CIRPASS
Digital Product Passport

D3.1 Annex:
DPP Related Initiatives

(V3)

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Document Revision History			
Date	**Version**	**Author/Contributor/Reviewer**	**Summary of Main Changes**
10/05/2023	V1	SLR, CEA, Polimi	
01/06/2023	V2	SLR, CEA, Polimi	13 additional initiatives
03/07/2023	V3	SLR, CEA, Polimi	8 additional initiatives

Preparing the ground for the gradual piloting and deployment of DPPs from 2023 onwards, focusing on developing a roadmap for prototypes in three value chains: electronics, batteries and textiles.

Grant Agreement: 101083432
Theme: DIGITAL-2021-TRUST-01
Start Date of Project: 01 October 2022
Duration: 18 months

Introduction

This document is a supplementary Annex to the CIRPASS report **'Benchmark of existing DPP reference architectures'** (CIRPASS Deliverable 3.1). This Annex provides summary profiles, organized according to a common template, of initiatives that are related to the Digital Product Passport (DPP). It thus provides the European Commission and the DPP stakeholder community with an overview of potentially relevant services and products. Summary details of 32 initiatives were included in the original report. As the CIRPASS consortium continues to collect information on numerous additional DPP-related initiatives, updates to this Annex will be regularly published on the CIRPASS website.

Please note that the information contained in these summary profiles was provided by the organisations responsible for the initiatives. Minimal, if at all, editing is performed by the CIRPASS consortium on the contributions received.

Please note that the CIRPASS consortium accepts all requests to be included in this Annex.

Please note that the summary profiles of DPP-related initiatives are published for information purposes only. The CIRPASS project does not endorse or promote any specific initiatives.

The table below lists the DPP-related initiatives included in this Annex. The summary profiles that have been added or updated (with revised information provided by the organisation responsible for the initiative) in this version of the Annex are highlighted with colour.

If you are involved in a DPP-related initiative and you would like a summary profile to be included in this Annex, then please contact the CIRPASS consortium at info@cirpassproject.eu.

No.	Initiative short name
1	ARIANEE DPP
2	atma.io
3	**BatWoMan**
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5	Wordline B-TraaS
6	CircThread
7	Circular.fashion
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14	**Dyne**
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17	EPEAT Ecolabel
18	eReuseDPP
19	FEDeRATED
20	GTS
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25	Log Data Hub
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28	**Octo + iWay**
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31	PRODUCT DNA®
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Arianee Tokenized DPP

Arianee Tokenized DPP						
Arianee enables brands to issue Tokenized DPP at scale using eco-friendly web3 technologies and NFT standards. Its tokenized DPP (enriched and dynamic NFTs) aim to accelerate the consumption revolution by unlocking 5 utilities (eg: by enabling high product circularity while extending product life cycle)						
Mapping with respect to the reference framework						
Product ID	**Type**	Instance		Category		
	Granularity	Model	Batch	Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes		No		
	Resolver	Yes		No		
Digital connector	**ID minting**	Centralized		Decentralized		
	Data storage location	Centralized		Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others	
	Data packaging	Data transfer		API		
IT architecture: Access control	**Level**	Simple		Advanced		
	If advanced	Attribute based		Role based		
IT architecture: Data use	**Labelling**	Enforcement		Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others		
	Convenience	Wallet	Data Ports	Others		
	Data protection	PETs	Anonymization	Others		
	Traceability	Tagging (QR, NFC, RFID)		Others		
Unique technical aspects						

-Arianee is developing tokenized Digital Product Passports built on the Arianee Protocol which is based on public blockchain. It allows decentralised, independent, and secure verification so that all users can trust each other without relying on a single centralising third party. The Arianee protocol enables management of custom assets called certificates. Certificates are non-fungible tokens (NFTs) compliant with the Ethereum's ERC-721 standard. They represent a unique, either digital or real-life product with its unique metadata stored as a data imprint on a distributed ledger. The Arianee protocol is blockchain agnostic and easily deployable with any Ethereum compatible blockchain. Based on manufacturers' choice, DPP data is stored either on decentralised/distributed cloud service providers (IFPS) or less frequently on centralised cloud service providers (AWS, Microsoft, OVH etc..)

Maturity level and application sectors

Arianee tokenized DPP contributes to the acceleration of the circular consumption revolution in particular in the luxury, retail & fashion sectors by unlocking 5 utilities:

- Upstream product information: it provides (incl. before buying) consumers with insight into the product manufacturing for transparency, traceability, and recycling

- Certificate of ownership and authenticity: authenticity proof created at product inception, transferable with each ownership change for trust in resale (key enabler for circularity)

- Product lifecycle management tool: maintenance booklet records product lifecycle events and offers add-on services (key enabler for durability)

- CRM tool: maintain a perpetual, direct connection with the product holders and enable access to exclusive experiences

Links:

Arianee | Leading NFT Platform for Digital Product Passports and a use case in the luxury sector

Arianee & BCG study: the case for native Digital Product Passport tokenization

Atma.io

atma.io							
End to end traceability platform.							
Mapping with respect to the reference framework							
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	Convenience	Wallet	Data Ports	Others			
	Data protection	PETs	Anonymization	Others			
	Traceability	Tagging (QR, NFC, RFID)		Others			
Unique technical aspects							
atma.io is built on a state-of-the-art microservices based architecture that follows domain-driven-design principles. This architecture and design split the overall functionalities into loosely coupled services that can be developed, operated, and scaled independently. We are following a polyglot approach for the individual microservices which means that we are employing different technologies that are best suited for the specific domain of the individual services (both, from a persistence layer and programming language perspective). For highly scalable inter-service communication, we utilise asynchronous messaging technologies and a variety of design patterns							

to enable both horizontal and vertical scalability. atma.io provides REST-ful APIs for data exchange with external systems and applications. Our standard APIs are GS1 EPCIS compatible to facilitate an easy data exchange with other systems. In addition, we have a standardised way to integrate with Blockchain and Distributed Ledger. Our platform features state-of-the art data security and is designed from ground up to be highly interoperable, and optionally offers a fully redundant set-up.

Maturity level and application sectors

The solution is used by 6 of the 20 biggest fashion brands and traces ca. 23 billion unique items. There are other sectors that utilise our solutions, i.e., food, pharmaceuticals, beauty, packaging, logistics and automotive. We are continuously enhancing our services, enabled by quantitative feedback from the process implementation, piloting and scaling up existing solutions. The atma.io platform provides a range of configuration options, ranging from enabling specific features and modules over use-case specific configurations down to data schemas. We implemented role-based access control for authorisation. User accounts can be created with different access rights and privileges. For both the product-level and the item-level, atma.io uses a flexible schema, allowing additional fields to be captured and managed. atma.io is designed and built for processing data at very large scale and throughput. For example, our Serialization API in the standard configuration provides the ability to process 300 requests per second with a payload size of up to 1000 identifiers per request. We enable consumers to interact with products directly via targeted, contextual and personalized experiences (resolver).

BatWoMan

BatWoMan - Carbon Neutral European Battery Cell Production with Sustainable, Innovative Processes and 3D Electrode Design to Manufacture

The project BatWoMan, started in September 2022 and funded by the European Union's Horizon Europe research and innovation programme, aims to develop new sustainable and cost-efficient Li-ion battery cell production concepts, including a battery passport demonstrator. As part of the three-year-long project, data is collected from materials sourcing, a full life-cycle assessment, as well as from an optimised, data-driven manufacturing process. These data serve as the basis for the battery dataspace and passport, considering all processes from material supply to end-of-life.

The demonstrator within BatWoMan builds on cooperation with major European product passport initiatives, such as BatteryPass and CIRPASS; and dataspace standards and guidelines from Gaia-X and IDSA. The BatWoMan passport builds on and validates the prepared guidelines and standards and showcases a battery passport based on real production data from pilot factories that are members of the BatWoMan consortium.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
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	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture:	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	

Data mgmt features	**Data protection**	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

Unique technical aspects

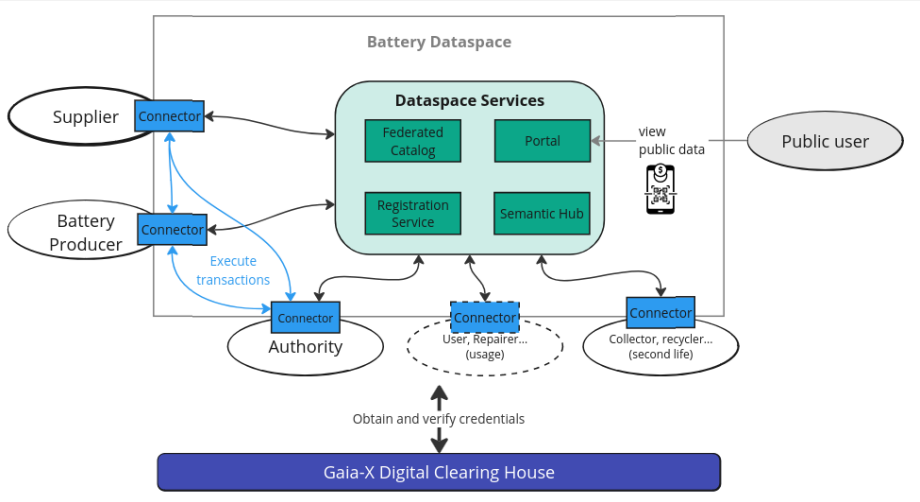
The BatWoMan battery passports builds on the IDS Reference Architecture Model and the Gaia-X Trust Framework to realise a decentralised ecosystem for sharing data, including individual battery passports. Participants and datasets are identified via verifiable credentials (VCs), that is, cryptographically signed certificates stored at their owner. The concrete architecture and implementation will be based on Eclipse Dataspace Components (EDC), in a connector architecture, consisting of dataspace service and connectors for each participant. The latter can connect to each other, to the Gaia-X Digital Clearing Houses to verify compliance, and to dataspace services. A minimal set of dataspace services will be included: a portal to provide user-friendly access, a federated catalog to allow participants to search and select datasets, a registration service to ease participant onboarding and a semantic hub to provide standardised data descriptions.

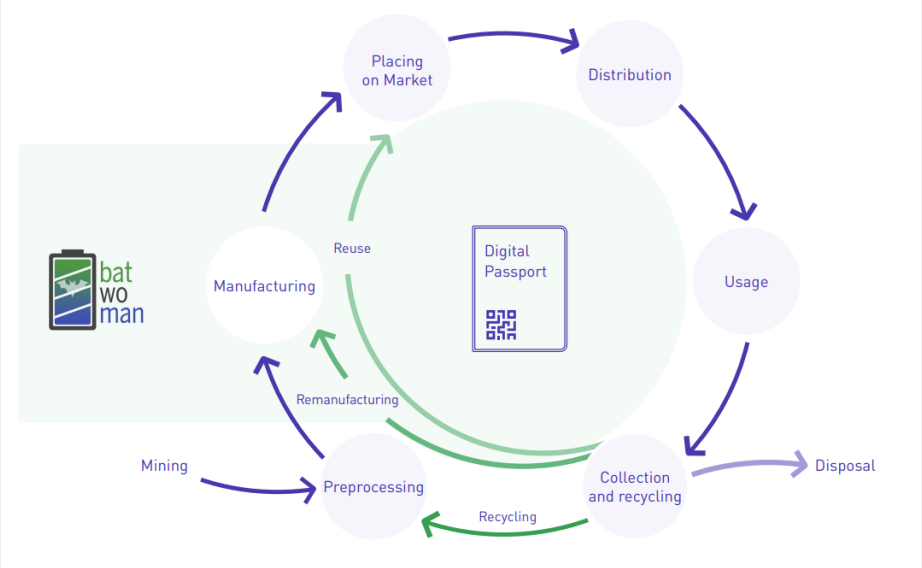
Maturity level and application sectors

Maturity level: Our system is demonstrated as part of battery production, but not in an operational environment pipeline, corresponding to Technology Readiness Level 6. We consider battery cells produced in a research project, which will not be placed on the market. Thus, we work with a reduced supply chain and emulate certain business role (e.g. retailer, authorities) and limit others (e.g. recycler, user). Our data will also be limited: only data from the battery cell production process will be generated as part of BatWoMan, complemented by external data from materials sourcing and estimated data on sustainability from the life cycle assessment. Data related to the usage phase, to the batteries' second life or even from assembled batteries past battery cells (e.g. modules or packs) are not directly included. However, data relevant to the recycling phase, complemented by recommendations on the recycling route, are included via the LCA.

Application sector: Batteries

Passport Architecture





Useful links:

Project website: https://batwoman.eu/

LinkedIn: https://www.linkedin.com/company/88912365/

Cordis: https://cordis.europa.eu/project/id/101069705

ERCIM News article: https://ercim-news.ercim.eu/en133/r-i/digital-battery-passports-for-a-circular-economy

BP

Battery Pass (BP)							
The Battery Pass Project is developing cross-industry content and technical guidelines for a digital battery passport according to EU Battery Regulation requirements and to demonstrate them in a pilot project.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance		Category			
	Granularity	Model	Batch	Prod. order	Single item		
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
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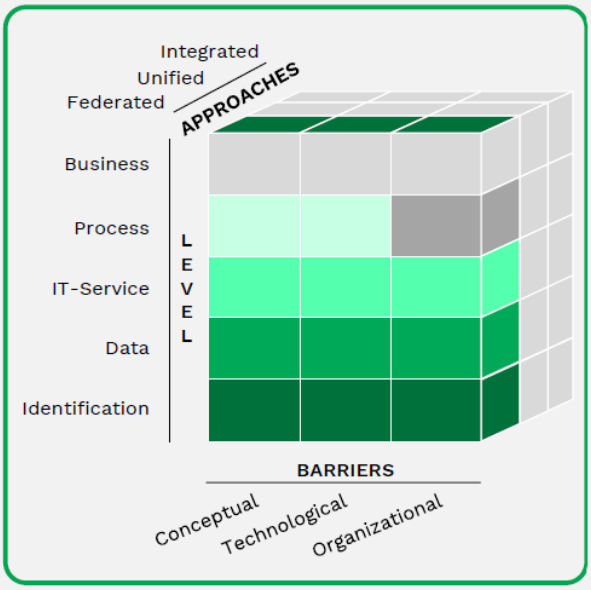
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others			
	Convenience	Wallet	Data Ports	Others			
	Data protection	PETs	Anonymization	Others			
	Traceability	Tagging (QR)		Others			
Unique technical aspects							
We consider the following technical aspects GAIA-X, NGSI-LD, SSI, comprehensive modular Standard Stack considering value chain, data processing and governance.							
Maturity level and application sectors							

Initially, the Battery Pass Project is scoping the automotive industry. But as discussed with stakeholders, most of the standard stack elements could be used for other products and sectors (e.g. GAIA-X specifications). The modularity of the standard stack architecture enables the exchange of sector specific aspects by not changing the entire architecture. As we are aiming to use existing standards for applying most adopted and mature standards.

Enterprise Interoperability Framework (ISO 11354)[1]

Level:

- Business: harmonisation at the level of organization (i.e., methods of work, legislations, culture, ...)
- Process: how to connect internal processes of two companies to create a common one
- IT-Service: Identifying and composing independently designed and developed IT-Services
- Data: interoperability of data to find and share information (i.e., different data models) from heterogeneous bases
- Identification: Unique identification of products, organisations and people along the value chain

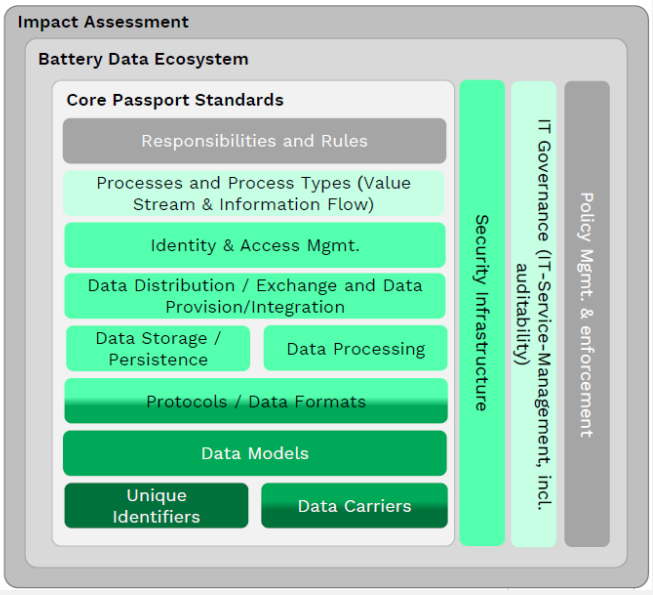


Barriers:

- Conceptual barriers: syntactic and semantic differences of information to be exchanged
- Technological barriers: incompatibility of IT to present, store, exchange, process and communicate data
- Organisational barriers: They relate to the definition of responsibility (who is responsible for what?) and authority (who is authorised to do what?)

1) Source: https://www.researchgate.net/publication/220921500_Enterprise_Interoperability_Framework

Technical Standard Stack



Worldline B-Traas

Blockchain Trace (B-TraaS)							
B-TraaS for Blockchain Traceability as a Service is an open product to allow creation, management and operability of specific traceability chain related to a product value cycle where multiple actors would be involved. As an example, the solution could be used to trace the supply chain of Tuna fish from fishermen up to end consumer who acquire transformed tuna product in a shop. At each stage of the product life cycle, each actor will input information related to his operation to the traceability chain.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
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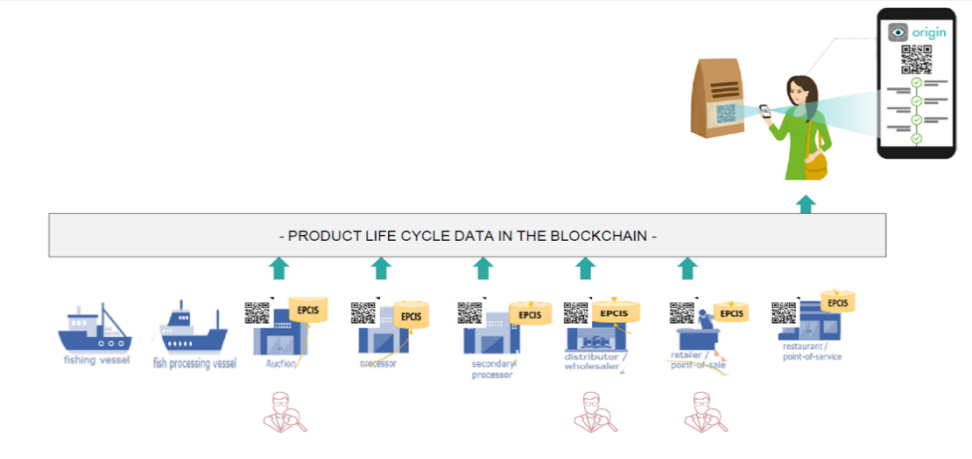
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		
Unique technical aspects							

B-TraaS has been designed in a way that enables the quick and easy creation of a traceability chain based on blockchain technology. Through a web interface, an economic operator would be able in a few clicks to define his traceability chain, input product characteristics to be traced, involve relevant stakeholders and finally generate their own private Blockchain. Through mobile apps or connecting production machines via standardised API, all actors involved would be able to exchange data via their own traceability blockchain.



Maturity level and application sectors

The solution has been used in its first version under the brand “Origin” from bureau Veritas. https://www.bureauveritas.fr/besoin/origin-la-solution-blockchain

CircThread

CircThread
CircThread is a H2020 EU-funded project (2021 – 2025) with the objective to unlock access to product data for circular economy purposes. The main target is to facilitate information flow exchanges across the extended product life cycle from the product as manufactured to retailers, consumers, repairers, collectors, pre-treatment operators and recyclers, as a Circular Digital Thread using Digital Product Passports. The information can vary from data consisting of product characteristics, product components, their materials and chemicals data, and related circularity, environmental, social, and economic information. This data will be captured, linked, and shared on a cloud-based, collaborative ecosystem with a software platform and a linked circular data space with a core set of open-source modules, to allow all actors throughout the product life cycle to share the necessary information. To ensure that more materials and products stay in the economic loop, benefitting the sustainability of the economy and the environment and reducing carbon emissions.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
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IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture:	**Evidence**	Blockchain		Verifiable Credentials		Others	

Data mgmt features	**Convenience**	Wallet	Data Ports	Others
	Data protection	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

Unique technical aspects

The CircThread Ecosystem will enable the following:

- The registration and validation of organisations and their users based on their roles across the life cycle of products.
- The central registration of product models, which form the basis of a model in a company's line of devices or appliances.
- The generation of Digital Product Passports for individual products under a product model. Based on a linkage between the product model, the product serial number that allows individual identification of a product, a QR code for the digital-physical linkage with resolver to the digital product information.
- The generation of product meta-data catalogues at the product model level to enable a registry of potentially available information for exchange at decentralized databases from the data provider.
- The exchange of documents referenced in a product meta-data catalogue based on the International Data Spaces reference model and associated IT infrastructure.
- The decentralized linking of software services to the data space, also referred to as external data apps, which can connect to the information exchange system, so as to process product information.

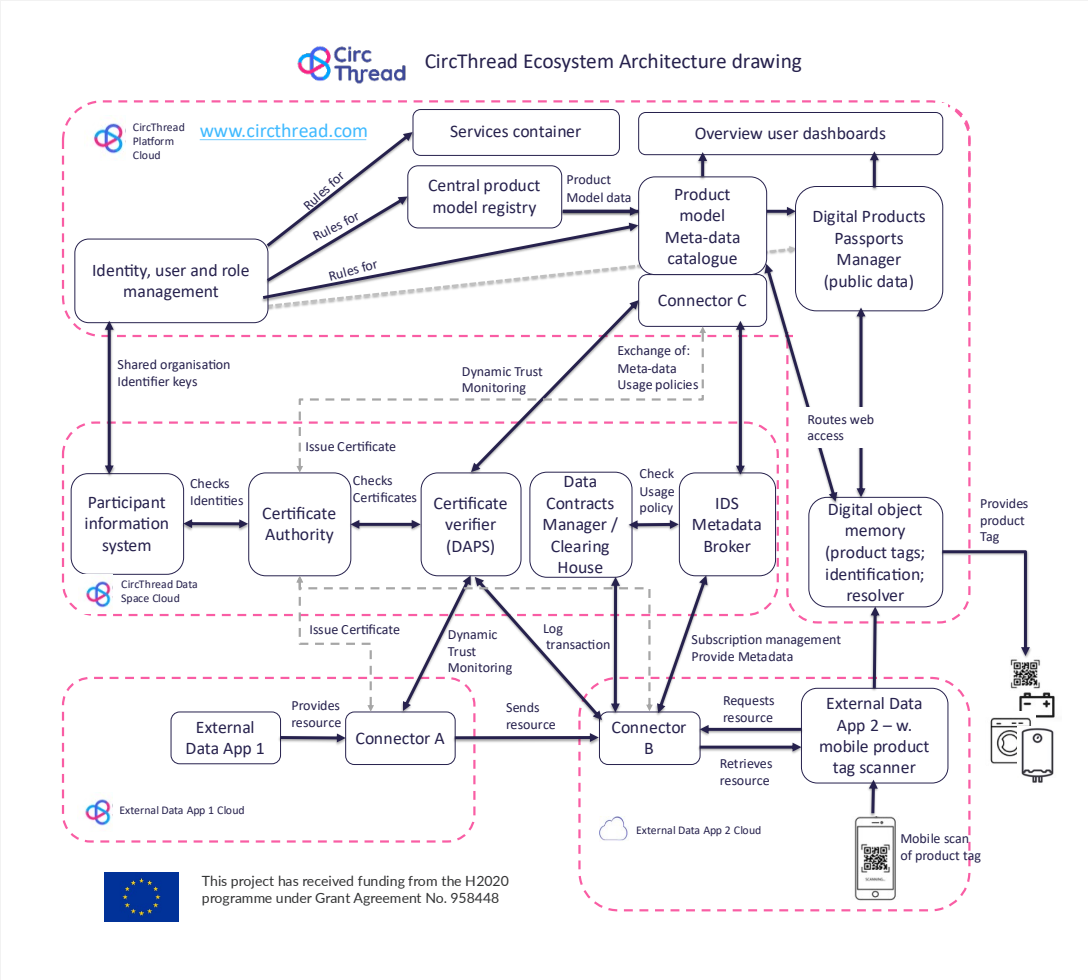
Maturity level and application sectors

Pilots: batteries; boilers; solar photovoltaic glass; washing machines; dishwashers.

Services: 14 product life cycle information exchange and management services at TRL 4 to 5 at start of the project.

Platform: first prototype under development

Dataspace: first prototype under development using IDSA test-bed & Fraunhofer connector.



CircThread IT architecture diagram: www.circthread.com

T5.1 report – CircThread architecture overview and schematics: https://circthread.com/download/deliverable-5-1-architecture-overview-and-schematics/

Circular.fashion

Circular.fashion						
Circular.fashion is a sustainable change agency creating software and system innovation for a circular economy in fashion and textiles. Their DPP initiative, the circularity.ID® is a digital platform containing product transparency information, along with essential material data, to enable a holistic circular system. The objectives are to provide data to facilitate circular business models such as resale, rental and recycling at end-of-life and meanwhile increasing transparency of sustainability efforts and empowering customers. The system is built on the circularity.ID® Open Data Standard which has been developed to power circular practices and ensure longevity and recyclability, taking into account insights and requirements for making a product circular from material to design, use and sorting. Data stored in the system can be reached using circularity.ID® data carriers that are attached to the garments and contain a URL for consumers and a machine-readable identifier.						
Mapping with respect to the reference framework						
Product ID	**Type**	Instance		Category		
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Data mgmt features	**Data protection**	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)	Others	

Unique technical aspects

- Interface for augmented sorting stations.
- Data carriers selected based on on-site tests with sorting facilities.
- circularity.ID Open Data Standard based on extensive research with recyclers, sorters, re-commerce/retailers, repair organisations and producers.
- Data standard is used or intended to be used from five other platforms.
- It allows machine-readable data exchange via API between different systems and stakeholders.
- Platform is built to work with various product identifiers such as GTIN and organisation/location identifiers such as OAR, GLN.

Maturity level and application sectors

The circularity.ID system has been in use with several fashion brands since 2019. The circularity.ID Open Data Standard has been constantly further developed. In 2023 version 4.0 will be launched. Currently, the standard and the circularity.ID system is built for apparel. It could be easily expanded to cover other similar product types. Several textile sorting companies are already equipped with sorting stations to work with the data from a circularity.ID. The sorting stations can be easily expanded to other product passports once they are standardised.

https://circular.fashion/en/

https://circularity.id

https://circularity.id/open-data-standard.html

COSMILE-APP, health&media

COSMILE-APP, health&media
The App offers a European-wide solution for information and identification of cosmetic products (e-labelling). The information on cosmetic ingredients is uploaded by the manufacturer which ensures a reliable source. The product identification is flexible - currently handled via GTIN or QR-code. The COSMILE-App is available in 8 languages, further are in progress. It is based on the European-wide ingredient database, the COSMILE-Europe database, published by the European Cosmetics Association Cosmetics Europe. All information on cosmetics, their ingredients and other information are uploaded by manufacturers, Further enlargements are in progress, e.g. on packaging materials. The application is available since 2018, is permanently upgraded and a solution for digital labelling of cosmetic products.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
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	Data protection	PETs		Anonymization			Others
	Traceability	Tagging (QR, NFC, RFID)			Others		

Unique technical aspects

The COSMILE-App is implemented in Flutter, an emerging framework by Google for app development on both iOS and Android. This allows us to serve both mobile ecosystems with a single code base, improving the user experience everywhere. The product data for the app is prepared in the backend, which receives product information from manufacturers. Data transfer from the manufacturer is realized via Atrify or proprietary methods in Excel or CSV format. During this preparation, ingredient information is validated and corrected through a semi-automatic process, providing a valuable service to manufacturers while simultaneously linking further INCI information to products.

The app primarily uses a barcode (or QR) scanner to recognize products. If products are not covered by our product database, the ingredient information on the packaging can be analyzed using Optical Character Recognition (OCR, text-recognition), and matching INCI information from the Europe-wide database can be provided.

Maturity level and application sectors

The website haut.de is a central communication platform for various interest groups about “cosmetics” in Germany since 2005. The INCI database (ingredients in cosmetics) has been available on this website since 2006, is constantly updated and today comprises around 30,000 individual substances. The first INCI app (text input) was available for iOS and Android since 2016, the successor COSMILE app, extended by the barcode scanner, was launched in Germany in October 2018, shortly thereafter also in Austria and Switzerland. This was followed by the bilingual version of the app: April 2021 (English/German) and the addition of the OCR-INCI reader, the expansion to include Polish in November 2022 and Romanian, Hungarian, Spanish, French in February 2023. The app, which is available throughout Europe, is constantly updated in terms of content and technology. The product database currently comprises 60,000 products, and the app has recorded around 70,000 downloads to date.

Useful link:

www.cosmile.app

Cyclance

CYCLANCE							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance		Category			
	Granularity	Model	Batch	Prod. order	Single item		
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes		No			
	Resolver	Yes		No			
Digital connector	**ID minting**	Centralized		Decentralized			
	Data storage location	Centralized		Decentralized			
IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others		
	Data packaging	Data transfer		API			
IT architecture: Access control	**Level**	Simple		Advanced			
	If advanced	Attribute based		Role based			
IT architecture: Data use	Labelling	Enforcement		Others			
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others			
	Convenience	Wallet	Data Ports	Others			
	Data protection	PETs	Anonymization	Others			
	Traceability	Tagging (QR, NFC, RFID)		Others			
Unique technical aspects							
The EECC DPP's uses GS1 Standards (EPCIS with EECC's EPCIS "EPCAT", Digital Link, Resolver,…)							
Maturity level and application sectors							
Application Sectors: Fresh Food, Textile, Plastic Packaging, Electronics Industry, and Battery							

- Packaging: DPPs are ready for Packaging at R-Cycle where we won the sustainability award https://packagingeurope.com/news/winners-of-the-sustainability-awards-2022-announced/8680.article, we use all relevant plastic producing parameters focusing on Recyclability.
- Battery: DPP demonstrator is ready using producing events for producing battery anodes within a Fraunhofer Initiative, focusing on CO2 and water footprint.
- Textile: DPP will be demonstrable with the consent of C&A with original 100Mio+ events
- Food: DPP adoption out of METROs PIER (ProTrace Inhouse EPCIS Repository powered by EPCAT), running for 7 years.
- Electro/Industry: DPP adoption demonstrator with real data for Schaeffler is ready.

DDCC

Digital Data Chain Consortium (DDCC)							
The Digital Data Chain is a technology stack consisting of three solutions: (1) identification of objects based on IEC 61406-x – Identification Link, (2) digital manufacturer information, conform to VDI Guideline 2770 (to become IEC standard in 2023) and (3) information exchange platforms for the provisioning of object data and information along the supply chain and over the whole object lifecycle.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others		
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
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IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials		Others		
	Convenience	Wallet	Data Ports		Others		
	Data protection	PETs	Anonymization		Others		
	Traceability	Tagging (QR, NFC, RFID)			Others		
Unique technical aspects							
(1) The Digital Data Chain offers a full-fledged technology stack with comprehensive solutions for identification, intelligent product documentation (manuals, drawings, spare part lists, certificates) and platform solutions for the provisioning of the documentation and information between							

manufacturer, owner/operator and service provider. This solution has been developed by the industry for the industry. Compared to other solutions from the B2C sector, that only cover basic requirements like ID and basic technical attributes, the Digital Data Chain covers all requirements of the producing industries, especially authority or legal/statutory documentation requirements.

