

# Blockchain Technical Blueprint

<https://alienworlds.io/>

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## Preamble

***It's 2055 — some of Earth's inhabitants have discovered a way to escape the raging pandemics on Earth.***

*The most advanced bitcoin mining community — the Federation — noticed a pattern in its algorithmic solutions. An advanced Alien race was sending messages through bitcoin mining algorithms, and the messages led to a big discovery.*

*A wormhole that allowed humans to travel to far flung exoPlanets.*

*The Federation travelled through the wormhole, gathering a unique supply of hyper rare Trilium as it went. The Federation's Trilium is the only supply in existence, and has a provable limited quantity. On the other side they found a new interstellar network with many inhabitable planets.*

*Today there are six planets within the Federation of Alien Worlds and a Metaverse is emerging where virtual and real worlds collide. To build a fair economy, everything in the Alien Worlds Metaverse was tokenised - from the Avatars explorers walk around in, to the Tools, and Weapons, explorers use in their daily adventures. Even Land, Minions and Artifacts have been tokenised and associated with an ancient Alien AI infrastructure.*

*Some enterprising explorers mine to earn their share of Trilium and unique items, some like to fight in the arena, while landowners rent their land to build new products and services to offer to the galaxy. The Federation also sends items to hard working explorers, to assist in their endeavours.*

*However, there are mysterious alien forces around ...*

*And so your story begins ...*

*Make your own destiny ...*

# Purpose

Alien Worlds is a decentralised metaverse (i.e. extensible platform) running on the Ethereum, WAX and Binance Smart Chain blockchains. The metaversal currency - Trilium (token symbol TLM) - incentivises explorers to play games and must be staked by users to participate in governance. Planets within the metaverse are decentralised autonomous organisations which receive daily Trilium from the central metaverse smart contracts. Explorers engage through mining, acquiring and renting land, voting for Planetary governance to impact Trilium and NFT (Non-Fungible Token) payouts, and other strategic actions which are likely to proliferate over time as Planets offer their own games and NFTs.

Explorers use rare and unique NFTs in their quest to earn more of the native token of the game, Trilium, and grow their influence.

More Planets can be created; this is intended to be done in a manner so as not to penalise existing Planets. Planets are the means by which blockchain communities can onboard onto Alien Worlds, get their own token and DAO, offer games and services into the ecosystem, and create and use NFTs.

# Blockchain

Alien Worlds runs on the Ethereum, WAX and Binance Smart Chain (BSC) blockchains. Ethereum is a useful blockchain for storing and accessing Trilium, whilst WAX is a game and NFT-focused blockchain. BSC is an attractive consumer-centric chain with a growing user base and inexpensive transactions.

## On chain components include:

- Trilium token
- All non fungible tokens
- All core game play including the mining game, missions game, future game actions such as fighting and quests
- DAO governance and voting including staking
- Database of Planets and gaming reward/inflationary distribution mechanism

## Off chain elements include:

- Graphical elements including of NFTs (avatars and other gameplay modifying NFTs)
- User interfaces

This document describes a project in development and is being regularly updated

- Pack opening
- DAO management interface
- Mining and Missions game interfaces
- Additional games and activities that are not part of the core distribution of TLM and/or NFTs

