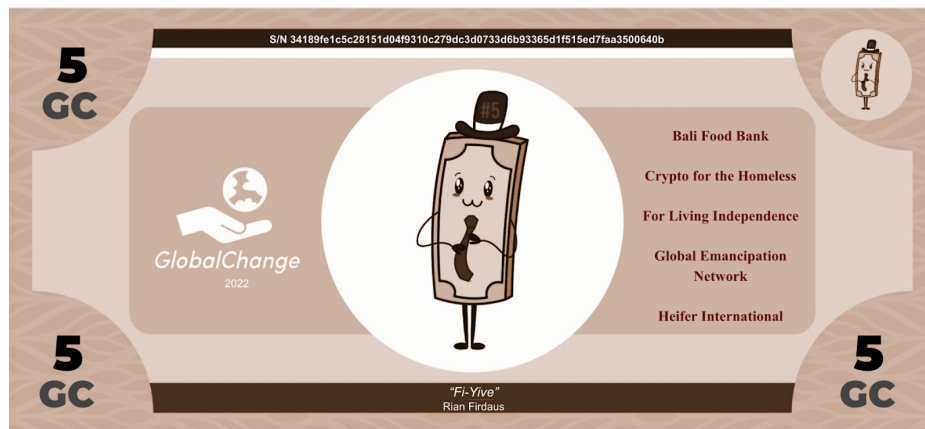


GlobalChange Cryptocurrency WHITEPAPER



Stable-cost cashlike hybrid digital/physical objects with face values

Mined by giving money to independent nonprofits

Energy-efficient and inexpensive transactions

Including Special Edition art and lotteries

Fully distributed, no central authority

Naturally limited supply

An ideal money anyone can make

Introduction

Money is an intentionally designed technology for storing and transferring value. But, what will people value in the future; and how can the thing of value be tightly tied to whatever is actually transferred?

Gold coins represented a moderately but persistently desirable substance shaped into a homogenous and artistic item including a human-readable face value. They spoke honestly of themselves - gold coins could be assayed and weight confirmed - and their honesty, homogeneity, and tradeability gave gold coins value beyond that of their underlying substance. Their supply was also limited, because mining and forging gold was difficult, so it was always unlikely the community would flood with gold the next year. As a result, even people who had no particular use for a small piece of rare earth were happy to accept gold coins in payment.

GlobalChange updates gold coins for the digital age, by stamping face values into another moderately but persistently desirable substance - namely, original art. The face value on a GlobalChange bill or coin represents a true cost paid to mint the GlobalChange coin; and the face value can be assayed and cost confirmed (on the blockchain). GlobalChange tightly bundles the elements that made gold coins useful as currency: human readable face values, honest and verifiable cost, and a substance with at least some persistent value to people.

The inherent cost to mine and forge gold helps make gold good as a currency by helping limit supply, but, unfortunately, mining is physically harmful and dangerous. Mining is wasteful, save for yielding some gold for whoever was rich enough to finance the mining operation. Same for Bitcoin, which uses massive and expensive amounts of electricity to force a cost to mine. But, a true and real cost to mine for currency does not need to be wasted; it merely needs to be paid. The cost behind GlobalChange face values is paid to independent nonprofit organizations. Thus, a true cost is paid - making new GlobalChange costs exactly what its face value says it costs. Not only is there no waste, but the cost for mining goes directly to the missions of nonprofits.

Specifically, you can mint 300 new GC by face value, for every CPI basket of value you give away to nonprofit organizations. CPI baskets are a [fixed basket of goods](#), which [currently happen to cost about \\$298 USD to buy](#). Whenever you give away to nonprofits enough to buy one such basket, you get 300 GC. Now, in 2022, if you give away \$1USD of value, you'll get

about \$1GC. In this way, the face values of GC represent a true and fixed opportunity cost, in terms of how much *stuff* the money you gave away could buy.

Independent artists can contribute the original art that sometimes, at random, gets attached to new GC bills. Bills that receive such artwork are called Special Edition. Artists can upload their art and indicate a nonprofit, so that the art may get attached to bills after donations that include that particular nonprofit. GC Bills can be used at their face value, or, alternatively, collected or auctioned - just like physical money.

In the case of a sale or auction of a Special Edition bill, artists can receive a percentage of resales of their bills. (Generic bills also have special benefits; they can act like lottery tickets).

Anyone can make GlobalChange bills and coins. All you have to do is give your other money away to independent nonprofit organizations, and then declare your own new GlobalChange bills and coins with face values equivalent to the number of CPI baskets your gift could have bought (times 300). You can then find out what new art, if any, your new bills (permanently) include. All this is completed on a blockchain, so anyone to whom you send a GC bill can verify for themselves that the bill was minted correctly in the first place, meaning only following a donation and with a correctly calculated face value. The method to deterministically connect one piece of art from a list to a bill is described in this Whitepaper, so whoever you send a bill to can also verify for themselves which, if any, piece of art the bill has had permanently attached.

There is no central authority “issuing” GlobalChange bills and coins. There is no “initial supply” of tokens. GC bills and coins only ever come into existence after someone gives away money to a set of nonprofits on the blockchain. In this way, anyone who can send money to independent nonprofits can “mine” GC for themselves, and define bills and coins including artwork that anyone else can verify were mined correctly. No machinery, like rare earth or Bitcoin mining equipment, is necessary; but still the cost is real.

Even though GlobalChange is the sort of concept that can independently be developed by multiple separate individuals or groups, and indeed there is no central authority, some coordination is necessary to allow the straightforward interchange of minted bills and coins. This Whitepaper therefore spells out formatting and other sometimes arbitrary choices, so that people who give their money away to good causes and instead self-mint their own digital replacement currency can recognize each other's bills and coins.

For convenience, the Whitepaper starts by describing how GlobalChange can work (is already working) on the Stellar Lumens (SL) blockchain. However, GlobalChange can work on any blockchain, work between blockchains, or support its own fee-free blockchain. Blockchain per se is not even essential; but it provides a convenient infrastructure to instantly transform proof of giving into transferable artistic money-like digital tokens.

There is, deliberately, no one single main reason anyone might want to use GlobalChange. Maybe you care about stable cost; maybe you care about owning rare art; maybe you care about cryptocurrency with face values; maybe you care about nonobjectional mining practices; maybe you want a usable cryptocurrency; maybe you want a monetary system that supports your values; maybe something else. Different reasons, for different types of users, can help make a larger network, which benefits everyone involved.

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1. Mine GC “Ore”: send XLM to 5 nonprofits

When you send money to nonprofits, you can have an equivalent amount for yourself, in face value GlobalChange digital cash.

What is the exchange rate?

For every “CPI gift basket” you send to nonprofits, you always get **300 GC in face value**. A CPI gift basket represents the current cost in U.S. dollars of a fixed, stable, predefined set of items.

The cost for a CPI gift basket as measured in dollars changes regularly, as dollars have inflation or deflation. You can see the current cost in U.S. dollars for a CPI basket at places like economy.com.



*Always get 300 GC for every 1
fixed basket of stuff
your gift to nonprofits could buy, at the time
you gave the gift*

The cost of new GC in terms of CPI baskets does not change, so GC is a stable-cost coin in terms of buying power opportunity cost: 1 GC always costs 1/300th of a CPI basket.

Whatever the current cost in U.S. dollars, whenever you transfer to nonprofits enough money to buy 1 CPI gift basket, whatever that gift basket happens to cost at the time you send the gift, you can get 300 GC.

Here is how to actually send the money to the nonprofit organizations, in a way that is publicly verifiable.

Step A: Get a supply of a currency the sending of which to nonprofits is publicly provable

We want gifts to nonprofits to be provable, meaning anyone can confirm that they happened. For this, we can use cryptocurrency, and Stellar Lumens in particular due to its low transaction costs.

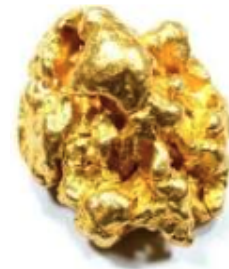
Go and get a supply of the Stellar Lumens currency, which comes in units called “Lumens” (aka “XLM”) and “Stroop.” You can buy XLM using the currency of your choice, at Coinbase or elsewhere. Use these XLM to fund a [Stellar Lumens](#) account.

Currency	USD	Stellar Lumens	Bitcoin
Larger units	Dollars	Lumens or XLM	Bitcoins
Smaller units	Cents or Pennies	Stroop	Satoshi

A Stroop is one ten millionth of an XLM.

Step B: Mine GlobalChange Ore

Before minting individual pieces of GlobalChange digital cash, first we'll mine GlobalChange Ore, by sending money to nonprofit organizations.



The Ore we mine can then be split and pieces formed into individual digital coins and bills of specific denominations.

To mine Ore, in a single Stellar Lumens transaction, send XLM split evenly between at least 5 nonprofits, and include in the transaction’s memo the total amount of GC Ore you are mining (the number of CPI gift baskets you are sending in total, times 300).

To find how many gift baskets you’re sending and therefore how much GlobalChange you can declare in the memo that you are mining,

1. Find how much¹ your XLM gift to the nonprofits is worth, in U.S. dollars - from [Coindesk](#) or [Coinbase](#).
2. Divide that value by the most recent “CPI” value listed at [economy.com](#) to find out many CPI Gift Baskets your gift could buy
3. Multiply by 300.

By design, 1 GC will start out approximately equal to 1 USD.

¹ It is okay to round to the nearest .01 in USD and GC - including rounding in favor of maximizing how much GC you mint in respect of your gift to nonprofits.

In our first example, let's say we are planning to send about \$30 to nonprofits, so for convenient numbers about 225 XLM. The starting list of valid nonprofits is shown later in this Whitepaper. For now, split 5 ways, we sent 45XLM to each of

- [Bali Food Bank](#)
- [Crypto for the Homeless](#)
- [For Living Independence](#)
- [Global Emancipation Network](#)
- [Heifer International](#)

We can check the exchange rate between XLM and dollars, and see the current CPI, to find out many "CPI gift baskets" we are sending to the nonprofits. It's about 1/10 of 1 gift basket, so about 30 GC:

1	<div style="display: flex; justify-content: space-between;"> <div> <h3>Stellar Lumens to US Dollar</h3> <p>225 XLM equals \$28.97 USD.</p> <div style="display: flex; align-items: center; gap: 10px;"> <input type="text" value="225"/> ↔ <input type="text" value="28.97"/> </div> <div style="display: flex; align-items: center; gap: 10px; margin-top: 5px;"> XLM USD </div> </div> <div style="border: 1px solid #ccc; padding: 5px; font-size: 0.8em;"> <p>United States: Consumer Price Index (CPI)</p> <table border="1"> <tr><td>Mnemonic</td><td>CPI.IUSA</td></tr> <tr><td>Unit</td><td>Index 1982-84=100, SA</td></tr> <tr><td>Adjustments</td><td>Seasonally Adjusted</td></tr> <tr><td></td><td>Monthly ▲ 0.33 %</td></tr> <tr><td>Data</td><td>Apr 2022 288.66</td></tr> <tr><td></td><td>Mar 2022 287.71</td></tr> </table> </div> </div>	Mnemonic	CPI.IUSA	Unit	Index 1982-84=100, SA	Adjustments	Seasonally Adjusted		Monthly ▲ 0.33 %	Data	Apr 2022 288.66		Mar 2022 287.71
	Mnemonic	CPI.IUSA											
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	Monthly ▲ 0.33 %												
Data	Apr 2022 288.66												
	Mar 2022 287.71												
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>225XLM=28.97USD</p> <p>https://www.coinbase.com/converter/xlm/usd</p> </div> <div style="text-align: center;"> <p>current CPI is 288.66</p> <p>https://www.economy.com/united-states/consumer-price-index-cpi</p> </div> </div>													
2	<p>Our gift to the nonprofits has cost us the equivalent of .10036 CPI baskets.</p> <div style="border: 2px solid #007bff; border-radius: 15px; padding: 10px; text-align: center; margin: 10px 0;"> $28.97 / 288.66 =$ <h2 style="margin: 0;">0.10036028545</h2> </div>												
3	<p>For this, we get 300 times .10036028545, or 30.108 in face value GC.</p> <div style="border: 2px solid #007bff; border-radius: 15px; padding: 10px; text-align: center; margin: 10px 0;"> $0.10036028545 \times 300 =$ <h2 style="margin: 0;">30.1080856371</h2> </div> <p>Rounding, we get \$30.11 GC.</p> <p>(Giving this many gift baskets will *always* get you \$30.11 GC)</p>												

In this example, our memo in the transaction that sends the 45 XLM to each of the 5 nonprofits declares: **GlobalChange 30.11**. Here is an image of that actual recorded transaction:

Transaction 94be9c569dd6558580321f1d2d13aac97c9a0d1ba2904ec783596da5e498d618

Summary

Status: ✔ Successful
Ledger: 40943297
Source Account: ✳GB605K...R4RX6S
Sequence Number: 168593795833659447
Memo (TEXT): GlobalChange 30.11

Processed: 2022-05-19 14:08:55 UTC
Max Fee: 0.0005 XLM
Fee Charged: 0.00005 XLM

Contains 5 operations

Operation 175850121605439489 - Payment
✳ ✳GB60...RX6S transferred 45 XLM to ✳GC4E...76MK

Operation 175850121605439490 - Payment
✳ ✳GB60...RX6S transferred 45 XLM to ✳GBY6...6HEA

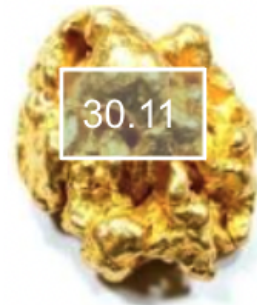
Operation 175850121605439491 - Payment
✳ ✳GB60...RX6S transferred 45 XLM to ✳GB4Z...OUUP

Operation 175850121605439492 - Payment
✳ ✳GB60...RX6S transferred 45 XLM to ✳GCQC...VTWI

Operation 175850121605439493 - Payment
✳ ✳GB60...RX6S transferred 45 XLM to ✳GAWG...6THI

That's it. You have paid a true cost, and declared the face value of GC that you can now have in respect of that cost you paid. In this case, **\$30.11GC**.

