Palaamon

White Paper

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Palaamon White Paper

Transparent, Reproducible and Frictionless Data Analysis

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Important Information

General

This White Paper provides information about the Palaamon project and its goals.

It also provides information about the crowdfunding token PALCFT and future developments of the Palaamon platform.

Neither Llaama SAS, which is driving the Palaamon project, nor its employees make any warranty as to the utility of the Palaamon platform or the PALCFT tokens.

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Introduction

Reproducibility in Pharmaceutical R&D

Today, data is produced at exponential speed, and has become a paramount economic factor. Companies such as Facebook and Google early on understood the **value of data analysis and algorithms** to transform raw data into actionable information.

In the biotech and pharmaceutical industry in general these same trends lag behind in execution. In this sector, **billion-dollar decisions** by regulatory authorities are **based on data analyses** which **require reproducibility**.

Today's exponential increase of digital health data will further require the need for data analysis reproducibility. Drug development and approval, and accurate disease diagnosis alike, depend upon fully reproducible and transparent data analysis.

Scientists, regulatory authorities, health tech providers or publishers of scientific journals alike will be able to use Palaamon to ensure guaranteed reproducibility of data analysis.

Drug development is a long, complex and iterative process with a high failure rate. The desired end product is a drug that does more good than harm to patients. Evidence for this is derived from analysis of data captured in preclinical and clinical studies. The cumulative evidence is then reviewed by regulatory authorities who have the power to approve drugs for sale and use. Evidence needs to be reproducible to demonstrate its integrity to regulatory authorities.

Decisions taken by regulatory authorities are ultimately based on data analysis. Authorities may even re-analyse the data to understand the value of the evidence. All in all, this process requires an impeccable level of rigor.

Pharmaceutical companies as well want to be able to reproduce their evidence. Over the roughly 10-year cycle of drug discovery and development, data analysis guides project decisions.

Drug discovery projects are often based on published evidence from scientific literature. However, because the methodologies are described with words and often not all data is published it's usually impossible to reconstruct the data analysis that led to the published evidence. Reproducibility of the published evidence would provide a more confident starting point for such projects.

In **healthcare** the same rigor applies to data analysis reproducibility when it comes to *e.g.* disease diagnosis, health state monitoring, or disease prevention. False diagnosis or the failure to prevent a disease clearly has a high impact on society.

In tandem with the growing amount of biometric data that apps and health-care databases can collect, such as steps taken, or sleep or heart monitoring, the number of analysis tools for self-diagnosis proliferates. Decisions based on such data analysis must be documented and importantly, reproducible. This is a crucial challenge for health technology providers (e.g. mobile medical applications, wearables, etc.), particularly in gaining regulatory approval.

Reproducing analysis results in pharmaceutical research and development is very difficult for many reasons including the biological nature of the material and the complexity of laboratory workflows. Palaamon was created to focus specifically on the **complexity of the data processing aspects**.

To produce a data analysis with software, many steps have to be followed in a precise order. First, raw data has to be captured, which can be of any kind *e.g.* a digital signal or a measurement of an analyte in a bodily fluid. Second, an ordered list of actions have to be executed. Examples include: reading a proprietary file format to get access to the data so that it can be used by further tools, doing quality checks, normalizing the data, linking the data to external meta information (e.g. reference sequence for DNA analysis), running a statistical test, producing reports, running machine learning algorithms, etc.

All these actions usually depend themselves on several dozen software packages at different layers (from low-level calculation modules in the operating system to advanced algorithms developed in different programming languages by statisticians, mathematicians, or computer scientists).

As outlined, **reproducibility of data analysis is of paramount importance** but not a given in the pharmaceutical industry and healthcare. From the very first moment, **reproducing these actions to get the same results is very difficult and cumbersome**. Afterwards, sometimes only a few weeks later, it becomes impossible because not only does the content of databases change over time, software is updated and even the underlying operating system can change, making data analysis virtually impossible to replicate. Even when possible the cost is often prohibitive.

Computer Science Paradigm Shift

However, recent developments in computer science can help us address these issues.

Containerization

First is the development of containerized software based on the Linux Control Groups included in the Linux kernel 2.6.24 in 2008.

This change to the Kernel was one of the features that enabled the incredibly fast development and adoption of containerized technologies like Docker.

A technology like Docker allows all the dependencies of a software, whatever their levels, to be compiled into one image that can then be run on a Docker engine. Each image provides a hash that uniquely identifies it. Docker Images can themselves be built on top of other images that are all identified by unique hashes.

Orchestrations systems like Kubernetes or DCOS are able to distribute and run Docker images on complex distributed hardware architectures.

