CryptoAssault

(WhitePaper v0.11)

Rogue Nations Games

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1 Introduction

CryptoAssault is a strategy MMO that runs on the Ethereum blockchain. Players will be purchasing units that will be battling in a single world to earn Ethereum. The units will be ERC-721 tokens that will have unique stats and can be traded amongst players.

Through strategic gameplay, strong units and powerful alliances, players will be able to capture territory and earn Ethereum daily. CryptoAssault will be the first MMO on the blockchain where all players will be in one world together. The power of a unit matters but strategy will be important since every unit has strengths and weaknesses. The 3D terrain will also play huge part in contributing to unit strategy. Joining a strong alliance and navigating inter-alliance politics will also be a huge factor in a player's success.

Units will be sold in random unit packs on http://cryptoassault.io but ultimately players will want to trade units amongst each other as they seek matching units to upgrade. Although there will be an overall meta, demand will also be unique to players as they search to upgrade their ideal army.

The game is a hybrid on-chain/off-chain dapp. The units are ERC-721 tokens purchased on-chain but the game actions are all off-chain. This ensures that players will be able to move, attack and play the game without having to pay and wait for each action. Players will still need to purchase units and pay a small fee for upgrading units since upgrading is creating a new ERC-721 token.

The game is currently 90% feature complete and is aiming for a Feb 2019 Beta release.

2 Market Forces

2.1 Value of Unit Tokens

Players will be able to earn a percentage of the previous day's revenue from CryptoAssault by holding territory throughout the day. One person a day also has the chance to win a large amount of Ethereum by catching a crash landed Satellite in their territory. The earning power of a player is dependent on how much territory they can capture with their units. The amount of territory they can capture is dependent on a player's strategy and the power of their units. The power of their units is given by their random stats which are generated when the ERC-721 unit token is minted. This earning power is what will give unit's their value for trading on the open market.

2.2 Buying Unit Packs

Units can be bought through the cryptoassault.io website, the game client or from other players. Units can only be bought as random unit packs from the website and game client.

Here are the chances when buying a pack with a COMMON unit or better:
- Common 80%
- Rare 15%
- Epic 4%
- Legendary 1%

The same weighting exists for the other packs but they will sometimes remove a category. So for a pack that has a RARE unit or better, the chances are:
- Rare 75%
- Epic 20%
- Legendary 5%

2.3 Unit Upgrading Relating to Demand

Obviously having high stats will increase the demand for a unit. However the unit upgrade system also plays a big part in the demand of a unit. Upgrading a unit increases its earning power by allowing access to the next inner ring on the map. The map consists of 4 rings and each successive inner ring has higher land earnings and an increased chance for the satellite to crash land. Units will be upgraded by absorbing two other units. Units must absorb units of the same type. I.e. Tanks must absorb tanks, jets must absorb jets, etc. However, if players absorb

the exact same unit, then the upgraded unit will be even better. This should ensure that demand is spread out a bit.

2.4 Gameplay Influencing Demand

Proper strategizing will influence a player's earning power. Therefore, terrain and overall player behavior will also drive unit demand. For example, a map with a lot of rivers might drive the demand for flying units. If flying units become popular, then mechs may become popular since they counter jets and helis. If a strong alliance is fortifying a plateau chokepoint with a lot of artilleries, then flying units may become popular again. This shifting meta will be key to an evolving marketplace.

3 Game Design

3.1 Overview

CryptoAssault is a strategy MMO where all players will be battling it out in a single world. We expect 100s (and eventually 1000s) of players to be in one world. Players start with their purchased units in their inventory. Players then click on a tile and a unit that they want to send

