



**TRUST**  
Over **IP**  
**FOUNDATION**

 **THE LINUX FOUNDATION**

# Introduction to ToIP

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Internet Identity Workshop #38

April 16, 2024



# ToIP's Mission

To simplify and standardize how trust is established over a digital network or using digital tools.

We focus on BOTH...

Interoperability and cryptographic verifiability at the machine layers

Human accountability at the legal, business, and social layers

Since we are trying to define an architecture for digital trust on the internet we need technology...



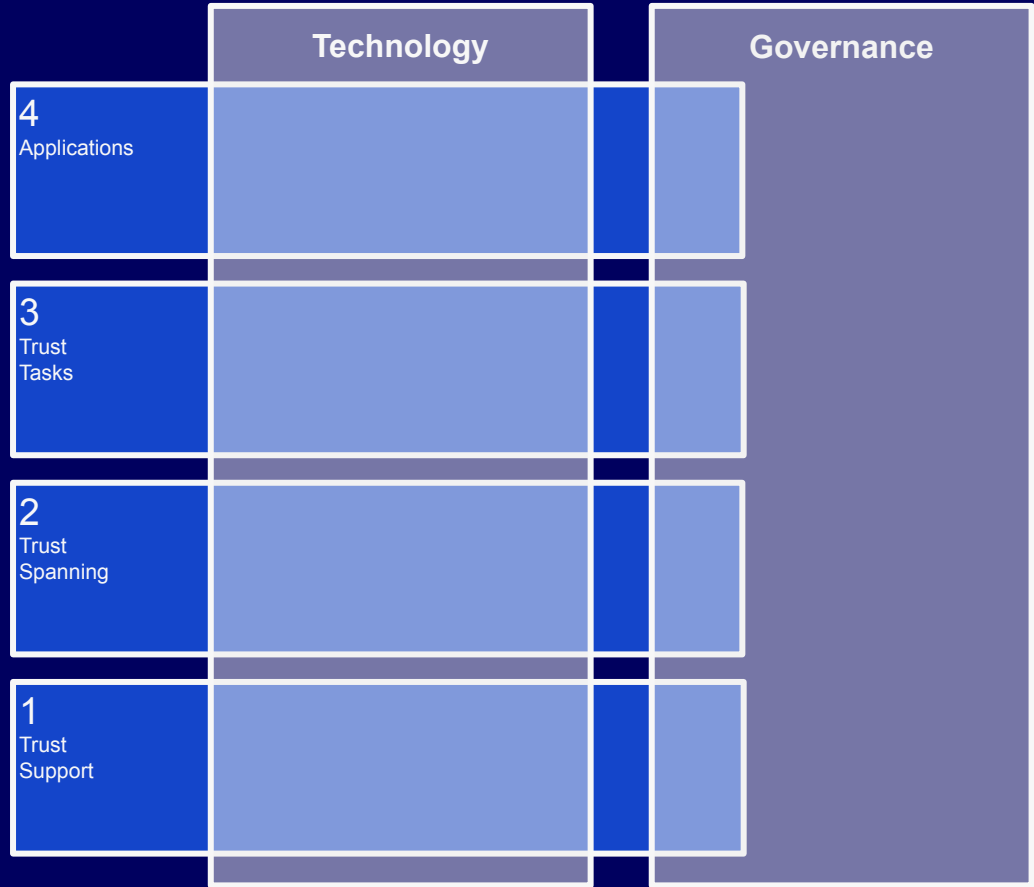
Technology

Technology

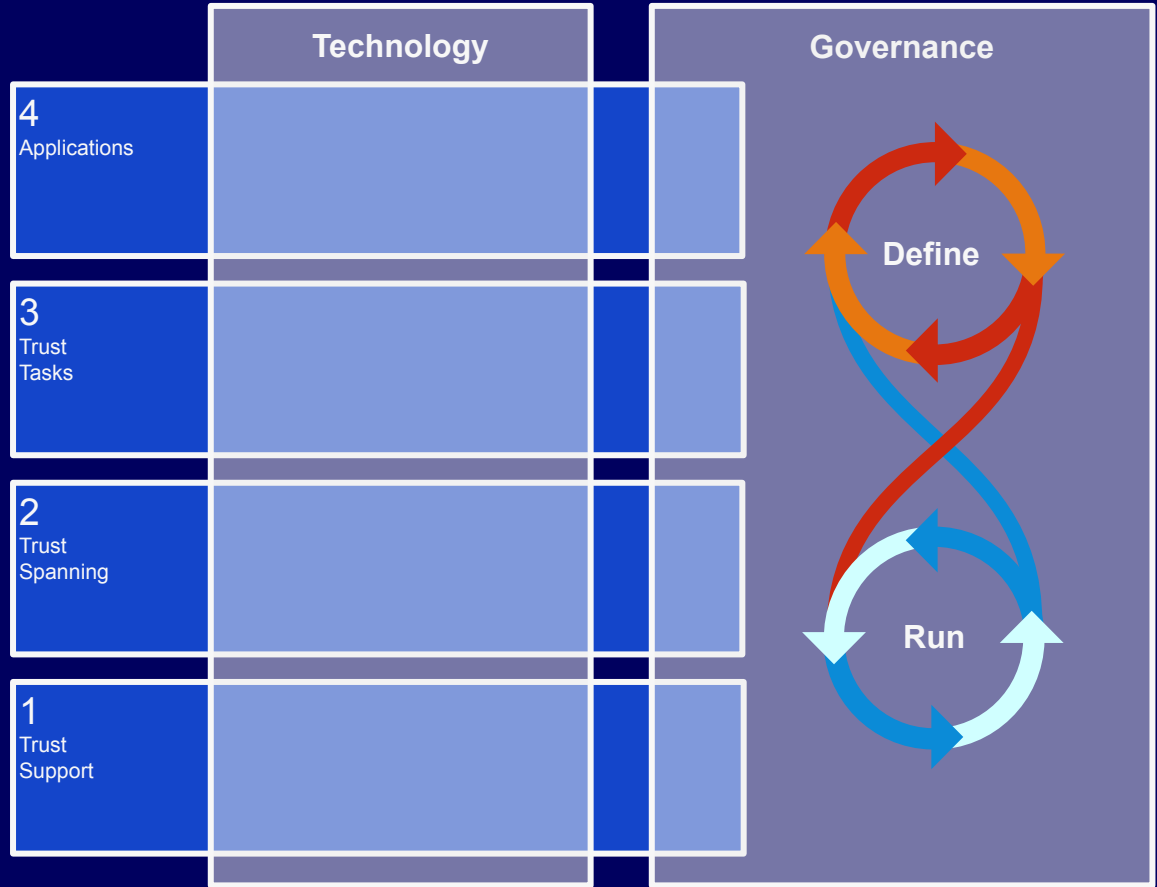
Governance

Experience has taught us that for technology to be trustworthy, we need to understand how it is governed

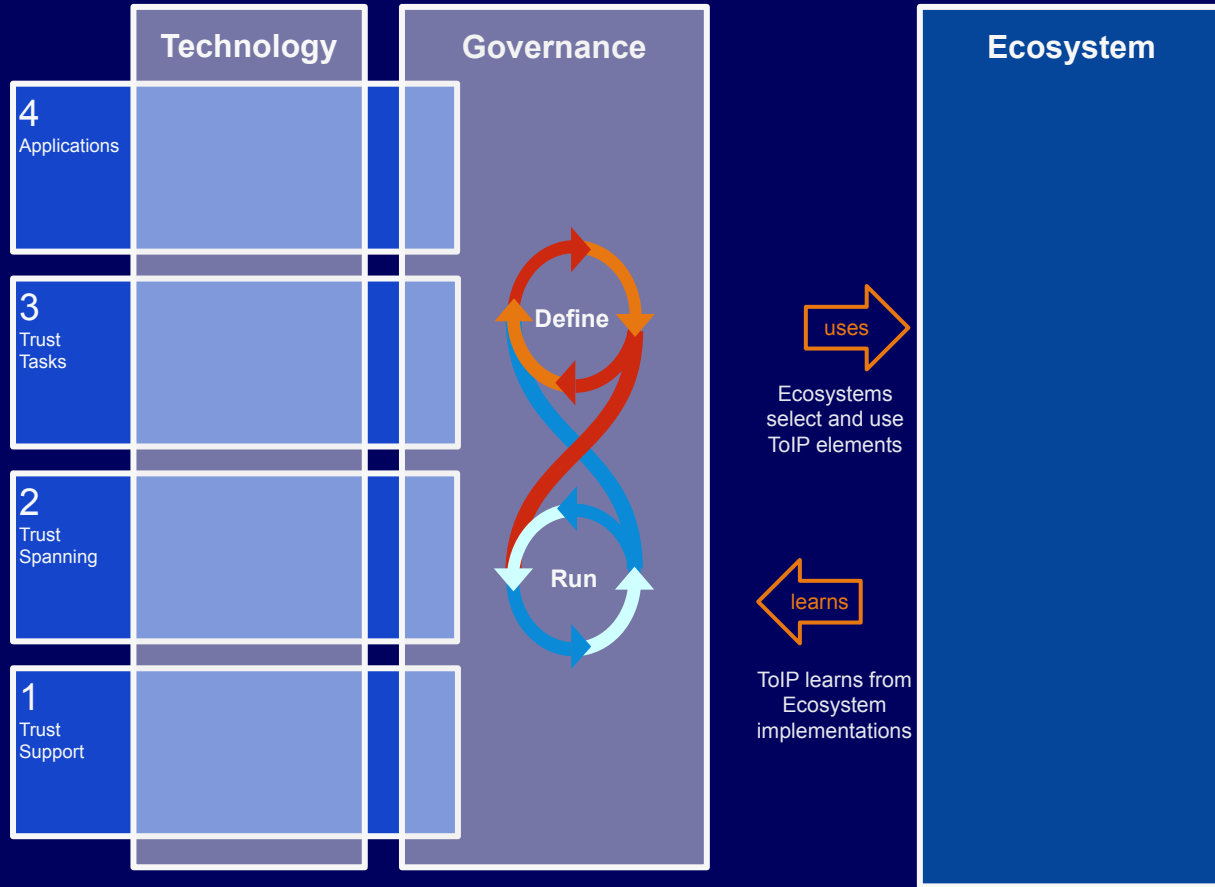
Using layers helps to describe how technology systems are built and we can see the need for governing each layer.



