Introduction to

Data Economics,

The Data Economics Company,

and the Lydion DEOS

"What has become **The Data Economics Company** *began in 2018 as a collaborative research alliance called Lydion Research. This collective brought together economists, mathematicians, computer scientists, philosophers, and artists to explore how digital data could be used as building blocks for new types of economic interactions.*

In particular, we wanted to explore economic interactions where data that was generated and sourced by the economy's participants acted as the markers expressing, communicating, and transacting both utility and value within the interactions.

In other words, we were exploring economies that allowed participants to transact using products built out of digital data that they were able to generate by completing work in the real world."

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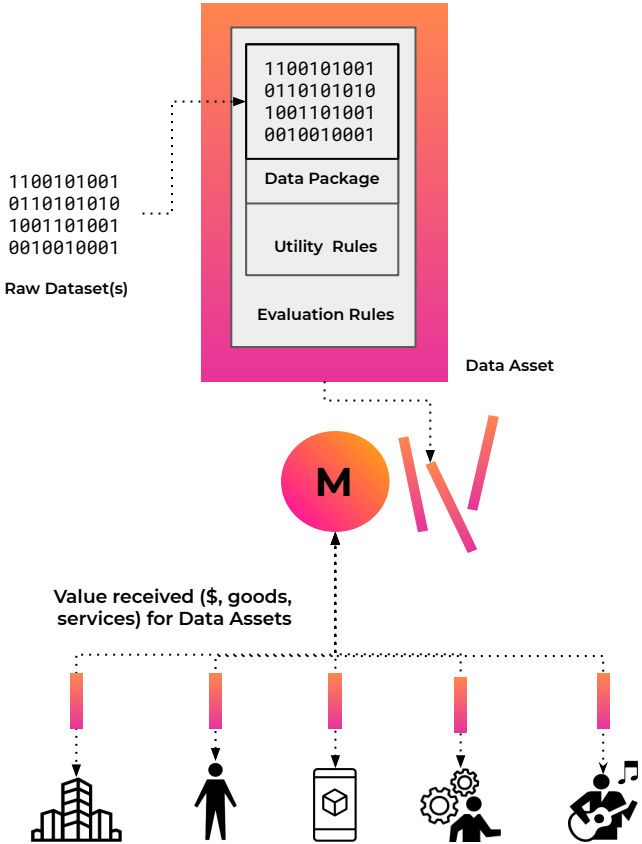
Data Economics is an emerging scientific discipline that explores the creation of *useful and valuable products* called *Data Assets* using digital data as raw material

Data Economics treats digital data as raw material that can build or manufacture products that can be used - or *utilized*.

These **products,** called ***Data Assets*,** can enable people and companies to:

1. **Pay for things** *using Data Assets*
2. **Measure the value of other things** *with Data Assets*

Data Economics creates frameworks to sell, license, and buy *ownership of the utility* of data structured as *Data Assets* without losing control or ownership of the underlying datasets



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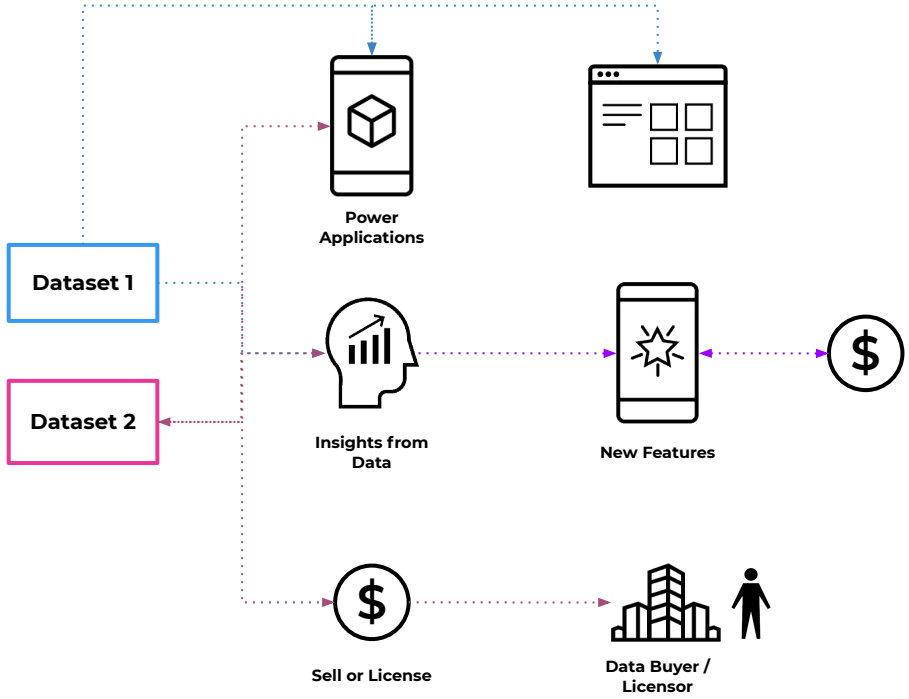
Digital data is traditionally utilized to power applications and analysis or traded as a commodity

The traditional utility of digital data since the late 1990s has been to:

1. Serve as data sources for digital applications delivering specific features of value to users, delivering revenue to the creators

2. Serve as a commodity that can, when analyzed, produce insights leading to potentially more revenue through optimized business and product strategies

3. By extension, serve as a commodity to be sold or licensed to others who may want to analyze and derive insights from the data



Data Economics, on the other hand, looks at digital data as raw materials for manufacturing, or minting, products that have *their own utility and value*

These products, created using digital data, are **Data Assets**

Datasets used to build “Data Asset” products

Three types of Data Assets with different utility, value and target markets “minted” from the same underlying datasets

Traditional methods of utilizing datasets and datastreams

by selling or licensing are analogous to parcels of land being sold or rented

Data Economic methods of utilizing datasets and datastreams are analogous to each parcel of land being used to extract resources they contain to build products that have their own uses, or utilities

Products Derived from Resources Extracted from Land

Products Derived from Datasets - *Data Assets*

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Data Economics Enables Three Primary Scenarios

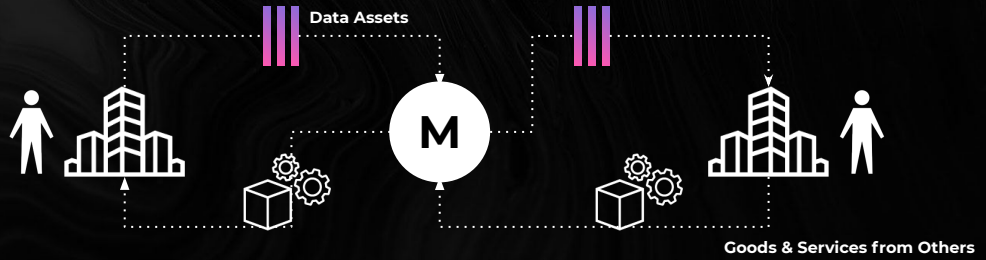
for the “Owner” of digital data and the “Manufacturer” of Data Asset products from such data

Scenario 1

Get paid money by Others (people and companies) for units of digital data packaged up as data-based utilizable products - *Data Assets*

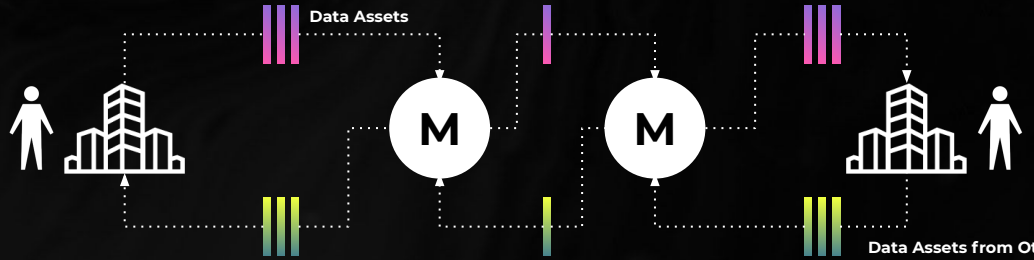
Scenario 2

Pay Others for Goods and Services they provide with units of digital data packaged up as *Data Assets*



Scenario 3

Pay Others for their Data Assets using units of digital data packaged up as *Data Assets*



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Over the three years spanning 2018 - 2020, the Lydion Research Alliance has developed:

Fundamental Data Economic Theory

Rigorous analysis and explanation of fundamental concepts using established economic and computer science principles

Development of foundational mathematical framework, ripe for further research, formalization, and publication

Applications identified in varied use cases across sectors and presentations at industry and academic conferences

Lydion Data Economic Operating System (DEOS)

Technology suite to implement fundamental Data Economic concepts and apply them to real-world challenges and opportunities

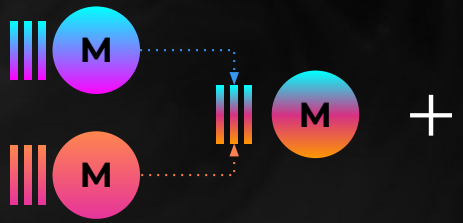
Development of the “Lydion Solutions Toolkit” composed of Lydion DEOS and related platforms and services to enable implement Data Economics Solutions

