3DES

decentralized system for 3D-models slicing

WHITEPAPER

3DES Team. 2018

Contents

This document is an approximate description of the developing project. At any given time any part of the text may be changed at the project developers discretion without anyone's approval. The information about the changes will be posted on the project's media channels.

Market review

The 3D printing market is actively developing now and is strongly undervalued. However, the technology is already used in many production areas: from plastic toys to spaceship engines.
The main advantage of 3D printing compared to the traditional production methods is its versatility. A 3D printer needs source raw material and a program with 3D printing instructions to make a wholesome item.
This unique approach lowers the demand for building and maintaining large-scale assembly shops for a concrete item production.

Detailed analysis of 3D printing advantages

1. Production flexibility and labor costs reduction.
You no longer need a factory workshop with lots of machines, casting molds and press-forms. A 3D printer with materials, energy and a 3D model are just enough. A printer melts the source material and creates a model slice-by-slice, following the program model. Also, a 3D printer is easy to switch from one item production to another: upload another 3D model and start printing.

2. Easy handling of a 3D printer.
Let's look at an approximate 3D printing algorithm:
2.1. A digital 3D model development using an editing program. You can choose from ready to use models either from commercial, or free sources.
2.2. A 3D model conversion to a form acceptable for the 3D printer. On this stage, a program (slicer) makes a 3D model segregation in horizontal layers and transforms it into a commands code (G-Code), understandable for a specific printer.
2.3. A 3D printer receives a printing command, then a human participation is minimal.
This way, the production of the items using a 3D printer can be one by a person without any specific qualification.

3. Low-waste production.
3D printing implies close to no waste production since a 3D printer uses only the required amount of materials for an item production.

4. Compact production.
No need to maintain the large-scale production facilities. The production area is restricted by the actual 3D printer and the material storage containers size.

5. Product price reduction.
This advantage of 3D printing usage is a consequence of the factors listed above. Apart from lowering the production costs, the market entering barriers for the smaller agents is lowering too. A small 3D printing studio can afford to produce items that used to be affordable only for large businesses. And in some cases, the end consumer can become a product manufacturer. This way, the added value from middlemen agents is excluded from the product price.
Consequently, the 3D printing technology lowers the market entering barriers for the small business. A partial products supply can be satisfied by the consumers who own 3D printers.

6. Freedom of creativity and unique products production.
Items of almost any form and difficulty can be created using 3D printing. If there are a 3D model and an appropriate material, then a 3D printer can make it. This feature of 3D printers pushes the boundaries for both production companies and common users. And there is a special value of 3D printers for the experimental production and small batches of unique items production.
In these case, a 3D printer is basically the only option since a production like is cost-effective only for large quantities.
You can see a lot of 3D-printed items examples in open access.

Perspectives of the 3D printing market

The leading consulting agencies and the analytics have different forecasts concerning the future of 3D printing market, but they agree on one thing: the market will grow.

According to a British consulting company EY, the 3D printing market may grow up to 4 times by the year 2020 and reach $20B.

