TagItSmart!
Smart Tags driven service platform for enabling ecosystems of connected objects

Grant agreement 688061

Circular economy for electronics reuse

Deliverable ID:	**D 2.3**
Deliverable Title:	Process design (draft)
Revision #:	**v1.6**
Dissemination Level:	**Public**
Responsible beneficiary:	TagITSmart! Consortium
Contributing beneficiaries:	
Contractual date of delivery:	30.4.2018
Actual submission date:	19.9.2018

Start Date of the Project: 1 January 2016 Duration: 36 Months

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Approvals

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Document history

Revision	Date	Modification	Authors
v0.1	25/4/2018	First draft	Stephan Fortelny
v0.2	26/4/2018	Ready for revision	Stephan Fortelny
v0.3	28/4/2018	Consistency check and final reading	David Franquesa, Xavier Bustamante
v1.0	30/4/2018	First version of the deliverable	Stephan Fortelny
v1.1	28/6/2018	Update with new processes	Stephan Fortelny, Mireia Roura, David Franquesa, Xavier Bustamante
v1.2	6/7/2018	Ready for revision	Stephan Fortelny
v1.3	7/7/2018	Consistency check and final reading	David Franquesa, Xavier Bustamante
v1.4	8/7/2018	Second version of the deliverable	Stephan Fortelny
v1.5	30/8/2018	Removed links to Spanish documentation and replaced with English documentation wherever possible.	Stephan Fortelny
V1.6	19/09/2018	The revised version of the deliverable	Leandro, David

Introduction

This document describes the processes for customer use cases (as described in D3.1) carried out with the support of eReuse tools and services.

Section 1 - Explanation of the work carried out and overview of the progress

The following processes describe in further details the steps to enable or facilitate customer use cases described in D3.1. The processes have been designed in close collaboration with the relevant customer segments.

1.1 General improvements through TiS integration

For each process, the expected improvements through TiS integration are summarized below the process description. Additionally, TiS integration is expected to improve most processes by the following means:

- Devices are currently identified by QR tags. Through TiS integration, tags will feature both QR and NFC (as described in D2.1.2 Tag proposal)
- Through NFC, devices will be scanned faster and more reliably especially in low-light conditions providing easier and more comfortable identification of devices.
- Maintaining QR codes as well serves as backup for devices not supporting NFC and may be easier in some use cases, e.g. for end-users due to higher-familiarity with QR codes.
- Easier and faster identification of devices facilitates splitting up preparation processes dynamically
- eTags are globally unique and thus prevent registration of two devices with same identifier, further preventing errors in device traceability
- eTags can not be copied or tempered with, increasing security and trust in the system
- Speed and comfort of bulk processing of devices will be increased dramatically in comparison to bulk processing with QR tags. As NFC tags do not require using the mobile phone's camera, bulk scanning of NFC tags can be done only by tapping the phone's NFC reader on devices sequentially and without having to interact with the mobile phone's screen.
- The tag is photochromic which provides a quick way for the end-user to validate that the device has been refurbished correctly. The user can apply a challenge to ensure the veracity of the tag by illuminating it

1.2 Definitions of processes

Processes relevant to TiS integration are listed in the following. Further documentation for these processes will be added to this document until the end of the project.

1 Registration and refurbish

The purpose of the registration process is to link a physical device with a virtual device in the system. The new version of the system with the TIS has completely modified this process: Previously the users created the tags themselves and now this process is done by the users's devicehub provider, and in the future they will be able to do it themselves. We will

keep the two ways of registering, one with simple QR tags created by refurbishers, and the other with eTags.

Expected improvements through TiS integration:

- eTags can not be copied or tempered with, increasing security and trust in the system
- Additionally to general improvements, easier and faster scanning and identification of devices will allow to split up processes of registration and refurbishes more dynamically

1.1 Tag provisioning

Current tags use QR codes that are printed by the organizations that register the devices.

Description of process using NFC-enabled eTags:

This section describes creation of eTags featuring NFC and QR on one single tag, going through the manufacturing of the tags and their distribution to the user. For this process we estimated we need 100 eTags.

Actors

- Tag provider: organization that orders and manages the eTags; it is certified by eReuse.org thus having permission to order the tags.
- NFC Tag manufacturer.
- Photochromic tag manufacturer.
- User: organization that uses the tags.

Requirements

At least one eReuse.org Devicehub. One Devicehub can contain several organizations and inventories, or organizations can have their own copy of Devicehub. Devicehub work distributely over the Internet.

One eReuse.org Tag running in a server over the Internet by the tag provider.

Process

1. The tag provider enters into the server containing the eReuse.org Tag software and executes the command etag create-tags 100 --csv file.csv, which creates 100 tags in the database and saves their URLs into a spreadsheet CSV file called file.csv.
2. The tag provider sends the CSV file to the NFC tag manufacturer and orders the 100 tags.
3. The NFC tag manufacturer creates those tags (NFC plus QR code) and updates the CSV file with the NFC ID of each tag, so each row of the CSV file contains the URL sent by the tag provider and the ID of the NFC tag created by the NFC tag manufacturer.
4. The Tag provider updates eReuse.org Tag with the ID of the NFC by executing etag update-tags file.csv where file.csv is the file sent by the NFC tag manufacturer.
5. The Tag provider orders 100 photochromic tags to the Photochromic tag manufacturer. Note that these tags don't require any special treatment.
6. The Photochromic tag manufacturer sends back 100 tags.
7. The Tag provider distributes the eTags (NFC and photochromic) to several organizations, users, both physically by sending them and virtually by executing etag set-tags http://some-devicehub.com 0 100; this marks the tags in eReuse.org Tag as sent to some-devicehub.com and creates the tags in that Devicehub.

