Enhanced EIC Accelerator Pilot (SME Instrument Phase 2) – Document 1

1. BASIC INFORMATION
(company description and summary)

Title of proposal: *Document eDelivery and Notarisation Blockchain Enterprise Suite (i.e. DEN-BES)*

Acronym of proposal: *DEN-BES*

Brand name: *4thpillar Technologies (i.e., 4thTech)*

Authors: *Dr. Tali Rezun, Denis Jazbec, Roman Dobrina and Anton Dobrina*

Details of applicant:

Name of the entity	4thTech Consortium
Project website	https://the4thpillar.io/
Creation date (if applicable)	03.10.2020
Type of entity	Consortium

1. Project Description

4thpillar Technologies (i.e., 4thTech) is a brand of the 4thTech Consortium and was established in 2017 to address the issue of blockchain data exchange and eDelivery.

2. Summary

4thpillar Technologies (i.e., 4thTech)[1] main innovation is the blockchain data eDelivery and document notarisation protocol, accompanied by a unique digital identity solution. Compared to existing systems, the 4thTech solution offers secure cross-border immutable service upgrade. Main protocol technical innovation reveals from the fact that the exchange data is not stored on the blockchain (e.g., storing or sending documents through any blockchain would be unsustainable). The electronic data and documents are stored off-chain. The protocol records links to encrypted files and hashes of the encrypted content on the blockchain. This safeguards the rights of individuals to confidentiality and privacy. Designed and built completely by the 4thpillar technologies, the protocols MVP is fully operational, ready for testing and provides the core technology solution for Europe's public and private sector.

The overall strategy of the 4thpillar Technologies is based on the implementation and adoption of the project's blockchain digital identity, data eDelivery and Notarisation solutions, to enable the cost-efficient transition to immutable, cross-border and green DLT systems.

[1] '4thpillar Technologies - Blockchain EDelivery Protocol' <https://the4thpillar.io/> [accessed 25 September 2020].

SECTION 1 – EXCELLENCE
(introduction, objective, scope, solution, compatibility, innovation, maturity, challenge, risk)

1. Introduction

Advanced blockchains and other DLT technologies are being tested and implemented on European and global level, creating the infrastructure for innovative applications. Now is the time to move forward with society beneficial applications. 4thTech already utilizes the power of blockchains to secure cross-border immutable electronic data and document exchange and eDelivery with unique features such as document source authenticity and timestamps (i.e., notarisation), while providing digital identity through blockchain address connection with physical person or organisation. 4thTech will enable legal, governance and technical interoperability in-line with European Blockchain Services Infrastructure with global usability, while meeting the highest standards of security, privacy, sustainability and compliance with EU laws.

2. Objective

The main objective of the project is to develop and deploy CEF compatible *Document, eDelivery and Notarisation Blockchain Enterprise Suite (i.e., DEN-BES)*, a suite of cross-blockchain applications that are essential in every organisation. Parallel to that a collection of APIs will be developed to provide a quick adoption solution. *The Document, eDelivery and Notarisation Blockchain Enterprise Suite (i.e. DEN-BES)* will be also deployed and integrated on *Slovenian National Blockchain Test Infrastructure* (i.e. SI-Chain)[2], providing a framework for future blockchain services. This action will support the development of blockchain identity, eDelivery and Notarisation, more specifically it will help build the foundations for safe, reliable cross-border digital services between both public and private sectors, as well as between such entities and citizens and organizations.

3. Scope

We are building the enterprise-level blockchain infrastructure with cross-border blockchain applications, based on a proven working pilot. The project scope is divided into ten activities; (1) transition development from MVP to production; (2) CEF (Connecting Europe Facility) compatible access-point blockchain gateway development; (3) hardware infrastructure and technology scalability setup and development; (4) EU compliant digital identity certificate integration; (5) API development; (6) support content and documentation creation; (7) client IT help desk setup; (8) support staff recruitment and training; (9) sales team recruitment and training, and; (10) marketing and sales activities.

4. CEF&eIDAS compatibility

To fully implement the blockchain 4thTech services and, to make it compliant with the Digital Service Infrastructure (DSI) and policy objectives, it is subjected to its unique Enterprise Access-Point (i.e. EAP) development. The current CEF eDelivery[3] solution is based on a model, where the Access Points of eDelivery implement an electronic data and documents exchange protocol which ensures secure and reliable data exchange. Trust is established between two public administrations' Access Points and the electronic data and documents exchange is activated. We propose the development of a new Enterprise-level Access-Point, where trust will be provided by the blockchain. The proposed 4thTech Enterprise Access-Point will behave in a similar way to the current CEF Access Point but with the main difference of interacting directly with the blockchain. In this case, there is no need for interacting with receiver Access Point. Also, there will be some differences in the case of the Access Point, SML, and SMP interacting because electronic data and documents are transmitted to receiver Access Point over blockchain, not over the internet and different data is used to determine the receiver. Electronic identification (eID) and Trust Services are key enablers for secure cross-border electronic transactions and central building blocks of the Digital Single Market[4]. The compatibility with existing eIDAS infrastructure will be achieved in two phases; (1) integration of Digital Certificate Standard X.509 Public Key Infrastructure, and; (2) integration of EU Login eID standard.

[2] 'Slovenia Launches National Test Blockchain Infrastructure and Slovenian Blockchain Partnership | GOV.SI' <https://www.gov.si/en/news/slovenia-launches-national-test-blockchain-infrastructure-and-slovenian-blockchain-partnership/> [accessed 31 August 2020].
[3] 'EDelivery' <https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/eDelivery> [accessed 27 May 2020].
[4] 'Trust Services and Electronic Identification (EID) | Shaping Europe's Digital Future' <https://ec.europa.eu/digital-single-market/en/trust-services-and-eid> [accessed 1 October 2020].

