BitDust

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EIC HORIZON PRIZE

ON BLOCKCHAINS FOR SOCIAL GOOD

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FIRSTLY
THANK YOU
FOR CONSIDERING US!

Personal data has become a commodity that is collected, analyzed and in numerous cases have been misused by centralized entities in order to benefit them.
The dilemma for the EU in particular is how to uphold highly valued European privacy rights, while EU citizens use online data platforms which are outside of the full jurisdiction of the EU.

Our online software platform BitDust will enable EU citizens to be in full control of their personal data again. Enabling a future where personal data property rights are protected and are part of a new social good for the 21st century.
We want to thank the Committee for considering us as one of the potential winners of the EIC Horizon Prize on Blockchains for Social Good.

BitDust team
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CONTENT

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1 | ABSTRACT

... FOR PUBLICATION

Currently, personal information is becoming more valuable and significant in the rapidly developing digital world. Personal photos, files, data on relatives and children, etc. are currently stored in various centralized services and are often used by commercial third parties of competing sovereign nations without the permission of the data owner, sometimes causing harm and compromising highly valued European privacy rights.

The lack of secure and private storage is a problem for EU Internet users. BitDust Technology solves this problem by providing users the ability to store their data fully encrypted on a decentralized network via an easy-to-use application for Windows, Mac and Linux, without a centralized owner that decides what they will do with that data. Providing them the ability to share data only with trusted contacts. In this way, BitDust delivers a social good, privacy of highly valued personal data storage. All data that is stored on the BitDust network is encrypted with a private key that only the data owner possesses.

The blockchain within BitDust will be used to account for the work carried out (storage, data processing, data rebuilding, etc.) and to compensate supporters within the network. BitDust will benefit

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the collaborative economy by allowing normal European citizens to rent-out their hard disk space, thereby supporting the network. BitDust allows you to maximize the use of existing underutilized computer power. Users do not need to rent servers in large data centers, but they use the computer power of their neighbors and fellow EU citizens. This will significantly reduce wasted energy consumption.

BitDust will primarily contribute to section D (Decentralized Networks) by enabling a fully decentralized data storage and chat platform. Fully encrypted and anonymous. BitDust is written in Python using pure Twisted framework and is published under the open source licence GNU AGPLv3. More information can be found on www.bitdust.io or our GitHub (https://github.com/bitdust-io).

We believe that this technology will benefit society by increasing ownership of personal data and protecting data from unauthorized access or censorship.

2 | MAIN FOCUS

ENABLING THE DEVELOPMENT OF DECENTRALIZED SOCIAL NETWORKS OR CLOUDS, OR OF DECENTRALIZED PLATFORMS FOR THE COLLABORATIVE ECONOMY

BitDust focuses on section D "enabling the development of decentralized social networks or clouds, or of decentralized platforms for the collaborative economy" as indicated in the rules of Contest. BitDust developed a decentralized storage network whereby users can safely and securely upload, download and share their data.

