

BlockMark Gems Ruby Paper

**Collectible Gemstones & Jewels on the Blockchain
in a variety of cuts, colors, and carats**

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1. Why Gems?

1.1 Ledgers: past, present & future

We were motivated to develop BlockMark Gems to learn from both the distant and recent past (Ethereum; Genesis, 2015) and explore the future of physical and digital ownership through blockchain based marketplaces.

Assets have long been used as stores of value and for exchange of value. A traditional oral ledger, as used by the Yapese to track Rai stone ownership, would not cope with the complexity of an early Athenian or later city state ecosystem.

Asset ownership in larger groups has long been logged in ledgers from Sumerian Cuneiform writing to Medici's Double-entry Bookkeeping (1494) through to Visicalc and computer spreadsheets in the 1970's. It is self evident that accurate ledgers are a key part of digital marketplaces - coordinating and confirming asset ownership and transfer of asset ownership or licences between sellers and buyers.

At BlockMark we believe that the best form of digital ledger is the new blockchain (Satoshi Nakamoto, 2009). In ledger terms, it's a perfect storm; cryptographic fingerprints, private key signatures and distributed copies on multiple computers. Cryptographic tools such as the SHA256 hash have existed since the 70's and have been well-tested and proven resistant to hacking or reverse engineering.

This backdrop creates a robust network built on consensus and with less opportunity for tampering - a key feature of any trustworthy ledger.

1.2 Pudding Proof

Software may well be eating the world but the proof of the blockchain pudding is in the eating or adoption. With over 20 million wallets on the Coinbase exchange, 35 million Ethereum Wallets, 1 million MetaMask accounts and 1.3 Million Crypto Kitties there is a demonstrable and clear interest in Crypto Assets and Crypto Goods.

These new assets and goods are all distributed via trustless blockchain ledgers. The challenge is currently in developing good blockchain user interfaces - blockchain accessibility at present is akin to eating soup with a knife.

1.2 Fungible vs Unique

Currencies, by their very nature, need to be fungible tokens (serial number notwithstanding); one dollar is interchangeable with another dollar, one bitcoin is interchangeable with another bitcoin. Fungibility is a key function of a currency which acts as a third party exchange mechanism for barter.

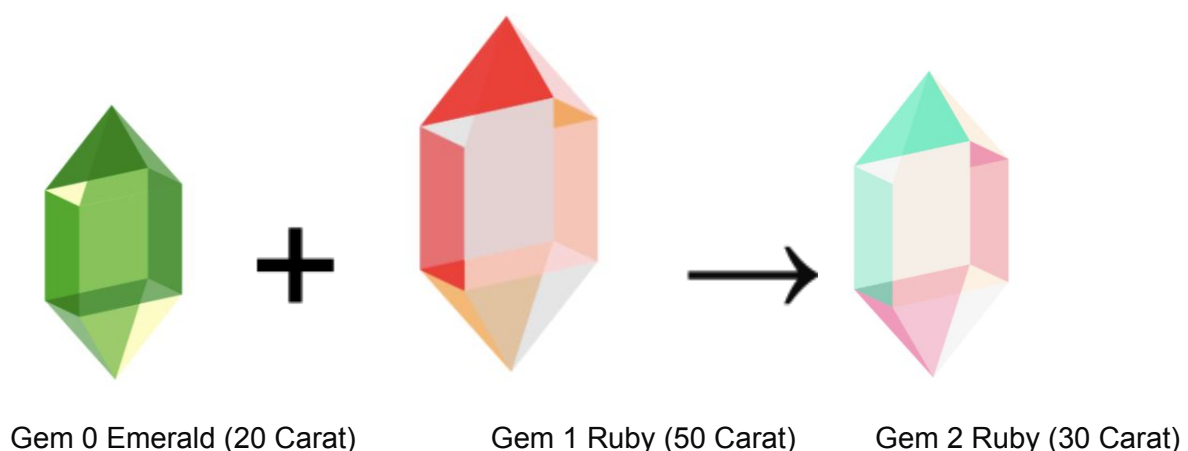
Non-fungible Tokens (NFTs) however are *unique* assets that are *not* interchangeable; My Mona Lisa painting cannot be interchanged with a Warhol or a Napkin Sketch. The Napkin Sketch, Warhol and Da Vinci are each unique assets.

