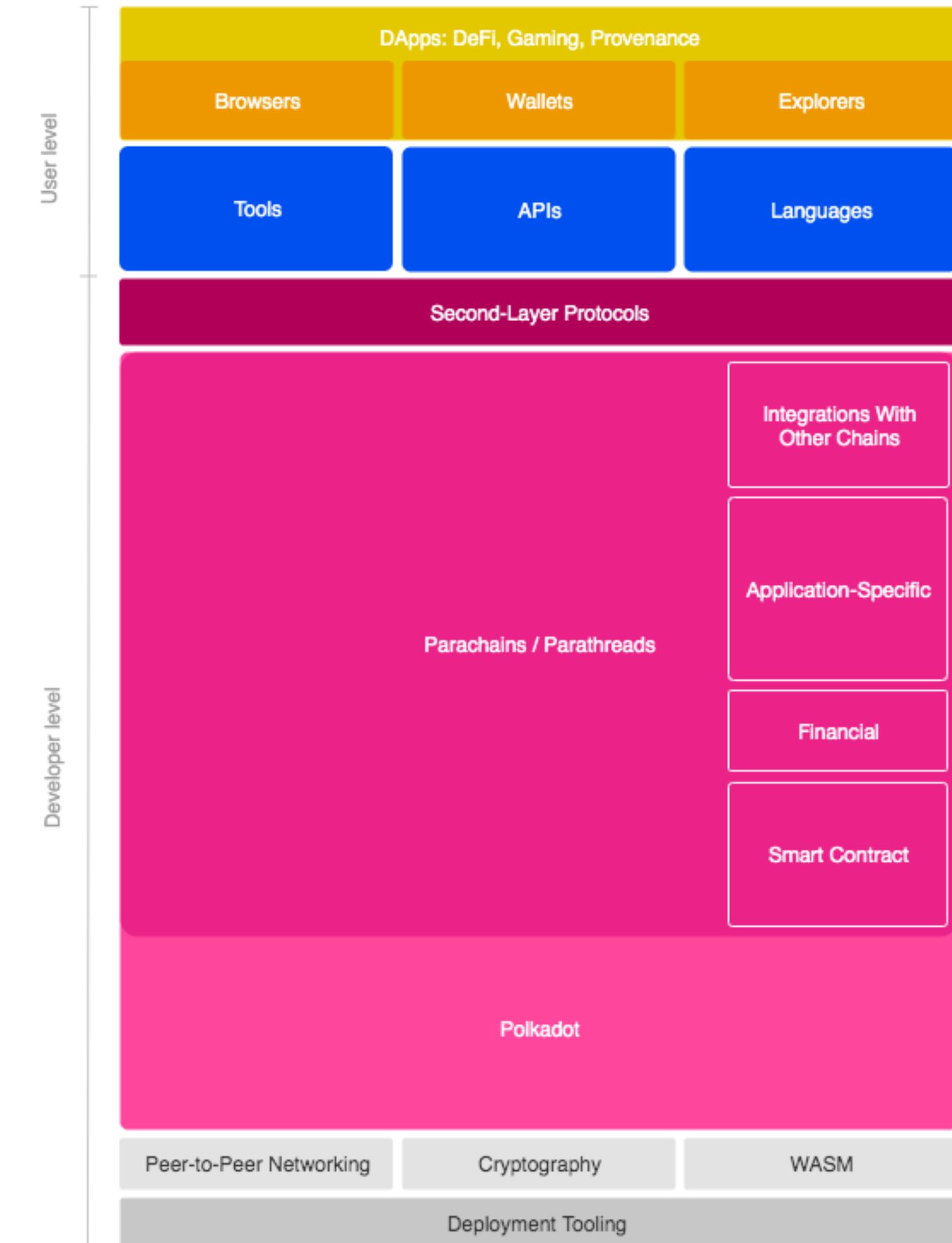
# ECOSYSTEM

Building a chain with Substrate means that you will also have wallets and infrastructure that will get your application into the hands of users.

*There are currently around 170 teams in the Polkadot ecosystem. Some of these teams will become parachains, while others are building tooling or infrastructure components.*

- [\*\*Polkaproject\*\*](#) is a community-led aggregator of teams building in the Polkadot ecosystem
- See Builders Program [V1](#) and [V2](#) announcements for some of the promising teams we providing close support for.
- The [\*\*Polkadot Tech Stack\*\*](#) repository discusses teams building at various levels of the Polkadot Technology Stack

Polkadot Technology Stack



# BRIDGES BUILDING ON POLKADOT

*Bridges are an important part of the ecosystem. They come with different trust-models and levels of centralization. You can connect your blockchain via bridges to external blockchains such as Bitcoin, Ethereum, Cosmos, and others.*

## LOW-TRUST BRIDGES:

this is the most decentralized/secure implementation but they're not production-ready yet.