5. Compatibility with the existing systems

The Document, eDelivery and Notarisation Blockchain Enterprise Suite (i.e. DEN-BES) high-level architecture will enable blockchain technology to be used as a service in the background in sync with existing enterprise systems and compatible with European CEF infrastructure, sourcing blockchains' true potential and benefits. A bridge will be developed between most used ERP systems such as SAP. This will enable fast integration into already established working processes used by organizations.

6. 4thTech digital identity mechanism (part of DEN-BES)

Blockchain digital identity mechanism derives as a direct result of the existing blockchain eDelivery protocol. The identity mechanism is capable of individual (or organization) wallet address verification. A link is created between an individual (or organization) and their blockchain wallet within the 4thTech system. The identity mechanism is also capable of; (1) connecting the X.509 standard digital certificate with blockchain wallet; (2) providing the digital identity for blockchain eDelivery, and; (3) providing digital identity for blockchain Notarisation.

Simplifying the blockchain digital identity process;

1. user account creation using 4thTech blockchain gateway wallet system;
2. digital certificate (i.e. x.509 standard) user KYC connection process;
3. digital certificates user identity verification check;
4. link creation between the verified user and his/her wallet

7. Digital certificate X.509 standard[5]

Digital certificate standard X.509 Public Key Infrastructure can be used for data encryption, notarization of signed data, digital signature, digital identity verification and timestamp. With various European Union certificate publications, the X.509 standard is widely used and as such appropriate for blockchain digital identity integration. The X509 Public Key Infrastructure is also approved by eIDAS[6] (i.e. electronic IDentification, Authentication and Trust Services).

8. 4thTech blockchain eDelivery protocol (part of DEN-BES)

As the main 4thTech solution, blockchain eDelivery protocol leverages trust provided by the blockchain and provides secure, immutable, instant cross-border electronic data and document exchange. The fully-featured protocol is capable of; (1) connecting senders and recipients by executing blockchain electronic data and documents exchange (i.e. blockchain eDelivery); (2) performing blockchain eDelivery based on the current CEF (i.e. Connecting Europe Facility); (3) archiving securely encrypted data and documents off-chain, and (4) following the EU GDPR guidelines.

Simplifying the blockchain eDelivery process;

1. electronic data or documents upload to the 4thTech API;
2. the electronic data or documents storage to the off-chain repository (enterprise repository options will be available);
3. sending the link to encrypted files and hashes of the encrypted content through the private or public blockchain to a recipient-specific wallet address;
4. download and decryption of the received electronic data (decryption is done with the user's private key saved in the 4thTech blockchain gateway wallet system)

**Follow the link to view 4thTech eDelivery MVP video tutorial: https://youtu.be/s-zyVMCB8Pc*

[5] *Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile*, 2008 <https://tools.ietf.org/html/rfc5280> [accessed 25 September 2020].
[6] '(No Title)' <https://www.luxtrust.com/wp-content/uploads/certificates_explained.pdf> [accessed 25 September 2020].

9. 4thTech blockchain notarisation service (part of DEN-BES)

4thTech notarisation service is a by-product of eDelivery protocol and digital identity mechanism and can leverage the power of cross-DLT blockchains to facilitate source and time confirmation for digital data and documents. The 4thTech blockchain notarisation service is also capable of; (1) storing and timestamping a digital data or document; (2) providing the verification of the digital data or document authenticity, and; (3) providing access and review of the notarisation details.

Simplifying the blockchain document notarisation process;

1. user account creation using 4thTech blockchain gateway wallet system;
2. user account verification using 4thtech digital identity mechanism which uses established online verifications protocols (i.e. digital certificate standard x.509 public key infrastructure);
3. digital data or document upload to the data repository, using eDelivery protocol, and;
4. blockchain notarisation transaction verification, using 4thTech blockchain checksum mechanism

**Follow the link to view 4thTech Notarisation MVP video tutorial: https://youtu.be/cG5KDx5Ahmo*

10. Stage of development

Blockchain technology proposes the ideal foundation to simplify digital data and documents exchange. To address this issue in 2017, 4thTech proposed (TRL 2 level) and later developed (TRL 3 level) a safe, fast cross DLT blockchain-based solution, which leverages trust provided by the blockchain and provides secure, immutable, instant cross-border electronic data and document exchange. To provide an option for blockchain address ownership verification, the identification mechanism later was constructed in 2018, which can with the help of X.509 Public Key Infrastructure authenticate the verified connection between a blockchain wallet and a person. Notarisation Service is also an essential part of the 4thTech ecosystem and provides unique digital data or document timestamp and authenticity verification. After two years of the protocol MVP testing in real life, the technical feasibility and its practical potential have been proven, with that TRL 7 level was achieved.

11. DLT deployment

Deployed first at Kovan[7] test-net at the beginning of 2018 and later on the Ethereum[8] main-chain proved to be a good decision which provided a reliable 4thTech data eDelivery protocol testing environment. The third protocol deployment was the SI-Chain private-chain deployment in 2020. There are two additional public-chain deployments planned until the end of 2020; (1) Polkadot[9] main-net, and; (2) HashNet[10] main-net. Private and public chain deployments form the basis for projects two pricing model, which will be described in details in the revenue model section.

12. Business challenge

During the first years of public blockchain application release, business models for their use were strictly transaction-based, paying each transaction with utility tokens released by the project in question. While this was the beginning of the blockchain adoption, we are currently experiencing extreme transactions price volatility[11] of "gas" utility tokens. Utility "gas" token price volatility is directly affecting transaction costs and network congestion which is resulting in low adoption of these business models. Even though open-chains brought transparency, volatility and network congestion makes it impossible to build a sustainable revenue model.