 In addition it will also partly contribute to section E "Contributing to financial inclusion", since it allows normal EU citizens to rent out their existing underutilized computer power and get a financial incentive in return. The BitDust software platform is permissionless meaning that any normal citizen can join the network and support it.
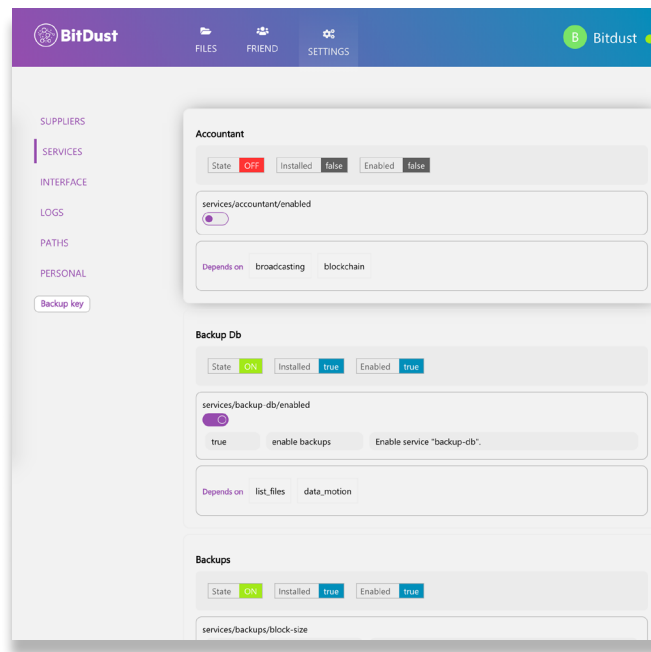
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3 | NATURE OF THE APPLICATION
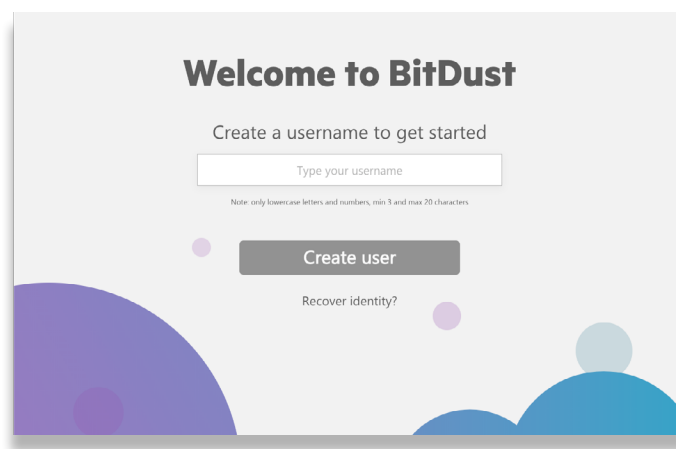
BitDust is a distributed on-line storage software platform, in which only the data owner has full access to their private data and has the ability to share it with others. The main purpose of BitDust is to create a fully independent storage solution where people can store personal data and make sure that data is kept private and is never compromised.

Currently we provide an easy to use application which is available for Windows 10, MacOS and Debian Linux. A user can safely and securely upload, download and share personal data with trusted contacts. The data is stored on the network of thousands of computers, which only the owner of the data can access with

their Private Key, rather than one single company. Any private information you upload to the BitDust network is encrypted before leaving your device and only with your Private Key you can read, share or remove it.

The BitDust network consists out of users and supporters. Users are normal people utilizing the network to manage their files securely. Data that a user uploads is divided into blocks and fragments, copied twice creating redundancy, encrypted

