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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Approvals

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Document history

Revision	Date	Modification	Authors
0.1	24/2/2020	First complete draft	Stephan Fortelny, Jordi Nadeu, Sergio Mosquera, Emmanouil Dimogerontakis, Mireia Roura, Leandro Navarro, David Franquesa
0.2	27/2/2020	Update and completion	Leandro Navarro, Emmanouil Dimogerontakis, Stephan Fortelny, David Franquesa
1.0	28/2/2020	Consistency check and final reading	Leandro Navarro

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

- 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.
- Approved participation of eReuse/USOdy in a workshop of the Internet Freedom Festival 2020 (IFF) in Valencia (24-24/4/2020).

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.

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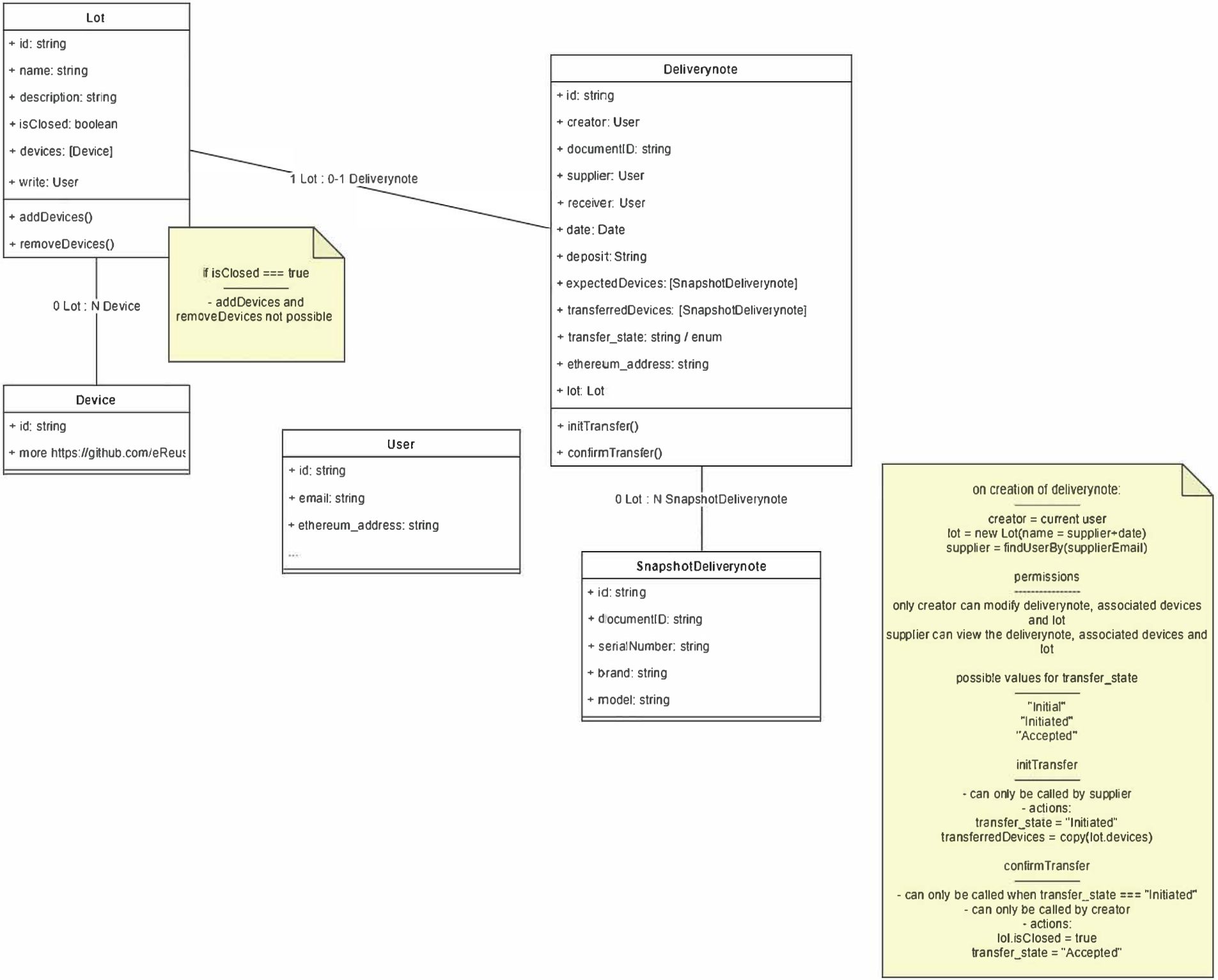
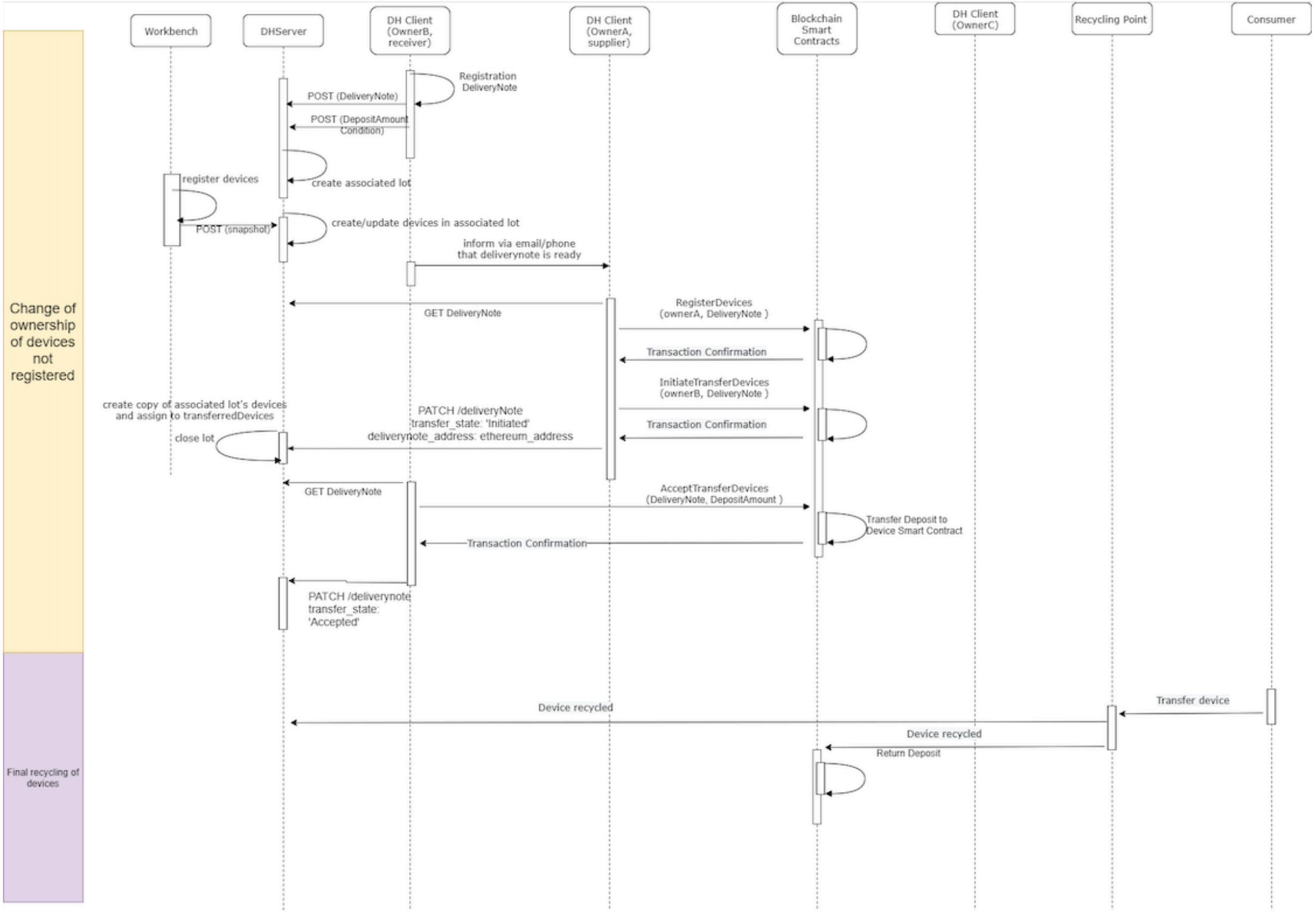
Annex 1: Diagrams about the software and services


