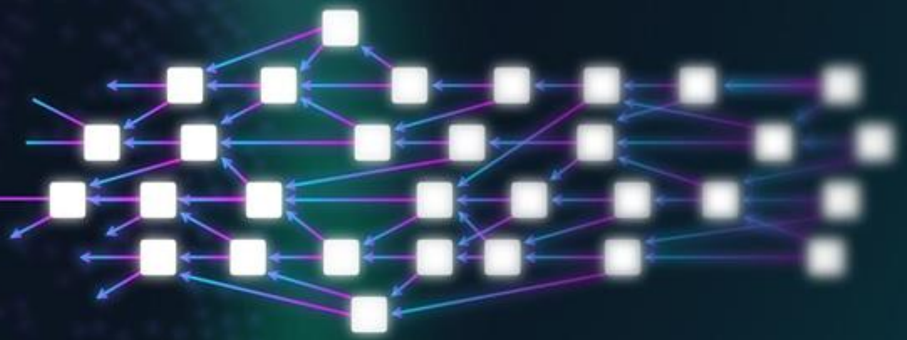
BEYOND THE BLOCKCHAIN



IOTA

IOTA
FOUNDATION

Review

IOTA Ecosystem - Backbone for IOT

Ecosystem aiming to become the backbone for the “Internet of Things”

- Development and promotion by german IOTA Foundation
- Based on a “***Public Permissionless* Distributed Ledger***” (the Tangle)

Specially designed for the IOT and Machine-to-Machine Communication

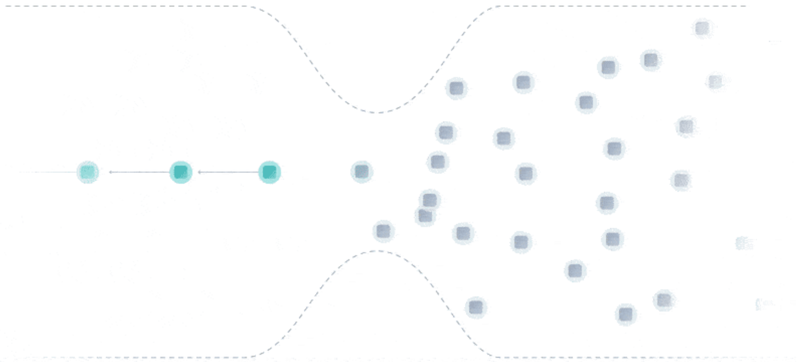
- Feeless transactions (enables microtransactions)
- Provides data and value transaction capability
- High scalability
- Quantum Proof (due to Winternitz one-time-signature scheme**)

* *definition* ***public permissionless,*** *see slide „Open Ecosystems vs. Private Solutions“*
** https://eprint.iacr.org/2011/191.pdf

IOTA

Future Proof Data Architecture

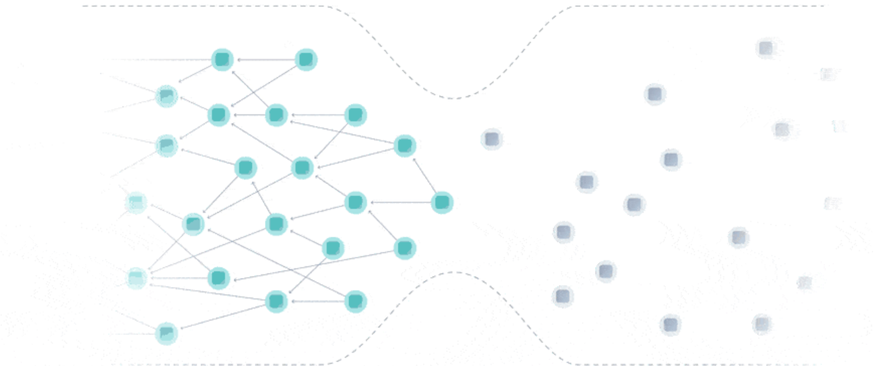
Blockchain



Blockchain bottleneck

Tangle

(DAG - Directed Acyclic Graph)



