Update Patch Notes

Overview

This patch will bring the following changes to Matrix AI Network:

1. Adjustments to the penalty policy;
2. Adjustments to the difficulty algorithm;
3. More search space for POW mining;
4. Bug fixes

Penalty Policy

In the current version, mining nodes that are elected but fail to report their base compute will get blacklisted and lose all rewards for that round.

The new patch will raise the penalty for backlisted mining nodes. If blacklisted, your node is also unable to become a candidate mining Masternode for the next election cycle.

Difficulty Adjustment Algorithm

We have found two flaws in the current version:

1. Difficulty level drops when a new validation leader is elected.

If there is a new validation leader in one mining cycle (the time for generating 3 blocks), this mining cycle will take longer to finish, and difficulty for mining the following block will lower down. (The validators take turns to generate blocks, and a validator which has generated a block is considered the validation leader of that block.) Therefore, the increase in mining time caused in this way has nothing to do with the actual computing power. (In fact, a problem with one validator can cause this to happen repeatedly to the point where difficulty adjustment fails. As a result, the difficulty level will be too low for miners to make full use of their computing power.)

When this happens, it is impossible to know a miner's actual mining time. Therefore, when calculating the difficulty level, we'll use "expected block-generation time" as the intermediate solution in place of the actual time.

2. In the quick setup and the tracking stages, mining difficulty is slow to stabilise due to lack of synergy.

Currently, the difficulty adjustment algorithm on the mainnet goes through two stages：

(1) **Quick setup**: Quickly establish an algorithm for the first ***n*** mining cycles. Adjust difficulty level exponentially to increase the estimation accuracy.

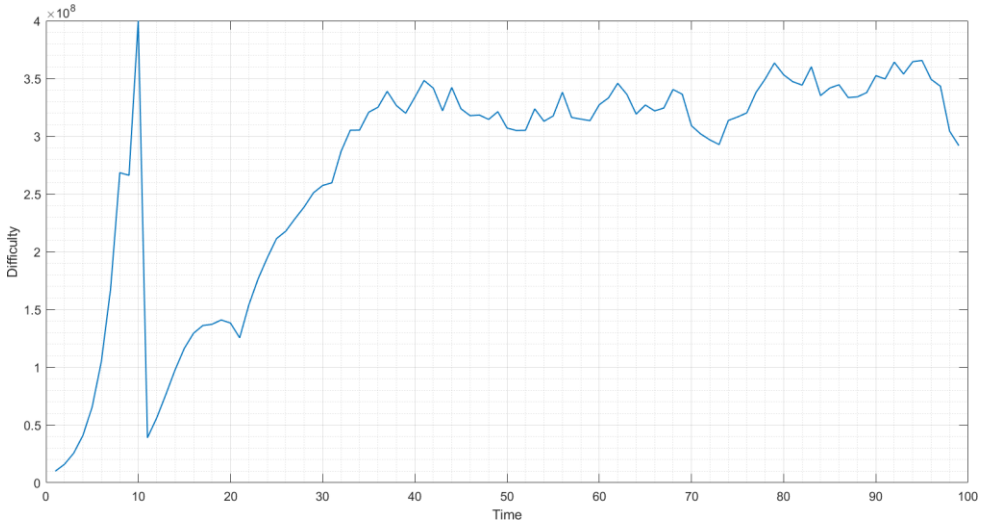
(2) **Tracking**: Use exponential weighted moving average to track compute change through the mainnet.

In the current version, when calculating an exponential weighted moving average, the block information (difficulty level and time) of the **quick setup** stage will be used at the beginning. This information is not an accurate reflection of computing power. But since the last block of the **quick setup** stage contains relatively accurate information, in the new version, we'll use this information instead of trying to get the difficulty level in other ways, when the calculating exponential weighted moving average.

