

# **UN Transparency Protocol**



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# About the UNTP

## ! INFO

Please note that this content is under development and is not ready for implementation. This status message will be updated as content development progresses.

The United Nations Transparency Protocol (UNTP) aims to support governments and industry with practical measures to counter greenwashing by implementing supply chain traceability and transparency at the scale needed to achieve meaningful impacts on global sustainability outcomes.

## Presentations & Videos

- Short UNTP Presentation [PDF PPT](#)
- Longer UNTP Presentation [PDF PPT](#)
- Video presentation (15 mins) [Youtube](#)

## Incentives for sustainable supply chains are increasing

Incentives for sustainable supply chains are increasing fast.

- Regulations such as the European [Regulation on Deforestation](#) (EUDR) and [Carbon Border Adjustment Mechanism](#) (CBAM) will present market access barriers or increased border tariffs for non-sustainable produce.
- These regulations impose [due diligence obligations](#) on entire supply chains, not just final products. Penalties for repeated non-compliance can be as high as 4% of global revenue.
- Financial institutions are rapidly moving to ensure that capital is preferentially focussed on ESG assets. [According to Bloomberg](#), within a few years, around \$50 Trillion or one third of all global assets under management will be ESG assets.
- Consumer sentiment is driving purchasing decisions to favour sustainable products. At the same time, consumers are increasingly mistrustful of unverifiable claims and look for third party certification based on trusted standards.

# But endemic greenwashing risks devaluing the incentives

Greenwashing is a term used to describe a false, misleading, or untrue action or set of claims made by an organization about the positive impact that a company, product or service has on the environment or on social welfare. Just as the incentives described above provide a strong motivation for genuine sustainability in products, so they also provide stronger motivations for greenwashing.

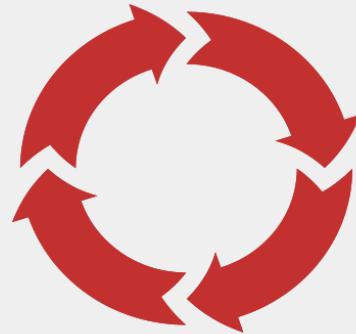
The evidence from multiple research activities is that greenwashing is already endemic with around 60% of claims being proven to be false or misleading. This presents a significant threat to sustainability outcomes. But there is room for optimism because around 70% of consumers expect higher integrity behaviour and are willing to pay for it. There are two plausible pathways ahead of us.

## A Race to the Top



1. It is hard to fake claims
2. Consumer confidence improves
3. Higher prices are justified
4. Business is motivated to make provable claims

## A Race to the Bottom



1. It is easy to fake claims
2. Consumer confidence drops
3. There's no price differential
4. Well-intentioned businesses fake claims to compete

To win the race to the top, fake claims need to be hard to make. The best way to achieve that is to make supply chains traceable and transparent so that unsustainable practices have nowhere to hide. But, to have any impact, the traceability and transparency measures must be implemented at scale.

## Challenges

The world's supply chains must reach to the point where digitally verifiable traceability and transparency information is available to meet regulatory compliance, satisfy investors, and motivate

consumers for the majority of products on the market. However, achieving transparency at that scale presents some challenges.

- **Which software to choose?** There are many traceability & transparency solutions on the marketplace. Many expect all actors in a given value chain to subscribe to the same platform in order to collect the data for end-to-end traceability. However, just as expecting your customers and suppliers to create accounts at your bank so that you can pay them is not rational or practical (that's why inter-bank payment standards exist), so the adoption of all actors in value chains to one platform is also not feasible or scalable. The UNTP is a standard protocol, not a platform, and assumes that supply chain data remains with each natural owner. So the answer to "which software to choose?" is "pick any, so long as it conforms to the UNTP".
- **Coping with a growing mountain of ESG standards and regulations.** The current count of ESG standards and regulations around the world runs into the thousands. Some are specific to particular commodities, jurisdictions, or ESG criteria and some cover multiple dimensions. There is very significant overlap between them and very little formal mutual recognition. The consequence is that it becomes very challenging for supply chain actors that sell to multiple export markets to know which criteria matter and how to demonstrate compliance. There is a risk that too much of the available ESG incentive is spent on demonstrating compliance and too little is left for implementing more sustainable practices. The UNTP does not add to the complexity by defining more ESG standards. Rather it seeks to minimise cost of compliance by making it simpler to test on-site ESG processes and data against multiple ESG criteria. Essentially this is about implementing a sustainable practice once and then re-using it to satisfy multiple overlapping criteria.
- **Protecting confidential information.** "Sunlight is the best auditor" and so verifiable transparency is the best greenwashing counter-measure. However, increased supply chain transparency for ESG purposes also risks exposure of commercially sensitive information. A viable transparency protocol must allow supply chain actors to share ESG evidence whilst protecting sensitive information. Rather than dictate what must be shared and what should not, the UNTP includes a suite of confidentiality measures that allow every supply chain actor to choose their own balance between confidentiality and transparency. The basic principle is that actors should be empowered to share only what delivers value.
- **Making a business case for implementation.** Each supply chain actor (or their software provider) will need to make a viable business case for implementation of the UNTP. The transparency incentives discussed in this section represent the benefit side of the equation. To keep the cost side as low as practical, UNTP has a strong "keep it simple" focus and offers a suite of implementation tools to further reduce cost. Some sample business case templates are provided to help actors make their case for action.

# The United Nations Transparency Protocol (UNTP)

The UNTP provides a solution to the transparency challenges facing the world's supply chains. By implementing a simple protocol that can be supported by existing business systems, stakeholders will realise immediate benefits and will become visible contributors to the sustainability of global supply chains.



# Audience, Benefits & Goals

## ! INFO

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## Goals

The primary goal of UNTP is to make significant reductions in the incidence of greenwashing by giving unsustainable behaviour nowhere to hide. This will also uplift the value of legitimate ESG credentials from supply chain actors that have implemented sustainable practices. UNTP will have achieved its purpose when

| Goals   | Description  |
|---|--|
| Most supply chain shipments are accompanied by verifiable ESG performance data.                           | In complex supply chains this means that at each supply chain step verifiable product and ESG information accompanies products via a Digital Product Passport.   |
| Greenwashing is a niche activity that is easily detected and quickly penalised by markets and regulators. | Businesses that chose not to share verifiable information about their products are assumed to be doing the wrong things from an ESG perspective and therefore get lower prices for their products or lose access to markets. |
| Products with the best sustainability characteristics enjoy the greatest market access and price uplift.  | Sharing data about your products becomes a competitive advantage and your business chooses to compete on the basis of high quality information.  |

## Target Audience & Benefits

All stakeholders in the global supply chain have a role to play and benefits to realise through implementation of the UNTP. As explained in the [Architecture Overview](#), the UNTP is a decentralised architecture where actors can be issuers, or subjects, or verifiers of digital credentials. In many cases, actors will be issuers of some credentials, subjects of others, and verifiers of others. Therefore, the

stakeholder roles and benefits described here are separated into the issuer, subject, and verifier roles as appropriate.

## Regulators

Regulators define rules, issue permissions, and manage compliance. By implementing UNTP, regulators will uplift the value of the permissions they issue and improve the efficiency and integrity of compliance operations.

- The primary role of regulators as **issuers** is as a [trust anchor](#). When identity credentials such as business registration certificates are issued as digital verifiable credentials according to UNTP then the subjects of those credentials (trading businesses) can add strong verifiable identity to their supply chain transactions. Verifiable identity can facilitate green-lane pre-clearance at import border and higher confidence lending from financial institutions. Similarly, when ESG permits and certificates that demonstrate compliance with domestic regulations are issued digitally, then traders can also attach that evidence to their transactions. In short, when regulators act as digital trust anchors, they will be uplifting their balance of trade by improving access to export markets and trade finance for their traders.
- As **verifiers** of increasingly transparent supply chain data, regulators can significantly uplift compliance activities. Rather than depend on unverifiable claims in regulatory reports that are occasionally audited at high cost, regulators can confidently automate compliance assessment on most trade transactions, leaving a much smaller volume of trade for manual compliance and enforcement activities.

Finally, as national authorities increasingly seek to uplift environmental performance through regulatory initiatives such as consumer centric product passports, we recommend that national regulators consider the UNTP as the basis for their national initiatives. By designing national initiatives as [UNTP extensions](#), regulators will not only be able to re-use a rich and tested body of work, but will also reduce compliance costs for their domestic industry because they will be better aligned with international supply chains.

## ESG Standards Organisations

Standards organisations include the national and international standards authorities as well as industry led organisations. There are a wide variety of governance arrangements in place that impact the legitimacy and value of the published standards. Unlike regulators, standards bodies do not manage compliance which can be self-assessed, or third party audited by test & certification bodies. There are

hundreds of standards organisations which collectively issue thousands of ESG standards, each with dozens of specific conformity criteria (i.e. the rules). Most of these are published as PDF documents. The key role for standards authorities under UNTP is to make their ESG rules machine readable so that they can be accurately referenced in conformity credentials.

- When ESG standards organisations publish their [ESG criteria as a machine readable vocabulary](#) then they are empowering their community of certifiers to issue digital conformity credentials that unambiguously reference the scope of the conformity claims so that the credentials can be digitally verified.
- Standards authorities will generally not be issuers, subjects, or verifiers of digital credentials unless they also act as accreditation authorities for third party certifiers that will make conformity assessments - in which case they will be issuers of accreditation credentials as described in the next paragraph.

## Accreditation & Certification Organisations

There is a very well established [global framework for conformity assessment](#) of entities, processes, and products that has been in place for over 50 years. It provides assurance that products sold on the marketplace meet applicable quality, safety or ESG standards. Under the framework, independent third parties (certifiers) assess products against recognised standards and issue conformity certificates. Furthermore, a global network of mutually recognised national accreditation authorities assess the certifiers to ensure that the conformity certificates are issued by suitably qualified organisations. For example, a manufacturer may claim that their product meets a particular environmental standard. You might ask "how do I know that claim is true?" and the answer would be "because a third party tested the product and issued a certificate". You might then ask "yes, but how do I know that the third party can be trusted?" and the answer would be "because they have been accredited by the national accreditation authority". Despite all this, it's still a relatively simple process to create realistic looking but fake paper certificates. UNTP provides a standard way to digitally verify this chain of trust that is much harder to fake. UNTP does not demand that every product claim is third-party assessed, nor that every third party certifier is formally accredited, but does make that chain of trust visible where it exists. UNTP also recognises that less formal but still valuable chains of trust can exist - for example a farmer's environmental land management claims might be verified by a community organisation that is endorsed by a well-known global environmental organisation.

- When national accreditation authorities or other well-known and trusted organisations **issue** their accreditations as UNTP standard digital credentials then they are creating a digital [identity anchor](#) that empowers verifiers of ESG conformity certificates to decide whether they can be trusted. The **subject** of the accreditation is the third party conformity assessment body. Implementation of

UNTP will amplify the value of the accreditation and the brand or 'trust mark' of the accreditation authority.

- When third party conformity assessment bodies (certifiers) **issue** their product ESG certificates as UNTP standard digital credentials then they are empowering verifiers of the ESG certificates to digitally confirm that the certificates are genuine, have not been tampered, and have not been revoked. Furthermore if the digital conformity certificate contains a link to the accreditation credential then the full **digital chain of trust** is established. Producers, manufacturers, brands & retailers that implement UNTP will also demand digital versions of the conformity credentials that they can attach to their products. Therefore, conformity assessment bodies that can provide UNTP standard digital credentials will be preferred over those that cannot.

## Primary Producers & Manufacturers

Most physical products are made of materials that either grow above the ground or are dug out from below the ground. Primary producers such as farmers and miners represent the starting point for most supply chains. Recyclers are a special case and are treated separately by UNTP because they are both the end and the (re)start of circular supply chains. Manufacturers take raw or recycled materials and produce intermediate components or final products. Primary producers and manufacturers collectively represent the upstream feedstock supply chain for the branded products sold to consumers.

- When producers and manufacturers implement UNTP by **issuing B2B digital product passports** (DPP) and **linking them** to every shipment of goods to their customers, then they are simplifying life for their customers by providing data at the right granularity for them to incorporate their inputs such as scope 3 CO<sub>2</sub> emissions into their own product environmental footprint.
- When producers and manufacturers **issue** UNTP **traceability events** linked to product passports then they are providing provenance evidence that can inform supply chain resilience and preferential treatment decisions by their customers and export market regulators.
- When producers and manufacturers link third party issued UNTP **conformity credentials** then they are adding trust to the ESG claims in their DPPs that will uplift the value or market access for their products.
- When producers and manufacturers **issue** the complete collection of passports, traceability events, and conformity credentials and link them to product shipments then they will significantly uplift value to their downstream customers by empowering them to easily and verifiably meet their own ESG due-diligence obligations.
- When producers and manufacturers link their issuer identity to a strong identity credential (such as a government business registration or trademark ownership credential) and implement the UNTP

anti counterfeiting mechanism then they will add strong anti-fraud measures to their products and preserve the value of their sustainability actions.

Producers and manufacturers are themselves **verifiers** of any UNTP credentials linked to their upstream supply chain. The **confidentiality measures** defined by UNTP allow supply chain actors to selectively redact upstream credentials before passing them on to their downstream customers so that ESG evidence can be passed on without revealing commercially sensitive information.

## Brands & Retailers

Brands and retailers consume products from their upstream producers and manufacturers and sell to the consumer. Whilst it is of course true that some brands are also manufacturers and that some retail is to business rather than consumers, the key distinction that UNTP makes is between B2B activities vs B2C activities. Sales to the consumer market is highly regulated in most economies and some are starting to develop regulations that also require product passports to support informed consumer choice and/or improved recycling processes. Brands and retailers must meet domestic regulations and face scrutiny from an increasingly greenwashing-aware consumer as well as from environmental activist organisations. The potential for reputational damage and high fines for non-compliance present brands and retailers with a strong motivation to ensure that sustainable practices are in place both for themselves and their entire supply chain.

- When brands and retailers can **verify** UNTP credentials linked to shipments from their upstream suppliers then they can confidently meet their due-diligence obligations and have the rich and verifiable information necessary to issue any consumer-centric product passports required under domestic regulations.
- UNTP should not conflict with local regulations. When international brands and retailers **issue** UNTP **product passports, conformity credentials** and **traceability events** across all markets then they are providing a consistent way for consumers to discover and verify ESG performance and are establishing a strong framework for compliance with any current or emerging domestic regulations.
- When brands and retailers request UNTP credentials from their upstream suppliers then they are avoiding the challenges associated with imposing specific traceability software solutions on their supply chain. Instead, they are simply requesting conformance with a common standard, irrespective of software platform.
- When brands and retailers that have already made significant investments in GS1 identifiers and standards implement the UNTP, they can follow the GS1 binding to build upon and re-use their

existing investments. It should also be noted that UNTP does not impose GS1 solutions on organisations that have not already invested in GS1 standards.

- When brands and retailers link their issuer identity to a strong identity credential (such as a government business registration or trademark ownership credential) and implement the UNTP [anti counterfeiting](#) mechanism then they will add strong anti-fraud measures to their products and preserve the value of their sustainability actions.

## Recyclers & Refurbishers

Recyclers & refurbishers play a critical role in the transition to a [circular economy](#). Recyclers process used products into raw materials for re-use in new production processes. Refurbishers take old products and restore them for re-use. The goal of both processes is to improve sustainability outcomes by re-using natural resources rather than producing new raw materials. As regulators start to impose minimum recycled content requirements and other circularity regulations, the current linear economic model (produce, use, dispose) will require significant change to provide sufficient recycled materials to meet regulatory goals and consumer expectations. The UNTP is designed to support circular economies by including verifiable information on recycled content of products. UNTP also incentivises manufacturers to design new products to optimise recyclability and provides access to product data to better inform recycling processes.

- When manufacturers optimise their product design for recyclability and provide access to that information via **issued** UNTP passports then they are uplifting the end-of-life value of their products. Recyclers can leverage this data (especially for high value products like EV batteries) to optimise the efficiency of their recycling processes.
- When recyclers **issue** UNTP passports with their recycled material shipments, they are empowering their customers (manufacturers) to make verifiable claims about the percentage of recycled content in their products. This reduces the due diligence burden and non-compliance risk for manufacturers that face mandated minimum recycled content thresholds.
- When consumers see recycled content claims on products then they can **verify** them with confidence.

## Environmental & Human Welfare Organisations

There are a large number of national and global not-for-profit organisations who's purpose is to promote environmental or human welfare causes. Some "trust marks", such as the WWF panda, have

very high global brand recognition. Although these organisations don't have the enforcement teeth of regulators, they can strongly influence product market success when their trust mark is added (or revoked).

- When influential ESG trust marks establish well-governed accreditation frameworks and **issue** (or revoke) UNTP accreditation credentials then they are able to participate in the digital trust ecosystem as [identity anchors](#), thereby multiplying the power of their brand to drive sustainable production practices.

## Consumers

Consumer sentiment around sustainable production is strong and growing with over 70% of consumers in some economies actively choosing sustainable goods where possible. At the same time cynicism around greenwashing is increasing which acts to devalue sustainability claims. As greenwashing countermeasures such as UNTP and national regulations become widely adopted, it is reasonable to expect that consumers will become familiar with product passports and ESG verification techniques.

- When consumers can confidently **verify** the sustainability performance of products simply by scanning barcodes, QR codes or RFID tags then they will be more likely to choose products with verifiable and trustworthy ESG qualities over those that make unverifiable claims. When this behaviour is ubiquitous then consumers will have played a pivotal role in combatting greenwashing and winning the [race to the top](#).
- When products are also equipped with the UNTP [anti-counterfeiting](#) measures then consumers can not only **verify** ESG performance but also confirm that the performance is associated with an authentic product and not a fake. Producers, manufacturers, brands, and retailers can be confident that their sustainability investments are not devalued by counterfeit products.

## Transport & Logistics Providers

The movement of cargo by sea, air, and land accounts for around [10% of global emissions](#) and, unless transport itself becomes more sustainable, will account for the largest fraction of global emissions by 2050. Transport (especially by road) is therefore a key part of the emissions intensity of a product on the market. In the same way that UNTP makes ESG credentials discoverable from product batch identifiers, so UNTP allows ESG credentials for transport services to be discoverable from consignment identifiers such as waybill numbers. But is it the buyer of goods or the seller of goods that is responsible to include transportation in the ESG footprint? The UNTP answer is that it follows the [INCOTERMS](#) - essentially whoever pays for the transport has the responsibility to include the transport

in their product footprint. This ensures there are no gaps or double counting and that incentives are appropriately aligned.

- When transport & logistics providers **issue** UNTP transport credentials and link them to consignment identifiers then they are providing their customers with quantifiable and verifiable transport related ESG metrics to include in their product footprint. As producers, manufacturers, brands, and retailers seek to drive improvements in sustainability performance they will be incentivised to choose low emissions transportation services. This will uplift the value of sustainable transport services per tonne-kilometre.

## Financial Institutions

Financial institutions are under increasing pressure from both regulators and the investment community to grant preferential terms for investment capital to sustainable businesses. The finance industry will increasingly verify sustainable performance via their customer annual reporting according to [IFRS sustainability standards](#). Just as financial transactions such as bills, invoices and payments aggregate up to corporate financial statements such as profit & loss and balance sheets, so corporate level annual sustainability metrics are constructed from operational data such as UNTP digital product passports. Furthermore, at consignment level, trade finance instruments such as documentary letters of credit normally require sufficient documentation for goods clearance to be presented prior to payment release. For cases where goods may be blocked at the border due to non-compliance with ESG regulations, then financial institutions will require ESG compliance evidence prior to releasing funds.

- When banks can use UNTP product passports and conformity credentials to digitally **verify** ESG compliance for shipments covered by letters of credit then they can more confidently release payment.
- When banks that are providing investment capital on sustainability grounds to businesses that have implemented UNTP then there is a clear line of sight from UNTP-based operational processes to IFRS-based corporate ESG performance, thereby reducing the financial risk associated with the investment.

## Industry Member Associations

There are over 100,000 industry associations world-wide. Most represent a specific industry sector within a specific jurisdiction. These member associations typically provide advocacy on behalf of the community and offer best practice advice. In many cases the associations define quality standards and

branding that distinguish their member's products in the marketplace (eg genuine manuka honey). These member associations are well positioned to assist their members in navigating the complexity of domestic and international ESG standards and in assisting them to implement the UNTP. When a particular association member engages in fraudulent practices then it can quickly damage the reputation of the entire industry. Therefore, member associations are strongly incentivised to ensure that their membership adheres to quality standards and to eject non-compliant members. This includes supporting the adoption of industry-wide sustainable practices and UNTP as the digital evidence of those practices.

- Industry member associations may add value to their membership by developing UNTP industry profiles that provide their members with targeted implementation guidance that meets the needs of their industry and jurisdiction.
- Industry member associations may develop training and implementation services, possibly in partnership with local service providers, thereby adding both a valuable service and also a revenue stream for the member association.
- Industry member associations may act as a trusted independent quota managers to counter **mass balance fraud** amongst their membership. The value of this service would be increased if the industry association is accredited by either a national accreditation authority or a global environmental or human welfare organisation.

## Software Developers

Software developers provide the tooling that is needed to implement UNTP because they hold the data that is needed to **issue** UNTP credentials and they will also consume the data from UNTP credentials that are discovered and **verified**. This category includes enterprise resource planning (ERP) systems, ESG management systems, and traceability platforms. By implementing UNTP, software developers are empowering their customers to participate in global transparent supply chains. For large organisations with heavily customised systems, UNTP implementation may be a customer specific project. For smaller organisations that subscribe to off-the-shelf packages, UNTP conformity is more likely to be simply a new feature in a release roadmap.

- ERP systems are the natural issuers of UNTP product passports and traceability events because they manage the finance and logistics operations around the manufacturing, sales, and shipment of products.
- ESG management systems are the source of the ESG data such as carbon intensity that will populate UNTP product passports as well as the conformity credentials referenced by the product passport.

- Traceability platforms are used to provide traceability maps of the upstream supply chain. Rather than gathering this data by direct enrolment of upstream actors, UNTP provides a means to gather the same data by following verifiable linked data trails.

The three system types described here may exist in separate software products or may be parts of a more integrated system. Some ERP systems also manage ESG data. Some ESG platforms include traceability functions. It is not unlikely that ERP systems, whether through native product features or acquisition or partnerships, will evolve to offer this integrated set of capabilities to their customers. UNTP defines a simple and implementable standard for software developers to empower their customers to connect into global transparent and sustainable supply chains.

## Service Providers

The adoption of UNTP by hundreds of millions of micro (under 5 employees) and small (under 50 employees) business will most likely be driven by implementation of UNTP as out-of-the-box capability by their chosen business software systems. However, the adoption of UNTP by tens of millions of medium (under 500 employees) and large (over 500 employees) business will most likely require some business analysis and systems integration investment. To minimise cost and risk, such businesses are likely to seek UNTP implementation support from a marketplace of experienced service providers.

- When service providers such as system integrators develop skills in UNTP implementation then they will be able to offer attractive service packages to their existing customers. They may also be able to leverage UNTP implementations skills to access new customers and markets.

## Success Measures

Although reduced greenwashing and improved sustainability are the ultimate goals of UNTP, the most direct measure of success is uptake. Therefore, UNTP will measure uptake by counting the number of pledges (i.e. promises to implement) and the number of successfully completed conformity tests (i.e. actual implementations). For UNTP to achieve its goals, uptake will need to exceed the minimum thresholds shown in the uptake trajectory below.

| <b>Stakeholder type</b> | <b>2024 pledge</b> | <b>2024 implement</b> | <b>2026 pledge</b> | <b>2026 implement</b> | <b>2028 pledge</b> | <b>2028 implement</b> | <b>2030 pledge</b> |
|-------------------------|--------------------|-----------------------|--------------------|-----------------------|--------------------|-----------------------|--------------------|
| Regulators              | 10                 | 1                     | 20                 | 10                    | 50                 | 20                    | 200                |

| Stakeholder type              | 2024 pledge | 2024 implement | 2026 pledge | 2026 implement | 2028 pledge | 2028 implement | 2030 pledge |
|-------------------------------|-------------|----------------|-------------|----------------|-------------|----------------|-------------|
| ESG Standards                 | 10          | 0              | 20          | 10             | 50          | 20             | 200         |
| Accreditation & certification | 20          | 2              | 50          | 25             | 100         | 50             | 300         |
| Producers & manufacturers     | 50          | 10             | 500         | 100            | 2,000       | 1,000          | 10,000      |
| Brands & retailers            | 50          | 10             | 500         | 100            | 2,000       | 1,000          | 10,000      |
| Recyclers & refurbishers      | 10          | 0              | 20          | 10             | 50          | 20             | 200         |
| Transport & logistics         | 20          | 2              | 50          | 25             | 100         | 50             | 300         |
| Financial institutions        | 10          | 0              | 20          | 10             | 50          | 20             | 200         |
| Member associations           | 20          | 10             | 200         | 100            | 1,000       | 500            | 3,000       |
| Software developers           | 20          | 2              | 50          | 25             | 100         | 50             | 300         |
| Service providers             | 20          | 2              | 50          | 25             | 100         | 50             | 300         |

Actual progress towards these targets will be tracked via the [Implementations](#) pages.

# Requirements

## ! INFO

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## UNTP Business Requirements

This page provides a summary of the high level business requirements for UNTP, grouped into 7 categories. Each requirement is linked to the page(s) where the solution to the requirement is defined.

## Governance Requirements

This set of requirements aim to ensure that UNTP is governed in an open and transparent manner, is freely available to all, and is extensible to meet specific industry and jurisdictional needs.

| ID    | Name                     | Requirement Statement  | Solution Mapping           |
|-------|--------------------------|--|----------------------------|
| GV.01 | Consensus driven process | UNTP development MUST be managed via a transparent and consensus-driven process that is open to contributions from all stakeholders - so that implementers can have confidence that the UNTP will meet their requirements. | <a href="#">Governance</a> |
| GV.02 | Freely available         | The UNTP IP MUST be owned by the UN and be permanently free to access and free to use - so that implementers can have confidence that there will never be any fees for use or IP infringement claims.                      | <a href="#">Governance</a> |
| GV.03 | Backwards compatible     | New versions of UNTP SHOULD be backwards compatible with earlier versions and each version MUST remain active and supported for a  | <a href="#">Governance</a> |

| ID    | Name                    | Requirement Statement   | Solution Mapping |
|-------|-------------------------|---|------------------|
|       |                         | minimum of 2 years - so that implementers can have confidence in the durability of their investment.  |                  |
| GV.04 | Open source             | UNTP implementation tools including reference implementations and test services MUST be available under open source and royalty free licensing - so that implementers can confidently use the tools to minimise their own implementation costs                                    | Tools & Support  |
| GV.05 | Extensible              | The UNTP MUST define a non-breaking extensions methodology - so that UNTP can be extended to meet specific jurisdictional or industry requirements and so that implementers of a registered extension can be confident that their implementation is interoperable with UNTP core. | Extensions       |
| GV.06 | Reusable extensions     | Industry and/or jurisdictional extensions to the UNTP SHOULD also be governed via an open process and released under royalty free license terms - so that implementers of extensions can have same fees & IP confidence as with UNTP core.  | Extensions       |
| GV.07 | Implementation register | UNTP MUST provide a mechanism for implementers to register their planned and actual implementations - so that implementers can choose to register both their sustainability commitment and conformant solutions for discovery by a global community of users and/or customers.    | Implementations  |

# Architectural Requirements

This set of requirements aim to ensure that UNTP is scalable enough to achieve global implementations at a volume of global trade that is sufficient to have a material impact on greenwashing - by building on top of existing industry systems and practices and using the simplest possible framework that meets the goals.

| ID    | Name                   | Requirement Statement  | Solution Mapping |
|-------|------------------------|--|------------------|
| AR.01 | Protocol over platform | The UNTP MUST define a standard protocol that is easily implemented by any business software system - so that every supply chain actor can continue to use their preferred business software without any need for upstream or downstream actors to agree on the use of shared platforms.   | Architecture     |
| AR.02 | Decentralisation       | The UNTP MUST define a decentralised protocol where data is stored wherever the owner chooses - so that supply chain actors retain control of their data and are able to monetise their evidence of sustainable behaviour.   | Architecture     |
| AR.03 | Natural business       | The UNTP MUST accommodate the continued use of existing natural business, product, batch, and shipment identifiers - so that UNTP implementation imposes minimal disruption to existing business processes and can leverage existing business and product registers.                       | Identifiers      |
| AR.04 | Technical maturity     | The UNTP MUST accommodate varying levels of technical maturity from (and including) paper based documents up to fully digitalised systems - so that every implementers of UNTP can confidently proceed without dependency on the capability or readiness of upstream or downstream actors. | Data Carriers    |

| ID    | Name                   | Requirement Statement   | Solution Mapping |
|-------|------------------------|---|------------------|
| AR.05 | Simplest possible core | The UNTP MUST prioritise simplicity by focussing on only the minimum specification that represents the common core needs across different jurisdictions and industries - so that implementation cost is minimised and interoperability is maximised.                            | Architecture     |
| AR.06 | Re-use not re-invent   | The UNTP MUST re-use (rather than re-invent) existing standards (e.g. W3C Verifiable Credentials, GS1 EPCIS, UN vocabularies, etc) wherever they are fit for purpose - so that interoperability is maximised and existing investments in software components is re-used.        | Architecture     |
| TT.07 | Rules as code          | The UNTP MUST define a mechanism to simplify the compliance assessment of entities, products, and processes against the fast growing set of ESG standards and regulations - so that any actor's investment in sustainable practices is easily tested against multiple criteria. | ESG Rules        |

## Traceability & Transparency Requirements

This set of requirements aim to ensure that UNTP provides the traceability and transparency data needed for each supply chain actor to confidently meet their due diligence obligations and customer expectations for verifiable evidence of sustainable practices.