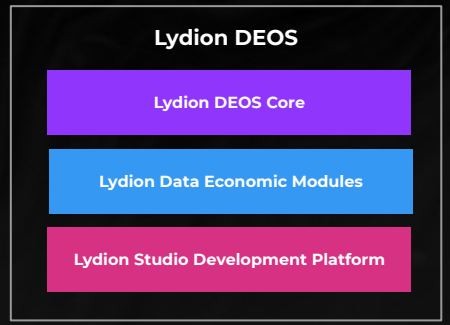
Lydion Data Economic Solutions

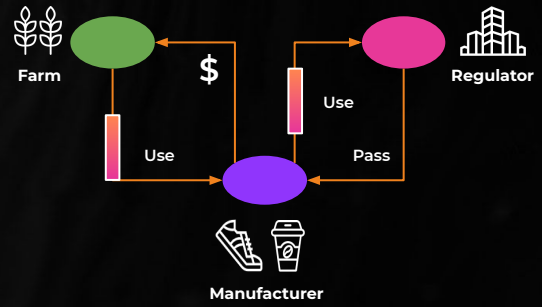
Software platforms to address high-impact opportunities and challenges in several sectors built using Data Economic Theory and Lydion DEOS

Each “Solution” being developed for and alongside one or more major industry/academic partners, targeting large existing and potential markets

Development and implementations with partners / customers covering 5+ years (2021 - 2026 and beyond)







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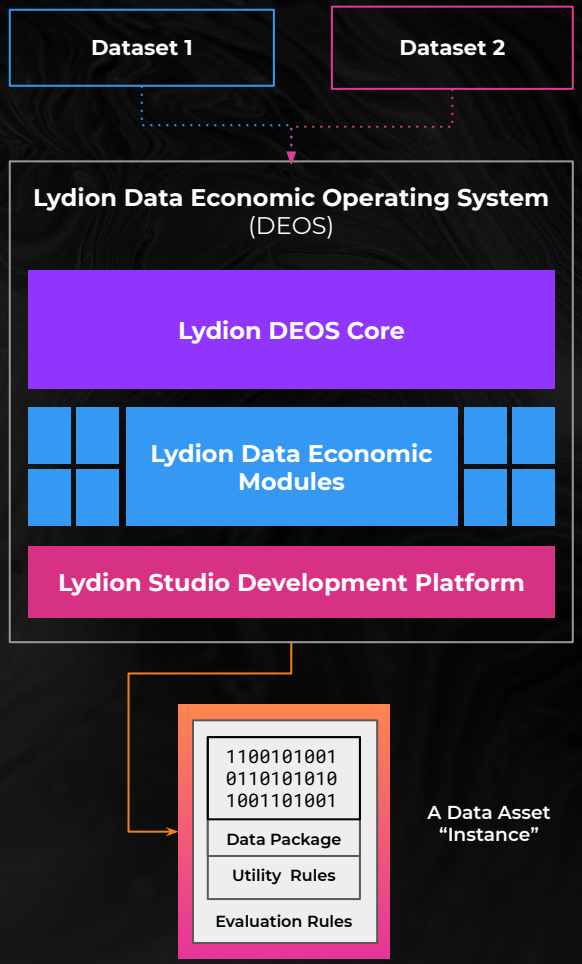

The Lydion DEOS (Data Economic Operating System)

1) **Manufactures Data Asset products from any combination of datasets and data streams** generated and owned by Participants - people and organizations - in the economy,

and

2) **Enables Participants to utilize these Data Asset products** to a) pay for things, b) get paid, and c) access other Data Assets of interest and value

The process of turning a digital data package (or quantum) into a utilizable Data Asset is called **"Assetization"**

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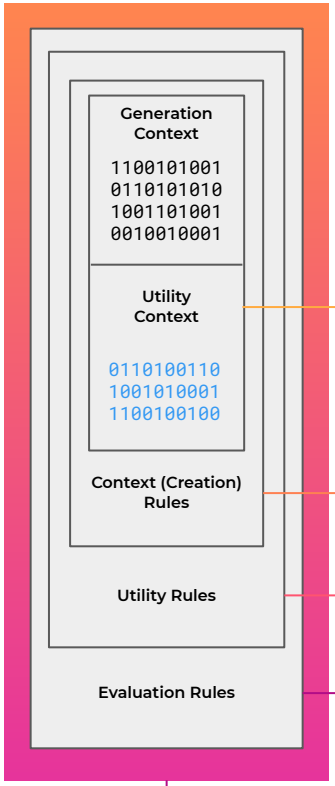
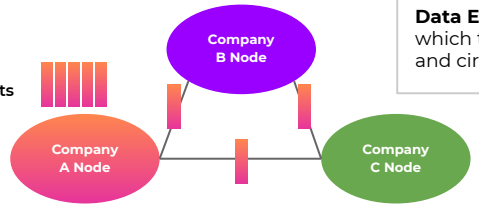
Assetizing a data package by turning it into a Lydion Data Asset enables a set of standard features leading to powerful functionality



1. **Define rules for generating the Data Asset and for interpreting its meaning (or "Context")**
2. **Define rules for exactly how the Data Asset can be used or utilized** - why, by whom, and under what conditions
3. **Define rules for measuring the "value" of the Data Asset**
4. **Define rules for credit received for each utilization of the Data Asset**
5. **Track, audit, and recall each access and utilization of the Data Asset**
6. **Track, audit, and enforce rules independently**, without relying on a central authority
7. **Original datasets or streams not modified nor leave their location of generation or storage**



Data Economic Network within which the Data Asset is generated and circulates

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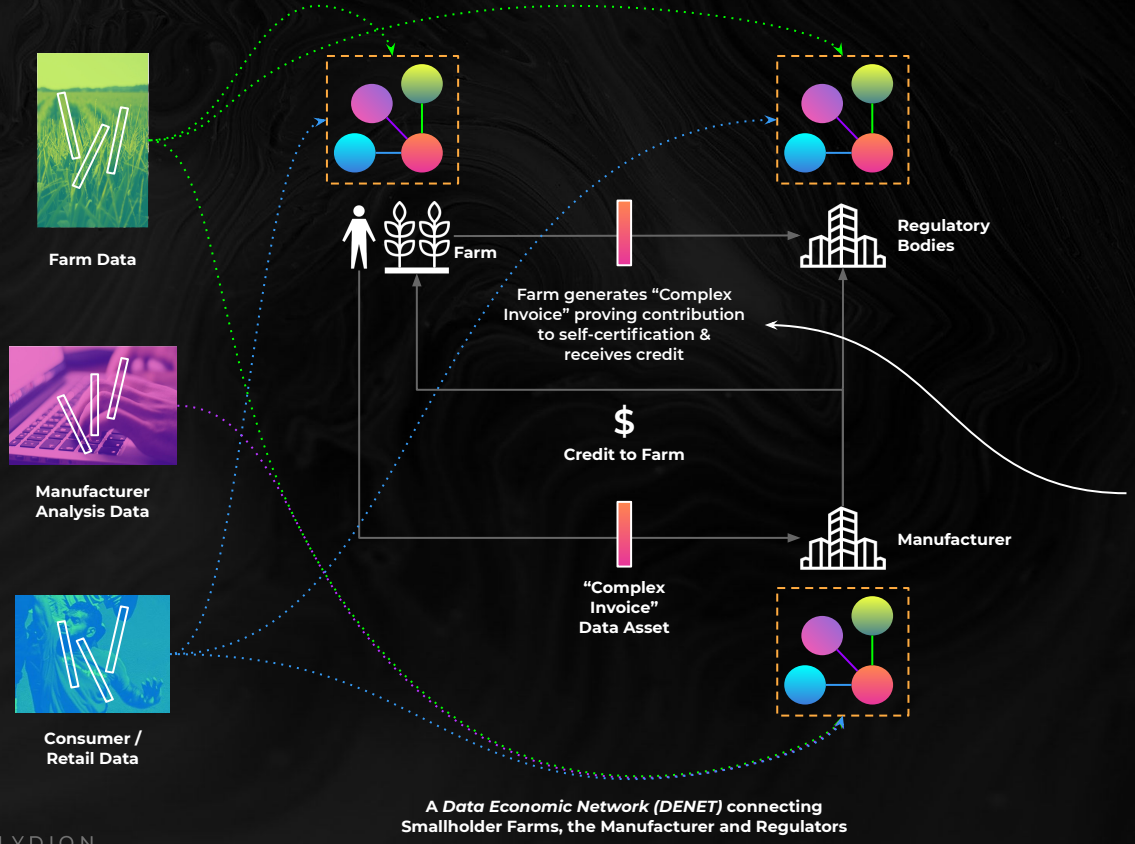
The Lydion DEOS enables the creation and utilization Data Assets within a *Data Economic Network (DENET)* - or ***Data Economy*** - comprising a) Participants and b) the Data Assets "minted" from a combination of datasets generated or owned by the Participants



One or more ***Data Economic Networks*** work together to form a ***Lydion Data Economic Solution***, designed to enable a set of functions valuable to its Participants through **transactions** featuring one or more types of Data Assets

Example of a Lydion Data Economic Solution enabling:

1. **Self-certification processes for crop-based manufacturers** and
2. **Credit for contribution of smallholder farmers** to self-certification and other economic and environment impact

