BITCOIN OFFLINE VAULT
SERVERLESS WALLET – BA.NET

How To Safeguard Your Bitcoins
With Your Own Offline Vault

May 2015

1 WHY BUY BITCOINS?

Many people have heard of Bitcoin, but far fewer understand why someone would want to buy bitcoins. "What is it used for?", "Why not use a credit card?" and other questions are common. So, here are the main reasons people just like you buy bitcoins.

1.1 ONLINE SHOPPING

Buying products and services online is often cheaper, faster, and results in higher overall customer satisfaction than other options. Unfortunately, credit cards and paypal can put limitations on what you can buy, from where. Growing costs paid to combat fraud and identity theft are passed onto you when you use them but are largely eliminated with Bitcoin.

1.2 PRIVACY

Identity theft is among the greatest costs to society. To combat identity theft, people subscribe to identity protection services and online shops require lots of personal info. Bitcoin payments can be trusted by the shop with no additional personal information. That means, unless you're getting something shipped to you, you may not even need to provide your name or address when shopping. Bitcoin is not anonymous but if additional steps are taken, nobody but you and the merchant are likely to know what you buy online.

1. 3 PERSONAL FREEDOM

Nobody can limit who you send your bitcoins to. Visa, Mastercard, and PayPal block payments to perfectly legal businesses, some political organizations, and to anyone that may bring them legal or PR problems. Bitcoin payment is a protocol that doesn't care who you're paying or why.

1.4 FINANCIAL INDEPENDENCE

When handled securely, Bitcoin can be even better than gold for savings. The exchange rate of early Bitcoin versus other currencies is volatile. If Bitcoin is successful at growing in usage, most of that volatility will increase its price and make you money. The fact remains that your bitcoins cannot be bailed-in or seized without your cooperation. You can even store bitcoin using a password that only you know. This places more power back in your hands to become financially independent.

1.5 LIMITED QUANTITY

There will only ever be twenty-one million bitcoins as sure as we all agree that 2 + 2 = 4. Contrast this with central banks around the world that create money with the click of a mouse. Bitcoin reduces monetary policy to a straightforward schedule.

1.6 Current and Future Valuation of Bitcoin

We argue that Bitcoin is currently not primarily valued as a medium of exchange or transactional currency, but as a gold-like store of value and speculative investment (an excellent one, if you agree with Peter Thiel that it has a 20% chance of going mainstream - a 20% chance of 100x or 1000x growth), and why this is not a bad thing.

It is important to distinguish between the reason for Bitcoin's present valuation and the reasons it will likely be valued in the future. For example, the fact that Bitcoin will probably save online retailers a lot of of money in the future makes Bitcoin valuable not as a currency now, but as an investment now and a currency in the future. It is easy to misinterpret the fact that its *future* as a currency is largely what is driving its current valuation to mean that it is right now, today, valued largely because it enables transactions. People buying bitcoins now because they believe they will be sought out for transactional purposes *in the future* is not the same as people buying bitcoins now because they are sought out for transactional purposes *now*.

Investors who understand Bitcoin's potential do it an important service. They inform the public, through price information, of that which most of the public is unable or unwilling to figure out on their own: that Bitcoin has tremendous potential to change the world and warrants serious attention, both currently for certain people as a hide-able, unconfiscate-able, transportable, no-third-party-risk store of wealth and in the future for everyone as a transactional currency.

Just because it turned out to be better for the "store of value" function first is no reason to worry overly about the transactional function taking time to blossom - that's what investors are for. The ones that invest based on a sound assessment of Bitcoin's future potential serve as a proxy for actual present commercial adoption by boosting the price in the present to a degree commensurate with how likely commercial adoption will be to take hold in the future.

Prematurely using commercial adoption as a measuring stick for Bitcoin's success doesn't really make much sense. Bitcoin is a many-splendored thing, and is valued by investors for both its current and future uses.