| ID    | Name          | Requirement Statement   | Solution Mapping |
|-------|---------------|---|------------------|
| TT.01 | Data carriers | The UNTP MUST define consistent methods for the discovery of data about products from both new and existing data carriers such as ID bar codes, 2D matrix, QR codes, and RFID tags - so that any party that has | Data Carriers    |

| ID    | Name                    | Requirement Statement   | Solution Mapping                                |
|-------|-------------------------|---|---|
|       |                         | only a product batch ID or goods shipment ID can find ESG data about that product or shipment.  |   |
| TT.02 | item/batch granularity  | The UNTP MUST provide data at the granularity of the individual items or batch in a shipment so that the downstream actor can easily aggregate their material inputs (e.g. scope 3 emissions) into their own ESG performance data.  | Digital Product Passport                        |
| TT.03 | end-to-end traceability | Subject to privacy & confidentiality constraints, the UNTP traceability model MUST be able to trace value chains from finished product to raw materials through any number of commercial boundaries (sale of goods), or logistics boundaries (consolidation & deconsolidation), and process boundaries (manufacturing transformation of inputs to different outputs) so that the provenance and ESG footprint of goods can be verified as the sum of component parts. | Traceability Events                             |
| TT.04 | Sustainability data     | The UNTP MUST provide a simple and consistent way to access and verify all available sustainability metrics (eg carbon intensity, deforestation, water usage, fair work, etc) about a given product item or batch - so that product buyers can easily meet their sustainability and due diligence obligations   | Digital Product Passport, Conformity Credential |
| TT.05 | Provenance data         | The UNTP MUST provide verifiable provenance information (raw material content and manufacturing origin countries) about a given product item or batch - so that product buyers can easily meet their supply chain resilience and goods origin controls.   | Digital Product Passport, Guarantee of Origin   |
| TT.06 | Circularity data        | The UNTP MUST provide a simple mechanism to access circularity data including both recycled content metrics as well as end-of-life recycling information - so that  | Digital Product Passport,                       |

| ID    | Name           | Requirement Statement   | Solution Mapping |
|-------|----------------|---|------------------|
|       |                | product buyers can meet their recycled content goals and recyclers can optimise their recycling processes.  | Circularity Data |
| TT.07 | ESG Vocabulary | Given the volume and diversity of ESG standards and regulations, the UNTP MUST define a simple and scalable mechanism to define both the precise meaning and general category of ESG claims - so that downstream actors can map either the specific criteria or the general category of ESG data confidently. | Vocabulary       |

## Trust & Integrity Requirements

This set of requirements aim to ensure that UNTP provides data that can be trusted and is resilient to several greenwashing attack vectors.

| ID    | Name               | Requirement Statement  | Solution Mapping  |
|-------|--------------------|--|-------------------|
| TI.01 | Trust anchors      | Trust in truth of sustainability claims can be established by third party audits, or by attestation of trusted authorities, or by long standing evidence of sustainable behaviour. The UNTP MUST provide a mechanism to link ESG claims to any or all of these "trust anchors" so that downstream actors can have confidence that claimed ESG performance is true. | Trust anchors     |
| TI.02 | Identity integrity | Identifiers of businesses, locations, products, and shipments underpin the UNTP. Therefore, the UNTP MUST provide a mechanism to verify that ESG claims made about products or locations or entities are made by actors that are genuine owners of the identifiers or their authorised delegates - so that downstream actors                                       | Identity Anchors) |

| ID    | Name                      | Requirement Statement   | Solution Mapping       |
|-------|---------------------------|---|------------------------|
|       |                           | can be sure that ESG claims are made by parties genuinely authorised to do so.  |                        |
| TI.03 | Accreditation             | Third party audits and assessments add trust. But if the verifier does not know the auditor / certifier then there's a risk that define a mechanism to link third party certifiers to the accreditation authority under which they perform their work so that downstream actors can trust the certificates even when they do not know the certifiers.                           | Conformity             |
| TI.04 | Verification of documents | The UNTP MUST define standard and interoperable mechanisms to prevent spoofing or tampering of any documents issued by upstream actors so that downstream actors can be confident that ESG credentials were genuinely issued by the claimed identity and have not been altered in any way.  | Verifiable Credentials |
| TI.05 | Verification of graphs    | Evidence of ESG performance in supply chains is not concentrated in one document but rather is distributed along the entire value chain. The UNTP MUST define a mechanism to describe and verify the collection of evidence that is available from chains of linked documents so that downstream actors can verify the full ESG footprint and provenance data for any shipment. | Trust graphs           |
| TI.06 | Product substitution      | As the brand value of verifiably sustainable products increases, so does the incentive to make fake products and attach them to genuinely verifiable sustainability evidence. The UNTP MUST define an anti-counterfeiting mechanism so that downstream actors can confirm that they have purchased genuine goods.   | Anti-counterfeiting    |

| ID    | Name               | Requirement Statement   | Solution Mapping |
|-------|--------------------|---|------------------|
| TI.07 | Mass balance fraud | Mass balance fraud occurs when a supply chain actor blends sustainable materials with cheaper non-sustainable materials as inputs to a manufacturing process and then claims that the manufactured product is 100% sustainable. The UNTP MUST define mechanisms to detect mass balance fraud so that downstream actors can be confident of the integrity of their sustainable supply chain and the value of sustainable products is maintained. | Mass balance     |

## Security & Confidentiality Requirements

This set of requirements aim to ensure that UNTP provides mechanisms to protect the security and confidentiality of supply chain data, allowing each actor to make their own choices about the balance between traceability & transparency.

| ID    | Name                            | Requirement Statement   | Solution Mapping |
|-------|---------------------------------|---|------------------|
| SC.01 | Transparency vs confidentiality | The UNTP MUST allow every supply chain actor to choose their own balance between transparency and confidentiality - so that each actor can choose to share only what delivers value whilst protecting the information they deem confidential.   | Confidentiality  |
| SC.02 | Multi-layered security          | Information about products have a range of commercial sensitivity from public data to highly confidential data. The UNTP MUST provide a range of data protection mechanisms that can be applied appropriately so that supply chain actors can choose the right protection level for specific data sets. | Confidentiality  |

| ID    | Name                | Requirement Statement  | Solution Mapping       |
|-------|---------------------|--|------------------------|
| SC.03 | Selective redaction | <p>ESG data and credentials from sellers may contain data that buyers do not want to pass on to their own customers. The UNTP MUST define a selective redaction method that allows any supply chain actor to redact information (without affecting the cryptographic integrity) from credentials received from upstream suppliers before passing it on to their downstream customers - so that verifiable ESG data can be passed on without leaking commercially sensitive data.</p> | Confidentiality        |
| SC.04 | Revocation          | <p>The UNTP MUST provide a mechanism to revoke previously issued conformity certificates when an actor is found to be non-compliant so that downstream actors can be confident of the currency of the ESG assessments they receive.</p>  | Verifiable Credentials |
| SC.05 | Availability        | <p>UNTP MUST define a mechanism for high availability and long term durability of ESG evidence - so that data can be accessed by verifiers even when source systems are down, and so that data for long-lifetime products such as batteries or building materials can be accessed long after source systems are retired.</p>   | Verifiable Credentials |
| SC.06 | Cryptography        | <p>The UNTP MUST support flexibility in cryptographic methods so that new algorithms can be supported as they emerge to meet new challenges such as quantum computing.</p>   | Verifiable Credentials |
| SC.07 | Key management      | <p>The UNTP MUST provide mechanisms for the discovery of public keys, the protection of private keys, and the rotation of key pairs so that keys remain secure and can be easily chained if compromised.</p>   | Verifiable Credentials |

# Compatibility & Interoperability Requirements

This set of requirements aim to ensure that UNTP is compatible with existing standards for technology, ESG criteria, and supply chain practices so that implementers can maximise the leverage of existing investments.

| ID    | Name                               | Requirement Statement   | Solution Mapping       |
|-------|------------------------------------|---|------------------------|
| CI.01 | National regulations compatibility | UNTP conformant data SHOULD be straightforward to map to national ESG regulations so that it can usefully provide the upstream B2B ESG evidence to support national B2C product conformance.  | Vocabulary, Extensions |
| CI.02 | Entity ESG reporting compatibility | UNTP conformant ESG data about products & shipments MUST be straightforward to map to entity level ESG reporting obligations so that UNTP transaction level ESG data can be easily aggregated to inform annual ESG reporting that conforms to standards like IFRS sustainability.   | Vocabulary             |
| CI.03 | ESG standards compatibility        | The UNTP MUST be able to support ESG claims against criteria from any ESG standard and MUST provide a mechanism to map those claims to a common vocabulary - so that implementers can align with standards of their choice and verifiers can make sense of the claims even when they are unfamiliar with specific standard criteria | Vocabulary, ESG Rules  |
| CI.04 | Credential interoperability (VCs)  | The UNTP MUST provide the flexibility to support multiple credential standards such as W3C Verifiable Credentials and Hyperledger Airies Anoncreds - so that ESG data along a value chain can be verified even when different credential standards are adopted by different actors along the value chain.                           |                        |

| ID    | Name                         | Requirement Statement  | Solution Mapping   |
|-------|------------------------------|--|--|
| CI.05 | Blockchain                   | Whilst some implementers MAY choose blockchain technologies to underpin their solutions, the UNTP MUST NOT require the use of blockchain for conformant implementations - so that implementers that wish to avoid the costs and complexity of blockchain technologies are free to do so.   |  |
| CI.06 | GS1 compatibility            | GS1 identifiers and standards are ubiquitous at the downstream consumer goods end of most supply chains. The UNTP MUST be compatible with GS1 standards but MUST NOT require the use of GS1 standards - so that supply chain actors that are already invested in GS1 identifiers and standards can maintain and build upon that investment |  |
| CI.07 | Other registry compatibility | The UNTP MUST define a mechanism to support existing identity registers so that implementers can continue to leverage existing business identifiers such as tax registration numbers, cadastral lot numbers, shipping container numbers, and so on under UNTP  | <a href="#">Identifiers</a> , <a href="#">Extensions</a> |

## Implementation Requirements

This set of requirements aim to ensure that UNTP is implementable at the lowest possible cost, and that early implementers gain a marketing advantage, and that the impact of implementations can be tracked.

| ID    | Name                   | Requirement Statement   | Solution Mapping              |
|-------|------------------------|---|-------------------------------|
| IM.01 | Making a business case | Every UNTP implementer will need confidence that the benefits of their implementation | <a href="#">Business Case</a> |

| ID    | Name                     | Requirement Statement   | Solution Mapping  |
|-------|--------------------------|---|-------------------|
|       |                          | outweighs the cost. UNTP SHOULD provide a set of business case templates so that each stakeholder type can fast-track their decision to proceed   |                   |
| IM.02 | Open source tools        | The UNTP MUST include an open source reference implementation that any supply chain actor can embed into their solutions to help fast-track their implementation.                             | Tools             |
| IM.03 | Conformity testing       | the UNTP MUST include a conformance test suite and test service so that each implementer can self-assess their conformance and be confident that their implementations will be interoperable. | Test service      |
| IM.04 | Implementation Support   | UNTP MUST provide mechanisms for implementers to get either community support or professional support so that they can minimise their implementation risk.                                    | Support           |
| IM.05 | Tracking implementations | UNTP MUST provide a mechanism to track implementations so that uptake and impact can be measured and so that early implementers can publicise their solutions.                                | Implementations   |
| IM.06 | Tracking extensions      | UNTP MUST provide a mechanism to track and publish industry & jurisdictional extensions so that new extensions can find and re-use relevant work.   | Extensions        |
| IM.07 | Tracking outcomes        | Although uptake is a simple and concrete success measure, the real purpose of UNTP is to lift the value of sustainable practices by countering greenwashing. Therefore, UNTP                  | Greenwashing KPIs |

| <b>ID</b> | <b>Name</b> | <b>Requirement Statement</b>  | <b>Solution Mapping</b> |
|-----------|-------------|---|-------------------------|
|           |             | MUST develop a set of greenwashing KPIs that can be tracked to assess whether UNTP is having a material impact. |                         |

# Governance

## ! INFO

Please note that this content is under development and is not ready for implementation. This status message will be updated as content development progresses.

## Management process

The UNTP development follows the same **standard governance rules** as any UN/CEFACT project.

- Free to use,
- Open source licensed,
- Maintained via an open process
- Version controlled
- Lifecycle managed

## Releases

As per [docusaurus version management practices](#), the latest stable version of UNTP will always be shown by default at /docs (this site). In-progress future version will be hosted at /docs/next and previous versions at /versioned-docs/version-x.y. The version history includes major versions (breaking) and minor versions (non-breaking but with functional change) but not patch versions (bug fixes and typos) which overwrite the relevant minor version.

The UNTP includes a number of distinct and separately versioned components such as passport schema, traceability event schema and so on. To simplify implementation management, all separate component versions are grouped together and listed under each aggregated UNTP version.

| UNTP Version | Status | Date       | Components | Comment         |
|--------------|--------|------------|------------|-----------------|
| 0.0.0        | Raw    | 2024-01-01 | TBA        | Empty framework |
|              |        |            |            |                 |

# Contribution Process

In general we follow the standard GIT Pull Request process.

1. By far the easiest way is to start from the Edit feature, here:

The screenshot shows a section of the United Nations Traceability Platform (UNTP) website. At the top, there's a navigation bar with the United Nations logo, a 'TP' icon, and links for 'About the UNTP', 'The specification', 'Tools and support', 'Extensions', 'Implementations', and social media icons for LinkedIn and GitHub.

The main content area has a sidebar on the left containing a list of topics: Architecture, Digital Product Passport, Conformity Credential, Traceability Events, Identifiers (which is highlighted with a blue background), Vocabularies, Verifiable Credentials, Data Carriers, Trust Anchors, Trust Graphs, Confidentiality, Anti-Counterfeiting, Mass Balance, and ESG Rules. Below this is a section for 'Business Case', 'Tools and support', 'Extensions Register', and 'Implementations Register'.

The main content area displays text about the ISO/IEC 18975 standard and its benefits. It includes three large headings: 'Global Uniqueness', 'Resolvability', and 'Verifiability'. At the bottom of the content area, there are navigation links for 'Previous' (Traceability Events) and 'Next' (Vocabularies).

A prominent red circle highlights the 'Edit this page' button, which is located in the center of the content area below the first heading. This button is accompanied by a pencil icon.

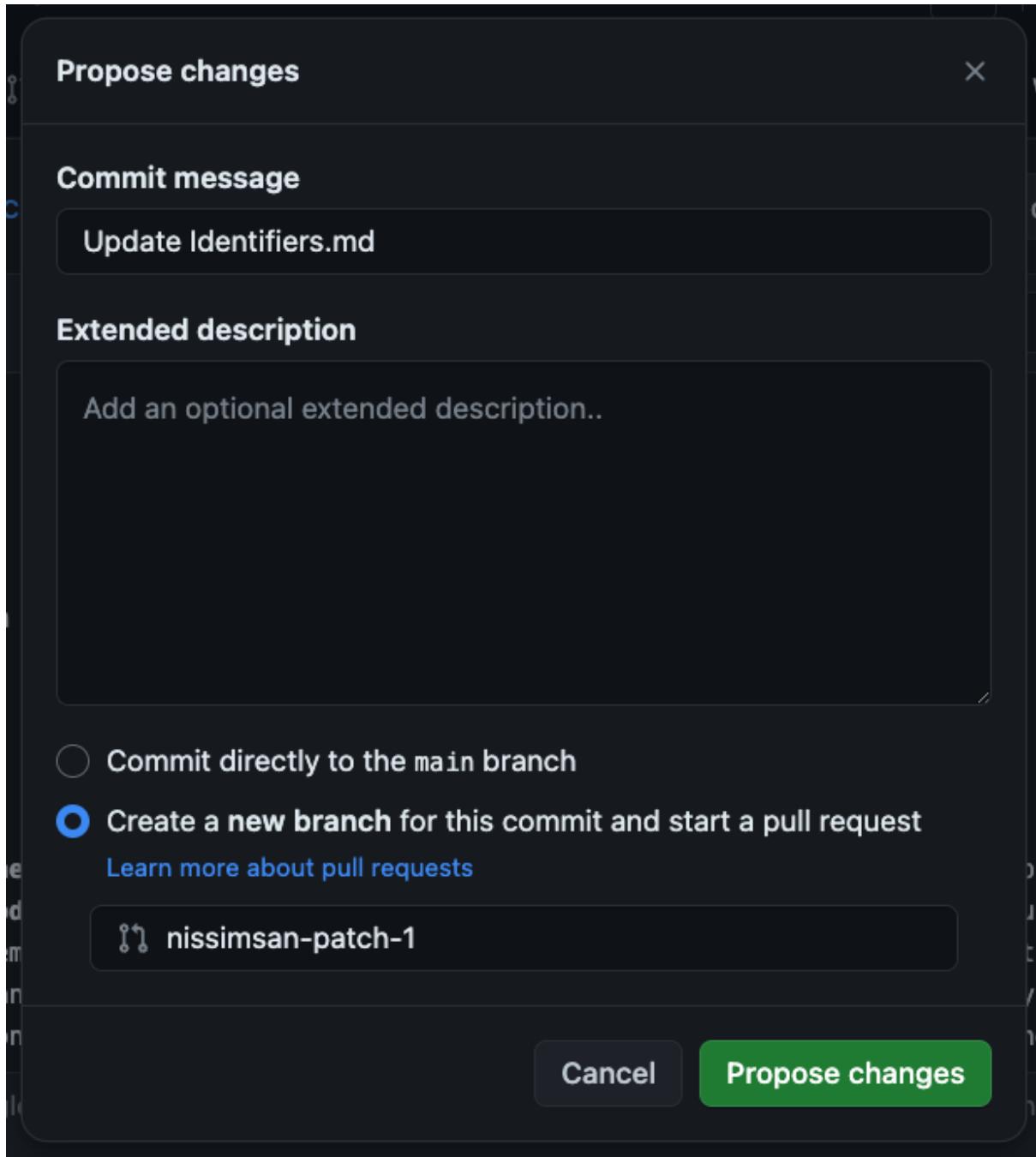
2. Make your changes in the markdown file, then commit:

The screenshot shows a GitHub repository page for 'spec-untp'. The repository name is 'spec-untp' and the branch is 'main'. The file being edited is 'Identifiers.md'. The code editor displays the following content:

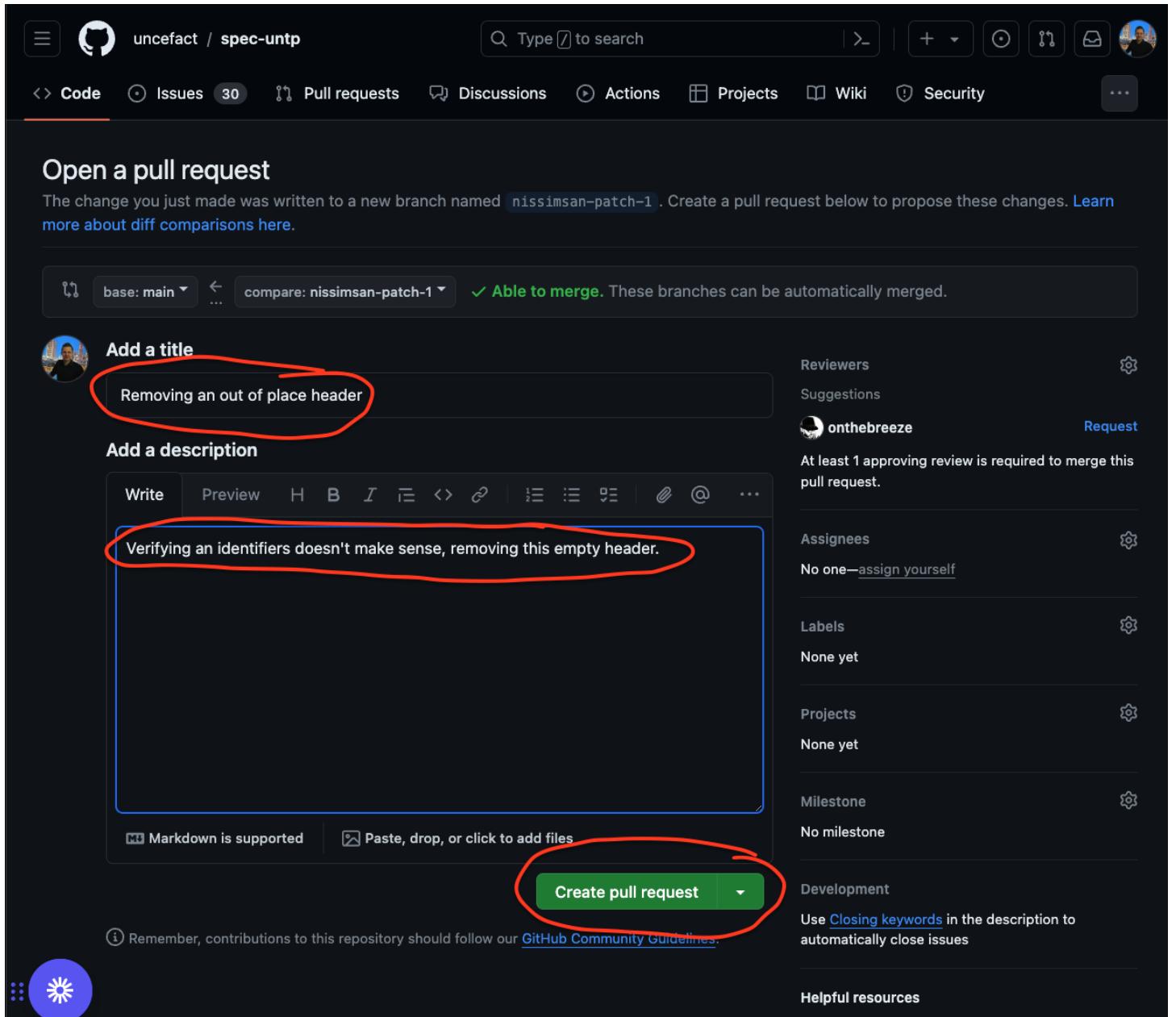
```
1 ---  
2 sidebar_position: 20  
3 title: Identifiers  
4 ---  
5  
6 import Disclaimer from '../_\disclaimer.mdx';  
7  
8 <Disclaimer />  
9  
10 ## Overview  
11  
12 Identifiers of **businesses** (eg tax registration numbers), of **locations** (eg google pins or cadastral/lot numbers), and of **products** (eg GS1 GTINs or other schemes) are ubiquitous throughout supply chains and underpin the integrity of the system. UNTP builds upon existing identifier schemes without precluding the use of new schemes so that existing investments and high integrity registers can be leveraged. UNTP requires four key features of the identifiers and, for those that don't already embody these features, provides a framework to uplift the identifier scheme to meet
```

Below the code editor, there is a note: "Press Control + Shift + m to toggle the tab key moving focus. Alternatively, use esc then tab to move to the next interactive element on the page." There is also a blue circular icon with a sunburst symbol and a message: "Attach files by dragging & dropping, selecting or pasting them." At the top right of the code editor, there is a green button labeled "Commit changes..." which is circled in red.

3. Just click okay on this (we don't have a commit message policy):



4. Then create a pull request for your change request. Here we do prefer a suitable title and a brief description of the change you are suggesting:



The screenshot shows the GitHub pull request creation interface for the repository 'unicefact/spec-untp'. The top navigation bar includes links for Code, Issues (30), Pull requests, Discussions, Actions, Projects, Wiki, Security, and more. A search bar is at the top right.

The main area is titled 'Open a pull request' and displays a message: 'The change you just made was written to a new branch named nissimsan-patch-1. Create a pull request below to propose these changes. Learn more about diff comparisons here.' Below this, it says 'base: main' and 'compare: nissimsan-patch-1' with a note: '✓ Able to merge. These branches can be automatically merged.'

The pull request form starts with 'Add a title' and 'Removing an out of place header', which is circled in red. The next section is 'Add a description' with the text 'Verifying an identifiers doesn't make sense, removing this empty header.', also circled in red. A note below says 'Markdown is supported' and 'Paste, drop, or click to add files'.

On the right side, there are settings for 'Reviewers' (onthebreeze, Request), 'Suggestions', 'Assignees' (No one—assign yourself), 'Labels' (None yet), 'Projects' (None yet), 'Milestone' (No milestone), 'Development' (Use Closing keywords in the description to automatically close issues), and 'Helpful resources'.

At the bottom right is a large green button labeled 'Create pull request' with a dropdown arrow, which is also circled in red. A note at the bottom left says 'Remember, contributions to this repository should follow our [GitHub Community Guidelines](#)'.

5. We will process your PR in the next meeting. Note that you will not see your change on the website before that happens, and we have agreed to merge your PR.



unicefact / spec-untp

Type / to search

Code

Issues 30

Pull requests 1

Discussions

Actions

Projects



Filters ▾

is:pr is:open

Labels 24

Mi

 Pull 1 Open ✓ 18 Closed

Author ▾

Label ▾

Projects ▾

Milestones ▾

P

 Pull Removing an out of place header

#63 opened now by nissimsan • Review required

# Business Case

## ! INFO

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## The Business Case for Change

Without sufficient commercial incentive, businesses will not act. In some cases the commercial incentive is regulatory compliance. But few economies (The European Union is a notable exception) have current or emerging regulation that demands digital product passports for products sole or manufactured in their economy. However, there is much wider regulatory enforcement of annual corporate sustainability disclosures. But without sustainability data from supply chains at product level, there is no easy way for corporates to accurately meet their annual disclosure obligations. Worse, without product level data from suppliers, there is no way at all for corporates to select supply in such a way that they can demonstrate year-on-year improvements to sustainability performance. On top of the disclosure obligation, most corporates are very concerned about reputational risk associates with un-sustainable behaviour from their upstream suppliers. Furthermore, the financial sector is increasingly able and willing to provide improved financial terms for trade finance or investment capital to businesses with strong sustainability credentials. All these incentives drive behaviour and value but there is still some effort needed for each implementer to make a positive business case for change. UNTP offers some tools to determine the value that can inform a positive case for change.

## Business Case Template (BCT).

A simple template for each role (buyer, supplier, certifier, software vendor, regulator, etc) to make a business case for the investment needed to implement UNTP. Continuously updated and improved with lessons from early implementations, the BCT provides a quick way for sustainability staff to support for their budget requests.

## Community Activation Program (CAP).

Supply chain actors are often reluctant to proceed with a specific initiative like UNTP unless they have some confidence that others in their industry are doing the same. There are not only obvious

interoperability benefits from industry wide adoption but also cost benefits. For example, it is often the case that a small number of commercial software platforms are commonly used by larger numbers of businesses in a given industry and jurisdiction. So a software vendor that implements UNTP once will benefit all its customers. Additionally there are often a few standards and a few certifiers that are common to an industry and country. Also, there is very often one or more existing member associations that represent most of the actors in a given industry and country. Finally, when a large community is willing to act together, there will often be financial incentives from governments and/or development banks that can assist with initial funding. In short, there are many reasons to approach uNTP implementation at a community level. The CAP is a business template for a community level adoption of UNTP including a tool for financial cost/benefit modelling at community level.

## **Value Assessment Framework (VAF).**

Once a community or individual implements UNTP and transparency data starts to flow at scale, it will become important to continuously assess the actual value that is realised. Dashboards and scorecards that measure key performance indicators will energise ongoing action and provide valuable feedback at both community and UN level. Therefore the UNTP defines a minimal set of KPIs that each implementer can easily measure and report to their community - and which communities can report to the UN.

# Business Case Templates

## ! INFO

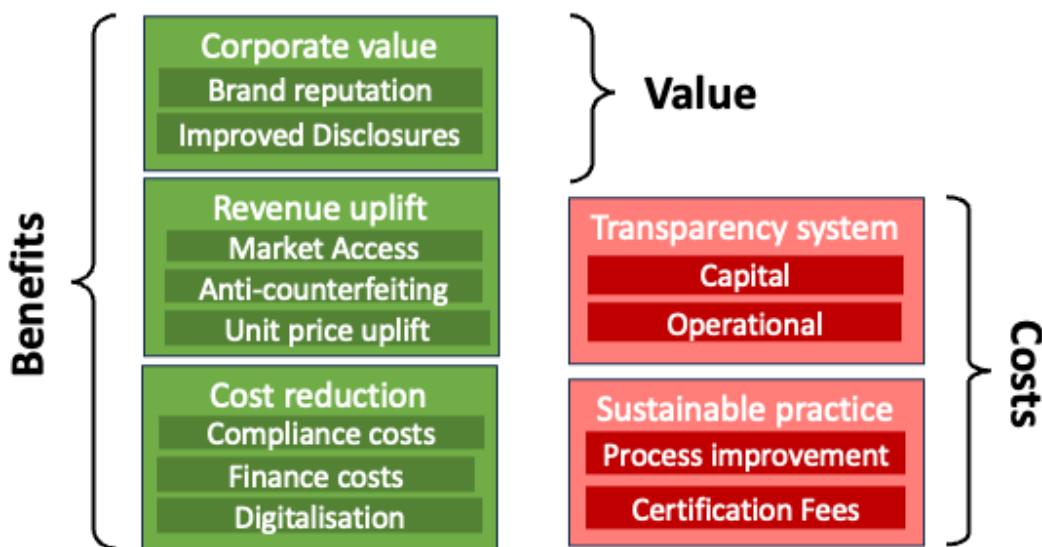
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The decision to implement UNTP needs a positive business case to justify the investment. The purpose of this page is to provide a framework for business case development. We provide a generalised cost / benefit model and then discuss it's application to specific roles and industries. We also provide a separate cost benefit model and business case template for regulators.

## Industry Cost Benefit Model

The high level model shown below breaks benefits into three categories and costs into two categories.

- Benefits accrue through increasing revenue and/or decreasing cost. Improved margins that result from that of course contribute to corporate value but there are also less tangible benefits at the corporate level such as brand reputation.
- Costs are incurred through changes to production processes to achieve greater sustainability and the implementation of traceability & transparency systems to communicate that verifiable sustainability.



