

# From Trustworthiness Profile Towards a “**Framework for Chain-of-Trust**”

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German Platform Industry 4.0

Siemens AG

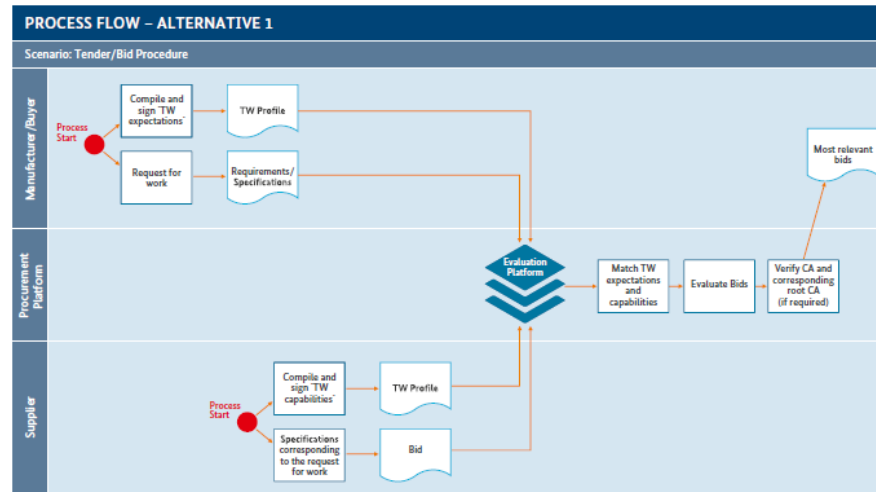
# Introduction

Plattform Industrie 4.0, Germany and Robot Revolution Initiative, Japan had been collaborating since 2017 on topics concerning security of Industrial IoT (IIoT) and Industry 4.0 use cases.