They can ensure that an image gets precisely the resources it requires to run which is of paramount importance for systems like Palaamon where the resources are very much depending on the algorithm deployed.

Some might take advantage of very large amounts of memory (a sequence alignment algorithm loading billions of base pairs of reference sequences), other of powerful multi-core CPU (statistical analysis) and other of most recent GPU processors (Deep Learning algorithms usually depend on them).

Distributed Ledger Technologies

The second development are Distributed Ledger Technologies (DLT), most commonly associated with cryptocurrencies such as Bitcoin.

Beyond the financial use, DLT provide a new approach on how to store data. Instead of relying on a centralized system and its owner, DLT relies on a decentralized system running on several nodes and where the authority is a software program.

In the scope of Palaamon and reproducible science, it is a very powerful feature.

It enables Palaamon to ensure traceability of every step without requesting anybody to trust who is running or using Palaamon. All proofs are in the DLT.

In a nutshell, Palaamon is building Merkle trees (tree structures of hashes) with the unique hashes provided by containerization technologies as well as those that can be calculated on input data, output data, and any data involved in the process.

The platform stores those Merkle trees directly into a Distributed Ledger to make them openly available for as long as needed.

Everything else that happens in Palaamon and that is of any meaning for traceability or reproducibility is stored as meta information in the Distributed Ledger as well.

What is Palaamon?

A Distributed Platform

Palaamon is a distributed platform running on cluster facilities with no limitation on the number of nodes, enabling horizontal and vertical on-demand scaling.

Palaamon enables distributing and controlling worker jobs on cluster nodes. These worker jobs can contain any kind of code written in any kind of language. They are packaged as container images that can be kept forever. The worker can scale horizontally or vertically depending on the demand. There can be several versions of similar code running in parallel.

Palaamon uses containerized software deployment (currently Docker) for ***transform workers*** to provide guaranteed reproducibility of data analysis. An analysis workflow in Palaamon is a tree of immutable objects called transforms.

In a nutshell and in Palaamon terms, running one of those workers on some data produces an immutable transform.

Palaamon is developed as a pure Reactive application using state-of-art technologies.

Palaamon uses **cryptographic hash functions** at every level of processing to guarantee final traceability and reproducibility of workflows. Users of Palaamon are able to compare results of transforms based on similarity scores of Merkle trees.

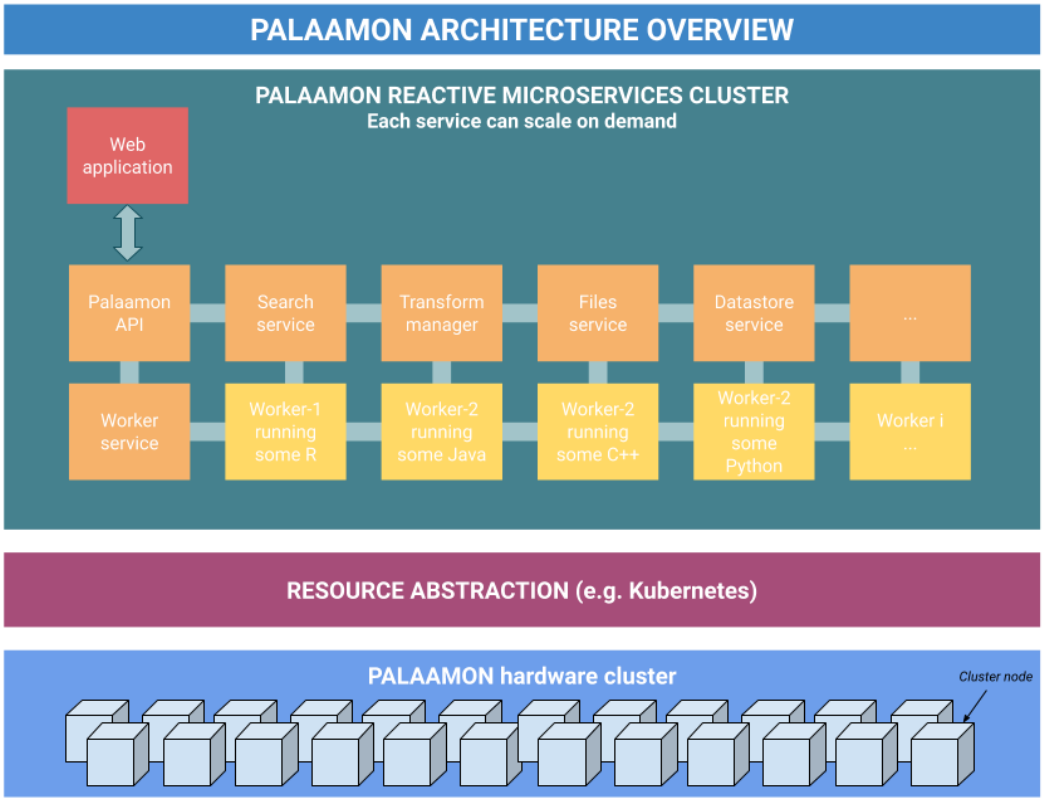
Palaamon will provide a service to push results signatures to **distributed ledgers.**

