



Bancor

A Protocol for Intrinsically Tradeable Cryptographic Tokens

Eyal Hertzog, Guy Benartzi, & Galia Benartzi

with contributions and edits by
Scott Morris & Bernard Lietaer

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The Bancor Protocol

Abstract: *The Bancor Protocol establishes a new international standard for the valuation and exchange of digital assets through smart-contract¹ enabled blockchains. It creates a new class of digital assets called “SmartTokens” which may be purchased or liquidated at an automatically adjusted price maintained by the protocol’s smart contracts and pricing formula. The Bancor Protocol thus enables convertibility and provides liquidity without requiring market makers, provides consistency in the composition of individual tokens, and goes further by bringing similar consistency to the way tokens are interconnected into nested, liquid ecosystems.*

The Bancor Protocol is named in honor of the transnational currency unit for recording and balancing international trade as John Maynard Keynes proposed² at the Bretton Woods Conference of 1944. The Bancor Protocol achieves the same objective but through a peer-to-peer, *bottom up* approach; rather than a centralized top down system.

Background

For centuries, different types of “money” units have been invented and used; from those imposed through centralized, top down systems: bank notes, bonds, and equity; to those driven from the bottom up: gift cards, loyalty points, and community currencies³, among other forms of stored value. Today’s world is one where anyone can publish articles, songs or videos, create discussion groups, or even sophisticated marketplaces online freely. However, it is only recently that this sort of creative accessibility has come to the technologies of money and finance.

In 2009, Bitcoin arrived as the world’s first *decentralized* digital currency--powered by blockchain technology--and was followed by a wave of so-called “crypto-currencies” using similar, distributed ledger technologies. More recently, we’ve seen the rise of a new class of assets in the form of digital “tokens” which may theoretically represent *any* kind of value. However, these innovations have outpaced both present understandings of value, and the models commonly used for accounting for and exchanging value between parties for a variety of useful purposes.

For example, when one wants to exchange one kind of currency or asset for another, they must rely on an intermediary ‘exchange’, which profits by matchmaking between two parties with a “coincidence of wants”. The exchange utilizes a particular type of mechanism which stores “bid” and “ask” orders which offer/seek to trade one asset for another. If new orders are matched with the existing ones on record, a trade occurs and the exchange collects its fee. If there are not enough matching orders, assets may be deemed “illiquid” and delisted from the exchange.

Larger exchanges--with more orders passing through them--are said to have better “price discovery”, meaning they better reflect the aggregate supply and demand in the market, and they provide more “liquidity”; meaning orders can likely be met with higher frequency. Smaller

¹ https://en.wikipedia.org/wiki/Smart_contract

² <https://en.wikipedia.org/wiki/Bancor>

³ https://en.wikipedia.org/wiki/Community_currency

exchanges, lacking these advantages, are thus less desirable, as are assets which are not traded at significant enough volumes to justify an exchange making markets and discovering prices for them. As a result, loyalty points, community currencies, and other such assets are excluded from the exchange-based model; meaning they do not enjoy the liquidity, accurate price discovery, and user reliability other currencies and assets traded at larger volumes do. This comes to the detriment of their overall function and portability as value instruments, and limits their usage to relatively small networks.

The Bancor Protocol offers a solution to these limitations, and addresses the structural issues underlying them by creating an automated way for assets of any kind, traded at any volume, to be reliably exchanged and priced in real time. In other words, Bancor will do to *value* what the internet did to *information*. This solution warrants a systems-scale rethinking of value creation, exchange, and storage, as it challenges many of the orthodoxical models and methods driving present systems of money, banking, payments, economics, and finance.

Introducing SmartTokens

The Bancor Protocol establishes a new class of digital assets, called “SmartTokens”. These SmartTokens are “smart” because the smart contracts governing them requires one or more pre-existing token(s) be maintained in a reserve. By holding an easily exchangeable token in reserve, anyone may easily buy into or cash out of a SmartToken at any time. As a function of this capability, SmartTokens do not need to be traded in an exchange in order to become liquid, nor do they require counterparties with their risks.

*“SmartTokens do not need to be traded
in an exchange in order to become liquid”*

SmartTokens maintain a constant ratio of value between that held in their reserve and the active supply of SmartTokens in the market through a smart contract and a “Constant Reserve Ratio” (CRR). The smart contract constantly measures the value in reserve against the supply of SmartTokens in circulation, and establishes a price for exchanging between the two based on the CRR. When a SmartToken is purchased, its price rises; when liquidated, its price falls. In this way, the ratio of value between reserve and supply is maintained over time as value travels into and out of a SmartToken. The details of the pricing method and formula are discussed later in this paper.

