

Blockchain in SpaceTech 2021/Q4

Teaser

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TABLE OF CONTENTS

Introduction	3
Blockchain Technology Explained	6
Blockchain Market Overview	11
SpaceTech Market Overview	19
How Blockchain and SpaceTech Work Together	28
Leading Blockchain in SpaceTech Companies	48
Leading Blockchain in SpaceTech Investors	57
Regulation of Blockchain in SpaceTech	65
Potential of the Sector and Future Projections	76
Key Takeaways	84
Disclaimer	87
About SpaceTech Analytics	88

This joint case study focuses on the relationship between the most fast-developing frontier sectors: **SpaceTech** and **Blockchain**. With 2021 nearing its end, there have already been several successful applications of blockchain technology in the SpaceTech industry. The basis of this case study is the information on **40+** companies involved in both sectors. While the number of SpaceTech companies with applied blockchain technology and the Blockchain companies with space-focused programs is not large as of 2021, there are numerous opportunities to increase that number. As such, this integration of sectors should not be overlooked by investors.

SpaceTech presents investors with astronomical opportunities for gains at moderate risk levels. It is a frontier industry with rapid growth and development rate. SpaceTech market capitalization is expected to reach **\$10T** by **2030**.

Blockchain represents a direction for optimization and improvement in terms of logistical and data structures. Becoming a hot topic in the second decade of the twenty-first century, it has a lot of potential opportunities for SpaceTech companies to apply, increasing their overall efficiency.

SPACETECH ANALYTICS METHODOLOGY

Methodology

Since the application of blockchain in space is not sufficiently popularized at the moment, SpaceTech Analytics has gathered more than 40 companies and 40+ of their investors associated with this sector using a manual search, as well as automated algorithms.

Content

The companies themselves have been categorized during the search into three key categories concerning space and blockchain:

- **Full spin companies** (company's core business)
- **Spin-in companies** (blockchain company started space-related business, direction or activity)
- **Spin-off companies** (SpaceTech company started blockchain-related business, direction or activity)

Some findings

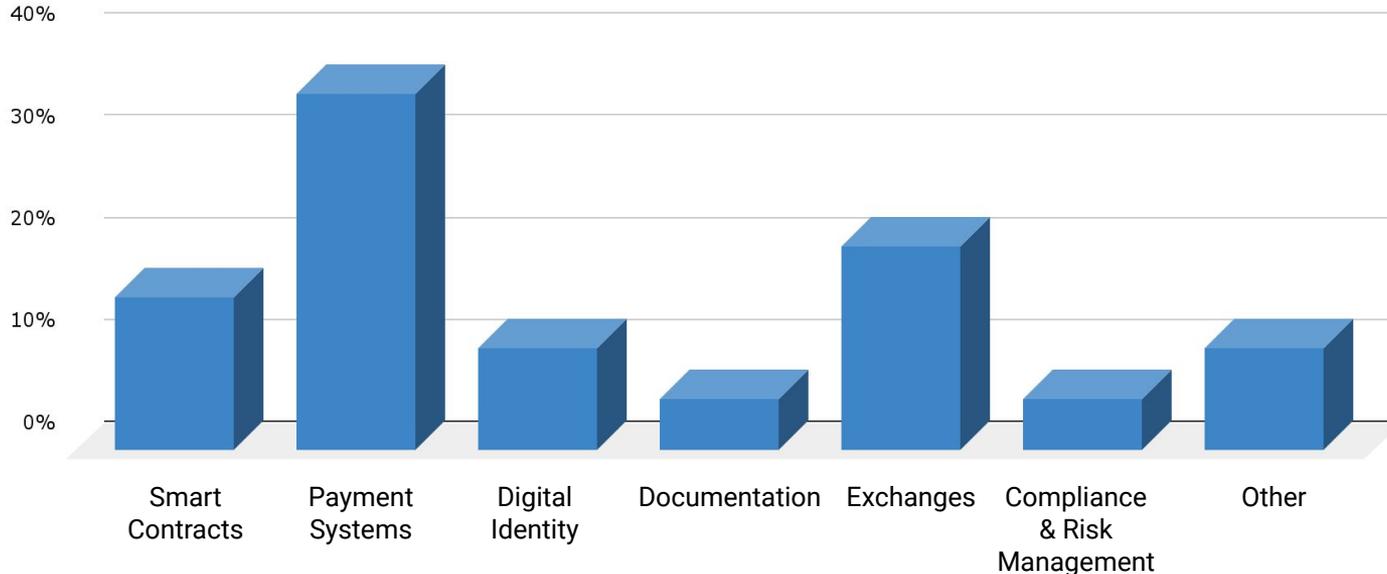
Because the direction of blockchain in space is only in its infancy and there are not many companies specializing exclusively in the intersection of these two industries, the leaders are represented by a fairly limited number of companies.

Both industries are highly developed separately, but it is useful to look for synergy to create mutually beneficial approaches to common issues.

BLOCKCHAIN MARKET OVERVIEW

Blockchain as an industry has recently developed into a major sector in economics. The market for its spheres of application has **grown** exponentially in the second decade of the twenty-first century. As blockchain technology can have different forms and applications, the market also varies in terms of spheres of the appliance. Currently, the most prominent usage conditions are **Payment Systems** and **Exchanges**, as cryptocurrency markets have been on the rise in the period of 2010-2021.