Actual benchmarks for benefits and costs by industry sector and geographic region will become increasingly available over time through the UNTP [Value Assessment Framework \(VAF\)](#). At this point in time, benefits and costs are described qualitatively and supported with metrics from public research.

## Benefits - Revenue Uplift

### Market Access

Legislation increasingly requires companies to prove ESG credentials to be able to trade in certain countries. Some examples include the EU Deforestation Regulation [EUDR](#) as well as several due-diligence regulations such as the [EU CSDDD](#) and [US UFLPA](#). Legislation effectively puts pressure on buyers to prove provenance and sustainability requirements for certain products, as well as a higher burden of proof from suppliers from certain regions. In many cases, these regulations reverse the burden of proof - namely that companies must prove that they are compliant in order to maintain market access. UNTP based transparency allows companies to keep trading in said areas, rewarding suppliers ensuring good practices rather than being forced outright out of these markets.

- *Quantification.* The percentage of revenue that is either retained or increased will depend on the commodity and footprint of any given supplier in a regulated market. The value of imported goods impacted by EUDR is approximately \$400Bn which is around 1.2% of world trade. The volume of trade impacted by Due Diligence acts is similar or larger than EUDR.
- *References.* [EU market import volumes](#), [Krungsri EUDR impact analysis](#),

The impact of these trade barriers for any given company will be between 0% and 100% of revenue depending on which commodities they sell to which market. But given the collective impact of between 2% and 3% of world trade, an average benchmark of 1% of revenue seems conservative.

### Unit Price Uplift

Consumers are increasingly selective about product choice based on believable sustainability criteria. There are several surveys that indicate around two-thirds of consumers consider sustainability in product choices and that around one third are willing to pay a premium. The amount of the price premium varies widely and there is evidence that consumer behaviour change is slow and sometimes only temporary. There is also evidence that rich data (for example UNTP DPPs) drives stronger behaviour. The amount of end product price increase that flows through to the upstream supply chain is more difficult to quantify but may be very limited. Nevertheless, if buyers select supply based on sustainability criteria then non-conforming suppliers and products are likely to be forced into lower-priced commodity markets.

- *Quantification* Estimates of the average sustainability premium that consumers will pay vary widely from around 1% to 12%. If 30% of consumers are willing to pay a 5% premium then the overall unit price impact is around 1.5%.
- *References*. [Consumer high estimates](#), [Consumer low estimates](#).

The unit price uplift for verifiably sustainable goods will vary widely depending on commodity and market. However an average benchmark of 1% seems reasonable and conservative.

## **Anti-Counterfeiting**

Global trade in counterfeit goods is estimated at between 2% and 5% of trade. The most impacted commodities are pharmaceuticals and luxury goods including quality wines & spirits. The volumes increase when pirated / smuggled goods are taken into account including illicit tobacco into high tax markets. What is more difficult to quantify is the proportion of counterfeit goods that are unknowingly purchased as genuine goods since, in many cases, buyers of fake luxury goods or illicit tobacco make purchases knowing that the goods are fake or pirated. UNTP offers a simple but effective anti-counterfeit protocol that works well when buyers are motivated to confirm that goods are genuine.

- *Quantification*. 4% of global trade represents about \$1.2Tn in counterfeit goods. If approximately 50% of that trade can be impacted by improved anti-counterfeiting measures then the average value is around 2%. If the effectiveness of anti-counterfeiting measures is estimated at 50% then the value falls to around 1% of trade.
- *References*. [OECD trends in counterfeit goods](#), [USTPO counterfeit estimates](#).

The value of sales recovered by reductions in illicit goods will vary from 0% for commodity goods to as much as 10% for pharmaceuticals and some luxury goods. A benchmark value of 1% industry-wide seems reasonable and conservative.

## **Benefits - Cost Reduction**

### **Compliance Costs**

Regulatory compliance costs include the administrative burden of reporting, processing fees, tariffs, border clearance delays, and penalties. As sustainability regulations increase, these will increasingly be enforced at the border and will most likely result in higher compliance costs. UNTP offers customs authorities corporate regulators higher confidence data that can be used to streamline border processing, reducing administrative costs and the likelihood of delays. As countries proceed at different rates towards net zero commitments and have different domestic carbon prices, it becomes increasingly likely that more countries will impose carbon border tariffs such as the planned [EU CBAM](#).

High quality evidence of low carbon footprint via UNTP DPPs together with full traceability can help companies prove origin and value add across different steps of the production process and value chain, and thus reduce the burden of proof to profit from preferential tariff treatment. Finally, high quality evidence of conformance of imported goods reduces the risk of punitive non-compliance fines.

- *Quantification.*
- *References.*

## **Finance Costs**

UNTP provides a framework based on international standards which can accommodate different ESG risks, enabling development banks to standardize their reporting and ensuring their mandate, without having to create ad-hoc structures for each Sustainable Supply Chain Finance Deal. This unlocks a significant trade finance gap, and enables preferential finance to reach deep-tier suppliers. Access to lower financing costs for suppliers results in lower cost of goods sold and improved margins. These trade finance arrangements often come with grants that can support costs associated with the ESG transition, such as support certification, consulting or implementation of new ERP systems for reporting.

- *Quantification.*
- *References.*

## **Digitalisation Efficiency**

- *Quantification.*
- *References.*

# **Benefits - Corporate Value**

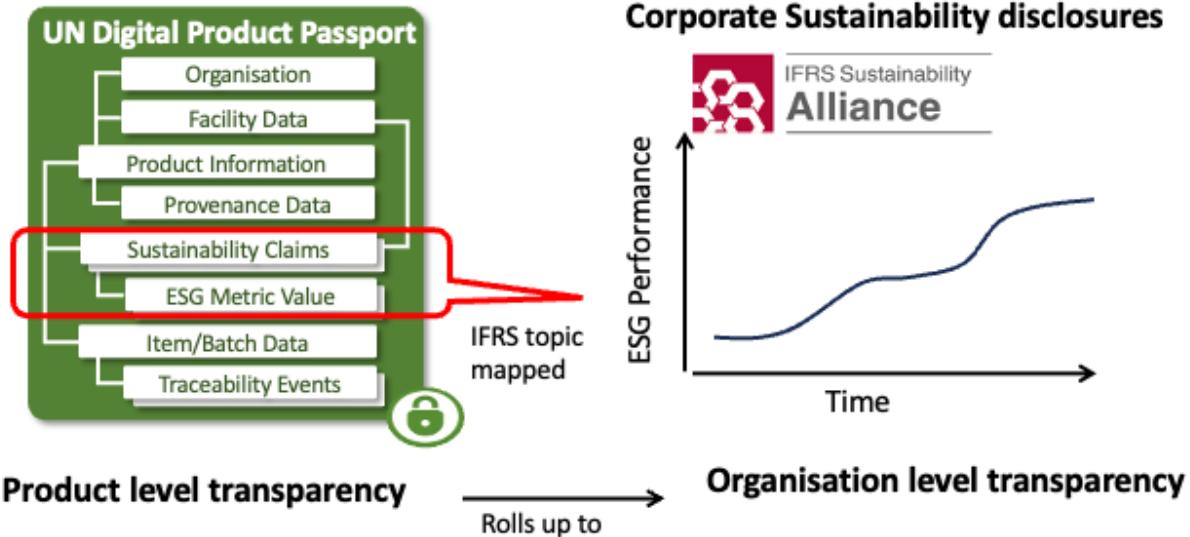
## **Brand Reputation**

- *Quantification.*
- *References.*

## **Improved Disclosures**



UNTP



- *Quantification.*
- *References.*

## Costs - Sustainable Practices

### Process Improvement

- *Quantification.*
- *References.*

### Audits & Certification

- *Quantification.*
- *References.*

## Costs - Transparency System

### Capital investment

- *Quantification.*
- *References.*

### Operational costs

- *Quantification.*
- *References.*

# **Industry Business Case Tempalte**

## **Regulator Cost Benefit Model**

TBD - insert model diagram here

**Benefits - National Economy**

**Benefits - Compliance Outcomes**

**Benefits - Government Efficiency**

**Costs - Implementation**

**Costs - Operational**

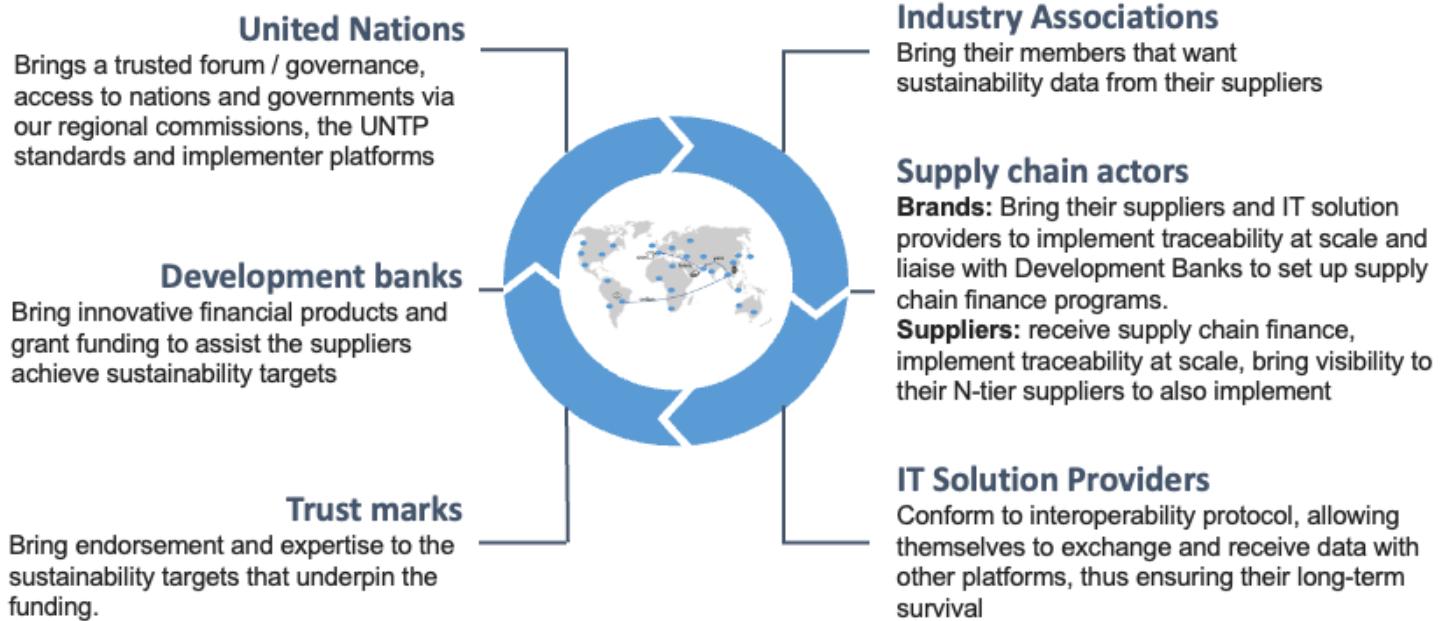
**Regulator Business Case Template**

# Community Activation Program

## ! INFO

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## The Community Activation Flywheel



## United Nations

## Development Banks

## Trust Marks

## Industry Associations

## Supply Chain Actors

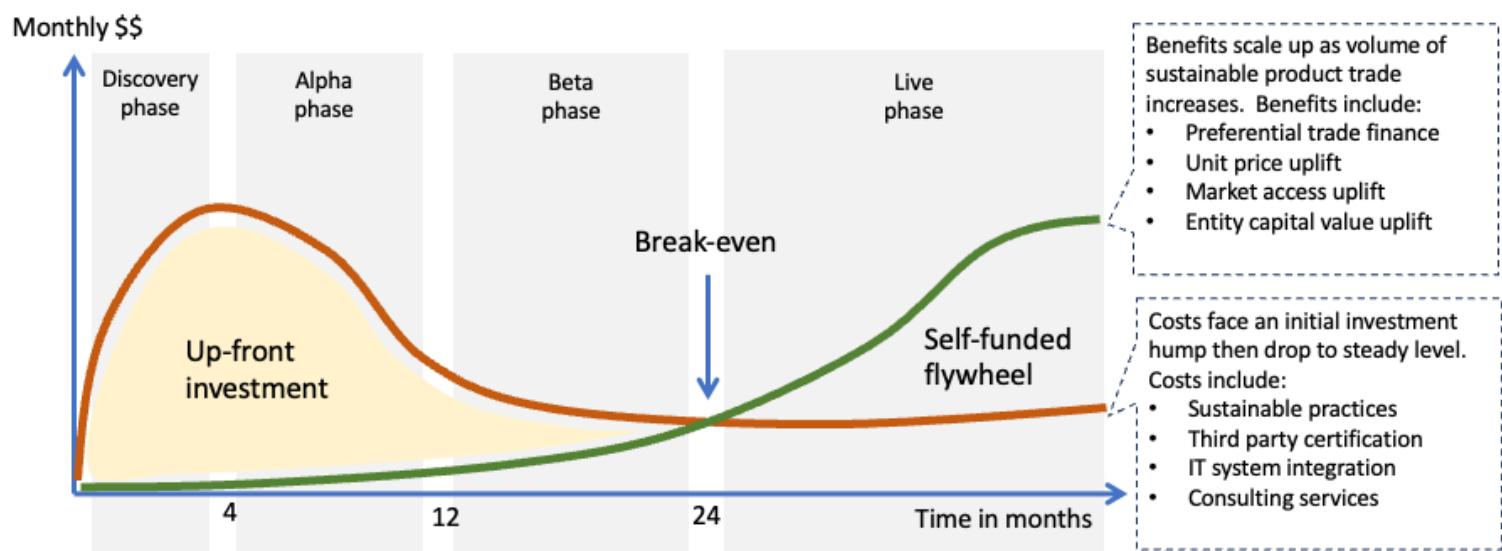
## Implementation Program Model

**Discovery Phase (Crawl)**

**Alpha Phase (Walk)**

**Beta Phase (Run)**

## The Community Level Business Case



## Business Case Template

# Value Assessment Framework

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## Ongoing Value Assessment

# Specification

## INFO

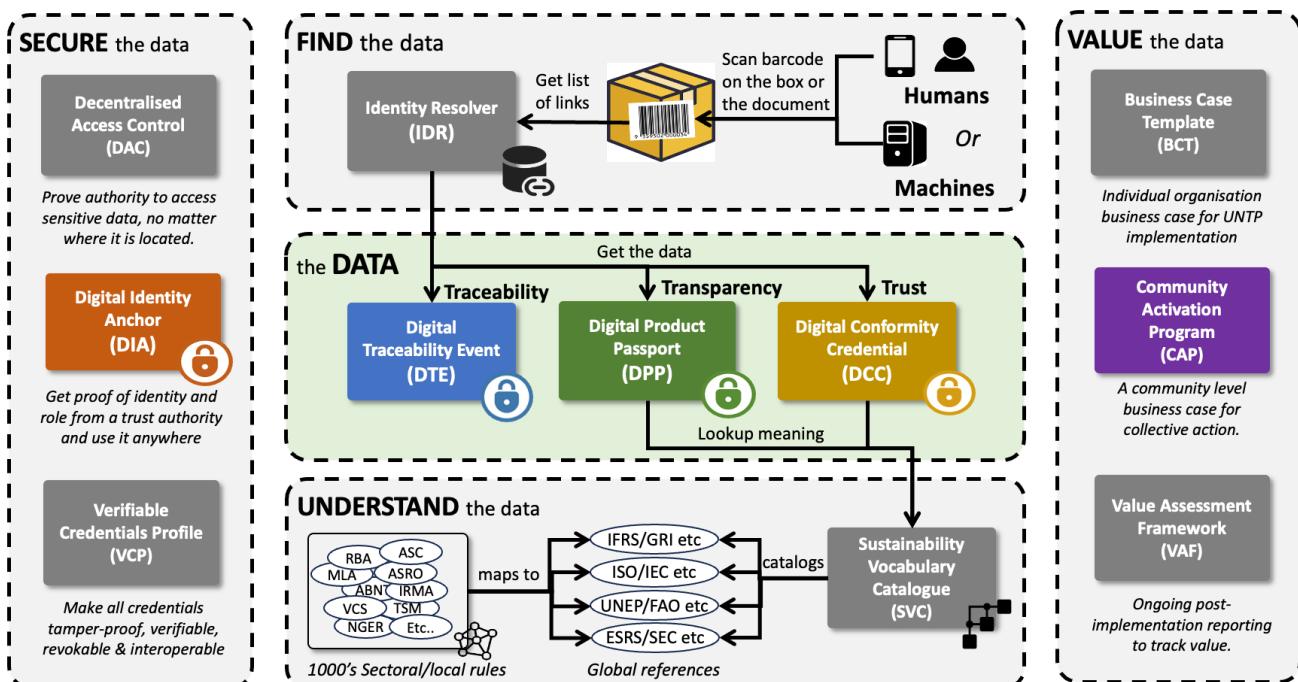
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The specification is the heart of UNTP. It defines the detailed specifications for interoperable implementations. This page provides an outline of the purpose and scope of each component of the specification.

## Architecture

The architecture is the blueprint for all the components of the specification and how they work together. It defines the **design principles** which underpin the UNTP and shows the components working together from the perspective of a **single actor** and across the **entire value-chain**. The UNTP is a fundamentally **decentralised architecture** with no central store of data.

## UNTP comprises five key pillars



# Verifiable Credentials Profile (VCP)

The World-Wide-Web Consortium (W3C) has defined a standard called [Verifiable Credentials \(VCs\)](#). A VC is a portable digital version of everyday credentials like education certificates, permits, licenses, registrations, and so on. VCs are digitally signed by the issuing party and are tamper proof, privacy preserving, revokable, and digitally verifiable. The UN has previously assessed this standard and has recommended it's use for a variety of cross border trade use cases in a recent [white paper](#). VCs are inherently decentralised and so are an excellent fit for UNTP which recommends that passports, credentials, and traceability events are all issued as W3C VCs. A related W3C standard called [Decentralised Identifiers \(DIDs\)](#) provides a mechanism to manage the cryptographic keys used by verifiable credentials and also to link multiple credentials into verifiable trust graphs. DIDs are not the same as the business / product / location identifiers maintained by authoritative agencies - but can be linked to them.

## Digital Product Passport (DPP)

The digital product passport (DPP) is issued by the shipper of goods and is the carrier of **product and sustainability information** for every serialised product item (or product batch) that is shipped between actors in the value chain. It is deliberately **simple and lightweight** and is designed to carry the minimum necessary data at the **granularity** needed by the receiver of goods - such as the scope 3 emissions in a product shipment. The passport contains links to **conformity credentials** which add trust to the ESG claims in the passport. The passport also contains links to **traceability events** which provide the "glue" to follow the linked-data trail (subject to confidentiality constraints) from finished product back to raw materials. The UNTP DPP does not conflict with national regulations such as the EU DPP. In fact, it can usefully be conceptualised as the **upstream B2B feedstock** that provides the data and evidence needed for the issuing of high quality national level product passports.

## Digital Conformity Credential (DCC)

Conformity credentials are usually issued by independent third parties and provide a **trusted assessment** of product ESG performance against credible **standards or regulations**. As such the credential provides trusted verification of the ESG claims in the passport. Since the passport may make several independent claims (eg emissions intensity, deforestation free, fair work, etc) there may be many linked conformity credentials referenced by one passport. As an additional trust layer, the conformity credential may reference an **accreditation** credential that attests to the authority of the third party to perform the specific ESG assessments. The conformity credential data model has been

developed by a separate UN/CEFACT project on digital conformity that has expert membership from accreditation authorities and conformity assessment bodies.

## Digital Traceability Events (DTE)

Traceability events are very lightweights collections of identifiers that specify the “what, when, where, why and how” of the products and facilities that constitute a value chain. The UNTP is based on the [GS1 EPCIS](#) standard for this purpose because it is an existing and proven mechanism for supply chain traceability. Note that UNTP supports but does not require the use of GS1 identifiers. The basic idea behind the traceability event structure is that any supply chain of any complexity can always be accurately modelled using a combination of four basic event types. An **object** event describes an action on specific product(s) such as an inspection. A **transaction** event describes the exchange of product(s) between two actors such as sale of goods between seller and buyer. An **aggregation** event describes that consolidation or de-consolidation of products such as stacking bales of cotton on a pallet for transportation. Finally, a **transformation** event describes a manufacturing process that consumes input product(s) to create new output product(s). The UNTP uses these events in a decentralised architecture as the means to traverse the linked-data “graph” that represents the entire value-chain.

## Digital Identity Anchor (DIA)

UNTP credentials will include identifiers of products, locations or businesses. UNTP credentials will also include ESG performance claims like emissions intensity values. But how can a verifier of these identifiers or ESG claims be confident that the claims are true and that they are made by the genuine party at a verifiable location? Trust anchors are national or international authorities that typically run existing business or product registration, certification, accreditation, or other high integrity processes. Examples of trust anchors include national regulators that govern things like land ownership or business registrations. Another example are the national accreditation bodies that audit and accredit certifiers to issue third party assessments. UNTP depends on trust anchors to add digital integrity to ESG claims and identities by linking them to the authority under which they are made. In essence, UNTP defines a protocol for existing trust anchors to continue doing what they have always done, but in a digitally verifiable way.

## Identity Resolver (IDR)

Identifiers of **businesses** (eg tax registration numbers), of **locations** (eg google pins, cadastral/lot numbers, GS1 [GLNs](#)), and of **products** (eg GS1 [GTINs](#) or other schemes) are ubiquitous throughout supply chains and underpin the integrity of the system. UNTP builds upon existing identifier schemes without precluding the use of new schemes so that existing investments and high integrity registers can be leveraged. UNTP requires four key features of the identifiers and, for those that don't already embody these features, provides a framework to uplift the identifier scheme to meet UNTP requirements. Identifiers used in UNTP implementations should be **discoverable** (ie easily read by scanning a barcode, QR code, or RFID), **globally unique** (ie by adding a domain prefix to local schemes), **resolvable** (ie given an identifier, there is a standard way to find more data about the identified thing), and **verifiable** (ie ownership of the identifier can be verified so that actors cannot make claims about identifiers they don't own).

## Decentralised Access Control (DAC)

There is a balance between the demands of transparency (more supply chain visibility means it's harder to hide greenwashing) and confidentiality (share too much data and you risk exposing commercial secrets). A key UNTP principle is that every supply chain actor should be able to choose their own balance between transparency and confidentiality. To achieve this, UNTP defines six data confidentiality patterns with different degrees of data protection so that they can be appropriately combined to meet the confidentiality goals of each party. This includes the ability to selectively redact data from credentials received from upstream suppliers before passing them on to downstream buyers - without affecting the cryptographic integrity of the data.

## Sustainability Vocabulary Catalog (SVC)

Web **vocabularies** are a means to bring consistent understanding of **meaning** to ESG claims and assessments throughout transparent value chains based on UNTP. There are hundreds of ESG standards and regulations around the world, each with dozens or hundreds of specific conformity **criteria**. Any given value chain from raw materials to finished product is likely to include dozens of passports and conformity credentials issued against any of thousands of ESG criteria. Without a consistent means to make sense of this data, UNTP would provide a means to discover a lot of data but no easy way to make sense of it. The UNTP defines a standard and extensible topic map (taxonomy) of ESG criteria and provides a mechanism for any standards authority, or national regulator, or industry association to map their specific terminology to the UNTP vocabulary.

# Architecture

## ! INFO

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## Overview

The architecture is the blueprint for all the components of the specification and how they work together. It defines the **design principles** which underpin the UNTP and shows the components working together from the perspective of a **single actor** and across the **entire value-chain**. The UNTP is a fundamentally **decentralised architecture** with no central store of data.

## Principles

The architecture principles that guide the UNTP design are

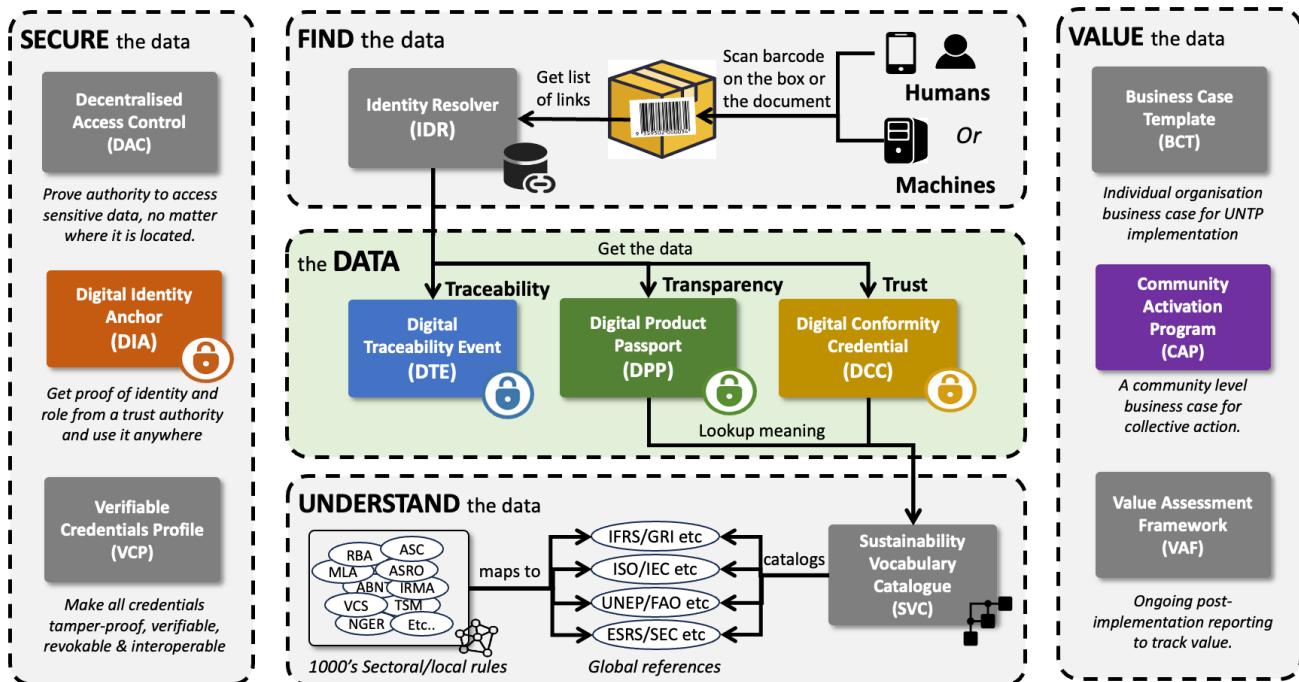
| Name             | Principle   | Rationale   |
|------------------|---|---|
| No dependency    | UNTP should not require any collaboration or dependency between issuers, consumers and verifiers of DPPs                                | Imposing such collaboration as a prerequisite for action in a complex many-to-many ecosystem would essentially stall progress               |
| Unknown verifier | UNTP should not assume that the consumer / verifier of UNTP data is known to the issuer, even when confidential data access is required | In a decentralised architecture with thousands of issuers, it would be impractical to register every authorised verifier with every issuer. |
| Any maturity     | UNTP should not assume any technical maturity for verifiers   | DPPs and other credentials must work equally for human and machine verifiers - otherwise an insurmountable complexity of                    |

| Name                  | Principle  | Rationale   |
|-----------------------|--|---|
|                       |  | knowing which customer has what capability would be required  |
| Legacy data carriers  | UNTP should work with any carrier of a product identifier including 1D barcodes, RFID tags, 2D codes and digital documents                                   | 1D barcodes and RFID tags are ubiquitous and will only be replaced slowly. Uptake should not require manufacturers to re-instrument their production lines and printing processes                                 |
| Verifiability         | UNTP should provide confidence in the integrity and trustworthiness of the data  | Without trustworthy data, the value of sustainability claims is reduced - possibly to the extent that the business case for adoption is non viable.   |
| Any criteria          | UNTP should not dictate any specific sustainability criteria but make the criteria transparent and allow criteria to be mapped (to achieve interoperability) | Costs will explode if every exporter must provide certification to every export market criteria. Where criteria are equivalent, mutual recognition provides a much more cost effective sustainability trajectory. |
| Action requires value | The benefits of UNTP implementation must exceed the costs.   | If not then there will be no implementation   |

## UNTP conceptual overview

Our mission is to support global traceability and transparency **at scale**. To achieve that mission we must not only define the **data** standards but also solve all the barriers to adoption at scale. That includes how to **find** the data, how to **secure** the data, how to **understand** the data, and most critically, how to realise enduring business **value** from the data. These are the five pillars of UNTP.

# UNTP comprises five key pillars



Small scale tests are possible with any of these pillars missing but scalability to full production volumes is not.

## The data

The data is the heart of the UNTP. There are three different data types, each represented as digital verifiable credentials.

- The **Digital Product Passport (DPP)** is issued by the product manufacturer and is designed to carry basic product product data plus the conformity data (including sustainability assurance data) that is needed by the next actor in the supply chain (ie the buyer of the product). The DPP represents the conformity information as a set of "claims" that specify product performance against specified criteria. In this way, the DPP is essentially a bundle of differentiated value that a buyer can use to choose a preferred supplier. The DPP also provides a statement of material provenance (ie what materials is this product made from and where were the materials sourced). The provenance data assist with ensuring conformance to minimum local content rules or sources under sanction.
- The **Digital Conformity Credential (DCC)** is issued by an independent auditor or certifier and it carries one or more "assessments" of an identified product or facility against well defined criteria. When the product ID and the conformity criteria in the DCC "assessment" match those in the DPP "claim" then the DPP data value is enhanced through independent verification. The DCC must

include the identity of the accreditation authority and, where relevant, links to the accreditation authority, so that verifiers can be sure that the auditor or certifier is genuine.

