

# RESEARCH UPDATE

SAE G-31 MEETING

OCT 25<sup>TH</sup> 2022, SEATTLE (WA)

## CONSORTIUM DRIVEN DATA EXCHANGES

Leading to consortium governed data market- and part data exchange solutions

**Leon Gommans, PhD**

Air France KLM Group, Science Officer

University of Amsterdam, prof. Data Exchange Systems

Co-founder IDCA

**Mark Roboff**

CEO Skythread

Co-founder IDCA



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Industry

Research

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## Data Exchange Research Update – Leon

- Scope: Platform Archetypes
- A Development Framework for Consortia
- Consortium building examples: SAE-ITC ExchangeWell and IDCA
- Data exchange infrastructure concept validation & demonstration: AMdEX fieldlab
  - What is the AMdEX Fieldlab?
  - Data Exchange Archetypes
  - Federated ML Data Marketplace use-case

## Consortium driven part data exchange – Mark Roboff

- Independent Data Consortium for Aviation (IDCA)
- Part Data Exchange solution: SkyThread

# SCOPE: COMMON INTEREST DRIVEN PLATFORM ARCHETYPES (WIP)

DIFFERENTIATED BY DIFFERENT WAYS TO DRIVE A PLATFORM

	Self interest		SCOPE Common interest	
Driver				
Trust	Trust established by a Single Party		Collaboration Organized Trust	
Driven by	Existing enterprise	Investors in new enterprise	Alliance / Consortium (with specific benefit)	Federation (with holistic benefit)
Platform Archetype	Internal platform offered externally	Centralized Platform	Collaborative Distributed Platform	Business Ecosystem
Strategic Goal	Be the best in your environment	Create shareholder value (typically at the expense of the existing environment at high investment cost)	Enlarge reach for supply parties and a more diverse product offering to demand parties	Support competition by enabling collaborative business models with the environment
Example	GE Predix	Uber, airbnb	SkyTeam	Dataspaces (GAIA-X)
			Current	Exploring for future

# A FRAMEWORK TO ORGANIZE & IMPLEMENT TRUST

## DRIVEN BY A CONSORTIUM

A consortium organizing trust needed to achieve a common benefit

Data Exchange Infrastructure



### COMMON BENEFIT

Define and agree common benefit no single organization can achieve on its own.



### GROUP RULES

Define consortium rules considering data use, access and benefit sharing



### ORGANIZE TRUST

Organize power and trust as a **means to reduce risk** for participating members



### IMPLEMENT INFRASTRUCTURE

Operationalize a **Data Exchange** infrastructure with solution supply members

# RESULT: SAE-ITC EXCHANGEWELL

## ORGANIZING TRUST VIA A CONSORTIUM BUILDING PROGRAM



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ExchangeWell is on the leading edge of research developing models to help data owners and algorithm developers collaborate to define and form private or public blockchain-based digital data marketplaces enabling members to design and operate in the model that fits their community developed vision.

There are many aspects required to establish a successful data sharing consortium and among the most important is to develop an appropriate governance model that includes these critical elements.

<p><b>COMMON BENEFIT</b></p> <p>Define and agree common benefit no single organization can achieve on its own</p>	<p><b>GROUP RULES</b></p> <p>Define consortium rules considering data use, access and benefit sharing</p>	<p><b>ORGANIZE TRUST</b></p> <p>Organize power and trust as a means to reduce risk for participating members</p>	<p><b>IMPLEMENT INFRASTRUCTURE</b></p> <p>Research operationalization of Digital Data Marketplace &amp; Data Exchange concepts</p>
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- Digital Data Marketplace**
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# RESULT: INDEPENDENT DATA CONSORTIUM FOR AVIATION

