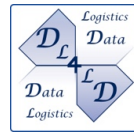


Training AI/ML models using Digital Data Marketplaces



DDSG teleconference
November 29th 2018




This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 769288



Leon Gommans, Anne Savelkoul, Wouter Kalfsbeek, Dirk van den Herik, David Langerveld, Erik IJzermans, Floris Freeman, Brend Dikkers, Cees de Laat, Tom van Engers, Wouter Los, Paola Grosso, Joseph Hill, Reggie Cushing, Giovanni Sileno, Lu Zhang, Ameneh Deljoo, Thomas Baeck, Willem Koeman, Laurie Strom, Axel Berg, Gerben van Malenstein, Kaladhar Voruganti, Rodney Wilson, Patricia Florissi

BUSINESS CONTEXT



Companies increasingly understand how to apply AI technologies to extract business value from data.

The more data the better: algorithm quality depends on data quantity and quality
Knowledge how to translate such data into reliable algorithms is **competitive**

Companies are reluctant to share data when considering involved risk.

Emerging platform dominance: *“While creating real value for users, these companies are also capturing a **disproportionate and expanding share of the value**, and that ‘s shaping our collective economic future”. **

Sharing data across companies increases the potential of creating business value no single organization can create on its own.

DATA IS INCREASINGLY CONSIDERED AN ASSET

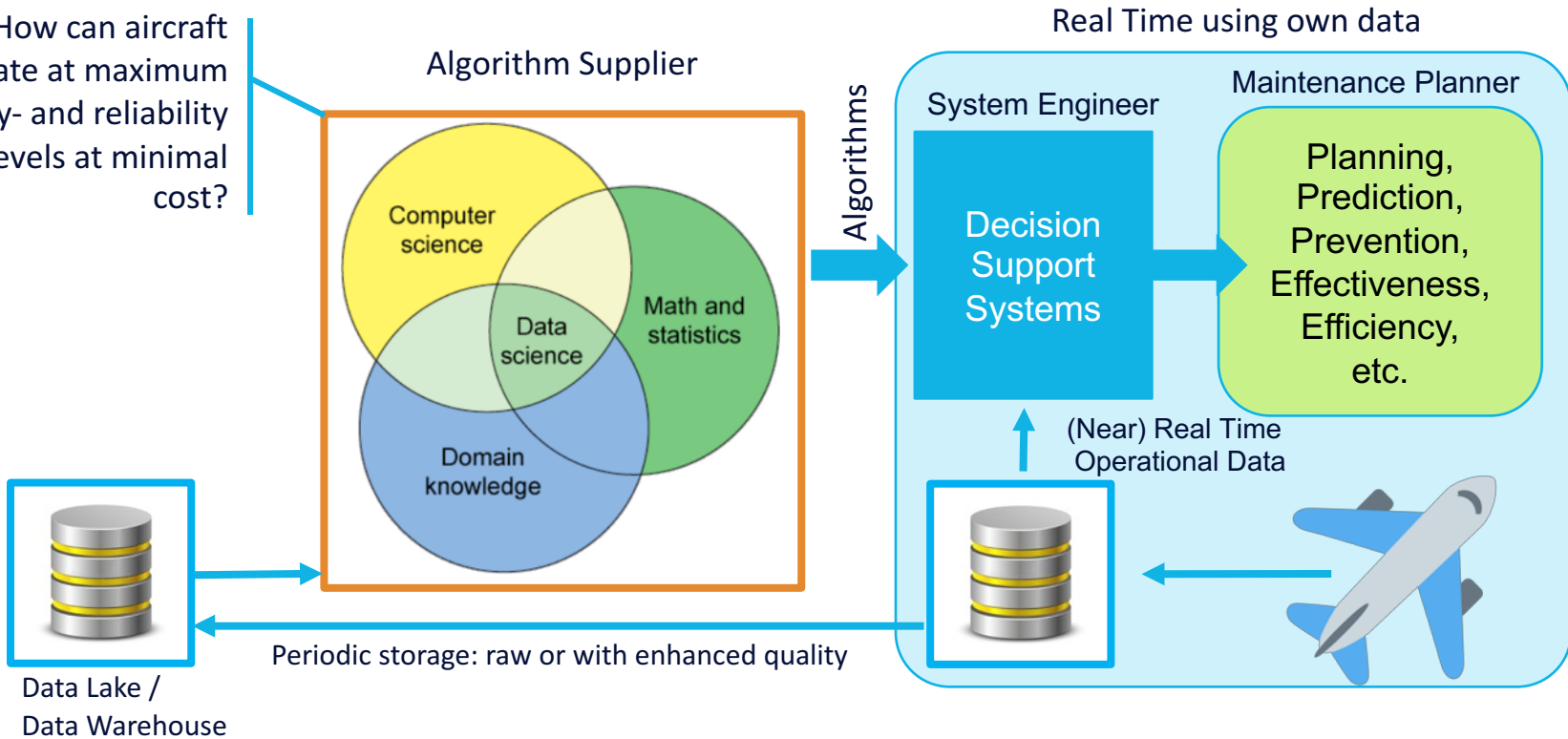
Considering value exchange and involved risk raises the main research question:

How can (big) data assets be shared between data suppliers and algorithms developers in

- 1) A fair and economic way,*
- 2) whilst providing adequate means to reduce risk?*

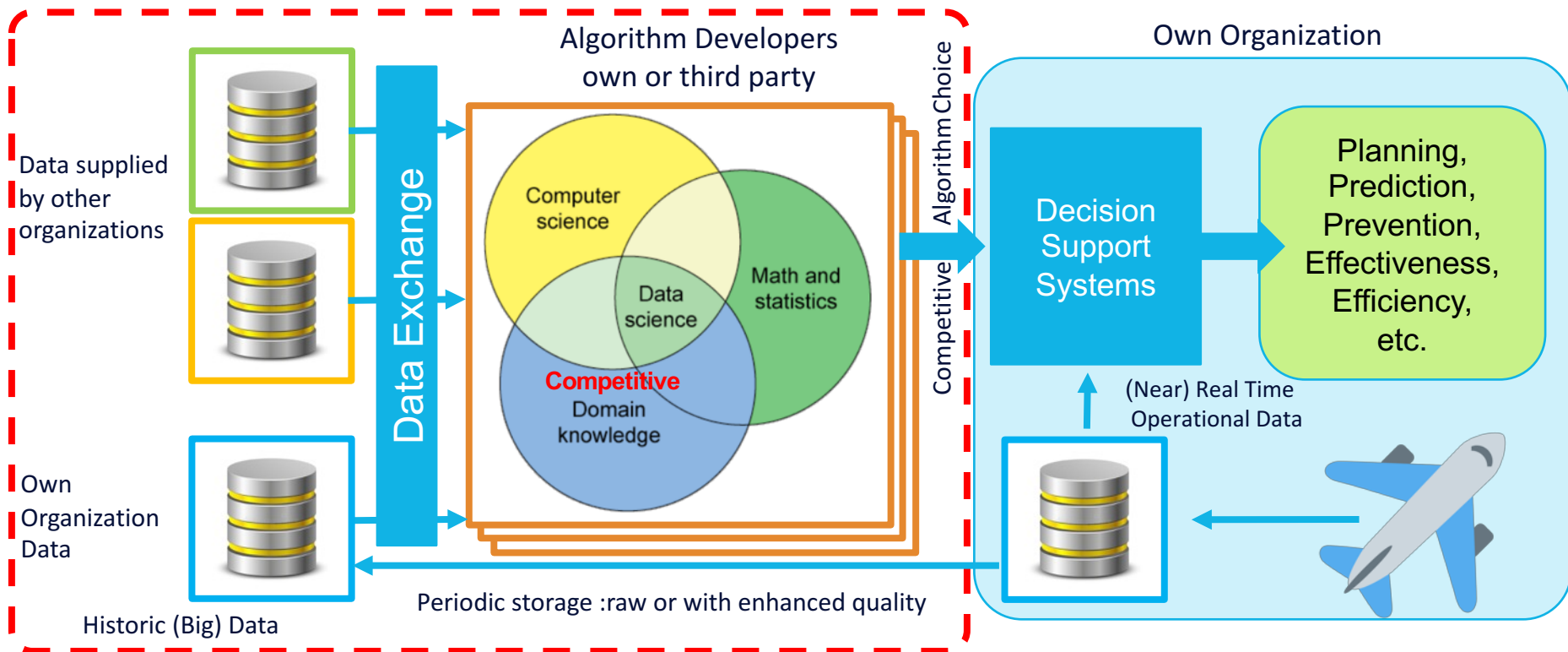
CURRENT ALGORITHM DEVELOPMENT CONTEXT

How can aircraft operate at maximum safety- and reliability levels at minimal cost?



RESEARCH CONTEXT

ARRANGE ADDITIONAL DATA TO IMPROVE ALGORITHM QUALITY & INNOVATION



B2B DATA SHARING APPROACHES

AN EU STUDY BY EVERIS JAN 2018

Case studies

Approaches to B2B data sharing



Five different approaches to B2B data sharing

1 DATA MONETISATION



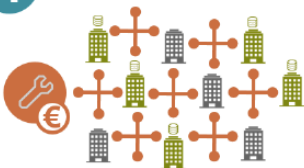
2 DATA MARKETPLACES



3 INDUSTRIAL DATA PLATFORMS



4 TECHNICAL ENABLERS



5 OPEN DATA



Open vs Closed

DATA MARKETPLACES



- ✓ Trusted intermediary between data suppliers and data users
- ✓ Data suppliers sell their data to interested data users
- ✓ Revenue is generated from each data transaction



INDUSTRIAL DATA PLATFORMS



- ✓ Strategic and collaborative partnerships
- ✓ Mutual benefits for all parties
- ✓ Data shared (for free) in a closed, exclusive and secure environment
- ✓ Develop new or improved products and/or services
- ✓ Enhance internal performance

AIRBUS



Difference with Data Marketplaces:

Governance by a **membership organization**

Difference with Industrial Data Platforms:

Data is stored **outside** data platforms to allow multiple platforms to use same data

Contracts determine access / use

Market rules arrange pre-contractual elements

DATA SHARING CHALLENGES

WHEN TRAINING MODELS WITH AS MUCH DATA AS POSSIBLE

Many organizations want to keep their historical data in their sovereign data zones.