We can call this transaction a GC mining transaction, in which you have mined "GC Ore" by giving a gift to nonprofit organizations. The Ore honestly and provably declares its true cost in its memo.



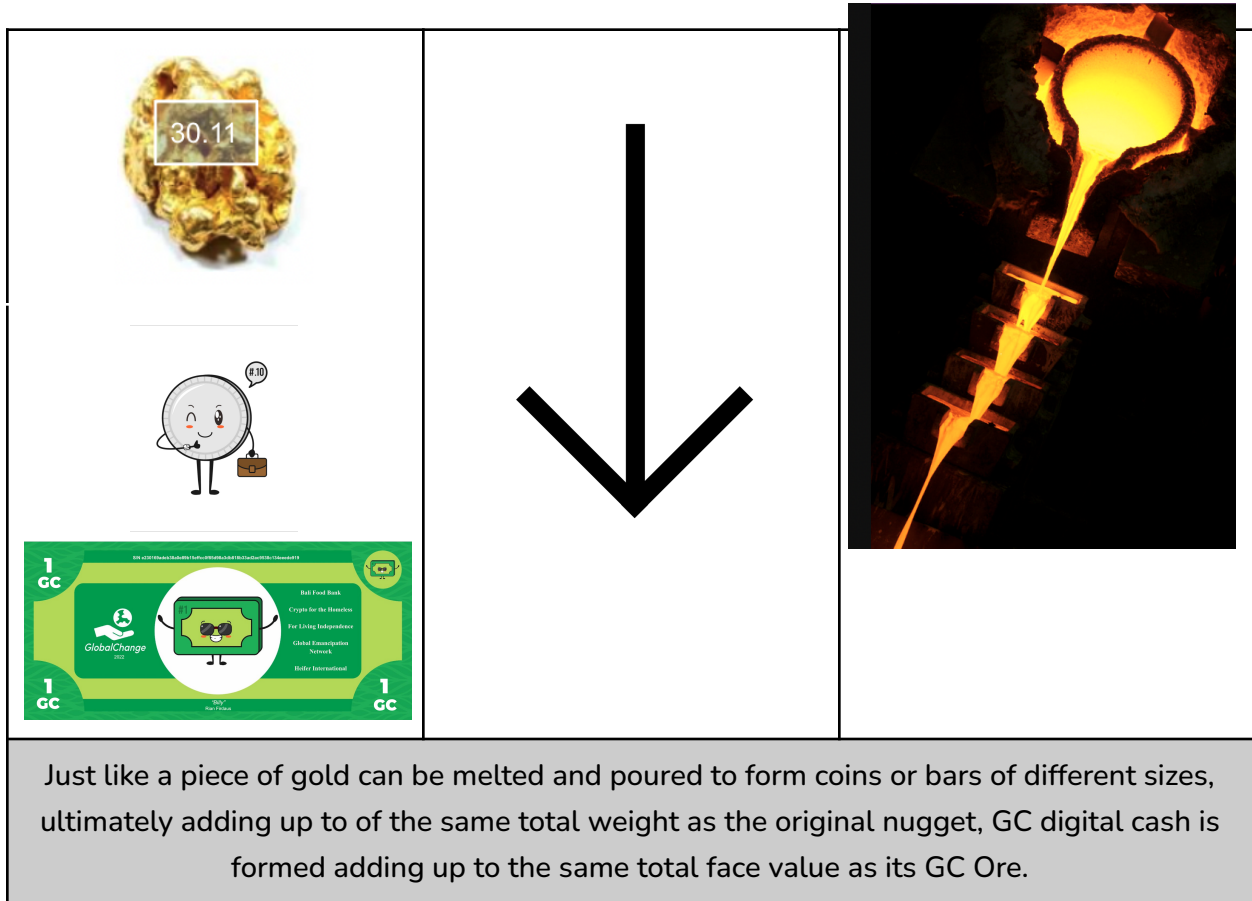
From this Ore, we can then mint individual digital cash tokens, "chipping off" face value pieces of digital cash from the Ore and attaching special edition NFT art to some of the

face value tokens. The total face value of the digital cash minted will continue to add up to the honest cost described in the Ore's memo.



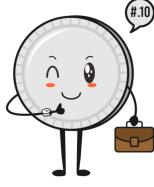


Unfortunately, there can be a fee to get XLM, e.g. 3%. If there were a way to prove to the satisfaction of validators (users like you) that a fiat donation went to nonprofits, that would be just fine as far as minting new GlobalChange. Maybe nonprofits could post receipts of gifts publicly, or some other mechanism. Alternatively, if there were a way to prove that the transaction fee (3%) was definitely paid as a cost, then as far as this Whitepaper is concerned, that 3% could also be accounted as GlobalChange - meaning the amount of GlobalChange could be calculated based on the total true and honest cost paid by the miner, rather than based on the amount received by nonprofits. This is probably do-able; but for the current Whitepaper, we will use the value received by nonprofits as the basis for our GC, just because that component of cost is currently more straightforwardly provable to validators.

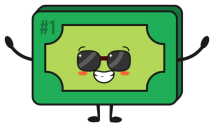
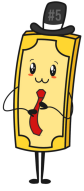
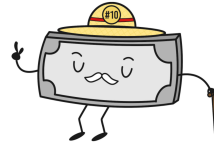
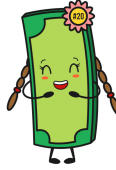
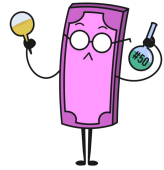
2. Self-mint tokens: Declare face-value bills and coins adding up to the value of your gift to nonprofits, per allowable GC denominations

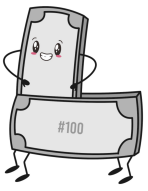
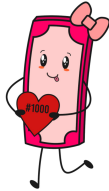
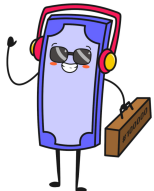
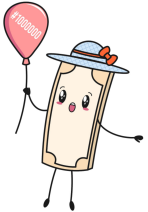

You can now go and mint GC digital cash with face values up to the amount of the Ore. Only the Stellar Lumens account that mined the Ore can mint bills from that Ore.



Following are the allowable GC digital cash denominations, along with the “face” of each digital cash denomination. Instead of George Washington, Queen Mary, or kings and emperors, we have a new set of personas to inhabit our currency.

.01	.05	.10	.25	.50
Pennyzy	Nicole	Dimetrius	Quazar	Haff-Sol
				

1	5	10	20	50
Billy	Fi-Yive	Decker	Twinda	Fighty
				

100	1,000	100,000	1,000,000	1,000,000,000
Centaur	Sen-Say	Gee-Ali	Milliam	Billiam
				

Because we have enough Ore to mint \$30.11GC.

let's mint

one ten

two fives

ten ones

one .01 (one Dimetrius) and one .01 (one Pennyzy)

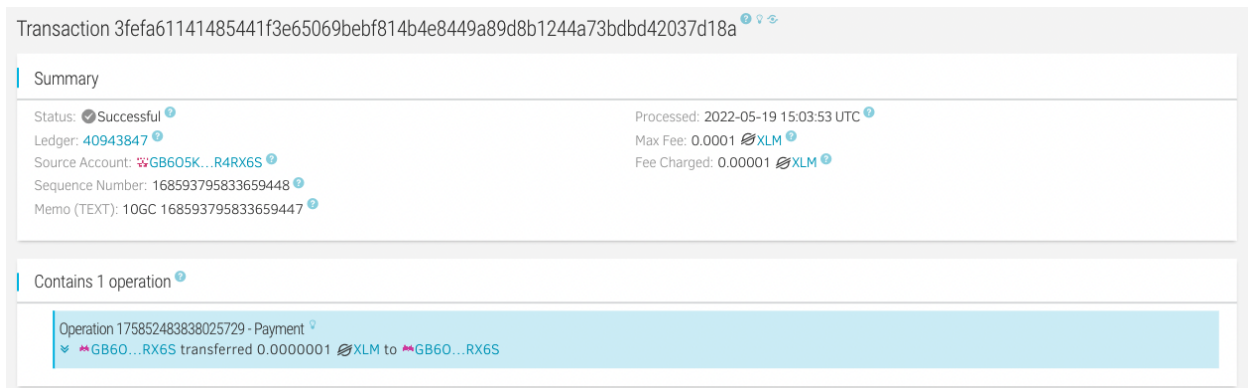
Step A.

For each piece of digital cash you wish to form, send one Stroop to each of the same set of nonprofits² and include a memo that lists

- 1) The face value of the piece of cash³ and
- 2) The transaction sequence number of the Ore out of which the cash is being minted

In our example, we have 15 separate transactions to send, one for each piece of digital cash we are minting out of the Ore. Each of those 15 transactions will point to the same piece of Ore which, as we saw above, had sequence #168593795833659447.

Here is an image of the minting transaction for the \$10GC bill in our example:



Then, we also send 14 additional transactions, each with a memo declaring the face value digital cash we wish to self-mint - each one chipping away at the Ore and finally adding up to our total allotment of \$30.11. In our example, the additional 14 memos are as follows:

1. 5GC 168593795833659447
2. 5GC 168593795833659447
3. 1GC 168593795833659447
4. 1GC 168593795833659447
5. 1GC 168593795833659447
6. 1GC 168593795833659447
7. 1GC 168593795833659447

² Sending the 1 Stroop to the nonprofits “registers” your bills as lottery entities, as described later in this Whitepaper. If for any reason you don’t want your new cash to serve as lottery entries, send 1 Stroop to yourself instead of to the nonprofits, and the new cash won’t be entered into lotteries. The example in this Whitepaper sends the 1 Stroop to self instead of to the nonprofits - so these pieces of cash will not be included as lottery entries in the future.

³ For 1 million and 1 billion GC bills, you can list them as 1M or 1B if you don’t have space in the memo for all digits along with the Ore’s transaction sequence

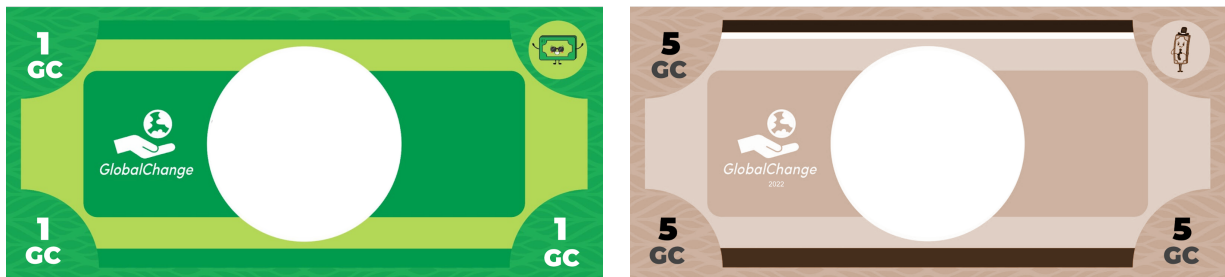
8. 1GC 168593795833659447
9. 1GC 168593795833659447
10. 1GC 168593795833659447
11. 1GC 168593795833659447
12. 1GC 168593795833659447
13. .1GC 168593795833659447
14. .01GC 168593795833659447

Each of these separate transactions will automatically receive a *transaction hash*, which is a string of 64 digits and letters. We will call this transaction hash a digital cash “Serial Number.” For that first \$10GC bill we minted above, we see that it starts “3fe...”

In our example, we have now defined a total 15 unique digital objects with face values and unique Serial Numbers, all provably linked via the Ore to the initial cost we paid to nonprofits.

3. Visualize the digital cash you have self-minted, including any Special Edition art

Each denomination includes a visual object, which is based on denomination background images (like these) that are listed in the appendix, cached, and publicly available, and which are inhabited by the personas shown above:



New GC bills can then layer the following on top of these denomination templates:

- Their serial number (top of the bill)
- Their born-on date (left side of the bill under GlobalChange logo)
- The 5 nonprofits that received the gift that allowed them to be minted or “born” (right side of the bill).

This information should be listed in a font that provides contrast and matches or complements the color of the font listing the face value. Different visualizers might visualize bills slightly differently from each other, just like different phone apps visualize emoji slightly differently from each other. Nothing about the font or visualization affects the validity of the bill.

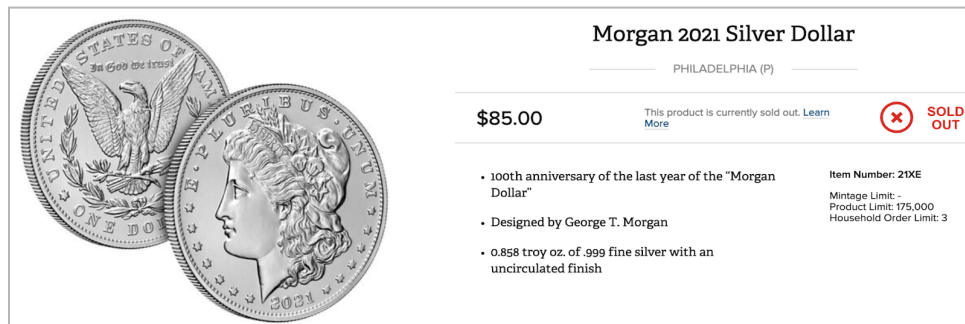
Coins layer just the year in which they were minted (but of course still retain their intrinsic connection to their metadata in their Ore; nonprofits; etc.)

But, what art goes in the middle of each bill?

