

Access Network

Decentralizing Financial Inclusion

The Access Network is a self-governing, incentivized token economy that empowers participants to define financial access for themselves

Mickey Costa, Ori Shimony, José V. Fernández & James Schuler

March 1, 2018

Abstract

Communities in the developing world face pressing real world challenges but lack access to the financial and technological tools to improve their situation. Crypto-communities have pioneered disruptive blockchain solutions but lack a user base eager enough to immediately make their innovations effective in the real world. In this paper, we introduce the Access Network (ACX Network) as a means of aligning the interests of these communities such that they may solve each other's problems.

The ACX Network is a self-sustaining token economy that empowers participants to define financial access for themselves. Participants are incentivized to create long-term value for one another by democratically controlling the distribution of the Network's Incentive Pool. These interactions are enabled by a modular suite of smart contracts that self-amend and distribute funds throughout the ecosystem according to the will of the network. The ecosystem consists of five core layers:

1. ACX utility token
2. Governance Protocol
3. Incentive Pool
4. Decision Modules
5. Off-chain services

ACX Network's intrinsic token (ACX) is used for the following

- Voting in on-chain protocols
- Participating in auxiliary services that incentivized contributors develop

6 Billion ACX will be unlocked over time to represent the 6 Billion financially underserved and allocated to ensure equitable distribution and aligned incentives among participants in the token generation event, the underserved, and future network contributors.

ACX Network was built by the team behind Atlas Money, a P2P branchless banking platform that has successfully pioneered the digitization of door-to-door financial services in Ghana and Senegal. Atlas will integrate with ACX Network as its first exchange in West Africa, leveraging over 300 agents and 17,000 users to become ACX Network exchanges and token holders, respectively. In addition to bootstrapping fiat-to-crypto liquidity in the developing world, Atlas will work with Access to offer mobile wallets and other services that enable greater participation in the ACX Network and the broader crypto revolution.

ACX Network will provide true economic freedom and accelerate financial inclusion to those that need it most and provide the previously underserved with an equitable say in the evolution of their financial freedom, connecting communities so that they may all co-create and thrive together.

ACX Network's Founding Principles of Empowerment:

1. Financial access is a fundamental human right.
2. That right shall be perpetually developed through a properly incentivized ecosystem.
3. Decisions on the ecosystem's evolution shall be equally accessible to all citizens of the world.
4. The previously excluded shall be all the more empowered to define and shape said evolution.
5. Humanity is a global family that must come together to realize its boldest ambitions, and co-create a world that belongs to and benefits us all.

Contents

1	Problem Statement	4
1.1	Crypto Communities Need Access to the Underserved	4
1.2	The Underserved Need Access to Decentralized Technology	4
2	Atlas Money Background	5
3	Access Background	6
4	The Access Ecosystem	8
4.1	ACX: The Access Token	8
4.2	The Governance Protocol: On-Chain Meta-Coordination	9
4.3	The Incentive Pool	10
4.4	The Polling Module: On-Chain Coordination	12
4.4.1	Proposal Registry	12
4.4.2	Resolution Registry	16
4.5	Beyond the Protocol: Off-Chain Services	18
5	The Access Underserved Exchange	19
5.1	Dynamics and Possibilities	19
5.2	Local integration of Atlas Money and ACX	20
6	ACX Allocation	22
6.1	Distribution of ACX supply	22
6.2	ACX Distribution	22
6.3	Use of Proceeds	23
7	Roadmap	24
8	Conclusion	26
9	Acknowledgements	27
10	Disclaimers	28

1 Problem Statement

1.1 Crypto Communities Need Access to the Underserved

Ever since Bitcoin appeared following the financial crisis of 2008, crypto and blockchain enthusiasts have been optimistic about the potential for blockchain technology to usher in an era of economic efficiency and inclusivity. Yet, while a vanguard of technologists focus on designing distributed cryptosystems to empower the people, 2 billion unbanked adults, that affect a total of nearly 6 billion lives are waiting on the sidelines. For these people engagement is forestalled by the following:

- Financially, a lack of local exchanges precludes individuals from 'buying in' to crypto-networks
- Technologically, the lack of smartphones and internet access precludes individuals from practically utilizing crypto-network development and 'working in' to the crypto economy.

For developed areas of the world where bank accounts and smartphones are ubiquitous, the problem is reversed. Financial and technological barriers are low, but people are much less willing to test unfamiliar paradigms since the existing centralized systems are just good enough. Most engagement with these potentially revolutionary technologies occurs only at the surface-level, with exchanges being used as trading platforms to seek a profit.

In effect, we have a minority of people with access to cryptocurrencies but little incentive to seriously participate in their true utilities, and a majority who could benefit immensely but lack the necessary access points to do so.

1.2 The Underserved Need Access to Decentralized Technology

The average adult in the developing world subsists on \$80 to \$120 a month[1], which has to cover all the costs of 1 living for their whole family. Most people do not have a formal job but are rather necessity entrepreneurs by default be they farmers, traders, craftspersons or street vendors. There is little to no public infrastructure, so marketplaces, while similar in the basic goods and services provided to those in developing economies, are largely informal. Despite a lack of access to the global economy, developing economies continue to grow at a rate of over 4% a year largely due to the high pace of commercial activity in these local marketplaces[2]. In Ghana for example, there is a population of nearly 30 million, with a GDP of roughly \$40B, growing at just over 3.5% annually.

Despite this growth, most people in developing economies have no access to basic financial services. The high costs associated with the brick and mortar model of formal banking institutions make setting up branches in rural areas infeasible (Ghana has 37 banks but 60% remain fully unbanked)[3]. Smaller financial institutions such as micro-finance institutions, while more accessible, are often untrustworthy and have been known to mismanage funds, collapse, and lose people's life savings, time and time again[4].

As a result, people often utilize their own communal networks to handle financial needs on an informal basis. In many emerging markets people pool their money together in rotating savings circles. Others simply store money under their mattress until they accumulate enough for large purchases.

Those who require additional lines of credit to grow their business are forced to borrow from predatory lenders who charge exorbitant rate of interest for relatively small loans. In many African and Asian countries, telecommunication companies have begun offering mobile money, a service that ties a customer's mobile phone account to a checking account. However, mobile money operators often charge high transaction fees

and limit users to domestic transfers.

Mobile phone penetration in West Africa currently stands at roughly 80%[5]. However, in countries like Ghana, only 25% of people have a smartphone[6]. Smartphones and associated data plans can be prohibitively expensive for an average consumer. Furthermore, most rural areas have no data coverage at all, with LTE/4G only recently becoming available in select cities. In short, basic communications technology is ubiquitous in the developing world but access to formal financial systems is not.

The synergies between these two groups are very clear. The underserved represent a massive, diverse population with pressing economic and technological needs. Decentralized cryptosystems, by their very nature, need a massive and diverse population to thrive at scale. They are each the solution to each other's problems. The only issue is access to each other.

2 Atlas Money Background

Atlas Money is a P2P branchless banking platform that allows anyone to become their own community micro-bank. Atlas Money Agents go door-to-door daily to Atlas Money Users collecting deposits, issuing withdrawals and offering microloans. Atlas Money is currently in Ghana and Senegal with over 300 Agents and 17,000 customers, most of whom use it for daily deposits. Atlas Money has issued over 3,000 microloans so far, and because the model is savings and relationship led, has a near 0% default rate. Ghana has a population of roughly 30M people, while Senegal has close to 15M. Their respective GDPs are about 1,000 times that of their populations. Sizeable portions remain completely unbanked and a large majority receive inadequate financial access. Atlas is currently present in 3 of Ghana's 10 regions, and in 1 region in Senegal.

Atlas Money Agents use a smartphone app to transact with customers, while customers only need a feature phone to participate on the platform. Customers pay Atlas Money a small monthly fee for the agent services provided. Being an Atlas Money agent is a full-time job and a well paying one at that, with most agents making over twice the country's average monthly income. Atlas Money sources new agents from local communities, empowering people that are already pillars of their offline communal networks, a pattern that is ubiquitous throughout West Africa and beyond.