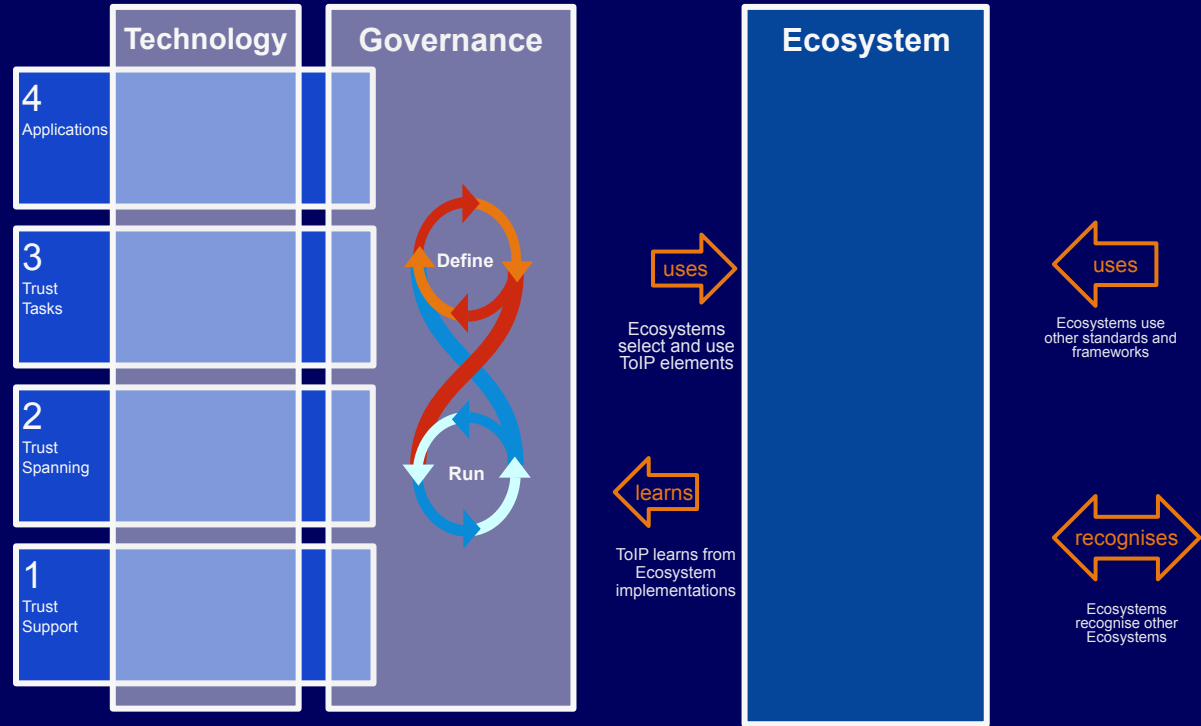
Governance is a continual process cycling through define, run, and (re)define cycles



Ecosystem implementations will use ToIP elements and ToIP will learn from how they are used.

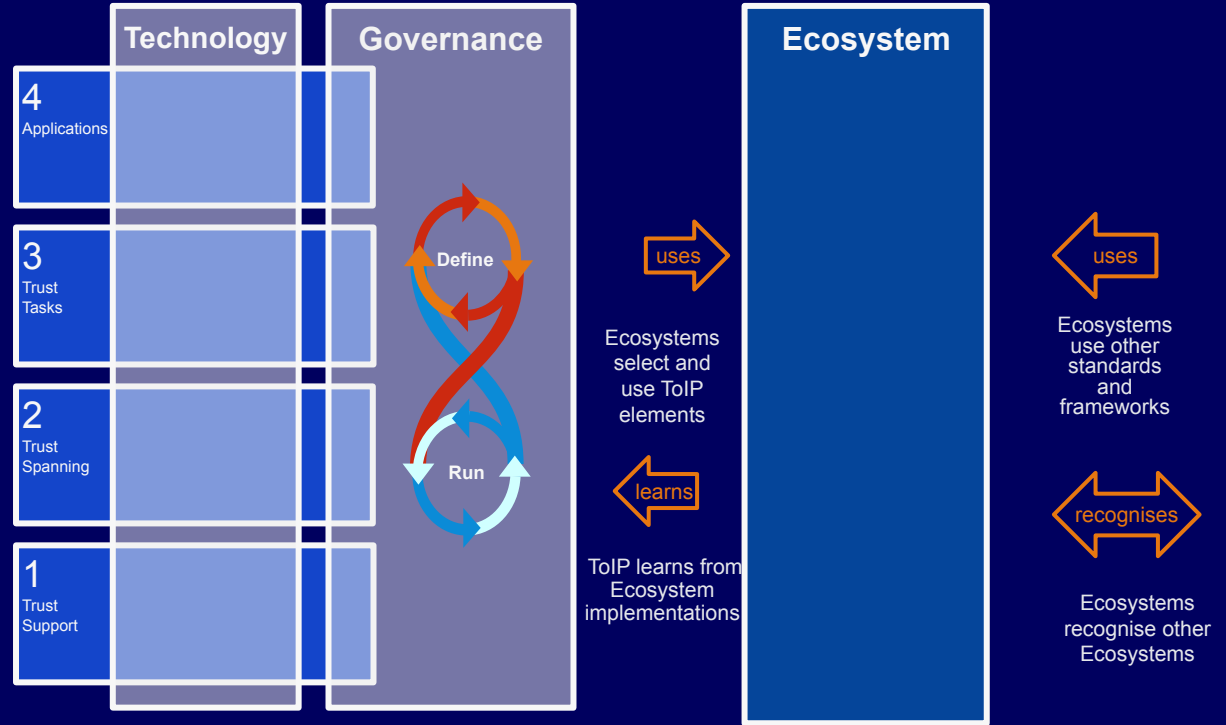


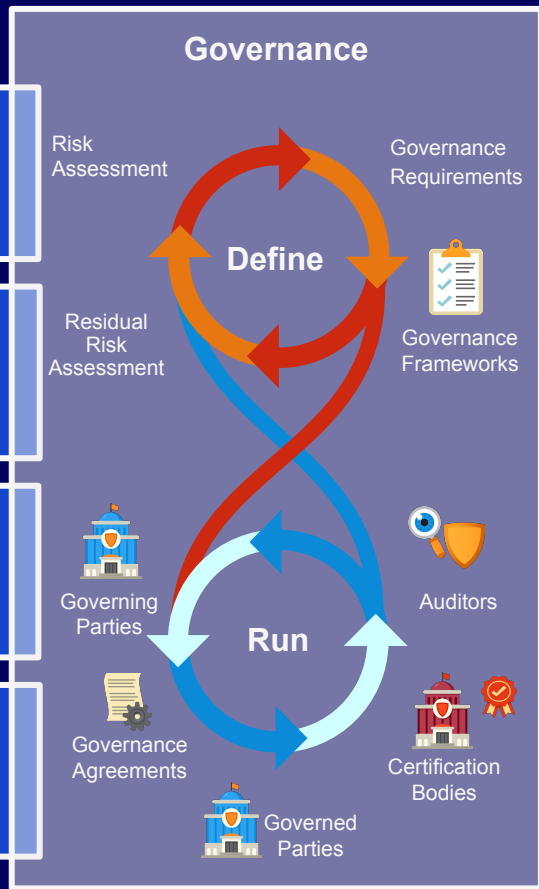
Ecosystem implementations may make use of other systems in addition to ToIP. Ecosystems may have relations with other ecosystems





Now we'll use some concrete representations of artefacts and parties to illustrate how it works...





- ### Ecosystem
- Purpose & Scope
  - Governance
  - Technology
  - Legal Model
  - Commercial Model
  - Credential Model
  - Ecosystem Roles (e.g., Issuers, Holders, Verifiers, Relying Parties)
  - Membership Policies
  - Regulatory Policies
  - Liability & Insurance
  - Mutual Recognition
  - ...

**uses**

Ecosystems select and use ToIP elements

**uses**

Ecosystems use other standards and frameworks

**learns**

ToIP learns from Ecosystem implementations

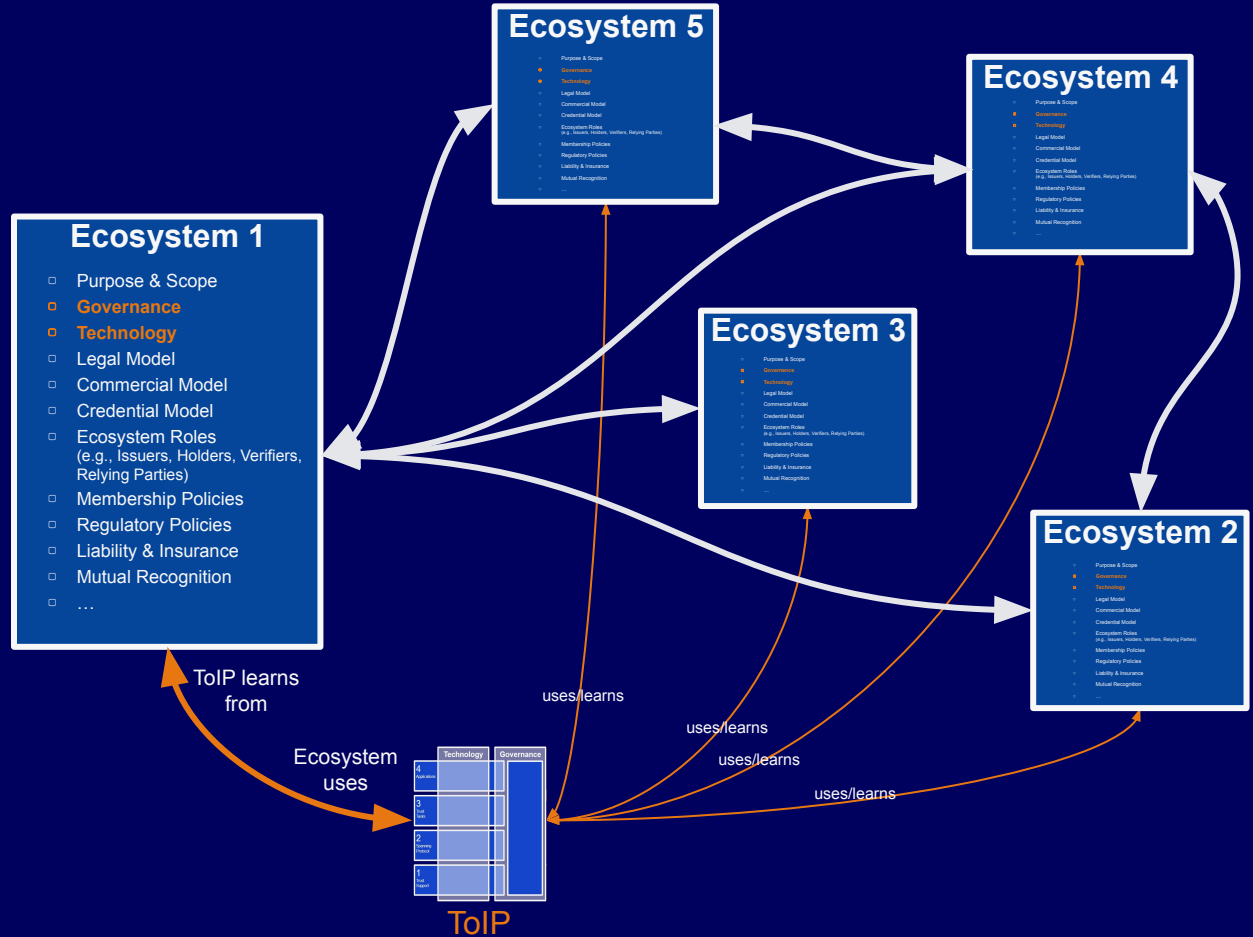
**recognises**

Ecosystems recognise other Ecosystems

ToIP Model  
Span of Control

Ecosystem Instance  
Span of Control

With ToIP, the Internet can become a world of interconnected & interoperable digital trust ecosystems





## Trust Over IP Foundation

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Organization Structure  
and work products

# Work of Trust Over IP

1. Specifications – that can be in code
2. Templates – that can be instantiated as documents
3. Definitions – that can be can be incorporated by different organizations
4. Recommendations –that can be that can be followed
5. Implementation plans - that can be executed
6. White Papers – that can be understood to clarify complex issues in the Self Sovereign Identity and Verifiable Credentials space, and the entire digital trust landscape.