Tangle scales with transaction volume

* https://docs.iota.org/docs/getting-started/0.1/network/the-tangle

Global standard for IOT-Applications

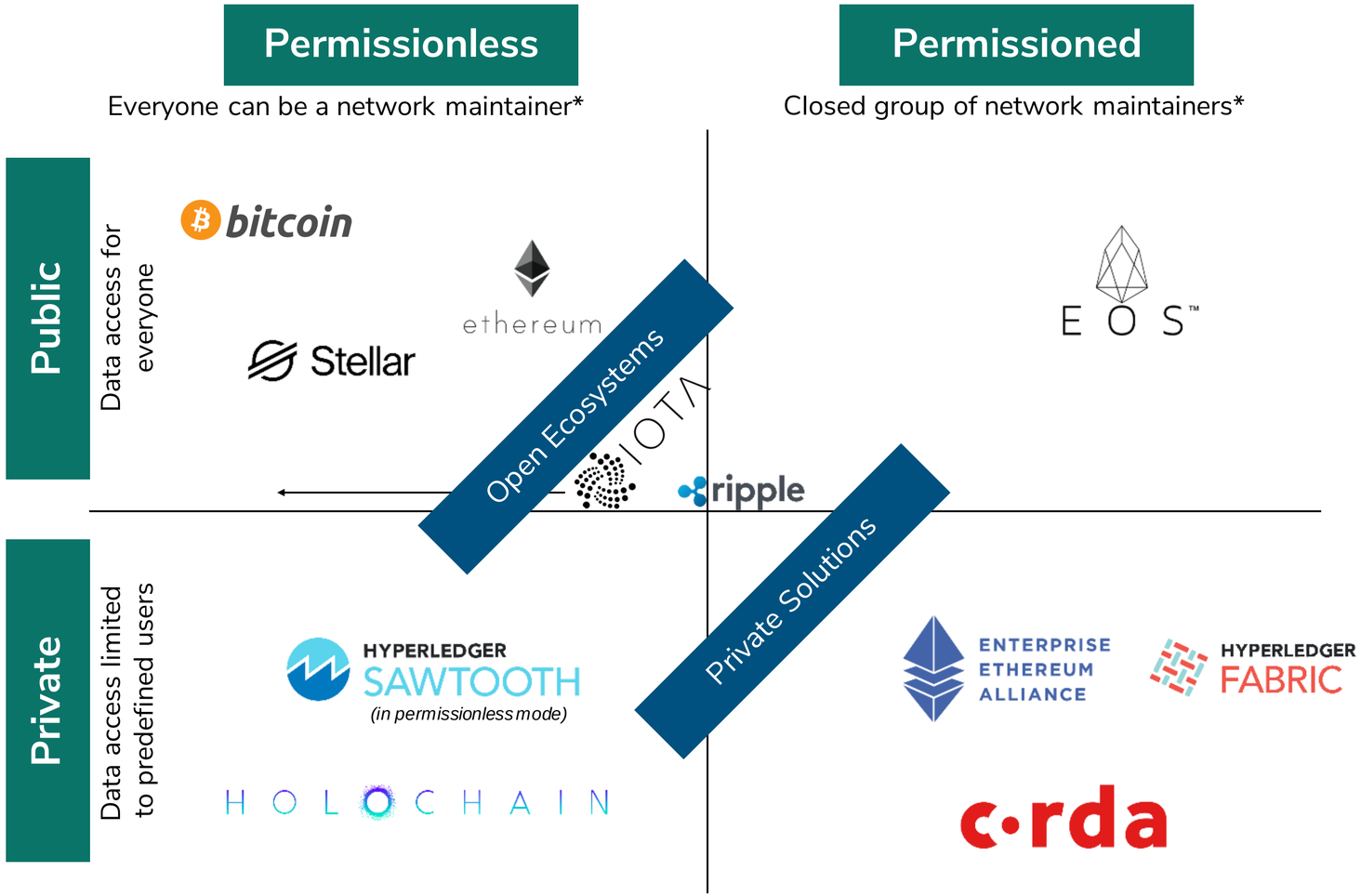
“Our vision is to make the machine economy a reality. The big problem with the Internet of Things is that machines often speak different languages because the protocols are not compatible.
IOTA is to become the protocol of the machine economy. You can not only send money via the Tangle, but also data. For example, from a sensor, or even smart contracts like Ethereum.”

Dominik Schiener, Co- Founder IOTA Foundation

"IOTA is the obvious solution and standardization will make it stronger.“
“"There will be an IOTA standard from the OMG and eventually from the International Organization of Standards / ISO at the end of next year.“(2020)

Dr. Richard Mark Soley
CEO Object Management Group
CEO Industrial Internet Consortium
IOTA Supervisory Board Member

Open Ecosystems vs. Private Solutions



* *Have a copy of the ledger and validate transactions*

** *Few public DLTs support encrypted Datastreams to provide privacy within open ecosystems (similar to an encrypted email)*

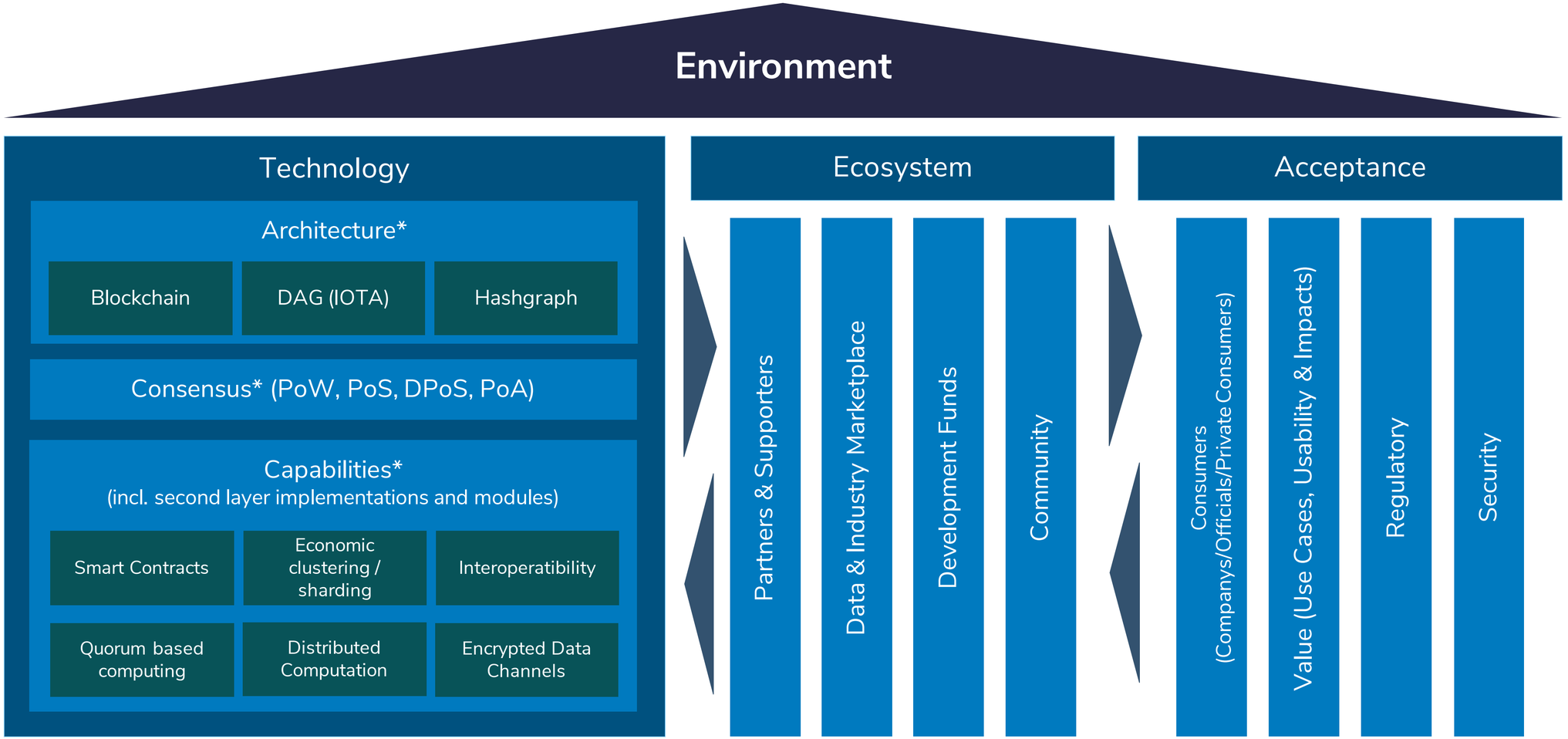
Public - Permissionless DLT:
Bitcoin – anyone can join the network, any node in the network can participate in the consensus algorithm (could validate transactions).