- Special Edition bills get assigned scarce art uploaded by artists.
- Coins and generic bills get standard art, as shown below. But, these pieces of money are still unique and collectable, and can let owners win lotteries and receive NFT art. See Section 7 below.

Find out if any additional art that artists have uploaded gets attached to your new tokens

Like physical cash, GlobalChange tokens can be generic or also Special Edition. For example, here is a Special Edition U.S. dollar coin, offered for sale by the U.S. Treasury for \$85. You could use it as face-value legal tender like any other dollar to make a payment; or you can collect it or auction it.



Art for Special Edition GlobalChange digital cash is crowdsourced with contributions from artists. Section 6 below describes how artists can upload art; the current section shows how already-uploaded art gets attached, randomly but permanently, to specific bills.

The intent here is that a person minting a GC bill has no control over the art that is attached, but, after a particular bill is minted, everyone including that person can agree on which art should deterministically be attached. To do this, we will seed a pseudo-random number generator with particular permanently recorded values associated with the bill creation transaction on the Stellar Lumens network, as described below.

Step A: Determine the Scarcity Level for the Art on the Bill

Artists determine the scarcity level of art they upload. Each bill can acquire up to only one piece of art.

A 1 GC bill has a

- 10% chance of acquiring at least Level 1 Scarcity art,
- 1% chance of acquiring at least Level 2 Scarcity art,
- .1% chance of acquiring at least Level 3 Scarcity art

and so on through 12 levels of decreasing probability, though the 12th level (“Level X”) breaks the pattern and is particularly rare, as shown in the table below.

If a GC bill does not acquire any art, it remains Generic.

For higher denominations, each 1 GC by face value essentially independently provides its bill with an increased chance of receiving scarce art. So, your odds of receiving Level 2 art on a \$10 GC bill are at least as high as your odds of receiving Level 2 art on at least 1 of a set of 10 separate \$1 GC bills.⁴ In this way, there is no intrinsic benefit to minting larger vs. smaller denominations.

Whether a particular bill acquires art, and what scarcity level that art is, is determined by a random value between 0 and 1, called the ArtOutcome. For each bill of a particular denomination, you can compare the bill’s ArtOutcome to the lookup table shown below and assign it *the highest Scarcity Level for which its ArtOutcome is smaller than the Scarcity Level’s listed threshold*. For example, for a 100 GC bill, if the ArtOutcome is .052, it becomes Level 3, because the highest scarcity level threshold is smaller than Level 3 (which is .19).

Denomination-->	1	5	10	20	50	100	1000	10000	100000	1000000	1000000000
Level 1	0.100000000000	0.42998550000	0.71645371589	1.05410801449	1.49226933719	1.99994687720	11.00000000000 0	101.00000000000 00	1001.000000000 000	10001.000000000 0000	10000001.0000000000000
Level 2	0.010000000000	0.05146044761	0.10517971749	0.21851167488	0.59249089929	1.26793531745	10.9995251162 8	101.00000000000 00	1001.000000000 000	10001.000000000 0000	10000001.0000000000000
Level 3	0.001000000000	0.00523951049	0.01095063177	0.02377336220	0.07319155770	0.19041570577	6.95535032752	100.995437492 06	1001.000000000 000	10001.000000000 0000	10000001.0000000000000
Level 4	0.000100000000	0.00052489501	0.00109950513	0.00239772137	0.00748165437	0.01990132262	1.04683817086	63.8460343102 7	1000.95457738 881	10001.000000000 0000	10000001.0000000000000
Level 5	0.000010000000	0.00005249895	0.00010999505	0.00023997720	0.00074981628	0.00199901032	0.10945237329	9.61146647291	632.754520629 99	10000.5459780 0420	10000001.0000000000000
Level 6	0.000001000000	0.00000524999	0.00001099995	0.00002399977	0.00007499816	0.00019999010	0.01099450733	1.00496729134	95.2577898357 5	6321.83954853 211	10000001.0000000000000
Level 7	0.000000100000	0.00000052500	0.00000110000	0.00000240000	0.00000749998	0.00001999990	0.00109994506	0.10094952182	9.96011690739	951.721026992 45	10000001.0000000000000
Level 8	0.000000010000	0.00000005250	0.00000011000	0.00000024000	0.00000075000	0.00000200000	0.00010999945	0.01009949512	1.00049967682	99.5116136671 7	9999547.00070249000
Level 9	0.000000001000	0.00000000525	0.00000001100	0.00000002400	0.00000007500	0.00000020000	0.00001099999	0.00100999492	0.10009499239	9.99600088885	6321206.11820211000
Level 10	0.000000000100	0.00000000053	0.00000000110	0.00000000240	0.00000000750	0.00000002000	0.00000110000	0.00010099996	0.01000995078	1.00005007946	951625.98971481900
Level 11	0.000000000001	0.00000000005	0.00000000011	0.00000000024	0.00000000075	0.00000000200	0.00000011000	0.00001010000	0.00100099958	0.10000950823	99501.68065069070
Level X	0.000000000000001	0.000000000000006	0.000000000000012	0.000000000000024	0.000000000000075	0.000000000000200	0.00000000000011000	0.00000000000011111	0.00000000000011111	0.00000000000011111	1.1102230734749600

10% chance per face value GC for level 1; 1% for level 2, etc. Plus, bonus probability: each GC gets its bill's face value higher chance of reaching each level. $1-(1-10\%)^{\wedge}\text{face value}$ PLUS FV as a percent times the same. (Any value > 1 is equivalent to 1.) For formulas showing where these values come from, see Appendix.

⁴ There is a slight probability “bonus” for higher denomination bills to receive scarcer art, to balance the fact that because each bill only gets 1 piece of art, higher denominations provide the user with fewer pieces of art.

To find a bill's ArtOutcome, do the following:

1. Determine the bill's "ArtSeed" by appending the ledger hash of the ledger that recorded the bill's Serial Number to to the end of the bill's transaction sequence number
2. Take the SHA256 hash of the ArtSeed
3. Discard letters from the ArtSeed hash, keeping only the digits⁵
4. Start the sequence with a decimal point

The table below shows these values for our example, for the \$10GC bill we minted:

Denomination	10GC
Memo	10 GC 168593795833659447
Sequence number of bill (this is a transaction sequence number associated with the individual account - not an operation number)	168593795833659448
Bill's ledger # that recorded the above transaction	40943847
Bill's ledger's hash	3b148f75bf8fb4eaec436981be6e96b5c01e8515076a4ce315a584bb8293c58c
Art Seed	168593795833659448 3b148f75bf8fb4eaec436981be6e96b5c01e8515076a4ce315a584bb8293c58c
SHA-256 hash of ArtSeed	EE567E56887B3B4EAE5AD33228FF38F440EEF90A505605ECD A5AB05D2E6D8657
Digits only from ArtSeed	5675688734533228384409050560555268657
ArtOutcome	.5675688734533228384409050560555268657
Values to "beat" for Scarcity Levels, for a \$10GC bill - from lookup table	Level 1 0.716453715890000000 Level 2 0.105179717490315000 Level 3 0.010950631769276900 Level 4 0.001099505131976760 Level 5 0.000109995050131473 Level 6 0.000010999950500434

⁵ At least 18 digits. On the off chance you don't have enough 18 numerals in the hash and all of your digits are "0," then take the hash of that hash and use its numerals (etc.), until you get as many digits as you need

	Level 7 0.000001099999504450 Level 8 0.000000109999995546 Level 9 0.000000010999999689 Level 10 0.000000001100000091 Level 11 0.000000000110000009 Level X 0.0000000000000001221
Highest Scarcity Level for which Art Outcome is lower than the threshold listed	Level 1

So, our \$10 GC bill is a Special Edition - Level 1! Most \$10 GC bills (71.6%) will be Special Edition with some Scarcity Level, and the rest will be Generic.

Step B: Create Available Art List and select one from list

Artists upload art and specify the intended Scarcity Level of their art by sending nonprofits memos that describe the art (e.g. a url or content identifier) and a number of Stroop that signifies the art’s scarcity level.⁶ Anyone can see any and all art that has been offered by artists by looking in the nonprofits’ accounts - the same nonprofits to which users sent an initial gift of XLM to mine GC. Artists specify which Scarcity Level their art is intended to represent. Each bill then has a list of art that might be assigned to it, and then from that list one piece of art is selected, as follows.

To create the Available Art List: Looking in the accounts of the 5 nonprofits whom you sent the initial gift, follow these steps in order:

- make a list of all operations paying the nonprofit the number of Stroop corresponding to the art’s scarcity level, e.g. 51 Stroop for Level 1 scarcity. These are listed in Section 6, Step B below.
- Keep any that are between ledger #40861299 and the ledger which recorded the cash’s Ore, exclusive.
- Exclude any that are not either
 - sent May 13, 2022 or
 - listing a lower time bound in the 1990s.

⁶ and, as described below, also a unix timestamp code that helps identify the art as intended for GC bills.

The latter is a “tag” that helps ensure the memo was intended as a GlobalChange art contribution.

- Exclude any whose transactions did not include a memo or the memo is only blank space(s)
- For any memos with space(s) before and after text, remove the space and consider only the text
- Within each account, exclude any duplicate memos, keeping only the first. Per the bullet above, two memos with identical text but one starting with a space would be considered identical, so the later one within the same account should be removed.
- Search within that same ledger range for any payments of 63 Stroop. This is the code for either the nonprofit or the contributing artist to “de-list” art. Within this ledger range, exclude any memos that after being sent were then “delisted” by being included as memos along with a 63-Stroop payment either by the nonprofit who owns the account or by the account that originally sent the memo.
- Put the remaining list of payments in Operation Number order.

The resulting list will be the bill’s Available Art List.⁷

This table shows the start of the construction of the \$10 bill’s Available Art List: all artist-specified Level 1 art previously provided into the accounts of the 5 nonprofits that were funded:

Nonprofit	Memos in nonprofit’s account associated with 51 Stroop	Operation number of transaction placing Stroop into nonprofits’ account
Bali Food Bank	https://tinyurl.com/5n7bk6da https://tinyurl.com/25ed6dw6 https://tinyurl.com/ycxun3mm tinyurl.com/2ay65337	175499970102370305 175499742468952065 175499652275064833 175498393849741313
Heifer International	https://tinyurl.com/5n7bk6da https://tinyurl.com/25ed6dw6 https://tinyurl.com/ycxun3mm	175499970102370306 175499742468952066 175499652275064834

⁷ Valid art is any memo in the nonprofit’s account that was 1) accompanied by the correct number of Stroop (51-62, as described below), 2) sent to the nonprofit on May 13, 2022 OR includes a lower bound unix timestamp from the 1990s, 3) sent to the nonprofit as of the ledger before the bill’s Ore was mined, 4) is not a duplicate of a prior valid memo in that same nonprofit’s account, and 5) has not been “delisted” by the nonprofit or artist sending 63 Stroop into the account along with the art’s memo.

Crypto for the Homeless	https://tinyurl.com/5n7bk6da https://tinyurl.com/25ed6dw6 https://tinyurl.com/ycxun3mm https://tinyurl.com/yhp2wrxk	175499970102370307 175499742468952067 175499652275064835 175498767511658497
For Living Independence	https://tinyurl.com/5n7bk6da https://tinyurl.com/25ed6dw6 https://tinyurl.com/ycxun3mm	175499970102370313 175499742468952073 175499652275064841
Global Emancipation Network	https://tinyurl.com/5n7bk6da https://tinyurl.com/25ed6dw6 https://tinyurl.com/ycxun3mm	175499970102370312 175499742468952072 175499652275064840

Here is the \$10 bill's Available Art List, as arranged in ascending order by operation #. One and only one of these pieces of art will be assigned to the bill, as described below:

#	Nonprofit	Art identifier	Operation number
1	Bali	tinyurl.com/2ay65337	175498393849741313
2	Homeless	https://tinyurl.com/yhp2wrxk	175498767511658497
3	Bali	https://tinyurl.com/ycxun3mm	175499652275064833
4	Heifer	https://tinyurl.com/ycxun3mm	175499652275064834
5	Homeless	https://tinyurl.com/ycxun3mm	175499652275064835
6	Emancipation	https://tinyurl.com/ycxun3mm	175499652275064840
7	Independence	https://tinyurl.com/ycxun3mm	175499652275064841
8	Bali	https://tinyurl.com/25ed6dw6	175499742468952065
9	Heifer	https://tinyurl.com/25ed6dw6	175499742468952066
10	Homeless	https://tinyurl.com/25ed6dw6	175499742468952067
11	Emancipation	https://tinyurl.com/25ed6dw6	175499742468952072
12	Independence	https://tinyurl.com/25ed6dw6	175499742468952073
13	Bali	https://tinyurl.com/5n7bk6da	175499970102370305

14	Heifer	https://tinyurl.com/5n7bk6da	175499970102370306
15	Homeless	https://tinyurl.com/5n7bk6da	175499970102370307
16	Emancipation	https://tinyurl.com/5n7bk6da	175499970102370312
17	Independence	https://tinyurl.com/5n7bk6da	175499970102370313

The length of the Available Art List is an N-digit number. In our example, it is 17, which is a 2-digit number. Now, take the last N digits from the right side of the ArtOutcome, to determine the ArtCycle number.⁸ In our example, this number is 57.

Then, count up through the list ArtCycle times: compute “ArtCycle mod Available Art List Length,” and go to that number item on the list. So in our example, $57 \text{ mod } 17 = 6$, so memo #6.⁹

The memo you land on is the one and only piece of art that gets associated with your new bill. In our example, we reach number 6: <https://tinyurl.com/yxcun3mm>, which the artist intended to get attached to bills minted by people who sent money to the Global Emancipation Network.

In this way, any bill will be assigned one and only one Scarcity Level, and, if assigned a Scarcity Level of 1 or greater, will be assigned one and only one piece of art. Anyone can repeat the calculations and get to the same result; and by standards of cryptography, the result will not change.