(2) To preserve and ensure the competitiveness of European manufacturers the technical solutions used for the DPP must be 100% cost free and open source. Otherwise, the European manufacturer will have to pay more for imported intermediate and preliminary products compared to non-European competitors and therefore loose competitiveness. If payable technologies were chosen for the DPP this would cause significant economic damages for European manufacturers. Compared to other solutions like EPCIS/Oliot the AutoID solution and the intelligent documentation solution of the DDC are 100% cost free. There is no protected IP, hidden costs or paid prerequisites to use the solutions of the DDC.

Maturity level and application sectors

The Digital Data Chain started as B2B solution for production hardware used in the chemical industry. It spread quickly to all sectors that use the same hardware for production such as pharmaceuticals, food & beverage, water & wastewater, infrastructure, oil & gas and power generation. Other industries like aeronautics, automotive and machinery are starting PoCs for implementation. The Digital Data Chain is already implemented by global players like Siemens, BASF, Bayer, etc. but also SMEs. In total the DDC technology stack is implemented or under implementation at 500+ companies worldwide. The estimated worldwide market volume of goods provided with DDC technologies till 2030 is 10+ billion EUR.

- SAMSON Product Video: https://www.youtube.com/watch?v=YVDFUrAzvRY
- LESER Product Video: https://www.youtube.com/watch?v=jZk6XZSJlCg
- EMERSON Product Video: https://videos.emerson.com/detail/video/6232376213001/find-spare-parts-using-qr-codes
- DDC Consortium official website: https://www.digitaldatachain.com
- Press release concerning the collaboration between DDC Consortium and Industrial Digital Twin Association (IDTA) regarding the Digital Twin: https://digitaldatachain.com/portal/news

DDC at the ACHEMA 2022, the world leading fair for production hardware in the chemical and pharmaceutical industry. Exhibition of 20+ DDC conform products on the DDC fair stand from different manufacturers. In total 100+ manufacturers showed their DDC conform products on their company fair stands on the ACHEMA 2022.

DIBICHAIN

DIBICHAIN							
DIBICHAIN aims to map material and product life cycles using distributed ledger technology (DLT) to enhance circular economy.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others		
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others			
	Convenience	Wallet	Data Ports	Others			
	Data protection	PETs	Anonymization	Others			
	Traceability	Tagging (QR, NFC, RFID)	Others				
Unique technical aspects							
Considers the concerns of companies exposing their full identity on the ledger.							
Maturity level and application sectors							
Maturity level: prototype level. Link: https://dibichain.com/							

https://www.blockchainresearchlab.org/wp-content/uploads/2020/05/BRL-Working-Paper-No-18-DibiChain.pdf
https://github.com/chainstep/dibichain-demo

DigiPrime

DigiPrime						
Focuses on enabling cross-sectorial applications of circular products by (1) federated platform architecture (2) circularity-oriented services and (3) value-chain integration services.						
Mapping with respect to the reference framework						
Product ID	**Type**	Instance		Category		
	Granularity	Model	Batch	Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes		No		
	Resolver	Yes		No		
Digital connector	**ID minting**	Centralized		Decentralized		
	Data storage location	Centralized		Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others	
	Data packaging	Data transfer		API		
IT architecture: Access control	**Level**	Simple		Advanced		
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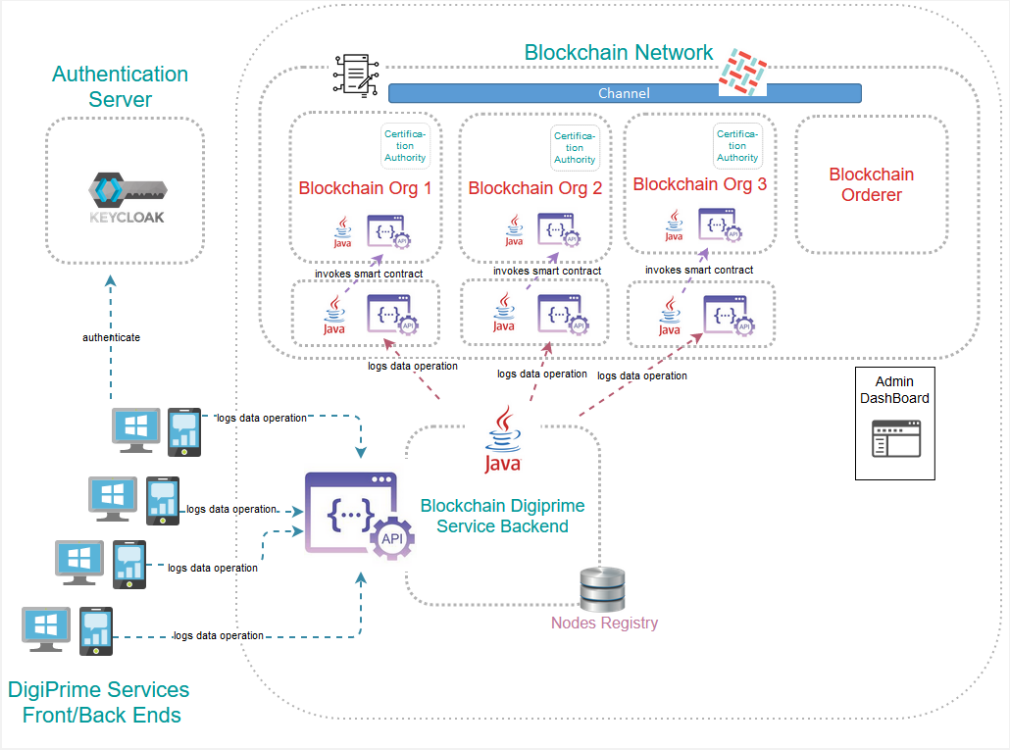
IT architecture: Data use	Labelling	Enforcement		Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others		
	Convenience	Wallet	Data Ports	Others		
	Data protection	PETs	Anonymization	Others		
	Traceability	Tagging (QR, NFC, RFID)		Others		
Unique technical aspects						
DigiPrime is a decentralized federated platform with general purpose data structures to allow maximum customizability and pluggability of services to allow processing and sharing of data across value-chains. Platform infrastructure acts as a container for business services and circular entities shared across the services that agreed to share the entities. Topics like the product management and the certification of a product are made by services, dedicated to a sector (like battery, automotive, etc.) or cross-sectorial. Some of services implement typical DPP features like						

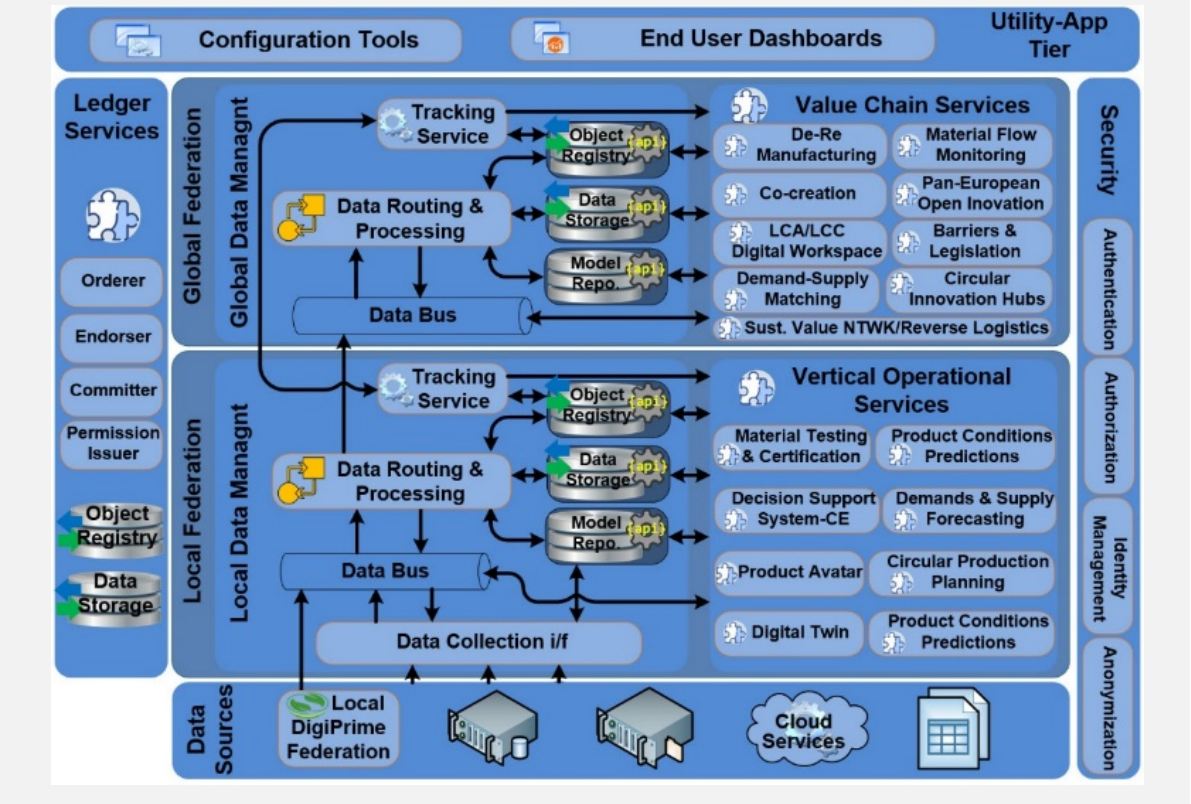
product data provenance, traceability and anti-tampering proofs. Traceability of data inside the platform is implemented by using a blockchain technology and smart contracts. Key strength of the platform is the easy extensibility, allowing many kinds of services made by very different technologies to be installed in the platform and integrated with the platform polymorphic database.

Maturity level and application sectors

The platform infrastructure and the services have been validated in a live environment, by satisfying a set of use cases defined for the DigiPrime platform. Maturity is TRL8 for the infrastructure and the core platform services. DigiPrime Services maturity ranges from TRL5 to TRL9: integration of new services is ongoing, so to extend the existing functionalities to all the sectors. The main sectors of application are Battery, Automotive, Solar Power, Textile, Composites and Techno-Polymers.

https://www.digiprime.eu/




Configuration Tools
End User Dashboards
Utility-App Tier
Ledger Services
Orderer
Endorser
Committer
Permission Issuer
Object Registry
Data Storage
Global Federation
Global Data Managnt
Tracking Service
Object Registry
Data Routing & Processing
Data Storage
Model Repo
Data Bus
Value Chain Services
De-Re Manufacturing
Material Flow Monitoring
Co-creation
Pan-European Open Inovation
LCA/LCC Digital Workspace
Barriers & Legislation
Demand-Supply Matching
Circular Innovation Hubs
Sust. Value NTWK/Reverse Logistics
Local Federation
Local Data Managnt
Tracking Service
Object Registry
Data Routing & Processing
Data Storage
Model Repo
Data Bus
Data Collection i/f
Vertical Operational Services
Material Testing & Certification
Product Conditions Predictions
Decision Support System-CE
Demands & Supply Forecasting
Product Avatar
Circular Production Planning
Digital Twin
Product Conditions Predictions
Data Sources
Local DigiPrime Federation
Cloud Services
Security
Authentication
Authorization
Identity Management
Anonymization

DNV

DNV Digital Product Passport							
DPP infrastructure based on proven industrial supply chain data collection solution with integrated data validation							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance		Category			
	Granularity	Model	Batch	Prod. order	Single item		
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes		No			
	Resolver	Yes		No			
Digital connector	**ID minting**	Centralized		Decentralized			
	Data storage location	Centralized		Decentralized			
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	Data packaging	Data transfer		API			
IT architecture: Access control	**Level**	Simple		Advanced			
	If advanced	Attribute based		Role based			
IT architecture: Data use	Labelling	Enforcement		Others			
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)		Others			
Unique technical aspects							
The key feature of the DNV product passport is twofold: • First, DNV's decades of experience in the certification and assurance domain allows to define the data stack for the establishment of a green claim to be fully in line with specifications of scheme owners or regulators. This knowledge is crucial at the outset of							

the establishment of a DPP program to make it coherent and compliant. Part of this is also, a definition of where and how to source data from either existing legacy systems or to ingest data manually or semi-automatically with a robust verification mechanism to avoid accidental or intentional data tampering/misrepresentation.

- Second is the use of proven traceability, serialisation technology that enables all key features as foreseen by the EU DPP (e.g. proof of provenance, unique/batch/product line identification, full track and trace, attachment of additional datasets to product/batch/etc. – such as social/environmental audit data etc.

Maturity level and application sectors

The DNV DPP is based on industrially proven serialisation and traceability technology, currently in use in several large-scale deployments across various industries (e.g. food, apparel/textiles, industrial products)

DNV's knowledge and expertise for claim and process verification and assurance spans decades and 100k plus customers

Dyne

Dyne
Developed within the Interfacer Project, FabCityOS is an operating system – a standard set of decentralised tools, using the standard vocabulary of Valueflows to describe the nature & relationships of collaborative creations. It has been developed to be compatible with the aims laid out by the EU ESPR which defines DPPs as the technical keystone to: • Increase sustainability. • Achieve a circular economy. • Minimise energy & primary resource consumption. • Provide product locality information. • Provide detailed insights to assess mass production models. Dyne's DPP implementation is designed to empower autonomous communities to create & collaborate in distributed design & manufacturing value chains across all participants & facilities by providing verifiability of contributions made to each product. Dyne's DPP portable linked data structure offers verifiable cryptographic objects that can be stored in any blockchain or distributed ledger.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance		Category			
	Granularity	Model	Batch	Prod. order	Single item		
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes		No			
	Resolver	Yes		No			
Digital connector	**ID minting**	Centralized		Decentralized			
	Data storage location	Centralized		Decentralized			
IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others		
	Data packaging	Data transfer		API			
IT architecture: Access control	**Level**	Simple		Advanced			
	If advanced	Attribute based		Role based			
IT architecture: Data use	Labelling	Enforcement		Others			
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others			
	Convenience	Wallet	Data Ports	Others			
	Data protection	PETs	Anonymization	Others			

	Traceability	Tagging (QR, NFC, RFID)	Others

Unique technical aspects

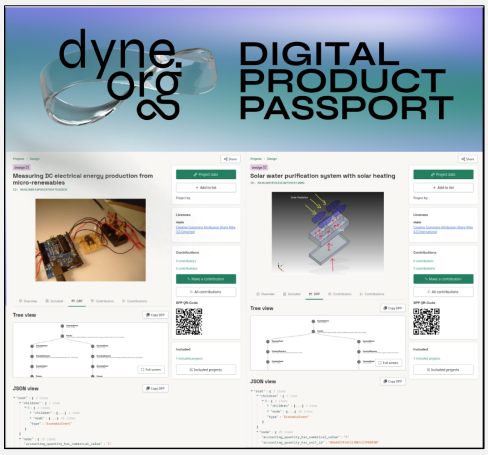
ValueFlows (VF) is based on a REA economic model (Resources, Events, & Agents) to describe flows of economic resources within distributed economic ecosystems & defines a casual graph object relationship.
Resources: including digital designs & physical products & services.
Events: past actions applied to Resources; create, modify, consume, use, or transfer from one Agent or Location to another.
Agents: individuals/orgs who perform Events affecting Resources.
Processes: containers for Events & Resources.
Zenflows (ZF) integrates multi-party signature cryptography to produce DPPs that link to the distributed VF trace graph over the entire product life cycle, allowing for a cumulative claim of contributions made across a product's life cycle, producing portable cryptographic objects & supporting multiple blockchain flavours.
ZF utilises the W3C DID standard for decentralised identifiers & ActivityPub for networking. This empowers digital sovereignty & federated cooperation.

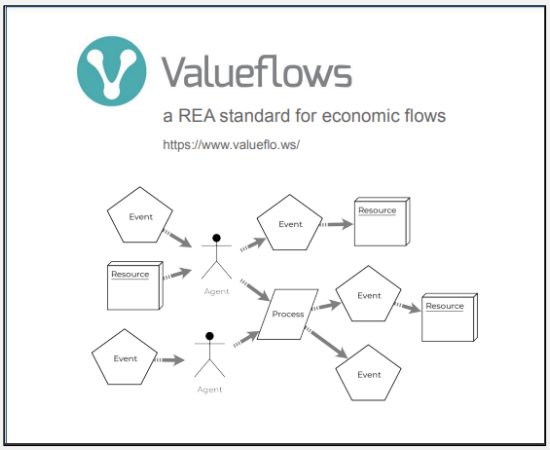
Maturity level and application sectors

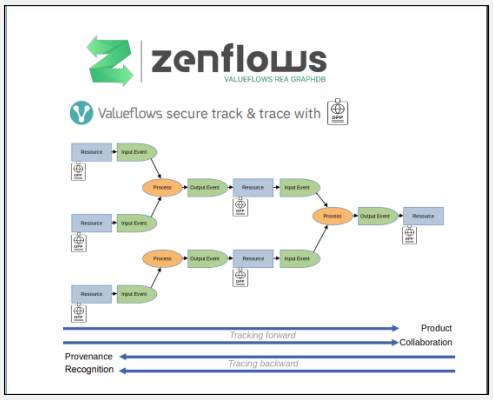
Dyne's implementation is a culmination of over more than 7 years of EU R&D public domain development in open data, cryptography & developer/end-user engagement. Focused on self-sovereignty, transparency & auditability, the entire stack is open source & designed on open protocols & standards. For modular interoperability, the design is federated & decentralized. The modularity & blockchain agnostic implementation allows interoperability with multiple blockchain/DLT flavours, or any other common-trust-root technologies.

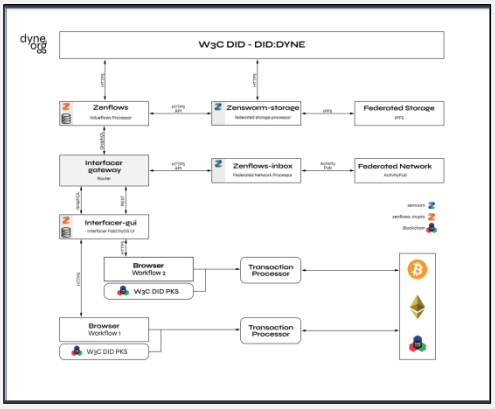
Atomic REA event flows as portable cryptographically assured objects ensure open compatibility across all application sectors and cooperative participants of all sizes (from individuals to SMEs to multinationals)

Because the architectural approach is open, modular and standards-based, it is easily integrated with other tools, applications & systems; from physical manufacturing & logistics to digital products such as art & source code.









Useful links:

Live Instance: https://interfacer.dyne.org

Documentation: https://interfacerproject.github.io/interfacer-docs/#/

EasyBat

EasyBat
To date, lifecycle asset management for batteries has been cumbersome at best. Before EasyBat, tracking battery assets was essentially non-existent. Currently, in Belgium, the registration of customer-owned assets, such as a home battery, requires a lot of information and burdensome paperwork collection. EasyBat aims to greatly simplify that process. The solution focuses on the entire battery lifecycle by creating a digital passport which third-parties such as the manufacturer, installer, and/or DSO can verify. Such a DER Passport provides a shared state of the asset and its history to any pre-approved energy market participants. Original equipment manufacturers (OEMs), distributors, installers, and accredited inspection and certification organisations issue and verify every relevant asset transaction throughout a battery's lifecycle. EasyBat heavily leverages the open-source EW-DOS technology stack, including EW Switchboard, a new interface for managing decentralised, self-sovereign identities, as well as their associated assets, roles, and permissions.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance		Category			
	Granularity	Model	Batch	Prod. order	Single item		
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes		No			
	Resolver	Yes		No			
Digital connector	**ID minting**	Centralized		Decentralized			
	Data storage location	Centralized		Decentralized			
IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others		
	Data packaging	Data transfer		API			
IT architecture: Access control	**Level**	Simple		Advanced			
	If advanced	Attribute based		Role based			
IT architecture: Data use	Labelling	Enforcement		Others			
IT architecture:	**Evidence**	Blockchain	Verifiable Credentials	Others			

Data mgmt features	**Convenience**	Wallet	Data Ports	Others
	Data protection	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

Unique technical aspects

EasyBat project is an asset lifecycle management project leveraging the use of Decentralised Identifiers (https://www.w3.org/TR/did-core/). Under this project, each battery has a unique DID and several stages in the life of a battery are recorded in the battery's DID serving as a digital passport.

Organisations themselves also have a role; these include:

- Governing Body: this could be a single or group of organisations. e.g. bebat. A single or group of organisation will have a Decentralized Identifier (DID).
- Asset: it is an eligible asset mentioned by governing body. e.g. battery, inverter, PV, EVSE, car. Each asset has a Decentralized Identifier.
- OEM: this could be an asset manufacturing company, producing finished products like Batteries. Each OEM will have a Decentralized Identifier(DID).
- Asset Installer: it is a certified professional or an organisation allowed to install assets (only qualified).
- Asset Verifier: a designated individual from an organisation to verify correctness of asset installation.
- Asset Owner/User: an individual or organisation owning or leasing the asset.

DLT technology is also used. More specifically, ERC 1056 and ERC 1155 standards have been utilized for this project.

- ERC 1056 can convert any externally owned Ethereum account to DID and support management of delegation and serviceEndPoints. It considers all valid Ethereum addresses as valid DID. A DID can have manages its own delegation and attributes. The implementation of ERC 1056 allows to maintain a registry of DIDs.
- ERC 1155 is a multi-standard token standard that include any combination of fungible, non-fungible tokens, or other configurations. The ERC 1155 approach can be extended to use a single ERC 1056 instance to create and manage proxy identities. This allows to:
    - update the owner of a DID without changing the DID uniform resource name (URN)
    - add/update metadata URI to the Proxy Identity (without the need of using serviceEndpoints)
    - add/remove recovery agents
    - add/remove delegates

Attributes per battery recorded in the digital passport include:

- Manufacturer: manufacturer of the battery [string]
- Model: model of the battery [string]
- Capacity: capacity of battery in kWh [float]
- Serial Number: serial number of the battery [string]
- Chemical Type: chemical type of the battery [string]

- Weight: weight of the battery in kg [float]

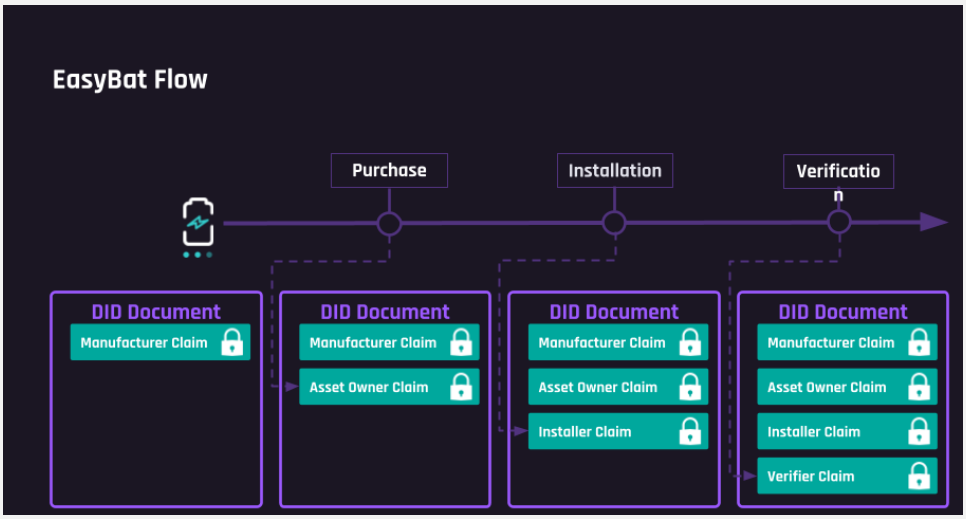
QR Code specification:

- Universally Unique Identifier (UUID) generated 128 bit QR code.

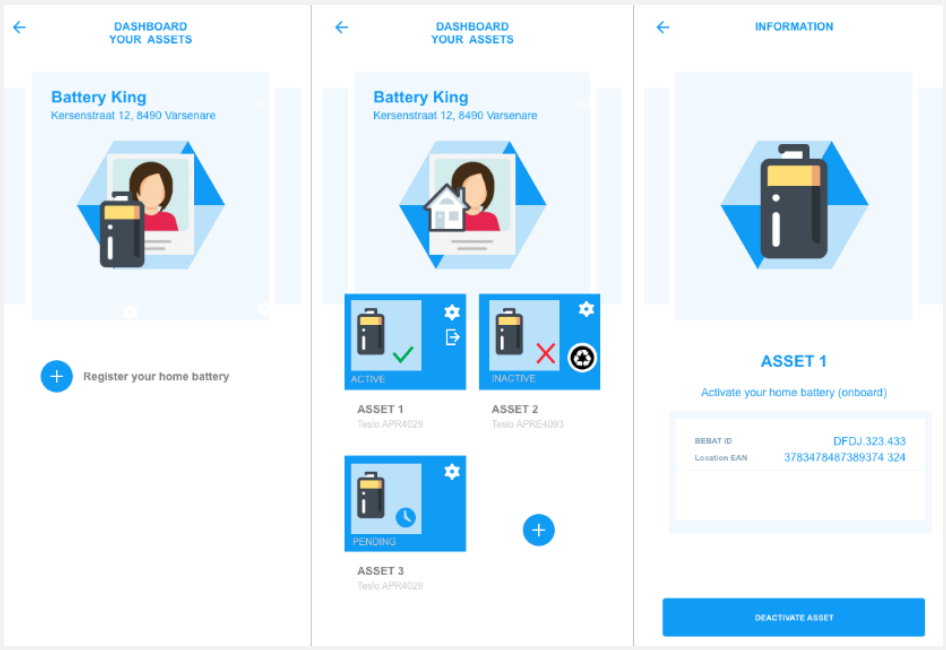
Maturity level and application sectors

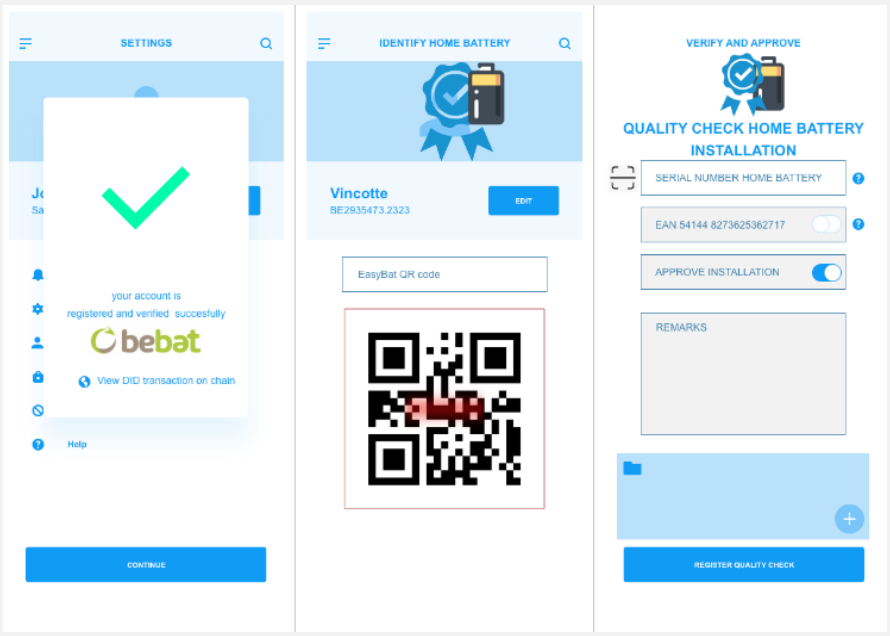
The EasyBat project is a Minimum Viable Product (MVP) that only focuses on the battery sector. A first beta release has been successfully tested and upcoming iterations are planned (still work in progress).

EasyBat DID flow:



Pictures of EasyBat wireframes:





Useful links:

https://easybat-dev.energyweb.org/
https://github.com/energywebfoundation
https://medium.com/energy-web-insights/bebat-launches-easybat-an-open-source-decentralized-solution-for-battery-lifecycle-management-281f2ace61e9
https://pers.fluvius.be/bebat-en-fluvius-lanceren-easybat-om-levensloop-batterijen-beter-op-te-volgen-via-blockchain.

EON

EON							
EON is retail's leading product digitisation platform. We connect physical products with a Digital ID to make them more traceable, interactive, and valuable.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order		Single item
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports		Others
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labeling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials			Others
	Convenience	Wallet		Data Ports			Others
	Data protection	PETs		Anonymization			Others
	Traceability	Tagging (QR, NFC, RFID)			Others		
Unique technical aspects							
The Product Cloud is an extensible data-centric application that allows brands to frictionlessly ingest product and event data from disparate sources, transform, harmonise, and resolve the data to support interoperability. This data management and orchestration layer allows brands to track, report and analyse on all aspects of a products lifecycle. EON's Data Ingestion/Pipeline tool offers a low-code/no-code intuitive self-service UI and underlying services to orchestrate data							

movement along with offering data mapping, transformations and processing reporting. Specifically designed to handle complexity automatically.

- Supports ingesting data from diverse and multiple sources.
- Supports all major data stores and file formats.
- Supports industry data standards just as EPCIS, Circular Data Protocol, etc along with brand defined data standards.
- Quickly analyse product data to determine compliance state based on brand defined policy scopes.
- Data governance, performance, scalability, and security built in.

Digital Link Resolver - Programmatic redirects with a robust rules engine. Certificate of Ownership - AI based rules engine along with optical character recognition and blockchain agnostic. Multi-layered brand protection approach which combines overt, covert, and digital authentication techniques. Exploration, Intelligence & Insights Lab. Traceability Manager. Customer Experience Studio. EON Exchange.

Maturity level and application sectors

EON powers product digitisation (Digital ID) for the largest global brands and retailers — with partners and clients like H&M, Chloe, Target, Mulberry, Kathmandu, Giorgio Armani, Brunello Cucinelli, Coach, Victoria Secrets and many more. We are an enterprise ready SaaS platform, with experience deploying Digital Product Passports across complex global organisations, and in many geographies. Our platform specialises in data sharing and data exchange between brands and resale and recycle partners, with some of the largest players in the world like Vestiaire Collective and Waste Management connecting in through the EON product digitisation platform.