Blockchain Technology by Share of Application Form



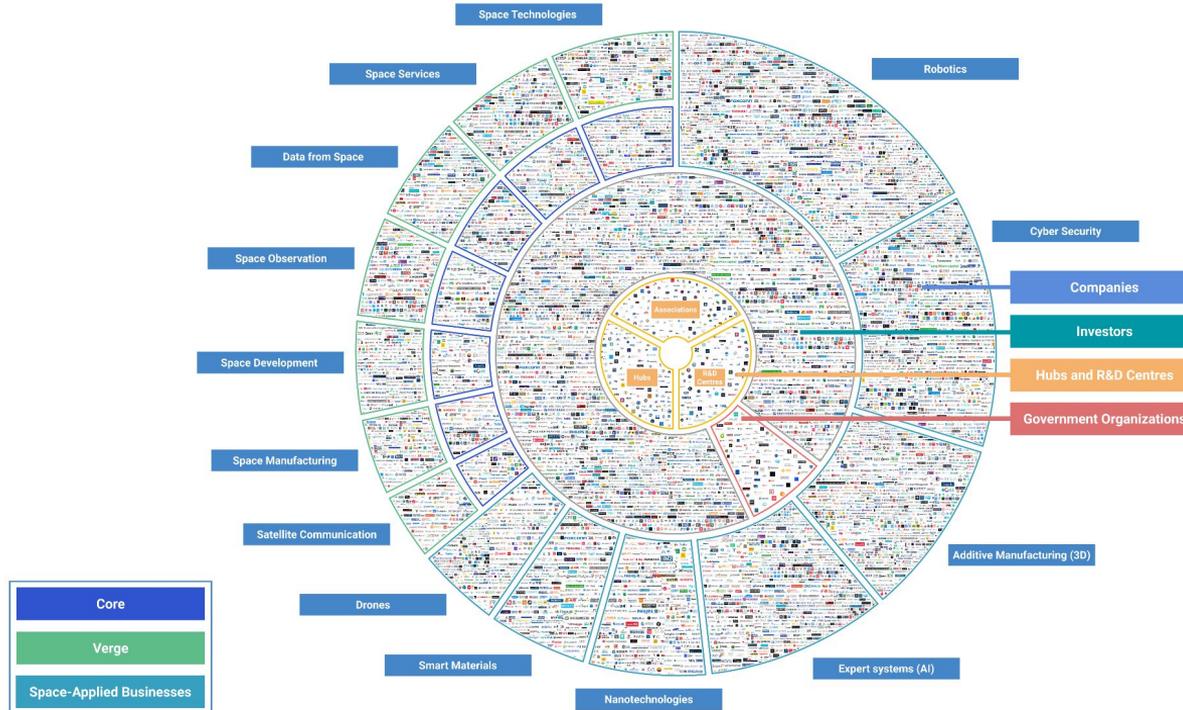
GLOBAL SPACETECH ECOSYSTEM 2021

12,000 Companies

5,000 Investors

200 R&D Hubs and Associations

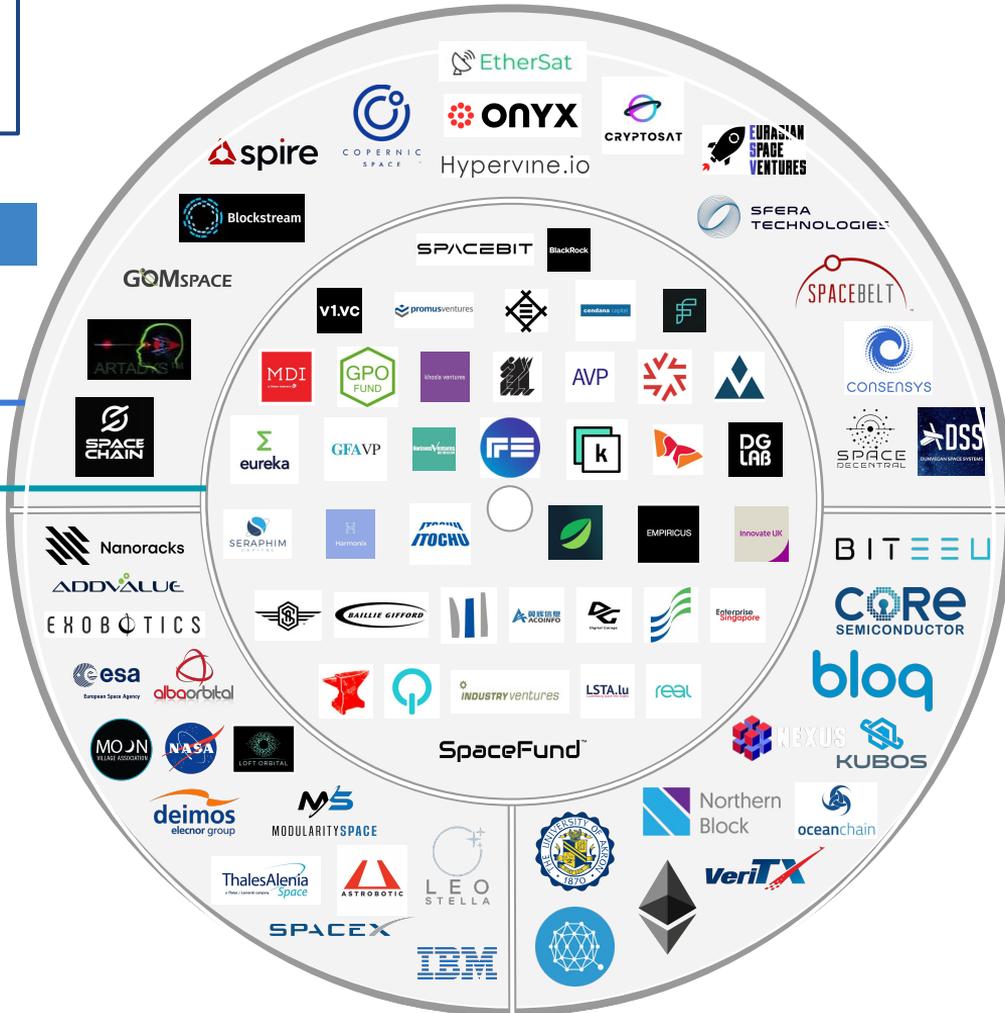
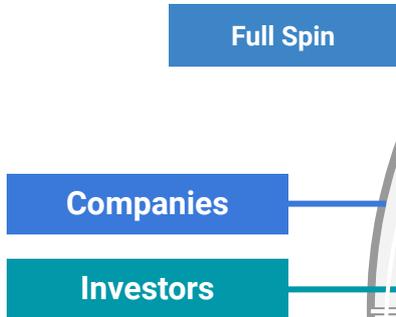
140 Government Organizations