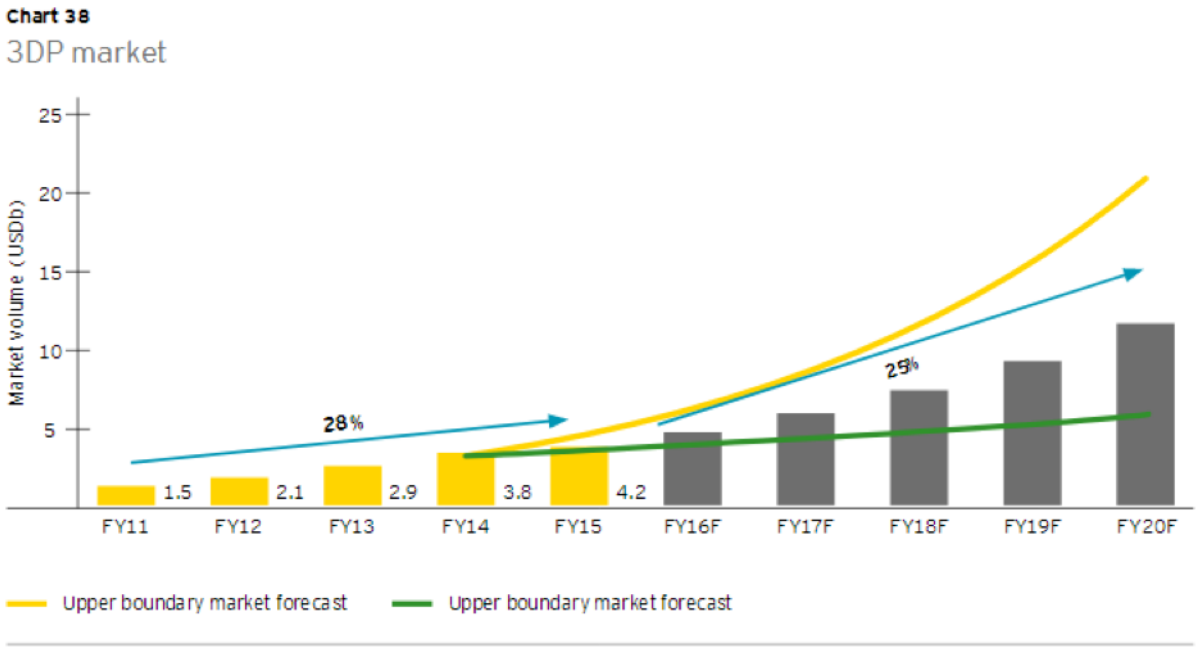

Fig 1. 3D printing market dynamics forecast by EY.

According to the analytical data from the Siemens corporation, the 3D printing will tend to grow its productivity while reducing the costs.

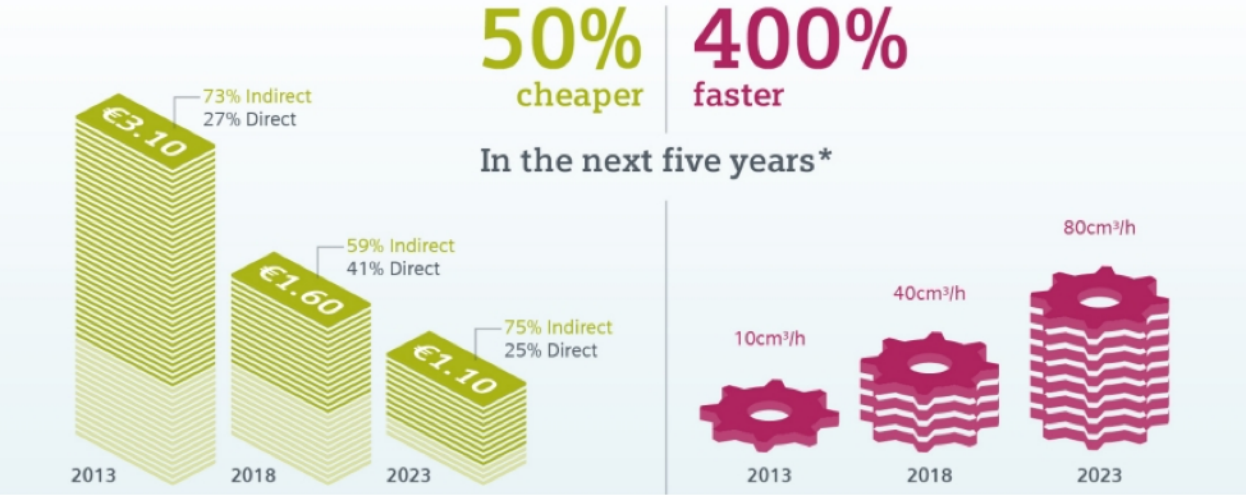

Fig 2. The technical parameters forecast for 3D printing.

The McKinsey consulting company's forecast tell us that the 3D printing market will reach $550B by the year 2025. This way, the 3D printing market has a more then 100x growth potential in next 8 years.

Problem

Over the last years, the 3D printing market has been growing rapidly. The number of companies in the industry increased. Investors and enthusiasts are still showing their interest. However, the industry is facing technical problems at every development stage, which prevents the target audience from expanding and new players from approaching the market.