In January 2016, the Atlas Money team moved to Ghana, and it was there that we found our product market fit of branchless community bankers already existing in the marketplace. The gaping problem was one of trust and uniformity personal bankers and larger micro-finance institutions would often collapse, losing all user deposits, but users always returned to the same channel seeking to rebuild trust anew. Before building our core product, we shadowed countless existing personal bankers, retaining the convenience and close personal relationships of the model, while digitizing the experience and providing much needed trust and greater financial access.

In order to provide accountability and guarantee safety of user funds, Atlas Agents pre-purchase digital credit before processing user transactions. They will swap credit for fiat throughout the day until they run out of credit, and then re-purchase more credit with the cash on hand in order to process more transactions. For example, an Atlas Agent may purchase \$100 of digital value, and when they take a \$5 deposit, the user gets \$5 in credit on their wallet, accessible through their feature phone. Now, the Agent has \$95 in digital credit, and \$5 in cash. They will repeat this process until they have \$0 in credit, and \$100 in cash. They then exchange that cash for more digital credit from what's called a Super Agent- be it Atlas, an individual provider, or a corporate partner such as a bank. In short, agents manage their liquidity while transacting in

a trustless environment for end users. This is a common distribution process for mobile carriers when circulating mobile money credit or airtime scratch-off cards, and a robust network of Super Agents and Agents already exist. Atlas used the testnet of Bitcoin's Blockchain to periodically publish a record of bulked transactions, but as the price of bitcoin continued to rise, its blockchain became increasingly infeasible to use for real-time transparent accounting of individual transactions.

Atlas grows and engages its operations by focusing on the existing communal fabrics of its markets. They meet with chiefs, market leaders, and religious leaders to source new community agents and get feedback on their product and services. They also host monthly gatherings in each region, with Agents, as well as with user community groups such as market women that all sell plantains or fish. Places like Ghana and Senegal have complex and strong decentralized networks of community for all aspects of life. By leveraging the strength of these networks, Atlas ensures that it is constantly building with, rather than simply for, the people of developing markets.

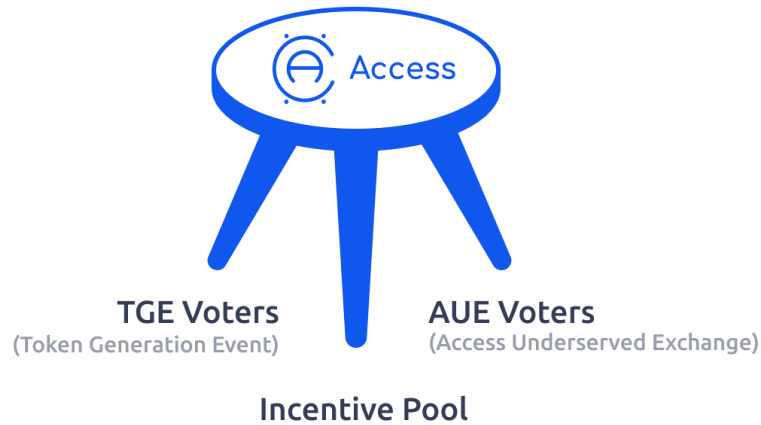
Born out of the Techstars Barclays fintech accelerator of London in Summer 2015, Atlas Money has raised over \$3.2M in capital from investors including Draper Associates, 1517 Fund, MITS Fund and Partech Ventures. Barclays Africa has been a staunch supporter of Atlas Money, acting as our strategic banking partner in mutually present markets.

3 Access Background

Atlas Money is leveraging its mobile banking platform and the borderless, programmable nature of cryptocurrency tokens to launch the ACX Network, a self-sufficient token economy that incentivizes participants in the developing and developed world to create value for one another. In doing so, we aim to enable emerging markets to leapfrog developed economies while avoiding the path of inefficient and disempowering centralized systems.

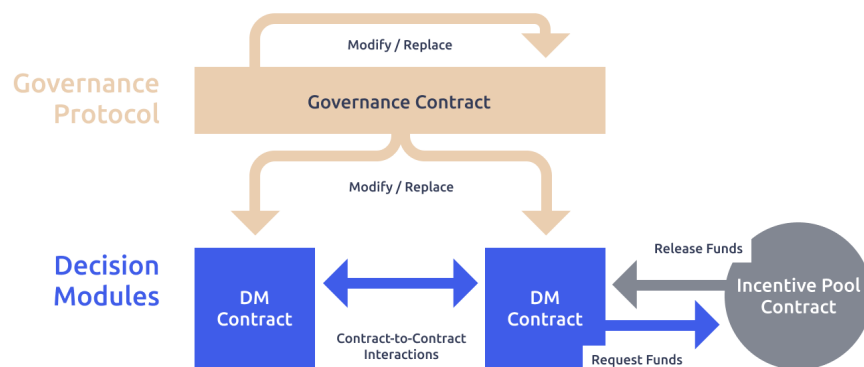
Rather than connecting to existing financial systems with predefined terms of service that advantage a select few, the ACX Network will animate a financial ecosystem controlled by its participants. The medium for political and economic participation in the ecosystem is ACX. ACX is both (1) the key for participating in the network's internal political processes, and (2) the intrinsic economic incentive itself. It will also be the medium of participation in auxiliary services, decentralized applications, and communities that incentivized contributors develop around the network.

Participants will utilize ACX in democratic decision-making processes that direct incentives towards projects that contribute utility value to the ecosystem. This will allow users to continually define, price, and reward utility as they see fit. A suite of smart contracts deployed to the Ethereum blockchain will transparently mediate this process, enabling diverse sets of stakeholders to collaborate in a trustless manner. Participants can also upgrade components of the smart contract architecture using a democratic procedure, which itself is upgradeable. Future-proofing the network in this way gives participants the ability to integrate new market mechanisms, governance models, and protocol design practices as they evolve.



In order to align interests among developing world users, developers, and developed world users, ACX will be distributed through the Access Underserved Exchange (AUE), Incentive Pool, and a Token Generation Event. Each component of this three-legged stool will provide a critical access point between the ACX token economy and relevant stakeholders in the global economy. The AUE serves as a fiat/crypto exchange for underserved populations in the developing world. Atlas Money will integrate the AUE into its mobile banking platform to circulate ACX to customers while providing downside protection to eliminate volatility risk. The Incentive Pool rewards participants who contribute to the Access ecosystem. Token holders will use trustless decision-making procedures to decide which projects to fund and how to price them. Lastly, the Token Generation Event will enable private contributors to join the network by purchasing tokens. These three access points constitute the liquidity channels that will facilitate the adoption and continued development of a truly inclusive token economy.

Smart Contract Architecture



4 The Access Ecosystem

Access aims to sustain a vibrant ecosystem of continually improving forms of financial access that is self-governed and internally incentivized.

The core components of the Access Ecosystem are the amendable Governance Protocol and fixed Incentive Pool. Upon reaching consensus at predefined intervals, network participants can use the Governance Protocol to modify and replace the smart contracts that define their coordination procedures. This allows for the creation of arbitrarily complex decision modules that regulate routine decision-making processes. The Governance Protocol can also self-amend, meaning a consensus of network participants can modify the rules for reaching consensus in the future. The Incentive Pool unlocks the network's utility token, ACX, at a predetermined, unchangeable rate. Although the Governance Protocol and its descendent modules cannot alter the Incentive Pool itself (i.e. the unlocking rate), they can regulate the distribution of its unlocked funds. In this paper, we propose the first iteration of one such module called the Polling Module, a multi-round voting system that rewards individuals who contribute to the ACX Network in proportion to the popularity of their contributions. After the initial Incentive Pool is completely unlocked, an inflationary mechanism may replenish the supply at a rate of up to 1% per year, at the discretion of network participants.

This democratically-mutable suite of smart contracts will be nested in a broader ecosystem of off-chain services that add utility to the token as they multiply and mature. Because the interests of network participants are aligned through common ownership of Access tokens, they will only be incentivized to make decisions or approve projects that improve the ecosystem's functionality. This paper will propose the first set of service layer applications including mobile and web wallets for ACX; a platform to track, submit, and vote on polls (Polling Module interface) and amendments (Governance Protocol interface); and Access' Underserved Exchange, which will act as a technological and economic bridge to stimulate the circulation of ACX in West Africa and beyond.