## ORGANIZING TRUST VIA A NEUTRAL INDUSTRY CONSORTIUM

### MISSION AND VISION



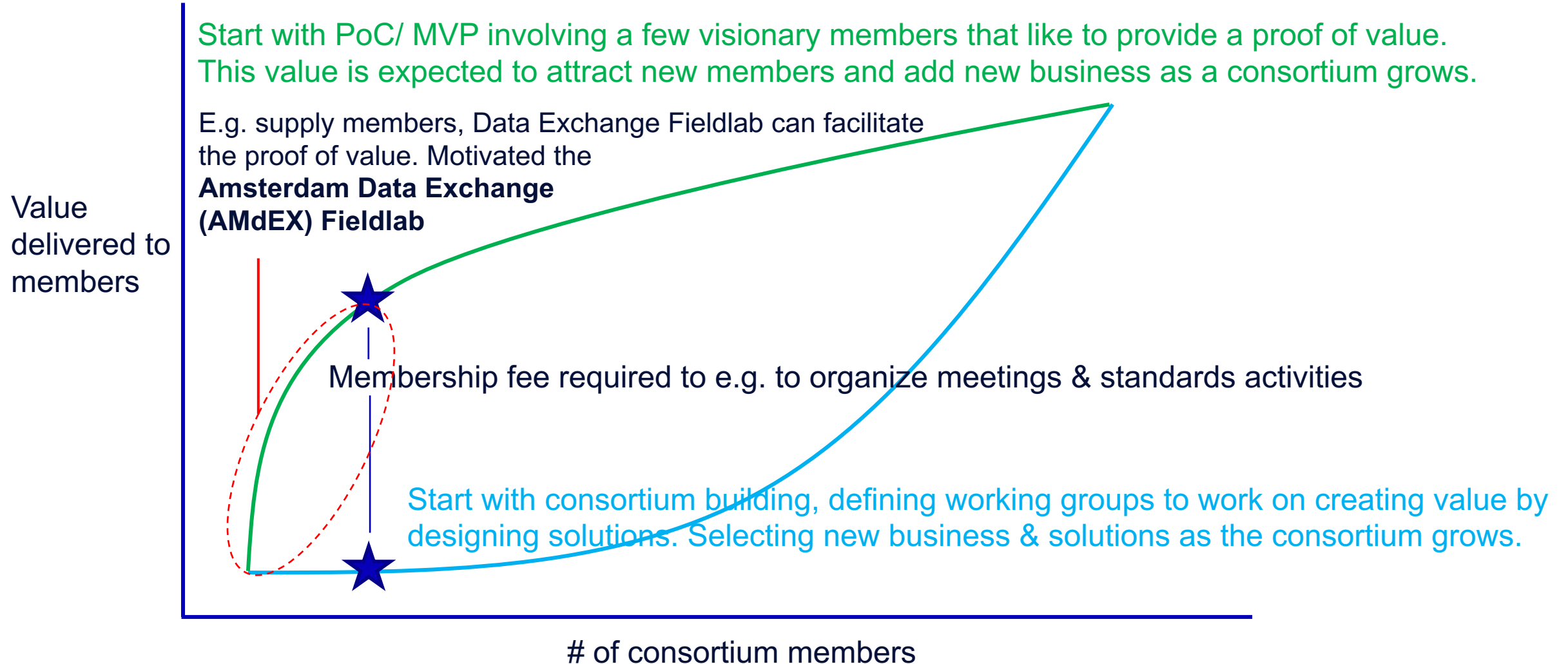
### The IDCA Mission Statement:

*IDCA will bring together aviation industry stakeholders to identify and leverage value chains, develop data standards, and **establish consensus-driven governance of data exchange mechanisms**. These processes will allow the industry to achieve gains in sustainability, safety, compliance, value creation, cost reduction and innovation at a scale that no single organization could achieve on its own.*

### IDCA's vision:

*Enable aviation stakeholders to **collaborate seamlessly in value chains based on the exchange of data** in a trustworthy, fair, and efficient manner to benefit themselves and the industry.*

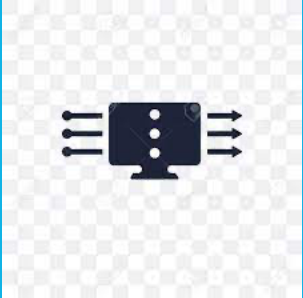
# APPROACHES TO BOOTSTRAP A CONSORTIUM: OVERCOMING THE CATCH-22 TO OBTAIN MEMBERSHIP FEES