Many implications need to be considered:

Business level

Value
Cost
Benefits
Agreements
Exchange
Trade

Legal level

Ownership
Access
Usage
Compliance
Liability
Market Rules

Data level

Processing
Storage
Management
Transport
Transform
Security

Worldwide Scale



OVERCOMMING CHALLENGES

ELEMENTS TO ORGANIZE TRUST AS MEANS TO REDUCE RISK



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

Research operationalization of **Digital Data Marketplace & Data Exchange** concepts

INTRODUCTION

- Organized by SAE ITC, **ExchangeWell** brings data owners and algorithm developers together in a digital data marketplace that provides the required trust for mutual engagement.
- It enables members to share their data assets in a **fair and economic way** whilst providing an adequate means to **reduce risk**.
- Sharing data enables **digital transformation of the industry** and **business value creation**.

Objective: Help answer key question:

- Will ExchangeWell as proposed provide value to our industry?



COMMON BENEFIT

GROUP RULES



ORGANIZE TRUST

IMPLEMENT
INFRASTRUCTURE





EXCHANGEWELL™

A Program of SAE ITC

A consortium program to provide the means for industry leaders to access industry experts, develop practical experience from pilots, collaborate on pre-competitive research and establish a strategic path forward to effectively implement data management strategies which positively impact and benefit industry.

SAE ITC
An SAE International Affiliate

*Collaborative Innovation.
Trusted Implementation.*

We're here!
ExchangeWell

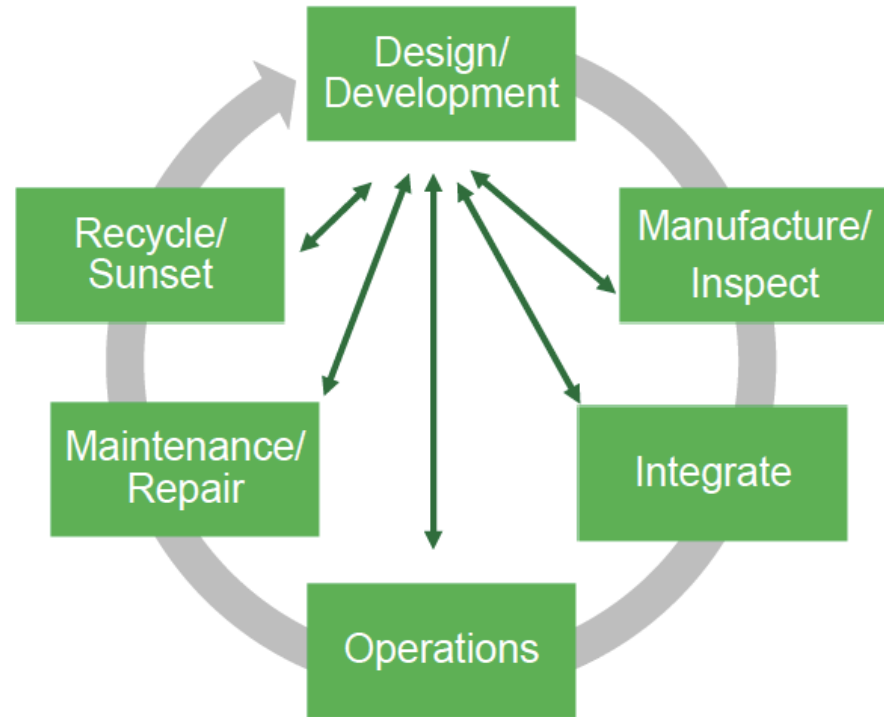


We're here!
ARINC IA



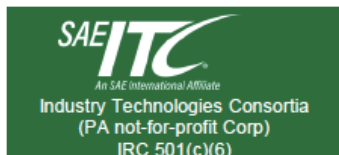
Stakeholders

- Regulatory
- Airline/ Operator
- Airframer/ Integrator
- OEM
- Sub Assembly Manufacturer
- Distributor
- Component/ Part Manufacturer
- Standards Organization
- Industry Review Body
- Auditor/ Mandated Body
- SAE ITC
- Registrar
- Maintenance
- Training Provider
- IT System and Software Tools Provider
- Data Aggregators and Analyzers
- Insurers
- Legal
- Access Authorizing Agent
- Research/ Academics



SAE ORGANIZATION

Affiliate



- AESQ SG
- ARINC IA
- ASQP
- DATC
- IBIS
- Probitas Authentication
- WMC/PIN

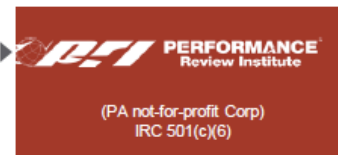
ExchangeWell



For-profit Subsidiaries



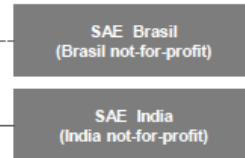
Affiliate



For-profit Subsidiaries



Alliance Partners



- Denotes Ownership & Governance Stewardship
- - - Denotes Governance Stewardship
- Denotes No Ownership or Governance Stewardship