Public - Permissioned DLT:
Ripple or any POS Blockchain – anyone can join the network, only selected nodes that respect a rule are allowed to validate transactions (to be part of consensus algorithm).

Private - Permissionless DLT:
Private Ethereum –"privacy" is ensured by allowing members to join the network if they have VPN credentials and/or digital certificates. Any node can participate in consensus algorithm.

Private - Permissioned DLT:
Hyperledger Fabric, Corda - "privacy" is ensured by allowing members to join the network if they have access rights. The permission to validate transactions (in the consensus algorithm) is granted to certain predefined nodes.

More than just a protocol



* examples

A DLT can only succeed if not only the technology is considered alone, but is created in interaction with an active ecosystem and taking into account the acceptance in society, politics and consumers!

More than 640 unique entities with a known interest in IOTA

- 117 official partnerships/collaborators
- 171 entities engaged in joint projects with the IOTA Foundation
- 81 known IOTA Data Marketplace participants
- 92 entities that developed one or more IOTA-based proof-of-concepts
- 324 academic references from 196 academic institutions

http://iotaarchive.com/listing.html

IOTA
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Enabling Industrie 4.0 & Machine Economy

DLT enables „Next Generation of the IoT“

IOT: CONNECTED DEVICES

> Internet of Things generates DATA

> DATA enables new products

ECONOMY OF THINGS

> CONNECTED devices become ECONOMIC devices

> Devices do seamless Business

> Towards AUTONOMOUS, LEGAL entities

DLT AND SMART CONTRACTS

> Foundation of crypto-currencies

> Decentralization and Trust

> Machine2Machine Value Exchange

DLT: „Distributed Ledger Technologies“

DLT-based business backbone as alternative to proprietary platforms

BOSCH

IOTA

IOTA

IOTA, DELL TECHNOLOGIES, & LINUX FOUNDATION

Project Alvarium

DELL Technologies

THE LINUX FOUNDATION

https://alvarium.org/

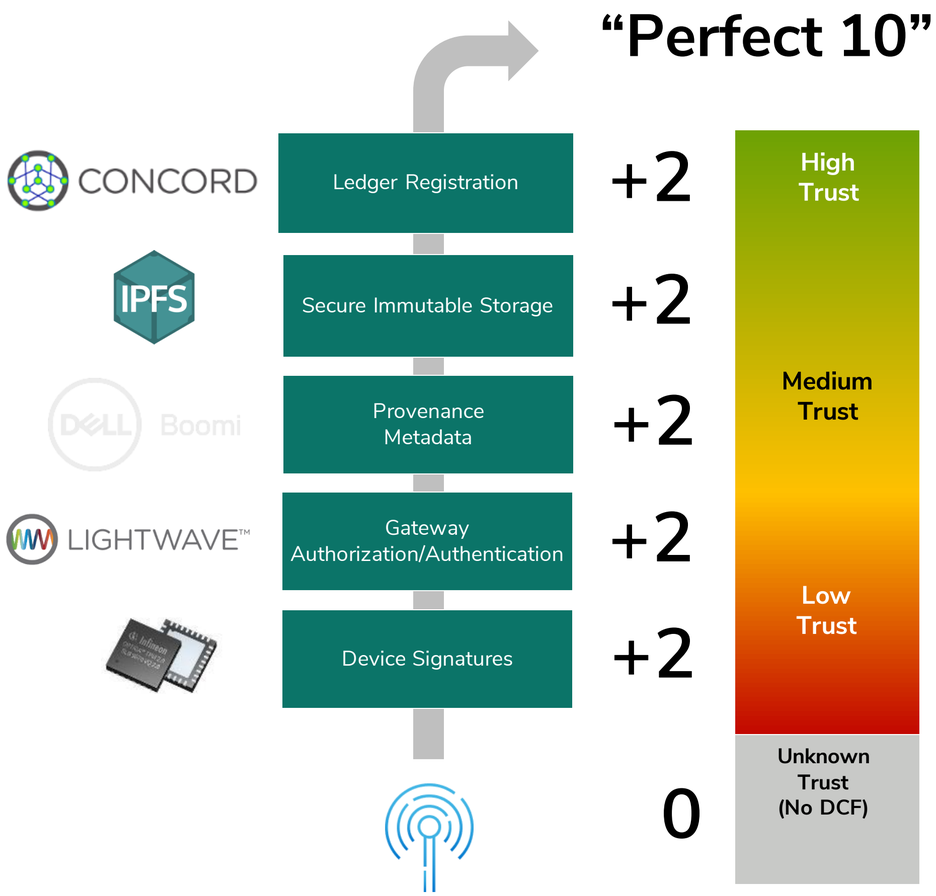
Project Alvarium

Project Mission

- Create framework and open APIs and bind together existing trust insertion technologies
- Develop confidence score algorithms

Data Confidence Fabrics

- Collection of trust insertion technologies delivering data to applications with measurable confidence
- **Scale trust across heterogeneous systems**