Private-chains are natively non-transparent, but they provide more constant performance, faster transactions and enable viable revenue models. Private-chains enable fixed transaction cost calculated and agreed between the network provider and user, paid not just in tokens but also in fiat.

[7] 'Kovan Testnet' <https://kovan-testnet.github.io/website/> [accessed 25 September 2020].
[8] 'Home | Ethereum.Org' <https://ethereum.org/en/> [accessed 25 September 2020].
[9] 'Polkadot: Decentralized Web 3.0 Blockchain Interoperability Platform' <https://polkadot.network/> [accessed 25 September 2020].
[10] 'Tolar - Hashnet' <https://www.tolar.io/hashnet> [accessed 29 April 2020].
[11] 'How DeFi Is Driving The Spike in Ethereum's Gas Price' <https://insights.glassnode.com/defi-spike-ethereum-gas-price/> [accessed 27 September 2020].

13. Technological challenge

As the 4thTech MVP protocol has been up and running for the past two years, main technical challenges remain in blockchain interoperability and scalability. To understand the solution, we must first take a look at the blockchain hardware layer and containerization.

13.1. Blockchain Hardware Layer

According to the Layered Structure of the Blockchain Architecture - Oracle Blockchain Quick Start Guide[12], the blockchain and its content is usually hosted on a server in data centres around the world. Content or data is sourced from application servers, which is commonly referred to as client-server architecture. Blockchain can be specified as a P2P network of computers that execute, validate, and store transactions in a shared organized ledger. Each computer in a P2P network is called a node. Each node is responsible for; (1) transaction validation; (2) transaction block organization, and; (3) transaction network broadcast. When consensus is reached, nodes are committing the block to the blockchain network and update the local ledger copy. This layer comprises of virtualization (i.e. creation of virtual resources such as storage, network, servers etc.). There is no hardware limitation as to where the blockchain nodes can be installed. Servers, clouds, personal computers or even phones will do just fine. According to our research, there should not be any hardware interoperability issues.

13.2. Containerization

Blockchain and containers are two technologies, but they share a common decentralized path. Just as blockchain uses decentralization to store data, a containerized application leverages multiple containers to distribute workload and shifts the workload across the environment if application demand. There are also other beneficial consensus factors in combining blockchain and containers when some blockchain nodes disconnect, others continue the operation with no data loss, which also applies for containers, as they operate similarly. If one container disconnects, the others take over the tasks. There are also similarities regarding immutability, where both technologies act as immutable infrastructure. To change or add blockchain records, new data is written, opposing to change the existing one. The same philosophy applies to containers, as the existing containers are not changed when modified, new containers are added[13]. There are several blockchain Containerization platforms, that enable the creation and deployment of self-contained, software components. These components can then be combined to create a service offering (SaaS), web or mobile application (app), or distributed blockchain application (dApp)[14].

13.3. Containerization and DLT interoperability

In the case of multi DLT system containerization on the same server, there should not be any conflicts. During the testing research the Docker and Kubernetes, performed without on the same server, running different DLTs without any issues. In the Docker case, conflicts can appear in the case of the same port usage if running multiple containers on the same machine. Blockchain and different container software interoperability-- Numerous use cases have proven the interoperability between blockchain and container software, but the blockchain interoperability with different container software remains an open issue.

13.4. Solution to scalability

According to our research, if the same nodes are running on the same blockchain, the interoperability with different container software should not present a problem. The same applies to the case where some nodes run container software and others do not.

[12] 'Oracle Blockchain Quick Start Guide' <https://www.packtpub.com/product/oracle-blockchain-quick-start-guide/9781789804164> [accessed 25 September 2020].
[13] 'Blockchain and Containers: More in Common than You Think - Container Journal' <https://containerjournal.com/features/blockchain-containers-common-think/> [accessed 30 May 2020].
[14] 'Docker Usage in Blockchain - Oneupcompany - Medium' <https://medium.com/oneupcompany/docker-usage-in-blockchain-1ef7dd4a1dd0> [accessed 30 May 2020].

Blockchain and containers are two technologies, but they share a common decentralized path. Just as blockchain uses decentralization to store data, a containerized application leverages multiple containers to distribute workload and shifts the workload across the environment if application demand. There are also other beneficial consensus factors in combining blockchain and containers when some blockchain nodes disconnect, others continue the operation with no data loss, which also applies for containers, as they operate similarly. If one container disconnects, the others take over the tasks. Docker, Kubernetes systems will be used to achieve technology scalability. Developed Docker containers will be integrated into Kubernetes clusters, which will enable the scalability of our systems.

14. Societal challenges

4thTech solutions were designed and build from the start to enable green electronic data and document exchange between organizations and end-users. *The Document, eDelivery and Notarisation Blockchain Enterprise Suite (i.e. DEN-BES)* will provide viable digital transformation option that can significantly reduce the usage of paper and reduce organization carbon footprint.

SECTION 2 – IMPACT
(market and clients, commercialisation strategy, revenue model, KPI)

1. Market landscape

Blockchain applications are still a part of a niche market and it is difficult to understand the size and the potential. The growth in Industry 4.0 is expected, as the growth in global trade and financial market volume. Clear digital transformation patterns are forming leading to decentralized solutions and autonomous data-sharing operations.

According to Blockchain Market Size, Growth, Trends and Forecast to 2025[15], the global DLT market size is expected to grow from 2,5 billion EUR in 2020 to 33 billion EUR by 2025, at an impressive Compound Annual Growth Rate (CAGR) of 67.3% during 2020–2025. The increasing need for simplifying business processes and supply chain management applications integrated with the DLT technology will drive the overall DLT market.

The increase of volume, digital transformation, online privacy, security and real-time digital data exchange are all contributing to the creation of a larger market for blockchain-based solutions such as 4thTech Enterprise Suite.