The following sections outline the mechanisms, actors, and incentives at play in each layer of the Access Ecosystem as well as their significance to the system as a whole. The ecosystem consists of five core layers: (a) the ACX utility token; (b) the Governance Protocol; (c) the Incentive Pool; (d) Decision Modules such as the proposed Polling Module; (e) and of -chain services introduced by Atlas Money and others. Taken together, these layers will provide a practical crypto-economic framework for communities around the world to dynamically address each other's needs. All of the aforementioned layers will be powered by our protocol native digital asset, the Access Token.

4.1 ACX: The Access Token

ACX is an ERC-20 token that will be used to participate in on-chain decision processes as well as the auxiliary services rendered in various off-chain contexts. The entire Access Ecosystem relies on the circulation of ACX, which is analogous to a key that grants its holder the ability to participate in the network. ACX will have several core functions that multiply as the ecosystem diversifies and expands.

- The Governance Protocol gives ACX holders the power to alter on-chain components of the ACX Network by drafting and ratifying new decision modules and governance amendments
- The Incentive Pool unlocks ACX tokens to reward participants who contribute to the ecosystem
- Once the Polling Module is deployed, ACX tokens will be used to participate in the process of delegating, voting, and submitting polls that will allocate and disburse Incentive Pool funds to Access contributors

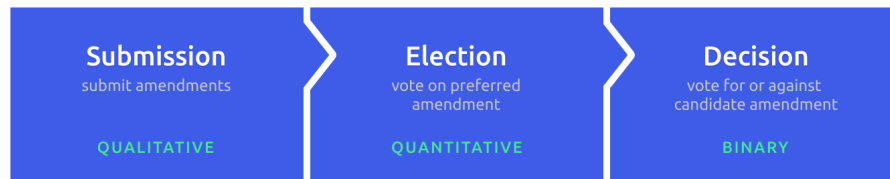
- Lastly, ACX will be used as the medium of exchange and unit of account in the applications, markets, and communities that are built around the network

There is an initial supply of 6 billion ACX, 1.62 billion of which are locked into the ACX Incentive Pool. After the token generation event, the Incentive Pool will begin unlocking these tokens at a decreasing rate to bootstrap the development of off-chain services. The unlocking rate will decrease each year until the entire pool is available ten years later. From this point on, the Incentive Pool will mint new tokens at a rate between 0% and 1% of total ACX supply based on the votes of token holders (*see Incentive Pool*).

4.2 The Governance Protocol: On-Chain Meta-Coordination

The Governance Protocol is a strictly defined set of rules for altering on-chain components of the ACX Ecosystem. It is designed to future-proof the network over the long-term while allowing it to operate effectively on a day-to-day basis. The procedure occurs entirely on-chain in three distinct phases and repeats on a quarterly basis. For every two election cycles to refine the decision module contracts, there is one to refine the Governance Protocol contract. This way, network participants have the opportunity to amend the contracts that control routine decision-making processes twice as often as those that control the rules for making those amendments. The network is free to alter these intervals and will likely opt for longer time intervals as preferred mechanisms are tested and stabilized.

First, network participants have a month to suggest protocol amendments by submitting hashes of replacement Solidity contracts. Next, participants have a month to vote on their preferred protocol amendment. The amendment that receives the most voting weight by the end of this period becomes the candidate contract for the current election cycle. In the third and final month, participants vote for or against the candidate contract. If quorum is reached and a majority of the quorum votes yes, then the amendment is ratified and replaces the relevant smart contracts. If quorum is not reached or a majority vote no, then all contracts remain unchanged. The initial quorum is set to 10% of all tokens in circulation.

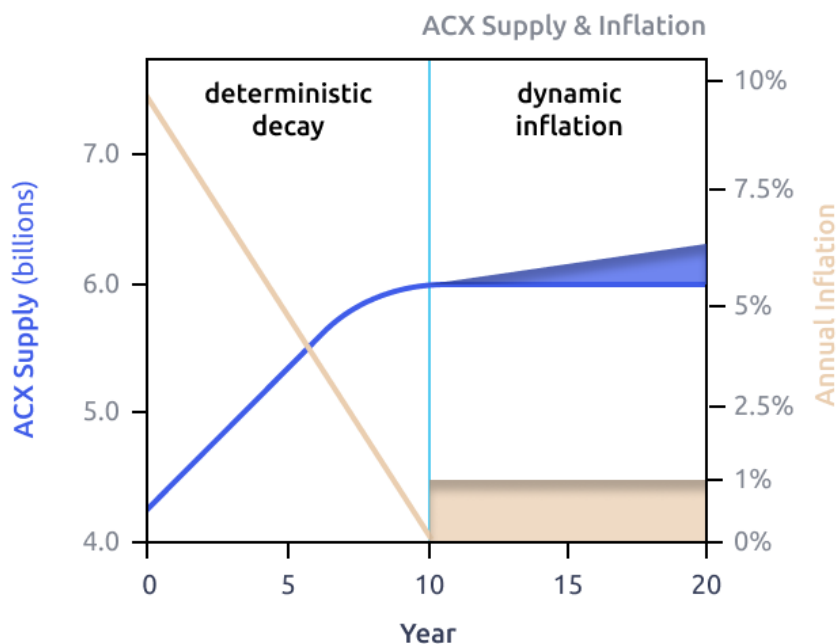


During decision module election cycles, smart contracts that control access to the Incentive Pool can be modified or replaced, but the Governance Protocol itself remains unchanged. Such changes could alter or remove components like the Radical Trust Function, Floating Quorum, or delegation rules (see Polling Module). Decision module elections cycles can also add entirely new mechanisms such as incentivized voting or Artificial Intelligence modules to filter spam polls. During Governance Protocol election cycles, only the Governance Protocol contract can be amended. Such amendments can alter parameters of the election cycle process itself, such as the frequency, duration, or quorum requirements. Token generation event and Incentive Pool contracts are immutable, as the former controls initial supply and stakeholder allocation while the latter controls the token supply over time. As a security measure, the ACX Network Founders will have a veto power expiring after twelve months, until we rule out any kinks in the Governance Protocol. This is to mainly ensure 1) technological feasibility and 2) maintenance of an equitable governance structure, such as the proper quorum threshold, ahead of greater maturity and amending practices.

4.3 The Incentive Pool

ACX Generation

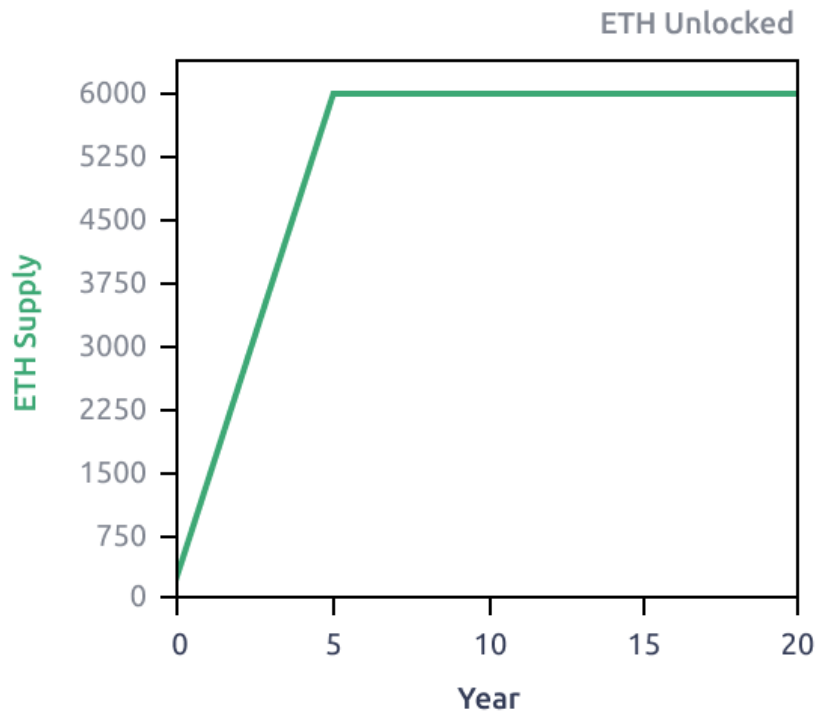
For the first ten years after launch, 1.62 billion ACX will be unlocked from the Incentive Pool at a deterministic rate to compensate contributors to the Access Ecosystem. After this period of deterministic decay, inflation will dynamically replenish the incentive pool at a rate between 0% and 1% of total ACX. Every account indicates binary support for or against inflation, and the aggregate support level determines the rate for the subsequent year. For example, if 60% of tokens signal support for inflation in year ten, then inflation for year eleven will be 0.6%. If 20% of tokens signal support for inflation in year eleven, then inflation for year twelve will be 0.2%.