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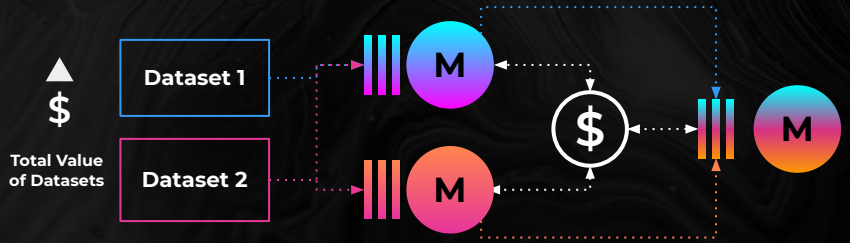
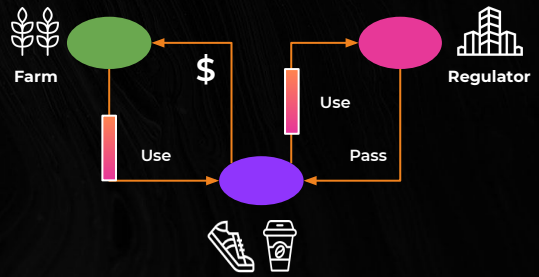
A *Lydion Data Economic Solution* enables companies and individuals to address complex problems related to using, sharing, tracking digital data through Data Assets transacted over *Data Economic Networks* (DENETs)

1. **Creating multiple products and associated revenue streams from the same digital data**, without losing control of the underlying datasets



2. **Tracking usage of each piece of digital data and transfer of credit** for each such utilization



3. **Value appreciation of :**

   I. **Underlying digital datasets** used to construct different Data Assets

   II. **Companies / individuals** who own such Data Assets

4. **Generating shared answers from multiple, disconnected datasets** (ie. "complex invoices") with proof

   Generating shared answers from disconnected datasets **whose source data can't be shared**

All of the above can be done by each DENET participant independently, without relying on a central authority

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As Organizations and Individuals assetize the datasets that they generate and control, each type of Data Asset produced:

a) Generates a potential revenue (or value) stream and

b) Enables value appreciation for the underlying datasets, as well as for the entity controlling the datasets

This enables the organization or individual to build a *"Portfolio" of Data Assets* with various utilities out of their digital data that can act as an additional source of value and wealth for them

Data about Music Listeners

Data about Music Creators

"Music Listener Insight" Data Assets

"Music Creator Insight" Data Assets

Other (Competitive) Streaming Apps

Music Companies

Musicians

Companies Catering to Musicians

Individuals can track and receive credit for the utilizations of their data, and build up a "Personal Data Asset Portfolio" as an additional form of wealth (such as credit card "miles")

Example of a Music Streaming Company creating a "Portfolio" of Data Asset types manufactured from the data generated by their core business activities and services

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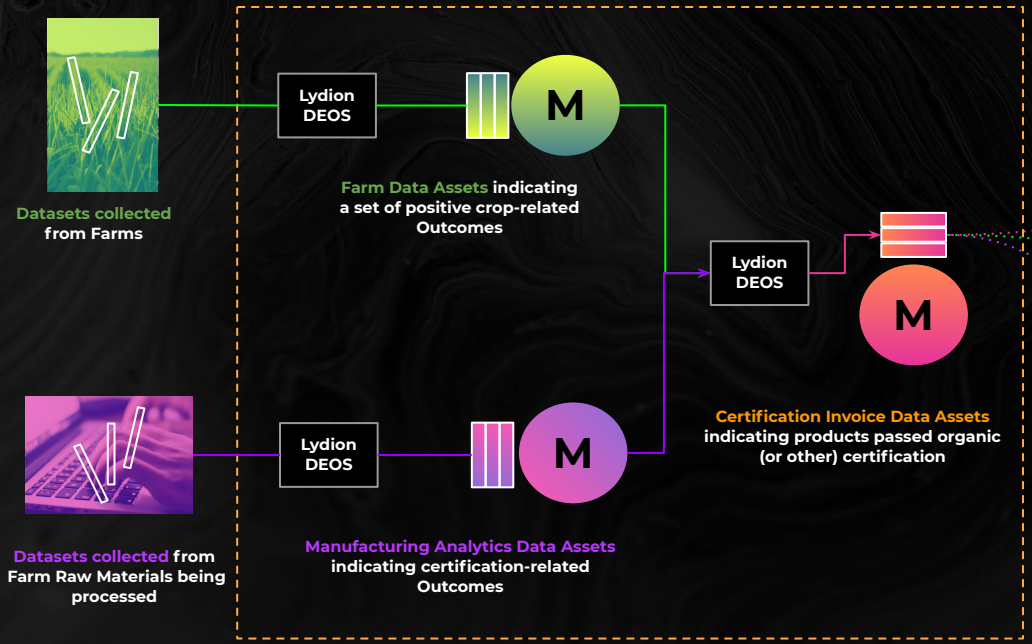
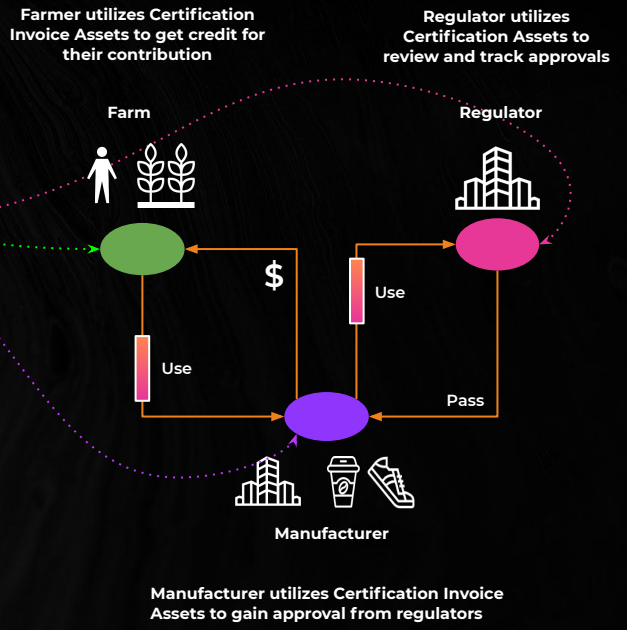
The Lydion DEOS enables Data Economic Solutions that need to generate and track shared answers from disconnected datasets, with proof, and without relying on a central authority

In many cases, the source datasets are private and cannot be shared with other Participants in the Data Economic Network





Example of a *Lydion Data Economic Solution* enabling a distributed (decentralized) self-certification process for crops and manufactured goods

A Lydion Data Economic Network (DENET) is the physical representation of the Data Economy and its Participants

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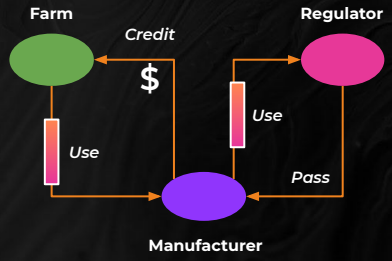
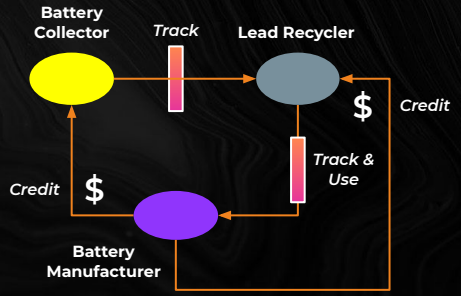
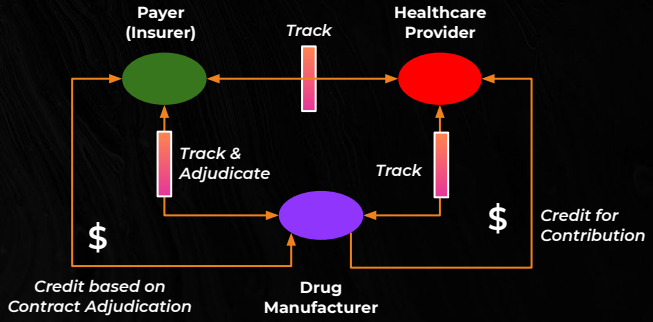
Lydion Data Economic Solutions currently in development are addressing several high-impact use cases involving shared answers from distributed, often private, datasets and tracking the utilization of data and flow of credit earned

Each Lydion Solution is being developed for and alongside one or more industry and academic partners targeting a total market of ~ **$300B** across current Lydion Solution products in development







Agricultural Self-Certification & Smallholder Farmer Solution Platforms

Crop traceability and transparency enabling self-certification for organic and regenerative farming practices and data-backed incentives and services for smallholder farmers

Industrial Material Traceability Solution Platform

End-to-end traceability and compliance for any primary industrial material's value chain, starting with lead and other metals

Health Outcomes and Contracting Solution Platform

Frameworks for translating clinical & non-clinical outcomes into value, including tools for efficiently building and adjudicating fully decentralized outcomes-based contracts for biopharmaceutical products

Examples of Lydion Data Economic Solution Platforms Currently in Development

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How does the Lydion DEOS Work? - Examined in 2 Parts:

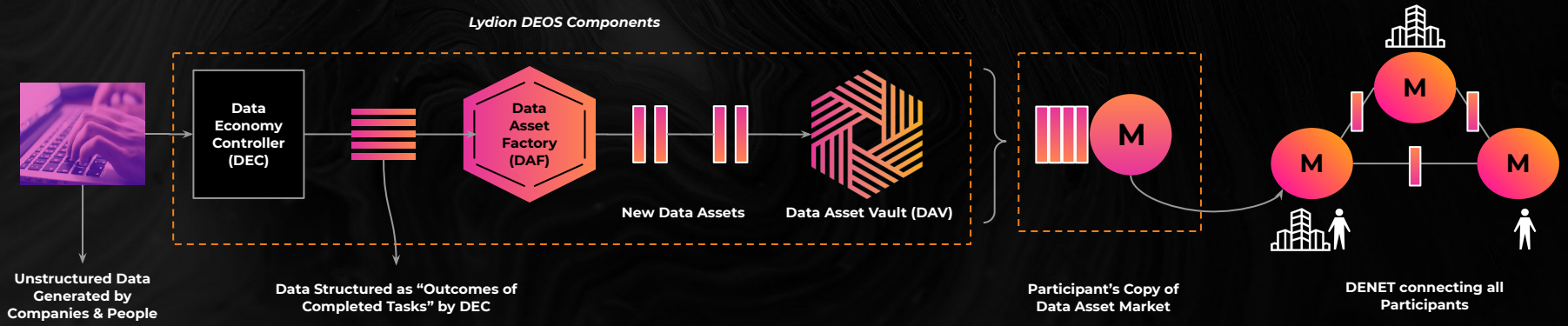
1. Lydion Data Assetization Methodology

How does the Lydion DEOS turn any combination of digital datasets and streams into useful and valuable products called **Data Assets**?