U.S. OFFICES

- Warrendale, PA (Corporate Headquarters for SAE, PRI and ITC)
- Troy, MI (Automotive Headquarters for SAE, DATC)
- Livonia, MI (ETI, Inc. offices)
- Washington, DC (Washington offices for SAE)
- New York/New Jersey (TBMG offices)
- Bowie, MD (ARINC IA offices)

INTERNATIONAL OFFICES

- London, UNITED KINGDOM (SAE, PRI offices)
- Derby, UNITED KINGDOM (PRI)
- Beijing, CHINA (PRI)
- Shanghai, CHINA (SAE WOFE office)
- Aichi (Nagoya), JAPAN (PRI)
- SINGAPORE (PRI)

DEFINE AND AGREE COMMON BENEFIT



Example: enable data sharing to improve quality of AI/ML innovations

- Understand need: the more data the better
- Expect: capability that will help transform the MRO business in the digital era.

Innovations that will improve air safety, passenger experience and additional cost reductions by:

- avoiding unplanned maintenance
- increasing maintenance planning flexibility
- moving from fixed interval planning to maintenance when indicated
- less network disruptions by avoiding 'Aircraft On Ground' situations

CONSORTIUM MEMBERSHIP RULES:

WHAT KIND OF RULES DO WE NEED?



Trust is considered as a means to reduce risk

Defining consortium membership rules is a starting point

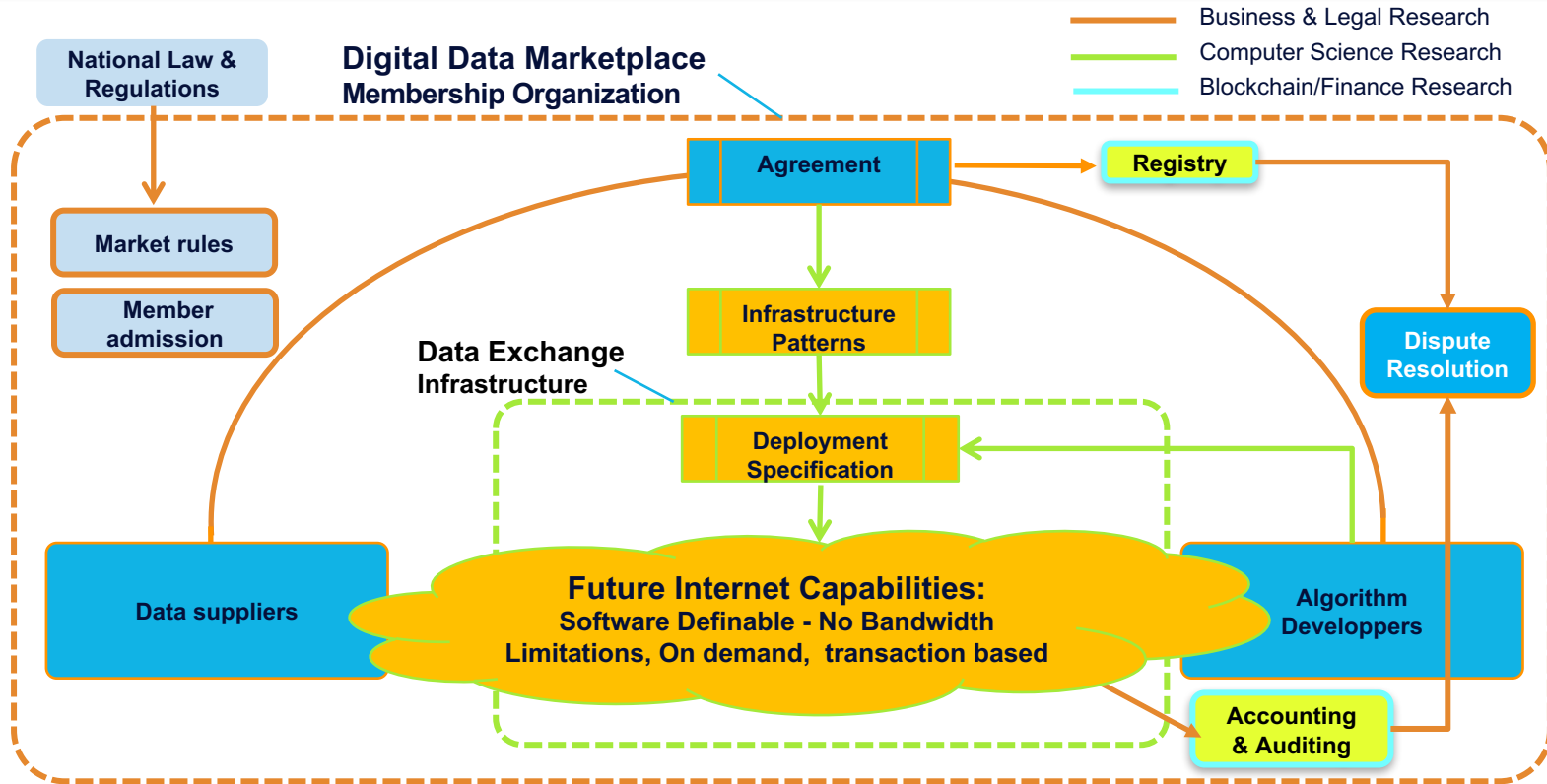
Legal research topic's for discussion:

- Data asset ownership
- Data access & usage
- Liability of owner & user
- Non-compliant behavior
- Market rules
- Purpose binding



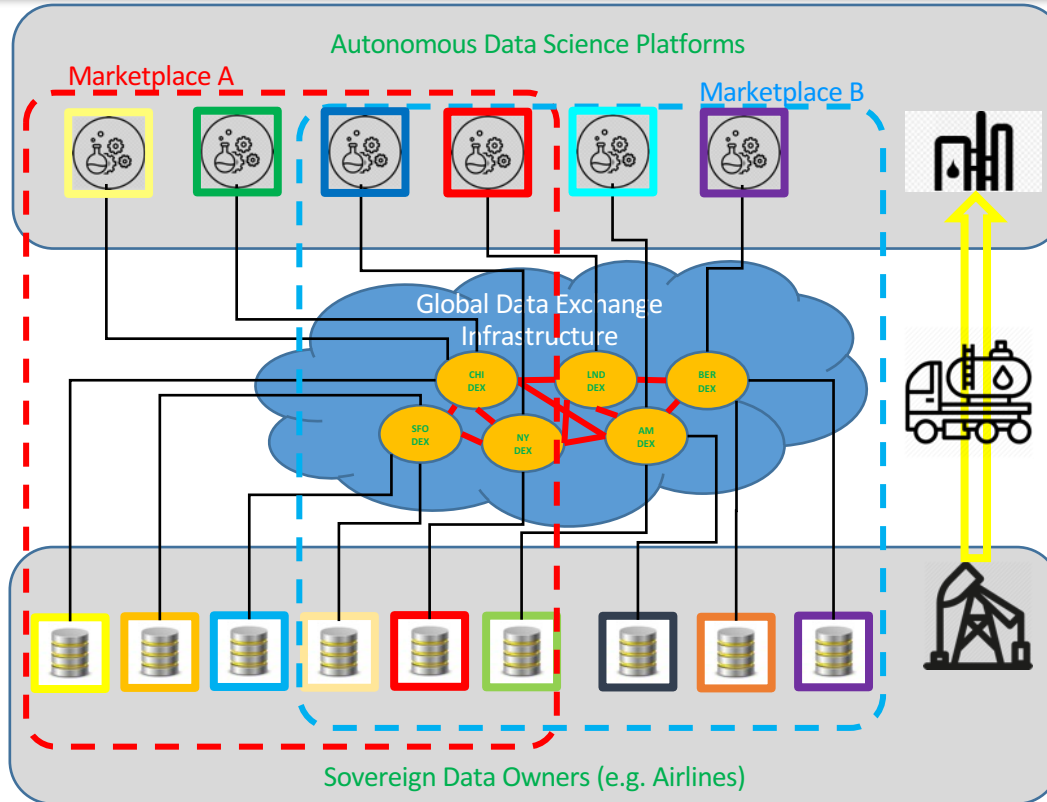
EXCHANGEWELL
A Program of SAE ITC

DIGITAL DATA MARKETPLACE CONCEPT: COMBINED BUSINESS, LEGAL AND COMPUTER SCIENCE RESEARCH



DATA EXCHANGE CONCEPT

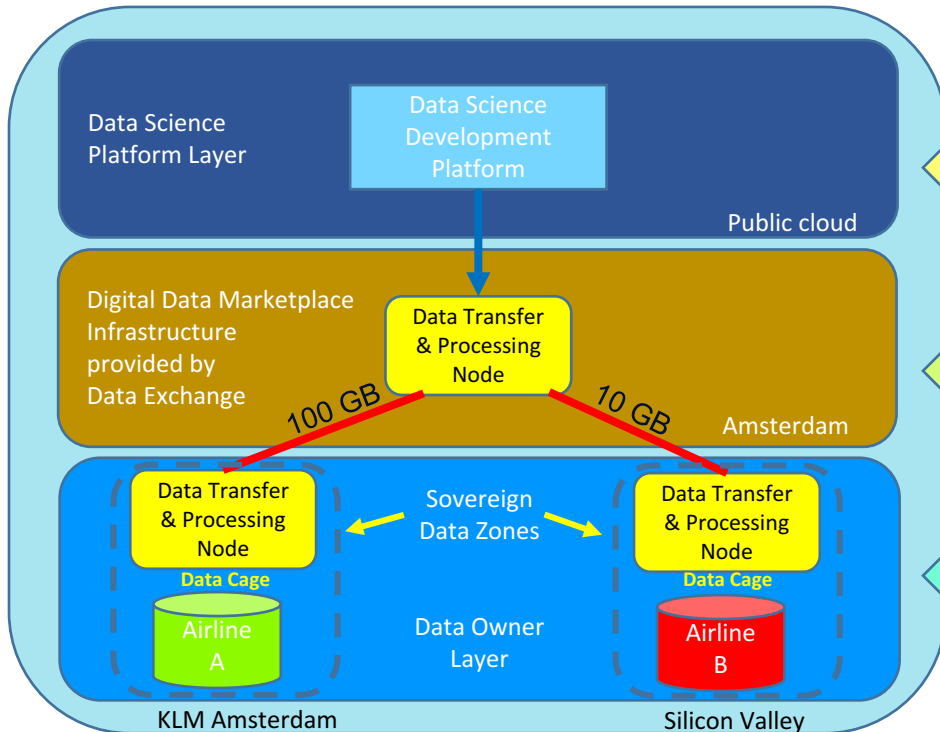
ENVISAGED GLOBAL EXCHANGE INFRASTRUCTURE



amsterdam
economic
board



RESEARCHING EXCHANGE ARCHITECTURES



Trust Modelling:

What is the optimal infrastructure archetype, describing storage and processing locations and their relationships, which best suit member requirements when considering risk?