Because the Incentive Pool is periodically paying out contributors to the Access Ecosystem as coordinated by the decision modules, the size of the ACX Incentive Pool is always the number of ACX tokens unlocked minus the amount paid out to contributors.

Ethereum Incentives

Immediately following the Token Generation Event, 20% of all Ether collected are locked to an Ether incentive pool as bonus compensation for early contributors. The Incentive Pool Contract unlocks the ETH over the first five years of the ten year inflationary era at a linear rate as follows:

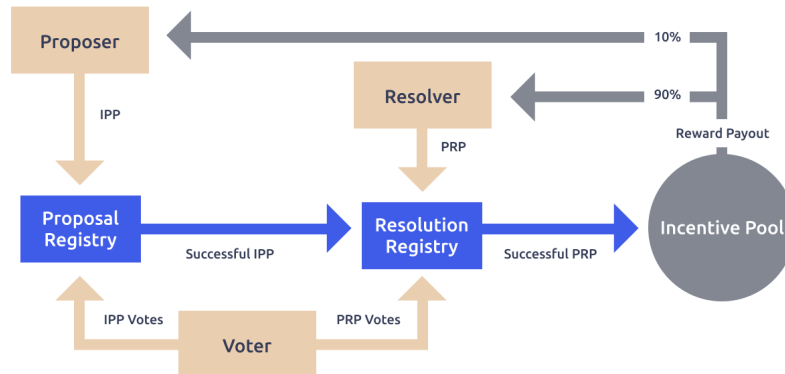


The amount of ETH rewards available at any given time is the amount of ETH rewards unlocked minus the amount paid out to contributors.

Payouts for successful resolutions will initially include both ACX and ETH but will shift towards ACX as the initial reserve of ETH is unlocked and distributed. Coupling incentives in this manner further incentivizes early development by protecting contributors from the price volatility inherent to nascent tokens. At the same time, decoupling the bonuses over time accelerates the Access Ecosystem towards fully sustaining development with its native token. This shift is achieved independently of any decision modules by having the Incentive Pool unlock the ETH Pool at a faster rate than it unlocks ACX. The proportion of the total amount of available ACX and ETH allocated for peer-approved contributions is then determined by the decision modules approved by network participants (see Payout Allocation).

The following section outlines a decision module that will be proposed during the first decision module election cycle. The Polling Module’s design reflects the Access team’s founding principles but will ultimately be voted on by network participants.

The Polling Module



4.4 The Polling Module: On-Chain Coordination

A decision module is a set of rules that asynchronously mediates the interactions of token holders during routine decision-making processes. These interactions occur entirely on-chain through user-to-contract and contract-to-contract transactions that allocate funds to reward contributions to the Access Ecosystem. The Polling Module is our proposal for the ACX Network’s first decision module. Its implementation will be voted upon during the first decision module election cycle.

The Polling Module sets up a two-phase call and response process for deciding on which projects to fund and how to price them. In the proposal phase, the network votes on whether or not a given improvement proposal should be approved. If it receives enough votes, then the resolution phase begins where users compete to submit proposal resolutions. If one of the resolutions are approved, then the resolving account as well as the original proposing account are credited with funds from the Incentive Pool in proportion to the popularity of the original proposal.

The Proposal Registry and Resolution Registry contracts autonomously administrate each phase of the process. The Proposal Registry accepts Improvement Proposal Polls (IPP’s) and IPP votes to compute their popularity. The Resolution Registry accepts Proposal Resolution Polls (PRP’s) and PRP votes to determine whether or not payment should be made.

4.4.1 Proposal Registry

Improvement Proposal Poll

An IPP outlines the proposer’s idea for an improvement to the network, be it a feature request for some existing service or an entirely new service altogether. It also contains several optional parameters including duration.

SPECIFIED BY PROPOSER		COMPUTED BY CONTRACT	
Title	title of IPP	Poll ID	transaction ID of the submission
Description	description of IPP	Author	public address of proposer
Duration	maximum length of time to keep IPP open (default/min = 2 weeks)	Status	status of IPP (open, closed, pending, settled)
Extension	extension to allow for additional fields in the future (optional)	Weight	cumulative voting weight staked towards IPP

Radical Trust: Reputation-Weighted Quadratic Voting

As long as the IPP is open, any token holder can vote in favor of the poll by temporarily staking a portion of their tokens towards it. The voting weight of each token is determined by the Radical Trust Function, a reputation-weighted quadratic voting formula intended to curb the power that any single voter can exert in the system. Quadratic voting decreases the marginal weight of each successive token staked by a user for a given poll along a sublinear curve. Our implementation uses a radical function that limits voting influence to asymptotic growth on the order of $T^{1/2}$ where T denotes the number of tokens staked towards the poll.

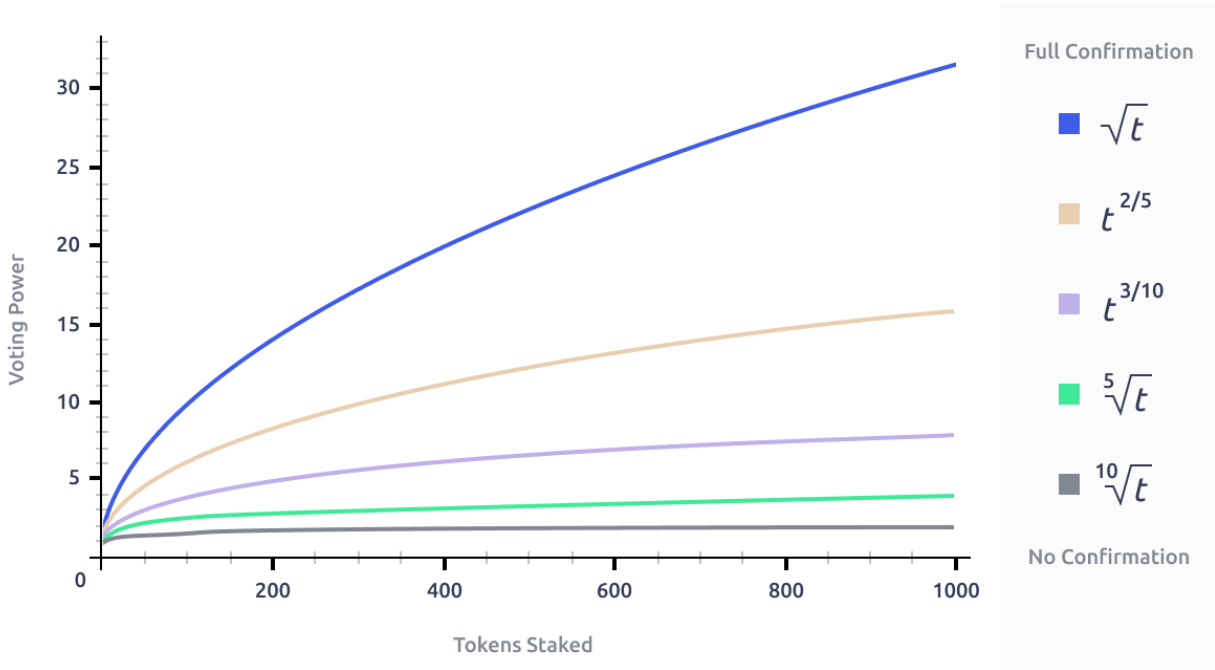
Voting power is further weighted by the participant’s reputation coefficient, r , which represents the level of trust associated with a particular account. Each account starts off with a reputation coefficient of 1.0. Users then have the option of verifying their identity through various decentralized channels including uPort, Civic, and Keybase for social media accounts. For each additional identity verification, an account’s reputation score increases by one up until a maximum of 5.0. This gives identity verified accounts up to five orders of magnitude more voting weight than unverified ones. The reputation score mitigates against Sybil attacks, where a user votes from multiple fake accounts to bypass the quadratic limitation, by giving well-known users more influence than unknown users. In this way, the Radical Trust Function encourages an equitable distribution of power where influence grows sublinearly as a root value of tokens staked rather than linearly as is the case with most token-weighted voting implementations.

