Trusting the Source and Content of Internet Communications

A Global Transformation Project

Scott Perry CPA, CISA – Founder / CEO - Digital Trust Institute

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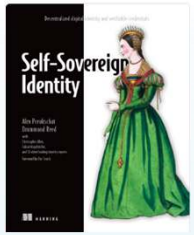
SESSION SPEAKER

Scott Perry

Founder and CEO

- Steering Committee Member, Trust Over IP Foundation
- Co-Chair ToIP Governance Stack Working Group
- Author, ToIP Trust Assurance Framework
- Certified WebTrust Practitioner
- Advisor – US Federal PKI
- Advisor - ISACA Digital Trust Framework
- Contributing Author – Self-Sovereign Identity



https://www.manning.com/books/self-sovereign-identity

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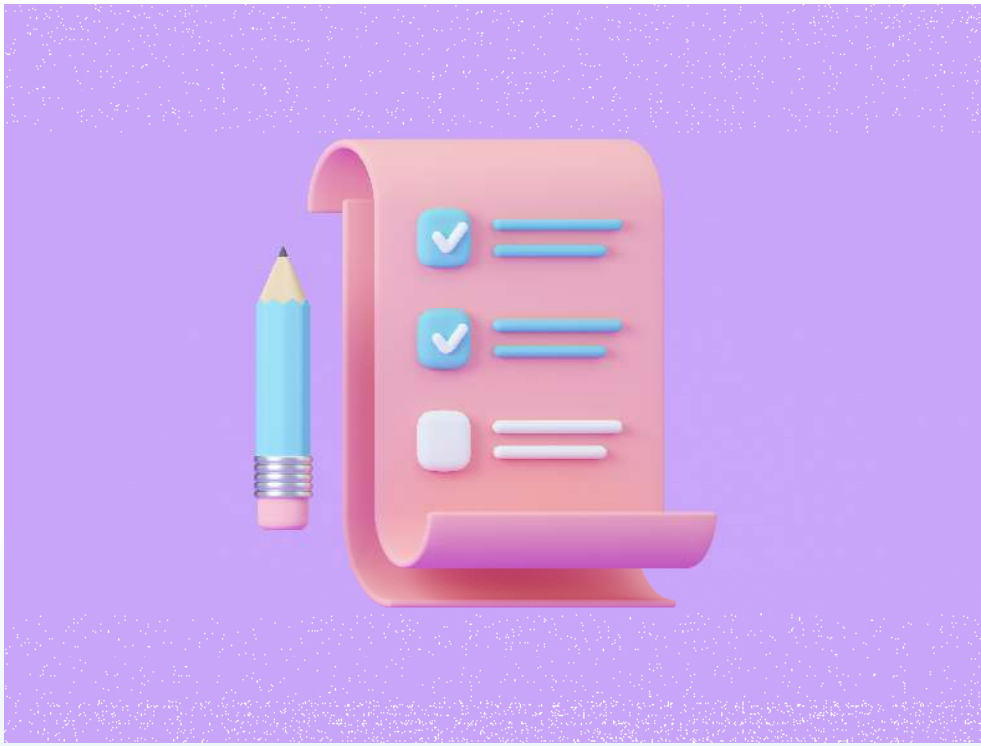
AGENDA

- Underlying Internet Trust Issues
- Architectural Trust Solution
- Architectural Trust Model
  - Elements of the ToIP Model
  - Governance and Accreditation
  - How Ecosystems Use the Model in Practice
- Case Studies
  - The Velocity Network
  - Bhutan National Digital Identity Project



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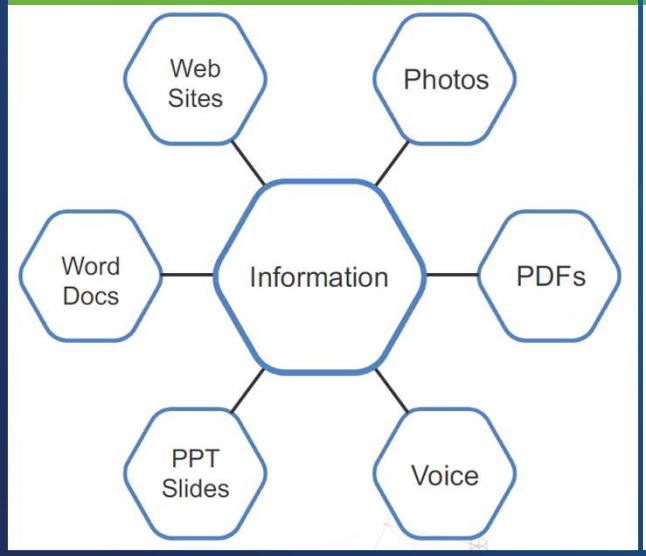
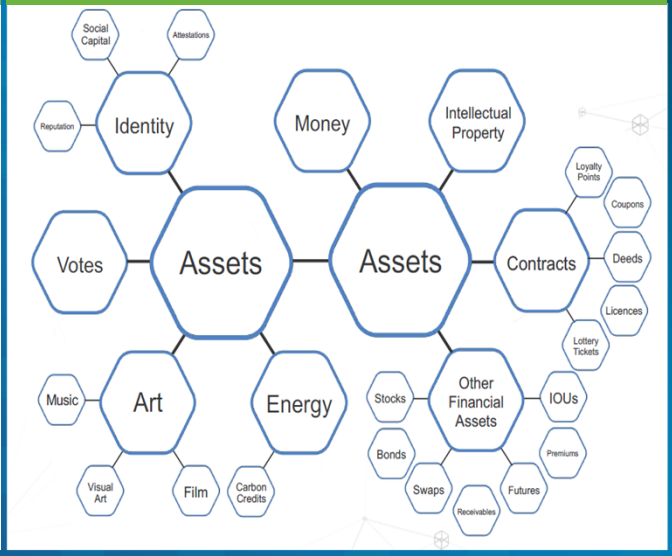
Underlying Internet Trust Issues

Digital Trust Transformation in Action

THE EVOLVING WEB

The Internet of Information	The Internet of Society	The Internet of Value
		
Web 1.0	Web 2.0	Web 3.0

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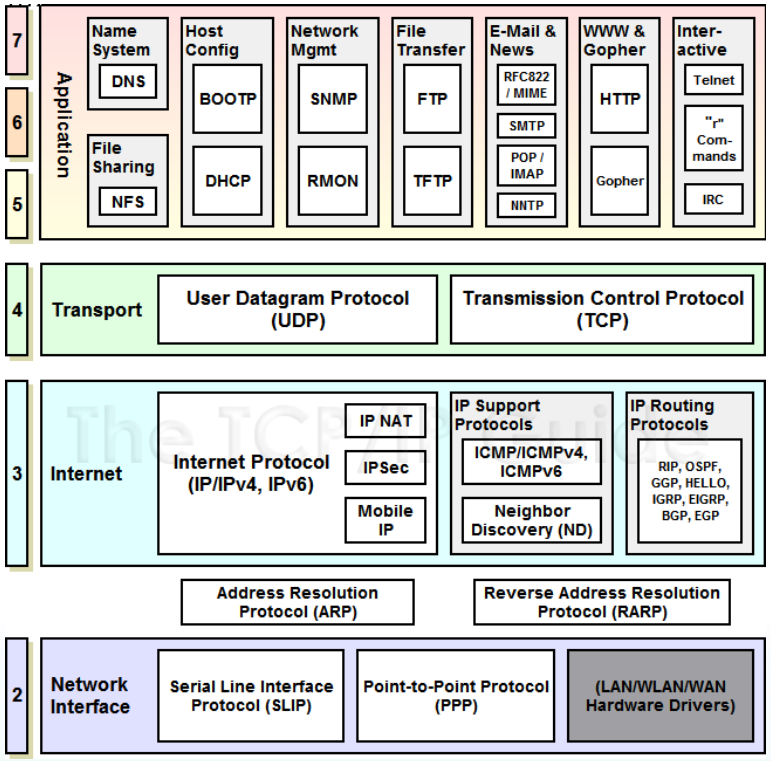
THE TRUST PROBLEM WITH TCP/IP



© TCP/IP Guide

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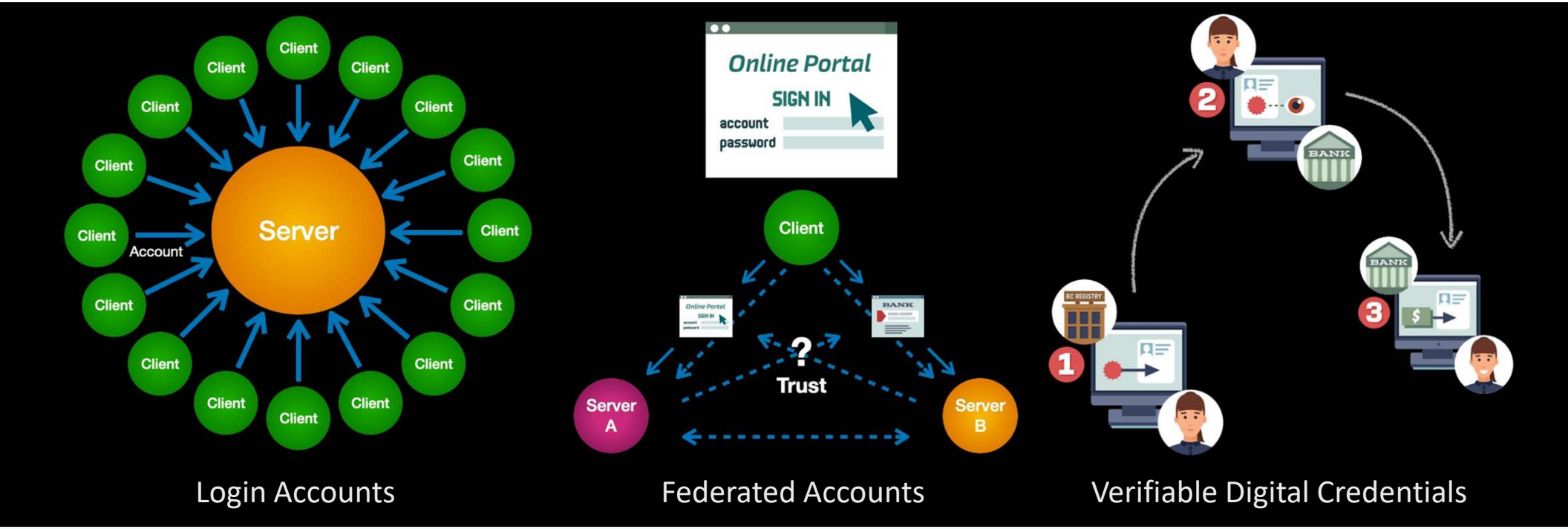
EVOLVING MODELS OF DIGITAL IDENTITY



Login Accounts | Federated Accounts | Verifiable Digital Credentials

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VERIFIABLE CREDENTIALS IN A NUTSHELL

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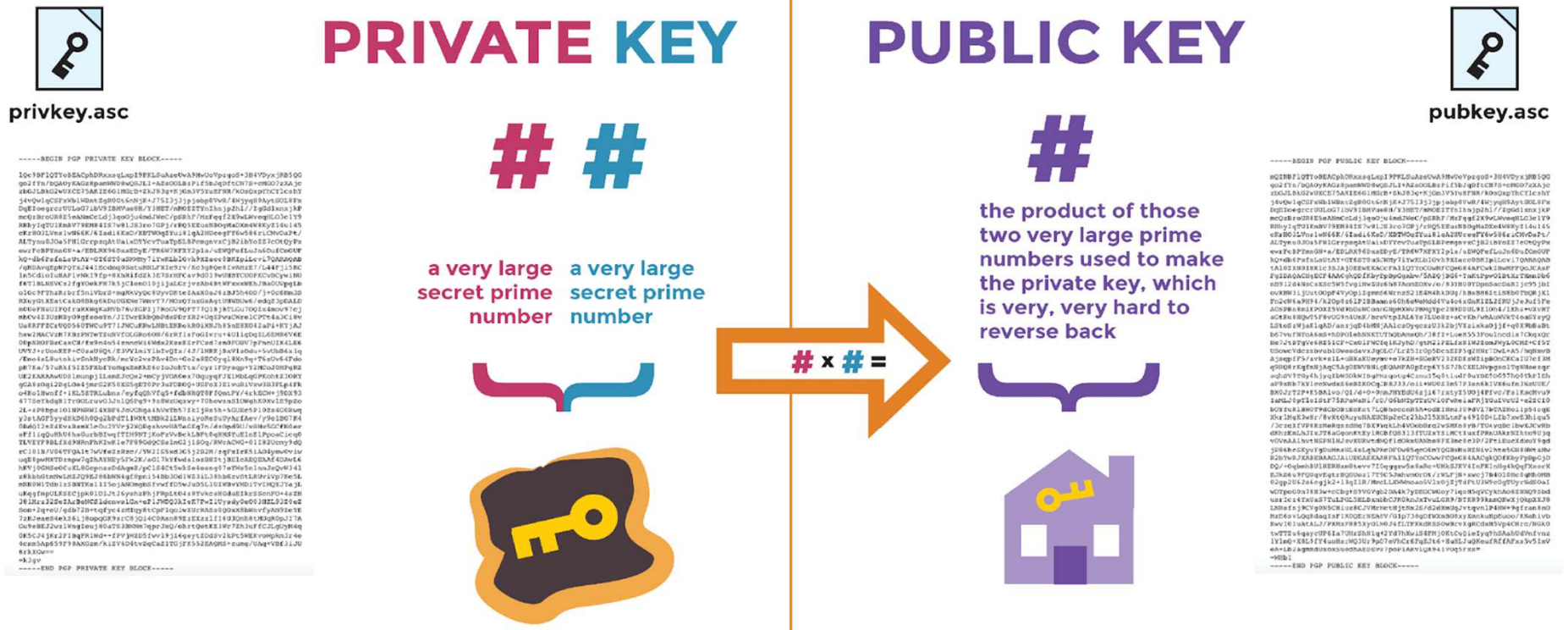
TYPES OF VERIFIABLE CREDENTIALS