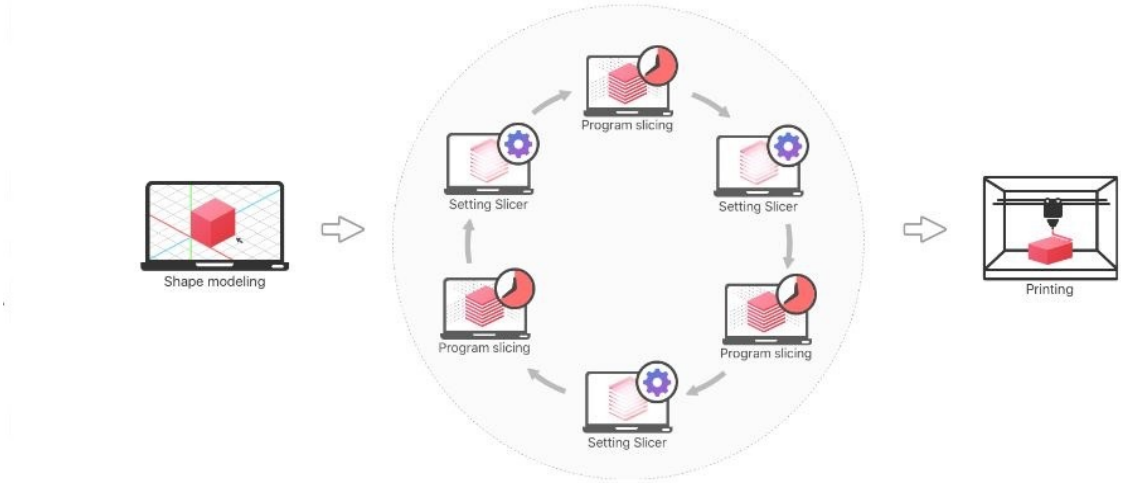

Fig. 4. 3D printing process

A standard 3D printing process using the most widespread FDM technology includes 3 main stages:

1. Shape Modeling (preparing the initial model);
2. Slicing (solo), preparing the task for the 3D printer;
3. Printing, launch the 3D printer's task.

Many problems appear on the slicing stage, forcing a user to adjust the settings multiple times before printing in order to achieve an object of suitable quality. In the meantime, it is the most resource-intensive stage. First of all, it concerns people, who can't afford expensive computing equipment.

For a low-power computer, this is a long process requiring all the computing capacity, at which point the computer can't be used for other purposes during the slicing. Consequently, the work efficiency decreases, since the slicing process needs to be repeated with every slightest settings adjustment.

This problem is especially relevant for small 3D printing studios, that have to constantly deal with the 3D models.

Basing on this problem, our team made a conclusion, that the industry needs a product enabling the fastest and the cheapest possible 3D model slicing process using any computing equipment.

Solution

Some companies already started to solve this problem. For example, AstroPrint (astroprint.com) and Printr (printr.com) use cloud slicing. They simply receive users' requests and proceed it on **their own** server hardware.