Radical Trust

$$W = T^{r/10}$$

where $1.0 \leq r \leq 5.0$

Voting Power at each Confirmation Level



Liquid Democracy: Hierarchical Token Delegation

ACX holders also have the ability to delegate their voting power to other ACX holders while retaining ownership of the tokens themselves. Using the `delegate()` function, any holder can specify the address of a desired delegate as well as the number of tokens to assign. The delegate then has that many more tokens at their disposal, subject to the limitations of the Radical Trust Function. This means that a group of people will tend to have more voting influence by voting individually than if they delegate their votes to a single representative. For example, if four fully verified ACX holders separately stake 100 tokens towards a particular poll, the total weight of their votes is 40.

$$\sum W = T_1^{5/10} + T_2^{5/10} + T_3^{5/10} + T_4^{5/10}$$

$$\sum W = 4 * \sqrt{100} = 40$$

If the group delegates all of their tokens to one representative, then all of the votes are weighted as if they came from that account, resulting in total weight of 20.

$$\sum W = T_4^{5/10}$$

$$\sum W = \sqrt{400} = 20$$

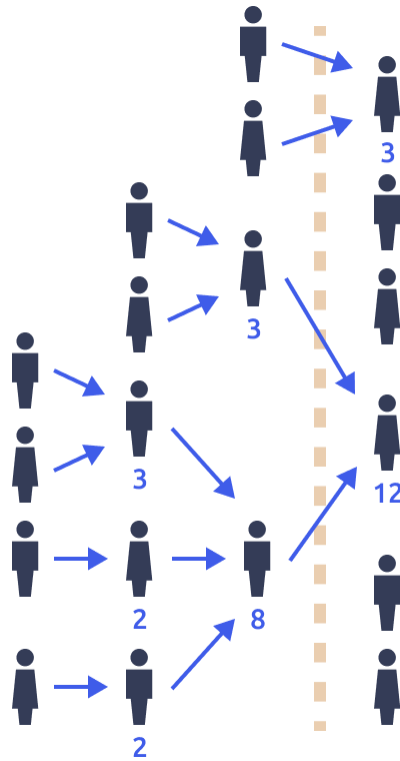
However, in cases where one individual has a higher reputation score than her peers, the group can use delegation to increase its cumulative weight. Reusing the previous example with a fully verified T and the rest fully unverified, 4 the total weight of the group is 14.75 when voting separately compared to 20 when delegating to T as shown 4 above.

$$\sum W = T_1^{1/10} + T_2^{1/10} + T_3^{1/10} + T_4^{1/10}$$

$$\sum W = 3 * \sqrt[10]{100} + \sqrt{100} = 14.755$$

All other costs equal, this design encourages voters to delegate towards higher reputation accounts when possible and to vote individually otherwise.

Delegations are also transitive, meaning that delegates can delegate the tokens they control to others, who can further delegate those tokens. While the original holder retains ownership of the token at all times, the power to stake the token towards particular polls can be passed along indefinitely. The owner retains the right to revoke any assignments they have made at any time. Transitive delegations create the possibility for delegation trees where participants higher up control more tokens, but remain fully accountable to users further down in the tree. If anyone is dissatisfied with decisions made by delegates further up in their delegation tree, then they can instantly collapse that branch by reclaiming control. The number of tokens that an account controls at any time that is, the tokens available to vote on polls or delegate to others is equivalent to the tokens it owns plus the tokens it has been delegated minus the tokens it has already delegated to others.



Hierarchical token delegation creates a liquid democracy where voters can recursively pass off the cost of poll due diligence to trusted third parties while maintaining full decisional control. Token holders may choose to delegate for various reasons including convenience, more efficient decision-making, and deferment to experts or trusted community leaders. Others might solicit delegations to exert more influence on voting outcomes. This mechanism can remove practical barriers to participation like lack of literacy, connectivity, or time without sacrificing democratic representation. It also allows for cultural flexibility, as societies with more communal or individualistic norms can delegate accordingly.

Reaching Quorum

The Proposal Registry updates the IPP's cumulative weight as votes are cast. Voters can also rescind their votes as long as the poll is open. The first vote cast after the IPP duration has elapsed will trigger a function that closes the poll. The function then calculates the IPP Quotient as the proportion of total network voting weight staked towards the poll at closing time. Network voting weight represents the maximum possible weight the poll would have received if every circulating token had been cast.

IPP Quotient

$$IPP\ Quotient = \frac{IPP\ weight}{network\ voting\ weight}$$

It then determines whether or not quorum was reached based on the Floating Quorum and returns all participating tokens back to their owners. The Floating Quorum represents the minimum IPP Quotient required for a poll to be valid and is dynamically updated to be the exponential moving average of the quorum of all previous valid polls. It is initially set at 10%. This allows the quorum to adjust dynamically based on participation rates and avoid excessive drainage of the Incentive Pool. If the IPP Quotient is greater than the Floating Quorum, quorum has been reached. The IPP’s status is set to pending and it is passed to the Resolution Registry. If quorum is not reached, then the poll is removed.

4.4.2 Resolution Registry

Proposal Resolution Poll

The PRP outlines the resolver’s solution to an improvement proposal, be it a business plan, live website, or bug fix. The resolver must specify the ID of the IPP that their resolution addresses as well as the proportion of the allocated payout they wish to claim (*see Payout Allocation*). A resolver might request less than the full allocation to increase the likelihood that voters will vote in favor of their resolution.

SPECIFIED BY RESOLVER		COMPUTED BY CONTRACT	
Proposal Reference	poll ID for the IPP that this PRP addresses	Poll ID	transaction ID of the submission
Title	title of PRP	Author	public address of resolver
Description	description of PRP; should include off-chain link to ‘subjective proof of resolution’	Status	status of PRP (open, closed)
Desired Allocation	proportion of allocated payout resolver is requesting (default 1.0)	Weight	cumulative voting weight staked towards PRP
Extension	extension to allow for additional fields in the future (optional)	Duration	length of time to keep PRP open (same as duration of corresponding IPP)

PRP Settlement

As long as the PRP remains open, any token holder can vote ‘for’ or ‘against’ the poll by temporarily staking a portion of their tokens towards it. The voting weight of the tokens staked is determined by the Radical Trust Function used in the Proposal Registry. The Resolution Registry updates the PRP’s cumulative weight as votes are cast or rescinded during this period. The first vote cast after its duration has elapsed triggers a function that closes the poll and determines if the PRP has succeeded. First, its PRP Quotient is calculated as the proportion of total network voting weight staked towards the poll at closing.

PRP Quotient

$$PRP\ Quotient = \frac{PRP\ weight}{network\ voting\ weight}$$

If the PRP Quotient is greater than or equal to the corresponding IPP Quotient, quorum has been reached. This means that at least as much voting weight was staked towards the PRP as was initially staked towards the corresponding IPP. If quorum is reached and the weight of 'for' votes outweighs that of 'against' votes, the PRP is allocated a portion of the Incentive Pool. The corresponding IPP is considered settled and any new PRP submissions referencing this IPP will be rejected. If quorum is not reached or the majority vote against the PRP, then it is removed and the IPP remains pending.