References:

- Forbes: This Technology Will Have a Profound Effect on the Fashion Industry
- Vogue Business: Digital IDs — a game changer for fashion
- Vogue Business: Chloe moves ahead on commitment to give all products Digital ID
- EU Commission invites EON — learning from frontrunners, Digital Product Passports
- EON pioneers Circular Data Protocol with H&M, GS1, EU and more — foundation for Digital Product Passport legislation
- Business of Fashion: What Digital IDs can do for Fashion with Natasha Franck x Natalie Massenet
- Forbes: Could fashion's digital tag, EON, help fashion become circular?
- Forbes: Carbon Labels, Digital Passports And Traceability Tags – Clothing Labels' New Normal

EPEAT Ecolabel

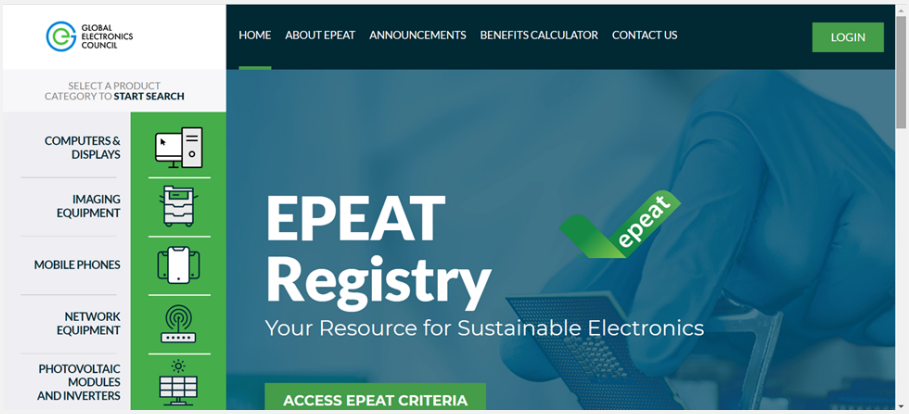
EPEAT Ecolabel							
EPEAT is a global Type 1 Ecolabel for electronic products, including ICT products and photovoltaic modules. It is used by purchasers world-wide to identify sustainable electronic products. EPEAT consists of 3 elements: 1) Lifecycle-based performance criteria for the product, supply chain and company in 4 areas – carbon/greenhouse gas reduction, circularity, chemicals of concern and corporate supply chain due diligence (social) performance; 2) 3rd party conformance assurance system; and 3) Public, searchable product registry (www.epeat.net) that identifies products awarded the EPEAT ecolabel.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		

Maturity level and application sectors

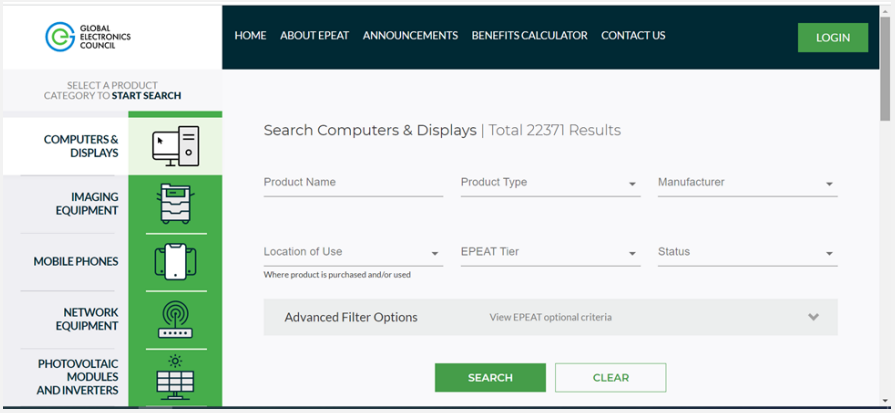
Electronics sector; applicable to finished products including computers, displays, imaging equipment, mobile phones, televisions, servers, network equipment & photovoltaic modules. EPEAT (www.epeat.net) was launched in 2006. Currently (Nov 2022), over 60 global and regional electronics brands participate and over 4000 unique products carry the EPEAT ecolabel. EPEAT has minimum criteria that must be met to be awarded EPEAT (bronze), products attain higher levels of recognition for meeting more aspirational, optional criteria (silver and gold).

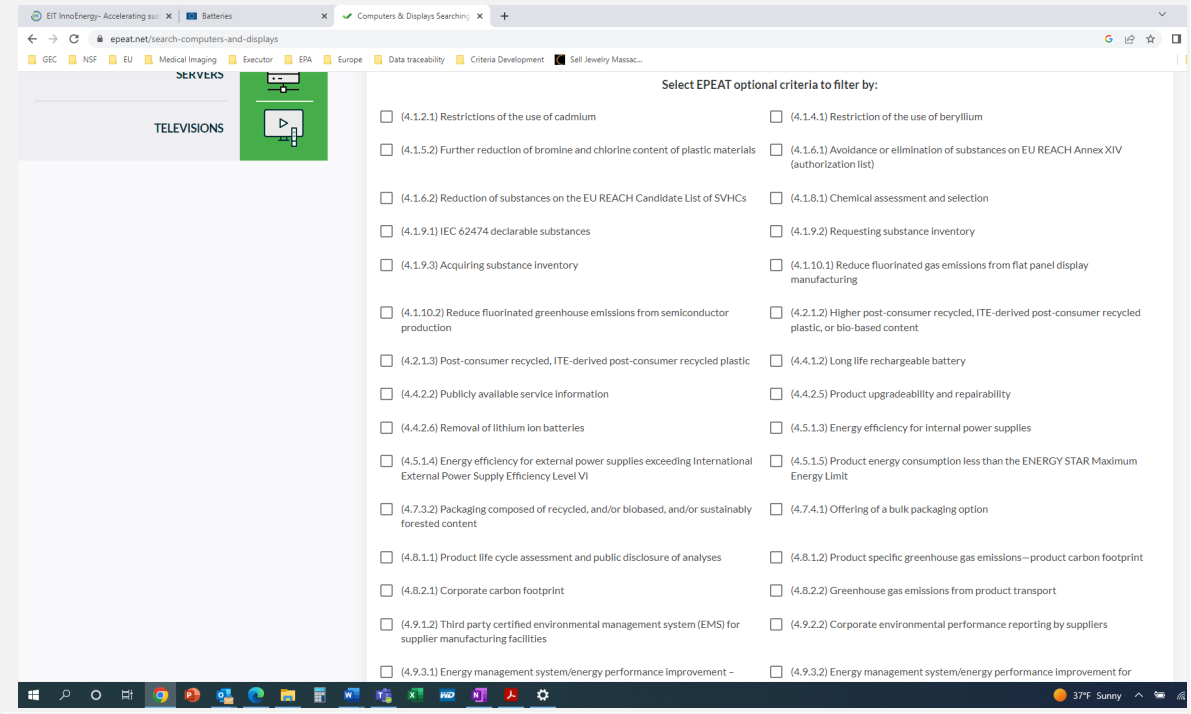
The EPEAT platform has a "back end" that is accessible by password only. Manufacturers enter data for performance criteria. Independent Conformance Assurance Bodies (CABs) and EPEAT Program verify data entry and review evidence submitted by manufacturers. The public-facing registry allows users to identify products (by model) that meet EPEAT and download data in Excel format. EPEAT also provides API data feeds using unique product identifiers.

EPEAT provides a public searchable Registry at www.epeat.net. Products are organized by category as shown on left.



Registry can be searched by product name, type, manufacturer, country of use, and EPEAT Tier.




EIT InnoEnergy- Accelerating su
Batteries
Computers & Displays Searching
epeat.net/search-computers-and-displays
GEC
NSF
EU
Medical Imaging
Executor
EPA
Europe
Data traceability
Criteria Development
Sell Jewelry Massac...
SERVERS
TELEVISIONS
Select EPEAT optional criteria to filter by:
(4.1.2.1) Restrictions of the use of cadmium
(4.1.4.1) Restriction of the use of beryllium
(4.1.5.2) Further reduction of bromine and chlorine content of plastic materials
(4.1.6.1) Avoidance or elimination of substances on EU REACH Annex XIV (authorization list)
(4.1.6.2) Reduction of substances on the EU REACH Candidate List of SVHCs
(4.1.8.1) Chemical assessment and selection
(4.1.9.1) IEC 62474 declarable substances
(4.1.9.2) Requesting substance inventory
(4.1.9.3) Acquiring substance inventory
(4.1.10.1) Reduce fluorinated gas emissions from flat panel display manufacturing
(4.1.10.2) Reduce fluorinated greenhouse emissions from semiconductor production
(4.2.1.2) Higher post-consumer recycled, ITE-derived post-consumer recycled plastic, or bio-based content
(4.2.1.3) Post-consumer recycled, ITE-derived post-consumer recycled plastic
(4.4.1.2) Long life rechargeable battery
(4.4.2.2) Publicly available service information
(4.4.2.5) Product upgradeability and repairability
(4.4.2.6) Removal of lithium ion batteries
(4.5.1.3) Energy efficiency for internal power supplies
(4.5.1.4) Energy efficiency for external power supplies exceeding International External Power Supply Efficiency Level VI
(4.5.1.5) Product energy consumption less than the ENERGY STAR Maximum Energy Limit
(4.7.3.2) Packaging composed of recycled, and/or biobased, and/or sustainably forested content
(4.7.4.1) Offering of a bulk packaging option
(4.8.1.1) Product life cycle assessment and public disclosure of analyses
(4.8.1.2) Product specific greenhouse gas emissions—product carbon footprint
(4.8.2.1) Corporate carbon footprint
(4.8.2.2) Greenhouse gas emissions from product transport
(4.9.1.2) Third party certified environmental management system (EMS) for supplier manufacturing facilities
(4.9.2.2) Corporate environmental performance reporting by suppliers
(4.9.3.1) Energy management system/energy performance improvement –
(4.9.3.2) Energy management system/energy performance improvement for
37°F Sunny

eReuseDPP

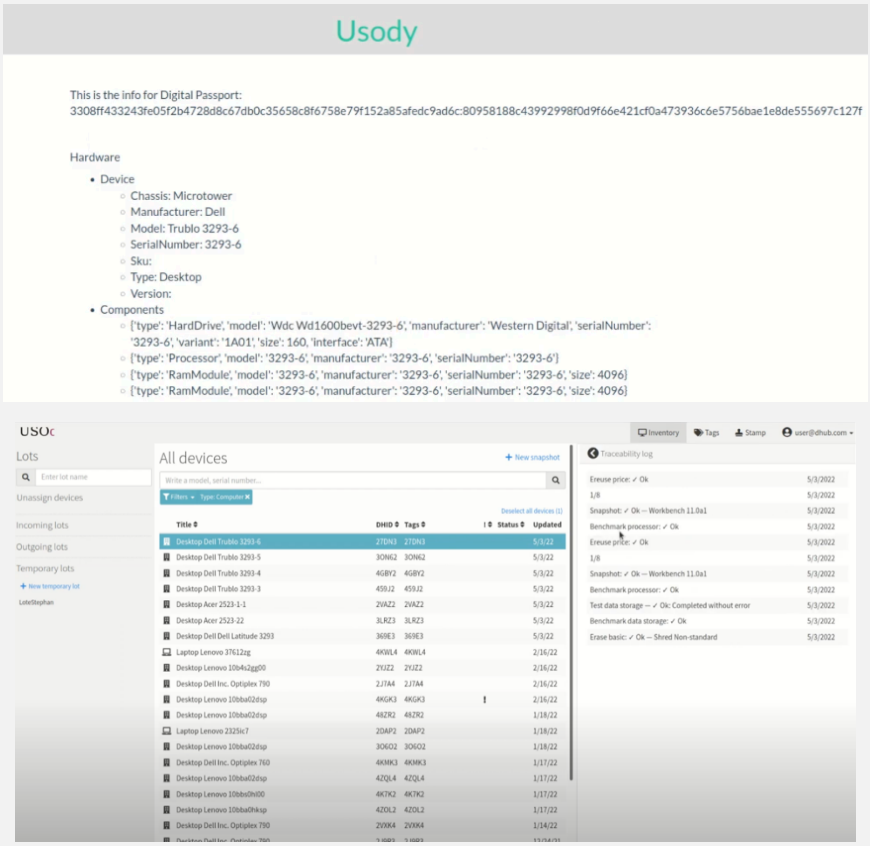
eReuseDPP/Usody							
A DPP architecture and pilot for the circular management of ICT devices in use.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		
Unique technical aspects							
The eReuseDPP system manages an inventory of digital device product details combined with a ledger of device lifecycle events. The ledger is recorded in a verifiable registry, equivalent to the function of a notary public, that offers transparency and accountability about the detailed data. The verifiable registry relies on an append-only distributed ledger, which can apply agreed on rules about procedures when a condition is met (smart contracts, inexorability). We have integrated it into DeviceHub, an open-source device inventory system that acts as a client and intermediary on behalf of human device owners that can record supporting digital details and content and generate and							

deliver digital product passports (JSON and HTML formats currently). The product and part details are retrieved using an open-source hardware inspection software that creates secure documents (snapshots).

Verifiable proofs and decentralised identifiers follow the W3C DID model. The verifiable registry is DLT agnostic and mapped into two backends: a permissioned Ethereum, and IOTA DLT.

Maturity level and application sectors

TRL 7 - System prototype demonstration in operational environment. The prototype manages about 20 thousand ICT devices and generates simple DPPs for these products as they change hardware configuration during lifespan due to repair, refurbishment, usage, while recording proofs in a verifiable registry linking changes to documents (snapshots), timestamps and summaries.



FEDeRATED

CEF FEDeRATED Action (FEDeRATED)
FEDeRATED was an EU CEF project for digital co-operation in logistics which consists of 15 partners located in 6 EU Member States (Luxemburg, Italy, Finland, Netherlands, Spain, Sweden). However, the project is open to observer organizations that would like to contribute and join efforts to realize sustainable data sharing. The German Ministry of Transport and Digital infrastructure participates as an observer in the FEDeRATED projects. Within the context of testing data sharing opportunities on their feasibility business and public authorities are invited to participate in a multitude of national and cross-bordering pilots and living labs. • Demonstrate how the federative platform as proposed by the EU Digital Transport and Logistics Forum (DTLF) can work. • Identify the conditions (barriers and opportunities/benefits) that allow different stakeholders to make use of federated data sharing platforms. • Facilitate seamless and cross bordering multimodal freight transport, cross bordering harmonized data interoperability, and data sharing between relevant actors. • Enable paperless transport in all transport modes via concrete actions and large-scale collaboration. • Support eGovernment, including a one-stop shop and only once reporting functionalities, and a corridor management information system approach. • Develop a reference architecture for a sustainable data sharing environment. Find more information at: http://www.federatedplatforms.eu/

Mapping with respect to the reference framework							
Product ID	**Type**	Instance		Category			
	Granularity	Model	Batch	Prod. order	Single item		
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes		No			
	Resolver	Yes		No			
Digital connector	**ID minting**	Centralized		Decentralized			
	Data storage location	Centralized		Decentralized			
IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others		
	Data packaging	Data transfer		API			
IT architecture: Access control	**Level**	Simple		Advanced			
	If advanced	Attribute based		Role based			

IT architecture: Data use	Labelling	Enforcement	Others	
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others
	Convenience	Wallet	Data Ports	Others
	Data protection	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

Unique technical aspects

The vision is to go from a monolithic data sharing platform perspective towards a federated network of platforms. Enabling all supply chain operators to connect, operating their own IT systems or platforms. In contrast to the traditional platforms which only access data that is within the database of their system, the federated platform aims to leverage on decentralized architectures in order to access any data anywhere in the world. Moreover, the adoption of semantic web technologies for linked data (RDF) enables a better representation of data and powerful querying capabilities.

Maturity level and application sectors

The maturity level is akin to the TRL 6-7 level. This means that FEDeRATED is applied and developed in several prototypes and different sectors but has no market ready product to offer.

The main purpose is the development of the foundations for a secure, open, and neutral data sharing infrastructure provision through practical Living Labs. The 15 FEDeRATED partners are executing 23 Living Labs/Pilots until the end of 2023. Living Labs are required to cover several modes of transport putting focus upon multi-modal concerns and events within (including a section of) a transport corridor. The Living Labs address the value of enhanced transparency, data sharing with a focus beyond a single organization, and encourage data sharing and collaboration among multiple parties along the transport chain.

GTS

Global Textile Scheme (GTS)							
Developed by a cross sectoral industry initiative of material suppliers, brands, retailers and IT companies (ERP). The develop a unique end-to-end data exchange standard for textile value chains with "Mapping function" (current data worlds can remain the same).							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)				Others	
Unique technical aspects							
USP: Pulling data concept, like an online bank statement. Covering data from fiber to circularity. Technical implications: (1) catalogue with clear semantics and; (2) encoding each of the data in the							

catalogue for multilingual features. Today the system is based on article – colour – size (Stock Keeping Unit = GTIN) but could be extended to article – colour – size – production order - lot.

Per user only onetime translation/mapping process per product class, therefore reduced interface complexities.

Maturity level and application sectors

Maturity level: Complete for today's needs.

GoodsTag GmbH Smart Products Platform

GoodsTag GmbH Smart Products Platform
With a unique digital ID for each product, our platform enables context-driven services, enhances management and tracking capabilities, and ensures unparalleled brand security. From source-tagging to label printing and personalized customer activation, GoodsTag Smart Products platform covers every aspect of your product journey. The platform provides user-friendly real-time management and analysis tools for every stage, from production and warehousing to in-store and at-home experiences. Gain complete visibility into the product life cycle, down to the individual item, and enjoy unmatched end-to-end control. By harnessing the power of smart products, you can transform them into real-time media channels. Forge deeper customer and brand relationships through personalized and meaningful product interactions. GoodsTag empowers you to deliver the perfect experience at precisely the right moment, fostering loyalty and engagement.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		

Unique technical aspects

The GoodsTag Smart Products Platform is built on the base of an API-first microservice infrastructure, it seamlessly integrates with various systems and applications, enabling effortless communication and data exchange. The platform is ID agnostic, accommodating multiple identification methods and standards such as RFID, NFC, QR codes, and more. It also supports handling IDs at any level, whether it's SKU, batch/lot, or single item, providing granular control and tracking capabilities. GoodsTag is trigger technology agnostic, allowing seamless integration with different trigger technologies like various RFID readers and mobile devices. This versatility ensures that your smart products can be activated and interacted with through the most suitable means for your business. Adhering to GS1 standards, including the early adoption of the GS1 Digital Link standard, GoodsTag ensures compliance and compatibility with global best practices in product identification and data management. This standard unlocks opportunities for richer product information, dynamic interactions, and extended functionalities through web links associated with product identifiers.

Maturity level and application sectors

The GoodsTag Smart Products Platform is a mature and robust solution that has been developed and refined to meet the diverse needs of various application sectors. With a proven track record and experience in the industry, GoodsTag offers a high level of maturity in terms of technology, functionality, and reliability. The platform caters to a wide range of application sectors, including retail, manufacturing, fashion, FMCG, healthcare, and more. GoodsTag enables enhanced inventory management, personalized customer experiences, and improved supply chain visibility. With its flexible and adaptable nature, the GoodsTag Smart Products Platform can be tailored to meet the specific requirements of various sectors, making it a versatile solution for companies across industries. The platform facilitates traceability and real-time tracking as well as monitoring capabilities of diverse products. GoodsTag's maturity level and its applicability to diverse sectors make it a trusted and reliable choice for businesses seeking to digitize their product lifecycle, enhance operational efficiency, and provide exceptional customer experiences.

Useful link:

https://www.goodstag.com/platform/

Infinite X

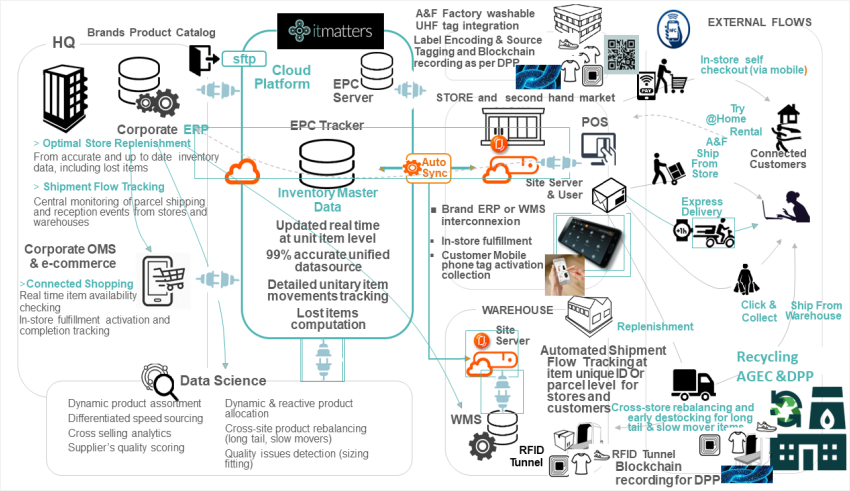
Infinite X
At Infinite X, we are building a closed loop system. It has three layers i.e., DPPs, Reverse Logistics and Partnerships. With DPPs we collect maximum possible information about the product from the brand and utilise this to route the product to the right partner at the right time at least cost. Partners here are recyclers, upcyclers, NGOs for donation, resellers, etc. We integrate DPPs with clothes during their manufacturing stage. We are primarily operating on heat seal taffeta based QR code labels and NFC chips. Currently we are limiting ourselves to fashion categories including bags, footwear, garments and accessories. We are primarily operating in India.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		

Unique technical aspects
Our DPPs are granular to item level. For easy handling of information at a granular level, we have categorised common information in sets like style, commerce. While onboarding, we copy them across items. We do not operate on any external stimuli-based event flow as of now. For example, we don't know whether a customer has bought a product or not until they register their purchase by themselves. Our database simply works on a hub and spoke model where the hub is a unique product and spokes are different data sets associated with it. These data sets are modifiable as we move ahead with more products and types of partnerships.
Maturity level and application sectors
We have onboarded 1200+ products of 4 brands and 1 marketplace till now. An TRL, we are at level 7 i.e., System model or prototype demonstration in an operational environment. Our application areas include garments, accessories, bags, and shoes. Useful links: https://infinitex.in/products/InfiniteX100003746

itmatters

Itmatters							
Unique Cradle to Grave 4.0 garment and footwear traceability solution.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order		Single item
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	NFC
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports		Others
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials			Others
	Convenience	Wallet		Data Ports			Others
	Data protection	PETs		Anonymization			Others
	Traceability	Tagging (QR, NFC, RFID, GS1)			Others		
Unique technical aspects							
Itmatters data Mesh cloud S.A.A.S Platform today has 1 billion connected objects capacity and provides the following information to brands & manufacturers, end consumers and governments administrations.							

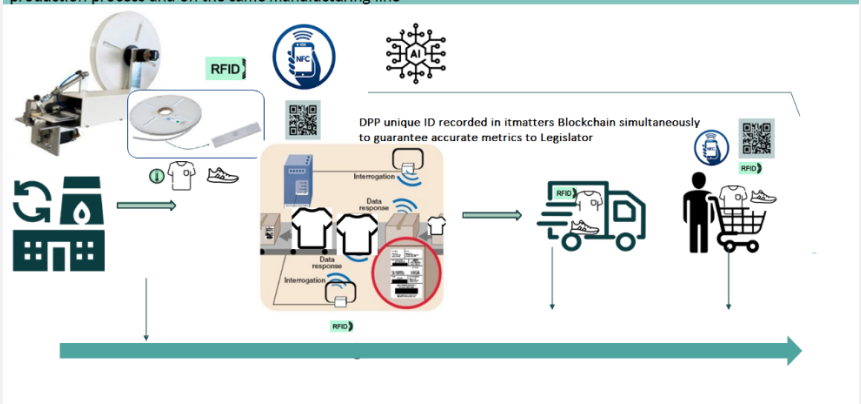


Itmatters technical solution: Itmatters provides a unique Cradle to Grave traceability 4.0 Solutions to propel retail brands in their digital transformation journey towards circular economy with powerful Direct to Consumer Engagement.

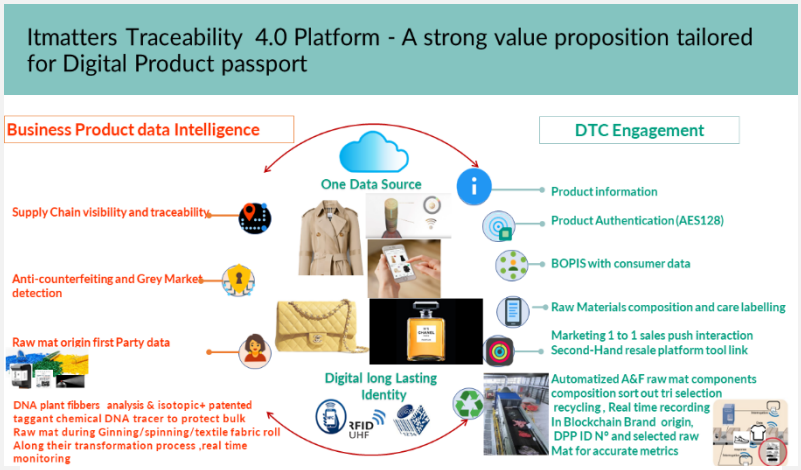
At itmatters we: Support brands & the raw material industry in D.N.A. analysis of plant fibers, (organic or fertilized, including % of purity) and an isotopic analysis to determine the geographic origin (an answer to Uyghurs Cotton & consumer concern). Itmatters supports brands & the raw material industry in tracking and authenticating every raw material origin with **itmatters By Olnica** a patented taggant chemical DNA tracer, harmless, odorless and easily readable with a mobile app. A solution, based on IoT Smart Tags, a cloud platform and a branded customised webapp for a proper Direct to Consumer Engagement. A range of long lasting soft washable tag UHF or BI techno (UHF & NFC) embedded in any garment or apparel to fit any product which supports our recycling automatised processing of raw material component composition sort out.

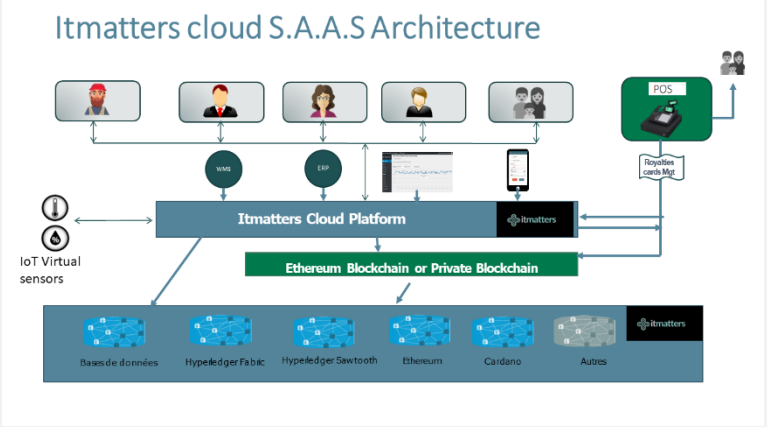
Please see all technical features related to Garments and shoes smart tag:
https://1drv.ms/x/s!AuG5tIk70Dt7g84TL6Ho1YTgllvCFw?e=42rkPU

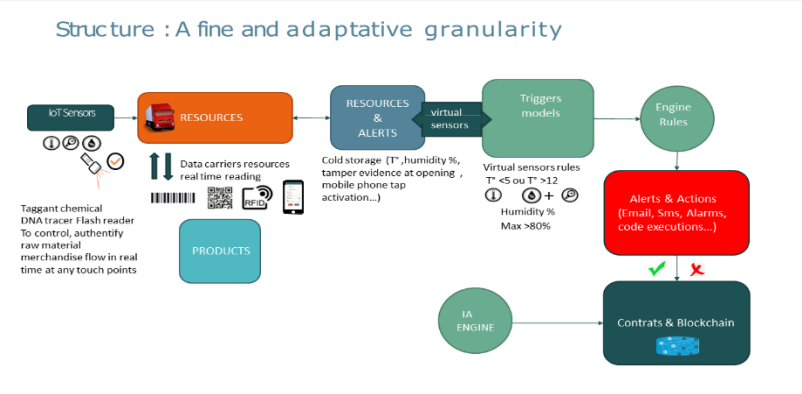
itmatters Turbo feeder, RFID and NFC Tex Track) is an innovative insertion machine washable tag integration is seamless and fully part of the production process (1000 tags ,each one sewed in 4sd). Easy to integrate, into an automated sewing finishing line or equipment. That enables RFID tags to be automatically, and precisely, placed into each Therefore, each garments and apparels foam tongue gets RFID&NFC -enabled with no disruption to the entire production process and on the same manufacturing line



Agnostic Data Mesh SAAS CLOUD Platform interoperable with any data carrier (UHF, RFID, NFC, GS1 digital Link, QR Code, Datamatrix, Bluetooth, Lorawan, Sigfox). Itmatters platform has Blockchain Ethereum and a private Blockchain, an AI tool, and an impact calculator tool under the EU PEF method (Product Environmental Footprint).







Maturity level and application sectors

The 4.0 solution is flexible and can be used with any existing IT environment. Tags are ready including the washable 3 cm soft UHF tag and the 7 cm bi techno UHF& NFC tag to support large production over 1 billion manufacturing capacity.

We have a cloud platform build on two engines; an IoT engine which records in real time any data carrier information from Cradle to Grave, and a predictive engine (AI) device set: to alert, to anticipate, to take action regarding merchandise flow traceability. Finally, our customised mobile phone is made with Progressive Web App technology, a powerful solution for businesses looking to improve their online presence and user engagement. It gives users an app-like experience that works on any device or platform. This includes a user interface that is smooth and easy to use, as well as the ability to work offline. PWAs can provide offline support, which allows users to access the app even when they don't have an active internet connection.

Useful link:
https://itmatters.fr/

Kezzler

Kezzler
Kezzler enables brand owners to build sustainable value chains through its Connected Products Platform. The platform is used to collect, structure, and share traceability data 'AT SCALE'. Massive product volumes are handled with flexibility and at speed. To comply with Digital Product Passport requirements, the Connected Products Platform allows brand owners to: 1. Digitize their products by providing a digital identity. 2. Collect all relevant data linked to a product's journey, all in one place. As products are travelling throughout the Value Chain there are multiple interactions and events, thus forming a product journey (or an item cv) that is being built. 3. Important is the ability to provide opportunities for dynamic interactions with a variety of users through the Digital Product Passport (Warehouse Managers, Prospects, Customers, Inspection agents, Repair Services, Recycling companies, …. or other IT systems). The Connected Products Platform enables these dynamic interactions

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order		Single item
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports		Others
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture:	**Evidence**	Blockchain		Verifiable Credentials			Others

Data mgmt features	**Convenience**	Wallet	Data Ports	Others
	Data protection	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

Unique technical aspects

While building a platform that prioritizes interoperability using standards-based integrations, Kezzler has ensured scalability and flexibility by developing proprietary technologies related to serialization, traceability data compression and data management. Our IP results in a reduction in the complexity of the repository required, reduces overall data processing requirements and the latency associated with large-scale track & trace.

