independent data consortium for aviation

Creating a norm compliant data sharing environment for the aviation industry

The World's First Norm Engineering Conference

Jan. 28th 2025

Amsterdam Science Park

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www.dataforaviation.org

Content

- Who am I
- Motivation for data sharing serving safety and efficiency
- Data sharing approaches
- Research approach at UvA involving consortium governance
- Data sharing challenges
- Organizing trustworthy data sharing via a Digital Data Marketplace
- Outline of the Independent Data Consortium for Aviation
- Next: Trust4Data, a research proposal to validate and demonstrate norm compliant data sharing infrastructures

LEON GOMMANS

1978
Send my first
e-mail via ADP
Network Services

Student
Chr. HTS Hilversum
Electronic Engineering

1981 – 2001
Several IT industry
functions

1996: CTO Office
Cabletron Systems
EMEA

2001 - 2008
Sr. Researcher
Systems & Network
Engineering Group
University of
Amsterdam

2014: PhD Multi-
domain Authorization

2008 - 2015
Sr. Infrastructure
Architect.

2015 – 2024
Science Officer
CIO Office R&D

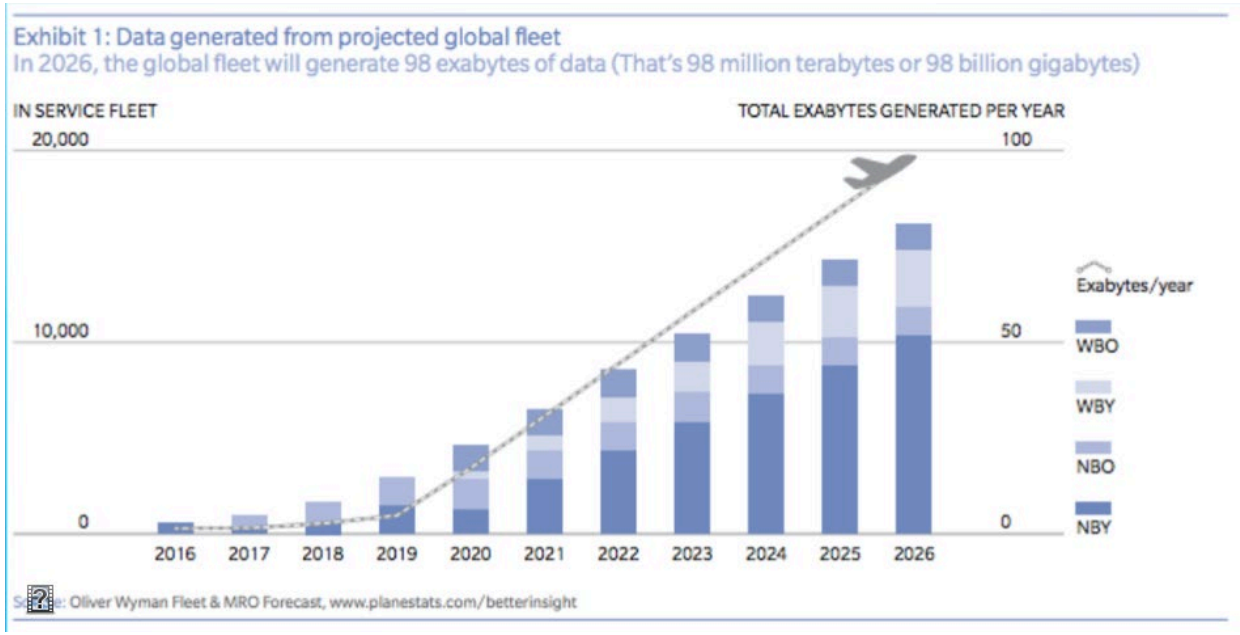
2019 Prof. Data
Exchange Systems

2022 Vice President
IDCA

MOTIVATION TO APPLY PHD RESEARCH

AIRCRAFT INCREASINGLY COLLECT DATA THAT CAN BE SHARED TO CREATE VALUE

A modern aircraft, such as the Boeing 787, is able to generate terabytes of data per flight



At start of our research in 2016:
Oliver Wyman claimed that by 2026, the total fleet of about 20.000 aircraft is expected to generate 98 exabytes (million terabytes) of data per year.
Multiple airline operators, however, 'own' such data

DATA SUPPORTING AIRCRAFT MAINTENANCE

ARTICLE ‘FINANCIEEL DAGBLAD’ SEP 2021

TECH EN MEDIA

Waarom KLM zelfs data uit de airco verzamelt

Sandra Olsthoorn Jan Fred van Wijnen 30 sept '21 05:57

Vliegen gaat veiliger en efficiënter als alle data uit alle toestellen van alle luchtvaartbedrijven worden gedeeld en geanalyseerd. Maar welk bedrijf wil nu gegevens delen met de concurrent? Digitale marktplaatsen voor gegevens moeten de impasse doorbreken. Want als één overstag gaat, volgt de rest.