Payout Allocation

When a PRP is successful, the Resolution Registry determines the proportion of available rewards to allocate as payout according to the corresponding proposal poll's IPP Quotient. The more votes an IPP received before closing, the higher the payout allocated for its resolution. The allocated payout is determined as follows:

$$Allocated\ Payout\ IPP\ Quotient * Incentive\ Pool$$

$$\text{where } 0 < IPP\ Quotient \leq 1.0$$

This way, the proportion of total network voting weight staked towards a proposal is equivalent to the proportion of the Incentive Pool allocated towards its resolution. This fundamental equivalency underpins the logic of compensation in the Polling Protocol.

$$\frac{Allocated\ Payout}{Incentive\ Pool} = \frac{IPP\ weigh}{network\ voting\ weight}$$

Because the resolver can specify a desired allocation below one hundred percent, the actual payout will be given by:

$$Payout = Desired\ Allocation\ IPP\ Quotient * Incentive\ Pool$$

$$\text{where } 0 < Desired\ Allocation \leq 1.0$$

The difference between Allocated Payout and Payout remains in the Incentive Pool.

Total payout is then determined by the amount of ACX and ETH available in the Incentive Pool at time of settlement (*see Incentive Pool*).

$$ACX\ Payout = IPP\ Quotient * Desired\ Allocation * ACX\ Pool$$

$$ETH\ Payout = IPP\ Quotient * Desired\ Allocation * ETH\ Pool$$

$$Total\ Payout = ACX\ Payout + ETH\ Payout$$

After payouts are calculated, the PRP author is awarded 90% of the total payout and the author of the corresponding IPP receives the remaining 10%.

4.5 Beyond the Protocol: Off-Chain Services

By participating in on-chain decision modules that allocate and distribute funds for contributions to the ecosystem, ACX holders will be able to continually direct the development of off-chain Access services. These networks can include financial services such as ACX exchanges, marketplaces, merchant payment services, or integrations with popular messaging apps. They can also include mobile and web applications for interfacing with the evolving smart contract architecture in ways that users and developers see fit. Beyond user-friendly interfaces for smart contract interactions, developers could also add auxiliary functionality to the core protocol like off-chain reputation systems, poll sorting algorithms, or delegate accountability systems. Such top layer components can utilize public data from the blockchain without the need to alter any decision modules. Lastly, network participants can reward contributions that are not technological or financial in nature. The network can leverage the Incentive Pool to fund community meetups, smartphone distribution, or other campaigns if it so chooses.

While Access tokens and Ether in the Incentive Pool will incentivize contributions from stakeholders over time, the Access team will develop several interfaces to make it easier for one to interact with the Network's on-chain protocols early on:

Governance Protocol Interface

A graphical user interface for submitting amendments and voting during election cycles.

Polling Module Interface

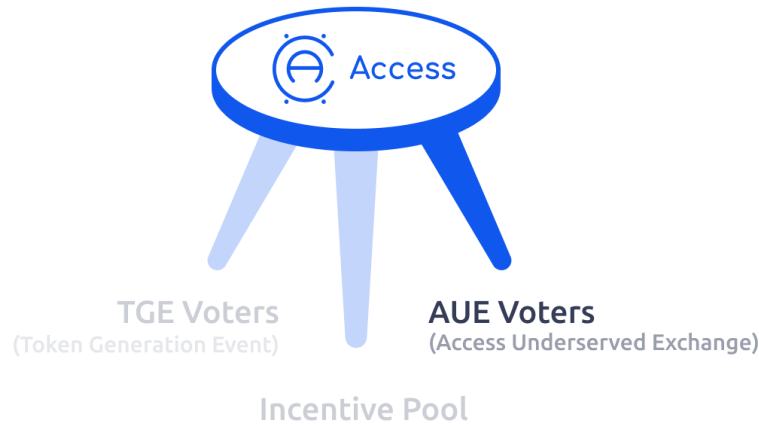
An updated interface that includes functionality for submitting proposals, voting on proposal polls, submitting resolutions, and voting on resolution polls. It will also include functionality for searching, sorting, and tracking submitted polls and real-time updates on relevant information like current voting weight and time remaining.

ACX Wallet

Multisig ACX wallets for developing world users to easily manage their ACX and participate in on-chain decision processes using their personal feature phones and Atlas agents' smartphones.

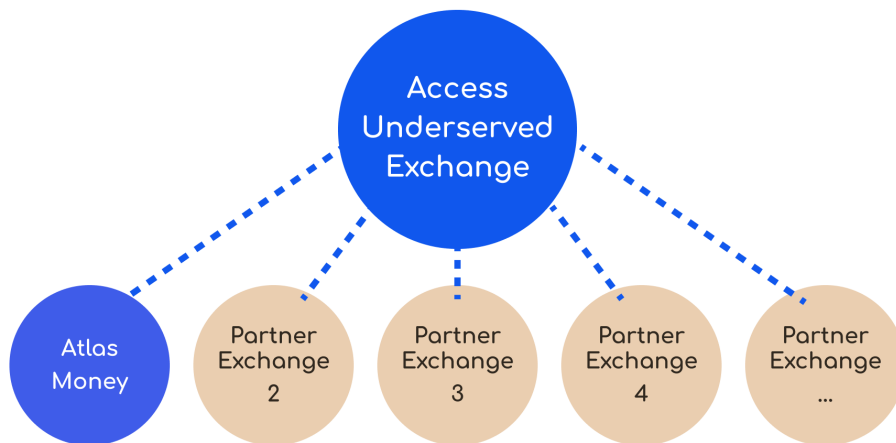
Access will work with Atlas Money to also develop second layer services for more advanced functionality such as fiat/crypto loans, remittance apps, and ecommerce products (*see generally; Roadmap*).

5 The Access Underserved Exchange



5.1 Dynamics and Possibilities

The Access Underserved Exchange (AUE) is a portion of minted ACX that is locked-up and released over time based upon need of distribution. As a central leg of our three-legged stool, the AUE is first and foremost dedicated to the equitable composition of developing world participants in the Network. It can only be accessed by AUE partner exchanges, for the sole purpose of distribution to financially underserved participants, so that they may vote.



A secondary use of the AUE is to off-set early volatility risk to developing world users, to enable a safe store of value for them, whereby they can feel comfortable to vote and direct incentives. ACX from the AUE can be used to buy back ACX at a premium in the wake of short-term volatility spikes, and can be sequestered as to not over throttle the AUE over time and remain sustainable in the near term.

An additional use of the AUE is to incentivize new individuals to become local ACX exchanges and adopt new participants, tying back to the original purpose of local distribution for increased local participatory composition. The same method can be deployed to incentivize macro exchange networks to partner and grow the exchange network well beyond the reach and organic growth rate of Atlas Money. This mechanism would allow ACX to spread beyond the borders of any given exchange partner, with the ability for individuals in new developing nations to distribute ACX and enable further participants to join the ACX Network, even if said developing nation lacked any pre-existing formal agent networks.

The amount of AUE that may be released will be directly tied to the demand for distribution to new participants, whether due to the growth of Atlas Money's network of Clients and self-employed Agents, or due to requests from new exchange partners servicing the underserved. The rate of AUE release will be dictated by rate-limiting smart contracts to ensure that it cannot be over depleted during a given period, with ACX unlocking along an exponential decay curve over five years.

5.2 Local integration of Atlas Money and ACX

Atlas Money has successfully pioneered the digitization of a P2P network of door-to-door financial service providers, and plans to grow their agent base to 2,000, and user base to 200,000 by the end of 2018. Atlas has already created an on-ramp for token distribution, but has also made a foundation of savings and loans for other developers to build upon, adding more functionality and greater impact. The potential growth of agent networks and newer tools for financial access is compounded and opened by the creation and structure of the ACX Network.

Atlas is excited by the opportunity for developers to build for their users and the greater base of the ACX Network, as they cannot even begin to conceive of the value that an open and collaborative network will create

Atlas will bootstrap ACX adoption and support continued circulation by serving as the ACX Network's first local partner exchange, having access to the AUE to request ACX for novel distribution. Upon integration, Atlas agents will become micro-exchanges that provide continued crypto-fiat liquidity for their clientele. They will also serve as technological access points for users with feature phones ahead of greater smartphone adoption. Because agents are already pillars of their local communities, they are well-positioned to act as voting delegates and key nodes in communication feedback loops between end users and the ACX Network. Atlas Money will also utilize their monthly meetups for agents, users, and community leaders to exchange ideas in order to facilitate inclusivity and active participation in the network's decision-making processes.