Palaamon will offer a marketplace platform that allows developers to upload their code with all its dependencies (OS, libraries, input fields and constraints, etc.). Scientists select the algorithm that best serves their data computation needs, and then lease the code and run the computation within Palaamon.

A blockchain-enabled contract ensures that algorithm owners are protected and paid.

Scientists, regulatory authorities, health tech providers or publishers of scientific journals will be able to use Palaamon to ensure guaranteed reproducibility of data analysis.

Palaamon Architecture Overview



Palaamon Marketplace Model

Palaamon allows users to run any kind of data analysis in a container on a big data cluster infrastructure. Palaamon provides the hardware and software infrastructure, the hash mechanisms and the distributed ledger technologies that guarantee absolute traceability and reproducibility.

The containers will be available on the Palaamon marketplace, which functions similarly to Etsy or BeatStars.

The Palaamon marketplace will allow anyone to upload an algorithm with its dependencies, which will then be packaged into a Palaamon worker. The original developer of the algorithm will profit when the container is used by others.

Llaama (Palaamon's developer and parent company) will provide an SDK for developers to publish and test their code on the Palaamon cluster.

Marketplace Use Case

A PhD student, let's call her Anna, has developed a new learning algorithm to analyse RNA Seq data. She wrote the code in the statistical language R and the final result is a report in R-Markdown. To run the program, she needs a CentOS computer with some specific native libraries, several CRAN and Bioconductor libraries and Python libraries. For most pieces of code she needs very specific versions to make everything work smoothly.

Normally this configuration would take hours or days to produce results, and in some cases the process might break other working software on the same machine.
Additionally if the code is not maintained by the original author or successor, anything from an OS update, a Python library change, to a new release of R or Bioconductor might render it useless.

Even well-maintained code is unlikely to produce exactly the same output after just a couple of months. The differences may only be cosmetic in the final results or could be more fundamental (calculation or model changes).

On Palaamon, Anna can simply provide her code and reference to the dependencies as Container instructions (e.g. Docker files instructions) as well as brief documentation (what does this code produce, what is expected as input and what can be expected as output). Of course she will also need to provide some sample data for Palaamon to be able to test the module and its integration.

Palaamon will take care of building the container images, and will save them in its protected image registry.

Once constructed and tested, the container will be started in the cluster as a *transform worker*. It will register itself in the Palaamon orchestrator and the Palaamon web application will make it available to everybody.

Now on Palaamon marketplace, a new *transform worker* is available. It can be started one time or a thousand times, Palaamon will make sure to scale it on demand.

It has a unique identity:

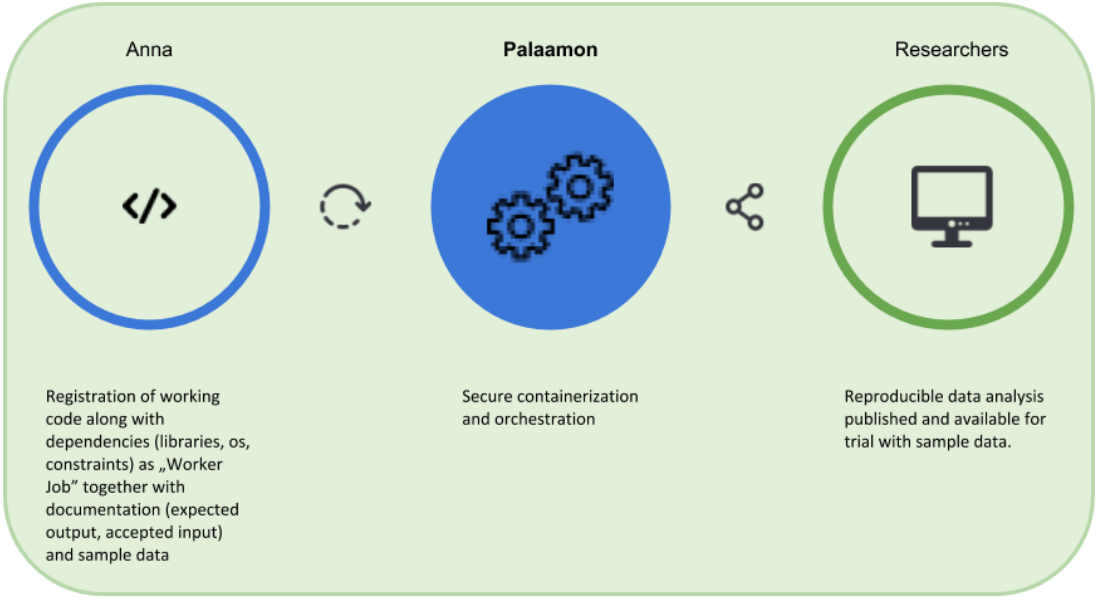
Domain name:
com.instituteOfAnna.sequencing.rna