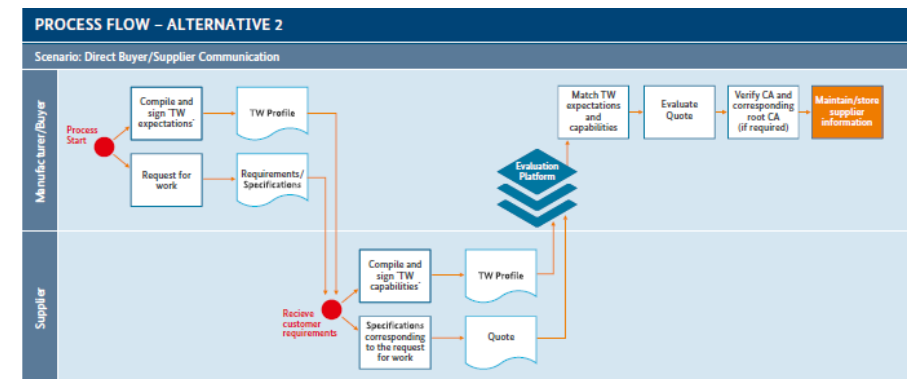


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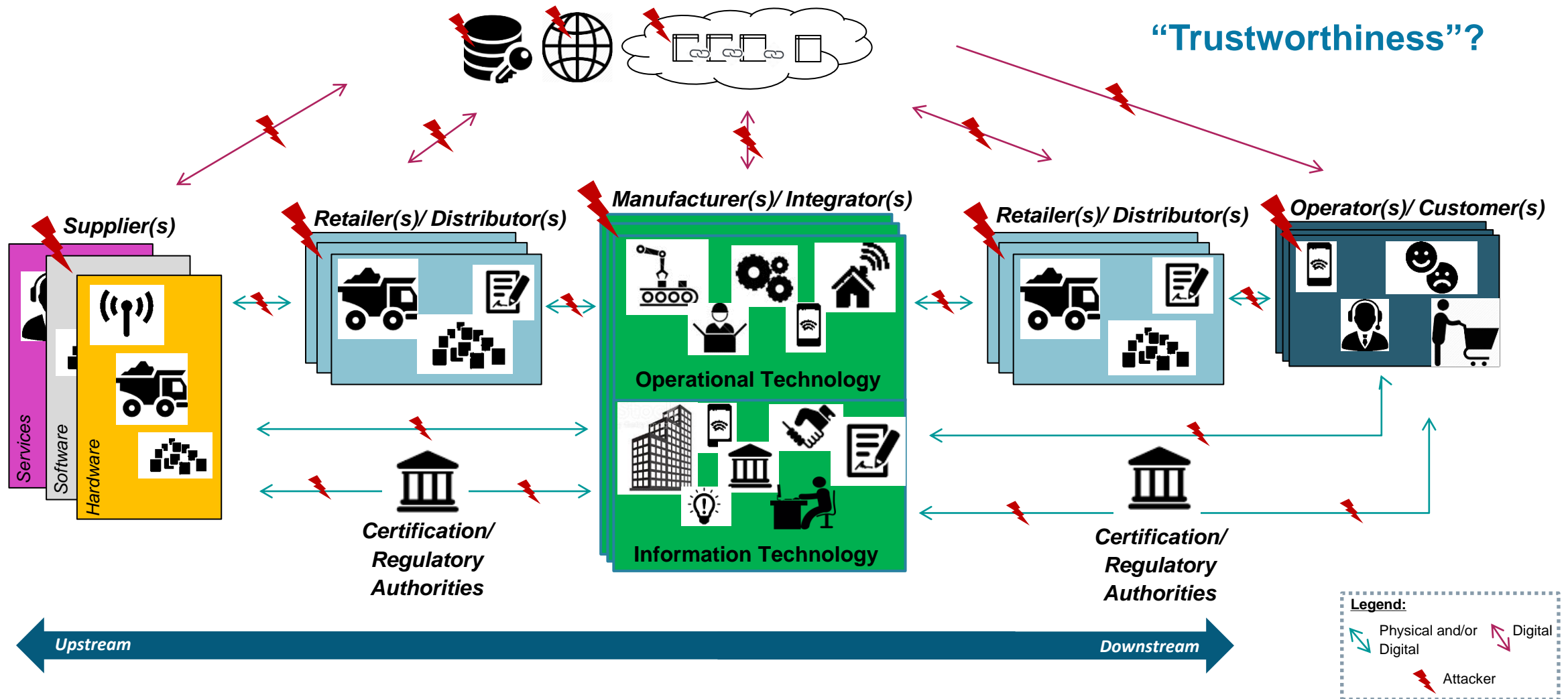
[i40.de/PI40/Redaktion/EN/Downloads/Publikation/IIoT\\_Value\\_Chain\\_Security.html](https://www.plattform-i40.de/PI40/Redaktion/EN/Downloads/Publikation/IIoT_Value_Chain_Security.html)



The white paper introduces a **Trustworthiness Expectations and Capabilities Exchange Protocol” (TECEP)** as a technical solution to be used for trustworthiness negotiation and exchange between participating peers.



# Generic Supply Chain Scenario



## Trustworthiness of Supply Chains for Industry 4.0

In the context of our work, the definition of the term ‘trustworthiness’ proposed by the ISO/IEC JTC1/WG13 has been adapted as:

***“For supply/value chain security, the term ‘Trustworthiness’ corresponds to the stakeholder’s ability to meet the expectations of the potential contract partner in a verifiable way”.***

Note 1: Depending on the use case and on the specific product, different characteristics would apply to fulfil stakeholder’s expectations. These characteristics may include **authenticity, integrity, resilience, availability, confidentiality, privacy, safety, accountability, usability, environmental properties (CO2 footprint), compliance to social regulations...**

Note 2: Trustworthiness is an attribute that can be applied to services, products, technology, data and information as well as, in the context of governance, to organizations.

Note 3: Products and components are considered and the ability to protect products and components regarding integrity and authenticity along the supply chain.

Note 4: Product properties must include considerations for the intended use/intended operational environment.

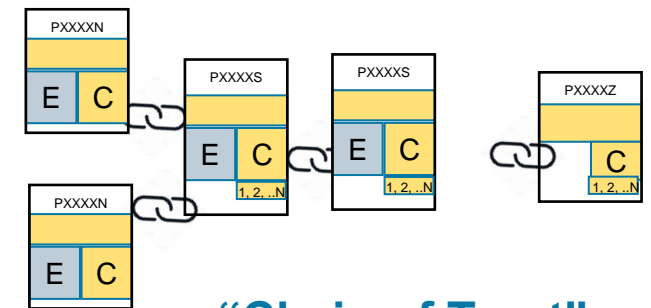
## “Chain of Trust” is needed

There exist many security approaches, which can be used for supply chains, e.g.:

ISO/IEC 28000, ISO 2700x, IEC 62443, ISO 15408, ISO TC292 “Anti-counterfeiting”,.....