Project Alvarium

Example trust insertion technologies

1. HW root of trust signatures on device data	2. Gateway Authorization/Authentication	3. Open data ingestion software	4. Trusted Execution Environments	5. Metadata/ policy attachment (e.g. data capture environment, provenance, confidence score, policies for sharing/monetization)	6. Secure, immutable scale-out storage	7. Registration of trusted assets in a multi-cloud distributed ledger
TPM	VMware Lightwave	EdgeX Foundry	Intel SGX	Siemens Coaty.io	IPFS	Hyperledger
ARM PSA-RoT), TrustZone	Keycloak	Fledge	Microsoft Open Enclave SDK	Tibco Flogo		IOTA
Linaro Trusted Substrate		Eclipse Kura	Red Hat Enarx	CNCF Open Policy Engine		
Intel/Arm SDO						

First Autonomous
and Decentralized

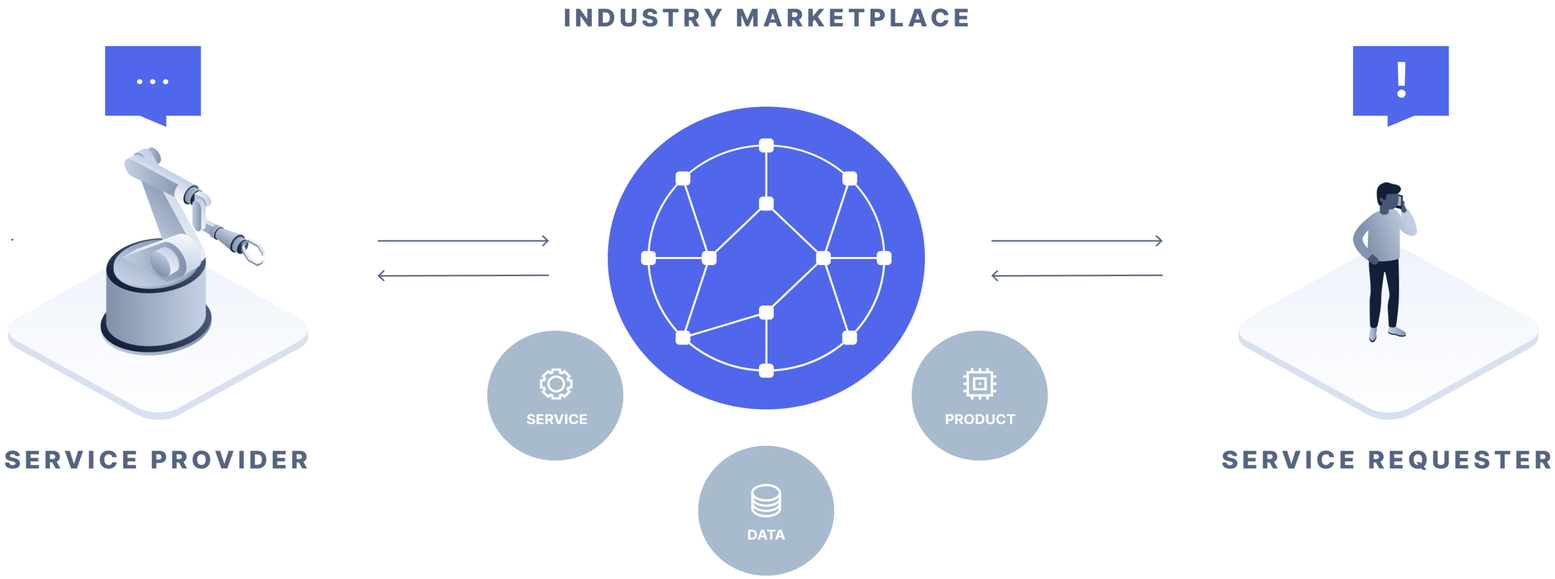
Industry Marketplace

Discover how the Industry Marketplace acts as an integrated hub to enable the Industry 4.0 vision.

https://industrymarketplace.net//
https://docs.iota.org/docs/blueprints/0.1/data-marketplace/overview

IOTA

IOTA Industry Marketplace



PROVIDER

The provider **sells** data, products and services for a fee.

The provider **offers** these on the electronic market place.

The provider **responds** to requests from users.

MARKETPLACE

Platform for **offering** and **searching** data and services.

Free of charge or **with costs.**

Open to everyone.

REQUESTER

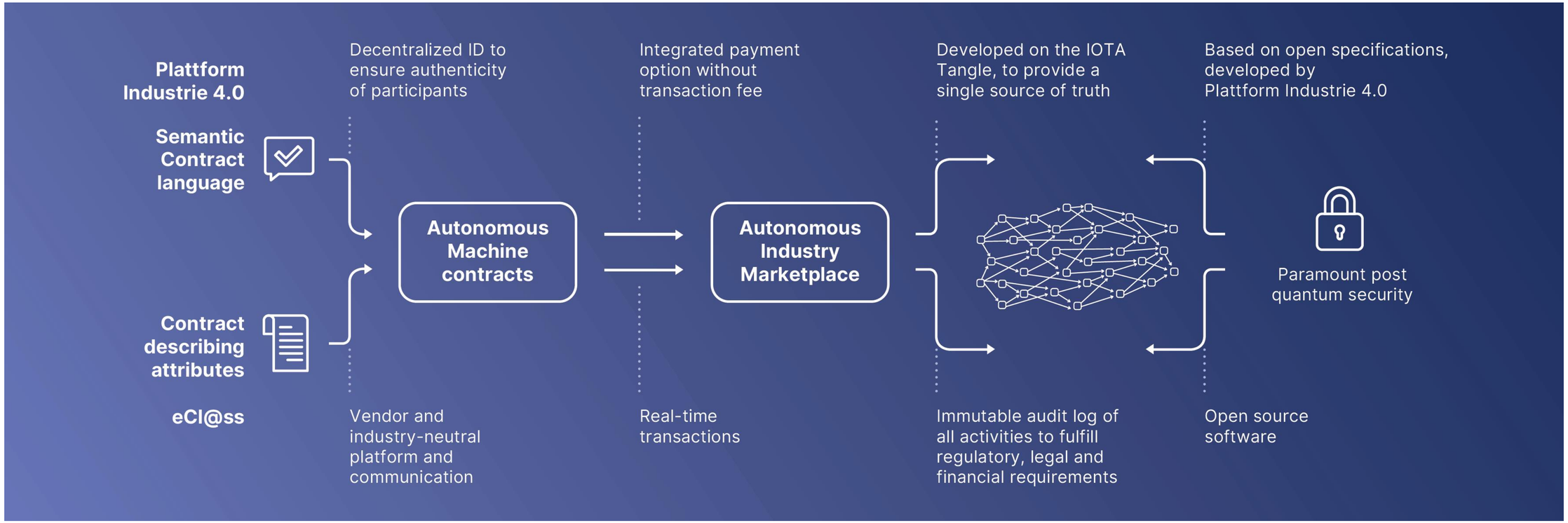
The user **searches** the electronic marketplace for data products and services.