2 BITCOIN WALLET BA.NET

2.1 A Bitcoin Wallet

A Bitcoin wallet is as simple as a single pair of a Bitcoin address with its private key. A wallet has been generated for you in your web browser and is displayed above.

2.2 BA.NET BITCOIN WEB WALLET

The easiest way to send a receive bitcoins without installing any software. No need to register username, email or any info.

Create a Bitcoin address, private key, experiment, test away. All code runs on your own web browser and does not depend on any central server. You are in control.

2. 3 TO SAFEGUARD THIS WEB WALLET

You must print or record the Bitcoin address and private key. You can use the My Address Webapp.

Make a backup copy of the private key and store it in a safe, separate location. This site does not have knowledge of your private key.

If you leave/refresh the site or press the "Generate New Address" button then a new private key will be generated and the previously displayed private key will be lost.

2. 4 ADD FUNDS

Add funds to this wallet by telling people to send bitcoins to your Bitcoin address. Make sure you made a backup copy of the private key.

2. 5 CHECK YOUR BALANCE

You can check your balance using the BA.net Bitcoin Web Wallet or by going to blockexplorer.com and enter your Bitcoin address.

2. 6 SPEND YOUR BITCOINS

Spend your Bitcoins using the Send Bitcoin Option.

Remaining change will be sent back to the sending bitcoin address (source address). Simple.

The amount of bitcoins you can spend will be checked before sending. Use the view history button for details. If the address has transactions pending with 0 confirmations, you will have to wait to send funds. 1 confirmation is enough to send bitcoins.

You can set the miner transaction fee to any value you choose. or 0.

2. 7 ADVANCED MULTISIG WALLET

You can create a private key with 3 components. Send the 3 components to 3 friends. And 2 friends are required to create an usable private key to spend the bitcoins. Also called split wallet.

Click on Multisig for split wallets and more advanced features. Cold Storage, Paper Wallet, Brain Wallet, BIP38 Encrypt, Bulk Wallet, Vanity Wallet and more.

If you don't have the private key, you don't own Bitcoin. Be your own bank Design Objective.

2.8 OFFLINE (OR AIR-GAPPED) BITCOIN TRANSACTION

An offline Bitcoin transaction is created with a computer that is not connected to the Internet (or any network). Assuming the installation process was secure the computer can not be reached by hackers.

3 DESIGN OBJECTIVES

If you don't have the private key, you don't own Bitcoin. If you store the key on someone else's server, even if encrypted, your key is not safe. Be you own bank.

3.1 PRIVATE KEY LOSS IS CATASTROPHIC

The primary problem is that losing a key means that all bitcoins stored with that key are lost forever. The way to deal with this is: Create keys frequently and destroy them as soon as they are no longer needed

3.2 MITIGATE RISK BY HAVING MORE KEYS FOR SHORTER DURATIONS

A more secure mitigation against key loss is to generate new addresses/keys frequently, use them for specific operations, and then destroy them.

For example, when traveling, create a new **Travel Key** and use that until you are back home. That way if anyone compromises your travel laptop or phone they only breach the compartment for the duration of your travel.

The impact of the compromise is contained by the limitation on the utility of the key.

For storing bitcoins create a cold paper wallet. You can create your address/key on a computer with no Internet connection. Air-gap computer running the ba.net serverless wallet.

3.3 Why use Offline Bitcoin ?

Computer security is hard. Physical security is much easier to accomplish.

Using Offline Bitcoin allows you to store your wealth securely in an offline vault. Your own vault that you control physically.

You can transfer needed amounts to online wallets on your phone or computer. Bitcoin is just like cash, you should only carry around spending money.

3.4 DO NOT TRUST SERVERS WITH YOUR KEYS

If you don't have the private key, you don't own Bitcoin. If you store the key on someone else's server, even if encrypted, your key is not safe. Be you own bank.

Backup your keys in different locations. You can keep them encrypted with a password.

3.5 SERVERLESS WALLET SIMPLICITY ADVANTAGE

Spend Your Bitcoins using the Send Bitcoin Option. Remaining change will be sent back to the sending bitcoin address (source address).

