Etherization L2 proposal

We implement layer2 (L2) mechanics for Etherization, an NFT ERC721 wrapper around the historic project, 2016 Etherization.
Etherization frontend (https://etherization.org/) shows a 34x34 map, populated by cities, each an ERC721 token. Each city has an owner, name, description and one or more buildings. Buildings define token rarity. In layer2 this also extends into the game mechanics, giving some advantages when it comes to unit production cost and maintenance.

Overview
Layer2 introduces game mechanics and makes the game dynamic. A new ERC20 token has been created called KUNA - to pay homage to the first city in the game, Zagreb, where Kuna was the official currency, until this year (2023) when it has been replaced by the Euro. In Croatian, kuna means marten, and from Roman times until the middle ages, taxes were collected in the region in the then highly valued marten skins. Each city generates a certain amount of KUNA every 24h. Players have two basic strategies to increase their KUNA revenues - military and culture. Military strategy is based on creating an army and turning other cities into vassals that then pay a percentage of their KUNA production to the ruling city. Culture strategy involves staking rare artefacts in cities and generating extra revenue that way.
We make a reasonable assumption that the city's daily KUNA production is the key to building traction. A successful NFT game called Wolf game has mechanics based on ERC20 called WOOL (https://mobile.twitter.com/wolfdotgame). The key is ensuring that the KUNA token is easily spendable in engaging game mechanics, so that daily KUNA production does not create (significant) inflation. More in the tokenomics section.
L2 is coded in Solidity and deployed on the Polygon network to avoid large gas fees associated with the Ethereum network.

Tokenomics
ERC20 KUNA has been deployed and a MATIC/KUNA trading pair created on Uniswap.
Every city has a base production of 10 KUNA each 24h.
Base income depends on the number of units in the city garrison/s, as units are also used for enforcing tax collection. Formula for tax factor is:
(1 + min(numUnits, 3)) / 4
This means a city with 1 unit will be making only half of what a city with 3 or more units would be making. A city with 0 units will be making a quarter of that.
If a city has an overlord, the overlord's tribute also depends on the number of units in the occupation garrison according to the same mechanic.

Unit based tax collection mechanic is useful for two reasons:

1) It motivates players to build units and thus makes the game more dynamic and increases the spending of KUNA
2) It motivates vassals to have some troops in the home garrison. Otherwise all the burden of city's defence would easily fall on the overlord

With KUNA we can build units or create artefacts.
Unit cost is 20 KUNA. Unit maintenance cost is 1 KUNA each 24h. Farm building reduces maintenance cost for all units by 25%, thus 0.25 KUNA. Unit specific buildings reduce that unit type's maintenance cost and production cost by 25%. For example, metalworks will reduce swordsman maintenance to 0.75 and production cost to 7.5 KUNA.
Artefact cost is 10,000 KUNA minimum, but can be higher depending on how many cities bid for that epoch's artefact. Lottery mechanics are used to determine who gets the artefact. Let us say that one city contributes 10,000 KUNA, a second city 5,000 KUNA and a third city also 5,000 KUNA. The first city would have a 50% chance of getting the artefact, while the other two would have a chance of 25% each.
An artefact is minted each epoch (14 days), but can be missed in an epoch if minimum bids do not reach the 10,000 minimum.

Mints and burn

20% of each city mint cost goes towards KUNA burn. This helps control KUNA inflation and also incentivizes the existing players to bring more people to the game and sell out the map.

Military

Three types of units exist: pikeman, swordsman and knight. Pikeman is strong vs knight, knight vs swordsman and swordsman vs pikeman. Strong is defined as having a higher likelihood of winning (55%).
Each city has a garrison containing space for 10 units. Units allow us to raid other cities and also defend our city. We cannot capture other cities, but we can raid them and plunder their KUNA. Also, if the raid is successful, that city becomes our vassal. The defending city has an option to surrender and become a vassal peacefully. A vassal still makes KUNA, but less, as 50% is sent as tribute to the ruling city. This mechanic is simple but long term it could create quite an interesting network of vassal cities.
A vassal city can decide to invest in building an army and revolt at some point. Then the ruling city can decide to intervene or let them go peacefully (this can be informally implemented by the ruling city by simply pulling out the troops (via the move method) before the vassal calls the rebel method).

Vassal city has 7/10 units available, ruling city can keep 3/10 units in vassal city as a garrison, in case of revolt these units defend against the uprising.
If a vassal city is raided by another city, the vassal pays automatically for the cost of lost units of the ruling city (if the vassal has enough KUNA).
Raiding army is affected by attrition. Attrition is 0 for neighbouring cities, and then increases by 2% for each extra tile distance. Let us illustrate by an example: if a swordsman is fighting a swordsman, the likelihood of winning is 50% if the targeted city is a neighbouring city. If the targeted city is 5 tiles away, then the likelihood of winning is 40%.

Generals
Generals increase unit strength both in attack and defence by 5% (10% with military academy upgrade). Let us illustrate by an example: if a swordsman led by a general is fighting a swordsman without one, the likelihood of winning is 55%.
Each general is a unique ERC721 token (we can deploy our own general token and/or implement existing tokens as possible generals - good for cross promotion with other projects, but unequal mint cost is an issue to be solved - maybe require several to be staked until the value is approximately 2,000 KUNA).
Proposed general mint cost is 2,000 KUNA.