The user creates a **request** that can be viewed by anyone else.

The **request** contains individual search parameters.

IOTA Industry Marketplace

- Specifications by ***„Plattform Industrie 4.0“*** (official central german network to develop and promote industry 4.0)
- ISO/IEC compliant data standard (eCl@ss)
- Standardized asset representation (AAS)



IOTA Industry Marketplace

Key Components

Industry 4.0 components must be able to talk to each other, offer services and, if necessary, negotiate tasks and offer payment.

Through the Industry Marketplace components, Industry 4.0 machine components act as independent service provider and consumer, who pay or are paid for the provided services supported by a common infrastructure.

Asset Administration Shell (AAS)

An AAS is a standardized virtual representation of an asset, providing storage of asset information. Examples of assets are machines, equipment units, software etc. AAS and Asset form together an Industry 4.0 component communication interface.

eCl@ss

eCl@ss is the worldwide, ISO/IEC-compliant data standard for the classification and unambiguous description of products and services. eCl@ss descriptions provide clear data structure in a M2M environment. Machines can identify and understand themselves or a counterpart's capabilities.

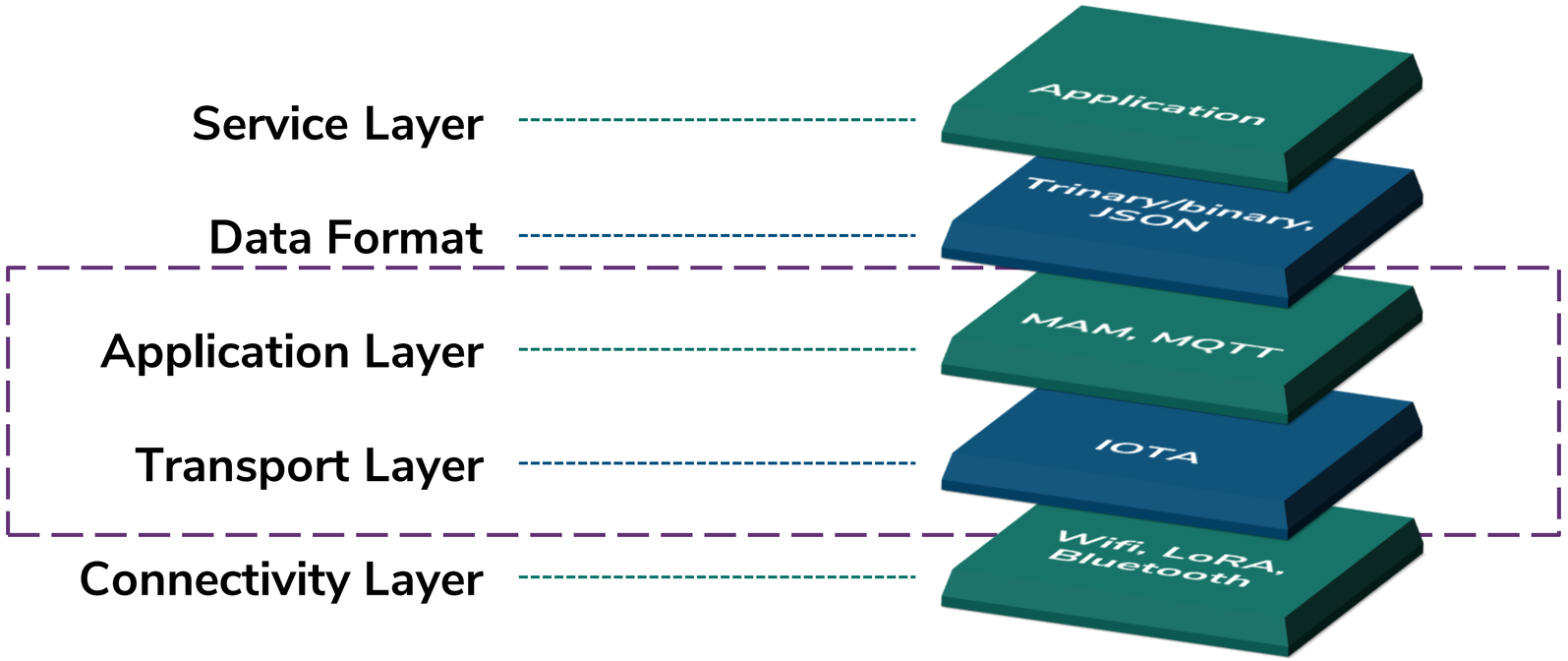
IOTA Tangle

The IOTA Tangle is a distributed ledger technology (DLT), recording data exchange in a secure and immutable log. A tamper-proof, single source of truth. Payments can be done globally and instantly after purchased goods have been received, a contract has been negotiated, or a bid is won.

https://docs.iota.org/docs/client-libraries/0.1/mam/introduction/overview

Masked Authenticated Messaging (MAM)