See CIENA booth 2847 and demo

Processing Models:

What are the implications of distributing data processing across membership organization owned infrastructures in terms of achievable model accuracy and processing performance using federated/distributed models vs centralized models

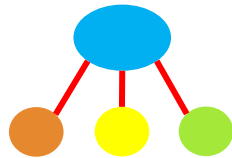
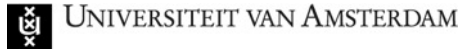
Marketplace Reference Architecture:

What constitutes a marketplace? Researching needed functions, personas, flows, credentials, contracts & rules, conflict resolution, and much more ...

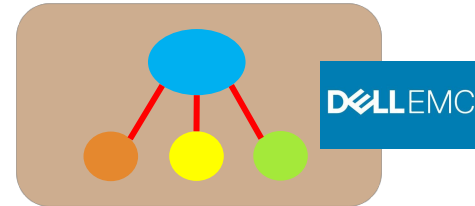
RESEARCHING PHYSICAL IMPLEMENTATION INVOLVING BOTH RESEARCH AND IT INDUSTRY

GLOBAL RESEARCH INFRASTRUCTURES

Data Sharing Infrastructure Model Research using Future Internet capabilities



GLOBAL DATACENTER INFRASTRUCTURES

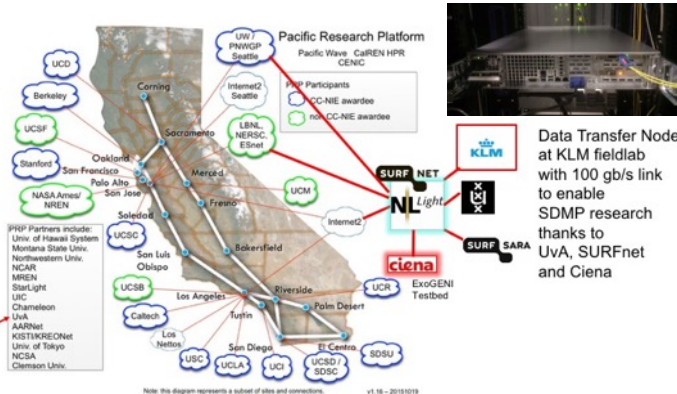


How to create a Global Digital Data Market Ecosystem via Data Exchanges



prp.ucsd.edu

As foundation of the National Research Platform



AM3 and AM4 Datacenters
 Amsterdam
 Science Park
 SV10 Datacenter
 Silicon Valley