Onderhoud aan een KLM-vliegtuig in Hangaar 11 op Schiphol-Oost. Foto: Ramon van Flymen voor het FD

Fontein van digitale signalen

Wat hier gebeurt, zou sneller kunnen. Als KLM maar genoeg data zou hebben. Aan de Boeing 777-200 ligt het niet. Zoals veel moderne apparaten is ook het vliegtuig een fontein van digitale informatie die elke seconde iets vertellen over de onderdelen. Maar je kunt er pas wat mee, legt Kalfsbeek uit, als je gegevens hebt van honderdduizenden vluchten. Liefst ook van andere luchtvaartmaatschappijen.

'Ons einddoel is dat we voor elk individueel onderdeel voorspellen wanneer het onderhoud nodig heeft', zegt hij. 'We willen geen reparaties omdat er ineens iets stuk gaat. Maar ook geen preventief onderhoud als het niet nodig is. We zoeken het optimum daartussen, zodat het toestel zoveel mogelijk in de lucht is en zo kort mogelijk in de hangar.'

De beste oplossing zou zijn dat data van alle vliegtuigen wordt verzameld en gedeeld door de hele branche: fabrikanten, onderhoudsbedrijven, luchtvaartmaatschappijen. In theorie heeft iedereen hier baat bij, maar niemand wil de eigen data zomaar prijsgeven, zonder iets terug te krijgen. En dus gebeurt het nu niet.

Prisoner's dilemma

Dit probleem speelt in elke bedrijfstak die data produceert. Het is het klassieke, uit de speltheorie bekende prisoner's dilemma: iedereen houdt elkaar gevangen in een situatie die voor iedereen ongunstig is. Niemand zet de eerste stap, want misschien profiteert een ander daarvan, zonder er iets voor terug te geven.

100.000

Tijdens een gemiddelde vlucht worden er 100.000 (digitale) signalen gemeten in een Boeing 777-200.

Om hier beweging in te krijgen wordt in Amsterdam gewerkt aan een digitale, publieke markt waar data wordt uitgestald, de AMdEX (Amsterdam Data Exchange). Ieder bedrijf en organisatie kan hier straks data aanbieden en eventueel verkopen. KLM is een van de partners in de ontwikkeling. Het verschil met een gewone markt is dat de aanbieder zelf bepaalt wie de spullen, in dit geval dus gegevens, krijgt. De aanbieder heeft ook zeggenschap over wat de gebruiker er vervolgens mee doet.

KLM Participating In AMdEX project

Key requirement: Supplier must have control over how data is used and processed

Aviation becomes **safer** and more **efficient** if all data from all aircraft from all airlines can be shared and analyzed. A data marketplace can be a means to overcome challenges causing reluctance to share data.

AIRFRANCE KLM GROUP

MAKING AVIATION SAFER

ISSUE OF EMERGENCY AIRWORTHINESS DIRECTIVE WAS RESULT OF SAFETY SURVEILLANCE ON AIRCRAFT DATA SUPPLIED BY MULTIPLE AIRLINE OPERATORS

EASA AD No.: 2022-0170-E

EASA
European Union Aviation Safety Agency

Emergency Airworthiness Directive

AD No.: 2022-0170-E

Issued: 17 August 2022

Note: This Emergency Airworthiness Directive (AD) is issued by EASA, acting in accordance with Regulation (EU) 2018/1139 on behalf of the European Union, its Member States and of the European third countries that participate in the activities of EASA under Article 129 of that Regulation.

This AD is issued in accordance with Regulation (EU) 748/2012, Part 21.A.3B. In accordance with Regulation (EU) 1321/2014 Annex I Part M.A.301, or Annex Vb Part ML.A.301, as applicable, the continuing airworthiness of an aircraft shall be ensured by accomplishing any applicable ADs. Consequently, no person may operate an aircraft to which an AD applies, except in accordance with the requirements of that AD, unless otherwise specified by the Agency [Regulation (EU) 1321/2014 Annex I Part M.A.303, or Annex Vb Part ML.A.303, as applicable] or agreed with the Authority of the State of Registry [Regulation (EU) 2018/1139, Article 71 exemption].

Design Approval Holder's Name: AIRBUS S.A.S.

Type/Model designation(s): A330 aeroplanes

Effective Date: 18 August 2022
TCDS Number(s): EASA.A.004
Foreign AD: Not applicable
Supersedure: None

ATA – Aircraft Flight Manual – Section Limitations – Amendment
ATA – Master Minimum Equipment List – Amendment

Manufacturer(s):
Airbus

Applicability:
Airbus A330-841 and A330-941 aeroplanes, all manufacturer serial numbers (MSN).