2. Competition

4thTech has developed a blockchain upgrade to existing CEF (i.e. connecting Europe facility) eDelivery. The solution is leveraging trust provided by the blockchain to achieve secure, immutable, instant cross-border electronic data and document exchange. As such 4thTech solution is unique to the market. According to extensive research, there is no working blockchain electronic eDelivery with notarisation feature available on the market.

**Supported and approved by Slovenian Ministry of Public Administration, the consortium was formed between 4thpillar technologies and HashNet, to enter the INEA (i.e. European Commission Innovation and Networks Executive Agency) 2020 CEF Telecom Call - eDelivery (CEF-TC-2020-1)[16]. The consortium presented the blockchain eDelivery cross-platform (i.e. Windows, Mac OS, Linux, Android, iOS) client as a blockchain CEF solution upgrade.*

[15] 'Blockchain Market Size, Growth, Trends and Forecast to 2025 | MarketsandMarkets' <https://www.marketsandmarkets.com/Market-Reports/blockchain-technology-market-90100890.html> [accessed 22 September 2020].
[16] '2020 CEF Telecom Call - EDelivery (CEF-TC-2020-1) | Innovation and Networks Executive Agency' <https://ec.europa.eu/inea/en/connecting-europe-facility/cef-telecom/apply-funding/2020-edelivery> [accessed 25 September 2020].

3. Customer segments

4thTech aims to provide services to the following client groups:

- EU-Commission
- National governments of all EU member states
- Municipal and other local governments
- Public sector organisations, such as document issuing entities, central banks and regulators
- Private sector organisations from sectors of finance, logistics, IT, manufacturing and other

Group segmentation:

- Partners, who purchase one of the 4thTech subscription plans
- Software partners who use 4thTech development tools and purchase one of the subscription plans or use services on public chains
- Public and private organisations that want to improve performance and reduce the cost of their existing electronic data and document exchange

4. Success factors

In the long term, the success of *Document, eDelivery and Notarisation Blockchain Enterprise Suite (i.e. DEN-BES)* will be determined by addressing the following questions:

1. Will it be able to become recognized as a CEF eDelivery blockchain alternative system?
2. Will it create network effects?
3. Will such blockchain solutions experience wide government support of EU member states?
4. Can it create customer lock-in/high switching costs?
5. Will it create sustainable business models for users and 4thTech?
6. Are its applications interoperable with external existing systems?
7. Will it have organic demand vs marketing spend?

5. Network effect[17]

The more users a particular service and the whole solution Suite have, the more valuable they will be to all 4thTech stakeholders. This means that the acquisition of key public services is key to 4thTech success, as they will instantaneously create network effects.

The ideal use cases would be:

- Government-issued identity based on already issued certificate standards (for physical and legal persons)
- Secure document exchange (to alleviate the reliance on antiquated postal services and insecure e-mail for delivery of important documents)
- Blockchain notarisation services (to follow the digital transformation initiative towards paperless services)

The initial use-case is likely to be secure document exchange and notarisation, already in testing on SI-Chain by 4thTech under the name eDelivery.

[17] 'Network Effect - Wikipedia' <https://en.wikipedia.org/wiki/Network_effect> [accessed 25 September 2020].

6. Customer lock-in

Likely to be driven by the following circumstances:

1. Lack of sufficiently mature technologies that provide CEF compatibility and maturity
2. Ecosystem development deters switching. Any alternative solution will have to provide similar services (e.g. eDelivery and Notarisation requires digital identity) and attract as many users
3. Re-development of applications for a competitor infrastructure

While it is likely that, with time, 4thTech competitors will eventually be able to offer similar solutions (1), currently they are unable to do so, thus giving time for 4thTech ecosystem development. Once there is a serious competitor to 4thTech, 4thTech customers will already be locked into a well-developed ecosystem (2). Even if they decide to migrate to a competing solution, they will have to re-develop their applications (3), incurring significant cost and risk.

7. Revenue model sustainability

Revenue model sustainability follows the following points:

1. Network effects (i.e. efficient 4thTech solution users to create effective revenue model)
2. The clear and transparent subscription revenue model

If both points are satisfied, both 4thTech and 4thTech users will benefit.

8. Go-to-market Strategy

Document, eDelivery and Notarisation Blockchain Enterprise Suite (i.e. DEN-BES) is in its essence a suite of decentralized blockchain applications able to support specific services.

A suite of solutions will need to satisfy different types of users (software companies and organizations that exchange sensitive documents internally or to another organization), which needs are clear, predictable and used already in the conventional form (i.e., centralized solutions). It can be predicted to some level, that sooner or later the transformation and migration to decentralized solutions will happen.

As the process of migration to blockchain services can be slow, consequently will prevail. To bridge the gap of a lack of blockchain knowledge benefits, the 4thTech solutions are already active on SI-Chain operating in Slovenia, offering future clients a unique chance to test the eDelivery and notarisation.

4thTech has already started to develop the early adopter's program enabling free testing for local companies, followed by the commercialization of its blockchain services once the companies are ready to commit. With the market expansion of the EU-Chain, a similar approach will be conducted on the EU and global level.

With many references and MVP conformations, 4thTech will be able to enlarge its business operations to other EU states and globally.

9. Go-to-market phases

Go-to-market 4thTech Enterprise Suite strategy consists of three phases:

1. Traction
2. Transition
3. Growth

10. Goals

With the primary goal to find a product-market fit, the second goal will be to understand and adapt to client existing infrastructure and to find a perfect match to solution pricing.

11. Marketing and sales channels

1. **OBA Marketing[18]:** Following OBA (i.e., Online Brand Awareness) guidelines, professional value-added content, the use of advanced web techniques, the use of advanced SEO techniques and the use of Social Media will be combined to achieve successful online brand positioning, brand exposure and online brand equity.