Culture and artefacts
A city can increase its KUNA production by holding artefacts. Artefacts are themselves NFTs (ERC721 tokens) and only one can be minted every epoch (14 days), making them extremely rare. If an artefact is staked in a city, it boosts its culture output. All the pilgrims flocking into the city increase that city's fame and trade links, resulting in increased KUNA production.
The total extra KUNA production based on global culture output equals from 0-40% of global regular KUNA production, depending on the number of artefacts present.
The current epoch artefact always generates 10%, while older artefacts have their contribution slashed according to a converging geometric series.
Let us illustrate this with an example. If there are 10 cities in the game, the global regular KUNA production is 100 KUNA each 24h (10 KUNA per city). If there are 2 artefacts present, total culture based KUNA production will be 10% (10% of global regular KUNA production equals 10 KUNA) for the most recent artefact and 5% (5 KUNA) for the previous artefact. If a new artefact gets produced, it will be generating 10% and the previous 2 artefacts will be generating 4% each, for a combined global culture based KUNA production of 18% (18 KUNA). If we look at the global culture based KUNA production as a percentage of the regular global KUNA production, we can describe it by a converging geometric series as a function of the number of artefacts present in the game as: 10%, 15%, 18% etc, converging to 40%.

If an epoch does not produce an artefact, then the current epoch's artefact is considered as the last artefact minted.
3 artefacts are offered each epoch and the player who wins the lottery gets to choose the artefact. Choosing from 3 makes it extra interesting as the winning city chooses the way the history unfolds.

Withdrawal risk based mechanics
Players can decide to withdraw their KUNA at any point during the game, however there is an associated risk. An exchange fair moves around the map every 3 days, and the risk of bandits capturing our KUNA wagons increases with the distance from our city to the fair (10% for each tile, diagonal distance is counted as 1 tile). This mechanic makes the game exciting as players will tend to wait with withdrawals to minimise the bandit risk, but this will incentivize neighbouring players to plunder their growing KUNA stockpiles. It also helps mitigate KUNA inflation, as any KUNA captured by the bandits gets burnt.
20% of the amount is always successfully withdrawn, so that people don't get completely frustrated if their caravan gets attacked by bandits.

Upgrades
Caravan escort - decreases bandit risk by 25%.
Convoying - decreases bandit risk by 50% (requires Caravan escort, makes Caravan escort obsolete). (note: a 50% decrease means reduction of risk by half)
Iron fist - occupying garrison in a vassal city defends always with a best unit against a revolting unit (unlike standard revolt mechanics where a random unit is selected). Additional 5% bonus with Monarchy or Horde.
Resistance network - revolting units have a 7% bonus (14% with Republic).
City walls - all defending units have a 10% defence bonus against raids.
Siege engine - attacking units are not affected by city walls.
Supply wagon - reduces unit distance fatigue when raiding by 25%.
Logistics - reduces unit distance attrition when raiding by 50% (requires Supply wagons, makes Supply wagons obsolete).
Live of the land - reduces unit distance attrition when raiding by 90% (requires Horde government, not stackable with Supply wagon or Logistics).
Workshop - reduces production time by 50% (to 12h).
Manufacture - reduces production time by 75% (to 6h, requires workshop, makes workshop obsolete).
Military academy - generals' bonus increases from 5 to 10%.
Capitol - allows the collection of KUNA from other cities under the player's control.

Proposed upgrade cost is 500 KUNA.

Production
Upgrade and unit building is subject to production wait times, by default 8h (without workshop / manufacture).
Rushing production - production can be rushed but be prepared to spend extra KUNA. For slicing the wait time period in half, the cost is increased by the default amount. So unit production would cost 40 KUNA for 4h wait time and 60 KUNA for 2h wait time, etc. Production cannot be rushed to less than 1h.
If a city has a workshop for example, then the default wait time is already 4h, so for 40 KUNA the wait time would be sliced to 2h and for 60 KUNA to 1h.

Government
1) Tribal (default)
2) Monarchy (30% increase in KUNA production, requires a general)
3) Republic (100% increase in KUNA production but 5% negative bonus if raiding a city, requires at least one artefact)
4) Horde (5% decrease in KUNA production but allows Live of the land upgrade, requires a general)

Switching government types costs 1,500 KUNA.

Daily bonuses
Incentivize players to visit the game as often as possible by having special days. Ie today a free unit is given via a lottery mechanic. Some other ideas: army day (30% off on unit production), freemason conference (30% off on upgrades), religious wave swept through the arab world -> 30% off on artefact in lower right quadrant (middle eastern civ) etc.

Citizen NFT
Allows players with limited funds to play, lower entry point, i.e. mint cost 100-200 KUNA. Citizens can be staked into cities.
Each citizen when staked produces some wage and allows citizen holders to participate in artefact auctions. Total city max wages are daily max of that city's production, but distributed ie as: 1st citizen 20%, 2nd citizen 15% etc for a total of 100% if all 10 citizens are staked (city cannot hold more than 10 citizens). For example, if a city is making 20 KUNA daily and has 3 citizens staked, the 1st one would be making 20% of 20 KUNA, so 4 KUNA daily and so on.
The idea with this ordering is for citizens to choose to live in cities likely to become prosperous in advance - creates whole metagaming universe, where city holders

(aristocracy) will be explaining to the citizenry why to move into their cities (I have this or that strategy, we will become rich and prosperous together).
City holders get a bonus on artefact lottery depending on the number of citizens they have.
Long term citizen wage can be reduced (halving) towards zero (to curb KUNA inflation) while still allowing holders to participate in artefact lottery.
Possibility to allow external NFTs to be citizens, good for cross-promotion. Best candidates are other projects with likeable characters and limited quantity with floor price at least mint cost equivalent (100-200 KUNA). Allow, for example, only 10 from each project that we integrate with.

UI
Show vassal cities as lines reaching out from the ruling city, checkbox to turn off global display. On city click show vassal lines for that specific city.