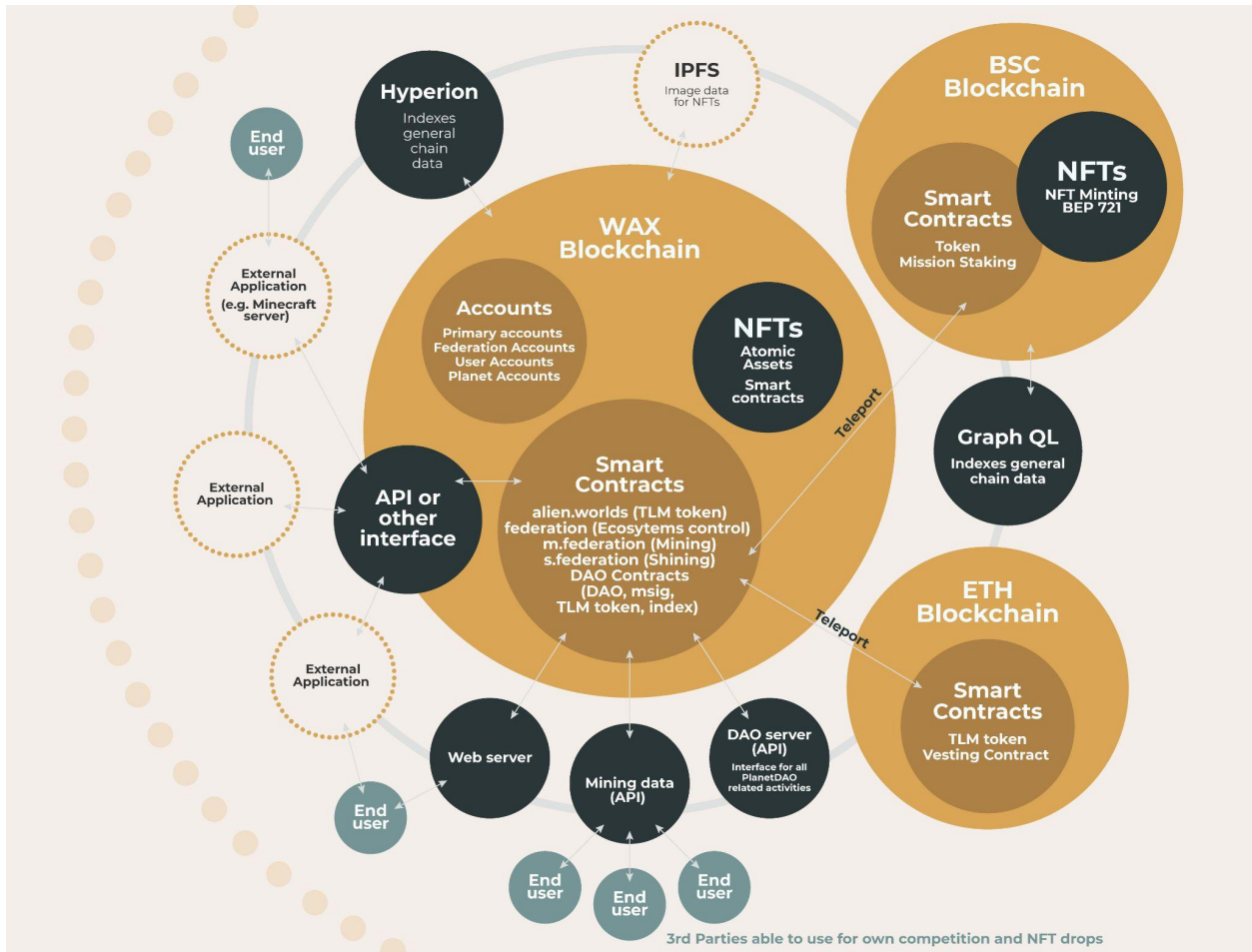


Figure 1: technical architecture

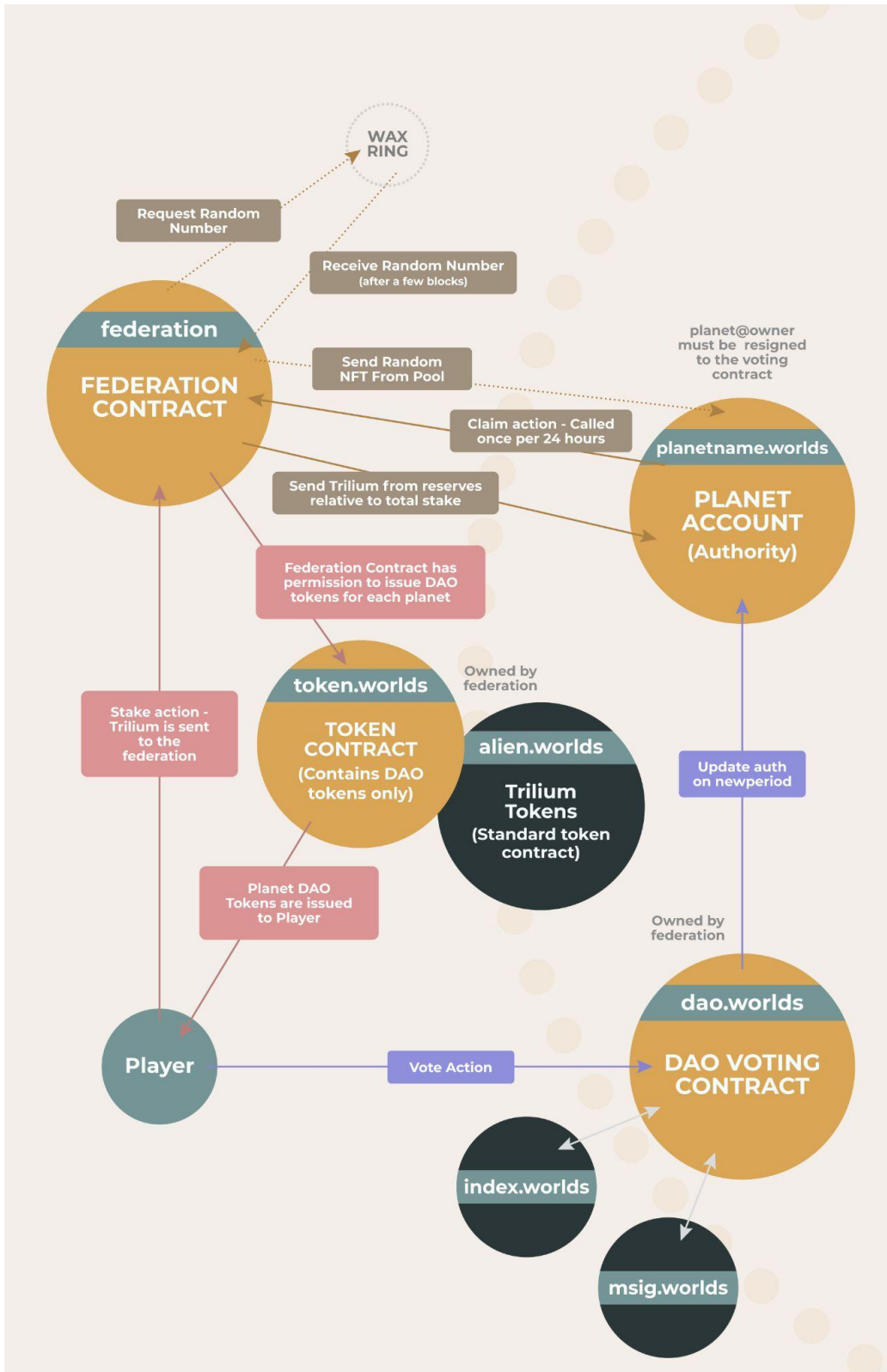


Figure 2: core game logic on WAX



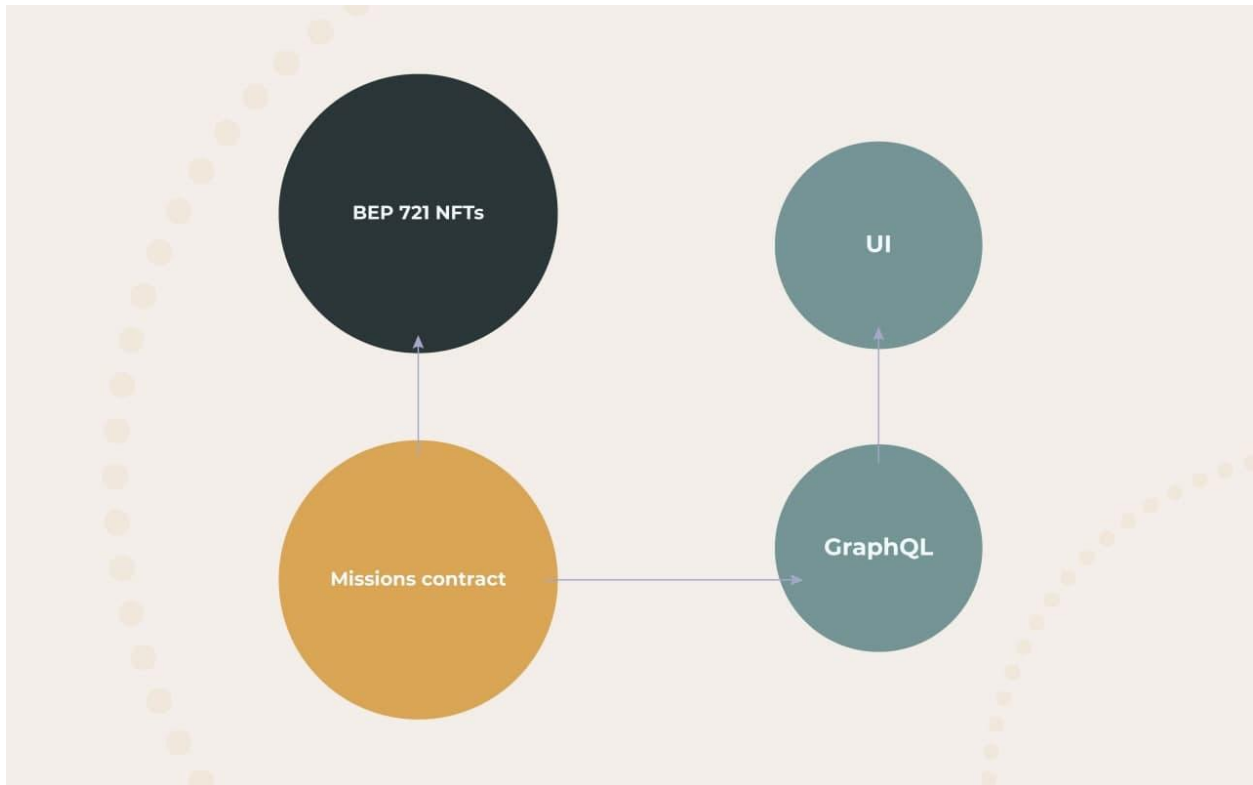


Figure 3: initial game functionality on BSC

## Metaverse elements

### Planets

Planets are the main locus of activity within Alien Worlds - they are where mining and game play occurs, and where governance happens. Each Planet sets its own resource strategy and games, and players vote for their own Planetary government with the power of their staked Trilium.

- At inception there are 6 Planets (Eyeke, Naron, Magor, Neri, Kavian and Veles) plus Planet B
- A Planet is represented by a WAX account and its corresponding smart contract
- The Federation will provide the Planets with smart contracts to run their mining and mission game
- Planets receive a daily flow of Trilium from the Federation which the Planets' Custodians choose how to allocate down to users

- Planets within Alien Worlds, except Planet B, are Decentralised Autonomous Communities (DAOs)
  - Each Planet is a DAO with a dedicated member client portal for Planet token holders to vote for their Governors and allocate Trilium and NFT flows

## Planet B

Planet B is the Planet on the Binance Smart Chain which does not have land and therefore does not offer mining. Planet B (represented on WAX as bina.world) receives a flat allocation of 2.4m TLM per month, to disseminate in its Missions game on BSC Chain.

## Membership of Planets

Users become a voting member of a Planet by staking Trilium to that Planet. Users can stake Trilium to an unlimited number of Planets.

## Staking to a Planet

- When a user stakes Trilium to a particular Planet (sends Trilium to a contract address), the contract sends a token for that Planet back to the user
- Therefore, each Planetary DAO's token has a corresponding amount of Trilium staked
- Each Planetary DAO's tokens can be swapped back 1:1 into Trilium at any time, immutably by smart contract
- The Planetary DAO's token becomes the token governing that user's membership of a Planetary DAO

## Planet Treasury

The Trilium or NFT balance held by the Planet DAO.