Lot
+ id: string
+ name: string
+ description: string
+ isClosed: boolean
+ devices: [Device]
+ write: User
+ addDevices()
+ removeDevices()
1 Lot : 0-1 Deliverynote
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()
if isClosed === true
- addDevices and removeDevices not possible
0 Lot : N Device
Device
+ id: string
+ more https://github.com/eReus
User
+ id: string
+ email: string
+ ethereum_address: string
...
0 Lot : N SnapshotDeliverynote
SnapshotDeliverynote
+ id: string
+ documentID: string
+ serialNumber: string
+ brand: string
+ model: string
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
"Initial"
"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"


Workbench
DHServer
DH Client (OwnerB, receiver)
DH Client (OwnerA, supplier)
Blockchain Smart Contracts
DH Client (OwnerC)
Recycling Point
Consumer
Change of ownership of devices not registered
Registration DeliveryNote
POST (DeliveryNote)
POST (DepositAmount Condition)
register devices
create associated lot
POST (snapshot)
create/update devices in associated lot
inform via email/phone that deliverynote is ready
GET DeliveryNote
RegisterDevices (ownerA, DeliveryNote)
Transaction Confirmation
InitiateTransferDevices (ownerB, DeliveryNote)
create copy of associated lot's devices and assign to transferredDevices
PATCH /deliveryNote transfer_state: 'Initiated' deliverynote_address: ethereum_address
Transaction Confirmation
close lot
GET DeliveryNote
AcceptTransferDevices (DeliveryNote, DepositAmount)
Transfer Deposit to Device Smart Contract
Transaction Confirmation
PATCH /deliverynote transfer_state: 'Accepted'
Final recycling of devices
Transfer device
Device recycled
Device recycled
Return Deposit

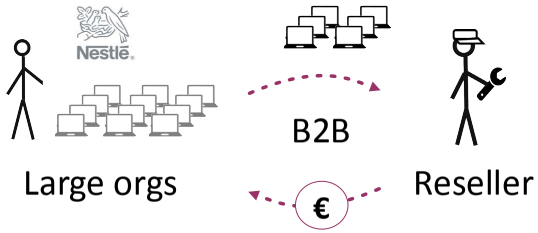
Annex 2: Business case in slides for a pitch