Second layer protocol enabling private and secure data transfer



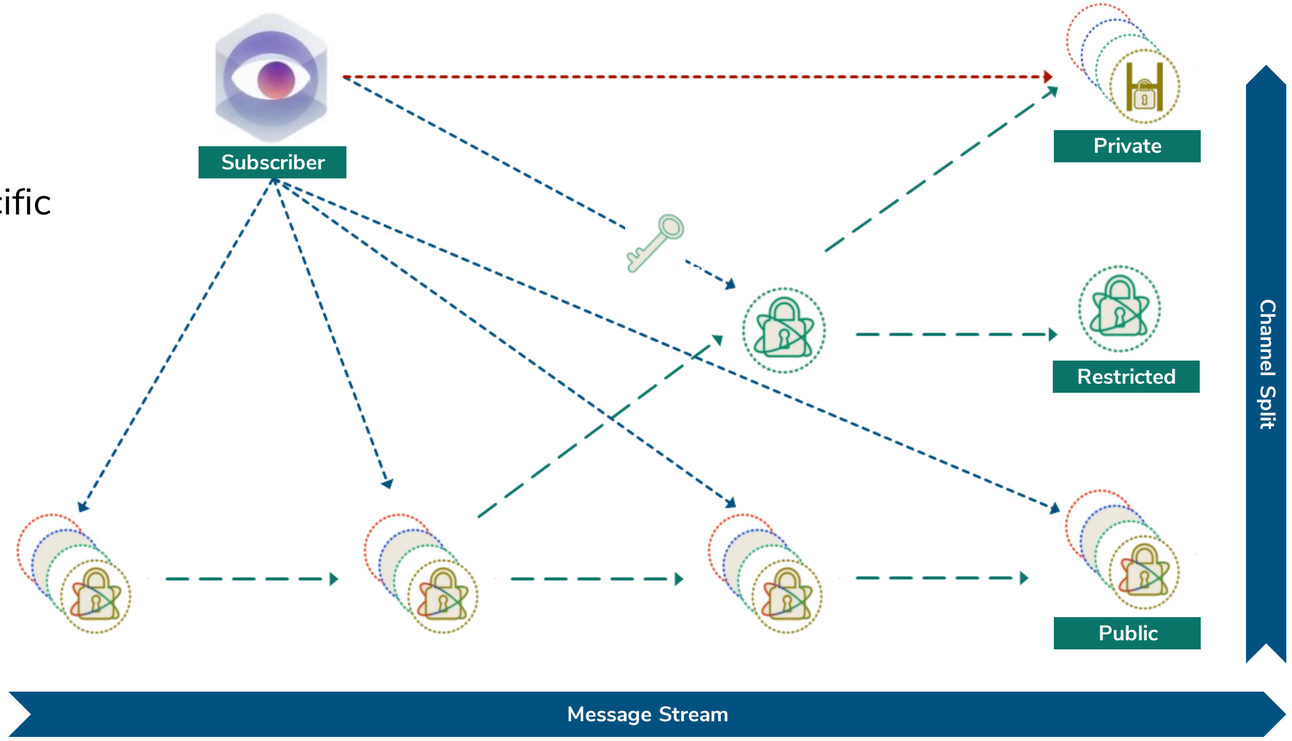
Masked Authenticated Messaging (MAM)

Post single data or message streams to a channel

- **Viewers can subscribe to** message stream **channels** where data can be (*continuously*) published
- **“Channel splitting” enables offshoot channels** for specific subsets of data accessible for permitted subscribers

Channel Modes

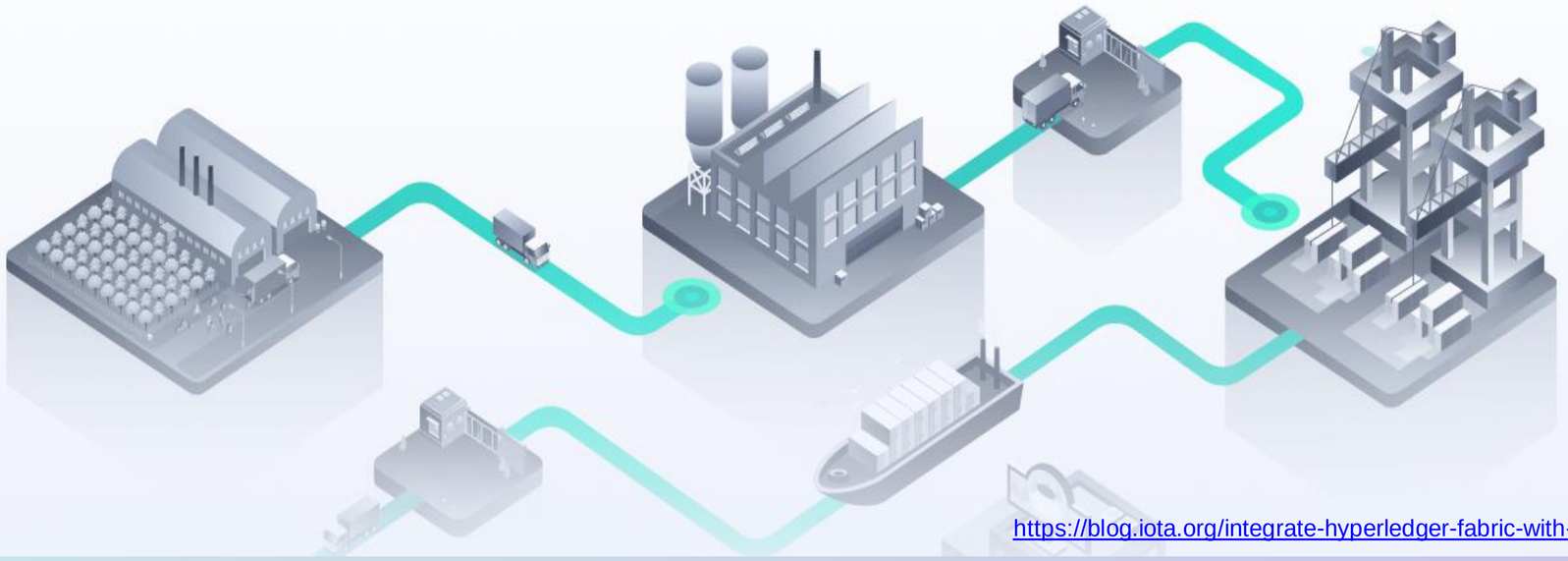
- **Public:** Everyone can view
- **Restricted:** Specify viewers by telling them a key
- **Private:** Only owner can view