# Working Group and Task Forces

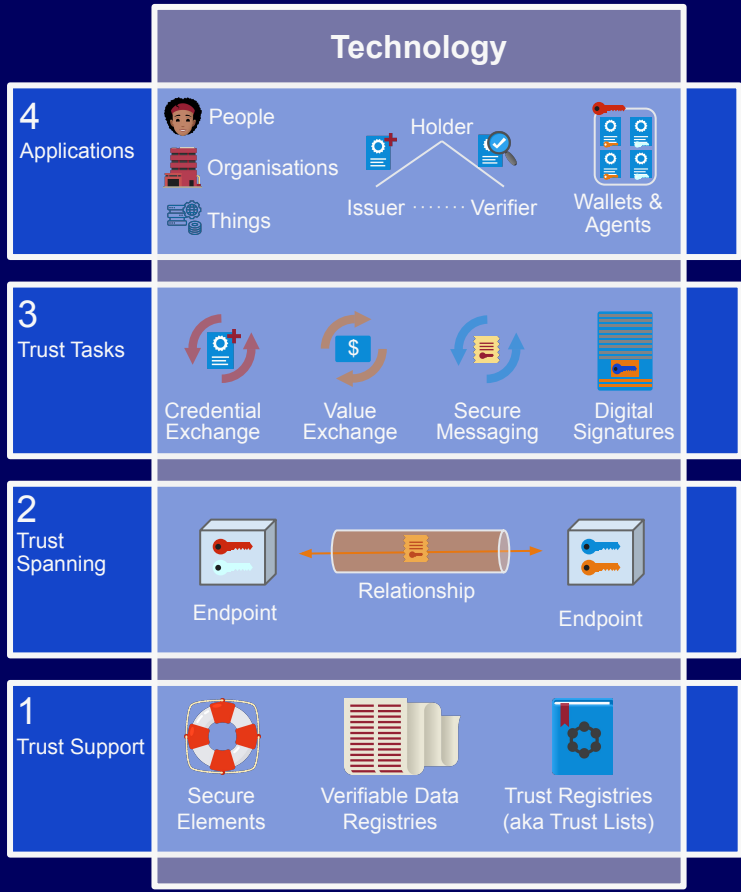
## Primary

1. Technology Stack WG
2. Governance Stack WG
3. Ecosystem Foundry WG
4. Data Modeling and Representation WG
5. Concepts and Terminology WG
6. Utility Foundry WG
7. Human Experience WG

## Special Purpose

Interoperability Working Group for Good Health Pass (GHPC)

# Technology Stack Working Group

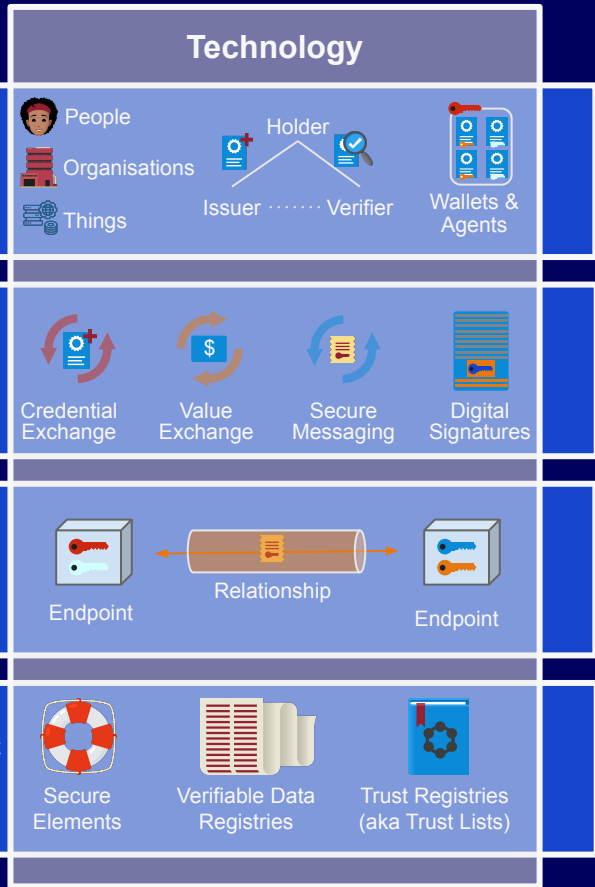


ToIP Model  
Span of Control

# Technology Stack Working Group

## Task Forces:

- Tech Architecture (TATF)
- Trust Spanning Protocol (TSPTF)
- Trust Registry (TRTF)
- ACDC TF - working Keri Suite
- X.509 TF
- DID:Webs TF
- Credential Exchange TF
- AI and the Metaverse TF (AIMTF)



ToIP Model  
Span of Control



# Technology Stack Working Group

- Tech Architecture Task Force (TATF)

Based on our Design Principles the TATF is working on the complete reference architecture for the entire stack.

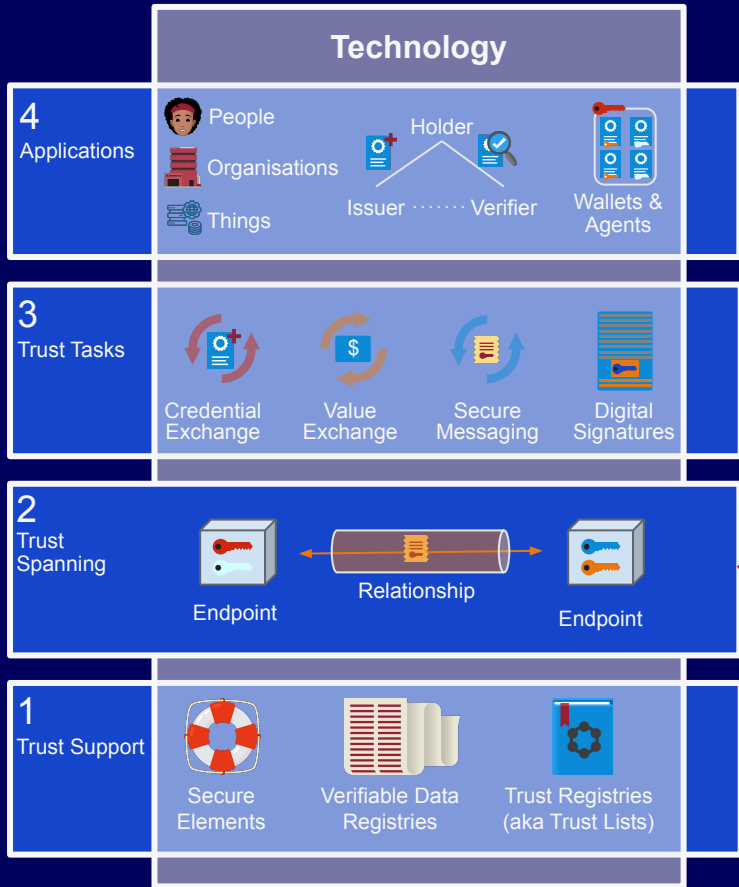


# Technology Stack Working Group

- Trust Spanning Protocol Task Force (TSPTF)

The TSPTF is working on the keystone of the ToIP stack.

TSP is a protocol design explicitly to serve as a universal spanning layer for digital trust relationships between any two parties in the same way that IP serves as a spanning layer for data packets between to local area networks.



# Trust Spanning Protocol



Implementers Draft

Released: April 11, 2024



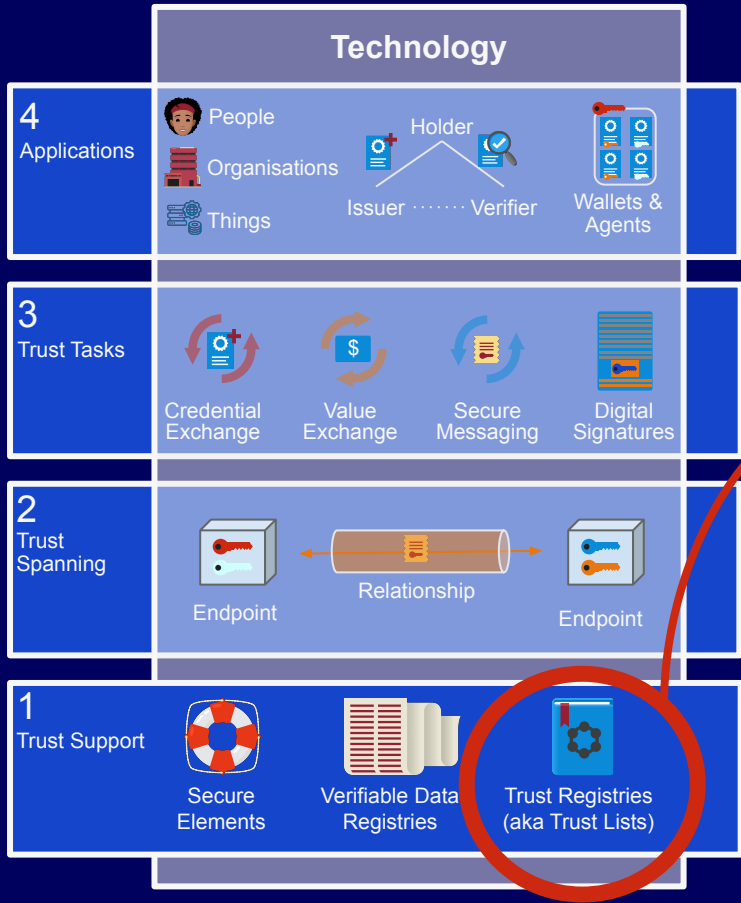
- Why do we need a Trust Spanning Protocol?
- Where can I get a high-level overview of TSP?
- What does the Implementers Draft cover?
- How does TSP differ from other trust protocols?
- What implementation projects have been announced?
- What kind of feedback are we seeking on this draft?
- How can you provide feedback?

# Technology Stack Working Group

- Trust Registry Task Force (TRTF)

The TRTF is working on Trust Registries Protocols.

The Trust Registry Protocol creates a simple and consistent way to programmatically get answers from authoritative ecosystem sources.



ToIP Model  
Span of Control

# Trust Registry Protocol



Implementers Draft  
Released: April 3, 2024



It enables parties to ask programmatically:

Does *entity X* hold *authorization Y* under *ecosystem governance framework Z*?

In addition to that core query type, the TRP V2 also supports queries to:

- Assist integrators in retrieving information critical to interacting with the trust registry (e.g. get a list of supported authorizations, namespaces, or resources).
- Assert the relationships of the queried trust registry with other trust registries, allowing the development of a registry-of-registries capability.



