Render Token (RNDR) Whitepaper

August 28th, 2017

Abstract

We are on the cusp of a technological transformation of our very view of reality, affecting everything from computation to physics. Everything is becoming more virtual, from people on the street glued to their smartphones to engineers producing new realities, augmented and virtual, that allow us to immerse ourselves in new computer-generated worlds. As entertainment companies adopt these new ways of producing new visual effects, content creators and editors find themselves facing new dimensions of complexity. However, larger and more complex jobs spanning thousands of frames across time (for animations) and space (for VR walkthroughs) require external servers and additional resources. No system has existed that scales rendering speed across many dimensions of work in order to allow content creators to tap into the vast pool of graphics cards from an online network. Imagine the possibilities in a world where physically correct rendering tasks are completed quickly and efficiently in a blockchain based peer-to-peer network with no error or delay and with securely protected property rights. We have already innovated the process of rendering reality to new, unprecedented levels. Now we innovate the rendering ecosystem. Welcome to the future - the age of the Render Token (RNDR).

Problem:

We are on the cusp of a technological transformation of our very view of reality, affecting everything from computation to physics. Everything is becoming more virtual, from people on the street glued to their smartphones to engineers producing new realities, augmented and virtual, that allow us to immerse ourselves in new computer-generated worlds. As entertainment companies adopt these new ways of producing new visual effects, content creators and editors find themselves facing new dimensions of complexity. OTOY already provides tools to meet these challenges, such as OctaneRender, the world's first and fastest GPU-accelerated, unbiased, and physically correct renderer. The world's first commercial renderer that exploits graphics cards rather than the CPU, Octane renders photo-realistic images orders of magnitude faster than previous renderers. Tracing how light and energy bounce around a scene, Octane necessarily anchors its algorithms in the laws of physics, accounting for everything from the velocity of light in exotic substances to interference patterns in sub-surface scattering in human skin. Octane uniquely combines its blazing speed with supreme accuracy. Its accuracy, for example, enables architecture firms to model elusive light-leak emissions in buildings. Its speed recently empowered artists confined to their offices to craft a [dazzling opening](#) for HBO's *Westworld* on just a few off-the-shelf GPUs. By using Octane in conjunction with the open source ORBX media and streaming framework, developers and content creators everywhere can readily lend their projects both impact and authenticity. This process works well for rendering HD images in a few minutes per frame on a PC using one or more off-the-shelf graphics cards. However, larger and more complex jobs spanning thousands of frames across time (for animations) and space (for VR walkthroughs) require external servers and additional resources. Complexity of rendering may exponentially increase due to higher frame resolution and frame rate (e.g. UHD 8K@240 fps is 256 x the work of HD 720p30). Further raising complexity are increases in views per frame (e.g stereo rendering doubles workload to support left and right viewpoints). However, until now, no system has existed that scales rendering speed across many dimensions of work in order to allow content creators to tap into the vast pool of graphics cards from an online network.

Solution:

Blockchain technology has evolved now to store, validate and time-stamp complex mixes of technical specifications, schedules, accounts, regulations, protocols, standards, and property rights. This technology can also handle digital rights management, needed for complex digital assets that can be routinely copied and for which time-stamped proof of authorship is crucial. Recently, the Ethereum blockchain has enabled *tokens*, which allow for immediate and more complex transactions to be executed using smart contracts.Imagine the possibilities in a world where physically correct rendering tasks are completed quickly and efficiently in a blockchain based peer-to-peer network with no error or delay and with securely protected property rights. We have already innovated the process of rendering reality to new, unprecedented levels. Now we innovate the rendering ecosystem. Welcome to the future - the age of the Render Token (RNDR).

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Value Proposition

Render Token (RNDR) will make the process of rendering and streaming intricate virtual works easier for all users. It will allow complex GPU-based render jobs to be distributed and processed on a peer-to-peer network, making the transactional process of rendering and streaming 3D environments, models, and objects much simpler for end users. Furthermore, the Render Network will eventually evolve to include crowd sourced 3D projects to digital rights management, creating a vibrant new marketplace to fund digital ideas, assets and applications that anyone can access and leverage.

Rendering 101

What is rendering? What is it used for?