and transferred to the computers of your suppliers. The system is designed to perform continuous monitoring of every supplier, to make sure your data is available.
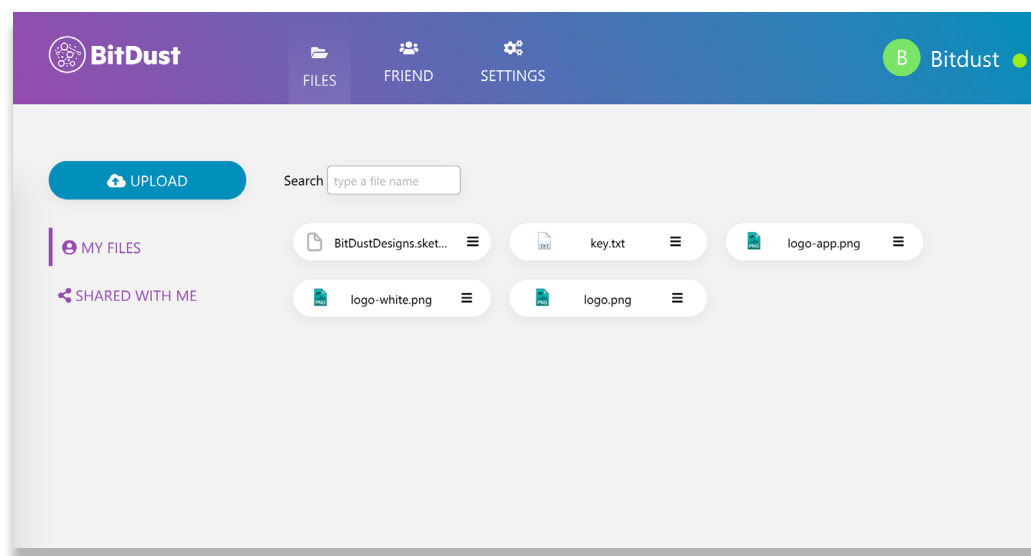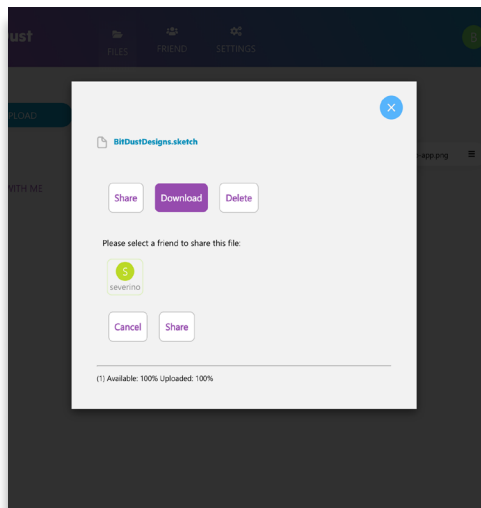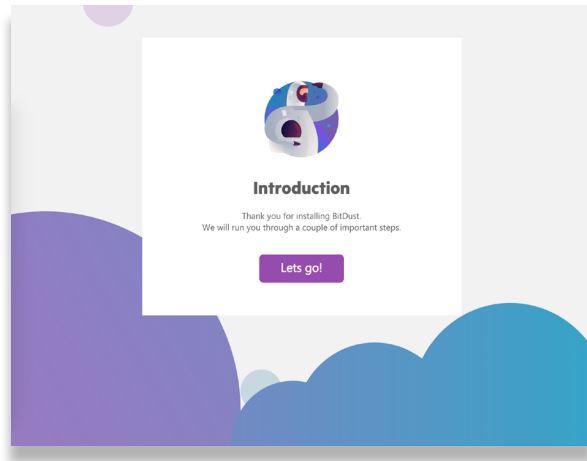
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Supporters of the BitDust maintain the network. BitDust has multiple roles that support the network and enable users to safely and securely store their private files. The roles which we currently offer are the supplier, the router and the ID server. The supplier contributes storage to the BitDust network, thereby enabling customers to store and access their encrypted files. The Router helps other nodes to reach each other inside the BitDust network and to send/receive encrypted packets. The ID Server maintains users authentication in the BitDust network. As a supporter you can fulfill multiple roles at the same time depending on your hardware. To determine whether your system has the necessary please check the minimum requirements for the role.
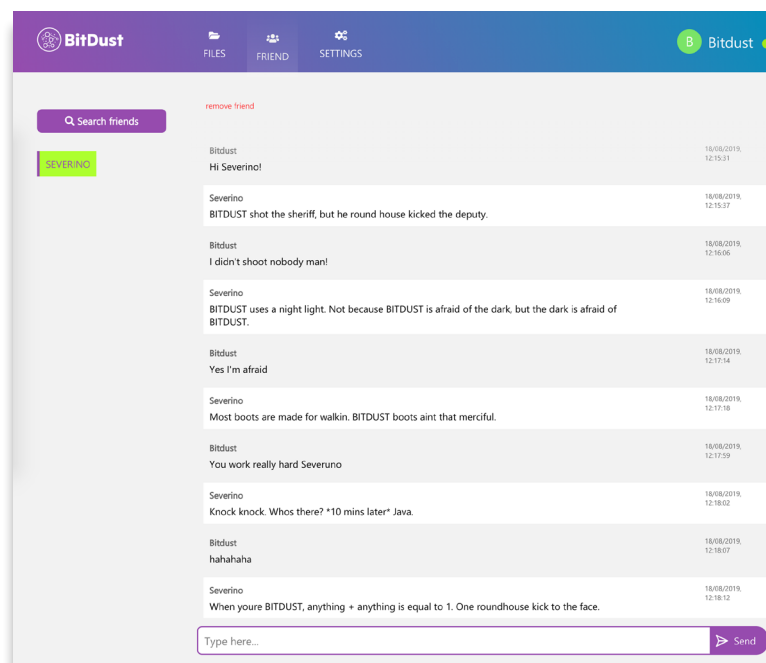
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There are two supporting roles we will enable in the future for the BitDust network which are the Miner and the ReBuilder. In the future the Miner will enable the blockchain within BitDust and will be used to account for the work carried out (storage, data processing, data rebuilding, etc.) and to compensate supporters within the network. The ReBuilder restores the data which was lost when one of your suppliers goes offline. The mechanism of automatic data restoring allows dynamic reassembling of the data fragments uploaded into the network on the new nodes without any action from the user. We have started the development for both roles to further enhance the functionality of the BitDust network. Note that a first Alpha version of the BitDust network is already live and matches a TRL7 of Technology Readiness.