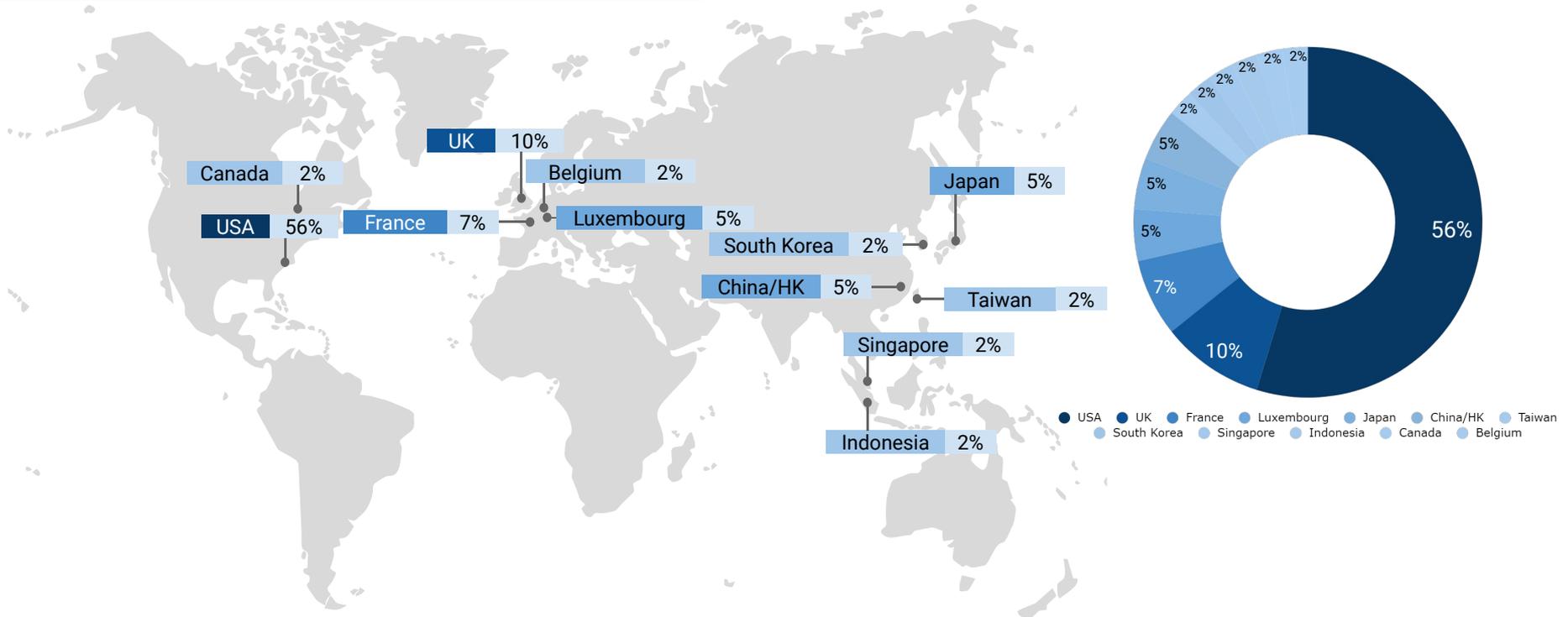
USA	Canada
UK	Germany
China	France
India	Israel
Spain	Japan
Australia	Eastern Europe
Singapore	Turkey
Southern America	Ireland
Gulf Region	EU
Africa	Sweden