Rendering (also called *image synthesis*) transforms a 2D or 3D computer model into a photorealistic image or scene. Occurring in the background of many processes in our tech-involved lives, rendering is how our smartphones and computers constantly present the images, videos, and games that make our lives easier or more enjoyable. A rendering can be as simple as a scene in a 2D Batman cartoon or as complex as an action-packed scene in a Transformers movie. Advances are accelerating, from the era of *Ratatouille* just a decade ago when every animated frame took 6.5 hours to render to the instant real-time OTOY rendering of photorealistic scenes on tens of thousands of parallel GPUs in the cloud today.

Far transcending entertainment and news, rendering also plays a crucial role in the tasks and workflows of our business and professional lives. Architects rely on accurate renderings in their 3D modeling software to create builds of their projects that display textures, lighting, and minute details. Surgeons rely on high-quality renders of organ scans to accurately diagnose and treat their patients. As virtual reality becomes more widely-used, program developers and computer engineers can leverage the power of real-time rendering to create dynamic environments for their users. Examples abound, from virtual blueprints for a new apartment complex to interactive virtual office meetings, to watching sporting events from the sidelines while sitting comfortably in your own home.

The bottom line is that there are many use-cases for rendering, and the selection and variety of these offerings are constantly increasing. As our world becomes more and more dependent on virtual and visual technology, enhancing the quality, speed, and cost-efficiency of rendering services becomes a vital and inviting challenge.

OTOY - rendering pioneers with a proven track record

OTOY was founded in 2009 with the vision to provide GPU-based software solutions that aid in the creation and delivery of cutting-edge digital content such as video games and movies. When founder and CEO Jules Urbach started OTOY eight years ago, the only way to perform a complex render job for massive projects such as Avatar or Transformers was at an expensive visual effects studio. Rendering took massive amounts of time, money, and storage space, none of which the average game developer, student, or designer could have access to. Urbach envisioned a future where anyone could have an easy pathway to cloud-based, real time,

photorealistic, and physically correct rendering software for just a few hundred dollars. In 2009, Urbach patented his idea for a "token-based billing model for server-side rendering", years before tokens and blockchain technology were in use. He wanted to provide the world's highest quality rendering software to everyone with a creative vision.

Today, OTOY's OctaneRender is the world's first and fastest GPU-accelerated, physically correct renderer. OctaneRender is revolutionary in that it uses the graphics card on your computer to render photorealistic images extremely quickly--images that previously took hours and sometimes days to render. With Octane's parallel compute capabilities, you can create stunning works in a fraction of the time.

OTOY has partnered with leading companies in the space and leveraged existing partnerships to provide their solutions to millions of users.

Cloud-based rendering and solving the inefficient rendering problem

Currently, OTOY hosts a website at http://orc.otoy.com which centrally manages the results of render jobs along with their costs. OTOY's vision is to distribute the framework of this existing rendering service through a token-based system built on the Ethereum blockchain. In the long term, rather than charging customers to render through OTOY's cloud or process the jobs in OTOY data centers or external data centers, OTOY aims to provide a peer-to-peer ecosystem for rendering. We will build on top of a current blockchain model to connect users looking to perform render jobs with people who have idle GPUs to process the renders. Users would send Render Tokens to the individual performing the render work and OTOY would receive a small percentage of Render Tokens for facilitating the transaction and running the render network. This Render token system creates a much more efficient, powerful, and widely-scalable rendering network.

The distributed rendering model is compelling because millions of developers who have OTOY's OctaneRender available to them render scenes regularly on their GPUs. However, the current system harbors many inefficiencies. Most developers' GPUs remain idle when they are not rendering their own work. By utilizing the Render Token network ecosystem, developers could choose to monetize their idle GPUs by performing renders in exchange for Render Tokens, which could then be converted into crypto or fiat currency.

In addition, graphics chip giants such as AMD and Nvidia have already started creating GPUs solely for mining on blockchains such as Ethereum. OTOY's Render Token can tap the potential of the ecosystem already existing among developers and OctaneRender customers and move it onto the immutable and distributed database of the blockchain. Such a blockchain based rendering network can facilitate efficient, reliable, and remunerative rendering of time-stamped tasks on a peer-to-peer basis.