The smart contract does more than establish the price, however, by acting as an automated issuer and redeemer of its SmartToken. When a SmartToken is *purchased*, the value in reserve expands and triggers the smart contract to create and issue new SmartTokens to the party who made the deposit into the reserve. Conversely, when a SmartToken is liquidated, the smart contract destroys SmartTokens and credits the party with a corresponding amount of reserve tokens. Again, the ratio of value between reserve and supply is maintained over time as value travels into and out of the SmartToken. An illustration of this is available on page 6.

Summary Advantages of SmartTokens


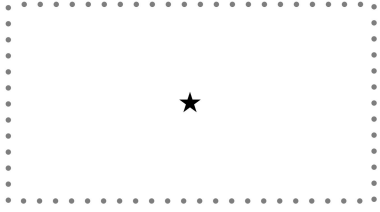
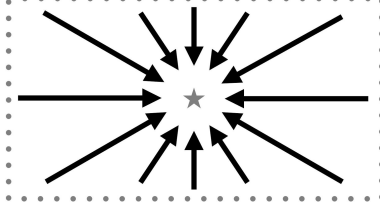
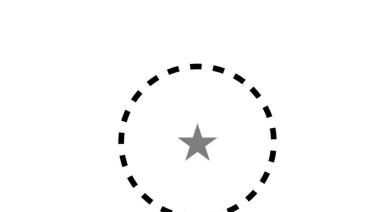
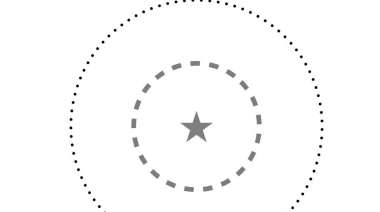
1. **Costs** - The only mandatory fees applied by SmartTokens are the blockchain fees (gas).
2. **Continuous Liquidity with Lower Risk** - A SmartToken may be purchased or liquidated through its smart contract at any time; regardless of its trading volume, and without the need for a counterparty (e.g. an online exchange) with its risks (e.g. hacking/theft).
3. **Algorithmic Pricing** - The smart contract automatically maintains the exchange price between a SmartToken and its reserve token(s), meaning there is *a single, real time price* for both buying and selling a SmartToken rather than the traditional bid/ask spread.
4. **Predictable Price Slippage** - As a function of the pricing formula, SmartTokens allow pre-calculation of price slippage for a transaction of a given volume prior to its execution.
5. **Native Market Depth** - While typical crypto-exchanges maintain a market depth of well below 1%, a SmartToken with a reserve of 10% can be compared to an exchange with 10% of the *entire supply* of a token in its order-book at all times, forming substantial market depth.

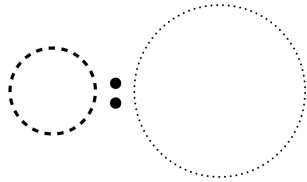
Summary Advantages of the Bancor Ecosystem