Detailed information about the software is available on the www.bitdust.io web site and we provide an extensive wiki whereby you can read about the architecture of BitDust here https://bitdust.io/wiki. In addition you can find detailed information about the code of BitDust on our GitHub repository (https://github.com/bitdust-io).

A user version for BitDust can be downloaded on our website for Windows, MacOS or Linux or by clicking the following links:

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5 | PARTICIPANTS

WE ARE FULLY CHARGE.

The BitDust team consist out of 3 professionals with 10+ year working experience and is supported by other parttime contributors. Each member brings a different skillset in order to make BitDust flourish. The details of each member is listed below.

CEO – Desmond Dekker

Desmond has over 10+ years working experience in the online gaming and the telecommunication sector. During his career he fulfilled different positions ranging from Marketeer of mobile propositions (KPN) to Business development of gaming platforms (Spil Games). Currently he is an Innovation Manager in the IT Innovation department at Royal KPN, which is the largest telecommunication company of The Netherlands. He focuses on managing IT projects and Organizational experiments concerning

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self-organization and self-steering. In addition he organizes and sponsors Blockchain events. For BitDust he is responsible for business development, finance, legal and other general activities outside of IT development. He holds a Master Degree in Business Administration from the University of Groningen.

He has the Dutch nationality and currently resides in Amsterdam, The Netherlands.

CTO & Founder – Veselin Penev

Veselin has over 10+ years working experience in software development. Starting his career in developing complex training simulation for the aviation industry he moved into developing a distributed network for the backup of data storage. From that experience he founded BitDust. He currently holds the position of Lead Architect at Royal KPN, where he worked on different projects ranging from organizing Customer Data to developing the main API within KPN IT. Within BitDust he is responsible for the overall architecture of the decentralized network.

He holds a Master Degree in Computer Science and Mathematics from the University of Saint Petersburg. He has the Bulgarian nationality and currently resides in Nieuw Vennep, The Netherlands.

Software development
Renato Cardoso

Renato has over 15+ years working experience in software development. He started his career in graphical design and web development at various Digital Marketing companies in Brazil. After that he moved to Amsterdam, The Netherlands and focused on front-end development and User Interaction at various online companies. He currently works as a developer at Royal KPN - Ciso, where he is responsible for security applications.

For BitDust he is responsible for the design and front-end development of the user interface of BitDust. He has the Portuguese nationality and currently resides in Amsterdam, The Netherlands.