Definitions:
For the purpose of this AD, the following definitions apply:

None

Reason:
Occurrences were reported of leaking Bleed System High Pressure Valves (HPV), apparently due to HPV clip failure and sealing ring damage. A leaking HPV may expose the Pressure Regulating Valve (PRV), which is installed downstream from the HPV, to high pressure, possibly damaging the PRV itself and preventing its closure, when required.

This condition, if not detected and corrected, could lead to high pressure and temperatures in the duct downstream from the PRV, with possible duct burst, damage to several systems and consequent loss of control of the aeroplane.

Airbus issued Flight Operations Transmission (FOT) 999.0062/22 to provide advance information and instructions to operators.

For the reasons described above, this AD requires amending of the applicable Aircraft Flight Manual (AFM), and implementing dispatch restrictions. This AD also requires reporting of specific maintenance messages to Airbus.

This AD is considered to be an interim action, and further AD action may follow.

Required Action(s) and Compliance Time(s):
Required as indicated, unless accomplished previously:

AFM Amendment:
(1) Before next flight after the effective date of this AD, amend the applicable AFM by incorporating the additional limitation as defined in Appendix 1 of this AD, inform all flight crews and, thereafter, operate the aeroplane accordingly.

Dispatch Restrictions:
(2) From the effective date of this AD, do not dispatch any aeroplane under the provision of any of the following A330 Master Minimum Equipment List items:

- 21-52-01 – Packs
- 36-11-01 – Engine Bleed Air Supply System
- 36-11-06 – Engine Bleed IP Check Valve
- 36-11-07 – Engine Bleed HP Valve.

This can be accomplished amending the operator Minimum Equipment List, informing all flight crews and, thereafter, operating the aeroplane accordingly.

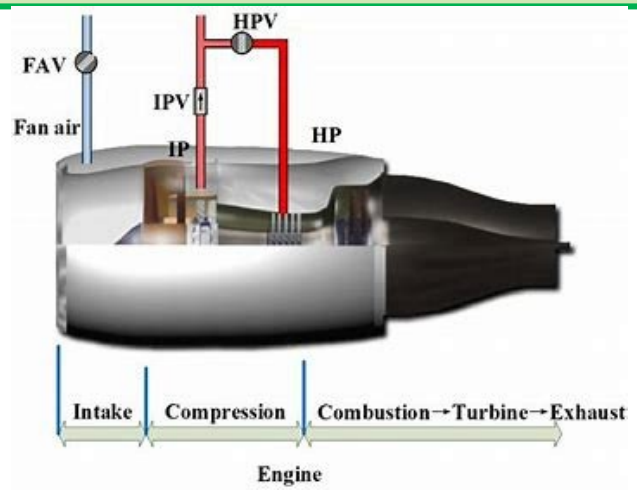
Reporting / Additional Maintenance:
(3) From the effective date of this AD, before next flight after any AIR ENG 1(2) BLEED FAULT, contact Airbus for applicable instructions and accomplish those instructions accordingly.

Ref. Publications:
None

Remarks:
1. If requested and appropriately substantiated, EASA can approve Alternative Methods of Compliance for this AD.
2. The results of the safety assessment have indicated the need for immediate publication and notification, without the full consultation process.

