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## Annotation

eGaaS is an international blockchain platform implementing four basic functions needed for efficient transfer of most types of government, legislative bodies and business activities into blockchain technology:

- Financial system,
- Registry structure,
- Smart contract algorithm,
- Smart law formation and execution mechanism.

The financial system secures transactions (in the currency of a particular country) between the accounts of individuals and organizations, entered in blockchain registries. Smart contracts automatically implement algorithm of deals with registry objects. Here, transactions in fiat currencies can be carried out. Smart laws are electronic algorithms describing the rules and conditions for implementing laws. These rules and conditions are confirmed by digital signatures of representatives of the relevant legislative bodies. Smart laws regulate the creation and implementation of smart contracts and automatically regulate the relationship between individuals and organizations in all areas of government activity, from civil registration to accrual of state subsidies and pensions.

By combining the financial system, registry structure, smart contract and smart law mechanisms into a common blockchain platform, eGaaS serves as an efficient tool for the government, business and citizens, which can be used to manage any activity. It eliminates the need for multiple intermediaries, regulatory authorities, and document circulation.

## Introduction

Blockchain combines the benefits of several technologies – decentralized networks, distributed databases and cryptographic algorithms. The main advantage of the blockchain technology is that data integrity and safety cannot be compromised. This is achieved through the use of special cryptographic algorithms and placement of the full version of the database on all the network nodes. An additional benefit of the blockchain is that any electronic assets can be exchanged in its space without intermediaries, while preserving privacy. After years of successful use as a software backplane for the Bitcoin cryptocurrency, the blockchain technology predictably attracted the attention of developers as a possible effective solution for implementation of many projects that are not connected with virtual money. Many major financial institutions and multinational corporations such as IBM, Microsoft, Goldman Sachs, Barclays, BNY Mellon and others have started to invest in research and development of blockchain technology.

### The advent of Blockchain

Distributed digital asset registries became the first projects that used blockchain systems. These are databases designed for secure storage of records on real estate property, stocks, copyright and so on. At that, it is assumed that hosting any document in blockchain is equivalent to notarization of its content at a fixed time point. Attempts are being made to create blockchain-based electronic document

management systems within organizations or territorial entities. There are projects that use such blockchain advantage as exchange transactions without intermediaries. Some of such projects include all kinds of decentralized exchanges ([NXT Asset Exchange](#), [Bitshares](#), [OpenLedger](#)), crowdfunding sites and p2p lending systems. Blockchain has attracted the attention of banks and other financial institutions, as it enhances security against cyber attacks, guarantees data integrity, and reduces operational costs. Some of the interesting financial projects include [Ripple](#), which combines a distributed payment system and currency exchange. Having assessed the benefits of the new technology, major banks (Bank of America, Bank of England, Reserve Bank of India [1]) and their associations (for example, R3 blockchain consortium, which includes banks, such as Goldman Sachs, JP Morgan, Credit Suisse, Barclays, UniCredit and others [2]), announced they will work on financial blockchain platform projects.

An important step in blockchain development was taken by the [Ethereum](#) project, which offered a universal blockchain platform for creation of applications based on smart contracts – software modules that execute transaction algorithm with arbitrary digital assets. The main advantages of smart contracts over the conventional contracts are: security, no need for intermediaries, reduced transaction costs and, of course, execution automaticity. A decentralized autonomous organizations (DAO) service has been implemented on the Ethereum platform. DAO is a smart contract system that fully or partially secures the work of commercial and non-commercial organizations.

Published state and corporate analytical studies [3, 4] found that widespread introduction of blockchain will reduce costs of financial transactions, while at the same time enhancing their protection against fraud. It will also bring indisputable advantages in effecting control over all sorts of assets and ensuring data confidentiality.

### Blockchain limitations

However, there are a number of technical challenges faced by blockchain:

- Poor scalability (growth in data volume on each node)
- Low bandwidth,
- Centralization tendency [5] as a result of the growing resource-intensity of data validation procedure (when using the proof-of-work method used in Bitcoin blockchain).

There are many ways to overcome these problems and there are acceptable solutions. However, it becomes obvious that they are not the main obstacles to expanded introduction of blockchain outside the sphere of electronic money.