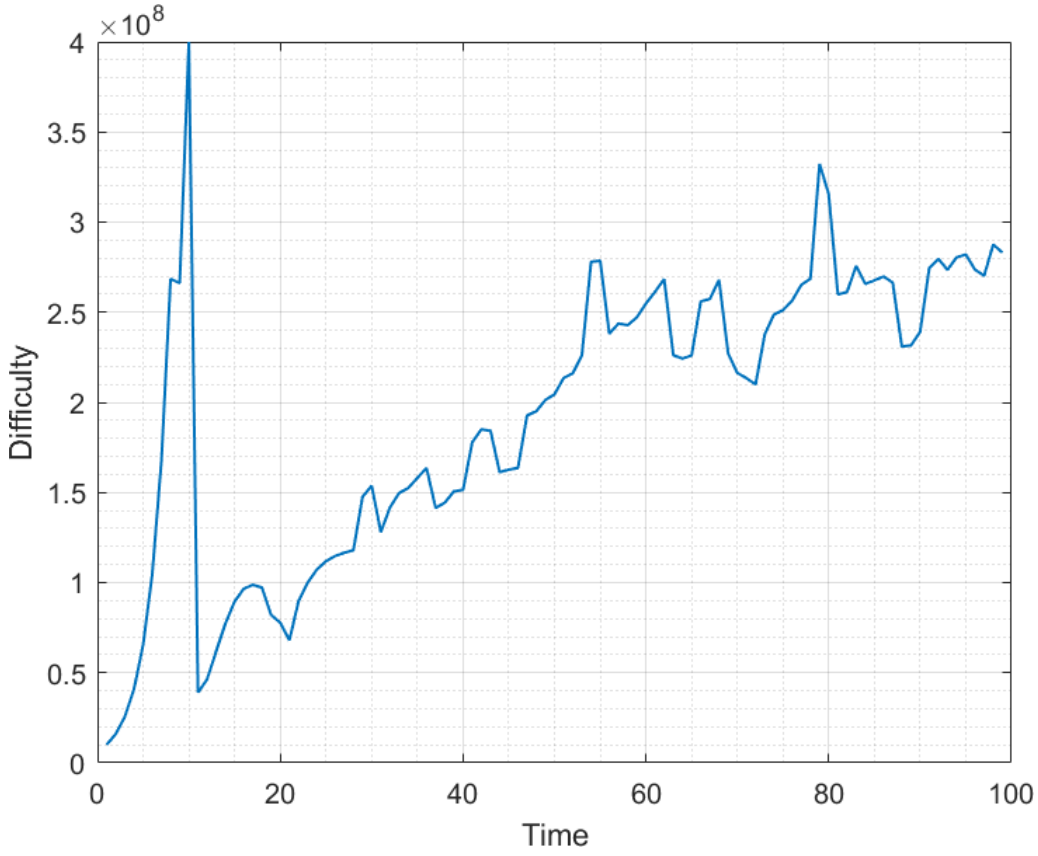
Algorithm Adjustment Result Analyse

We tested the effects of these adjustments under the same level of difficulty and computing power, with validation leader rotation either enabled or disabled. The results are as below.

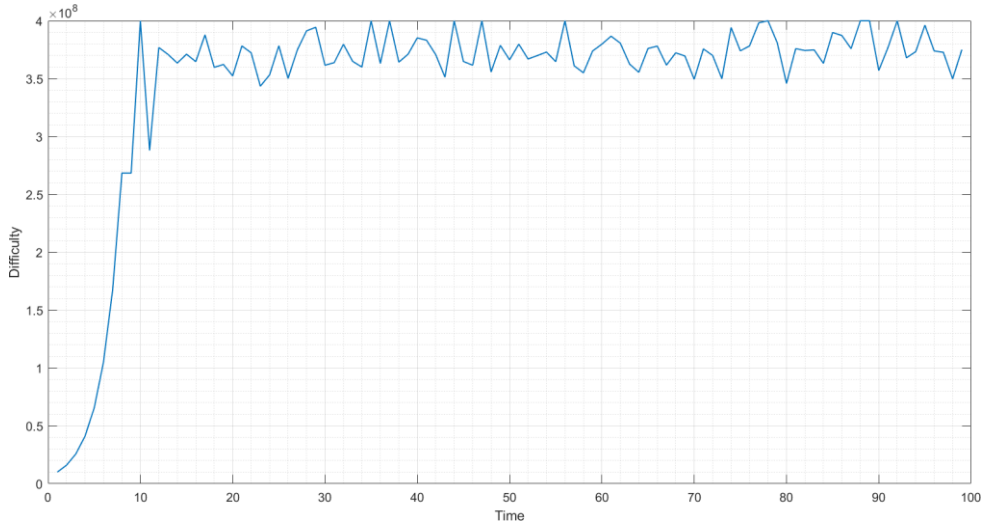
1. Chart One: difficulty adjustment in the current version with validation leader rotation disabled



2. Chart Two: difficulty adjustment in the current version with validation leader rotation enabled



3. Chart Three: difficulty adjustment in the new version with validation leader rotation disabled



4. C

hart Four: difficulty adjustment in the new version with validation leader rotation enabled