1.2 Tagging

Assuming, the user has ordered eTags from the devicehub provider (described in 1.1) , this section describes how to tag devices and establishing a linkage between the tag and the computed device information.

Process

1. The user sticks the tags on their devices, and scans the NFC or QR codes.
2. By using the eReuse.org Android App the user can scan the QR code or the NFC of the eTag.
3. If the user is processing devices with the eReuse.org Workbench, Workbench automatically attaches hardware information like serial numbers, otherwise the user can add that information through the app.
4. These softwares communicate with the Devicehub of the user and command the Devicehub to link the device with the tag.
5. The Devicehub of the user links the tag.
6. The Devicehub creates or updates a virtual entity [1] in Evrythng containing the device and the tag.
7. If Devicehub or Evrythng detect that the tag was linked they won't allow this operation. Devicehub can only detect if the app is linked by looking at its internal database. Evrythng, as it contains all device and tag information, validates that the tag is not linked elsewhere.

1.3 Rating

To be described in the final version of this deliverable.

1.4 Storage

To be described in the final version of this deliverable.

1.5 Erase data and obtain certificate

- Process to configure workbench server
- Process to obtain a certificate of data deletion

1.6 Packaging

To be described in the final version of this deliverable.

1.7 Delivery

To be described in the final version of this deliverable.

1.8 Estimate value of devices

Expected improvements through TiS integration

- Automatically calculated price estimates facilitate purchase of used computer (buyback)

1.9 Share device information with retailers

- Process to share with one specific entity
- Process to share with all entities of a repair circuit

1.10 Manage sale with buyer / retailer

To be described in the final version of this deliverable.

1.11 Verify refurbishment of end-user's device

An end-user may verify their device's status and obtain a certificate for its refurbishment.

Process

1. End-users buy second-hand devices from retailers.
2. End-users can apply a more throughout validation or learn about the life-cycle of the device by reading the ID Tag. For example, the QR code or NFC code scanning app, leads to a Web App with the information about the device.
3. The photochromic Tag provides a quick way for the end-user to validate that the device has been refurbished correctly. The user can apply a challenge to ensure the veracity of the Tag by illuminating it. The Web App, in step 2, allows to illuminate the Tag correctly using the phone flashlight (Android smartphones) or instructs how to illuminate the tag manually in case their smartphone is not compatible (no flashlight for example).

1.12 Delivery or pickup from buyer after reuse

To be described in the final version of this deliverable.

2 Retail and distribution

To be described in the final version of this deliverable.

2.1 Make devices available for sale to final users

To be described in the final version of this deliverable.

2.2 Manage purchase of devices with refurbisher / ITAD / etc.

To be described in the final version of this deliverable.

2.3 Distribution of devices

Distribution process is described in this diagram
https://nextcloud.pangea.org/index.php/s/C2xUWggId4GY4xv

2.4 Transport between service providers and buyers

To be described in the final version of this deliverable.

2.5 Estimate selling price

To be described in the final version of this deliverable.

2.6 Manage donations and interactions with donors

To be described in the final version of this deliverable.

3 Post-sale channel support

To be described in the final version of this deliverable.

3.1 Customer service for hardware issues

To be described in the final version of this deliverable.

3.2 Provide hardware warranty

To be described in the final version of this deliverable.

4 Recyclers

To be described in the final version of this deliverable.

4.1 Get certification for recycling

To be described in the final version of this deliverable.

5 Device reuse management

To be described in the final version of this deliverable.

5.1 Pick-up at donor

To be described in the final version of this deliverable.

5.2 Transfer donations to refurbishers

To be described in the final version of this deliverable.

5.3 Get internal custody chain report for donation

To be described in the final version of this deliverable.

6 View public custody chain for present devices

To be described in the final version of this deliverable.

Section 2 - Conclusions

TiS integration will expectedly improve eReuse main processes and subsequently facilitate relevant use cases of different customer segments. Through the use of NFC-enabled tags, processes of handling devices such as registration, refurbishment and transport will be faster and more seamless due to improved scanning of devices. Additionally, this will also enable to split up some processes dynamically so they can be executed asynchronously. Furthermore, adapting and integrating eReuse key modules to TiS is expected to improve functionality and user experience of the respective modules.

The processes most relevant to TiS integration are already developed in great detail, while other processes require more refinement. Additionally, almost all processes need to be further documented. We will continue to work closely with customers across different segments to improve process design and documentation.

Section 3 - References

[1] D1.2 Initial TagItSmart! Reference Architecture and API description [Online]. Available: https://www.tagitsmart.eu/D1.2.pdf