If we turn to the experience of effective development of the Bitcoin cryptocurrency and its clones, it would be noted that it was made possible primarily thanks to the closedness of the data space of their blockchains –credibility and privacy of transactions without intermediaries are ensured only due to the fact that transactions are conducted within one database and they do not require reference to any external source. It is exactly this necessary condition – closedness of data space – that is not implemented when attempting to apply blockchain in projects related to real rather than virtual objects. In fact, the Bitcoin blockchain should be regarded as a distributed registry of digital assets. These assets (coins) appear in blockchain in strictly fixed amounts, and the blockchain stores data of all transactions with these assets. This is what ensures security and privacy of the Bitcoin system and user trust in it.

## Problem of data integrity

Any data placed in blockchain registries, document management systems and crowdfunding sites have no higher reliability than original offline information. That is, blockchain provides only data security, protects them from modification after entry into the system and ensures confidence in the safety of relevant transaction inside the blockchain. But it doesn't guarantee full data integrity. Smart contracts also have this same kind of limitations – they can only be effective if the executable code has direct access to the objects described in them. It means that they can only operate on data stored in the blockchain platform implementing smart contracts. And it is clear that contracts operating only within the closed information environment of a particular blockchain cannot be widely used by state, financial and business institutions. The problem of credibility will not be solved either by entering all digitized state, financial and business information into a variety of specialized blockchain registries. Even if a common blockchain platform protocol for data transmission between blockchains is developed, the system as a whole will still not provide the level of reliability and, most importantly, the credibility level that the Bitcoin blockchain provides – transaction, verified within one blockchain cannot be reliable when data obtained from the outside is included in it even if the data are entered not by humans but by special applications ("oracles").

## The eGaaS blockchain platform

### Common space for smart contracts

From this analysis, it can be concluded that the obvious benefits of the blockchain technology can be fully realized only within a common enclosed information space, that is, within a common blockchain platform for all possible data types. This was the idea that formed the basis for the eGaaS project.

The following principles lie at the heart of the eGaaS blockchain platform:

- Only those data that are generated within the platform can have full credibility;
- These data would be credible only if they are used within the platform;
- Maximum credibility of data inputted into the system from the outside can be obtained only if there is an extremely formalized and legally verified offline protocol, implemented at the level of governments.

In today's world when all spheres – state, financial, economic, social – are extremely intertwined, interdependent and integrated into a common information flow, blockchain can be a reliable and effective platform only if data on maximum number of objects and agents involved in activities in these spheres are included. That is, the eGaaS database should incorporate all possible registries: of citizens, property, organizations, shareholders, industrial products, copyrights, licenses, etc. Besides, it is obvious that all financial activities delegated most likely to the central bank of the country has to be transferred to a common blockchain platform.

However, full functionality and maximum efficiency of such a common blockchain can be secured only by including in it the legislative regulations of the state. This will complete the creation of a closed information space required for efficient functioning of smart contracts. It is only when agreement objects (registry objects), conditions of agreements (legislative regulations, tariffs, standards), financial instruments, and, of course, transaction agents are joined in the common data space that smart contracts can be actually used for mass purposes.

## Common information space and the state

Transfer of core activities to the eGaaS common blockchain platform and widespread use of smart contracts as a means of regulating relations between the parties would inevitably lead to fundamental transformation of the existing forms of state governance. The role of legislative activity would utterly increase, and the need for the controlling functions of the government would virtually be eliminated. Laws that have been transferred to blockchain become instruments of direct effect: any changes in legislative regulations, tariffs and rates are automatically taken into account by all the existing smart contracts. At that, the smart contracts themselves are initially created in strict compliance with legislative regulations –this is ensured programmatically and no longer by lawyers. Therefore, combining laws and activities regulated by them in the eGaaS common database would eliminate a lot of regulatory authorities and automatically perform many functions of the state. The new term "smart law" is introduced to emphasize the special form of implementing state laws in the eGaaS blockchain platform.