- Birth Certificate
- ID Badge
- Certificate of Completion
- College Diploma
- College Transcript
- Bank Access
- Driver's License
- Health Insurance Card
- National Identity
- Industry Membership
- Business Role
- CISA Credential
- Museum Pass
- CPA License

PUBLIC/PRIVATE KEY CRYPTOGRAPHY



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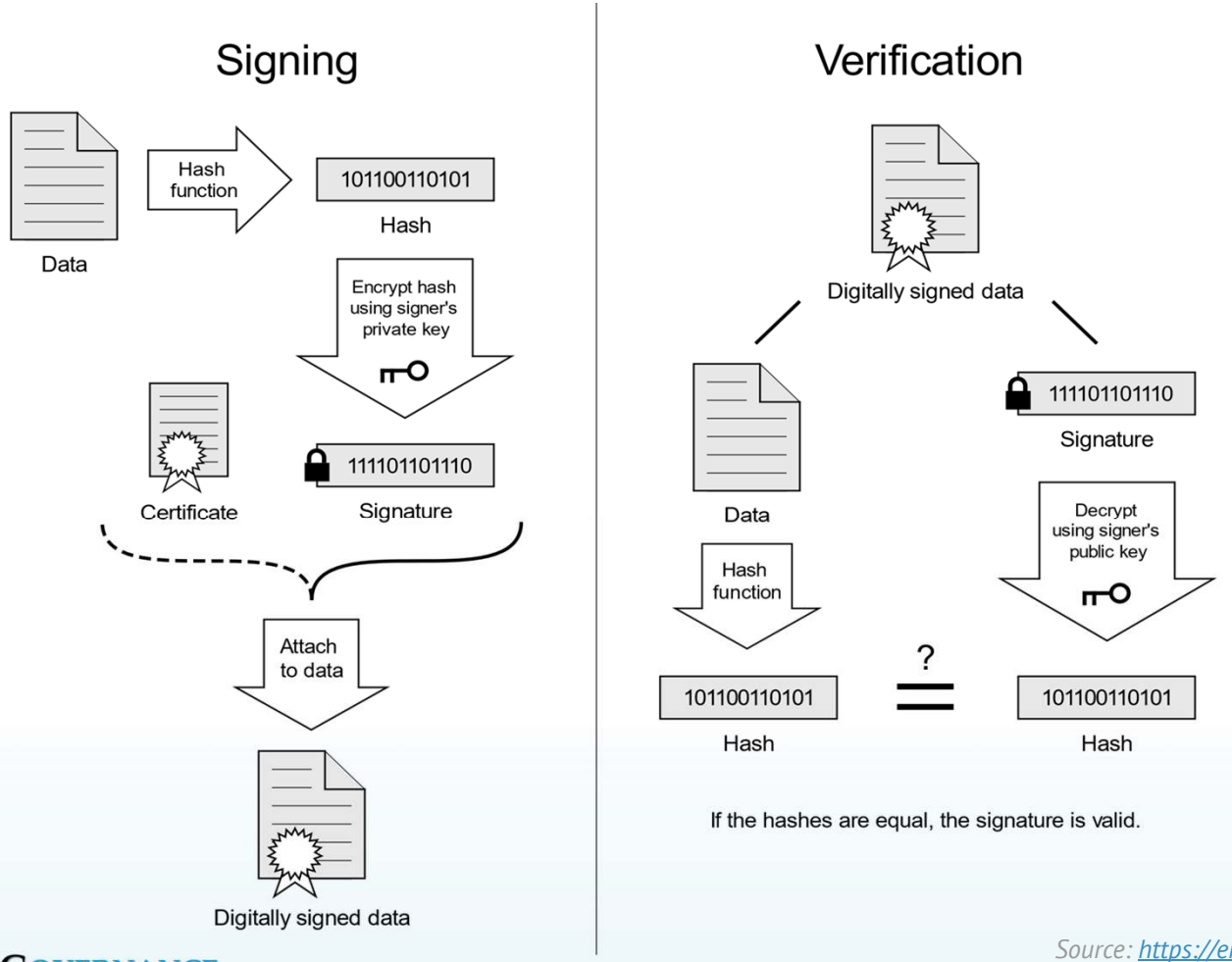
HOW PKI SIGNING AND VERIFICATION CREATES TRUST



Source: https://en.wikipedia.org/wiki/Electronic_signature

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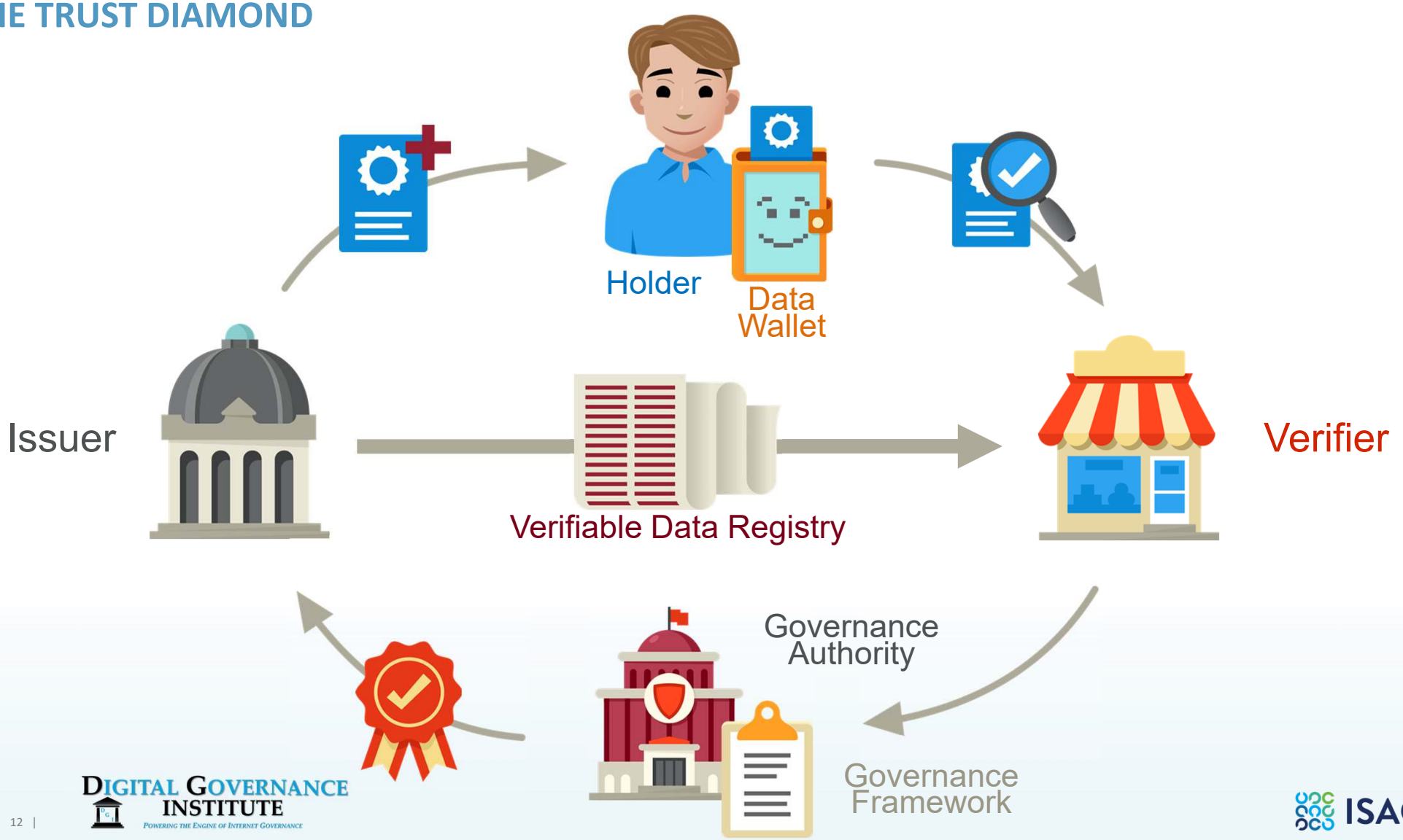
THE TRUST DIAMOND



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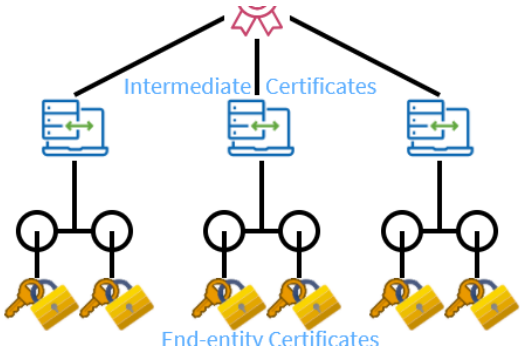
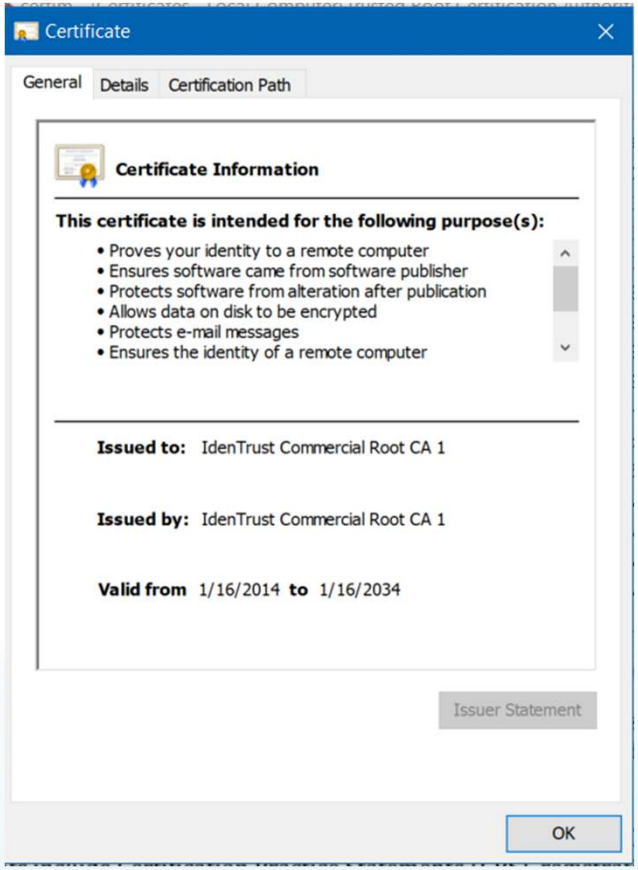
WHAT ABOUT TRADITIONAL PKI?





- Focus on Encrypted Traffic not Content
- Expensive
- Documented Breaches
- Dependent on Central Authority
- Certificate Lifetimes Shrinking
- Driven by Browsers or Governments
- Incredibly Difficult to Provision
- High Barriers to Entry

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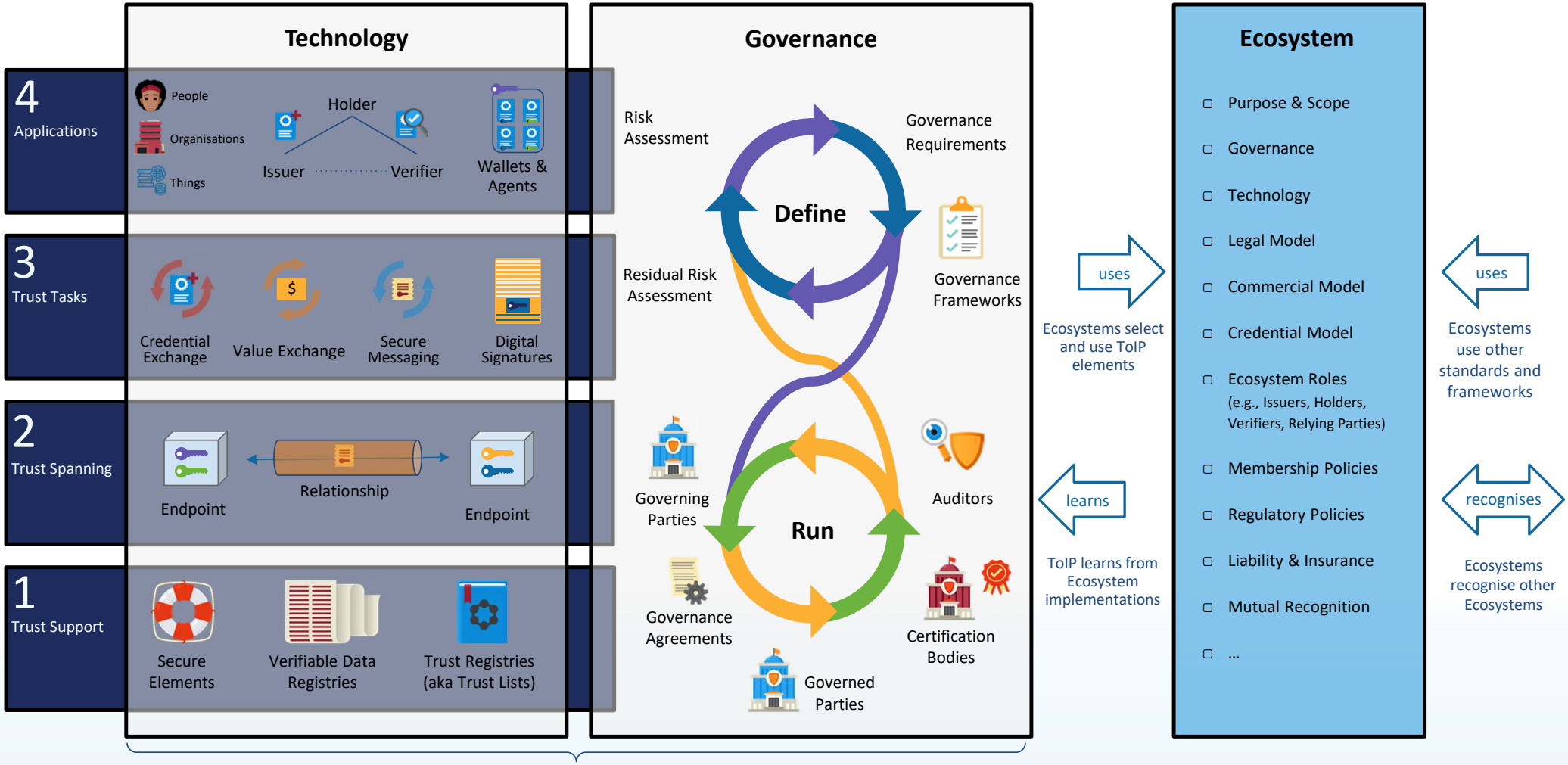
Architectural Trust Model