## Satellites

Satellites are user-created DAO worlds that orbit a Planet in the Alien Worlds metaverse. They are highly scalable and flexible, allowing any number of users to create their own DAO, the governance of which is controlled by the token created at DAO inception.

## Purpose of Satellites

Satellites provide communities a home within Alien Worlds, where Satellite communities can organise their activities, compete with other Satellites, earn TLM rewards and develop new games, NFTs, lore and other community efforts. Participation in Satellite games requires staked TLM.

At creation of a Satellite, the creator defines the following DAO parameters:

- Token supply
- Token distribution at genesis
- Governance parameters such as voting approval thresholds, number of Custodians, and periodicity of elections

## Games for Satellites

Games will be available for Satellites to run in their accounts.

## Relationship of Satellites to Planets

Satellites specify one of the 6 DAO Planets in Alien Worlds (Kavian, Neri, Magor, Naron, Veles, Eyeke) to orbit.

Games played by the Satellites require their equivalent (orbited) Planet DAO token to play. Creators and supporters of Satellites must stake TLM to obtain Planet DAO tokens to participate in these games. By having active Satellites in its 'orbit', a Planet therefore keeps at least 20% of the TLM rewards allotted to it because of Planet DAO tokens used in the Satellite games.

## Daily Trilium Allocation (DTA) from inflation

New tokens are minted by the smart contract "alien.worlds" through an inflation mechanism as illustrated in [this table](#); new tokens never cease to be minted as the inflation mechanism declines as a percent of supply over time.

All the new tokens minted from inflation become the Daily Trilium Allocation.

The intention of the Daily Trilium Allocation is to disseminate Trilium to users continuously, rewarding activity that grows the metaverse.

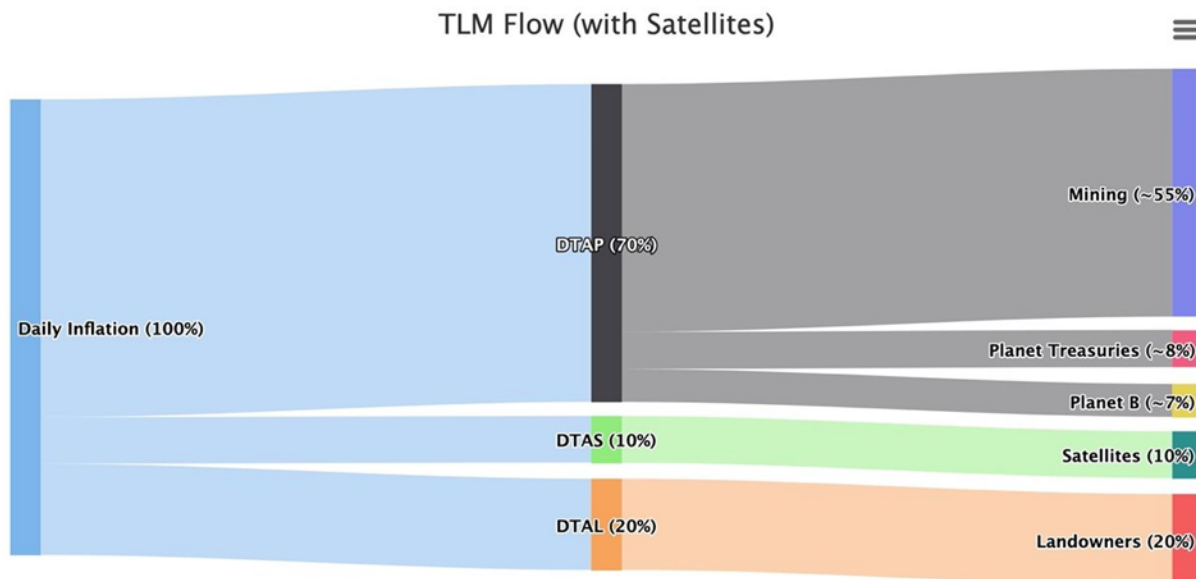
$$\text{Daily Trilium Allocation} = \frac{\text{RESERVE} * (13 + (\text{NOP} * 1.9))}{100000}$$

**Variables**

**NOP** = Number of Planets<sup>1</sup>

**RESERVE** = Trilium still held in the Federation Trilium release account (5bn at inception)

80% of this Daily Allocation goes to Planets and Satellites via the Daily Trilium Allocation to Planets and 20% goes to Landowners via the Daily Trilium Allocation to Landowners.