to that tile. Units will initially travel from the closest point on the outside edge of the map. Once a unit moves, they cannot move for another 3 hours. A unit can only move a max travel distance. To attack an enemy unit, players simply move a unit on top of an enemy unit. The unit will travel there and after a short battle animation will determine the winner.
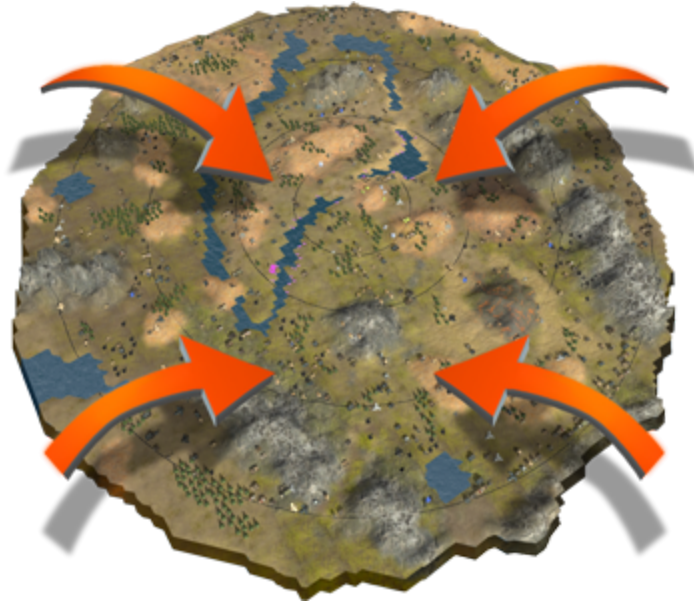
3.2 Unit Don't Die!

When a unit loses a battle, they just go back to their owner's inventory and cannot be deployed for another 24 hours while they're being repaired.

3.3 Capturing Territory

Units will own the territory around them in a small radius. Players will earn Ethereum based on the total territory owned throughout the day. We call this Land Earnings. A Satellite full of Ethereum will also come crashing down once a day. If that Satellite falls into a player's territory, then they will receive a large amount of Ethereum that day.

3.4 The World

The world is a circular continent broken up into a grid viewed from an isometric camera angle. It has an approximate radius of 100 tiles. The world is broken up into 4 rings (Technically, it's 3 rings and a center circle). As you move towards the center, the tiles in a given ring has an increased value for the Ethereum you earn through Land Earnings. Each ring also has an increased chance that the satellite will land in it.

3.5 Resources

Resources will spawn in the world occasionally. Players must position their units on top of the resource to begin mining it. The unit will begin mining the resource over time. Eventually the resource patch will be depleted and removed from the world. A new resource of that type will spawn somewhere in that ring soon after. Here are the amounts of each resource in each ring:

resource	ring	max_patches	amount
oil	4	58	100000
oil	3	14	100000
iron	3	42	100000
iron	2	9	100000
titanium	2	28	100000
titanium	1	7	100000
uranium	1	20	100000

Resources are used to purchase enhancements for units.

3.6 Movement & Pathfinding

Currently, a unit can move their max travel distance once every 3 hours. They can travel less than their max travel distance but they still incur the full 3 hour refueling time. Units can move

pretty far in one move (maybe 50–100 grid squares) but they need to pathfind. Each terrain tile will be one of the following:

- Plains
- Mountains
- Forest
- Water

That means they will automatically avoid obstacles when the player selects a destination. Here are the pathfinding rules:

- Ground units will avoid other ground units, mountains, forest and water.
- Helicopters can fly over water, forest and ground units but will fly around other air units and mountains.
- Jets can fly over water, mountains, forest and ground units but still need to avoid other air units.

We've balanced jets and helicopters by making them have very low resource mining rates. Players can move through their own units and alliance mates' units. Creating blockades and protecting your weaker units will be key to survival. Players can upgrade a unit's max travel distance by evolving that unit and increasing its star-rating.

3.7 Battling and the Battle Formula

When a player selects a unit to move, they will be able to see their chances against all the other units on the map. Players can click on units to see their percentage chance to win against an enemy unit. When a unit battles another unit, the game will pick a winner based on that percentage chance. Here is how that is calculated:

Attacker's chance to win = ((A-D)/max(A,D) + 1)/2

Where A is the attacker's damage vs the defender's unit type
And D is the defender's damage vs the attacker's unit type

4 Units

4.1 Stats

A unit is made up of a few different stats. Here are the stats that are unique to a given unit token:

- Damage vs Tanks
- Damage vs Trucks
- Damage vs Mechs
- Damage vs Jets
- Damage vs Helis
- Mining Rate

- Birthdate. Used to calculate the unit's age.

The rarity of a unit defines a range for the damage and mining rate. The actual damage or mining rate is a random number within that range. The birthdate is the purchase date (when the token was minted).

These stats are given by the rarity:
- Territory radius

Here are the stats that are defined the unit type:
- Max travel distance. This is increased as a unit evolves its star-rating.
- Available enhancements. Enhancements are unlocked as a unit evolves its star-rating.
- Special traits like +20% damage to adjacent ground units.