In particular, the Kezzler Connected Products Platform provides:

- The ability to create and manage vast volumes of cryptographically secure UIDs
- Proprietary compression technology for long-term data storage of events data and rapid query response simultaneously
- Scalable and flexible API Integration Gateway for unmatched ease of integration
- Security first approach with multi-layered security to ensure only appropriate access to data via Role Based as well as Object Based access control
- ISO 9001 certified, GDPR and ISO 27001 compliant

Maturity level and application sectors

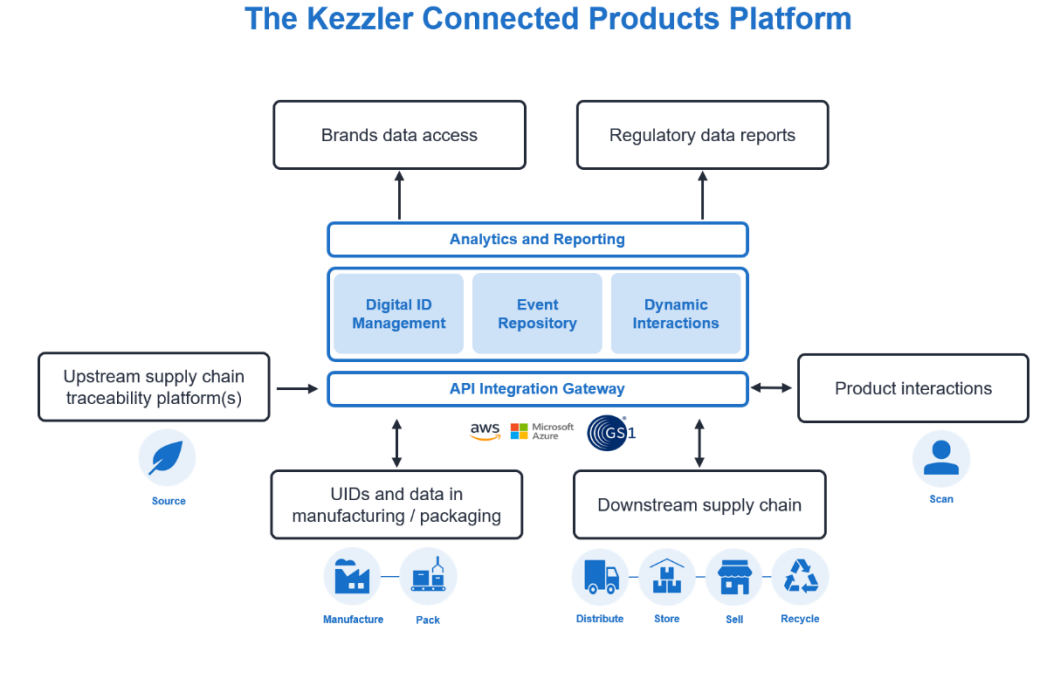
Kezzler is an independent company with 20 years' experience in implementing its Connected Products Platform as its only core business, headquartered in Norway with subsidiaries in the Netherlands, USA, India, Singapore, and China. Kezzler has a mature global partner network as well as being backed by solid industrial investors.

Recent experience of dedicated client instance deliveries at scale:

- Handling an annual addition of 5+ billion items into a single client's environment.
- Handle 2+ billion EPC identifiers annually in a scalable EPCIS 2.0 repository.
- Handling multi-million daily API calls for a single client.
- Track and Trace system spanning multiple software instances including across the Chinese firewall.
- Integrating 5000+ Point of Sales systems, as well as over 20 integrations towards other parts of their IT landscape.

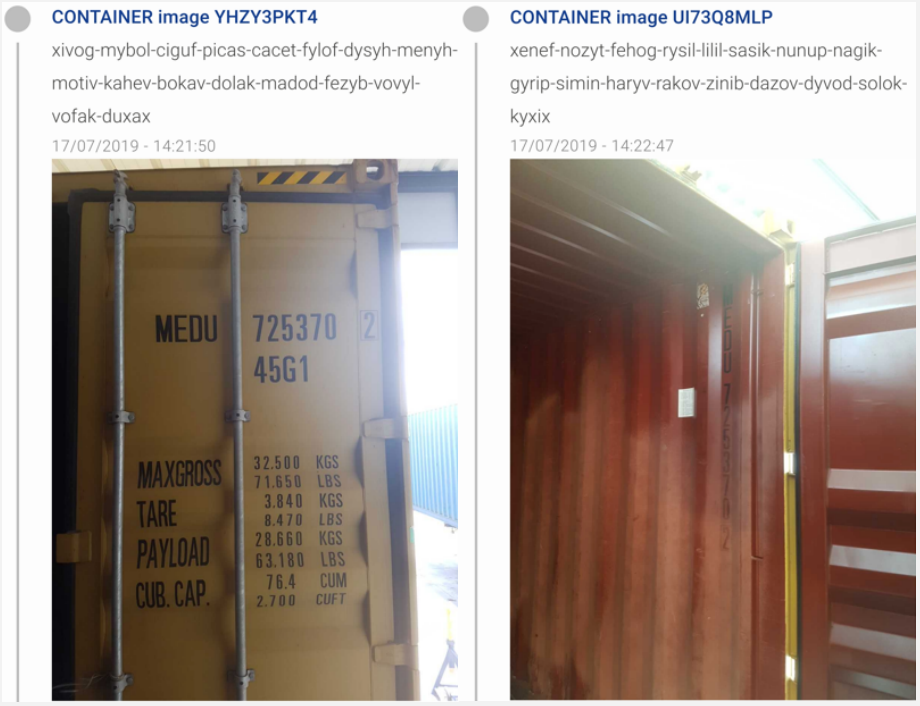
Application Sectors: Textile, Electronics, Furniture, Cosmetics, Batteries and/or any products manufactured at scale with a complex Value Chain.

Useful links:
www.kezzler.com


The Kezzler Connected Products Platform
Brands data access
Regulatory data reports
Analytics and Reporting
Digital ID Management
Event Repository
Dynamic Interactions
Upstream supply chain traceability platform(s)
API Integration Gateway
Product interactions
aws
Microsoft Azure
GS1
Source
UIDs and data in manufacturing / packaging
Downstream supply chain
Scan
Manufacture
Pack
Distribute
Store
Sell
Recycle

Log Data Hub

Log Data Hub
Log Data Hub is a solution that enables companies to create digital product passports for goods, parcels, or containers, with a focus on the supply chain and carbon footprint. The history of a product can be completed with elements from the owner or third parties for optimal traceability. The solution encourages the extension of a product's life and allows to really enter the circular economy.

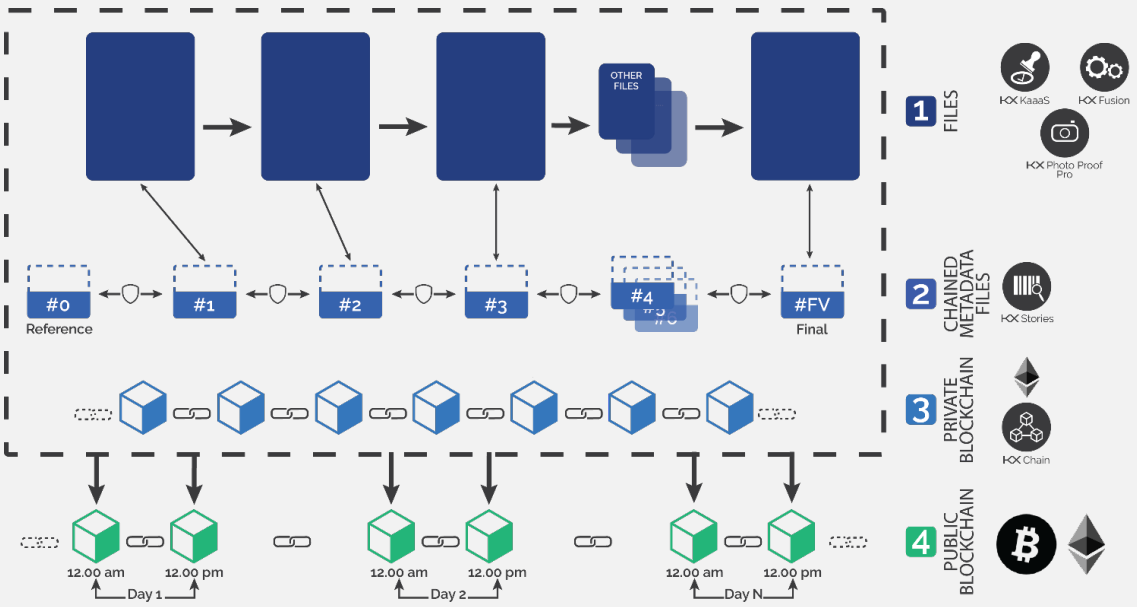


Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model		Batch	Prod. order		Single item
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized		Proprietary	Data ports		Others
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		

IT architecture: Data use	Labelling	Enforcement	Others	
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others
	Convenience	Wallet	Data Ports	Others
	Data protection	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

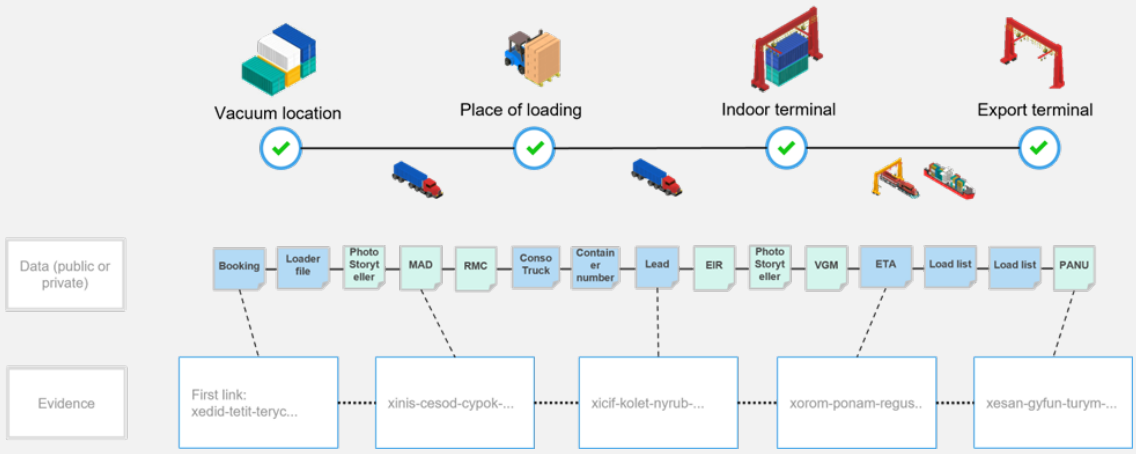
Unique technical aspects

Log Data Hub is based on KeeeX Stories, a universal framework developed by KeeeX to track and trace any product using navigable chained metadata files whose sequence can be traversed from end to end. It allows to record evidence related to the history of a specific product or process (events, information, documents).



The solution guarantees the confidentiality and security of the data: it records only the traces and leaves the files to their owners. Each trace is linked by a unique identifier to a protected, signed, time-stamped, provable, and verifiable file.

The tool allows you to record an event on one or more traceability chains with the ability to trace from batch to unit. An open-source repository of json schemas ensures the interoperability of information. The main industrial data and exchange standards are supported: REST-API, GS1 EPCIS, Digital Link, SSI.



It is also possible to use the Photo Proof Pro mobile app to add photo or video evidence to a product story.

Maturity level and application sectors

The solution is used in production since 2019 and KeeeX has been developing digital evidence and traceability solutions since 2014.

The main applications sectors are industry, supply-chain, luxury and cosmetics, agrifood.

Useful links:

KeeeX & Supply-Chain: https://www.youtube.com/watch?v=IynUtCz-oTI

KeeeX technical properties: https://keeex.me/wp-content/uploads/Note-on-KeeeXs-properties-keeexed-xusos-tolaf.pdf

Loopcycle

Loopcycle
Loopcycle is a digital platform that connects manufacturers and operators to trace, manage and recover commercial equipment across its lifecycle, unlocking latent circular and commercial value. Loopcycle provides a lifecycle solution using three products: 1. A product tracker, enabling manufacturers to embed traceability at industrial scale from the point of manufacture. 2. A digital inventory for operators of commercial equipment to effectively track, trace and manage their equipment across multiple sites. 3. A resale marketplace through which operators can obtain maximum value through traceable exchanges with other platform members, or recovery of unwanted equipment by the product manufacturer. Loopcycle builds a digital ecosystem that provides customer intelligence and asset management resource recovery with profiling data to measure embodied carbon. With the adoption of DPP regulation, Loopcycle can help organizations stay compliant, competitive and on track for Net Zero goals.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order		Single item
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports		Others
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture:	**Evidence**	Blockchain		Verifiable Credentials			Others

Data mgmt features	**Convenience**	Wallet	Data Ports	Others
	Data protection	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

Unique technical aspects

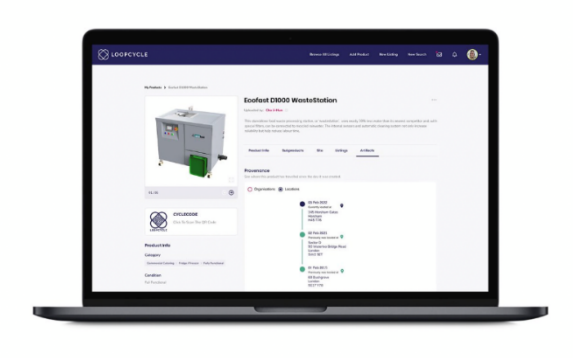
Of aspects related to DPPs, the Lifecycle Tracker is most relevant. It ascribes a digital identity to every product baked into the blockchain. As an entity changes ownership or state throughout its lifecycle, the platform detects the change and encodes it as an immutable transaction. The provenance of any identifiable asset can be presented by simply scanning a QR Code or NFC.

As it enters the platform, an AI model powered by machine learning automatically detects the specifications of the product and registers it to the platform. Another model detects the manufacturer and builds a link back to them. Owners of the product can then interact with the manufacturers of the product or relevant service partners via an MQ Telemetry Transport (MQTT) based messaging system for warranty, maintenance, and recovery.

This then creates a digital inventory for all parties, which harnesses the power of the blockchain for security, privacy, and immutability.

Maturity level and application sectors

Loopcycle is a commercialised product, working in a live environment at TRL9. Our platform has been successfully applied to manufacturers and operators in the commercial catering equipment sector. As a two-sided platform, we connect manufacturers of commercial equipment on one side, with operators of this commercial equipment on the other – with operator segments broken down into healthcare, education, hospitality, and commercial real estate. Through our healthcare operators we have identified potential soft landings into new manufacturing sectors, with early validation in the medical equipment sector and exposure to companies like Medtronic, Johnson & Johnson and Philips. Whilst we have targeted specific sectors in which to land and expand, Loopcycle is applicable to B2B sectors in which intermediaries exist and manufacturers want to better understand their products, and where operators have a need to better understand the equipment that they have across several locations.



Useful links:

loopcyle.io

https://www.linkedin.com/company/loopcycle/

Minespider

Minespider AG
Minespider AG is a technology company that has developed its own blockchain solution and set of tools for digital traceability of raw materials and products that can be applied starting at any point in the supply chain. Its product portfolio includes: • Product Passports • Battery Passports • Tracking tool • Regulatory templates for ESG and DD and • Carbon tracking The digital passports can collect all the necessary data for communication between supply chain participants and provide blockchain access to it with a simple QR code. Minespider's solutions are adaptable to any type of entity or regulation across the supply chain, from large OEMs to artisanal miners. By leveraging their blockchain-based platform, Minespider enables immutable and secure records, supporting transparency and helping businesses become more responsible and carbon neutral. Companies can track their entire products' lifecycles and make more informed decisions based on data benefiting their performance and the environment.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others		
	Data packaging	Data transfer			API		
	Level	Simple			Advanced		

IT architecture: Access control	**If advanced**	Attribute based	Role based	
IT architecture: Data use	Labelling	Enforcement	Others	
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others
	Convenience	Wallet	Data Ports	Others
	Data protection	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)	Others	

Unique technical aspects

Minespider has developed a public-permissioned blockchain, that gives companies secure blockchain access to their products' data with a simple QR code thus providing end-to-end traceability and scalability. These are some of the technology advantages:

- **Blockchain:** Minespider is the only company that uses a permissioned-public blockchain, developed in-house. At the same time, because of its PoA consensus mechanism, it keeps energy use at an absolute minimum.
- **Data Structure:** a three-layered data structure, where the user can decide individually. This allows for a balance of transparency and privacy, safeguarding companies 'confidential data.
- **Integration and interoperability:** Minespider has its own API and is blockchain agnostic hence can provide for faster scalability.
- **Multiple Industry focus:** the solutions can be applied and adjusted to multiple sectors.
- **Flexibility:** it allows for integration of additional standards/metrics making it fully adaptable to the changing regulatory environments.

Maturity level and application sectors

The Minespider solutions have been developed and are successfully applied across various sectors, predominately mining and metals, the electronics and battery related sectors.

The Minespider Battery Passport and our latest addition the Open Battery Passport (currently V2 prototype) can be subject to refinement based on the upcoming implementation acts that will be coming out of the recently adopted EU Battery regulation.

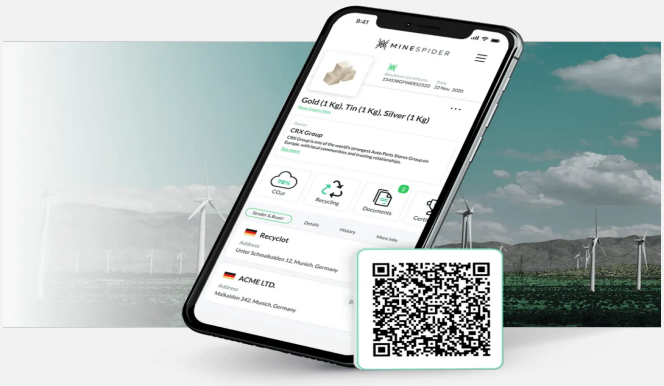
However, Minespider's Battery Passport V1 is functional and already in use across the different EU funded battery related project that Minespider is part of, such as the **BATRAW** project.

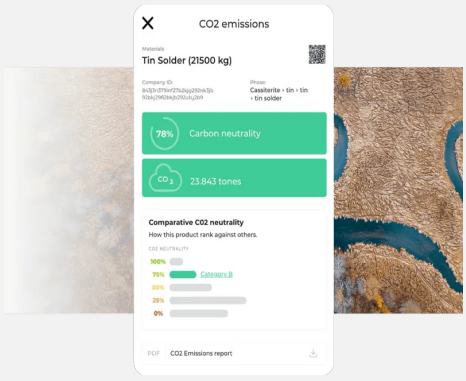
List projects and sectors in which this can be applicable:

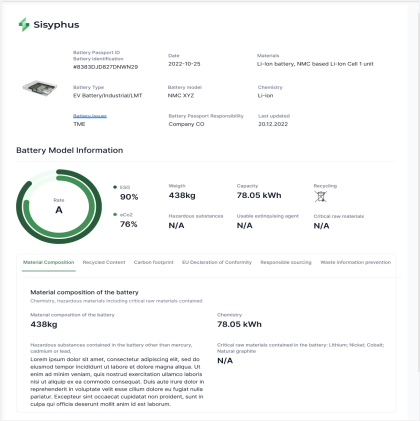
Some of our publicly announced projects include:

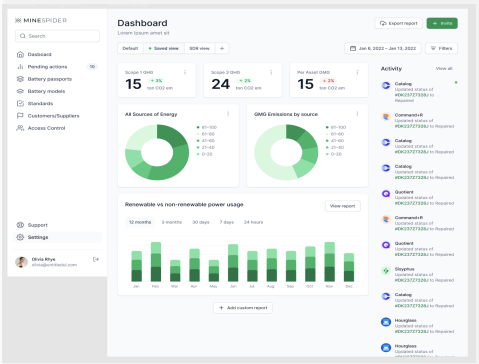
- BATRAW
- Recirculate
- Raw Materials Radar (RMR)

Sectors in which the solution is and can be applicable: Metals and Mining industry; Electronics industry; Battery industry; Recycling; Textiles; Plastics etc. The Minespider solutions can be applicable to any type of sector and/or industry.









Useful links:

https://www.minespider.com/

https://www.openbatterypassport.com/

https://www.minespider.com/press/european-commission-finances-a-10-million-euro-project-to-create-a-new-process-for-recovering-critical-raw-materials-from-electric-vehicle-batteries

https://www.minespider.com/press/the-eu-funded-project-recirculate-to-create-new-business-models-for-repair-reuse-and-recycling-of-second-life-batteries

Octo + iWay

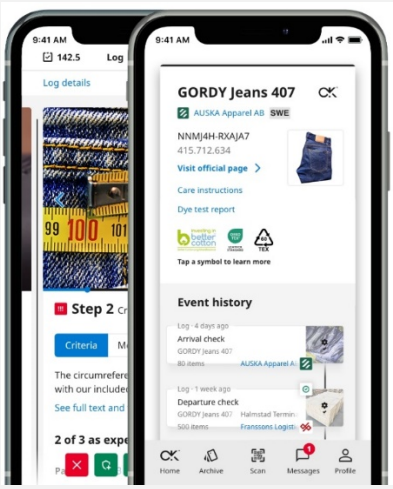
Octo + iWay
Frequentiel assists Retailers and Brands to mark and track products. For this purpose, the company developed a software platform named OCTO+. • OCTO+ helps retailers to improve traceability, stock accuracy, logistics efficiency and customer engagement. • OCTO+ is available in Europe, North America, and Middle East. • OCTO+ Retail is widely used by retailers in warehouses and stores to manage stock, leveraging RFID and barcode technologies. • OCTO+ iWay is built to help brands to meet new customer expectations as well as new regulations regarding transparency and circularity.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		

Unique technical aspects
Octo+ iWay is a SAAS Product Traceability and Transparency Platform. It is built on a scalable microservice architecture able to manage high volume of data inputs. This event driven solution allows brands to capture, through a set of REST APIs, events from various sources during their products lifecycle. All events are stored in a secure, scalable, distributed data base. A flexible product master data management allows brands to customize their profile to match the specificities of their products. Product marking is compliant with GS1 Digital Link at product/batch/single item levels. A Digital Link Resolver allow customers redirection to contextual information.
Maturity level and application sectors
Octo+ iWay is available in production for every Brands eager to activate transparency and customer engagement through their products. It is designed to manage a high volume of data. The platform is continuously updated with new functionalities. Useful link: https://octoplus-iway.fr/

The OK Supply Chain Management platform

The OK Supply Chain Management platform
OK helps organisations in cross-industries manage and share documentation, work, and relationships for products, sites, workers, and the organisation itself.

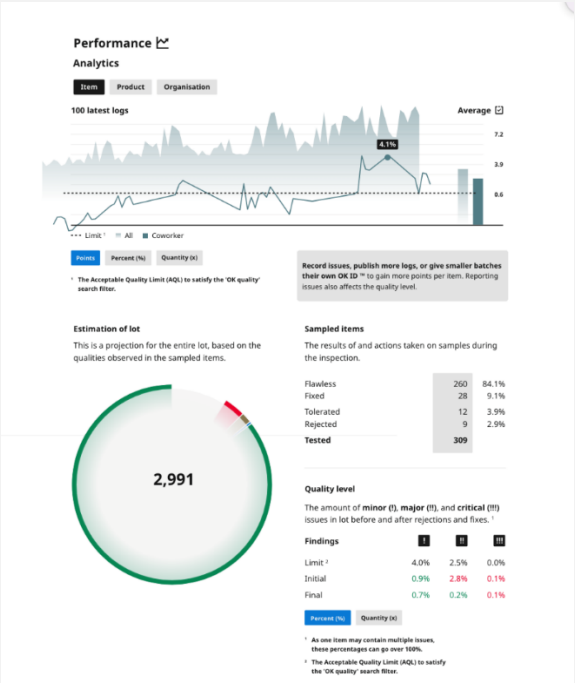


Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture:	**Evidence**	Blockchain		Verifiable Credentials	Others		
	Convenience	Wallet		Data Ports	Others		

Data mgmt features	**Data protection**	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

Unique technical aspects

- Powerful product database: comprehensive product information (linked products, relevant documentation, customer & producer feedback, etc.), easily identifiable & publically verifiable with unique OKIDs
- Digital-physical synchronization: Generating QR code asset labels and allows physical products to be verified easily through our in-built scanner
- Enables end-to-end supply chain transparency: Supply chain visualizations of linked products, verifiable user and organisation information
- Accessible analytics: Clear visualizations of asset quantifications to support further relevant analysis



Maturity level and application sectors

OK focus on intuitive user interfaces over depth, allowing small-to-medium enterprises to unify and share basic information across the value chain (including with end consumers) more easily and with a low barrier of entry. Our goal is to help companies start their sustainability journey and build brand trust through transparency over time, by sharing lab reports, quality control logs, automated visual supply chain maps of individual items and the like with ease.

At OK, we view it as our responsibility to our members to track the development of Digital Product Passports, Digital Ports etc. and build simple interfaces to synchronise data to such systems, even if you are a smaller or growing actor without the engineering or financial means to implement enterprise level software. We want to live in a world where it is easy to buy, make, and maintain reliable and environmentally friendly things.

Current users: Battery, Electronics, Furniture and Construction. It can be used in any sectors.

Useful links:

https://oktrade.org
https://rethink-event.com/insight/an-ok-workflow-for-product-sustainability/
https://blog.okgrade.com/how-to-improve-supply-chain-collaboration-and-the-benefits-for-your-organisation-cbdcfb79b3ca

Peppol

Peppol
Peppol is a global network based on open standards, where you can connect once and reach everybody in the network. The format is based on ISO standards and any kind of product related information can be exchanged using the Peppol network. Suppliers and manufacturers are already using this network to provide this kind of data. It is a mature organization with well-established governance (Peppol Interoperability Framework) including legal agreements, governance, and compliance measures, operating in more than 40 countries all over the world. OpenPeppol, a non-profit international association established under Belgian law, was founded in 2012 as a follow-up to the PEPPOL Large Scale Pilot project (LSP) launched in 2008 and funded by the European Commission. The goal of the PEPPOL LSP was to enable frictionless trade between public and private bodies by developing Business Interoperability Specifications and standardising the exchange of business documents on an open and secure network.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture:	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	

Data mgmt features	**Data protection**	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

Unique technical aspects

Peppol enables buyers and suppliers to exchange business documents and processes by using the Peppol network in compliance with the Peppol Interoperability Framework. Peppol provides a ready-to-use, scalable, both domestic and cross border, four-corner model, utilising a market of private sector service providers that are connected to sending and receiving organisations.

The Peppol Interoperability Framework provides the specifications and the governance for the exchange of data over the Peppol eDelivery network. Peppol is based on standards from OASIS and CEN and can enable traceability based on specific business requirements.

The Peppol network connects the platforms of service providers, but it is not a platform in itself. The Peppol network is created by hundreds of Peppol-certified Service Providers around the world. They securely distribute message content (business documents or any product information agreed) between buyers and suppliers, based on an open, four-corner model.

Maturity level and application sectors

Although originally conceived as a European project, Peppol is increasingly being used around the world, therefore the market scope is international with high penetration. The interoperability framework is just as relevant for trade between private businesses (B2B) as it is for trade between public and private sector bodies (B2G). The Peppol network can be used for any type of information as long as it is defined in a standardized way and agreed by the partners exchanging it. Peppol has information models and technical formats for product information used for product catalogues and ordering used in the supply chain exchange. Because Peppol is being used for business process interoperability such as product information exchange, eCatalogues, eOrdering, etc., it is being used in any type of organization (public or private). The Peppol initiative is cross-sector, as Peppol is the main network for exchanging data regarding electronic catalogues, electronic invoices and other supply chain documents in all sectors of the economy.

Useful link:
https://peppol.org

Product DNA®

PRODUCT DNA®
Trimco's ProductDNA® digital technology streamlines all stages of a product's life cycle to implement, monitor and achieve a brand's sustainability goals while complying with international regulations. ProductDNA® features **four modules**, each designed to facilitate a brand's sustainability goals; 1) The **Certificate Manager** helps brands monitor environmental, social, safety compliance documentations and any other document relevant to map and understand a brand's supply chain; 2) The **Product Manager** provides in-depth insights at the material level, including certifications and any other documentation, crucial for responsible sourcing and an essential tool for validating weight-based claims and answering the EU strategy for a circular and sustainable textile industry; 3) The **Digital Manager** involves the use of QR codes and NFC solutions to communicate and increase transparency with consumers as well as any other stakeholder involved in the product lifecycle. It includes PaaS options and connecting with the consumer via a product's digital ecosystem; 4) The **Packaging Manager** generates automated packaging reports for international EPR requirements.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		

IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others
	Convenience	Wallet	Data Ports	Others
	Data protection	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

Unique technical aspects

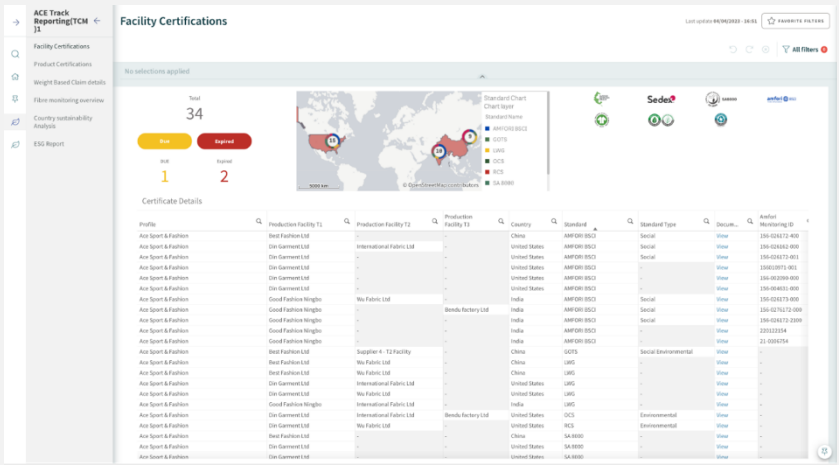
Trimco's ProductDNA® is built on composable architecture adopting MACH (microservices-based, API-first, cloud-native and headless) principles. The overall architecture consists of a Single Master location with centralised components such as integrations APIs and file storage; as well as satellite locations where interactions are hosted close to the user for better supply chain user experience. The security architecture ensures IT and data security, compliance and orchestration. The API based layers maximise interoperability and enable Product DNA® to connect to and collaborate with multiple supply chain partners and compliance authorities. The architecture and solution design maximise scalable solution with intelligent model generation for predictive analytics and machine learning, also focus on high scalability and flexibility with best UI/UX experience for supply chain users. A mobile app extension for value-added initiatives is possible and has been adopted by several companies. GS1 Digital Link standard is adopted with revolver capability for multiple use cases.

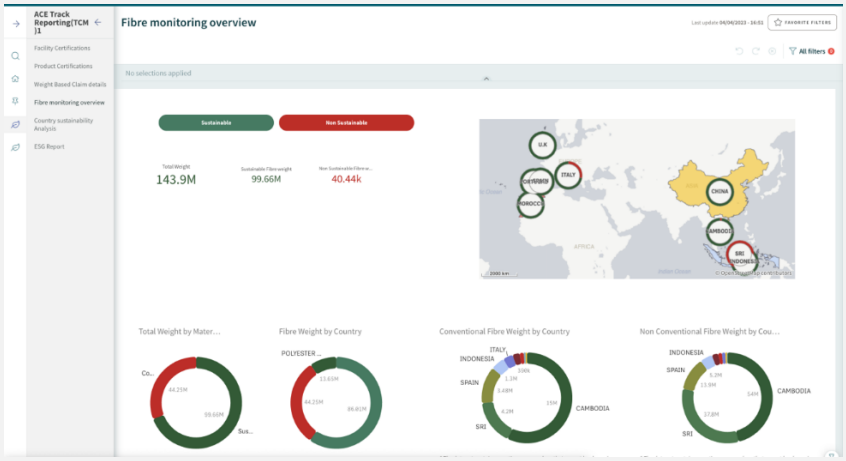
Maturity level and application sectors

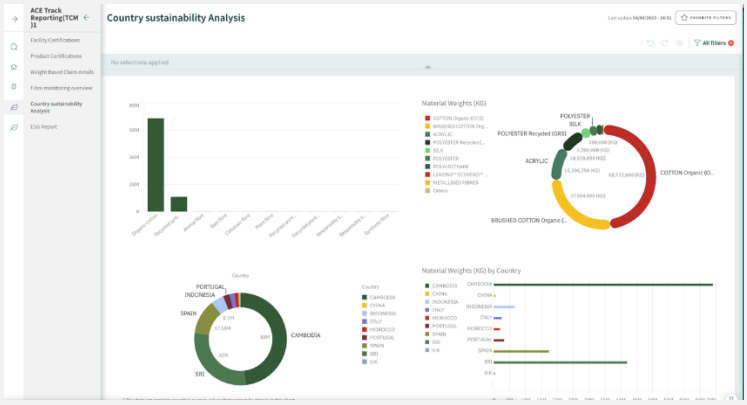
The onboarding of the complete 4 modules system is enabled by the already existing global network of garment factory and fabric suppliers, as well as the already integrated EDI API platforms between TRIMCO and textile and footwear brands since 2010. ProductDNA is today in use by **30 Global Textile and footwear brands,** among them DK Company, Asics, Dynamic Brands, Bergans, Tog24.