# DATA EXCHANGE ARCHETYPES

## RECOGNIZING THE VARIETY OF GENERIC EXCHANGE FUNCTIONS



Streaming Data



Transactional Data



Big Data



Data Tracking

e.g. authorized Stream Routing

e.g. High Performance Transaction Infrastructure

e.g. Federated ML digital data market Infrastructure

e.g. Blockchain Digital Thread Infrastructure

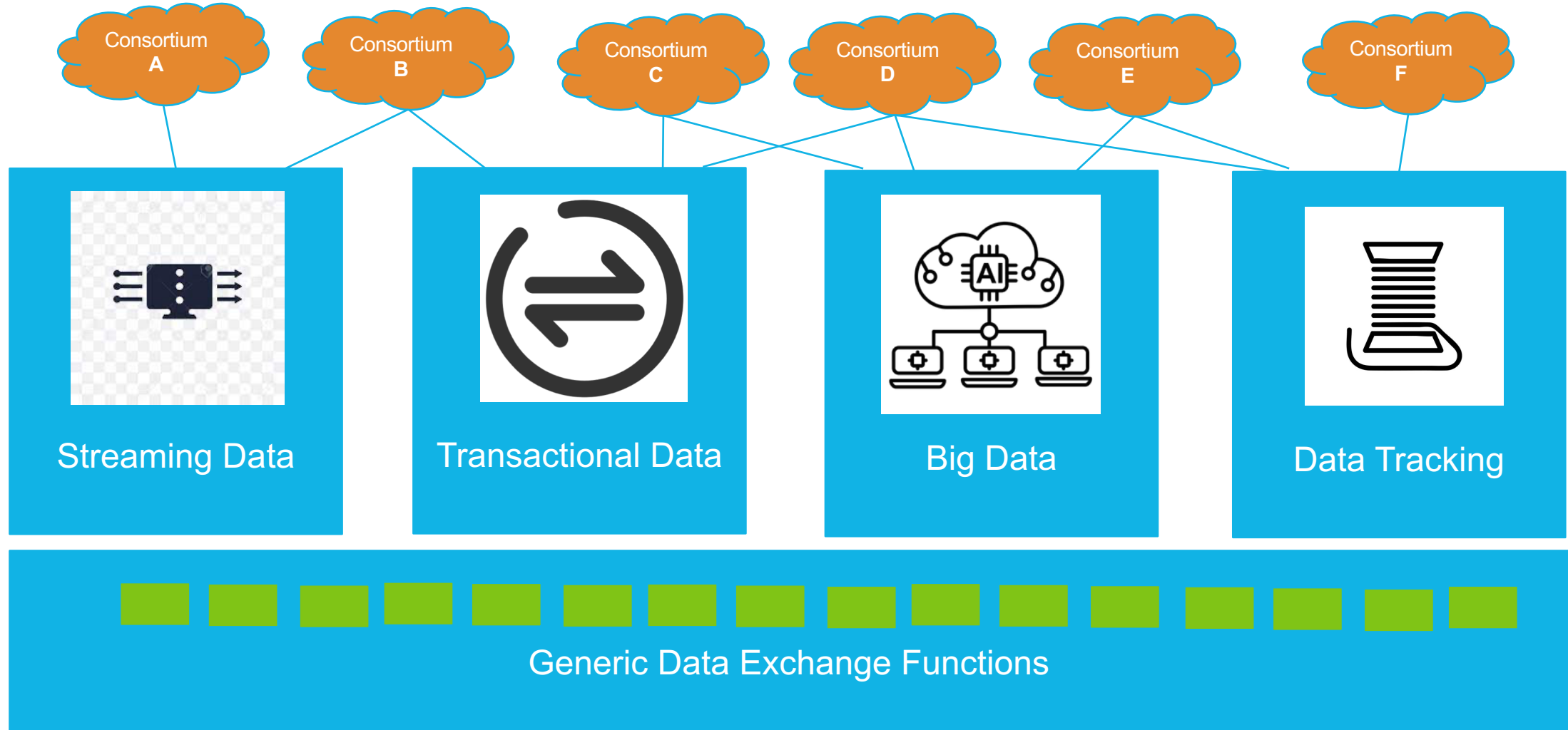
Generic Data Exchange Functions

AMdEX Fieldlab research



# CONSORTIA USING EXCHANGE SERVICES

SERVING COMMON BENEFITS MAY REQUIRE MULTIPLE ARCHETYPES



# WHAT IS THE AMSTERDAM INTERNET EXCHANGE?

## AMS-IX IS LEADING THE **AMDEX FIELDLAB PROJECT** TO IMPLEMENT A KLM USE-CASE

The screenshot shows the top navigation bar of the AMS-IX Amsterdam website. It includes the AMS-IX logo, a location dropdown for Amsterdam, and menu items for Platform, Services, Technical, and About. A status bar displays network metrics: CURRENT 8.795 Tb/s, PEAK 11.152 Tb/s, and ASNS 881. A 'GET STARTED' button and a search icon are also present. The main hero section features a cityscape background with the text 'Your interconnection platform in Amsterdam' and two buttons: 'ABOUT US' and 'CONTACT US'.

### Amsterdam in numbers

**881**  
Connected networks

SEE NETWORKS

**11.152**  
Peak (Tb/s)

SEE STATISTICS

**16**  
Colocations

SEE COLOCATIONS

Connect through  
500+ locations  
worldwide

GET STARTED

### Usecases



#### Aircraft maintenance data market

Predictive Maintenance is a highly competitive field in many industries. Machine learning allows the industry to transition from fixed to variable maintenance intervals of parts through prediction. Training data is required for this, preferably on all global flight conditions, from arctic to desert conditions. There is no company that collects all this kind of data with its flights. AMdEX provides the possibility to set up data markets for maintenance data in which companies can share this data with each other. Read [this article](#) for more info.

# USE-CASE: THE 787 SUPPLEMENTARY COOLING UNIT

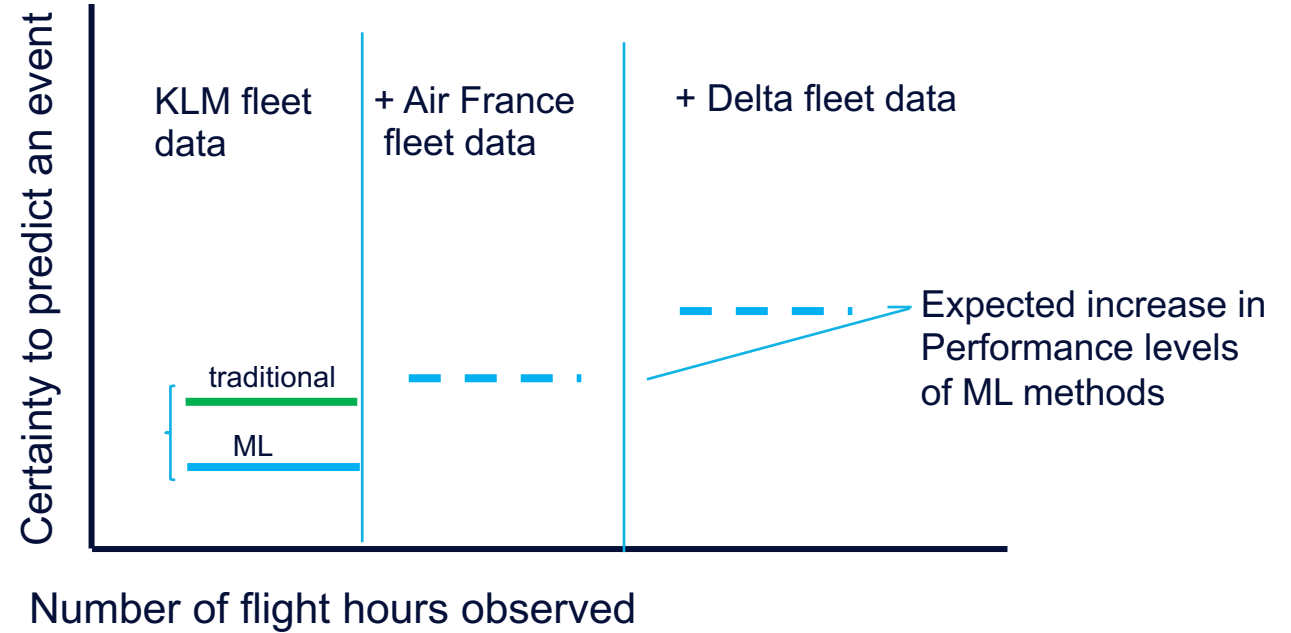
## PREDICTIVE MAINTENANCE USE-CASE IN NEED OF MORE DATA FROM ADDITIONAL AIRLINE FLEETS.