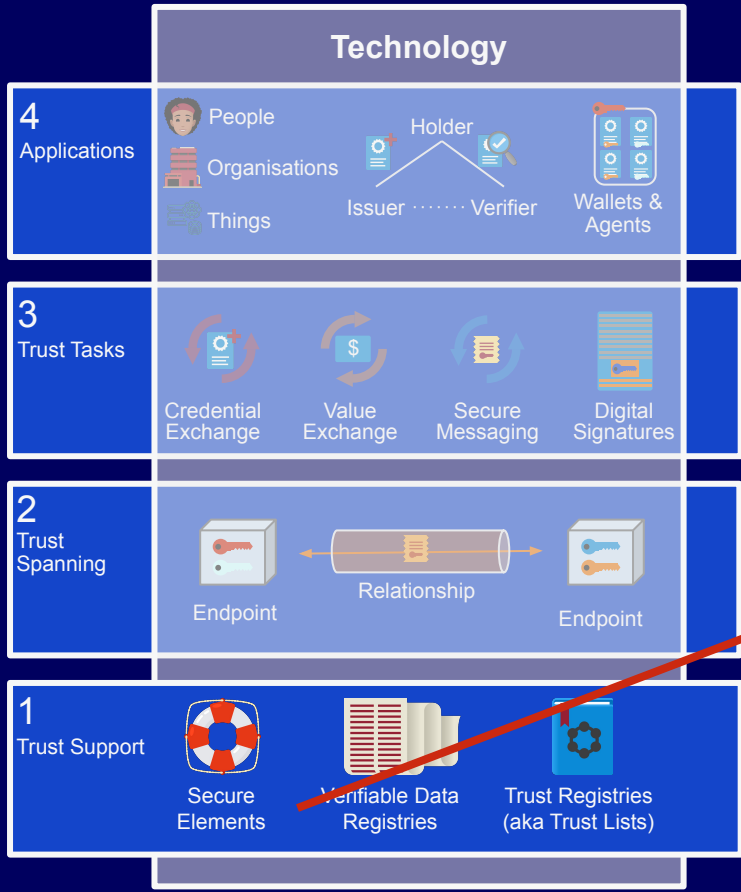
# Technology Stack Working Group

- ACDC Task Force

Working on following specifications:

- Key Event Receipt Infrastructure (KERI)
- Authentic Chained Data Containers (ACDC)
- Composable Event Streaming Representation (CESR)

ToIP Model  
Span of Control



# Technology Stack Working Group

- ACDC Task Force

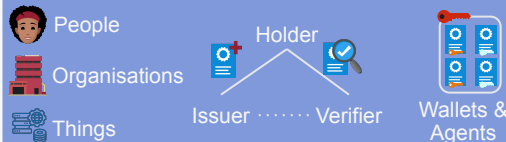
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## Technology

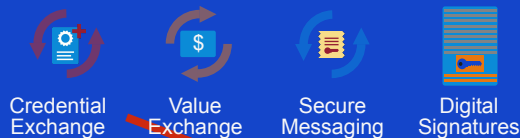
4

Applications



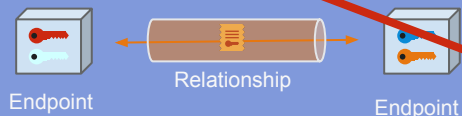
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Trust Tasks



2

Trust Spanning



1

Trust Support



ToIP Model  
Span of Control

## Technology Stack Working Group

- ACDC TF

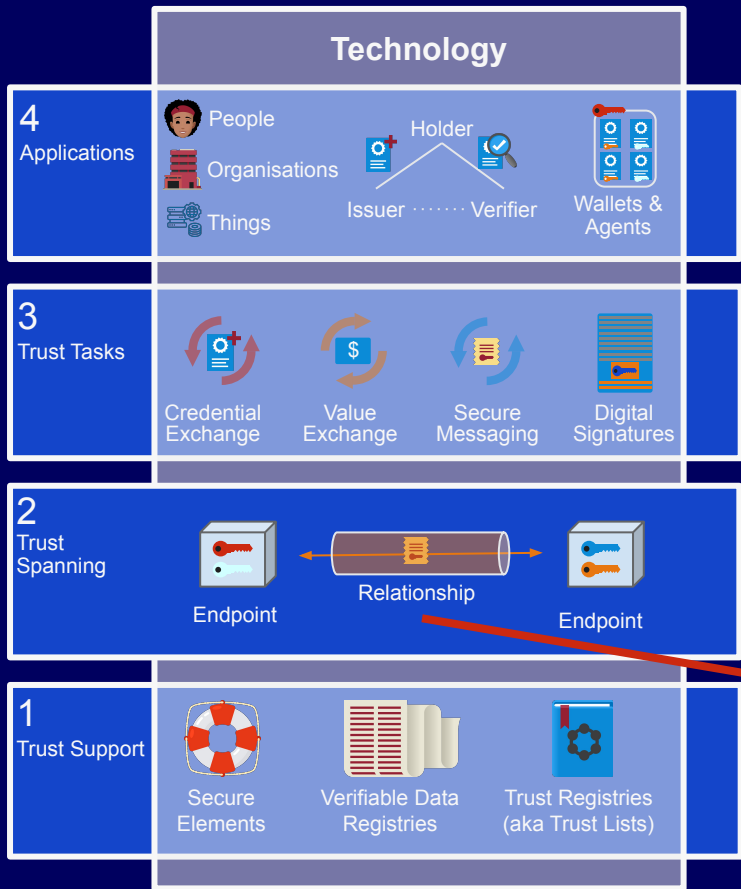
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## Technology Stack Working Group

- ACDC TF

Working on following specifications:

Key Event Receipt Infrastructure (KERI)

Authentic Chained Data Containers (ACDC)

Composable Event Streaming Representation (CESR)

CESR is used in the Trust Spanning Protocol (TSP)

# KERI Suite of Specifications



Public Review:  
March 21, 2024



Together, this suite of specifications provides a blueprint for creating truly decentralized, authentic, and verifiable ecosystems of identifiers, “credentials”, and attestations.

1. [Key Event Receipt Infrastructure \(KERI\)](#)
2. [Authentic Chained Data Containers \(ACDC\)](#)
3. [Composable Event Streaming Representation \(CESR\)](#)

## Technology

4

Applications



People



Organisations



Things



Holder



Issuer ..... Verifier



Wallets &  
Agents

3

Trust Tasks



Credential  
Exchange



Value  
Exchange



Secure  
Messaging



Digital  
Signatures

2

Trust  
Spanning



Endpoint



Relationship



Endpoint

1

Trust Support



Secure  
Elements



Verifiable Data  
Registries



Trust Registries  
(aka Trust Lists)

## Technology Stack Working Group

• Credential Exchange Task Force

• X.509 Task Force

• DID:Webs Task Force

ToIP Model  
Span of Control

# DID:Webs Method Specification



Public Review:  
December 15, 2023

In short, a did:webs DID is a valid did:web DID that has special cryptographic properties.



# Credential Exchange Protocols

The group has fully documented these four issuance protocols against the comparison criteria: ACDC, ISO 23220-3, Issue Credential v2, OpenID4VCI ...

Credential Exchange Protocols	ACDC	ISO 23220-3	Issue Credential v2	OpenID4VCI
<b>Working documents -&gt;</b>	<a href="https://docs.google.com/document/d/1m5L8a1u0y1b7u0Wkq2tM66dJf6t0PwYw0a0/edit">https://docs.google.com/document/d/1m5L8a1u0y1b7u0Wkq2tM66dJf6t0PwYw0a0/edit</a>	<a href="https://www.iso.org/standard/71204.html">https://www.iso.org/standard/71204.html</a>	<a href="https://docs.google.com/document/d/1m5L8a1u0y1b7u0Wkq2tM66dJf6t0PwYw0a0/edit">https://docs.google.com/document/d/1m5L8a1u0y1b7u0Wkq2tM66dJf6t0PwYw0a0/edit</a>	<a href="https://docs.google.com/document/d/1m5L8a1u0y1b7u0Wkq2tM66dJf6t0PwYw0a0/edit">https://docs.google.com/document/d/1m5L8a1u0y1b7u0Wkq2tM66dJf6t0PwYw0a0/edit</a>
<b>1. Protocol Objective(s)</b>	<p>To provide granular provenance proof-of-authorship (authenticity) of contained data via a tree or chain of linked ACCDCs (technically a directed acyclic graph or DAG).</p> <p>Similar to the concept of a chain-of-custody, ACCDCs provide a verifiable chain of proof-of-authorship of the contained data.</p>	<p>The objective of ISO/IEC TS 23220 Part 3 is to:</p> <ul style="list-style-type: none"> <li>- minimize the burden on issuers to engage in device discovery, device attestation, device branding;</li> <li>- ease the process of categorizing a mdoc app implementation according to the issuer's policy;</li> <li>- ease the process of provisioning mobile documents;</li> <li>- rely on a third party for integral Mobile eID function characterization.</li> </ul>	<p>To enable the issuance of verifiable credential from an issuer to a holder.</p> <p>The protocol is agnostic to the type of credentials being issued, with attachments to messages used for handling the specifics of different credential types.</p> <p>The protocol includes 4 messages (propose, offer, request, issue), that supports both "happy path" issuance, and the ability for the two parties to negotiate about the credential to be issued.</p>	<p>Narrow focus on the lightweight issuance of personal identity credentials. The primary goal was to implement a protocol that is Credential Format agnostic (including cryptic agility), identifiers agnostic (both PKIs and DIDs can be used for the involved parties) and evolutionary (based on widely deployed and understood OAuth 2.0).</p> <ul style="list-style-type: none"> <li>- Based on OAuth 2.0 protocol</li> <li>- Supports a range of credential formats, including verifiable credentials</li> <li>- Provides a standard approach to presenting and verifying credentials in different contexts, including online and in-person transactions</li> </ul>
<b>2. Protocol Governance</b>	<p><b>2a Specification Link and Versioning</b></p> <p><a href="#">IETF Draft</a></p> <p>2c Specification Body</p> <p>IETF</p> <p>2d OSS/IPR</p> <p>Apache 2.0</p>	<p>Technical Specification: <a href="#">ISO/IEC WD 23220-3:2021(E)</a></p> <p>Note: Had to refer to ISO/IEC CD 23220-1 to answer the questions ISO</p> <p><a href="#">Working Group 4 with Steering Committee 17</a></p> <p><a href="#">ISO/IEC JTC 1/SC 17</a> - Cards and security devices for personal identification</p> <p>Specifications can be bought from iso.org for a fee once they are approved. Till then only members of the working committee have access to the drafts.</p> <p>Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the introduction and/or on the ISO list of patent declarations received (see <a href="http://www.iso.org/patents">www.iso.org/patents</a>).</p>	<p><a href="#">RFC 8453 Issue Credential V2</a></p> <p>The Hyperledger Aries project at the Hyperledger Foundation.</p> <p>An evolution of the protocol (<a href="#">Issue Credential 3.0</a>) is managed by the DIDComm Messaging Working Group at the Decentralized Identity Foundation. That evolution of the protocol is/was also called the "WACI Issue Credential" Protocol.</p> <p>All contributions have DCO (<a href="#">DCO - Developer Certificate of Origin</a>) signoff. Open Source and no IPR encumbrances.</p>	<p><a href="#">openid4-verifiable-credential-issuance-1_0-11</a></p> <p><a href="#">OpenID Foundation</a></p> <p>Non-exclusive, royalty-free copyright license granted by the OpenID Foundation (OIDF) - <a href="#">see here</a></p>
<b>3a Architecture Model</b>	<p>Server-client</p> <p>OR</p> <p>Peer-to-peer model</p>	<p>Server-client</p>	<p>Peer to peer model</p>	<p>Server/Client Model (based on OAuth 2.0)</p> <p>The Issuer can either take the role of OAuth Server or collaborate with a third-party OAuth Authorization Server. Holder takes the role of an OAuth Client.</p>