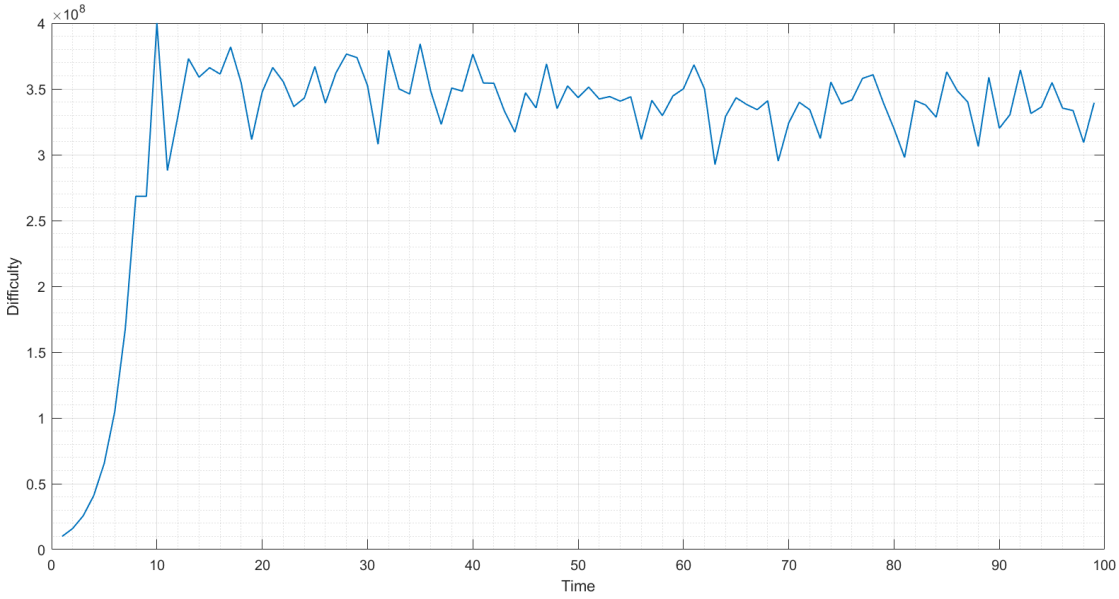


Chart One shows that in the current version, the difficulty level will see a dip after quick setup before rising again slowly, and it takes time for the level to stabilise.

Chart Three shows that in the new version, difficulty level stabilises much faster after quick setup. This proves that the fixes we introduce are effective.

Comparing Chart One and Chart Two, we see that, with validation leader rotation enabled, not only does difficulty go up more slowly, it will also end up at a lower level than in Chart One. Comparing Chart Three and Chart Four, we see that, under parameters identical to those in Chart Two and with validation leader rotation enabled, there isn't an obvious change in the speed at which difficulty level goes up. Although the final difficulty is still lower, the difference is not big. This shows that the patch will effectively control the impact of validation leader rotation on difficulty calculation.

Parameter Changes

We have made changes to some parameters of the difficulty adjustment algorithm based on the current mainnet performance.

Parameter	Current Version	New Version
Block-generation Time（sec）	11	12

Parameter	Current Version	New Version
Difficulty at the Beginning of Election	10 million	20 million
Minimum Difficulty	2 million	15 million
X11 Maximum Difficulty	400 million	No Maximum Difficulty
SM3 Maximum Difficulty	400 million	400 million

More search space for POW mining

In the current version, the search space for POW mining is only 4 bytes large. When the difficulty level is too high, an ideal target value may not be found after searching the entire space. In the new version, we'll add a 12-byte space, at the initial 12 bytes of the **mixDigest** field of a block head.

Bug Fixes

The new version will introduce the following bug fixes.

1. In the current version, validators in the mainnet only accept mining results that are one block higher than the local height. When the POW mining difficulty is too low, this can cause mining results to arrive two blocks earlier. In consequence, miners with greater computing power may not see their mining results accepted. This bug will get fixed with the patch.

2. In the current version, the nonce cannot be 0 for CPU mining. This bug will get fixed with the patch.

3. In the current version, the P2P module does not lock up visits to the map using certain codes, causing the system to crash sometimes when there are too many connected nodes. This issue will get fixed with the patch.

Notice

1. Miners are responsible for keeping their nodes in good running condition. If an elected node fails to report its base compute, not only will it lose all rewards for the current mining cycle, it will also be excluded from the next election round.

2. Our experiments show that a 40-core CPU is no match for the Apocalypse in computing power and has no chance of generating blocks. To guarantee your profitability, it is recommended to use the Apocalypse for mining, become a staked validator or enter joint mining to earn validator rewards.