### Current situation:

Traditional methods outperform ML methods using KL SCU data only.

**More data is needed.**

**Problem: How to enable access to SCU data from other airline fleets**



Resulting into

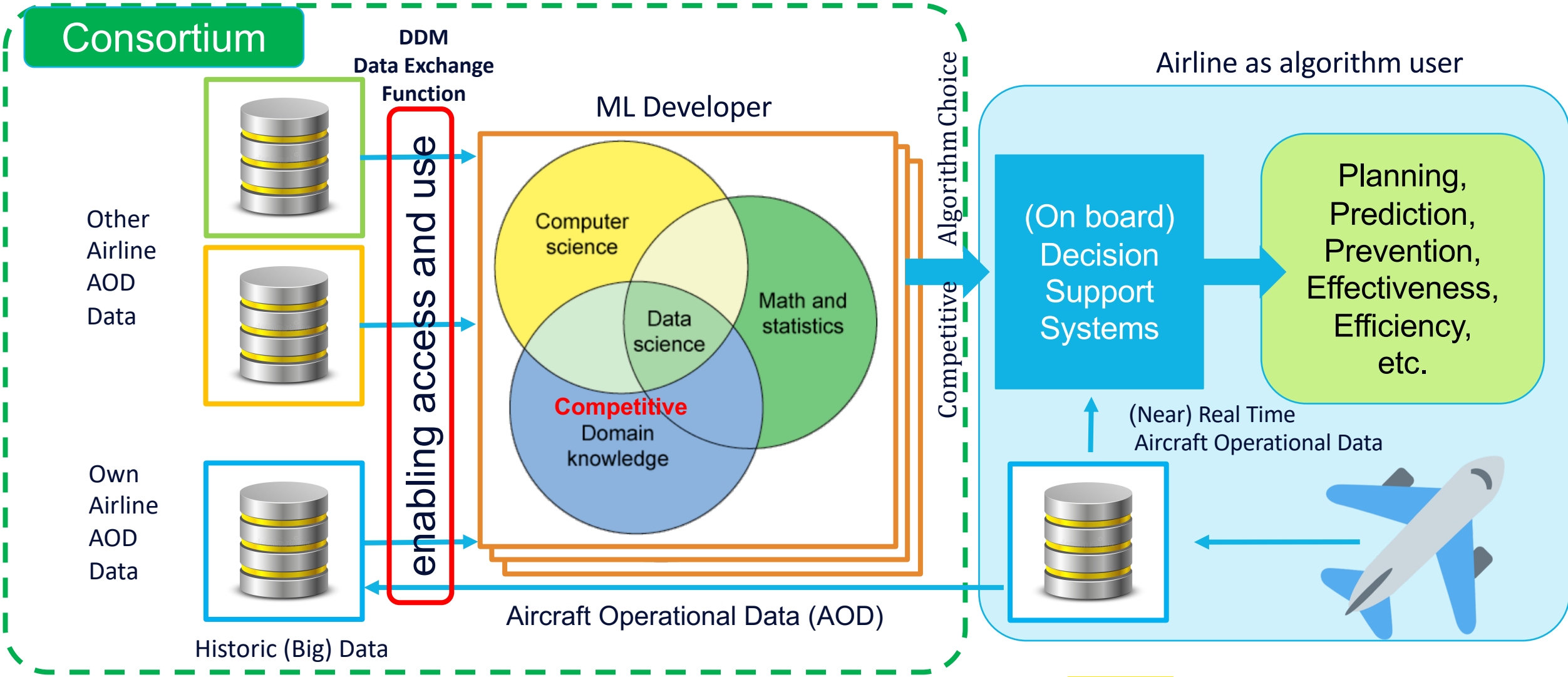
*Amsterdam Data Exchange Fieldlab use case: Enable data access to other airline fleet data via a **consortium governed Digital Data Marketplace** using a neutral **Data Exchange Infrastructure** supporting global federated machine learning.*