- Low-Trust BTC bridge - [POC](#) complete.  
Expecting production solution in Q1 2021.
- [Low-Trust ETH bridge](#)  
Expecting production solution in Q4 2020.
- Low-Trust Tendermint Bridge - Partially completed.  
Expecting production solution in Q4 2020.

## OTHER BRIDGE INITIATIVES:

less sophisticated trust-model but largely ready today.

- Ethereum Mainnet Bridge  
- [ChainSafe ChainBridge](#)
- Bitcoin Bridge - [ChainX](#)
- [Tendermint Bridge](#)
- Kusama Bridge
- Ethereum Proof of Authority Bridge - [PoA Bridge](#)
- [Substrate <> Substrate Bridge](#)

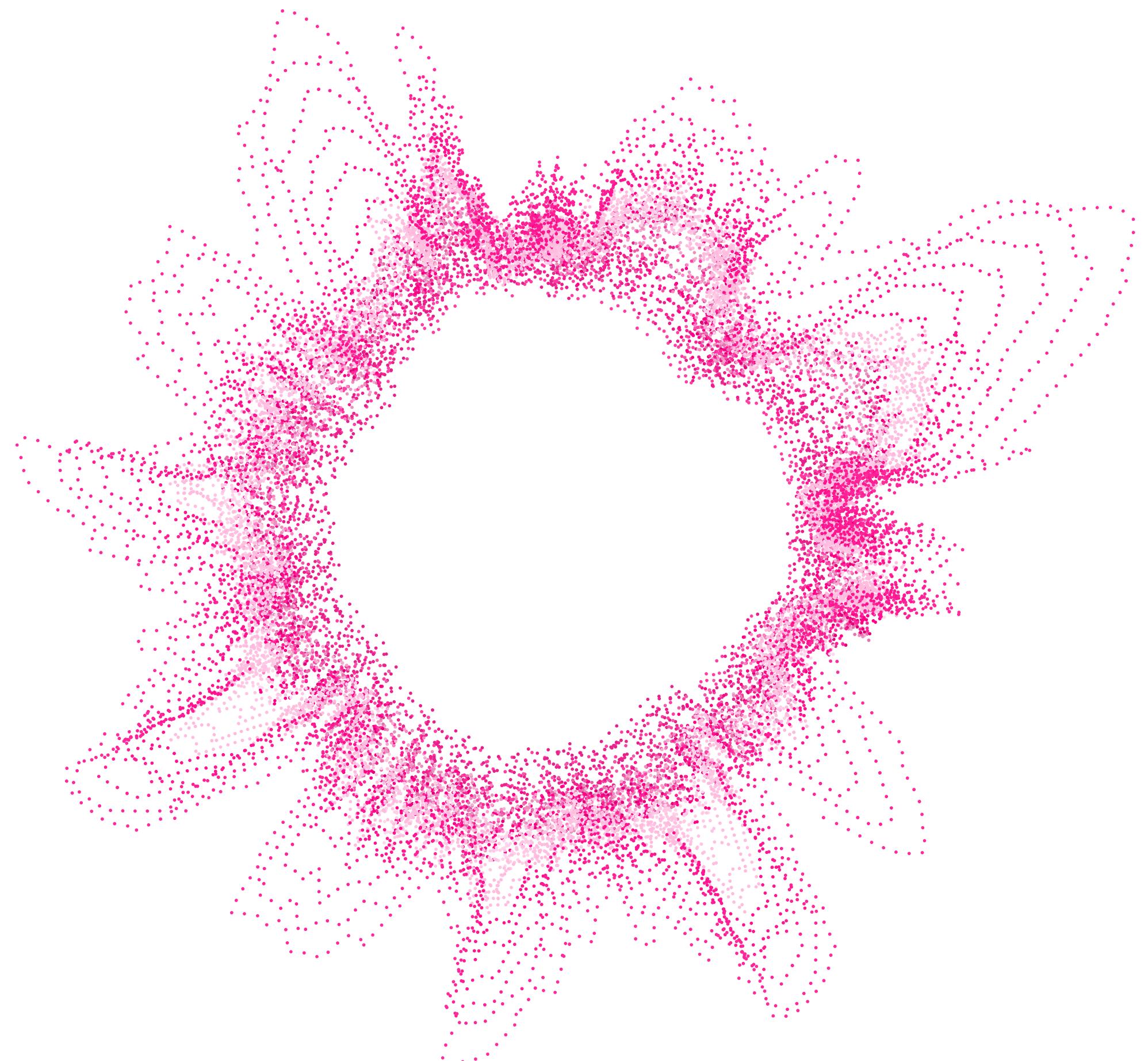
# POLKADOT INTEROPERABILITY

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# POLKADOT INTEROPERABILITY