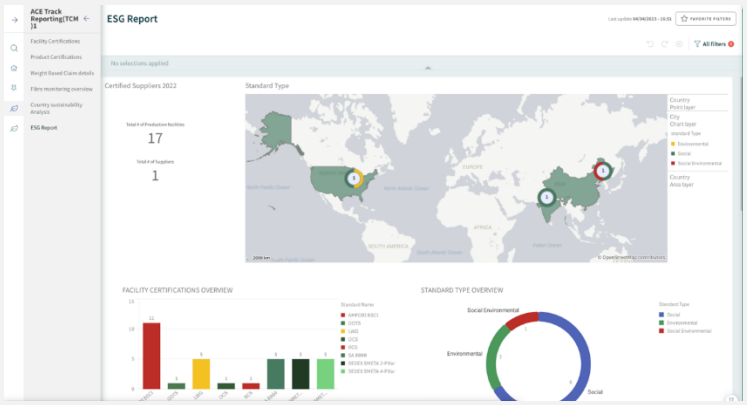
References and useful links:

- About ProductDNA https://www.trimco-group.com/solutions/product-dna-supply-chain-traceability/
- ProductDNA case studies https://www.trimco-group.com/?s=productDNA
- Scan QR code and check an example of DPP by ProductDNA
- ProductDNA dashboard overview:


Facility Certifications
34
1
2


Fibre monitoring overview
143.9M
99.66M
40.44k


Country sustainability Analysis


ESG Report
17
1

QI-Digital

QI-Digital
QI-Digital is an initiative of the central players in German quality infrastructure (QI) - DIN, DKE, DAkkS, PTB, and BAM. The Federal Ministry of Economic Affairs and Climate Action (BMWK) supports QI-Digital as an essential contribution to the success of innovative technologies, products, and processes - to strengthen Germany as a business location. The pillars are built on a foundation of suitable data structures, the QI Cloud, smart standards, digital product passports and digital certificates , as well as a corresponding legal framework. The interplay creates synergies that we use for the sustainable establishment of an agile innovation system for modern, digital QI. The resulting processes and procedures can be transferred to different use cases. For BAM, two use cases are considered: additive manufacturing and H2 gas stations.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		

Unique technical aspects
A digital product passport based on assets administrative shells which is compatible with other QI digital assets such as Smart Standards and digital certificates. QI-Digital offers a unique approach to embed the DPP in the complete chain of quality infrastructure. Hence it is an important element make the DPP as the starting point to transform the EU single market into the age of digitization – in in other words “EU single market 4.0”.
Maturity level and application sectors
Maturity is in the concept level and user stories collections and requirement analysis. https://www.qi-digital.de/

QI-Cloud

Solution Name: QI-Cloud
The QI-Cloud is a trust network for mapping processes with and for a digital product passport. Its objectives are (1) to serve as single point of contact, where all information relevant to a product is contained in an abstract digital representation, (2) to offer uniform interfaces, that allow simple and transparent integration of data, and (3) to provide data sovereignty in the network by secure provision of data and consideration of the principle of minimality.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials		Others		
	Convenience	Wallet	Data Ports		Others		
	Data protection	PETs	Anonymization		Others		
	Traceability	Tagging (QR, NFC, RFID)			Others		

Unique technical aspects

Full crypto-based security is provided via a distributed ledger PKI. Our solution supports a key-based login as well as signing of processes by certification bodies.

The distributed ledger facilitates secure processes and their distributed, tamper-proof logging, while also ensuring data consensus.

The data management supports an enriched data schema, allows access management, and offers a data merger.

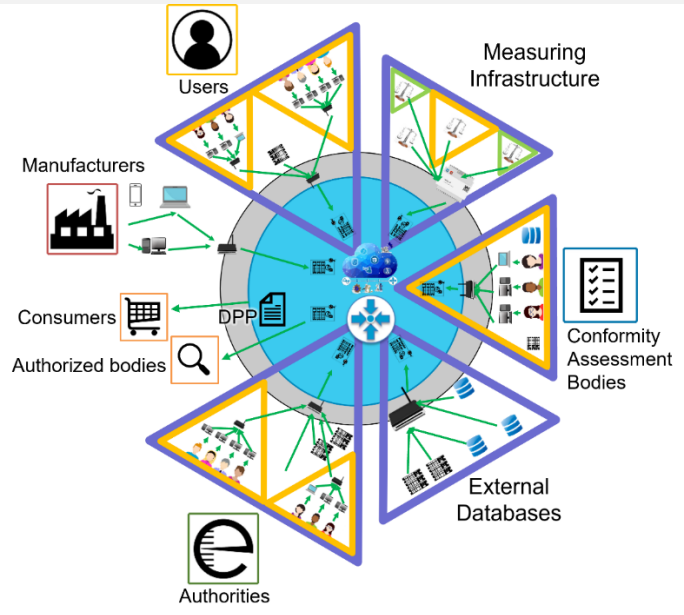
Maturity level and application sectors

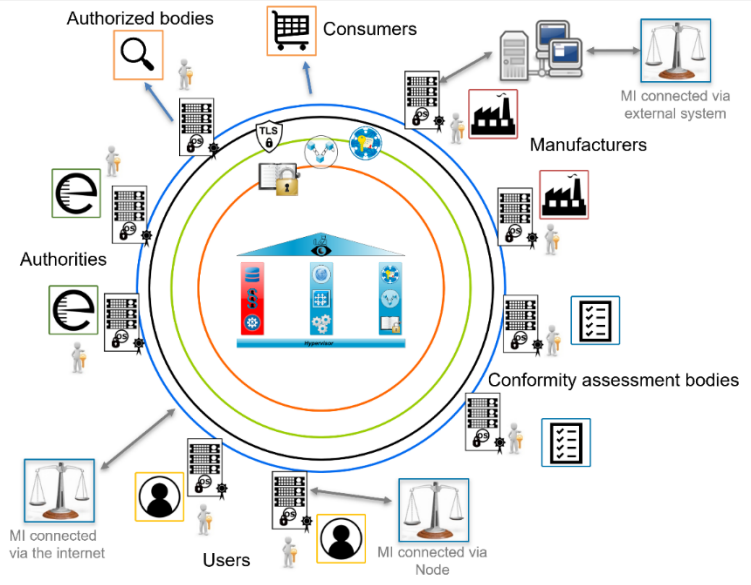
We developed a reference architecture that complies with all contraits that were initially derived from the requirements in the field of legal metrology. The reference architecture can be implemented in many ways and is, thus, generalizable to a wide range of different domains in the quality infrastructure system and beyond.

An OpenSource demonstrator code in RUST is being developed in order to encode all features of the reference architecture. The employed software stack is based on existing solutions and includes, amongst others, Raft, PostGres, ring/rustls, Hyper, Docker, and Debian.

Useful links:

www.qi-digital.de/en/qi-cloud
digital.ptb.de/qi-digital
digital.ptb.de/MetrologyCloud




Authorized bodies
Consumers
MI connected via external system
Manufacturers
Authorities
Conformity assessment bodies
MI connected via the internet
Users
MI connected via Node

RCS BP

RCS BP							
RCS Battery Passport has clear data governance over a chain of custody system to issue the battery passport combining multiple threads of data from multiple data points. RCS BP incorporates different global users (public, regulator, commercial), to understand battery's ESG footprint/origin, tracing solution for passport material, recycled content and GHG emissions.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
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IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		
Unique technical aspects							
As the project is in the stage of proof of concept at the moment, the tech solution at the moment is prototype end-user website based on ReactJS and optimised towards mobile devices. In parallel we are working on backend and database architecture design, depending on learnings and validations of our assumptions based on user feedback, after interactions with created hands-on							

prototype. As we are considering integration with RCS VINE possible tech stack could be based on Elixir with PostgreSQL DB, hosted in the Cloud (AWS or other providers), but as the track and trace part may require using distributed ledger some of the blockchain technologies are also in consideration.

Maturity level and application sectors
Prototype website for user hands-on experience with UX optimized for mobile devices, initial high-level system design and possible architecture scenarios (advanced product sprint, just before MVP development stage).
PoC, Considering different options

RR

Reserve Resources (RR)							
SaaS from where textile recyclers can collaborate with fashion brands and textiles waste suppliers (manufacturers, post-consumer sorters) to access the waste in large aggregated volumes and by their required spec (fibre composition, fabric type, colour, right preparation, quality check), including help with best set up of the necessary supply chains. Brands and public sector can get market insight, aggregated data and trace verification of textile waste flows from source to recycling, do planning and matchmaking or policy development.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
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	Data packaging	Data transfer			API		
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IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		
Unique technical aspects							
Traceability of textile materials is unique: when materials are passed from one party to another, we register batches, but through inhouse processes we allow mixing of batches and apply a mass-							

balance approach. We don't do any trace product by product, but material category by category (e.g. 100% cotton knit scraps). We also enable trace of brand share of the waste throughout the supply chain with the same approach.

Maturity level and application sectors

Our SaaS offers a service for 4 stakeholders: brand, recycler, waste supplier (e.g. garment factory, a hotel or a post-consumer sorter) and waste handler (any type of preprocessor in between supplier and recycler). The product is fully operational and covers the majority of key features needed for brands and garment factories (industrial waste) for the basic processes. We are currently ~50% level with features for recyclers and handlers, and we are just starting to include post-consumer collectors.

Sloer

Sloer
Sloer is connecting brands to their products all along their life cycle. The product is a responsibility but also a source of value at any moment of its life making new business models possible (such as getting commissions on each resale, getting new materials from wastes). Our unique digital ID is enriched by external traceability, recycling & reparing solutions whilst connected to our CtoC resale platform designed to create the maximum value for brands & customers.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model		Batch	Prod. order		Single item
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
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IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports		Others
	Data packaging	Data transfer			API		
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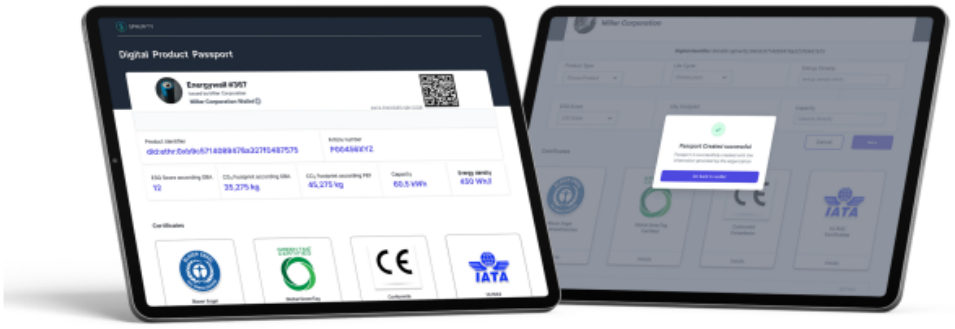
	Convenience	Wallet		Data Ports			Others
	Data protection	PETs		Anonymization			Others
	Traceability	Tagging (QR, NFC, RFID)			Others		

Unique technical aspects
Our digital ID is a Cloud Data base accessible via QR code. It contains 4 purposes: traceability, reparability, recyclability & resale all being filled in by the brand in a basic version. The date base can be enriched by external solutions adding more precise & valuable information with time. We don't claim to have integrated all uses ourselves, we claim to partner with specialists to connect their information to ours having in mind our business is about customer's interest in scanning the QR code because he/she will decide alone what to do with the product at the end.

Maturity level and application sectors
Our QR code is ready for textile industry & linked to our CtoC platform which will be live in September/October 2023. We started to equip the first samples & we'll go on production for the first products in September with 5 brands. The information from external partners is to be added manually so we are currently working on automation systems & middle where solutions to connect various data bases to ours. We're aiming to create a working group to study other architectures where the ID would be hosted & owned by brands as we believe flexibility is key for brands.

Spherity DPP Solution

Spherity DPP Solution
Spherity's DPP solution is an interoperable, trusted, and secure data exchange and compliance tool **Receive Trusted Data** Process trusted data from your suppliers, such as GHG emissions reports, ESG compliance, and validated company data. **Market your products** Inform your customers about your USP, Eco-labels, and the sustainability aspects of your product, e.g., the percentage of recycled material used. **Reach Legal Compliance** Fulfill your reporting obligation for various upcoming EU regulations, such as the Ecodesign for Sustainable Products Regulation or the Green Claims directive. **Become Interoperable** The solution is based on open standards which avoid vendor lock-in and naturally facilitate interoperability with other DPP solutions and simplifies data exchange with your supply chain partners.



Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model		Batch	Prod. order		Single item
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		

IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others
	Data packaging		Data transfer		API
IT architecture: Access control	**Level**		Simple		Advanced
	If advanced		Attribute based		Role based
IT architecture: Data use	Labelling		Enforcement		Others
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials	Others
	Convenience	Wallet		Data Ports	Others
	Data protection	PETs		Anonymization	Others
	Traceability		Tagging (QR, NFC, RFID)		Others

Unique technical aspects

The DPP solution gives every stakeholder complete control over their own data by using a decentralized approach. Each stakeholder has their own instance of the solution, which includes a decentralized identity wallet. This wallet manages the storage, issuance, verification, and exchange of information regarding products and companies. The wallet implements standards like DIDs, Verifiable Credentials, and DIDComm, ensuring compatibility with other DPP solutions.

Using the solution, two parties can create encrypted channels to exchange information securely without an intermediary. The recipient can verify the authenticity of the information even if it was not directly received from the issuer. This is highly beneficial in supply chains as it grants stakeholders throughout the entire lifecycle of the product access to verifiable product information.

Maturity level and application sectors

Spherity's system is currently being used in production to exchange information related to organizational identity in the US Pharma Supply Chain. Companies in ths supply chain use Spherity to perform Authorized Trading Partner (ATP) authentication to comply with the Drug Supply Chain Security Act (DCSCA).

The DPP system which also comprises product data in addition to oragnisational credentials and enables the generation of DPPs is currently in the pilot phase with a focus on the battery supply chain. Furthermore, Spherity is leading DPP specification and development in the EU-funded research projects MaDiTrace (Critical Raw Materials for batteries). Trace4EU (agri-goods and textiles) and

Further pilots have been completed or are underway in the energy sector, consumer goods, and life sciences. As a consequence, the solution is applicable in a wider range of sectors requiring a Digital Product Passport and secure information exchange along the supply chain.

Useful links:

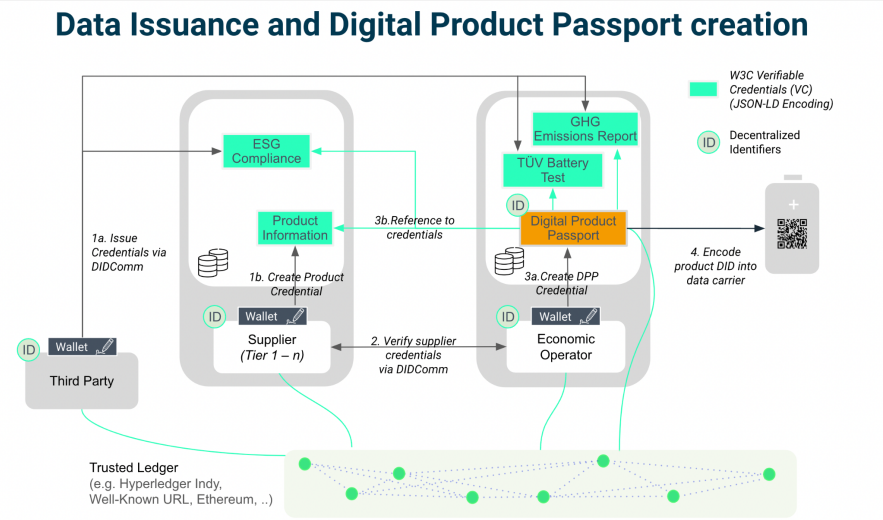
Implementing Digital Product Passports using decentralized identity standards

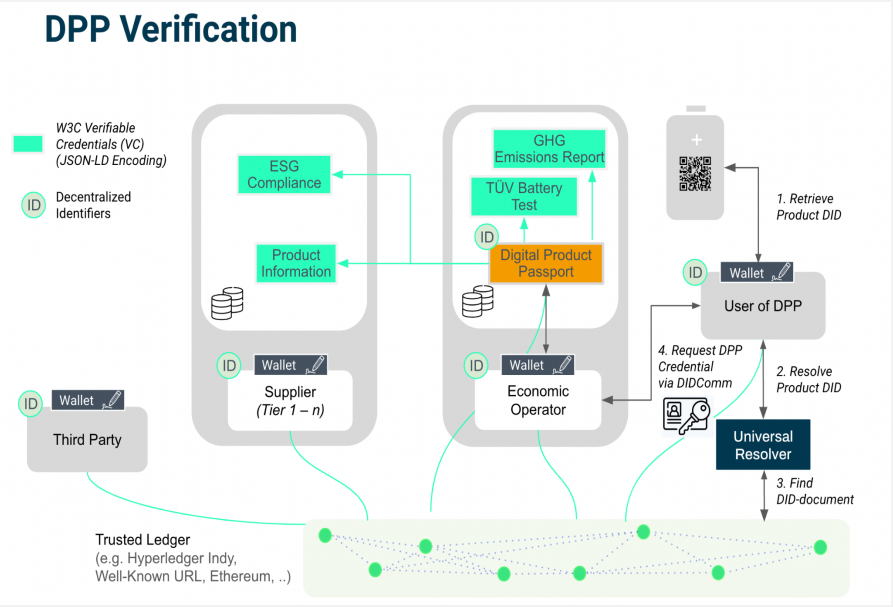
Accessing Digital Product Passports with DIDs

The Digital Product Passport and its technical implementation

Digital Products Passport Pioneers podcast

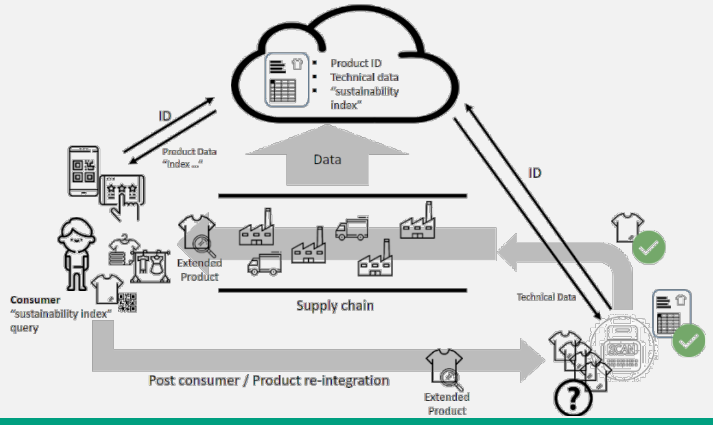
The below Diagrams illustrate the functioning of Spherity's DPP solution which is based on decentralized identity standards. For a full explanation of these diagrams, refer to our blog article Implementing Digital Product Passports using decentralized identity standards





STVgoDigital Texjourney

STVgoDigital Texjourney
STVgoDigital project intends to access secure and reliable information on the sustainability and circularity of textile products, including information about who, where, how, with what and under what conditions the product was manufactured. The project aims to define and develop a digital copy of a textile product with an emphasis on sustainability and circularity, to be able to support services for the various players in the life cycle of the product. To achieve that goal, we developed a system that collects various indicators (manually and automatically), such as resource consumption and pollutants emitted, registering the detailed information about each of the value chain activities. Also, economic and social indicators are collected, such as the certifications of the company, salaries and the number of workers. Using a suitable developed model, algorithms, and platform to compile the data, our system allows sharing of data with its users about environmental and social indicators for each of the products, enabling the environmental and social scoring of every traced product lot.



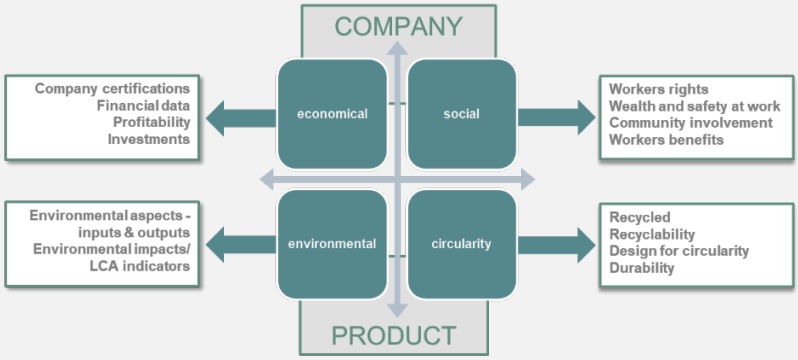
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
	Level	Simple			Advanced		

IT architecture: Access control	**If advanced**	Attribute based		Role based
IT architecture: Data use	Labelling	Enforcement		Others
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others
	Convenience	Wallet	Data Ports	Others
	Data protection	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

Unique technical aspects

There were several technical aspects developed during the course of this project such as:

- **Sustainability Index:** A sustainability index was defined and calculated, represented in the form of a global score, which makes it possible to classify the impact of the individual textile articles, taking into account the impact in relation to economic, social, environmental, and circular factors, as represented in the following figure:



- **Real data:** Instead of using estimated data, this system uses real data, collected automatically and manually for the particular textile product item being produced, and related to its production lot;
- **Data carrier:** Different alternatives have been developed for data carriers that survive the entire life cycle of the textile article, such as invisible thermochromic QR codes or NFC tags;
- **Decentralized storage**: With the use of blockchain technology, which is a type of distributed ledger technology (DLT), data storage is decentralized;
- **Data confidence model**: developed to assesses the reliability, accuracy, and completeness of data, in order to ensure that the data collected is reliable;
- **Supply chain interoperability**;
- **Traceability support**.

Maturity level and application sectors

Our system is the result of an R&D project, developed in a collaborative environment, ranging from research institutes, software providers and some Portuguese SMEs from the T&C textile industry, focusing two different value chains: a centralized vertical one, with only one player dedicated to home textiles and a horizontal one with different SMEs engaged in the process, dedicated to clothing items. Bearing this in mind, our system was validated already at TRL 6. The technology has progressed beyond the laboratory or basic research stage and was tested in an industrially relevant environment (TRL 6) in two different value chains, being now ready for testing in real-world operational environments (TRL 7). We are now conducting additional tests focused on verifying the functionality and performance of the prototype or model under realistic operating conditions and complex, including international, value chains. The successful completion of TRL 6 sets the stage for subsequent stages, such as full-scale production, deployment, and commercialization of the technology.

Useful links:

http://www.stvgodigital.pt/

https://texjourney.com/

Tappr

Tappr
Tappr is the equivalent of Webflow or Wordpress for products. We are committed to crafting an intuitive and engaging consumer-facing experiences for products and brands. We make it easy for brands to start building digital product passports themselves or by a team of experts. Three distinctive yet interdependent components form the bedrock of Tappr's offerings, allowing brands to interact meaningfully with consumers, retailers, and other stakeholders. Our Experience Center is a mobile-oriented platform that enables consumers to immerse themselves in your products and brand. Product Cloud is the repository for all product-related data, forming the backbone of our consumer experiences. Meanwhile, Passportbuilder.com is our dedicated online environment where brands and partners are empowered to build and design these remarkable experiences.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture:	**Evidence**	Blockchain		Verifiable Credentials		Others	

Data mgmt features	**Convenience**	Wallet	Data Ports	Others
	Data protection	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

Unique technical aspects

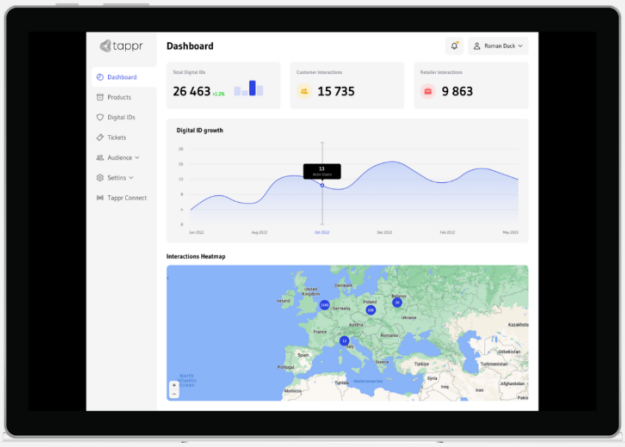
- We offer a fully white-labeled solution, brands can use their branding, and we support custom domain names (e.g., qr.brand.com)
- We have a passport builder that allows brands to tailor & customize their experiences on the fly
- We support many unique features such as Bill-of-material, spare parts, wash instructions, warranty, repair, resale, and circularity programs.
- We are integrated with the larger CRM / marketing automation systems such as Klaviyo, Hubspot, ActiveCampaign
- We are GS1 compliant, and we support both QR, NFC, and Encrypted NFC (NTAG424)
- We are entirely ISO27001 certified and GDPR compliant

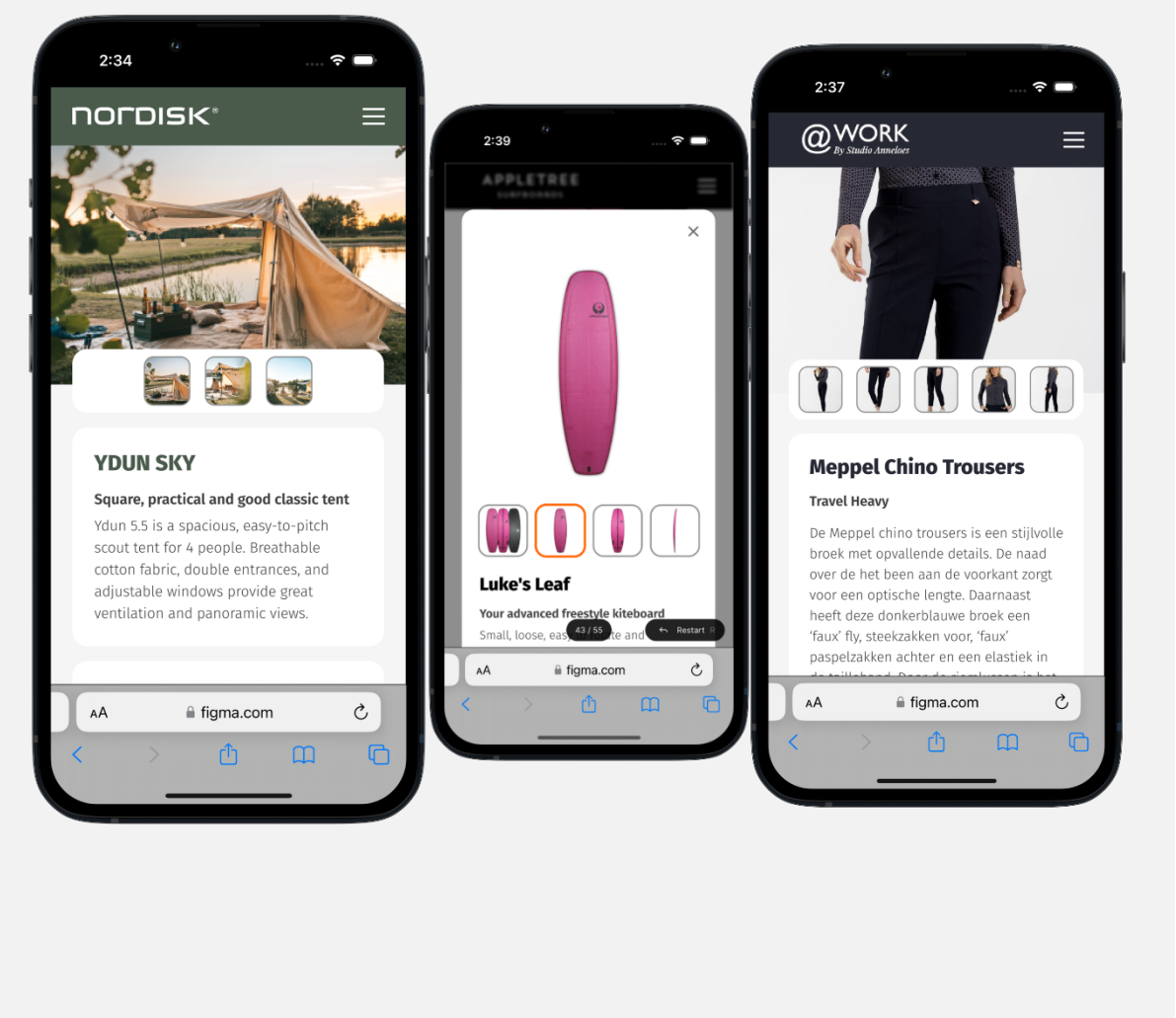
Maturity level and application sectors

Our solution has maturity level "Defined". We have a solid client base with promising results that support real-world (business) cases. Our implementation process is mature and we have a standardized project approach. Currently, we are extending our scope with technology & resale partners to prepare for roll-out on a mass scale.

Useful links:

https://usetappr.com/
https://usetappr.com/meeting (book a meeting)
https://passportbuilder.com/ (coming july '23)




2:34
nordisk
YDUN SKY
Square, practical and good classic tent
Ydun 5.5 is a spacious, easy-to-pitch scout tent for 4 people. Breathable cotton fabric, double entrances, and adjustable windows provide great ventilation and panoramic views.
AA
figma.com
2:39
APPLETREE
Luke's Leaf
Your advanced freestyle kiteboard
43 / 55
Restart
AA
figma.com
2:37
@WORK
By Studio Anneloes
Meppel Chino Trousers
Travel Heavy
De Meppel chino trousers is een stijlvolle broek met opvallende details. De naad over de het been aan de voorkant zorgt voor een optische lengte. Daarnaast heeft deze donkerblauwe broek een 'faux' fly, steekzakken voor, 'faux' paspelzakken achter en een elastiek in
AA
figma.com

TripleR

TripleR
TripleR is a circularity enabler for the mattress industry. Unique single item level identification is achieved via a washable dual tag (QR and RFID) linked to a cloud platform, managing the product composition and all events in the lifecycle of a mattress. TripleR connects all stakeholders: from subcontractors to mattress produces to retail/point of sale to the consumer. Key differentiator is the focus on the end-of-life process: we onboard mattress collectors, refurbishers, disassemblers and recyclers to facilitate end-of-life treatment of the mattress with the goal to increase the level of recycling and move the industry towards circularity. We close the loop! Besides meeting the purposes of Digital Product Passports for the mattress industry, the solution allows various stakeholders to optimize their logistics processes by unlocking the use of RFID. The item level identification allows mattress brands to engage with the consumer.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		

Unique technical aspects

We offer a washable dual tag with QR, well known by the consumer, and RFID to optimize industrial operations (inventory movements, shipments, stock control, etc).