Supplementary cooling unit

# RESEARCHING DATA SHARING SOLUTIONS FOR ML DEVELOPMENT

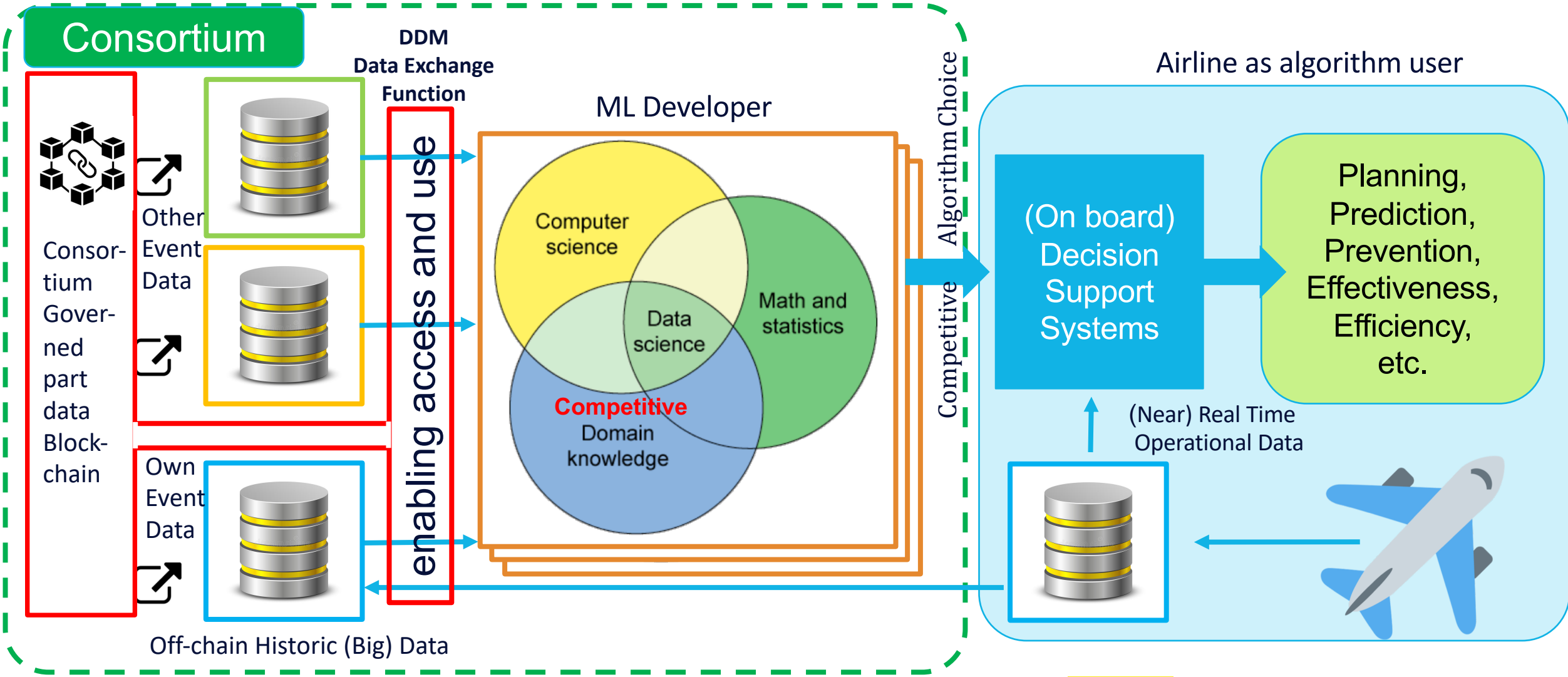
## A DIGITAL DATA MARKETPLACE (DDM) GOVERNED BY A CONSORTIUM





# RESEARCHING DATA SHARING SOLUTIONS FOR ML DEVELOPMENT

## NEW: A DDM USING OFF-CHAIN PART EVENT