Atlas already requires their existing base of Agents to pre-purchase digital credit, in order to guarantee the safety of customer deposits. Upon integration, Atlas will swap their digital credit with ACX and their Agents will seamlessly continue the same exchange procedures with users and transactions with Super Agents to help locally manage their liquidity. Agents will now become ACX exchanges and provide users with an equivalent amount of ACX for all fiat deposits. For its existing user base, Atlas will exchange their current account balances into ACX upon integration. ACX locked up in the AUE is set aside for circulation to developing world participants only and as an ACX exchange, Atlas Agents will be able to request and unlock new ACX as they grow the user base and increase their exchange volumes.

Moreover, in order to continue to provide a safe store of value to its growing user base and offset early ACX volatility, Atlas will be able to utilize ACX from the AUE to provide downside protection to developing world users, who can sell back their ACX at a premium in the event that it is below the original purchase price. Atlas users are free to elect to leave the Atlas exchange ecosystem and direct their own private keys using the ACX Wallet. However, such an election would expose them to fair market value volatility. Dedicated

to making the circulation of ACX as easy as possible, Atlas is simply a token exchange and distribution platform of financial services. It is the greater ACX Network that can provide West Africans with more liquidity points and a broader range of tools and services.

Atlas will use a portion of the proceeds from the token sale to help expand the ACX exchange network and user base across Ghana and Senegal, with a target of 2,000 Agents and 200,000 users within 6 months after integration, so that others can openly provide a greater suite of services. Atlas is simply here to help proactively expand the ACX Network ahead of other exchange integrations. To help further expand ACX exchanges beyond the borders of Atlas's operational presence, a portion of ACX in the AUE can also be used to incentivize other individuals and networks to become ACX exchanges. This will allow ACX to become more rapidly adopted in other African countries and even beyond the Continent itself. Combined, these actions will reduce the barrier to entry, and increase growth of more liquidity outlets and network participants, helping to achieve the impact potential of the Network.

ACX is designed as a standalone ecosystem and medium of exchange for developing world users, who can transact daily between each other using ACX and only withdraw back into their domestic fiat currency when they need to transact at a point of purchase that has yet to adapt ACX. To further facilitate fluid movement of ACX, the development team will implement free P2P sending of ACX. Any users entering the ACX ecosystem, whether through Atlas Money or not, will open themselves to all the innovations initially brought up by Access as well as the many more to be built by the ACX Network, enriching their financial lives and empowering their communities. (*see generally; Roadmap*)

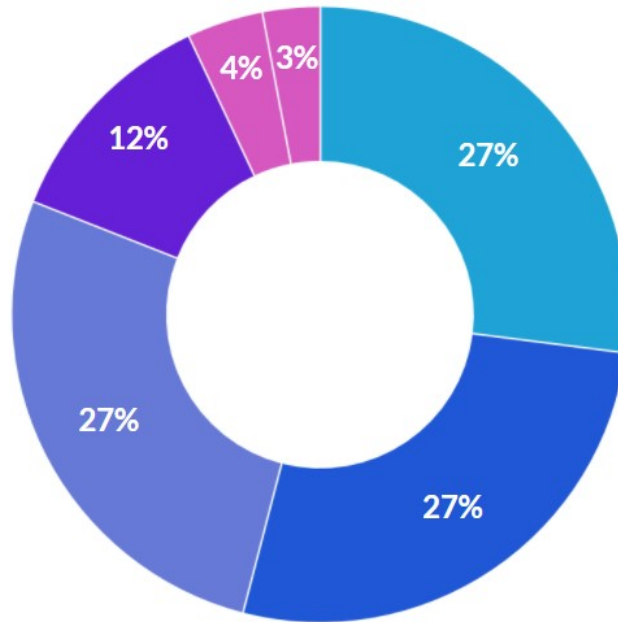
One of the most important problems for developing countries and their population is access to capital. Without credit history, potential borrowers have to pay enormous interest fees. It is truly a fallacy that loans to Africans are of higher risk. Atlas has already adapted its lending model to leverage the strength of the African continent: its strong sense of community. On the back of rich savings data, community leaders and agents have served as last mile gatekeepers of risk profiling, as well as guarantors of loans. Having provided over 3,000 fiat loans with a near 0% default rate, Atlas will look to empower Access with a similar approach for ACX-based P2P loans. With the right mix of communal trust, saving history with Atlas Money and involvement with Access, borrowers will have access to the capital they need to develop their economy from borrowers across the Network. Access may work with other tokens, such as Bloom, to contribute to and leverage an open credit scoring system.

Atlas will thus begin as a basic layer for financial access for the developing world to enter the ACX Network. ACX will work with Atlas to take advantage of Africa's greatest asset, its community, in order to direct ACX from the Incentive Pool towards the development of countless new tools and solutions that can solve their everyday needs. To reach the scale Access looks to achieve, every user will need to have her voice heard, which is made possible by ACX Network's Governance Protocol. Atlas will integrate the liquid democracy solutions of Access to enable delegate voting and greater participation, so that they may help to dictate the direction of ACX Network's continued evolution.

6 ACX Allocation

6.1 Distribution of ACX supply

6,000,000,000 ACX, to represent the 6 Billion people without adequate financial access, will be created, and distributed over time to various participants. Achieving the most widespread distribution is critical to the fulfillment of the very purpose of the Network as Access sees equitable communal composition as crucial to its success.



6.2 ACX Distribution

- **27% Token Generation Event:** 1,620,000,000 ACX will be made available in consideration of contributions from initial participants to stimulate the initial circulation of ACX.
- **27% Access Underserved Exchange:** 1,620,000,000 ACX will remain locked up and will newly enter into circulation on an as needed basis. These ACX are locked-up in order to ensure equitable circulation of ACX amongst developing world participants, whether in West Africa or beyond. Partner exchanges will be able to call upon the Network to access ACX from this reserve. Atlas Money will provide ACX to users in West Africa ahead of further integrations with a broader network of exchanges that are dedicated to servicing the underserved. Airdrop incentive models may also be developed to reward individuals that lead to the distribution of tokens to new underserved participants. Upon depletion of the reserve, exchanges will continue to act as liquidity providers of ACX.
- **27% Incentive Pool:** To ensure alignment of interests across the ACX Network, 1,620,000,000 ACX will be created and locked into an incentive pool that is released upon the directions of the Network via its decision-making modules. During the first 5 years, the pool will be unlocking rewards in a mix of ETH and ACX and will become fully funded by ACX for the following years. The pool will be distributed until reaching zero ten years later. From this point on, the inflation rate will be reset between between 0% and 1% each year based on the votes of token holders.
- **12% Founders:** Built by the team behind Atlas Money, the Access team will have access to 720,000,000 ACX over time, for all of their research and development efforts and years spent creating a successful operation model for connecting West Africans to the ACX Network. A portion will be set aside to

incentivize future team members. In conjunction with the greater ACX Network, the Access team will continue to support the mission of ACX and will be tirelessly dedicated to the development of necessary products and features to improve interactions with the ACX Network. Founders tokens will be locked in a smart contract and will vest quarterly over 48 months, with 25% vesting immediately to allow for voting participation.

- A portion of Founders tokens will be set aside to be delegated to an advisory council called The Guardians. The Guardians are to compose a balanced mix of all stakeholders, to reflect the diverse community of the ACX Network, whose sole purpose is to utilize a dedicated amount of voting power to ensure that the Founding Principles are adhered to as the ACX Network matures. The Guardians will be initially elected by the Access Founders and then annually elected by the ACX Network.
- **4% Advisors:** 240,000,000 ACX will be awarded to current and future advisors and partners who are aligned with the vision of the ACX Network. Any Advisor's tokens will be locked in a smart contract and will vest quarterly over 48 months, with 25% vesting immediately upon issuance to allow for participation in the voting process.
- **3% Community Rewards:** 180,000,000 ACX will be rewarded through a Community Rewards programs to assist in community building. This will also include our future Bug Bounty Rewards programs.