This allows you to make the backup of your key at the creation time only. As opposed to, backing up your wallet all the time on a downloaded wallet. Downloaded wallets create a new change address for each transaction. This is the reason for confusion and the need of constant backups.

The BA.net serverless Wallet needs only one backup when you create it!

3.6 DOWNLOADED WALLETS LIMITATIONS

You can download a bitcoin client and import your private key. Note that on downloaded bitcoin clients, usually remaining change goes to a new address. That is why Satoshi recommended never to delete a wallet!

3.7 Bitcoin Address and Private Key Reuse

When you reuse your Bitcoin Address you reveal your balance and transaction history of that address to your counterparty. Losing financial privacy.

Another un-desirable problem is that for each use there is a hash signature on the blockchain generated with the private key. There is a theoretical attack exploting information from this signatures. This attack has not been seen yet, but it could be possible.

So both for privacy and security, bitcoin addresses should not be reused. Especially for large amounts of coins.

4 OFFLINE BITCOIN TRANSACTIONS

4.1 WHY OFFLINE BITCOIN ?

Computer security is hard. Physical security is much easier to accomplish.

Using Offline Bitcoin allows you to store your wealth securely in an offline vault. Your own vault that you control physically.

You can transfer needed amounts to online wallets on your phone or computer. Bitcoin is just like cash, you should only carry around spending money.

4.1 WHAT IS AN OFFLINE BITCOIN TRANSACTION ?

An offline Bitcoin transaction is created with a computer that is not connected to the internet (or any network). Assuming the installation process was secure the computer can not be reached by hackers.

To create a Bitcoin payment the offline machine can create a Bitcoin transaction which can then be carried by an USB key. This information can then be copied to a machine that is online, and the transaction can be broadcast.

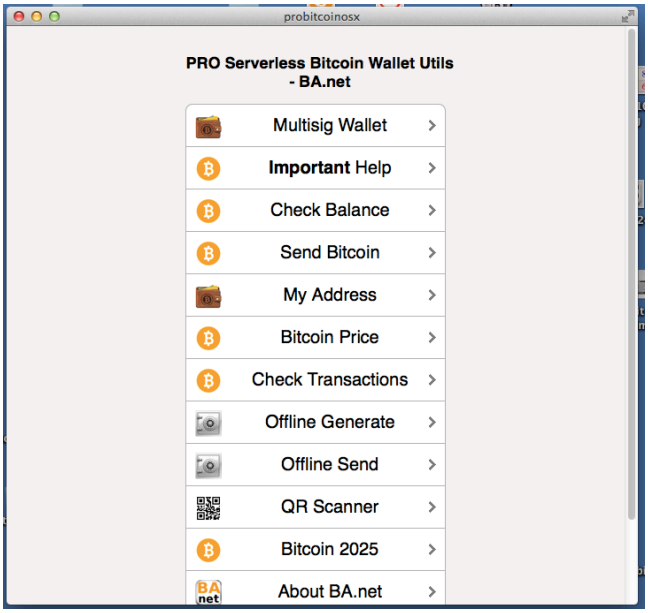
Your private key never touches the Internet. Maximum Security.

4.2 HOW DO I CREATE AN OFFLINE TRANSACTION ?

Use the PRO Bitcoin Wallet and Vault BA.net App. Search for “banet” at the Apple AppStore for OSX.