New community standards have emerged on the Ethereum Protocol (ERC-721) which make ownership of NFTs possible, for example by linking a unique token ID (e.g Token ID 3 -MonaLisaByDavinci) to a blockchain wallet address (Token ID 3- MonaLisaByDavinci + 0x12345ABCDE789). NFT's can change ownership by changing the wallet address linked to the unique token. In short, NFTs are a blockchain innovation that enables the sale and transfer of digital assets to new owners.

1.4 Growing up

Blockchain is growing up fast. Crypto Kitties, BlockMark Gems and other NFT projects have paved the way for new forms of Digital Asset, Intellectual Property (IP) and Rights Management. NFTs are set to disrupt art markets, corporate branding, IP licencing, insurance, loans (negative assets), ticketing and more.

To better understand this brave new world of NFTs we encourage you to play with BlockMark Gems, own Gems, transfer Gems, trade Gems, auction Gems, remix (below) and create new Gems. For example:



BlockMark Gems are a digital asset class in their own right - but also serve as placeholders to be replaced by any ownable and transferable asset limited only by your imagination.

2. Gemology

2.1 How to Play

To get going with BlockMark Gems you will need some basic tools outlined in the **Get Started** section. You will need an Ethereum node interface to talk to the blockchain (e.g. MetaMask) and some Ether cryptocurrency to buy Gems and pay for transaction fees using Gas.

2.2 Gemology

BlockMark Gems are mined at variable intervals according to supply and demand and are then added to the Marketplace. Only 100,000 “Generation (sic) Zero” Gems will ever be mined.

Prices of newly mined Gems are automatically set using auction market dynamics according to rarity, size and beauty. There are 10 types of gem to collect as shown in the table below (4 precious gems and 6 semi-precious gems).

Digit	Name	Rarity from algorithm
0	Diamond (precious gem)	1 in 100
1	Ruby (precious gem)	3 in 100
2	Sapphire (precious gem)	3 in 100
3	Emerald (precious gem)	3 in 100
4	Lapis Lazuli (semi-precious gem)	10 in 100
5	Amethyst (semi-precious gem)	10 in 100
6	Aquamarine (Beryl) (semi-precious gem)	10 in 100
7	Garnet (semi-precious gem)	20 in 100
8	Opal (semi-precious gem)	20 in 100
9	Topaz (semi-precious gem)	20 in 100

Gems also come in 8 cuts, as shown below.



Cubic	Extended Octa	Octahedral	Cylindrical	Dodeca	Broad	Triclinic	Lozenge
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Gems are also found in 10 different sizes (1, 2.5, 5, 7.5, 10, 25, 30, 50, 75 and 100 carat).

Generation Zero Gems are mined using a random number generator to determine; Type, Cut, Carat, Colour, Clarity, Inclusions (faults) and Origin.

Each Gem, therefore, has a code that defines its characteristics (think of a Darwinian ‘Gemmule’) that in turn maps on to derivatives of original artwork created by BlockMark’s Artist-in-Residence Mr Paul Farrell.

2.3 Mana-gem-ent

Mined BlockMark Gems are linked to unique NFT identification numbers which are assigned to an Ethereum wallet by the ERC-721 Gems NFT smart contract.

Once a BlockMark Gem has been discovered from deep within in one of our mines, it is named according to Gem convention; with an animal name and a location, for example: The Pink Panther of Chelsea or the Snow Leopard of St Tropez. Gem origination history is also displayed for the curious.

All BlockMark Gems are displayed in our Gallery, a display cabinet that includes rare, beautiful and valuable Gems. Those that are for sale are displayed in the Marketplace.

MarketPlace

For all your Gem needs

The screenshot shows the MarketPlace interface. A red 'Filters' button is at the top left. A dropdown menu is open, showing filter options for 'Type', 'Cut', and 'Carat'. The 'Cut' dropdown is currently selected, showing options: 'No Filter', 'Diamond', 'Ruby', 'Sapphire', 'Emerald', and 'Garnet'. Below the dropdown, two gem listings are visible. The first listing is 'Waxbill of Gelang - #11' with a 'Light or Dark' theme toggle, 'Generation: 0', and tags for 'High Atlas, Morocco', 'Extended Octa', and 'Opal'. It has a 'Buy for 0.062 eth (\$6.65)' button and a 'View >' button. The second listing is 'The Carpet python of Cahors - #10' with a 'Light or Dark' theme toggle, 'Generation: 0', and tags for '30 Carat', 'High Atlas, Morocco', 'Extended Octa', and 'Sapphire'. It has a 'Buy for 0.0716 eth (\$7.68)' button and a 'View >' button. Both listings have an 'Owner: Gemma-Auctioneer' label.

