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RESEARCH PROGRESS UPDATE
DIGITAL DATA MARKETPLACES

Trusted, fair and economic data sharing enabling value creation for the aerospace industry

SAE International IHVM HM-1 Meeting
April 3rd 2019 Charlotte, NC

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Technology Office R&D
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UNIVERSITEIT VAN AMSTERDAM SURF ESnet ENERGY SCIENCES NETWORK EQUINIX DELL Technologies NOKIA ciena EXCHANGEWELL A Program of SAE ITC

INTERNET HISTORY EUROPE

AMSTERDAM SCIENCE PARK

1988:
The Internet landed in Europe at CWI

1994:
The Amsterdam Internet Exchange housed at NIKHEF

Now > 60 datacenters emerged around the Amsterdam Internet Exchange, creating 12.500 jobs*
Digital Reality (3.0B$ >175 DCs) Equinix (4.4 B$ >200 DCs)

University of Amsterdam
Faculty of Science
located right in the middle

Data centers are neutral places housing equipment from multiple (cloud) providers in separate ‘cages’

* Source 2019 report datacenters and employment, Dutch Datacenter Association

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WHAT IS IT ABOUT?

A DIGITAL DATA MARKET PLACE:

- **Serves a common benefit no single organization can achieve on its own.**
- **Is created and governed by an industry consortium as a means to reduce risk, ensuring competition, fairness and trust.**
- **Supply members advertise their assets, contracts arrange asset access and usage by other members.**
- **To prevent data asset exposure, members can use a consortium governed infrastructure to execute data science scenario's**
- **Allows consortia to implement (digitally) enforceable contracts, whilst supporting dispute resolution by immutable logging.**

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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 using data to predict maintenance need & optimize planning

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

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RESEARCH QUESTION

CONTEXT: DATA SCIENCE ALGORITHM DEVELOPMENT

Taking into consideration:

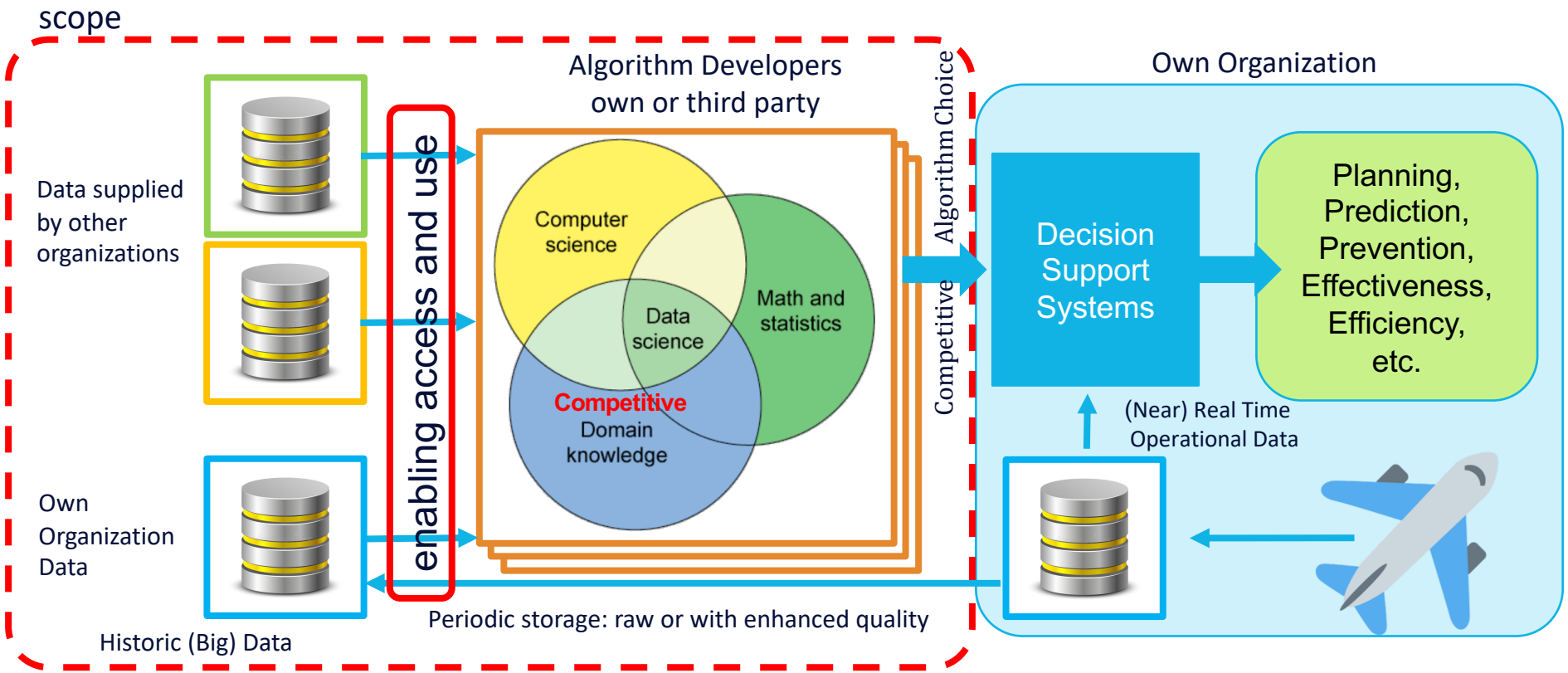
1) **The value creation potential of data sharing to increase algorithm accuracy**
2) **Disproportionate value generation by data platforms creating monopolies**

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?***

RESEARHING DATA SHARING SOLUTIONS:

A DIGITAL DATA MARKETPLACE GOVERNED BY A MEMBERSHIP CONSORTIUM



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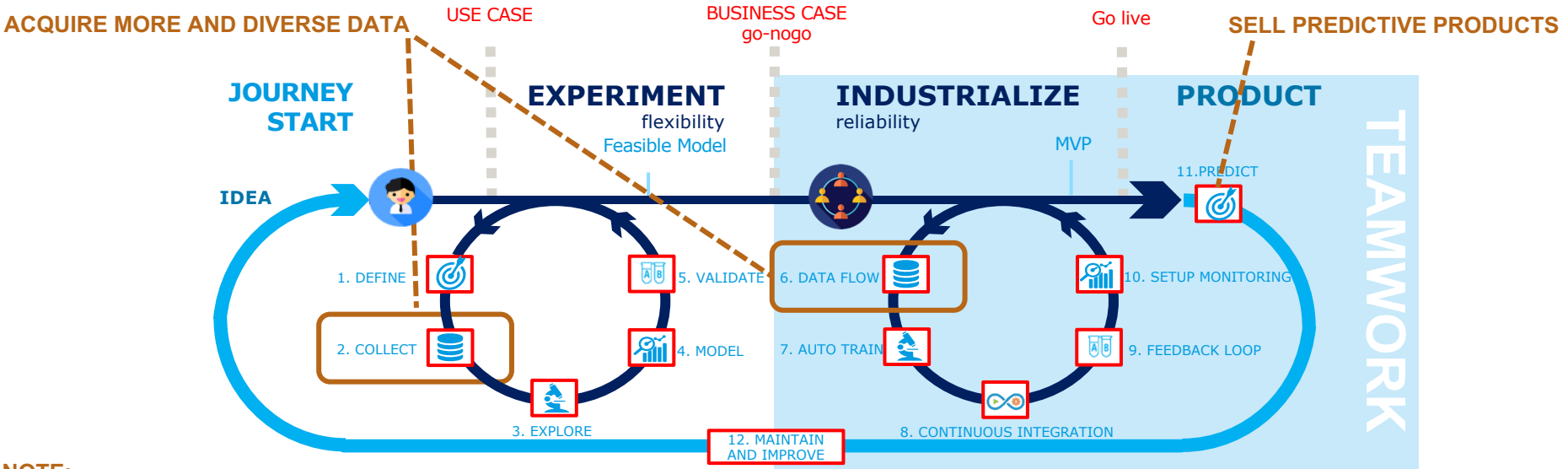
JOURNEY OF THE DATA SCIENTIST / ENGINEER

ROLE OF THE DIGITAL DATA MARKETPLACE



NOTE:
KNOWLEDGE SHARING IN OTHER PHASES (4,7,9,10) MAY ALSO BE A GOALS OF COLLABORATION IN A MARKETPLACE COMMUNITY.

DEFINE (1-3)	EXPERIMENT (4-5)	INDUSTRIALIZE (6-10)	IMPROVE (11-12)	SHARE
What is the end purpose? How will it add value? Use case, data scope and stakeholders identification	**Collect and explore data, research data science model** Prototype, go/nogo to production	**Deliver the solution in production environment** Product GO live	**Feedback analysis, A/B testing, and performance monitoring** New product releases, business insights	

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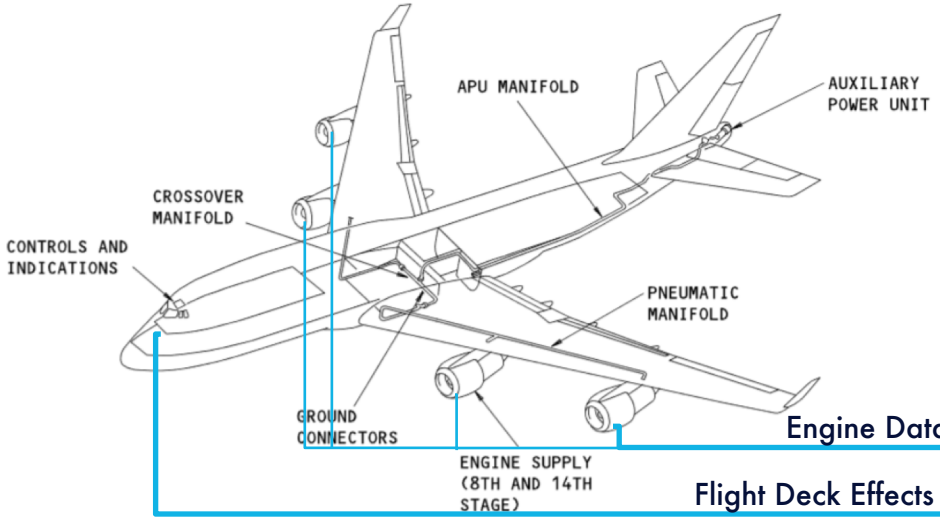
USE-CASE – THE 747 BLEED AIR SYSTEM

WHERE DATA IS SPLIT ACROSS THREE PLACES.

Imagine if data scientist can use historic data from 747 aircraft operated by multiple airlines.

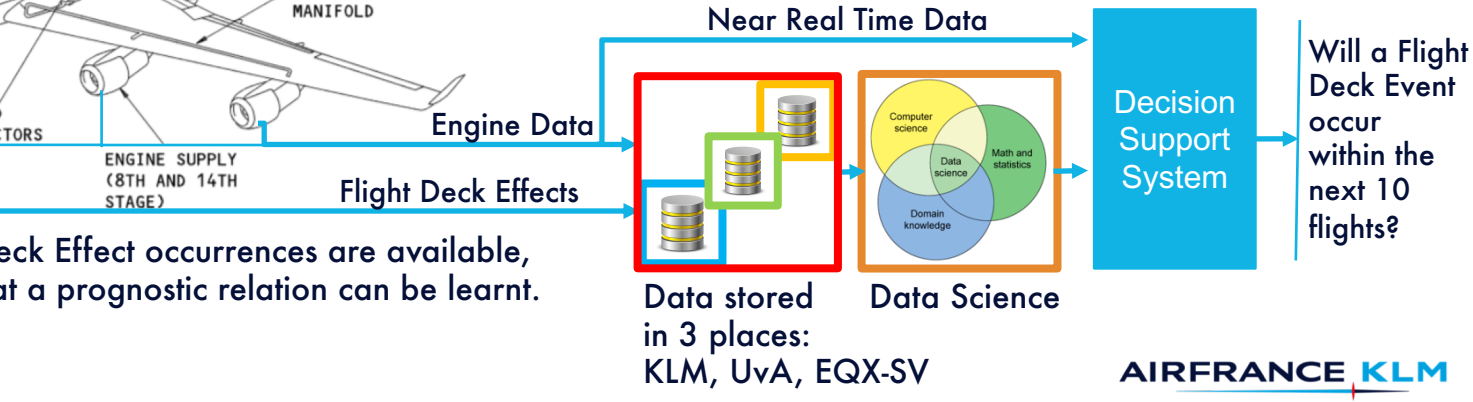


The more Flight Deck Effect occurrences are available, the more likely that a prognostic relation can be learnt.