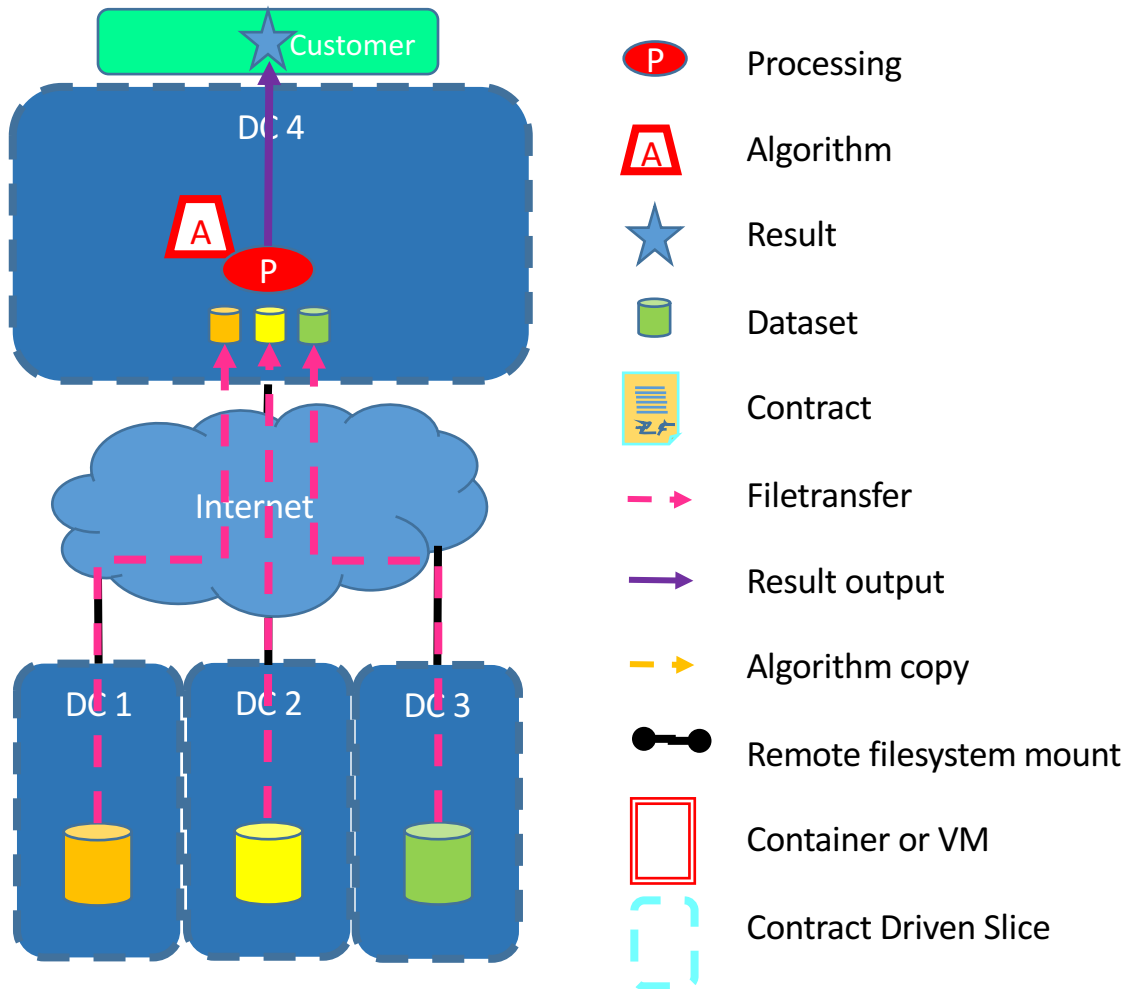
Traditional model

DC4 acts as platform:

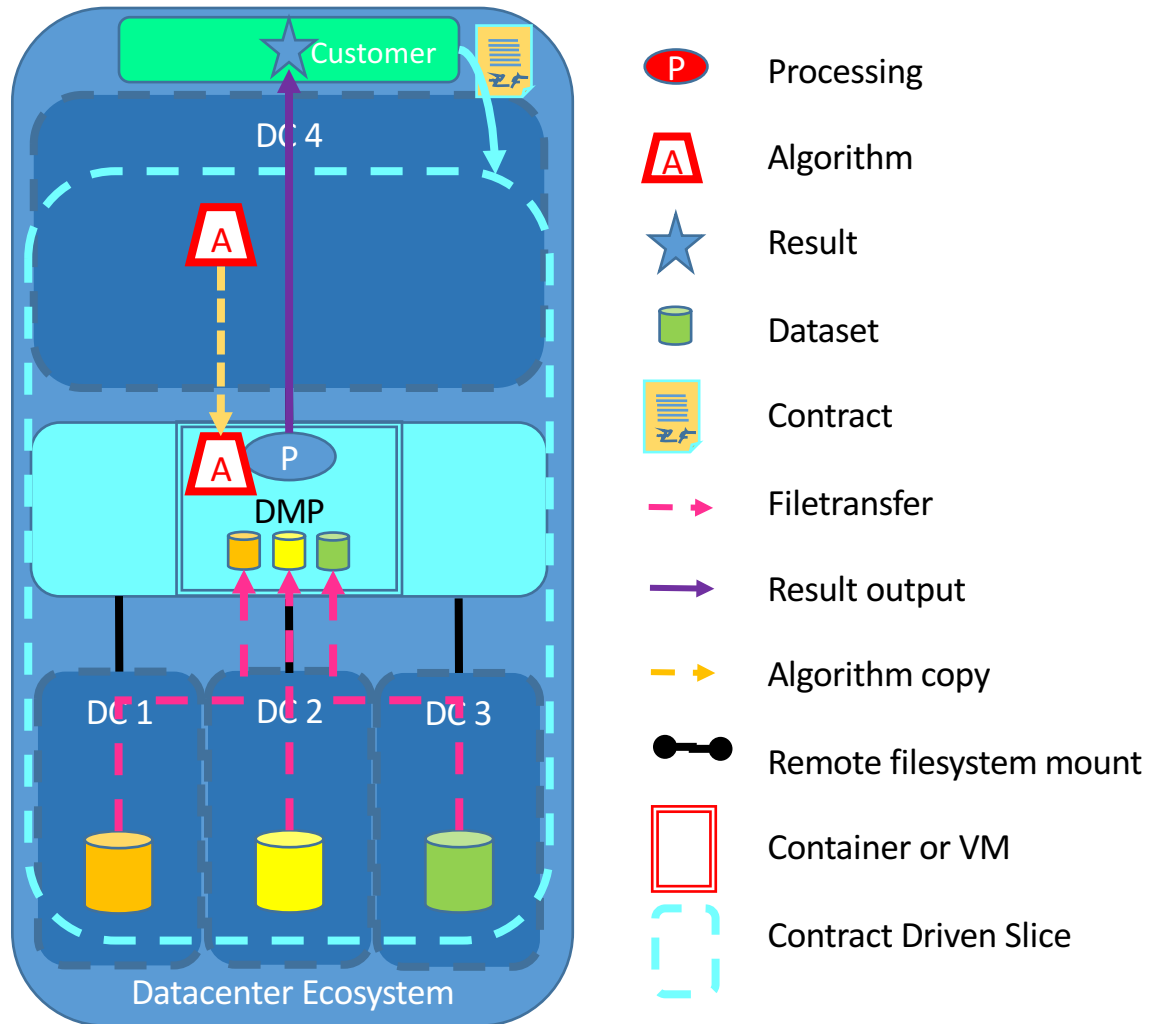
1: creates potential competitive bottleneck / lock-in.