## Smart laws

Smart law is an algorithm (scenario) in which the conditions necessary for ascribing attributes/relations to objects of the law (legal and natural persons) or for performance of certain actions with these objects are established. For example, a smart law may determine the conditions of establishment of relationship "married" between two citizens of the state or conditions of transaction "tax payment". Some smart laws (for example, tax laws) work in a tracking mode – they record execution of transactions of a certain type and automatically perform statutory action (tax deduction). Other smart laws (for example, marriage smart law) are triggered when they are accessed through special forms and are performed interactively. After checking all the conditions set out in them, these smart laws complete their action by ascribing attributes/relations to new objects or refusing to do so. Economic smart laws control both how smart contracts are created and how they are executed, thereby automatically prohibiting the inclusion in them of operations that contravene the law. Introduction of smart laws (in addition to the financial system and registry structure) therefore completes the creation of a common information space for full and efficient operation of smart contracts.

All state laws whose subjects are objects listed in the eGaaS blockchain registries are transferred into smart law format. Transfer of state laws into smart law format does not require the involvement of programmers – a special eGaaS interface is used. Earlier-adopted laws come into effect in the eGaaS space in the form of smart laws after signing them with electronic keys belonging, for example, to the heads of the legislative and executive bodies of the state. New laws can be created and tested right in the eGaaS space. A new smart law is adopted and comes into force once signed with the required number of electronic keys of representatives of the legislative body of the state. A special smart law establishes the percentage of votes required for the adoption of laws. Special smart laws prescribe the duration and conditions of legislative elections, they accept applications from candidates, launch the voting procedure and count the votes. Voting by means of electronic keys is quick and incurs minimum cost. Voting results, that are stored in the blockchain, are practically impossible to be tampered with.

Smart laws are directly effective laws. Implementing them does not require intermediaries or regulatory authorities. Amendments and changes made to them take effect immediately. Many of the functions of state bodies – most notably registration of civil status (birth, marriage, divorce), taxation, regulation of financial and business relations – are automatically executed and controlled by eGaaS smart laws.

## Security and privacy

Transfer of all data on objects regulated by state laws (natural persons and legal entities, real estate, shares, etc.) to the eGaaS platform minimizes the possibility of fraud and manipulation of these objects – their origins and operations with them become extremely transparent. Also, continuous monitoring by smart laws makes business transactions conducted using smart contracts much safer. Together with paper documents, the very concept "forgery of documents" is also eliminated: blockchain entry about getting a driver's license, visa, certificate, awarding of a title or award cannot be changed, and you can gain a free and secure access to this information from any device connected to the network.

However, despite the openness and accessibility of information contained in the eGaaS database, the blockchain technology ensures its confidentiality. The link between a bank account or medical data and a citizen to whom they belong is encrypted and closed for direct access. But if necessary, for example, by a court order, any data can be accessed if there are two or more electronic signatures of representatives of various institutions (e.g. the central bank, prosecution and investigation).

## State sovereignty

As an interstate blockchain platform that features equality of all its components and information security against forgery, eGaaS can increase the independence of every country in international relations and strengthen the supremacy of state power in domestic affairs. That is, eGaaS

- Would ensure automatic implementation of many international standards and agreements;
- Would make it impossible to change the state affiliation of objects of unified registries without relevant international agreements;
- Would reduce the possibility of hidden influence of the external structures on the legislative activity of the state as a result of the transparency of blockchain technologies;
- Would hinder illegal financing of political organizations from outside the state.

However, eGaaS would also become an effective tool for implementation of the UN Resolution on the Responsibility to Protect [6], which says that state sovereignty should be conceived not only as a privilege but also as a duty to protect the people living within the boundaries of the state. In the event the rights and freedoms of people in a particular state are violated, eGaaS would serve as an effective mechanism for international institutions for introduction of such coercive measures as economic sanctions, which will be automatically executed by all members of the platform.

## The eGaaS technology

### Problems to solve

Practical implementation of the eGaaS project requires addressing several technical problems. One of the main problems is to ensure a capacity sufficient to maintain the working efficiency of all system components. Here, it should be noted that the capacity of any blockchain platform does not exceed the capacity of its weakest node. That is why Ethereum-type blockchain cannot be used to create a common database – its nodes simply cannot cope with the load required to process transactions of even a small country. The possibility of distributing computing operations among all nodes exists only in theory. Although the very idea of load distribution is very attractive and it is included in the list of tasks to be solved by the eGaaS team.



And, of course, the existing blockchain platforms are incapable of providing the required transaction processing speed. Even if 7 billion people will each make 10 transactions per day, you'll have over 700 thousand transactions per second. Consequently, the system should be designed for a load of at least one million transactions per second.

