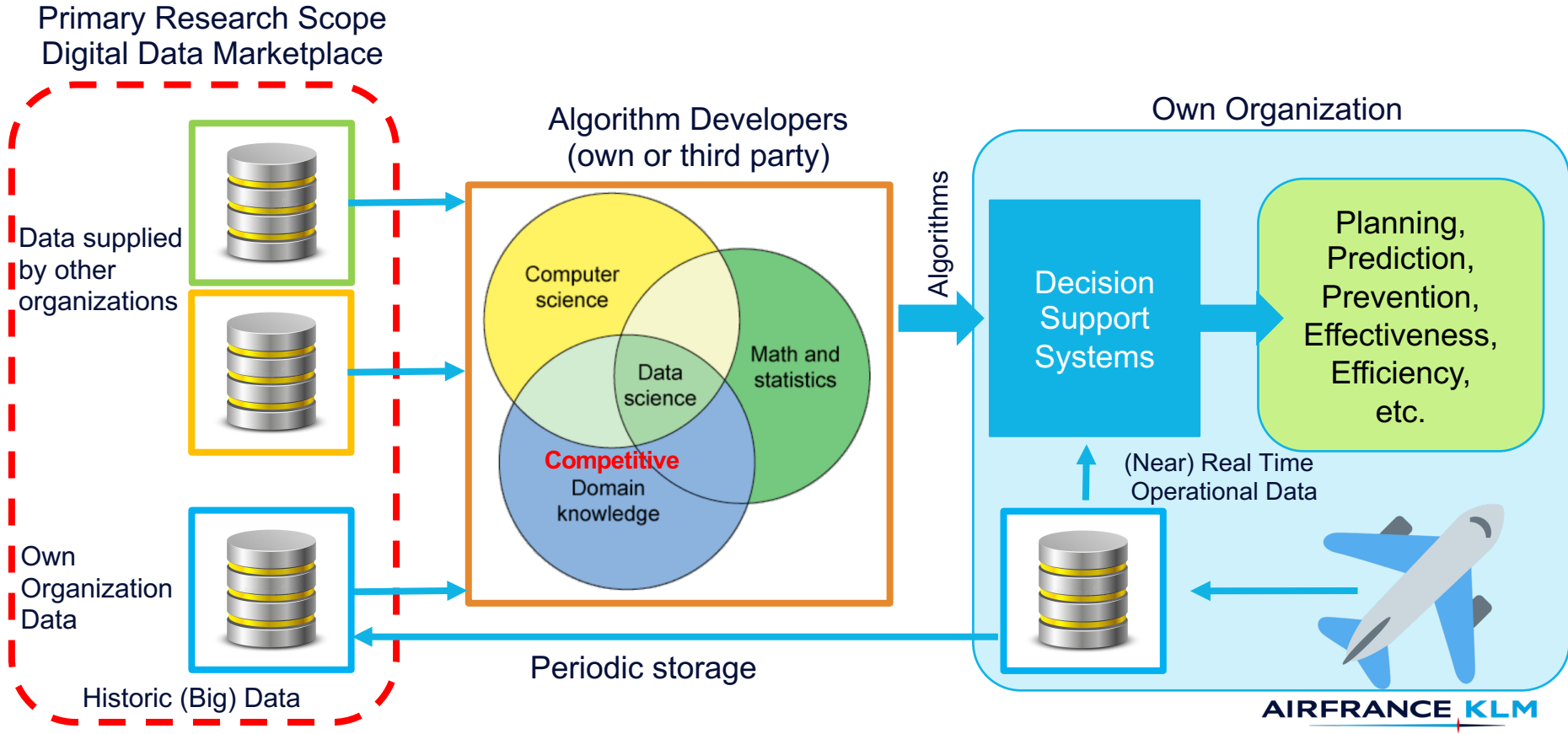# EXPLORING DIGITAL DATA MARKETPLACES

Researching data sharing principles in aviation context
An outline

IATA Aviation Data Symposium
June 19th 2018 – Berlin

Dr. ing. Leon Gommans,
Science Officer / Guest Researcher
IT Strategy & Technology Office - R&D / University of Amsterdam - Systems & Network Engineering Lab
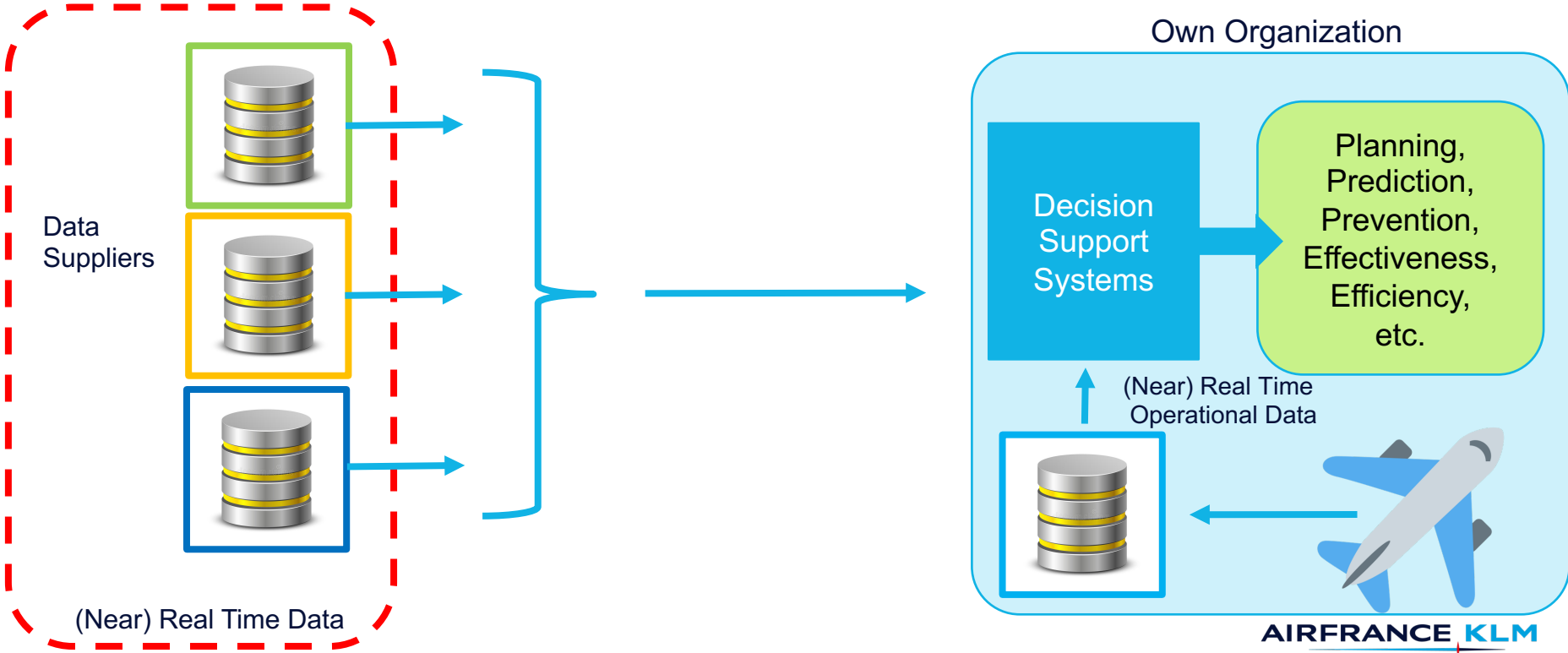**Active in SAE HM-1 and DDSG**

RESEARCH CONTEXT
PROVIDING ADDITIONAL DATA TO IMPROVE DATA SCIENCE ALGORITHM DEVELOPMENT

RESEARCH CONTEXT
PROVIDING ADDITIONAL DATA TO IMPROVE DECISION TAKING

Secondary Research Scope
Digital Data Marketplace

Data
Suppliers

(Near) Real Time Data

Own Organization

Decision
Support
Systems

Planning,
Prediction,
Prevention,
Effectiveness,
Efficiency,
etc.