Here are the stat ranges for each common unit type at different star-ratings:

	stars	Damage min tank	max tank	min truck	max truck	min mech	max mech	min jet	max jet	min heli	max heli	Mining min	max
common tank	1	44	56	61	78	52	67	35	44	26	33	70	80
common truck	1	26	33	44	56	61	78	52	67	35	44	70	80
common mech	1	35	44	26	33	44	56	61	78	52	67	70	80
common jet	1	52	67	35	44	26	33	44	56	61	78	1	5
common heli	1	61	78	52	67	35	44	26	33	44	56	5	10
common tank	2	110	140	152	195	130	167	87	110	65	82	82	94
common truck	2	65	82	110	140	152	195	130	167	87	110	82	94
common mech	2	87	110	65	82	110	140	152	195	130	167	82	94
common jet	2	130	167	87	110	65	82	110	140	152	195	1	5
common heli	2	152	195	130	167	87	110	65	82	110	140	5	11
common tank	3	275	350	381	487	325	418	218	275	162	206	97	111
common truck	3	162	206	275	350	381	487	325	418	218	275	97	111
common mech	3	218	275	162	206	275	350	381	487	325	418	97	111
common jet	3	325	418	218	275	162	206	275	350	381	487	1	6
common heli	3	381	487	325	418	218	275	162	206	275	350	6	13
common tank	4	687	875	953	1218	812	1046	546	687	406	515	115	131
common truck	4	406	515	687	875	953	1218	812	1046	546	687	115	131
common mech	4	546	687	406	515	687	875	953	1218	812	1046	115	131
common jet	4	812	1046	546	687	406	515	687	875	953	1218	1	8
common heli	4	953	1218	812	1046	546	687	406	515	687	875	8	16

Keep in mind that some units have different stats when noted in the description.

4.2 Counters

A given unit type will hard counter a single unit type and then soft counter a second unit type. Here is a good rule to know:

Tank > Truck > Mech > Jet > Heli > Tank

For example, a tank hard counters a truck, and soft counters a mech. Of course this pertains to when the units are the same rarity and star-rating. The chart below shows the matchups for units with average stats for star-rating 1:

			1 comm tank	1 comm truck	1 comm mech	1 comm jet	1 comm heli	1 rare tank	1 rare truck	1 rare mech	1 rare jet	1 rare heli	1 epic tank	1 epic truck	1 epic mech	1 epic jet	1 epic heli	1 legen tank	1 legen truck	1 legen mech	1 legen jet	1 legen heli
1	common	tank	50.00	78.57	66.67	33.33	21.43	20.00	46.67	30.00	13.33	8.57%	8.00%	18.67	12.00	5.33%	3.43%	3.20%	7.47%	4.80%	2.13%	1.37%
1	common	truck	21.43	50.00	78.57	66.67	33.33	8.57%	20.00	46.67	30.00	13.33	3.43%	8.00%	18.67	12.00	5.33%	1.37%	3.20%	7.47%	4.80%	2.13%
1	common	mech	33.33	21.43	50.00	78.57	66.67	13.33	8.57%	20.00	46.67	30.00	5.33%	3.43%	8.00%	18.67	12.00	2.13%	1.37%	3.20%	7.47%	4.80%
1	common	jet	66.67	33.33	21.43	50.00	78.57	30.00	13.33	8.57%	20.00	46.67	12.00	5.33%	3.43%	8.00%	18.67	4.80%	2.13%	1.37%	3.20%	7.47%
1	common	heli	78.57	66.67	33.33	21.43	50.00	46.67	30.00	13.33	8.57%	20.00	18.67	12.00	5.33%	3.43%	8.00%	7.47%	4.80%	2.13%	1.37%	3.20%
1	rare	tank	80.00	91.43	86.67	70.00	53.33	50.00	78.57	66.67	33.33	21.43	20.00	46.67	30.00	13.33	8.57%	8.00%	18.67	12.00	5.33%	3.43%
1	rare	truck	53.33	80.00	91.43	86.67	70.00	21.43	50.00	78.57	66.67	33.33	8.57%	20.00	46.67	30.00	13.33	3.43%	8.00%	18.67	12.00	5.33%
1	rare	mech	70.00	53.33	80.00	91.43	86.67	33.33	21.43	50.00	78.57	66.67	13.33	8.57%	20.00	46.67	30.00	5.33%	3.43%	8.00%	18.67	12.00
1	rare	jet	86.67	70.00	53.33	80.00	91.43	66.67	33.33	21.43	50.00	78.57	30.00	13.33	8.57%	20.00	46.67	12.00	5.33%	3.43%	8.00%	18.67
1	rare	heli	91.43	86.67	70.00	53.33	80.00	78.57	66.67	33.33	21.43	50.00	46.67	30.00	13.33	8.57%	20.00	18.67	12.00	5.33%	3.43%	8.00%
1	epic	tank	92.00	96.57	94.67	88.00	81.33	80.00	91.43	86.67	70.00	53.33	50.00	78.57	66.67	33.33	21.43	20.00	46.67	30.00	13.33	8.57%
1	epic	truck	81.33	92.00	96.57	94.67	88.00	53.33	80.00	91.43	86.67	70.00	21.43	50.00	78.57	66.67	33.33	8.57%	20.00	46.67	30.00	13.33
1	epic	mech	88.00	81.33	92.00	96.57	94.67	70.00	53.33	80.00	91.43	86.67	33.33	21.43	50.00	78.57	66.67	13.33	8.57%	20.00	46.67	30.00
1	epic	jet	94.67	88.00	81.33	92.00	96.57	86.67	70.00	53.33	80.00	91.43	66.67	33.33	21.43	50.00	78.57	30.00	13.33	8.57%	20.00	46.67
1	epic	heli	96.57	94.67	88.00	81.33	92.00	91.43	86.67	70.00	53.33	80.00	78.57	66.67	33.33	21.43	50.00	46.67	30.00	13.33	8.57%	20.00
1	legendary	tank	96.80	98.63	97.87	95.20	92.53	92.00	96.57	94.67	88.00	81.33	80.00	91.43	86.67	70.00	53.33	50.00	78.57	66.67	33.33	21.43
1	legendary	truck	92.53	96.80	98.63	97.87	95.20	81.33	92.00	96.57	94.67	88.00	53.33	80.00	91.43	86.67	70.00	21.43	50.00	78.57	66.67	33.33
1	legendary	mech	95.20	92.53	96.80	98.63	97.87	88.00	81.33	92.00	96.57	94.67	70.00	53.33	80.00	91.43	86.67	33.33	21.43	50.00	78.57	66.67
1	legendary	jet	97.87	95.20	92.53	96.80	98.63	94.67	88.00	81.33	92.00	96.57	86.67	70.00	53.33	80.00	91.43	66.67	33.33	21.43	50.00	78.57
1	legendary	heli	98.63	97.87	95.20	92.53	96.80	96.57	94.67	88.00	81.33	92.00	91.43	86.67	70.00	53.33	80.00	78.57	66.67	33.33	21.43	50.00

4.3 Rarity

When opening a unit pack, the player has a chance to get a common, rare, epic or legendary unit. All unit types exist at all rarities. Damage stat ranges will be 2.5x higher than a unit 1 rarity lower. Mining stat ranges will be 1.18x higher than a unit 1 rarity lower.

Here's a table to show the average win rate vs a 1-star common and how the different rarities and star-ratings vary.

1-star	2-star	3-star	4-star	win rate vs common 1	power scalar
common 1				50.00%	1
rare 1	common 2			80.00%	2.5
epic 1	rare 2	common 3		92.00%	6.25
legendary 1	epic 2	rare 3	common 4	96.80%	15.625
	legendary 2	epic 3	rare 4	98.72%	39.0625
		legendary 3	epic 4	99.49%	97.65625
			legendary 4	99.80%	244.140625

Increasing a unit's star-rating is equivalent to going up in rarity for the damage stats.

4.4 Special Attributes

10% Plateau Bonus
All ground units get their damage stats boosted by 10% if they are the defending unit on a plateau.

Bonus Travel Distance
Units that have this attribute will be able to travel much farther than any other unit at its star-rating.

2 Attack Range, -20% while defending
Some units will be able to attack a unit 2 tiles away from them. Normally a unit has to move on top of a unit to attack it. However, their stats are lowered by 20% if they are the defender. Be sure to surround and protect this unit.

20% bonus to nearby ground/air units
These units will increase the stats of the units around them. This includes the 4 units directly north, south, east and west. The units can only be 1 tile away.