THE TRUST OVER IP STACK MODEL



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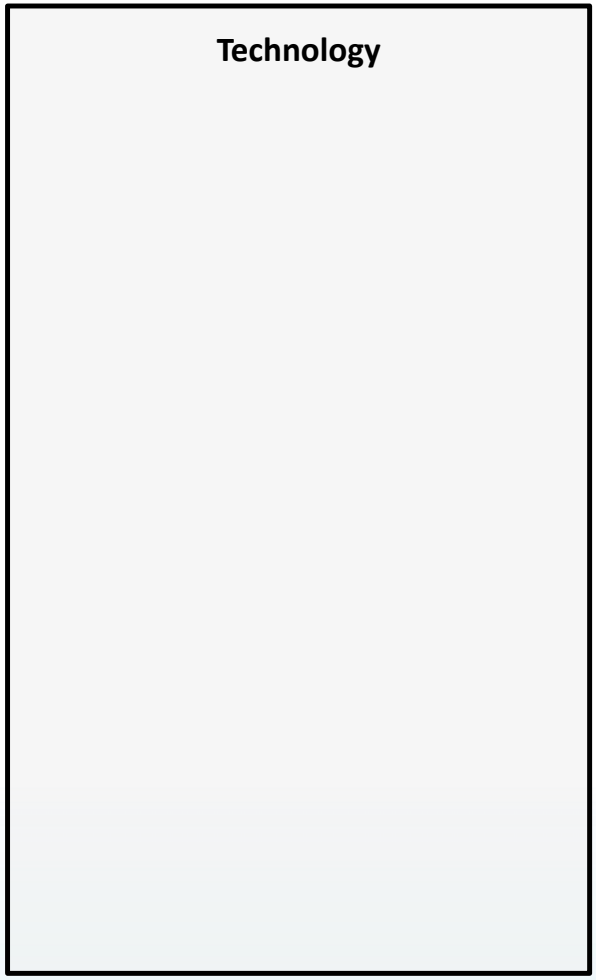
THE NEED FOR A TECHNOLOGY STACK

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



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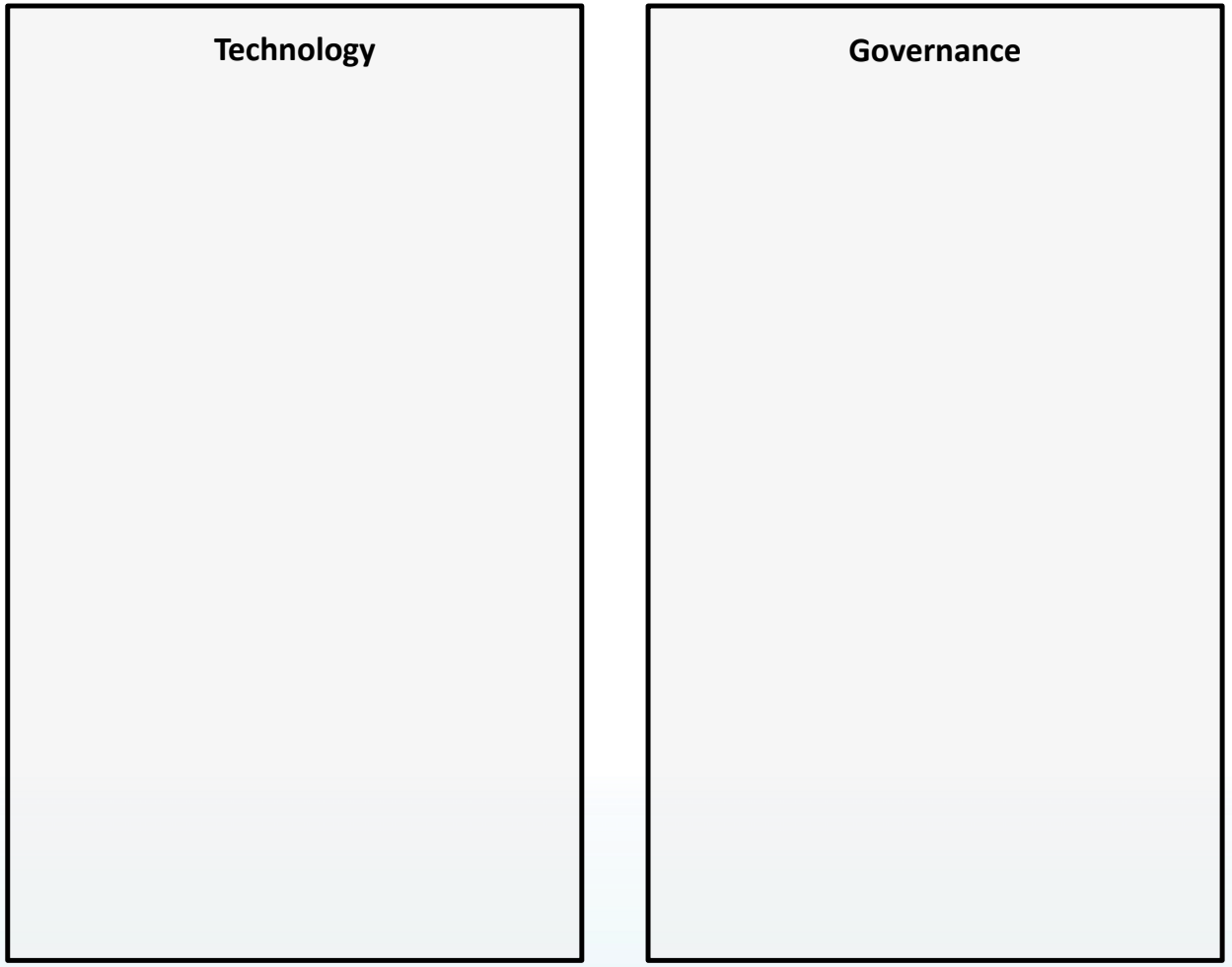
TECHNOLOGY NEEDS TO BE GOVERNED

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



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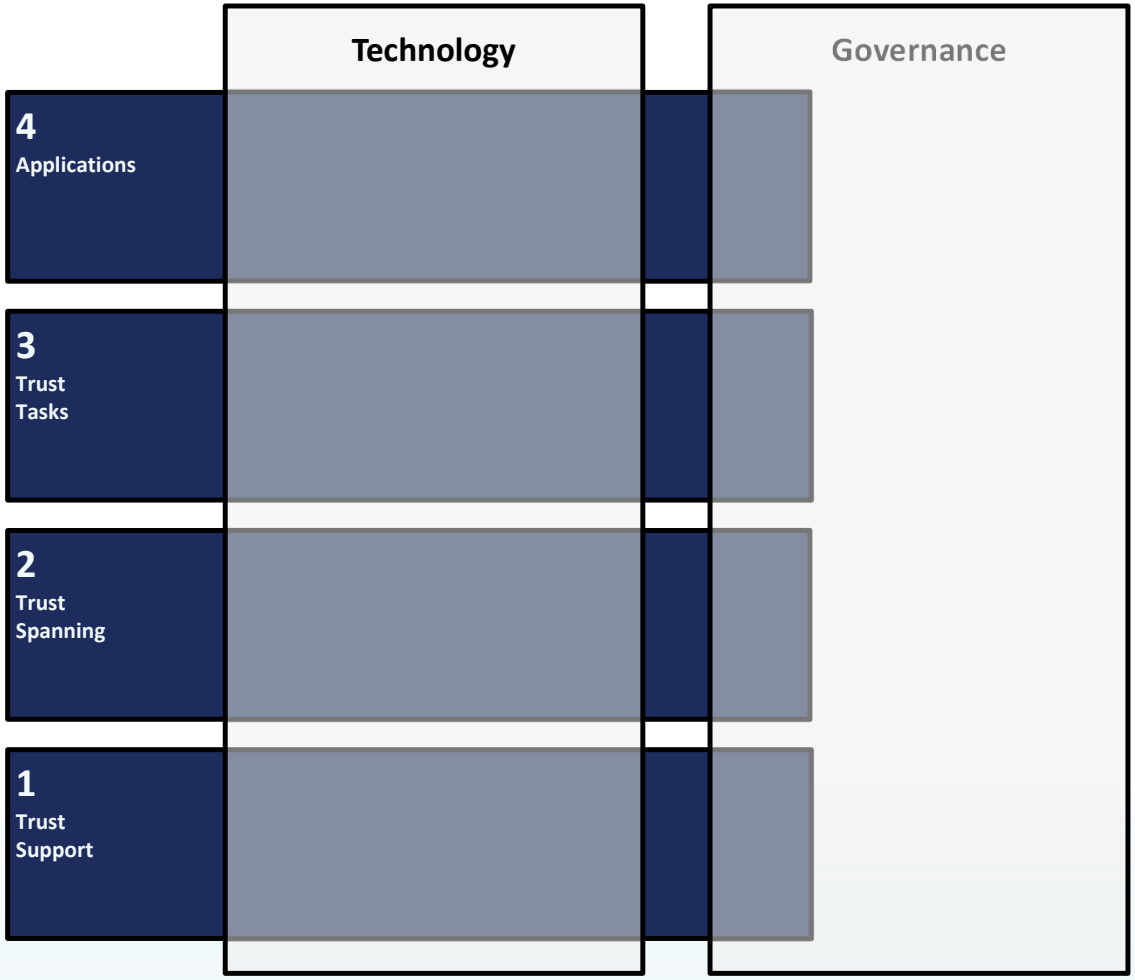
Elements of the ToIP Model

TECHNOLOGY STACK LAYERS

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



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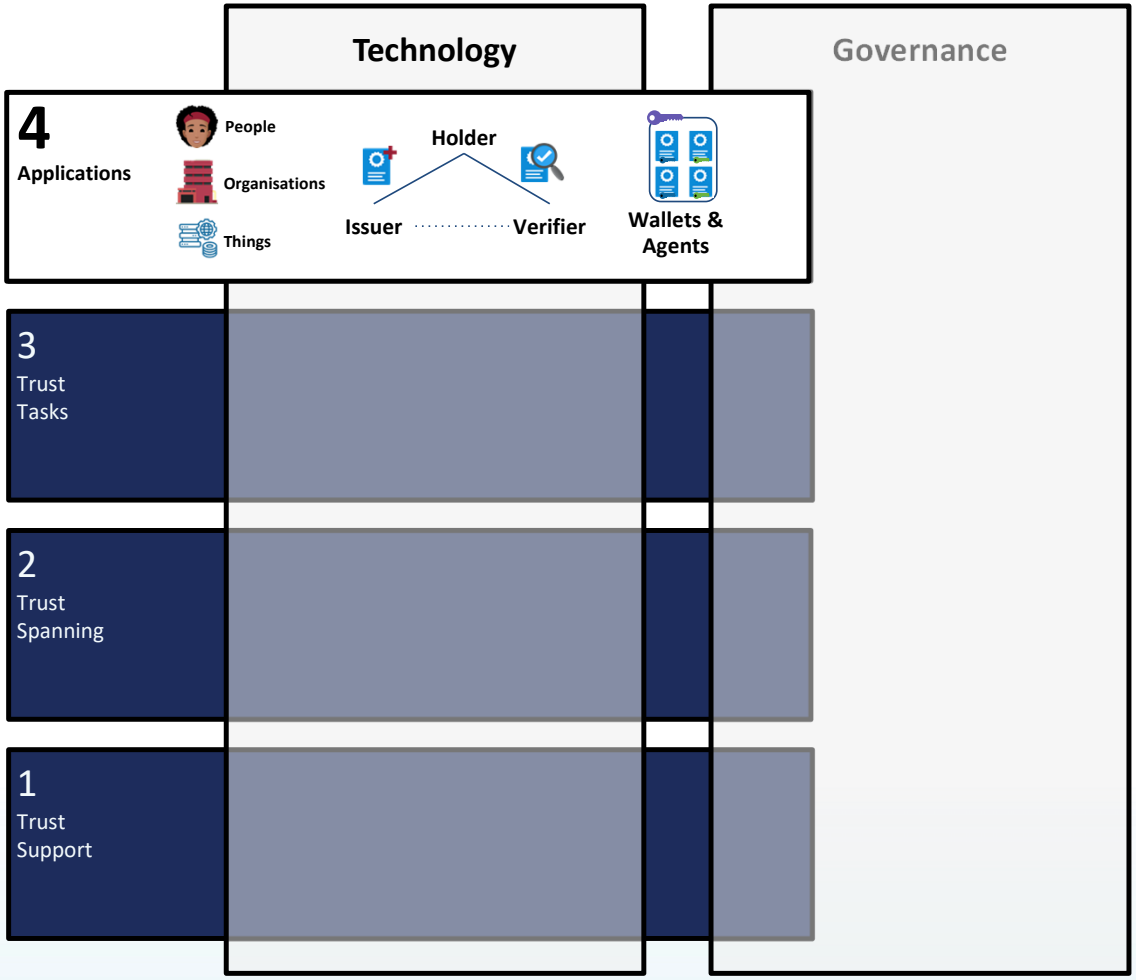
LAYER 4 - APPLICATIONS

Layer 4 contains system endpoints including devices and “trust diamond” participants. It reaches down the stack to engage in trusted interactions and trust tasks.