- **The Digital Traceability Event (DTE)** provides a means to trace product batch data throughout the value chain. The DTE links input products (eg bales of cotton from the primary producer) to output products (eg woven cotton fabric). Therefore the DTEs provide a means to trace product provenance through manufacturing processes to discover an entire value chain. DTEs are only available when products are managed and traceable at batch level. DTEs provide links to reach deeper into the value chain which may contain commercially sensitive data and so may only be available to authorised roles.

All three UNTP data structures are designed to be extensible to meet the needs of specific industry sectors or jurisdictions.

## Finding the data

We deliberately say "finding" the data rather than "exchanging" the data because a very critical principle is that the issuer of the data usually will not know who will ultimately use it. Obviously each seller knows their immediate buyer but many other actors in a circular economy may also encounter the identified product and need to access the DPP information. It follows that a key principle of UNTP is "if you know the identifier of a product then you can get the data about the product" - even many years after the product was created.

- **Identity Resolver (IDR)** specifications are a concretisation of ISO/IEC 18975 that provide a standardised way to resolve an identifier (of a product, batch, item, facility or entity) to a list of links (URLs) to further information about the identified object. The format of the linkset itself is defined by [RFC9264](#). One identifier can resolve to multiple links, each of which is annotated with a specific link type (eg UNTP DPP). The IDR works with simple identifiers (eg encoded as a traditional 1D barcode) or complex identifiers (eg encoded as a QR code). In this way a single barcode or QR code can return a rich variety of information tailored to the requestor's needs. Furthermore, the IDR can return a collection of similar link types with different date stamps or versions. One important use case for this capability is to return post-manufacture events such as consumption and eventual recycling of identified products.

## Securing the data

As the value of sustainability attributes increases, so the temptation to make fake claims increases. Without confidence in the integrity of data, value is diminished. Additionally, as businesses publish more and more data about their products and upstream value chains, there is an increased risk of

leakage of commercially sensitive information. Without confidence that sensitive data is accessible only to authorised parties, businesses will be less likely to participate. The UNTP security specifications address these challenges.

- **Verifiable Credentials Profile (VCP).** All UNTP data objects (DPP, DCC, DTE, DIA) are issued as W3C Verifiable Credentials. This ensures that the data, once issued, cannot be tampered with, that the issuer is identifiable, and that status changes like revocation are immediately visible. The VCP defines a simple subset of the larger W3C specifications so that interoperability is simpler and cheaper to achieve. The VCP also includes an human-readable rendering template extension to the W3C specification so that anyone can verify UNTP credentials even if they have no technology maturity.
- **Digital Identity Anchor (DIA).** The issuers and subjects of Verifiable Credentials are identified using W3C Decentralised Identifiers (DIDs) which provide a means to discover the cryptographic keys necessary to verify the credentials. However, DIDs are self-issued and do not ensure that the issuer is really who they say they are, only that the owner of the DID was certainly the issuer of the credential. The DIA is a Verifiable Credential issued by a trusted authority (eg a government agency) that links a DID to a known public identity such as VAT registration number. In this way, verifiers can be assured of the identity of issuers. The DIA also has a "scope" so that, for example a national accreditation authority can attest to the identity of a certifier but also specify the scope of the accreditation.
- **Decentralised Access Control (DAC).** Not all traceability and transparency data for a given product is public information. Some is accessible only to authorised roles like a customs authority or a recycling facility. Some is accessible only to the verified purchaser of a product. In centralised systems, this kind of access control is managed by granting privileged access roles to authenticated users. But in decentralised systems such as the world of DPPs, this approach is not practical. There could be thousands of different platforms that host DPPs and it would be impractical for each authorised actor to create accounts on thousands of systems. The DAC defines a simple way to encrypt sensitive data with a unique key for every unique item and a way to distribute decryption keys to authorised roles without any advance knowledge about who has which role. Even if a decryption key is lost or leaked, the scope of data access is limited to one item. The DAC also provides a mechanism for the verified purchaser of an item to **update** the DPP record with post-sale events like consumption, repair, or recycling.

## Understanding the data

The UNTP data objects (DPP, DCC, DTE, DIA) are deliberately simple so that they are easy to understand and low cost to implement. However a lot of the structural simplicity of a DPP is achieved via the "claims" object which is a simple abstraction that can carry any sustainability or conformity

metric measures against any criteria from any standard or regulation. So this simple abstraction hides a world of complexity. In a world of thousands of standards or regulations, each with dozens or hundreds of distinct criteria, how can one claim about social welfare or biodiversity be meaningfully compared to another? How can an importer know whether a product sustainability criteria from an exporting economy is equivalent to the regulated criteria in the importer's economy? As a corporate subject to sustainability disclosures under IFRS or ESRS, how can I know how to match the claims in a received product passport with the impact areas of my disclosures statement? The UNTP cannot and should not dictate which sustainability standards or regulations any given claim or assessment references. However it can provide a way to map these criteria to a harmonised vocabulary to achieve interoperability.

- The **Sustainability Vocabulary Catalog (SVC)** provides a framework to map sustainability knowledge across different standards, regulations and industry practices. It may not always answer the question but it provides a decentralised semantic governance model that allows mappings and corresponding value to grow over time and gaps to be fixed as they are found. The SVC is a W3C DCAT-conformant catalog of external sustainability standards and regulations. Mappings are defined using W3C SKOS and can be made either by UN working groups external standards **or** by external authorities to the UN catalog. This allows for a decentralised mapping effort that is far more scalable than depending on a small centralised team.

As uptake of UNTP grows, maintenance of the SVC is one of the key activities that grows with uptake and adds continuously increasing value to the global sustainability effort.

## Valuing the data

Without sufficient commercial incentive, businesses will not act. In some cases the commercial incentive is regulatory compliance. But few economies (The European Union is a notable exception) have current or emerging regulations that demand digital product passports for products sold or manufactured in their economy. However, there is much wider regulatory enforcement of annual corporate sustainability disclosures. But without sustainability data from supply chains at product level, there is no easy way for corporates to accurately meet their annual disclosure obligations. Worse, without product level data from suppliers, there is no way at all for corporates to select suppliers in such a way that they can demonstrate year-on-year improvements to sustainability performance. On top of the disclosure obligation, most corporates are very concerned about reputational risk associates with un-sustainable behaviour from their upstream suppliers. Furthermore, the financial sector is increasingly able and willing to provide improved financial terms for trade finance or investment capital to businesses with strong sustainability credentials. All these incentives drive behaviour and value but there is still some effort needed for each implementer to make a positive business case for change. UNTP offers some tools to determine the value that can inform a positive case for change.

- **Business Case Template (BCT).** A simple template for each role (buyer, supplier, certifier, software vendor, regulator, etc) to make a business case for the investment needed to implement UNTP. Continuously updated and improved with lessons from early implementations, the BCT provides a quick way for sustainability staff to support for their budget requests.
- **Community Activation Program (CAP).** Supply chain actors are often reluctant to proceed with a specific initiative like UNTP unless they have some confidence that others in their industry are doing the same. There are not only obvious interoperability benefits from industry-wide adoption but also cost benefits. For example, it is often the case that a small number of commercial software platforms are commonly used by larger numbers of businesses in a given industry and jurisdiction. So a software vendor that implements UNTP once will benefit all its customers. Additionally there are often a few standards and a few certifiers that are common to an industry and country. Likewise, there is very often one or more existing member associations that represent most of the actors in a given industry and country. Finally, when a large community is willing to act together, there will often be financial incentives from governments and/or development banks that can assist with initial funding. In short, there are many reasons to approach UNTP implementation at a community level. The CAP is a business template for a community level adoption of UNTP including a tool for financial cost/benefit modelling at community level.
- **Value Assessment Framework (VAF).** Once a community or individual implements UNTP and transparency data starts to flow at scale, it will become important to continuously assess the actual value that is realised. Dashboards and scorecards that measure key performance indicators will energise ongoing action and provide valuable feedback at both community and UN level. Therefore the UNTP defines a minimal set of KPIs that each implementer can easily measure and report to their community - and which communities can report to the UN.

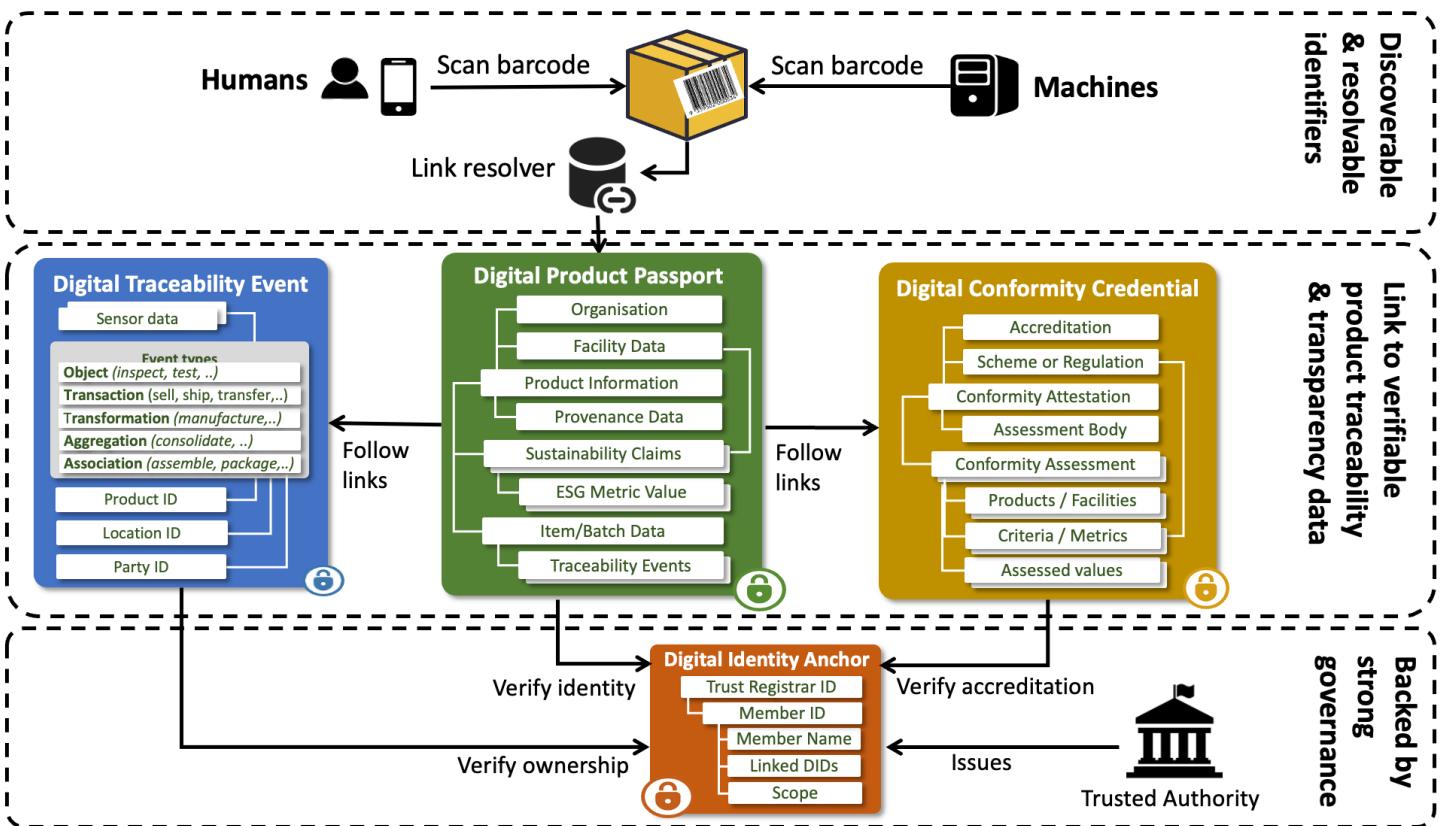
## UNTP for one product

This section drills down a little into the key credentials that UNTP defines to answer "what's in a product passport or conformity credential or traceability event?". The diagram shows the perspective of one product. The product identifier (at product, batch or item level) is the key for an Identity Resolver (IDR) to provide links to the UNTP credentials (and any other product related data). Every credential is both human and machine readable so that the same product scan will return a nicely formatted DPP and related data to a human scanning a barcode or QR code with their phone - or a structured digital data set to an automated scanner at the factory door.

Summary and detailed information about the content of each UNTP credential is available on this site and need not be repeated here

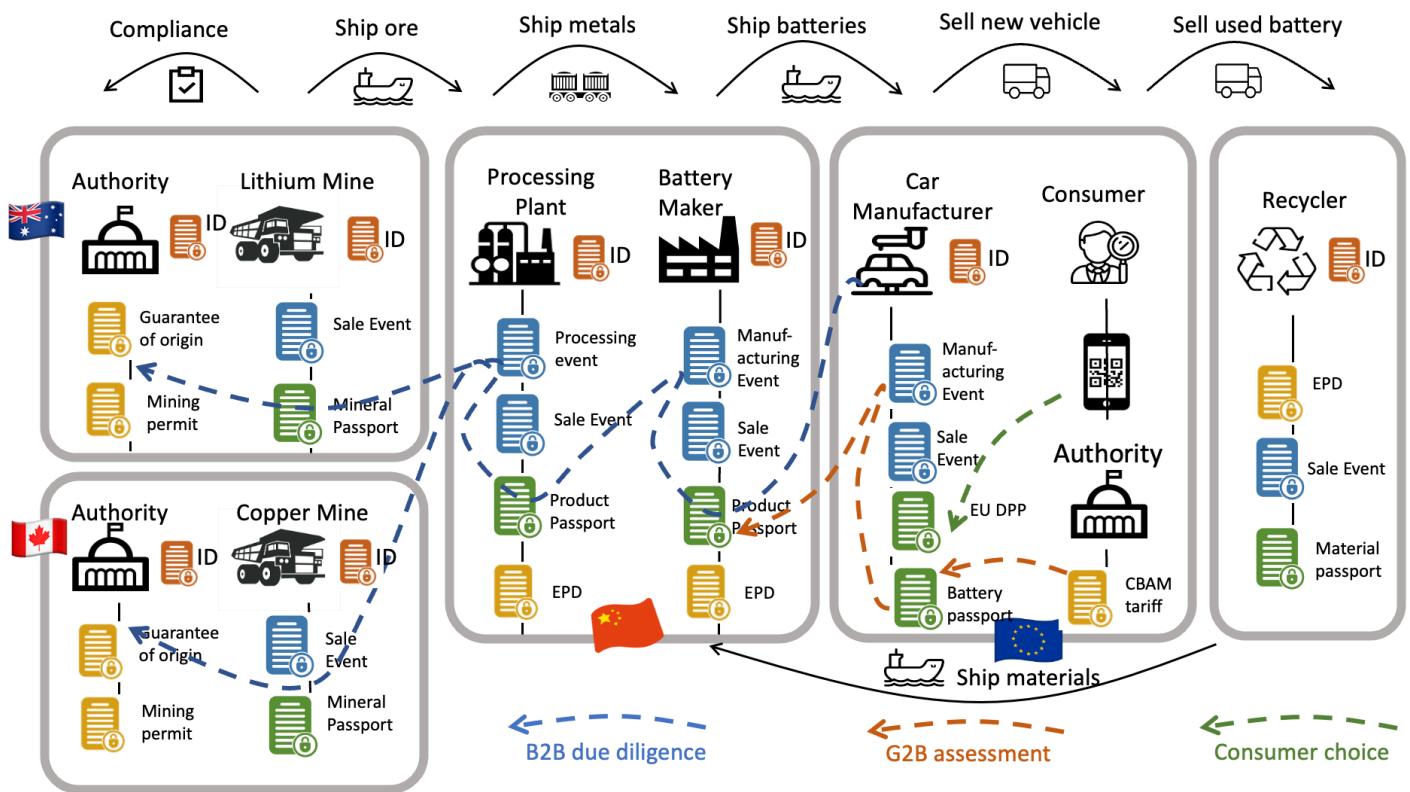
- [Digital Product passport \(DPP\)](#)

- Digital Conformity Credential (DCC)
- Digital Traceability Event (DTE)



## UNTP for a value chain

When each actor in a value chain implements UNTP then it becomes possible to trace product provenance across value chains back to primary production. There is no need for all actors in a value chain to collaborate or to implement at the same time. In many cases, the timing and incentives in different industry sectors of the same value chain will be very different. For example a leather goods manufacturer will usually be unable to influence the behaviour of cattle farmers because leather is a by-product and their focus is on the food value chain. Nevertheless, when an agriculture sector implements UNTP for their own reasons, the leather manufacturer can still access the data because UNTP provides a traceability mechanism that crosses industry boundaries without requiring collaboration between those industry sectors. In the example below, a battery can be traced to raw material production even when, from the perspective of the miner, the copper in the anode represents a tiny fraction of production.



# Verifiable Credentials

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## Overview

The World-Wide-Web Consortium (W3C) has defined a [data model for Verifiable Credentials](#) (VCs). A VC is a portable digital version of everyday credentials like education certificates, permits, licenses, registrations, and so on. VCs are digitally signed by the issuing party and are tamper evident, privacy preserving, revocable, and digitally verifiable. The UN has previously assessed this standard and has recommended its use for a variety of cross border trade use cases in a recent [white paper](#). VCs are inherently decentralized and so are an excellent fit for UNTP which recommends that passports, credentials, and traceability events are all issued as W3C VCs. A related W3C standard called [Decentralized Identifiers \(DIDs\)](#) provides a mechanism to manage the cryptographic keys used by verifiable credentials and also to link multiple credentials into verifiable trust graphs. DIDs are not the same as the business / product / location identifiers maintained by authoritative agencies - but can be linked to them.

## Business requirements for UNTP application of VCs

Verifiable Credentials technology is one of the key tools in the UNTP anti-green-washing toolbox. But there are many different technical implementation options which presents an interoperability risk - namely that credentials issued by one party will not be understandable or verifiable by another party. UNTP will not design new technical standards as that is the role of technology standards bodies such as W3C or IETF. However, by recommending the use of the narrowest practical set of technical options for a given business requirement, the UNTP can enhance interoperability.

A key design principle that is applicable to decentralized ecosystems such as UNTP recommends is [Postel's robustness principle](#) which, for UNTP, means that **an implementation should be conservative in its sending (issuing) behavior, and liberal in its receiving (verifying) behavior**. That is because the sustainability evidence that is discovered in any given value chain may be presented as many different versions of W3C VCs, or ISO mDL credentials, or Hyperledger Anoncreds,

or as human readable PDF documents. Being as open as possible in what is received and verified will allow sustainability assessments to be made over a wide set of evidence. Conversely, choosing a narrow set of ubiquitous technology options when issuing UNTP credentials such as digital product passports will simplify the task of verifiers and minimise costs for the entire ecosystem.

| <b>ID</b> | <b>Name</b>    | <b>Requirement Statement</b>  | <b>Solution Mapping</b>                 |
|-----------|----------------|---|---|
| VC-01     | Integrity      | VC technology recommendations must support tamper detection, issuer identity verification, and credential revocation so that verifiers can be confident of the integrity of UNTP credentials.   | All VC options support this requirement |
| VC-02     | Compatibility  | VC technology recommendations for issuing UNTP credentials should be as narrow as practical and should align with the most ubiquitous global technology choices so that technical interoperability is achieved with minimal cost                  | Basic profile                           |
| VC-03     | Human readable | VC technology recommendations must support both human readable and machine readable credentials so that uptake in the supply chain is not blocked by actors with lower technical maturity.  | Render method                           |
| VC-04     | Discovery      | VC technology recommendations must support the discovery and verification of credentials from product identifiers so that verifiers need not have any a-priori knowledge of or relationship to either the issuers or the subjects of credentials. | Presentations                           |
| VC-05     | Semantics      | VC technology recommendations must support the use of standard web vocabularies so that data from multiple independent credentials can be meaningfully aggregated.  | Vocabularies                            |
| VC-06     | Performance    | VC technology recommendations should value performance so that graphs containing hundreds of  | Basic profile                           |

| ID    | Name        | Requirement Statement  | Solution Mapping |
|-------|-------------|--|------------------|
|       |             | credentials of any size can be traversed and verified efficiently.   |                  |
| VC-07 | Compliance  | VC technology recommendations must meet any technology based regulatory requirements that apply in the countries in which credentials are issued or verified.  | Basic profile    |
| VC-08 | Openness    | VC DID method recommendations must not drive users towards closed ecosystems or proprietary ledgers so that there is no network effect coercion towards proprietary ledgers.   | DID methods      |
| VC-09 | Portability | VC DID method recommendations must allow users (issuers) to move their DID documents between different service providers so that long duration credentials can remain verifiable even when issuers change service providers. | DID methods      |
| VC-10 | Evolution   | VC technology is evolving and UNTP recommendations must evolve as newer tools and versions become ubiquitous   | Roadmap          |

## VC basic profile

The VC basic profile is designed to be as simple, lightweight, and interoperable as possible. A conformant implementation

- MUST implement the [W3C VC Data Model v1.1](#) using the JSON-LD Compacted Document Form
- SHOULD implement the [W3C VC Data Model v2.0](#) using the JSON-LD Compacted Document Form
- MUST implement [W3C VC Bitstring Status List](#) for credential status checks including revocation checks
- MUST implement [W3C-DID-CORE](#) using DID methods defined in [DID methods](#)
- MUST implement the enveloping proof mechanism defined in [W3C VC JOSE / COSE](#) with JOSE (Section 3.1.1)

- SHOULD implement the embedded proof mechanism defined in [W3 Data Integrity proof](#)

## DID methods

There are a large number of did methods listed in the [W3C did register](#). It is reasonable to expect that this proliferation of did methods will consolidate to a much smaller number of did methods, each designed to meet a specific business need. In future the UNTP may provide a did method decision tree with different methods for different use cases (eg legal entities vs products). In the meantime, a conformant implementation

- MUST implement the [did:web method](#) as an Organizational Identifiers
- SHOULD implement the did:web method using the web domain of the issuer to avoid portability challenges.

Note that there is activity within the VC technical community to define new did methods that achieve the ubiquity of did:web whilst still maintaining portability across web domains. For example [Trusted DID Web](#). This work may impact future UNTP DID method recommendations.

## Render Method

To support uptake across supply chain actors with varying levels of technical maturity, human rendering of digital credentials is essential. A conformant implementation

- SHOULD use the `renderMethod` property as defined in the [VC data model](#).

## Presentations

Verifiable Presentations (VP) are widely used in the verifiable credentials ecosystem to support holders to combine one or more credentials in a digital wallet and then present them for in-person or online verification purposes. The VP is signed by the holder did and so provides a holder binding mechanism. In UNTP supply chain implementations, the subject of most claims is an inanimate object (eg bar-coded goods) and digital credentials about the goods are discovered by any party that has access to the goods. The box of goods does not create verifiable presentations on demand and the binding is to the identity of the goods. A conformant UNTP implementation

- MUST issue and publish product passports, product conformity credentials, and traceability events as verifiable credentials and MUST include the identifier of the goods within the VC subject.
- MAY exchange these and any other credentials as verifiable presentations in wallet-to-wallet transfers or any other method.

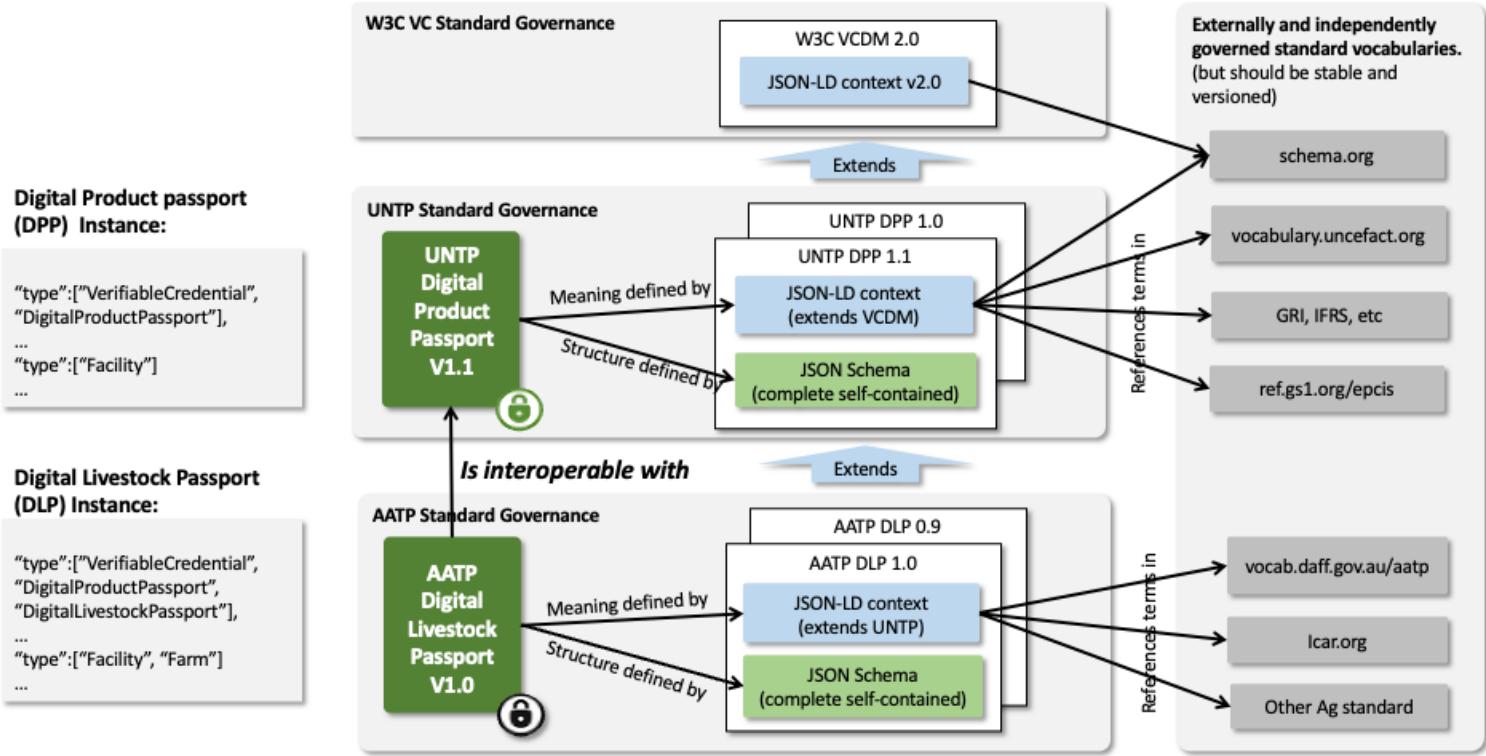
# Vocabularies

A shared understanding of the meaning of claims made in verifiable credentials is essential to interoperability. To this end, conformant UNTP implementations

- MUST use the [JSON-LD](#) syntax for the representation of data in all issued credentials.
- MUST reference the relevant [UNTP @context](#) file for the given credential type. These context files are themselves extention of the W3C VC Data Model 2.0 context.
- MAY extend credentials with additional properties but, if so, MUST include additonal @context file reference that defines the extended properties. The @vocab "catch-all" mechanism MUST NOT be used.
- SHOULD implement widely used industry vocabularies such as [schema.org](#) or [GS1 web vocabulary](#) as a first choice for UNTP extensions requiring terms not in the UN vocabulary.
- MAY use any other published JSON-LD vocabulary for any other industry or country specific extensions.
- MUST maintain @context files at the same granularity and version as the corresponding credentila type. This prevents the risk of verification failures when context files change after credentials are issued.
- SHOULD provide a complete and versioned JSON schema for each credential type. This is to facilite simple and robust implementations by developers without detailed knowledge of JSON-LD.

The data governance architecture for UNTP credentials is shown below. the key points to note are

- That credential instances contain Verifiable Credential Data Model (VCDM) type references for each unquely identified linked-data object. Each extension builds upon parent types and is enumerated in the type array (eg `["Facility", "Farm"]`).
- UNTP @context types are `protected` and so MUST not be duplicated in extensions. Similarly UNTP @context does not duplicate `protected` terms in WCDM @context.
- Unlike @context files, the JSON schema for each credential MUST be a complete schema that defines the entire credential including terms from VCDM and UNTP.



# Roadmap

Future versions of this specification will

- Provide richer guidance on did methods via a decision tree that helps to select the right method for the right purpose
- Provide guidance on selective redaction methods to better support confidentiality goals.
- Provide timelines for transition between versions of technical specifications (eg when VCDM 2.0 will change from SHOULD support to MUST support)

# Digital Product Passport

## ! INFO

Please note that this content is under development and is not ready for implementation. This status message will be updated as content development progresses.