2. Lydion Solutions and DENETs

How does the Lydion DEOS create **Data Economic Networks (DENETs)** for Data Assets to be generated and utilized within?

How do these DENETs work together to implement **Lydion Data Economic Solutions**?



Lydion DEOS - Data Asset "Assembly Line"

Lydion DEOS enables the setup of an "assembly line" for each type of Data Asset using its standard components such as a **Data Economy Controller (DEC)** and **Data Asset Markets (DAMs)**

Lydion Data Asset Market (DAM) and DENET

Each Participant maintains a copy of the **Data Asset Market's Factory and Vault** that are synced over a **Data Economic Network (DENET)**

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The Lydion Assetization Methodology is a general framework for turning *any combination of digital datasets* into one or more *Types* of Data Assets

Lydion DEOS framework packages digital datasets and data streams into **logical blocks called "data quanta"** that represent measurement of results - or "**Outcomes**" - created by work done in the real world and **can be valued and utilized as proxies** of such outcomes

1. Work Done / Tasks Completed in the Real World

2. Data Generated from Completed Tasks collected in Datasets or Data Streams

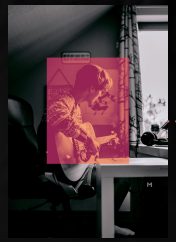
3. Lydion DEOS creates data packages (data quanta) that each represent a set of Completed Tasks and becomes a Data Asset

4. Each *Data Asset Type* can then be accessed and utilized through its *Data Asset Market*

Lydion DEOS

M

User Analytics Data Asset Type



Lydion DEOS

M

Music-related Data Asset Type

Lydion DEOS

M

Farm-related Data Asset Type

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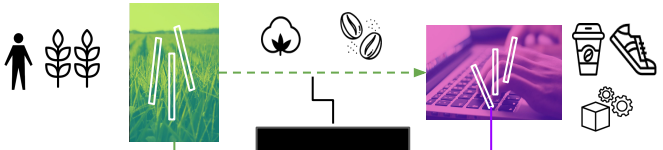
The existence of a Lydion Data Asset is the result and *proof of work* performed in the real-world: "Outcomes of Completed Tasks"

"Unstructured" Datasets and streams generated as a result of work done / tasks completed in the real-world



Lydion DEOS

DEOS "quantizes" datasets into logical blocks representing *Outcomes of Completed Tasks*

110010100101
101010101001
101001001001
00011001

Selected Outcomes

Completed Tasks

M

Completed Tasks are packaged together to generate the new Data Asset once "sufficient" Tasks are completed

Generation Context

Utility (Dynamic) Context

Context (Creation) Rules

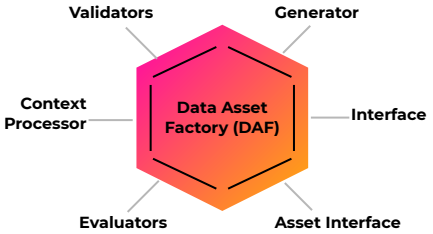
Utility Rules

Evaluation Rules

Generation (Static) Context
Original Data Quantum used to generate the Data Asset

Utility (Dynamic) Context
Completed Tasks representing transactions utilizing this Data Asset after its creation

The Data Asset Factory
Modular digital programs called **Machines** that together encode and enforce the Market **Rules**



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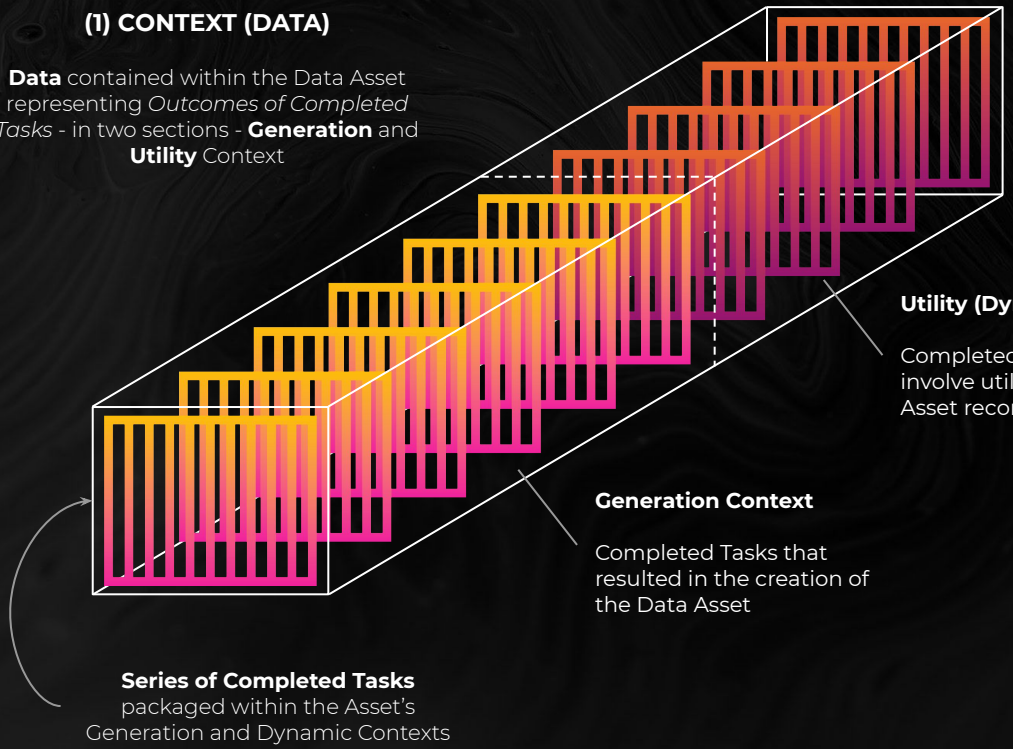
A Lydion Data Asset has two primary components - 1) ***Context*** and 2) ***Machines*** that be used to define and validate the rules for creating, valuing, and utilizing instances of that *type* of Data Asset

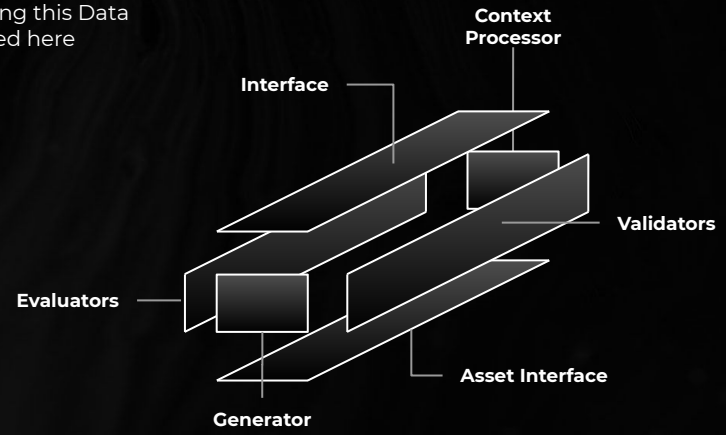
(1) CONTEXT (DATA)

Data contained within the Data Asset representing *Outcomes of Completed Tasks* - in two sections - **Generation** and **Utility** Context



(2) "MACHINE" PROGRAMS (RULES)

Rules governing the creation and usage of the Data Asset, embedded in it by the Data Asset Factory as modular programs



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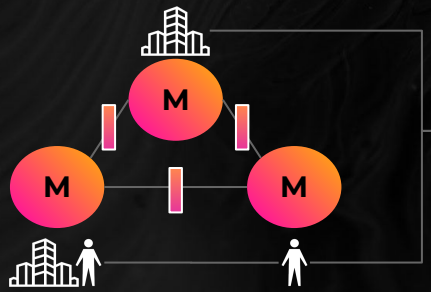
Each *Type* (Class) of Data Asset is managed by its corresponding *Data Asset Market* comprising 3 components

1. Market Participants

Set of entities - people, or companies - who are responsible for generating and utilizing Data Assets from that Market, as well as designing and enforcing the rules governing the Asset Type