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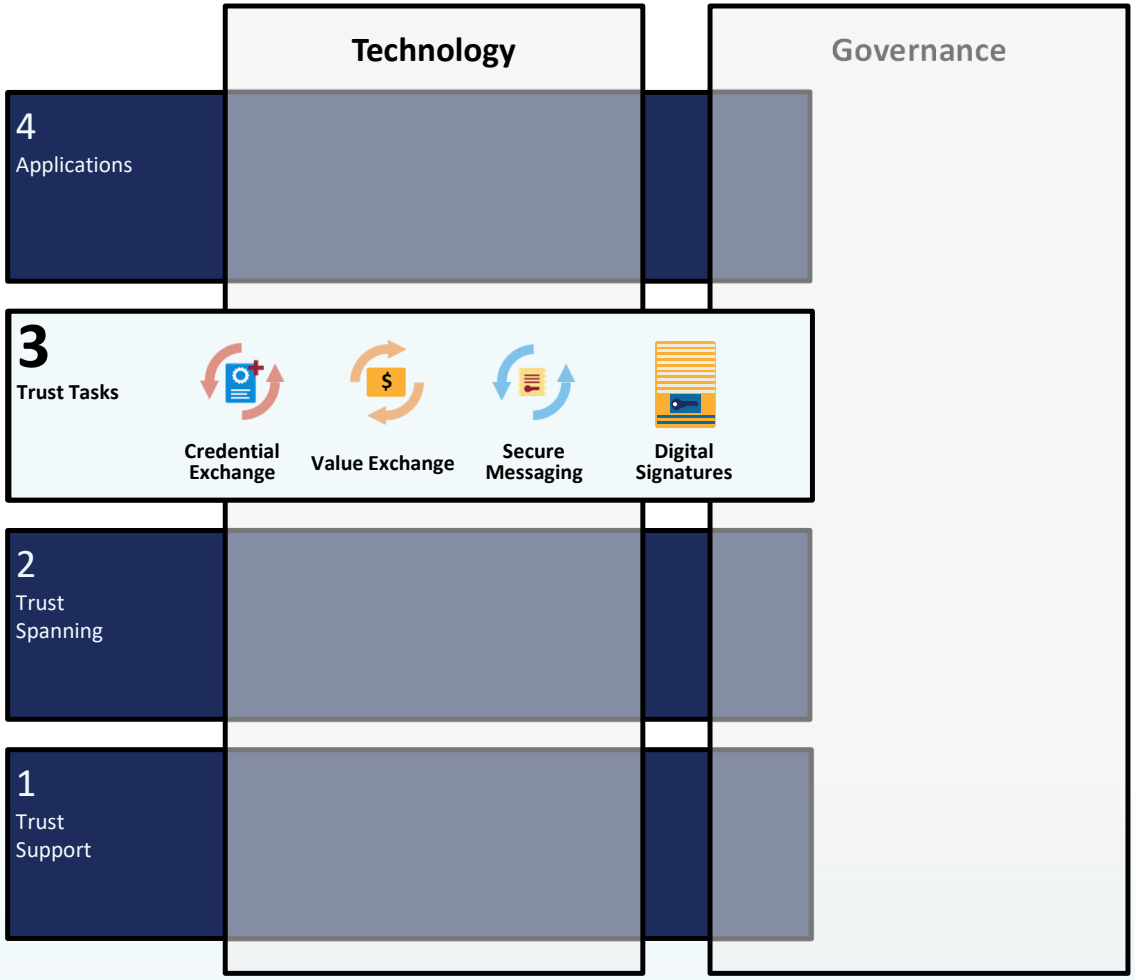
LAYER 3 – TRUST TASKS

Layer 3 focuses on the tasks that support the overall trust objectives of the application.



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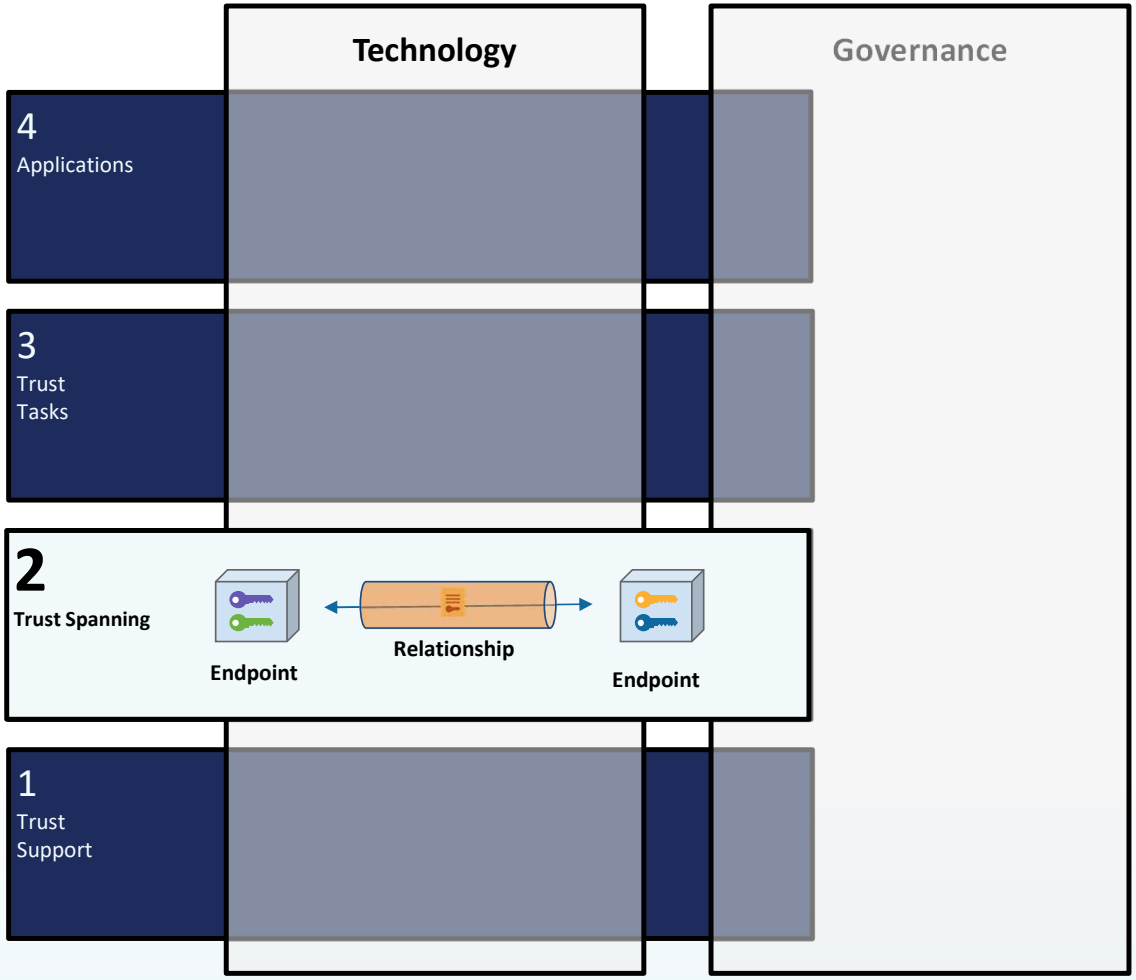
LAYER 2 – TRUST SPANNING

Layer 2 is the layer that enables the establishment of a trusted connection between any two peers using a single standard trust spanning protocol.

Note: This layer is to the ToIP stack what the IP layer is to the TCP/IP stack.



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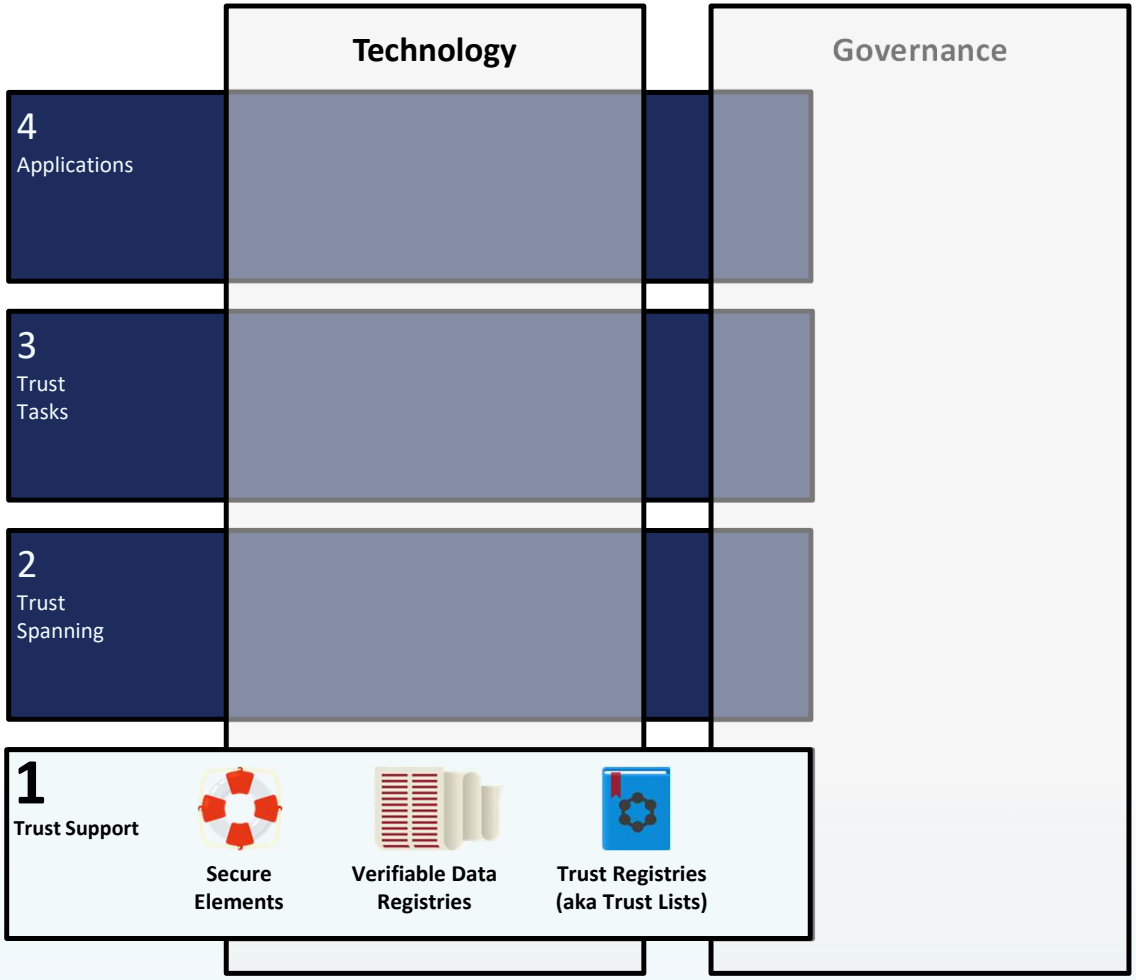
LAYER 1 – TRUST SUPPORT

Layer 1 contains the foundational elements to support the higher layers, to provide decentralized roots of trust that can span within and across different digital trust ecosystems).



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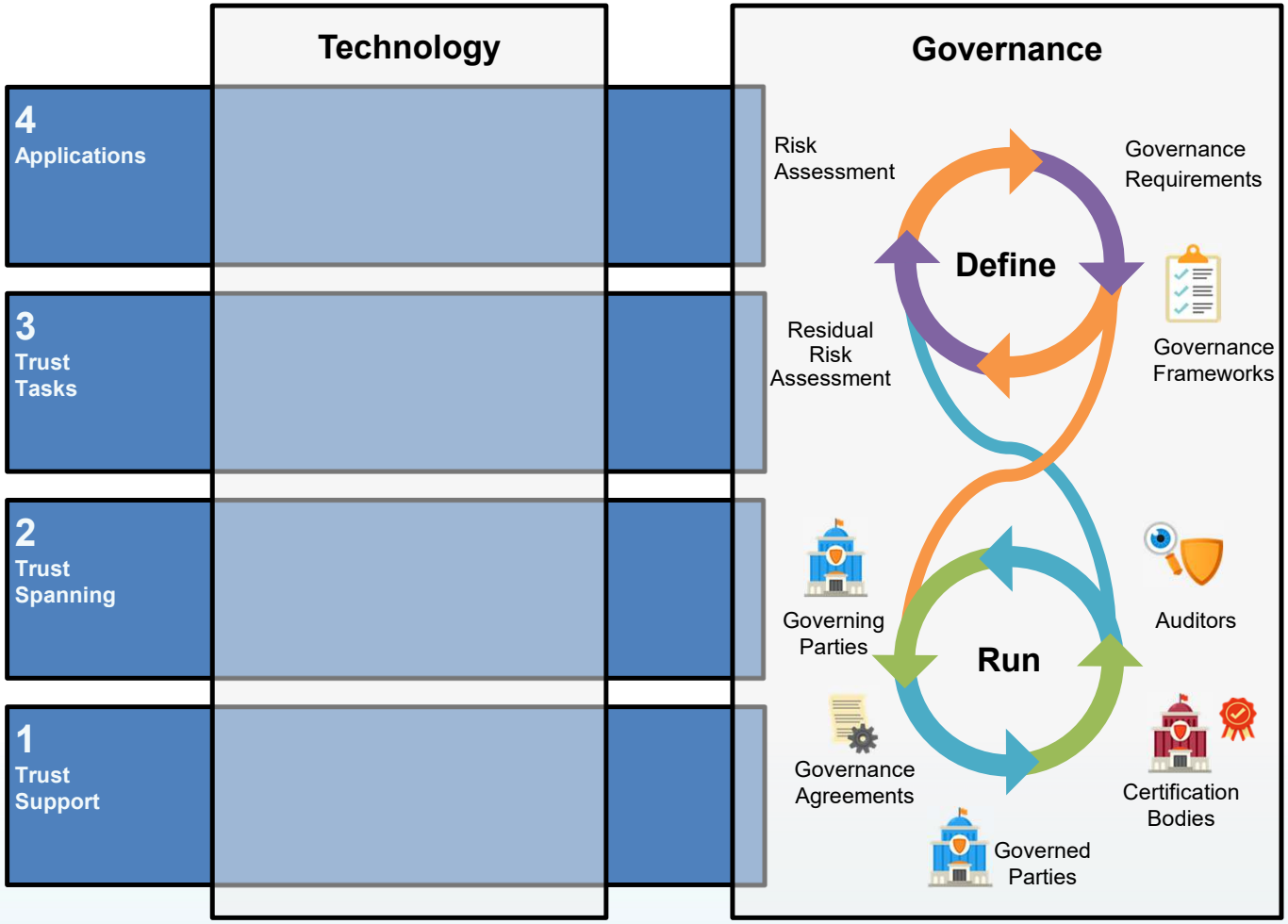
Governance and Accreditation