*Polkadot provides unique guarantees about interoperability and messaging.*

- Pass asynchronous messages between parachains and parathreads using [XCMP and HRMP](#).
- Messages can contain arbitrary data, including but not limited to cross-chain asset transfers.
- SPREE adds further guarantees to messages regarding their provenance and the recipient's action.
- No messaging bottlenecks such as relayers.  
Messages transfer chain-to-chain.

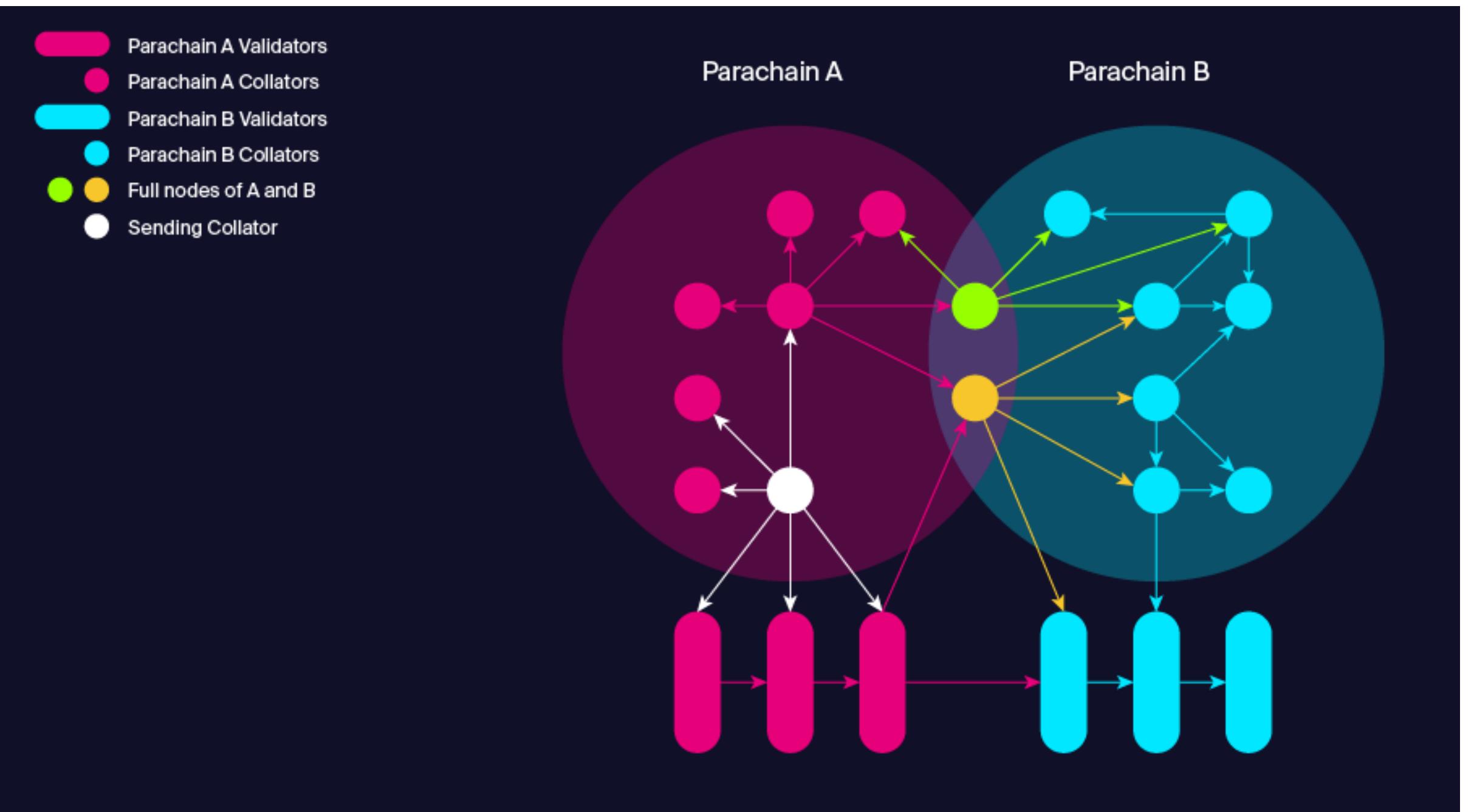


## XCMP

Allows parachains to message each other without having the message relayed via the Relay Chain. Messages are passed through the gossip network and put on transaction queues in both chains.

