ACALA Token Economy Working Paper

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12 Sep 2020

1 Key Functions of ACA Token

ACA is the native token of ACALA Network. ACAs serve two key functions in ACALA Network:

- **Network Utility Token**
  ACA is a native fee token (e.g. fee for native transactions and smart contracts), and also utilized in staking for collator, staking for oracle and other network activities.
- **Governance of the Network**
  As a governance token, ACA tokens provide their holders voting right in Treasury governance, Council member election, referendum, network upgrade, risk management and more, e.g. adjustment of key risk parameters, such as Stability fee, Liquidation Ratio, and Collateral Type.

2 Minting and Distribution of ACA Tokens

The total supply of A unit of ACA Tokens will be minted at the launch of the mainnet and stored in the ACA Reserve Pool to be distributed to: [1]

- **ACALA Team**
  20.25% will be reserved for the ACALA Team.
- **Ecosystem**
  5% will be reserved for Ecosystem development, e.g. rewarded as grants and bounties.

[1] The distribution plan is subject to change.

- **Reserved**
  11.62% will be reserved as Acala Foundation Treasury.
- **Strategic Investors**
  29.13% will be distributed to the strategic investors:
  - Seed Investors - 18.33%
  - Ventures - 10.8%
- **Reward**
  34% will be distributed as reward, to IPO participants as proposed in Section 7, and network contributors including liquidity providers, early participants, oracle operators and collators.

ACA tokens are subject to re-denomination.

3 Governance of Treasury

Network fees from the following sources are stored in the Treasury, which is under governance of ACA holders.

- **Stability Fee**
  To close a CDP with outstanding debt of n aUSDs, the CDP owner is required to pay $s \cdot n$ aUSDs as Stability Fee, where s is the effective interest rate.
- **Liquidation Penalty**
  All open CDPs are constantly monitored by the system. For each collateral type, a corresponding liquidation ratio is voted by ACA holders, reflecting the amount of overcollaterization a CDP is required to meet to avoid liquidation.

  Once the value of the CDP collateral has fallen below the requirement based on the liquidation ratio, the CDP becomes risky and is automatically liquidated by the system through a hybrid mechanism consist of built-in DEX and Collateral Auctions.

  In a Collateral Auction, a proportion of collateral is sold to cover the outstanding debt in the CDP, and a liquidation penalty of $p \cdot n$ aUSDs, with any remaining collateral returned to the CDP original owners.
- **System Fees**
  System fees include native transaction fee, DeX fee, L-DOT protocol fee and fees for other network activities.

4 Parachain Auction

We plan to launch our mainnet on a Parachain slot, to be leased from Polkadot, using DOTs to be crowdfunded. A specially designed Candle Auction is utilized to sell the leasing right of Parachain slots. It is a mechanism designed for fairness, e.g. to prevent early sniping and provide bidders with higher valuation higher chances of winning. Since it will be a challenge to estimate private valuation distribution of bidders with private bidding strategies, and we plan to conduct a Crowdfund IPO (Initial Parachain Offering), that we will:

1. Start our DOT Crowdfund at time $t - 30$
2. Bid W_0^1, total fund collected for a 12-month lease of a Parachain slot, at time 0, the open time of the first Parachain slot auction
3. Bid W_t^1, whenever total fund increase at time $t < T$, before the close time T of the first Parachain slot auction
4. After the retroactive close time t^* of the first Parachain slot auction is announced, if our last bid before t^* is successfully accepted, $W_{t^*}^1$ unit of DOTs will be locked to lease the Parachain slot and the rest of $W_T^1 - W_{t^*}^1$ DOTs that are deposited into the crowdfund after t^* will be returned to their owners,
5. Distribute ACA tokens as rewards to DOT owners who participate our first IPO successfully, to compensate their opportunity costs of having their DOTs locked for 12 months.

5 Parathreads

In case our first Parachain slot auction was not successful, we will continue to launch our mainnet on Parathreads instead. DOTs raised in IPO will be returned to their owners, and ACA tokens will still be minted at launch, but only distributed to ACALA Founders and Seed Investment Partner according to the original plan, with the rest reserved for future investment opportunities including IPO in the second Parachain auction.

Compared to Parachain, there are gas costs using Parathreads, depending on frequency of validation. The more frequent a validation is processed, the safer the network is, at a price of higher gas costs. ACA holders will vote to determine the frequency. A small amount of ACA tokens will be released from the reserve and sold to public for DOTs daily to cover the entire gas costs of the network daily validation. For say, if the total gas costs are estimated to be 5 ACA tokens worth of DOTs for the day, 5 ACA tokens will be released and sold by

the system. Another IPO will be raised to lease a Parachain slot before the second Parachain auction.