FOCUS ON GOVERNANCE

In this topic, we'll discuss the elements of governance in the ToIP Model



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GOVERNANCE OPERATION

Controllable risks are evaluated for likelihood and impact

Selected risks are addressed with requirements (MUST statements)

Audit reports are reviewed for framework effectiveness in mitigating risk to an acceptable level

Certification scheme is developed from requirements with independent evaluations from qualified auditors

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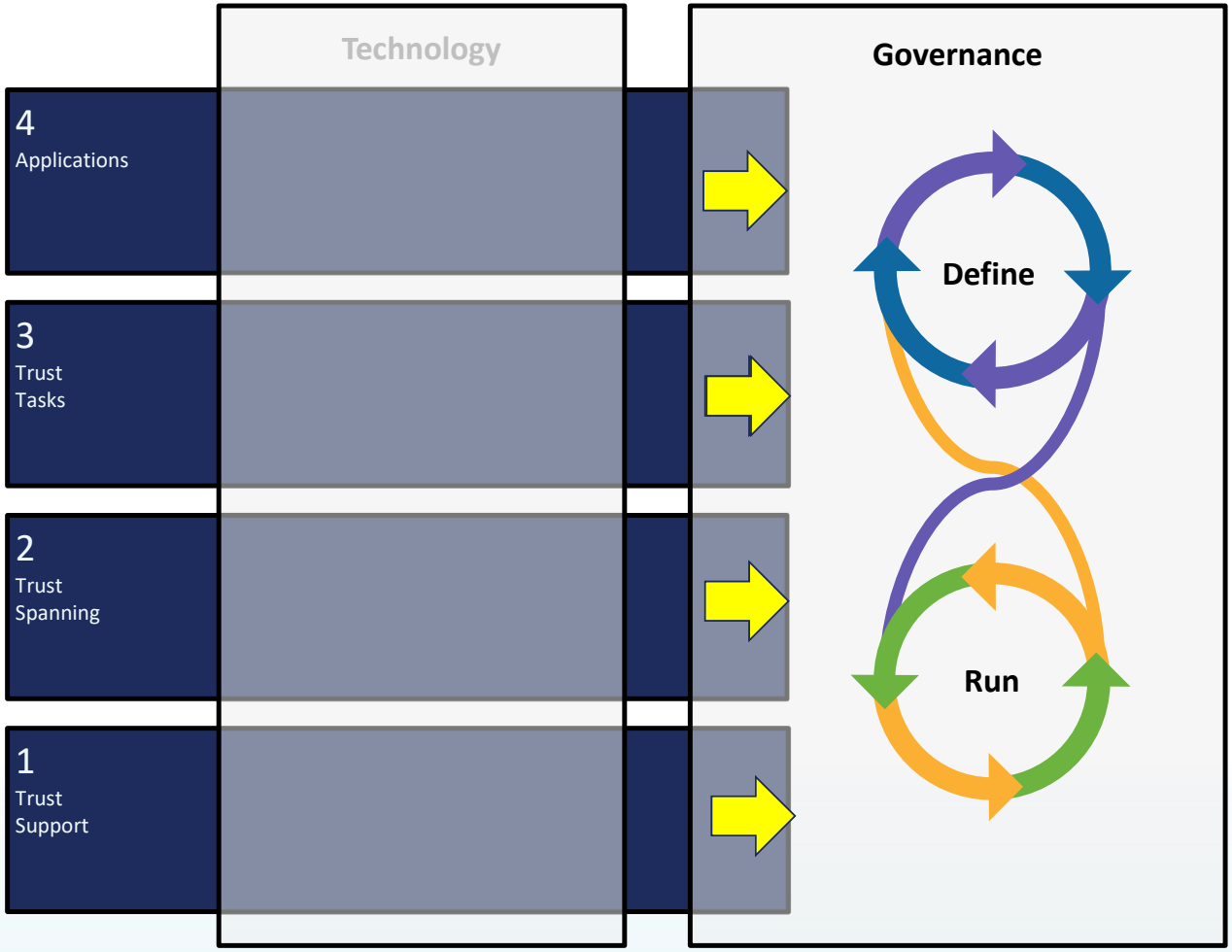
GOVERNANCE APPLICATION IN THE MODEL

This is how the governance cycle is reflected in the model. Governance processes are drawn from technology used in stack layers.



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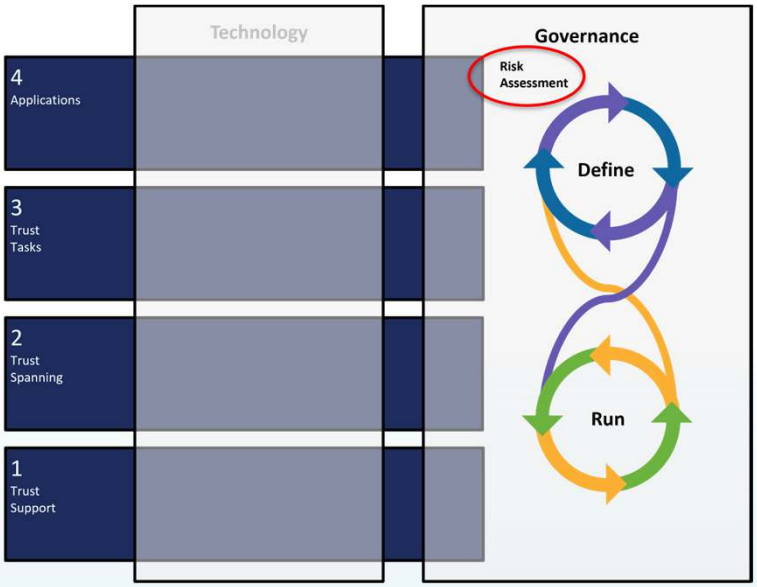
RISK ASSESSMENT

LEGEND			
COLUMN HEADER	EXPLANATION	Potential Values	
Risk #	A unique identifier of a risk for reference purposes	#	
Risk Description	Description of a unique risk	Text	
ToIP Layer	The Governance Stack Layer the risk operates based on the ToIP Governance Stack	Ecosystem	
		Credential	
		Provider	
		Utility	
Trust Area Affected	Information trust component affected by the risk	Governance	
		Availability	
		Security	
		Availability	
		Privacy	
		Processing Integrity	
Severity	Judgemental evaluation of impact the risk would have on the entity if realized	Negligible	1
		Minor	2
		Moderate	3
		Major	4
		Critical	5
Likilhood	Judgemental evaluation of the potential that the risk will occur risk without controls or other circumstances to prevent it.	Highly Unlikely	1
		Unlikely	2
		Possible	3
		Likely	4
		Highly Likely	5
Impact	Judgemental scoring of risk's effect based on severity and and likilihood.	Low	1-3
		Low-Medium	4-7
		Medium	8-12
		Medium-High	13-18
		High	19-25
Risk Consideration Actions	Factors to consider reguarding risk treatment	Text	
Risk Treatment	Recommended action category to take to handle the risk	Mitigation	
		Avoidance	
		Transference	
		Acceptance	
		Other	
Risk Treatment Action	High level action identified to treat risk	Text	
Residual Risk	Judgemental level or state of risk after applying risk treament	Text or Impact Level	

SCALE OF LIKELIHOOD		SCALE OF SEVERITY 1 NEGLIGIBLE	2 MINOR	3 MODERATE	4 MAJOR	5 CRITICAL
1	HIGHLY UNLIKELY	LOW	LOW	LOW	LOW - MEDIUM	LOW - MEDIUM
2	UNLIKELY	LOW	LOW - MEDIUM	LOW - MEDIUM	MEDIUM	MEDIUM
3	POSSIBLE	LOW	LOW - MEDIUM	MEDIUM	MEDIUM	MEDIUM-HIGH
4	LIKELY	LOW - MEDIUM	MEDIUM	MEDIUM	MEDIUM-HIGH	HIGH
5	HIGHLY UNLIKELY	LOW - MEDIUM	MEDIUM	MEDIUM-HIGH	HIGH	HIGH

Controllable risks are evaluated for likelihood and impact



[Risk Assessment Worksheet Template:](https://trustoverip.org/permalink/ToIP-Risk-Assessment-Worksheet-Template-V1.0-2021-08-24.xlsx) https://trustoverip.org/permalink/ToIP-Risk-Assessment-Worksheet-Template-V1.0-2021-08-24.xlsx

[Risk Assessment Companion Guide:](https://trustoverip.org/permalink/ToIP-Risk-Assessment-Companion-Guide-V1.0-2021-08-24.pdf) https://trustoverip.org/permalink/ToIP-Risk-Assessment-Companion-Guide-V1.0-2021-08-24.pdf

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GOVERNANCE REQUIREMENTS / GOVERNANCE FRAMEWORKS

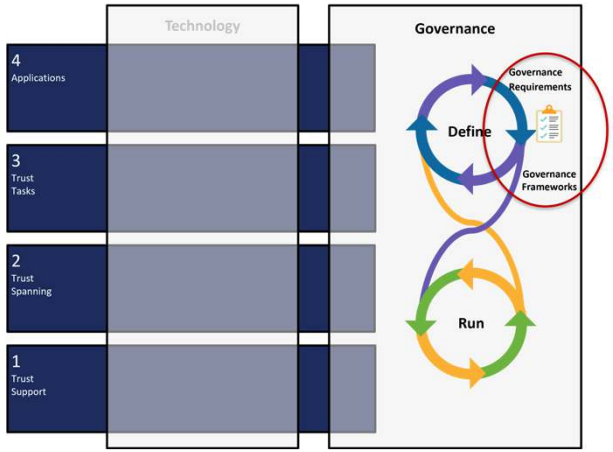
Primary Document

- Introduction
- Terminology
- Governing Authority
- Administering Authority
- Purpose
- Scope
- Objectives
- Principles
- General Requirements
- Revisions
- Extensions
- Schedule of Controlled Documents

Controlled Documents

- Glossary
- Risk Assessment
- Trust Assurance & Certification
- Governance Requirements
- Business Requirements
- Technical Requirements
- Information Trust Requirements
- Inclusion, Equitability, & Accessibility
- Legal Agreements

Selected risks are addressed with requirements (MUST statements)



Governance Architecture Specification: https://trustoverip.org/permalink/ToIP-Governance-Architecture-Specification-V1.0-2021-12-21.pdf

Governance Metamodel Specification: https://trustoverip.org/permalink/ToIP-Governance-Metamodel-Specification-V1.0-2021-12-21.pdf
Companion Guide: https://trustoverip.org/permalink/ToIP-Governance-Metamodel-Specification-Companion-Guide-V1.0-2021-12-21.pdf

Governance Framework Matrix: https://trustoverip.org/permalink/ToIP-Governance-Framework-Martix-V1.0-2021-10-19.xlsx
Companion Guide: https://trustoverip.org/permalink/ToIP-Governance-Framework-Matrix-Companion-Guide-V1.0-2021-10-19.pdf

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TRUST ASSURANCE

Trust Assurance and Certification Controlled Document Template

Version 1.0
19 October 2021

This publicly available template was approved by the ToIP Foundation Steering Committee on 19 October 2021.

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 300 organizational 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.

Trust Assurance Criteria Matrix Template

Version 1.0
20-Oct-2021

This publicly available worksheet, was approved by the ToIP Foundation Steering Committee on [date of approval(20 October 2021.

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 300 organizational and 100 individual members from around the world.