The Bleed Air System regulates pressure and temperature of air from a turbine engine needed by other aircraft systems taking care of:

- cabin pressure
- de-icing
- water pressure
- and more..

Flight Deck Effects indicate system functionality decreases and may trigger maintenance actions



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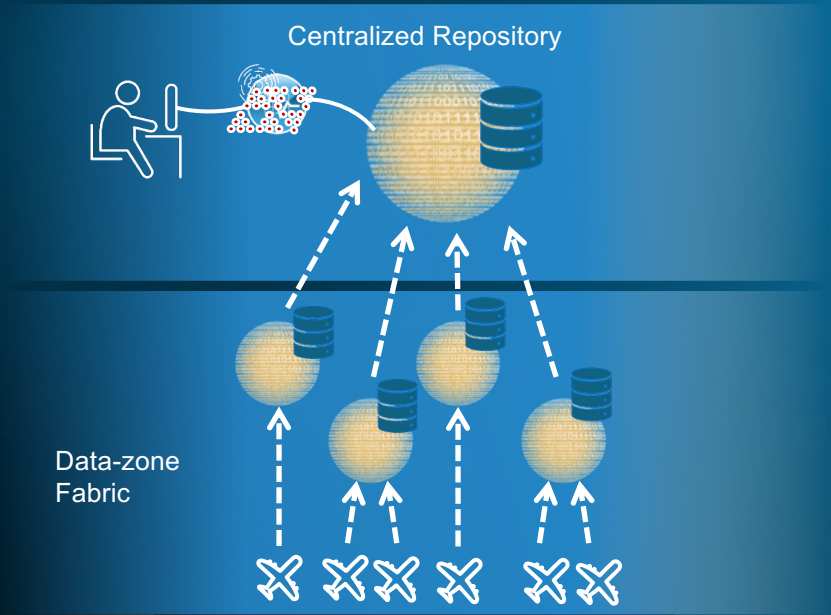
Training Strategies

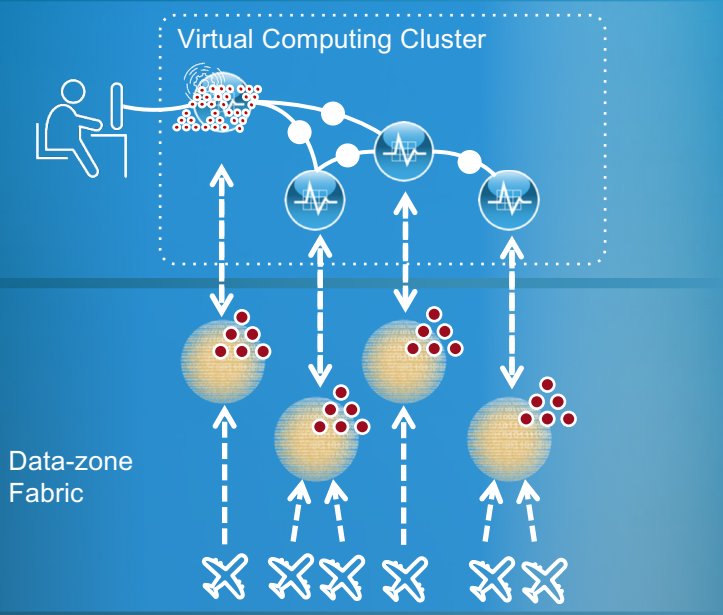
Centralized

Raw data transferred from dispersed data zones to a central repository for analysis



Federated

Raw data stays in place. Model trained through orchestration of local (at each data-zone) and global computations



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DIGITAL DATA MARKETPLACE GOVERNANCE

A FOUR STEP APPROACH

ExchangeWell | DEMO

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** concepts

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EXCHANGEWELL™
A Program of SAE ITC

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

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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

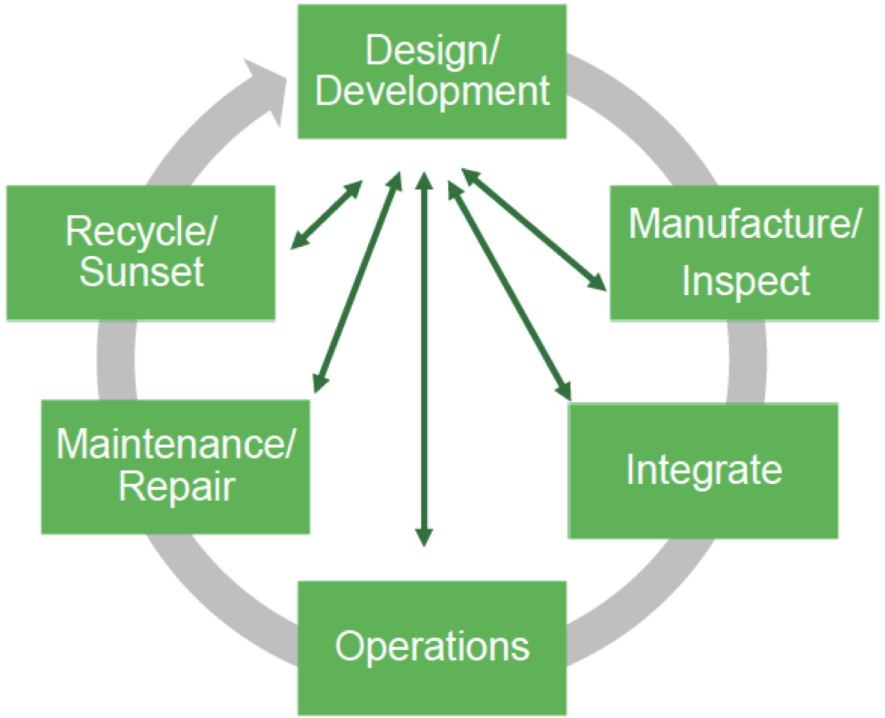
Collaborative Innovation.
Trusted Implementation.