Package name:
Great Learning Algo for RNA Seq

Version:
2.3.5

Author:
Anna Smart

Unique Hash:
6c8c787be473f75f38e850f3efce45925a6a6bba7f330621bc0cd195d0b4798a



Anna's code is rather complicated and needs a lot of calculation power. It was difficult to develop. Anna estimates its "value" on a scale from 1 to 10, from very simple to highly complex. That will determine the revenue that Anna will get from her work. Anna values her work at a 7.

Now comes a scientist in a big pharmaceutical company, let's call her Emilia. Emilia read an interesting paper that mentioned a sequencing experiment that was analyzed with Anna's code. She would be very interested in reproducing the experiment and the analysis.

Her in-house IT/Bioinformatics/Biostatistics team estimates that doing the same analysis might take a least a couple of days, maybe a few weeks just to get the code working.

The Palaamon platform will be Emilia's most straightforward solution.

On Palaamon, Emilia can directly test Anna's code a few times for free. If it does what she wants then she can use it *in production*. But she has to pay for the code, the hosting, and the computer power.

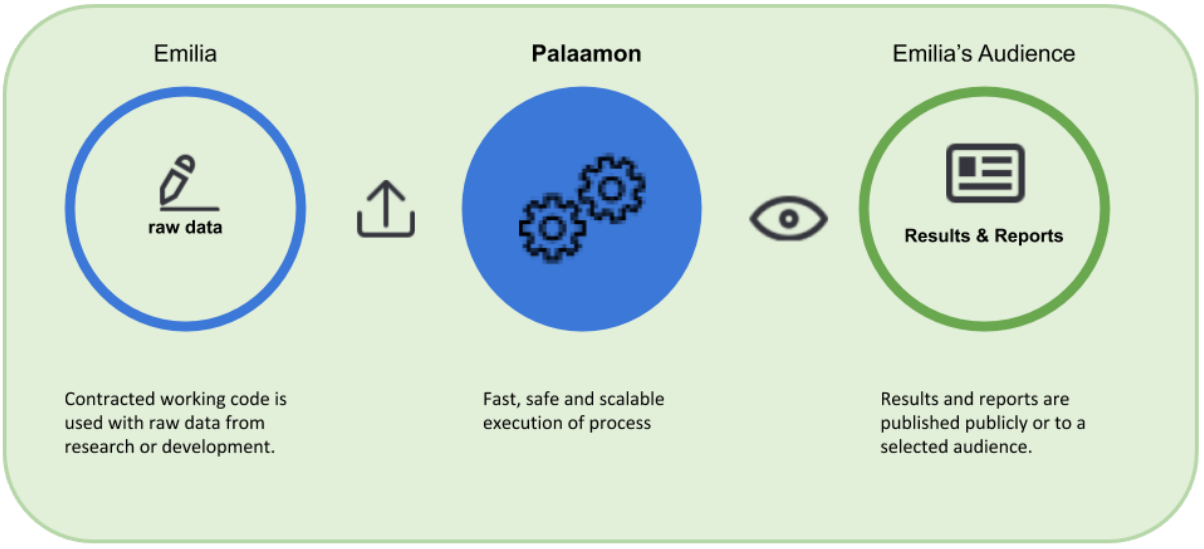
On the Palaamon platform Emilia sees how much Anna's code costs in production. The price covers Anna's part (based on her own complexity estimate), hosting part (per GB), hosting duration of the results (1 Months to 20 Years), and computer power.

For Emilia, the costs are based on usage and not on licensing; it's a pay as you go licensing.

When Emilia starts the productive calculation, a smart contract event is triggered.

If the transform is a success, the smart contract is completed: Anna gets her financial reward while Palaamon gets paid to run the calculation and to host and to keep the data as stated in the contract.

As a final result, **Palaamon provides a final and immutable URI** (e.g.: https://test.palaamon.com/transforms/93b07e71-f4cc-4b7f-be0a-f20f8bb5d9b7). This URI will be active and pointing to the transform results for the time defined by Emilia in the contract.