6.3 Use of Proceeds

- **40% Access Development:** Access is looking to eradicate the hurdles restricting the unbanked from entering the global financial market and will thus need to develop a robust platform tailored to their needs. Access will develop multiple products to kickstart the usability of the platform and beyond.
- **25% Access Community Exchanges:** To facilitate the adoption and exchange of ACX in West Africa, Access will look to grow its local community exchanges which will act as P2P Fiat/ACX exchanges.
- **20% Incentive Pool:** Contributors to ACX Network will be rewarded with ETH and ACX in the first 5 years to minimize the volatility risk of one or the other.
- **10% Gas Fees:** Until scalability solutions are live on the Ethereum Mainnet, Access will pay the transaction fees of underserved users to limit the barriers to adoption.
- **3% Marketing & Storytelling:** Access will make sure to share the promises of its network both in developed and developing countries.
- **2% Legal Fees:** Access has hired one of the top law firms in the United States and West Africa to protect the interest of the project and its participants.

To ensure the longevity of ACX development and its operations we will liquidate a significant portion of the funds to fiat currency after the end of the Token Generation Event. The remainder will be stored in a multi-signature hardware setup controlled by the management of Access. Alternative treasury measures may be introduced to maximize the longevity of the funds.

7 Roadmap

As founders of Access, our development team will provide the network with core products and features by creating the first layers of financial access for the underserved. To kickstart the usability of the ACX Network, Atlas Money will assist Access in its deployment of the following development roadmap:

Q1 2018:

Access Network and its Governance Protocol goes live on testnet

Q2 2018:

Token Generation Event

Access Network and its Governance Protocol goes live on mainnet

Governance Protocol Interface

A graphical user interface for submitting amendments and voting during election cycles, making it cleaner and easier to participate on the Governance Protocol.

Atlas Money supported ACX Wallet

After the network is live, Atlas Money will create an ACX wallet for each of their users in West Africa, which will be pre-loaded with an amount of ACX equivalent to the fiat currently deposited in their personal savings accounts with Atlas Money.

Atlas Money supported ACX Exchanges

Each Atlas Money agent will become an ACX micro-exchange and offer exchange services to users looking to buy ACX with fiat. With hundreds of agents embedded across local communities, Atlas Money will put ACX in the hands of thousands of West Africans.

Decision Making Module interface to make it easier to submit, track and vote on future decision making modules.

Q3 2018:

Submitted Decision Making Modules will be voted on for adoption.

Atlas Integrates feature phones delegations

Atlas Money will develop the infrastructure required for delegated voting so that West Africans will be able to put their votes in the hands of the most knowledgeable people in their communities and always be able to review the authenticity of their vote.

Remittances

Atlas Money users have complained about the fees around sending money domestically to their loved ones in other cities and rural areas. Some of them also rely heavily on money sent to them and would love to access a service with lower fees. Atlas will look to develop a P2P sending app so that Atlas Money users can easily transfer ACX between each other.

Q4 2018:

The first decision-making module will go live on the Access Network mainnet.

Fiat/Crypto loans

By far and away the largest request Atlas Money receives is greater access to starting capital. Atlas Money itself has processed over 3,000 micro loans to small businesses, mostly market women, with only a few partial defaults. One of the biggest problems halting individual economic growth is simply access to more capital. Thus, Atlas will develop a P2P loan product where users can use ACX as collateral for loans. Atlas and Access may explore synergies around credit scoring with the Bloom Protocol.

Q1 2019:

Access will continue to develop useful Dapps for the Network, above and beyond developments contributed through any decision-making modules.

E-Commerce

Many Atlas Money users are groups of people that have perfected a craft, such as basket weaving or leather shoe making. These crafts already drive their financial stability; however, they have saturated their growth in their local markets. They want access to trade with new markets abroad so that they can sell more goods and also make more money per good sold by reaching developed users with more capital. Atlas Money agents will act as shipping agents for Atlas Money users entering in trades with other ACX Network participants.

Technological Inclusion

Financial inclusion is tied to technological inclusion. So many people suffer from unreliable mobile phone and data service, especially in more rural areas. Access will look into the mesh network technologies being developed and potential partners in the space, blockchain based or otherwise, to leverage Atlas's agent network as a potential mesh network that brings not only financial access to their community but also access to the internet as well.

Entrepreneurship network

Atlas Money users want to create many new businesses but lack the tools to do so. Communities have expressed interest in the ability to create and co-own their own schools, which they would support through school fees, and vote on who the teachers would be. The same model was requested to fund, use, and co-own their other development needs, such as new businesses, factories, or energy independence solutions. Atlas Money will look to either create its own decentralized governance solutions or partner up with projects such as District0x or Aragon to enable the integration of such infrastructure into Access Dapps.

8 Conclusion

ACX is conceived as a way to decentralize financial inclusion and empower the underserved: designed to speed up overall development through continued improvements to their state of financial access, accomplished by an incentivized token economy that they can govern and control for themselves. ACX Network is poised to ensure their economic empowerment thanks to an amendable governance protocol and suite of decision modules that keep their interests paramount as the ACX Network innovates with them. The ACX Network offers the crypto-community an elegant future-proof on-chain governance protocol and a sizeable incentive pool to stimulate innovation of the ecosystem. Importantly, the ACX initial deployment via Atlas Money offers the crypto-community access to a fast growing base of thousands of underbanked users whom they can directly communicate with and serve. The crypto-community has innovated greatly despite the generalized speculative trend and the lack of access to regular daily users with which to prove their prototypes. In the same way, the unbanked have found resourceful ways of practicing community to overcome the burden of financial exclusion. ACX is born to connect and empower these two communities so they may thrive and co-create together.

9 Acknowledgements

We'd like to acknowledge and give a special thanks to those that took the time to review and strengthen our White Paper:

- Joe Urgo
- Alain Meier
- Ryan Lackey
- Yannick Folla
- Keith Hamlin
- Ruth Richardson

10 Disclaimers

The ultimate implementation of the ACX Network is dependent upon several factors and risks outside of the control of the founding member(s), including regulatory risks, contributor participation, the adoption of blockchain technology and the continued use and adoption of the Ethereum network. Nothing in this paper or otherwise shall require the Access or Atlas Teams to take any steps to continue the development or otherwise implement the ACX Network in its envisioned form if not all the necessary conditions are in place for any such implementation.

Access reserves the right to abandon the ACX Network and/or to change the implementation of Access contemplated by this paper at any time and for any reason. AUE partner exchanges must be approved by Access and limited to underserved geographies, such as parts of Africa, Latin America and Asia.

Prospective users of the ACX Network and other contributors to the Token Generation Event are advised to participate at their own risk and without reliance on any statement contained in this White Paper or any other corresponding materials.

An ACX token is not a security, debt, equity, investment contract or other profit sharing or interest-bearing instrument.

Since no blockchain based ecosystem can thrive by restricting the transfer of its digital rights, the ACX tokens are made transferable among participants of the protocol. One inherent consequence of these digital token attributes is price fluctuation. The price of a token may fluctuate based on the quantity of tokens earned, spent or transferred among the protocol participants, including via the Incentive Pool or otherwise.

Each participant of the protocol provides value-added services to make the protocol an innovative, decentralized, thriving and resilient ecosystem. Each participant has the obligation to abide by its terms of service and code of conduct or risks being banned for serious breach or repetitive non-compliance behaviors. The token attributes come with governance rights and incentives to grow and promote the protocol but also deterrence mechanisms to ensure services are rendered in accordance with the purpose of the protocol and its code of conduct, such that the protocol can realize its full growth potential.

The official version of this document is the English version.

References

- [1] <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD>
- [2] <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>
- [3] <https://www.graphic.com.gh/business/business-news/unbanked-population-low-savings-culture-high-interest-rates.html>
<http://www.thestatesmanonline.com/index.php/business/3292-only-40-ghanaians-have-bank-accounts-bawumia>
- [4] <http://scholarworks.wmich.edu/cgi/viewcontent.cgi?article=1048&context=ijad>
- [5] <https://www.gsma.com/mobileeconomy/west-africa/>
- [6] <http://assets.pewresearch.org/wp-content/uploads/sites/2/2016/02/2-23-2016-10-31-42-AM1.png>