Step C: Visualize the bill including its associated art

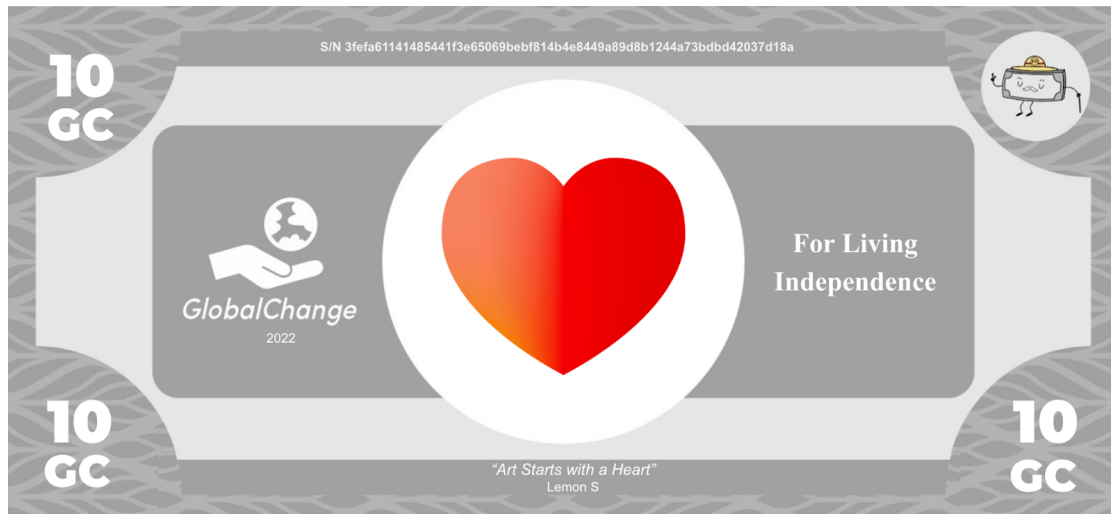
Now you have everything you need to visualize a unique digital object that, per standards of cryptography, cannot be counterfeited. This means you uniquely own the GC digital cash, including its serial number and face value, and also you can include the NFT art’s contents as part of your validly-generated bill - as the artist intended the art to be displayed.

⁸ On the off-off-chance that the ArtOutcome hash did not include N digits within its hex string, take *its* hash (and repeat recursively) until you find a hash that does include N digits, and use those as your ArtCycle number.

⁹ If the result is “0,” then select the *last* item on the list, so in our example that would be memo #17. This method represents a correction - See Proposal 3 vs. primary whitepaper.

Artists may use the provided template (see below) to organize their art's title, images, etc. If so, you can easily use [the information provided in the template](#) to format and visualize your bill. If the title or artist name is unclear or missing, just state "untitled" or "unknown."

When listing nonprofits, Special Edition bills can list only the nonprofit associated with its art.



Here is a compiled image of the \$10 GC bill in our example. Anyone involved can re-compile the image, given just the bill's Serial Number (and access to Stellar Lumens blockchain, to confirm the face value and Scarcity Level; and access to the Internet/IPFS, to find the stored image).

The face value of each piece of GC digital cash is fungible, while each piece's serial number, including its permanent and deterministic connection to a particular scarcity level and piece of art, is much like a non-fungible token. The fungible and non-fungible aspects of GC money are linked together, just like a physical piece of cash, which has a face value and also is a unique and singular object that includes art and might be collectable.

The memo, comprising any content, content identifier, URL, etc. is the key part of an artist's artistic contribution. By owning a bill, including its serial number, everyone involved can agree it is valid for you to place content defined by the memo on your bill or otherwise attach it to your bill. When you own a U.S. dollar bill, you do not own the copyright to the portrait of George Washington, but you do own the object in your hand. If a URL breaks, or if ink fades, that is up to the artist and the printer - some art is more permanent than other art, as a fact of life. And maybe the breakage was intentional, as part of an artistic concept where the art's state changes over time. Either way, you still own the object with a face value, however its art

ages or evolves over time.

When visualizing art, if artists provide a media or other file and a thumbnail, it is certainly okay to layer a “play” button or other signifier of a link on top of the thumbnail, and let a tap link to the file. A moving .gif can be displayed as moving.

Generic bills simply display the denomination’s persona in the center, and list the nonprofits that were part of the initial gift.

Here are all 15 pieces of the new digital cash from our example, as formed from the Ore that cost about 1/10 of a CPI gift basket, or 30.11GC:





- The 10 is a Special Edition, Level 1
- One of the fives is generic, and one is Special Edition Level 1 - and happened to receive the same art as the 10. The uploader of the art put it into both nonprofits' accounts, which is certainly okay.
- One out of ten of the ones are Special Edition.
- The two coins - a Pennzy and a Dimetrius - just list the year. They are still also attached to the meta-data of which nonprofits the original gift to nonprofits benefited; and can function as unique lottery entries.

Both generic and Special Edition may act as “lottery tickets” to gain additional NFT art and

prizes for whoever owns them in the future. For example, as described later, owners of coins and bills that were generated in respect of gifts to specific nonprofits are able to receive deposits of NFT art and even cash prizes directly into their accounts.

If none of the nonprofits you have sent money to have the appropriate Level art in their accounts, you can instead display the correct Level number in the center in any font you like, and set the font of the information displayed on the right side to a new color that does not match any color in the face value font.

(Optional): Reject Special Edition Art

If the art's memo fails to identify art; a link is broken; or it or presents any other sort of problem for you, your options are as follows:

Option 1. You can display a large "Question Mark" or the URL itself in the middle of your bill, and still keep the right to attach the memo content to your bill. For example, maybe the memo identifies a URL that is currently down, but it might work in the future; or maybe the content is designed to appear in the future upon some triggering event.

Option 2. *Level Reduction.* If the image is bad, missing, inappropriate, or there is any other reason you would rather dissociate your bill from the art, you have the option to permanently remove the art's link to your bill and instead accept a randomly assigned alternative from one scarcity level down.

If, for example, your Scarcity Level 4 bill is associated with a memo with a URL you don't want to keep, then send yourself 19 Stroop with a memo containing the Serial Number of the bill. Then, find a new ArtSeed/ArtOutcome/ArtCycle based on the transaction with the 19 Stroop, to determine which art the bill now gets assigned, stipulating that regardless of the new ArtOutcome itself the bill will now be one level lower (Level 3). The Available Art List then looks at art between the same ledgers as the bill's initial art selection, just one Scarcity level down, and uses the rightmost digits of the ArtOutcome (the ArtCycle number) to determine which piece of art on the list now goes onto the bill.

Or, send yourself 119 Stroop including the serial number of the bill, to downgrade directly to Generic.

Anyone can do this any time with any bill they have in their account; and the operation is

permanent - validators recognize the newest Scarcity Level, not the original.

4. Send and receive GC

Sending GC

If you want to send someone your GC bill, send them 1 Stroop with a memo containing the bill's Serial Number. Now they own the GC, and you don't.

Any time you send away in a memo the Serial Number for a piece of cash in your account, you've lost ownership of the GC money - that is what it means to give money.^{10,11}

Looking at anyone's publicly viewable SL account, any Serial Number they have put into a memo in an outgoing transaction should be counted as a bill that is "not present" in their account. (Of course, unless and until sometime later they happen to receive that same Serial Number back in a subsequent incoming transaction).

Receiving and validating GC

If someone sends you a transaction with a memo including a Serial Number, you might have received a GC payment!

The payment's face value will be listed in the memo field for the transaction that the Serial Number identifies. The art assignment calculations will be the same regardless of who carries out the calculations or when the calculations are carried out.

To fully validate that you now own a valid piece of GC money, follow essentially the following steps (in any order; or any isomorphic sort of algorithm - if you make a mistake, you only risk that money you accept will not be validated by someone else down the line who does not make that mistake).

¹⁰ (Even if for any reason you include some other number of Stroop than 1)

¹¹ If you accidentally send a Serial Number to the wrong account, or even a burn account by accident, oops - the money is gone from you. Theoretically, a majority vote by the community could restore money in some unjust circumstance - but don't count on it to work out for you! If you lose your cash, you lose your cash; that precise harshness and coldness is part of what cash is. Though of course it would also be nice for digital cash to be better than cash.

Step A. Make sure the Ore the cash was minted from - in the transaction listed in the cash's original memo - was mined correctly.

- Search for the cash's Serial Number as a Stellar Lumens transaction. Look at the transaction and the memo in that transaction. It should include a face value and a Transaction Sequence Number corresponding to Ore.¹²
- Find that Transaction Sequence Number (the Ore the bill is pointing to) in the same account that minted the bill; look at that transaction.
- Confirm that in the Ore Mining transaction, 5 valid nonprofits each received 1/5 of a total gift.
- Check the XLM-USD exchange rate from the day the Ore was mined, and the CPI from that month as listed at economy.com, moodys.com, or similar source that you expect other users generally to accept. Find the maximum and minimum exchange rate within the range in a 24-hour window around the transaction, and find the maximum and minimum CPI within 2 months around the transaction. These "windows" allow some flexibility and make sure a transaction is not considered invalid because someone had slightly out of date data.
 - Calculate using these windows the range of acceptable GC Ore to mine based on that particular gift of XLM on that particular day, and confirm the amount stated in the Ore's memo is within that range.¹³
- Look at transactions between the Ore and the minting of the cash being validated and add up the face value of any other correctly minted bills, to confirm the face value of the Ore had not previously been used up ("overdrawn") before the cash at hand was minted.¹⁴ Similarly confirm the Ore was not transferred to another account (its transaction hash placed in a memo) prior to the formation of the cash you are validating.

Step B1. Confirm the piece of cash had not previously been double-spent previously in its life.

¹² If the SL transaction indicated by the cash's Serial Number is a transaction with 22 Stroop to self and another bill's Serial Number, the cash was the result of a user "making change," changing a larger denomination into smaller ones. Confirm still that the Ore that was ultimately the source of the cash was mined correctly, by looking at the SL transaction indicated by the Serial Number in the 22-Stroop transaction.

¹³ The Ore value as stated is the permanent amount of Ore. If someone states a valid value that could have been higher due to exchange rates, still the amount that is stated is permanent. However, given a particular amount of Ore, if a coin has not yet been minted from it, it still can be anytime in the future.

¹⁴ Similarly, if you are validating a piece of cash that was the result of a 22-Stroop change-making operation, also add up the face value of any other cash minted between the 22-Stroop transaction and the new piece of cash, to make sure no more new cash was minted than warranted.

For example,

- starting in the account that mined the Ore and minted the cash, look for that account's next operation after the minting sending the piece of cash's Serial Number in a memo to a recipient.
- Then, looking in the recipient's account, starting with that operation, look for the first time the recipient sent the memo. [This might be an operation on the bill, like sending Stroop to themselves and downgrading the bill's Level; or might be sending to another account]^{15,16}
- Look at the recipient account of that memo, and look for the next time they send the memo.
- And so on.
- The current owner of the cash is the most recent recipient of the memo in that list - if all is well and you are validating a payment, the current owner is you!

Step B2. As you conduct Step B1, note if at any point an owner sent themselves the Serial Number along with 19, 119, 22, 33, 100, 101, 102, 103, or other key values of Stroop. These are flags that owners can use to modify the cash.

Step C.

For bills, run the art assignment procedure to confirm or see what the piece of money looks like, including any Special Edition art, by calculating the bill's scarcity level, (re-)generating the bill's Available Art List, counting through the list ArtCycle times, etc. If the bill's Scarcity Level was downgraded per a 19- or 119-Stroop transaction you found in step B2, run the procedure as described previously for downgraded bills, using the downgrading transaction's ArtOutcome etc.

Cash that was minted as the result of a 22-Stroop change-making operation should inherit the art of its parent if it is the first bill minted after the 22-Stroop operation; otherwise it should be generic.

¹⁵ Serial Numbers should be considered case insensitive: anytime you send the sequence of letters and numbers, you have sent the bill, regardless of the capitalization you have used. For legibility, it might be better if only capital letters were ever used for Serial Numbers, throughout the GC ecosystem; but this is not essential.

¹⁶ Sending another account a Serial Number transfers ownership, regardless of the number of Stroop. What if a user sends a special tag number of Stroop in the same transaction sending the bill to a new owner? The transfer to the new owner goes forward; but the tag is ignored and does not serve its function.

And, Congratulations! For any Serial Number someone sends you in a memo field that corresponds to a valid initial transaction and has not been double-spent or previously de-listed, you now own the GC cash including displaying any Special Edition art or url. You can spend it, collect it, auction it - whatever works for you.

Sending Ore

Ore ownership can be transferred too. Ore can be transferred by the owner of the account containing the Ore sending its transaction hash (its own “serial number,” as it were”) as a memo to another account. Even Ore that is partially (or fully) depleted can be transferred, if desired. If one mints new bills/coins from Ore that have been transferred, then to clarify the origin of the Ore, let the format of the memo of the bill/coin state the face value of the GC followed by the note, “transferred Ore.” Then, the next operation from the account minting the bill from the transferred Ore should include a memo containing the transaction hash of the original Ore transaction. For example, minting transactions with memo “10 GC - Transferred Ore” followed immediately by clarifying transactions with memo “94be...”

Transferring bills/coins/Ore by Merging accounts

“Merging,” a Stellar Lumens function, shifts all the contents from one account into another .

Within the GC protocol, let us also say that merging account A into account B in Stellar Lumens results in account B owning all the GC assets from account A - including bills/coins, Ore, etc.

When tracing the history of a coin starting with Ore/minting, look not just for transfers via memo but also transfers via its containing account merging with a new account.

5. Artists: Upload art for Special Editions and lottery prizes

The art you can contribute is a memo: 28 ASCII characters, or, if you prefer, 64 hex characters (probably representing a content hash identifier on IPFS or similar). This allows for representing well over a decillion different pieces of art - trillions for every individual human - so plenty.