<sup>1</sup> If a new Planet were to be added, slightly more Trilium would be released overall per day. This is necessary to prevent existing Planets from being reluctant to allow new Planets to join the metaverse.

Indicative DTA flows

(eg at October 2022, values decline over time)

Type	TLM	% DTA
DTAL (20%)	221,333	20%
DTAP (approx 70%)	771,837	70%
<i>Planet B</i>	<i>80,000</i>	<i>7%</i>
<i>Planet Treasuries</i>	<i>90,240</i>	<i>8%</i>
<i>Mining</i>	<i>601,598</i>	<i>54%</i>
DTAS (approx 10%)	113,493	10%
DTA	1,106,663	100%

*Note: DTAS is a derived figure, resulting from 40% of Planet Treasury flows and 40% of Planet B flows being allocated to DTAS (prior to launch of Satellites, 40% min parameter applies).*

Daily Trilium Allocation to Planets (DTAP)

Every 24 hours a Planet may call the Federation contract once to get its new supply of Trilium.

The amount of Trilium each Planet can claim is given by:

**TLM due to NFT component plus TLM due to staked component**

**Where:**

$$\text{TLM due to NFT component: } \frac{0.8 * \text{RESERVE} * (13 + (\text{NOP} * 1.9)) * (\text{NFTMOD}) * \text{PNFTs}}{100000 * \text{APNFTs}}$$

$$\text{TLM due to staked component} = 0.8 * \text{RESERVE} * (13 + (\text{NOP} * 1.9)) * (1 - \text{NFTMOD}) * \text{PST} + \text{N}$$



-----  
100000

-----  
APST

**And:**

**TLM due to NFT component + TLM due to staked component < 500,000**

**Variables:**

**Trillium staked to Planet**

**PST** = Trillium staked to the Planet (P) plus Planet DAO tokens staked into the Satellite games, when Planet calls the claim action

**APST** = Trillium staked to all Planets when Planet calls the claim action

**NFTs received by explorers connected with the Planet<sup>2</sup>**

**PNFTs** = Number of NFTs issued by the Federation for that Planet<sup>3</sup> since genesis, time adjusted to enhance the effect of recent performance

**APNFTs** = Stake weighted total (across Planets) of PNFTs

**NFTMOD** = Multiplier to the above two variables, which will be calibrated to balance competing strategies of passive yield versus active gaming

Note, there is a cap of 500k TLM that each Planet can be allocated per day, even if its staked TLM + NFT component would otherwise generate more TLM for the Planet. This is to prevent the emergence of one Planet becoming dominant over the metaverse.

Until the launch of the Satellites, the DTAP split across Planets is determined solely with reference to the TLM staked into each Planet account and the "NFTmod" described above.

After the launch of the Satellites, TLM flow from the account "federation" to each Planet account is determined in proportion to the sum of the TLM staked into the Planet plus the number of Planet tokens used in the Satellite games, plus an NFT mod component which is currently inactive. That is, the more TLM a Planet has staked into it, and the more TLM has been converted into the Planet token and used in the Satellite games, the more DTAP that Planet will receive relative to other Planets. In the case of Planet B, DTAP is currently a flat 2.4m TLM<sup>4</sup> (formerly 4m TLM – 40% sent to Satellites).

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<sup>2</sup> The NFTs earned by miners of land on a Planet plus the NFTs earned by explorers fighting on behalf of a Planet

<sup>3</sup> That is, NFTs sent to explorers for mining on the Planet or fighting on behalf of the Planet

<sup>4</sup> Planet B is intended to move to a 'live' formula, related to TLM sent on Missions at any given time

## Daily Trilium Allocation to Satellites (DTAS)

The Federation contract sends Trilium to an account sat.worlds daily according to the following formula:

**% DTAP (excluding mining) TLM to allocate to Satellites = (Planet DAO tokens staked into Satellite games / sum of Planet DAO tokens)**

with minimum 40% TLM to Satellites and maximum 80%.

## Daily Trilium Allocation to Landowners (DTAL)

Every day, all Landowners of opened packs will receive a payment from the Daily Trilium Allocation to Landowners (DTAL).

The Land Rating (described under “Land” section) will determine the amount they receive.

**To landowner = Daily allocation from notional locked box reserve \* 0.2 \* landrating / totallandrating**

## Core NFTs

Core NFTs are the NFTs created by the Federation (Alien Worlds’ creators) at inception

- The Core NFTs within Alien Worlds are
  - Land
  - Avatars
  - Artifacts
  - Tools
  - Weapons
  - Minions
  - Missions
- The elements of the NFT that are recorded on chain are
  - Its name

- Its attributes (including its visual representations and powers)
- Who owns it
- Its history of ownership.
- NFTs in Alien Worlds are depicted as trading cards; these elements are described in the UI codebase

## NFTs on WAX

The NFTs on WAX exist as a row in the database of the Atomic Assets smart contract (<https://wax.bloks.io/account/atomicassets>) on the WAX blockchain

- The Atomic Assets smart contracts run the Atomic Assets protocol

## NFTs on Binance Smart Chain

The NFTs on BSC are built on the BEP 721 standard. The NFTs on BSC exist as data in the state trie of BSC and their associated data is in a JSON file on an IPFS server.

## Land

- Land is an NFT associated with (located on) all Planets (except Planet B)
- Land ownership is represented by ownership of the NFT
- A land NFT defines modifiers which affect gameplay aspects such as:
  - Time between mining calls
  - Amount of Trilium that the land generates per mine
- Planets have a finite amount of land on them at inception
- Land owners can set a commission (which is the % of Trilium mining rewards the landowner receives)
- Unsold land is owned by the Federation until bought
  - Mining on unsold land (ie still owned by the Federation) has a default commission of 20%
  - This 20% commission is collected into The Land Fund which pays out to a user upon the user opening a new Land pack
  - This is to incentivise opening land packs rather than hoarding them, since land is required for game play

Land NFTs have attributes used in the mining game - see section on Mining Game.