However, there does not exist a standard suite or a framework yet:

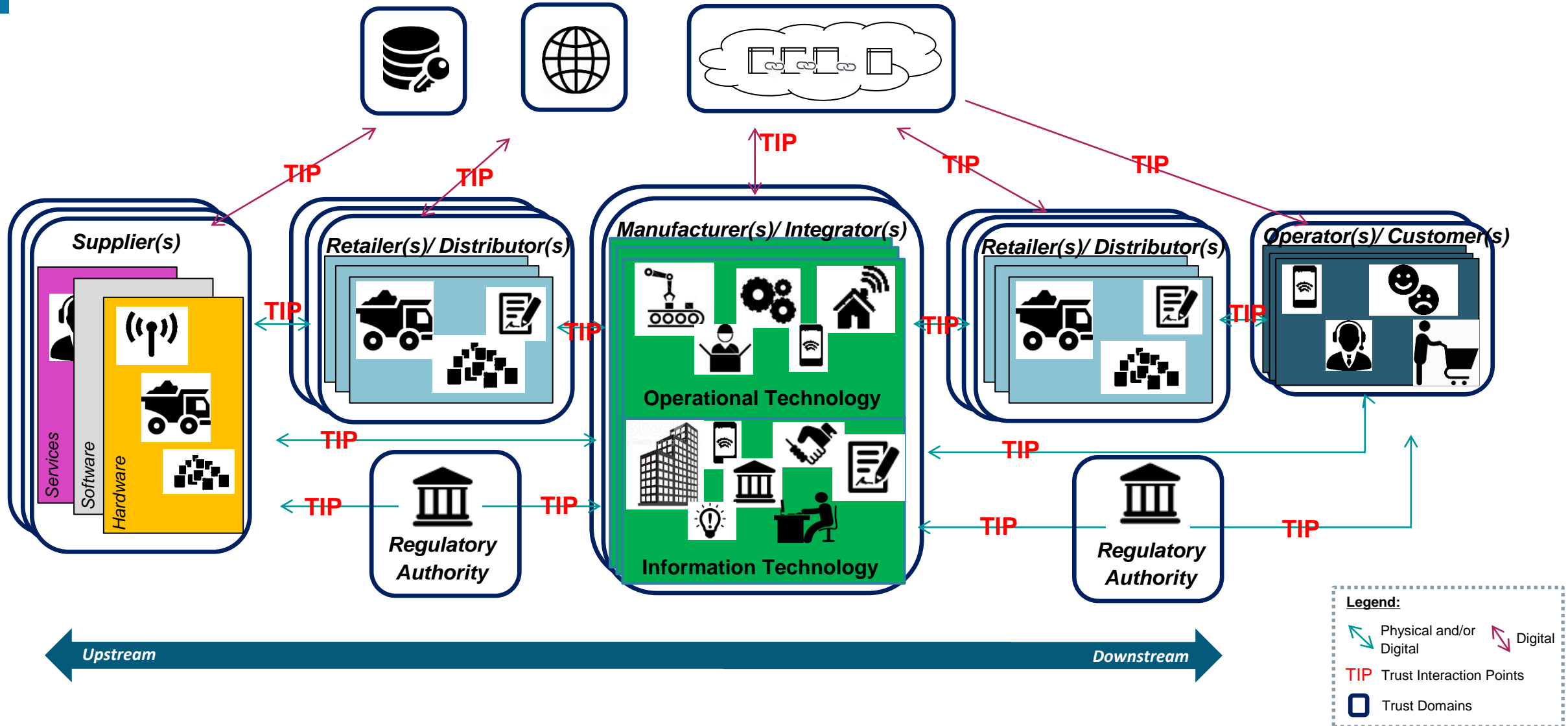
- which establishes & measures Trustworthiness of security properties **along the supply chain**
- which includes **interoperability**
- which provides **assurance** for several nodes of the supply chain
- which supports **automated** processing



“Chain of Trust”

*Trustworthiness profile serves as the basic building block for the chain of trust, to provide trustworthiness information at any node along the supply chain.*

# Structured Approach to Establish Trustworthiness



## Ingredients for Trustworthiness Negotiations at Trust Interaction Points

### Identities ...

- of organizations, such as NTA, etc.
- of employees, such as usernames, email addresses, PKI certificates, etc.
- of processes, such as the unique process ID assigned by the operating systems, etc.
- of products and components, such as barcodes, etc.