2.4 Remixing Gems

When you have two or more Gems, you can *Play God* and intermingle the Gemotypes of both Gems by using the Remix function to create the next Generation of Gems.

Creation of new BlockMark Gems are only dependent on the speed of the Ethereum Virtual Machine (EVM).

The Remix Function calls the Gems NFT Smart Contract to retrieve the characteristics of each Gem. These 16-digit Gemmules are *intermingled* using a mixer algorithm to produce a new Gem based on the characteristics of the two originals.

Two Gem Zero's create a new Gem 1 which can in turn be remixed with other Gems to create a Gem 2 and so on until the end of time or the end of computing time, whichever comes first. The resulting generation is determined by adding one to the primary gem added to the remixer.

Each time a Gem is remixed it's carat is reduced by one level, for example 100 to 50, or 50 to 25.

Occasionally (10% of the time) the Remixer Function accesses a recessive Gemmule Gemotype, creating a seemingly unique Gem facet independent of the remixed gems.

2.5 Crown Jewels

When a user is registered and logged in to BlockMark Gems and MetaMask you can see your wallet, your collection of Gems and **Crowns**.

You can select and display any of the Gems you own as your own Crown Jewels. Gems can only be displayed in one crown at a time. Multiple crowns are available for those with extensive collections. A fine example of a Coronation Crown is shown below. The gemmiest of Crowns would have large carat precious stones with great clarity in Lozenge, Triclinic or Tetrahedral form.



Beautiful as they are, it is important to note that the Gemmiest of Crowns will not always win the Keys to the Kingdom in the Game of Crowns.

2.6 Game of Crowns

Once you have a complete crown with 5 gems you can, as a Subject, compete against other Crown owners (Princes, Princesses, Knights, Barons, etc) for the Keys to the Kingdom in the Game of Crowns.

A player challenges another by Throwing Down a Gauntlet. If a player receiving a Gauntlet picks it up, then a Battle has begun.

Full engagement occurs when each player selects their favourite Crown to enter a Battle. When two players have selected their Battle Crowns, a “provably fair” hash is created and logged on the blockchain to ensure no funny business. The selected Crowns and Players are appended to the Game Seed with a hash created at the start of the battle. At the end of

each Crown Battle the hash can be checked as a guarantee of an immutably logged fair game.

The Game of Crowns is a game of 5 independent simultaneously revealed rounds.

There are 3 waves of battle. Rounds 1 & 2, Rounds 3 & 4 and Round 5. Each winning round gains a player one point. Round 5 counts for 3 points. If Gem scores for a given round are equal to each other, a draw with null points is declared before moving on to the next round.

Each round involves strategically selecting a Gem from your Crown (Gem position 1, 2, 3, 4 or the main gem 5) to challenge your opponent's selected Gem. The Gem score (best or worst) and the challenging trait are selected by the random generated Game Seed.

For example John Doe's Imperial Crown may look like this;

Trait/Position	1	2	3	4	5
1.Type	8 Opal	2 Sapphire	7 Garnet	5 Amethyst	4 Lapis Lazuli
2. Size	20 Carat	15 Carat	50 Carat	75 Carat	10 Carat
3. Shape	4 Dodeca	0 Lozenge	7 Extended tetra	7 Extended tetra	6 Dodeca
4. Mine	7 Mererani, Tanzania	4. Hiddenite, US	3 Ilakaka, Madagascar	5 Badakhshan, Afghanistan	5 Badakhshan, Afghanistan
5. Clarity	1	1	5	2	5

The Game Seed Challenge for Round 3 is for your Best score on Trait 2 (Size)

Game 1	Best/Worst	Trait
Round 1	Best	3
Round 2	Worst	4
Round 3	Best	2
Round 4	Best	5
Round 5	Worst	1

For Round 3 John may select his best Gem 4 with 75 Carats (or he may chose to sacrifice his lowly 10 Carat Gem 5).

Each Gem can only be played once per Crown Battle. Because Round 5 counts for triple points many strategies and tactics can be deployed to win the Battle.

Once a battle has been won a Gem Swap occurs whereby the Winners Worst Gem is swapped with the Vanquished player's Best Gem.

At any one time, there are many Subjects but only one King (or Queen). A Kingdom Leaderboard shows which Subject is in position to win the Keys to the Kingdom.