## Land development and the Land Rating

In future, Landowners will pay Trilium for upgrade items that modify various parameters of the Land. One of the parameters it is possible to upgrade is the Land Rating. A higher Land Rating yields more payout from the Daily Trilium Allocation to Landowners (DTAL).

The Land Rating of a Land NFT degrades relative to all other Land over time and can be topped up for additional Trilium. In particular, landowners can pay to open up 15 “slots” (units of capacity to increase Land power) in each Land. Once opened, a slot becomes available for five boosts per day. Either the landowner or any other party can perform the boost action on the land; the landowner can specify the minimum boost possible per slot per day.

Due to the ‘use it or lose it’ nature of boosting Land relative to the cohort of all Land, periodically landowners can purchase an NFT at auction which allows them to catch up their boost position relative to other landowners.

## Avatars

- Avatars are NFTs
- Avatars do not confer powers within the core game elements and are collectibles for aesthetic value

## Tools

- Tools are NFTs that explorers use to mine for Trilium on land
- Explorers may use up to 3 tools at a time
- Tool attributes include
  - Time delay between mines
  - Weighted chance of receiving an NFT
  - Proof of Work modifier
  - Representation of how much of the available Trilium mining pot the tool can collect
- Tool NFTs produce different mining modification when used on different parcels of land
- Rarer and shinier Tools can have increased powers

Tool NFTs have attributes which impact the mining game - see section on Mining Game.

## Weapons

- Weapons are NFTs that will be used in the core fighting game



- Also ideally suited to be used by any other battling game created by communities in the Alien Worlds metaverse
- They have an attack rating and a defensive rating
- Rarer and shinier weapons can have increased powers

## Minions

- Minions are NFTs which explorers select to fight with in the future fighting game and potentially any other battling game in the Alien Worlds metaverse
- Their attributes are
  - an attack rating
  - a defensive rating
  - a move modifier that influences when the Minion can enter a contest or the amount of power needed to move or use the Minion
- Rarer and shinier Minions can have increased powers

## Artifacts

- Artifacts are a diverse category of NFT that impact gameplay in a variety of ways
  - Affect explorer experience and can impact NFT stats
- Artifacts as an NFT type do not exist yet and are scheduled for release subsequently
- New artifacts may be introduced into the Alien Worlds ecosystem to change the meta dynamics and improve the explorer experience

## Pack opening

Assets are created (ie created on the blockchain and attributed to an account) at the point at which the user opens the pack within which the assets are contained. The user opens a pack of NFTs by calling the on-chain action “open”. When the user opens the pack, the NFTs in the packs are created (sometimes called “minted”).

## The Land Fund

Every time a user mines a piece of land, a default 20% (configurable) percentage of the Trilium mining reward is paid to the land owner; this is called “commission”. This commission accrues every time a user mines on a Land NFT irrespective of whether that Land NFT has been opened by a landowner. Prior to a Land NFT being purchased and opened, it is held in an account *open.worlds*. On Land pack opening, the Land NFT is transferred to the purchaser’s

account and the 20% mining commission (Trilium) begins accruing into the purchaser's account instead of the open.worlds account.

The Trilium accruing into the open.worlds account from mining on unopened land, goes into the Land Fund.

The Land Fund, when set to operational, pays out to users when they open a Land NFT as an incentive for purchasers of Land NFTs to open their Land packs rather than leaving them unopened.

The payout to an unboxing user from the Land Fund is a random percentage of all the Trilium in the Land Fund pot at that time, varying from 10% - 20% of the pot.

## Asset ID - 'mint number'

All assets except land have their asset IDs ('mint number') created at the point when the user opens the pack the asset is contained within. Land NFTs have asset IDs that are already in place at the time the user opens the pack. This is because all Land NFTs have been 'pre-minted' because they exist on Planets, and have been distributed into the Land NFT packs for purchase by players.

For NFTs redeemed for points in the mining game, early mints reflect NFTs created from new templates. NFT templates are created in the Alien.Worlds collection of the Atomic Assets standard (<https://wax.atomichub.io/explorer/collection/alien.worlds>).

## Properties of NFTs

### Rarity

Every item with the Alien Worlds Metaverse has a rarity level. These levels are (in order of least scarce to most scarce)

- Abundant
- Common
- Rare
- Epic
- Legendary
- Mythical

## Shininess

Each NFT has a quality attribute which reflects its shininess. The shininess levels are (in order of least shiny to most shiny): -

- Stone
- Gold
- Stardust
- Antimatter

More shiny cards often have more power than less shiny versions.

### Increasing shininess - “Shining”

- All NFTs begin as Stone, and can be upgraded by the user.
- The user sends multiple NFTs and Trilium to a contract
- Contract sends back a new NFT with higher shininess

### Pricing shining

- The amount of Trilium required to be sent by the user in conjunction with the NFTs will be set so as to balance TLM dynamics in the metaverse
  - Shining is one of the mechanisms that will absorb Trilium supply

## Explorers (users)

- Explorers require a WAX account (which gives them enough to CPU to initiate gameplay)
- Explorers have the choice to stake to a Planet (or more than one) or none at all
- They are onboarded through the WAX Cloud Wallet
- Explorers can set their own name (up to 18 characters)
- New Explorers are given a starter ‘pack’ of containing the following
  - Basic avatar
  - A shovel
- To begin acquiring Trilium through gameplay only, explorers mine Trilium
- New users sign up for an account at <https://all-access.wax.io/>
  - They can also choose to be part of a DAO (ie stake their Trilium to a Planet account)

# Trilium

Trilium is the native token of Alien Worlds and is used to stake to Planets and participate in core games. It exists on the Ethereum, WAX and BSC blockchains so that users can store Trilium on the chain of their preference and use it for the games constructed on WAX and BSC.