Emilia can decide to restrict the visibility of the results to herself, her company, a list of people in her company or outside, or to anyone she specifies. She can also restrict access to some artifacts of the transform. Or she can grant access to everybody, thus supporting open science.

Also, a general transform history, with a Merkle tree, including hashes of the input data, config, code, containers, etc. will be put into the distributed ledger to insure ultimate immutability and prevent any tampering of the data and results.

Once Emilia is happy with her experiment and the analysis, she can put the URI and the address in the ledger in her next scientific paper and satisfy the transparency requirements of most high-impact journals. She can also add her URI and the reference of her own results as an evidence for Anna's work.

Emilia and her company, instead of wasting time setting up an environment for reproducing Anna's analysis, are able to run the analysis in a couple of minutes.

They know for sure that the analysis is reproducible and they can prove it. All evidence is available. If required, Palaamon can securely store the data for many years, freeing up another concern for Emilia.

Images of the Containers that run the code will be saved in the Palaamon registry forever. Hash signatures of those containers will be saved in the Distributed ledger to guarantee immutability.

Anna is happy as well because her hard work, smart ideas and the long nights coding R are finally rewarded. Not only is her code being used; she is making money on the transaction.

Finally, authorities like the FDA or EMA as well as society in general will benefit because results are easily reproducible and virtually incorruptible.

Direct Acyclic Graph (DAG) of transforms

In most cases researchers will not run one transform on data; they will run a series of transforms.

Usually they will start with some raw data, maybe do some preprocessing, cleaning, quality checks, etc. They will continue with one or several analysis and eventually finish with some reporting.

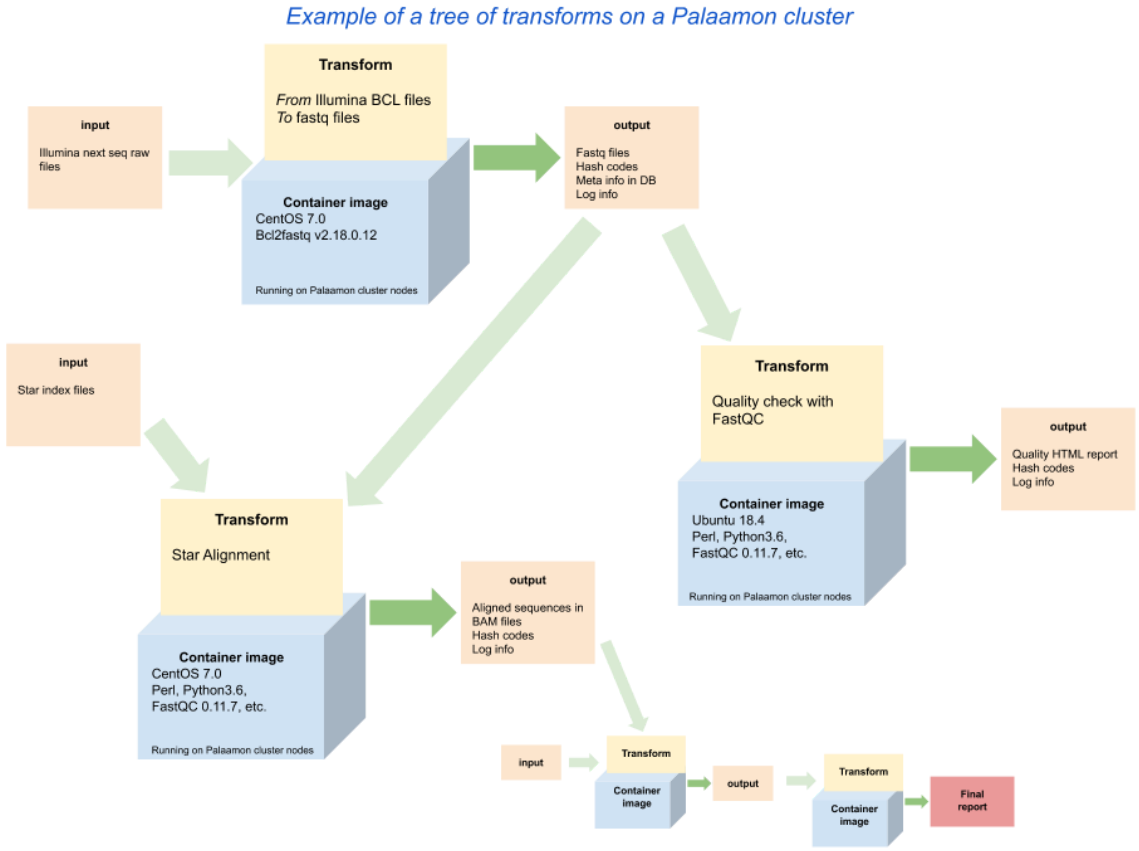
In Palaamon, these kind of workflows are called ***DAG-of-transforms***. So a new transform can inherit from parent transforms and can also combine transform results.The workflow is like a tree of many transforms and those that are in parallel branches can also run in parallel on the different nodes of the cluster.