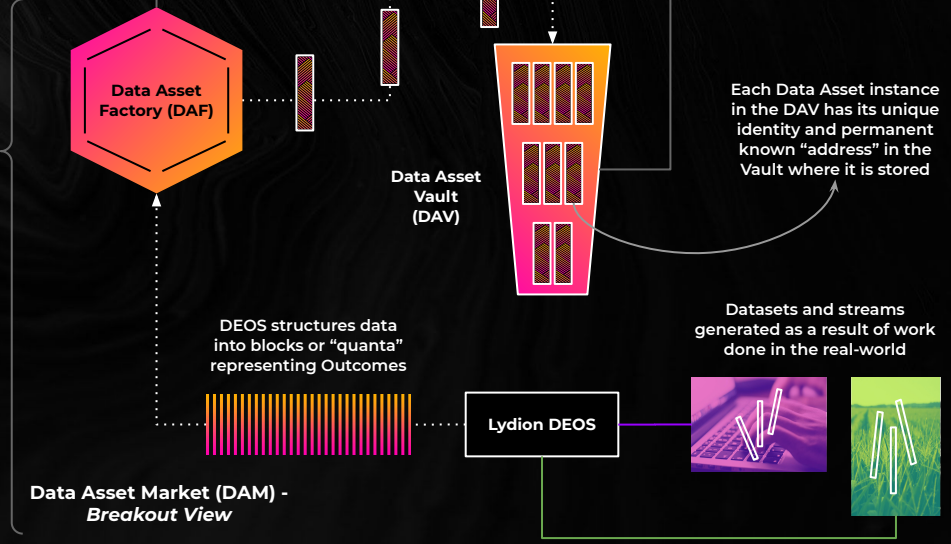
Data Economic Network (DENET) connecting DAM Participants

Each Participant maintains a verified copy of the Factory (DAF) and Vault (DAV), synchronized with each other by Lydion DEOS over a *Data Economic Network* (DENET)

2. Data Asset Factory (DAF)

A set of modular digital programs called **Machines** that encode and enforce the rules for generation, storage and utilization of all instances of a Type of Data Asset

Data Asset Market (DAM) - *Condensed View*



3. Data Asset Vault (DAV)

Where the Data Assets of the same Type created by the same DAM are stored (as digital data, typically in a database)

4. Data Sources

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Multiple *Data Asset Markets* work together and connect over a *Data Economic Network (DENET)* to enable the implementation of a *Lydion Data Economic Solution* for their Participants

Example: *Agricultural Self-Certification Solution Platform* for crop-based goods manufacturers that tracks and enables data-backed credit for farmers

Lydion DEOS

M

Data collected directly from farm

Farm Data Assets indicating a set of positive crop-related Outcomes

Certification Invoice Data Assets indicating the contribution of the farm to the Certification process

Lydion DEOS

M

Data from raw materials processed from crops ready for distribution or manufacturing

Certification Analytics Data Assets with each indicating certification-related Outcomes

Lydion DEOS

Farm

Regulator

$ *Credit for Contribution*

Lydion DEOS

M

Data collected from consumers and retail sources about manufactured products

Regulatory Analysis Data Assets indicating positive Outcomes related to the impact of the manufactured product

Proof of Contribution

Manufacturer

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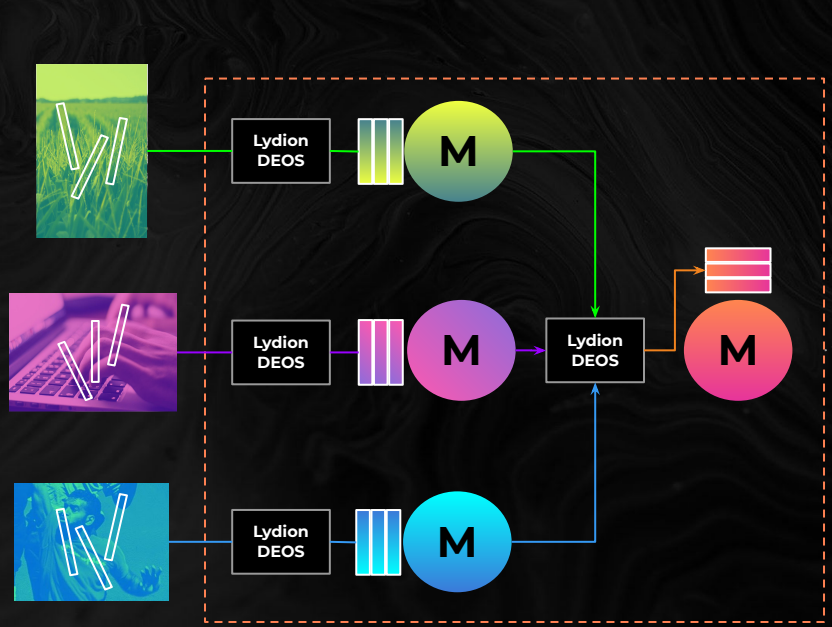
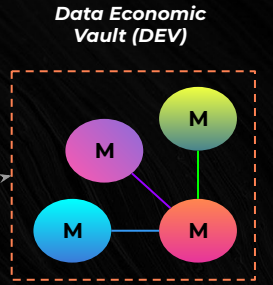
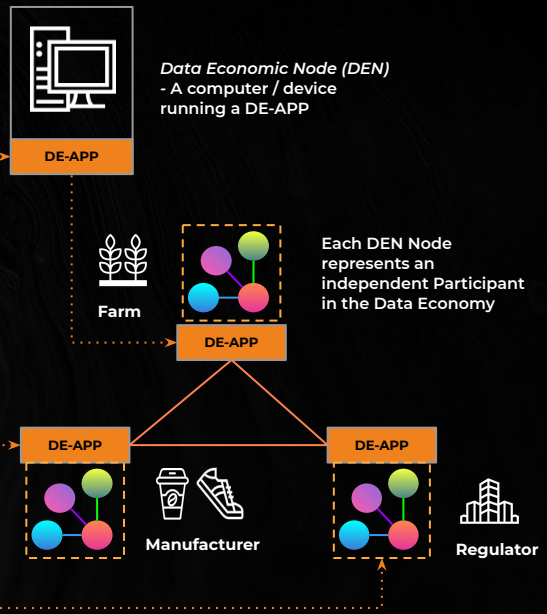
A *Lydion Data Economic Solution* is implemented as one or more *Data Economic Networks (DENET)* formed by *Nodes (DENs)* running copies of *Data Economic Applications (DE-APPs)* connecting with each other







*A Lydion **Data Economy*** is any number of *Data Asset Markets (DAMs)* working together to create a *Data Economic Solution*

A Data Economic App (DE-APP) implements the Data Asset Markets (DAMs) in the Solution using Lydion DEOS and maintains a copy of each DAM's Factory and Vault in its *Data Economic Vault (DEV)*

Data Economic Nodes (DENs) connect with each other through the DE-APP to form a *Data Economic Network* (DENET) connecting the Participants of the DAMs and their copies of the *Data Economic Vault (DEV)*

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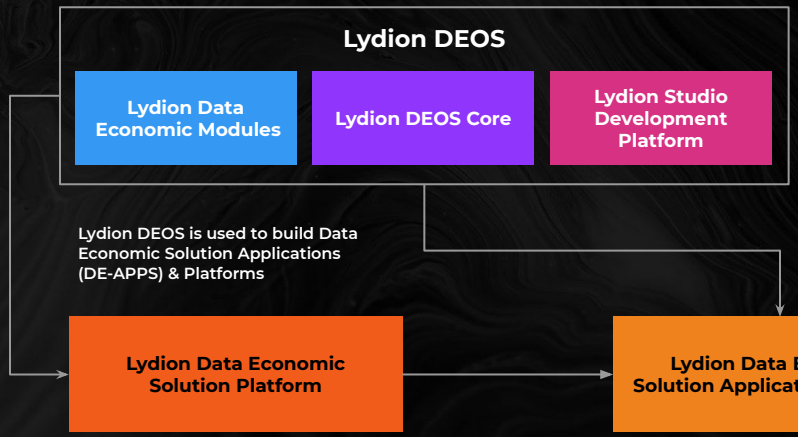
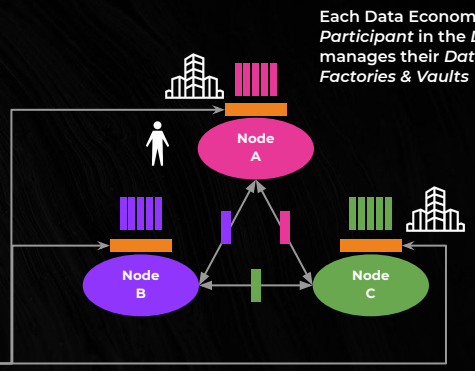
The Lydion DEOS creates *Lydion Data Economic Applications (DE-APPs)* and *Solution Platforms* that can be used to design and deploy specific *implementations of Data Economic Solutions* for a sets of Participants





DATA ECONOMIC SOLUTION IMPLEMENTATION -
Over a Data Economic Network (DENET)

1. Data Economic Solution Platforms

The Lydion DEOS can be used to build **Data Economic Solution Platforms**, which in turn can be used to build customized **Data Economic Applications**

2. Data Economic Applications (DE-APP)

Data Economic Applications (DE-APPs) can be built from Solution Platforms or using the Lydion DEOS directly

3. Data Economic Solution Implementation

(over DENET)

Data Economic Applications (DE-APPs) can be used to power one or more implementations of the Data Economic Solution, each implementation creating a **Data Economy** among its Participants and manifesting as a **Data Economic Network (DENET)** comprising **Data Economic Nodes (DENs)** connecting to each other through the DE-APP