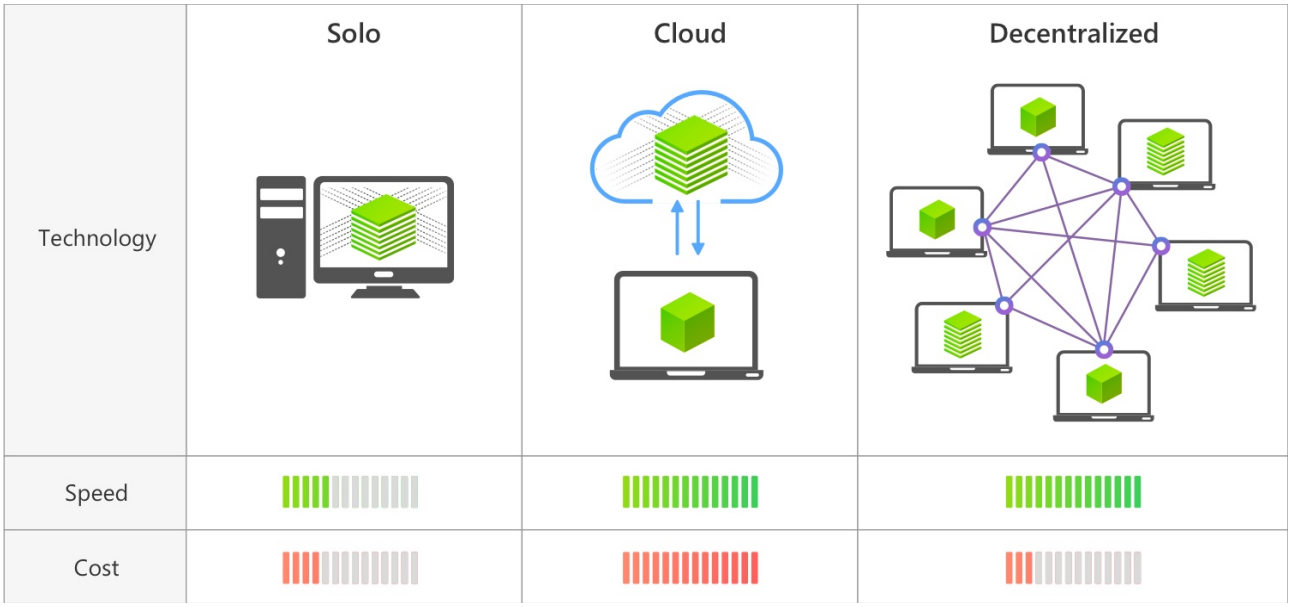

Fig. 4. Slicing methods comparison.

These services face different problems: equipment maintenance, electricity payments in disadvantaged locations, high tax burden. The 3DES network technical realization described below enables to even out the mentioned problems of centralized cloud slicing services.

The blockchain and smart-contract technologies enable to improve the remote slicing by creating a decentralised 3D model slicing system. The network members who have computing capacities will be able to provide slicing services to other members who need it and get paid in cryptocurrency.

This way, the service will proceed in the most cost-efficient locations since the provider is chosen market-wise, which naturally leads to the service price optimization and 3D printing market development due to it's cheapening. The self-employment rise among people providing the computers for calculations may be considered as an additional benefit.

First of all, this problem is relevant for the new developing 3D printing studios, facing a challenge to proceed a lot of 3D models. This leads to the need to purchase and maintain computing equipment.
Based on the described problem, our team made a conclusion - the industry needs a product that allows proceeding the 3D slicing as fast and cheap as possible on any computing equipment.

Technical Feasibility

The solution base and also the goal of 3DES project is to use the capacity of the idle computing equipment. The project's team sets a goal to achieve it any possible way. The technical solution and the realization degree will be chosen according to the project budget raised at all crowd-sale stages.

At the moment we have realized a minimal working version of the product (MVP) that allows reach ing the project goals using limited resources. You can check the MVP here: https://mvp.3des.network/.

Later there is the final version description that will be developed if a sufficient amount will be raised during the main TokenSale stage. The developers can't guarantee the invariability of the technical realization.