- Latest JSON-LD @context : <https://test.uncefact.org/vocabulary/untp/dpp/0/3/6/untp-dpp-context.jsonld>
- Latest JSON Schema : <https://test.uncefact.org/vocabulary/untp/dpp/0/3/6/untp-dpp-schema.json>
- Example DPP : [untp-digital-product-passport-v0.3.6 \(battery use case\)](#)

## Versions

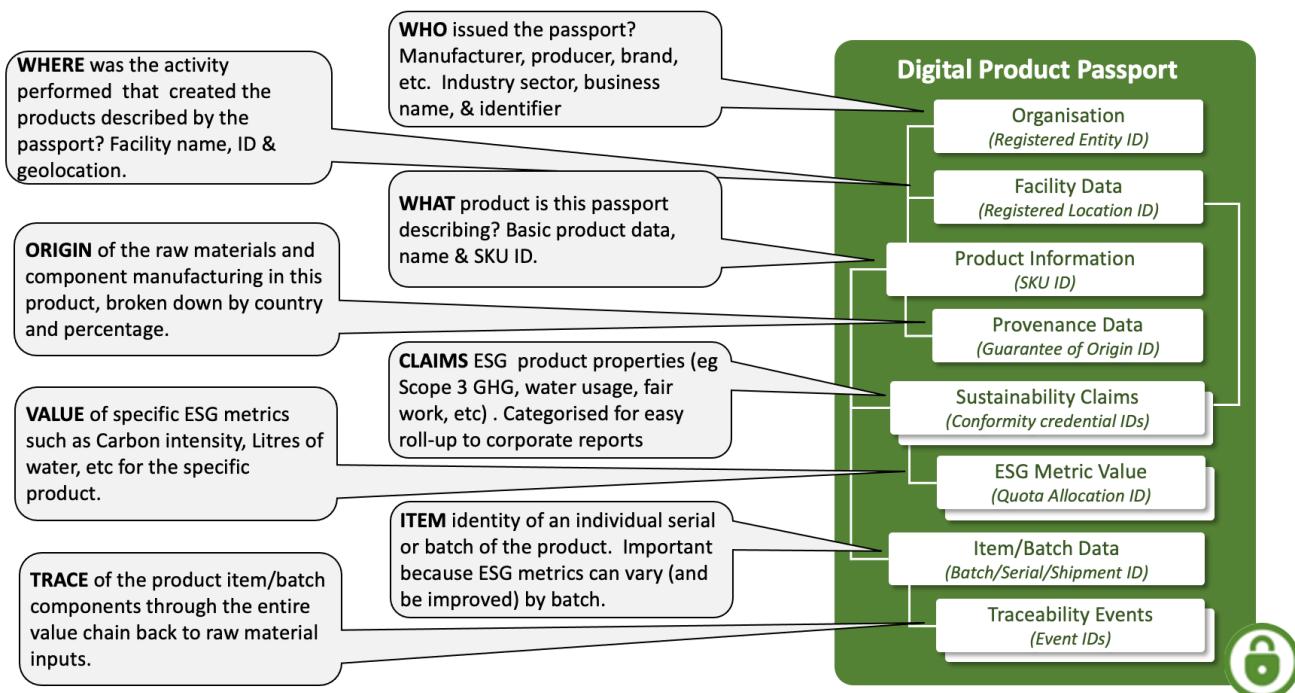
| DPP Version | Date       | Status | Change summary                                       | JSON-LD Context          | JSON Schema            |
|-------------|------------|--------|--|--------------------------|------------------------|
| 0.3.0       | 01-07-2024 | Raw    | Refactored to build on untp-core                     | <a href="#">@context</a> | <a href="#">Schema</a> |
| 0.3.1       | 25-07-2024 | Draft  | Bug fixes and sample values added                    | <a href="#">@context</a> | <a href="#">Schema</a> |
| 0.3.6       | 22-08-2024 | Draft  | Consistency enhancements.<br>Ready for pilot testing | <a href="#">@context</a> | <a href="#">schema</a> |

## Overview

The digital product passport (DPP) is issued by the shipper of goods and is the carrier of **product and sustainability information** for every serialised product item (or product batch) that is shipped between actors in the value chain. It is deliberately **simple and lightweight** and is designed to carry the minimum necessary data at the **granularity** needed by the receiver of goods - such as the scope 3 emissions in a product shipment. The passport contains links to **conformity credentials** which add

trust to the ESG claims in the passport. The passport also contains links to **traceability events** which provide the "glue" to follow the linked-data trail (subject to confidentiality constraints) from finished product back to raw materials. The UNTP DPP does not conflict with national regulations such as the EU DPP. In fact, it can usefully be conceptualised as the **upstream B2B feedstock** that provides the data and evidence needed for the issuing of high quality national level product passports.

## Conceptual Model



## Requirements

The digital product passport is designed to meet the following detailed requirements as well as the more general [UNTP Requirements(<https://uncefact.github.io/spec-untp/docs/about/Requirements>)]

| ID     | Name                 | Requirement Statement  | Solution Mapping   |
|--------|----------------------|--|--|
| DPP-01 | product, batch, item | The DPP should support use at either product level or at batch level or at individual serialised item level. | Claims are made at the passport level, which MUST have a related product and |

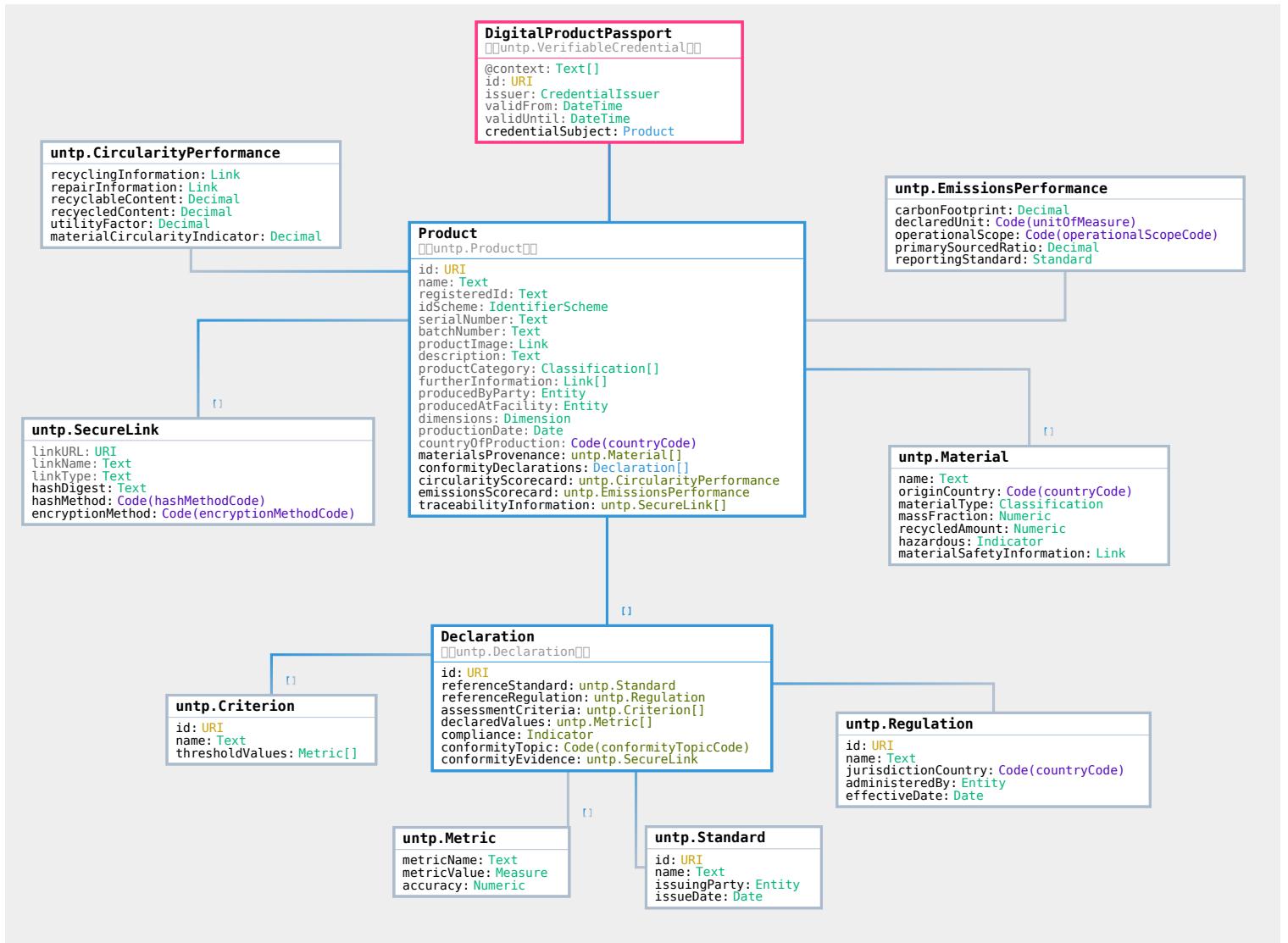
| <b>ID</b> | <b>Name</b>          | <b>Requirement Statement</b>  | <b>Solution Mapping</b>   |
|-----------|----------------------|---|---|
|           |                      |   | MAY have a related batch and item   |
| DPP-02    | Classification       | The DPP should support any number of product classifications using codes from a defined classification scheme (eg UN-CPC)   | The classifications property  |
| DPP-03    | Materials provenance | The DPP should provide a simple structure to allow issuers to break down the material composition of their products by mass fraction and origin country so that raw material provenance requirements are easily assessed and met.                       | The DPP "materialsProvenance" structure is designed to meet this need.              |
| DPP-04    | Produced at          | The DPP should provide a simple structure to describe the manufacturing facility at which the product was made. The facility identifier SHOULD be resolvable and verifiable and SHOULD link to cadastral boundary information.                          | The "Facility" structure including the location class is designed to meet this need |
| DPP-05    | Dimensions           | The DPP must support the definition of key product dimensions such as length, width, height, weight, volume so that conformity claims made at the unit level (eg Co2 intensity in Kg/Kg) can be used to calculate actual values for the shipped product | Dimensions class  |
| DPP-06    | Traceability         | The DPP should provide a means to follow links to further DPPs and conformity credentials of constituent products so that (subject to   | The links to ISO/IEC 19987 (EPCIS)-based traceability event credentials from the    |

| ID     | Name             | Requirement Statement   | Solution Mapping   |
|--------|------------------|---|--|
|        |                  | confidentiality constraints), provenance claims can be verified to any arbitrary depth up to primary production   | productBatch class is designed to meet this need   |
| DPP-07 | characteristics  | The DPP should allow an issuer to provide descriptive information about the product (image, description, etc) that is extensible to meet industry specific needs.                                   | Characteristics property as an industry extension point  |
| DPP-08 | Verifiable Party | The DPP should provide DPP issuer, product manufacturer, and facility operator identification including a name, a resolvable and verifiable identifier, and proof of ownership of the identifier    | DigitalProductPassport.Issuer<br>Product.ProducedByParty,<br>Product.ProducedAtFacility - all are uniquely identified objects and SHOULD have related resolvable <a href="#">Identity Resolver</a> credentials |
| DPP-09 | Claims           | The DPP MUST provide a means to include any number of conformity claims within one DPP so that it can provide simple single point to aggregate all claims about the product in one place            | The "conformityClaims" array is designed to meet this need   |
| DPP-10 | Conformity Topic | The DPP MUST provide a simple mechanism to express the sustainability/circularity/conformity topic for each claim so that similar claims can be grouped and the high level scope easily understood. | The ConformityTopic code list is designed to meet this need  |
| DPP-11 | Metrics          | The DPP MUST provide a simple mechanism to quantify a conformity claim (eg carbon intensity, water  | The "Metric" class is designed to meet this need   |

| <b>ID</b> | <b>Name</b> | <b>Requirement Statement</b>   | <b>Solution Mapping</b>   |
|-----------|-------------|--|---|
|           |             | consumption, etc) and to express any accuracy range and also to compare the claimed value to a relevant benchmark such as a standard/regulation requirement or an industry average   |   |
| DPP-12    | Criteria    | The DPP MUST provide a means to reference a standard or regulation as well as the specific criteria within that standard or regulation - so that claims can be understood in terms of the criteria against which they are made.  | Claim.referenceRegulation,<br>Claim.referenceStandard,<br>Claim.referenceCriterion        |
| DPP-13    | Evidence    | The DPP MUST provide a means to reference independent conformity assessments that support and verify the claims being made. The related evidence SHOULD be digitally verifiable but MAY be a simple document or web page. The confidence level attached to the evidence should be clear. | The Claim.conformityEvidence property references a relevant digital conformity credential |

## Logical Model

The Digital Product Passport is an assembly of re-usable components from the UNTP core vocabulary.



## Core Vocabulary Documentation

The [UNTP core types vocabulary](#) defines the uniquely identified Linked Data entities such as Product, Location, Facility, Party, Standard, Regulation, Criteria, Declaration, Attestation, Endorsement. These entities provide the building blocks for construction of Digital Product Passports and Digital Conformity Credentials.

## DPP Documentation

The [DPP documentation](#) provides a technology-neutral definition of classes, properties and code lists in the DPP model.

## Implementation Guidance

This section provides sample JSON-LD snippets for each DPP component.

## Verifiable Credential

All DPPs are issued as W3C Verifiable Credentials and MUST conform to the [VCDM 2.0](#). Also note that all identified objects (ie those with an "id" property also have a "type" property that indicates the Linked Data type of the object. The "type" values must be defined in the associated JSON-LD @context file. Key points to note from the VC sample below are

- That the credential type is both a W3C "VerifiableCredential" and a UNTP "DigitalProductPassport".  
The DPP is an extension of the VCDM.
- That the "@context" reference similarly lists both the W3C VCDM context URL and the UNTP DPP context URL.
- The "id" is any globally unique reference for this specific DPP credential - typically a domain/UUID pattern.
- The issuer property, unlike most VC examples, is an object with multiple properties.
  - The object conforms to the UNTP "CredentialIssuer" type.
  - The id SHOULD be a DID and, if it is a DID then it MUST be a did:web.
  - The name property provides a human readable name of the issuer.
  - The array of "otherIdentifiers" is used to provide references to authoritative business identifiers for the issuer. In the example shown the issuer is also identified as an Australian Business with an ABN and link to the authoritative business register entry.
- The validFrom and ValidTo fields are as defined in the W3C VCDM. They are optional but UNTP DPPs SHOULD include a validFrom date representing the date that the DPP was issued.
- The credential subject carries the bulk of the digital product passport information. It's type is both a UNTP "Entity" and a UNTP "Product".

```
{  
  "type": [  
    "DigitalProductPassport",  
    "VerifiableCredential"  
  ],  
  "@context": [  
    "https://www.w3.org/ns/credentials/v2",  
    "https://test.uncefact.org/vocabulary/untp/dpp/0.3.6/"  
  ],  
  "id": "https://example-company.com/credentials/2a423366-a0d6-4855-ba65-  
2e0c926d09b0",  
  "issuer": {
```

```

"type": [
  "CredentialIssuer"
],
"id": "did:web:identifiers.example-company.com:12345",
"name": "Example Company Pty Ltd",
"otherIdentifiers": [
  {
    "type": [
      "Entity"
    ],
    "id": "https://business.gov.au/ABN/View?abn=1234567890",
    "name": "Sample Company Pty Ltd",
    "registeredId": "1234567890",
    "idScheme": {
      "type": [
        "IdentifierScheme"
      ],
      "id": "https://business.gov.au/ABN/",
      "name": "Australian Business Number"
    }
  }
]
},
"validFrom": 2024,
"validUntil": 2034,
"credentialSubject": {
  "type": [
    "Product",
    "Entity"
  ],
  "id": "https://id.gs1.org/01/09520123456788/21/12345",
  ... remainder of product passport information goes here ...
}

```

## Product

The Product object is the the subject of the verifiable credential. Key points to note from the product snippet below are

- That the product identification comprises five properties that identify both the specific product and the identifier scheme as defined by the UNTP Entity core type. The expectation is that the product ID in the DPP will match the information printed on the physical product or its container (for bulk goods) and that the identifier is a **resolvable and verifiable ID**. So, scanning a physical product QR code (or resolving its 1D barcode) should return a link type that is a pointer to the DPP described by the specification.

- DPPs may be issued at product class level (i.e. all shoes of the same model) or at the individual item level (ie this specific serialised pair of shoes). `serialNumber` and/or `batchNumber` MUST be provided if the DPP is issued at item level.
- The `productImage` is expected to be an instance of the UNTP `Link` object that provides `linkURL` and metadata.
- `productCategory` is expected to be an array of UNTP `Classification` objects that classify the product using a global scheme such as [UN CPC](#). Industry-specific classification schemes (eg cattle breed) may also be used.
- `furtherInformation` is an array of UNTP `Link` types that optionally provide links to additional information such as material safety data sheets etc. The `linkType` values should match the `linkTypes` returned by an [Identity Resolver](#) service for the same product ID.
- `producedByParty` is a UNTP `Entity` type that identifies the producer or manufacturer of the product.
- `producedAtFacility` is a UNTP `Entity` type that identifies the manufacturing site or farm or mine site where the product was produced.
- The `dimensions` object defines the `length`, `width`, `height`, `weight`, `volume` dimensions of the product. Implementers should choose the relevant dimensions to include for the product.
- The `productionDate` is relevant for batch or serialised items and should indicate the date that the specific batch or item was produced.
- The `countryOfProduction` property must carry the ISO-3166 two letter country code for the country where the product was manufactured. Note that this represents only the country of manufacture for the identified product. The provenance of materials used to make the product are defined separately.
- The `characteristics` property provides an extension point for commodity-specific properties such as battery capacity in AmpHours or shirt size. UNTP does not define values for this property but does provide guidance for [industry extensions](#).
- `materialsProvenance` is an array of UNTP `Material` types that define the origin and characteristics of constituent materials in the product.
- `conformityInformation` is an array of `Claim` types that list the product quality or sustainability claims made by the manufacturer against criteria defined by a reference standard or regulation. The [sustainability vocabulary](#) is designed to accommodate the very diverse set of conformity criteria expressed by various standards and regulations.
- `circularityInformation` is a simple object that defines the overall percentage of recycled content (and recyclable content) as well as links to recycling and repair information.
- `traceabilityInformation` is an array of `Link` objects that reference UNTP [Digital Traceability Events](#). This provides traceability through the value chain via events such as the

TransformationEvent that lists the input product identifiers and the output product identifiers for a manufacturing process.

```
"credentialSubject": {
  "type": [
    "Entity",
    "Product"
  ],
  "id": "id.example.com/01/09520123456788/10/6789/21/12345",
  "name": "Baked beans, tinned, 500g.",
  "idValue": "09520123.456788",
  "idScheme": "ref.gs1.org/ai/",
  "idSchemeName": "GS1 SGTIN",

  "serialNumber": "12345",
  "batchNumber": "6789",
  "productImage": {},
  "description": "Big and tender Great Northern Beans in tasty tomato sauce. These beans are rich in fiber and low in fat. Fiber rich food helps to maintain a healthier digestive system & reduces cholesterol.",
  "productCategory": [],
  "furtherInformation": [],
  "producedByParty": {},
  "producedAtFacility": {},
  "dimensions": {},
  "productionDate": "2024-04-25",
  "countryOfProduction": "AU",
  "characteristics": {},
  "materialsProvenance": [],
  "conformityInformation": [],
  "circularityScoreCard": {},
  "emissionsScorecard": {},
  "traceabilityInformation": []}
```

## Dimensions

The `dimension` type is a simple array of decimal values for length, width, height, weight, and volume. Units MUST be drawn from [UNECE recommendation 20 units of measure](#)

```
"dimensions": {
  "length": {"value": 0.87, "unit": "MTR"},
  "width": {"value": 0.5, "unit": "MTR"},
  "height": {"value": 0.3, "unit": "MTR"},
```

```
"weight": {"value": 8, "unit": "KGM"},  
"volume": {"value": 7.5, "unit": "LTR"}
```

## Materials Provenance

An array of `Material` objects is used to describe the constituent materials in a product and to define some key properties of each material

- A human readable `name`
- The `originCountry` as a 2-letter ISO-3166 code.
- The material type as a UNTP `Classification` object. The relevant classification scheme to use depends on the commodity type of the products. For example batteries may use the emerging [UNFC](#)
- The `massFraction` is the percentage by mass of the product that is made from this constituent material.
- The `recycledAmount` is the percentage by mass of this material constituent that is made from recycled sources.
- The `hazardous` flag is a boolean that indicates whether this material constituent is a hazardous material
- If the hazardous flag is `true` then a `Link` object should provide `materialSafetyInformation`.

```
"materialsProvenance": [  
  {  
    "name": "Egyptian Cotton",  
    "originCountry": "EG",  
    "materialType": {},  
    "massFraction": 50,  
    "recycledAmount": 50,  
    "hazardous": "false",  
    "materialSafetyInformation": {}  
}
```

## Emissions Scorecard

The Emissions scorecard provides an overall GHG emissions performance indicator for the product. More detailed emissions performance data measured against specific criteria and standards would be placed into the `conformityInformation` structure.

- The carbonFootprint represents GHG emissions intensity CO2eq for the product.
- The declared unit defines the product unit per KG Co2Eq (usually KGM)
- the operational scope represents the scope 3 boundary - which should be cradle to gate for DPPs (ie does not include post sale footprint)
- the primarySourcedRatio indicates the proportion of scope 3 emissions data that is directly sources (rather than estimated)

```

"emissionsScorecard": {
  "carbonFootprint": 1.5,
  "declaredUnit": "KGM",
  "operationalScope": "Scope123toGate",
  "primarySourcedRatio": 0.3,
  "reportingStandard": {
    "type": [
      "Standard"
    ],
    "id": "https://www.wbcsd.org/resources/pathfinder-framework-version-2-0/",
    "name": "WBSCD Pathfinder framework - V.2.0",
    },
    "issueDate": 2023
  },
},

```

## Circularity Scorecard

The circularity Scorecard provides a simple high level summary of circularity performance of the product. This summary may be further supported by detailed information and evidence in one or more **Declarations** within the **conformityInformation** data.

- **recyclingInformation** provides a **Link** to recycling instructions. Primarily targeted at recycling centers.
- **repairInformation** provides a link to repair instructions. Primarily targeted at end users or repair service centers.
- **recyclableContent** is a percentage indicating the proportion by mass of the product that is designed to be recycled.
- **recycledContent** is a percentage indicating the proportion by mass of the product that is made from recycled materials
- **utiltiyFactor** provides a measure of durability of the product above or below industry average

- `materialCircularityIndicator` provides an overall circularity score which is a function of all three of the above measures [MCI reference](#)

```
"circularityScorecard": {
  "recyclingInformation": {
    "linkURL": "https://files.example-
company.com/products/123456789/recycling.pdf",
    "linkName": "Recycling instructions",
    "linkType": "https://www.gs1.org/voc/recyclingAndRepairInfo"
  },
  "repairInformation": {
    "linkURL": "https://files.example-company.com/products/123456789/repair.pdf",
    "linkName": "Repair instructions",
    "linkType": "https://www.gs1.org/voc/recyclingAndRepairInfo"
  },
  "recyclableContent": 0.5,
  "recyecledContent": 0.3,
  "utilityFactor": 1.2,
  "materialCircularityIndicator": 0.67
},
```

## Traceability Information

Traceability Information is an array of links (with context information) to UNTP Digital Traceability Event (DTE) structures.

```
"traceabilityInformation": [
  {
    "linkURL": "https://files.sampleCompany.com/events/123456789.json",
    "linkName": "Battery Assembly Event",
    "linkType": "https://test.uncefact.org/vocabulary/linkTypes/dte",
    "hashDigest": "50af99a26f4af48c9f4ad8cf9d2f5018780ab4bb1167f0e94884ec228f1ba832",
    "hashMethod": "SHA-256",
    "encryptionMethod": "AES"
  }
]
```

## Conformity Information

Conformity information is included in the DPP as an array of UNTP `Declaration` structures. The same structure is re-used for third party assessments in UNTP Digital Conformity Credentials (DCC). Please refer to the [Sustainability Vocabulary Page](#) for further information and examples.

# Working examples from pilot projects

| Project | DPP Version | Description       | Credential                    | Rendered View                 |
|---------|-------------|-------------------|-------------------------------|-------------------------------|
| AATP    | 0.1.0       | Packaged Meat DPP | <a href="#">sample DPP VC</a> | <a href="#">DPP VC Viewer</a> |

# Conformity Credential

## ! INFO

Please note that this content is under development and is not ready for implementation. This status message will be updated as content development progresses.

- Latest JSON-LD @context : [DCC v0.3.7 JSON-LD context](#)
- Latest JSON Schema : [DCC v0.3.7 JSON schema](#)
- Sample Instance : [DCC v0.3.7 JSON sample \(better data needed\)](#)

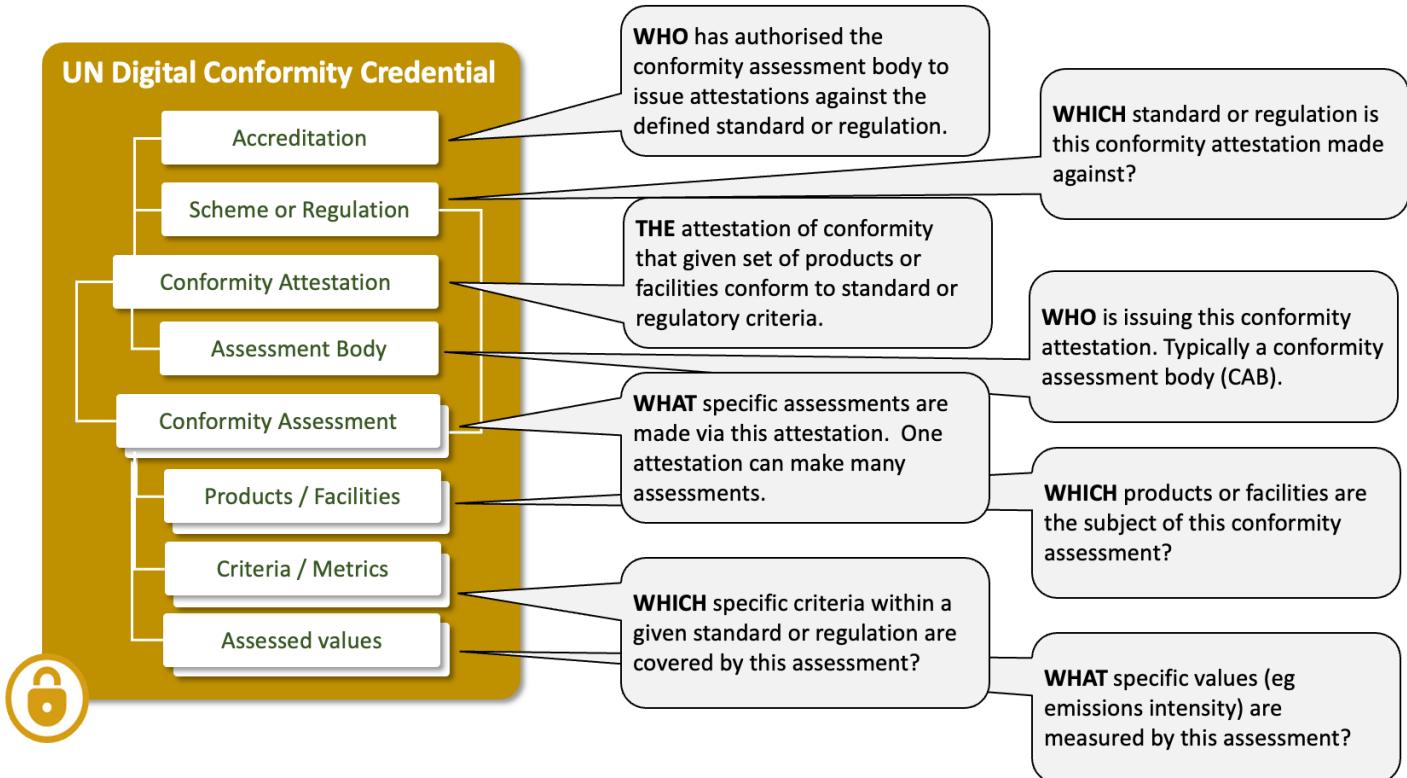
## Versions

| DPCC Version | Date       | Status | Change Log   | JSON-LD Context         | JSON Schema            |
|--------------|------------|--------|--|-------------------------|------------------------|
| 0.3.0        | 01-07-2024 | Raw    | rebuilt on untp-core vocabulary                                  | DPP context - TBA       | DPP schema - TBA       |
| 0.3.7        | 22-08-2024 | Draft  | Resolved issues, aligned with untp core, ready for pilot testing | <a href="#">context</a> | <a href="#">schema</a> |

## Overview

Conformity credentials are usually issued by independent third parties and provide a **trusted assessment** of product ESG performance against credible **standards or regulations**. As such the credential provides trusted verification of the ESG claims in the passport. Since the passport may make several independent claims (eg emissions intensity, deforestation free, fair work, etc) there may be many linked conformity credentials referenced by one passport. As an additional trust layer, the conformity credential may reference an **accreditation** credential that attests to the authority of the third party to perform the specific ESG assessments. The conformity credential data model has been developed by a separate UN/CEFACT project on digital conformity that has expert membership from accreditation authorities and conformity assessment bodies.