2. **Event and PR Marketing:** Use-cases are presented on preeminent events. The last presentation was held at the UNCEFACT Geneva event, which brought a lot of publicity and recognition. **Follow the link to video clip example: https://youtu.be/rtTJSkHRXGU*

3. **B2B Marketing:** Direct use-cases and solution presentation including saving calculations will be made specifically for the organisation in question.

4. **Cause Marketing:** As the tendency goes toward digital transformation and paper saving processes, the 4thtech solutions can be labeled also as green solutions.

5. **Alliance Marketing:** With every blockchain deployment, the promotion resources pool comes together to promote or sell the services. In the case of SI-Chain deployment, 4thTech solutions serve as the main use-case presentation across Europe.

12. Revenue model and pricing strategy

To address the complexity of blockchain monetization, two pricing revenue models were created:

1. **The subscription pricing model** was designed based on the current conventional corporate online eDelivery solution pricing and early adopters experience surveys. Based on the private permissionless blockchain it is most suitable for regulated users from the private and public sector and civil society.
2. **The transaction pricing model** is based on the network transaction (i.e. pay per transaction). Based on the public blockchains, it is most suitable for users that have the necessity for traceability of executed transactions.

Both models are viable, as users are coming from two completely different groups. The trade-off is between low-cost private-chains with no open transaction traceability and public-chains with volatile and in most cases higher prices but publicly traceable transactions.

12.1. Private-chain subscription-based revenue model

Based on the chosen monthly subscription plan, the user will be charged for electronic data transactions. Based on the initial deployment agreement the fixed network cost will be 50% of the revenue collected, so the 4thTech revenue is also 50%.

- Tier 1 - Pay as you go subscription plan: 0,6€
- Tier 2 - organization subscription plan: 1000 to 5000 eDelivery documents, monthly price: 2.500,00€
- Tier 3 - corporate subscription plan: 5000 to 10.000 transactions, monthly price: 4.000,00€
- Tier 4 - subscription plan: 10.000 to 50.000 transactions, monthly price: 15.000,00€
- Tier 5 - Enterprise

Specifications:

- Network: SI-Chain, EU-Chain
- Network type: private blockchain
- Speed: 50.000 plus transaction per second

Benefits:

- Fixed price, no volatility

[18] 'Online Brand Awareness, Brand Equity & Value-Added Content' <https://talirezun.com/download/online-brand-awareness/> [accessed 26 September 2020].

- Fixed speed and performance
- Permissionless

12.1.1. Subscription-based profitability (private-chain) model:

Tier	Number eDeliveries	Maximum deliveries	Price	Price per delivery	Cost (%)	Cost (€)	Margin (%)	Margin (€)	Maximum margin (€)
Tier 1	0-999	999	Per transaction	0.6	50	0.3	50	0.3	299.7
Tier 2	1000-5000	5000	2500	0.5	50	0.25	50	0.25	1250
Tier 3	5000-10000	10000	4000	0.4	50	0.2	50	0.2	2000
Tier 4	10000-50000	50000	15000	0.3	50	0.15	50	0.15	7500

12.2. Public-chain transaction-based revenue model

The user will be charged for electronic data and documents transactions exchange (i.e. eDelivery). The transaction fee is used for "gas" to fuel the public chain transactions, so the 4thTech revenue will come from charging an additional margin of 0.3€ on the main chain transaction "gas" fees.

Specification:

- Network: Ethereum, HashNet, Polkadot
- Network type: public blockchains
- Speed: depends on the network stress
- Actual transaction cost - variable (determined by ETH / TOL / POL price)
- Margin in EUR - fixed (determined by 4thTech, and used to protect the margins)
- Price calculation is dynamic (each time a user connects, current transaction price shows).
- Transaction discounts will be enabled via FOUR token staking
- Option: The user doesn't see the network; the system automatically chooses the network based on the lowest transaction cost and higher transaction speed.

Benefits:

- Transparency (open public transaction traceability)
- Open-source
- Self-integration (infrastructure and developer tools will be available publicly)
- Fast solution
- Permissionless

The eDelivery protocol combines two smart contract transactions; (1) the first transaction saves the data of the document to the smart contract, and; (2) second transaction sends the transaction fee in FOUR to 4thTech fee-taker address*

* In the case of a monthly subscription, the second transaction executes only once a month, when a subscription is processed.

Tolar HashNet public main-net transaction calculation example:	Ethereum public main-net transaction calculation example:
Transaction one calculation: TX_COST = GAS_UNITS * GAS_PRICE TX_COST = 260.701 * 10 uTOL TX_COST = 2,60701 TOL Transaction two calculation:	Transaction one calculation: TX_COST = GAS_UNITS * GAS_PRICE TX_COST = 260.701 * 421 gwei TX_COST = 109.755.121 gwei TX_COST = 109.755.121 gwei * 0,000000001 TX_COST = 0,109755121 ETH

TX_COST = GAS_UNITS * GAS_PRICE TX_COST = 75.465 * 10 uTOL TX_COST = 0,75465 TOL Total eDelivery and notarisation transaction cost on Tolar HashNet (September 14, 2020): 2,60701 TOL + 0,75465 TOL = 3,36166 TOL (0.017€)	Transaction two calculation: TX_COST = GAS_UNITS * GAS_PRICE TX_COST = 75.465 * 421 gwei TX_COST = 31.770.765 gwei TX_COST = 31.770.765 gwei * 0,000000001 TX_COST = 0,031770765 ETH Total eDelivery and notarisation transaction cost on Ethereum (September 1, 2020): 0,109755121 ETH + 0,031770765 ETH = 0,14152 ETH (55,7€)

12.2.1. Transaction-based profitability (Tolar HashNet public-chain) model:

Price calculation = Realistic transaction cost (see above) in base asset (ETH, TOL, POL) + margin (0.3) in €.