Technologies

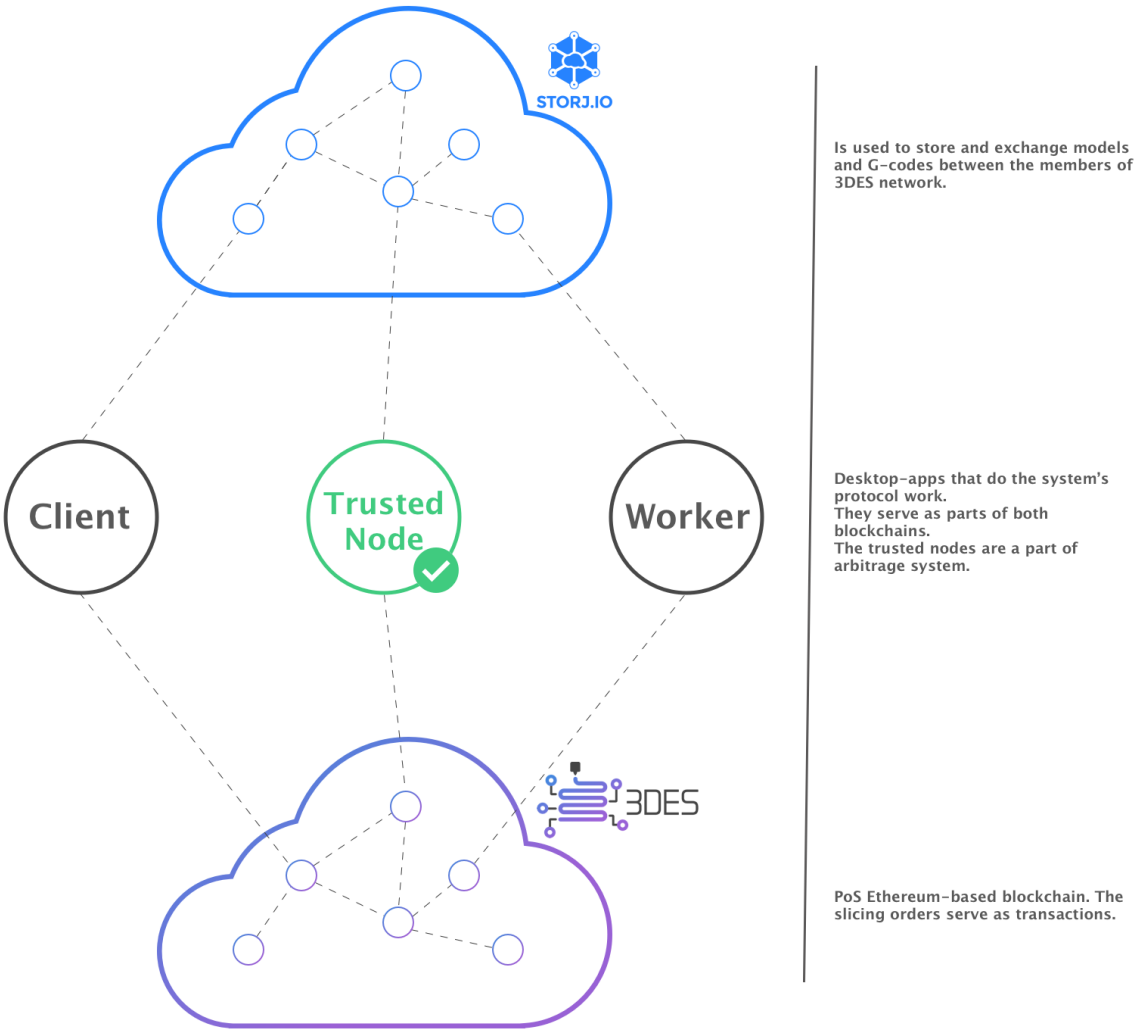

Fig. 5. 3DES system scheme.

3DES
An Ethereum network analog will be created to process the payments in DES tokens, based on the original Ethereum code base. The 3DES team decided this because of the high transaction costs in Ethereum mainnet. In this case that is a necessity, since the amount of the transacted data via the smart-contract and the frequency of the blockchain usage are very high. Also, we decided to opt out of PoW (Proof-of-Work), as this technology requires to start working with launching a miners network, which is a resource-consuming, long and vulnerable task. For these reasons, the team decided to create a payment network based on a renewed Ethereum code base, that includes a Casper algorithm. It practically excludes the 51 attack, allows starting the system work faster and easier.

STORJ
It was chosen as the most reliable option to store and exchange data between network members. Also, we studied the options of integrating Sia, Ethereum Swap, and IPFS. Storj stands out among the alternatives, since it's ready to use, has a free trial and let delete files. Full-function API enables to make integration as effective as possible.

USERS' CLIENTS
The web-version that first appeared in MVP will be used as the main user client. Also, it's probable that other separate desktop apps running the system protocol work will be released. This is a cross-blockchain development, the 3DES and Storj blockchains may be used simultaneously.

TRUSTED NODES
Reliable workers serve as trusted nodes. This is a tool to solve disputes between the network members. Only members who have been in the network for a long time and have a reputation of reliable and fair workers can serve as a trusted node.
At the system's start all the trusted nodes will be supported by the 3DES team, later other members can join the list.

ARBITRAGE
If after receiving a slicing result a customer doesn't agree with its quality, he/she can apply to arbitrage. A trusted node is chosen to solve the dispute, that will process the task under the same conditions as the previous worker. Then the results are compared and if the system finds any mismatch, the work's price and a fee are taken from the worker's account. Also, the worker's trust level is lowered, which decreases a chance to get the tasks in the future.