STAKEHOLDERS

INTEGRATED PRODUCT CYCLE

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



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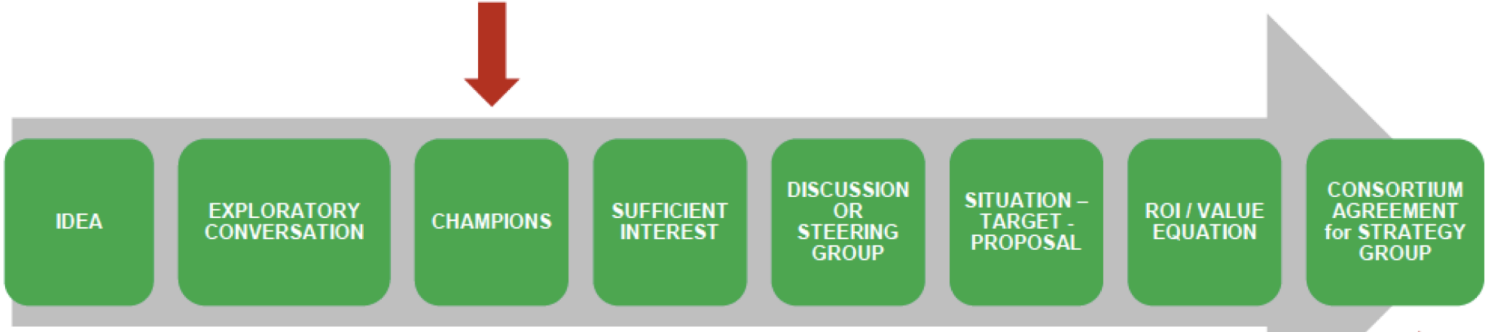
SAE ITC

CONSORTIUM MATURATION PATH

We're here!
ExchangeWell



We're here!
ARINC IA

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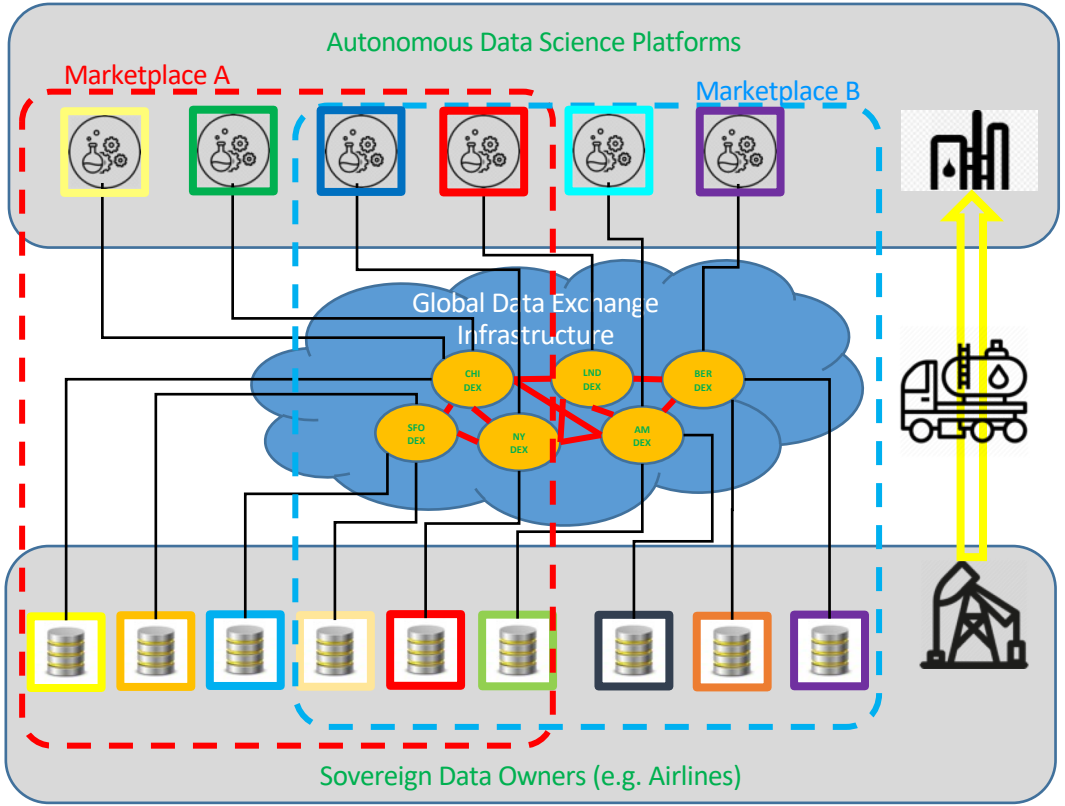
DATA EXCHANGE CONCEPT