Unlike traditional RFID solutions that are linked to local ERP and WMS systems, our RFID is linked to a cloud platform. Various stakeholders connected to the platform can use the RFID, e.g., a subcontractor can scan the RFIDs for goods shipments, and the mattress manufacturer can use this info to scan the goods reception.

Unique item level identification, based on GS1 structure, together with the open API communication of the platform, allows the mattress brand to use the TripleR data in its own after sales processes and systems, creating opportunities for cross- and up-selling.

Maturity level and application sectors

The TripleR solution for the mattress industry is built on the atma.io platform (an Avery Dennison company). The atma platform is already in use by major apparel brands and more than 28 billion items are already managed in the platform.

After some pilot runs in the previous months, TripleR is current onboarding its first customers.

Applications for subcontractors, mattress manufacturers, retail, point-of-sale and consumers are ready. Applications for end-of-life processes (collectors, refurbishers, dismantlers and recyclers) are scheduled for the coming year.

The solution can easily be expanded towards other product segments, and various tag identifiers are being developed.

Stakeholder Map

Useful link:

www.tripler.io

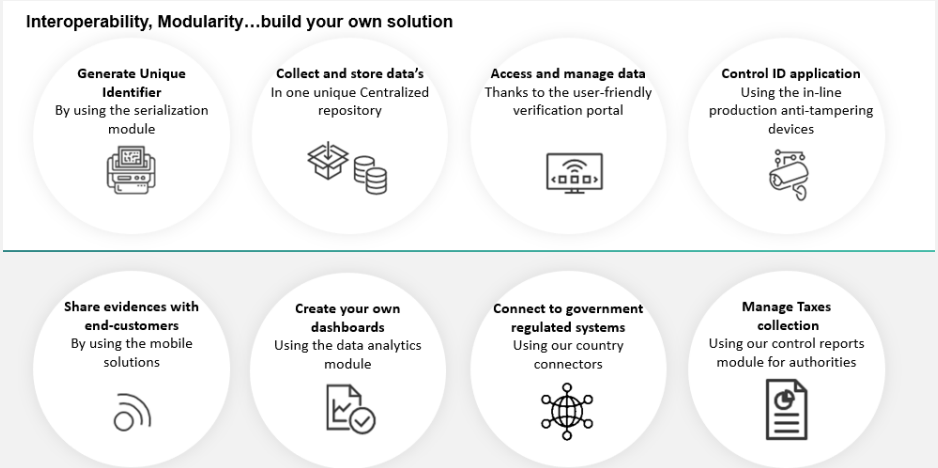
Worldline TCS

Tax Control Suite (TCS)							
Worldline excised stamp and track and trace solution, so called product name Tax Control Suite: • Is a digital tool for control and monitoring of all excised goods, manufactured or imported into a market, territory or country (near real time visibility with our mobile app); • Destined to fight illicit trade with less admin burden; • Increases the revenue for the authority's administration due to the tax collection monitoring; • Fully compliant with existing international and/or local regulation; • State-of-the-Art: customisable, interoperable with existing IT systems and leading edge technologies; • Supporting digitisation and international recognition.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	

	Traceability	Tagging (QR, NFC, RFID)	Others

Unique technical aspects

Worldline Tax control suite is a modulable solution to be composed with components that would suit with local authority's needs.



The core components are:

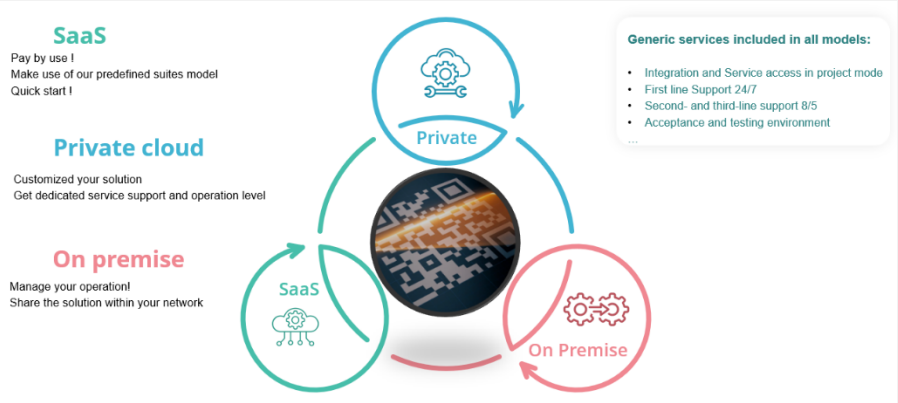
- Portal to register the economic operators (including registration of related master data such as information around their facilities, their machines, etc.).
- Portal to enable the order or generation of Unique Identifier to be applied on product to be traced.
- Event repository to control and store the product tracking related events sent by the manufacturers along the product life cycle. The events may cover production processes as well as logistic operations.
- Machine to machine integration thanks to API managing the operations directly from the system of the manufacturers.
- Additional modules could be:
- Statistics and reporting module to provide to the authority a full market or industry related report.
- Mobile application to provide easy access to evidence or control tools.

In addition to the Worldline Tax Control suite which is a fully digital solution, Worldline has strong partnership with the best specialists to provide additional features that would enhance the verification and control of traceability notions:

- Anti-tampering hardware devices to control unique code application on production lines:

- Physical tax stamps design lay-out, printing and supply facilities and;
- New security features technologies.

Worldline may propose a flexible delivery model of the Tax Control Suite. From acting as a global and dedicated service provider to a simple solution provider operated on local premise.



Maturity level and application sectors

Solution used to control tobacco industry in different versions.

- Digital Tax Verification in Switzerland;
- Unique Identifier generation and economic operator registrations in Denmark, Lithuania, Greece, Cyprus, The Netherlands;
- Tax control and import management in Ecuador.

Link: WL Traceability for Authorities - YouTube.

TextileGenesis

Textile Genesis							
Textile Genesis is a Blockchain-based platform for the traceability of the origin of fibres for the fashion and textile ecosystem. It includes all 5-6 tiers of the supplier ecosystem, using Fibercoins to trace sustainable textile products from fibre-origin to retail. Fibres such as wood-based.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
I doIT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials		Others		
	Convenience	Wallet	Data Ports		Others		
	Data protection	PETs	Anonymization		Others		
	Traceability	Tagging (QR, NFC, RFID)			Others		
Unique technical aspects							
Blockchain-based architecture, highly scalable, using so-called Fibercoins to warrant against double spending. Not only companies that want to produce with sustainable fibres but also third-party auditing bodies have access to verify ESG credentials of supplier's production sites. Thus, the platform offers a chain of custody for raw materials/fibres (and farm level) from the source							

throughout the entire value chain. Including fibre forensic audit results. Data is real-time data from different stakeholders.

The platform uses bots for automated business and certificate validations (source: https://textileexchange.org/app/uploads/2021/05/Webinar-Textile-Exchange-and-TextileGenesis-Collaboration-September-2-2020.pdf)

Maturity level and application sectors

Cross-industry platform with a high maturity level, more than 1500 suppliers that create sustainable products have joined Textile Genesis and more than 50 brands in the textile/fashion industry use Textile Genesis to be sure about the origins of the fibres they use. In this way they can show they are using sustainable fibres in their production chain.

Useful links:

https://textilegenesis.com/

https://textileexchange.org/app/uploads/2021/05/Webinar-Textile-Exchange-and-TextileGenesis-Collaboration-September-2-2020.pdf

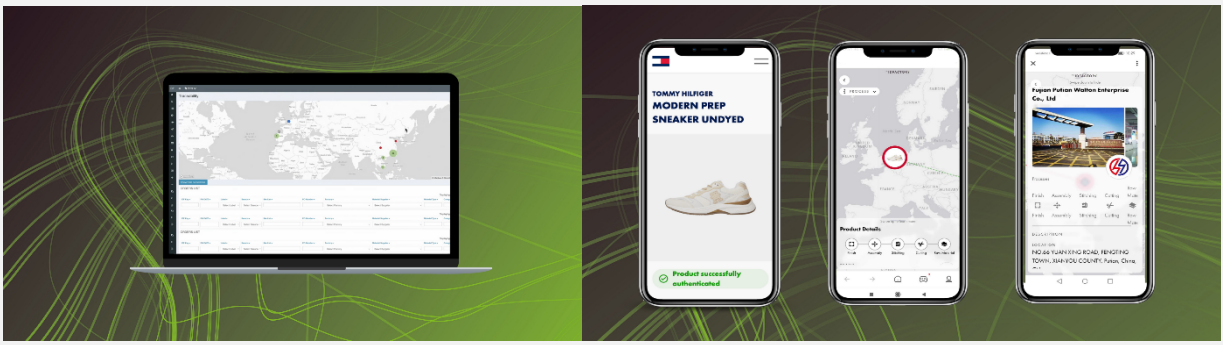
The ID Factory Società Benefit

The ID Factory Srl Società Benefit

The ID Factory is a supply chain traceability platform (SaaS) designed to provide fashion companies visibility across their global supply chains thanks to our digital ID technology.

Our platform contributes to key operations as quality control, compliance, procurement and traceability, by using a dynamic centralized database integrated with any management system:

- TRACKING MATERIAL FLOWS: thanks to an integrated solution enabled by physical traceability of materials, we give insights on suppliers' performance.
- EXTENDING RAW MATERIAL PROCUREMENT: With real-time information for the management of orders, bill of materials, delivery lead time and forecast of orders.
- DIGITALIZING THE QUALITY CONTROL: Chemical and physical compliance of raw materials and finished products with a system that interacts with international labs (Bureau Veritas, UL, SGS, TUV).
- DIGITAL PRODUCT PASSPORT: bolstered by both physical, digital and documental traceability of materials, processes and products.



Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model		Batch	Prod. order		Single item
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		

IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others
	Data packaging	Data transfer		API	
IT architecture: Access control	**Level**	Simple		Advanced	
	If advanced	Attribute based		Role based	
IT architecture: Data use	Labelling	Enforcement		Others	
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others	
	Convenience	Wallet	Data Ports	Others	
	Data protection	PETs	Anonymization	Others	
	Traceability	Tagging (QR, NFC, RFID)		Others	

Unique technical aspects

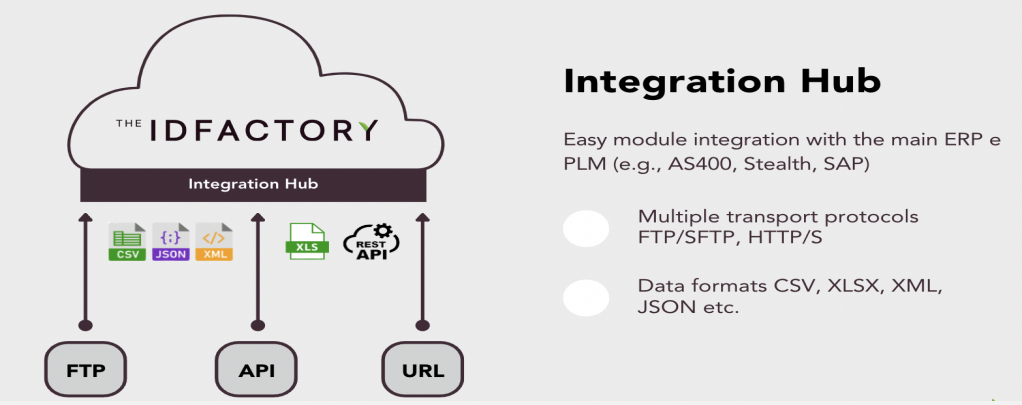
The ID Factory has designed a Traceability Protocol, to set the rules to achieve greater traceability of materials, components and products and to enable a systematic and scalable data collection system along the fashion and luxury supply chains thanks to a joined digital, physical and documental traceability framework that leverages on the experience of the existing traceability standard of the industry.

We have created a mixed method for our framework:

Physical traceability through Smart-Tag labels applied to the single component or material piece, linked to the respective batch and order, enriched with the information collected through the whole production processes.

Documental traceability through the direct engagement of the supplier as data owner: direct upload of the documents on a shared data repository, a platform on cloud in our case, where each material certificate is linked to the production order and divided by product category.

The ID Factory is also ISO 27001 certified.



Maturity level and application sectors

In strategic collaboration with Sopra Steria, a world-leading system integrator, we have enhanced our capabilities and seamless implementation with the existing fashion brand management systems.

As an active participant in the Innovation Forum of the Global Fashion Agenda (GFA), The ID Factory contributes to shaping sustainable fashion practices. This coveted membership showcases our commitment to fostering innovation and traceability, positioning us at the forefront of industry transformation.

We have been recognized among the innovation provider solutions listed by the Bocconi Monitor for Circular Fashion study and as part of The Fashion for Good DIGITAL TRACEABILITY PLATFORM ANALYSIS that evaluates The ID Factory fashion readiness as 5 out of 5 with a high maturity level.

The ID Factory stands as a mature and trusted leader in traceability, empowering brands and stakeholders with our innovative Digital Product Passport solution focused on supply chain traceability and transparency.

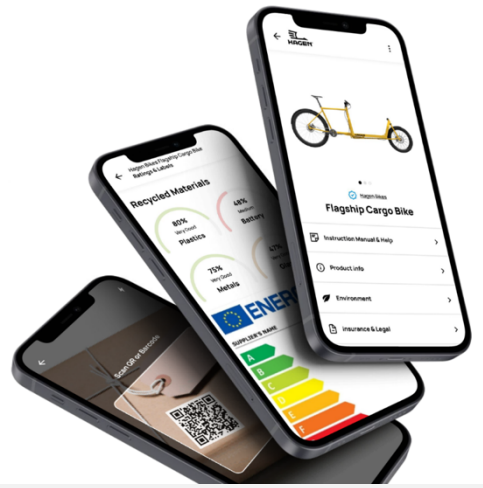
Useful links:

TRACEABILITY PROTOCOL
INNOVATION FORUM GFA
BOCCONI MONITOR FOR CIRCULAR FASHION: Link 1, Link 2
FASHION FOR GOOD REPORT TRACEABILITY PLATFORM

Tings

Tings						
Responsible operator and consumer focused product lifecycle support system. Durable goods and apparel. DPP ready.						
Mapping with respect to the reference framework						
Product ID	**Type**	Instance		Category		
	Granularity	Model	Batch	Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes		No		
	Resolver	Yes		No		
Digital connector	**ID minting**	Centralized		Decentralized		
	Data storage location	Centralized		Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others	
	Data packaging	Data transfer		API		
IT architecture: Access control	**Level**	Simple		Advanced		
	If advanced	Attribute based		Role based		
IT architecture: Data use	Labelling	Enforcement		Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others		
	Convenience	Wallet	Data Ports	Others		
	Data protection	PETs	Anonymization	Others		
	Traceability	Tagging (QR, NFC, RFID)		Others		
Unique technical aspects						
Support for different taxonomies by using mapping capability.						
Maturity level and application sectors						
Closed MVP with users. Cross-sector. Designed to fit with DPP data and data system if similar to ESPR and CIRPASS proposal described DPP will be decided. Before DPP enforcement offers responsible operators to make as much product data digitally available as possible for consumers						

to use products more responsibly, extend product consumption period, support products taken to upcycle and recycle. Currently uses based on guesswork DPP data set. System supports more data and functionality from responsible operators to consumers than predicted for DPP.



Tokenized Distributed Ledger

Circularise/Tokenized distributed ledger						
Circularise is the leading software platform that provides end-to-end traceability and secure data exchange for industrial supply chains.						
Mapping with respect to the reference framework						
Product ID	**Type**	Instance		Category		
	Granularity	Model	Batch	Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes		No		
	Resolver	Yes		No		
Digital connector	**ID minting**	Centralized		Decentralized		
	Data storage location	Centralized		Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others	
	Data packaging	Data transfer		API		
IT architecture: Access control	**Level**	Simple		Advanced		
	If advanced	Attribute based		Role based		
IT architecture: Data use	Labelling	Enforcement		Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others		
	Convenience	Wallet	Data Ports	Others		
	Data protection	PETs	Anonymization	Others		
	Traceability	Tagging (QR)		Others		
Unique technical aspects						
The patent-pending Smart Questioning makes it possible for all companies to cooperate in a trusted information exchange. In the system, companies are anonymous, remain the only owner of the data and can stop communicating it any time. They decide how much information is shared and with whom and are able to validate the answers to any question without sharing the original data. Circularise's technology allows for companies to communicate about the data of their products and for anyone to scan the QR-Code on the product in order to see the product						

information or ask a Smart Question to the decentralised store of the full bill of material spread over the local databases of all suppliers reaching back to the mining stage. The anonymity and control of the amount of data shared at any moment is the only way to get all companies to cooperate and thereby overcome the issues with centralised databases that are rejected due to the risk to confidential business data.

Maturity level and application sectors

Circularise technologies allow communication on data instead of simply the data. In supply chains we often deal with data that needs to remain a secret. All normal encryption methods can be decrypted over time. We use an implementation of zero-knowledge proof (ZKP), a technology we call “Smart Questioning” that allows stakeholders to ask critical questions (e.g. "Does this plastic part contain material “x”?") to a guarded dataset of private information (e.g. the bill of materials). Practically speaking, the user sees the reference on Blockchain (hash) and by asking questions to this hash, the question is sent to every locally stored dataset of every supply chain stage. Practically speaking, it is the "interrogation" of the entirety of the supply chain of a product by asking a list of specific questions to a QR-Code or hash. As the private information is audited, so is the output.

Useful link:

www.circularise.com

Toxnot

Toxnot							
Toxnot (a 3E company) is a software company with a mission to improve health and sustainability across the global supply chain by streamlining the chemical transparency process. Toxnot provides an efficient system for manufacturers to import chemicals data, provide insight into their hazard profiles, report on the results and create safer products. Organisations use Toxnot to automate transparency reporting and compliance, easily collect hazard information, and reduce risks across their global supply chain. Toxnot scales from small businesses to Fortune 500 enterprises. www.toxnot.com							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance		Category			
	Granularity	Model	Batch	Prod. order	Single item		
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes		No			
	Resolver	Yes		No			
Digital connector	**ID minting**	Centralized		Decentralized			
	Data storage location	Centralized		Decentralized			
IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others		
	Data packaging	Data transfer		API			
IT architecture: Access control	**Level**	Simple		Advanced			
	If advanced	Attribute based		Role based			
IT architecture: Data use	Labelling	Enforcement		Others			
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)		Others			

Unique technical aspects

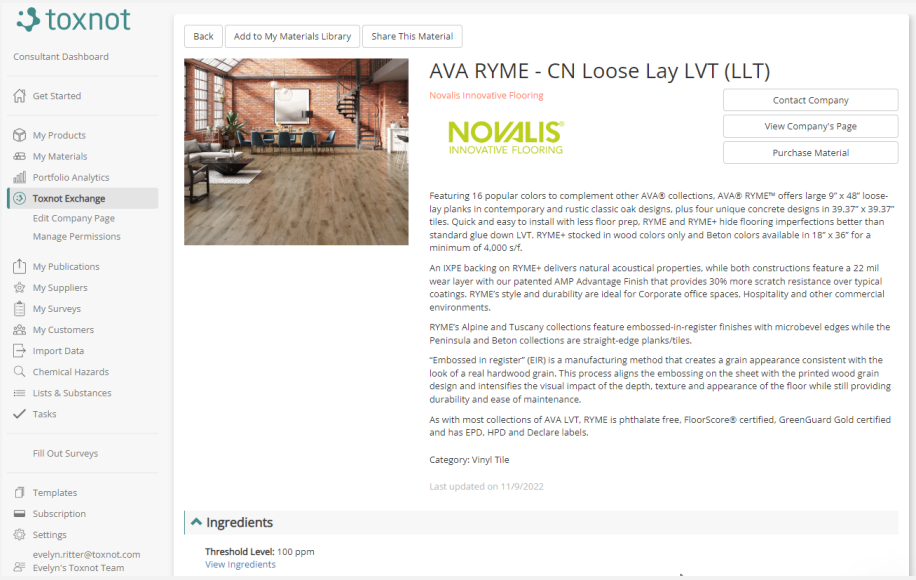
The Toxnot Product Passport system is specifically designed to meet emerging product passport requirements, enable supplier data exchange today, and be easily expanded as guidelines evolve. Our proprietary data protections allow suppliers to mark chemicals as proprietary but users to still screen those proprietary chemicals against regulations such as EU REACH or PFAS regulations. Simplified infrastructure allows for clear ownership and low cost. Suppliers can create a Toxnot Digital Product Passport for free and can automatically create an EU REACH, EU RoHS, CA Prop 65, and Product Circularity Data Sheet as part of the free account. All data fields are aligned with industry-standard initiatives & needs and are updated as terms and usage change.

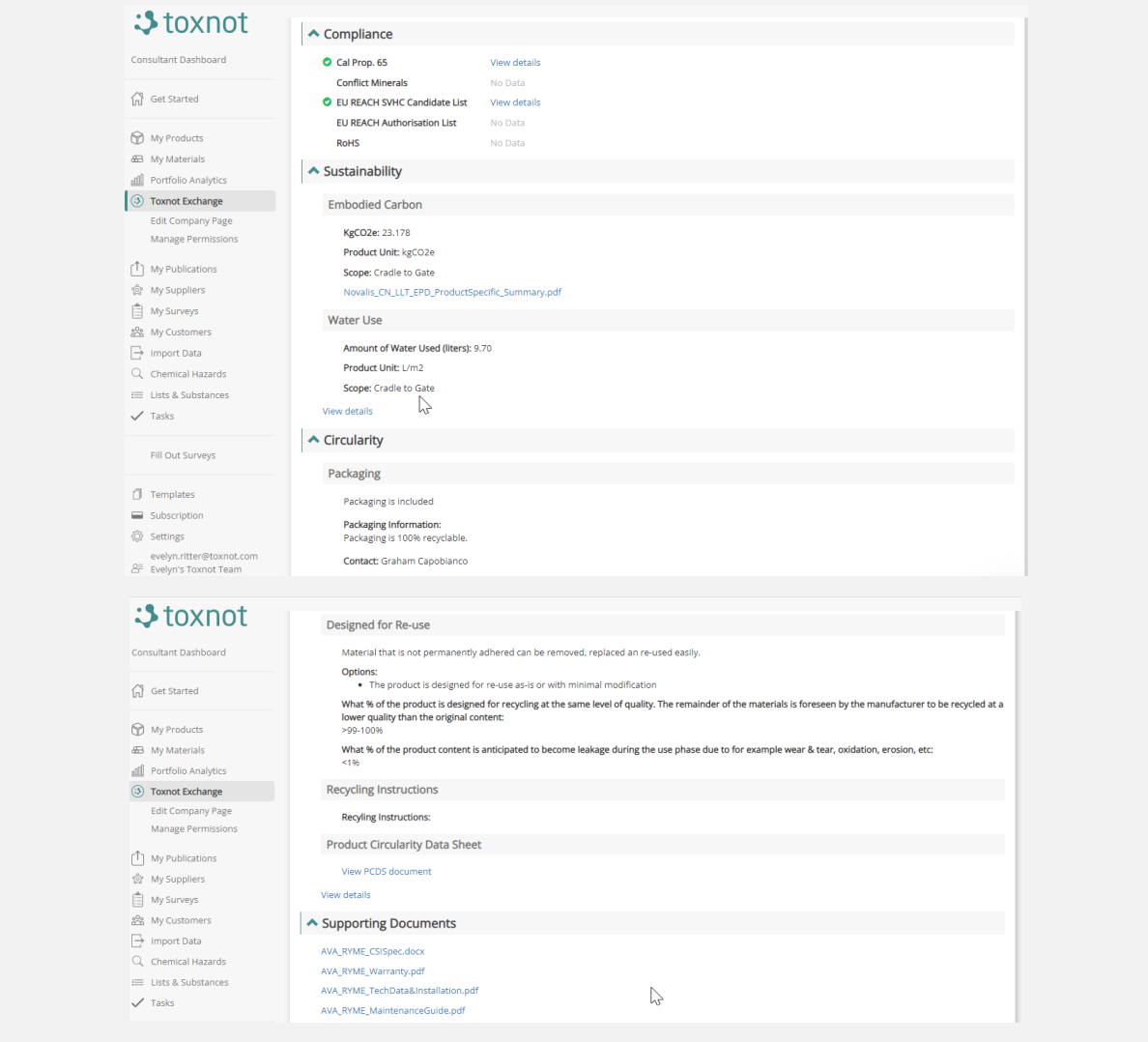
Maturity level and application sectors

The Toxnot Product Passports are live in the system and already used by X of companies. Companies can enter full chemical ingredient disclosure, compliance data, sustainability data such as embodied carbon and water use, circularity information, recycled content, end-of-life options and more. We have companies from a wide variety of sectors using the system, including industrials, building products, chemical manufacturers, packaging, electronics and more. Passports can be published as public, restricted, or private, based on each company's desire. Some notable product passport publishers include: Covestro, Novalis, Steelcase, Kohler, AEP Span, Windmöller GmbH, and more.

Follow this link to an example passport:

https://toxnot.com/Exchange/Database/Detail/d3531fe3-9750-49b9-a546-fe19f7c5d90f




toxnot
Consultant Dashboard
Get Started
My Products
My Materials
Portfolio Analytics
Toxnot Exchange
Edit Company Page
Manage Permissions
My Publications
My Suppliers
My Surveys
My Customers
Import Data
Chemical Hazards
Lists & Substances
Tasks
Fill Out Surveys
Templates
Subscription
Settings
evelyn.ritter@toxnot.com
Evelyn's Toxnot Team
Compliance
Cal Prop. 65
View details
Conflict Minerals
No Data
EU REACH SVHC Candidate List
View details
EU REACH Authorisation List
No Data
RoHS
No Data
Sustainability
Embodied Carbon
KgCO2e: 23.178
Product Unit: kgCO2e
Scope: Cradle to Gate
Novalis_CN_LLT_EPD_ProductSpecific_Summary.pdf
Water Use
Amount of Water Used (liters): 9.70
Product Unit: L/m2
Scope: Cradle to Gate
View details
Circularity
Packaging
Packaging is included
Packaging Information:
Packaging is 100% recyclable.
Contact: Graham Capobianco
toxnot
Consultant Dashboard
Get Started
My Products
My Materials
Portfolio Analytics
Toxnot Exchange
Edit Company Page
Manage Permissions
My Publications
My Suppliers
My Surveys
My Customers
Import Data
Chemical Hazards
Lists & Substances
Tasks
Designed for Re-use
Material that is not permanently adhered can be removed, replaced an re-used easily.
Options:
The product is designed for re-use as-is or with minimal modification
What % of the product is designed for recycling at the same level of quality. The remainder of the materials is foreseen by the manufacturer to be recycled at a lower quality than the original content:
>99-100%
What % of the product content is anticipated to become leakage during the use phase due to for example wear & tear, oxidation, erosion, etc:
<1%
Recycling Instructions
Recyling Instructions:
Product Circularity Data Sheet
View PCDS document
View details
Supporting Documents
AVA_RYME_CSISpec.docx
AVA_RYME_Warranty.pdf
AVA_RYME_TechData&Installation.pdf
AVA_RYME_MaintenanceGuide.pdf

Trackit

Trackit Traceability Programme and Shared Measurement System
Trackit is a technology agnostic traceability program developed based on a set of open materials, processes and product standards that are widely adopted by the textile sector, to trace certified fiber and raw materials across the textile supply chain from source to product. It currently leverages our chain of custody, the Content Claim Standard, to trace third-party certified materials across the supply chain. Trackit centralises site-level verification and offers two alternatives to transaction verification: • dTrackit allows certification bodies, brands and suppliers accredited/certified to our standards to access their scope certificates, transaction certificates, and traceability data in one central place. • eTrackit uses new technologies to increase efficiency and integrity in traceability. It tracks the volume of certified material for each product (rather than the entire transaction) online via tokens, shows real-time inventory, and ensures peer-to-peer validation of transactions within a closed-loop supply chain.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture:	**Evidence**	Blockchain		Verifiable Credentials	Others		

Data mgmt features	**Convenience**	Wallet	Data Ports	Others
	Data protection	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

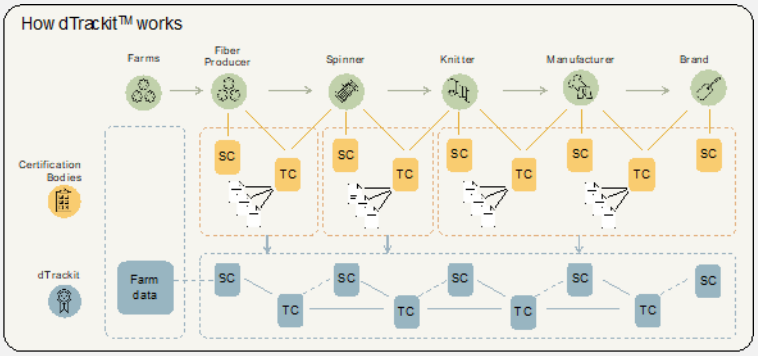
Unique technical aspects

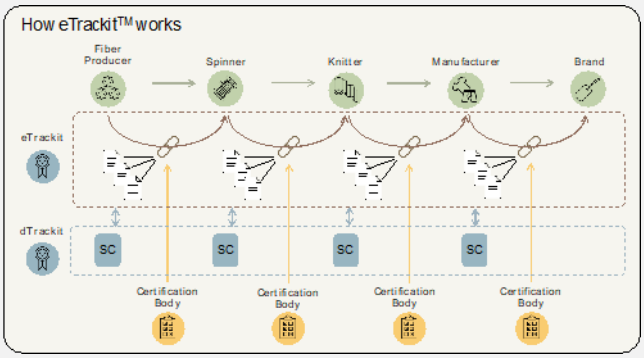
1. **Third-party verified.** Trackit data are third-party verified by certification bodies that are independently accredited by accreditation bodies to ISO 17065.
2. **Modern data architecture.** Trackit is developed as a part of Textile Exchange's Shared Measurement System ("SMS", see video), a modern data architecture set up to track and measure the fashion, apparel and textile sector towards the Climate+ goals.
3. **Open data standard.** Trackit leverages a suite of growing open data standards that Textile Exchange developed in consultation with and for the standardised reporting of the fashion, apparel, and textile sector.
4. **Mission based.** Trackit data is securely stored and governed centrally by Textile Exchange (a U.S. based 501(c)(3) not for profit with a mission to accelerate and scale global fiber and materials production that positively impacts our planet) as a single source of truth for traceable certified materials.