6 Six Years of Parachain Lot Lease

We plan to lease the Parachain slot for six years, in hope to switch to our independent blockchain bridging to Polkadot after six years.

Assuming that DOTs are estimated to generate a net effective annual return of r for DOT holders, we will distribute a proportion of ACA tokens reserved in the Rewards pool, a total of $\alpha \cdot A$ unit of ACA tokens, to IPO participants during the six years, as reward for locking their DOTs for our lease of Parachain slot.

The following work-in-progress in Section 6.1 - 6.5 is constantly reviewed and subject to change.

6.1 Ideal Situation

In ideal situation, when relative cost of leasing a Parachain do not fluctuate significantly among Parachain leasing periods. Suppose we won our first Parachain auction at cost of $W^1_{t^*}$ that the estimated costs of leasing the same slot at the second round and third round are $W^1_{t^*}(1+r)^2$ and $W^1_{t^*}(1+r)^4$ respectively. all ACA tokens in the IPO Reward Reserve are distributed to IPO participants in the three IPOs accordingly that there will be zero ACA token left by the end of the third round of lease (six years after launch). The ACALA network is expected to be ready to upgrade to an independent blockchain bridging to Polkadot by then, and all ACA holders will be invited to vote whether to upgrade to independent blockchain or lease another round of Parachain slot by minting more ACA tokens as rewards for the fourth-round IPO participants.

Three Rounds of Parachain Lot Lease (Ideal Situation)			
Round	Winning Bid	Proportion in Reward Reserve	ACA Rewards when $r = 10\%$
1	$W^1 = W^1_{t^*}$	$\frac{1}{1+(1+r)^2+(1+r)^4}$	$8.17\% \cdot A$
2	$W^2 = W^1(1+r)^2$	$\frac{(1+r)^2}{1+(1+r)^2+(1+r)^4}$	$9.88\% \cdot A$
3	$W^3 = W^1(1+r)^4$	$\frac{(1+r)^4}{1+(1+r)^2+(1+r)^4}$	$11.95\% \cdot A$
Total	$W = W^1 + W^2 + W^3 = W^1[1 + (1+r)^2 + (1+r)^4]$	100%	$30\% \cdot A$

However, extreme cases are not uncommon in the world of blockchains, that all possible scenarios (categorised into four special cases as below) are analysed.

6.2 Special Case I

In situations when rapid growth of the Polkadot network cause exploding demand of the Parachain slots, that W^2 winning bid in the second round of Parachain auction is much higher than W^1. When

$$W^2 > W^1[(1+r)^2 + (1+r)^2]$$

the system will distribute all remaining ACA tokens in the IPO Reward Reserve

$$\frac{(1+r)^2 + (1+r)^4}{1 + (1+r)^2 + (1+r)^4} \cdot 30\% A$$

to IPO participants in the second round. For instance, when $W^2 = 5W^1$, all remaining ACA tokens in IPO Reward Reserve are distributed in the second round.

Therefore, we have zero ACA tokens left in reward reserve for IPO participants in the third round. Given the trend of growth, it is very likely that by the end of the second round of lease (four years after launch), the ACALA network will be ready to upgrade to an independent blockchain bridging to Polkadot, rather than leasing a Parachain slot. All ACA holders will be invited to vote whether to upgrade to independent blockchain or lease another round of Parachain slot by minting more ACA tokens as rewards for the third-round IPO participants.

Three Rounds of Parachain Lot Lease (Special Case I)			
Round	Winning Bid	Proportion in Reward Reserve	ACA Rewards when $r = 10\%$
1	$W^1 = W^1_{t^*}$	$\frac{1}{1+(1+r)^2+(1+r)^4}$	$8.17\% \cdot A$
2	$W^2 > W^1[(1+r)^2+(1+r)^2]$	$\frac{(1+r)^2+(1+r)^4}{1+(1+r)^2+(1+r)^4}$	$21.87\% \cdot A$
3	Strategy to be Voted	TBV	TBV
Total	W	TBV	TBV

6.3 Special Case II

In situations when growth of the Polkadot network is faster than expectation and cause increasing demand of the Parachain slots, that W^2 winning bid in the second round of Parachain auction is higher than expectation, but not as extreme as in Special Case I. When

$$W^1(1+r)^2 < W^2 < W^1[(1+r)^2 + (1+r)^2]$$

the system will distribute a proportion of remaining ACA tokens in the Reward Reserve with respect to ratio of W^2 and W^1

$$\frac{W^2/W^1}{1+(1+r)^2+(1+r)^4} \cdot 30\%A$$

to IPO participants in the second round. For instance, when $W^2 = 2W^1$, reward ACA tokens distributed in the second round are doubled compared to the first round.

