

Tezos Amendment Process



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Introduction





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Introduction

Tezos stands out from previous-generation blockchains on 3 characteristics:

- 1. The on-chain governance layer that enables self-amendment of the protocol in response to successive on-chain amendments proposals
- 2. The LPOS (Liquid Proof Of Stake) consensus model
- 3. The Michelson virtual machine which enables formal verification of smart contracts

The aim of this document is to offer a detailed view of the on-chain governance model by going through the process used to consider protocol amendments.

Definitions of main concepts

Definitions of main concepts

- **Baking :** The creation of new blocks on the Tezos blockchain by its validator nodes (aka "bakers"), who receive compensation for each block produced.
- **Endorsement**: Each baked block is validated by other bakers who have not baked the block. These are known as endorsers of the block, and they receive compensation for this.
- **Delegation**: All holders of XTZ cryptocurrency can delegate their baking and voting rights to a baker called a "delegate", while still maintaining control of their funds.
- **Roll**: All holders of XTZ cryptocurrency can delegate their baking and voting rights to a baker called a "delegate", while still maintaining control of their funds.
- **Cycle** : The time required for 4,096 blocks to be created on Tezos; usually this is 2 days, 20 hours and 16 minutes (or 1 minute per block, if all bakers cooperate effectively)
- Proposal : A request for an addition, adjustment or removal of a feature of the protocol.

Amendment process





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Amendment process

On Tezos, any baker can put forward a proposal to amend the protocol.

The proposal/voting process then takes place entirely on-chain, and is known as the **amendment process**.

This process involves 5 stages:

- 1. Proposal
- 2. Exploration Vote
- 3. Cooldown
- 4. Promotion
- 5. Adoption



As each period lasts **5 cycles (approx. 14 days)**, a complete amendment process requires **25 cycles**, or around **2 months and 10 days**.

First period: Proposal



First period: Proposal

First period - Proposal (Cycles 1-5)



Cycle 1-5: Bakers can submit and/or vote for proposals

During this period, the bakers can submit **up to 20 amendment proposals** which are then subjected, over subsequent periods, to voting and testing.

Proposals can relate to a variety of features, for example :

- The size of a roll
- The gas consumption process
- Aspects of the smart contract language
- and so on...

Bakers across the network then proceed to vote (in the form of up-voting). The most highly voted proposal then moves on to the **Exploration** period.

Second period - Exploration

Second period - Exploration Vote (Cycles 6-10)



During this period, all voters must decide whether or not the proposal brought forward will proceed to the next period: **the Testing period**. Unlike in the previous period, Tezos uses **the concepts of Quorum and supermajority vote** – or qualified majority vote – to decide whether or not to send it to the testing period.

What we mean by these terms :

- Quorum : the representation weight required for a vote to actually take place.
- A super-majority vote or qualified majority vote establishes a minimum percentage of positive expressed votes needed (80% for Tezos) for a decision to be passed.

In order to move to the next period, a proposal must have a greater Voter Turnout than the Quorum and a greater percentage of positive votes than the supermajority.

Voting during the Exploration period (Cycle 6-10) 1/2 Calculating the Quorum:

When the Tezos Mainnet was launched, the Quorum was set at 80% and updated at the end of each vote which was successfully approved, based on the Voter Turnout.

The Babylon amendment introduced two major changes to the calculation of the Quorum:

- The calculation now takes into account the exponential moving average (EMA) of the Voter Turnout
- The Quorum is now bounded between 30% and 70%

The following formula is used to calculate the Quorum:

 $Quorum = 0.3 + MME_t * (0.7 - 0.3)$

The following formula is then used to update the moving average for the next vote:

 $MME_{t+1} = 0.8 * MME_t + 0.2 * Participation_t$

Voting during the Exploration period (Cycle 6-10) 2/2 Voting system:

There are 3 possible ways to vote :

- 1. Yays (Y) : For
- 2. Nays (N) : Against
- 3. Abstains (A) : Neutral

To vote each active baker on the network must have at least 1 roll. Currently, one roll equals 8000 XTZ. Each holder of the XTZ cryptocurrency (whether or not reaching 1 roll) can delegate their "associated voting right" to a baker, while retaining control of their funds.

The weight of a baker's vote is determined on a pro-rata basis by the number of rolls they represent. **The more XTZ a baker has, the greater the weight of their vote**.