In 28 characters, you might compose a short poem; or, perhaps more likely, place a URL or other pointer to additional content. The additional content can be any size, and might be limited only by the imagination.

The 28 (or 64) characters is, for all intents and purposes, an NFT; one that gets attached to GlobalChange money and accounts.

This [template](#) (also depicted below, in this Whitepaper, in case the link breaks) provides a standardized way to represent NFT content within 28-letter memos, which anyone can use to help visualize GlobalChange bills. The template includes instructions on graphics dimensions, uploading art files, etc. You can include your art directly within the template, or you can provide a link.

The true art is the memo itself; anything it points to or identifies, including a template, is, naturally, also part of the art's unfolding display.

Step A

Complete and upload the template to any cloud storage of your choice, including IPFS or Arweave if you like. Or, go free-form, forget the template, provide other content in the memo that is your artistic contribution. It is up to bill owners, or validators, to interpret your memo - so make it as easy for them as you would like. If you send a hash, you can indicate to validators to decode as IPFS by sending additional information how to decode by using the end of the lower-bound time code, like adding a "1220" to let validators know to add the "Qm" prefix and convert into Base 58 to reconstruct an IPFS CID.

How to list IPFS content in a memo: an example	How to find IPFS content listed as a hash in a memo
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<ol style="list-style-type: none"> 1. Upload and pin content, using e.g. Pinata. This could be a template, a .gif, a movie file, whatever. 2. Find the content's CID and paste it into the CID inspector (cid.ipfs.io) 3. Place the 32-character Hex Digest as your a memo, with memo type "hash" 4. To be helpful, if your CID started with a "Qm" prefix, end your unix timestamp with "12:20" minutes/second; or, in decimal, a "40" (which represents 12:20). You'll also set the date to the 1990s. 	<ol style="list-style-type: none"> 1. Place the memo's 32-character hex code into a Base58 encoder, probably first adding "1220" as a prefix. The encoded string should start, "Qm..." 2. Place the string at the end of a url like this one: "ipfs.io/ipfs/___(string)___"
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Step B

Send a nonprofit or multiple nonprofits the number of Stroop listed below and a memo, e.g. a poem, URL or CID hash that is your content (and/or lets users find and view your content).

Scarcity level	Probability of 1 GC (face value) being assigned this level of art.	To indicate the level (scarcity) of your art, send this # Stroop	Memo for transaction	Recipient	Unix Date Code
1	0.10000000000	51	Whatever art you like - the memo is the essence of the NFT art - e.g. URL that finds uploaded Art Template for your art Could be SHA-256 hex digest of IPFS hash	Nonprofit account(s) donors to which might receive your art	Set the "lower bound unix timestamp" to a date in the 1990s If employing an IPFS hash, feel free to use rightmost digits of the unix timestamp to represent the prefix that is missing from the multihash (e.g. 1220 or 40 for Qm), or other information to help validators locate your hash's content
2	0.01000000000	52			
3	0.00100000000	53			
4	0.00010000000	54			
5	0.00001000000	55			
6	0.00000100000	56			
7	0.00000010000	57			
8	0.00000001000	58			
9	0.00000000100	59			
10	0.00000000010	60			

11	0.000000000001	61			
Level X	0.000000000000000001	62			

For example: to offer Scarcity level 2 art to Bali Food Bank, prepare this transaction

- 51 Stroop to Bali Food Bank,
GC4EN3GEKM2SOCIBMW3URTQSPIYCTFNOK5ZWDUBOT3ZSXXKHGZKFO76MK
- memo: <https://tinyurl.com/4uahrpju>
- lower time bound 3:30 pm January 10, 1992

You should receive a percentage of resales that include your art, as described later.

If you ever want to “retract” your art contribution, just send the same nonprofits the same memo but with 63 Stroop. A 63-Stroop-memo is interpreted as “do not list” the original memo; it is not included in subsequent lists when users are newly minting bills after the ledger containing your 63-Stroop memo. The retracted art will still be attached to any bills it was previously associated with prior to you sending 63-Stroop memo.

(Nonprofits can also “delist” specific art, by sending the art’s memo to themselves along with 63 Stroop, as further described later).

Selling/auctioning

Bills can be bundled as payments per their face value. However, individual bills can also be sold or auctioned, like the unique digital objects they are.

When selling individual bills, a portion of sales should benefit the artist and general community value. When you sell a piece of cash as a particular item, instead of using the cash per its face value, the buyer pays the following:

- 80%: to the seller
- 5%: split among whatever nonprofits from the bill’s Ore transaction still have accounts
- If the bill is Special Edition: 10% to the original artist
 - If this artist specified to pay just a nonprofit in the art template, this 10% also goes to the nonprofits containing the transaction the bill’s ArtCycle number

landed on.

- If that nonprofit's accounts are closed, select a different currently-active nonprofit.]
- The remainder: to whatever account mined the most Ore the previous day from any of the nonprofits the bill's Ore paid. If no mining happened on that day, then, instead, a 2nd currently valid nonprofit can be the recipient of this 10%.

The above should all be included in a single transaction with XLM (or other currency supported by Stellar Lumens, that can easily be deposited into the relevant accounts).

If you want to cheat the system, you can sell someone GC by sending them the bill's serial number in a memo, and then in a totally separate transaction, even off-line, they give you money. Then, the seller does not need to pay the "taxes" to the artist and to the community resales commission. The transfer, *per se*, of the GC, should be recognized by validators as valid - it is a successful cheat, as far as blockchain rules go. The ones who lose out are the artists and the general community value. The cheat does not hurt the integrity of GC bills. Even so - don't do this!

A proposal (see Proposals later) might include a specific way to ensure these payments all happen as intended.

6. Make change, print GC, or attach GC to fiat bills

Validators recognize the following procedure to "make change," reducing one larger denomination to multiple smaller ones.

Send a memo to yourself with 22 Stroop and the larger denomination's serial number, as well as 22 Stroop to each of the nonprofits the bill's Ore came from, skipping any whose accounts have closed. This delists the larger denomination, and lets it essentially serve as Ore again, to be used to mint smaller denominations.

Then, to define each new smaller denomination, send 1 Stroop to yourself and to as many of the nonprofits who received Ore donations still have open accounts with a memo including the new face value and the transaction sequence, in your account, of the 22-Stroop delisting transaction.

Each new piece of cash's transaction hash becomes its Serial Number.

All of the new pieces of cash will be generic save the first bill you mint, which will inherit the larger denomination's Scarcity Level and art. If your new cash is only coins, any art from the larger denomination is permanently lost.

The new smaller denominations can serve as Lottery entries (see Lottery below). The larger denomination is still calculated as a Lottery entry, but it cannot win - if it is selected, the winner becomes the next Lottery entry after it in the list that has not been delisted for change.

Smaller denominations can *not* be grouped together into larger denominations.

Locking/Printing

If you want, you can print (or email) GC bills. When you do, they become temporarily unavailable to trade on the SL network, locked to a new password that needs to be entered to continue blockchain trading.

- Choose a password of up to 28 characters; make it as good a one as you like.
- Create a SHA-256 hash of the password
- When you print the bill (or email a picture of the bill), print that password on it (or include the password in the email or in another channel). The password could be as a QR code.
- Send 33 Stroop to yourself with the bill's serial number in a memo.
- In your next transaction, send yourself 33 Stroop and the password's hash (which you also printed on the bill) as a memo

The 33-Stroop transaction locks the bill for trade on SL, until unlocked.

To unlock the bill - perhaps someone handed you the bill as a piece of paper, or sent a picture in an email? -

- First, you can validate the bill by searching for the serial number as a transaction, checking the bill was minted correctly in the first place, and then trace the path of memos until the bill's most recent owner on the SL blockchain - who, presumably, then locked the bill with a 33-Stroop transaction. And, check that no one has already unlocked the bill, by looking at whether any subsequent transactions have included the serial number of the bill along with 44 Stroop, followed by a transaction whose

memo hashes to the hash code that was initially used to lock the bill.

- Then, send the prior owner (account) 44 Stroop and the bill's serial number; or if their account is closed, send that to yourself.
- Then, in your next transaction, send the same recipient (account) 44 Stroop and the password printed on the bill (which, you can already have confirmed, hashes to the hash listed in the 2nd 33-Stroop transaction).

Validators recognize that after a piece of money is locked on the blockchain, the next owner is whoever next sends a memo (the password) that hashes to the hash displayed in the 2nd "33" transaction. From there, the new owner can pass the cash through the blockchain from the new account that provided the password, as per usual.

You might want to check that any paper money people hand you is valid; and has not already been returned to the network. Paper money is susceptible to copying and double-spending. You might want to origami-fold the password so it is not easily visible, or to make it apparent if it has been unfolded to be seen and used. Note that someone can check the bill's serial number to confirm that the bill has "gone to paper" and has not been returned to the blockchain, without seeing the password.

Be careful not to lose the paper money, and in particular the paper money's password - if you lose the password, the money is kind of forever lost, unless someone can guess the password. And be careful not to assume that paper money you receive is valid - someone else might be holding an identical paper copy. You can check privately for yourself, though, that you do have a valid password (see if the password hashes to the hash in the 33-transaction on the blockchain), and you can also see that no one else has yet claimed the bill back onto the blockchain for themselves. If you claim it back first using a 44-transaction, it's yours! Or pass it off to someone else, trading it around as paper (until someone claims it back in!)

When you print, you can print the password or QR code on the front or back - anywhere that works for you aesthetically. You can also print "not legal tender" as makes sense or as warranted or required by any laws, or just to avoid any confusion that GC currency is paper fiat.

Ghost Rider Mode

GlobalChange bills can also be bound to fiat currency. This way, you can give someone GlobalChange just by giving them a fiat bill. The fiat bill acquires a "second life" in this way: in

addition to its life as, say, a 1 dollar, or 10 Euro, national banknote, also it has a “Ghost rider” GlobalChange token.

There are three modes of Ghost Riding.

- 1) Attached: With a password. Whoever knows the password can detach the GlobalChange bill from the fiat. When you receive a fiat bill with a Ghost Rider attached, you should make sure you also receive the password - and then change the password, so only you know it. Otherwise, you might walk away from the transaction, and then someone else who knows the password could detach the GC from the fiat, and you are left with a fiat bill. Worth only the paper it's written on. Which is not nothing ... It's still a fiat bill.
- 2) Fused: Without a password. Whoever owns the fiat owns both the fiat and the GC token. When you receive a fiat bill with GC fused to it, you do not need to also check a password. You should check that the fiat bill's serial number appears on the blockchain alongside the GC's serial number, in memos correctly formatted to fuse the fiat and GC. If you want, you can locally store a list of fiat serial numbers that have been permanently associated with GC serial numbers. Once on that list, the GC never leaves the list. You can even print the list sometime, if you want. If you receive fiat with a serial number on that list, you have also received the GC. However, you cannot trade that GC on the blockchain. You own it; and ownership of the GC now tracks ownership of the fiat bill.

Might someone attempt to counterfeit the fiat bill, and thus claim ownership of the GC? Yes, they might. It is difficult, and illegal. That is one of the risks of owning GC that is fused to fiat. Any contention would be resolved through ordinary, non-blockchain legal means.

- 3) Connected: Without a password, but potentially disconnectable - with some effort. To disconnect a GC that is connected to fiat with a serial number, you need to prove physical ownership of the fiat with the serial number. That is not trivial. One solution that is adequate is to show, or mail, your fiat to a neutral third party, who will attest to the fact that you have controlled the bill so as to send it to them. This neutral third party, let us say, can keep the bill, as payment for making their attestation. All they need to do is publish on the blockchain the serial number of a fiat bill that they receive; along with an account number that you have also shown or mailed to them. Then, the GC belongs to the account number they publish - and the fiat belongs to the witness.

Let us say the witness should be one of the nonprofits participating in GobaChange; this is another form of income. Other witnesses or methods could suffice - it is always in the hands of validators, after all, to accept or not GC on the blockchain given its particular transaction history.

Ghost Rider Binding Method	Attach	Connect	Fuse
Password?	Password	No password	No password
Initial setup	<p>Send memo#1 to yourself with serial number of the GC you own, plus 100 Stroop</p> <p>Send memo#2 to yourself with the serial number of the fiat plus a human-readable identifiable country code (USA, Euro, etc.)</p> <p>Send memo#3 to yourself with the hash of a password you have made up</p>	<p>Send memo#1 to yourself with serial number of the GC you own, plus 101 Stroop</p> <p>Send memo#2 to yourself with the serial number of the fiat plus a human-readable country code (USA, Euro, etc.)</p>	<p>Send memo#1 to yourself with serial number of the GC you own, plus 102 Stroop</p> <p>Send memo#2 to yourself with the serial number of the fiat plus an identifiable country code (USA, Euro, etc.)</p>
Unbindable?	<p>Yes: Send a 144-Stroop memo to yourself with the GC's serial number, and then a 144-Stroop memo to yourself with the password. Now you own the GC on the blockchain, and can send to others in the standard way.</p>	<p>This is harder. You need to get a trusted neutral third-party witness to verify that you have control of the bill - for example, you mail it to them along with a SL account number - and they send 145-Stroop to that account number with the serial number of the fiat. Now, any and all GC assets that were connected to that fiat are now owned by that Stellar account. To start, let's say that any valid nonprofits' address (Tier 1 or 2) can be valid sources</p>	<p>No</p>

		of 145-Stroop disconnection memos. In the future, other neutral witnesses might be accepted. Let us also say that as a default, the witness keeps the fiat.	
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In theory, you can attach your GC in this way to any uniquely identifiable physical object. You just need to provide an acceptable description of that object in memo #2, akin to the fiat's serial number; this could be an IPFS link to additional content or the like. If an identifier besides fiat serial number is used, the user takes a risk that it is not identifiable; nevertheless, as of sending such a memo, the GC is no longer tradeable as unbound GC unless and until it is unbound in a way that validators de facto recognize.