Also available on iPhone, iPad, or Flashboot Software Appliance

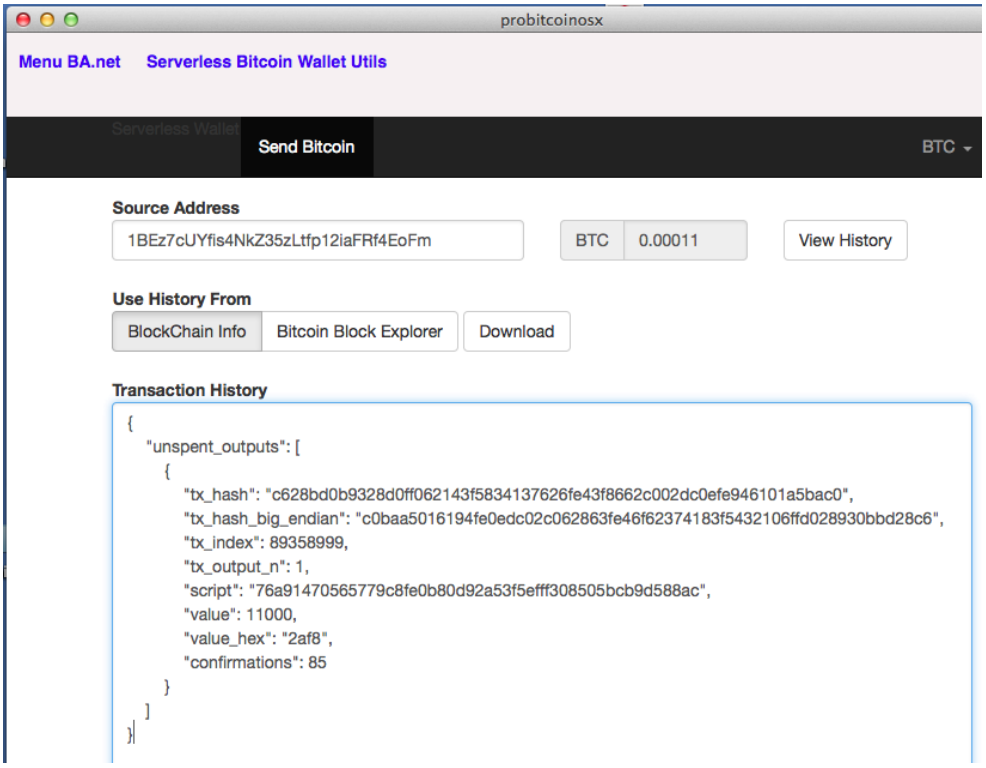
Featured by Apple on top 100 Finance Apps



4.3 Retrieve Unspent Outputs

Retrieve the unspent outputs for your bitcoin address. Use the button Send Bitcoin (the regular online send bitcoin) paste your source address and **click view history**

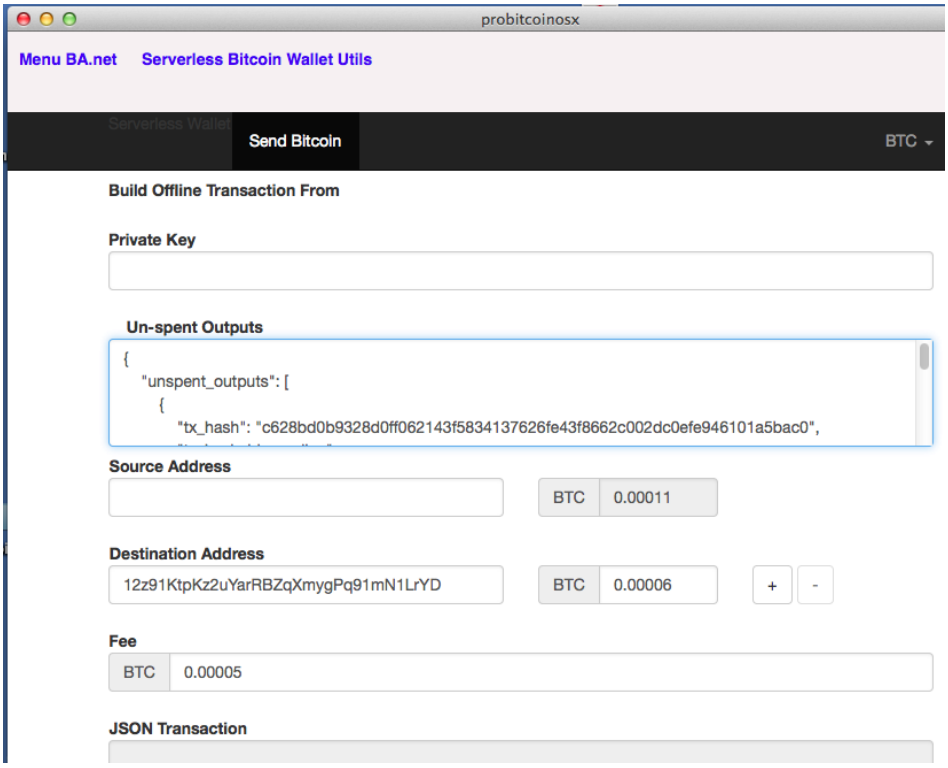
You need to cut and paste this info into a text file and transfer it to the USB key.