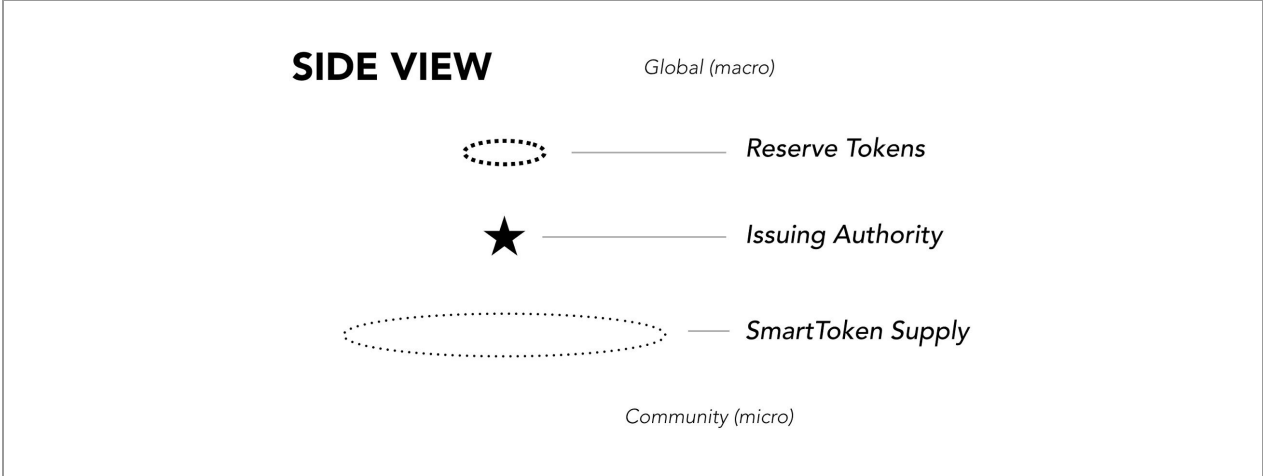
1. **Easy Token Creation** - Bancor makes creating digital tokens easier, unlocking the long tail of user-generated tokens. These tokens also provide very cheap access to many services that have been prohibitively expensive and/or otherwise inaccessible in the past.
2. **Modular Toolkit** - The Bancor Protocol establishes a single standard that enables multiple use case scenarios for digital tokens. As SmartTokens are able to hold other SmartTokens in reserve, they can be used as building blocks for new integrative financial, banking, and monetary solutions that deliver value to themselves and to the ecosystem as a whole.
3. **Nested Valuation** - By holding pre-existing tokens in reserve, SmartTokens exist in relation to assets with pre-established valuations. SmartTokens are thus established in terms of the tokens they are connected to, *both directly and indirectly* in a greater context. The long term evolution of the ecosystem remains open, but with Bancor, networks may design their preference for stability over speculative activity and volatility.
4. **Connective Framework** - SmartTokens enable very small entities and networks to unite as a collaborative network of networks by helping them share and exchange resources easily without sacrificing individual uniqueness.

Illustrated Anatomy of a SmartToken

SmartTokens can be difficult to grasp as a whole before understanding their components. This guide will help readers develop an understanding of the different elements that compose SmartTokens and provide some relevant considerations for each.

	<h3>Community / Market Purpose</h3> <p>The first essential element is the end user a SmartToken is intended to serve. Without a clear sense of purpose or community, a value instrument exists devoid of any real meaning or functional value. <i>What problem is being solved?</i></p>
	<h3>Issuing Authority</h3> <p>Each SmartToken is maintained by the individual, venture, or organization that created it, as well as the smart contract that governs issuance, redemption, and pricing of the SmartToken via its Reserve. <i>Who makes key decisions?</i></p>
	<h3>Capitalization</h3> <p>As every SmartToken must maintain a Reserve, its creators and/or community must capitalize that reserve through a crowdsale of the SmartToken or otherwise. The creators must specify what portion of proceeds will capitalize the Reserve. <i>How is this gaining real buy in from users?</i></p>
	<h3>Reserve</h3> <p>A Reserve may be composed of as many tokens as its creators wish. Conceptually, anything that is considered valuable by a community of users could serve as a Reserve, the only practical requirement is that such value must be accounted for as ERC20 compliant tokenized assets.</p> <p>Example reserves are: tokenized fiat currencies, such as Euro or Dollars; commodities like gold or land; cryptocurrencies like Bitcoin or Ether; and/or other SmartTokens. <i>What types of tokens best suit this SmartToken's purpose?</i></p>
	<h3>SmartToken Supply</h3> <p>SmartTokens are issued during / after the crowdsale in accordance with the terms set forth by the token's creators. They may act as currency units for circulation, shares of equity ownership in a company or fund, or may be intended for use as reserves for other SmartTokens, among other potential uses. See below for use cases in more detail. <i>What does this token represent as users own & use it?</i></p>

	<h3>Constant Reserve Ratio (CRR)</h3> <p>The CRR is set upon creation of the SmartToken. 100% CRR is required for certain types of SmartToken; others may only require a small percentage of total supply be maintained in reserve for the purposes of maintaining a pool of liquidity for buying in and cashing out. See below for use cases. <i>What is appropriate for the context & purpose of this token?</i></p>
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Value Flow & Pricing Basics

This is a step by step walkthrough of what happens when value enters, or leaves, a SmartToken via its reserve tokens where a CRR of 1:2 (or 50%) is in effect. Though no particular unit of account is denoted, it should be understood that the unit measuring value remains constant.