**Blockchain in Space
by Research Field
Q3 2021**

**Companies – 42
Investors – 40**

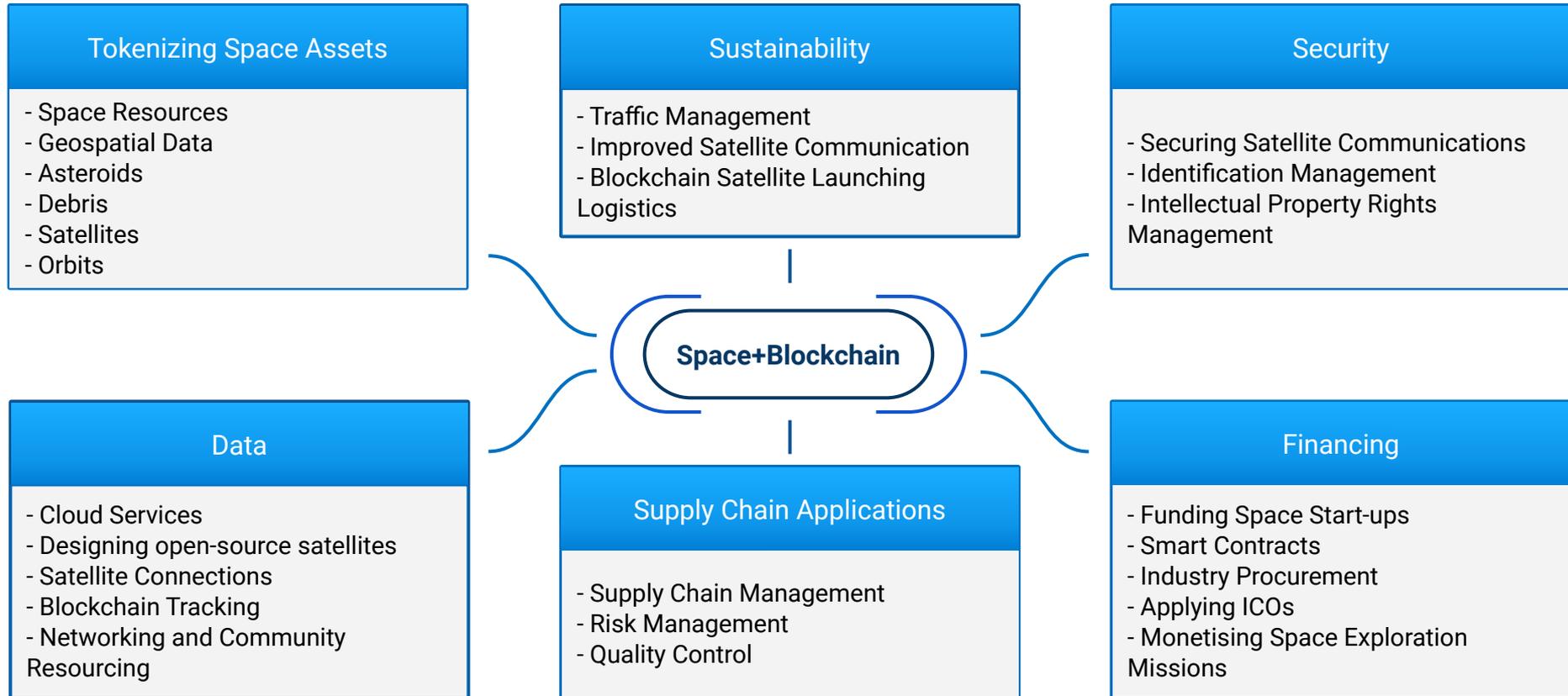


BLOCKCHAIN IN SPACE INVESTOR REGIONAL STRUCTURE



The chart represents the distribution of Blockchain in Space investors by country or region. Not unexpectedly, the overwhelming number of investors are from the USA. This is congruent with the number of companies and the amounts of investments originating from that country. One of the primary explanations could be the availability of the highly developed financial markets there.

THE WAYS SPACE AND BLOCKCHAIN CONNECT



DLT BENEFITS FOR SPACE SECTOR

TRANSPARENCY

DLTs can be set up openly or privately. Open ledgers (Figure 2, left side) allow anyone to review transaction history without special permission.

EFFICIENCY

DLT technology can automate and improve business processes and organizational efficiencies (e.g., self-executing contracts)



PRIVACY AND ACCESS

Privacy and permissioned access are facilitated by combining cryptography and data decentralization

NEW PRODUCTS AND SERVICES

Decentralizing traditional models can create new cooperative business models. It remains to be seen what might emerge in the space sector since most efforts are in the concept or demonstration phase.

RESILIENCE

DLTs can increase the resilience of communities and ecosystems. Embedded peer-to-peer smart contracts, for instance, do not need to go through a centralized authorization or distribution center.

SPACEFUND LAUNCHED THE FIRST SECURITY TOKEN IN SPACETECH

The logo for SpaceFund, featuring the word "SpaceFund" in a bold, black, sans-serif font. The "S" is significantly larger than the other letters. A small "TM" trademark symbol is located to the upper right of the "d". The logo is enclosed in a thin, dotted blue border.

STO Ticker	SF1
STO Date	January 1, 2019
Blockchain Platform	Etherium
Token Standard	ST-20 (Polymath)
Min. Investment	\$500M
Accepted Currencies	USD
Public Sale Price	1SF1 = \$1
Issued By	Abacus

On **October 29th, 2018**, the world's first space security token was announced by Venture Capital firm **SpaceFund**. The new token would allow for increased liquidity and efficiency for investors who wish to participate in the funding of SpaceTech startups.

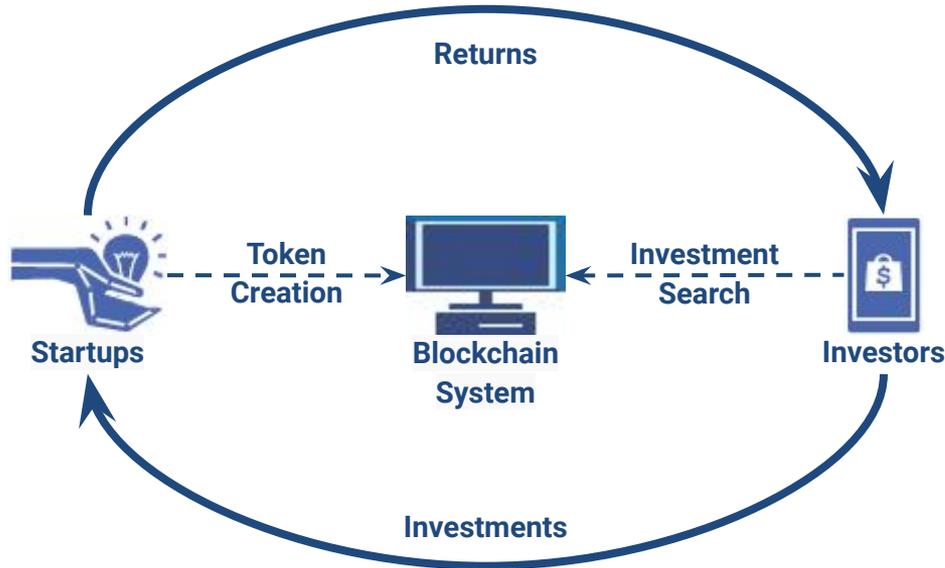
SpaceFund has officially brought these benefits to the space industry. According to the company, the **Security Token Offering (STO)** can reform the current structure of space-focused startups.

When SpaceFund helps a portfolio company with tokenization, investors can be confident that these companies are successful, well-run, legitimate investment opportunities and that the tokens offered will be secure and highly tradable.

The SpaceFund model also helps mitigate the risks of investing in restricted technologies across borders. While security tokens can help implement transfer restrictions and enforce regulations, tokens cannot allow companies and investors to navigate the intricacies of foreign investment restrictions specific to the space industry.