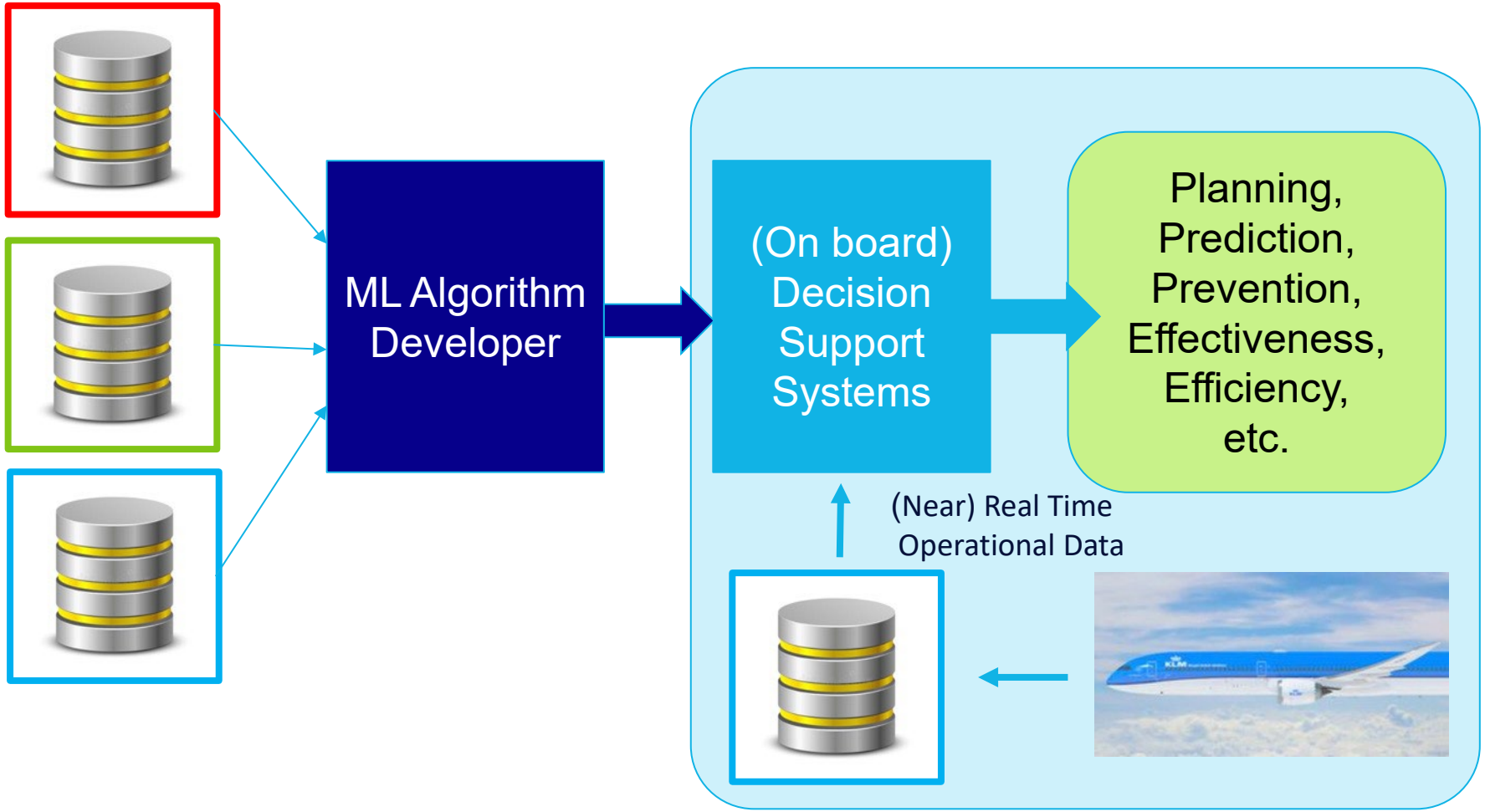
Occurrences were reported of leaking Bleed System High Pressure Valves (HPV), apparently due to HPV clip failure and sealing ring damage. A leaking HPV may expose the Pressure Regulating Valve (PRV),..

This condition, if not detected and corrected, could lead to high pressure and temperatures in the duct downstream from the PRV, with **possible duct burst, damage to several systems and consequent loss of control of the aero plane**.



MAKING AVIATION MORE EFFECTIVE

A COMMERCIAL INTEREST USE-CASE



B2B DATA SHARING APPROACHES

AS RECOGNIZED BY EU BASED ON ANALYSIS OF SITUATION BY EVERIS

Case studies | Approaches to B2B data sharing

European Commission

everis an NTT DATA Company

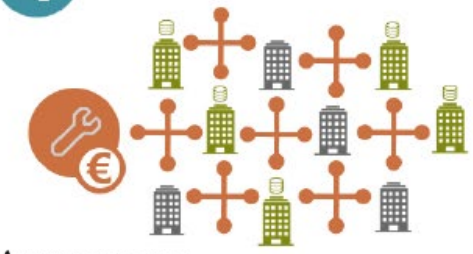
Five different approaches to B2B data sharing

1 DATA MONETISATION

2 DATA MARKETPLACES

3 INDUSTRIAL DATA PLATFORMS

4 TECHNICAL ENABLERS



5 OPEN DATA

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 MAN

Source http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=49352

INDEPENDENT DATA CONSORTIUM FOR AVIATION

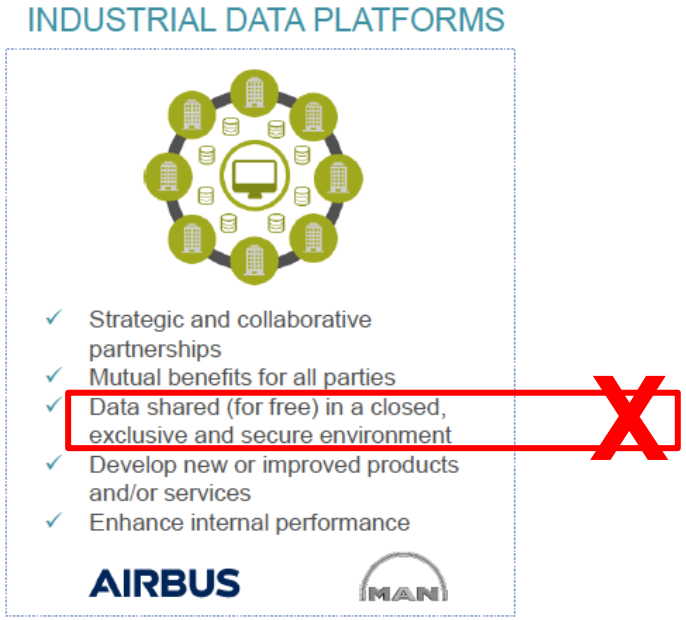
CONTEXT

	Be king of the hill	Resolve community concerns
Platform Purpose	Serving self-interest	Serving common interest
Trust	Organized by single party	Organized by members
Platform	Single owned	Consortium owned
Challenge	Reluctance to share data	Willingness to share data: focus on reaching critical mass