Therefore, we have a lot less ACA tokens left in reward reserve for IPO participants in the third round, compared to the ideal situation. Given the trend of growth, it is likely that by the end of the second round of lease (four years after launch), the ACALA network will be ready to upgrade to an independent blockchain bridging to Polkadot, rather than leasing a Parachain slot. All ACA holders will be invited to vote whether to upgrade to independent blockchain or lease another round of Parachain slot by minting more ACA tokens as rewards for the third-round IPO participants.

Three Rounds of Parachain Lot Lease (Special Case II)			
Round	Winning Bid	Proportion in Reward Reserve	ACA Rewards when $r = 10\%$
1	$W^1 = W^1_{t^*}$	$\frac{1}{1+(1+r)^2+(1+r)^4}$	$8.17\% \cdot A$
2	$W^2 > W^1(1+r)^2$	$\frac{W^2/W^1}{1+(1+r)^2+(1+r)^4}$	$8.17\% \cdot A\frac{W^2}{W^1}$
3	Strategy to be Voted	TBV	TBV
Total	W	TBV	TBV

6.4 Special Case III

In situations when demand of the Parachain slots somehow shrink extremely due to unexpected problems, that winning bids in the second and other future round of Parachain auction becomes super small or zero that it is free to lease a Parachain slot. When

$$W^i = 0 \quad \forall i > 1$$

the system will NOT distribute any remaining ACA tokens in the IPO Reward Reserve. All ACA holders may vote to decide whether to use these tokens for other purposes such as raising investment or burn them to remove permanently from the ACA supply.

Three Rounds of Parachain Lot Lease (Special Case III)			
Round	Winning Bid	Proportion in Reward Reserve	ACA Rewards when $r = 10\%$
1	$W^1 = W^1_{t^*}$	$\frac{1}{1+(1+r)^2+(1+r)^4}$	$8.17\% \cdot A$
2	$W^2 = 0$	0%	0
3	$W^3 = 0$	0%	0
Total	$W = W^1 + 0 + 0 = W^1$	100%	$30\% \cdot A$

6.5 Special Case IV

In situations when demand of the Parachain slots somehow do not grow as fast as expected in ideal situation or shrink, that winning bids in the second and other future round of Parachain auction is smaller than expectation in ideal situation. When

$$0 < W^2 < W^1(1+r)^2$$

the system will distribute a proportion of remaining ACA tokens in the Reward Reserve with respect to ratio of W^2 and W^1

$$\frac{W^2/W^1}{1+(1+r)^2+(1+r)^4} \cdot 30\%A$$

to IPO participants in the second round. For instance, when $W^2 = 0.5W^1$, reward ACA tokens distributed in the second round will only be half as many compared to the first round.

If the weak trend in demand of Parachain slots continue that we will more ACA tokens left in the IPO Reward Reserve by the end of the second round of lease, than expected in ideal situation. When

$$0 < W^3 < W^1[(1+r)^2+(1+r)^4] - W^2$$

the system will distribute a proportion of remaining ACA tokens in the Reward Reserve with respect to ratio of W^3 and W^1

$$\frac{W^3/W^1}{1+(1+r)^2+(1+r)^4} \cdot 30\%A$$

to IPO participants in the second round. For instance, when $W^3 = 0.75W^1$, reward ACA tokens distributed in the second round will only be three quarters as many compared to the first round.