<p>Value IN CRR = 1:2</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;"><i>before</i></td> <td style="text-align: center;">+</td> <td style="text-align: center;">▼ □ ↓</td> <td style="text-align: center;">1</td> <td style="text-align: left;"><i>after</i></td> </tr> <tr> <td style="text-align: right;">100</td> <td></td> <td style="text-align: center;">○</td> <td></td> <td style="text-align: left;">101</td> </tr> <tr> <td></td> <td style="text-align: center;">+</td> <td style="text-align: center;">★ ↓</td> <td style="text-align: center;">2</td> <td></td> </tr> <tr> <td style="text-align: right;">200</td> <td></td> <td style="text-align: center;">○</td> <td></td> <td style="text-align: left;">202</td> </tr> </table>	<i>before</i>	+	▼ □ ↓	1	<i>after</i>	100		○		101		+	★ ↓	2		200		○		202	<h3>Purchasing SmartToken via Reserve Token</h3> <p>When a user is purchasing a SmartToken: 1) they send reserve token to the smart contract, which 2) stores this value in the reserve. 3) The smart contract calculates the price based on the CRR, and 4) issues <i>new SmartToken</i> to the user. In this example, one reserve token yields two SmartToken. The SmartToken's price <i>rises</i>.</p>
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Value OUT		CRR = 1:2	
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Liquidating SmartToken for Reserve Token

When a user is liquidating their SmartToken, 1) they send them to the smart contract which 2) *destroys SmartToken* and 3) in accordance with the price calculated on the basis of the CRR, 4) credits them with a corresponding number of Reserve Token. In the example, two SmartToken are liquidated into one reserve token. The SmartToken's price *falls*.

Use Cases for SmartTokens

Token Shares

Similar to: Most ICOs and Sale of tokens to date.

A Token Share is what may be seen in the vast majority of ICOs taking place today, where a digital asset is issued in the form of a token in exchange for contributions of capital into a collected pool, venture, etc. These digital assets may convey equity ownership, a claim to profits, or otherwise as defined by the issuer.

Token Currencies

Similar to: DogeCoin; Time Credits; SamenDoen; WIR

The field of social and complementary currencies predates blockchain technology by decades --if not centuries--and offers many exemplary models such as: social currencies that support volunteerism and mutual aid; green incentives offered for reducing carbon footprints and combating climate change; and business oriented loyalty credit schemes which encourage consumers to shop locally rather than with globalized distributors.

Token Changers

Similar to: Shapeshift.io; Oxproject; Internet of Coins

A Token Changer holds 2 or more digital assets in its reserve at 100% CRR. By holding ready amounts of these assets, a Token Changer provides a mechanism for exchanging between any two of them; in other words, an automated micro-utility for asset exchange or currency conversion. The SmartToken's value is determined by the total value of the assets held in its reserve, and grows through fees it might collect from users as they utilize it for conversions.

Advantage 1 - The Bancor Protocol's price calculation formula ensures that when reserve token A is converted to reserve token B -- the price of A decreases and the price of B increases. As on contemporary exchanges, larger transactions will move the price more sharply, causing volatility. Token Changers may remedy this volatility by maintaining sizable reserves.

Advantage 2 - Any standard ERC20 token can be used as a reserve-token, even if it is already traded in other exchanges. In such a scenario, the calculated price of a reserve token and its price in an outside exchange may present a discrepancy. This situation creates an arbitrage

opportunity which incentivizes arbitrageurs to restore economic equilibrium, and thus to keep the token changer reserve token prices in sync with their prices on other exchanges.

Advantage 3 - Popular exchanges (such as MtGox and Bitfinex) have been hacked, and hundreds of millions of dollars worth of assets have been stolen from their accounts. Converting one token to another using a token changer does not require depositing funds in an exchange and thus removes the counterparty risk from the process on top of reducing the costs of performing conversions.

Advantage 4 - As is the case with other instant trading solutions, an important additional benefit is that no transaction limits need to be applied due to the decentralized nature of the token changer. While decentralized exchanges offer this benefit as well, SmartTokens do not rely on trade volume to provide liquidity.

Token Baskets

Similar to: TaaS; Prism

A Token Basket also holds 2 or more digital assets in its reserve with a total CRR of 100%. However, instead of acting in an exchange capacity, it functions similarly to an exchange-traded fund (ETF) or index fund, where the SmartToken represents shares in the portfolio of underlying assets held in its reserve.

Advantage 1 - As prices of any of the reserve tokens rise or fall, so does the value of the SmartToken. Similar to the incentives provided by token changers, arbitrageurs are incentivized to realign the conversion rates with market prices and ensure the proper ratios are kept between the reserves according to their real-time market value. These SmartTokens enable users to directly hold asset baskets without a financial services provider as an intermediary.