USOdy

2 billion new devices every year

Large orgs

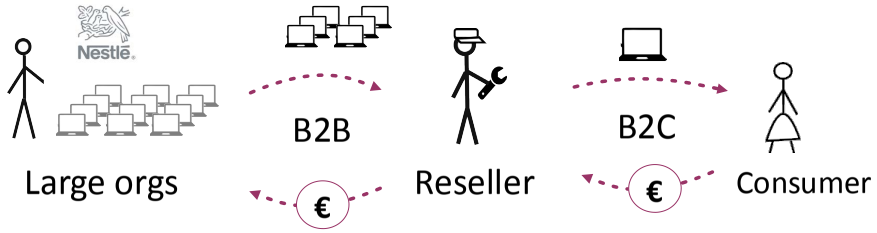
Replaced devices sold to resellers



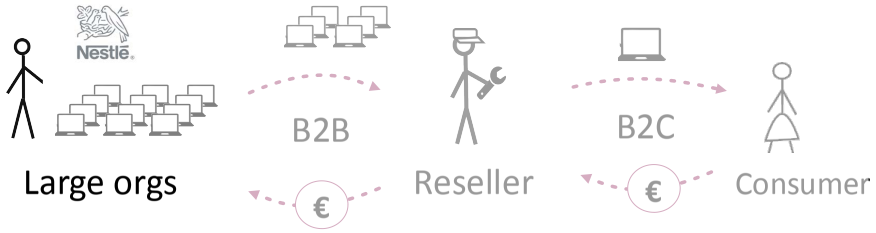
Large orgs

Reseller

Finally resold to consumers



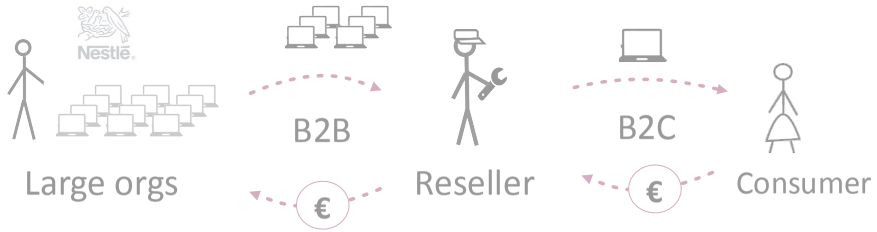
Large organisations want to improve



NEEDs

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

This doesn't work

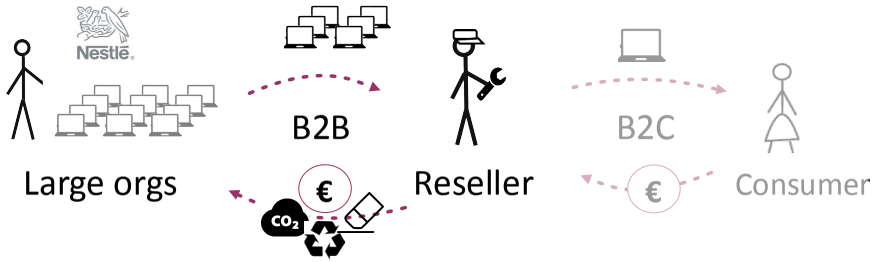


80% **Landfill**

20% **Recycling**

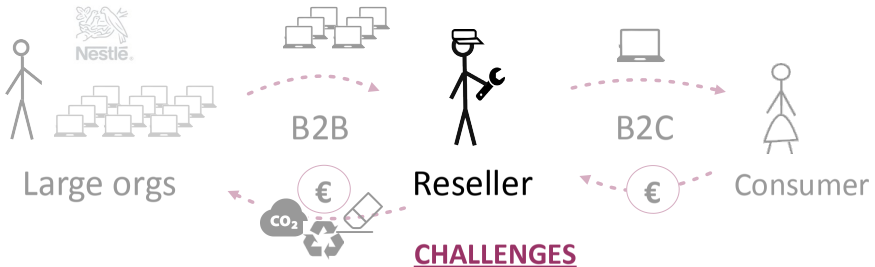
Loss of raw materials, soil pollution,
CO2-intensive production

A new exchange



- money
- recycling guarantee
& impact data
- data erasure

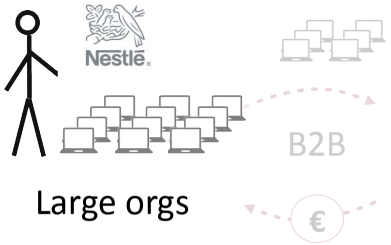
New challenges for resellers



CHALLENGES

- Impact data requires costly monitoring & reporting
- Risk of buying non-resaleable devices

USOdy Value proposition – Large organizations



NEEDs

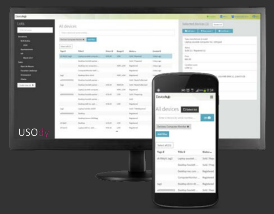
- Ensure recycling to prevent landfill
- Get environmental impact data
- Data security