Moving between Blockchains

A similar method can be used to move tokens between blockchains.

- Record a password's hash on a 2nd blockchain
- In Stellar Lumens, send yourself 200 Stroop with a memo including the bill's Serial Number.
 - In your next transaction, send yourself 1 Stroop with a memo that is the password.
 - In your next transaction, send yourself 1 Stroop with a memo that is the transaction hash of the transaction on the 2nd blockchain.
 - In your next transaction, send yourself 1 Stroop with a memo that names or points to the new blockchain.
 - In your next transaction, send yourself 1 Stroop with a memo that indicates the source for rules by which you expect to govern your bill (e.g. a Whitepaper, Protocol, or Proposal that details how bills move on the 2nd blockchain, including how they move back to Stellar Lumens).
- On the 2nd blockchain, send a memo with the bill's Serial Number.

From Stellar Lumens' perspective, the bill now lives on another blockchain. It can return for validators who recognize the rules the bill points to - and who can identify and process transactions on both blockchains.

7. Lotteries and general NFT marketplace

Anyone can provide a GlobalChange lottery prize in the form of a memo. The memo might lead to a link; a message that can only be seen or opened by a particular account holder, if that is how you program it; a method to distribute cash; etc - like any other NFT.

Lottery winners receive “pure” NFT art: the art goes to their account, and does not get attached to the particular coin or bill that won them the prize.

There are two types of lottery: hodler lottery and day-of lottery.

- Hodler lottery prizes go to whoever is holding the winning GC bill (or coin), and are biased to let older coins win more often.
- Day-of lotteries go to whoever mints the new winning bill (or coin) on a particular day.

To supply a lottery prize, send a transaction to a single nonprofit including

- a memo which is the prize
- a number of Stroop specifying the GC denomination that would win the lottery, as shown in the table below.
- The type of lottery you are offering a prize (hodler or day-of)
 - For hodler lotteries, set the lower bound date year to 1984.
 - For day-of lotteries, set the lower bound date year to 1988.
- The date of the lottery draw: set the lower bound date to the month and day you wish the lottery to be held. It will then be held on the next upcoming such month and day. For example, if the current date is May 24, 2022, and you set the date to “February 2,” then the lottery will be held on February 2, 2023. If you set the date to a leap year (February 29th; in either 1984 or 1988, depending on the type of lottery), the lottery will be held on the next actual February 29th.

Lottery					
Denomination	Stroop to send	Memo	Recipient	Day of lottery (upcoming day in the next year)	Type of lottery
.01	71				

.05	72	The memo is/describes the prize	A single nonprofit account	Enter the month and day you wish your lottery to be held in the lower bound date for transactions	Savings (hodler) lottery; any existing piece of cash can win): 1985 New entry lottery (day-of lottery); a piece of cash minted on that specified month and day will win: 1989
.10	73				
.25	74				
.50	75				
1	76				
5	77				
10	78				
100	79				
1000	80				
100000	81				
1000000	82				
1000000000	83				

The transaction hash of the transaction you send offering the prize is the Serial Number of the lottery prize. The prize can be traded/sent just like cash (to transfer it to another account, the winner places the Serial Number in a memo, to transfer it to another account).

To calculate who wins a lottery: Look at transactions defining valid pieces of cash of the specified denomination (not Ore) that are in the nonprofit's account up to and including the last ledger recorded at the end of the day on which the lottery is "held."

- For hodler lottery: all such transactions
- For day-of lottery: all such transactions on that date only as defined by SL's date stamp

Cash that has been delisted for change is included in the entry list for the sake of figuring out the winner, but cannot win itself (the larger delisted denomination is listed but cannot win. The new smaller denominations are listed and can win). Cash that is locked is listed but cannot win.

Put transactions in operation order; this is the "EntryList." The length of the EntryList is an N-digit number. Construct a new number, the WinnerIndex number, based on the digits seen

in the hash of the final SL ledger on the date of the lottery draw, starting from the left.¹⁷

- For hodler lottery: If $N > 1$, then the WinnerIndex Number is $N-1$ digits long, thus biasing that only relatively older operations have a chance of winning
- For day-of lottery: the WinnerIndex number is N digits

Then, starting on the first entry in EntryList, count up through the EntryList WinnerIndexNumber times until landing on the winning piece of cash.

Winning is passive - nothing else needs to be done. The account holding the winning entry may as of then start, if they wish, viewing, using, or trading away the prize; for example by sending the Serial Number in a memo to someone else. Anyone can validate that someone who starts sending the prize's Serial Number in a memo was the winner; and anyone can validate that the prize has not been double-sent since; etc.

If cash that has been delisted for change or locked is selected, the winner becomes the next lottery entry that is a valid piece of money that has not been delisted or locked.

Lottery contributions may not be retracted by the artist.

If there is any dispute over who won the lottery (for example, disagreement over which entries should have been in the EntryList), whoever offered the prize may adjudicate. You can send a message in memos to whoever offered the prize explaining the situation, including a signal payment of 1000 Stroop. If the lottery offerer then sends an account that sent a signal payment 1000 Stroop, that account is considered the winner.

See the section on Democracy for a mechanism to propose improvements to the lottery mechanisms specifically.

NFT Marketplace

GlobalChange additionally supports a freestanding NFT marketplace unlinked to currency.

Offer art

¹⁷ On the off chance more digits are needed, take the hash of that hash and continue adding digits to the WinnerIndex number you are constructing

To offer art for sale, send an NFT-memo to a valid GC nonprofit using a lower bound timestamp in the year 1978. The transaction hash becomes the NFT's serial number. You can include a payment either of 1 Stroop or, if you want, a higher number of Stroop corresponding to the number of XLM you would likely accept in a sale. (For example, to set a proposed price for your NFT of 200 XLM, send the nonprofit 200 Stroop in the initial transaction).

Move NFT from Ethereum to GlobalChange

To move an NFT from Ethereum to GlobalChange, send your NFT to the following Ethereum Burn address -

0xGCG

Then send the hash of that burn transaction (removing the hash's prefix, so 64 characters) as your Stellar Lumens memo, along with a Stroop Stellar Lumens payment to a nonprofit with a lower bound year of 1979.

The NFT will be lost to further trade on Ethereum, but still findable and viewable on Ethereum blockchain explorers like Etherscan using its burn transaction hash.

Current ownership within GlobalChange will be tracked on Stellar Lumens in GlobalChange per the rules described below in this Whitepaper.

Initial sale

The first sale of an NFT on GlobalChange should include 10% of the sale price going to the nonprofit whose account the NFT is in. The payment should be viewable on the blockchain, either within the same transaction or otherwise referenced or immediately proximate to the transaction paying the artist's account (the account that sent the NFT memo to the nonprofit). Either the buyer or the seller needs to send the payment to the nonprofit.

Without the 10% to a nonprofit, the NFT is no longer considered a GlobalChange NFT by validators; it is as if it has been burned. Don't buy one with that transaction history - future validators might not recognize it.

Subsequent sales

Future sales of the NFT need to include payments to the new seller (80%), the original nonprofit (10%), and the original artist (10%).

NFTs that do not demonstrate the cut to the nonprofit and original artist are considered “burned” and should not be included by validators. Don’t buy them.

See the section on Democracy for a mechanism to propose improvements to the NFT marketplace specifically.

8. Additional details, including list of valid nonprofits, distributed democratic decision making, etc.

List of valid nonprofit organizations

What nonprofit organizations can receive gifts that mine GlobalChange ore? Good question.

It is nice that GlobalChange funds nonprofit organizations. This maintains a true cost for the currency, which is a key feature. Allowing nonprofits to serve as the beneficiary of the cost helps make GlobalChange cryptocurrency a coordination point, meaning independent people can agree it is a good meeting point for conducting exchanges. However, ultimately, the funding of the nonprofits is almost a side-effect of the currency system, rather than its *raison d'être*. For this reason, it is more essential to maintain the stability and value of the system than to make sure every potentially worthy nonprofit can receive funding. This is all by way of saying that controversial nonprofits should probably not be allowed to be recipients of gifts, if there is a risk of devaluing or compromising the system or spawning off incompatible validators and minters who do not accept each others' currencies.

Ultimately, the list of acceptable nonprofits is in the hands of validators, meaning recipients of GlobalChange currency. No one wants to mine Ore and mint bills that others refuse to accept as valid; and no one wants to receive bills that downstream users won't accept. Miners, users, validators, recipients - more or less, these are all the same people. What good causes do "we," as a group, want to support? Whatever those causes are, they can receive Ore donations. But what happens when there is disagreement; and someone, or a small minority, stops accepting bills stemming from Ore from a nonprofit that offends them? How can we keep a large central group of users aligned as much as possible?

If it turns out that people have mutually incompatible desired recipients of Ore gifts, we sort of end up in different ways with multiple forked GC currencies, all of which naturally see themselves as the best; and which might end up with exchange rates with respect to each other, so some extra friction - not the worst thing, but also let's not start there.

The rules below are intended to serve as a guide, coordination point, or magnet to establish at least a minimum base of nonprofits. Let us all strongly encourage everyone else to accept the following nonprofits as Ore recipients, at a minimum. *I do not personally love each of these*

nonprofits' missions equally! And, there are some great causes, and spending concepts, that I wish would start on the list - but they do not.

We start with the following three-tier method and mechanisms for adding new nonprofit organizations to the list of valid nonprofit recipients of gifts.

Tier 1: Initial list. Before GlobalChange minted its first bill, these organizations already had Stellar Lumens accounts and could receive funds accompanied by arbitrary memos. Because bootstrapping the system needs some initial participants, these initial nonprofit organizations are a sample of convenience, and they are important to the inception of the system. Thanks to them! Here are their addresses, and links to where I found them:

- [Bali Food Bank](#)
GC4EN3GEKM2SOCIBMW3URTQSPIYCTFNOK5ZWDUBOT3ZSXXKHGZKFO76MK
- [Heifer International](#)
GBY6IQU3COE7SPWRNIVX72NSPAIK2X6O3WLFWAS3CXDSMJUJ35JT6HEA
- [Crypto for the Homeless](#)
GB4ZF5RC42KIKVGODIELXAAXFZM2ZGJTYN37WHFP74WE373ZUKIYOUUP
- [Aid for Ukraine](#)
GD7ZVRSGHETEYLB4XUVFVGFWJKNDHORHAY72HZVXYFINUNZSRVABKVSH
- [University of San Francisco](#)
GAO63FGKTVLS43OBSL6THTNB2R4IQHZOFYKWTV5L6ZOHLTB4MRPBTQ3X
- [Freedom of the Press Foundation](#)
GB5A3OA657UWF3BN7WU4XFFWT333HFP2KFK2OFAXPEL3BBGQ7QLRNASG
- [Women Who Code](#)
GB2OSOAYVKT5O3QTXJ6U3C6NYX2U5X3CSXDSACNQBWEEVGLCWYALO4TA
- [Global Emancipation Network](#)
GAWGCWX3VD2MMCNK4KNECPBMNLVNFE4GLB5DV4ZT3YFBS6NWF17K6THI
- [For Living Independence](#)
GCQC3WNP6PG463276UP4B4NKTXGMKMKC2OWVRQOOABMZW7Q6OBAYVTWI
- [Empower ED Pathways](#)
GB6FL35A2476K7OQ5EIJCOHJNZEEN6HTIJKQV5TZ5FSE5CXGYU2RD25L
- [Tor Project](#)
GABWGQEQESRX5TKDTPYJFPGJDMEW6VLOOLBTIFPJIN7XT6KAFXJQPJ
- [Coin Center](#)
GBKCLZSQZR5MM6WWL3CUJWX6QSE74XODUU34BBGT7SVD32BWJQIX7ER
- [Fight for the Future Fund](#)
GCGNWKJC3KHRLPM3TM6N7D3W5YKDJFL6A2YCFXNMRTZ4Q66MEMZ6FI2
- [Solar Dos Abraxis](#)
GDCQ5TKZXF7FSILKZNB274RKZGVVDJ4G3NXAJLPIFUTXMEOQ4JODM5C

- [Stellar.expert](#)

GDQ75AS5VSH3ZHIZ3P4TAVAOOSNHN346KXJOPZVQMMS27KNCC5TOQEXP

Tier 2: Existing respected nonprofits. Any star-rated nonprofit at CharityNavigator.org that was founded prior to 2023 should naturally be allowed by validators. This includes about 9,000 nonprofits. Here is how to bring them into the network.

After one of these publishes a SL address on the website indicated at CharityNavigator.org, someone should send 11 Stroop to each of the existing nonprofits on the list with a memo listing the address of the new nonprofit; and then a 2nd followup 11-Stroop memo pointing to the website or location the account was found.. Validators can follow such links and confirm for themselves if they approve that the nonprofit meets the criteria. Then, miners can send them XLM and art memos and mine GC Ore and mint bills! (If the 11-Stroop memo is not sent, that does not inherently invalidate Ore transactions to those addresses, assuming Validators do recognize the address is appropriate.)

[See below on how to move to delist a nonprofit if it seems they might turn out to be fraudulent.]

Tier 3: Any additional beneficiaries desired by the community. Any other organization can be proposed as a new recipient of funds; and the proposal is put to a vote. No Tier 3 can be added by this mechanism until at least 2024 - validators do not recognize earlier such additions as valid. A vote proposal for Tier 3 organizations can include a batch list to point to, like another list comparable to CharityNavigator's. Adding new beneficiaries requires at least 70% of votes to be in agreement, before validators recognize the new recipients. This is because most everyone should agree; controversial beneficiaries that can garner a bare 50% agreement might lead to a less stable system.

An individual validator can, of course, opt to recognize any GC as valid as they so choose, regardless of any vote. They just take the risk that downstream recipients won't agree, and refuse to accept bills in their possession.