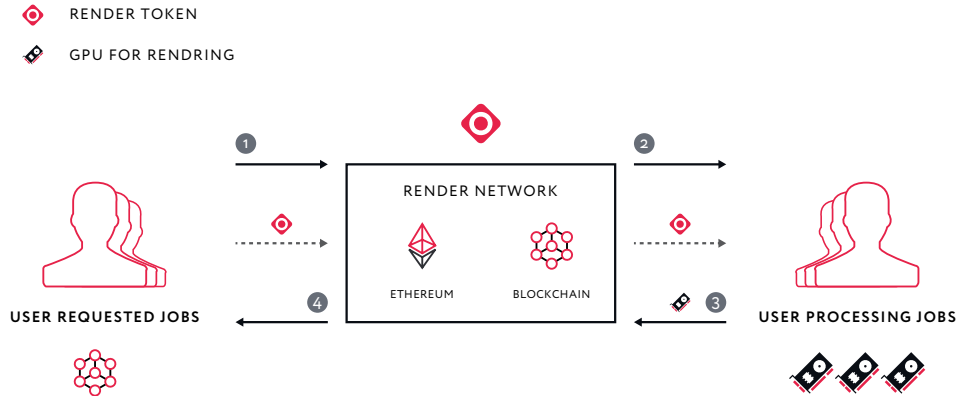### Dive into Render Token - the solution for widely accessible, P2P, cloud-based, blockchain rendering

As described earlier, Render Token will be the primary unit utilized to exchange rendering and streaming services and proof-of-render work on the OctaneRender Cloud (ORC) network, OTOY's cloud rendering marketplace. In its final form, the token will allow users to utilize the wide array of available GPUs in the peer-to-peer network, allowing for quick and reliable rendering facilitated and kept track of by the blockchain.

On the ORC Network, users will create accounts that will be linked to the Ethereum blockchain through smart contracts and unique wallets. By purchasing and storing Render tokens in their accounts, users will be able to exchange these tokens on the network for various rendering and streaming services. During this exchange, the network will send a request for a Render token smart contract in order to enter a transaction with both parties - the person or server processing the render/streaming and the person who requests the rendering services. The cost of the job will be calculated and determined in Render tokens. The smart contract will then transfer funds across accounts once the allotted render job has been completed.

Once the process is completed, users will then be able to withdraw their Render Tokens into Ethereum and convert to fiat currency if they wish.

Basic Transaction Flows diagram through the ORC Network

RENDER SYSTEM FLOW

1. The user needs a render job, they go to the ORC portal on the web or in one of 30 supported toolchains and submit a render task. ORC renders will be one click away from any Octane plug-in, allowing for easy access at any time.
2. The render task is calculated and they get quoted a price for the task in Render tokens - they "pay" and the tokens and the render details get attached to the smart contract. The task is sent across the Render Network and facilitated by a user that will match the task and process the render job.
3. The user processing the job then utilizes their GPU to perform the task requested from them and once complete, sends the completed task back through the Render Network.
4. Once completed and reconciled, the tokens are transferred from the user who requested the task to the user or server that completed the task via the smart contract.

Mapping the value of a Render token

One Render Token will be initially mapped to 256 seconds of work at 256 OctaneBench, a benchmarking unit created by OTOY to reflect the processing power of various GPUs in a rig.

Users will be able readily to modify the speed and time of their render job. For example, a job consuming one Render token could be modified to equal 128 seconds of work at 512 OctaneBench, or 32 seconds of work at 2048 OctaneBench. The user interface within the network will allow users to perform jobs and will give them a quote in Render tokens for the job that they are trying to process. The job would then be passed through the network with the pertinent render parameters (i.e. "process the job for 64 seconds at 1024 OctaneBench") attached to the smart contract.

The price of a render and/or streaming job will be based off-chain by analyzing supply of GPUs available and the demand of rendering work. The algorithm will analyze the amount of available GPUs vs. the scale, concurrency (e.g. OctaneBench/s^2) and complexity of the work that the user requires. This will allow us to link the unit of work linked to the value of the token to the specific parameters of the job. This process will also allow us to always allocate a render job in the most efficient way possible, ensuring that the network is working at peak capacity and that there is no wasted GPU power.