Voting examples 1/2

3. Positive voter turnout: = 88%

To illustrate this process, let us assume a total of 100 active rolls managed by bakers and a Voter Turnout EMA of 75%, and then 90 votes (Yay, Nay and Pass) during the Exploration period. **Exemple 1**:

1. Quorum = 0.3 + 75% * (0.7 - 0.3) = 60%



2. Update of the Exponential Moving Average

 $EMA_{t+1} = 0.8*75\% + 0.2*90\% = 78\%$

- Including: $75\% = EMA_t$ 90% = Voter Turnout
- 4. Proposal approved





Voting examples 2/2

To illustrate this process, let us assume a total of 100 active rolls managed by bakers and a Voter Turnout EMA of 75%, and then 55 votes (Yay, Nay and Pass) during the Exploration period.

Example 2 :

1. Quorum
$$= 0.3 + 75\% * (0.7 - 0.3) = 60\%$$



2. Update of the Exponential Moving Average

 $EMA_{t+1} = 0.8 * 75\% + 0.2 * 55\% = 71\%$

Including: $75\% = EMA_t$ 55% = Voter Turnout

3. Proposal rejected

Although the Yays have reached the number required for a supermajority, the proposal is rejected as the Quorum has not been reached. We must therefore go back to the initial proposals stage.

Third period - Cooldown



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Third period - Cooldown (Cycles 11-15)

Cooldown period

Cycle 11-15: The only purpose of this period is to let some time elapse before the promotion period.

If a proposal is accepted by a supermajority during the Exploration period, the Cooldown period will begin. This period replaces the previous Testing period that was underused since most of the testing happens on a dedicated testnest.

Fourth period - Promotion



Fourth period - Promotion

Fourth period - Promotion (Cycles 16-20)



At the end of the Cooldown period, the network decides whether or not to adopt the amendment proposal, based on off-chain discussions and its behavior on the test network.

The same concepts of both the Quorum and the supermajority are applied here.

After the vote, the Voter Turnout moving average is updated again.

The version of the protocol integrating the amendment is then disseminated by the network and transmitted to the nodes, which are automatically and openly updated.

Fifth period – Adoption



Fifth period – Adoption

Fifth period – Adoption (Cycles 21-25)

Adoption period

Cycle 21-25 : Bakers update their infrastructure

During the adoption period, bakers update their infrastructure. At the end of this period, the new protocol will be adopted. This period is dedicated to help validators to migrate on the new mainnet version.



End of process



End of process

At the end of the Promotion period, we return to the Proposal period.

The person whose proposal is ultimately adopted as a protocol amendment has the merit of having evolved the Tezos blockchain, and **is compensated in XTZ by an amount determined beforehand in the source code of their proposal**.

Record of amendments



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Record of amendments (1/2)

- 1. May 2019, Athens amendment :
 - Reduced roll size for bakers (from 10,000 to 8,000 XTZ) (10000 à 8000 tz)
 - Increased gas limit per operation and per block
- 2. October 2019, Babylon amendment:
 - Adjusted "emmy+" consensus algorithm
 - New features in low-level language (Michelson) for smart contracts, adjusted cost of gas
 - Adjusted formula for updating Quorum (30% \leq Quorum \leq 70%)
- 3. March 2020, Carthage amendment:
 - Increased gas limit per operation and per block
 - Improved formula for calculating compensation for baking
- 4. November 2020, Delphi amendment:
 - Reduced storage costs by 4
 - General recomputation of the gas costs

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Record of amendments (2/2)

- 5. February 2021, Edo amendment:
 - Inclusion of Sapling protocole
 - New Michelson data structure : tickets
 - New Michelson functions, especially hash functions SHA3 et Keccak
 - Updating of the amendment protocol :
 - A fifth period to allow bakers to update their infrastructure : The adoption period
 - Reduction of the overall time of each period, from 8 to 5 cycles

6. May 2021, Florence amendment:

- Increase maximum operation data size
- Depth-First execution order
- Performance optimization
- Updating of the amemdment protocol: testing period is now replaced by a cooldown period

On-chain governance reduces the risks of hard forks



On-chain governance reduces the risks of hard forks

The development of Bitcoin has shown that hard forks are necessary in order to make changes to a protocol.

There are risks involved here, as two chains can co-exist if a consensus can not be reached within the community, which can then lead to operational risks for some blockchain projects.



However, whenever a critical bug is found, the protocol must be updated urgently – for Tezos just as for Bitcoin. However, this type of situation has never led to a chain splitting into two, as this type of change is always driven by consensus.

How to vote ?



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How to vote?

It is possible to vote by using the Tezos client :

To know the current period :

\$ tezos-client show voting period

To vote for the proposal whose hash is <proposal> with the address <delegate>:

\$ tezos-client submit ballot for <delegate> <proposal> <yay|nay|pass>

Kiln is a tool often used by bakers, owns a grpahical interface to vote.

Summary diagram of the amendment process



Summary diagram of the amendment process



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https://tezos.com https://developers.tezos.com