Workflow process

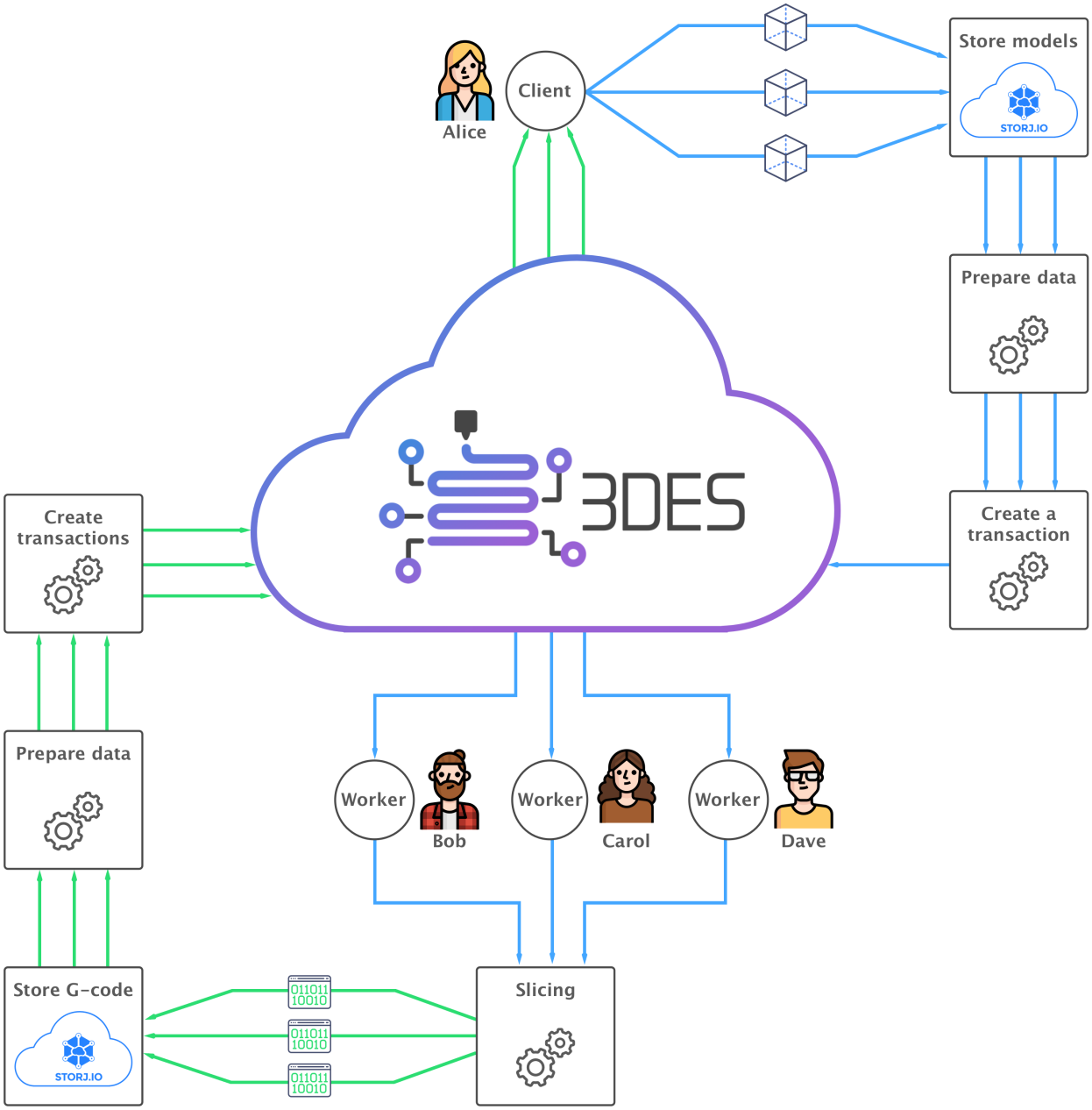

Fig. 6. Proceeding tasks in the 3DES system

UPLOADING MODELS

A customer uploads models to a Storj storage using the client. After uploading, the client automatically prepares all the data required for a transaction: generates access tokens, scans metadata and files addresses. Also, a customer adjusts the required slicing settings and the maximum work price.