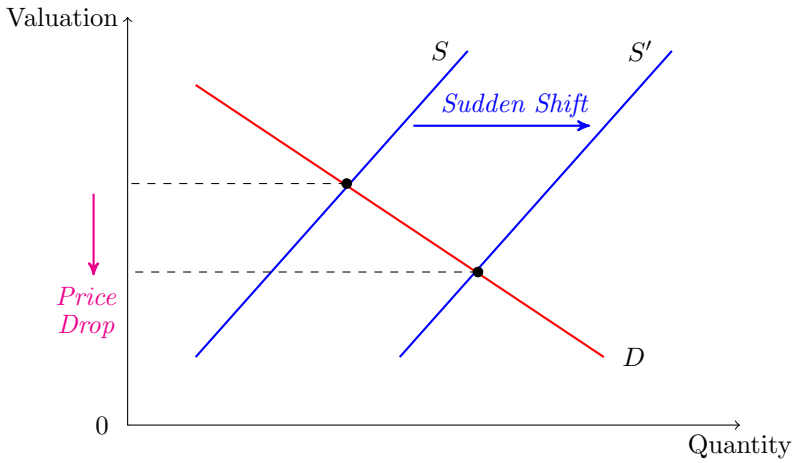
Therefore, we still have some ACA tokens left in the IPO reward reserve after the end of the third round lease. If there are enough to reward IPO participants in the fourth round, the system will distribute them the same way as in previous two rounds. If there are not enough ACA tokens left, all ACA holders will be invited to vote whether to mint more ACA tokens as rewards to run a fourth IPO.

Three Rounds of Parachain Lot Lease (Special Case IV)			
Round	Winning Bid	Proportion in Reward Reserve	ACA Rewards when $r = 10\%$
1	$W^1 = W^1_{t^*}$	$\frac{1}{1+(1+r)^2+(1+r)^4}$	$8.17\% \cdot A$
2	$W^2 < W^1(1+r)^2$	$\frac{W^2/W^1}{1+(1+r)^2+(1+r)^4}$	$8.17\% \cdot A\frac{W^2}{W^1}$
3	$W^3 < W^1[(1+r)^2+(1+r)^4] - W^2$	$\frac{W^3/W^1}{1+(1+r)^2+(1+r)^4}$	$8.17\% \cdot A\frac{W^3}{W^1}$
Total	TBV	TBV	TBV

7 Distribution of ACA Tokens as IPO Reward

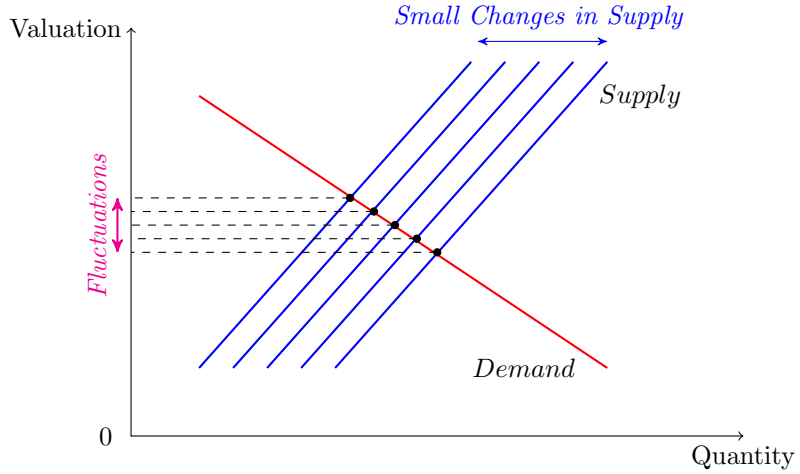
The ACA tokens reserved as IPO reward are planned to be distributed to IPO participants during the first six years. It is obvious that these ACA tokens would be better distributed in a frequent small batches rather than in lump sums at beginning of each round of Parachain lease, which would lead to sudden large shifts in ACA supply causing unfavourable large price fluctuations as shown below.

ACA Tokens Rewarded in a Lump Sum



We propose that all ACA Reward tokens planned to be distributed in each round are to be distributed to each successful IPO participant at every second, according to the proportion of their shares of locked DOTs in the total number of locked DOTs, for less market fluctuation.

ACA Tokens Rewarded in Frequent Small Batches



Since ACA Tokens are distributed to cover the opportunity cost of the net yield of these locked DOTs, the initial valuation of one ACA token for a IPO participant in round one is derivable.

8 ACA Initial Liquidity Injection

After a Parachain slot is secured by winning the first Parachain auction, a small proportion of ACA tokens reserved in Treasury will be available at public sales events before the launch of mainnet, to inject initial liquidity to the network.

ACA tokens sold through public sales events will be distributed to the participants immediately and are ready to be traded at the launch of the mainnet.

9 Distribution of ACA Tokens to Other Parties

ACA Tokens distributed to other parties such as Strategic Partners, are not allowed to be traded for a fixed length of time (vesting schedule vary from 12 to 24 months after launch of mainnet) for market stability.