amsterdam economic board

AMdEX
THE DATA HYPERMARKET

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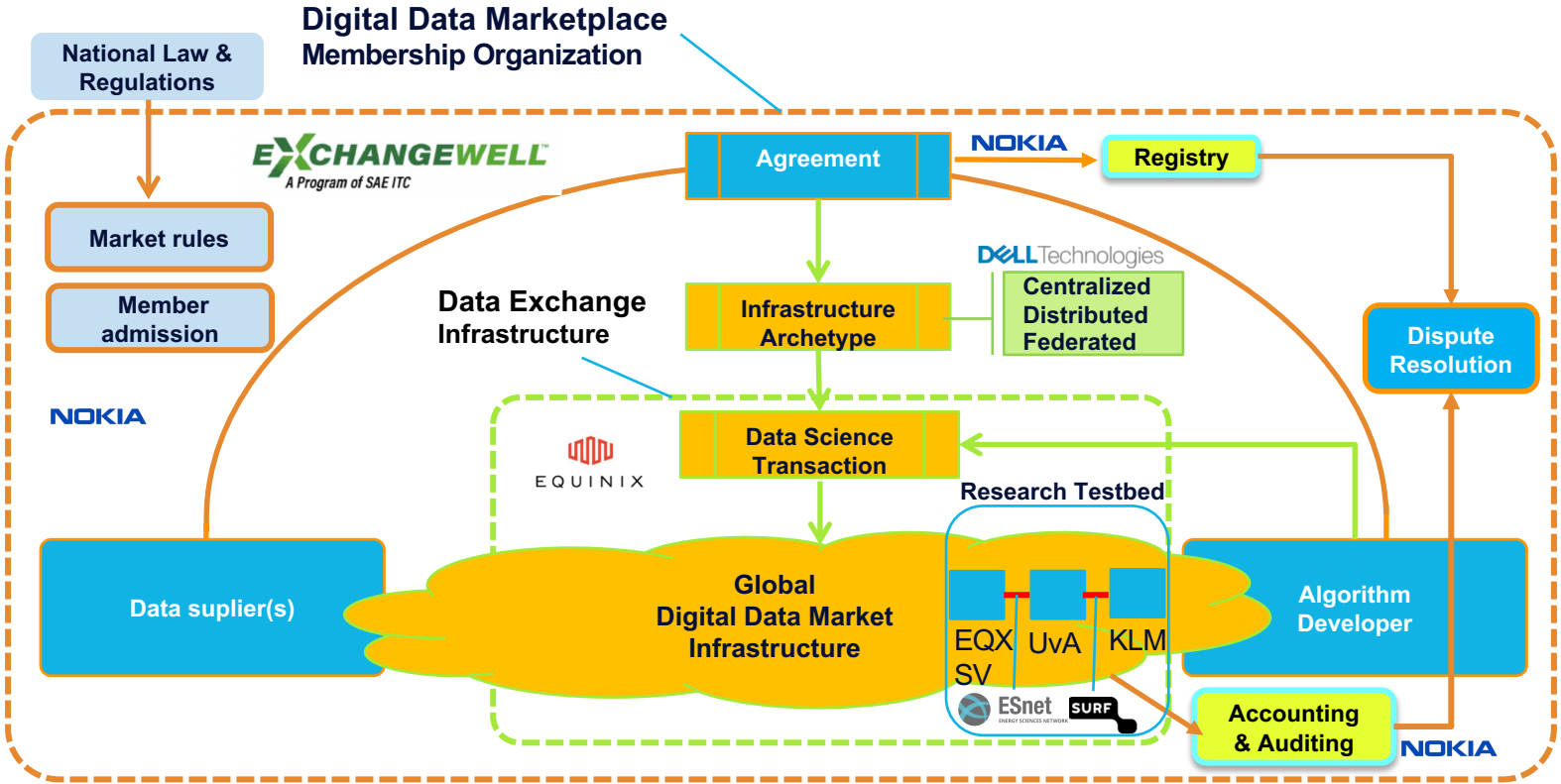
DIGITAL DATA MARKETPLACE ARCHITECTURE

RESEARCHING IMPLEMENTATION OF ESSENTIAL ELEMENTS



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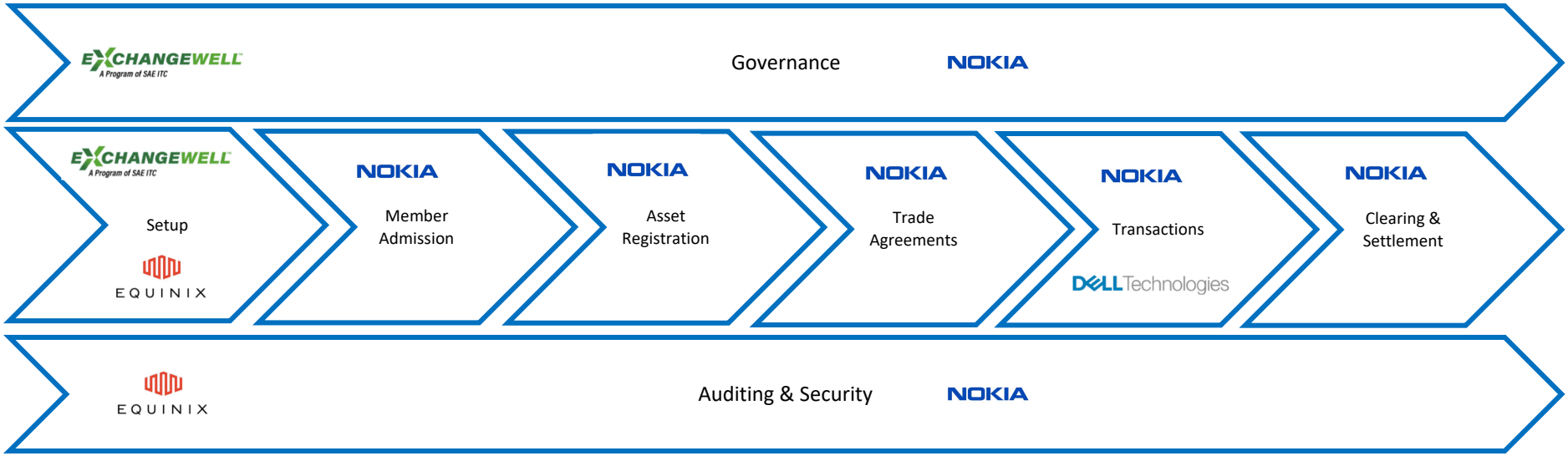
DEMO



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QUESTIONS

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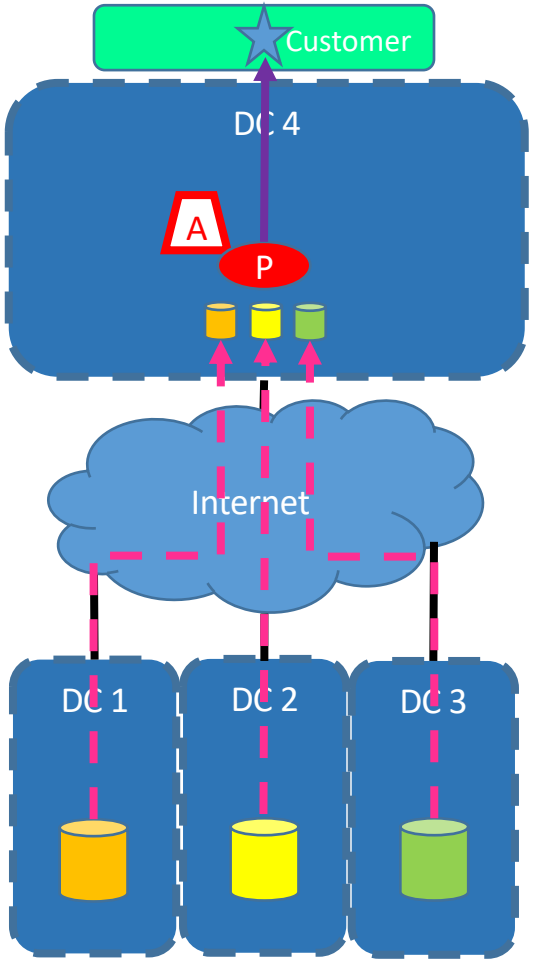
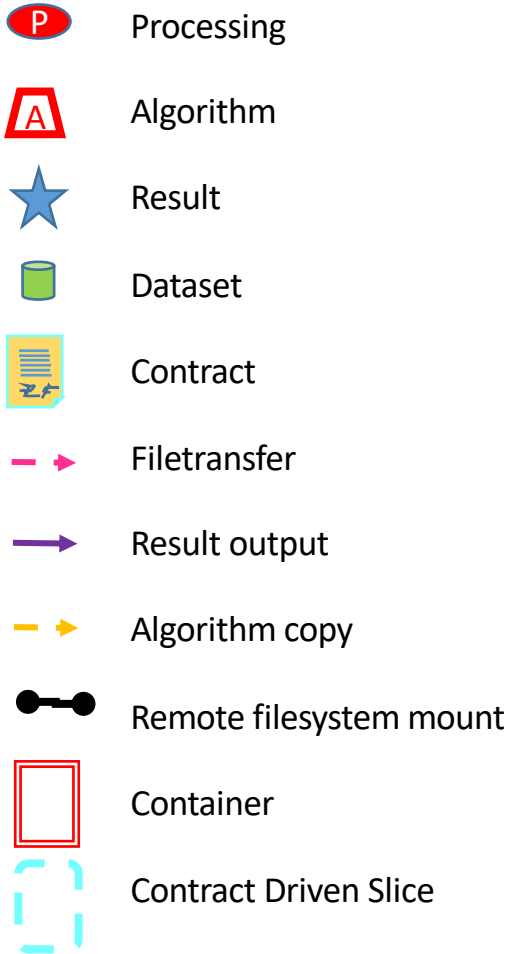
APPENDIX: INFRASTRUCTURE ARCHETYPES