DATA SHARING RESEARCH APPROACH

A NEUTRAL PLACE PROVIDES AN INDUSTRY PLATFORM AS A DATA MARKETPLACE

Combine approach 2+3 ;
where a Data Marketplace acts as independent Industrial Data Platform
governed by an industry consortium



What role should a consortium play?

Airbus industrial data platform is hosted in Palantir Cloud.
Palentir is controvesial e.g UK NHS was forced
to cancel contract with Palantir due to privacy concerns

DATA SHARING CONCERNS
TO BE CONSIDERED BY CONSORTIUM

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

Many implications need to be considered:

Business level

Value
Cost
Benefits
Agreements
Exchange
Trade

Legal level

Ownership
Access
Usage
Compliancy
Liability
Market Rules

Data level

Processing
Storage
Management
Transport
Transform
Security

Global diversity in law & regulation

DIGITAL DATA MARKETPLACE RESEARCH

IS BASED ON FOUR STEP APPROACH

Consortium Governance

Automating norms

Data Market

COMMON BENEFIT

Define and agree common benefit no single organization can achieve on its own and transcend self-interest.

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

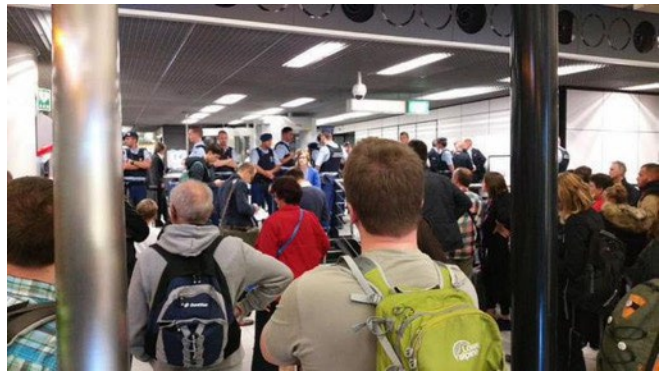
Research operationalization of **Digital Data Marketplace** & **Data Exchange** concepts

DATA SHARING ARCHETYPES

FOCUS IS ON HISTORICAL DATA SHARING FOR ML DEVELOPMENT

Streaming Data

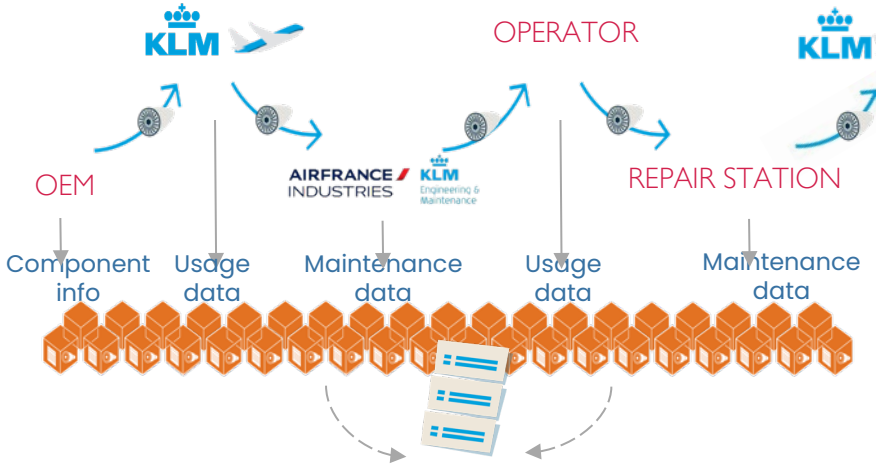
Sharing sensor data



Passenger volume monitoring at Schiphol Airport

Transactional Data

Tracking part event data to create a back to birth history of a part



Digital data sharing between chain partners, is still a largely paper based process

Historical Data

ML development to support maintenance decision taking.