Ensure recycling & get impact data CO₂

Earn money €

Secure data erasure

USOdy



B2B platform for selling used IT equipment in exchange for

Recycling & impact data CO₂

Money €

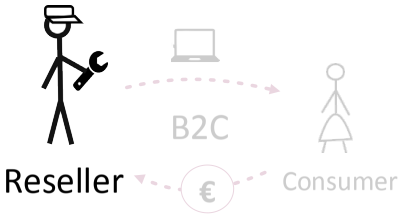
Data erasure

USOdy Value proposition - Reseller

Get paid for monitoring & reporting

Improve supply of good quality electronic devices

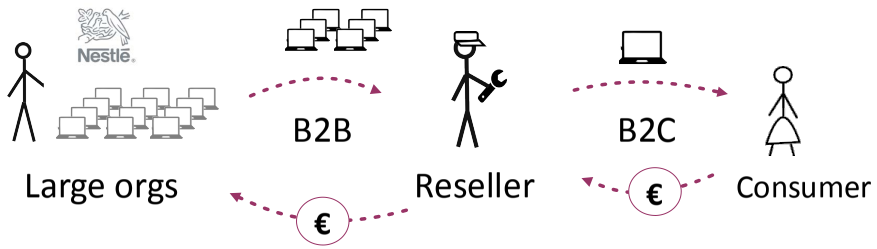
Buy only valuable devices



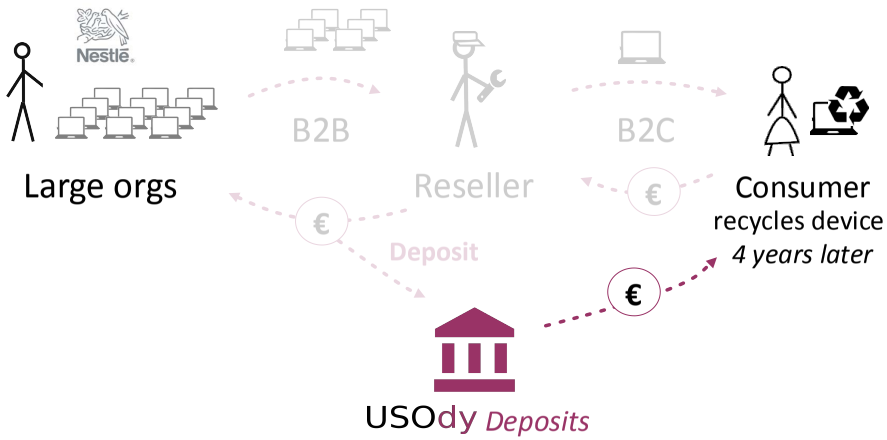
CHALLENGES

- Labor-intensive impact reporting processes
- Risk of buying non-resaleable devices

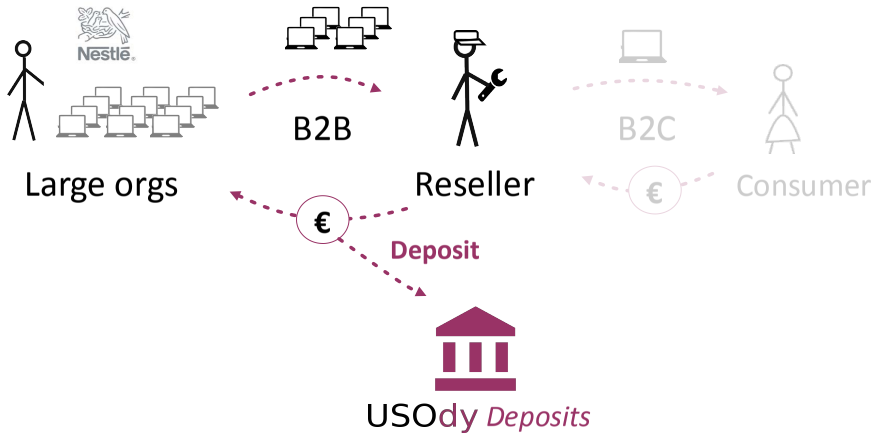
How to ensure recycling & impact reporting