Examples	Number of eDeliveries	Price per transaction (€)	Price per delivery	Cost (%)	Cost (€)	Margin (%)	Margin (€)	Maximum margin (€)
1	1000	0.017 + 0.3	0.317€	5.36	0.3	94,64	0.3	317
2	5000	0.017 + 0.3	0.317€	5.36	0.25	94,64	0.3	1585
3	10000	0.017 + 0.3	0.317€	5.36	0.2	94,64	0.3	3170
4	50000	0.017 + 0.3	0.317€	5.36	0.15	94,64	0.3	15850

13. EU laws Compliance

The 4thTech DEN-BES will be developed according to the requirements of the:

- Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC (eIDAS),
- Regulation 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (GDPR).
- Regulation (EU) 2018/1724 of the European Parliament and of the Council of 2 October 2018 establishing a single digital gateway to provide access to information, to procedures and to assistance and problem-solving services and amending Regulation (EU) No 1024/2012,
- Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union

4thTech DEN-BES, will strive to the full compliance with all applicable EU legislation. In addition, it will contribute to establish best practices and guidelines on how to implement blockchain solutions.

*more information regarding the legal interoperability can be found in the interoperability chapter

14. License

The 4thTech solutions are developed from modules in which the source code is published under a copyright holder licence. The licence will be released as an EU open source licence. The licence will permit users the rights to; (1) study the code; (2) test the code, and; (3) distribute the software openly.

15. Legal interoperability

Sending personal data through the blockchain presents quite a big legal challenge. GDPR demands responsibility for ensuring compliance, which can become demanding, especially in the permissionless public blockchain network. GDPR allows personal data processing only in the case of explicit authorization by the subject. GDPR also invokes the right of data erasure, which can be especially tricky when dealing with blockchain-ledger.

To achieve legal interoperability, 4thTech solutions are designed and built according to the EU and GDPR guidelines with main GDPR compliance features; (1) transaction is authorized by the user; (2) blockchain network is used for transactions that include encrypted electronic data or document link, that only the receiver can open using his or her private key; (2) no personal information is located in the blockchain transaction; (3) send encrypted electronic data or documents are stored in the off-chain data repository (i.e. data repository of user choice and control) and can be erased on the user request; (4) the protocol records only links to encrypted files and hashes of the encrypted content on the blockchain, what safeguards the rights of individuals to confidentiality and privacy, and; (5) the sender and the receiver jointly assume responsibility for complying with the GDPR and establishing a lawful basis.

16. Governance interoperability

4thTech solutions are deployed as an application operating currently on Ethereum and SI-Chain networks, with third and fourth open-chain deployment coming on Polkadot and Hashnet. As such, the 4thTech solutions transaction governance falls under the DLTs governance of its deployment. The challenge lies in single and multiple cross-platform DLT governance interoperability and content user control. 4thTech solutions can be deployed on a different DLT chain, so there is only a matter of choosing the chain that will be most compatible and Governance interoperable according to deployment needs. As the protocol uses DLTs only for recording transaction links to encrypted files and hashes of the encrypted content exchanged between sender and the receiver, and the content can be accessed only with the private key, the protocol transaction Governance is completely in the user's hands.

17. Key performance indicators

Objective	KPI	Success criteria	Time frame
Finance	Operational breakeven	Company is operating with net-positive margins for more than 2 months in a row	M18-M20
Operations	Compliance	Relevant compliance archived	M1-5
Operations	Service management	All main systems operational and without errors	M6-12
User environment development	User growth	10% month to month user growth	M17-M20
User environment development	Transaction growth	10% month to month transaction growth	M17-M20
User development	Revenue model	Revenue model adoption with less than 30% rejection	M17-M20

Sales development	Client acquisition	3 clients acquired	M17-M20
Sales development	Client acquisition	5 leads per month 2/5 conversion rate	M15-M20
Client development	Solution features	The solution features a 70% acceptance rate	M17-M20
Revenue development	Revenue evaluation	MRR > €50k	M18-M20

18. Broader impact

The internet changed the way we live, it opened the ways of unlimited communication and revolutionized access to information, but it failed greatly regarding our digital freedom. Instead of providing trust, granted privacy, security, peer-to-peer communication, simplification, and digital money, it evolved into a system of global intermediaries, that manipulate our private data and charge a percentage for every interaction. Blockchain in its core excludes any intermediary's, it brings peer-to-peer communication, online trust, security, privacy, authenticity, identity, synchronizes ledger and much more[19].

Exchanging sensitive electronic data and documents should be as easy as exchanging information. Blockchain technology proposes the ideal foundation to simplify digital value-holding file and documents exchange. To address this issue in 2017, 4thpillar technologies (i.e., 4thTech), proposed and later developed a safe, fast cross DLT blockchain-based solution, which leverages trust provided by the blockchain and provides secure, immutable, instant cross-border electronic data and document exchange. To provide an option for blockchain address ownership verification, the identification mechanism later was constructed in 2018, which can authenticate verified connection between a blockchain wallet and a person. Notarisation is also an essential part of the 4thTech eDelivery ecosystem and provides unique digital data or document timestamp and authenticity verification. Our products are reducing the usage of paper and actively help the environment. The applications of our services are limitless, as they could be applied to any industry. The article from The Economist[20] predicts that billion new internet users will be joining the rest of us soon, there are countries such as Mauritius that are skipping centralized digitalization and want to adopt blockchain technology directly, so now more than ever a significant internet advancement is needed.