Maturity level and application sectors

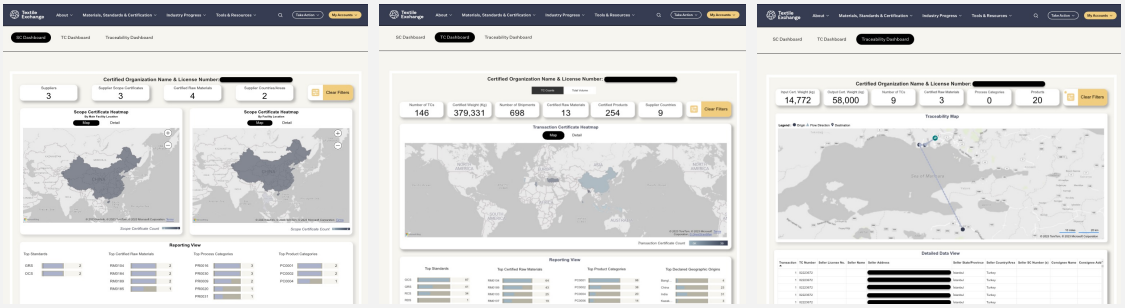
dTrackit is operational across 30+ certification bodies, 60,000+ sites in 104 countries for 150 certified materials in organic, recycled, responsible wool, alpaca, mohair and down. This service will be extended for producer-level schemes to trace certified materials from source to product, and there is potential for site-level schemes to connect facility certifications to existing chains. As the source of truth for certified materials across six key categories in the textile sector, discussions are also underway with technology solution providers to validate the certified materials and/or facilities in their system. Access to dTrackit is based on roles: public, brand, supplier, producer, and certification body. Public access to certified listings and transaction authentication was released in November 2022. A general release is expected in the coming months. Certification body access is planned in 2023, and supplier, producer access in 2024.

eTrackit pilot for the Recycled Content Standard and Global Recycled Standard eTrackit was completed in August 2022. We are expecting to release the Recycled Content Standard and Global Recycled Standard for commercial use on eTrackit in July 2023. We will be piloting the Organic Content Standard and the Responsible Animal Fibers in June 2023 and Responsible Down Standard in 2024.





Digital Trackit™

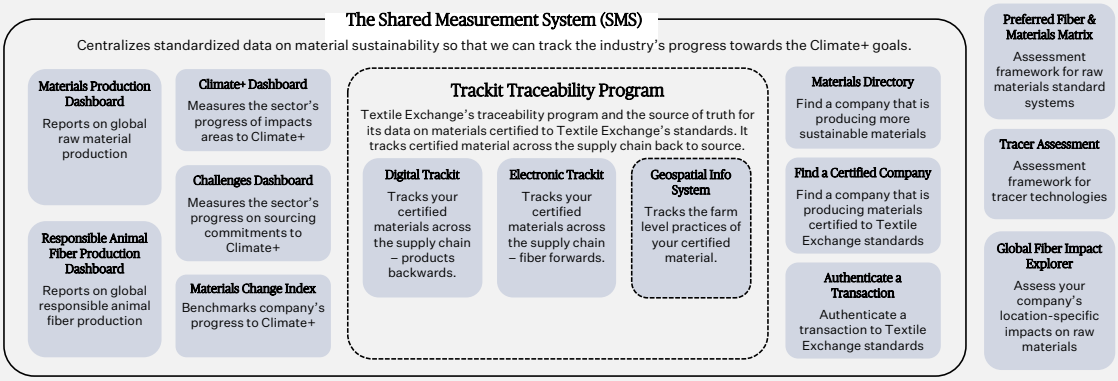


8 standards
31 certification bodies

~ 60,000 sites
104 countries

> ~ 150 certified materials

Textile Exchange's Digital Tools



SMS tools:

- Climate+ Dashboard
- Materials Production Dashboard
- Materials Change Index
- Materials Challenges Dashboard

Useful links

Trackit & SMS Presentation ; Trackit video ; Trackit web page ; dTrackit web page ; eTrackit web page ; Shared Measurement System video ; Climate+ Vision ; chain of custody ; Content Claim Standard ; Open data standard example - Materials, Processes & Products Classification

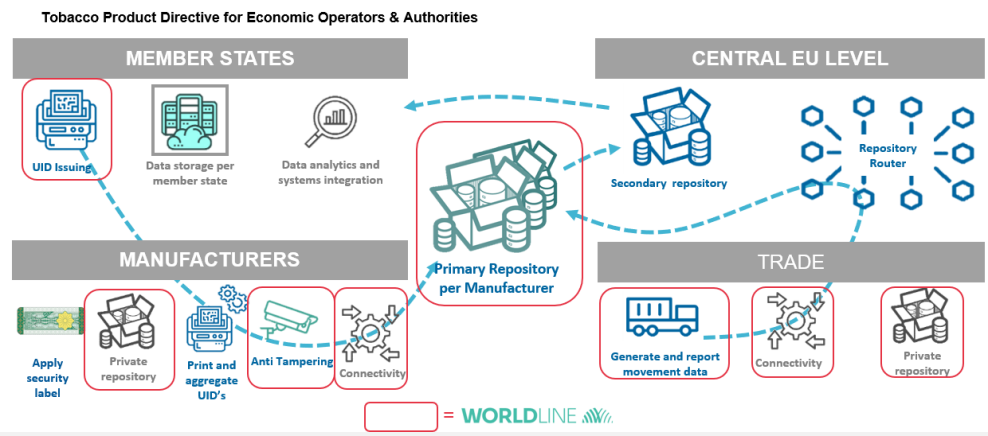
Worldline TPD

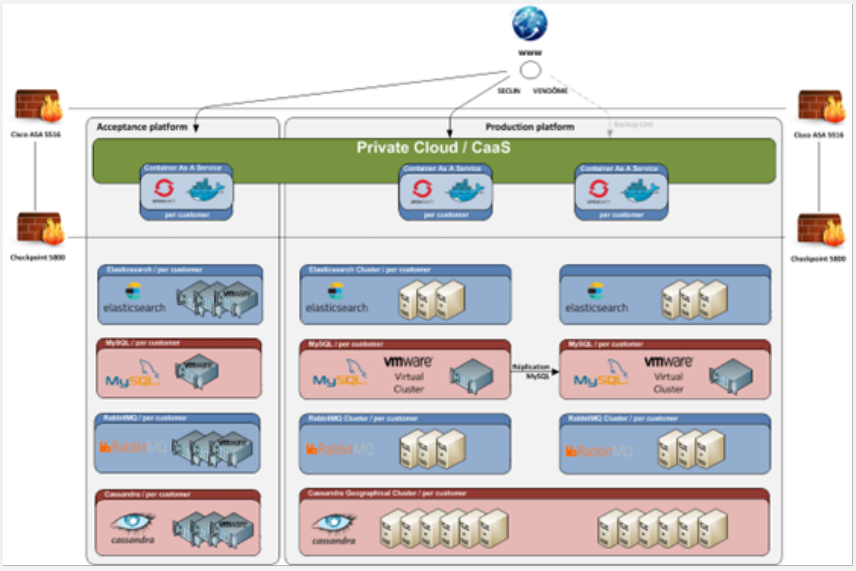
TPD Repositories
Worldline is deeply involved in the Track and Trace activities linked to the European Regulation for tobacco manufacturers and importers and for local and European authorities. The European Regulation (TPD and Implementing Acts) helps European authorities to fight against tobacco illicit trade by tracking all tobacco products in the European territory. Worldline provide one stop shop solutions to EU economic operators and EU member states allowing them to comply with the regulation, for example the primary repository for importers and manufacturers of tobacco products. When necessary, Worldline also provides to its customers other ancillary services such as private repositories and connectivity modules to further secure the compliance with the regulation.

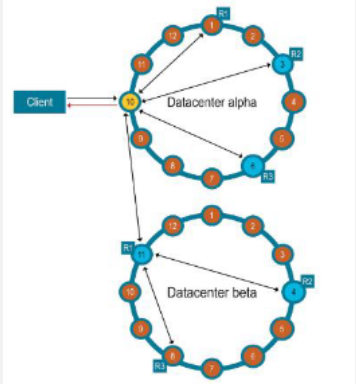
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model		Batch	Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials	Others		
	Convenience	Wallet		Data Ports	Others		
	Data protection	PETs		Anonymization	Others		
	Traceability	Tagging (QR, NFC, RFID)			Others		

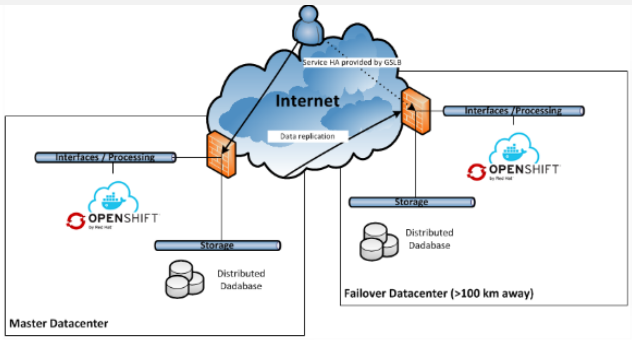
Unique technical aspects

In order to ensure business continuity and no loss of data as per EU regulation, Worldline implemented on their private cloud infrastructure a fully redundant platforms architecture using different data-centres (active and passive). This architecture allows an instant platform switch in case of major disaster. All used technologies are fully redundant at several levels (Openshift and CaaS management, MySQL management, Elastic stack and RabbitMQ, Cassandra storage, WebDAV and Webscale).









Maturity level and application sectors

Worldline is operating 6 regulated primary repositories and 5 manufacturer centralised Track and Trace systems since 2019 to support to EU tobacco product directive implementing regulation.

This is representing the management of:

- 25 billion unique products traced a year;
- 100 billion of product related tracking events a year and;
- 30 Terabytes of data processed and stored a year.

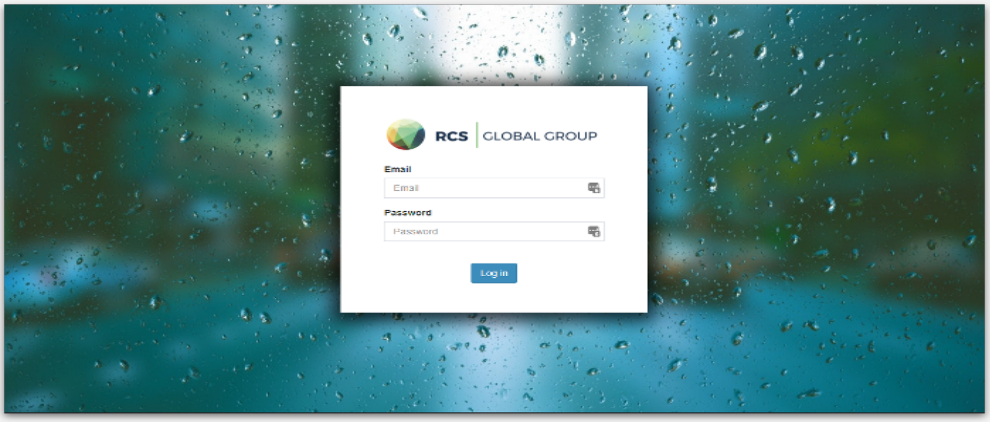
TRACE

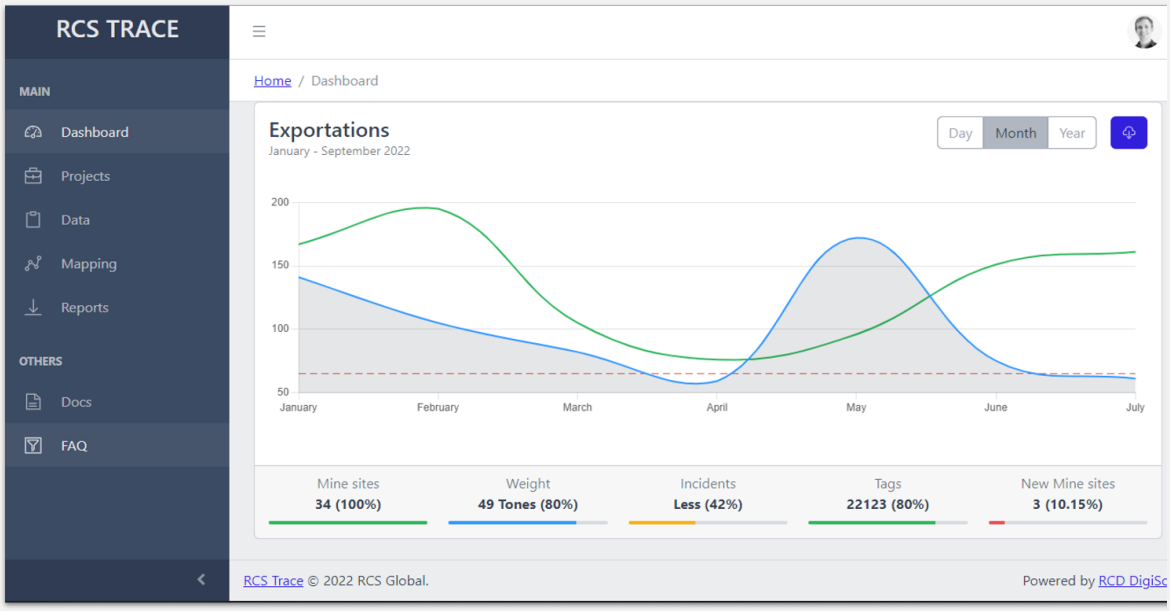
TRACE							
TRACE is a web-based platform functioning as an established approach to collect ASM traceability data to ensure chain of custody documentation, transparency on contamination risks and provide traceability reports and export documentation to our clients							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	**Batch**		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			**No**		
	Resolver	Yes			No		
Digital connector	**ID minting**	**Centralized**			Decentralized		
	Data storage location	**Centralized**			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	**Others**	
	Data packaging	**Data transfer**			API		
IT architecture: Access control	**Level**	**Simple**			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		**Others**	
	Convenience	Wallet		Data Ports		**Others**	
	Data protection	PETs		Anonymization		**Others**	
	Traceability	**Tagging (QR, NFC, RFID)**			Others		
Unique technical aspects							
The tech solution is in production since 2019, TRACE 2.0 will adopt a miro-service architecture to ensure agility, improved traceability, easier debugging and maintenance. This will be based on a cloud formation infrastructure on AWS to enhance security, quality, maintainability, and data integration. Possible tech stack could be based on Elixir with PostgreSQL DB.							

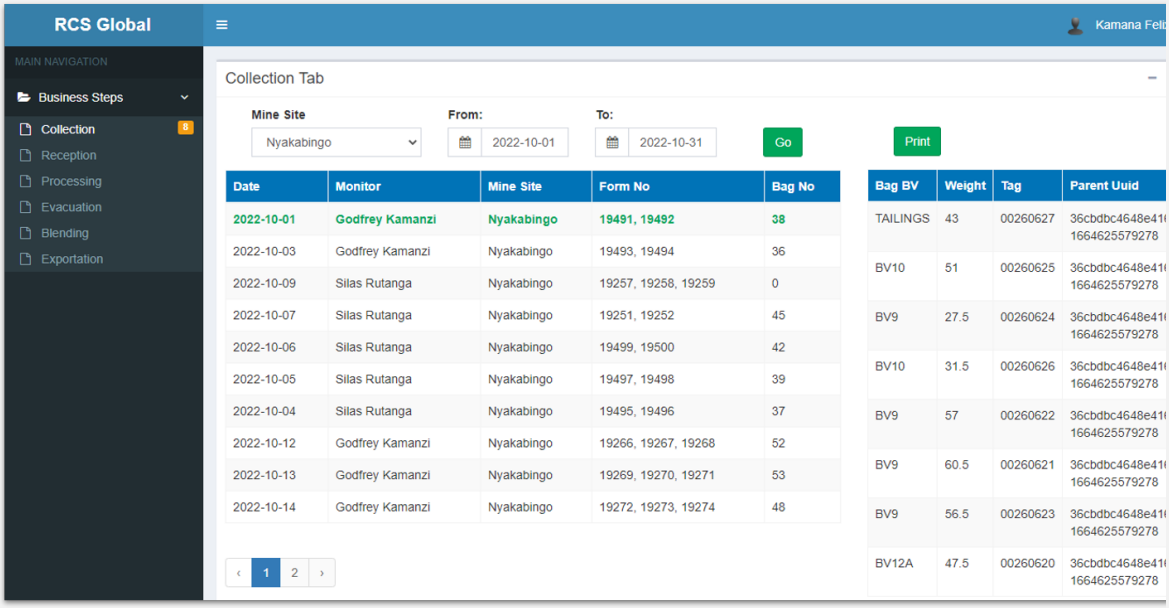
Maturity level and application sectors

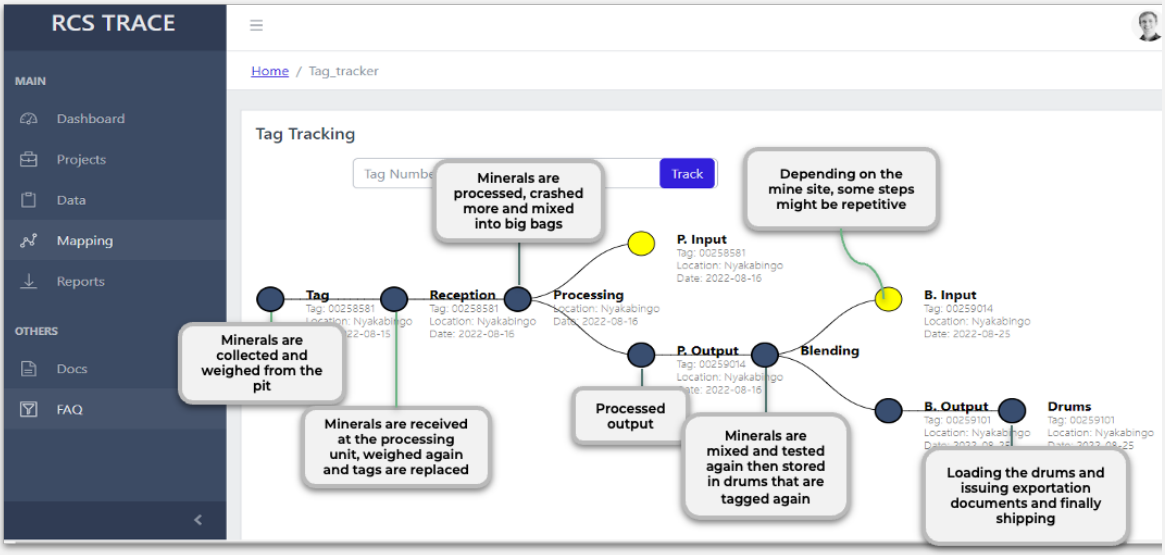
TRACE version 1.0 was launched in 2019, current work is on TRACE 2.0. TRACE is used by RCS clients to trace monitored ASM material from pit/ tunnel to export, with potential expansion to extend traceability to cover the entire value chain.

Note: the dataset used for demonstration is a dummy one






RCS Global
MAIN NAVIGATION
Business Steps
Collection
Reception
Processing
Evacuation
Blending
Exportation
Collection Tab
Mine Site
Nyakabingo
From:
2022-10-01
To:
2022-10-31
Go
Print
Date
Monitor
Mine Site
Form No
Bag No
2022-10-01 Godfrey Kamanzi Nyakabingo 19491, 19492 38
2022-10-03 Godfrey Kamanzi Nyakabingo 19493, 19494 36
2022-10-09 Silas Rutanga Nyakabingo 19257, 19258, 19259 0
2022-10-07 Silas Rutanga Nyakabingo 19251, 19252 45
2022-10-06 Silas Rutanga Nyakabingo 19499, 19500 42
2022-10-05 Silas Rutanga Nyakabingo 19497, 19498 39
2022-10-04 Silas Rutanga Nyakabingo 19495, 19496 37
2022-10-12 Godfrey Kamanzi Nyakabingo 19266, 19267, 19268 52
2022-10-13 Godfrey Kamanzi Nyakabingo 19269, 19270, 19271 53
2022-10-14 Godfrey Kamanzi Nyakabingo 19272, 19273, 19274 48
Bag BV
Weight
Tag
Parent Uuid
TAILINGS 43 00260627
BV10 51 00260625
BV9 27.5 00260624
BV10 31.5 00260626
BV9 57 00260622
BV9 60.5 00260621
BV9 56.5 00260623
BV12A 47.5 00260620


RCS TRACE
MAIN
Dashboard
Projects
Data
Mapping
Reports
OTHERS
Docs
FAQ
Home / Tag_tracker
Tag Tracking
Track
Minerals are processed, crashed more and mixed into big bags
Depending on the mine site, some steps might be repetitive
P. Input
Tag
Reception
Processing
B. Input
Minerals are collected and weighed from the pit
P. Output
Blending
B. Output
Drums
Minerals are received at the processing unit, weighed again and tags are replaced
Processed output
Minerals are mixed and tested again then stored in drums that are tagged again
Loading the drums and issuing exportation documents and finally shipping

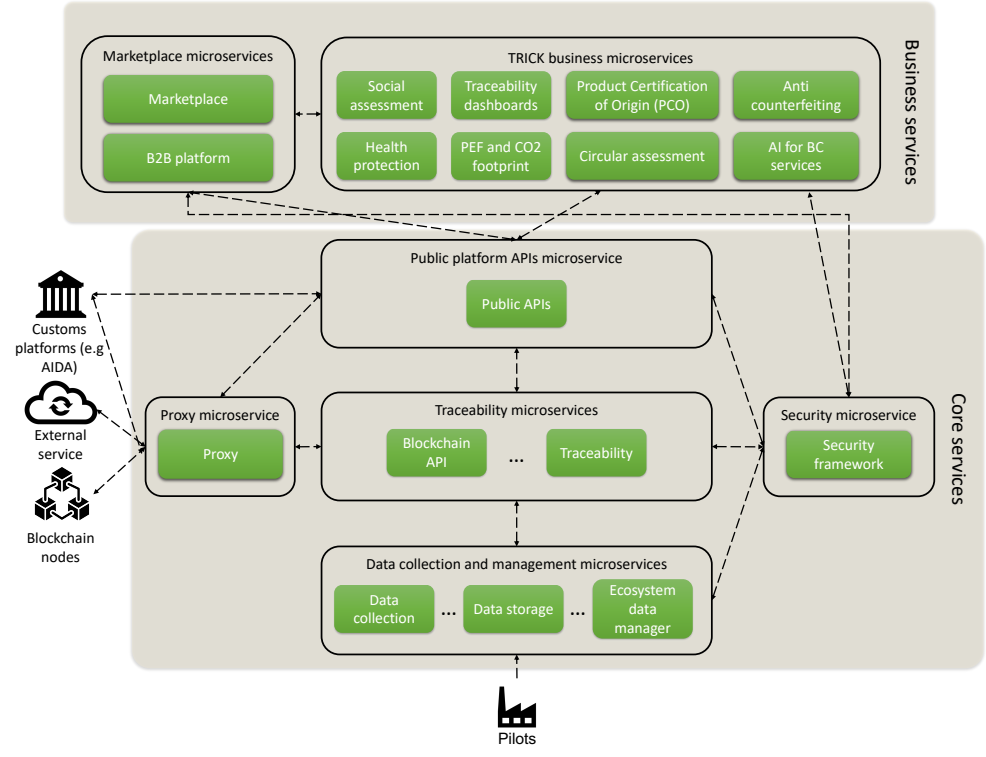
TRICK

TRICK							
Product data TRaceability Information management by BloCKchains interoperability and open circular service marketplace. TRICK Project arises from the need from the Textile and clothing industry to be more transparent and traceable, easing the transition from linear to circular. The TRICK project consists of providing a complete, reliable, SME-affordable and standardised platform to support the adoption, tracing and demonstration of sustainable and circular approaches, secured by Blockchain enabling the enterprises to collect product-secured data. TRICK's main goal is to provide affordable and standardised enablers to move SMEs closer to a circular economy. The achievement of this objective will come through the creation of a platform for the management of circular product information based on data collection and secured by Blockchain. The TRICK platform will perform the collection and data management of secure product data all along the supply chain together with a set of six services available in an open B2B marketplace.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order		Single item
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports		Others
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture:	**Evidence**	Blockchain		Verifiable Credentials		Others	

Data mgmt features	**Convenience**	Wallet	Data Ports	Others
	Data protection	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)		Others

Unique technical aspects

Typically, the modern IT platform architectures are based on several services, i.e., data storage, database, core services to perform specific functionality. The micro-service approach, proposed in TRICK, uses loosely coupled, collaborating services to enable rapid development and deployment and adoption of simple communication protocols, synchronous or asynchronous. The figure depicts TRICK microservice architecture where data coming from end users is collected and managed by a set of microservices (e.g. data collection, data storage and ecosystem data manager). Traceability micro-services are responsible for managing data stored in the blockchain and to implement the traceability functionality. The basic functionalities, provided by core services are exposed by public platform APIs micro-service. This service is the touch point among the core services, the marketplace, the business services and B2B platform. The business services offered by TRICK platform are: social assessment, health protection, traceability dashboards, PEF and CO2 footprint, Product Certification of Origin (PCO), circular assessment, anti-counterfeiting, AI for BC services. In the proposed approach, each business service is a microservice. By following the same approach, marketplace microservices contain this application and B2B platform. The goal of B2B platform is to offer access directly to TRICK public APIs to build external application based on TRICK services.



Maturity level and application sectors

Considering the technical aspects of the TRICK platform traceability and PCO as core of the TRICK solution are on a good maturity level. The smart contracts have already been implemented to be used on the Blockchains both public and private.

The TRICK platform is addressed specifically for the textile sector which end users are represented on the project consortium covering the whole textile value chain for both technical and fashion textiles. The solution will be validated by the textile industrial users on two pilots and a replication for the food sector, as well represented on the project.

Link: https://www.trick-project.eu/

TrusTrace

TrusTrace							
Supply chain transparency and product traceability SaaS platform for global fashion and retail brands. TrusTrace is a leader in fashion supply chain traceability. Our SaaS technology empowers brands and suppliers around the world to standardize how supply chain and material traceability data is captured, digitized and shared. With all trusted supply chain traceability data stored on a single platform, brands get the right evidence in the right place to back-up product claims and meet regulatory compliance. Trustrace is based in Stockholm, Sweden, with offices in India (Coimbatore), France and the US. We currently have a 100+ strong team and solid experience in delivering large scale traceability programs.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order		Single item
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports		Others
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials			Others
	Convenience	Wallet		Data Ports			Others
	Data protection	PETs		Anonymization			Others
	Traceability	Tagging (QR, NFC, RFID)			Others		

Unique technical aspects
Trustrace is SAAS platform which is built for scale. And configurable for multiple use cases. We have ultra large fashion brands recording millions of transactions per month. Platform includes Extraction Framework (OCR) over 80% accuracy Entity Customization (Extending any entity without code). Data warehouse for analytics (Includes Power BI). Integrations with Rest API and Excel. Event triggers (webhooks for brands). TrusTrace's technology stack and automation is ISO 27001 certified which means it meets rigorous information and data protection standards with its information security practices keeping user data secure.
Maturity level and application sectors
Trustrace was founded in 2016 and is currently a trusted traceability solution provider for more than 45 Brands. TrusTraces core customer are global enterprise scale fashion and retail brands such as Adidas, OTB and Fast Retailing. Trustrace operates worldwide with most customers in Europe and the US. Trustrace already has a small version of the Digital Product Passport i.e.: https://m.trustrace.com/product/Residus/en/CYRIL-DRESS/product-journey TrusTrace is leading the textile group for the development of the DPP in Sweden under the Trace4Value project, where we are also testing RFID technology as well as looking into the use of resolvers: https://trace4value.se/ Trustrace has recently launched the Traceability Playbook as an industry initiative: https://trustrace.com/traceability-playbook-fashion-supply-chains

Twintag

Twintag							
Twintag is an all-in-one connected products platform, bringing digital information and workflows to physical products and assets. All with a single scan of a unique (QR) code. Access this wealth of information with any smartphone; no apps or accounts required. A product becomes a single, bidirectional point of contact for everything from product manuals, logistical flows, safety and transparency information to services such as repair, recycle, reuse, maintenance and support. It is essential to understand that the same product tag can serve an unlimited number of flows and experiences, conducted by an unlimited number of personas. External parameters such as time and location can fully drive the function and UI. Most solutions typically start with a simple value proposition and evolve over time as driven by user feedback.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary	Data ports	Others		
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		

Unique technical aspects

Twintag fully embraces today's polyglot world. We offer our own proprietary APIs that optimize for developer friendliness. In addition, we offer support for a variety of standards and connectors to a diverse range of data management and other IT systems. In the same vein we offer our own UUID based IDs as well as support for GS1 Digital Link and bring-your-own-ID.

Finally, we offer an all-in-one solution from a fully managed SaaS platform for hosting the digital data and experiences behind each code, to customization services and even the physical tagging of products via our partner network. This includes a comprehensive language and text framework where all application texts can be maintained and new language options created, while the UI will default to the detected platform locale.

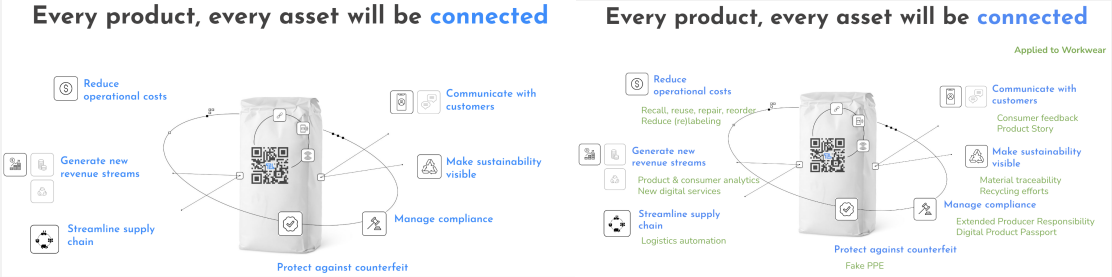
Maturity level and application sectors

Fully operational solution (TRL9), faithfully serving industry leading enterprise customers such as ExxonMobil Chemical, Katoen Natie, Equans, Kiwa, Tricorp - manufacturing and/or servicing millions of products/assets. We're active in a diverse set of industries from petrochemicals, rental services, industrial manufacturing, and textiles to furniture and mattresses.

Recent R-Cycle Digital Product Passport project for certified circular packaging, which Twintag developed together with ExxonMobil, Reifenhäuser and Comexi:

Recent Digital Product Passport initiative enabling circularity in workwear that was started up at workwear company Tricorp, in collaboration with Twintag's partner EE Labels, a label manufacturer with in-house capabilities to weave serialized QR codes:

The underlying rationale for our customers, and thus of the Twintag value proposition, is to realize multiple strategic business outcomes through the same unique digital twin - or “twintag” - of their product:



Useful links:

https://twintag.com
https://twintag.com/customer-stories
https://www.katoennatie.com/twintag

Twinu

Solution Name: twinu GmbH							
Twinu's circularity solution for Digital Product Passports helps companies to measure and improve the circularity of their products. The Circular Pass gives each product a digital twin on the blockchain which can be used to improve the functionality, convenience, and safety of the product, extend its lifetime and usage, and build a closer relationship with the customer until the product is collected and recycled at the end of its lifetime.							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model	Batch		Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized	Proprietary		Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		

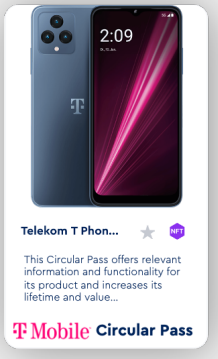
Unique technical aspects

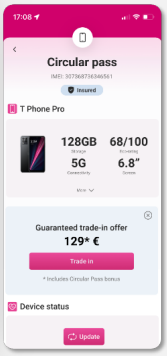
The solution consists of three core elements: The Circular Pass of the product, a B2B product suite including dashboards and management tools to measure and improve a company's circularity as well as B2C apps to give end-users access to information and functionalities of the Circular Pass.