Network Tokens

Similar to: Ether; Veritaseum

A Network Token is a SmartToken that supplies liquidity to a number of other SmartTokens. It does this by simultaneously being held as a reserve for other SmartTokens, and holding those SmartTokens in its own reserve. By positioning itself between multiple tokens, it acts as an ultimate token changer across its network and becomes a common representation of value present in the network. The “BANCOR” (BNT) token will be the first Network Token and is discussed in more detail below.

Advantage 1 - Network tokens can be useful for those who wish to create multiple and related SmartTokens for different purposes (e.g. regional network of community currencies, a video game studio with multiple game credits, a group of independent businesses issuing a joint loyalty program). Network tokens make it easy to convert value from one network to another.

Advantage 2 - An additional network token use-case is to interlink a set of token changers, each holding a reserve in the network token and a second reserve in another, standard token. This structure would enable exchanging any token in the network to another, while increasing the demand for the network token whenever a new token changer is created or appreciates.

Advantage 3 - Increased demand for any SmartTokens in a network increases the demand for their network token, as it is required for purchases of these tokens. Similarly, a rise in the price of a network token benefits the entire network in turn since this price increase is reflected in each SmartTokens' reserves.

Core Problems & Solutions

Unlocking the Long Tail of Token Creation

The “long tail”⁴ phenomena is observed in many online ecosystems such as publishing (blogs), videos (YouTube), discussion forums (Reddit, Facebook Groups) among others. A long tail is formed as barriers to user-driven content are removed, e.g. YouTube making it simple for anyone to upload and share user-generated videos. In each of these examples, the long tail has become significantly larger compared to everything that preceded it.

There are many examples of user-generated assets: group currencies (community oriented currencies), loyalty points (business oriented currencies), and more recently the hundreds of cryptocurrencies (protocol oriented currencies) that exist today. However, not only has it been difficult to create these small or new currencies in the first place, the need to achieve and maintain liquidity for them has remained a significant barrier for their viability at a global scale.

Because SmartTokens can be created easily and use the Bancor protocol for seamless conversion across networks, even small-scale currencies can become continuously liquid and enjoy global portability on top of local use.

Coincidence of Wants

SmartTokens are a *technological solution* rather than the *labor-based solution* used in traditional (even decentralized) exchanges. The current laborers in asset exchange are the professional market-makers who provide liquidity and facilitate collaborative price discovery. In the domains of information exchange and trade, the technologies of writing and currency replaced other labor-intensive solutions--speaking and manual barter--with technological ones; creating mass efficiencies for societies and unlocking collaboration on global and intergenerational levels. The Bancor protocol proposes to similarly advance the domain of asset exchange through the application of new technologies that save incredible amounts of human labor and related costs.

In the current asset exchange model, the coincidence of wants problem⁵ creates a situation where assets are required to be traded at a minimal volumes or face liquidity risk⁶. The chances of finding a second party for a trade within a useful time period is correlated with an asset's trading volume, meaning there is a fundamental limitation to this approach. SmartTokens solve this problem by using smart contracts to hold liquid assets in reserve for the express purpose of providing market depth and facilitating conversions.

⁴ https://en.wikipedia.org/wiki/Long_tail

⁵ https://en.wikipedia.org/wiki/Coincidence_of_wants

⁶ https://en.wikipedia.org/wiki/Liquidity_risk

Price Discovery

SmartTokens are traded for their reserve tokens (and vice versa) utilizing a novel method for price-discovery based on the Constant Reserve Ratio (CRR). The CRR established by a SmartToken's creator prescribes a balance between the total value of the tokens held in reserve and the SmartToken supply, and is maintained by the SmartToken's smart contract. This *asynchronous price-discovery* model works by constantly readjusting the current price toward an equilibrium between the purchase and liquidation volumes.

The price at which an exchange occurs is calculated by dividing the reserve balance by the SmartToken supply multiplied by the CRR; as reflected in the formula:

$$Price = \frac{Reserve\ Balance}{SmartToken\ Supply \times CRR}$$

When SmartTokens are purchased, the payment for the purchase is added to the reserve balance--at a rate determined by the current price--and *new SmartTokens are issued* to the buyer.

When a SmartToken with less than a 100% CRR is purchased, its price will increase.