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5 | SOURCE CODE

BitDust has been under development in its current form since 2014 and has over 3000 commits on GitHub. BitDust is licensed under the GNU Affero General Public License v3.0 and has been Open Source since 2014. The GNU Affero General Public License is a free, copyleft license published by the Free Software Foundation in November 2007. The licenses for most software and other practical works are designed to take away your freedom to share and change the works. By contrast, the General Public License (GNU v3.0) is intended to guarantee your freedom to share and change all versions of the BitDust program, in order to make sure it remains free software for all its users.

In addition a secondary benefit of defending all users' freedom is that improvements made in alternate versions of the BitDust program, if they receive widespread use, become available for other developers to incorporate. The GNU Affero General Public License v3.0 is one of the most widely used open source licenses today and ensures that the BitDust software is completely open source.

6 | ADHERENCE TO THE AWARD CRITERIA

WE BRIEFLY DISCUSS HOW THE AWARD CRITERIA FIT WITH THE CURRENT STAGE OF THE BITDUST NETWORK.

POSITIVE SOCIAL IMPACT

BitDust currently released an Alpha version for users for Windows, MacOS and Linux. BitDust has a running operational environment where by users can do the following:

- CREATE AN ACCOUNT ANONYMOUSLY AND RECEIVE A PRIVATE KEY WHICH ENCRYPTS ALL YOUR DATA.

- UPLOAD, DOWNLOAD AND SHARE FILES VIA AN EASY TO USE INTERFACE.

- SEARCH AND ADD OTHER USERS TO YOUR FRIENDS LIST.

- END TO END ENCRYPTED CHAT WITH OTHER USERS.

We are currently working on implementing two new features that will benefit user experience and also attract more supporting roles to join the BitDust network.

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1 Currently when a supplier that stores your data goes offline then as a user you need to manually replace your supplier. Because of redundancy, your data can be placed at a new supplier. However we are currently developing a new role called the "ReBuilder". A ReBuilder will rebuild your data and places it automatically at a new supplier.

2 Blockchain: Currently there are no incentives on hosting encrypted data by suppliers or performing any kind of supporting role for the BitDust network. We are already testing to implement a blockchain to keep track of all the interactions within the BitDust network. In order to facilitate that we will implement the BitDust blockchain within the BitDust network and create a new role called the "Miner". The Miner will enable the blockchain within BitDust and will be used to account for the work carried out (storage, data processing, data rebuilding, etc.) and to compensate supporters within the network.

DECENTRALISATION AND GOVERNANCE

The BitDust network is completely decentralized and permissionless. Any machine with the correct configuration can join the network freely.

There is no central entity that controls the BitDust network. In addition you are free to create an account with only a nickname. No other additional information is needed, making it completely anonymous. All your personal data is RSA encrypted there by upholding the highest standard of privacy. The user creates a key locally which encrypts and decrypts all their data. Only the user

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possesses the key, there is no other entity that holds a copy of your key. In addition the BitDust software is completely open-source, thereby making it highly auditable.

Existing storage platforms provide a centralized solution, whereby the company has full control over your data. For example Google, Apple, Dropbox, etc. These corporations have full control over your data and have the power to read, copy or in other form distribute your data to third-parties. Although it might be that within their terms of conditions they have stated that they will not do it, it is possible to do that from a technical perspective. When data is stored on the BitDust network your suppliers hold only a small portion of your data. In addition all the data that is stored on your suppliers is RSA encrypted, making the data useless if you don't possess the private key.

USABILITY AND INCLUSIVENESS

BitDust offers users an easy to use application for the most common computers (Windows, MacOS, Linux)

Any person with a computer and an internet connection can download the BitDust application and start using it. In addition there are no criteria for a user to start using BitDust, making it accessible to almost everybody in the EU.

BitDust plans to make a simple economic model utilizing blockchain technology to bring users and suppliers and/or other supporting roles together. The market based on supply and demand will provide the cost associated with storing data. However current estimates are that renting 1 TB per month will be around a few euro per month. Which makes it vastly cheaper than current solutions.

Each element of the BitDust network is replaceable at any moment in time and there are no hard dependencies between the nodes in the BitDust network.