INITIAL COIN OFFERING: HOW BLOCKCHAIN ASSISTS STARTUP FUNDING

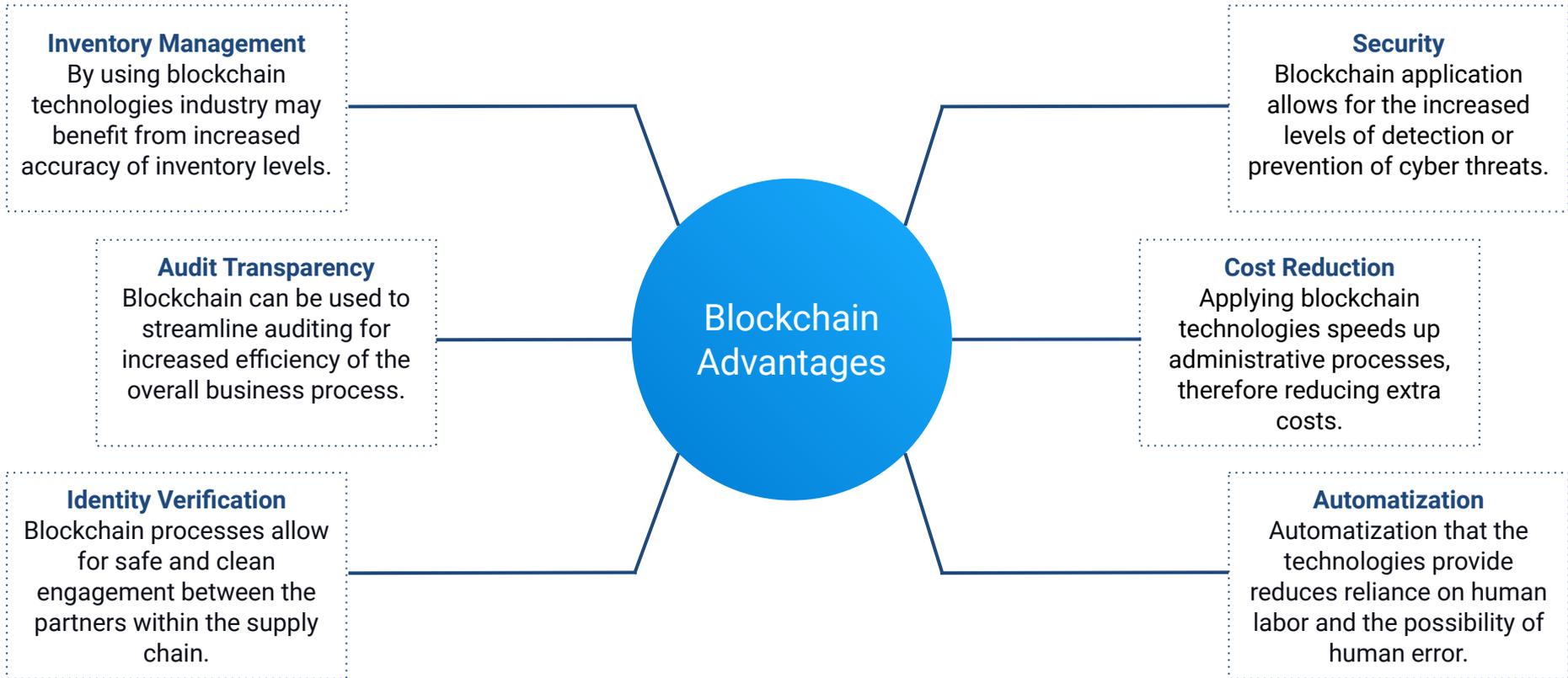
An **Initial Coin Offering (ICO)**, also known as a “**token sale**” or “**token launch**,” is the process, analogous to the **Initial Public Offering (IPO)**, where a company is creating a new product and wants to attract investors who would benefit from purchasing it early. Such a sale enables the company further to develop its’ product with the attracted funds. ICO can be both public and private, with the public being a form of crowdfunding, while private focuses on the select group of investors.



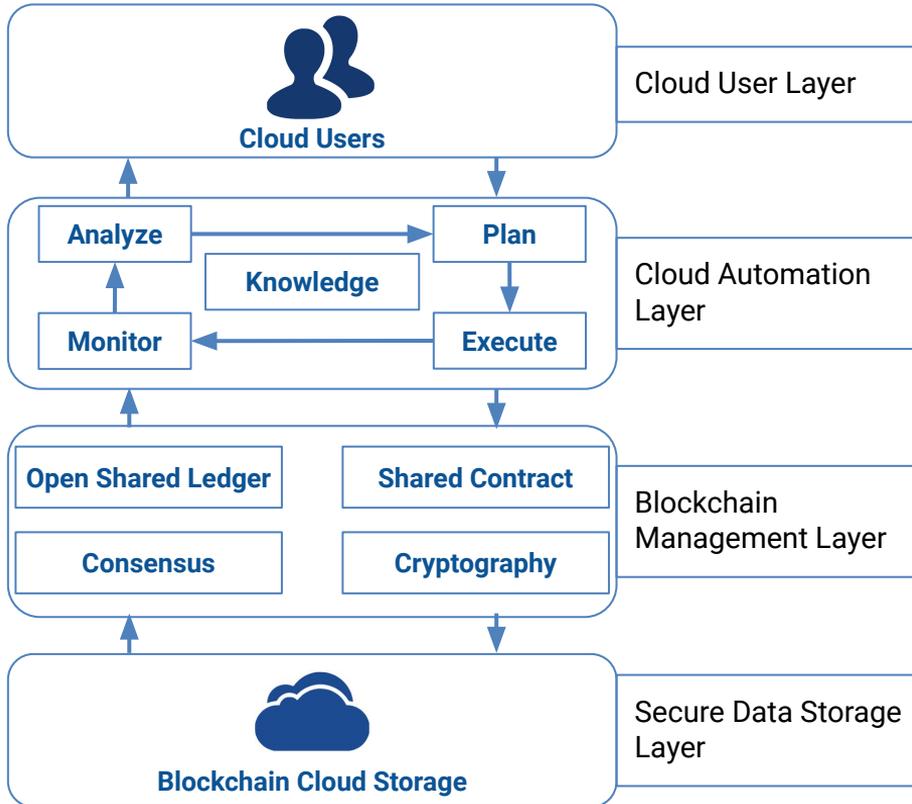
Stages of ICO:

- **Targeting Investment.** Every ICO starts with the company’s intention to raise capital. The company identifies the targets for its fundraising campaign and creates the relevant materials and media about the company (or project) to attract potential investors.
- **Token Creation.** The next step for the company is to create the token using specialized platforms. The process is relatively simple due to the code for it being provided by major platforms like Ethereum.
- **Promotion.** At the same time, the company runs the promotion company to attract the attention of the investors.
- **Initial Offering.** After the token is created, the company offers it to potential investors.