Conversely, when SmartTokens are liquidated, they are *removed from the supply* (destroyed) and again--at a rate determined by the current price--reserve tokens are transferred to the liquidator. In this case, when a SmartToken with less than a 100% CRR is liquidated, its price will decrease.

Price Calculation Per Transaction

The above formula calculates the *real time* price of a SmartToken. However, when a purchase or liquidation is executed, the effective price is calculated as a function of the transaction size; i.e. every transaction is broken up into infinitely small increments, where each increment changes the SmartToken's supply, reserve balance, and consequently also its price. This ensures that purchasing the same amount of SmartTokens in single or multiple transactions yields the same effective price. This method also ensures that A) the CRR will be kept constant and that B) a reserve can never be completely drained unless 100% of its SmartTokens are liquidated. See the following formulas⁷ where:

R - Reserve Token Balance

S - SmartToken Supply

F - Constant Reserve Ratio (CRR)

- T = SmartTokens received in exchange for E (reserve tokens), given R , S and F

$$T = S \left(\left(1 + \frac{E}{R} \right)^F - 1 \right)$$

- E = Reserve tokens received in exchange for T (SmartTokens), given R , S and F

$$E = R \left(\sqrt[F]{1 + \frac{T}{S}} - 1 \right)$$

⁷ The mathematical proof is available online at <https://goo.gl/HXQBUr>

CONCLUSION

The Bancor Protocol is establishing not only a new class of digital asset, it is creating the potential for unprecedented creativity and innovation in the realms of money, banking, finance, and trade. While there are certainly many problems that remain in markets and economics, with the Bancor protocol the world is presented with a toolkit for engineering new financial systems which might function in accordance with the values our existing systems seem to have very little regard for. One could say it is as if we have returned to the Bretton Woods Conference, and may now choose freely which proposals we wish to see enacted. We are free to design new global systems which support life, support the earth, and empower people to realize their full potential.

About the Bprotocol Foundation

The Bprotocol Foundation is a Swiss nonprofit foundation whose core objective is the establishment of the Bancor protocol as a global standard for intrinsically tradeable currencies.

By contributing to the Bprotocol Foundation, users will generate BNT — the first smart token to be deployed using the Bancor protocol, establishing the Bancor network. The Foundation will collaborate with different contractors to achieve its goals, as well as governments, businesses, academia and NGOs committed to realizing collaboration potential in communities around the world.

BANCOR - The First SmartToken

The Bancor Network Token (BNT) will hold a single reserve in Ether. Other SmartTokens, through using BNT as (one of) their reserve(s), will connect to the Bancor network and all the other tokens holding it in reserve. The Bancor network will include user-generated SmartTokens, token changers (forming a global decentralized, highly liquid exchange), decentralized token baskets, as well as subnetworks formed around other network tokens.

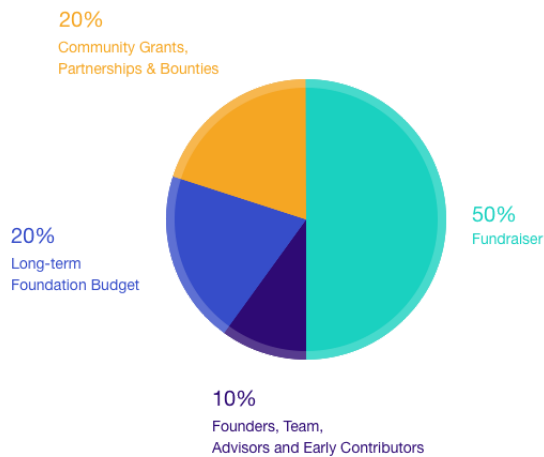
BNT establishes network dynamics where increased demand for *any* of the network's SmartTokens increases demand for the common BNT token, benefiting *all* other SmartTokens holding it in reserve. Naturally, it is also susceptible to decreased demand.

BANCOR Crowdsale Objectives

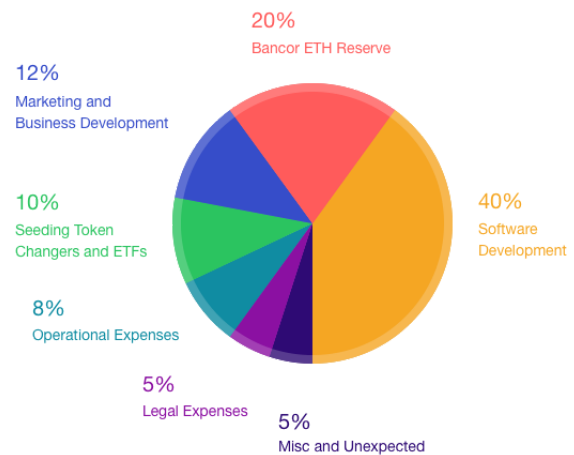
As the ICO community has gained in popularity, so too have risks and security concerns. Do not rely on any information not relayed through official Bancor channels or directly from Bancor team members. Please see the post made on the Bancor Medium blog for [recent ICO details](#). The *only* trusted sources for this information are:

- The official [Bancor Medium blog](#); An article with the final details of the fundraiser, including the address and initial block to accept contributions, will be published on **June 10th**.
- The official [Bancor website](#); Once the fundraiser contract is deployed, the contract address will be posted on the website.

Token Allocation



Use of Proceeds



- 20% of the funds raised will be used to capitalize a reserve in Ether for the BANCOR network token; enabling continuous liquidity to Ether for any BANCOR holder as well as any holder of a SmartToken using BANCOR as a reserve.
- 40% of the funds will be used to develop, promote and support the open-sourced, blockchain-agnostic, Bancor protocol implementations, and support related technologies and applications such as open-source, user-friendly web services (desktop and mobile) providing wallet, marketplace, token-conversion, SmartToken creation and crowdsale solutions.
- 10% of the funds will be used to set-up and propel the first batch of token changers for popular ERC20 tokens, which function as a *decentralized solution for token exchange* between all the included tokens. Doing so incentivizes *asset tokenizers* to formalize additional real-world assets into ERC20 tokens on Ethereum.
- A portion of the funds will be used to foster future innovation through support of promising SmartToken crowdsales in the BANCOR network. These may include new, location-based and vertical-specific SmartToken initiatives such as regional token networks, community currencies, crowdfunded projects and other token-based ecosystems.

Official Channels

Medium Channel: <https://blog.bancor.network/>

Website: <https://bancor.network>

Twitter: <https://twitter.com/bancornetwork>

Telegram: <https://t.me/bancor>

Reddit: <https://www.reddit.com/r/Bancor/>

Slack: <https://bancor-slack-invite.herokuapp.com/>

Bitcointalk: <https://bitcointalk.org/index.php?topic=1789222.0>

Email: contact@bancor.network

Examples and Illustrations

Example #1: SmartToken Crowdsale

A crowdsale for a new token (BANCOR) has collected 300,000 ETH. Based on a CRR set at 20%, the reserve in ETH is maintained at a 1:5 ratio vs. the BANCOR market capitalization; amplifying the collected 300,000 ETH into 1,500,000 BANCOR.

Division of Proceeds

The crowdsale terms specified that 20% would go to the reserve, 20% would go to crowdsale participants, and 60% would be allocated to the BANCOR project's development, such that:

- A. 300,000 BANCOR (60,000 ETH) are kept in the BANCOR smart contract as a reserve;
- B. 300,000 BANCOR are transferred to the crowdsale participants; and
- C. 900,000 BANCOR are allocated to cover project development costs.

Buying and Selling

Purchasing and liquidating BANCOR becomes possible as soon as the crowdsale is completed. The opening price is the last crowdsale price; in this example we assume 1 ETH = 1 BANCOR.

- BANCOR buyers pay ETH into the reserve of BANCOR; they receive newly minted BANCOR, and the BANCOR price increases.
- BANCOR liquidators get ETH from the reserve of BANCOR; the liquidated BANCORS are destroyed, and the BANCOR price decreases.

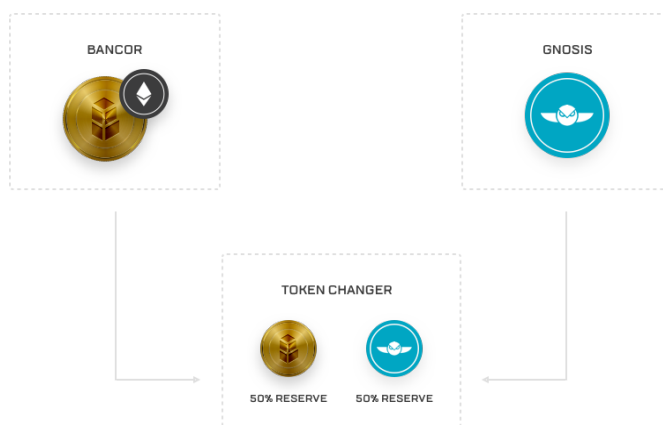
Smart Token Symbol	BANCOR
Reserve Token	ETH (Ξ)
Constant Reserve Ratio (CRR)	20%
Initial Token Price	Ξ1
Crowdsale Proceeds	Ξ300,000
Tokens Issued in the Crowdsale	300,000