Ranking Render token users - creating incentives to benefit the network

As the use and demand of the Render token scales, it is critical to determine a way to evaluate the capability and reliability of users that process the render jobs, as well as give a separate ranking to the users requesting the jobs. The rankings will serve to incentivize the needs of all stakeholders in the network, allowing it to run smoothly and efficiently.

For users processing render jobs:

All users processing rendering jobs will be assigned a numerical ranking that will range from 0-100. Initially, users will start with a value of 60 - if a job is completed correctly, the user's score will rise according to a combination of the complexity and duration of the work. Likewise, if the job is not completed, the user's score will drop by a number relative to a 30-day rolling average of the percentage of completed jobs vs. total jobs taken. Here are both examples below:

USER POINT TABLES

COMPLEXITY	REWARD
1-5 RENDER TOKENS	+1 POINT
5-10 RENDER TOKENS	+2 POINTS
11+ RENDER TOKENS	+3 POINTS

30-DAY SUCCESS PERCENTAGE (Must have over 5 jobs completed)	PENALTY
80% OR LESS	-3 POINTS
80% - 90%	-2 POINTS
90% - 100%	-1 POINT

For example, User A has a ranking of 60 and a 30-day success percentage of 87% - they decide to take on a render job that will reward them one render token. There are two outcomes:
1. Success! The user gains 1 point and now has a ranking of 61.
2. Fail. The user loses two points and now has a ranking of 58.

If Randy is assigned a render job, he will utilize his GPUs in order to generate a quick preview of how the render job will look once it is completed. Marsha, the user requesting the job, has the option of accepting the quality of the render job. If she decides to move forward with the job, then it will be the Randy's responsibility to ensure that the job gets completed. The smart contract will remain open until the job is completed. If for some reason Randy's GPUs turn off and the job is not completed as relayed in the smart contract, then Marsha will have her tokens reimbursed and the Randy's ranking will decrease.

For users requesting jobs

A user's rank will be a key factor in determining their priority in line if there is a render queue. The user's rank will be dynamically calculated by a weighted average as follows:
- 75% total 60-day volume of Render token usage
- 25% amount of Render tokens in your wallet on the platform

Although the possibility of a backup on the render queue is low, the user ranking system will serve as a needed tie-breaker in specific situations. Here is an example:

There are 20 GPU's currently available, and two users have a render job that needs to be completed that will require 20 GPU's. User A is a new user who just joined the network and does not have any history of requesting rendering work; User B is an established user that requests render jobs on the ORC Network every day. All other things equal in this case, User B would take priority for the render job because they have rank over User A.

Preventing fraud on the network

There are several systems in place to prevent fraud that include both on-chain and off-chain processes. For example, let's say that Jason submits a job to be rendered on the network. Katie decides to take on his job, but she unwisely plans to render Jason's work at a lower quality than Jason paid for. The system has the ability to send thumbnails of the renders as they progressively get done, so that Jason can see his work as it is being processed. Combine this with the information already stored in the smart contract (in plain English, "process Jason's basketball court render at 256 OctaneBench for 256 seconds"), and it becomes near impossible to spoof the render or not deliver what is promised in the render job "agreement". Katie would have to process the job as stated or risk her reputation. These combinations of fraud prevention make up something that we refer to as "proof-of-render". The system will process the transaction only when the job is completed as outlined in the initial transaction, via smart contracts. Additionally, other features are built into the network to verify render jobs - these features will not be made public in order to not divulge information to those looking to take advantage of it.

Render Token Roadmap

Render Phase I: Post Token Sale (Q1 2018)

Begin to enable cloud rendering services on the orc.otoy.com website with the ability to exchange tokens for rendering services that will be kept track of and facilitated by the blockchain. These services would be initially handled by OTOY or third party servers and would set the framework for a reliable transition into the peer-to-peer framework of rendering.

Render Phase II: Development Process & Preparation for Peer-to-Peer Transition (Q2 2018)

Leverage our ecosystem to bring ~7 million users on-board with the Render token platform on the ORC Network and create a simple user interface so that users and developers can easily utilize their GPU power for rendering and streaming jobs in exchange for Render tokens. We will also create and expand the structure for the back-end OTOY network that will handle the efficient processing of the rendering and streaming transactions via the Ethereum blockchain. Beta launch of the network and testing will take place in this phase.