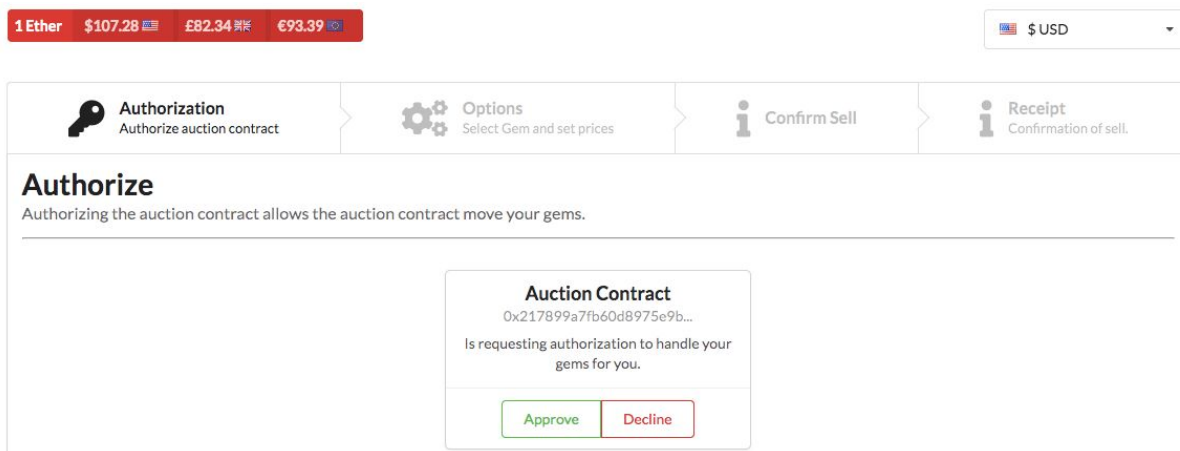
Coronation Day is declared Monthly on the first Monday of the Month at Midday according to the time on the Tower of London.

2.7 Selling Gems

Gems are known by geologists as 'The Flowers of the Kingdom'. Some Gems are more beautiful to the beholder than others. Large Diamonds with clarity will almost certainly be worth much more than small common Topaz gemstones with inclusions. Generally the gemmiest gems are the best but with Best / Worst options in Crown Battles a small Topaz can occasionally beat a large Ruby or Diamond.

Gems can be traded and sold using the *Auction Function*. An English Auction (based on a reserve price followed by bid 1, then bid 2, then bid 3, etc before the hammer falls) would require calling the BlockMark Gems NFT contract for every bid, which in turn would require gas (payable in Ether). These fees would be non-refundable for unsuccessful bids and so to avoid unnecessary charges at BlockMark Gems, we have adopted the Reverse Time Lock Auction.





The first step involves *Authorising BlockMark Gems* to run an auction on your behalf, and then on completion to move your Gems from you the seller to the new buyer. The second step involves you setting the maximum price you wish to sell your Gem for and the lowest price you are willing to sell your Gem. The Gem then gets transferred to the Gems Marketplace for sale.

A buyer who wishes to own a particular Gem can bid at the current price (Buy Now function) or wait over the seller's allocated period of time to see if the price goes lower.

Using the Reverse Time Lock Auction means that Gems are sold at prices determined by the whole market, and not by BlockMark Gems or Ethereum.

Calling an auction contract incurs a small transaction fee payable in Gas to Ethereum and a 3.75% fee for BlockMark Gems to enable us to fund the creation of more Gem 0's.

2.8 Winning Stratagems

BlockMark Gems help you to win at life. Like real baubles and bling, by owning and displaying BlockMark Gems, your status amongst peers, as with all Veblen goods, will rise in accordance with the scarcity, price, number and size of the Gems and Crown Jewels you own.

Gems can be displayed as Crown Jewels, played in Crown Battles, kept in wallets, put up for sale in the Gem Marketplace or displayed in a Gems Display Cabinet.



There are many many facets, some crystallographic, to BlockMark Gems. Through buying, selling and remixing BlockMark Gems it is our hope that you will become familiar with blockchain-based NFTs and the transfer and ownership of digital assets using a blockchain.

All transactions are transparent, viewable, auditable and trackable on www.etherscan.io

At BlockMark Gems we believe NFT's transferred on blockchains are the future of digital ledgers and represent a step change in ledger security and technology.