Activity	RESERVE		PRICING			SMART TOKEN		
	ETH Recieved (Paid-out)	ETH Reserve	Effective BANCOR Price	Resulting BANCOR Price	Price Change	BANCOR Issued (Destroyed)	BANCOR Supply	BANCOR Market-cap
Post-crowdsale initial state		Ξ60,000		Ξ1.0000			300,000	Ξ300,000
300 ETH converted to BANCOR	Ξ300	Ξ60,300	Ξ1.0020	Ξ1.0040	0.40%	299	300,299	Ξ301,500
700 ETH converted to BANCOR	Ξ700	Ξ61,000	Ξ1.0086	Ξ1.0133	0.93%	694	300,993	Ξ305,000
1302 BANCOR converted to ETH	Ξ(1,308)	Ξ59,692	Ξ1.0046	Ξ0.9959	-1.72%	(1,302)	299,691	Ξ298,460
100 ETH converted to BANCOR	Ξ100	Ξ59,792	Ξ0.9966	Ξ0.9972	0.13%	100	299,792	Ξ298,960

[Link to Spreadsheet](#)

Example #2: Token Changer Transaction Flows

In this example, a “BNCGNO” SmartToken is created (with 100% CRR) to function as a token changer between BANCOR and GNO (tokenized gold). It holds each in reserve at 50% CRR.



Assuming a current market price of 1 BANCOR = 2 GNO, the contract can define the initial prices as 1 BANCOR = 2 GNO = 1 BNCGNO. In this example, 10,000 BNCGNO are issued to the depositors of the initial reserves.

Buying and Selling

The opening prices are 1 BNCGNO = 1 BANCOR = 2 GNO as set in the smart contract.

- BNCGNO can be purchased with BANCOR or GNO. The price of BNCGNO will increase relative to the reserve token (BANCOR or GNO) used to purchase it, and will decrease relative to the uninvolved reserve token.
- BNCGNO can be liquidated back to BANCOR or GNO. This will decrease the BNCGNO price relative to the reserve token being liquidated, and increase it relative to the uninvolved reserve token.

This scenario demonstrates how a 100% backed SmartToken with two 50% CRR reserve tokens can function as a decentralized token changer, open for anyone to use, and with organic incentives for price balancing by arbitrageurs.

Smart Token Symbol	BNCGNO	
Reserve Tokens	BANCOR + GNO	
Constant Reserve Ratio (CRR)	BANCOR	50%
	GNO	50%
Initial Token Price	BANCOR	1
	GNO	2
Deposited Reserves	BANCOR	5,000
	GNO	10,000

Activity		RESERVE		PRICING			SMART TOKEN			
		Reserve Recieved (Paid-out)	Reserve Balances	Effective BNCGNO Price	Resulting BNCGNO Price	BNCGNO Price Change	1 BANCOR = GNO	BNCGNO Issued (Destroyed)	BNCGNO Supply	BNCGNO Market-cap
Initial State	BANCOR		5,000		1.000		0.500		10,000	10,000
	GNO		10,000		2.000					
Buying BNCGNO for 30 BANCOR	BANCOR	30	5,030	1.0015	1.003	0.30%	0.503	30.0	10,030	10,060
	GNO		10,000		1.994	-0.30%				
Converting 70 GNO to BANCOR Step 1 (GNO->BNCGNO)	BANCOR		5,030		1.000	-0.35%	0.500		10,065	10,060
	GNO	70	10,070	1.9975	2.001	0.35%		35.0		
Converting 70 GNO to BANCOR Step 2 (BNCGNO->BANCOR)	BANCOR	(35.0)	4,995	1	0.996	-0.35%	0.496	(35.1)	10,030	9,990
	GNO		10,070		2.008	0.35%				

[Link to Spreadsheet](#)

Illustrative Map of a Potential Bancor Network

- BANCOR - The BANCOR network token, backed by Ether
- ETH, DGD, DGX, REP and GNT are standard Ethereum-tokens
- NEW - New SmartTokens created (e.g. crowdfunding campaign, a community currency, etc.)
- SmartTokens hold reserves (arrows point to the reserve tokens)
- Token changers are 100% backed, and hold two or more reserves