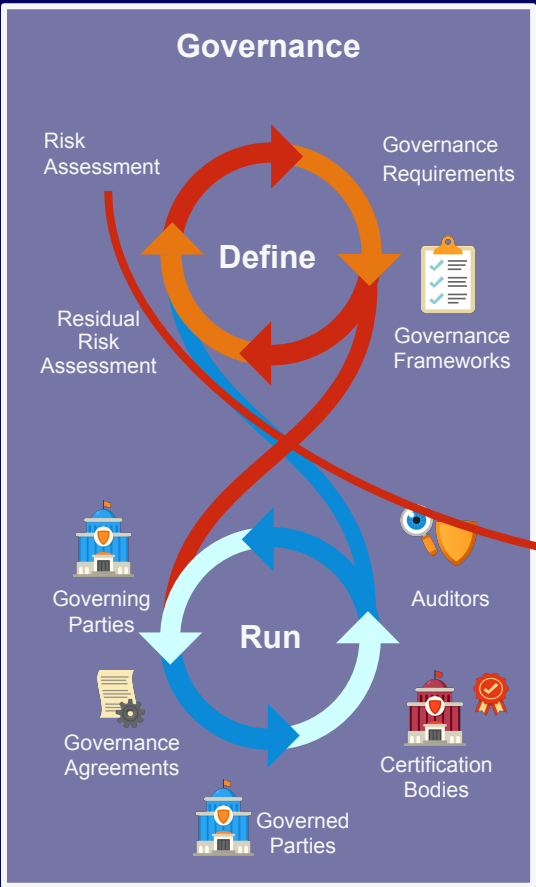
# Governance Stack Working Group



Name of Deliverable	Deliverable Type	Link to Draft Deliverable	Task Force	Status
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Screenshot

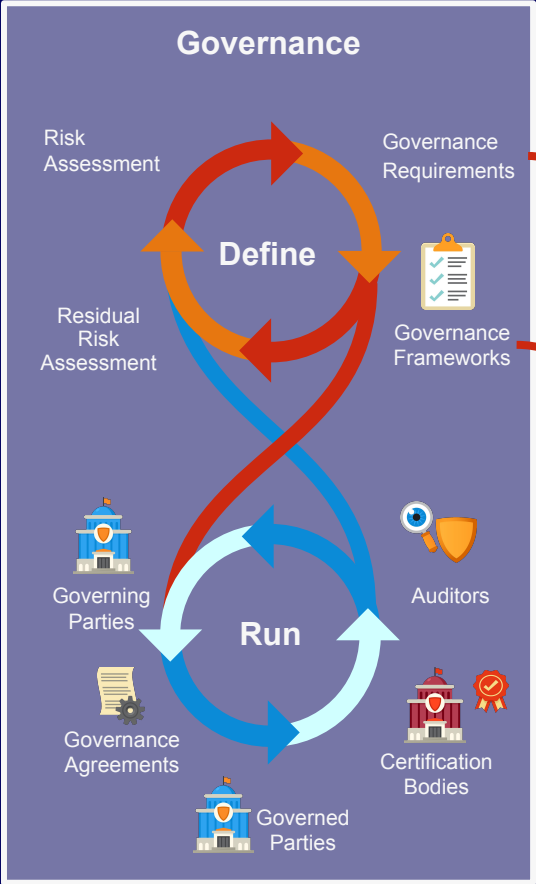
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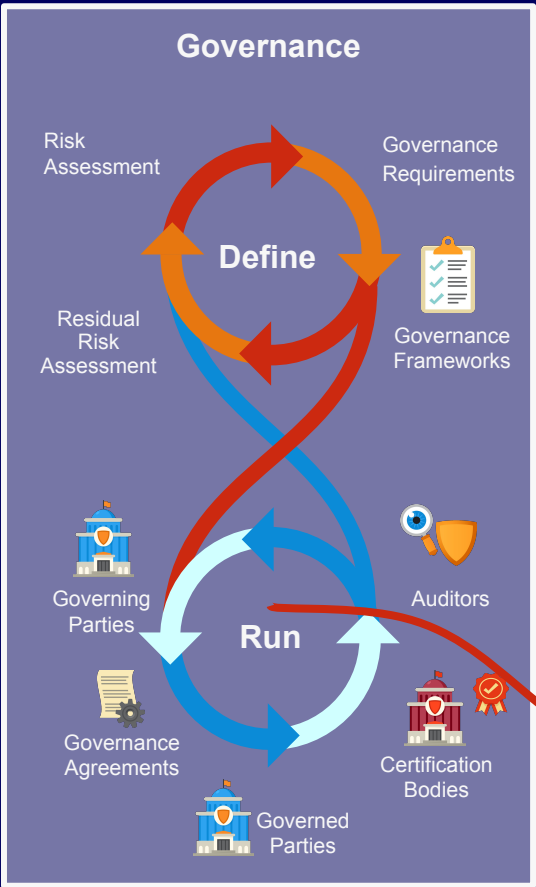


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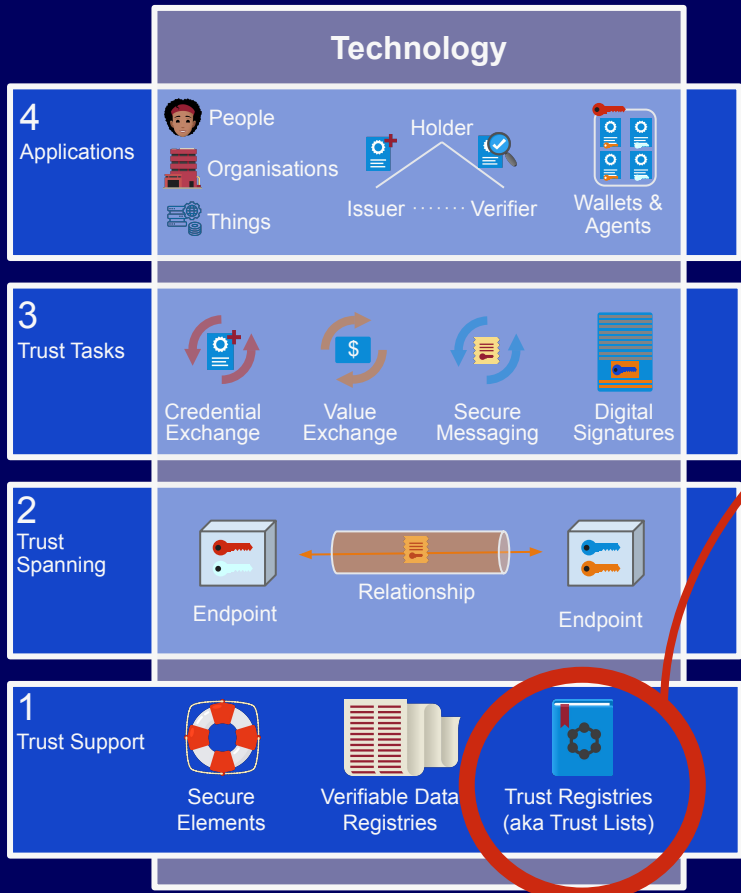


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Screenshot



ToIP Model  
Span of Control



## Governance Stack Working Group

### Current Task Forces:

- Issuer Requirement Guide TF
- Governance Architecture TF
- Attraction Pass TF

# Issuer Requirements Guide for Governance Frameworks of VCs



## **Issuer Requirements Guide for Governance Frameworks of Verifiable Credentials**

Governance Metamodel Compliant  
Governance Stack Working Group  
**APPROVED DOCUMENT**  
Version .01  
30 January 2024

This publicly available guide was approved by the ToIP Governance Stack Working Group on 30 January 2024. The ToIP permalink for this document is:

<https://trustoverip.org/permalink/Issuer-Requirements-Guide-Y0.01-2024-01-30.pdf>

The mission of the Trust over IP (ToIP) Foundation is to define a complete architecture for Internet-scale digital trust that combines cryptographic assurance at the machine layer with human accountability at the business, legal, and social layers. Founded in May 2020 as a non-profit hosted by the Linux Foundation, the ToIP Foundation has over 400 organisational and 100 individual members from around the world.

Please see the end page for licensing information and how to get involved with the Trust Over IP Foundation.