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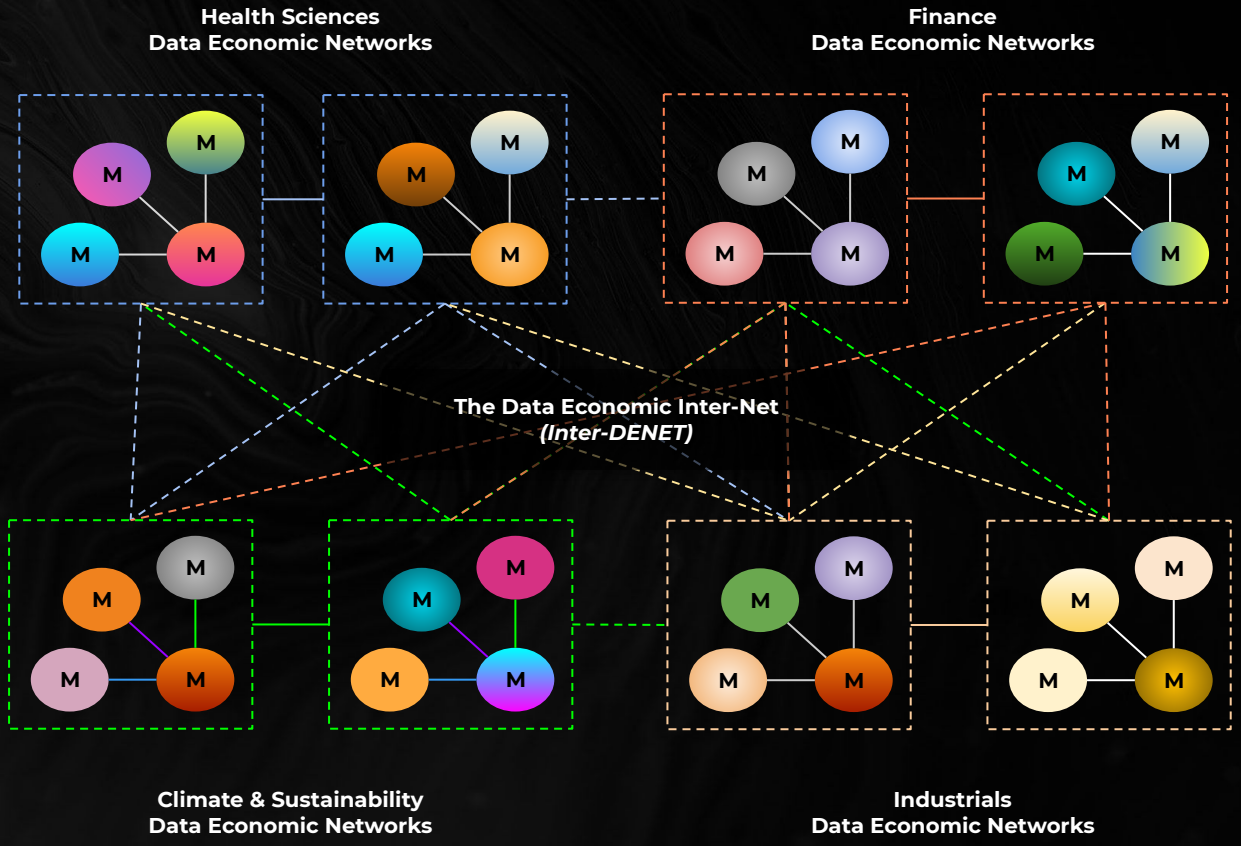
As Data Economic Networks start connecting with each other, Data Assets start getting recognized, valued and traded across previously disconnected sectors and markets - enabling brand new classes of economic transactions and the formation of the **Data Economic Inter-Net (Inter-DENET)**

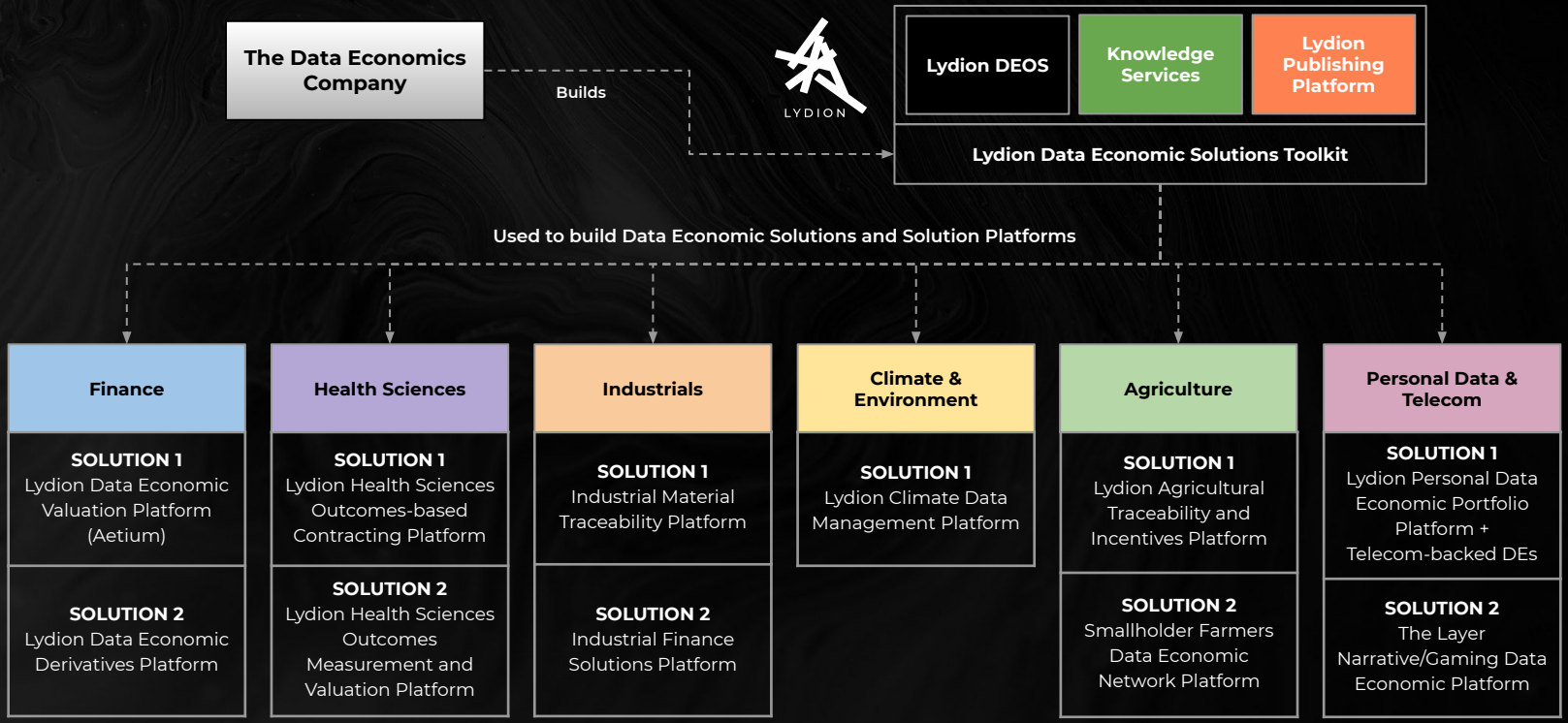
The Data Economic Inter-Net forms over the next decades as:

1. DENETs form within various industries
2. DENETs within industries start connecting with each other
3. DENETs across different industries start connecting with each other
4. “Mixed” and “Pure” Data Economic Networks emerge as DENETs also connect to traditional financial systems



CONTENTS

The Data Economics Company (DECO) was formed in 2020 by the members of the Lydion Research Alliance to lead the further development of the science of Data Economics, the Lydion DEOS technology, and the suite of Lydion Solutions and Platforms being developed for and alongside enterprise and academic partners



Mission of The Data Economics Company:

To pioneer and propagate the science of Data Economics and its applications

1. **Create meaningful impact enabled by the science of Data Economics** on individuals and communities through research, publications, technology, and real-world implementations

2. **Enable everyone — individuals and organizations — to engage in one or more Data Economies** through the propagation of Data Economic initiatives developed and driven by The Data Economics Company

3. **Empower everyone to build Data Economies** — enable streamlined development, testing, and optimization of Data Economic Applications and Networks using Lydion DEOS and Solutions Toolkit

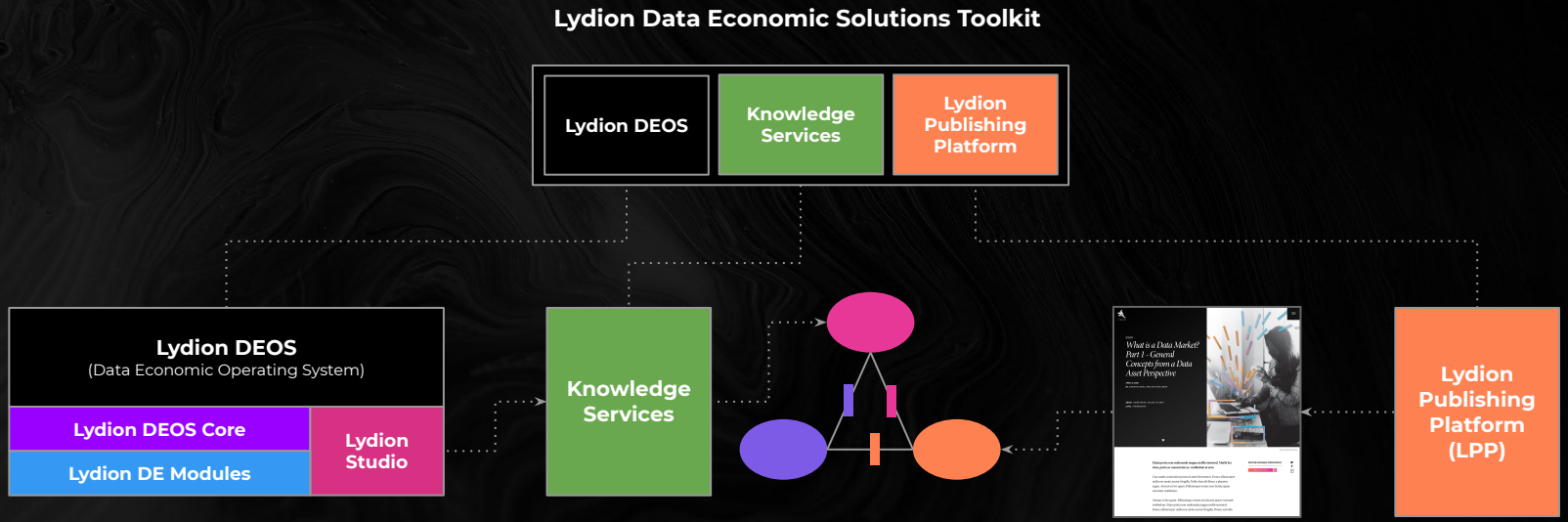
The Data Economics Company (DECO)