## Supply of Trilium

- There is a finite supply of Trilium at 5 billion Trilium with inflation at 9% of supply in year 1, 7.64% in year 2 and declining year on year
- Inflation funds the Daily Trilium Allocation to Planets, Daily Trilium Allocation to Satellites and the Daily Trilium Allocation to Landowners

## Token contract - Trilium on Ethereum

An ERC 20 Trilium token contract exists on Ethereum which records balances and gives transfer functions. The TLM Ethereum token contract is

**0x888888848B652B3E3a0f34c96E00EEC0F3a23F72**

## Token contract - Trilium on WAX

A Trilium token contract exists on WAX which does the same as the above. The WAX TLM token contract is

**alien.worlds**

## Token contract - Trilium on BSC

A BEP 20 Trilium token contract exists on BSC which does the same as the above. The BSC TLM token contract is

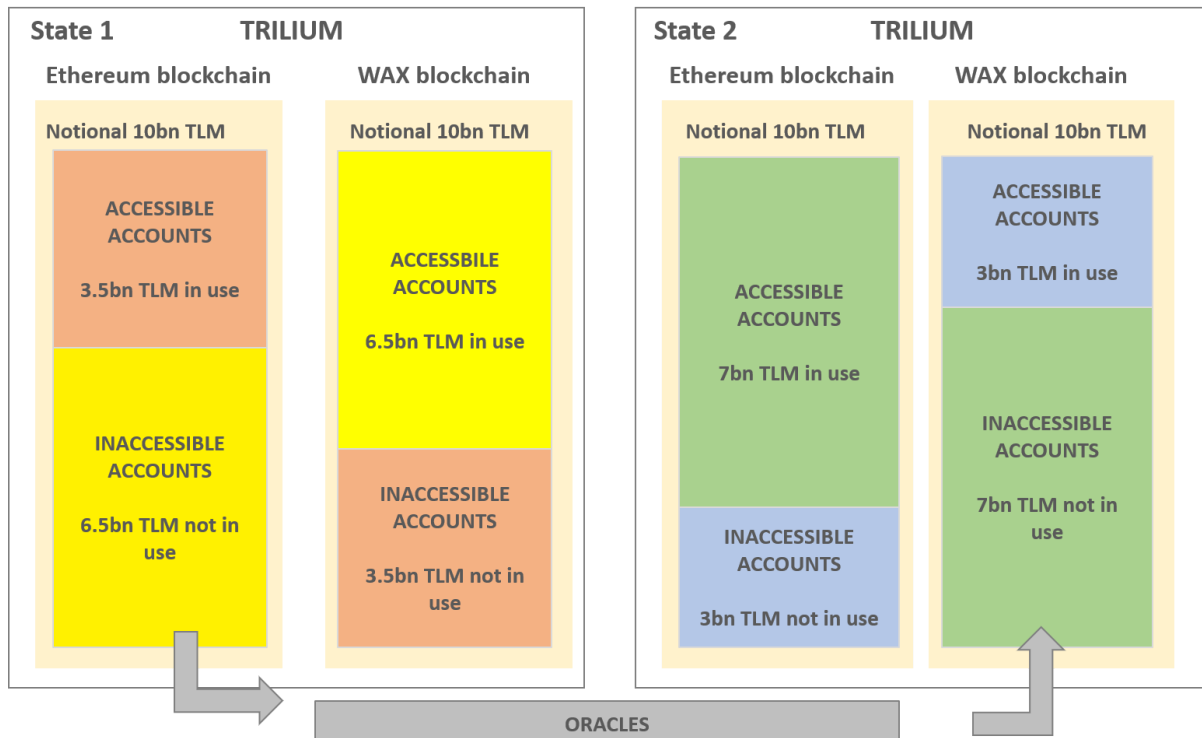
**0x2222227E22102Fe3322098e4CBfE18cFebD57c95**

## Cross-chain reconciling mechanism

The tokens governed by the Ethereum token contract and those governed by the WAX token contract must always sum to a notional cross-chain maximal figure of 10bn TLM.

When the user wants to transfer Trilium from one chain to the other, the transferred amount is added to the inaccessible balance on the starting chain at the same time as being deducted from the inaccessible balance on the destination chain.

### Cross-chain reconciling mechanism - how balances transfer



When a user transfers Trilium from WAX to Ethereum (or the other way around)

Oracles listen for this type of request and instructs the Ethereum Trilium to transfer ETH-based Trilium into inaccessible account (meaning it is in use on WAX). This instruction comes from multisig of majority of oracles who are watching each chain

Vice versa – instruction to transfer WAX-based TLM from accessible to inaccessible account (meaning it is in use on ETH) comes from majority multisig of oracles.

In the above example, users have transferred 3.5m Trilium from WAX to Ethereum (state 1 versus state 2)

At any given time the sum of the accessible accounts across ETH and WAX will equal the notional cross-chain reconciling value of 10bn.

## Cross-chain reconciling - oracles

An oracle (off-chain account recognised as a source of truth) will listen for a user requesting to move Trilium between chains. The user request makes the balance inaccessible on the source chain. The oracle then gives an instruction to the destination chain's Trilium token contract to move the corresponding balances into the accessible balance on the destination chain.

### Majority of oracles required

The token contracts will require majority approval of multiple constituent oracles before sending instructions. Each oracle will have keys for both chains and those keys will be approved by each chain's token contract, so that once the token contracts register a majority of approvals, the transfer is made from inaccessible to accessible account.

## Uses of Trilium

- Trilium must be staked by users to vote in Planet governance
- The Federation (and if they chose, Planets) will charge Trilium fees for gameplay such as the fighting game
- Trilium must be staked by Custodians to run as a candidate in Planet DAOs
- Trilium is required to participate in Nebula Events whereby users can obtain Legendary and Mythical items
  - Trilium fees go to Treasury
- Trilium is required to participate in Quests
- Trilium can be used to shine NFTs

## DAO structure

Explorers participate in decision-making about how Trilium flows by staking to a Planet and participating in that Planet's decision-making - by becoming a Planetary Custodian or voting for one.

## Planet DAOs

- Each Planet's DAO Committee decides how to allocate its "spending budget" (described below, ie its available Planetary rewards for that period) toward the following expenditures:
  - Mining rewards

- Including any components such as NFT rewards for mining
- Currently not configurable by DAOs, but intended to be when greater autonomy rests with the DAOs
- Worker proposals
- or any other purpose permitted under the Terms & Conditions
- It takes two days to unstake from a Planet
  - To prevent a whale Trilium holder from staking to a Planet just prior to Planet's Trilium allocation being calculated, and then moving to another Planet
- Transfers require a majority of Custodians approving

## Planetary accounts

- Each of the six Planets on WAX is governed by a DAO
- Each Planet account (eyeke.world, veles.world, kavian.world, magor.world, naron.world, neri.world) is allocated a daily release of Trilium proportionate to the sum of the amount of Trilium staked to that Planet and, when the Satellites are live, the Planet tokens used in the Satellite games

## Planet 'spendings' budget

- Every period (currently, 1 week), 2% of the TLM in the Planet's account is claimable by the DAO Custodians into the Planet's 'spending' account
- The spendings amount of 2% is an introductory level which is likely to be increased and also made linear
  - Planet spending accounts are veles.dac, eyeke.dac, kavian.dac, magor.dac, naron.dac, neri.dac
- 3/5 Custodians are required to sign the 'claim' action which claims the spending amount for that period
- The spending account being 2% per period of the Planet's account is configurable based on observed conditions at the DAOs

## DAO voting and election parameters

At inception, the following are the governance configurations of the Planet DAOs.