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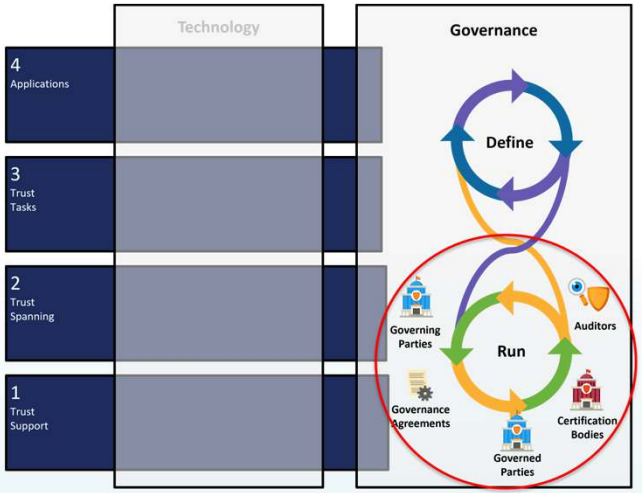
Certification scheme is developed from requirements with independent evaluations from qualified auditors



Trust Assurance and Certification Template:
https://trustoverip.org/permalink/ToIP-Trust-Assurance-and-Certification-Controlled-Document-Template-V1.0-2021-10-19.pdf
Companion Guide:
https://trustoverip.org/permalink/ToIP-Trust-Assurance-Companion-Guide-V1.0-2021-10-19.pdf

Trust Assurance Criteria Template:
https://trustoverip.org/permalink/ToIP-Trust-Assurance-Criteria-Matrix-Template-ToIP-Approved-V1.0-2021-10-10.
Companion Guide:
https://trustoverip.org/permalink/ToIP-Trust-Criteria-Matrix-Companion-Guide-V1.0-2021-10-19.pdf

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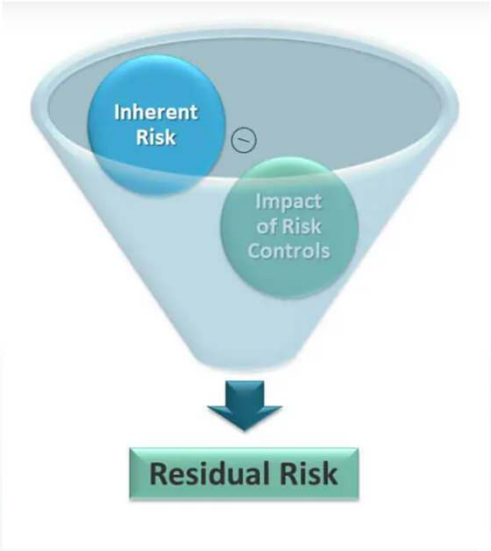
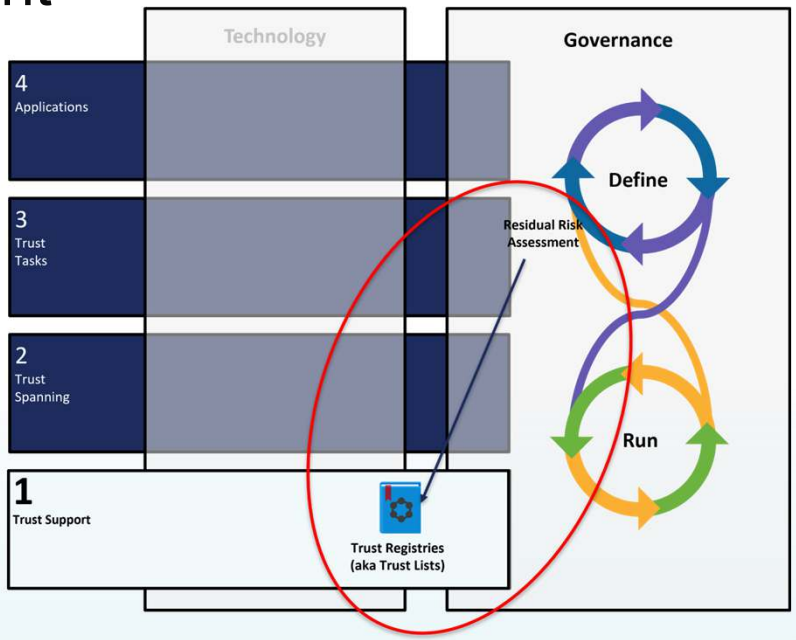
RESIDUAL RISK ASSESSMENT

Audit reports are reviewed for conformity to the governance framework in mitigating risk to an acceptable level. Those conforming entities may appear on a Trust Registry. Non-conforming practices are assessed for risk which feeds back into the risk assessment





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RELATIONSHIP OF GOVERNANCE DOCUMENTS

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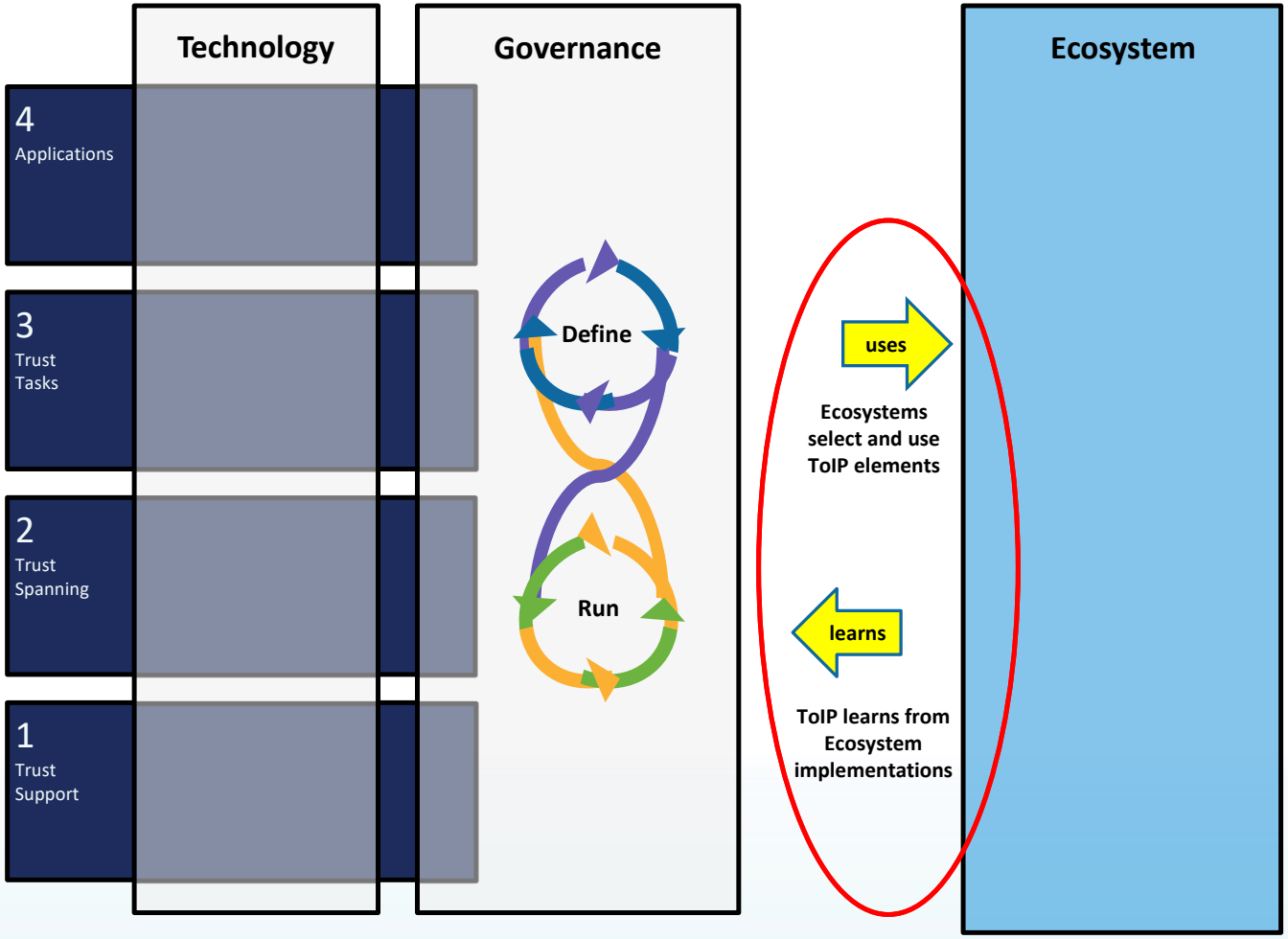
How Ecosystems Use the Model in Practice

TOIP INFLUENCE ON ECOSYSTEMS

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



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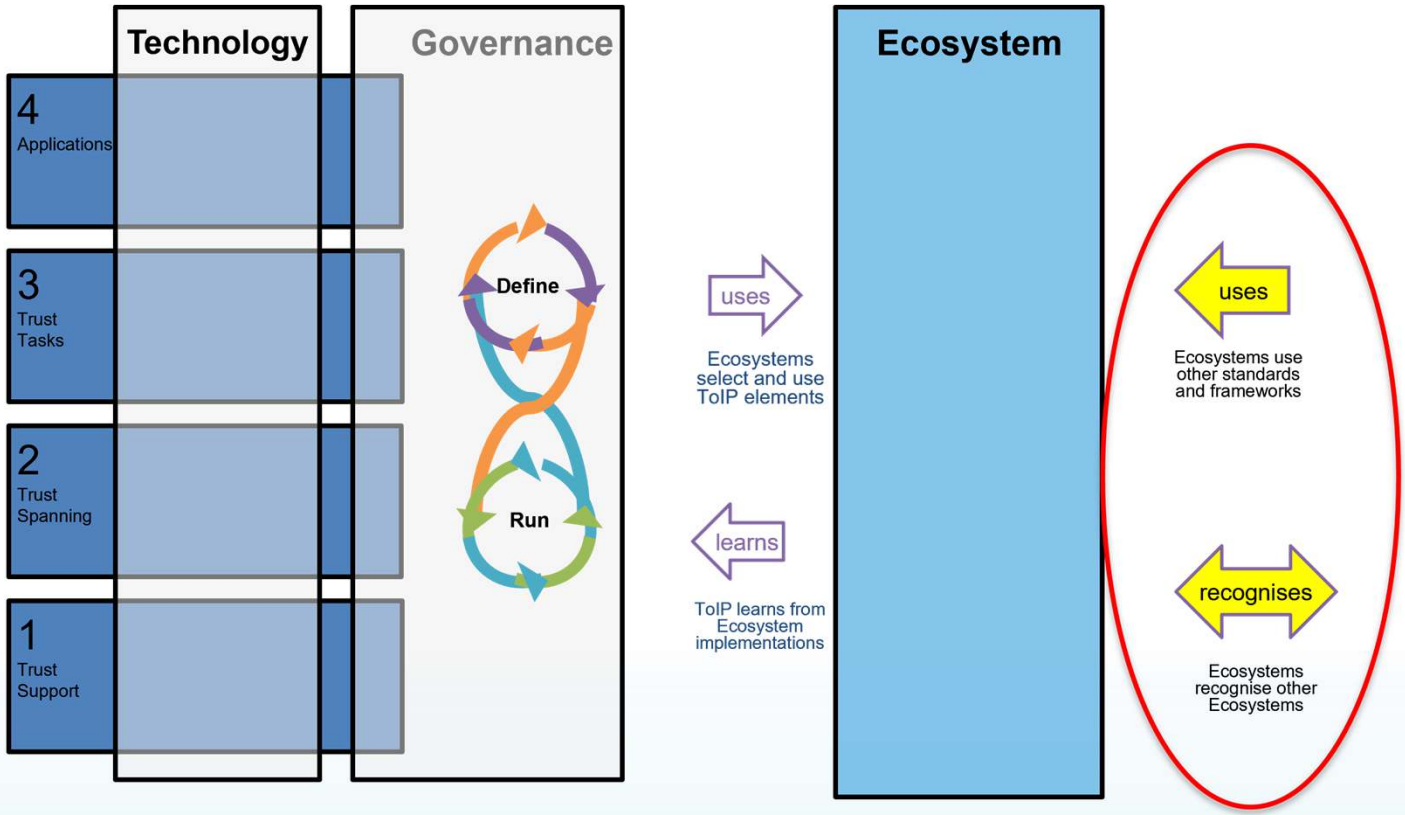
MARKETPLACE INFLUENCE ON ECOSYSTEMS

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



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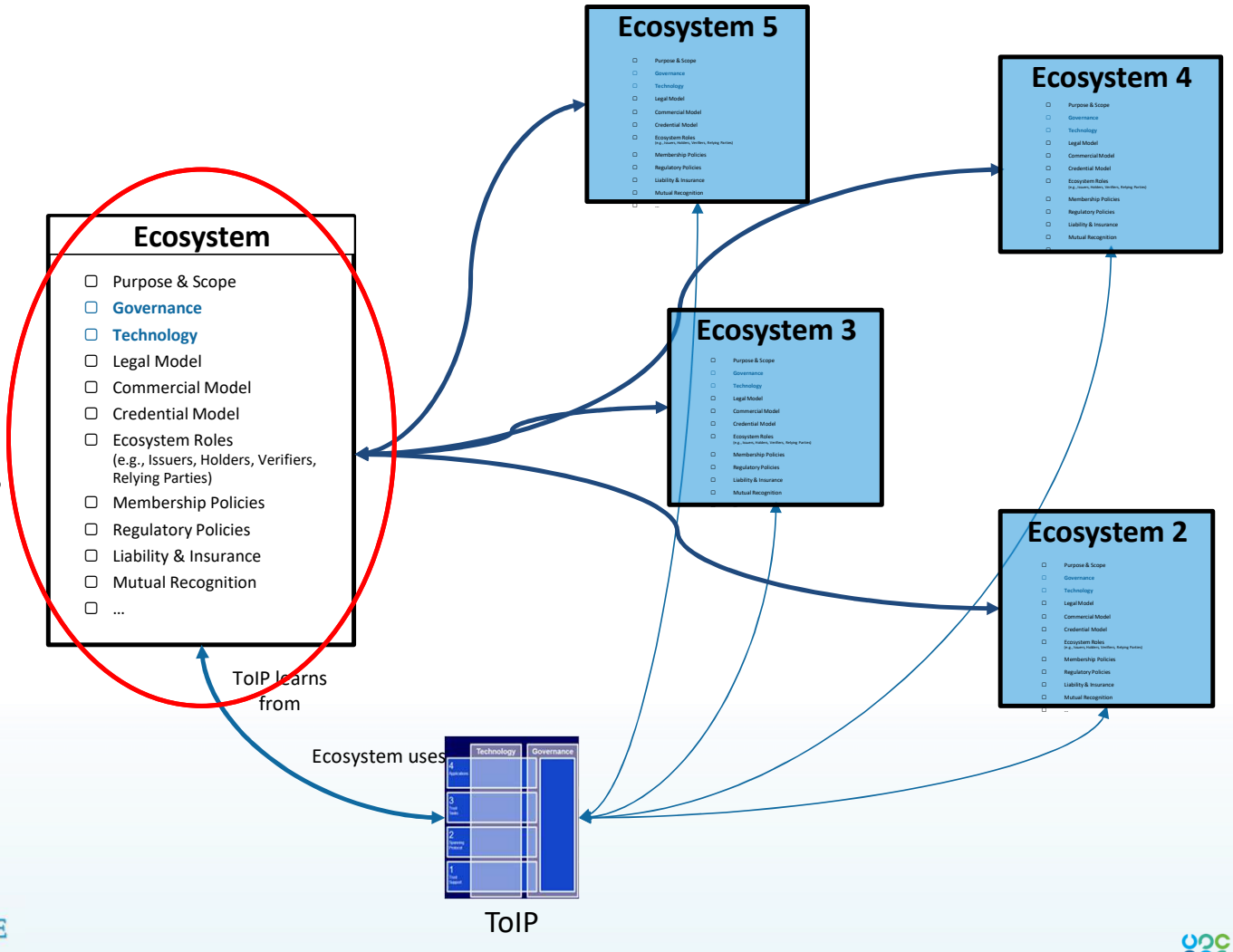
WEB OF TRUST IMPACT ON ECOSYSTEMS

Ecosystems are impacted by claims issued and verified in other ecosystems. This contributes to technology and governance choices.