(Near) Real Time
Operational Data

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EXAMPLES OF DATA SHARING
RELEVANT TO OUR INDUSTRY

Improve **passenger experience** at airports

Improve **efficiencies** across multi modal logistic chains

Increase **fleet availability** by improving maintenance scheduling by estimating maintenance credits from aircraft data.

Research efforts also consider use-cases in Healthcare, Agriculture, Smart Cities, Public Safety, Cybersecurity, ..

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PRIMARY RESEARCH QUESTION
RECOGNIZING DATA IS AN ECONOMIC ASSET THAT CAN BE TRADED

Given a common benefit:
How can (big) data be shared amongst Data Suppliers and Algorithm Developers in a 1) FAIR and ECONOMIC way, whilst providing adequate 2) means to REDUCE RISK?

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PROBLEM WITH MARKET DEVELOPMENT

1) FAIR AND ECONOMIC WAY: MONOPOLISM VS OPEN MARKET DEVELOPMENT

As in seen in the beginning of the oil industry: control of the transport platform enabled monopolism. Open marketplace mechanisms will enable trade, innovation and fair competition

Oil Economy	Concept	Data Economy
Crude Oil	Resource	Raw Data
Land / well owner	Ownership	Operator of data generator ?
Oil price	Value	Data price ?
Barrel, rail, pipeline, tanker ..	Transport	Future Internet ?
Oil market	Trade	Data Market ?
Petrochemical industry	Value Creation	Data science algorithms
Fuel, lubricants, plastics, detergents,..	Products	Efficiency, predictions, planning, recognition, behavior,..

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DIGITAL DATA MARKETPLACE CONCEPTS
AREA CONSIDERED BY OUR RESEARCH EFFORT

Concept	Data Economy
Resource	Raw Data
Ownership	Operator of data generator ?
Value	Data price ?
Transport	**Future** Internet ?
Trade	Data Market ?
Value Creation	Data science algorithms
Products	Efficiency, predictions, planning, recognition, behavior,..

FLAGSHIP RESEARCH EFFORT

Amsterdam Economic Board and University of Amsterdam coordinate a multi-disciplinary research effort, involving multiple disciplines:

**Law,
Computer Science,
Business School,
Economics,
Social Sciences**

Amsterdam houses one of the largest Internet Exchanges (AMS-IX):
*Can it house a Data Exchange that facilitates Data Marketplaces (AMS-DX)?*

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CONSEQUENCES OF MAINTAINING A MONOPOLY
SOCIETY WILL OBJECT DISPROPORTIONATE VALUE CREATION AND ENTANGLEMENT

Standard Oil got named
The Octopus, with many of its
tentacles in society.

US government created antitrust law
*to protect the public from the
failure of the market* where
unfair conduct tends to destroy
competition itself.

(Sherman Act - 1890)
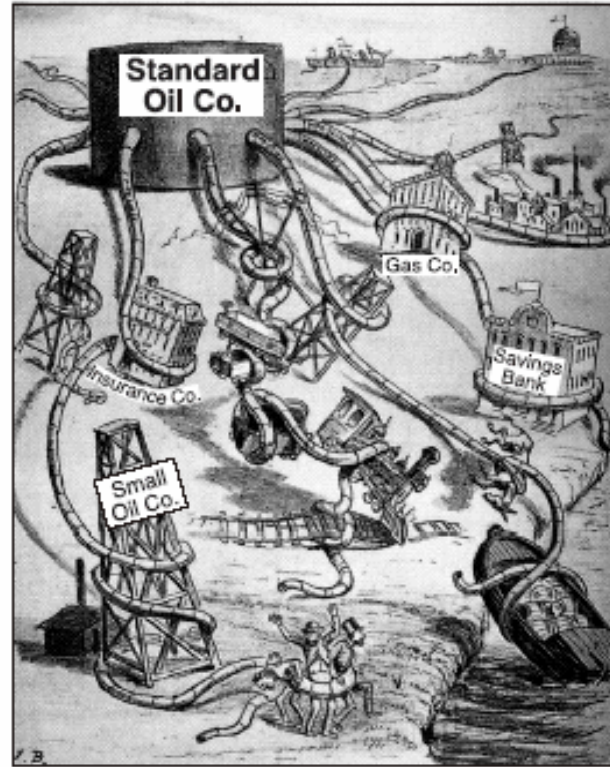
Source: Herman Viola, *Why We Remember: United States History,* Scott Foresman–Addison Wesley Publishing Co. (adapted)