- Number of Custodians – 5 per Planet
- Number of votes an explorer can cast for a custodian – up to 2
- Minimum Custodians voting in favour of a proposal – 3 (out of 5)
- Periodicity of elections - 7 days, autocalled (later, newperiod may be called by any user)



# Core games

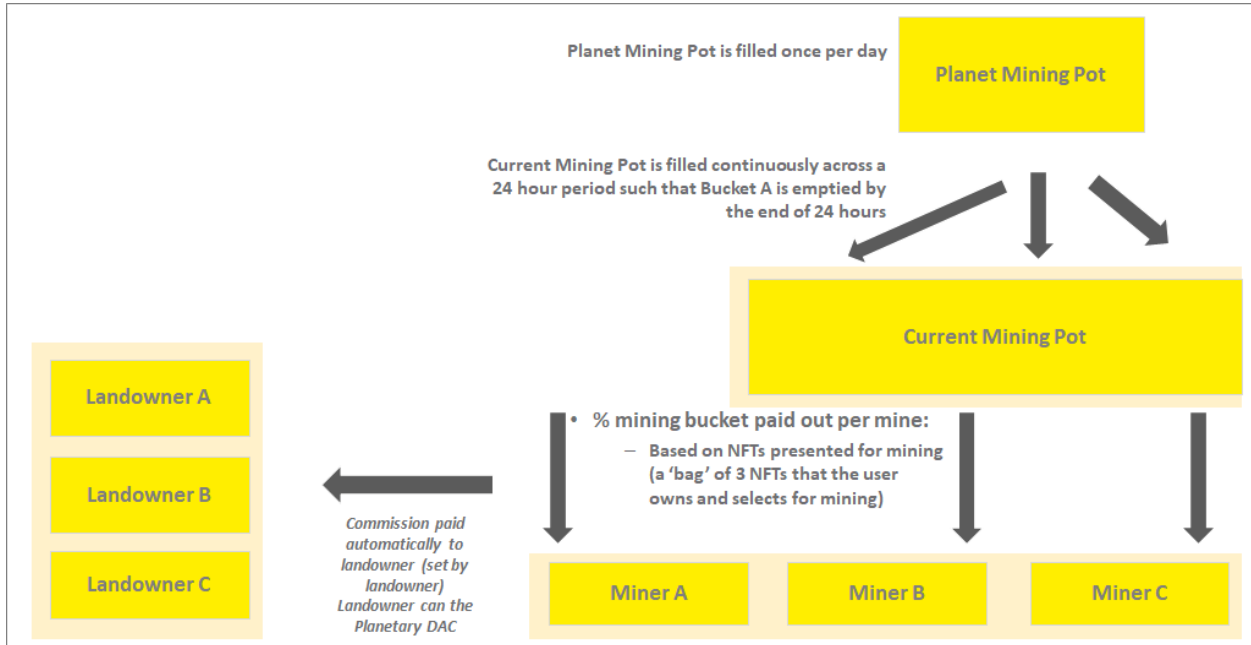
## Mining game

The mining game is a set of smart contracts available to Planets which they can offer to their explorers. It allows explorers to mine for Trilium and NFTs on Land on a Planet.

Each time the explorer calls the mining action, the explorer receives a Trilium payout. Additionally, sometimes, an NFT is paid out. The amount of Trilium and NFTs paid out depends on:

- First: How much Trilium is in the Planet's (where the Land is located) Current Mining Pot at time of mine (described below under 'The Planet's Mining Pots')
- Then, a formula which considers the type of Land and Tools being used (described under 'Amount of Trilium Paid Out')
- Finally, unless the miner is mining on Land he/she owns, a Trilium commission goes to the Landowner, and the rest is kept by the miner (described below under 'Commission to Landowner')
  - All NFTs are kept by the miner
- Additionally, there is a minimum time between mines which is a function of the Land and Tools being used (described below under 'Land and Tool Attributes - Impacts on Mining Frequency and Rewards')

## The Planet's Mining Pots



Trilium flowing into Planet Mining Pot depends on how much Trilium the Planet's DAO government has decided to allocate toward the mining game. The default is 80% of the DTAP being allocated toward mining rewards; the default will not be initially configurable but will be configurable at a later phase. At this later stage, the default 80% will only be alterable by a maximum percentage per week, so as to allow landowners on this planet time to adjust or respond to this.

Because Trilium rewards from mining are paid out as a percentage of the available 'pot' at the time a given mine is attempted, the Current Mining Pot exists to smooth mining payouts across the day. The Current Mining Pot is drip-filled from the Planet Mining Pot, and then the Current Mining Pot is the pool from which mining rewards are calculated.

The amount of Trilium paid out to a user on mining will be impacted somewhat by recently preceding payouts to miners, since the Current Mining Pot would have been newly depleted by a recent mine, but this effect is minimised by the Planet Mining Pot / Current Mining Pot system.

## Amount of Trilium Paid Out

The Trilium payout from mining is determined by:

**% of the Planet's mining Current Mining Pot at time of mine awarded to miner =**

## **(Sum of Trilium Mining Power percentages of the Tools NFTs) \* Trilium Mining Power Multiplier of the Land NFT**

The Trilium Mining Power percentages of Tools and Trilium Mining Power multiplier of Land can be found in the [Appendix section](#).

### Land and Tool Attributes - Impacts on Mining Frequency and Rewards

Explorers select a Land NFT (Land) to mine on and up to 3 Tool NFTs (Tools) to mine with.

Both Tools and Land have attributes which impact the Trilium reward players get when they mine. Those attributes are charge time and Trilium Mining Power.

#### Charge time

The amount of time that must have elapsed since you last mined.

- 1) Tools: have a 'charge time' associated with them which is the time, in seconds, that must have passed since you last mined.
  - a) If three tools are being used, the longest 2 charge times are added to derive the charge time. If two tools are used, the longer charge time and half of the shorter charge time are added together to give the total time that must have elapsed since last mine
- 2) Land has a charge time multiplier. The charge time in seconds given by the Tools is multiplied by the Land's charge time multiplier.