At any given time, any number of users can connect to the network without any barriers and start using privacy-respecting online services. Due to the complete distribution of information flows among independent machines, the network is easily scalable to millions of nodes without loss of connection speed or the quality of services provided. Private data is transmitted directly from node to node, which in some cases can improve the speed of downloading and uploading files in comparison with classic online services where all users depend on the quality of the infrastructure of the service provider. In other words, high scalability of BitDust is ensured by the system design and software quality.

The use of modern technologies such as Distributed Hash Table, Blockchain, Cryptography and smart algorithms allows you to build an application with exclusive properties: fault-tolerant, high-performant, secure and, most importantly, preserving the privacy of user data. Privacy, freedom and mutual respect are the main principles that BitDust was built on. In combination with distributed data storage, we have implemented a fundamentally new method of authentication and authorization of users when they use the BitDust application. Instead of logging in using a username and password, your device will automatically generate a secret private key for you when you start the BitDust application for the first time. Your private key is the only way to access uploaded personal data and is also used for the identification and verification when communicating with other users on the network. You can also use the so-called "keychain" - at any

time you can create a new key and use it to encrypt data that you later want to share with your friends. Thus, only you and your friends have access to a particular file and no one else. Personal data is always encrypted on your side before leaving your device and only you control your "keychain". That means that other users who store your personal data do not have access to it, but only the data owner.

For encryption and verification, we have implemented RSA, AES, and DES3 algorithms that are well-tested by time and we are planning to expand this list in the future with more modern BlowFish and Elliptic-curve, which will improve the performance of the entire network.

EU   EUROPEAN ADDED VALUE

There are numerous elements where by BitDust provides an added value for the European Union. They are listed below.

1   Protection of personal data of EU citizens and companies.

The major added European value of BitDust is that it provides EU citizens the power to be a data owner again. To store their personal data securely and safely. To share it with whomever they want and be absolutely sure that their personal data is not being misused. This is vastly different as stated before with current centralization solutions.

The BitDust technology complies with the basic principles of The General Data Protection Regulation (EU) 2016/679. Moreover, it allows an EU citizen to become a controller of their data. This solves a part of the current challenges people face when becoming responsible for the proper use of their personal data.

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2 **Promotion of the importance of personal data protection in the EU.**

With the development of technology the value of personal information is growing exponentially. It is therefore crucial that every EU citizen should realize the importance of their personal data and securely store them on their own. This is for example similar to human health, the EU conducts programs to support the health of their citizens, however it is the responsibility of each individual to maintain their own health to the best of their abilities. If they neglect their health (personal data) it can lead to unfavorable consequences. BitDust facilitates in making sure that your personal data remains healthy. BitDust enables Data privacy and ownership which are the new social goods of the 21st century.

3 **Support for freedom of speech and opposition to censorship.**

Freedom of speech and censorship is one of the foundations of a democratic state. Currently, most of the media is electronic and a vast portion of the information citizens receive is digital, growing at a rapid pace. It is easy to change, falsify, censor electronic information. To counter these potentially harmful threats BitDust allows you to store and share information without adjustment and/or redaction of the document by third parties.

4. Creating a new distributed (European) data storage market.

From an economic perspective BitDust can spawn a large amount of suppliers who enter the market together and increase economic efficiency when it comes to price per stored Gigabyte. Currently this is vastly different since there are only a handful of companies providing storage space at the moment. From a societal perspective an EU citizen can also freely become a supplier when they have the right equipment and in return host encrypted data of fellow EU citizens safely. Enforcing a more united European Union among its citizens. It is this community thought that drives the BitDust development team.

5. Saving on electricity and resources.

The economy of the 21st century is committed to the most efficient use of various types of resources, by developing a Sharing economy (Car sharing, House sharing, etc.) BitDust allows you to maximize the use of existing underutilized computer power. Users do not need to rent servers in large data centers, but they use the computer power of their neighbors and fellow EU citizens. This will significantly reduce wasted energy consumption. In addition low energy home servers have reduced in energy consumption tremendously over the past 10 years. Europe is aiming to produce 24GW of solar energy by 2020 (source: solarpowereurope.org). A large part of this solar energy is also coming from solar panels mounted on residential homes. In this scenario, in the years to come, EU citizens will be able to become a BitDust supplier using their own low energy hardware that is powered by their own green solar energy.