19. External strategic partners

To enable both revenue models, partnerships were made with Tolar HashNet[21] and SI-Chain[22]. Tolar HashNet is developing a next-generation distribution ledger solution for the needs of the general public and provides fast and low-cost transactions powering 4thTech public-chain solutions.

Supported by Slovenian Ministry of Economic Development and Technology, Si-Chain[23] (later EU-Chain[24]) was established in November 2019 with the intent to enable testing of existing and new blockchain applications for the public and private sector. 4thpillar technologies joined the Slovenian national blockchain testing infrastructure called SI-Chain to be able to provide fast and reliable transaction with a fixed price enabling the subscription-based revenue model and provide a viable enterprise solution.

UN/CEFACT is a subsidiary of the United Nations Commission for Europe (UNECE) and is a key player within the United Nations Economic and Social Council for setting electronic business standards and trade

[19] Dr. Tali Rezun and the 4th Pillar team, *The 4 TH PILLAR Project - Whitepaper 3.0* , 2018.
[20] 'The Second Half of the Internet', *The Economist*, 431 (2019), 21–25.
[21] 'Tolar - Hashnet'.
[22] 'Slovenia Launches National Test Blockchain Infrastructure and Slovenian Blockchain Partnership | GOV.SI'.
[23] 'SI-Chain - National Blockchain Pilot Infrastructure' <https://euchain.org/sichain/> [accessed 26 September 2020].
[24] 'EU-Chain - Enterprise-Level Blockchain Infrastructure' <https://euchain.org/> [accessed 26 September 2020].

facilitation recommendations. UNECE Chain[25] initiative highlights new technology and outlines promising use cases which boast improved trust, transparency and efficiency. 4thTech blockchain eDelivery protocol is one of the use cases that will be presented and later featured in the recommendation whitepaper known as UNECE Chain. This action will contribute to the 4thTech solution recognition and add an additional project reference.

20. Intellectual property

4thTech Consortium is the owner of intellectual property rights for 4thTech solutions. All other IP rights resulting from *DEN-BES* project deliverables will be defined in additional IP rights contract.

SECTION 3 – IMPLEMENTATION
(team, capabilities, financial needs, equity)

1. Team and capabilities

Team Member (Name and Surname)	Position	Department	Function/ key competences	Commitment (from 1-100 % where 100 % is full time, i.e. no other commitments/roles/responsibilities outside of the company).
Dr. Tali Rezun	Managing director	Management, Marketing	20+ years of entrepreneurship experience, 7 years of multinational management experience, expert in online marketing, EU/CEFACT blockchain expert	80
Roman Dobrina	CFO	Finance, Management	22+ years of finance experience, 12 years of multinational management experience	80
Anton Dobrina	Legal and reporting	Legal	17 years experiences in legal matters, 10 years experiences in projects of digitalization of the pension system	80
Denis Jazbec	CTO	Development	5 years of active development of Blockchain/DLT systems, 15 years of active IT development	100

[25] '- Trade - UNECE' <https://www.unece.org/uncefact-chain-workshop> [accessed 1 September 2020].

Andrej Gorenjak	Sub-contracting project developer	Development	3 years of active development of Blockchain/DLT systems, 12 years of active IT development	90

Dr. Tali Rezun[26] (male): started his entrepreneurial career at the age of 18 and grew his business organically until this day. Under the domain of Cotrugli Business School, Tali finished his EMBA and later in 2018 his Business Doctorate (i.e. DBA, specializing in online technology. Dr. Rezun specializes in online brand awareness, web application development and blockchain technology. He enjoys the title of lecturer, advisor and UN/CEFACT expert. Current, Dr. Rezun publishes articles associated with his expertise, serves as projects consultant and appears as a guest speaker to the media. Tali is one of the main founders of the 4thpillar technologies and holds the title of Council Chain.

> **Experience:** 2018 - "Leader Beyond" award by Beyond 4.0 • 2020 - UN/CEFACT blockchain expert. • 2017 – present Crypto & DLT/blockchain Lecturer at Cotrugli Business School • 2012 – 2017 Board member and owner at Naton HR • 2008 - 2011 Senior HR recruiter and advisor at Naton HR • 2000 – 2011 Founder and Executive Manager of TDS Group.

Roman Dobrina (male): started his professional career as a Finance Manager in GlaxoSmithKline and continued as General Manager for the Adriatic region and Marketing Director for Aquafresh Central Eastern Europe. Since then, he has been working in the pharmaceutical industry with a broad experience in sales, marketing, finance, and general management. Currently, he is CFO and shareholder in one of the globally most innovative CBD company. In the 4thpillar technologies, he is responsible for budgeting, forecasting, reporting and other financial matters regarding the project.

> **Experience:** • 2014 – 2017 CFO at Naton HR • 2009 - 2014 Adriatic BST Group • 1997 – 2009 GlaxoSmithKline • 2017 Currency Exchange Operations (The Bank Association of Slovenia) • Rewarded "Top 20" Young Executives title in Europe • Member of GSK President Exchange Days for talented leaders • Member of Super Brands Slovenia Board

Anton Dobrina (male): has over 15 years of experience in the field of both national and international pension insurance law. He also has exceptional experience and practical skills in media communication and various forms of communication with various audiences. He actively works on resolving European legislation issues concerning 4thpillar technologies.

> **Experience:** 2000 – present Head of Research and Development Department at the Slovenian Pension Fund (SPIZ) • 2010 – present EESSI Team Member at Electronic Exchange of Social Security Information • 2002 EU Social Security Labor Training Academy, Netherlands

Denis Jazbec (male): is a software engineer with more a decade of experience and a computer science degree. As 4thTech CTO, he is researching and developing blockchain and DLT systems and their integration into existing IT systems. Denis also manage the first SI-Chain application integration between different DLT frameworks. He is highly proficient in PHP, JS and MySQL. His focus remains set on quality and secure, fast final products. In the 4thpillar technologies, he holds the title of chief technology officer.