### Network of states

However, the very idea of a common blockchain platform that requires creation of a common global space of the most reliable data already contains a solution to the problem of providing sufficient network capacity and to the problem of maintaining the equality of states and their confidence in all nodes. It is clear that such solution involves creating a eGaaS blockchain network node for each state joining the platform. At that, each node will have to contain a complete copy of the blockchain database. To this end, a special data center capable of serving the node operation should be allocated for each state. The equality of all states and their confidence in the information posted in the eGaaS database is secured via equal participation of all nodes in the creation and signing of blocks.

### Transaction confirmation

All the network nodes confirm transactions and sign blocks consecutively. If a block is not signed within the allotted time, the right of signature is transferred to the next node. For creating a block, each node receives a commission from transactions.

To maintain the working efficiency of the eGaaS blockchain, the transaction confirmation commission is established such that it is sufficient for maintenance of the data center. The commission is calculated every month based on the average expenses incurred by nodes to maintain data centers and the total transaction amount. Such a way of calculating commissions will allow each node – no matter how small the country that owns it – to maintain its functionality, regardless of the number of transactions and the blockchain size.

The range within which the commission (relative to the calculated baseline) can be changed – depending on the transaction amount – should be established via a special international smart law.

## On the way to eGaaS

### Virtual test state

Initially, the main eGaaS systems (financial transactions, smart laws and smart contracts) will be tested on a virtual state. An account will be opened in its Central Bank for each user who obtained its citizenship. Citizens will have access to the basic business operations: creation of organizations, financial settlements in the local currency using smart contracts. Standard smart laws, for example, marriage and divorce laws, laws for elections to the parliament of the virtual state, and laws for writing and adopting new smart laws will be subsequently tested.

### International working groups

eGaaS offers only a technological solution for implementation of the financial activities of states, for creation and execution of smart laws and smart contracts and for creation of the appropriate registries. However, eGaaS can not predetermine the legal procedures necessary for states to join the blockchain platform.

It is advisable to allow experts to draw up rules and regulations necessary for deployment of the eGaaS platform. To this end, it is proposed that international working groups be established in all areas in which eGaaS technology will be used: state structure and international relations, monetary policy and banks, customs relations, certification of goods and services, common registries, medicine, education, social protection, ecology, etc. These working groups will have to create rules and regulations that will regulate the creation of smart laws that set out the procedure on how states will join the project.

### Joining the eGaaS platform

At the first stage of eGaaS joining procedure, governments and legislative bodies of each country will have to develop and implement a citizens' registration mechanism protected against forgery with transfer of their account electronic keys to them. When registering in eGaaS, the date of birth, gender, parents, marital status and details of identity documents (and other information at the discretion of the government) are entered. After compiling the registry of citizens, the government can enter smart laws of civil registration (registration of birth, marriage, divorce, death) into the system and enact them. The registry of citizens will also allow to use election smart law that regulates acceptance of applications from candidates for elected office and the voting procedure.

Implementing just this first step will allow not only to form a secure registry of citizens required for implementation of any activity, but also to work out an algorithm for adopting and applying smart laws and making amendments thereto, and most importantly, to save significant resources spent by the state on civil registration and elections.

As the first international eGaaS project that does not require linkage to financial transactions, it is proposed to create a common visa registry for all states. With registries of citizens, the procedures of obtaining an invitation and visa, which in essence comes down to making entries to the eGaaS blockchain, in most cases can take place without visiting consulates and embassies – reliable information about citizens is available in the common database. One can check from any smartphone whether a visa was issued or not. Such visa is definitely more accessible, reliable and protected against tampering than a paper label on a passport.

To fully introduce smart contract technology, the government would need to open eGaaS accounts for all its citizens in its Central Bank. After that, most financial settlements can be performed via smart contracts under the control of smart laws.

### Expected results

Full transition of government to the eGaaS platform would:

- Significantly reduce documents circulation in the public, social and economic spheres;
- Make the provision of public services convenient and fast;
- Allow the real-time analysis of social, political and economic processes;
- Almost eliminate expenses on monitoring and registration authorities;
- Make the government activity more transparent and accessible for accounting and control, which will enhance its efficiency and lead to significant reduction in corruption and shadow economy;
- Offer new methods of combating crime.