Algorithm development for predictive maintenance

The more data, the better an algorithm may become

DIGITAL DATA MARKETPLACE CONCEPT

FOR ML DEVELOPMENT WHERE DEMAND AND SUPPLY IS ORGANIZED

Data suppliers

Digtal Data Marketplace
data sharing agreements

Data users

Atlanta

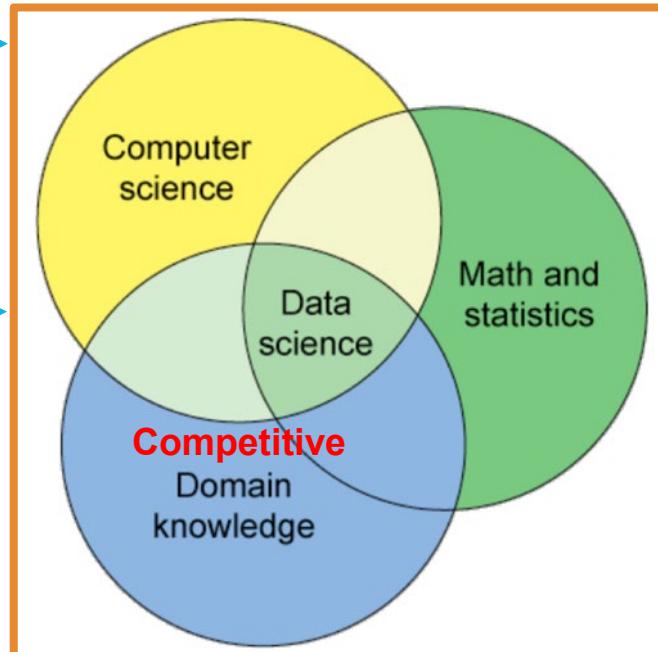
Paris

Amsterdam

Historic Data

Data Exchange supporting a Digital Data Marketplace

KLM Engineering as ML developer



Periodic storage

Consortium rule governance

KLM Airline as customer

(On board) Decision Support Systems

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

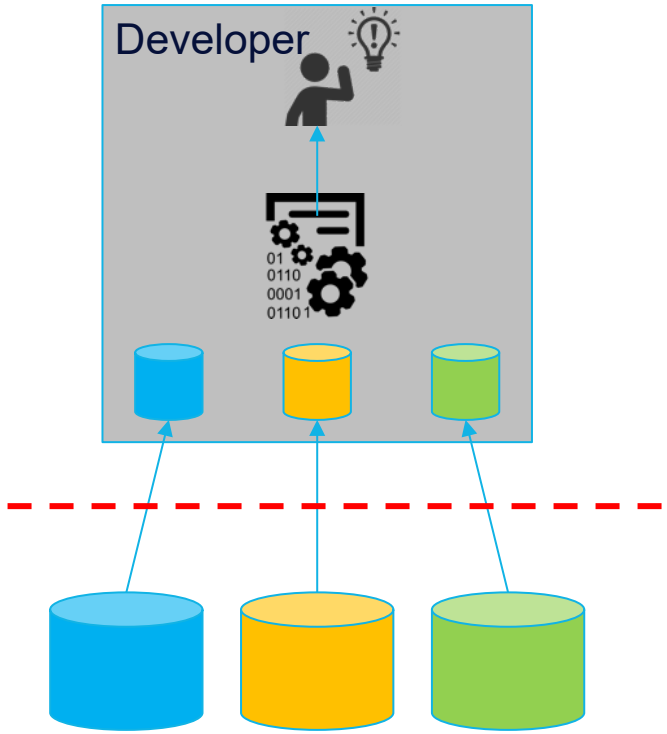
(Near) Real Time Operational Data

ESSENTIAL INFRASTRUCTURE ARCHETYPES

TO SHARE DATA ACROSS MULTIPLE DATA SUPPLIERS

Centralized

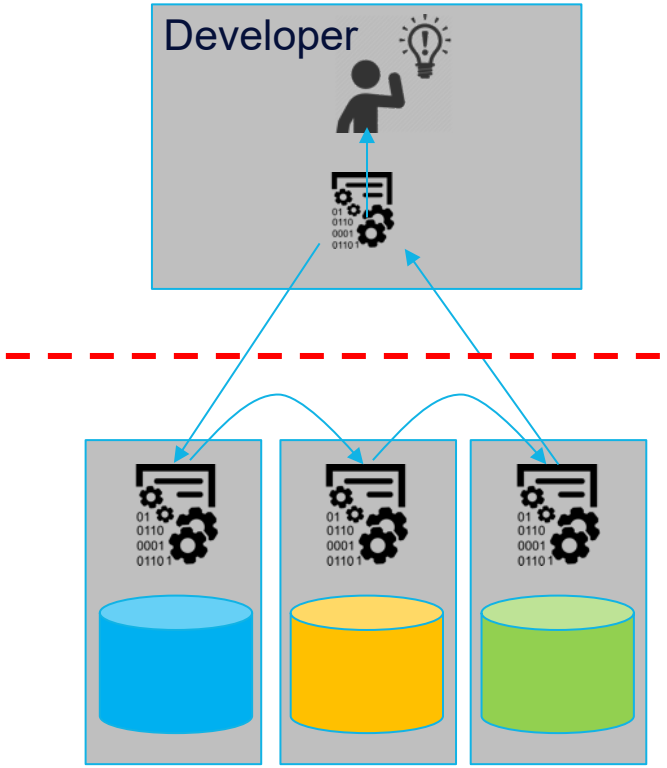
Bring data to the algorithm



Data suppliers

Distributed

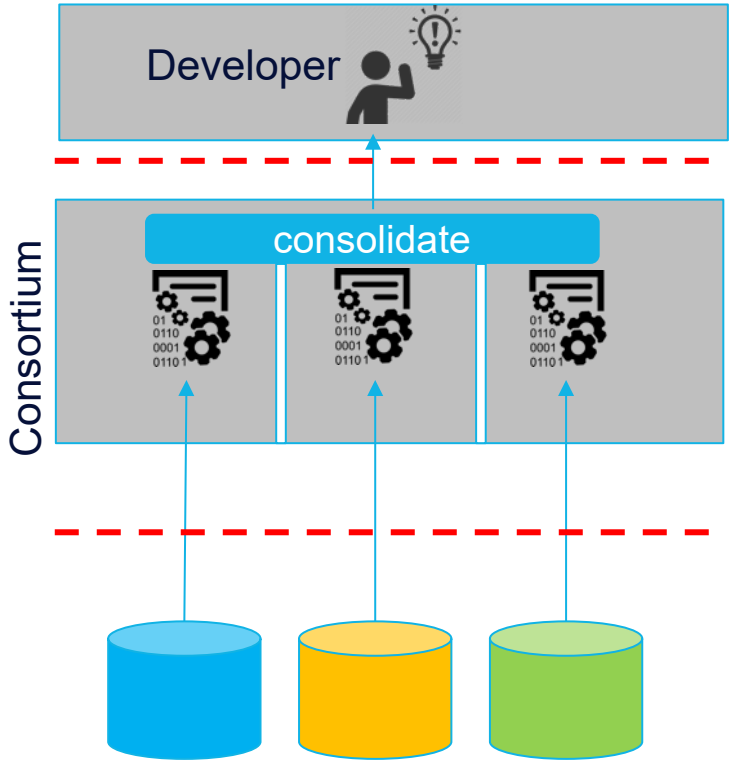
Bring algorithm to the data



Data suppliers