+20% while attacking, -20% while defending
These units get a 20% boost to their stats when they attack but a 20% penalty when they are defending. Be sure to protect these units.

+50% mining rate, -50% damage stats
These units mine 50% faster but are very fragile. Their damage stats have a 50% penalty.

4.5 Evolving Units to Increase Star-Rating

All units start out at 1-star. A 1-star unit can absorb two other 1-star units to upgrade to a 2-star unit. With Evolution, players select a primary unit to evolve and then select 2 units to absorb. Only units of the same type can be absorb each other. i.e. Tanks must absorb tanks, jets must absorb jets, etc. However, absorbing the exact same unit type will be better. 4-stars is the max evolution. When evolving a unit, the following occurs:
- damage stats increase
- resource mining rate increase
- travel distance increase
- access to the next map ring
  - Access to a new resource for an unlocked enhancement
  - Access to more valuable tiles for land earnings
  - Access to tiles that have a higher chance of the satellite landing
- new enhancement unlocks

Evolving a unit will increase its battle stats by 2.5x so a 4-star unit will be over 15x more powerful than a 1-star unit. The resulting unit will also keep the age of the oldest unit. Remember that older units can collect up to 4x more ETH land earnings.

4.5.1 Accessing a New Area

The biggest reason to evolve is to give your unit access to the next ring in the world. The tiles in the center are worth 12x more than the outer ring when you collect your daily land earnings. Units will also want to be in the center of the map to have the best chance at catching the daily Ethereum-rich satellite. The satellite has a 60% chance of landing in the center as opposed to the outer ring, which only has a 5% chance. Each ring also gives you access to a new resource to enhance your units.

4.5.2 Evolution Formula

Here is the formula used to determine a damage or mining stat for the evolved unit:
Resulting stat = Avg * Rand * Match * Rarity

> Where Avg = average of the 3 unit stats together,
> Rand = a random value between 0.9 and 1,
> Match = if no unit matches the parent unit exactly this will be 0.9, if 1 unit matches this will be .94, if all units match exactly this will be 1,
> Rarity = if the resulting unit 3 rarities higher than the lowest rarity this will be 0.85, if it's 2 rarities higher then this will be 0.89, if it's 1 rarity higher this will be 0.95, otherwise this is 1.

The resulting rarity is determined based on the 3 units. If there is a mix of rarities then the evolved unit's rarity has a chance to change. The table below shows the probability given the 3 input units. This is not an exhaustive table but the probabilities are symmetric and can be flipped when the inputs are flipped:

input				result			
common	rare	epic	legendary	common	rare	epic	legendary
			3				100.00%
		1	2			33.30%	66.70%
	1		2		22.20%	33.30%	44.50%
1			2	16.50%	22.20%	27.80%	33.50%
1		1	1	16.60%	27.80%	38.90%	16.70%

4.5.3 Selecting the Rights Units to Evolve

There is a lot of strategy in evolution. The ingredients matter! For the best results, players should try absorb the exact same unit with the same rarity. i.e. Legendary Stormstriker jets should try to absorb other legendary Stormstriker jets. Absorbing units of the exact same type will give your resulting unit a boost in stats. However, absorbing commons into a legendary unit will drag down your result. The resulting unit's stats are also influenced by the 3 original units. You should select units that have high desired stats. It's up to you what you want to "breed" for.

4.6 Enhancements

Every unit has a set of enhancements that can increase a unit's stats. The player spends a certain amount of resources to activate the enhancement. The enhancement then has a set of charges. These charges are spent every time the unit attacks or is destroyed. Once these charges run out, the enhancement must be repurchased with resources.

Players should be constantly mining resources to supply their units' enhancements. Every time a unit evolves, it will unlock a new enhancement. This unit will now be able to travel to the next inner ring which contains the resource needed for their new enhancement. A fully enhanced unit will be over 2x stronger!

There are 4 resource types. Each ring in the world contains a more advanced resource as you move towards the center. Resources can be mined by placing a unit on top of the resource. Every resource patch has a limited amount inside. When it is mined out, the resource will disappear. New resource patches will spawn into the world at a certain rate. There should be quite a few battles over the rarer resources. Be sure to protect your miners while they are harvesting a precious mineral!