DATA (IDCA USE-CASE)

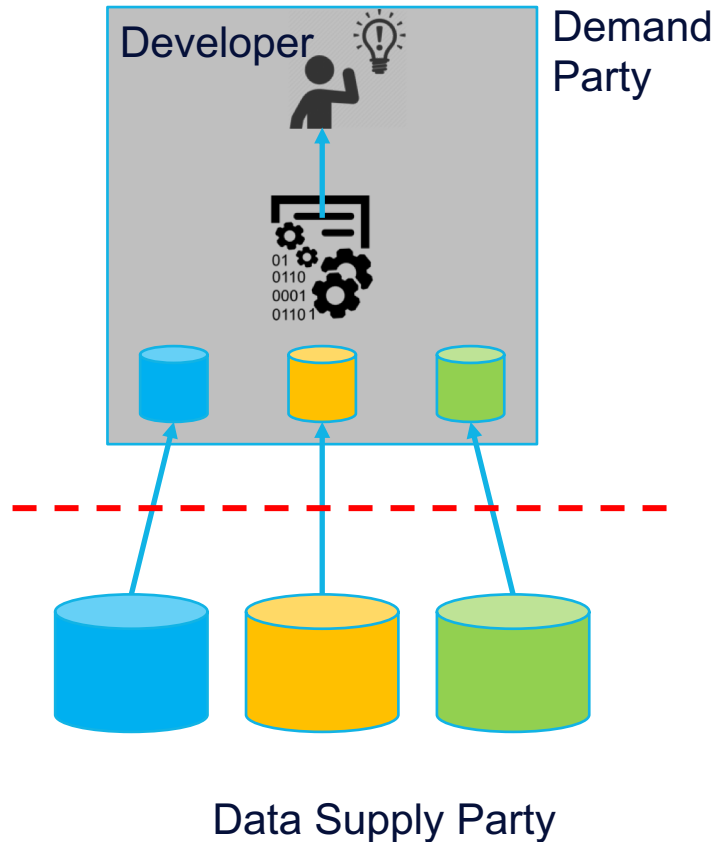


# DATA EXCHANGE LEVEL: ML ARCHETYPES

A CONSORTIUM MAY OFFER ONE OR MORE ARCHETYPES DELIVERED BY DATA EXCHANGE

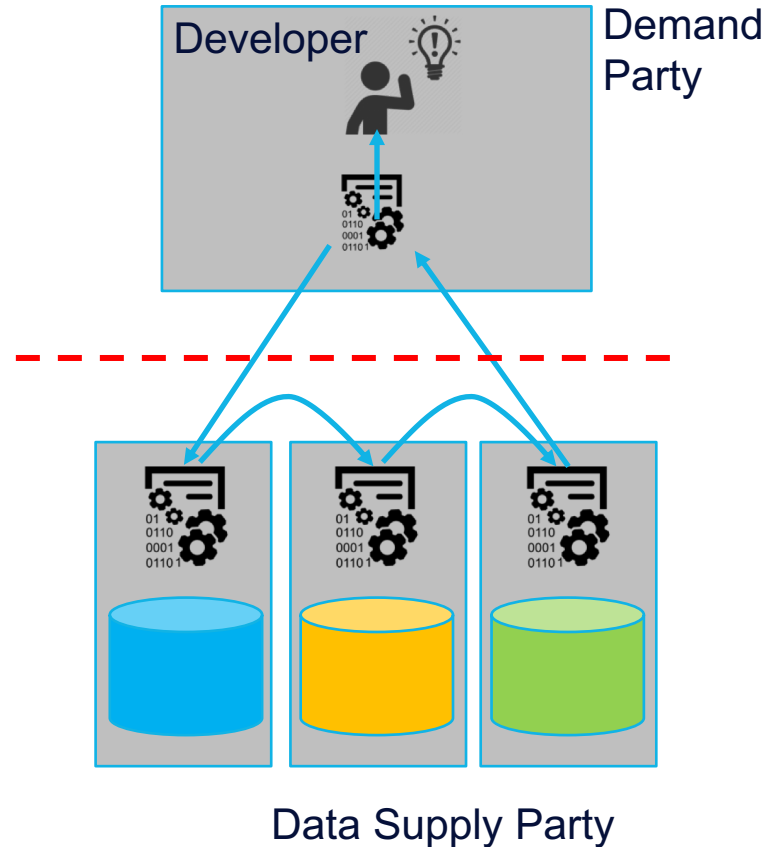
## Centralized Learning

Bring data to the algorithm