# Conceptual Model



## Requirements

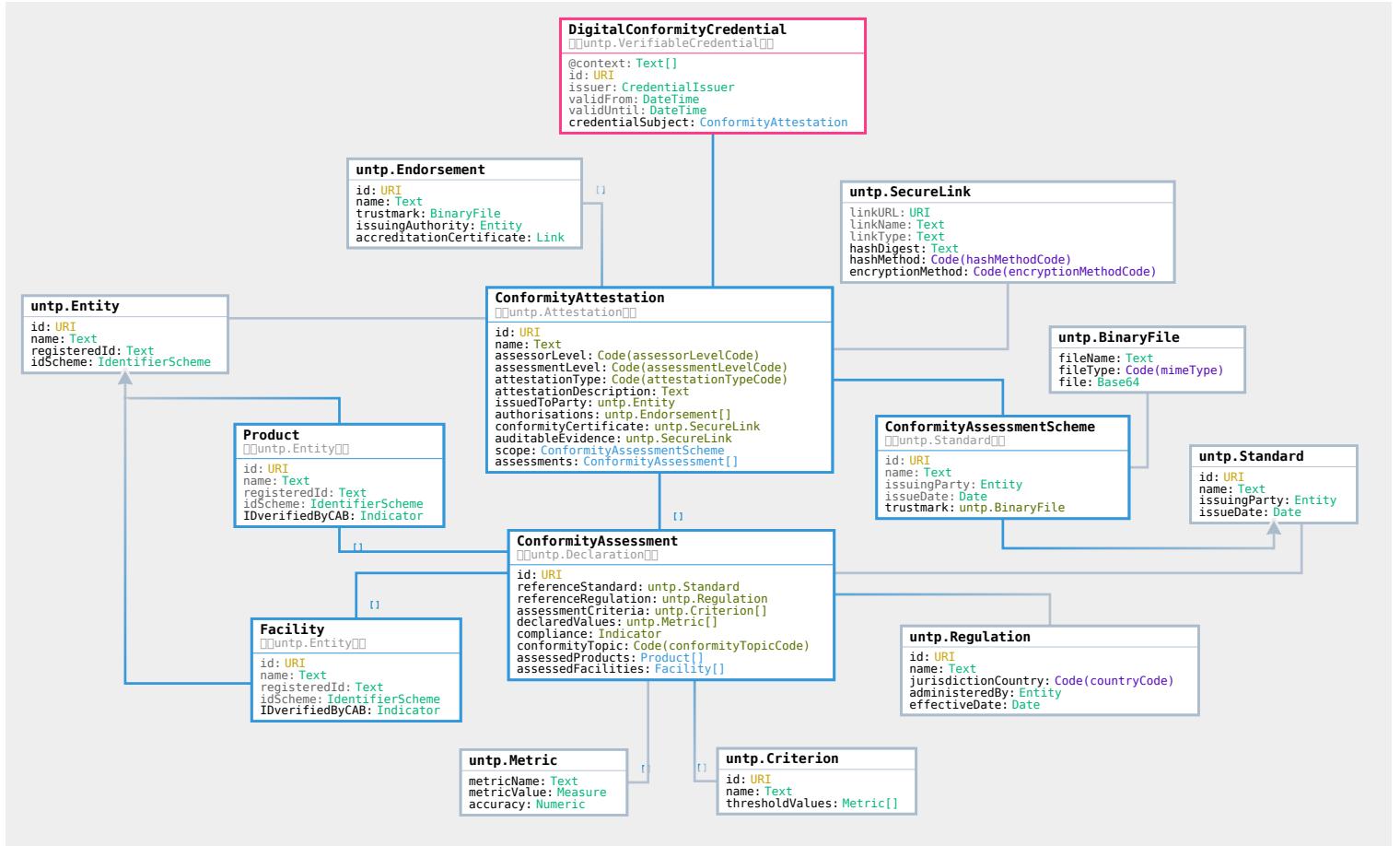
The digital product conformity credential (DPCC) is designed to meet the following detailed requirements as well as the more general [UNTP Requirements(<https://uncefact.github.io/spec-untp/docs/about/Requirements>)]

| ID      | Name              | Requirement Statement  | Solution Mapping  |
|---------|-------------------|--|---|
| DPCC-01 | Authorised source | The DPCC MUST be verifiable as issued by an authorised source, typically a conformity assessment body (CAB)  | DPCC MUST be issued as a digital <b>verifiable credential</b> signed by the CAB |
| DPCC-01 | Assurance level   | The DPCC MUST identify the nature of any authority or support for attestation, such as formal recognition by a Governmental authority or an Accreditation Body | Attestation, accreditation property   |

| <b>ID</b> | <b>Name</b>                      | <b>Requirement Statement</b>  | <b>Solution Mapping</b>  |
|-----------|----------------------------------|---|--|
| DPCC-03   | Subject of conformity            | The DPCC MUST unambiguously identify the subject of the conformity assessment, whether a product or facility.   | Assessment.<br>assessedProducts,<br>Assessment.<br>assessedFacilities                          |
| DPCCE-04  | Reference standard or regulation | The DPCC MUST identify the reference standard(s) and/or regulation(s) that specify the criteria against which the conformity assessment is made. If appropriate this must include specific measurable thresholds (eg minimum tensile strength)  | ConformityAssessment.<br>referenceStandard and<br>ConformityAssessment.<br>assessmentCriterion |
| DPCC-05   | Conformity Attestation           | The DPCCE MUST unambiguously state whether or not the subject of the assessment is conformant to the reference standard or regulation criteria  | ConformityAssessment.<br>compliance  |
| DPCC-06   | Measured metrics                 | The DPCCE SHOULD include actual measured values (eg emissions intensity, tensile strength, etc) with the conformity assessment  | ConformityAssessment.<br>declaredValues  |
| DPCC-07   | Evidence                         | The DPCCE MAY include references to audit-able evidence (eg instrument recordings, satellite images, etc) to support the assessment. If so then the hash of the evidence file-set SHOULD be included (so that an auditor can be sure that the evidence data has not changed). The evidence data MAY be encrypted with decryption keys provided on request | ConformityAttestation.<br>auditableEvidence  |

# Logical Model

The Digital Conformity Credential is an assembly of re-usable components from the UNTP core vocabulary.



## Core Vocabulary

The [UNTP core types vocabulary](#) defines the uniquely identified Linked Data entities such as Product, Location, Facility, Party, Standard, Regulation, Criteria, Declaration, Attestation, Endorsement. These entities provide the building blocks for construction of Digital Product Passports and Digital Conformity Credentials.

## DCC Documentation

[DCC class & property definitions](#)

## Implementation Guidance

## **Verifiable Credential**

See DPP section

## **Conformity Attestation**

Add implementation guidance

## **Scope (Conformity Assessment Scheme)**

Add implementation guidance

## **Authorisations (Endorsements)**

Add implementation guidance

## **Auditable Evidence (Secure Link)**

Add implementation guidance

## **Conformity Assessments**

Conformity assessments are included in the DCC as an array of UNTP [Declaration](#) structures. The same structure is re-used for third party assessments in UNTP Digital Product Passport (DPP). Please refer to the [Sustainability Vocabulary Page](#) for further information and examples.

## **Sample**

# Digital Traceability Events

## ! INFO

Please note that this content is under development and is not ready for implementation. This status message will be updated as content development progresses.

- Latest JSON-LD @context : [DTE v0.3.0 JSON-LD context](#)
- Latest JSON Schema : [DTE v0.3.0 JSON schema](#)
- Sample Instance : [DTE v0.3.0 JSON sample \(better data needed\)](#)

## Versions

| Version | Date       | status                  | changes  |
|---------|------------|-------------------------|--|
| 0.3.0   | 20-04-2024 | Raw (for review)        | Coming soon - fixing a bug   |
| 0.3.6   | 22-08-2024 | Draft for pilot testing | Aligned with UNTP core, modified to support multiple events per credential |

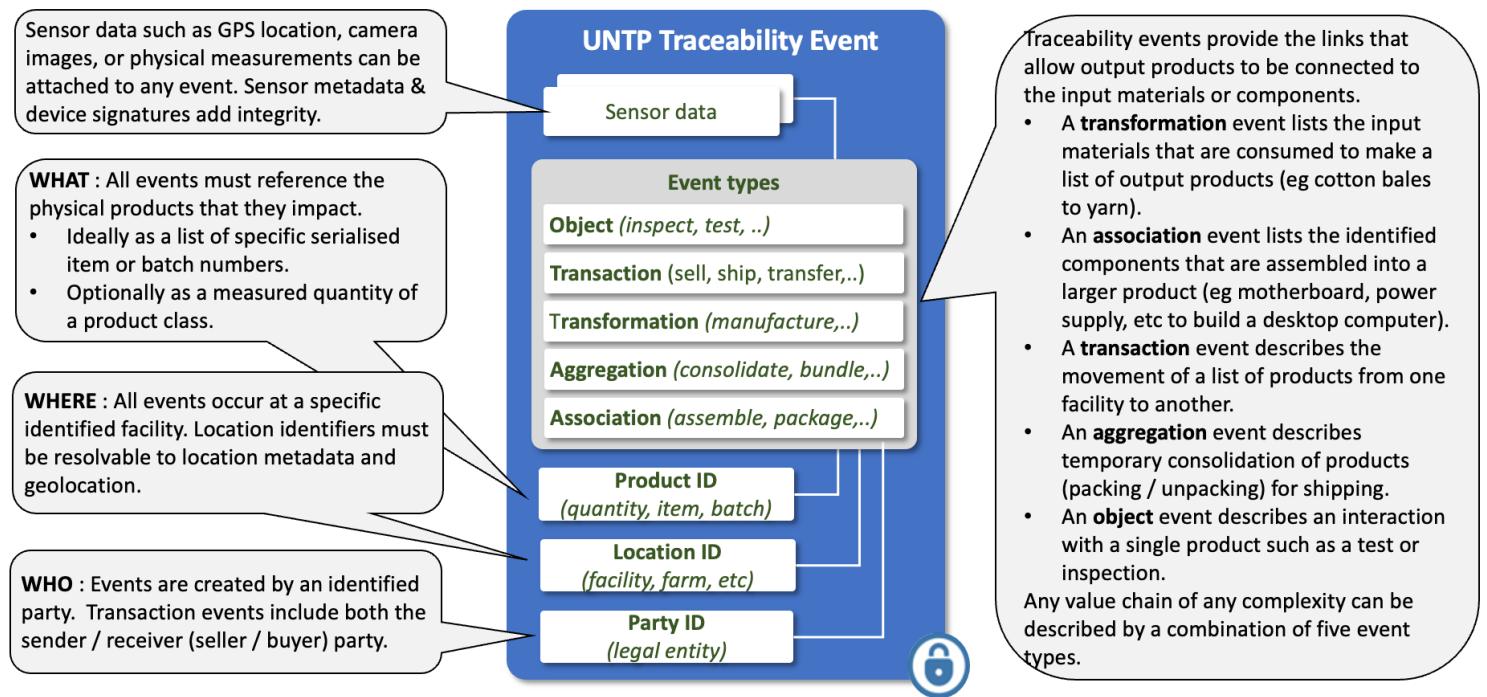
The current version of this specification is v0.3.0

## Overview

Traceability events are very lightweights collections of identifiers that specify the “what, when, where, why and how” of the products and facilities that constitute a value chain. The UNTP is based on the [GS1 EPCIS](#) standard for this purpose because it is an existing and proven mechanism for supply chain traceability. Note that UNTP supports but does not require the use of GS1 identifiers. The basic idea behind the traceability event structure is that any supply chain of any complexity can always be accurately modeled using a combination of four basic event types. An **object** event describes an action on specific product(s) such as an inspection. A **transaction** event describes the exchange of product(s) between two actors such as sale of goods between seller and buyer. An **aggregation** event describes the consolidation or de-consolidation of products such as stacking bales of cotton on a

pallet for transportation. An **association** event describes the assembly of sub-components to make a composite product. Finally, a **transformation** event describes a manufacturing process that consumes input product(s) to create new output product(s). The UNTP uses these events in a decentralised architecture as the means to traverse the linked-data "graph" that represents the entire value-chain.

## Conceptual Model



## Requirements

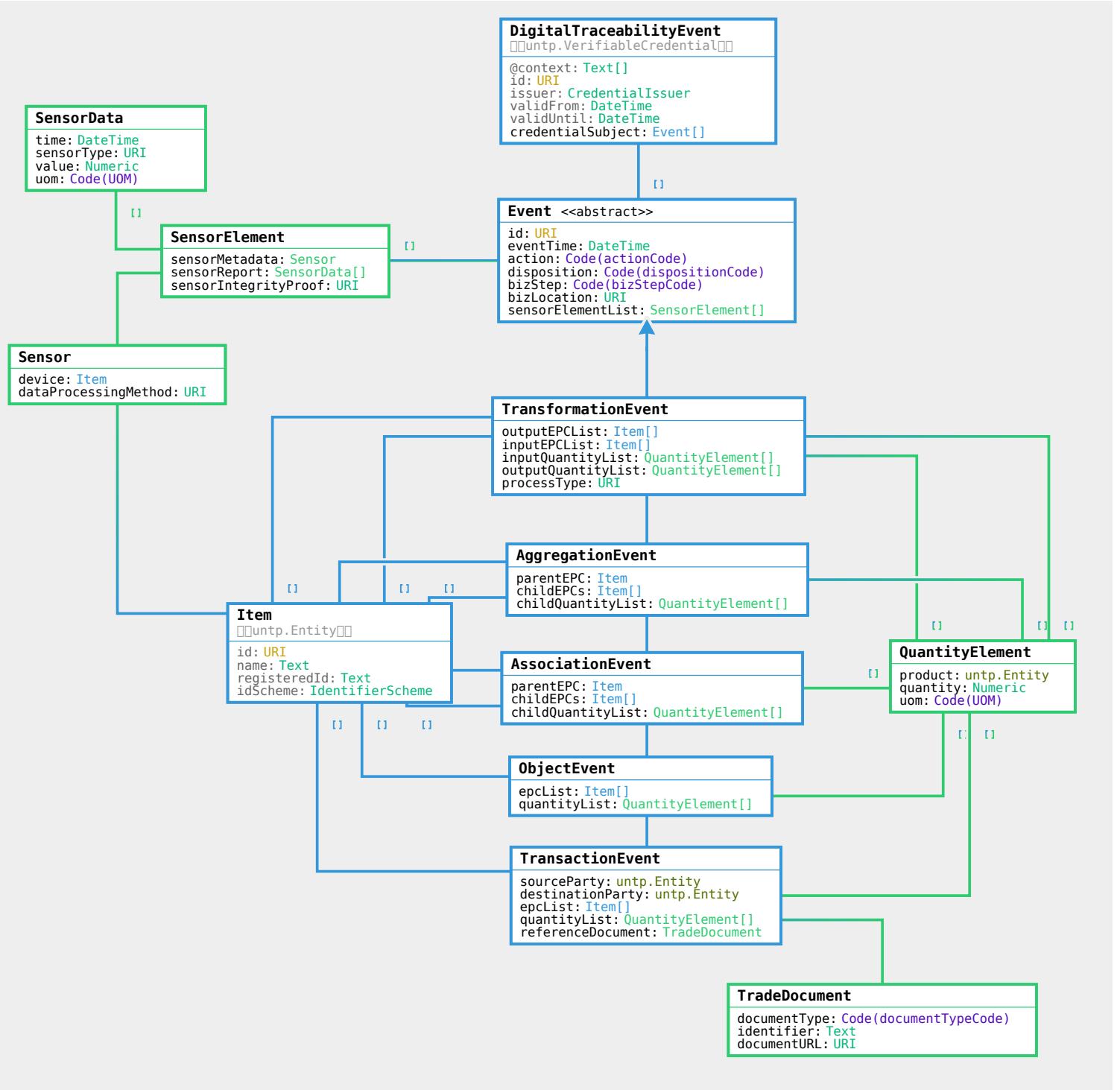
The traceability event is designed to meet the following detailed requirements as well as the more general [UNTP Requirements(<https://uncefact.github.io/spec-untp/docs/about/Requirements>)]

| ID     | Name           | Requirement Statement  | Solution Mapping  |
|--------|----------------|--|-------------------|
| TEV-01 | Sub-components | The traceability event MUST provide a mechanism to trace from a DPP representing a product assembly to the individual DPPs of each sub-assembly component part | Association Event |

| <b>ID</b> | <b>Name</b>         | <b>Requirement Statement</b>  | <b>Solution Mapping</b>                      |
|-----------|---------------------|---|--|
| TEV-02    | Consumed materials  | The traceability event MUST provide a mechanism to trace a manufactured product DPP back to the DPPs representing batches of input materials that are consumed in manufacturing one or more output products.  | Transformation Event] (#transformationevent) |
| TEV-03    | Aggregated bundles  | When a DPP represents an aggregated bundle of similar items (eg a pallet of cotton bales) then the traceability event MUST provide a means to allocate the aggregate measures to each individual item (ie each bale)                                      | Aggregation Event                            |
| TEV-04    | Transportation      | when a product (or consolidated consignment) is shipped from one physical location to another, the traceability event MUST provide a means to record the movement and associate sustainability measures such as transport emissions to the shipped bundle | Transaction event                            |
| TEV-05    | items or quantities | Traceability events MUST work equally well whether the input or output items are individually serialised items or measured quantities (mass or volume) of a product class.  | Items Quantity                               |
| TEV-06    | IoT Sensor data     | Traceability events will often be generated by or associated with physical sensor readings. In such cases, the traceability event SHOULD support the association of sensor data with the event  | Sensor element                               |

| <b>ID</b> | <b>Name</b>     | <b>Requirement Statement</b>   | <b>Solution Mapping</b> |
|-----------|-----------------|--|-------------------------|
| TEV-07    | Time & Location | Traceability events MUST always record the timestamp and physical location of the event so that multiple events can be connected in time and space | Event                   |

## Logical Model



# Data Definitions

## Event

This abstract event structure provides a common language to describe supply chain events such as shipments, inspections, manufacturing processes, etc. There are four types of event but this is an abstract class representing all common properties of an event.

| Property          | Definition  | Type                      |
|-------------------|---|---------------------------|
| eventID           | The unique identifier of this event - SHOULD be a UUID  | Text                      |
| eventTime         | The ISO-8601 date time when the event occurred.   | DateTime                  |
| action            | Code describing how an event relates to the life-cycle of the entity being described.   | Code<br>(actionCode)      |
| disposition       | Disposition code describing the state of the item after the event.  | Code<br>(dispositionCode) |
| bizStep           | A business step code drawn from a controlled vocabulary.  | Code<br>(bizStepCode)     |
| bizLocation       | A Business Location is a uniquely identified and discretely recorded geospatial location that is meant to designate the specific place where an object is assumed to be following an EPCIS event until it is reported to be at a different Business Location by a subsequent EPCIS event. The bizLocation must be a resolvable URI that links to facility information and geolocation data. | URI                       |
| sensorElementList | An array (one for each sensor) of sensor device data sets associated with the event.  | SensorElement             |

## Object Event

Object represents an event that happened to one or more physical or digital objects - such as an inspection or certification of a product or shipment. The physical objects may be identified either as specific items (eg a unique consignment number) or as a quantified amount of a product class (eg 100Kg of cotton yarn)

Note that object event includes all the properties of [Event](#) as well as the additional properties described below.

| Property     | Definition   | Type            |
|--------------|--|-----------------|
| epcList      | A list of uniquely identified items (eg specific items serial numbers or tagged shipments / packages) that are the focus of this object event. | Item            |
| quantityList | A quantified list of product classes (eg GS1 GTINs) that are the focus of this object event  | QuantityElement |

## Aggregation Event

Aggregation represents an event that happened to one or more objects that are physically aggregated together (physically constrained to be in the same place at the same time, as when cases are aggregated to a pallet). This event is also used to represent de-aggregation (eg unpacking) when businessStepCode is unpacking.

Note that aggregation event includes all the properties of [Event](#) as well as the additional properties described below.

| Property          | Definition  | Type            |
|-------------------|---|-----------------|
| parentEPC         | The unique item identifier that is the result of this aggregation. Typically a packaging ID used in shipments that represents a box/ pallet / container of contained items.   | Item            |
| childEPCs         | The list of child items that have been aggregated into the parent (or dis-aggregated from the parent). Maybe a list of package references (eg boxes on a pallet) or may be individual items (eg products in a box). | Item            |
| childQuantityList | List of quantified product classes that have been aggregated into the parent. Used when the child items do not have unique identifiers (eg 100 Kg of cotton bales)  | QuantityElement |

## Transaction Event

Transaction represents an event in which one or more objects become associated or disassociated with one or more identified business transactions - such as the purchase / shipment of goods between buyer and seller.

Note that transaction event includes all the properties of [Event](#) as well as the additional properties described below.

| Property          | Definition  | Type                            |
|-------------------|---|---------------------------------|
| sourceParty       | The source party for this supply chain transaction - typically the seller party   | <a href="#">Party</a>           |
| destinationParty  | The destination party for this supply chain transaction - typically the buyer party.  | <a href="#">Party</a>           |
| epcList           | The list of uniquely identified trade items included in this supply chain transaction.  | <a href="#">Item</a>            |
| quantityList      | List of quantified product classes that are included in this transaction. Used when the trade items do not have unique identifiers (eg 100 reels of yarn) | <a href="#">QuantityElement</a> |
| referenceDocument | The supply chain document reference for this transaction event - eg the invoice, order, or dispatch advice  | <a href="#">TradeDocument</a>   |

## Transformation Event

Transformation represents an event in which input objects are fully or partially consumed and output objects are produced, such that any of the input objects may have contributed to all of the output objects - for example consuming bales of cotton to produce yarn.

Note that transformation event includes all the properties of [Event](#) as well as the additional properties described below.

| Property           | Definition  | Type            |
|--------------------|---|-----------------|
| outputEPCList      | The list of uniquely identified items that are the output of this transformation event - for example a list of individually identified bolts of cloth that are the output of a weaving process.   | Item            |
| inputEPCList       | The list of uniquely identified items that are the input of this transformation event - for example a list of individually identified bobbins of yarn that are the input of a weaving process.  | Item            |
| inputQuantityList  | The quantified list of product classes that are the input of this transformation event - used when each item does not have a unique identity. for example the weight of raw cotton that is the input to a ginning process.                  | QuantityElement |
| outputQuantityList | The quantified list of product classes that are the output of this transformation event - used when each item does not have a unique identity. for example a count of the bales of cleaned cotton that are the output of a ginning process. | QuantityElement |
| processType        | An industry specific process type code.   | URI             |

## AssociationEvent

The association event represents the assembly of child sub-components to create a parent assembled item. For example a desktop computer assembled from power supply, hard drive, and motherboard. The association event is very similar in structure to the aggregation event but is used for physical assembly. An association event may represent a bill of materials used to assemble a product whilst an aggregation event may represent a packing list or items for transport.

Note that association event includes all the properties of [Event](#) as well as the additional properties described below.

| Property          | Definition  | Type            |
|-------------------|---|-----------------|
| parentEPC         | The unique item identifier that is the parent of this association. Typically an assembled product ID such as a desktop computer that is built from the associated child components.                       | Item            |
| childEPCs         | The list of child items that have been assembled to create the parent - for example the power supply or hard drive components of a desktop computer.  | Item            |
| childQuantityList | List of quantified product classes that have been assembled into the parent. Used when the child items do not have unique identifiers (eg brackets and screws used in the assembly of a desktop computer) | QuantityElement |

## QuantityElement

The quantity element is used to define the quantities (eg 100), units of measure (eg Kg) and product class (eg GTIN or other class identifier) of products that are inputs or outputs or the subject of supply chain events.

| Property | Definition   | Type       |
|----------|--|------------|
| epcClass | THe identifier of a product class (as opposed to a product instance) such as a GTIN code for a manufactured product. | URI        |
| quantity | The numeric quantity of the product class (eg 100 kg of cotton)  | Numeric    |
| uom      | The unit of measure for the quantity value (eg Kg or meters etc) using the UNECE Rec 20 unit of measure codelist.    | Code (UOM) |

## TradeDocument

A trade transaction between two parties such as an invoice, purchase order, or shipping notification.

| <b>Property</b> | <b>Definition</b>  | <b>Type</b>                |
|-----------------|--|----------------------------|
| type            | The document type representing the trade transaction drawn from the business transaction type vocabulary.  | Code<br>(documentTypeCode) |
| identifier      | The identifier of the trade transaction document - eg an invoice number or bill of lading number. Must be unique for a given source party  | Text                       |
| documentURL     | The URL of the referenced trade document. For integrity reasons, it is recommended (but not required) that the documentURL is a hash-link ( <a href="https://w3c-cdg.github.io/hashlink/">https://w3c-cdg.github.io/hashlink/</a> ) so that if the document the URL is changed then the hash verification will fail. |                            |

## Item

A specific trade item /product code which could be either a product serial number or a consignment identifier

| <b>Property</b> | <b>Definition</b>   | <b>Type</b> |
|-----------------|---|-------------|
| itemID          | The globally unique identifier (eg GS1 GTIN or digital link) of the product item. | URI         |
| name            | The name of the product class to which the product item belongs.                  | Text        |

## Party

A trade party

| <b>Property</b> | <b>Definition</b>  | <b>Type</b> |
|-----------------|--|-------------|
| partyID         | The globally unique identifier of the party. This must be expressed as a URI that is (preferably) resolvable to an entity register such as a national business register - eg <a href="https://abr.business.gov.au/ABN/View?abn=41161080146">https://abr.business.gov.au/ABN/View?abn=41161080146</a> | URI         |

| <b>Property</b> | <b>Definition</b>   | <b>Type</b> |
|-----------------|---|-------------|
| name            | The entity name of the identified party - usually the business name from the corresponding national registry -eg ACME LTD | Text        |

## SensorElement

A SensorElement is used to carry data related to an event that is captured one sensor such as an IoT device. Include one sensor property and an array of sensor data values.

| <b>Property</b>      | <b>Definition</b>   | <b>Type</b> |
|----------------------|---|-------------|
| sensorMetadata       | Data that describes the physical sensor that recorded the sensor data set.  | Sensor      |
| sensorReport         | A list of sensor readings from the given sensor relevant to the traceability event context.   | SensorData  |
| sensorIntegrityProof | An optional reference to a verifiable credential signed by the sensor device or device manufacturer that contains the digitally signed raw data associated with this sensor report. | URI         |

## Sensor

A physical sensor that records a sensor data set.

| <b>Property</b>      | <b>Definition</b>  | <b>Type</b> |
|----------------------|--|-------------|
| device               | The device Identifier for the sensor as a URI (typically an EPC)   | Item        |
| dataProcessingMethod | The data processing method used by the sensor - should reference a documented standard criteria as a URI | URI         |

## SensorData

A data point read by a sensor.

| <b>Property</b> | <b>Definition</b>   | <b>Type</b>   |
|-----------------|---|---------------|
| time            | the timestamp at which the sensor reading was made.   | DateTime      |
| type            | the measurement type of the sensor reading, as a URI reference to a measurement method specification. | URI           |
| value           | the sensor reading  | Numeric       |
| uom             | the unit of measure for the sensor reading  | Code<br>(UOM) |

## Code Tables

### actionCode

The Action type says how an event relates to the lifecycle of the entity being described. For example, AggregationEvent is used to capture events related to aggregations of objects, such as cases aggregated to a pallet. Throughout its life, the pallet load participates in many business process steps, each of which may generate an EPCIS event. The action field of each event says how the aggregation itself has changed during the event: have objects been added to the aggregation, have objects been removed from the aggregation, or has the aggregation simply been observed without change to its membership? The action is independent of the bizStep (of type BusinessStepID) which identifies the specific business process step in which the action took place.

| <b>Name</b> | <b>Description</b>  |
|-------------|---|
| observe     | The entity in question has not been changed.                          |
| add         | The entity in question has been created or added to.                  |
| delete      | The entity in question has been removed from or destroyed altogether. |

### dispositionCode

Disposition code is a vocabulary whose elements denote a business state of an object. An example is a code that denotes “recalled”. The disposition field of an event specifies the business condition of the event’s objects, subsequent to the event. The disposition is assumed to hold true until another event indicates a change of disposition. Intervening events that do not specify a disposition field have no effect on the presumed disposition of the object.

Code values for this table can be found here:  
<https://ref.gs1.org/cbv/Disp>

## bizStepCode

BusinessStep is a vocabulary whose elements denote steps in business processes. An example is an identifier that denotes “shipping.” The business step field of an event specifies the business context of an event: what business process step was taking place that caused the event to be captured?

Code values for this table can be found here:  
<https://ref.gs1.org/cbv/BizStep>

## UOM

UNECE Recommendation 20 Unit of Measure code list.

Code values for this table can be found here:  
<https://vocabulary.uncefact.org/UnitMeasureCode>

## documentTypeCode

Document type codes for trade and logistics documents supporting the event such as purchase order, invoice, shipping notification, bill of lading, etc.

Code values for this table can be found here:  
<https://ref.gs1.org/cbv/BTT>

## Samples



# Digital Facility Profile

## ! INFO

Please note that this content is under development and is not ready for implementation. This status message will be updated as content development progresses.

- DFR context : [JSON-LD @context](#)
- DFR schema : [JSON schema](#)
- DFR sample : [JSON Sample](#)

## Versions

| DPP Version | Date       | status | Change summary                  | JSON-LD Context          | JSON Schema            |
|-------------|------------|--------|---------------------------------|--------------------------|------------------------|
| 0.3.0       | 21-08-2024 | Draft  | Initial model for facility data | <a href="#">@context</a> | <a href="#">schema</a> |

## Overview

The digital facility record (DFR) is issued by the owner or operator of a production or manufacturing facility and is the carrier of **facility data and sustainability information** for an identified facility in the value chain. It is very similar to the digital product passport except that it describes a facility rather than a product. The DFR is discoverable in the same way as a DPP - namely by resolving the facility ID to an Identity Resolver service that will return links to facility records. The sustainability performance metrics are also at the facility annual total level rather than at the product level. In many value chains, facility level information may be sufficient to meet the due diligence requirements of buyers and so the facility record can be used independently of the product passport. However product passports should reference the facility at which the product was produced. Where both facility and product information are available, verifiers can perform an approximate mass-balance assessment for quantity based criteria such as GHG emissions. For example, the total individual emissions recorded in all products shipped from a facility should approximately equal the reported annual emissions of the facility.