The mechanism for voting is described below.

Removing a nonprofit

To propose removing a nonprofit, of any tier, initiate a voting proposal to remove that

nonprofit. If 70% of valid votes are to remove the nonprofit, consider it removed. Bills and coins minted before the effective removal date are still considered valid, but Ore and lotteries after that date are not.

It is democratically “hard” to either add or remove nonprofits, to help keep the list stable - while still allowing changes that the community wants.

Again - if you, as a recipient of tokens, wish to accept at face value tokens minted after Ore gifts supporting good causes that are not approved per the rules above ... okay; that is up to you; and maybe even lots of other people - even every other user - might agree with you. Very well. If there is agreement and consensus on how to send money away from ourselves and into nonobjectional causes, and then use our new digital money instead, we don't need the rules at all. If, however, there is disagreement, and anyone is on the fence, then hopefully the coordination rules above can help the system coalesce around some answer or other. The agreement on some set of mutually agreeable sources of Ore provides value to the entire network, including providing value to those beneficiaries we do agree on.

If you consider a nonprofit at least mostly harmless, and other people want to include it, then let's include it.

Nonprofit self-management

If a nonprofit sends itself a memo with 63 Stroop and listing a transaction hash corresponding to an art upload in its account, then as of that ledger stop including that art in the AvailableArtList; the nonprofit has indicated it does not want to be associated with that art. Any bills that from Ore mined prior to that ledger can keep the art.

If a nonprofit sends itself a memo saying “STOP GC,” then respect its wishes. If the nonprofit later says “Never mind, go GC!” then feel free to carry on including them.

Democracy and parameters

Value is in the eye of the recipient. If recipients have consensus over what they will accept as valid, then minters can best meet those targets and we can all mutually access each other as a network of trading partners. If there is some rule in this Whitepaper that is inefficient, impractical, difficult or problematic, and there is a consensus to do things another way, then okay - not even a formal rule change is required. Recipients will value what they value, and all involved will agree on how to proceed.

If, on the other hand, there is disagreement, then maybe this Whitepaper can serve as a coordination point, and hopefully coalesce people who appreciate the gist of GC into a single trading network. The rules can help gather-in people who are willing to compromise for the sake of keeping a large network together. If the network does eventually fork, the rules can work within each fork to that same end, as well as help communicate between forks.

Some rules are more important than others. The exchange rate (300 GC per CPI basket) is important for network alignment, though the definition of exactly how to agree on the current CPI (or similar substitute) can change within the rules, as described below. The set of valid nonprofits is important, to avoid some people giving money to nonprofits and minting GC but other people not accepting the GC. The rules for random assignment of artwork is important - minters should be quite unable to control what artwork is assigned, and all should agree on which art gets assigned where. If in doubt about artwork, a bill can still be valid to all per its face value. But much better to keep in agreement about artwork.

Rules around visualizing bills are more of a nice-to-have - knowing the background denominations can inform artists' decisions, and the fonts and displays are part of what bills and coins "should" look like, but how bills are visualized should not affect their validity; and should not affect their value per their face value. Lottery uploads can be even freer - anyone is free to send anyone else random gifts for any reason - and the formal starting point(s) in this Whitepaper are certainly not the only way to go.

Community standards might evolve without the formal voting system described below - but in case of doubt or dispute, or in case it is otherwise helpful, the following content is here to help keep validators in step with each other, to try to maximize the efficiency of the overall network and system.

In this context, voting for most community directions and proposals is weighted: each GC, by

face value, has a vote, which can be directed by the person controlling the account the GC is sitting in. GC that has been locked for printing is not included in vote tallies.

One ideal decision rule for keeping the network aligned would be to adopt any proposal on which at least 50% of face value GC agree. This decision rule is good for maintaining system alignment. It is clear, relatively easy to verify, and it makes malicious voting literally real-world expensive: an evil actor would have to out-spend the entire rest of the innocent network, as measured in USD CPI, to control voting. Voting by “proof of worth” can be compared to “proof of work.”

A major downside of this decision rule is that it affords more power to richer people.

Even so, we can also at least have some confidence that richer people who are invested in the system will support decisions that maintain the integrity of the network and the overall network value. While it doesn't always sit right to again give richer people power, one time it does make some sense is when they are co-shareowners, with us, of a bank.

There is another problem with the 50% rule, which is that some people might not vote, for various reasons, meaning decision procedures might not reach a threshold where the majority of GC weigh in at all - even if there were unanimous interest in following a particular direction.

Therefore, to split the difference, we will base most voting in the system on majority rule by Active Participants, where GC only counts towards votes if they are in an account that within the prior year has positively indicated an interest in participating. Locked bills do not count / cannot vote. To indicate interest in being counted in voting, send yourself and the initial set of nonprofits a memo saying “Active Voter” (along with 1 Stroop).

(This initial starting rule of following the majority of Active Participants can itself be changed/modified/abandoned following a vote that tallies a true 50% of all face value GC..)

The following parameters are susceptible to modification by voting and following the decision by the majority of active voters:

Exchange rate sources¹⁸

¹⁸ If coindesk, coinbase, economy.com, and/o Moody's go defunct or become problematic, it would be nice to simply choose another “reputable” source for exchange rate and CPI. You can define this in a proposal, but even before that you can just publish in a memo the name of the new source, for anyone else who also finds the first sources to be

Exchange rate time window
CPI date window
Format for memos
Include / Exclude nonprofit (70% vote needed)
Formal rules for defining who wins lottery
Randomization method for artseed
Change or add denomination art
Art Template updates
Ad hoc justice/decisions: who owns a bill; resolving art assignment ambiguities.
Potential to duplicate bill, in case of ownership or art assignment dispute.

To initiate a network proposal, for example, a rule that validators should adopt, send 74 Stroop to each of the initial set of nonprofits¹⁹ with a memo linking to a description of the rule you would propose. The exact formatting etc. of your proposal should allow for comprehension, uptake, analysis, and decision making. Formatting for proposals generally might itself be defined in a proposal.

To vote to adopt a proposal (assuming you have already sent your Active Voter memo) send those same accounts 175 Stroop each, with a memo listing the transaction hash of the proposal you are supporting. There is no need to vote “no” on proposals: proposals are accepted by all simply when 50% of active participants’ GC support them (70%, for adding/removing nonprofits). To remove your ‘yes” vote, send yourself 57 Stroop with the same memo.

A proposal might or might not specify a vote date. If it does, then votes are tallied on the last ledger of the date that is specified.

When someone notices that a proposal’s transaction hash has the support of the majority of GC held by active participants, send that set of accounts 189 Stroop and a memo with the proposal’s transaction hash. As of that ledger, the proposal is adopted, regardless of future

problematic; minters and validators should just gravitate to the most popular source that is trustworthy to them - and sources should not differ very much. To change from the CPI calculation itself that is represented at economy.com, for example to adopt a new and better measure of inflation and cost in USD, let that be a proper voted proposal. There is probably a behavioral economics sort of way to derive this empirically without using a trusted source, like by actually offering some set of items at auction in USD and then use their actual selling price to determine the inflation correction between USD and GC.

¹⁹ If some or all of the initial nonprofit accounts close, then instead include a set of the oldest currently-active nonprofit accounts in the system

calculations. Others, whatever their role, can verify it was tallied correctly as of a ledger just before the 189 stroop memo, before adopting the proposal into their own personal use of GC. All should pay close attention to 189-Stroop memos, checking to confirm themselves that they are valid.

A proposal might describe a justice system to delegate smaller decisions to a smaller group; for example, to let a randomly chosen set of crowdsourced jurors make decisions around any ambiguities arising for bill ownership. (Decisions there could be “appealed” by a proposal to the whole system majority; but potentially it would be efficient to let some set of decisions happen more easily than full votes.)

A proposal might describe a system of “taxation” where some portion of some funds in the system - for example, a percentage of resales of Special Edition art - are allocated for use according to additional voted initiatives. Such funds might be held and invested while awaiting use. For example, initiatives undertaken after adoption of such a proposal might include funds in some currency to be distributed to real-world actors upon provable completion of some task.²⁰ If so, consider analyzing potential initiatives and their effects within a risk-based brainstorming framework to avoid foreseeable short- and long-term problems. Conscientiously and in a structured manner seeking to understand and act to avoid anticipated problems is an efficient use of crowdsourcing in the context of a digital democracy.

Each proposal will ideally list the hash of the most recent prior proposal that was accepted and that it is “aware of,” thus creating a chain (even if a branching chain) back to the first Whitepaper published by listing its hash on the blockchain. Potentially, two proposals might be unaware of each other and not cite each other before adoption; if both are adopted, then both should be incorporated into users’ practices. If they have a contradiction or other issue, a new proposal can cite and describe the situation to that point and clarify.

²⁰ *A proposal to emulate redemptions might be described: GC can be minted in respect of long-term loans, rather than gifts, to nonprofits, where the lender puts money or items of known value into a pool and nominates particular nonprofits to be allowed to withdraw from the pool. Nonprofits repay value into that pool, for the lender to eventually withdraw if desired. The lender can “redeem” and retrieve their initial donation after a term (7.5 years? - the amount of time compound interest doubles the principal, so the donor has effectively gifted the nonprofit with that fiat, in the form of interest) by burning their initially received amount of GC. Stagnant value in the pool can gather interest to be used to fund rare loan defaults as well as voted network proposals. There might also be a “penalty” that the original GC minted has a -1 Scarcity Level assigned - but the GC after minting is treated identically and fungibly with other GC. Redemptions can thus attract users who value redeemability of currency; and can generate funds for the network to use.*

If, for some reason, the network were to fork, with people in apparent disagreement with each other, then alternate forks hopefully at the least will be able to recognize and validate GC that would be valid as of the last common proposal; even if just face values; even if in the worst case the last common proposal is the initial Whitepaper. One can imagine a tree, or bush, of forks; yet there will be incentive to mint to the lowest common denominator, as well as to validate efficiently to that lowest common denominator.

Potentially many developments can take place without any formal voting, especially when unanimous and if dissenters graciously opt to join the unanimous front. The above shows a starting place for decision making if necessary - and can itself be changed and the change can be clearly identified and published by the mechanisms of public voting as described above.

No mean forks

No mean trolling, forks, or pranks are allowed in the proposals and rules in the ongoing democracy.

The concern this proposal addresses is that some somewhat-rich person or group thinks it would be fun and funny, or just plain mean, to get a relatively big chunk of GC and then propose and vote on rules that divert the system, either in a selfish self-serving way or just in a pointless, mean, diverting, or trolling way . Like, put votes on record that delegitimize all other bills, or that vastly change the rules of who can receive donations, so the system loses its character, etc.

If someone tries such a thing, then yes, even without the rule in this section, the rest of the innocent network can fork and carry on, ignoring them. But, the evil actors would otherwise have acquired legitimacy of the letter of the law, and might use that in a trolling manner.

This rule does not find a way to perfectly preserve the spirit of GlobalChange, but it does at least give the innocent actors in this scenario legitimacy to claim that they are the ones who have legitimacy even by the letter of the rules, due to the voted-in rule being in formal violation of the no mean forks rule. In other words - a mean-spirited, blatantly self-serving and harmful, or trolling fork might happen anyway, but this rule takes away some of its legitimacy in the eyes of well-meaning yet strict people who want to follow both the spirit and letter of GC rules.

People get GC by truly paying a cost, where the cost is paid to independent causes that can use the money for good. Good is defined as the sorts of things, by and large, the set of thousands of star-rated nonprofits listed at CharityNavigator as of the start of 2022 work on: food for the hungry, medical research, sustainable environmental causes, anti-trafficking, anti-war efforts, reduction of unfair inequalities, access to education, arts, etc. To the extent possible, using CPI or better measures, the amount of GC per face value received for a given true buying power opportunity cost should be approximately stable.

Social

GC in a blockchain with memos can enable a social network of messaging. The following sorts of messages can be included.

Notes

Someone might doodle on a piece of physical cash, or write a message. Same for GC: When you own a bill, send a memo to yourself with the bill's Serial Number and 23 Stroop. In the next message, send 23 Stroop and a message in the memo field. That message can forever now be interpreted as a note, as if doodled on the bill. You can see the note history of a bill - whoever has ever owned it might have added a note. The note could be a url or other pointer; or a human readable message; or any other text. Notes can potentially be formatted so they can only be read by the current actual owner of the bill - by including a pointer to code that only reveals a message to the owner of an account that the code's validator confirms is the bill's current owner.

Broadcasts

You can send a message to be received by the current owner of a bill/coin you have previously sent.

To post such a message, send yourself the bill's Serial Number along with 24 Stroop. In your next transaction, send 24 Stroop along with a memo describing your message. It can be open, or a coded format that only the account that validly owns the bill can read.

Or, you can send a message to be received by any current owner of bills/coins you have previously sent. For example, if you own a bill that a celebrity once owned, you can get that celebrity's messages as long as you keep owning that bill.

To do this, send yourself a memo with the word “Broadcast forward”, and then an additional memo with a description of your message. Again, this can be open, or could be a link coded to only reveal itself to a current valid owner of a bill that previously passed through your account.

Alternatively, use a “Broadcast reverse” memo to send messages to anyone from whom you have previously received GC - perhaps you want to advertise back to your past customers.

(Recipients of messages would need to scan the blockchain for the posting of messages. This should be an automatic function of GC SmartWallets.)

Alternative codes or means for messaging can easily be adopted, even without Whitepaper proposals or votes.

Gallery

If you want to generally advertise a piece of GC cash as “on offer” - for sale/auction - you can send yourself a memo with the GC’s Serial Number and 1200 Stroop. This tag does not affect any other processes, rules, or validities, but lets others scan the blockchain for available items.

One could initiate a buying offer on Stellar Lumens by sending a proposed transaction for countersigning including the GC Serial Number in the memo, and XLM divided among the appropriate parties.