IOTA

INTEGRATE

Hyperledger Fabric with the IOTA Tangle

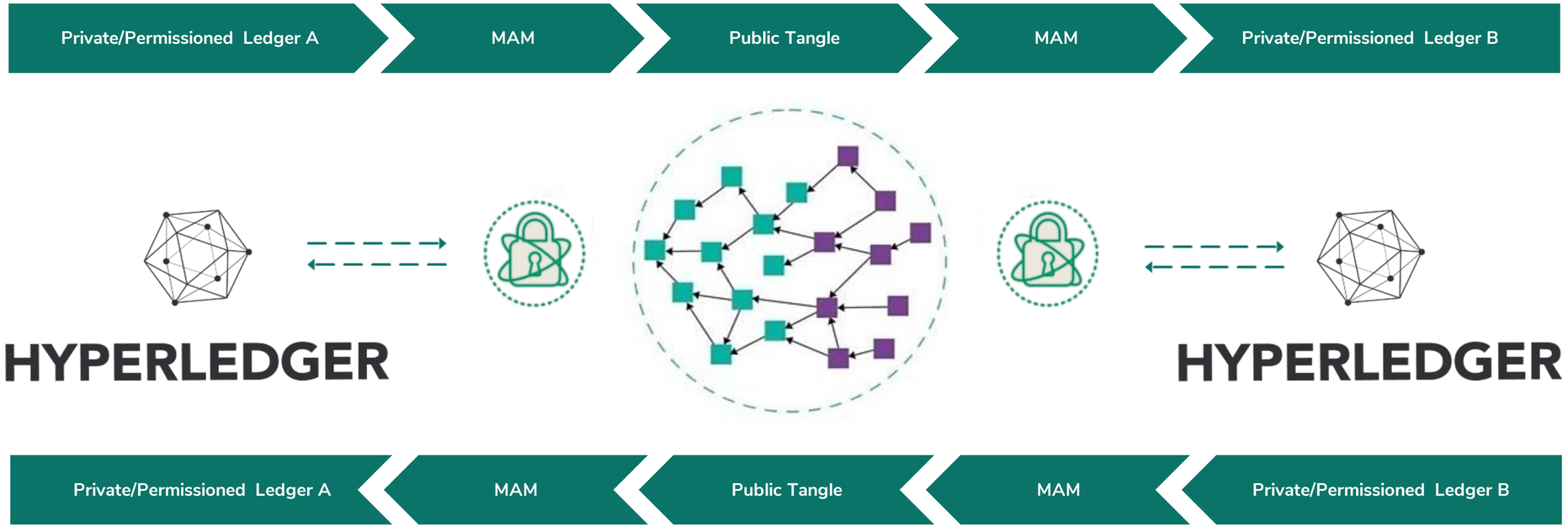


https://blog.iota.org/integrate-hyperledger-fabric-with-the-iota-tangle-9bc3ac873e82

Hyperledger connector

Connect Hyperledger Fabric with IOTA Tangle

- Seamless exchange of data via MAM (masked authenticated messaging) streams
- Secure and immutable data hub between siloed private/permissioned systems



Project Overview

Project Alvarium

Description

Framework for data confidence fabrics delivering data to applications with measurable confidence.

Development

Dell,
Linux Foundation,
IOTA Foundation,

Status

Prototype released

MAM
(Masked Authenticated Messaging)

Description

Emit and access a forward-secret and encrypted data stream over the Tangle.

Development

IOTA Foundation

Status

V1.0 released
V1.1. in development
(new libraries & features)

Industry Marketplace

Description

Decentralized, public and permissionless hub enabling open markets for industry 4.0.

Development

IOTA Foundation, eCl@ss,
Plattform Industrie 4.0, Otto von Guericke University Magdeburg, Helmut Schmidt University Hamburg, Neoception

Status

Prototype available on public testnet

Hyperledger Connector

Description

Hyperledger Fabric bridge to securely connect private Hyperledger networks with IOTA Tangle.

Development

IOTA Foundation,
Linux Foundation

Status

Released

Next generation Industry 4.0

Project Alvarium

+

MAM
(Masked Authenticated Messaging)