> **Experience:** 2016 Engineering Degree from Faculty of Electrical Engineering and Computer Science, Maribor, Slovenia • Silver award at the ACM Competition in Computer Science (national level) • Made several connections for Magento with payment & accounting systems • Worked on projects for larger online shops on the German-speaking market

Andrej Gorenjak (male): holds a computer science degree and specializes in web development. He is a full-stack developer with high knowledge of PHP, JS, MySQL and servers. With over 10 years of experience, Andrej is a highly valuable member of 4thtech development team. In the 4thpillar technologies, he is responsible for the development of the identity mechanism, as well as general supervision of solution construction.

[26] 'Dr. Tali Rezun - Entrepreneur, Business Developer and Lecturer' <https://talirezun.com/> [accessed 27 September 2020].

21. Need for EIC support

Due to projects experimental solutions and lack of overall DLT technology understanding and benefits, the project had to be funded by the 4thpillar technologies founding council and their private partners from day one. Three years of development run-time has put a heavy toll of the project finances, so the EIC support would be very beneficial at this point. The EIC support would stimulate and fast-forward 4thTech go-to-market and bring additional credibility and recognition. As 4thTech main solutions (i.e. blockchain eDelivery, document Notarisation and digital identity mechanism) are tested and fully developed in MVP form and solve specific EU and global document management challenge, the project should attract additional investor sooner or later to finance go-to-market phase described in this proposal.

22. Risks

Risk	Impact	Probability	Mitigation	Residual risk
Technology incompatibility	High	Low	Additional R&D investment and API or access-point update	Inability to fulfil obligations to clients
Technical development drawbacks	High	Low	Invest in additional developers, N/A – MVP operational	Inability to meet the go-to-market deadline
Slow product development	High	Low	Invest in additional developers, N/A – MVP operational	Inability to meet the go-to-market deadline
Key team member leaving	High	Low	Invest in the work environment and team relations	Inability to meet the go-to-market deadline
Subcontractors not meeting their deadline	Medium	Medium	Re-task open dev modules	Inability to fulfil SLAs lead to insufficient funding
Negative feedback from clients	Low	Medium	Accelerate product development	Product development update too slow
Unable to find new clients	High	High	Accelerate and invest in marketing and sales, enter new markets, re-segment the existing market and find a niche	Insufficient funding
Insufficient funding	Medium	High	Find new funding and reduce costs	Impact to capitalisation table, unable to raise sufficient funds
A similar offer from a stronger competitor	High	Low	Accelerate development and go-to-market	Insufficient funding
Competitors copying solution	Medium	Low	Trademarks, patents Litigation, N/A – already 2 years in MVP testing	Insufficient funding
Wrong pricing model	Medium	Medium	Product re-pricing	Insufficient funding, losing clients

Infrastructure blockchain failure	Medium	Low	Migration to other blockchains	Insufficient funding, losing clients
Failure to raise funds	High	Low	Exit	N/A

23. Approach

The project is divided into ten tasks, described in details in the work packages tables; (1) transition development from MVP to production; (2) CEF (i.e. Connecting Europe Facility) compatible Enterprise Access-Point (i.e. EAP) blockchain gateway development; (3) hardware infrastructure and technology scalability setup and development; (4) X.509 digital certificate standard integration; (5) API bridge development; (6) WIKI support content and documentation creation; (7) client IT helpdesk setup; (8) support, sales and marketing staff recruitment and training; (9) marketing activities, and; (10) client acquisition.

24. Gantt chart

		Year 1												Year 2											
	Project Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Task	WP1: Project Management																								
T1.1	Operational project management	S																			D				
T1.2	Project quality and risk management	S			D																				
T1.3	Project development monitoring	S													D										
T1.4	Recruitment	S	D													S		D							
T1.5	Reporting	S																			D				
	WP2: Building a blockchain Document eDelivery and notarisation Enterprise solution																								
T2.1	Solution transition development from MVP to production	S	D																						
T2.2	CEF compatible enterprise access-point blockchain gateway development	S						D																	
T2.2.1	Enterprise Access-Point development specification			D																					
T2.2.2	Wallet and blockchain connection development				D																				
T2.2.3	Access-point web service development					D																			
T2.2.4	Access-point deployment							D																	
T2.3	Docker container Kubernetes integration								S	D															
T2.4	Digital X.509 standard certificate integration										S	D													
T2.5	Fast adoption bridge development												S		D										
T2.6	Testing and deployment		S												D										
	WP3: Service adoption																								
T3.1	Publication of Wiki support web pages															S		D							
T3.2	IT Help desk integration																S	D							
	WP4: Go-to-market																								
T4.1	Staff training																S	D							
T4.2	Marketing and Sales content creation			S																	D				
T4.3	Marketing and Sales strategy integration	S																D							
T4.3.1	OBA Marketing and Sales strategy integration																	D							
T4.3.2	Event and PR Marketing strategy integration																	D							
T4.3.3	B2B Marketing strategy integration																	D							
T4.3.4	Cause Marketing strategy integration																	D							
T4.3.5	Alliance Marketing strategy integration																	D							
T4.4	Project recognition and client acquisition													S							D				
T4.5	Product support																	S, D							

Task start = S
Deliverable = D

24. Resources

The facilities and other resources are available to the 4thTech project research and development team at the consortium offices in Slovenia and include everything needed to undertake and complete the proposed research project successfully. Offices are equipped with a high-speed optical internet connection and available to the team 24/7. Facilities provide a sufficient environment that is appropriate for the success of the project. Due to COVID-19 pandemic, the research and development had to be restricted to the home office. For the past 6 months, the team collaborated successfully with the help of video calls.