CREATING TRANSACTION

To minimize the customer's time and money, the system allows making several slicing tasks in one transaction, transferring the models' information in a pack. It lowers commissions and the models are processed in parallel.

TASKS DISTRIBUTION
A worker's client contains an option to evaluate the work difficulty from the model's metadata. Every user set his/her price for a difficulty unit and other parameters that are used to filter the tasks. The system chooses available workers automatically and sets the one with the lowest price. If there is no worker found, the task goes to a trusted node, whose job is to slice any given models.

COMPLETING TASKS
After the slicing, a worker uploads a G-code to the Storj storage and starts a process similar to preparing models for uploading. The customer's client receives a notification that task is complete. Then a customer has a fixed amount of time to start an arbitrage process. If the result satisfies the customer or the time is up, the model and G-code are deleted from the storage.

Due to the project goals adjustment, the development path may be changed towards a more stable and applicable client service. That said, the main goal of the project remains the same: the capacity usage of the idle computing equipment. As a result of reaching this goal, there may be decided to opt out of certain decentralization functions. The developers have an opportunity to constantly administer the only trusted node in the network and/or operate the 3DES tokens payments in the 3DES platform, and also operate the temporal storage of models and G-Code.

RoadMap

The project development might speed up or slow down depending on the amount of raised funds.

December 2016	Project foundation
April 2017	Start of work
August 2017	3DES announcement
25 September, 2017	**pre-ICO**
November 2017	Start of development: MVP version. MVP version is a centralized solution, designed to check the technology and demand.
March 2018	ICO marketing campaign launch
7 April, 2018	Public testing: MVP version
15 May, 2018	**ICO**
June 2018	Start of development: version 0.1 Version 0.1 is partly based on Ethereum network and has a centralized data storage.
September 2018	Private testing: version 0.1
October 2018	Public release: version 0.1
November 2018	Start of development: version 1.0 Version 2.0 is a solution based on 2 blockchains: Ethereum for transactions and either Sia or StorJ to store and exchange data. The choice of storage solution will depend on the required functions, security and price at the moment of version development.
January 2019	Launch of project's marketing campaign
February 2019	Private testing: version 1.0
March - April 2019	Public release: version 1.0
May 2019	Private testing: version 2.0 In version 2.0 the Ethereum blockchain will be replaced by our own PoS blockchain to increase the speed and lowe the transactions fees.
June 2019	Public release: version 2.0

Tokensale parameters

We decided to use a rounds scheme for the Tokensale.
There will be a certain number of tokens for every round. During the early rounds, the participants can get bonuses which will become smaller as the roads are passing by.
Below is the table with Tokensale details.

Round number	Round duration	Token price, USDT	Amount of tokens per 100 USDT	Bonus
1	4 hours	0,286 USDT	350 DES	75 %
2	24 hours	0,294 USDT	340 DES	70 %
3	48 hours	0,303 USDT	330 DES	65 %
4	72 hours	0,313 USDT	320 DES	60 %
5	72 hours	0,318 USDT	314 DES	57 %
6	72 hours	0,325 USDT	308 DES	54 %
7	72 hours	0,331 USDT	302 DES	51 %
8	72 hours	0,338 USDT	296 DES	48 %
9	72 hours	0,345 USDT	290 DES	45 %
10	72 hours	0,352 USDT	284 DES	42 %
11	72 hours	0,360 USDT	278 DES	39 %
12	72 hours	0,368 USDT	272 DES	36 %
13	72 hours	0,376 USDT	266 DES	33 %
14	72 hours	0,385 USDT	260 DES	30 %
15	72 hours	0,394 USDT	254 DES	27 %
16	72 hours	0,403 USDT	248 DES	24 %
17	72 hours	0,413 USDT	242 DES	21 %
18	72 hours	0,424 USDT	236 DES	18 %
19	72 hours	0,435 USDT	230 DES	15 %
20	72 hours	0,446 USDT	224 DES	12 %
21	72 hours	0,459 USDT	218 DES	9 %
22	72 hours	0,472 USDT	212 DES	6 %
23	72 hours	0,485 USDT	206 DES	3 %
24	72 hours	0,500 USDT	200 DES	0 %

Contacts

If you have any remaining questions about the project or cooperation suggestions, contact us, we'll be glad to discuss it:

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