The DECO is organized into three teams

Each team has a few key areas of focus and is responsible for developing and managing products and services that together form **The Lydion Data Economic Solutions Toolkit**

LYDION

Along with Lydion DEOS, DECO provides a suite of complementary tools, knowledge, and services to support real-world Data Economic Solution implementations that together form the *Lydion Data Economic Solutions Toolkit*



1. Lydion DEOS

Software libraries, tools, and knowledge materials enabling the design and development of Data Economic Applications (DE-APPs) and Networks (DENETs) powering the Data Economic Solution Implementation

2. Data Economic Solution Design and Implementation Services

Knowledge and implementation services to assist partners and customers manage and deploy Data Economic Solutions through the four-stage process of Discovery, Design, Simulation, and Deployment

3. Lydion Publishing Platform (LPP)

Optimized for publishing and showcasing research and related rich media content, the LPP can be used for the development of standalone publications such as *The Lydion* and other partner or Solution-specific sites to support DE Solution implementations

LYDION

Lydion Publishing Platform (LPP)

Optimized for publishing and showcasing research and related rich media content, the LPP can be used for the development of standalone publication sites such as *The Lydion* and *Lydion Insider* as well as other partner or Solution-specific sites to support DE Solution implementations as part of the Lydion Solutions Toolkit

Lydion Insider

Invite-only portal hosted at insider.lydion.com for access to previews and details of research and products from the DECO

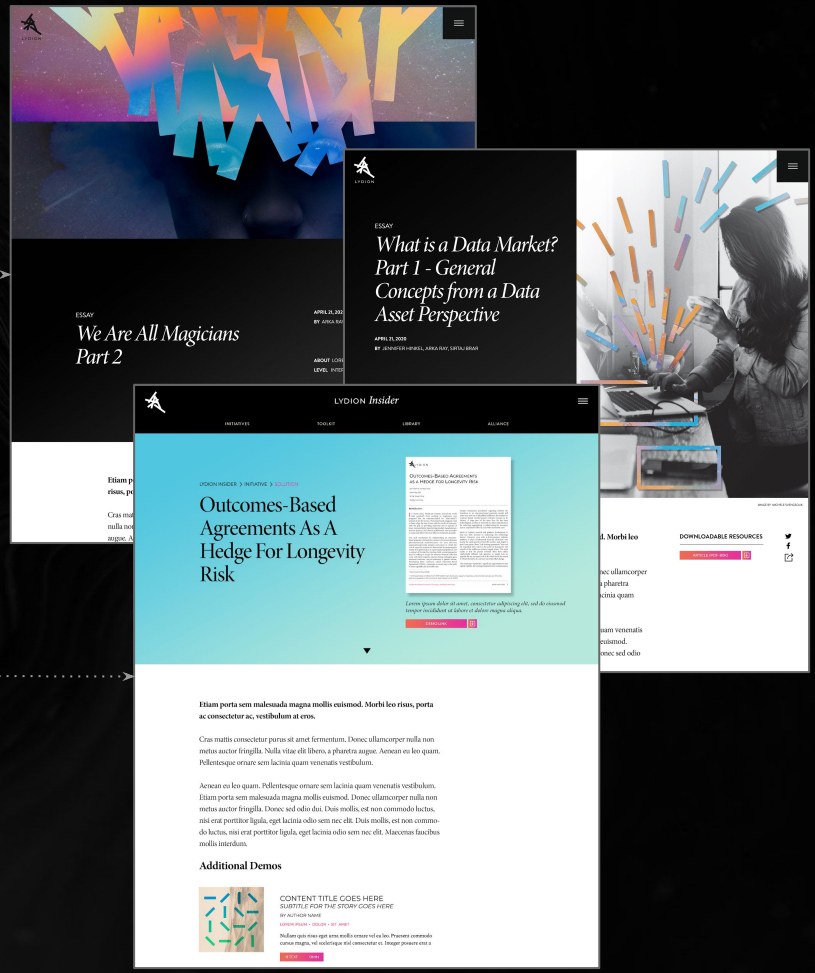
The Lydion (Lydion.com)

The primary outlet for publishing research and other relevant content from The Data Economics Co. and its partners

Partner or Solution Specific Portals

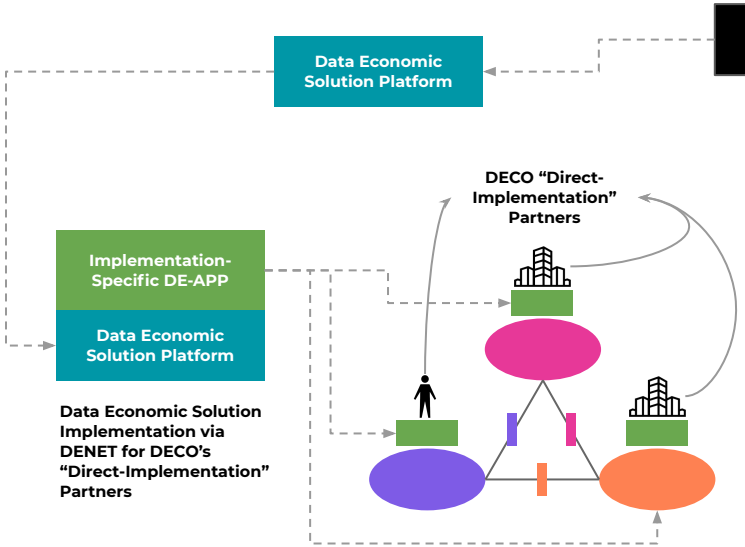
Custom publishing portals dedicated to specific Solution Platforms and / or Partners, built on the LPP

Lydion Publishing Platform (LPP)



LYDION

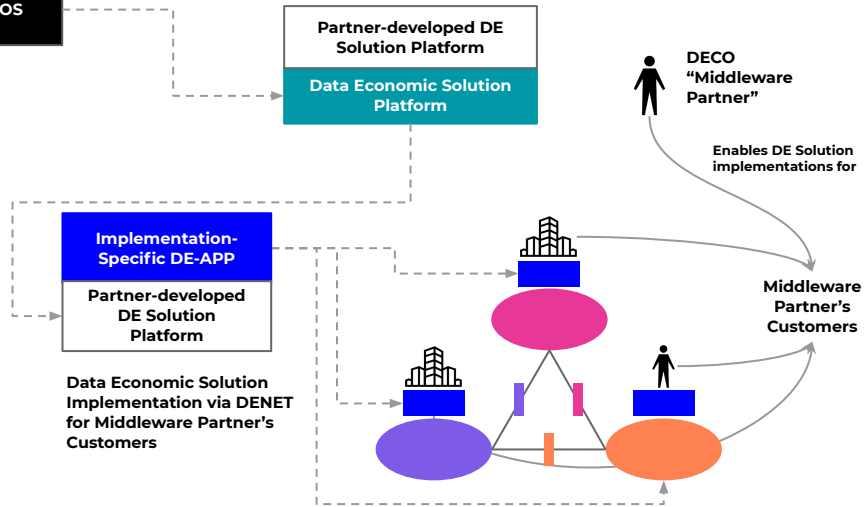
Data Economic Solution Development and Partnership Models enabled by the Lydion DEOS & Solutions Toolkit



1. Direct Implementation Partnerships

DECO works with a set of partners to enable custom implementations of Data Economic Solutions for them

A Direct Implementation typically involves the creation of a DE-APP using an existing Solution Platform built on Lydion DEOS that enables the deployment of one or more DENETs for the set of partners



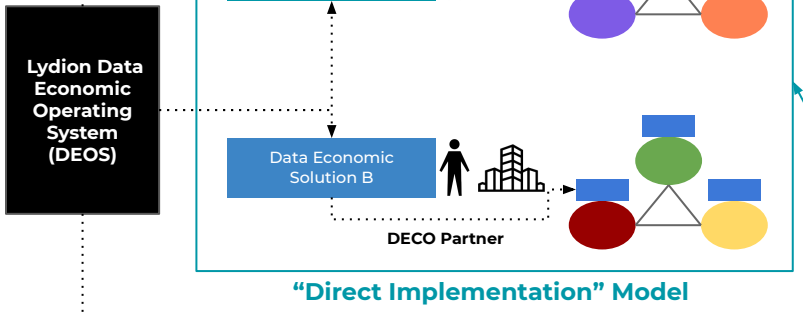
2. Middleware Implementation Partnerships