# Conceptual Model

TBA

## Requirements

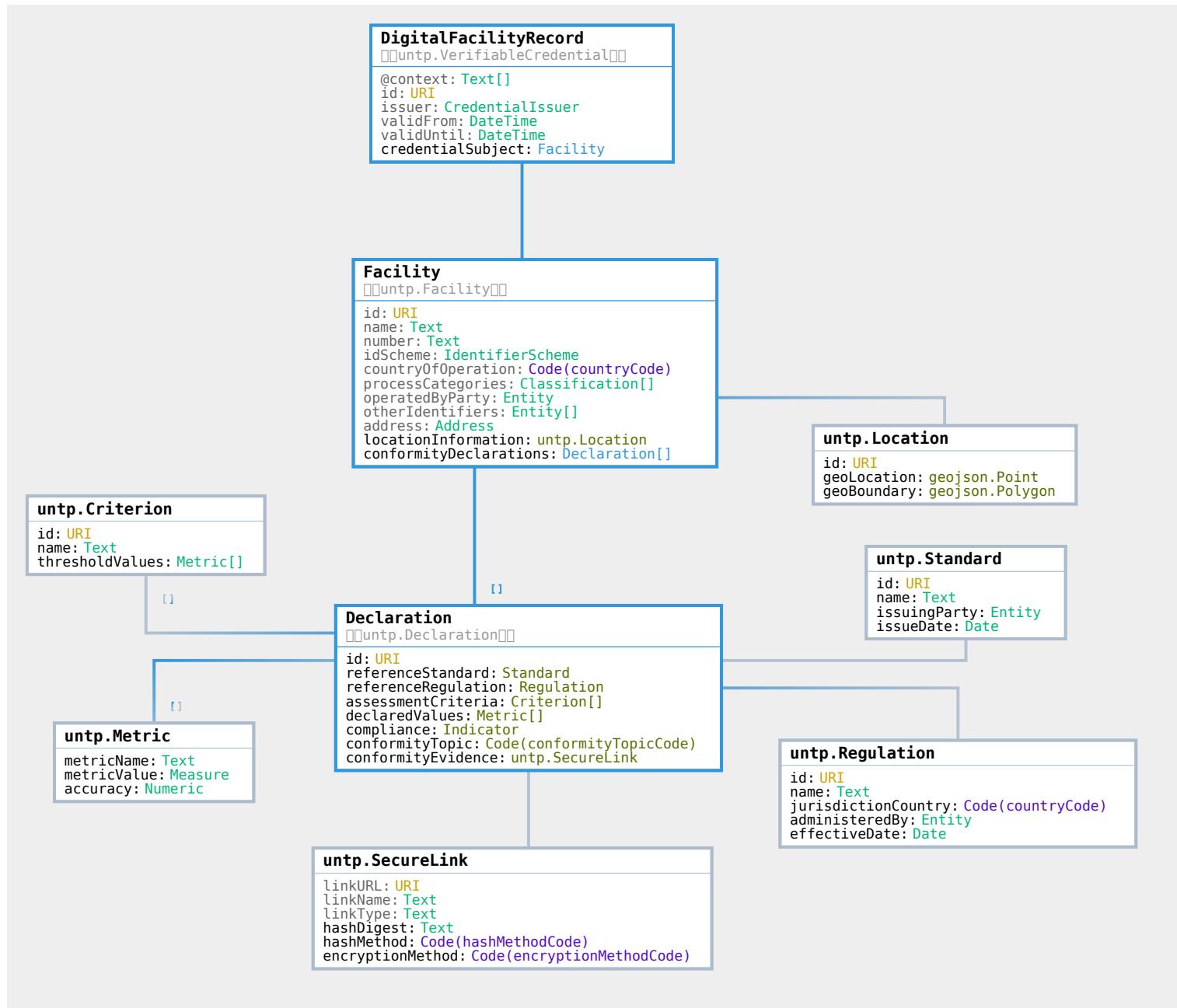
The digital facility record is designed to meet the following detailed requirements as well as the more general [UNTP Requirements](#)

| ID     | Name               | Requirement Statement   | Solution Mapping  |
|--------|--------------------|---|---|
| DFR-01 | Resolvable ID      | Each facility must have at least one resolvable identifier that can be used in digital product passports and other data exchanges so that verifiers can always access the latest facility data. | Facility.id   |
| DFR-02 | Process categories | The DFR should support any number of industry process classifications using codes from a defined classification scheme (eg UN-CPC)  | The classifications property  |
| DFR-03 | Geo-Location       | The DFR should provide a means to specify both a geo-location point (aka pin) and a boundary geometry (aka polygon) so that verifiers can geo-locate supplier facilities                        | The Location class meets this need.                                       |
| DFR-04 | Owner / operator   | The DFR should specify the owner and/or operator entity of the facility using one or more globally unique and resolvable entity identifiers.  | Facility.OperatedByParty is a UNTP Entity structure that meets this need. |
| DFR-05 | Declarations       | The DFR MUST provide a means to include any number of conformity declarations so that it can provide  | The "conformityDeclarations" array is designed to meet this need          |

| <b>ID</b> | <b>Name</b>      | <b>Requirement Statement</b>   | <b>Solution Mapping</b>   |
|-----------|------------------|--|---|
|           |                  | simple single point to aggregate all claims about the facility in one place  |   |
| DFR-06    | Conformity Topic | The DFR MUST provide a simple mechanism to express the sustainability/circularity/conformity topic for each claim so that similar claims can be grouped and the high level scope easily understood.  | The ConformityTopic code list is designed to meet this need   |
| DPP-07    | Metrics          | The DFR MUST provide a simple mechanism to quantify a conformity claim (eg carbon intensity, water consumption, etc) and to express any accuracy range.  | The "Metric" class is designed to meet this need  |
| DPP-08    | Criteria         | The DPP MUST provide a means to reference a standard or regulation as well as the specific criteria within that standard or regulation - so that claims can be understood in terms of the criteria against which they are made.  | Declaration.referenceRegulation,<br>Declaration.referenceStandard,<br>Declaration.referenceCriteria |
| DPP-09    | Evidence         | The DPP MUST provide a means to reference independent conformity assessments that support and verify the claims being made. The related evidence SHOULD be digitally verifiable but MAY be a simple document or web page. The confidence level attached to the evidence should be clear. | The Declaration.conformityEvidence property references a relevant digital conformity credential     |

## Logical Model

The Digital Facility Record is an assembly of re-usable components from the UNTP core vocabulary.



## Core Vocabulary Documentation

The [UNTP core types vocabulary](#) defines the uniquely identified Linked Data entities such as Product, Location, Facility, Party, Standard, Regulation, Criteria, Declaration, Attestation, Endorsement. These entities provide the building blocks for construction of the Digital Facility Record.

## DFR Documentation

The [DFR documentation](<https://jargon.sh/user/unece/DigitalFacilityRecord/v/0.3.0>) provides a technology-neutral definition of classes, properties and code lists in the DFR model.

# **Implementation Guidance**

This section provides sample JSON-LD snippets for each DFR component.

## **Verifiable Credential**

TBA

## **Facility**

TBA

## **Location**

TBA

# Identity Resolver

## ! INFO

Please note that this content is under development and is not ready for implementation. This status message will be updated as content development progresses.

## Overview

Identifiers of **businesses** (eg tax registration numbers), of **locations** (eg google pins or cadastral/lot numbers), and of **products** (eg GS1 GTINs or other schemes) are ubiquitous throughout supply chains and underpin the integrity of the system. UNTP builds upon existing identifier schemes without precluding the use of new schemes so that existing investments and high integrity registers can be leveraged. UNTP requires four key features of the identifiers and, for those that don't already embody these features, provides a framework to uplift the identifier scheme to meet UNTP requirements. Identifiers used in UNTP implementations should be **discoverable** (ie easily read by scanning a barcode, QR code, or RFID), **globally unique** (ie by adding a domain prefix to local schemes), **resolvable** (ie given an identifier, there is a standard way to find more data about the identified thing), and **verifiable** (ie ownership of the identifier can be verified so that actors cannot make claims about identifiers they don't own).

## Discoverability

The term 'data carrier' applies to all 1- and 2-dimensional barcode symbols and radio frequency tags. A very large number of data carriers are in use, including proprietary ones tied to specific apps. For UNTP, the important data carriers are those defined by [ISO/IEC Joint Technical Committee 1, Steering Committee 31](#). These include different types of linear symbol most people think of as 'a barcode', as well as [Data Matrix](#), [QR Code](#) and RFID tags. The standards for those data carriers do not define the type of identifier(s) that can be encoded so that, for practical purposes, it's necessary to also consider the origin and management of the identifiers to be encoded, the syntax to be used for that encoding, the devices and software necessary to print and read the data. It is this multi-layered complexity that makes "Automatic Identification and Data Capture" (AIDC) a professional activity in its own right.

Given this background, 'discoverability' itself has several aspects. It is reasonable to assume that someone inspecting goods in the course of their work will be equipped with a specialist device. This is

always necessary for RFID tags, the principal advantage of which is that hundreds, if not thousands, of tags can be scanned within a given volume, even without line of sight. But be aware that the device needs to be running software that can interpret the data it receives. Handheld optical scanners are also in common use and these will typically be able to read a very wide variety of optical symbols. But again, the key question is whether or not the software can interpret the data read from the carrier.

It hardly needs saying that the more standardized the identifiers and the encoding used, the more widely used the data carrier, and the more ubiquitous the software used to interpret the data read from the carrier, the more interoperable and therefore the more discoverable the identifiers will be. It is this kind of consideration that often leads industry to choose established identifier and data exchange systems such as that offered by GS1. That said, modern smartphones can read any almost any optical barcode and NFC tag *if* the user first opens an app that can interpret the data. This is true for proprietary data carriers and identifiers as well as standardized ones. Installing an app can readily turn a general-purpose smartphone into a specialist device. This opens up the option of using less-established identifier schemes and syntaxes including Decentralized Identifiers (DIDs). Then it's a question of whether the identifiers are equally discoverable at different points along the supply chain.

One case deserves special mention: a URL encoded in a QR Code. Almost all smartphone users can scan a QR Code just using the native camera app and, if the QR Code contains a URL, the Web browser will open the relevant Web page. This kind of identifier is therefore the most discoverable of all. That is, if a URL in the QR code is treated as the identifier then discoverability is a given. However, using a URL itself as the identifier brings some issues of its own. For example, over the medium to long term, many URLs suffer 'link rot' - that is, the URL no longer functions. Or if it does, it may lead to a Web page very different from the one originally intended. Furthermore, existing data exchange systems are likely to be built on short offline identifiers. ISO/IEC 18975 (currently a Draft International Standard) attempts to offer the best of both worlds by providing a means to encode existing identifiers into a data structure that is also a URL. Non-specialist software - notably a smartphone's camera app - can just read it like any URL. But specialist software can parse the URL to extract the identifiers used to identify products, batches and more.

## Global Uniqueness

To be useful across a supply chain, identifiers must be globally unique. This can be achieved in a variety of ways

## Issuing Agencies

Issuing Agencies act as a root that manages an identifier space. Examples include the internet domain name system, Digital Object Identifiers (DOIs), Legal Entity Identifiers (LEIs) and GS1 identifiers. In all these examples, the eventual identifier is created by appending a locally-defined string on the end of a prefix that is managed by the issuing agency that takes *its* authority from a central root. A well-known example is ICANN, which is the root authority for the internet domain name system. By renewable contract, they issue ".com" to Verisign who then license individual domain names under .com to others (usually via intermediaries). The licensee then creates their URLs under that domain name. Because ICANN is solely responsible for the internet's domain name system, global uniqueness is assured.

The same principle applies in all managed identifiers. For LEIs, GLEIF acts as the root authority that gives prefixes to its Local Operating Unit who then issue specific identifiers and so on.

## ISO/IEC 15459 Issuing Agencies

In the world of Automatic Identification and Data Capture (barcoding etc), the ISO/IEC 15459 series of standards establishes a registry that acts as the root authority. Organisations that wish to issue identifiers that are intended to be encoded in barcodes and/or RFID tags are assigned a unique Issuing Agency Code that ensures their identifiers do not clash with any others. A further standard, ISO/IEC 15418, defines so-called *Data Identifiers* and *Application Identifiers* that "qualify" identifiers. It is this system that enables those Issuing Agencies to efficiently encode globally unique identifiers in optical and radio frequency data carriers without any duplication and for the print and scan industry to be able to create and interpret the barcodes and tags.

For example, the Data Identifier 2B is for a *Gas Cylinder Container Identification Code assigned by the manufacturer in conformance with U.S. Department of Transportation (D.O.T.) standards*. The Application Identifier 01 is for a *Global Trade Item Number (GTIN)*. Data Identifiers are managed under the auspices of ANSI, Application Identifiers are managed by GS1.

## Generated identifiers

As an alternative to being issued, identifiers can be algorithmically-generated. The best-known example of this is the Universally-Unique Identifier (UUID). This relies on it being *extremely* unlikely, but not impossible, that the same identifier will be generated twice. For many practical applications, that can be "good enough" although there are many instances where duplicates have arisen (known as "collisions").

Decentralised Identifiers (DIDs) are also generated but the methods used vary significantly and typically depend on some piece of data that the originating person owns. This might be their private cryptographic key or some other extremely hard to guess piece of data. Collisions are all-but

impossible but the identifiers are usually significantly longer. The most widely used DID method is "DID Web" which uses the owner's internet domain name as the basis for identification, thus mixing the issued and generated philosophies with one advantage being that the resulting DIDs are short. It's important to note though that the primary purpose of a DID is to provide a means of proving control over the identifier and, having done that, retrieving the DID owner's public cryptographic key.

## Resolvability

An identifier is nothing more than a string of characters. In isolation, it has no specific meaning. However, in most cases, the identifier will have a recognisable structure that gives a strong hint about its intended purpose and how it can be processed. In the context of UNTP, what's important is that the identifier can be *resolved* - that is looked-up online - and connected to a source of data, most notably, the identified entity's DPP. Approaches to resolving identifiers vary but a common feature is that it is typically a multi-stage process. Again taking the internet's domain name system as an example, an internet domain *resolves* to an IP address - the actual internet address of the server(s) that provide the content expected from that domain.

Decentralised Identifiers *resolve* to a "DID Document" - a small piece of data that includes the public cryptographic key for the DID's controller and, optionally, a list of services related to that identifier. At the time of writing, the established method for DID resolution is being formally standardised at W3C. An app is needed to recognise and resolve a DID, and to process the returned DID Document.

ISO/IEC (FDIS) 18975 defines a framework for resolving any existing identifier that is globally unique in its own right, most notably, those issued under the ISO/IEC 15459 series. It sets out two options for how those identifiers can be encoded in a regular HTTP URI (Web address), using Data Identifiers and Application Identifiers, and how that URI can resolve to a set of links to information about the identified entity. That [linkset](#) can be operationalised in a resolver. This defines a framework for creating a simple query interface for any identified entity. ISO/IEC 18975 enables identity issuing agencies to develop conformant standards that specify the following:

- The identifiers can be encoded in a URL within a QR Code printed on a product that can be scanned just using a mobile phone's camera, without any need for a specialist app. The user can select the DPP from the list of available links to information (i.e. manually select the correct link from the linkset).
- The identifiers can be encoded in a URL within a QR Code printed on a product that can be scanned using a specialist app that queries the resolver and returns the DPP.

The [GS1 Digital Link](#) and [GS1-Conformant resolver](#) standards conform to ISO/IEC (FDIS) 18975.

# **Verifiability**

UNTP credentials will include identifiers of products, locations or businesses. UNTP credentials will also include ESG performance claims like emissions intensity values. But how can a verifier of these identifiers or ESG claims be confident that the claims are true and that they are made by the genuine party at a verifiable location? Trust anchors are national or international authorities that typically run existing business or product registration, certification, accreditation, or other high integrity processes. Examples of trust anchors include national regulators that govern things like land ownership or business registrations. Another example are the national accreditation bodies that audit and accredit certifiers to issue third party assessments. UNTP depends on trust anchors to add digital integrity to ESG claims and identities by linking them to the authority under which they are made. In essence, UNTP defines a protocol for existing trust anchors to continue doing what they have always done, but in a digitally verifiable way.

# Decentralised Access Control

## ! INFO

Please note that this content is under development and is not ready for implementation. This status message will be updated as content development progresses.

## Overview

There is a balance between the demands of transparency (more supply chain visibility means it's harder to hide greenwashing) and confidentiality (share too much data and you risk exposing commercial secrets). A key UNTP principle is that every supply chain actor should be able to choose their own balance between transparency and confidentiality. To achieve this, UNTP defines six data confidentiality patterns with different degrees of data protection so that they can be appropriately combined to meet the confidentiality goals of each party. This includes the ability to selectively redact data from credentials received from upstream suppliers before passing them on to downstream buyers - without affecting the cryptographic integrity of the data.

## Discoverable Public Data

### Public Data with GUID key

### Encrypted Data with Shared Key

### Encrypted Data with Requestable Key

### Selective Redaction

### Private Data

# Usage Patterns

# Sustainability Vocabulary Catalog

## ! INFO

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Latest JSON-LD @graph vocabulary : <https://test.uncefact.org/vocabulary/untp/core/0/3/6/>

Note: The presentation of the vocabulary will be updated to include super classes and referenced domains.

## Overview

Web **vocabularies** are a means to bring consistent understanding of **meaning** to ESG claims and assessments throughout transparent value chains based on UNTP. There are hundreds of ESG standards and regulations around the world, each with dozens or hundreds of specific conformity **criteria**. Any given value chain from raw materials to finished product is likely to include dozens of passports and conformity credentials issued against any of thousands of ESG criteria. Without a consistent means to make sense of this data, UNTP would provide a means to discover a lot of data but no easy way to make sense of it. The UNTP defines a standard and extensible topic map (taxonomy) of ESG criteria and provides a mechanism for any standards authority, or national regulator, or industry association to map their specific terminology to the UNTP vocabulary.

## UNTP Core Vocabulary

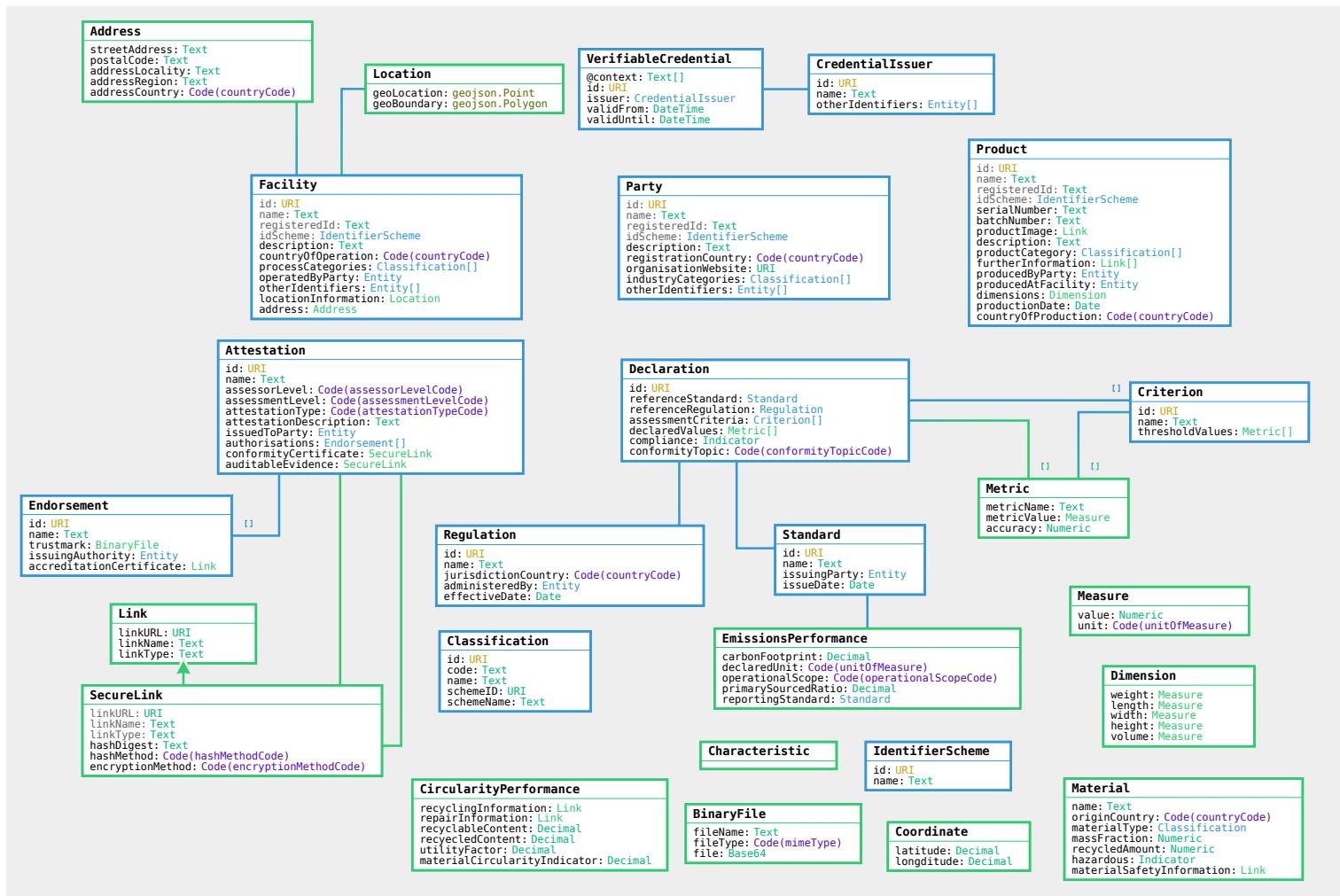
The UNTP core vocabulary defines the uniquely identified linked data entities such as Product, Location, Facility, Party, Standard, Regulation, Criteria, Declaration, Attestation, Endorsement. These entities provide the building blocks for construction of Digital Product Passports and Digital Conformity Credentials.

- A **Digital Product Passport** is a set of declarations (claims) against sustainability criteria defined in regulations or standards - made by a manufacturer party about a given product that is

manufactured at a facility in a defined location.

- A **Digital Conformity Credential** is an attestation made by an endorsed conformity assessment body - which includes one or more assessments of a list of identified products or facilities against specific criteria.

Although these two credential types have different structures, they are assembled from the same core vocabulary building blocks. This allows a supply chain transparency system to easily construct a linked data graph (a.k.a "transparency graph") from a stream of DPPs and DCCs. Claims about a product found in a DPP can be linked to assessment of the same product in DCC when both credentials have matching product and criteria identifiers.

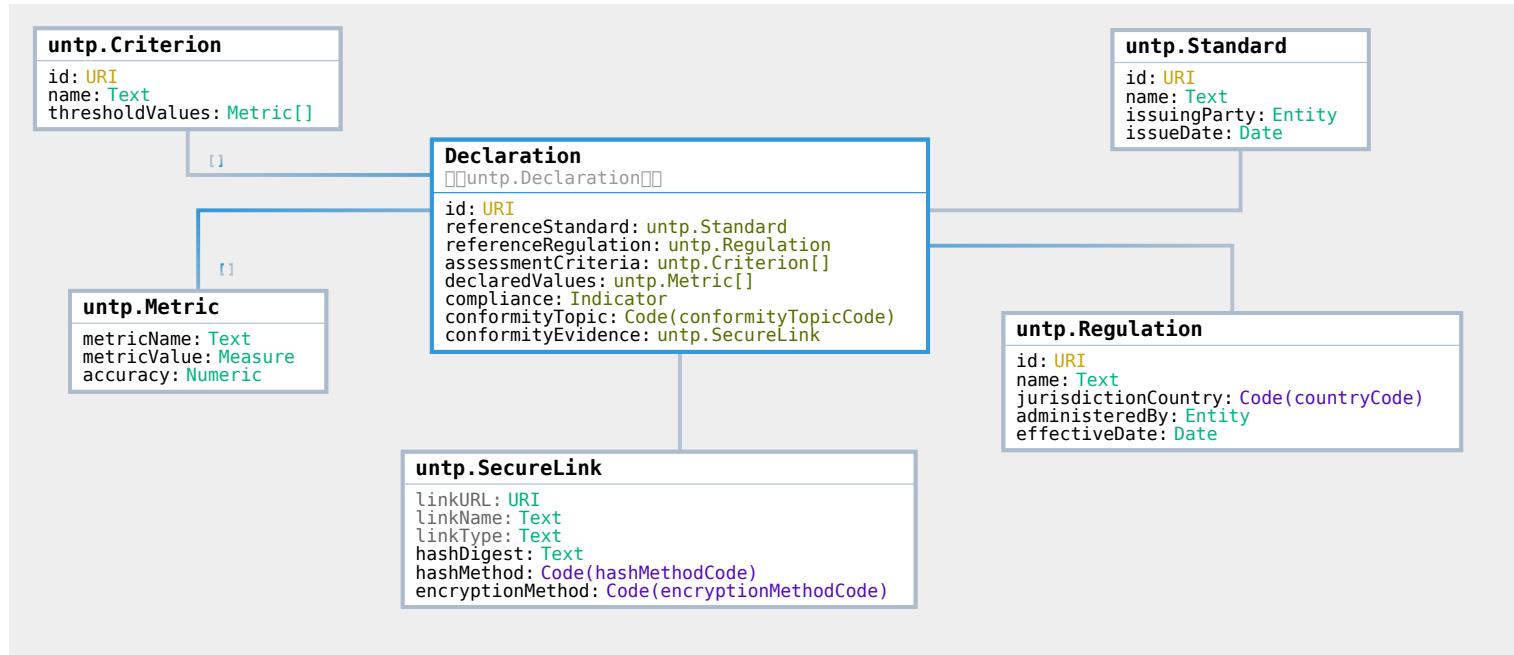


The core vocabulary [data model](#) and browsable documentation

## Declarations Structure

The declarations structure defined in the core vocabulary is re-used by both the Digital Product Passport (as manufacturer self-assessments) and the Digital Conformity Credential (as third party

conformity assessments). The declarations structure is defined here and referenced by both the DPP and DCC pages.



The conformity Information structure in the DPP is an array of UNTP `Declaration` types that carry product conformity or sustainability claims made by the manufacturer. The key properties are

- The `id` which must be globally unique and may be either a UUID or a URI in the DPP issuer's domain.
- The `referenceStandard` against which the conformity claims are made. This is a UNTP `Standard` object
- The `referenceRegulation` against which the conformity claims are made. In most cases a conformity claim will reference either a `Standard` or a `Regulation` but in some circumstances both will apply.
- The `assessmentCriteria` is an array of UNTP `Criterion` objects that define the specific rule(s) within the standard or regulation against which this conformity claim is made.
- The `thresholdValues` are an array of UNTP `Metric` objects that define the minimum or maximum values that are required to be met. For example, a construction steel standard might specify 300 MPa as the minimum tensile strength threshold.
- The `declaredValues` property defines the actual specified values for the DPP product. For example, a minimum tensile strength of 350 Mpa within a 5% confidence range. In many cases this may be sensitive data and can be replaced by a simple `compliance` assertion.
- The `compliance` boolean is a declaration by the product manufacturer that the product meets the conformity criteria specified.

- The `conformityTopic` is a high level UNTP classification scheme for safety and environmental and social sustainability.
- `benchmarkValue` (eg 10 Tons per Ton carbon intensity) is used in cases where a `declaredValue` (eg 5 Tons per Ton) is usefully compared to an industry average performance (benchmark) value. When a `benchmarkValue` is provided, a `benchmarkReference` link MUST also be provided and should provide a link to an authoritative reference to support the benchmark value.
- `conformityEvidence` is a `Link` to a second or third party attestation such as a UNTP [Digital Conformity Credential](#) that provides independent verification of the claims made. Note that this property may also link to a PDF or a website or some other format of conformity evidence.

```
"conformityDeclarations": [
  {
    "type": [
      "Declaration"
    ],
    "id": "https://files.example-company.com/declarations/90664869327/",
    "referenceStandard": {
      "type": [
        "Standard"
      ],
      "id": "https://www.globalbattery.org/media/publications/gba-rulebook-v2.0-master.pdf",
      "name": "GBA Battery Passport Greenhouse Gas Rulebook - V.2.0",
      "issuingParty": {
        "type": [
          "Entity"
        ],
        "id": "https://kbopub.economie.fgov.be/kbopub/toonondernemingsps.html?ondernemingsnummer=786222414",
        "name": "Global Battery Alliance",
        "registeredId": "786222414",
        "idScheme": {
          "type": [
            "IdentifierScheme"
          ],
          "id": "https://kbopub.economie.fgov.be/",
          "name": "Belgian business register"
        }
      },
      "issueDate": 2023
    },
    "referenceRegulation": {
      "type": [
        "Regulation"
      ],
    }
  }
]
```

```
"id": "https://www.legislation.gov.au/F2008L02309/latest/versions",
"name": "National Greenhouse and Energy Reporting (Measurement)
Determination",
"jurisdictionCountry": "AU",
"administeredBy": {
  "type": [
    "Entity"
  ],
  "id": "https://abr.business.gov.au/ABN/View?abn=72321984210",
  "name": "Clean Energy Regulator",
  "registeredId": "72321984210",
  "idScheme": {
    "type": [
      "IdentifierScheme"
    ],
    "id": "https://abr.business.gov.au/ABN/",
    "name": "Australian Business Number"
  }
},
"effectiveDate": 2024
},
"assessmentCriteria": [
{
  "type": [
    "Criterion"
  ],
  "id": "https://www.globalbattery.org/media/publications/gba-rulebook-
v2.0-master.pdf",
  "name": "GBA Battery rule book v2.0 battery assembly guidelines.",
  "thresholdValues": [
    {
      "metricName": "Industry Average emissions intensity",
      "metricValue": {
        "value": 1.8,
        "unit": "NIL"
      },
    }
  ]
}
],
"declaredValues": [
{
  "metricName": "GHG emissions intensity",
  "metricValue": {
    "value": 1.5,
    "unit": "NIL"
  },
  "accuracy": 0.05
}
```

```
        },
        {
          "metricName": "GHG emissions footprint",
          "metricValue": {
            "value": 15,
            "unit": "KGM"
          },
          "accuracy": 0.05
        }
      ],
      "compliance": true,
      "conformityTopic": "environment.energy",
      "conformityEvidence": {
        "linkURL": "https://files.example-certifier.com/1234567.json",
        "linkName": "GBA rule book conformity certificate",
        "linkType": "https://test.uncefact.org/vocabulary/linkTypes/dcc",
        "hashDigest": "6239119",
        "hashMethod": "SHA-256",
        "encryptionMethod": "AES"
      }
    }
  ],
}
```

## Sustainability Vocabulary Catalog

The sustainability vocabulary catalog is designed to provide a reference-able digital library of sustainability conformity standards, regulations, and criteria that can be used as an allowed set of terms to use in conformity declarations. The library also aims to provide a mechanism for mutual recognition of conformity criteria between different regulations and standards.

TBA

# Best Practices

## ! INFO

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Design patterns are non-normative but provide best practice guidance for UNTP implementers.

## Trust Graphs

The ESG footprint of a finished product is the aggregation of its components and processes through the value chain. Verification of ESG claims therefore involves assessing a bundle of linked credentials (aka a "trust graph") drawn from all or part of a value chain. Whilst each credential may be valid in its own right, one challenge is verifying the context of related credentials. For example, a conformity assessment body that is accredited to test strength of structured steel might not be accredited to issue emissions intensity certificates. A technically valid emissions certificate linked to a technically valid accreditation certificate that has a different scope would be fraudulent. To address this problem, the UNTP defines a simple method to verify the contextual scope of linked credentials. Essentially this provides a mechanism to verify a linked graph of data at a layer above individual credential verification.