4.4 CREATE YOUR TRANSACTION ON YOUR OFFLINE MACHINE

Use the button **Offline Generate**.

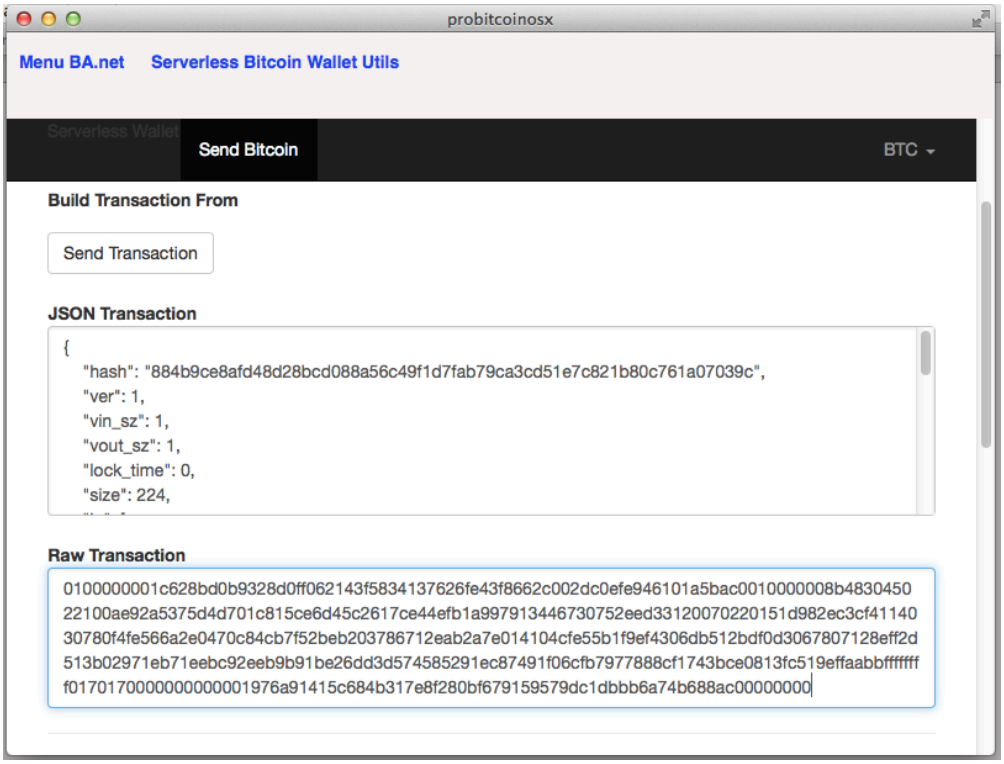
To do this you will need the private key of the address you want to send from, destination address and the amount you want to send.



Cut and Paste the values into the form and generate a transaction. Cut and the paste the generated transaction RAW HEX from the form field into a text file and place it on your USB key.

4.5 SUBMIT THE TRANSACTION TO THE BITCOIN NETWORK

Use the button **Offline Send**.



At no point in this process is the private key data exposed through the transaction data. Your private key never touches the internet, for maximum security.