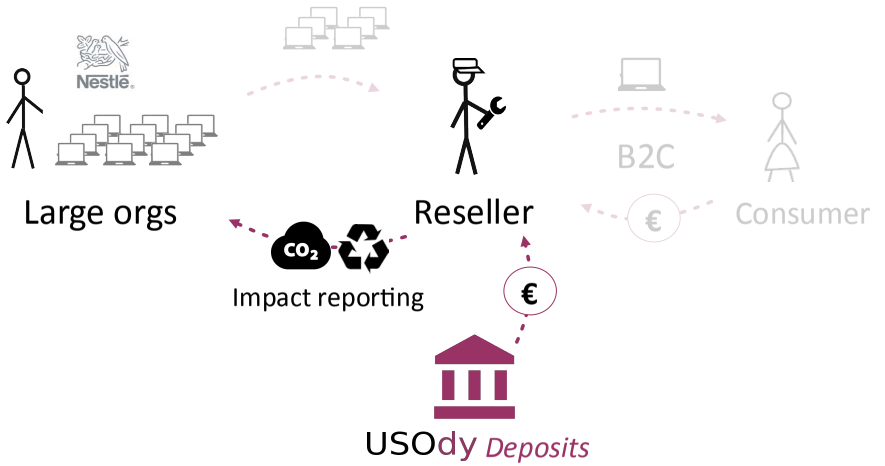
Reward recycling



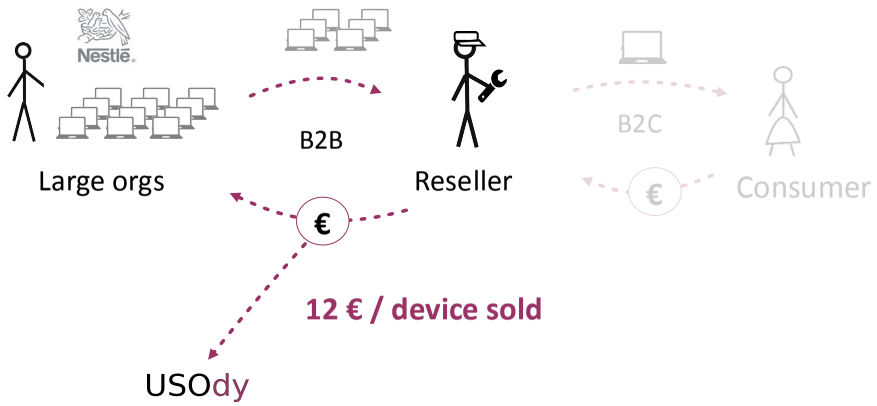
Deposit at time of purchase



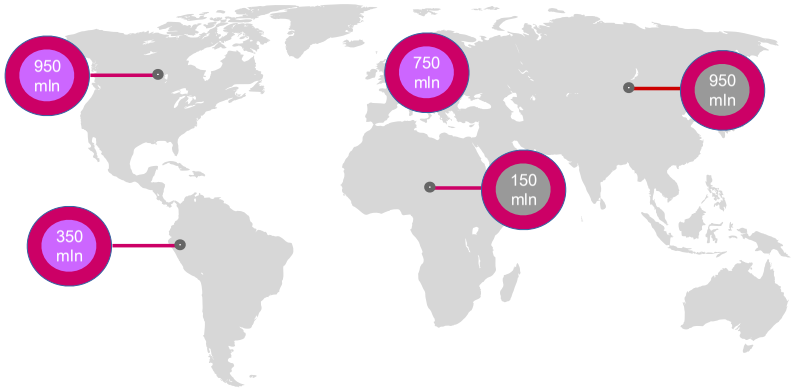
Reward reporting



Business model



USOdy Estimated market value 2020



estimations based on number of disposed devices with 50% reuse potential

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

USOdy Achievements

- 7,000 devices reused up to now, 100% YoY
- 700,000€ in grants dedicated to USOdy technology
- 25 refurbishers US, AR, ES. +150% profit margin from 150,000€ revenue
- Recycling rate of our customers from 20% to 50%, preventing landfil of 6,000 Kg hazardous waste
- 100 customers, large organizations disposing devices
- 1,200 Tons CO_2 avoided
- Automated inventory, assessment and secure data wipe (massively parallel)
- Device life-time extension by 17 million hours

USOdy Differentiation strategy

Network

SUPPLY - Collaborations with companies & public institutions

DEMAND - Trusted & local refurbishers

Technology & Features

INCENTIVES - Circular economy compliance through deposit-refund system

EFFICIENCY - Remote & secure assessment of device value

TRUST - Irreversible traceability log & certified impact reporting

USOdy

Team

David Franquesa
CEO

Jordi Nadeu
CTO

Stephan Fortelny
VP Product

Leandro Navarro
VP Blockchain

Mireia Roura
VP Sustainability

USOdy

Trusted & supported by

Customer Companies	MOBILE WORLD CAPITAL BARCELONA	Nestlé	**American Retroworks Inc**
Customer Public Administrations	Ajuntament de Barcelona	Agència de Residus de Catalunya	**Generalitat de Catalunya**
Research Institutions	OBADA	UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH	ereuse.org
Accelerators	CIVICHUB	NGI LEDGER	Ship2B

USOdy

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

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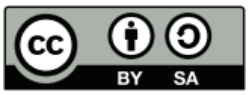
UPC, Pangea



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Barcelona, February 2020