Combination of a full range of registries, financial, legal and economic systems in a common information space would open up new business opportunities:

- Would simplify the process of registration, licensing, insurance, and approval of business loans;
- Would minimize the need for accounting and legal services;
- Would enhance transaction safety;
- Would eliminate a great number of intermediaries;
- Would radically reduce transaction costs, particularly in international trade.

For citizens, eGaaS would:

- Automate the process of receiving public services;
- Protect personal data from other citizens, as well as from unauthorized access by certain state structures;
- Eliminate the need to obtain, maintain and provide paper documents;
- Lower the cost of many services due to the p2p (person-to-person) services eliminating intermediaries: mutual crediting, ordering a taxi, hotel reservations, buying flight tickets, etc.;
- Raise the level of medical care thanks to full account of all medical records, prescriptions, procedures and so forth.

### Economic impact

Data on expenses in public areas and economic sectors where introduction of a common blockchain platform can radically change financial situation or completely eliminate financial losses:

- In 2015, there were approximately 2.81 million people employed as accountants and auditors in the U.S. only. This figure is projected to increase to 3.4 million in the coming years. Business expenditures on the accounting, tax preparation and payroll calculation services in the United states are projected to reach \$160 billion by 2018 [7].
- The IRS expenses in 2015 passed \$11 billion [8].
- In 2015, the global banking sector generated \$1.3 trillion in total profit formed from business and citizens' expenses on banking services [9].
- A study by Prof. Edgar Feige, an economist at the University of Wisconsin-Madison, estimates that shadow economy turnover in the US in 2012 totaled as much as \$2 trillion. According to the Internal Revenue Service, about \$500 billion in taxes were lost because of unreported wages [10].
- According to a report "Corruption Perceptions Index 2015" released by Transparency International, poor countries lose \$1 trillion to corruption every year [11].
- In 2009, the United Nations Office on Drugs and Crime put transnational organized crime turnover at around \$870 billion – an amount equal to 1.5 per cent of global GDP [12].

If we consider the above-listed global losses and extrapolate the US data to the whole world, we can predict that transition to the eGaaS blockchain can save about 10% of global GDP.

## Conclusion

The main question that should have been answered by this write-up is: Why do states need this particular common blockchain platform? Why is it meaningless to implement some of its services (such as smart laws, smart contracts, financial transaction mechanism, all kinds of registries) on separate blockchains? The key arguments in favor of a common eGaaS blockchain platform are summarized below:

- Separate blockchain registries and blockchain platforms ensure data accuracy and integrity only within their own databases – any data transmission between separate blockchains minimizes all the advantages of this technology.
- Smart contracts are effective only when all the data on objects involved in the transaction, as well as statutory provisions governing the contract, and, of course, the relevant financial transactions, are directly accessible by the smart contract algorithm, that is – are recorded in a common database.
- Transfer of the legislative system of a state to smart law technology is also possible only if all the objects, whose interrelationships, including financial ones, are regulated by state laws, are presented in the common blockchain platform.
- The normal functioning of the economy of a modern state cannot be closed within its borders. Therefore, a common blockchain platform can perform only as an international platform that connects all the states of the world together into a common network.
- None of the existing blockchain platforms of which conventional computers could be the nodes, can provide the necessary reliability and performance of a common network. Therefore, only state-supported large data centers, each of which stores a full version of the blockchain, can serve as blockchain platform nodes. Only such a network configuration, where each of the nodes is involved in the verification and signing of blocks, can provide reliable data storage and accuracy.

All previous attempts at building information models of state and economic activities have failed because the parties involved built a typical model– they tried to duplicate and replicate offline relationships in the program code. But eGaaS offers just to give up offline economy and provides a tool for building a new, initially digital economy. A common blockchain is needed not to model relationships, but to implement them on a fundamentally different basis. All formal communications, all formal relations, contacts, transactions, sales & purchases go to the blockchain subspace. They fall into digital sediment. Live communication and creativity remain outside, on the surface..

eGaaS is an international blockchain platform that is needed both by states and by citizens in equal measures. eGaaS is designed to illuminate the shadowy niche in which the modern financial and political systems reside. eGaaS should be the platform on which the state and business structures of all countries should function harmoniously for the benefit of the citizens.

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