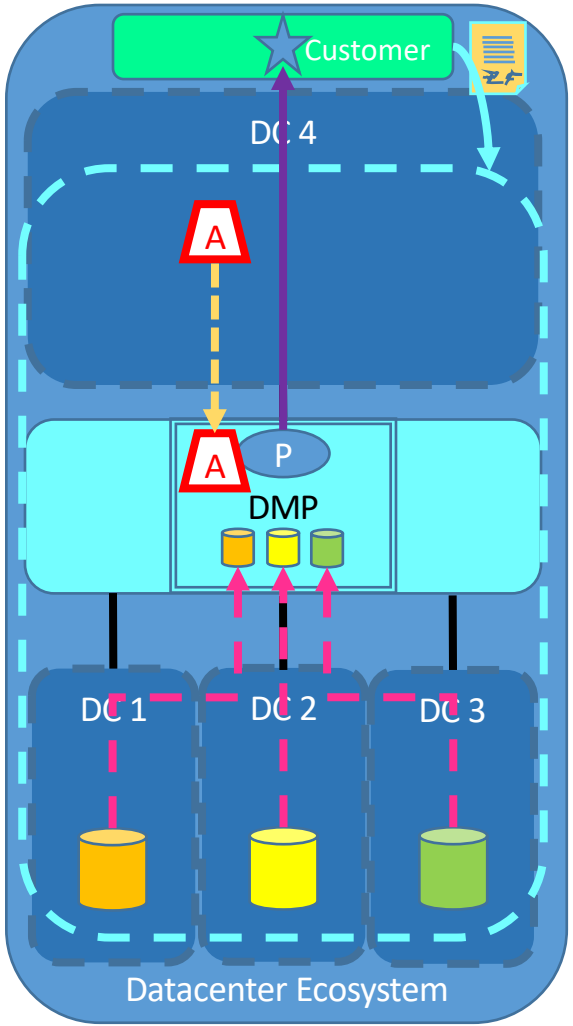
RESEARCHED FOR THEIR APPLICABILITY AT UNIVERSITY OF AMSTERDAM

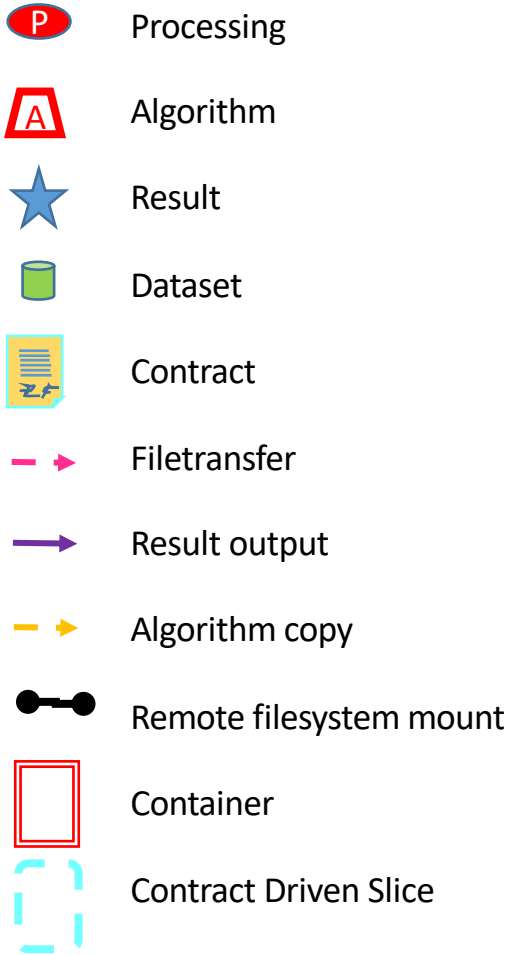
INFRASTRUCTURE MODELS: Traditional

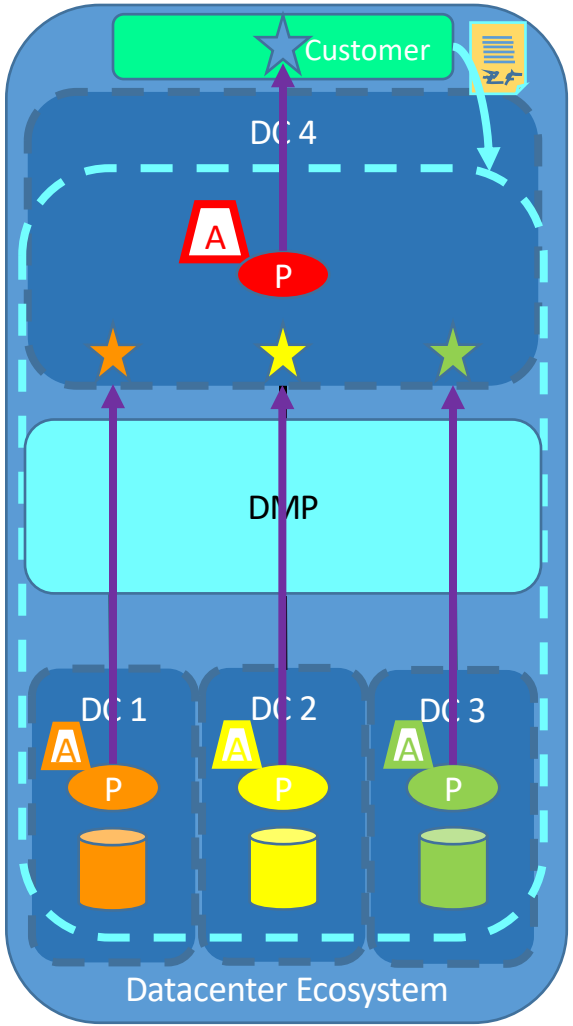




INFRASTRUCTURE MODELS:
DMP arranged,
between members
via datacenter ecosystem






Customer
DC 4
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DMP
DC 1
DC 2
DC 3
A
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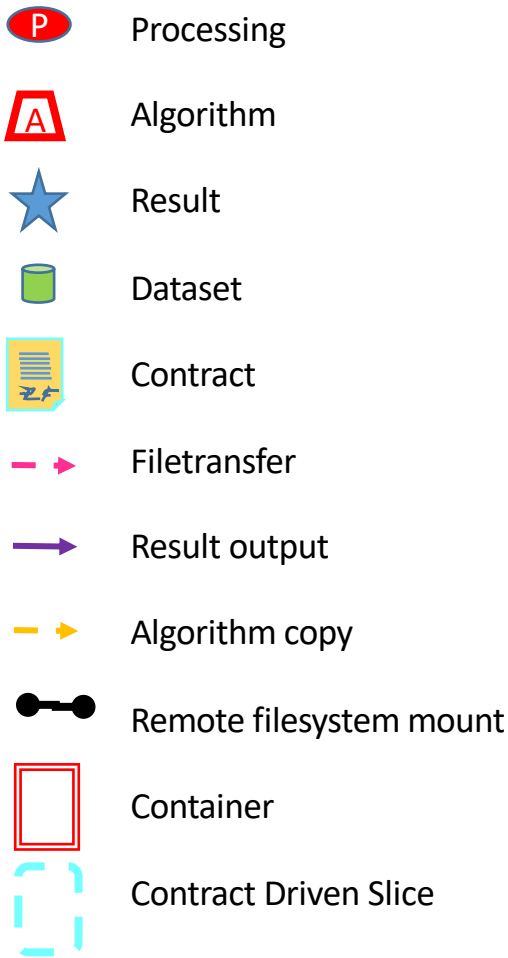