If public, a transform result can be used as a source for anybody in any new transform, hence here as well encouraging open and sound science. There is no limitation on what is possible, except what researchers and their companies decide.

Still, each transform in the tree has all the properties of immutability and reproducibility.

Example of Palaamon DAG

Transforms that do not depend on results from other transforms can run in parallel.



How Palaamon Uses DLT

Reproducibility of results in R&D in the pharmaceutical industry and in many other industries is a perfect use case for smart contracts applications on a distributed ledger.

Providing as much evidence as possible about a result is always preferable. And tamper-free data processes are paramount.

Palaamon offers an innovative solution:

- a big data clustered processing engine for different types of code
- a carved-in-stone mechanism to memorialize what has happened with data
- a way to reproduce an analysis
- a final immutable tree of signatures (Merkle tree) of the results
- a storage in the distributed ledger of all important steps

Validated systems (those that the authorities, like the FDA or EMA, ask for) ultimately care about formal documentation: what counts is that everything that happens in the system is well documented because ***only what is documented exists***.

We will validate the Palaamon platform, but we will also go one step further. We will extend the formal aspects and provide real evidence about any given analysis. As a matter of fact we intend to define a new standard in **good data analysis practice (GDAP).**

The final document, the hash of the transform and the whole processing history (all possible hashes that represent steps in the transform, container hashes, input data hashes, etc.) will all go into the distributed ledger. **The transform itself will be referenced as a unique and immutable URI (unique resource identifier) on the Palaamon platform.**

Extensive Use of the Distributed Ledger Technologies

We plan for many more features on **Palaamon** to be implemented as **smart contracts using distributed ledger technologies.**

Let's take a few examples.

Similarity Score between Experiments

Petra is running a similar experiment to Simone. However, her final hash is not the same as the one that Simone obtained. That is actually no surprise. Final hashes will very unlikely be the same just because it's very likely that at some stage in the process some data is local to the experiment even if everything else is exactly the same. Think of full file paths, or user names; these things can be included in some results.

Palaamon will calculate multiple hash trees (Merkle tree). In some it will first replace local data (e.g. user name) with variables to avoid the problem mentioned. Ultimately, it will offer a similarity score between experiments, comparing all Merkle trees and weighting some branches differently than others. For instance, using the same library and code will be weighted more than a parameter indicating in which color a report should be shown.

Palaamon can independently generate Merkle tree comparisons. However, if Simone's company requires guaranteed and decentralized traceability of the work done, partial or full hash trees will be saved into the distributed ledger or, if needed, into the Interplanetary File System (IPFS) or SWARM. The comparison of Simone's and Petra's results is thus totally decentralized and independent.

Timed Content Release by Smart Contract

Imagine Petra is finished with her experiment and its analysis; she is happy because the results are comparable to those of Simone. She decides to write an article. In Palaamon she will be able to trigger a smart contract that makes sure some part of the results can be seen by the entire world right now (final report as PDF for instance) but not yet the result data matrix as CSV that has been produced as well. That artefact contains too much sensitive data and should be visible either never or after a defined time period. The smart contract will be the programmatic authority to make sure those decisions are implemented.

Blinding of Experimenters by Smart Contract

Now, Petra is contacting Simone to discuss a collaboration on a similar topic but a little different. They decide to run a similar experiment in parallel. To avoid being biased in the interpretation of the results, they decide to trigger another Palaamon smart contract that will open each one's results to the other at the same time. So both will have to be finished with their own work before they get access to the other's results.
The proof that it really happened as it was described is enshrined in the code.

Moving Data and Results to a new location

Results processed with Palaamon will remain on Palaamon for a defined retention time. However, if Petra's company decides that her results should be hosted on their local infrastructure, that can easily be done with a dedicated smart contract.

Yet another contract would specify which data has to be moved and where and the information will be kept by the DLT. Palaamon itself would only keep the redirect and some hashes and meta information to guarantee continuous traceability.

Status Update by Smart Contract

A couple of months later, Simone discovers that the provider from which she gets her transgenic mice made a mistake in the annotations. Some mice described as wild type were actually transgenic. Simone marks the results as wrong in Palaamon. A smart contract written for this purpose is triggered that marks the results as "withdrawn" and all parties can check it as it's written in the distributed ledger.

