NGI LEDGER
Grant agreement 825268

An IT Asset Disposition platform that incentivises and certifies the circular economy of digital devices:
MVP testing – February 2020

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MVP Testing

Executive Summary

The implementation of a deposit-refund system (DRS) is the basis for our value proposition of facilitating and incentivising (rewarding) the compliance with donor conditions during the entire life cycle of a computing device. Donors charge a deposit to refurbishers, who will in turn charge the deposit to final customers, and all these relevant changes are recorded in an irreversible ledger. If the donors’ conditions are met, e.g. the device is finally recycled, smart contracts will be triggered to pay back the deposit automatically and inexorably to all agents participating in the reverse supply chain, while the system operator retains a service fee (eReuse/USOdy).

The development and testing phase of the operative MVP (see deliverable 1 for details) of an eReuse ledger, i.e. a permissioned Ethereum Proof-of-Authority blockchain, including a deposit mechanism has been carried out to implement the DRS as specified in the work plan. On a technical level, the deposit and conditions are represented as a smart contract attached to a device. The code of the MVP, in a public repository, implements this behaviour at TRL 4 (technology validated in lab), and has been integrated with the DeviceHub web application to manage device inventories, to reach TRL 5 (technology validated in relevant environment). The business and sustainability model of the service proposition has been developed, polished and completed, as well as the definition of the ecosystem (partnerships to market), including partnerships for concrete pilots, and even plans for input to standardisation processes. The development and testing MVP work is being completed (partly done, with ongoing tasks expected to complete by mid to end of March), that will be the basis for pilot end-to-end tests with early adopters to validate the services, business model and be ready to accelerate to reach wider audiences towards financial sustainability.

1. Status

Testing MVP (M8 - February 2020)

Devices can be transferred between an agent (donor) and an agent (refurbisher), the donor can establish a deposit, charged when the refurbisher accepts the transfer. Integrated (under integration and testing) with the backend and frontend of the Usody inventory system, these transactions are recorded in the eReuse ledger/blockchain, as part of the traceability record of the device. When a device is returned and complies with the terms and conditions, then the deposit will be returned inexorably.

The system can record proofs of disposal, data wipe, function, reuse and recycling in the blockchain (under integration and testing). In this milestone the basic proof is implemented and we are implementing the specific proofs defined in a previous phase:
1. **Proof of disposal**: After collecting the devices from the donor, the refurbisher generates with the software an inventory of these devices. This creates a *secure disposal delivery note*. The donor confirms the delivery note and sets the required deposit. At this point, the deposit is billed to the refurbisher and the transfer is recorded in the blockchain.

2. **Proof of data wipe**: The donor or the refurbisher uses the software to generate a certificate of data wipe. This information is recorded in the blockchain and donors have access to it.

3. **Proof of function**: The proof of function can be performed any time with a software that runs on the device and creates a rating of its performance. The refurbisher can share this information with potential buyers.

4. **Proof of reuse**: The final consumer accepts the transfer of the device created by the refurbisher, and at this point the deposit is billed to the final consumer. This transfer is recorded in the blockchain.

5. **Proof of recycling**: After recycling the device the final consumer provides information of the collection point (name of the collection point, time of delivery, contact person and, if possible, a delivery ticket). This information is recorded in the blockchain. At this point the deposit will also be returned to the final consumer.

*Future improvements - Market Proof of the MVP (M9 - March 2020)*

The specific proofs will be operational, with data exported from our blockchain as an open data set. Privacy safety of the exported data will be evaluated. The resulting formats will be contributed to the global OBADA consortium and other organisations for adoption.

From the unitary and partial integration tests, end-to-end integration tests will be performed followed by a pilot-ready release of the software.

The software, services and business model will be ready for pilot tests with external users.

2. **Testing MVP**

Three aspects to consider:

- Software and services: software model, implementation, testing.

- Business: service model and business model, including economic sustainability, benefits and potential impacts.

- Ecosystem: partnerships towards market, including planning and agreements for implementation, adoption, testing, and assessment in target operational scenario.

2.1 **Software and services**

There is an development epic (Agile development method) for a market proof MVP. Some UML diagrams included in Annex 1.
• Register/data wipe/Device assessment: A large organization willing to sell and dispose used business IT equipment or a reseller with devices from a large org does the following:
a) Access to its USOdy account, b) does an assessment of device value and/or data wipe, c) share devices’ public links with resellers or end consumers\(^1\).

• Development and testing of support to manage mobile devices in addition to desktop and laptop computers.

• Implementation of Delivery notes.

• Blockchain Proofs: once a basic proof is produced, development of specific proofs.

• Deposits: management of wallets.

• User experience: polishing of it.