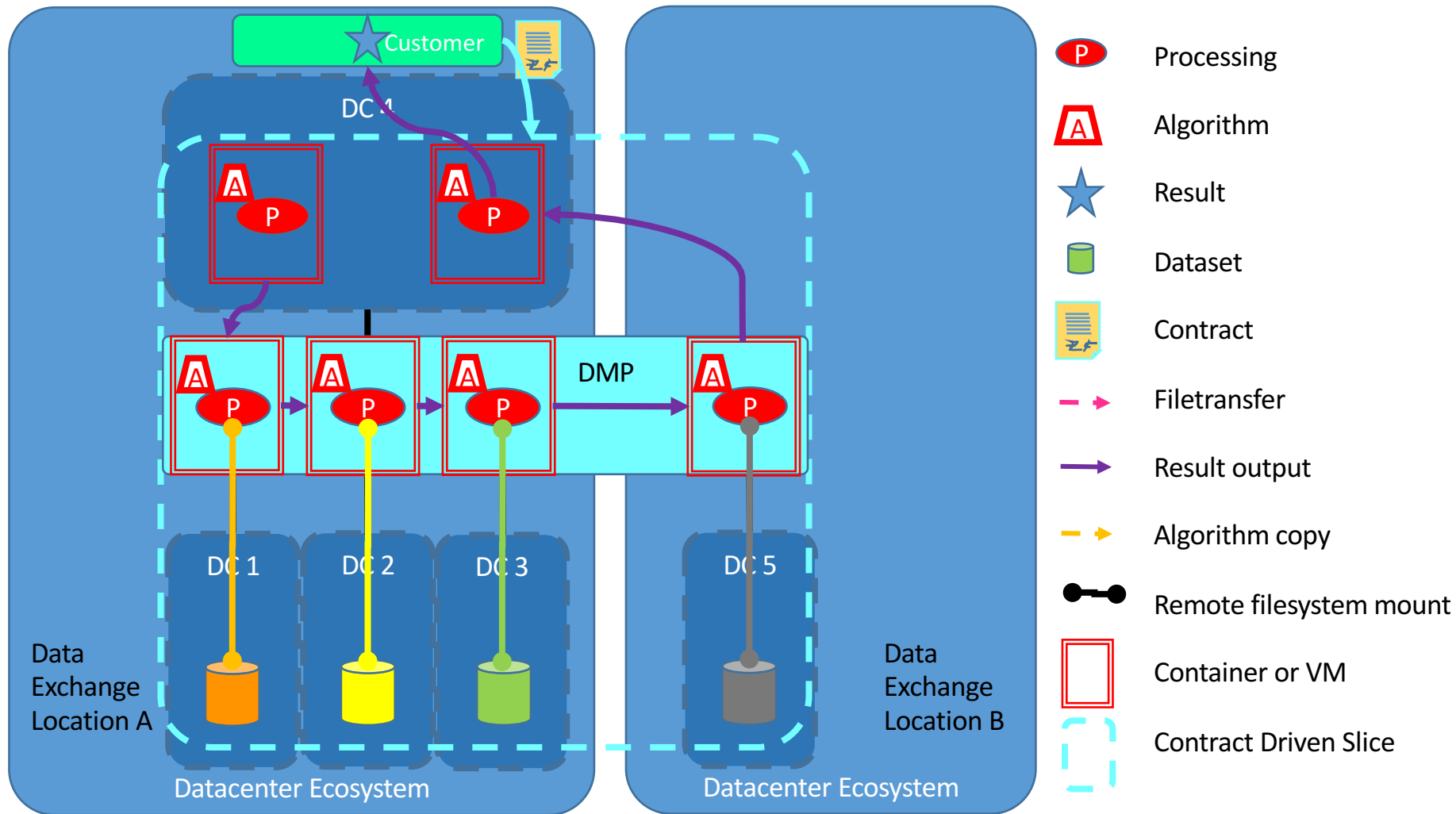
and












2: raises data owner concerns about risk



DMP provides neutral processing capabilities, which dissolves after Execution.





-  Processing
-  Algorithm
-  Result
-  Dataset
-  Contract
-  Filetransfer
-  Result output
-  Algorithm copy
-  Remote filesystem mount
-  Container or VM
-  Contract Driven Slice

SUMMARY



Enterprises join a membership organization to achieve a common goal *no single enterprise can achieve on its own*



Membership rules are defined by rulemaking & standards processes, subsequently execution, enforcement and judgement is organized by membership organization as *a means to reduce risk.*



Members arrange data sharing and processing via *agreements deployed in an infrastructure*, provided by a secure digital market place owned by its members.



Members *achieve common benefits in a transparent way.* Members trust its operation based on use of accounting & auditing mechanisms, relying on market dispute resolution mechanisms.