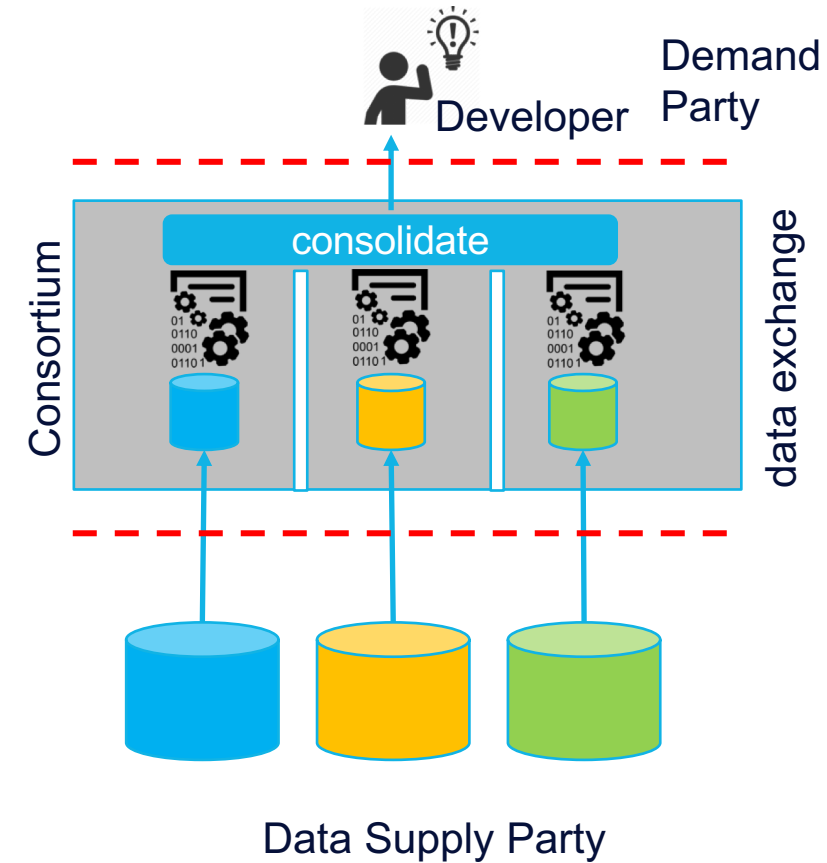
## Distributed Learning

Bring algorithm to the data



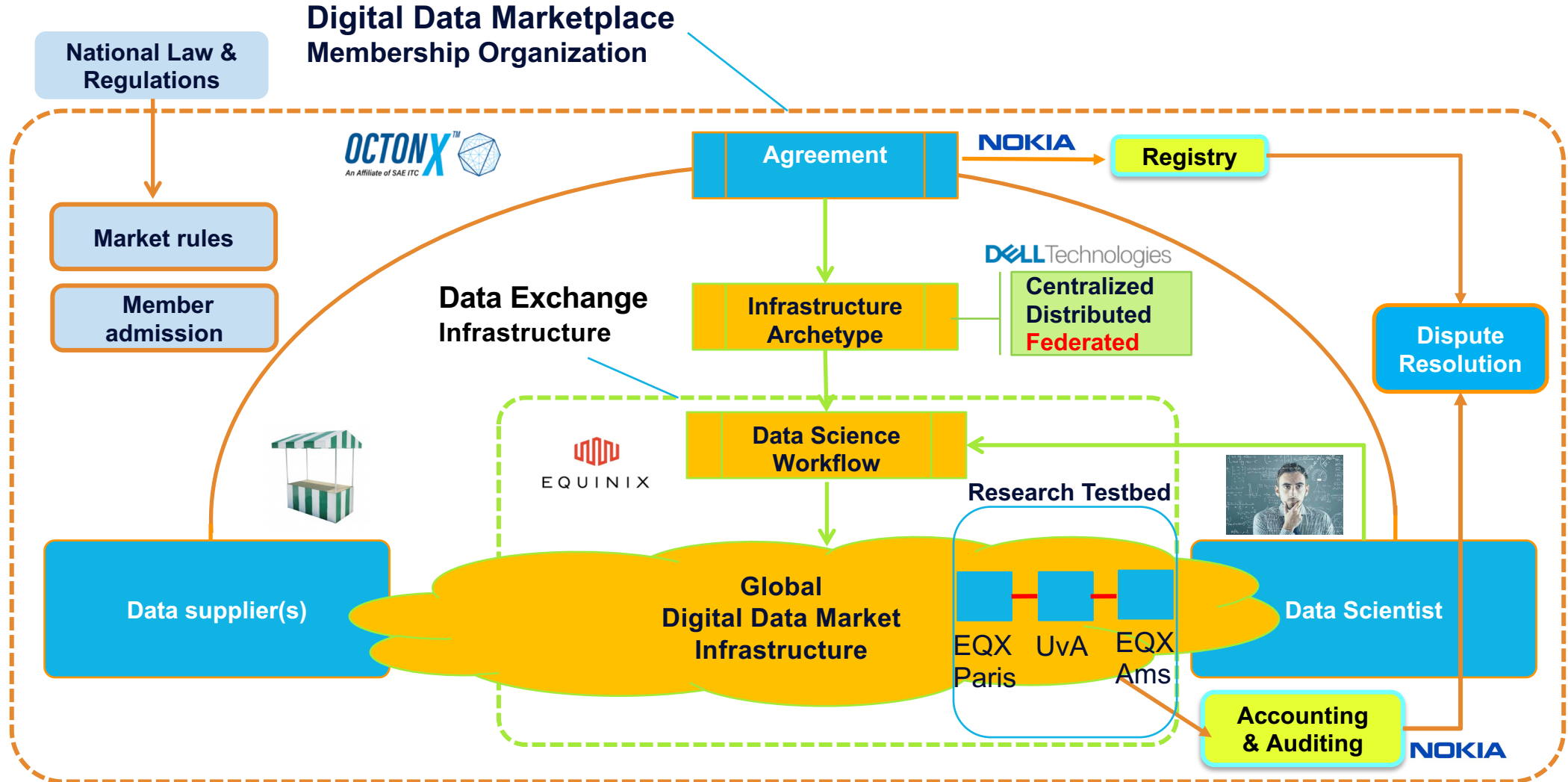
## Federated Learning

Via a consortium data exchange



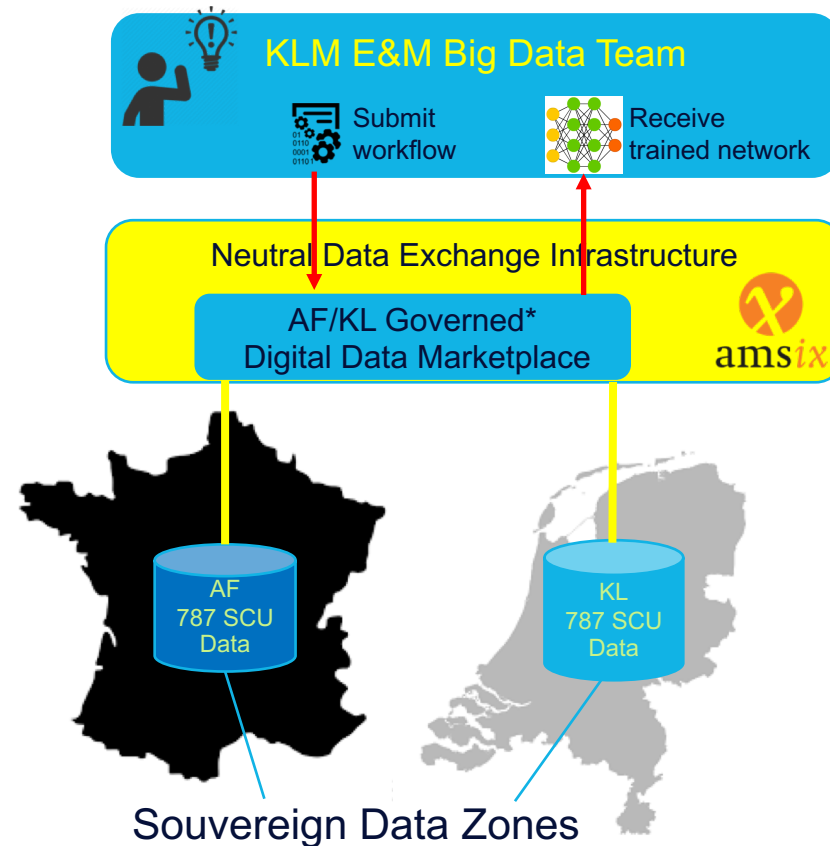
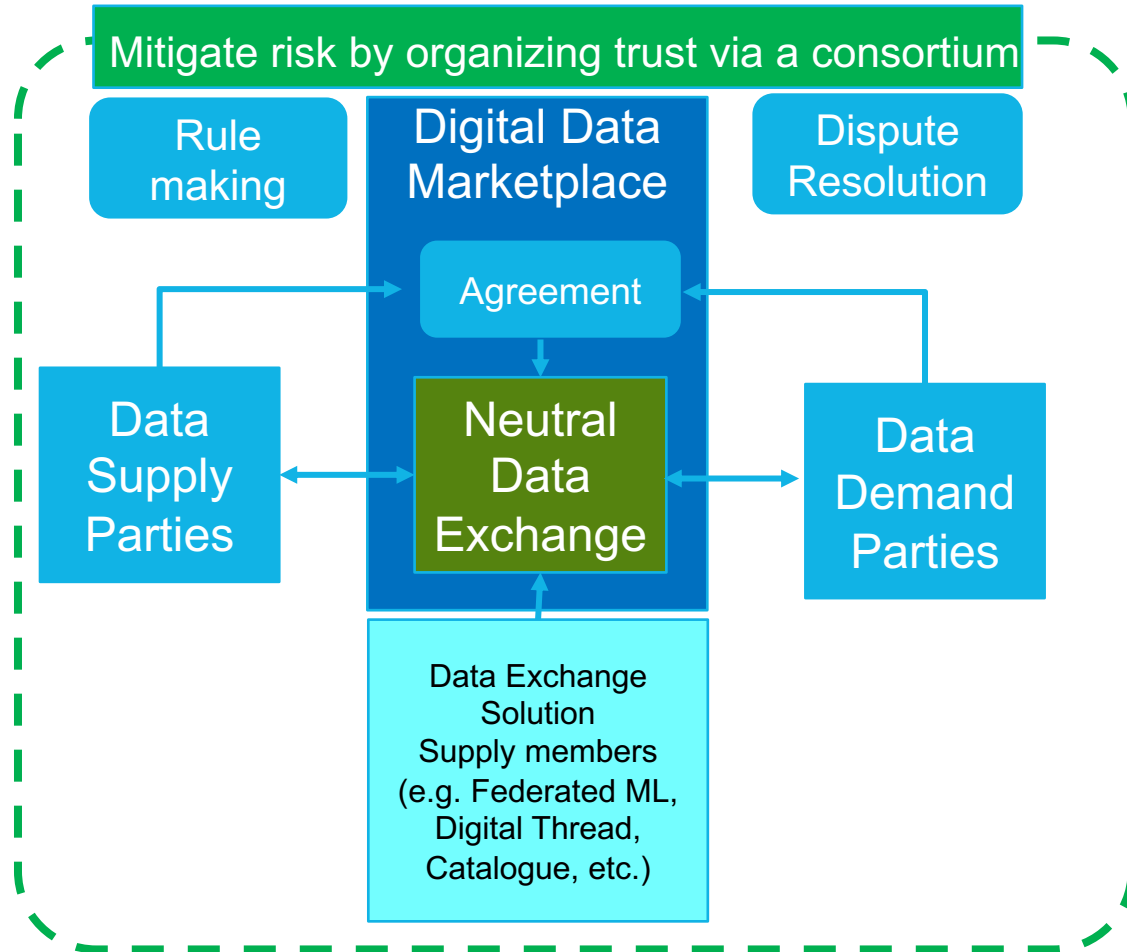
# DIGITAL DATA MARKETPLACE SOLUTION ARCHITECTURE

DEMO IMPLEMENTATION OF ESSENTIAL ELEMENTS AT AMS-IX MORE-IP MAY '23





# TO CONCLUDE: AMDEX DEMO CONCEPT AND IMPLEMENTATION



DELL Technologies

EQUINIX

NOKIA

\*A consortium will be involved when scaling up

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