2.2 Business

The Business case is completed, after discussion and validation with Bluemorpho, supported by the software system is described in a slide set included in annex 2 (4 slides per page)

2.3 Ecosystem (partnerships to market)

We have established partnerships with:

• Refurbishers & ITADs: Donalo (ES) & Good Point (USA) for the validation of device transfer process with delivery note, using the prototype and storyboard.

• Manufacturers: Fairphone (NL) has expressed interest to perform a concept validation, with a proof-of-concept test in March and a pilot starting in April, to manage a decentralized infrastructure to collect and refurbish second-hand Fairphone phones. Until now all second-hand devices are handled in the central office. After interactions over the last months, they have decided to the effort of exploring a decentralized model using eReuse/USOdy.

• Social organisations: RREUSE, a European network of social enterprises working on recycling and reuse, have expressed interest in testing our solution. Pilots not yet defined.

• Joined ITU-D SG2 (sponsored by APC.org) and discussion to join ITU-T SG5 (sponsored by the Spanish government) regarding the circular economy of ICT devices, mainly in the rating of devices and traceability: an opportunity to align our work and contribute to global standards, which can facilitate to establish a competitive global solution.

• Government: the Waste Agency of the Catalan government is considering the testing and adoption of our model for the management of used computers and phones, on the range of more 30,000 potential devices, perhaps including other governmental offices.

\(^1\) [http://www.usody.com/?page_id=679](http://www.usody.com/?page_id=679)
• Industry (main donors): Nestlé (Spain) is considering to participate in a pilot test as they are interested in the traceability of devices to report on environmental impact (CO2 savings) and social impact (hours of reuse by target social inclusion goals).

• Industrial associations: we continue collaboration with the global OBADA.io consortium by hosting a blockchain node and exploring interoperability of open data representations.

• Agreement to contribute our experience to the new DLT4EU project, where UPC will be DLT4EU Challenge Owner of a circular economy challenge.

3. Main dissemination activities

Among several activities we highlight the following:

• Mobile Social Congress 2020 (26-2-2020): organization of an Ideathon on uses of 2nd hand mobiles (Joint with Pangea, Andròmines, Fundació Trinijove, Innoground) with about 25 participants that worked for 3 weeks on ideation of business models to work with second-hand mobile phones.

• Mobile Social Congress 2020 (26-2-2020): organization and participation in a round table on “Consumer alternatives to ICTs”.

• Update of the website usody.com.

• Presentation of Ledger/eReuse at the Barcelona Tech Spirit (27-2-2020), the replacement of the 4YFN meeting as part of the cancelled Mobile World Congress 2020.


4. Expected MVP Market proof

Our plans for a MVP market proof by the end of March is the following. Regarding software services:

• Transfer of device using delivery notes and deposits (Implementation and integration finished, start testing with early adopters).

• Registration and exploration of proofs: recycling, reuse, data wipe, function, device transfer (Implementation and integration finished, start testing with early adopters).

Regarding the ecosystem (partnerships to market):

• Proof-of-concept with Fairphone, start of a pilot in April.

• Additional pilots with partners, according to our capacity and partners’ needs and volume of devices and activity (at least one pilot).
5. Conclusions

We are in the final development and testing phase of the MVP of an eReuse ledger with the USOdy business and sustainability model. In the coming weeks of March the software will be completed and validated to be ready for release and for external validation in a pilot, a demonstration (TRL 6-7) in a relevant or operational environment, where early adopters can register devices and obtain proofs of disposal, data wipe, function, reuse and recycling in the blockchain. We expect this will create human-centric solutions to manage electronic and computing devices that are economically, environmentally, and socially sustainable, traceable, accountable and scalable, under the principles of the circular economy.
Annex 1: Diagrams about the software and services
Lot
- id: string
- name: string
- description: string
- isClosed: boolean
- devices: [Device]
- creator: User
- addDevices():
- removeDevices():

Device
- id: string
- more https://github.com/eReu

User
- id: string
- email: string
- ethereum_address: string

Deliverynote
- id: string
- creator: User
- documentID: string
- supplier: User
- receiver: User
- date: Date
- deposit: String
- expectedDevices: [SnapshotDeliverynote]
- transferredDevices: [SnapshotDeliverynote]
- transfer_state: string / enum
- ethereum_address: string
- lot: Lot
- initTransfer():
- confirmTransfer():

SnapshotDeliverynote
- id: string
- documentID: string
- serialNumber: string
- brand: string
- model: string