Render Phase III: Launch Peer-to-Peer Network (Q3/Q4 2018)

Launch the peer-to-peer exchange and unlock full capability of the Render token network to enable users to use the untapped GPU power from the available resource pool. Make back-end processes streamlined and make the facilitation of the rendering/streaming job to the recipient completely automated through smart contracts and blockchain development.

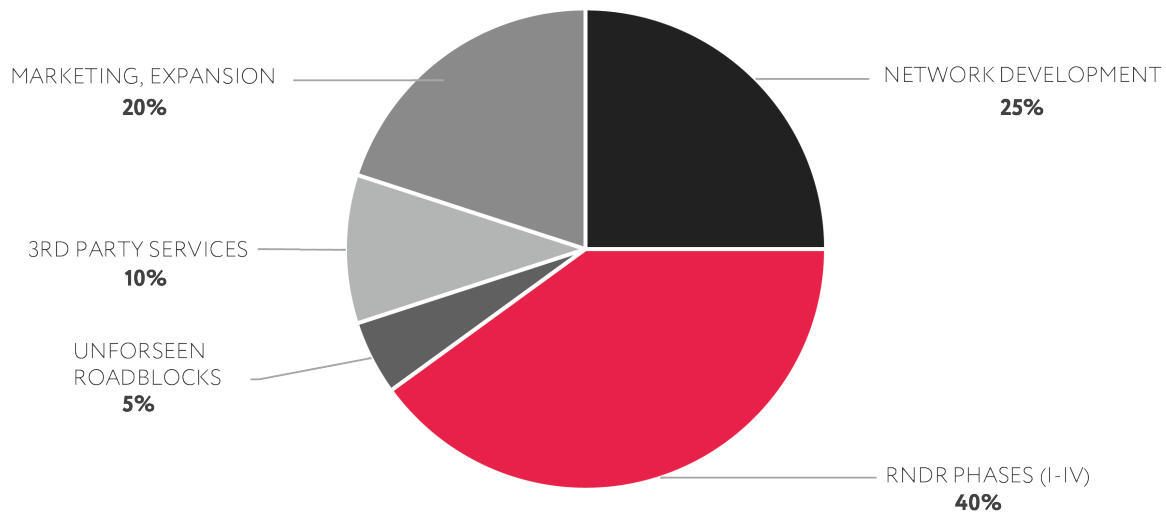### Render Phase IV: The Ultimate Vision (TBD)

Once the peer-to-peer network is all set-up and running in a stable manner, we will begin to focus our efforts to unlock the true value and potential of the render jobs processed through the Render Token and the ORC network. We will stress the capabilities that they will bring in terms of custom streaming permissions, copyright protection, and unique render creation and publishing. Eventually, the process of rendering using our framework will carry additional value in the form of new and exclusive features. We will release additional information on this process during future written posts and documentation.

Use of Funds

For this vision and product development, we are looking to raise $70 million dollars, as stated previously. This will be enough to cover the costs outlined in the Use of Funds section (below) and will enable us to build the robust ecosystem needed to support the dynamic framework that we have envisioned for the future of this project.

Thus, we aim to use proceeds from the Token Sale to facilitate our goals outlined in the roadmap process below, as well as fund supplemental development for the future of the Render Token and ORC Network framework.

USE OF FUNDS

MARKETING, EXPANSION
20%

NETWORK DEVELOPMENT
25%

3RD PARTY SERVICES
10%

UNFORSEEN ROADBLOCKS
5%

RNDR PHASES (I-IV)
40%

40% - will go to future development of each expansion phase (I-IV) and will support the team dedicated to the operations and engineering of the Render Token platform.

25% - running, maintaining, and scaling the network - this will include developing and creating new and more efficient solutions for rendering through custom built GPU solutions, effectively lowering the price of rendering across the network and the world.

20% - will be allocated to marketing and expanding the applications and reach and use-cases of the network.

10% - for third party services and contractors providing guidance and efficiencies to the project.

5% - for unforeseen roadblocks and circumstances.

Additional details about the project can be found on http://www.rendertoken.com - we will be releasing more information throughout the process in order to bolster the vision and outlook behind this idea. Please reach out to us via Rocketchat or Twitter with any direct questions.

Thank you!