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MANAGING RISK AT DATA MARKETPLACE

2) MEANS TO REDUCE RISK: **REQUIRES STEPS AT DIFFERENT LEVELS**

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

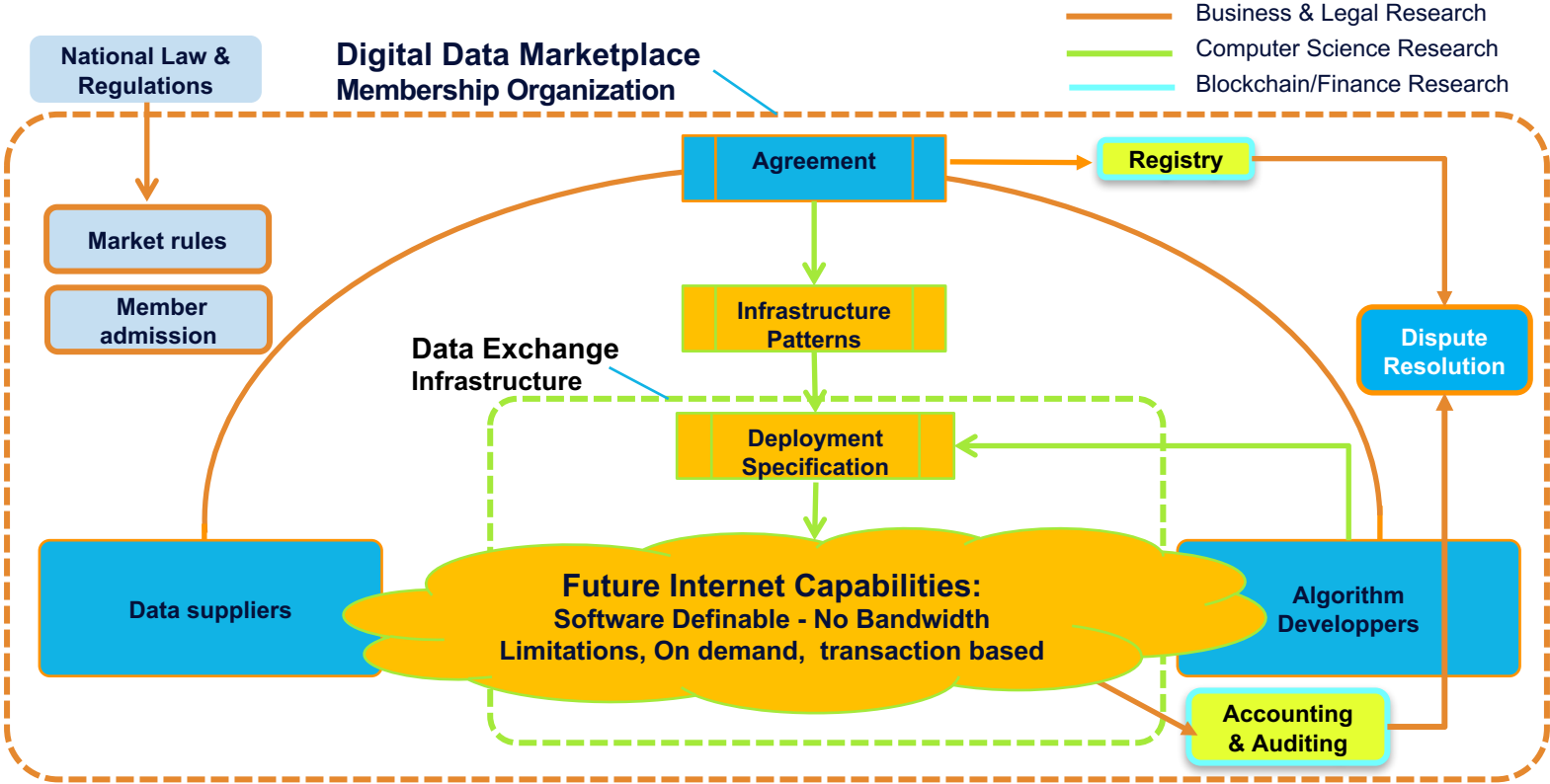Organize power and trust as a means to reduce risk for participating members