3. Future Applications

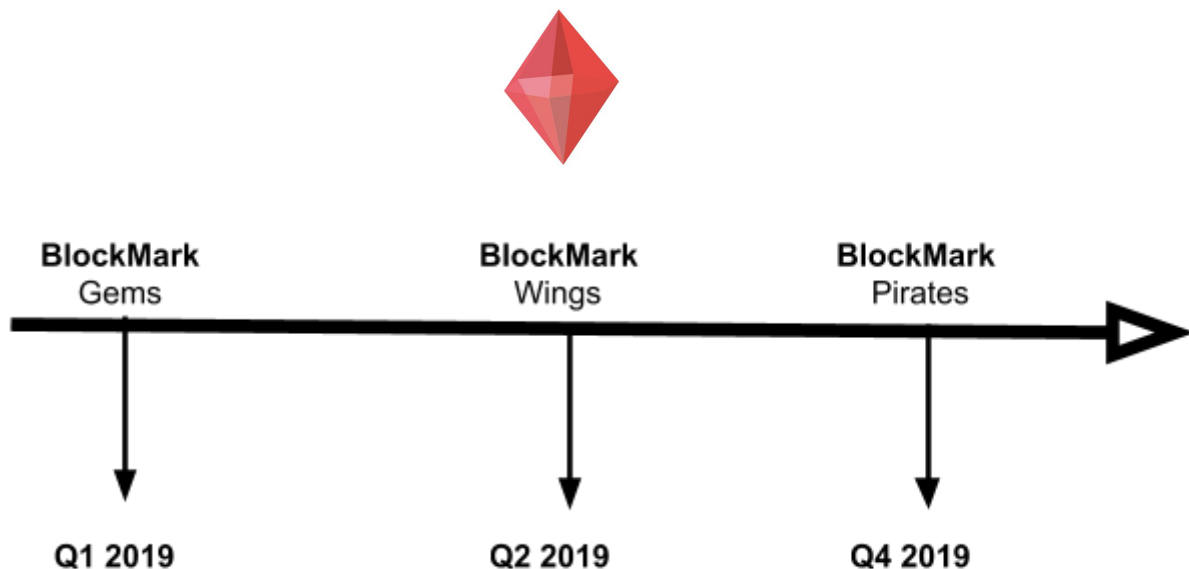
3.1 Treasure Islands

BlockMark Gems are the first collectible in the Treasure Islands Collectible Series. In future all BlockMark collectibles will interact with each other via the ERC721 protocol. A BlockMark Pirate, with a BlockMark Parrot on his shoulder, can discover buried treasure in the form of a BlockMark Gem Crown and sell it on a fair marketplace.

The BlockMark current road map involves 3 NFT ecosystem milestones;

1. Gems: collectible gemstones & jewels, remixing, crowns & kingdom battles
2. Wings: collectible butterflies & birds, breeding, aviaries & aerobatic battles
3. Pirates: collectible pirates & privateers, press-ganging & sea battles.

BlockMark Collectibles Treasure Island Map



3.2 Blockchain Marketplaces

Musicians, artists and creatives over time have become increasingly small cogs in the creative production and consumption machine. Marketplace dynamics have evolved over time to favour not the creators or users but the information power brokers, intermediaries and impresarios.

It is our belief at BlockMark Technologies that control over IP created by artists and owned by gallerists, collectors and archivists can be reset and be made both easier to control and fairer by using NFTs and autonomous smart contracts on a blockchain platform like Ethereum.

In future, artists will be able to directly control their intellectual assets and assert their rights and secondary rights over prior art. BlockMark Gems represents a revolutionary step in unique asset ownership and management.



The rights of ownership and transfer of ownership of BlockMark Gems are detailed in the terms and conditions section of our website. We have adopted the industry standard NIFTY™ licence as the baseline, with additional new commercial and non-commercial rights displayed on the 'My Merch' section of our website as we roll-out new services.

In future BlockMark Technologies will demonstrate quick and efficient blockchain-enabled trustless management of IP associated with digital assets, extending to the licensed production, manufacturing and retailing activities across a range of different industries.

Warning

Remember to keep your private keys and blockchain wallets secure. BlockMark Technologies Ltd and the BlockMark Gems platform cannot help you to recover Gems lost through independent wallets and personal computers. BlockMark Technologies Ltd and the BlockMark Gems platform is not a financial advisor and this document is not investment advice. Do not spend more than you are prepared to lose completely on BlockMark Gems. The value of Gems may go up or down according to independent market forces not determined or in the control of BlockMark Technologies Ltd and the BlockMark Gems platform.