#### Trilium Mining Power (Power)

How fruitful it is to mine.

- 1) Tools: have a 'Trilium Mining Power' percentage; 'Trilium Mining Power' % of all Tools used in a given mine are summed
- 2) Land: have an 'Trilium Mining Power' multiplier which is multiplied with the sum of the Tools' Power percentages

#### NFT Luck

NFT Luck is an attribute that does not have utility within Federation games but which communities or other metaverse participants may choose to recognise in their gameplay.

## Proof of Work Requirement

Finally, in order to prevent network abuse and disincentivise automation, successful mining attempts must supply proof of work. For an average user, this is all handled through the game interface without the user being aware of it, although for users mining on mobile devices with low computing power, the proof of work requirement may create a noticeable time lag.

However, for completeness the algorithms are given below.

The proof of work calculation is:

**sha256( concat( account\_name, first\_8\_bytes\_last\_mine\_tx\_id, nonce ) )**

**if wam first 2 bytes == 0, next 4 bits must be less or equal than pow reduction**

**if not wam first 3 bytes 0, next 4 lte pow reduction**

## Actual Values for Land and Tools

The actual values of these attributes for Land and Tools are listed here:

[https://docs.google.com/spreadsheets/d/1BjpZQfG5JWnL5Vv\\_YMAi3LYytHJSBwhnLDp0Sc2zHCg/edit#gid=0](https://docs.google.com/spreadsheets/d/1BjpZQfG5JWnL5Vv_YMAi3LYytHJSBwhnLDp0Sc2zHCg/edit#gid=0)

## Commission to Landowner

Land is owned by a landowner if it has been bought (or held by a Federation contract if unbought). The landowner may choose to extract a commission from miners, in which case this is deducted automatically. By default, the commission is set to 20% on all Land NFTs and this is configurable by the landowner. The commission on Federation-owned land is held in a reserve.

## Landowner-offered NFTs

Landowners who wish to make it more attractive for miners to mine on their land can both lower the % Trilium Commission charged as discussed above, and can also 'seed' their land with non-Core (non-Federation created) NFTs - these are called "Landowner-offered NFTs".

Commercial entities within the metaverse (separate from the Federation) offer to seed Land with Landowner-offered NFTs as a commercial services, and several community groups organise these for their members.

Landowner-offered NFTs must be created on the Atomic Assets contract (atomicassets) on the WAX blockchain and must not contravene the Dacoco GmbH Terms and Conditions; in particular they must not be breaching copyright protections of the author, or contain offensive material. Landowners who attempt to offer NFTs that fail these tests may be blacklisted.

## Fighting game

A fighting game will be offered to players.

## Missions game

A missions game is available on BSC whereby users can send spacecraft on missions of varying durations and receive a TLM and NFT reward.

The number of TLM offered as a reward for a given mission depends on the number of other spacecraft going on the mission - the user may gather intelligence off platform on which missions are most popular, thereby using strategy to find one relatively undersubscribed. One NFT will be awarded per spacecraft per mission to a maximum of 5 NFTs per account per mission.

Missions NFTs will have utility within the BSC part of the metaverse, in particular through crafting and enhancing mission power variables in subsequent missions releases, as described below at “Extensions to the Missions Game” section.

Mission durations will be 1 week, 2 weeks, 1 month and 3 months. During this time the TLM fee is locked and inaccessible to the user.

Sending a spacecraft on a mission incurs a TLM fee which is returned at mission end. Mission rewards must be actively claimed by the user when the mission has ended.

## Permissions

### NFTs

- NFTs that impact the Alien Worlds metaverse (ie mining and genesis games) are created by the Federation DAO

- Planet DAOs are able to create their own NFTs but in order for these to confer powers within the genesis games they must be permissioned by the Federation

## Planets

- Planets can only be recognised by the Federation

## Extensions

New game features are provided by the Federation to Planets as code updates; Planets must update their contracts.

As part of the Roadmap, the following gameplay elements and modifier are envisaged to be released.

## Extensions to the Missions game

The missions game offered on BSC is planned to be extended to by adding the following

- Supercharged missions with the addition of BNB
  - Greater rewards when the user sends BNB alongside TLM on missions
- NFT staking
  - Modification to 'Mission mining power' and NFT rewards when the user stakes NFTs in addition to other fungible tokens
- Missions that alter mutable attributes of NFTs
- Missions that reward the user with NFTs that have gameplay utility in other core games
- Other elements described in the [Missions roadmap](#)

## Interoperability - NFTs

Alien Worlds is a place where NFT collectibles can take on gameplay powers.

## External collectibles

It is possible for NFTs built on Atomic Assets to be used to play Alien Worlds genesis games (mining, fighting).

The Federation would enable this by mapping the Atomic Assets template elements of the NFT in question onto Alien Worlds NFT-attributes systematically. In particular, we would use the card's template to tabulate the card's properties against attributes required in our gameplay and ascribe powers within our game to each card.

## Example - GPK collectibles within Alien Worlds

- A player could set their GPK card as their avatar, giving the player specific defined attributes
- A player could select their GPK card as their fighter within a fighting game with attributes decided by the game owners.

## Modifications to Land NFTs

- Ability to 'name' land
- Ability to sell advertising links on land through "Windows"
- Ability to change Land Rating with respect to DTAL and mining reward modifiers
- Other elements described in [Land Rating roadmap](#)

## DAO permissions and configurations moving to autonomous control

Over time, the configurable variables above, the amount of each Planet's account (sometimes referred to as "treasury") that is available for expenditure each period (the spendings account), and the amount of DTAP ascribed to the mining game, are intended to move to the control of the Planet DAOs themselves. DTAL and DTAS always remain outside Planet DAO control.

## Multiplayer games

Users should be matched with other users of a similar level using a rating system. Tournaments could be implemented at some future stage alongside squad matchups.

## Minion extensions

- An offchain game element in which Minion NFTs can be sent to fight each other
- “Mana”, a variable describing the users’ power with deploying Minions, to be integrated into the game

## Appendix

Table of Tools and Land and their attributes:

[https://docs.google.com/spreadsheets/d/1BjpZQfG5JWnL5Vv\\_YMAi3LYtHJSBwhnLDp0Sc2zHCg/edit#gid=0](https://docs.google.com/spreadsheets/d/1BjpZQfG5JWnL5Vv_YMAi3LYtHJSBwhnLDp0Sc2zHCg/edit#gid=0)