Direct Messaging

Feel free to send yourself 99 Stroop and a means of contact in the memo - like an email address or similar. This would alert other GC users how to contact you, for example to negotiate potential sales.

You can update this via a 2nd such memo, with users knowing to use the method described in the most recent 99-Stroop transaction.

Additional notes

This seems like a good place for a note on the long-term effect of GC. This protocol - like any new currency or printing of currency, national or crypto - increases the world’s total money supply. Somehow both the money you send to nonprofits has value - it can buy them real-world CPI baskets full of goods at market rate - and also the new GC has value, as an

inherently costly; usable; and artistic currency that conveys ownership of original artwork, and which can replace and work better for its users than the money they swapped away for it. You can't just duplicate money and both have value, right? Doesn't that lead to an imbalance, because now there is too much money around, to represent the same static underlying set of goods and services?

In answer, I'd just say I hope not, in part because the underlying set of goods and services is not static. When nonprofits have more spending power, more goods and services - more value - can now exist in the world. As a single example, if more people in a region receive skills training (education), there are now more skills represented worth paying more for. The marginal value of money - of buying power; of CPI baskets - is higher in the hands of poorer people. A single particular piece of food is most valuable to the world in the hands of a starving person, who now has a chance to live and go on to earn a living. If a rich person just gives money for food to the starving person, do we suppose that eventually there will not be the right amount of money in the world, when that now-living person charges for their services in the future? For would there not now be an excess of value in the world, for that same static amount of money to get split paying for. In this way, maybe giving money where it is most needed *should* result in more money starting to exist.

Formulas for Scarcity Level

Denomination-->	1	5	10	20	50	100
Level 1	0.1000000000	$\frac{1}{1+(-1-SC13)/SD12+((-1-SC13)/SD12)^2}$	$\frac{1}{1+(-1-SC13)/EB12+((-1-SC13)/EB12)^2}$	$\frac{1}{1+(-1-SC13)/FB12+((-1-SC13)/FB12)^2}$	$\frac{1}{1+(-1-SC13)/GB12+((-1-SC13)/GB12)^2}$	$\frac{1}{1+(-1-SC13)/HB12+((-1-SC13)/HB12)^2}$
Level 2	<C13/10	$\frac{1}{1+(-1-SC14)/SD12+((-1-SC14)/SD12)^2}$	$\frac{1}{1+(-1-SC14)/EB12+((-1-SC14)/EB12)^2}$	$\frac{1}{1+(-1-SC14)/FB12+((-1-SC14)/FB12)^2}$	$\frac{1}{1+(-1-SC14)/GB12+((-1-SC14)/GB12)^2}$	$\frac{1}{1+(-1-SC14)/HB12+((-1-SC14)/HB12)^2}$
Level 3	<C14/10	$\frac{1}{1+(-1-SC15)/SD12+((-1-SC15)/SD12)^2}$	$\frac{1}{1+(-1-SC15)/EB12+((-1-SC15)/EB12)^2}$	$\frac{1}{1+(-1-SC15)/FB12+((-1-SC15)/FB12)^2}$	$\frac{1}{1+(-1-SC15)/GB12+((-1-SC15)/GB12)^2}$	$\frac{1}{1+(-1-SC15)/HB12+((-1-SC15)/HB12)^2}$
Level 4	<C15/10	$\frac{1}{1+(-1-SC16)/SD12+((-1-SC16)/SD12)^2}$	$\frac{1}{1+(-1-SC16)/EB12+((-1-SC16)/EB12)^2}$	$\frac{1}{1+(-1-SC16)/FB12+((-1-SC16)/FB12)^2}$	$\frac{1}{1+(-1-SC16)/GB12+((-1-SC16)/GB12)^2}$	$\frac{1}{1+(-1-SC16)/HB12+((-1-SC16)/HB12)^2}$
Level 5	<C16/10	$\frac{1}{1+(-1-SC17)/SD12+((-1-SC17)/SD12)^2}$	$\frac{1}{1+(-1-SC17)/EB12+((-1-SC17)/EB12)^2}$	$\frac{1}{1+(-1-SC17)/FB12+((-1-SC17)/FB12)^2}$	$\frac{1}{1+(-1-SC17)/GB12+((-1-SC17)/GB12)^2}$	$\frac{1}{1+(-1-SC17)/HB12+((-1-SC17)/HB12)^2}$
Level 6	<C17/10	$\frac{1}{1+(-1-SC18)/SD12+((-1-SC18)/SD12)^2}$	$\frac{1}{1+(-1-SC18)/EB12+((-1-SC18)/EB12)^2}$	$\frac{1}{1+(-1-SC18)/FB12+((-1-SC18)/FB12)^2}$	$\frac{1}{1+(-1-SC18)/GB12+((-1-SC18)/GB12)^2}$	$\frac{1}{1+(-1-SC18)/HB12+((-1-SC18)/HB12)^2}$
Level 7	<C18/10	$\frac{1}{1+(-1-SC19)/SD12+((-1-SC19)/SD12)^2}$	$\frac{1}{1+(-1-SC19)/EB12+((-1-SC19)/EB12)^2}$	$\frac{1}{1+(-1-SC19)/FB12+((-1-SC19)/FB12)^2}$	$\frac{1}{1+(-1-SC19)/GB12+((-1-SC19)/GB12)^2}$	$\frac{1}{1+(-1-SC19)/HB12+((-1-SC19)/HB12)^2}$
Level 8	<C19/10	$\frac{1}{1+(-1-SC20)/SD12+((-1-SC20)/SD12)^2}$	$\frac{1}{1+(-1-SC20)/EB12+((-1-SC20)/EB12)^2}$	$\frac{1}{1+(-1-SC20)/FB12+((-1-SC20)/FB12)^2}$	$\frac{1}{1+(-1-SC20)/GB12+((-1-SC20)/GB12)^2}$	$\frac{1}{1+(-1-SC20)/HB12+((-1-SC20)/HB12)^2}$
Level 9	<C20/10	$\frac{1}{1+(-1-SC21)/SD12+((-1-SC21)/SD12)^2}$	$\frac{1}{1+(-1-SC21)/EB12+((-1-SC21)/EB12)^2}$	$\frac{1}{1+(-1-SC21)/FB12+((-1-SC21)/FB12)^2}$	$\frac{1}{1+(-1-SC21)/GB12+((-1-SC21)/GB12)^2}$	$\frac{1}{1+(-1-SC21)/HB12+((-1-SC21)/HB12)^2}$
Level 10	<C21/10	$\frac{1}{1+(-1-SC22)/SD12+((-1-SC22)/SD12)^2}$	$\frac{1}{1+(-1-SC22)/EB12+((-1-SC22)/EB12)^2}$	$\frac{1}{1+(-1-SC22)/FB12+((-1-SC22)/FB12)^2}$	$\frac{1}{1+(-1-SC22)/GB12+((-1-SC22)/GB12)^2}$	$\frac{1}{1+(-1-SC22)/HB12+((-1-SC22)/HB12)^2}$
Level 11	<C22/10	$\frac{1}{1+(-1-SC23)/SD12+((-1-SC23)/SD12)^2}$	$\frac{1}{1+(-1-SC23)/EB12+((-1-SC23)/EB12)^2}$	$\frac{1}{1+(-1-SC23)/FB12+((-1-SC23)/FB12)^2}$	$\frac{1}{1+(-1-SC23)/GB12+((-1-SC23)/GB12)^2}$	$\frac{1}{1+(-1-SC23)/HB12+((-1-SC23)/HB12)^2}$
Level X	<C23/100000	$\frac{1}{1+(-1-SC24)/SD12+((-1-SC24)/SD12)^2}$	$\frac{1}{1+(-1-SC24)/EB12+((-1-SC24)/EB12)^2}$	$\frac{1}{1+(-1-SC24)/FB12+((-1-SC24)/FB12)^2}$	$\frac{1}{1+(-1-SC24)/GB12+((-1-SC24)/GB12)^2}$	$\frac{1}{1+(-1-SC24)/HB12+((-1-SC24)/HB12)^2}$

	1000	10000	100000	1000000	100000000
=1-(1-\$C13)/\$I12+((1-(1-\$C13)/\$I12)/\$I12/100)	=1-(1-\$C13)/\$J12+((1-(1-\$C13)/\$J12)/\$J12/100)	=1-(1-\$C13)/\$K12+((1-(1-\$C13)/\$K12)/\$K12/100)	=1-(1-\$C13)/\$L12+((1-(1-\$C13)/\$L12)/\$L12/100)	=1-(1-\$C13)/\$M12+((1-(1-\$C13)/\$M12)/\$M12/100)	=1-(1-\$C13)/\$N12+((1-(1-\$C13)/\$N12)/\$N12/100)
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Filenames / initial locations of key documents

Denomination background art templates:

- Coins
 - Generic only
- Bills
 - Generic
 - Special Edition

All available at: gc-coin-family.zip

<https://gateway.pinata.cloud/ipfs/bafybeic3pqm3rxuvdnnwzsm3u6sjkfxgc7lckxdxy7t3wllqtl5mif4>

<https://ipfs.io/ipfs/QmWZx9it5TXkqbNexVmxhXYNZvgeM4P1TMK3qrEBi3Anzu>

<https://tinyurl.com/coinfamily>



Template

Copy this to sheets/Excel, or use this (should be essentially identical) template

Ipfs identifier [add to end of ipfs gateway url]:

[QmPq3bjSaNGtJf3BmLfdPoaPczBD1THLXbCsVM4pvSNQ8Z](https://gateway.pinata.cloud/ipfs/QmPq3bjSaNGtJf3BmLfdPoaPczBD1THLXbCsVM4pvSNQ8Z)

<https://gateway.pinata.cloud/ipfs/>

ipfs.io/ipfs/

Instructions to artists/creators

This template can be used either for Special Edition art, or for Generics Lottery art, depending on the Memo you send to the nonprofit wallet address

Make a copy of this template, e.g. download as Excel (xlsx)

Open it in Excel, Google Sheets, or similar

Fill out each empty yellow field below

Save the file, with whatever file name you like, in Excel (.xlsx) format

Upload it to any cloud storage you choose (IPFS, arweave, dropbox - up to you)

Use a URL shortener (preferred) OR follow the "long URL" instructions in the whitepaper

Confirm all relevant files are viewable publicly using the URLs you provide, including the URL for people to see this template and URLs you list within the template

Make sure you have a Stellar Lumens wallet (XLM)

Send the # Strop and memo to intended nonprofit's Stells Lumens wallet address, as described in the Whitepaper

Field	Notes	Insert yours here	Example
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Created by	Your name or ID as "creator" of artwork; for Special Edition, to be displayed on the bill itself. Better to keep to under 32 characters. If you are uploading someone else's art, make sure you are permitted to do so, and consider including their name to give them credit		Robin Artista
Resales address	10% of secondary sales should go to the artist's account; or the nonprofit's account?	"My account" - the account that first sends the URL pointing to this template to a nonprofit	"My account" - the account that first sends the URL pointing to this template to a nonprofit
Art title	Title of art; for Special Edition, to be displayed on the bill itself. Better to keep to under 32 characters.		Seal Life
Link to Art	If no usable image is provided here, a "..." or "?" placeholder may be displayed on the bill and the owner can follow the link to the art's completed template (this page) to find additional resources If an ipfs gateway does not load, try a different gateway (take the last part of the URL)		https://ibb.co/3h88D1z
Thumbnail (optional)	For Special Edition art: If art does not lend itself to simple presentation as a layer on a bill - maybe it is very large, details, a movie; audio; etc. - consider including a thumbnail specifically intended for placement on the bill. .gif preferred, up to 600X400		(not needed)
Additional resource	This can point to a higher res or larger image, other data, instructions, content, etc.		http://gifgifs.com/animals/seals-and-walruses/2964-seal.html

Additional notes	Notes can say anything you like		I'm linking to the art I modified to make this perfect seal gif - see the link above! BTW, thanks to the Marine Megafauna Foundation for all the good work they do!
Etc.	Whatever else might be useful or helpful		I love seals! Check out this article! https://www.chimuadventures.com/blog/2017/01/international-seal-day-fun-facts/

9. Revision history

Here are the additional post-primary-Whitepaper proposals I am aware of in the system and the rules of which which have been incorporated into this Active Whitepaper (unless I missed something in the editing):

[Primary Whitepaper](#) - [version referenced](#)

on the Stellar Lumens blockchain starting at transaction

9b46d4b11edd146e7aacdad1d8bfd32cb5d2da48acdd4052bda724695d0dab62

[Proposal 1 - voting for Tier 3](#)

[Proposal 2 - no mean forks](#)

[Proposal 3 - clarify counting art](#)

[Proposal 4 - Sending not just to self](#)²¹

Additional edits incorporated:

- blank spaces before and after memos should be ignored when making an available art list
- Otherwise-valid art uploads with nothing but space or spaces in the memo (blank memo field) should be excluded from the available art list
- Formatting

Following this:

ed8b30c3bfd3da9278633083053bce012cdea6611a16621565d6722bc9d005c9

New edits including introduction; and clarifying here that

²¹ 3dbcfcc24296c12633f4cf15eacd4c77ad3239dfdae78c7183c72f3590bd4065

- Ore ownership can be sent by sending its transaction hash to a new account.
- Clarifying what is apparent anyway, that merging account A into account B in Stellar Lumens results in account B owning all the GC assets from account A - including bills/coins, ore, etc. one account into another in Stellar Lumens results in the account B owning the assets.

12/20/22: after QmRTVCwiQ1ZyaBM3sup1TFgUXGeN3FNr2ZZ1yjx8kA5njf

Clarified printing, added tags for Ghost Riders, expanded the Introduction

12/30: current version. Formatting changes, clarifications, added Social tags, updated/fixed lottery and selling parameters. .