5 Earning Ethereum

5.1 Satellite Reward

The satellite reward will reward one lucky player per day with a ton of Ethereum. Everyday a satellite drops from the sky and lands somewhere in the world. A percentage of every sale made the previous day goes to filling up that satellite with Ethereum. If that satellite lands in a player's territory, then they will win the entire amount of Ethereum for that day.

5.1.1 Claiming Territory
Players begin by deploying their units from the outer edge. The world is divided into a large grid where a single unit can fit on 1 grid square. A unit will own all the grid squares around them in a radius.

5.1.2 Rarity Matters!
Higher rarity units have a larger radius. Here are a unit's territory radius for each rarity:
- Common 10

- Rare 14
- Epic 18
- Legendary 20

When 2 opposing units have intersecting radii, they will split the territory. For a given unit, each grid square has a weight applied to it. That weight starts at 1 and drops to 0 as you move from the center to the edge of a unit's territory circle. When there are intersecting radii, a unit will own a grid square if they have the higher weight. Basically, a higher rarity unit will be able to have more territory "pushing" power since they have a larger radius. For all you mathematicians, it's a weighted Voronoi diagram!

5.1.3 Increasing your Chances to Catch the Satellite

The satellite is most likely to land in the center of the world and least likely to land on the outer edge. The world is divided into 3 rings and a circle in the center. The chances for the satellite to land in each area from the center is 60%, 25%, 10%, 5%. Getting units to the center is important! You must evolve your units to travel to the center.

5.2 Land Earnings

We know that catching the satellite will be tough. Therefore we want to provide rewards for all players. They of course, won't be as large as the Satellite Reward but should still be meaningful. All the same territory that you own for the satellite is also relevant in land earnings. Each tile that your units' own has a land value. The land value is the same numerical value as the chance that the satellite will land there. Every minute, we take a snapshot of the world. At the end of the day, we take a look at all those snapshots and figure out an average of how much a player owned throughout the day. We take this and reward the player a percentage of the previous day's sales. We basically want to figure out how well a player is doing in the game. Holding onto tiles in the center will be hard but the most valuable while holding onto tiles in the outside will have less land value.

5.2.1 Older Units are Better

A unit's age matters. Before we sum up a unit's contribution to a player's land value, we multiply that unit's land value by a scalar. That scalar grows with the unit's age. A unit can 4x their land value if they are a year old. A new unit will 1x their land value but as that unit gets older, that unit's land value scalar will grow to 4x. Once a unit is a year old, the scalar is capped at 4x. Presale units will get a great head start!
When fusing 3 units together for evolution, the resulting unit will inherit the oldest age.

5.3 Referral Bonus

We also want to reward players who invite other players directly. Players will be able to send a url to their friends. Every time their friend purchases, they will receive 5% of that purchase. This is done directly through the smart contract.

6 Team

Dan Chao, Game Design
Dan has been an engineer, producer, and game designer for console, PC and mobile games for the past 20+ years. He has built and led many teams and was the lead designer at Funzio on the multi-million dollar mobile titles: Crime City, Modern War, Kingdom Age and War of Nations. Funzio was sold to GREE in 2012 for $210M. Prior to that, he worked on titles such as Cooking Dash, Legacy of Kain: Defiance and Tomb Raider: Legend.

Greg Maxey, Engineering
Greg has been in engineer for the past 15+ years on many successful titles including Cars, Destroy All Humans and War of Nations at GREE with Dan. He was an early engineer at OpenFeint which sold to GREE for $104M. He also worked in the blockchain space with Eric on a mining pool.

Eric Maxey, Engineering
Eric has worked in the gaming and blockchain space since the early days. In 2013, he created a highly successful and innovative mining pool that pioneered on-the-fly coin mining. That mining pool mined over $100M in today's value and had 10k concurrent users. Prior to that, he worked in the gaming space on titles such as the Incredibles Wii U and Family Guy: Back to the Multiverse.

Pierre Roussel, Art
Pierre was an early artist at Funzio that lent his 2D concepting skills to Crime City, Modern War, Kingdom Age and War of Nations. He has worked in gaming at Funzio, GREE, Tinyco and Juicebox. He designed and concepted all the military units in CryptoAssault and has directed the overall look.

Jack Balingit, Art
Jack is a veteran artist in the gaming space having worked at Funzio, GREE, PlayFirst and Chobolabs. An amazing concept artist, Jack has contributed to most of the prop design in CryptoAssault.

7 Links

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