IMPLEMENT INFRASTRUCTURE

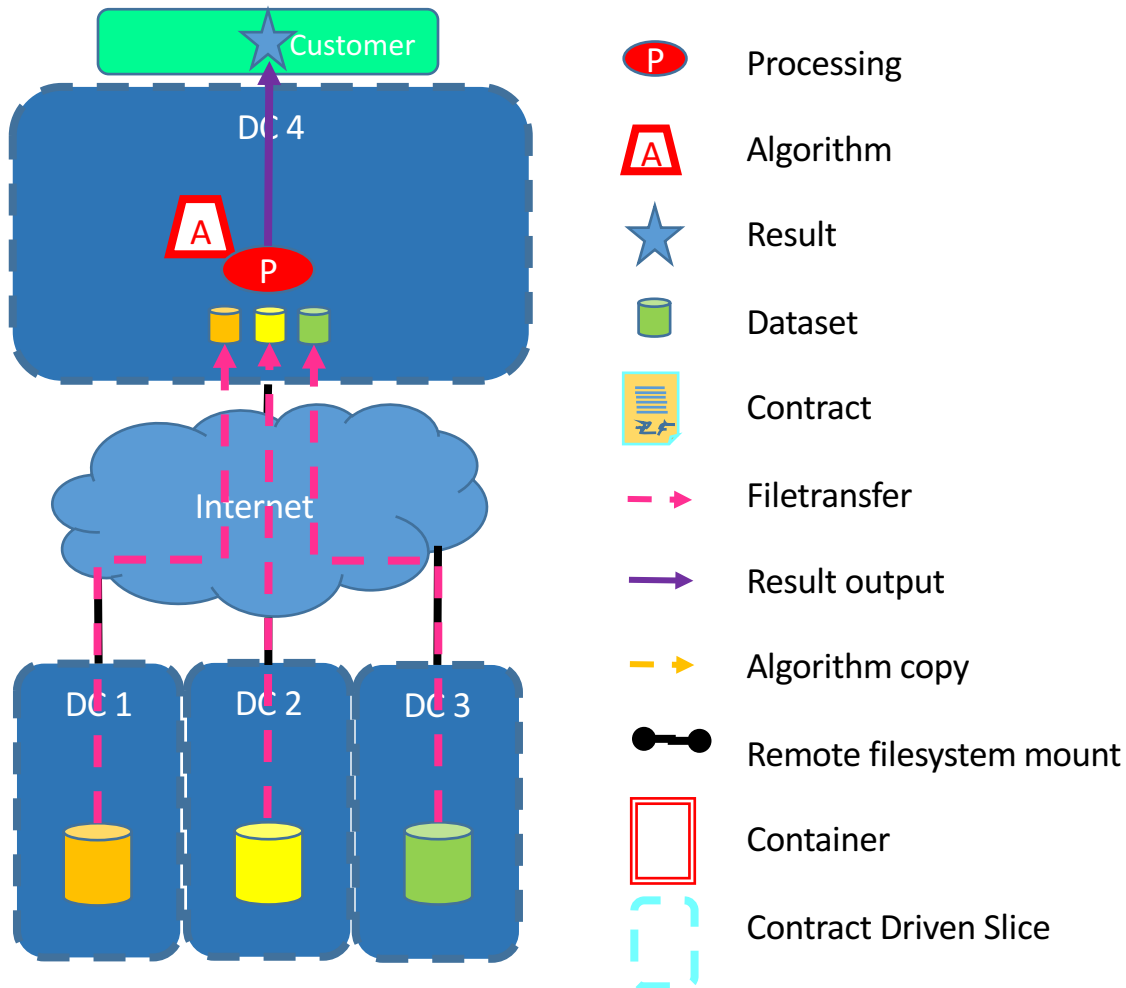Research operationalization of **Digital Data Marketplace & Data Exchange** concepts