Datacenter Ecosystem


P
Processing
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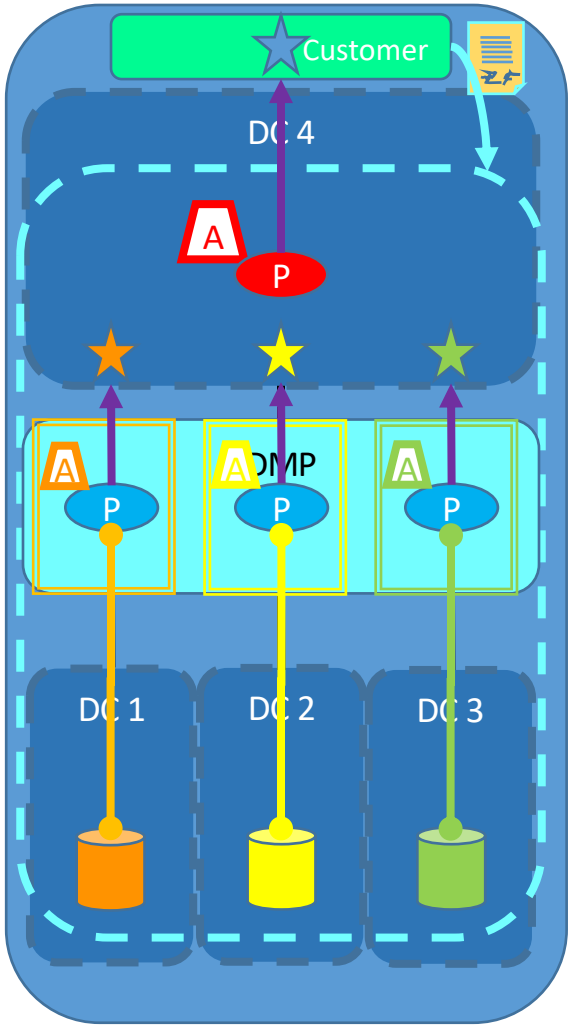
Algorithm
Result
Dataset
Contract
Filetransfer
Result output
Algorithm copy
Remote filesystem mount
Container
Contract Driven Slice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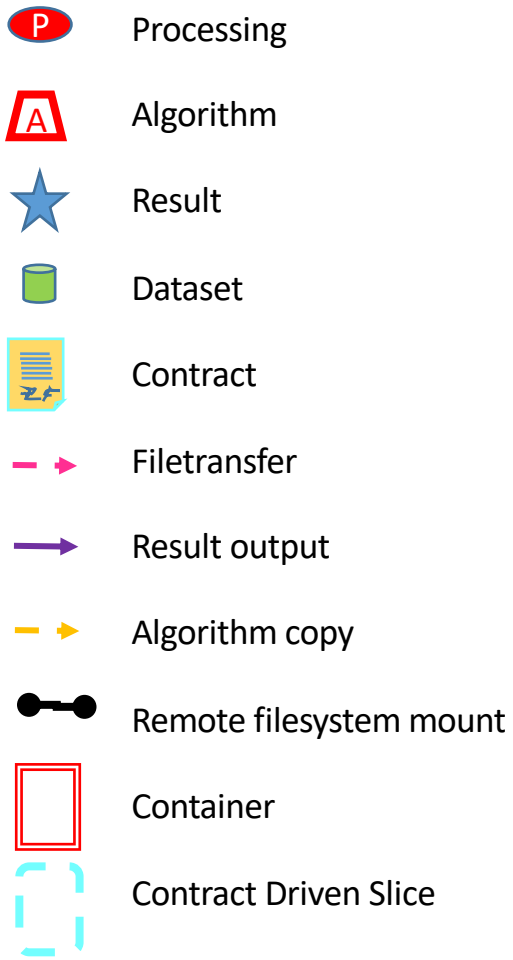
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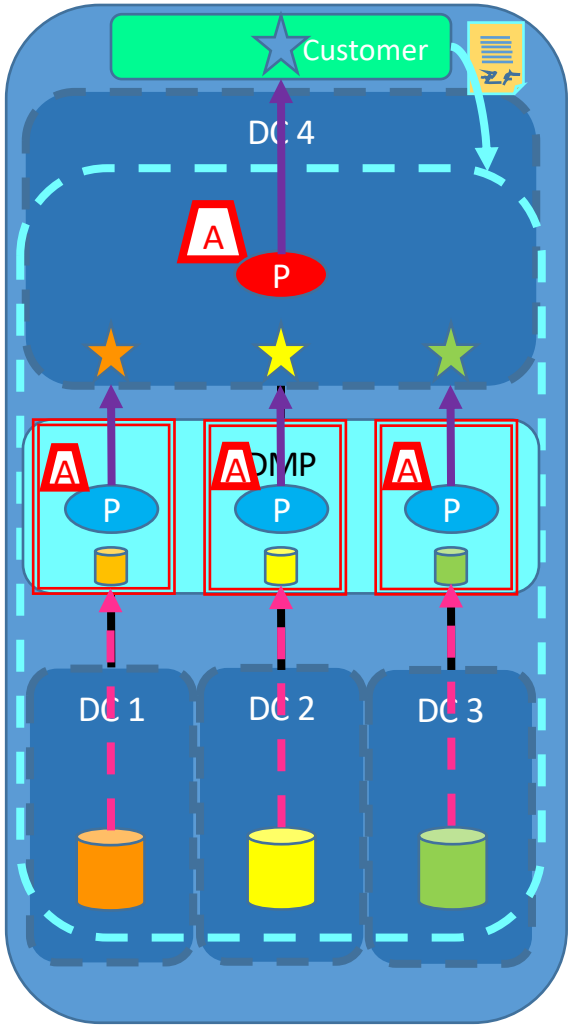