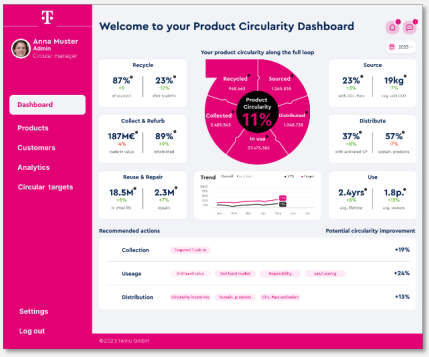
Twinu's Circular Passes are being built as Digital Twins of the product using semantic web technologies (knowledge graphs) which help to make the products information machine-readable and understandable. Additional AI/IoT use-cases can be built efficiently and effectively on-top. Examples are available Voice- and IoT apps to access and control products via their Circular Pass. The Circular Pass is minted as a semantic Digital Twin on the blockchain to create uniqueness and clear ownership. To link and connect products with their Circular Pass an innovative patent has been developed and registered.

Maturity level and application sectors

Twinu's circularity solution has been tested and piloted successfully, for example for smartphones, furniture, fashion. Other application sectors are industry appliances where the Circular Pass also serves as maintenance & service pass to track history of an appliance. Twinu's solution got awarded as the "most sustainable solution" by two large telecommunication providers.







Useful link:

www.twinu.com

Vine

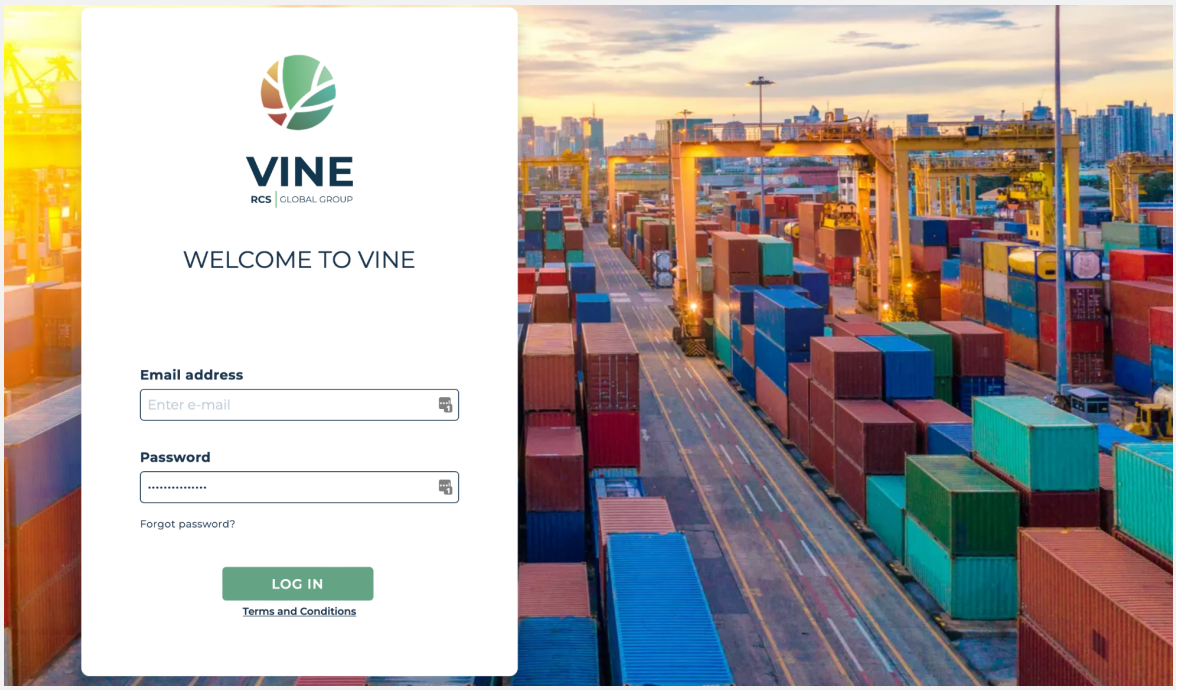
VINE							
Vine is a Cloud based Platform for Supply chain visualisation, ESG & DD performance management, audit programme overview and supply chains risk mitigation							
Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model		Batch	Prod. order	Single item	
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized		Proprietary	Data ports	Others	
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		
IT architecture: Data use	Labelling	Enforcement			Others		
IT architecture: Data mgmt features	**Evidence**	Blockchain		Verifiable Credentials		Others	
	Convenience	Wallet		Data Ports		Others	
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		
Unique technical aspects							
At the moment Vine is a cloud platform hosted on Heroku, using Elixir with Phoenix framework and LiveView as core for the backend and also Javascript (AlpineJS) and GraphQL, all connected to PostgreSQL DBs. As the system is constantly scaling and expanding some of the elements of tech stack and architecture could be updated in Q1-2 to provide better performance and security for more mature products and allow future scaling. Part of Vine is customised fork of Balkan library							

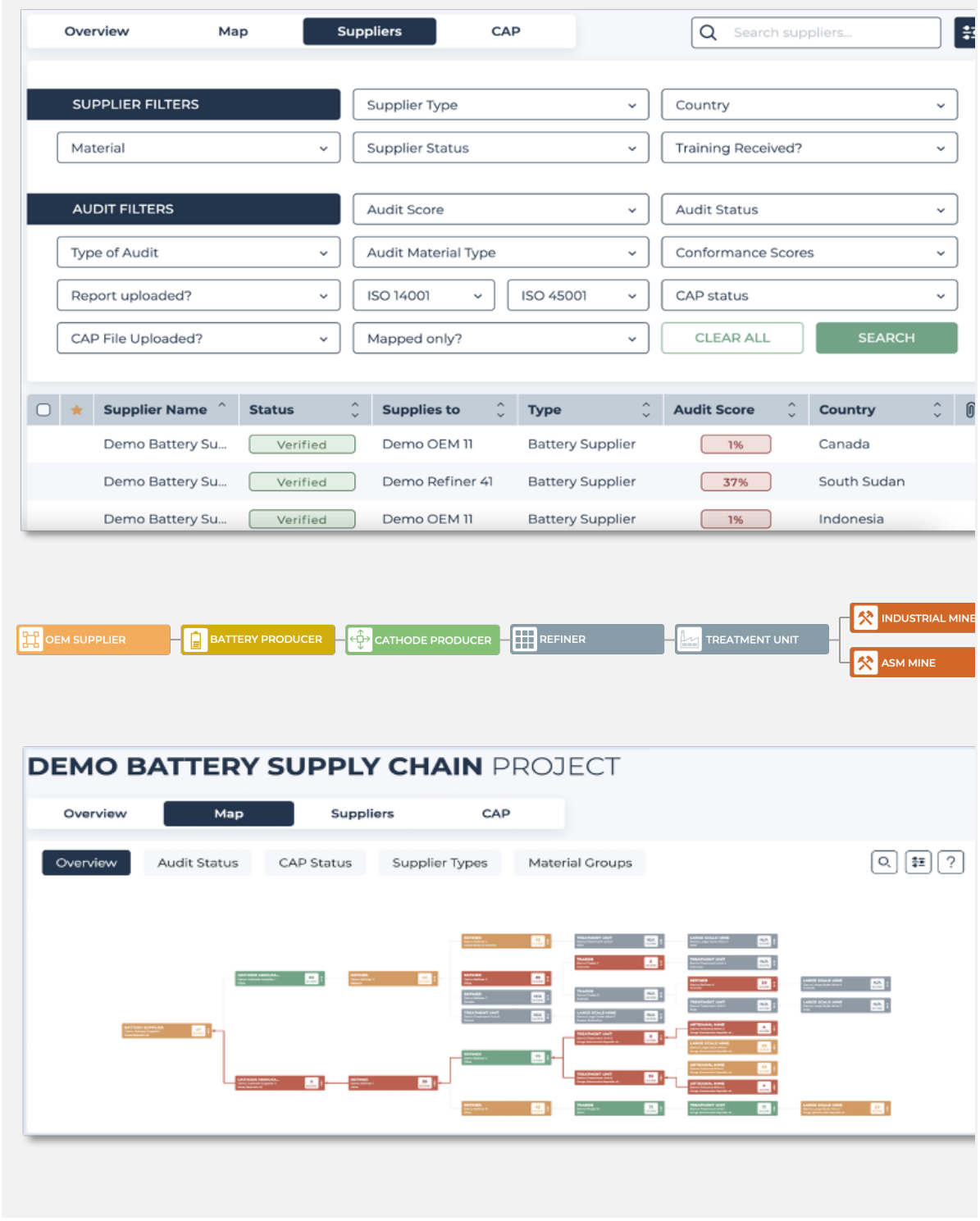
that was optimised towards supply chain mapping and could be regarded as a unique technical solution.

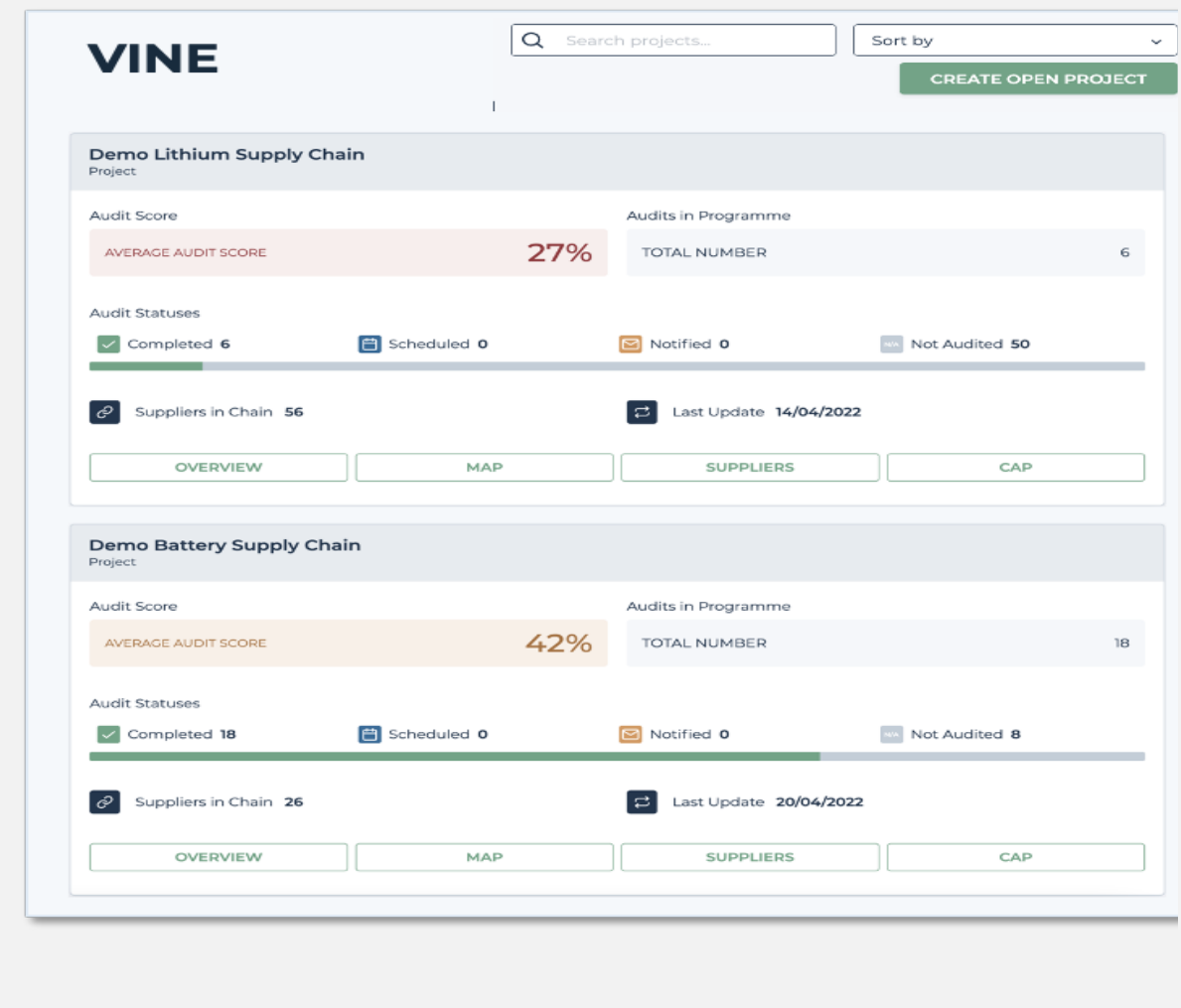
Maturity level and application sectors

VINE version 1.0 was launched in early 2022, current work is on version 1.5 as well as VINE Battery Passport extension. VINE is a platform used by various value-chain stakeholders' functioning in the mining, manufacturing, and automotive sectors. It offers clients a wide range of services including multi-tier supply chain visualisation, ESG & Due Diligence performance management, and audit programme overview.

The idea of Vine is to be a central element of multi-tool platform for multiple ESG and sustainability due diligence and risk management tools tailored towards particular business use cases (so the platform could work in connection with RCS Battery Passport & RCS Trace and other, depending on the business goals and case of the customer).




Overview
Map
Suppliers
CAP
Search suppliers...
SUPPLIER FILTERS
Supplier Type
Country
Material
Supplier Status
Training Received?
AUDIT FILTERS
Audit Score
Audit Status
Type of Audit
Audit Material Type
Conformance Scores
Report uploaded?
ISO 14001
ISO 45001
CAP status
CAP File Uploaded?
Mapped only?
CLEAR ALL
SEARCH
Supplier Name
Status
Supplies to
Type
Audit Score
Country
Demo Battery Su...
Verified
Demo OEM 11
Battery Supplier
1%
Canada
Demo Battery Su...
Verified
Demo Refiner 41
Battery Supplier
37%
South Sudan
Demo Battery Su...
Verified
Demo OEM 11
Battery Supplier
1%
Indonesia
OEM SUPPLIER
BATTERY PRODUCER
CATHODE PRODUCER
REFINER
TREATMENT UNIT
INDUSTRIAL MINE
ASM MINE
DEMO BATTERY SUPPLY CHAIN PROJECT
Overview
Map
Suppliers
CAP
Overview
Audit Status
CAP Status
Supplier Types
Material Groups


VINE
Search projects...
Sort by
CREATE OPEN PROJECT
Demo Lithium Supply Chain
Project
Audit Score
AVERAGE AUDIT SCORE
27%
Audits in Programme
TOTAL NUMBER
6
Audit Statuses
Completed 6
Scheduled 0
Notified 0
Not Audited 50
Suppliers in Chain 56
Last Update 14/04/2022
OVERVIEW
MAP
SUPPLIERS
CAP
Demo Battery Supply Chain
Project
Audit Score
AVERAGE AUDIT SCORE
42%
Audits in Programme
TOTAL NUMBER
18
Audit Statuses
Completed 18
Scheduled 0
Notified 0
Not Audited 8
Suppliers in Chain 26
Last Update 20/04/2022
OVERVIEW
MAP
SUPPLIERS
CAP

whatt.io

Product Life Cycle and Digital Spare Parts platform (whatt.io)
whatt.io is a cloud-based platform that allows businesses and consumers to access information, authenticate products, and order spare parts. Through a combination of NFC technology and QR codes, whatt.io enables users to simply tap their smartphones on products for instant access to relevant data, eliminating the need for apps. The accompanying app is used for fabrication and creating the token-based link to the physical product's metadata. The cloud-based administration of whatt.io is comprehensive, allowing for the management of complete product assemblies, sub-products, components, and a spare part library. The platform also features the 3MF Vault, a secure token and blockchain-based repository for protecting digital assets, such as production CAD models. whatt.io offers unique features that enhance authentication and safeguard digital IP and copyrights. By leveraging tokens and distributed data, the platform ensures secure access and protects intellectual property. The system is designed for seamless integration with other systems through API, enabling data sharing and retrieval.

Mapping with respect to the reference framework							
Product ID	**Type**	Instance			Category		
	Granularity	Model		Batch	Prod. order		Single item
Product data carrier	**Type**	RFID	QR Code	Digital watermark	Bluetooth label	Bar Code	Other
	Machine readable data carrier	Yes			No		
	Resolver	Yes			No		
Digital connector	**ID minting**	Centralized			Decentralized		
	Data storage location	Centralized			Decentralized		
IT architecture: Data transport	**Openness level**	Standardized		Proprietary	Data ports		Others
	Data packaging	Data transfer			API		
IT architecture: Access control	**Level**	Simple			Advanced		
	If advanced	Attribute based			Role based		

T architecture: Data use	Labelling	Enforcement	Others	
IT architecture: Data mgmt features	**Evidence**	Blockchain	Verifiable Credentials	Others
	Convenience	Wallet	Data Ports	Others
	Data protection	PETs	Anonymization	Others
	Traceability	Tagging (QR, NFC, RFID)	Others	

Unique technical aspects

1. Cloud-based multi team and multiuser platform using only a web browser
2. Simple user access to product information by tapping the products NFC tag without using any APP installed.
3. Processes include embedding the NFC's inside the material.
4. App used for fabrication and creating token-based links to physical product metadata.
5. Comprehensive cloud-based administration for managing product assemblies, sub-products, components, and spare parts library
6. 3MF Vault for secure storage of digital assets
7. Unique features enhancing authentication and protecting digital IP and copyrights
8. API integration for seamless data sharing and retrieval
9. Digital spare parts that allow for immediate order of parts in decentralized e-commerce applications or direct download of 3D asset for local manufacturing (Additive Manufacturing)
10. Support for circular models, 7Rs
11. No prototype, technology in use and open as freemium

Maturity level and application sectors

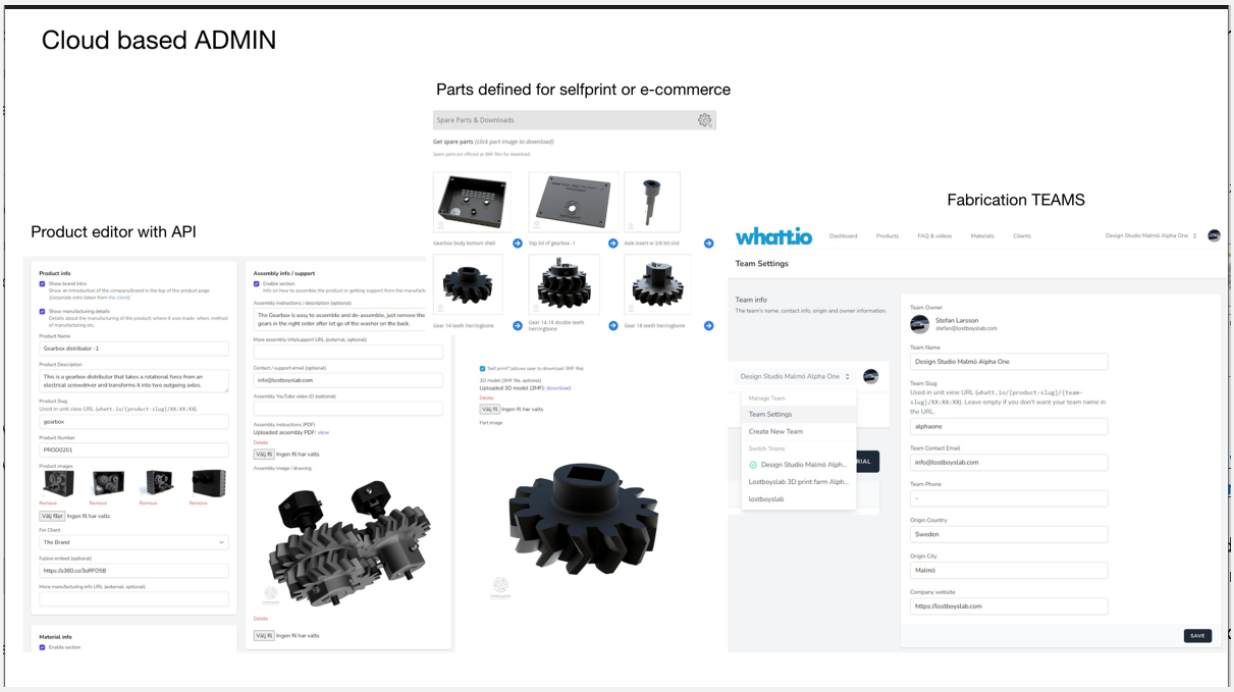
whatt.io is a mature and fully functional cloud-based platform. All apps for both Apple iOS and Google Android are available to be downloaded and used. The system is used in multiple industries like industrial, construction, additive manufacturing, furniture, accessories, electronics and building components.

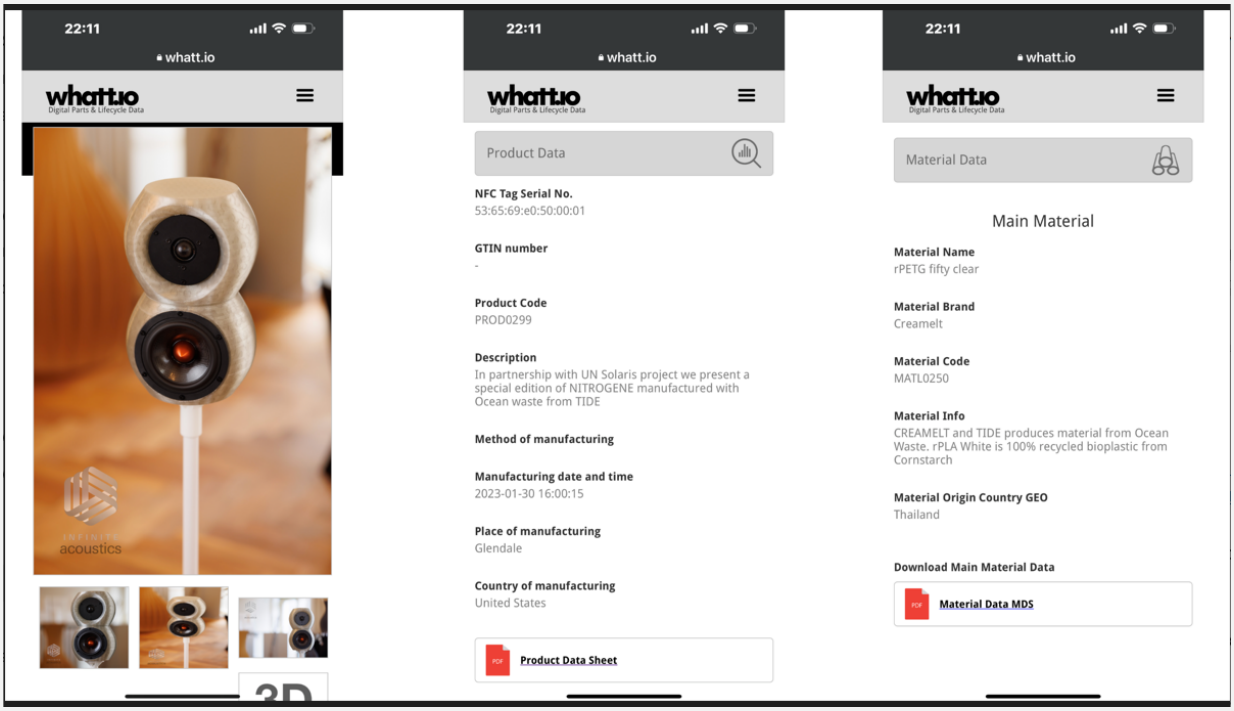
The main functionality of whatt.io is sustainable products made from recycled materials and 3D printing plays a major role. As the solution handles very complex and multi-level substructure of products it is likely to attract products and brands that have multiple levels of spare parts and allow for refurbishment, remake, repair and recycle. Eprel, and MSD, MSDS, SVHC, RoHS, EPD certificates are standardised data sets in the system. The focus of development has been to build a system that can protect original products and also protect IP and copyright on the digital assets used for repairs for example.

Useful links:

Seminar about circular economy whatt.io. https://youtu.be/xyH-quNg2_Y
Parts and assemblies: https://youtu.be/mEy0LqQB1aU
Getting started: https://youtu.be/sJTFUanPa_g


whatt.io
7R
MODEL
whatt.io enables any mobile phone to connect a physical product with its own unique product data. Your product becomes a true digital touchpoint and a direct opportunity to tell your story directly to consumers. whatt.io's Tap-Without-An-App secures you are always-on and always there
R1 R2 R3 R4 R5 R6 R7
RETHINK
REDUCE
REPAIR
REUSE
REFURBISH
RECYCLE
REMAKE
whatt.io 7R MODEL
Reuse
whatt.io original token, allows for reuse of products to be sure it is not fake. Easy to manage ownership change with blockchain bound tokens in the chip and in the cloud.
Design and build to last. whatt.io engages with its product information to enable reuse to extend its life.
Gearbox Distributor Number One


Cloud based ADMIN
Parts defined for selfprint or e-commerce
Product editor with API
Fabrication TEAMS
whatt.io
Team Settings


22:11
whatt.io
whatt.io
Digital Parts & Lifecycle Data
INFINITE acoustics
3D
22:11
whatt.io
whatt.io
Digital Parts & Lifecycle Data
Product Data
NFC Tag Serial No.
53:65:69:e0:50:00:01
GTIN number
-
Product Code
PROD0299
Description
In partnership with UN Solaris project we present a special edition of NITROGENE manufactured with Ocean waste from TIDE
Method of manufacturing
Manufacturing date and time
2023-01-30 16:00:15
Place of manufacturing
Glendale
Country of manufacturing
United States
Product Data Sheet
22:11
whatt.io
whatt.io
Digital Parts & Lifecycle Data
Material Data
Main Material
Material Name
rPETG fifty clear
Material Brand
Creamelt
Material Code
MATL0250
Material Info
CREAMELT and TIDE produces material from Ocean Waste. rPLA White is 100% recycled bioplastic from Cornstarch
Material Origin Country GEO
Thailand
Download Main Material Data
Material Data MDS

ZVEI DPP4.0

DPP 4.0							
The Digital Product Passport 4.0 (DPP4.0) is an industry-ready way of collecting and providing product information in a human- and machine-readable format for different parties, such as companies, authorities, and users. The DPP4.0 can include all product information of the complete product lifecycle, which enables different use-cases. Furthermore, by having the product documentation that today must be provided in paper in a digital format, paper waste can be reduced across the industry and sustainability can be increased.							
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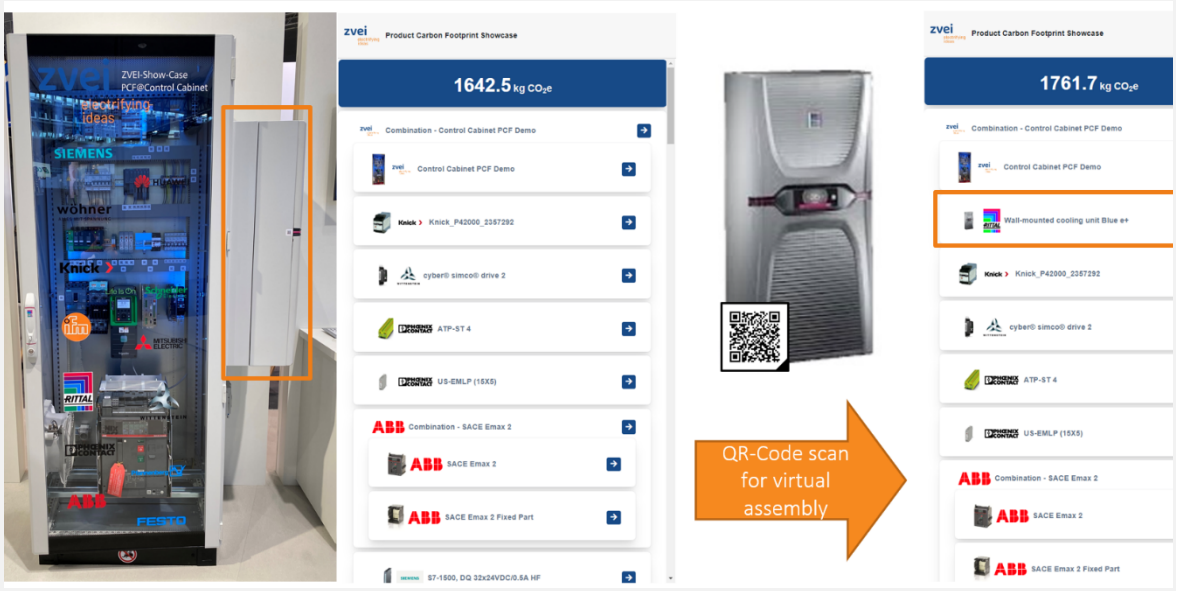
	Data protection	PETs		Anonymization		Others	
	Traceability	Tagging (QR, NFC, RFID)			Others		

Unique technical aspects
The DPP4.0 combines the unique identification of product instances, product types, batches or lots via identification link (IEC 61406) and information transfer with the Asset Administration Shell (AAS, IEC 63278) that offers a semantically unambiguous description of product information in a machine-readable format in accordance with ECLASS and/or IEC CDD. Via the ID-Link, the information can be accessed and used in different processes across companies, authorities, and users. In the AAS product information is organized in sub-models which are a collection of properties that can be standardised. Additional submodels can be added based on use-cases. Access to the information can be controlled via attribute-based access control. The AAS can be stored/hosted decentrally, e.g., on the infrastructure of the companies as well as on infrastructure offered by third parties and data-providers. The identification link and the AAS are IEC standards to ensure that the DPP4.0 is accessible and usable for all companies and products.
Maturity level and application sectors
The identification link connects a physical asset with its digital representation in form of the AAS. The AAS is an IEC standard in development and used by many companies in the industrial sector. For the AAS especially, a user organisation in form of the IDTA (Industrial Digital Twin Association) was found in 2021 with 23 members which increased to more than 70 members today. Associated companies are mainly in the electric and digital industry, the battery sector as well as manufacturing. On the SPS Nuremberg 2022, 27 companies presented use-cases that included the AAS. The ZVEI manages the project “ZVEI-Show-Case PCF@Control Cabinet” to demonstrate the DPP4.0 with the example of a control cabinet. Around 30 companies are associated with this project of which many were able to provide the needed AAS and ID-Link for the DPP4.0. Note that the DPP4.0 is not limited to these sectors as the underlying technology can be used in different sectors as well. Useful links: ZVEI-Show-Case: ZVEI-Show-Case PCF@ControlCabinet - zvei.org IDTA Members and Partners: Members & Partners - IDTA English (industrialdigitaltwin.org) The ZVEI-Show-Case on the Digital Summit 2022:

How the DPP4.0 can be used in company processes across the supply chain using the example of product carbon footprint (PCF) calculations:



Left shows the control cabinet and its digital twin without the climate control unit (orange box). The blue box of the digital twin shows the current PCF value. When the climate control unit is added in the assembly process, the ID-Link can be scanned to retrieve the product information for the climate control unit. This information can than automatically be used to update the digital twin of the now completely assembled control cabinet, including its PCF value.