0 Lot : N Device

1 Lot : 0-1 Deliverynote

0 Lot : N SnapshotDeliverynote

on creation of deliverynote:
creator = current user
lot = new Lot(name = supplier\-date)
supplier = findUserBy(supplierEmail)

permissions
only creator can modify deliverynote, associated devices and lot
supplier can view the deliverynote, associated devices and lot

possible values for transfer_state
- "initiated"
- "Accepted"

initTransfer
- can only be called by supplier
- actions:
  - transfer_state = "initiated"
  - transferredDevices = copy(lot.devices)

confirmTransfer
- can only be called when transfer_state === "initiated"
- can only be called by creator
- actions:
  - lot.isClosed = true
  - transfer_state = "Accepted"
Annex 2: Business case in slides for a pitch
Loss of raw materials, soil pollution, CO₂-intensive production

Electronic waste

Replaced devices sold to resellers

Large orgs

2 billion new devices every year

Reseller

Large orgs

B2B


**Recycling vs. Landfill**

- **Recycling**:
  - 20% of resources are recycled.
  - Benefits: Reduced environmental impact, conservation of raw materials.

- **Landfill**:
  - 80% of waste ends up in landfills.

**NEEDS**

- Money
- Recycling guarantee
- Impact data

**A new exchange**

- Large organisations want to improve
- Finally resold to consumers

- Data erase
- Ensure recycling & get impact data
- Money

This doesn't work
**Value proposition - Large organizations**

Secure data erasure

- Get paid for monitoring & reporting

- Earn money

- Ensure recycling & impact data

**Challenges**

- Non-resellable devices
- Risk of buying non-resellable devices
- Labor-intensive impact reporting processes
- Labor-intensive impact monitoring & reporting

**Needs**

- Data security
- Get environmental impact data
- Ensure recycling to prevent landfill

**Value proposition - Reseller**

- Improve supply of good quality electronic devices

- Buy only valuable devices

- Get paid for monitoring & reporting

**Reseller needs**

- Secure data erasure

- Money

- Impact data

**New challenges for resellers**

- Exchange for B2B platform for selling used IT equipment in exchange for data erasure & recycling

- Improve supply of good quality electronic devices

- Buy only valuable devices

- Get paid for monitoring & reporting
How to ensure recycling & impact reporting

Deposit at time of purchase

Reward reporting

4 years later

Consumer

Reseller

Large orgs

B2B

B2C

Deposit

Recycles device

Consumer

Reseller

Large orgs

B2B

B2C

Deposit

Reward reporting

Impact reporting
**Business model**

- **Achievements**
  - 7,000 devices reused up to now, 100% YoY
  - 25 refurbishers in the US, AR, ES.
  - 100% profit margin from 150,000€ revenue
  - 1200 Tons CO2 avoided
  - 700,000€ in grants dedicated to USOdy technology
  - Recycling rate of our customers from 20% to 50%, preventing landfill of 6,000 Kg hazardous waste
  - 1,200 Tons CO2 avoided
  - Device life-time extension by 17 million hours
  - Estimated market value 2020: 2015-2025

- **Differentiation strategy**
  - **EFFICIENCY**
    - Remote & secure assessment of device value
  - **TRUST**
    - Irreversible traceability log & certified impact reporting
  - **SUPPLY**
    - Collaborations with companies & public institutions
  - **DEMAND**
    - Trusted & local refurbishers
  - **INCENTIVES**
    - Circular economy compliance through deposit-refund system

- **Technology & Features**
  - Automated inventory, assessment and secure data wipe
  - Network

- **Estimated market value 2020**
  - 950 mln
  - 350 mln
  - 150 mln
  - 2015-2025

- **2015-2025**
  - For sales of used phones
  - +10% global growth

- **Technology & Features**
  - Estimated based on number of disposed devices with 50% reuse potential

- **Network**
  - 7,000 devices reused up to now, 100% YoY
  - 25 refurbishers in the US, AR, ES.
  - 100% profit margin from 150,000€ revenue
  - 1,200 Tons CO2 avoided
  - 700,000€ in grants dedicated to USOdy technology
  - Recycling rate of our customers from 20% to 50%, preventing landfill of 6,000 Kg hazardous waste
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    - Trusted & local refurbishers
  - **INCENTIVES**
    - Circular economy compliance through deposit-refund system

- **Technology & Features**
  - Automated inventory, assessment and secure data wipe
  - Network
Usody

trusted & supported by

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Team

Industry

Accelerators

Customer Companies

Institutions

Research Institutions

Public Administrations

Customer

American Retroworks Inc

B2B platform for selling and disposing used business IT equipment in exchange for data erasure, money and circular economy impact reports during full life-cycle
An IT Asset Disposition platform that incentivises and certifies the circular economy of digital devices:

Testing MVP – February 2020

NGI LEDGER

UPC, Pangea

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