Working Group Approved  
Public Comments:  
January 2023

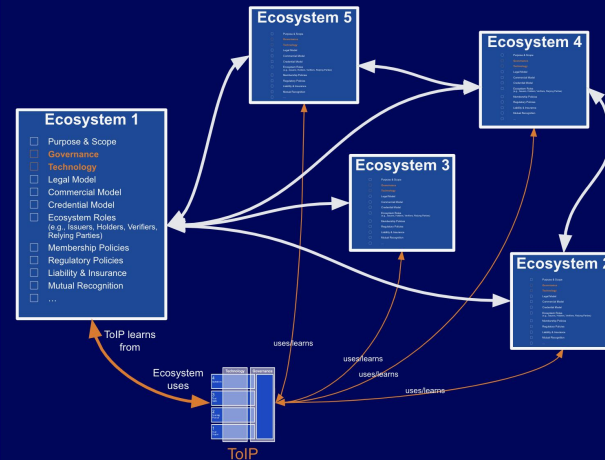


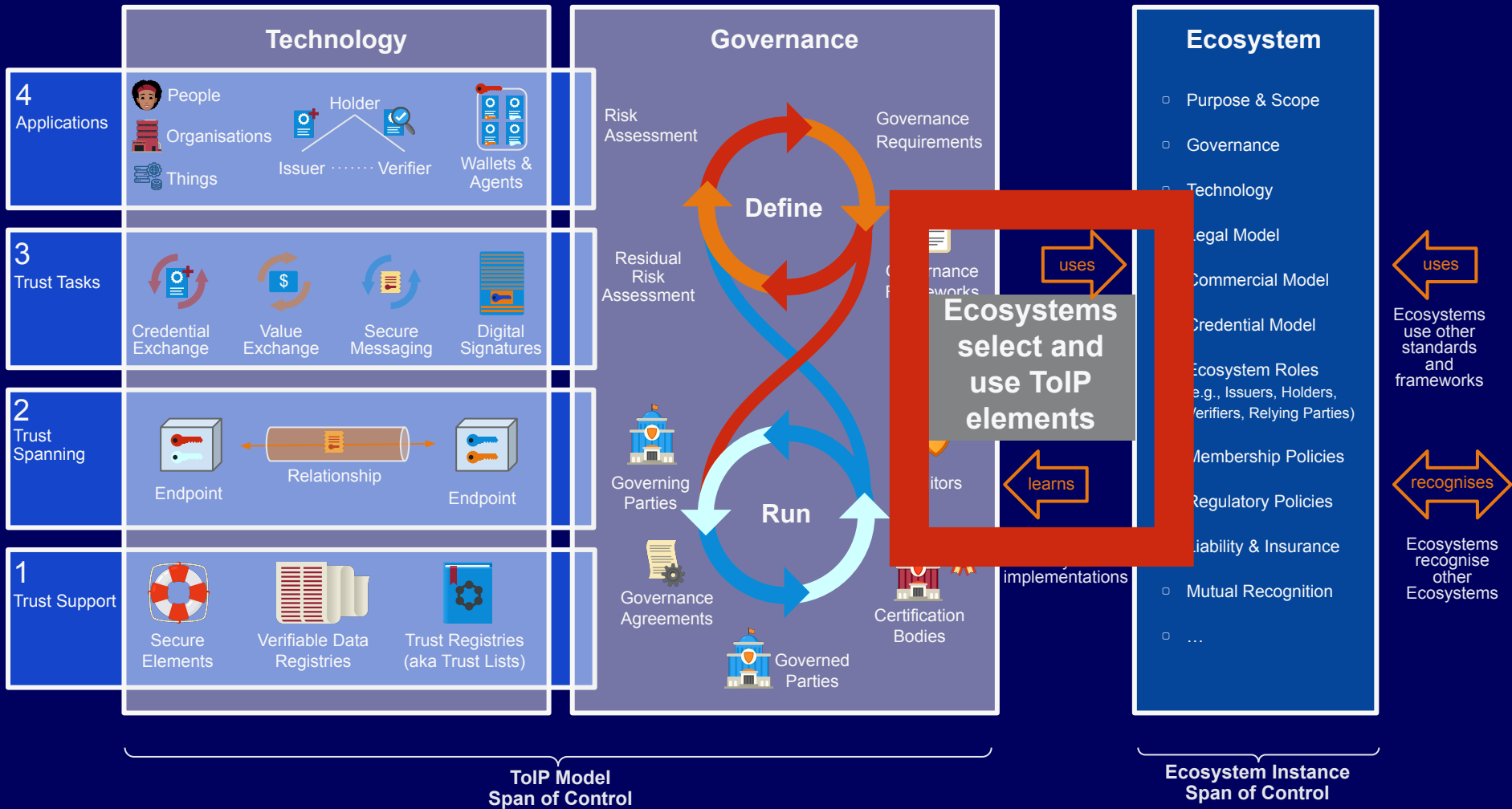
# Ecosystem Foundry Working Group

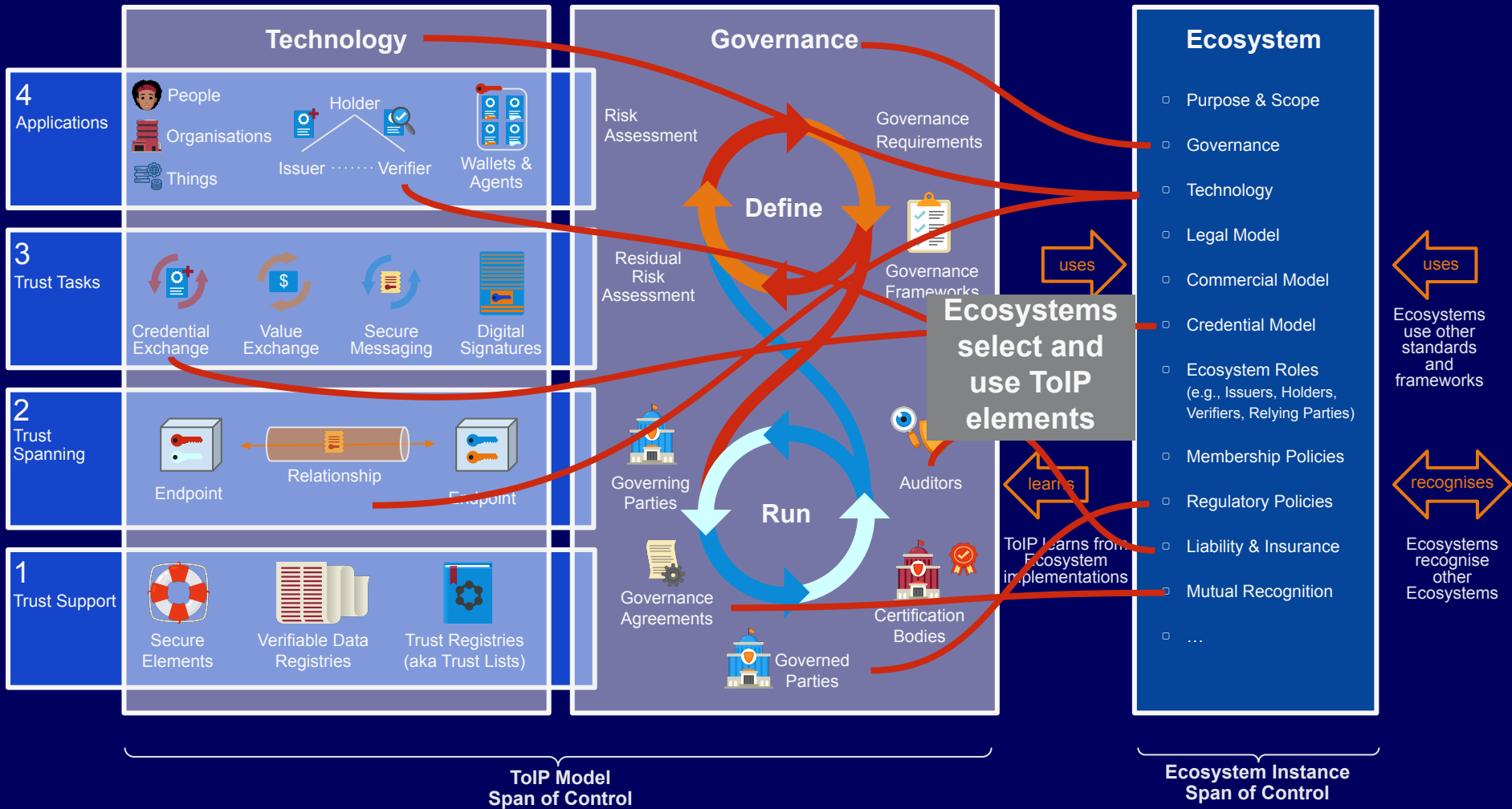
A neutral place for partners to work together to decide on all the things that are required for their specific Digital Trust Ecosystem.

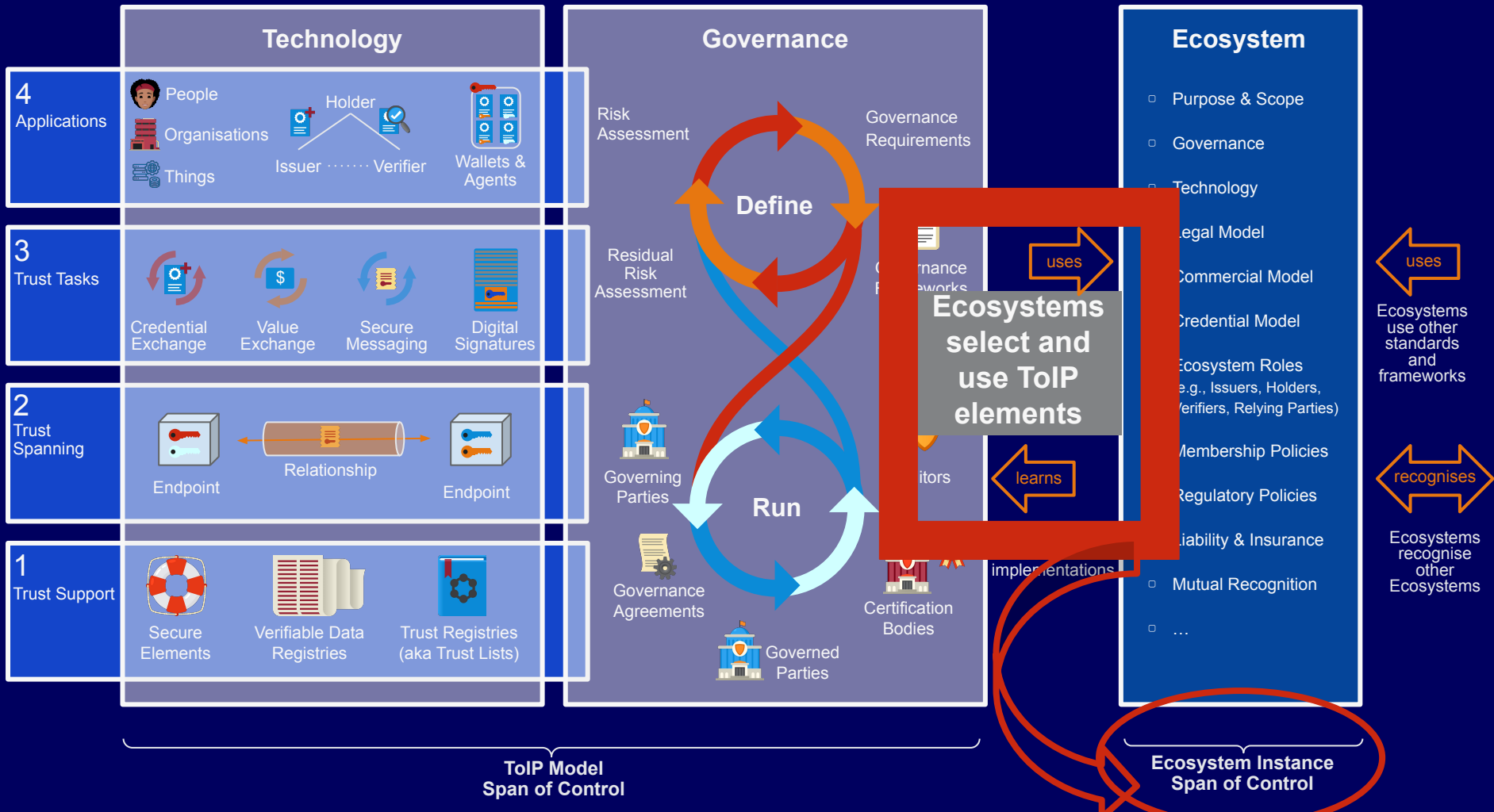
## Ecosystem

- Purpose & Scope
- Governance
- Technology
- Legal Model
- Commercial Model
- Credential Model
- Ecosystem Roles  
(e.g., Issuers, Holders, Verifiers, Relying Parties)
- Membership Policies
- Regulatory Policies
- Liability & Insurance
- Mutual Recognition
- ...