Submission of Results to Authorities

The development, hosting, running, maintenance, etc. of the Palaamon platform follow the regulations (e.g. 21 CFR Part 11) of the health authorities.

Once Petra's company is happy with the analysis results of a new drug candidate it might want to submit its data to the Health authorities.

Palaamon will make it much easier than current solutions especially for advanced data analysis.

A transaction ID in the DLT will be transmitted as central entry point to the data. This transaction contains a list of hashes, meta data, etc. referencing the DAG of transforms that led to the results in Palaamon.

Once again, if data gets too big an associated distributed database like IPFS or SWARM will be used next to Ethereum.

The health authorities will be able to directly verify the results, how they were produced and if anything has been tampered.

It will save a lot of time for the authorities and it will enable Petra's company to bring their new drugs to the market much faster.

We know of dozens of such use cases that will help research as well as authorities with results using Palaamon and the distributed ledger. The daily use of Palaamon will give hundreds of as-yet-unforeseen ideas to users for new smart contracts.

Scientific and Technical Coherences

The most important feature of a system to achieve reproducibility and traceability is **immutability**. Immutability means that some *objects* cannot be changed once they have been produced, whatever happens in the system.

An analysis workflow in Palaamon is a tree of immutable *objects* called **transforms**.

A branch of immutable transforms in a DAG makes any leaf transform (e.g. one to be used for a submission to an authority like the FDA) a result for which traceability and reproducibility are guaranteed.

In Computer Science managing series of immutable events is called Event Sourcing. In Palaamon, a branch of transforms is the source of Events, and the actual *state* of the system is the output of the last event or transform.

The core of Palaamon is an open source project written in Scala using the Akka library. Scala is one of the best programming languages for Machine Learning, Streaming and Reactive Systems. Scala is a language that puts a lot of emphasis on Immutability with the concept of *case classes*. The actor paradigm with Akka is itself based on the exchange of immutable messages (using Scala case classes).
Akka is currently one of the most advanced implementation of Event Sourcing.

Distributed Ledger Technologies can also be seen as Event Sourcing systems. A transaction on the distributed ledger is an immutable event that is distributed over all the copies of the Ledger.

Palaamon is written in Scala and runs on an Akka cluster, it's itself an Event Sourcing system. It stores its key meta information into a Distributed Ledger.

True and sound Science requires
***transparence, traceability and reproducibility**,*
Transparence, traceability and reproducibility require
Immutability** and **Event Sourcing,
***Immutability** and **Event Sourcing** are at the core of*
Palaamon with Scala and Akka
***Immutability** and **Event Sourcing** are guaranteed*
through storage of meta information into a distributed ledger

Llaama's DLT Strategy

Ultimately the whole Palaamon platform will be supported by an Analysis Software Market Token (ASMT).

This token will be used for any activity on Palaamon: to lease an algorithm, to store some results for a certain retention time, to publish some compiled results for an authority, to reward a data analyst that uploaded her code, etc.

The ASMT will be the principal means to access the Palaamon platform and it will be traded on a token exchange platform. ASMT can be seen as a unifying token for advanced reproducible data analysis.

Ultimately we also expect the Palaamon platform to be a reference implementation of a general standard to access distributed and reproducible calculation infrastructures, the ASMT becoming the default token for this standard.

Llaama is launching a DLT crowdfunding campaign to speed up the development of Palaamon. The DLT crowdfunding will enable the fast development of Palaamon which we envision will very quickly become a reference platform for the industry as well as for the savviest data analysts around the globe.

The crowdfunding will also enable Llaama to build a GxP compliant version of Palaamon.

Palaamon is currently in alpha or POC version. However, some transform workflows can already be fully used. We are very close to our first Minimum Viable Product (MVP).

We want to accelerate the development of the platform as well as the token infrastructure.

The DLT crowdfunding will run for 6 months and all the ethers raised will be put into the development of the Platform and the ASMT.

Once the ASMT market will be launched and after the end of the crowdfunding period, buyers of Palaamon crowdfunding tokens will get 2 ASMT for 1 crowdfunding token. They will be able to trade the token or use them on the ASMT market as soon as it's launched.

During the crowdfunding period, tokens will have an increasing rate value, making it more profitable for earlier acquisitions.

The Palaamon crowdfunding smart contract as well as the ASMT smart contracts will run on the Ethereum Virtual Machine.

Both tokens will be issued as fully-functional ERC777 tokens (currently most advanced standard for fungible token) thus fully compatible with ERC20.

Crowdfunding and Token Market

The development of the core of the Palaamon platform depends neither on the crowdfunding nor on the Token Market. It's an open source project that we will continue to develop.