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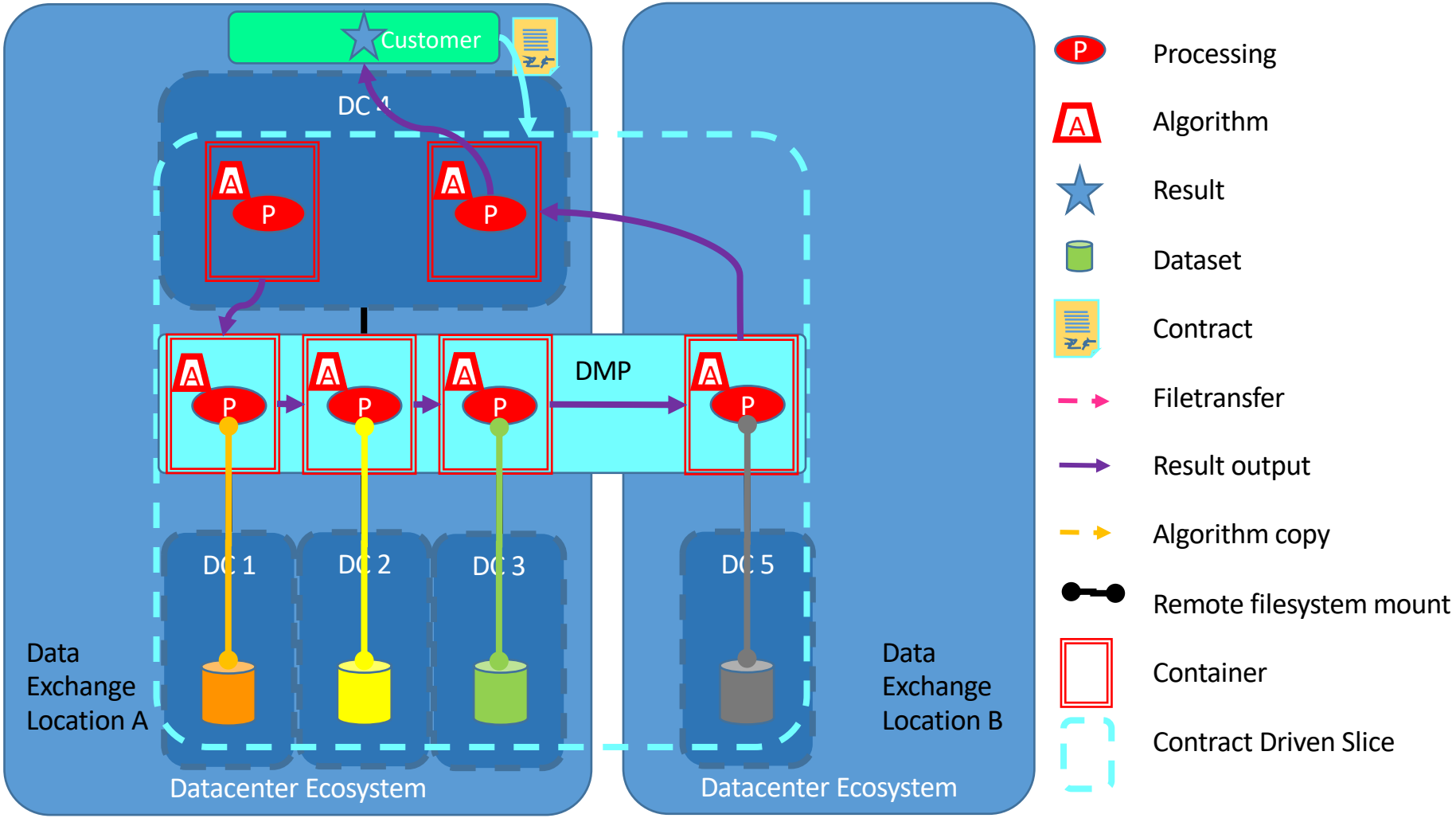
Customer
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Data
Exchange
Location A
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Data
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