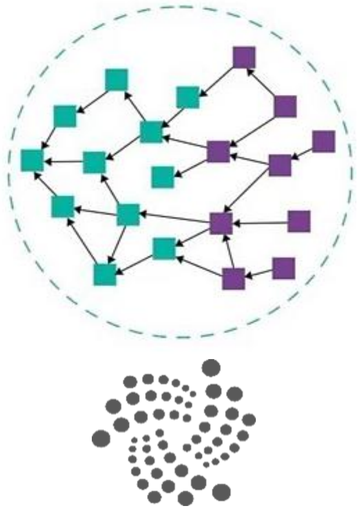
+

Industry Marketplace

+

Hyperledger Connector

+



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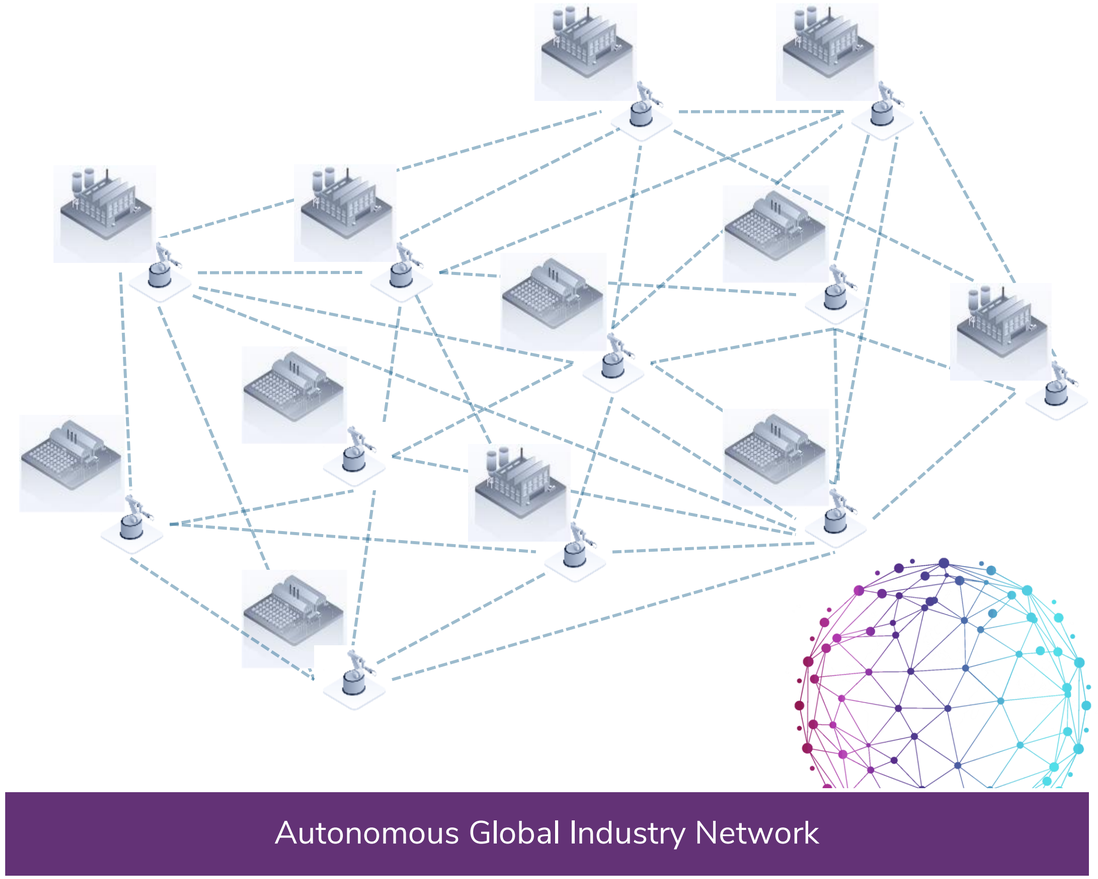
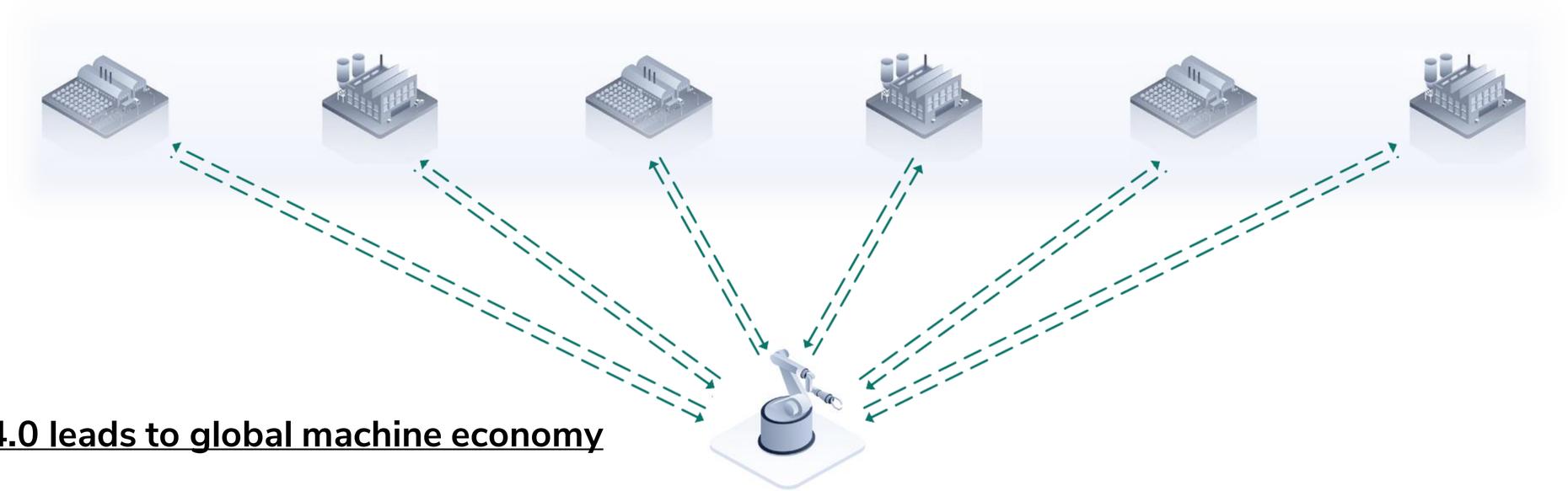


Autonomous Global Industry Network

Machine economy



Industry 4.0 leads to global machine economy

- Machines are providers and consumers of services and goods/products
- Lifecycle of goods and **services as well as payments** will be executed, recorded and traced on the distributed ledger (*here Tangle*)
- **Machines are autonomous market participants** and e.g. choose their suppliers depending on current market prices, availability, quality, time for delivery etc.

If machines have an own economy …

… what is the impact on banking industry?

<u>Note:</u> The IOTA Foundation is currently in contact with several large financial institutions (mainly in germany) to co-create interfaces to the „IOTA Tangle Network“ as well as develop business models and use cases for the financial industry.

Questions?