DIGITAL DATA MARKETPLACE ARCHITECTURE

ENABLING COMPETITIVE ALGORITHM DEVELOPMENT

Business & Legal Research
Computer Science Research
Blockchain/Finance Research

National Law & Regulations

Digital Data Marketplace
Membership Organization

Agreement

Registry

Market rules

Member admission

Data Exchange Infrastructure

Infrastructure Patterns

Dispute Resolution

Deployment Specification

Data suppliers

Future Internet Capabilities:
Software Definable - No Bandwidth Limitations, On demand, transaction based

Algorithm Developpers

Accounting & Auditing

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INFRASTRUCTURE PATTERN RESEARCH
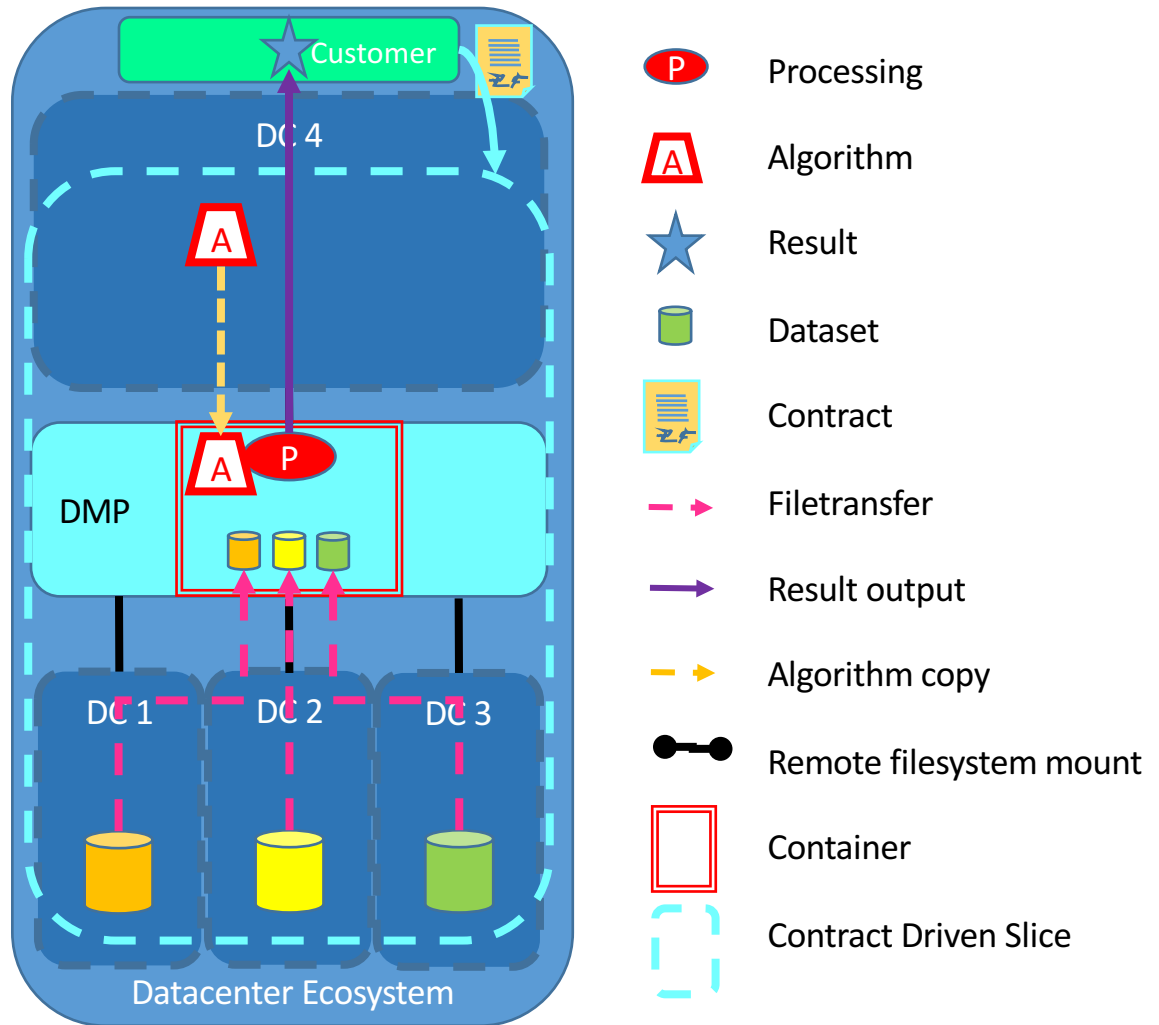
Traditional Model
(raising data owner concerns)