HOW BLOCKCHAIN APPLICATION WOULD HELP THE SUPPLY CHAIN



BLOCKCHAIN APPLICATION IN CLOUD SERVICES



Over the past few years, the blockchain has become a method of implementing **cloud storage services**, reducing the chances of human error and increasing the overall trust and security in the system.

Blockchain can be considered as the answer to the **eternal need for storage space**. One of the ways of applying blockchain could be the decentralization of the storage space with blockchain-based cloud storage. Decentralization **eliminates** the need for large storage farms and the environmental impacts that come with it. Decentralized data ultimately means more security and privacy. All the parts of a file created due to sharding are protected with their private keys.

Security is one of the biggest reasons that using blockchain for cloud services is better than traditional cloud services. In the blockchain, the protection of both data and identity is ensured in ways like no other. **No third party has any control over any data**, be it personal or public. Due to sharding, data remains secure, as complete contents of the file cannot be gauged from just one fragment.

BLOCKCHAIN TECHNOLOGY SERVICES IN SPACE

The blockchain protocol is responsible for verifying the new space transactions to **add a new valid block** to the blockchain. All space stakeholders can then access the newly added blocks through the connected dashboard to the blockchain platform that manages a satellite constellation. Each space transaction has to be converted into a Space Digital Token (SDT). This new transaction has to be verified using a blockchain protocol (or consensus) to validate a specific transaction between two satellites in the same constellation.

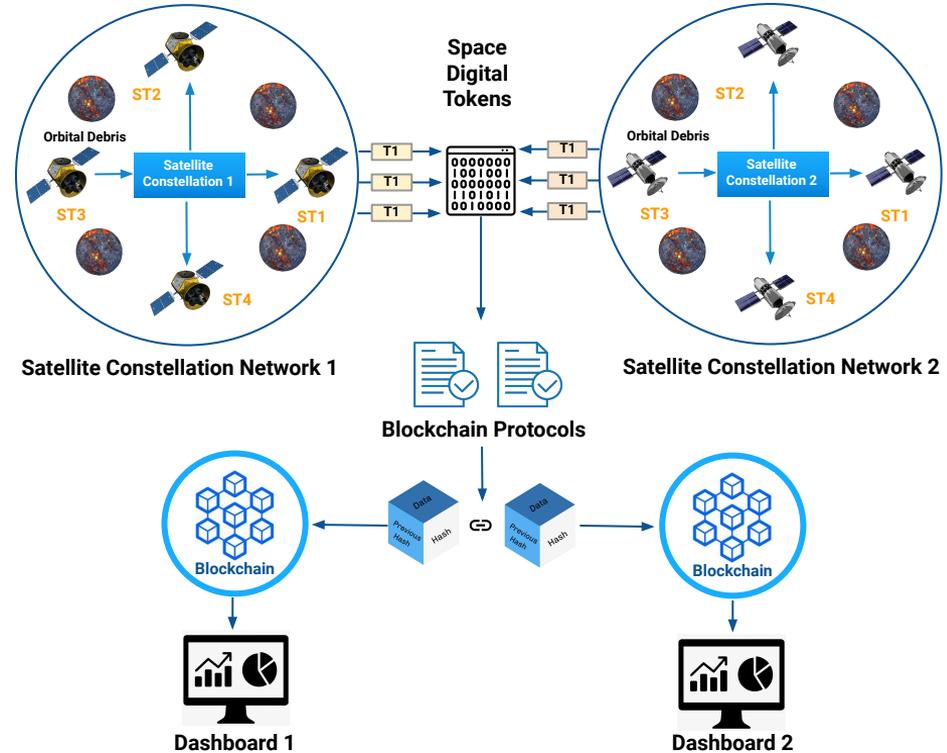
Additionally, the blockchain protocol is **responsible for validating all transactions exchanged within a satellite constellation**. If the handled SDT is valid, a new block is added to the blockchain. The new block contains all details of the new space transaction. This further information can be used by space stakeholders who are authorized to access the blockchain.

Advantages of tokenizing space transactions as SDTs:

Greater control over space transactions

Faster transactions and automated compliance

Security

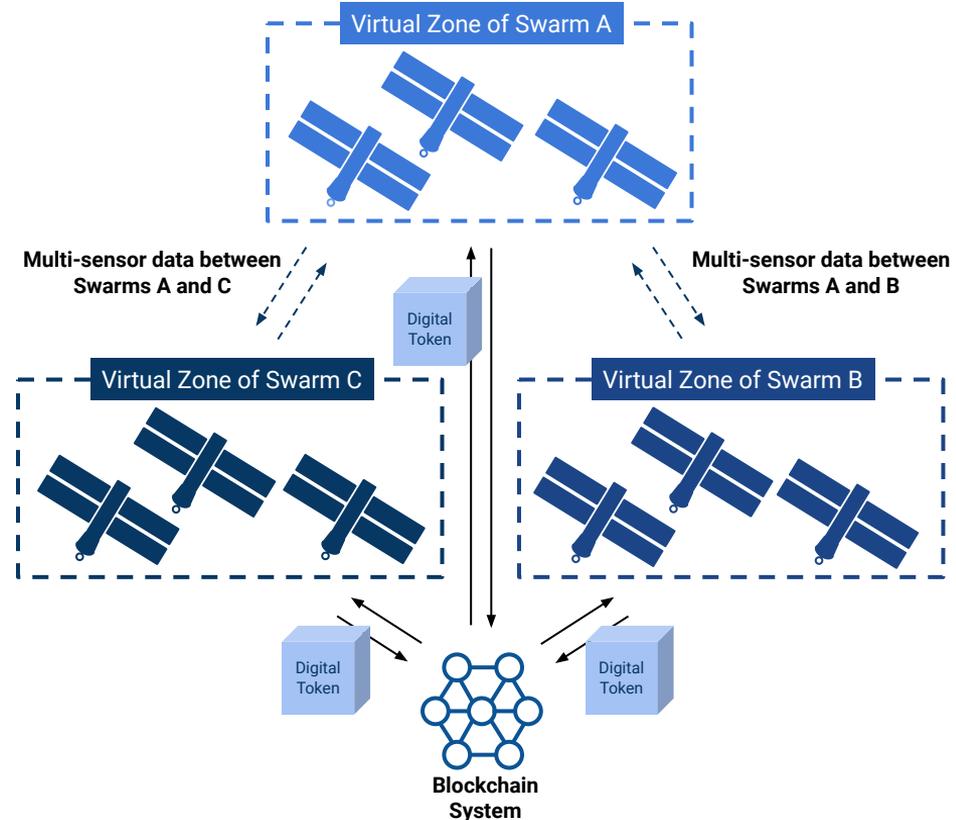


Modeling space digital tokens using blockchain

SECURING SATELLITE COMMUNICATIONS

Blockchain technology can be implemented in satellite communications in a variety of ways. Spacecrafts can either be nodes in the network or act as validators; they can only request some data stored in the blockchain. The establishment of communications between ground stations and satellite swarms requires decentralized tracking and monitoring of space objects. When the connections are set up, it becomes possible to develop a **virtual zone** for each **satellite swarm** in its orbit. The zones are made for the security of a swarm. If a single satellite senses a collision hazard, it notifies every other vehicle in the swarm. Moreover, a swarm in LEO orbit may establish another connection with another MEO/GEO satellite swarm for providing the data as a digital token.

The graph on the right shows how blockchain can manage and secure the connection patterns between three satellite swarms with their virtual zones. Any satellite in **Zone A** can connect with another satellite from **Zone B** or **C** via a multi-sensor system to transmit data. The feedback of this connection is saved as a new digital token and brought into a new block in the blockchain system.



BARRIERS OF IMPLEMENTATION BLOCKCHAIN IN GOVERNMENT

Incompatibility between blockchain-based solutions and existing legal and organizational frameworks is a significant barrier to unlocking blockchain's transformative capability. The main policy objective should be to develop the technological and ecosystem maturity of distributed ledgers. Policy actions should aim not only to adapt the technology to existing ecosystems but also to transform existing processes, organizations, and structures using the disruptive potential of blockchain.

According to the European Commission research, primary policy targets are the following:

Guidance and knowledge sharing



Creating programs for sharing best practices on blockchain deployments and providing guidelines and recommendations to develop knowledge on the technology. A better understanding of the topic for all ecosystem actors will result in easier adoption and increased effectiveness.

Focused pilot development



Identifying key use cases and ongoing implementations and co-financing pilot projects which experiment with blockchain technology and new re-engineered administrative processes in the areas of relevance. It could still result in the various blockchain protocols being used in similar use cases while allowing for the development of common requirements for standards and infrastructures.

Standards definition



Supporting the development of international standards on security, privacy, and governance, creating certification processes to ensure compliance of blockchain architectures with these standards. Standards compliance will mark a critical point on the maturity scale of distributed ledger technologies.

Blockchain foundational components



Providing foundational components to support the utilization of blockchains, such as data model for certificates credentials and distributed identity management. This policy action would require a lot of research and market consultation, yet it could enable a high degree of interoperability on a service level.

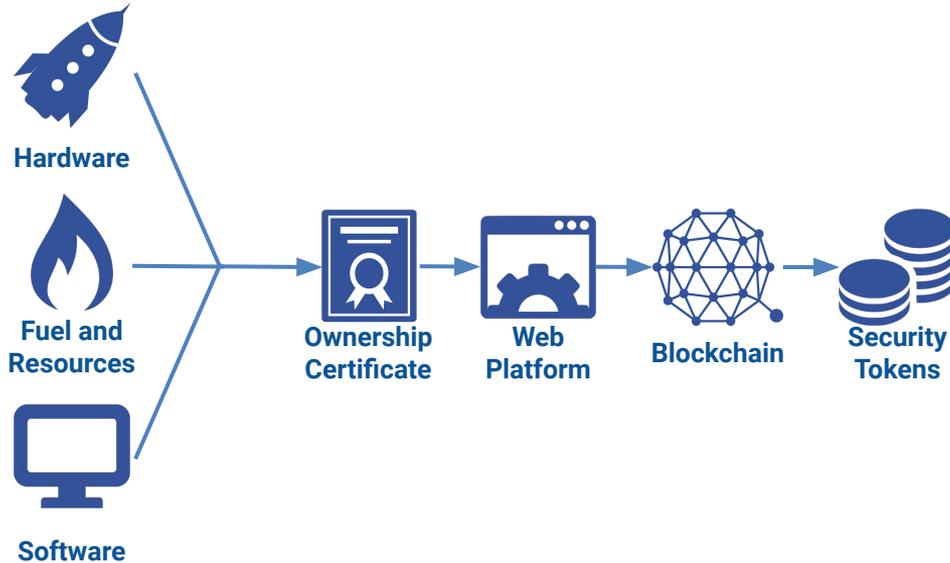
Use case-based dedicated infrastructures



Defining reference conditions and creating shared infrastructures most suitable for specific use case types, such as land title registries or tax systems.