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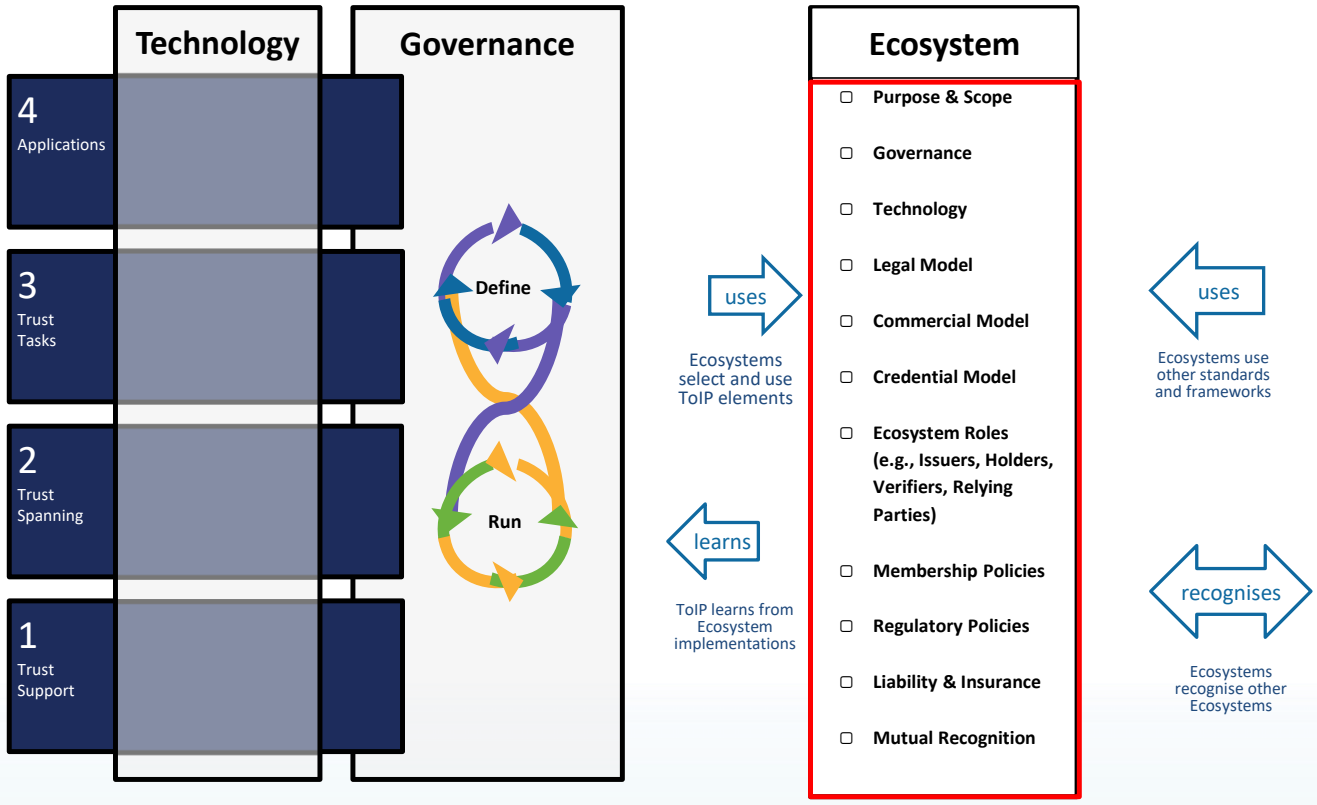
ECOSYSTEM DRIVEN TECHNOLOGY AND GOVERNANCE

Ecosystems derive their own technology and governance requirements based on their risks and interactions with other ecosystems and standards.



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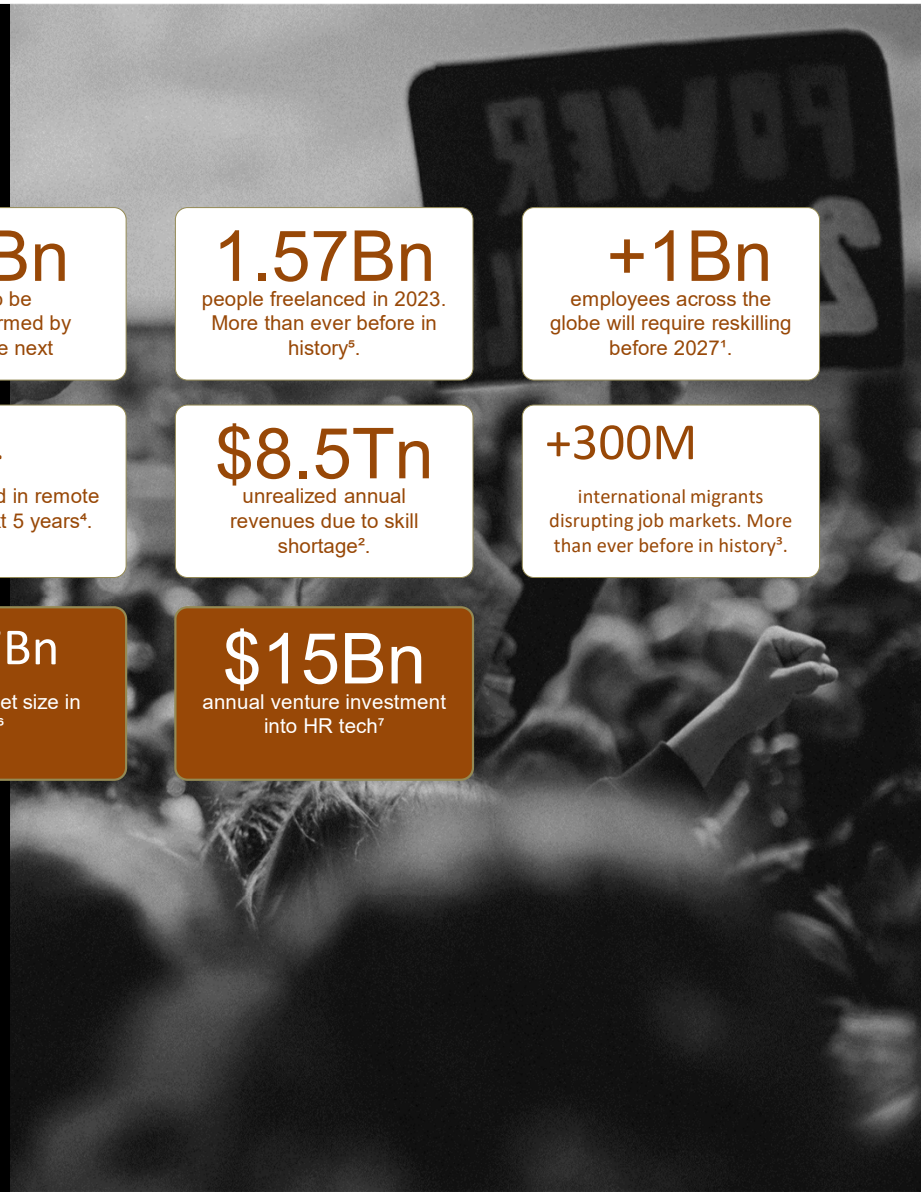
Case Study - The Velocity Network

THE PROBLEM

The timing: a defining moment

The disrupted labor market is one of humanity's biggest challenges for the next few decades.

The lack of a globally-inclusive infrastructure for proof of qualifications, limits the potential to mitigate these mega trends.



[1] Future of Job Survey, World Economic Forum, 2023
[2] The Global Talent Crunch, Korn Ferry
[3] United Nations Publications
[4] EurDev, Remote Work in Europe, 2023
[5] World Bank Publications
[6] Global Human Resource (HR) Technology Market, Verified Market Research, 2023
[7] HR Technology 2023, Josh Bersin, 2023

THE BUSINESS PROPOSITION

The ‘Great Transformer’ the market has been waiting for

Verify education and career credentials in seconds, not weeks.

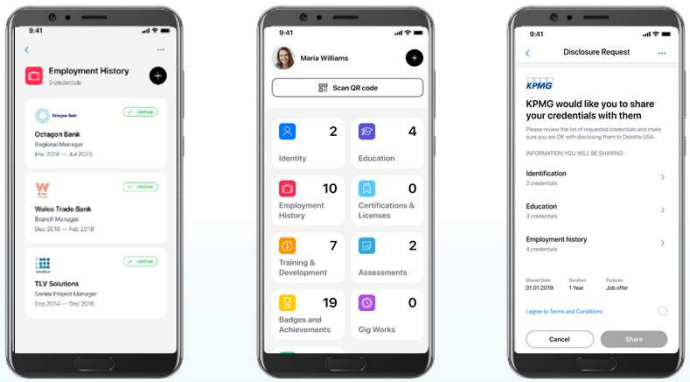
Individuals

It’s about people’s right to own their career reputation, access better career opportunities and maintain complete privacy when navigating their careers.

Claim proofs of your employment history, educational background, skills, and qualifications.

Privately store your verified records on career wallets…

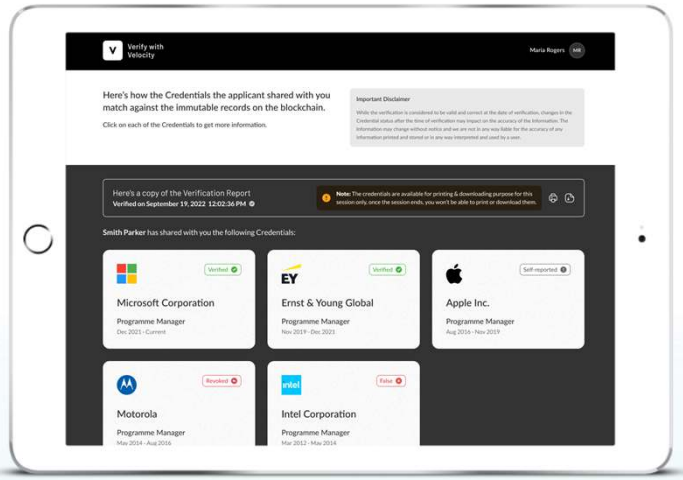
…and choose what to share and what to keep private.



Relying Parties (Employment, Financial Services)

Instantly verify career and education records shared by applicants, students, employees, freelancers and consumers.

Accelerate processes. Improve compliance and unlock innovative engagement models.



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THE VELOCITY NETWORK SOLUTION

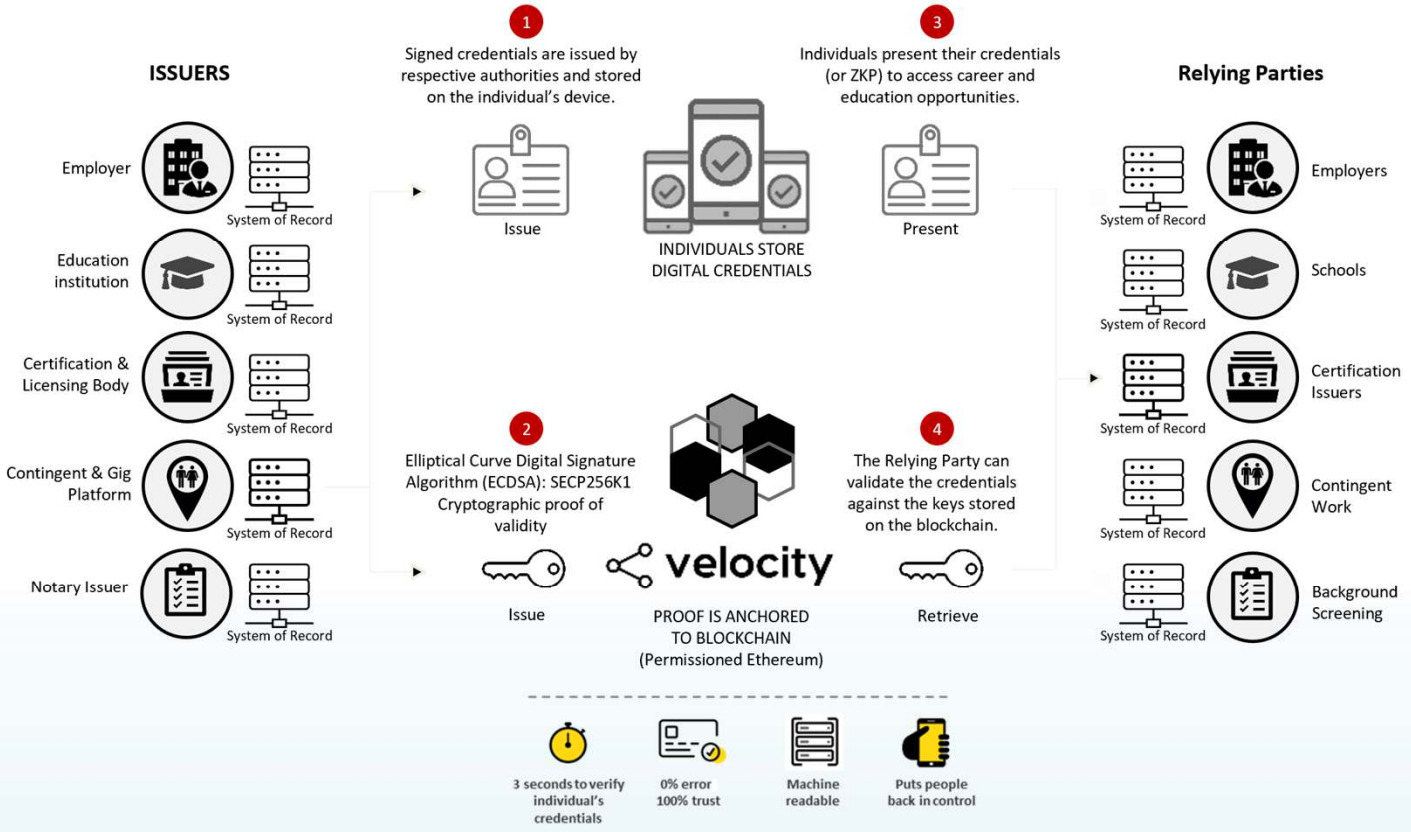
The Solution

Scalable, compliant, tamper-proof

A blockchain based utility layer, which makes it simple for people and organizations to exchange verifiable, immutable, trusted career credentials .