INFRASTRUCTURE PATTERN RESEARCH:
One of several examples

Digital Marketplace (DMP) infrastructure supports creation of (temporary) slice across data centers, implementing a data science workflow based on a contract between customer and suppliers of data and algorithm.

Generic Infrastructure is supported by a **Data Exchange**

Customer

DC 4

DMP

DC 1   DC 2   DC 3

Datacenter Ecosystem

P — Processing

A — Algorithm

★ — Result

— Dataset

— Contract

- - → Filetransfer

——→ Result output

- - → Algorithm copy

•—• Remote filesystem mount

□ Container

- - - Contract Driven Slice

RESEARCH INFRASTRUCTURE
INTERNATIONAL RESEARCH WORKING ALONGSIDE IT INDUSTRY

NETWORK RESEARCH INFRASTRUCTURES

COMMERCIAL DATACENTER INFRASTRUCTURE AS NEUTRAL GROUND

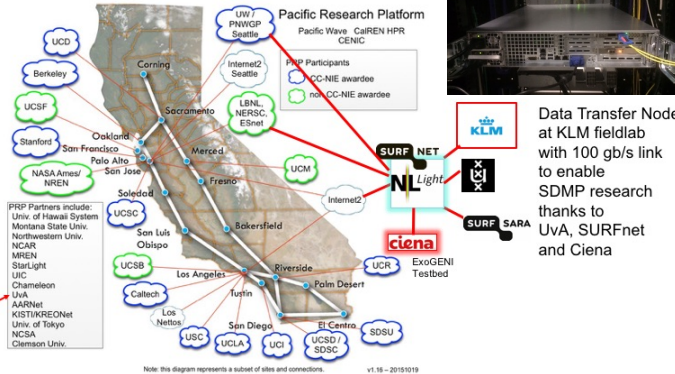**Data Sharing Infrastructure Model Research using Future Internet capabilites**

Research collaboration
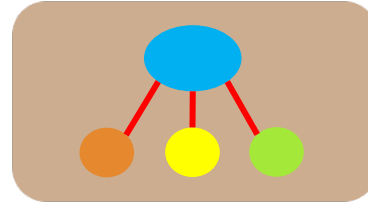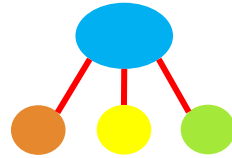
Goal: How to create a Digital Marketplace Ecosystem

prp.ucsd.edu

As foundation of the National Research Platform

Pacific Research Platform

Data Transfer Node at KLM fieldlab with 100 gb/s link to enable SDMP research thanks to UvA, SURFnet and Ciena

AM3 and AM4 Datacenters Science Park Amsterdam

SV10 Datacenter Silicon Valley

CONCLUSION

A DIGITAL MARKET PLACE:

➢ **Is created** and **governed** by an **industry membership organization** as a means to reduce risk.

➢ **Serves** a common benefit no single organization can achieve on its own.

➢ **Connects data suppliers and algorithm developers** via a software definable, membership organization owned, infrastructure.

➢ **Arranges processing as** an on-demand infrastructure **transactions**, where the infrastructure is guaranteed to be cleaned up after execution.

➢ **Infrastructure itself is delivered** by neutral Data Exchanges across the world, in the same way neutral Internet Exchanges interconnect Internet Service Providers.

THANK YOU

Want to help our research?

Email me:
leon.gommans@klm.com