The biggest threat to an offline wallet is an USB-key virus that executes when plugged in. However, such viruses would have to be highly targeted, and can be mostly mitigated by disabling USB-auto-run on the offline computer.

Alternatively, you can transfer this information using the new QR Code Generator Option. No networking of any kind needed.

4.6 TAKE TIME TO GET FAMILIAR WITH THE PROCESS

It is normal to be uneasy using new software to store your savings, especially with advanced features. Make a few offline transactions with new addresses/keys and small amounts of bitcoins.

After a couple of offline transactions you will be doing them in less than a minute. You will be able to say that you are your own bank!

4.7 Bitcoin Address and Private Key Reuse

When you reuse your Bitcoin Address you reveal your balance and transaction history of that address to your counterparty. Losing financial privacy.

Another un-desirable problem is that for each use there is a hash signature on the blockchain generated with the private key. There is a theoretical attack exploting information from this signatures. This attack has not been seen yet, but it could be possible.

So both for privacy and security, bitcoin addresses should not be reused. Especially for large amounts of coins.

For offline cold wallet storage the simplicity of having only one address/key to backup is important. As well as not having any more change addresses to add complexity. Once the coins come out of cold storage it is best practice not to reuse addresses.

5 UNIQUE BITCOIN ADDRESSES

5.1 BITCOIN ADDRESSES

Bitcoins are 'stored' in something called **bitcoin addresses** - they look something like this: 1j2m5TakK99HvJUTfg2b2b8EGWQenmdTh. There are two parts to a bitcoin address – the public key (commonly just called the address) and the private key – the important part that lets you spend the bitcoins on its corresponding public key. Bitcoin is an example of public key encryption, as you can give out the public key freely but you must keep the private key to yourself.

To send bitcoins to an address, a message is broadcast from the owner of the sending address to the network that X amount of coins from that address now belong to the new address. This operation is authorized by the sender's private key, and if he doesn't have the private key he can't spend the coins, plain and simple.

BItcoin addresses are created by first picking a random number (for the all important key) and creating an ECDSA (Elliptic Curve Digital Signature Algorithm) public / private key pair with them. This operation alone generates the private key – but Bitcoin addresses are not simply public keys, but rather modified versions of them. The generated public key is then put through several SHA-256 and RIPEMD-160 operations, until eventually being converted into a format called Base-58. Base 58 is an encoding that removes the possibility of similar looking characters, such as lowercase L and uppcase I, as well as 0 and O. Finally an identifying number is added to the beginning of the address – for most bitcoin addresses, this is generally 1, indicating it is a public bitcoin network address.

It is infeasible though technically possible that two different people could generate the same bitcoin address. In such a case, both would be able to spend the coins on that particular address. The odds of this

happening are however so small that it is not going to happen in the next couple million years. If you're skeptical, read Why is 2^256 Secure for a stern talking to regarding the security and wonders of exponential growth.

5.2 Why is 2^256 Secure

There's always a lot of talk about the security of modern cryptographic hash functions, mainly SHA-256. This is a hash function used to verify a lot of important stuff – modern website logins are hashed with it, and Bitcoin relies on it almost entirely. There's always a lot of confusion regarding the safety of the function – as we know in the past things are found to be insecure after being declared 'absolutely secure' a few years prior to them being broken. Why is this particular iteration of hash functions so perfect?

The main problem with this idea is how poorly the human mind can understand the exponential function. Our brains can wrap around the concepts of addition and multiplication fine – but when we get to exponents our minds have trouble wrapping our heads around how quickly numbers get unimaginably big.

So what exactly is 2^256? Well, if we're being technical…

2115792089237316195423570985008687907853269984665640564039457584007913129639936

So – for all those doubting the security of 2^256 collision chances, there's the number: There is a 1 in over 115 quattuorvigintillion (that's a 78 digit number) chance of finding a collision. Note: In practice it's actually SLIGHTLY higher than that, due to something called the birthday problem, however the difference is so abysmal that it's hardly worth accounting for.