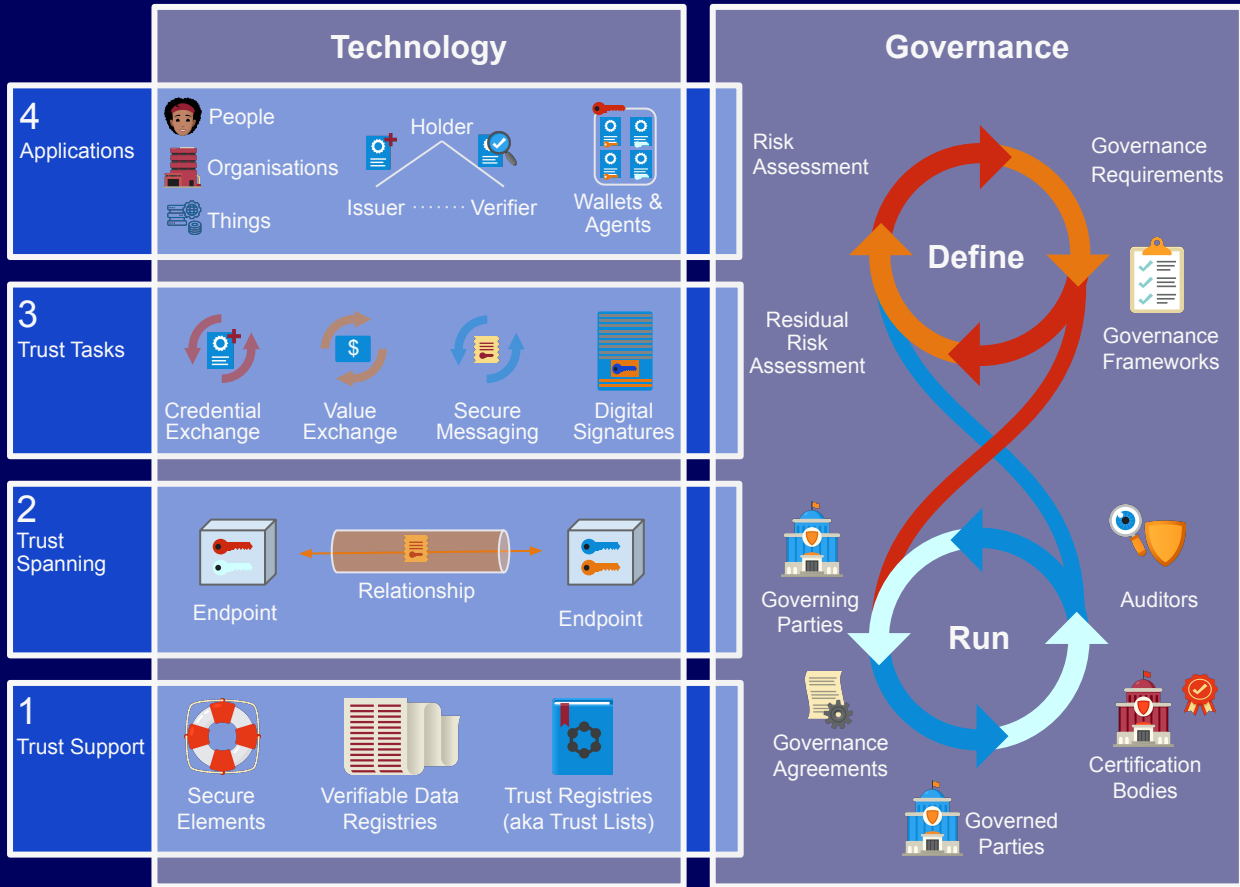




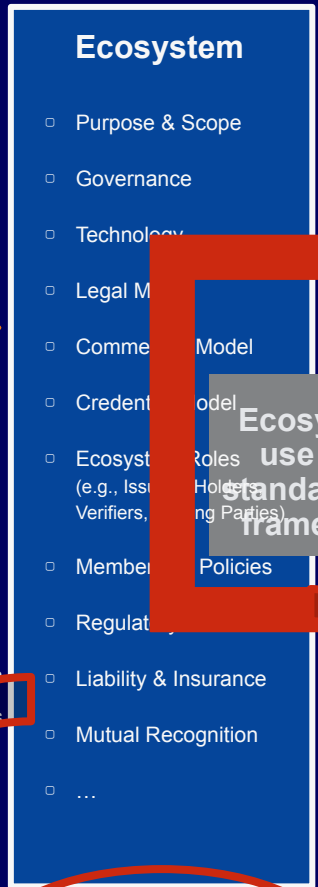




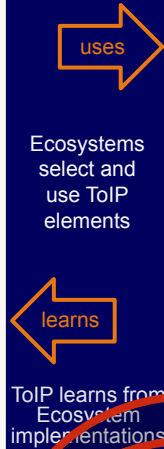




ToIP Model Span of Control



**Ecosystems use other standards and frameworks**



Ecosystems recognise other Ecosystems

Ecosystem Instance Span of Control

## Ecosystem

- Purpose & Scope
- Governance
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- Ecosystem Roles  
(e.g., Issuers, Holders, Verifiers, Relying Parties)
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- ...

# Ecosystem Foundry Working Group

EFWG has speaker series that highlights ecosystems, technology, solutions, and products.

Check out our YouTube Channel for recordings of past presenters.

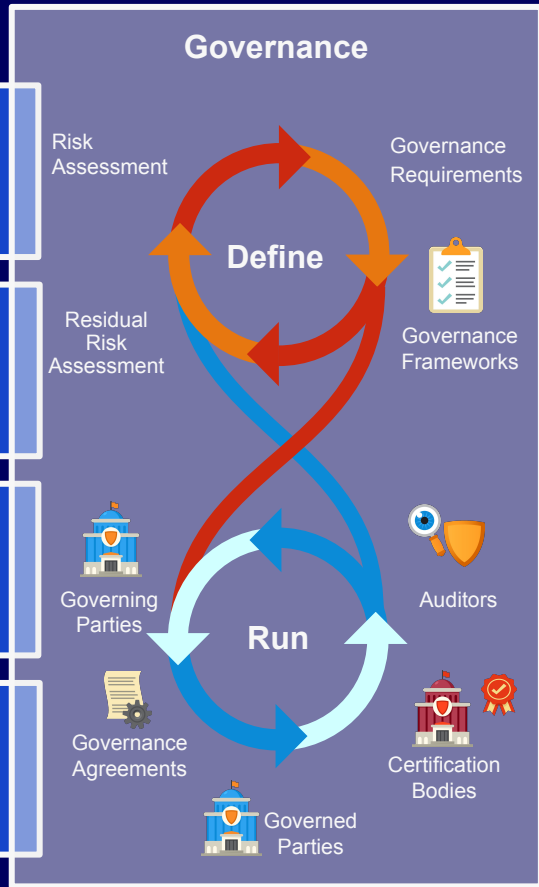
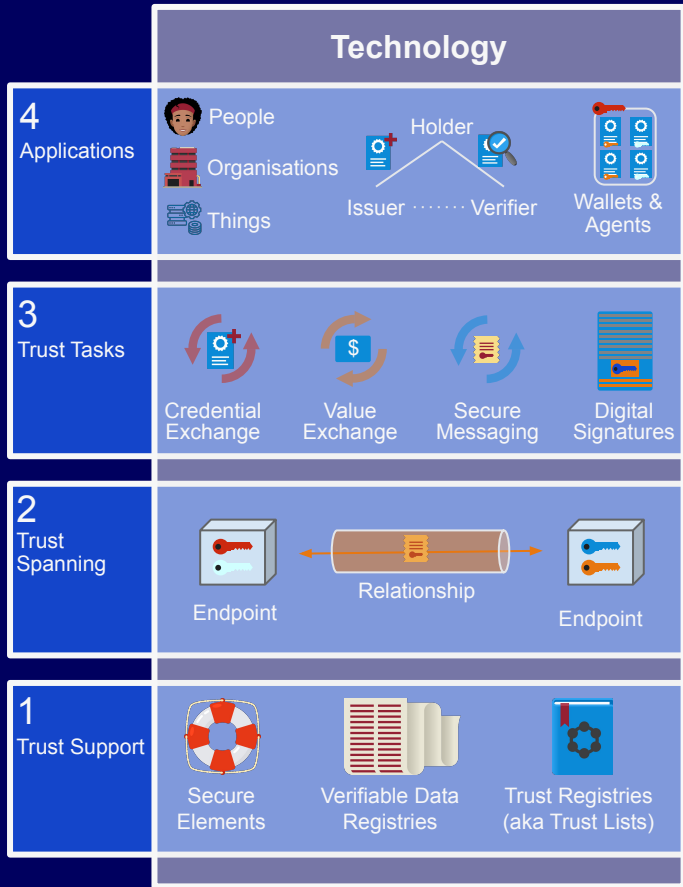
**Videos** ▶ Play all

Thumbnail	Title	Views	Time
	Unforgeable Peer 2 Peer Asset Value Transfer	52 views	52:57
	What if your media is lying to you?	60 views	57:49
	Learnings at Entidad are guiding software product...	48 views	53:01
	Overcoming Human Harm Challenges in Digital Identity Ecosystems	61 views	39:22
	Entra Verified ID: A cheaper, faster & more trustworthy...	349 views	46:23

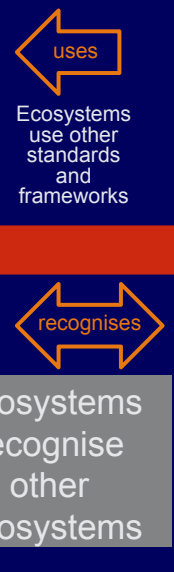
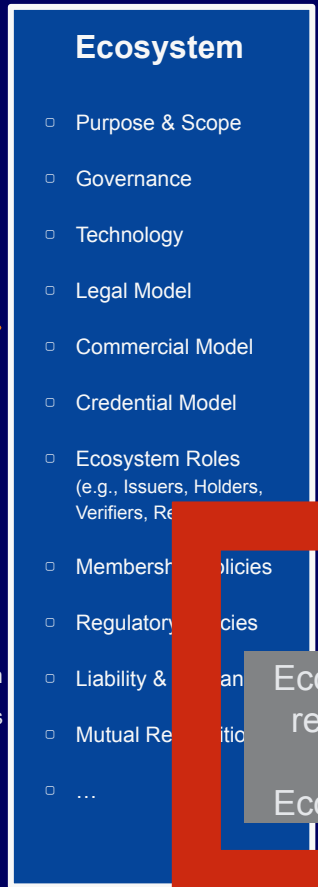
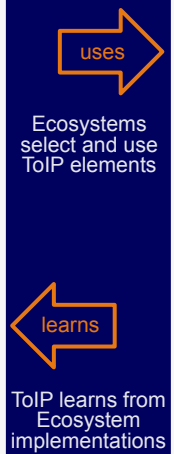
**Videos** ▶ Play all

Thumbnail	Title	Views	Time
	Web3 Battery Birth Certificate Credential...	25 views	48:04
	Content Authenticity Initiative and Trust Over IP Foundation...	82 views	1:00:22
	Digital Credentials Transforming Mining with...	47 views	57:23
	Trusted Transactions powered by decentralized...	66 views	48:54
	Building Minimum Viable Ecosystems	117 views	56:33