However, our crowdfunding campaign and our token launch afterwards will ensure:

- ❖ accelerated development of the platform
- ❖ a profitable infrastructure and platform for reproducible science
- ❖ adoption by data scientists who want to port their code to Palaamon
- ❖ provision of required documents and procedures for authorities (FDA, EMA)

The following table provides a summary of our DLT funding strategy. The goals described are slated to be achieved 18 months after the launch of the ASMT market.

	Crowdfunding	ASMT
Number of employees	~8	~40
Palaamon MVP*	Yes	Yes
Palaamon marketplace MVP*	Yes	Yes
First cloud infrastructure	Yes	Yes
Data scientist Palaamon worker template	Yes	Yes
Development of 25 standard workers	Yes	Yes
Extended Palaamon	Partially	Yes
Extended Marketplace	Partially	Yes
Development of hundreds of workers for use cases in Pharmaceutical industry as well as other industries where reproducibility is key	Partially	Yes
ISO, GxP, etc. Validation & Qualification	Partially	Yes
Multiple cloud infrastructures, including on premise	Partially	Yes
Companies private local Palaamon installation	Partially	Yes
Integration of smart streaming features	No	Yes
Data scientist full SDK (to replace worker template) for different languages + web interface as well	No	Yes
Fundraising goals	**~20 000 ETH**	**~200 000 ETH**

*MVP: Minimum Viable Product

Conclusion

Distributed ledger technologies will change the way R&D data analysis is conducted in most industries.

Our platform, Palaamon, can change the way R&D pharmaceutical data and research data in general are analyzed. Our platform will become a game changer. It will provide the industry with results of much higher quality, due to reproducibility. It will also help the industry to get the best products much faster on the market.

The platform will enable authorities to verify results in a sound way.

It will enable scientific journal readers to quickly verify what a paper claims:

- can one reproduce results using a Palaamon worker?
- Is it possible to produce the same or a similar Merkle tree with our results?

Cheating or tampering with data, results, or reports will be made almost impossible.

Everything that counts will be kept in the distributed ledger.

The Palaamon platform will ultimately benefit Science.

Risks summary

Distributed Ledger Technologies (DLT) is a new domain and buying DLT tokens involves considerable risk.

People acquiring PALFCT are responsible for understanding and meeting all their tax obligations.

This White Paper is not intended to substitute or replace the due diligence that a purchaser should undertake before deciding whether or not to contribute to the crowdfunding in buying PALFCT.

The content of this White Paper must not be taken as a basis for participating in the crowdfunding.

Llaama SAS has acted in good faith and has made every effort to ensure that the statements made in this White Paper are reliable and accurate, and that all estimates, forecasts, expressions of opinion and other subjective judgments contained in this White Paper are based on assumptions considered to be reasonable as of the date of this White Paper. However, no warranty or guarantee, or representation (whether written, oral or otherwise) is made by Llaama SAS with regard to the accuracy, completeness or suitability of the information presented in this White Paper (to the extent permitted by law).

This White Paper should not be relied upon, and shall not confer rights or remedies upon you or any other person.

To the maximum extent permitted by law, Llaama SAS has no obligation to amend, modify or update this White Paper should any of the information presented herein change or subsequently become inaccurate, incomplete or unsuitable.

Llaama SAS does not give any assurance of returns of benefit. Any purchase of PALFCT tokens should therefore only be considered by persons who can afford a loss of their entire investment.

With DLT, a new business model emerges which offers new opportunities but also carries significant risks. There is no guarantee regarding the value of cryptocurrencies over time. Past performance is not a reliable indicator of future performance, and investors may not recover the full amount invested.

Regulation of digital tokens is a fast- evolving domain and will vary significantly among various jurisdictions. Changing laws might impact token price as well as cryptocurrency markets.

Llaama SAS is a new innovative company and is subject to all of the business risks and uncertainties associated with disruptive innovations.

PALCFT token holders do not carry any voting, management, or control rights.

Palaamon and PALCFT are built using state-of-the-art technologies. Palaamon is built on technology stacks similar to those used by Twitter, Linkedin, or Netflix. PALCFT is based on ERC777, which is the new version of ERC20 fixing most of its issues.

However, DLT are still in early development stages therefore they carry all the risks related to new technologies (bugs, vulnerabilities, cyber attacks, etc.).

There are many more risks that any buyer of DLT tokens should be aware of before purchasing PALCFT. Amongst those are risks about keeping private keys, storing tokens in wallets, etc.

We cannot give a complete list of the risks involved in acquiring PALCFT.

We can only urge potential contributors to consult their advisors before deciding to invest in PALCFT.