### Certificates

- Identity Authenticating Certificates such as X.509 PKI, eIDAS, DIDs, etc.
- “Security Certification Certificates”, such as ISO 27001 certificates, IEC 62443 certificates, ISO/IEC 15408 certificates, etc.
- ...

### Standards and Frameworks

- IEC 62443-x-x
- ISO 27001
- METI CPSF
- NIST CSF
- ISO 21434
- TISAX
- ISO/IEC 15408-x
- ISO TC 292 Standards, such as ISO 22384, etc.
- ...

# Trustworthiness Profile

A standardized container that can be realized irrespective of the base communication technology.

The granularity of trustworthiness expectations is flexible and depends on the business provider's requirements.

The Trustworthiness Profile leverages cryptographic mechanisms to ensure integrity of the exchanged information.

Trustworthiness Profile					
To be filled by the Buyer			To be filled by the Supplier		
<b>Buyer's Information</b>			<b>Supplier's Information</b>		
Contact Partner:			Contact Partner:		
*Contact Partner's Unique Identifier:			*Contact Partner's Unique Identifier:		
Contact Information:			Contact Information:		
Legal Entity Name:			Legal Entity Name:		
*Legal Entity Unique Identifier:			*Legal Entity Unique Identifier:		
*Unique Identifier Scheme: (e.g., link to LEI code repo, VATIN by DUNS, NTA by TSE, etc.)			*Unique Identifier Scheme: (e.g., link to LEI code repo, VATIN by DUNS, NTA by TSE, etc.)		
Country:			Country:		
Additional Information:			Additional Information:		
<b>Trustworthiness Expectations</b>					
	Additional Information	Expected Validity	Supplier Conformance	Self	3rd party
ISO/IEC 62443-4-2	Upload/Attach		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ISO 27001	Upload/Attach		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NIST SP 800	Upload/Attach		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Common Criteria	Upload/Attach		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PSS Supplier Questionnaire	Upload/Attach		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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	Upload/Attach		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Upload/Attach		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reference Request-for-work					Time Stamp
Digital Signature			Digital Certificate (If required)		
<b>Trustworthiness Capabilities</b>					
Conform:	Proof/ Evidence	Proof Expiry Date	Additional Information		
<input type="checkbox"/> Self-Assessment <input type="checkbox"/> 3rd-Party Assessment <input type="checkbox"/>	Upload/Attach	DD.MM.YYYY			
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Reference TW Expectations	Quote/Bid Reference		Time Stamp		
Digital Signature			Digital Certificate (If required)		



# Trustworthiness Profile Extension

Trustworthiness Profile																																																																																																					
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<p style="text-align: center;"><b>Buyer's Information</b></p> <p>Contact Partner: _____</p> <p>*Contact Partner's Unique Identifier: _____</p> <p>Contact Information: _____</p> <p>Legal Entity Name: _____</p> <p>*Legal Entity Unique Identifier: _____</p> <p>*Unique Identifier Scheme: (e.g., link to LEI code repo, VATIN by DUNS, NTA by TSE, etc.) _____</p> <p>Country: _____</p> <p>Additional Information: _____</p>	<p style="text-align: center;"><b>Supplier's Information</b></p> <p>Contact Partner: _____</p> <p>*Contact Partner's Unique Identifier: _____</p> <p>Contact Information: _____</p> <p>Legal Entity Name: _____</p> <p>*Legal Entity Unique Identifier: _____</p> <p>*Unique Identifier Scheme: (e.g., link to LEI code repo, VATIN by DUNS, NTA by TSE, etc.) _____</p> <p>Country: _____</p> <p>Additional Information: _____</p>																																																																																																				
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## Next Steps

- Standardization of the Framework for Trustworthiness, including the Trustworthiness Profile.
- Suitable secure identities/identifiers and corresponding infrastructure to realize the Chain of Trust.
- Mechanism(s) to bind SCCs to the corresponding real world entity and its operational environment.
- Identify and evaluate technologies to realize the Chain of Trust along supply/value chains.
- Communicate and discuss the results.

# Plattform Industrie 4.0

**Thank you  
very much**

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