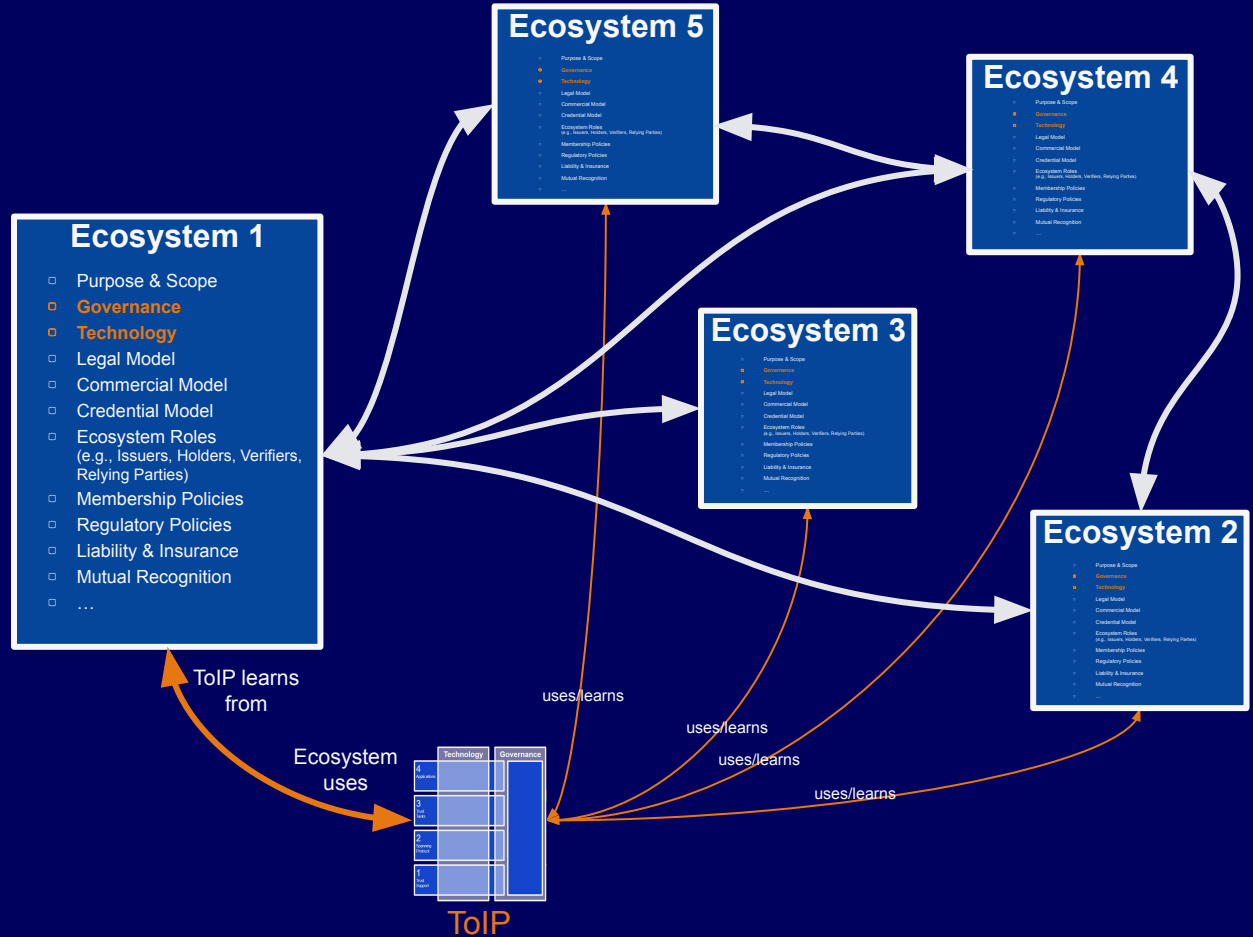


ToIP Model  
Span of Control



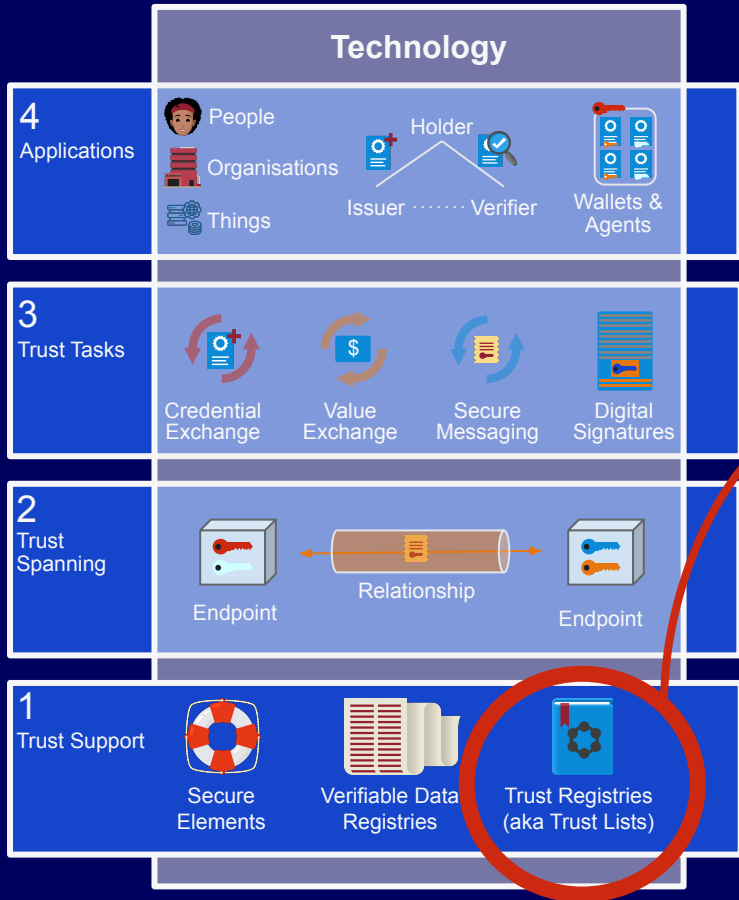
Ecosystem Instance  
Span of Control

With ToIP, the Internet can become a world of interconnected & interoperable digital trust ecosystems



# Ecosystem Trust Registries

Trust Registries and Trust Registries of Trust Registries enable ecosystems to make trust decision about other ecosystems.



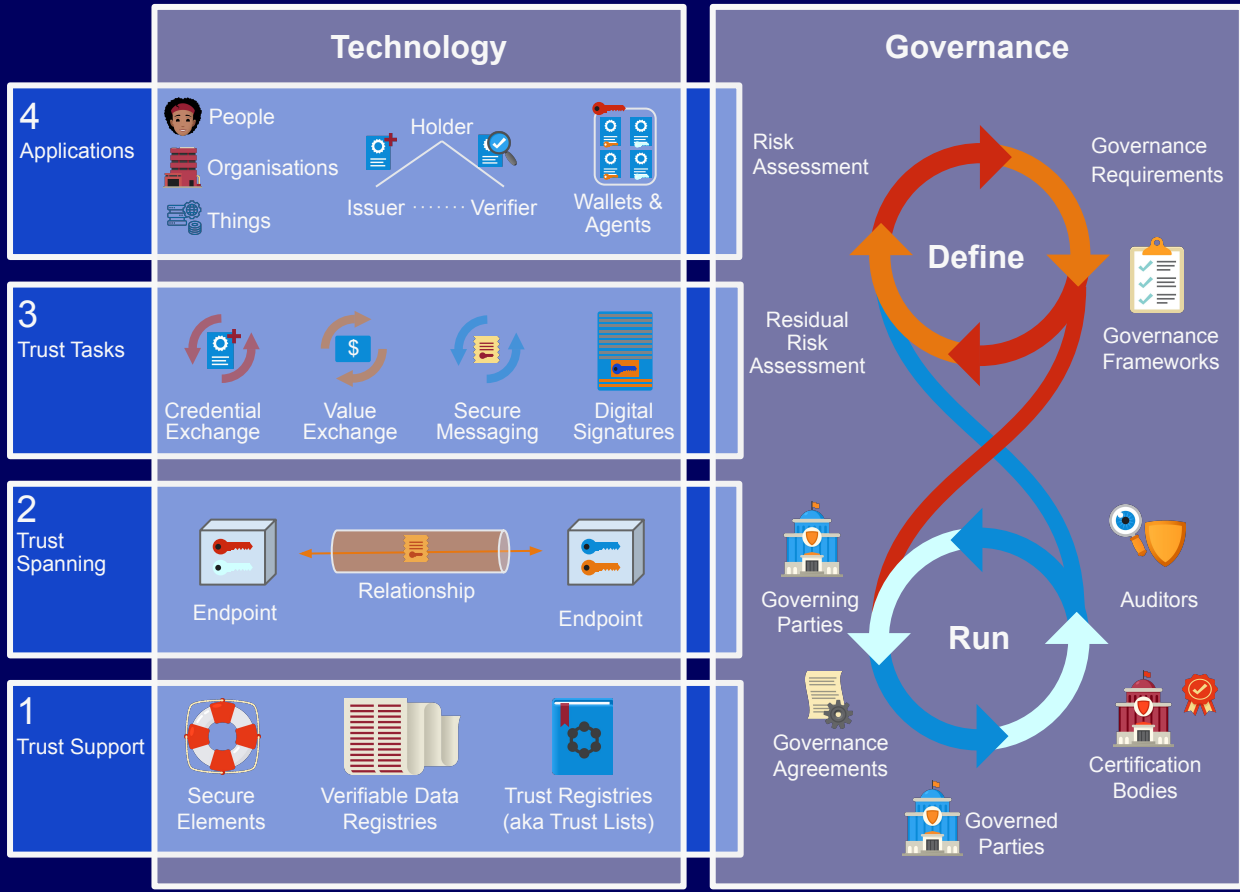
ToIP Model  
Span of Control



## Ecosystem Governance Documents

Allow ecosystems to define rules of business process, technologies, and operations to mitigate risk, then hold participants accountable for their implementation of these rules through audit and certification.

Other ecosystems rely upon the governance process to interoperate with full disclosure of the rules and the risks.



## ToIP Primary Working Groups

1. Technology Stack WG
2. Governance Stack WG
3. Ecosystem Foundry WG
4. Data Modeling and Representation WG
5. Concepts and Terminology WG
6. Utility Foundry WG
7. Human Experience WG

ToIP Model  
Span of Control



# ToIP Membership

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How to get involved at  
ToIP?



# What Is ToIP?

- Collaborative Community
  - International Community meetings happen in various time zones via Zoom.
  - Asynchronous collaboration via Google Docs and GitHub and the ToIP Slack Workspace.
  - Industry experts and people new to decentralized identity.



# What Is ToIP?

- Joint Development Foundation (JDF) project within the Linux Foundation (LF)
  - The JDF is the standards development organization with in the Linux Foundation open source community with connections to ISO and other standards bodies.
  - Linux Foundation and the JDF is our fiduciary to manage the ToIP funds and provide the legal structure for the foundation.
  - Linux Foundation provides the infrastructure for our work and is known for collaborative processes.

# What Is ToIP?

- The Trust Over IP (ToIP) Foundation was launched in May 2020 with 27 original founding member organizations.
- ToIP now has **over 500** member organizations and individuals.
- We are financially supported by our membership.
- The work gets done by contributors like you!

# Funding Members

Thanks to our Steering and General Level funding members:

 **accenture**

**ANONYOME LABS**



**CERTIZEN**  
TECHNOLOGY

**esatus**



**Gen**<sup>TM</sup>



**monokee**

**MITRE**

**IO** INTESI  
GROUP



# How to Engage?

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Joining Trust Over IP

Go to our website



Click on Join:

<https://trustoverip.org/get-involved/membership/>

Select the membership level that fits your interests.

# Membership Levels

## Contributor Member

You have full and unfettered access to engage and contribute within the all of the ToIP WG and TF. You have access to all of our materials, white papers, resources and recordings.

## Steering Member

Opportunity to have a seat on the Steering Committee to participate in the direction setting discussions of that committee. May have voting rights.

## General Member

All the rights of the Contributor member, plus your logo on our website and financial contributions to the efforts.

# Work of Trust Over IP

Work of the Working Groups is meant to create deliverables!

**Yes** - to have interesting conversation and meet intelligent people who are up to changing the Digital Trust Landscape!

**Yes** - to learn and invent new things through the synergy of being together in this space!

But the work of the working groups is **primarily to create deliverables!**



# Engagement Channels

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**Mailing List** - Groups.io

**Slack** – ToIP Workspace (live channel)

**The Confluence Wiki**

*Meeting notes, presentations, recordings, document briefs, get posted for members and public.*

**Most importantly the ToIP calendar!**

*Subscribe via Wiki*

**Google Shared Drives & GitHub Repos**

*Used only by for some working groups*



Or just use our  
deliverables to  
build your  
ecosystem,,,

## DELIVERABLES

### Templates, Specifications, and Companion Guides

#### Governance Stack Working Group

- **Governance Architecture Specification V1.0 (PDF)**

✔ *ToIP – Approved • 21 Dec 2021*

This is the core specification for the interoperability requirements for ToIP-compliant governance frameworks. (Note that it references the Governance Metamodel Specification as a subset; see below.)

- **Governance Metamodel Specification V1.0 (PDF)** and **Companion Guide V1.0 (PDF)**

✔ *ToIP – Approved • 21 Dec 2021*

A subset of the ToIP Governance Architecture Specification, this specifies the

#### Technical Stack Working Group

- **Trust Spanning Protocol Specification**

📄 *Implementers Draft • 11 Apr 2024*

Trust Spanning Protocol, the first protocol designed explicitly to serve as a universal spanning layer for digital trust relationships between any two parties in the same way that the Internet Protocol (IP) serves as a spanning layer for



Join the ToIP Fun



Join the ToIP Fun