POTENTIAL OF BLOCKCHAIN IN SPACE

As blockchain moves into outer space, its ability to tokenize spacecraft and payloads emerges as a key to its success, which could help in massive upcoming space projects such as the international, collaborative **Gateway space station NASA** wants to build in cislunar space near the Moon. With blockchain, it is possible to commercialize space exploration faster and more efficiently. Tokenizing a spacecraft would allow different entities to construct various components of the spacecraft, giving institutions like **NASA** and **ESA** the ability to procure things efficiently, with much more transparency and traceability.

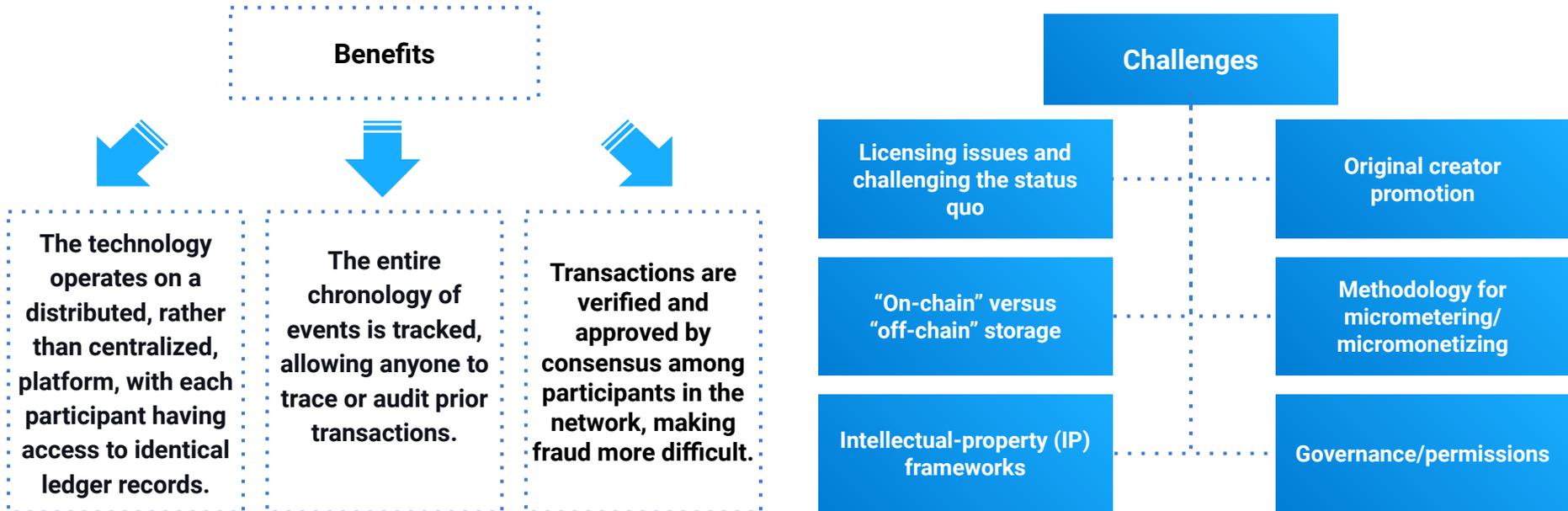


Because of the immutable nature of the blockchain, where every transaction is recorded transparently, tokenized assets are **immutable**, **verifiable**, and **always accessible** to all interested parties. The most crucial application of asset tokenization is that there are no territorial barriers to investing in assets. Hence, any interested entity from anywhere in the world can invest in an asset without complicated procedures, with high-security models and the speed of transfer offered by the blockchain network, due to the absence of middlemen.

Any asset can be tokenized into the blockchain network, including venture capital funds, materials, hardware, software, etc.

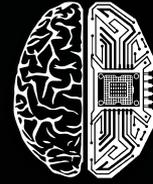
THE BENEFITS AND CHALLENGES OF BLOCKCHAIN

As blockchain technologies become more popular, bringing on their **benefits**, there arise multiple **challenges** to overcome for the significant increase of data-usage efficiency and overall quality of infrastructure. The most common challenges when talking about blockchain stem from the methodological and legal standpoint. With the industry itself being somewhat new and still in the process of self-defining, there is still a lack of fully-developed legislative and scientific backing toward defining the sector. At the same time, it's apparent that both governmental and private entities are working towards rectifying these issues.



KEY TAKEAWAYS

1. The direction of blockchain in space is only in its infancy, and at the moment, there are not many companies specializing exclusively in the intersection of these two industries. Therefore, the leaders are represented by a relatively **limited number of companies**.
2. Blockchain as an industry has recently developed into a major sector in economics. The market for its application **has grown exponentially** in the second decade of the twenty-first century. As blockchain technology can have different forms and applications, the market also varies in terms of spheres of the application. Currently, the most prominent forms of usage are Payment Systems and Exchanges, as cryptocurrency markets have been on the rise in **2010-2021**.
3. As of the third quarter of **2021**, the Blockchain sector contains **7 ETFs**, with the largest of them being **Amplify Transformational (BLOK)**, with more than **\$1.1B** in assets.
4. The rise of the SpaceTech market caused many new companies with apparent untapped potential to appear on investors' radars. Overall, the market capitalization of the SpaceTech Industry equates to **\$4.7T** as of the third quarter of 2021, with an expectation of continued steady growth of capitalization in this sector, reaching **\$10T** by **2030**.
5. On October 29th, 2018, the world's first space security token was announced by Venture Capital firm **SpaceFund**. The new token would allow for increased liquidity and efficiency for investors who wish to participate in the funding of the SpaceTech startups.
6. The options that blockchain offers to SpaceTech could be used to optimize further and improve the industry. Such technologies as **tokenization** allow for access to cryptocurrency markets for investments and provide additional security in terms of ownership rights to the holders.
7. While the most popular use of blockchain technologies has been in the **financial sector**, specifically due to **cryptocurrency**, other forms of its usage could be applied for space.



SpaceTech
Analytics

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