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7 | PUBLICITY MEASURES

BITDUST WAS CREATED UNDER THE CRITERIA OF FULL TRANSPARENCY TO ITS USERS AND SUPPORTERS. OUR CODE IS COMPLETELY OPEN-SOURCE AND WE WELCOME CONTRIBUTORS TO IMPROVE THE BITDUST CODE. WE HAVE TAKEN THE FOLLOWING ACTIONS TO INFORM (POTENTIAL) USERS OF OUR APPLICATION.

- **Website:** BitDust has an informative website where (potential) users can read about the BitDust network and can install a consumer version of the BitDust application on their computer. See more information on www.bitdust.io.

- **GitHub:** BitDust's development is open source and the code can be reviewed in our code repository on https://github.com/bitdust-io.

- **YouTube:** BitDust has created an informative video on what BitDust is and what it aims to solve. See video https://www.youtube.com/watch?v=CiyHeMUJgys.

- **Wiki:** BitDust has created an extensive wiki with articles describing the BitDust network and the underlying architecture. In addition articles were made to inform people on how they can become a supporter of the BitDust network. See more information here https://bitdust.io/wiki/.

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- **Telegram:** BitDust has created two channels on telegram to inform people about the development progress and to have discussions about the BitDust network. See more information here https://t.me/bitdustnews.

We do recognize that we are with a small team and have been mostly focusing on the development of the BitDust network. However there are plans in the future to inform the public more by:

- **Meet-ups:** BitDust wants to organize meet-ups where fellow enthusiast regarding decentralized storage networks can come together. Most likely we will start in Amsterdam, The Netherlands.

- **Informative video's:** BitDust wants to create informative video's on how to use the BitDust application correctly.

- **External exposure:** BitDust wants to contact external blogs, vlogs and other informative sites to inform the public about the BitDust network.

These above measures will help to inform the public about the importance of personal data security. Furthermore we authorize the Commission services to disclose any additional information regarding the BitDust software and its team members.

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8 | ETHICS

Gern Leonhard, a renowned futurologist, once said: "A society without ethics is doomed". What he means by this is that there is a danger in setting aside human values when pursuing technological progress. Technology knows no ethics. However the way technology is progressing is mostly due to what we as humans think is the proper way forward. Lines of codes represent human thinking. But there is always a danger when mankind wants to test the outer edges of technology and investigate what is possible. It can be that during that journey one disregards whether what they are doing is also ethical.

90% of all data was created in the last two years and a large part of this data can be categorized as personal data. The majority of this data is stored at a few corporates like Google, Facebook, Amazon, etc. However during recent years it has been questioned whether your personal data is still safe and secure with these centralized entities. There have been numerous investigations about the potential misuse of personal data by these large corporations. Facebook for example has been under investigation and fined by the SEC for the misuse of customer data. Just recently the EU's powerful antitrust authority launched an in-depth investigation into Amazon, amid suspicions the US-based online behemoth misuses merchant data hosted on its website. Apart from misuse of data by corporations there have also been sufficient examples

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that personal data was hacked by third parties. These examples provide the basis of a growing sentiment that people need to be more careful on where they store their data. BitDust aims to provide a solution whereby your data is distributed among different servers in the network and where by all your data is encrypted using RSA encryption. Only you as the user hold the key to decrypt your data. There is no other central entity that stores your key. BitDust aims to provide decentralized and encrypted storage for personal data for EU citizens and citizens outside of the EU, there by focusing solely on being a civil application.

The BitDust project has the obligation to comply with ethical principles, as set out for instance in the Horizon 2020 guidelines as the European Code of Conduct for Research Integrity.