## SPREE

Fragments of logic comparable to runtime modules on Substrate, but live on the Polkadot Relay Chain and may be opted into by parachains. These ensure that message logic gets shared between parachains, so that parachains can agree on what a certain message, such as a token transfer, means.



# MESSAGING WITH THE RELAY CHAIN

## VERTICAL MESSAGING

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Messaging between the parachain and the Relay Chain. Messages either go “up” to the Relay Chain from parachains or “down” to a parachain from the Relay Chain.

## HORIZONTAL MESSAGING

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Allows parachains to message each other, but only by first messaging from parachain to Relay Chain and then Relay Chain relaying the message to the other parachain. This is a precursor to XCMP and will be retired once XCMP is complete.

# PARACHAIN FUNDING OPTIONS

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# MESSAGING WITH THE RELAY CHAIN

*Parachain economics are fundamentally different from other blockchain models.*

## PRINCIPAL

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Because parachains are allocated via *locked* tokens, contributors don't lose their DOT tokens. The cost of a parachain slot is limited to the potential staking rewards for those funds. Contributors will always be able to recover their principal in the future.

## TOKEN DESIGN

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Independent blockchains need high token inflation to create incentives for a secure validator community. Because parachains get their security from Polkadot, your token economics are not bound by creating inflationary policies.

# PARACHAIN FUNDING: AN EXAMPLE

*Consider a potential parachain that wants to raise funds and design its native parachain token economics.*

## FUNDING

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**Funding target:** 3 million DOT to bid for a parachain slot (note that this number is for illustration purposes only and may not approximate the actual number, which will be based on parachain slot supply and demand).

**Cost:** 3 million DOT has an opportunity cost of 450,000 DOT for one year of staking returns.

## MAINTENANCE

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**Collator network:** Assume 30 collators (this number is on the high side).

**Cost:** About 2,000 USD/collator/month, or 540,000 USD per year. Therefore, your token inflation mechanism should provide at least this value to collators in block rewards or other. Based on a 40M USD market cap at a 10% annual inflation rate, this would constitute only 13% of the annual token inflation rate.

## COMPARISON

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Other projects pay millions in inflation costs that dilute their token holders:

- Solana is exploring an initial 5-10% **inflation**. At a market cap of \$100m, that's 5-10 million USD/year.
- Networks that don't pay enough inflation **lose their validators**, as happened to Loom Network.
- In September 2020, Uniswap users paid \$12.7m in **gas fees**, for access to a shared platform.

**Building on Polkadot is cheaper, more secure, and more sustainable than other options.**

# METHODS TO RAISE DEPOSITS

## Crowdfunding Module

Use the [crowdfunding module](#) deployed to the Polkadot Relay Chain to securely accept DOT loans.

- DOTs in this account can ONLY be used for parachain bonding.
- Projects are not able to transfer DOTs out of this account.



If your project is **able to secure** enough contributions to win the auction

The DOT loans will be returned to the contributor at the end of the parachain lease period



If the project is **unable to secure** enough contributions and the auction is lost

The DOTs will be returned to contributors immediately

# METHODS TO RAISE DEPOSITS

## Polkadot Treasury



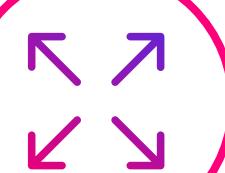
A **council-governed pot** of funds that can be allocated towards projects.



The pot is collected through transaction fees, slashing, and staking inefficiencies.



Recommended for projects who add value to the network, where it makes sense to fund with Polkadot funds.



Recommended in conjunction with seeking other forms of fundraising.

As of Feb 16, 2021, there were **12,098,000 DOT** in the treasury.

# ROADMAP

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# ROADMAP 2020 and Beyond

## Polkadot.

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Mainnet has launched and balance transfers have been enabled. The next runtime upgrades will add in the features of XCMP, SPREE, and parachain auctions.

- PoA - launched May 2020
- NPoS - enabled June 2020
- Sudo Removed - completed July 2020
- Balance Transfers - August 18, 2020

Coming next:

- XCMP
- Parachain Auctions

# Questions?

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