Issuers write to Velocity Network's blockchain a cryptographic key for each credential making it verifiable and trusted.

The keys hold no PII and used for verification only.



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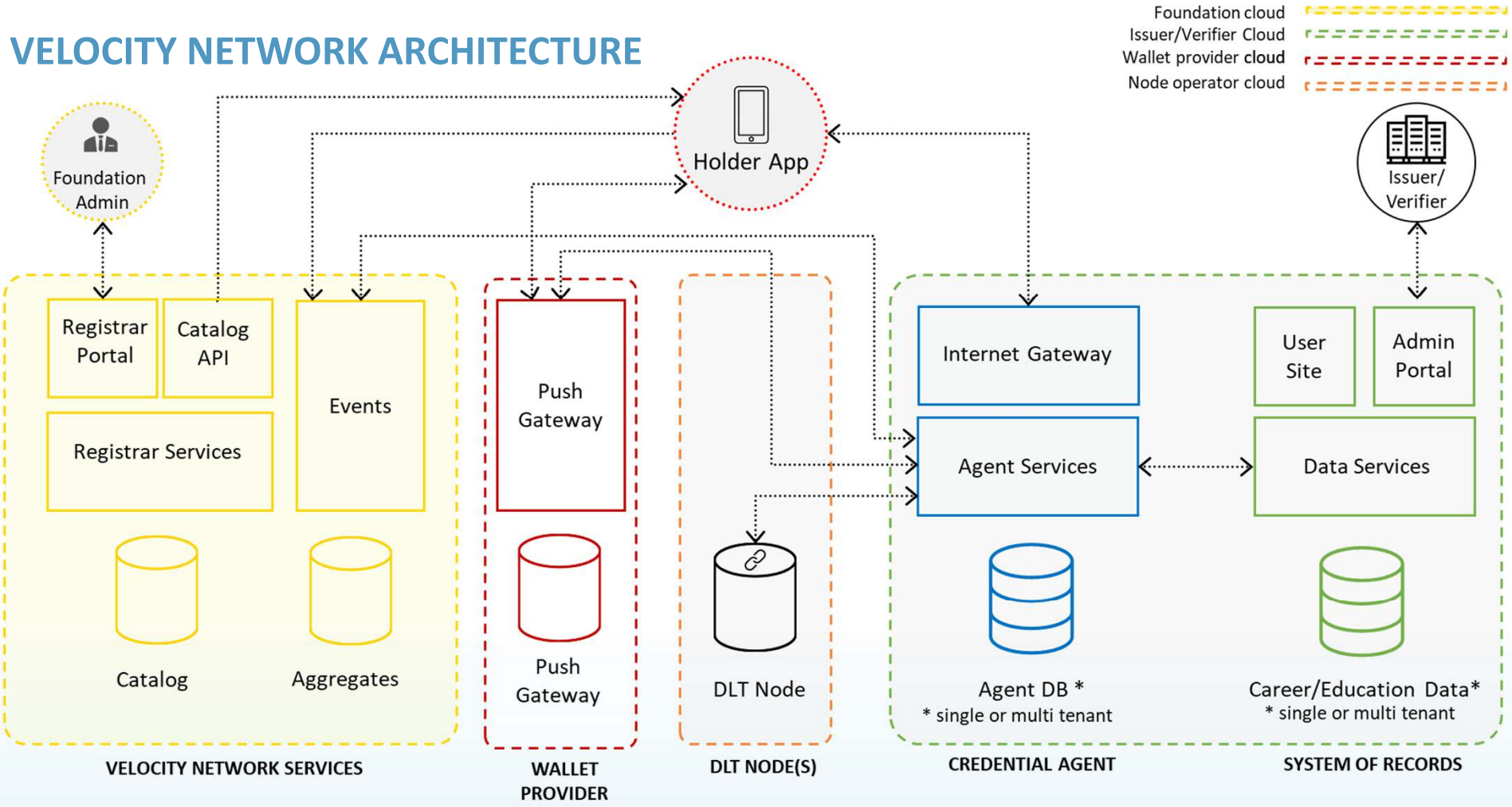
VELOCITY NETWORK ARCHITECTURE



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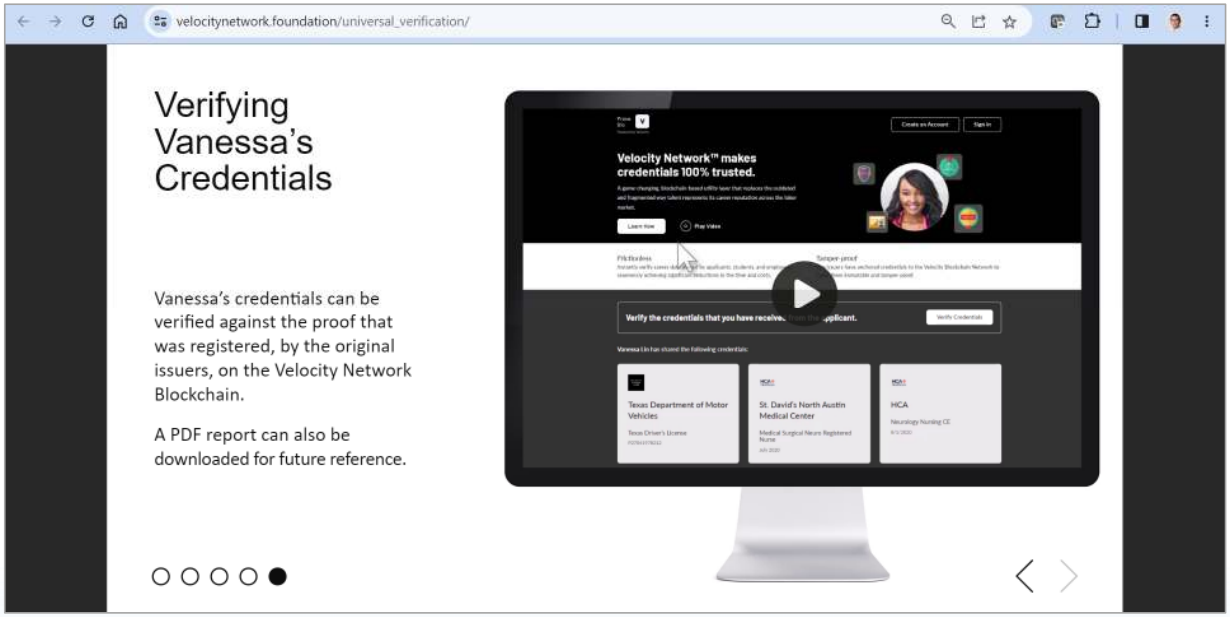
VELOCITY NETWORKS VERIFICATION PROCESS FLOW

A semi-interactive demo showcasing the Universal Verification service (aka www.prove.bio) is available on the VNF website:

- Vanessa claims credentials
- Vanessa creates a presentation – a set of credentials she wants to share – and generates a QR-code or URL.
- Vanessa includes the QR-code or URL in any document, email, resume
- Any organization with the QR-Code or URL can access the universal verification service, view the credentials and verify them.



https://www.velocitynetwork.foundation/universal_verification/

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Case Study –
The Bhutan National Digital Identity Network

Bhutan NDI Introduction

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BHUTAN NDI's VISION AND MISSION

VISION

To accelerate seamless access to government, business, and financial services by facilitating a digital ecosystem rooted in trust.

MISSION

- To build identity as the cornerstone of every digital interaction.
- To foster a harmonious digital ecosystem for seamless delivery of government & business services.
- To provide verification and authentication as-a-service for individuals and service providers to meet compliance requirements.
- To continuously innovate to meet the demands of an evolving landscape of digital transactions.

BHUTAN NDI's DESIGN PHILOSOPHY

Driven by His Majesty The King's personal vision to provide every citizen with the right to privacy, Bhutan NDI has been launched with the philosophy of Self-Sovereign Identity.

Data is stored on the user's personal biometrics-enabled wallet (and not with a third party or in the cloud).

Individuals control their personal data and are empowered to share only the information that is required for a specific transaction or interaction.

Individual's identity proofs are not owned or controlled by a single authority and cannot be altered or deleted without detection, reducing the risk of a single point of failure.

BHUTAN NDI's DESIGN PRINCIPLES

Inclusion

Future Proof

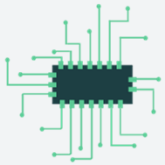
Cost

Scalability

Integrated Digital Experience

Trust & Security

Partial Digitization



Complex KYC process

BHUTAN NDI's GOVERNANCE DESIGN

Bhutan NDI meets the global web standard mandated by the World Wide Web Consortium (w3C)

Bhutan NDI's biometric algorithm is in line with the standards approved by the National Institute of Standards & Technology (NIST)

Bhutan's NDI Act 2023 established the Kingdom as the first sovereign state to implement a comprehensive decentralized digital identity framework

BHUTAN NDI's PRODUCT ROADMAP

PRODUCT

- CUSTODIAL WALLET
- HYBRID WALLET
- CONTROLLER CAPABILITIES
- GUARDIAN CAPABILITIES
- KAIOS NATIVE APP
- DIGITAL SIGNING
- PEER-TO-PEER CHAT

USE CASES

- ELECTRONIC PATIENT MANAGEMENT SYSTEM
- NATIONAL SERVICES
- FINANCIAL INSTITUTIONS
- TELECOMMUNICATIONS
- ROAD & AIR TRAVEL
- NATURAL RESOURCES
- SECURITY, AUDIT, TAX CERTIFICATIONS

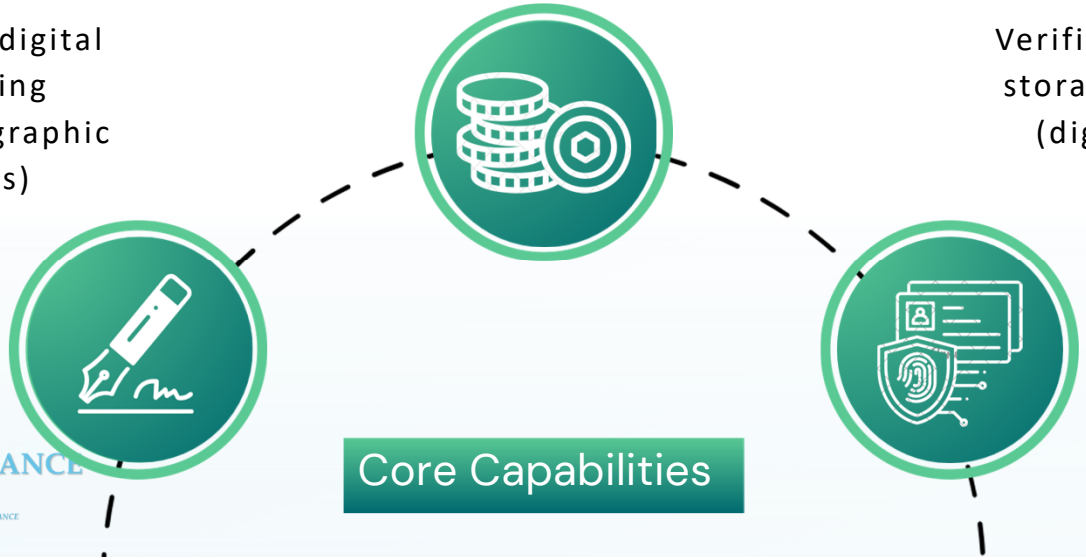
BHUTAN NDI's WALLET DESIGN

Bhutan National Digital Identity (NDI) is a biometrics-enabled edge mega wallet that has been developed as the foundation for digital transformation, connectivity, and inclusion in Bhutan.

Seamless currency transactions (digital tokens)

Secure digital signing (cryptographic keys)

Verifiable credential storage & exchange (digital identity proofs)



Core Capabilities

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BHUTAN NDI's PROGRAM STATISTICS

80K+

Foundational ID Issued

14

G2C Services Integrated

10+

Integrations Underway

BHUTAN NDI's PLATFORMS

Bhutan NDI
www.bhutanndi.com

For Users

GET IT ON Google Play

Download on the App Store

For Organizations

Issuer

Verifier

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BHUTAN NDI DEMO VIDEO

Issuance of Verifiable Credentials

Verified e-KYC

Passwordless Login

Backup & Restoration

[Bhutan NDI Demo Video]

QUESTIONS?

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