## Data Carriers

Digital data needs to be linked to the physical product it describes and should be discoverable through the identifiers printed on that product serial or batch number. For high volume goods and easy / reliable discovery, these identifiers are already typically represented as barcodes, matrix codes, QR codes, or RFID encoded data. UNTP supports the use of these existing data carriers. A basic UNTP principle is that if you have a product then you should be able to find ESG data about that product even when the identifier is not a web link. Therefore, the UNTP defines a generalised protocol (based on [GS1 Digital Link](#)) to allow any identifier scheme (GS1 or otherwise) to be consistently resolvable so that product passports and other data can always be accessed from the identifier of the product. The UNTP also defines a specific QR based data carrier format for use on paper/PDF versions of conformity credentials or other trade documents that provides secure access to credentials in a way that is both human and machine readable. This provides a simple but powerful mechanism to facilitate uptake of digital solutions alongside existing paper/PDF based frameworks.

# **Anti-Counterfeiting**

As the value of genuinely sustainable goods increases, so do the incentives to sell fake goods as the real thing. UNTP defines a simple and decentralised anti-counterfeiting protocol that can be implemented by any producer at very low cost. It builds upon the W3C DID standard by issuing a unique DID (and corresponding keypair) for every serialised (individual or batch) product. The DID (and therefore the public key) is discoverable from the product serial number using the standard link resolver protocol. The item/batch level DID is cryptographically linked to the product class level DID. The private key is discoverable from a QR code hidden inside the product packaging. Scanning the QR provides the necessary key to update the individual serialised product public status to indicate consumption. Attackers that copy genuine serial numbers will find that their products are quickly identifiable as fakes. Attackers that try to create new serial numbers will not be able to create valid links to the genuine product class. The UNTP anti-counterfeiting protocol provides additional value/incentive for UNTP uptake beyond ESG integrity.

## **Mass Balance**

Mass balance fraud is a particularly challenging greenwashing vector. It happens when a fraudulent actor buys a small quantity of high ESG integrity inputs (eg genuine carbon neutral, organic, deforestation free cotton) and mixes that input with lower quality alternatives and then sells the full volume of manufactures product (eg woven cotton fabric) as sustainable product, re-using the valid credentials from the niche supply. The UNTP solution to this problem involves trusted third parties (certifiers or industry associations) to act as quota managers that issue "guarantee of origin" credentials (a type of conformity credential). In this model, the guarantee of origin certificate for 10 Tons of cotton fabric (for example) can only be issued when the third party has evidence of the purchase of at least 10 Tons sustainable input materials. The third party will also mark the input batch as consumed (in a similar way to the anti-counterfeiting protocol) so that the valid sustainable input cannot be re-presented to a different third party.

## **ESG Rules**

Yet another greenwashing attack vector is to deliberately apply incorrect rules to the determination of criteria such as emissions intensity. The verification question in this case is "yes, but how do I know you calculated it right?". The UNTP proposes an independent calculator service offered either by the standards body or regulator that defined the rules or by an accredited service provider. The Supply chain actor presents raw data to the calculator which returns with a signed credential confirming that

the rules were correctly applied. This protocol has an additional benefit for legitimate actors if widely adopted by rules authorities - which is to significantly simplify the assessment of compliance against multiple different rules. By separating observed facts from the assessment of those facts against specific rules then it becomes relatively simple to test compliance against multiple standards and regulations.

# Data Carriers

## !(INFO)

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## Overview

Digital data needs to be linked to the physical product it describes and should be discoverable through the identifiers printed on that product, including serial or batch number as appropriate. For high volume goods and easy / reliable discovery, these identifiers are already typically represented as barcodes, matrix codes, QR codes, or RFID encoded data. UNTP supports the use of these existing data carriers. A basic UNTP principle is that if you have a product then you should be able to find ESG data about that product even when the identifier is not a web link. Therefore, the UNTP defines a generalised protocol (based on [ISO/IEC DIS 18975](#)) to allow any identifier scheme (GS1 or otherwise) to be consistently resolvable so that product passports and other data can always be accessed from the identifier of the product. The UNTP also defines a specific QR based data carrier format for use on paper/PDF versions of conformity credentials or other trade documents that provides secure access to credentials in a way that is both human and machine readable. This provides a simple but powerful mechanism to facilitate uptake of digital solutions alongside existing paper/PDF based frameworks.

## Resolvers

A *resolver* is a service that connects an identifier to one or more sources of information about the identified thing. An internet domain name *resolves* to one or more actual servers (identified by their IP addresses). Digital Object Identifiers ([DOIs](#)), commonly used to identify research papers, *resolve* to the paper itself (wherever it may be). In the UNTP context, identifiers for products, locations and supply chain operators must resolve to information about those entities. This can include the DPP, ESG certificates and more, some of which may be access-controlled. That is, knowing the location of information is not the same as automatically having access to it.

[ISO/IEC DIS 18975](#) specifies two different approaches for encoding identifiers in HTTP URIs (web addresses). Either can be used to point to a resolver that associates an identifier with a set of links to one or more sources of relevant information following the IETF's Linkset standard [RFC9264](#). A

conformant resolver can respond to queries for a particular type of information about the identified entity by providing the appropriate link from the linkset. GS1 Digital Link is conformant to this model. The [URI syntax](#) follows the *structured path* approach set out in ISO/IEC DIS 18975 and the [GS1-Conformant resolver](#) standard defines the related service. An example will make this clearer:

Imagine a white t-shirt that has a GTIN of 9506000164908. This can be encoded in a GS1 Digital Link URI as <https://id.gs1.org/01/09506000164908>, which can, in turn, be encoded in a QR Code. Following that link, without any specialist software, will take you to a landing page for the white t-shirt from which there are links to specific types of information. One of those links is to sustainability information. Using an app, it's possible to ask the resolver directly for that sustainability information by appending the GS1 Digital Link URI with an instruction thus: <https://id.gs1.org/01/09506000164908?linkType=gs1:sustainabilityInfo>. The resolver recognises the `linkType` parameter and redirects immediately to that page. Alternatively, software can [request the full linkset](#) and either present it to the user or process it as it sees fit. See the next section for more on link types.

## Link Vocabulary

With very few exceptions, all websites include hyperlinks to different pages within those websites. Users understand that clicking a 'menu' option will take them to that kind of information. Online newspapers provide a good example. There will typically be a home news section, foreign news, economics, sport, arts, lifestyle, weather, TV guide and so on. Applying this to UNTP, when looking for information about a product the user will want the DPP, certificates covering ESG issues and conformance, perhaps manufacturer's details. These can all be provided using the same infrastructure and methods as used for consumer information such as the sustainability page in the white t-shirt example above.

The IETF's [RFC9264](#) defines how sets of links can be made machine-discoverable and machine-interpretable. The key feature being that each link is annotated with the type of thing it points to. There is no limit on those link types but interoperability is lost if everyone uses their own. Therefore it is preferable to choose link types from a defined list that is under formal change management. GS1 provides [one such list](#) as part of its Web Vocabulary.

## 1D Barcodes

## 2d Matrix Codes

**QR Codes**

**RFID Codes**

# Transparency Graphs

## ! INFO

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## Overview

The sustainability footprint of a finished product is the aggregation of its components and processes through the value chain. Verification of sustainability claims therefore involves assessing a bundle of linked credentials (aka a "transparency graph") drawn from all or part of a value chain. Whilst each credential may be valid in its own right, one challenge is verifying the context of related credentials. For example, a conformity assessment body that is accredited to test strength of structured steel might not be accredited to issue emissions intensity certificates. A technically valid emissions certificate linked to a technically valid accreditation certificate that has a different scope would be fraudulent. To address this problem, the UNTP defines a simple method to verify the contextual scope of linked credentials. Essentially this provides a mechanism to verify a linked graph of data at a layer above individual credential verification.

## Trust Chains

In the world of verifiable credentials, it is crucial that such credentials are issued by trusted and accredited entities. Consider the scenario where GHG emissions of a product result in a GHG emissions tax that must be paid. In such cases, the potential for fraud is significant, as some manufacturers might falsely claim zero GHG emissions in their digital product passport or in a separate GHG emissions credential. To combat this, verifiers must be able to construct a chain of trust. For example

- A manufacturer issues a declaration in a UNTP Digital Product passport (DPP) that states an emissions footprint for a given product ID. If the verifier trusts the manufacturer then this may be sufficient. But often a third party attestation is needed.
- A third party Conformity Assessment Body (CAB) issues an attestation as a UNTP Digital Conformity Credential (DCC) about the same product ID that confirms the emissions footprint. If

the verifier knows and trusts the CAB then this may be sufficient. But there are thousands of CABs and so it is very possible that the verifier does not know the specific CAB.

- A national accreditation authority issues an endorsement as a UNTP Digital Identity Anchor (DIA) which states that the CAB is accredited to issue certifications under a recognised scheme such as the [GHG Protocol](#). The number of accreditation authorities is only a little larger than the number of countries. So verifiers only need a short list of accreditation authorities ("trust anchors") in order to trust the chain from product manufacturer -> CAB -> national authority. But the list could be even shorter.
- Most national accreditation authorities are members of a global association such as [ILAC](#). If ILAC were to issue a credential attesting that national authority is a member then there is a chain of trust from manufacturer -> CAB -> national authority -> ILAC.

There are other trust chains that can be followed to anchor trust to a national or global authority that follows rigorous processes to manage its accreditations and memberships. For example a battery passport may link to a certifier who is, in turn, accredited by the [global battery alliance](#). Verifiers of credentials should follow these linked credential chains until a trusted entity is reached. That could be at the first step or after several steps.

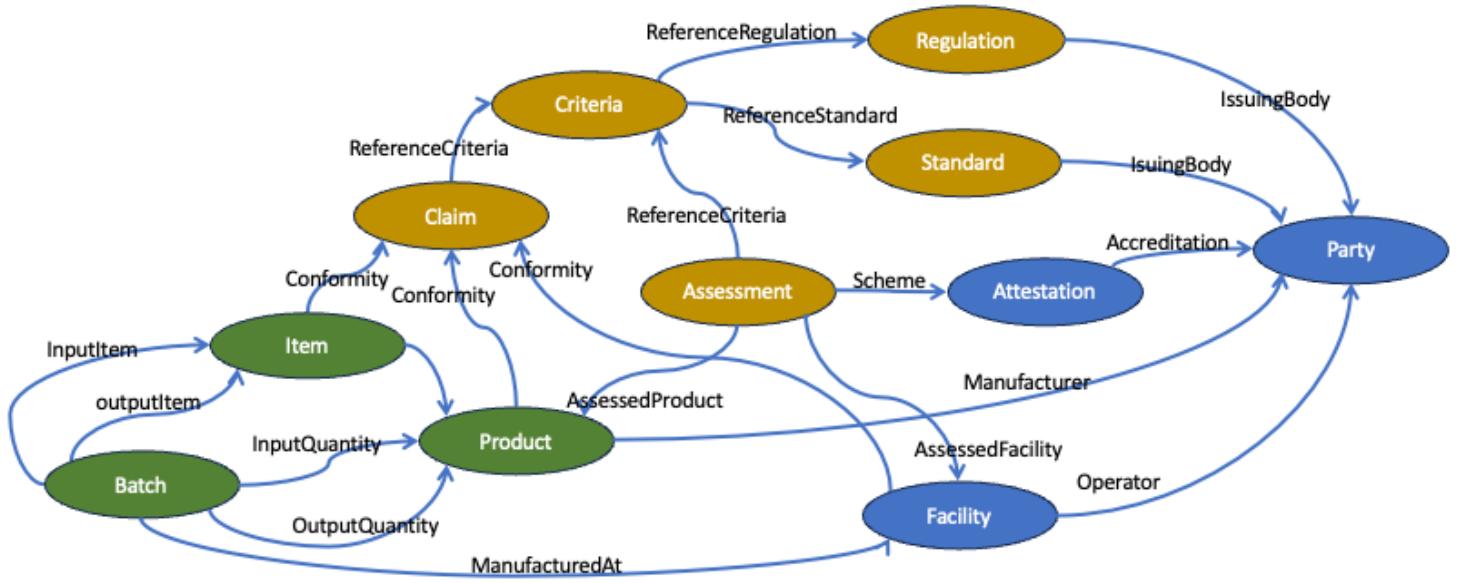
## Transparency Graphs

A transparency graph is a linked set of identified nodes such as Product, Location, Facility, Party, Standard, Regulation, Criteria, Declaration, Attestation, or Endorsement. The data to construct a transparency graph comes from multiple individual credentials. When multiple credentials identify the same entity (eg a business, a facility, a product) then the graph will draw meaningful connections that can be used to make valuable verifications such as "product XYZ has a GHG assessment from CAB ABC". UNTP is designed to simplify the task of creating linked data graphs because UNTP credentials are represented as a collection of uniquely identified entities that are ready to be added to a graph.

- A Digital Product Passport is a set of declarations (claims) against sustainability criteria defined in regulations or standards - made by a manufacturer party about a given product that is manufactured at a facility in a defined location.
- A Digital Conformity Credential is an attestation made by an endorsed conformity assessment body - which includes one or more assessments of a list of identified products or facilities against specific criteria.

Although these two credential types have different structures, they are assembled from the same core vocabulary building blocks. This allows a supply chain transparency system to easily construct a transparency graph from a stream of DPPs and DCCs. Claims about a product found in a DPP can be

linked to assessment of the same product in DCC when both credentials have matching product and criteria identifiers.



## JSON-LD Representation

TBA

## SCHACL Graph verification

TBA

# Anti-Counterfeiting

## ! INFO

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## Overview

As the value of genuinely sustainable goods increases, so do the incentives to sell fake goods as the real thing. UNTP defines a simple and decentralised anti-counterfeiting protocol that can be implemented by any producer at very low cost. It builds upon the W3C DID standard by issuing a unique DID (and corresponding keypair) for every serialised (individual or batch) product. The DID (and therefore the public key) is discoverable from the product serial number using the standard link resolver protocol. The item/batch level DID is cryptographically linked to the product class level DID. The private key is discoverable from a QR code hidden inside the product packaging. Scanning the QR provides the necessary key to update the individual serialised product public status to indicate consumption. Attackers that copy genuine serial numbers will find that their products are quickly identifiable as fakes. Attackers that try to create new serial numbers will not be able to create valid links to the genuine product class. The UNTP anti-counterfeiting protocol provides additional value/incentive for UNTP uptake beyond ESG integrity.

## Product Serial DID

## Product Serial VC

## Brand Trust Root

## Public Verification

# **Private Acquittal**

# Mass Balance

## ! INFO

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## Overview

Mass balance fraud is a particularly challenging greenwashing vector. It happens when a fraudulent actor buys a small quantity of high ESG integrity inputs (eg genuine carbon neutral, organic, deforestation free cotton) and mixes that input with lower quality alternatives and then sells the full volume of manufactures product (eg woven cotton fabric) as sustainable product, re-using the valid credentials from the niche supply. The UNTP solution to this problem involves trusted third parties (certifiers or industry associations) to act as quota managers that issue "guarantee of origin" credentials (a type of conformity credential). In this model, the guarantee of origin certificate for 10 Tons of cotton fabric (for example) can only be issued when the third party has evidence of the purchase of at least 10 Tons sustainable input materials. The third party will also mark the input batch as consumed (in a similar way to the anti-counterfeiting protocol) so that the valid sustainable input cannot be re-presented to a different third party.

# ESG Rules

## ! INFO

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## Overview

Yet another greenwashing attack vector is to deliberately apply incorrect rules to the determination of criteria such as emissions intensity. The verification question in this case is "yes, but how do I know you calculated it right?". The UNTP proposes an independent calculator service offered either by the standards body or regulator that defined the rules or by an accredited service provider. The Supply chain actor presents raw data to the calculator which returns with a signed credential confirming that the rules were correctly applied. This protocol has an additional benefit for legitimate actors if widely adopted by rules authorities - which is to significantly simplify the assessment of compliance against multiple different rules. By separating observed facts from the assessment of those facts against specific rules then it becomes relatively simple to test compliance against multiple standards and regulations.

# Implementation Guidance

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## Implementation Guidance

# Implementation Plans

## ! INFO

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## For Buyers and Suppliers in the Value Chain

Implementation guidance is broken into three phases (crawl, walk, run) that provide a mechanism to safely transition from low cost pilots to full scale production implementations with decision points (proceed, pivot, pause) at each stage gate.

| Phase                | Focus   | Outcome  |
|----------------------|---|--|
| Discovery<br>(crawl) | Familiarisation with UNTP.<br>Assessment of scope and value.                              | Manually created trial digital credentials exchanged with a small number of trading partners. Business case for Alpha phase ready for decision.      |
| Alpha<br>(walk)      | Validation of integration cost & complexity. Validation of scope and value                | Automated creation and verification of digital credentials from natural business systems (test environments). Ready to scale. Go/NoGo decision ready |
| Beta (run)           | Managed expansion to full scale implementation for all products, facilities, and partners | Realisation and reporting of ongoing value   |

## Discovery Phase (Crawl)

| <b>Step</b> | <b>Activity</b>  | <b>Result</b>  |
|-------------|--|--|
| 1           | Map cost & benefit categories using <a href="#">business case template</a> | Raw case for implementation                                      |
| 2           | Map sustainability categories  | Prioritised sustainability criteria scope                        |
| 3           | Map value chain scope  | Pilot product and participant scope                              |
| 4           | Create identities  | Got usable DIDs  |
| 5           | Create sample DPPs using reference implementation                          | Got a realistic DPP for one product                              |
| 6           | Verify supplier DPPs   | Upstream supply visibility                                       |
| 7           | Map supplier DPPs to corporate disclosures                                 | Prove scope 3 feasibility  |
| 8           | Create transformation event  | Supplier DPP is linked to my DPP                                 |
| 9           | Add conformity credential  | Add 3rd party verification to my DPP                             |
| 10          | Create & publish links   | Made my DPP discoverable   |
| 11          | Encrypt one supplier DPP & create secure link                              | Prove that confidential information can be selectively disclosed |
| 12          | Provide QR to customer   | Test customer perception of value                                |
| 13          | Revisit & refine business case   | Case (or not) for Alpha phase                                    |
| 14          | Declare implementation intent  | public marketing of your commitment                              |

## Alpha Phase (Walk)

| <b>Step</b> | <b>Activity</b>                 | <b>Result</b>   |
|-------------|---------------------------------|---|
| 1           | Engage with activated community | Achieve consistency in implementation across a commodity and/or geographic sector |

## **Beta Phase (Run)**

**For Registry Operators**

**For Conformity Assessment Bodies**

**For Industry Associations**

**For Regulators**

**For Software Vendors**

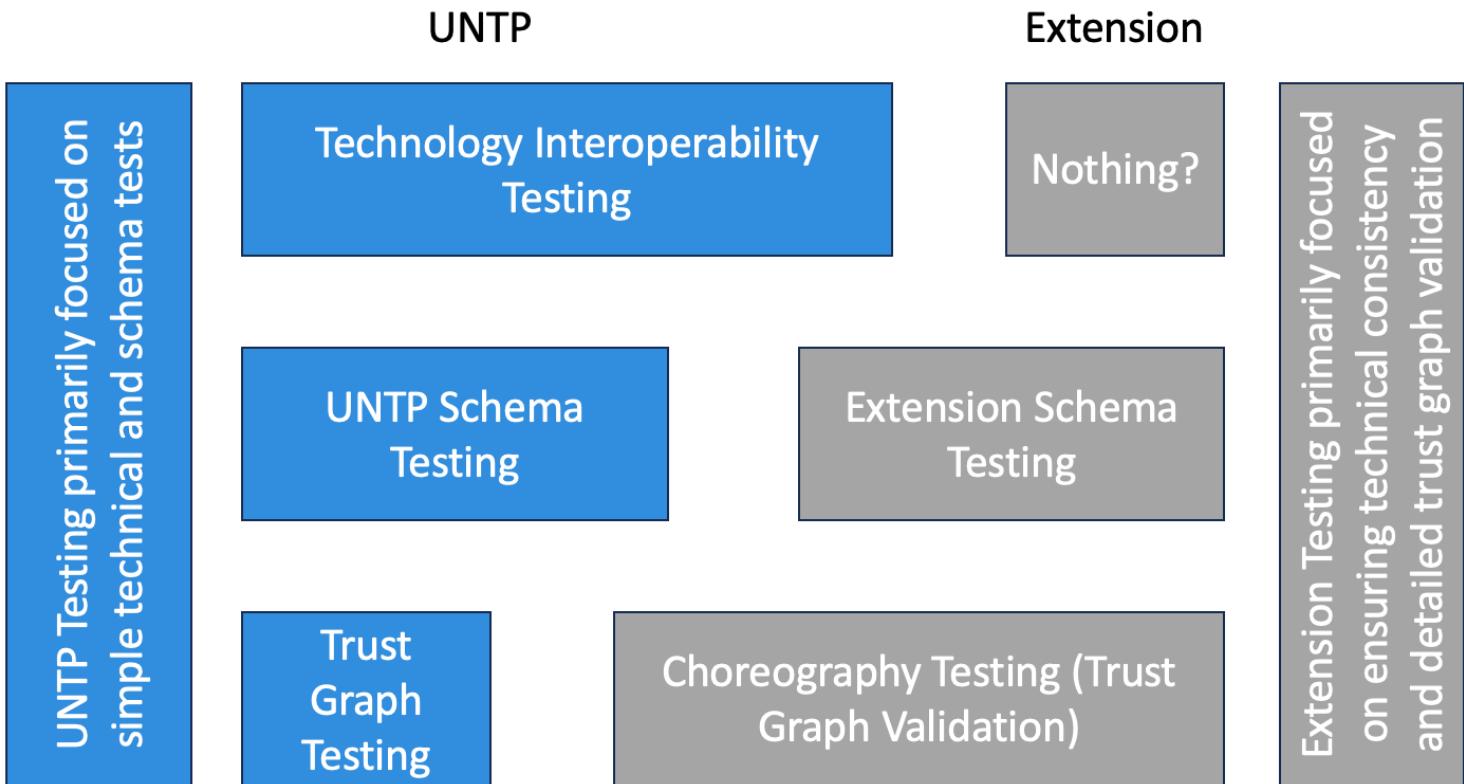
# Test Services

## ! INFO

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## 3 Tier Test Architecture

There is a 3 tier testing architecture to help implementors ensure that they are issuing UNTP interoperable digital product passports. This architecture also ensures that as implementors 'extend' the UN Transparency Protocol they do that in a non-breaking fashion.



At each tier we articulate the specific testing for UNTP and for an extension.

## UNTP Testing (the blue sections in the diagram)

The UNTP testing is intended to provide implementors the ability to validate that they have a complete valid reference implementation of UNTP. This testing gives a starting point so that implementers know that their implementation is starting as UNTP compliant and that any extensions that they make need to have validations added to ensure continued UNTP interoperability.

## **Tier 1: UNTP Test: Technology Interoperability Testing**

This testing is intended to provide implementers confidence that the technical implementation is correct. It is primarily focused on W3C verifiable credential compliance.

## **Tier 2: UNTP Test: UNTP Schema Testing**

This tests that the schema that are being used to issue credentials are a valid UNTP schema. This will enable an implementor to validate that they are starting with a valid UNTP set of schema.

## **Tier 3: UNTP Test: Trust Graph Testing**

This validates that the links between the different components of the UNTP schema (DPP, DTE, DCC) are validated. It is anticipated that this is relatively simple at generic UNTP level, but will get more involved for each extension.

## **Extension Testing (grey boxes)**

UNTP has been designed so that each industry and jurisdiction can extend UNTP to meet their specific business, governance and community needs. In order to ensure that supply chain customers downstream can consume details from their upstream supply chain partners - it is important that extensions maintain UNTP compliance. Extension testing is intended to provide that confidence to implementors.

## **Tier 1: Extension Test: Nothing?**

It is expected that there won't be changes at Tier 1 of the testing architecture for extensions. This is because we are using W3C standards and if there are requirements for extensions it is beyond the scope of UNTP to manage. We are including it in the architecture to facilitate future unforeseen needs.

## **Tier 2: Extension Test: Extension Schema Testing**

This testing is designed to ensure that as implementors are extending UNTP schema (DPP, DTE, DCC) to meet their specific needs that they are not breaking compatibility with UNTP and that they are able to provide the implementors of their extensions with confidence that their extension is correct.

## **Tier 3: Extension Test: Choreography Testing (Trust Graph Validation)**

This provides the ability for extendors to map the different credentials together to validate specific industry or regional scenarios. In Australia NATA is the national accreditor for laboratories - so the link from NATA to an accredited laboratory to a specific accreditation would be validated by a test in this component.

# Help and support

## ! INFO

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## Implementation Support

# Reference Implementation

## ! INFO

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## Reference Implementation

The following tools make up a reference implementation.

| Tool              | Link  | Description  | Status                               |
|-------------------|---|--|--------------------------------------|
| Project VC Kit    | <a href="https://github.com/uncefact/project-vckit">https://github.com/uncefact/project-vckit</a>   | This is a tool that verifies and issues credentials.   | Active Development                   |
| Mock Apps         | <a href="https://github.com/uncefact/tests-untp/tree/next/packages/mock-app">https://github.com/uncefact/tests-untp/tree/next/packages/mock-app</a>               | Tool to build testable supply chain implementations to enable testing and validation of your DPPs and supply chain | Active Development                   |
| Identity Resolver | <a href="https://github.com/uncefact/project-identity-resolver">https://github.com/uncefact/project-identity-resolver</a>   | Tool that enables to go from the identifier to more information about the identified object including a DPP        | Not yet release (expected Sept 2024) |
| UNTP Test Suite   | <a href="https://github.com/uncefact/tests-untp/tree/next/packages/untp-test-suite">https://github.com/uncefact/tests-untp/tree/next/packages/untp-test-suite</a> | Provides tooling for implementers to validate their DPP's across the 3 tiers (correct credential,                  | Active Development                   |

| Tool | Link | Description                                  | Status |
|------|------|--|--------|
|      |      | correct schema, and<br>correct choreography) |        |

# Extensions Register

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## Extensions Register

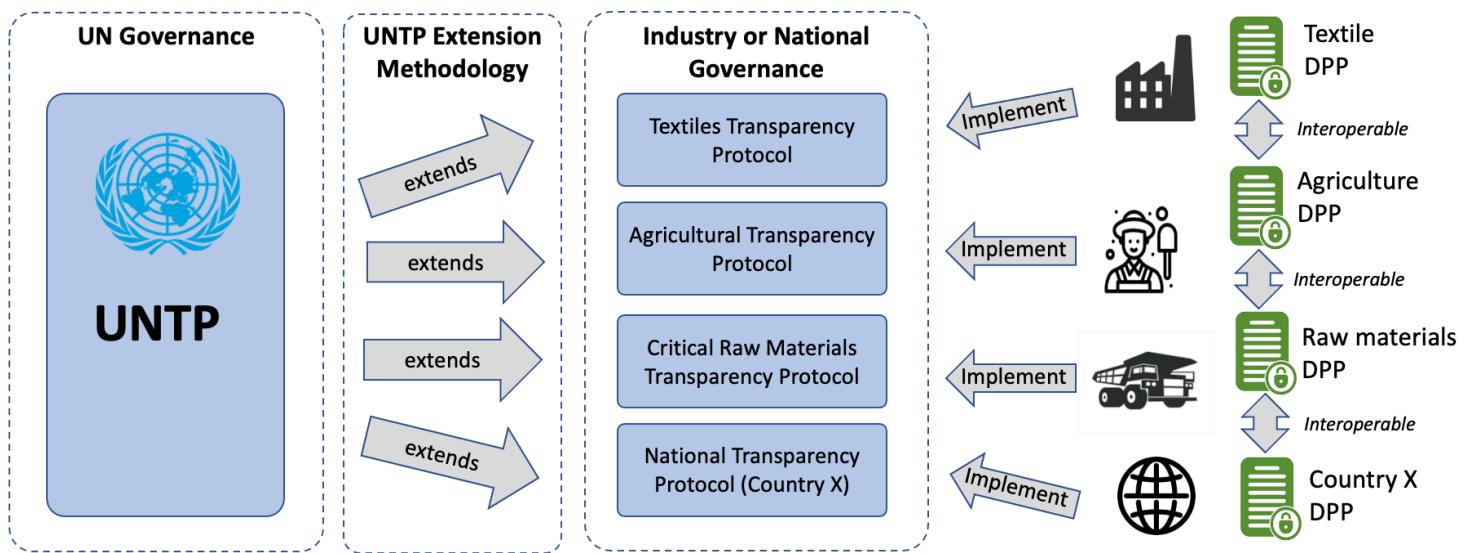
# Extensions Methodology

## ! INFO

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## Overview

UNTP is designed as a common core that is usable by any industry sector or in any regulatory jurisdiction. This extensions methodology describes how to extend UNTP to meet the specific needs of any industry sector or regulated market in such a way that the extension maintains core interoperability with any other extension. This cross-industry and cross-border interoperability is a core value of UNTP because almost every value chain will cross industry and/or national borders.



In some cases, UNTP extensions are themselves UN projects - such as the extensions defined by the [UN critical raw materials traceability and transparency project](#). In most cases however, industry sectors and/or national projects will govern their own extensions.

To be registered as UNTP conformant, an extension MUST remain interoperable with UNTP. This is achieved by limiting extensions to the extension points described below and be completing interoperability testing.

## Extension Points

**Schema Extensions**

**Vocabulary Extensions**

**Identifier Extensions**

**Choreography Extensions**

**Testing Extensions**

# Extensions Register

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## Extensions Register

# **Implementations Register**

# **Industry**

# Trust Anchors

# Certifiers

# **Software Solutions**