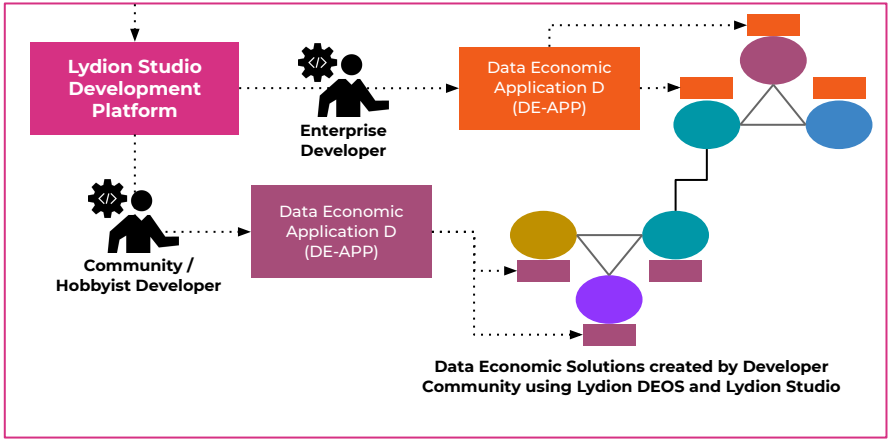
Middleware Implementations involve the development of Data Economic Solution Platforms for Partners who in turn use them to enable Data Economic Solutions and DENETs for their customers

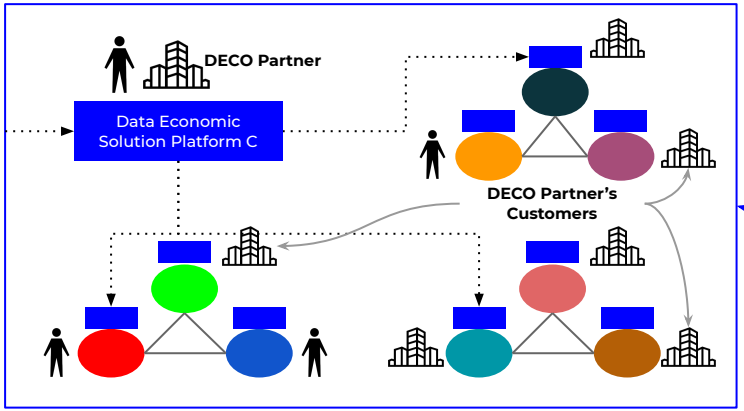
Lydion DEOS in this case is used as middleware in Solution products that are built for DECO's Partners and sold by them to their customers

LYDION

Comparison of the Lydion DEOS Propagation Models - 1) Direct Implementation, 2) Middleware, 3) Developer-Driven







1. Direct Implementation: Limited propagation rate;
Strong long-term engagement, revenue and relationship-building;
Strong experimentation and research opportunities

2. Middleware: Fast, scalable propagation rate;
Strong long-term engagement, revenue and relationship-building;
Strong experimentation and research opportunities

3. Developer-driven: Very fast, very scalable propagation rate;
Limited engagement and relationship-building opportunities;
Strong experimentation, commercialization and research opportunities

The Data Economics Company (DECO) is realizing the potential of Data Economics in 3 Phases

2018

Phase 1 (2018 - 2020)

1. Formation of the "Lydion Research Alliance" to develop Data Economic science and tech

2. Creation of fundamental Data Economic Theory and *Lydion DEOS v0.1*

3. Data Economic Solutions and their initial designs and implementations in multiple sectors

4. Initial DENET implementations ready for deployment within several high-impact sectors to kick off Phase 2

2021

Phase 2 (2021 - 2023)

1. Formation of The Data Economics Company (DECO) to consolidate assets and team

2. Launch and rollout of details around DECO, the Lydion DEOS technology stack and Data Economics Research

3. Rollouts of live implementations of Data Economic Solution implementations setup in Phase 1 in *Health Sciences, Finance, Industrials, Climate, Agriculture, Telecom, and Gaming*

4. DENETS forming and connecting within industries

5. Data Economic Solutions identified in Energy, Personal Data, Real Estate and others

2024

Phase 3 (2024 - 2026)

1. Data Economic research and evangelism in academia, industries, and press

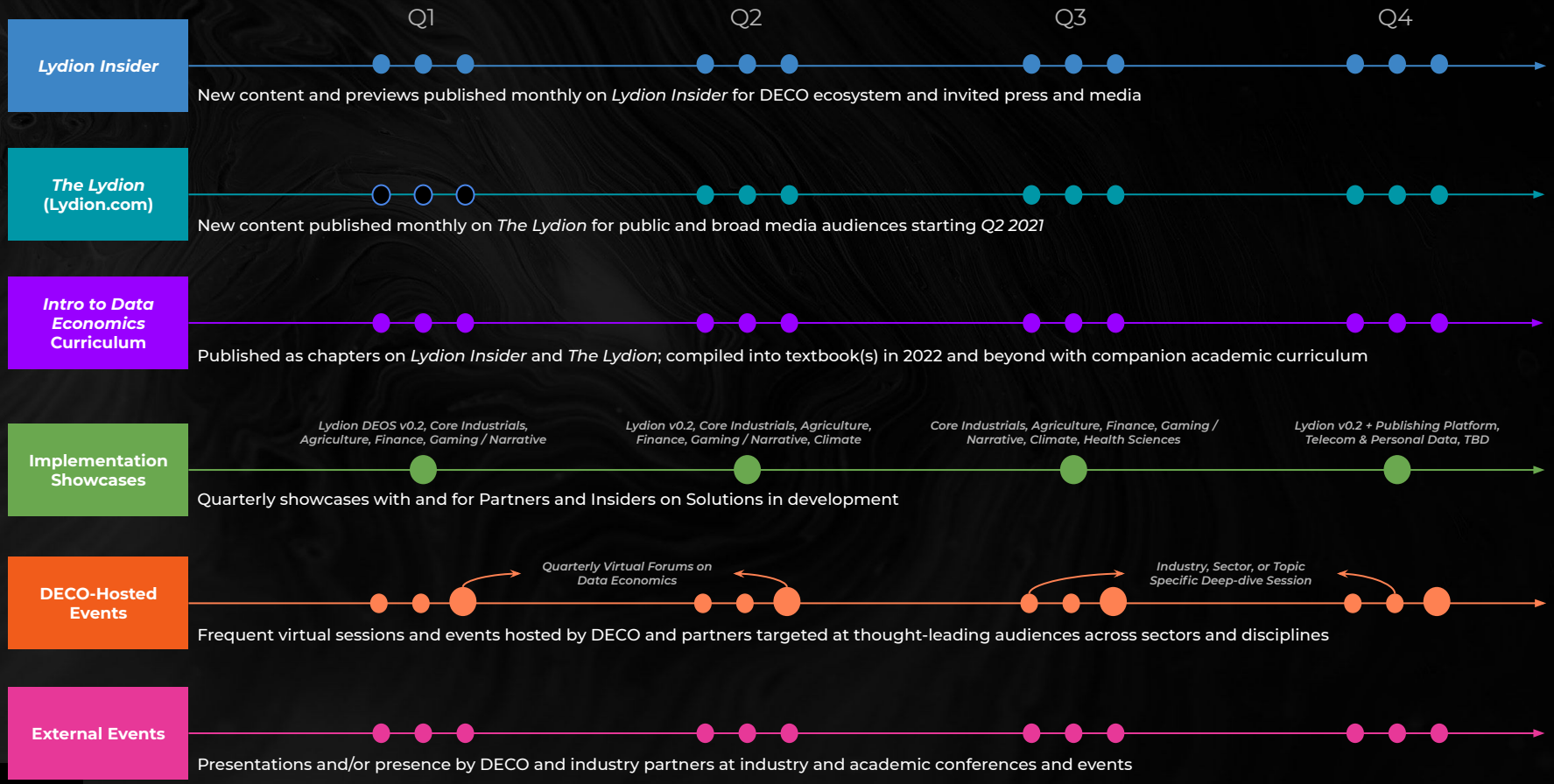
2. Public rollout of Lydion Studio enabling wide-scale DENET development

3. Inter-DENET emerges as DENETs from different industries and sectors connect

4. Investments by DECO and industry and government partners to build Data Economic infrastructure, especially in areas and geographies where traditional economics have left a gap

LYDION

Annual Research, Product, and Event Milestones for DECO - 2021 - 2024



We have only scratched the surface...

There is much more to explore within the science of Data Economics, the Lydion DEOS and the Lydion Data Economic Solutions being developed by the DECO

1. **Become a Lydion Insider, i**f you are not already one, by going to insider.lydion.com/join

   A wealth of materials related to DECO, Lydion DEOS and Data Economics research await at the *Insider* portal, with previews of upcoming research, solutions and other products published regularly as well as invites to DECO-Hosted Events

2. **Dive deep into the science of Data Economics and the Lydion DEOS** with the ***Introduction to Data Economics*** series, being published in parts over 2021 - 2022 to be compiled into an introductory Data Economics "textbook"

   You can find this series and much more on the Science page on Lydion Insider

3. **Learn about the Data Economic Solutions** that DECO is currently developing with partners and how these Solutions can impact your industry, business, or community

   The Solutions page on Lydion Insider is a great place to start learning about these

You are also welcome to reach us with your ideas, questions, or feedback at contact@lydion.com

Thank You,
The DECO Team

LYDION