Federated

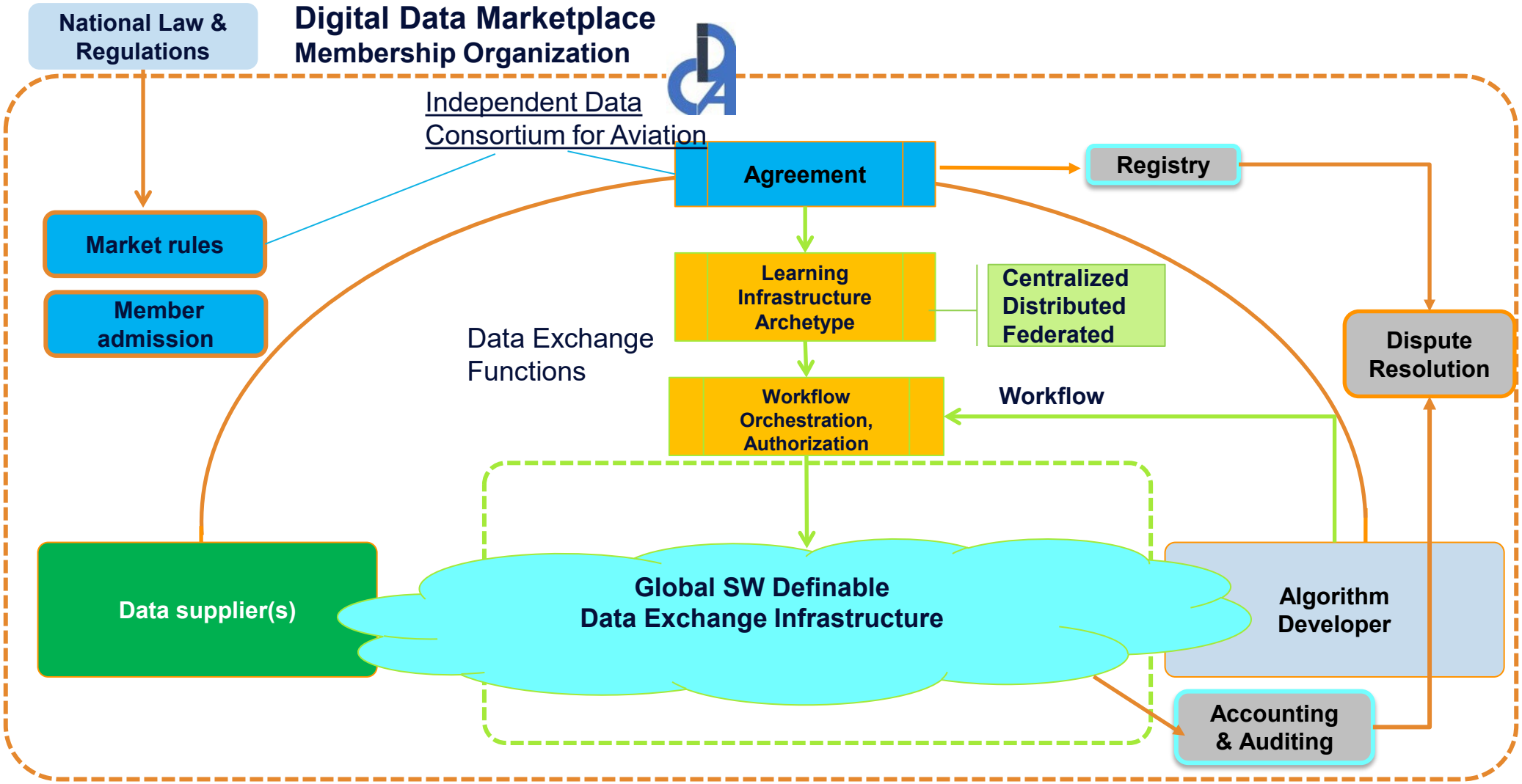
Learning in consortium infrastructure



Data suppliers

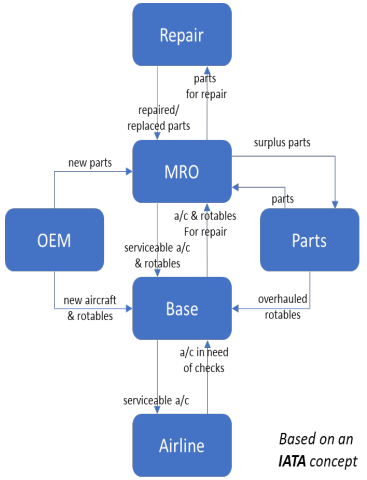
DIGITAL DATA MARKETPLACE ARCHITECTURE

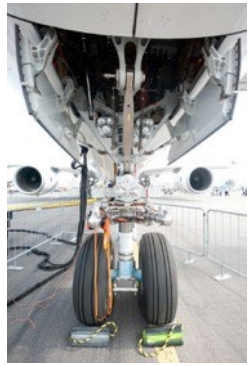
IMPLEMENTATION OF ESSENTIAL HIGH LEVEL FUNCTIONAL ELEMENTS AT GLOBAL SCALE

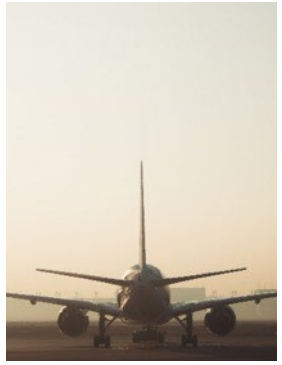


Aviation Industry Common Pain Points considered by IDCA where data sharing may help, red topics are subject of our research

- **What has happened to this part since its birth? Is its information complete and compliant?**
- How do I quickly locate and procure parts for getting my plane back in the air after an Aircraft on Ground (AOG) situation?
- **If I'm having an issue with equipment many others fly: Could we pool our data to diagnose or predict this problem quicker?**
- How confident am I that an aircraft operating in a region experiencing a conflict and has become isolated from the world still has genuine airworthy parts?
- Are there any fake parts installed on my aircraft?







IDCA Leadership

IDCA Board of Directors

Jeff Smith
IDCA Board Chairman

Leader, Digital Product Programs, Parker Aerospace

Bio

Mark Roboff
IDCA Board Treasurer

Co-Founder & CEO, SkyThread

Bio

Fabrice Villaume
Head, Digital Services Biz Growth & Leader, Digital Alliance (with Delta & GE), Airbus

Bio

Zachary Jakaitas
Head, Data Governance, Connected Aviation Solutions, Collins Aerospace

Bio

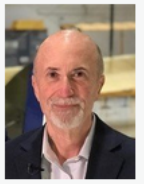
Derk Nieuwenhuijze
VP Digital, Marketing & Communication, AFI-KLM Engineering & Maintenance

Bio

Jan de Wall
Head, Loan & Exchange, AOG Services,Lufthansa Technik

Bio

IDCA Boad Advisors



William Voss, FRAeS
President and Independent Consultant, William R. Voss, LLC

Bio

Chris Markou, PhD
Head, Technical Operations, IATA

Bio

IDCA Leadership Council

Ravi Rajamani, PhD, FSAE, FIMechE
President

Bio

Leon Gommans, PhD
Vice President

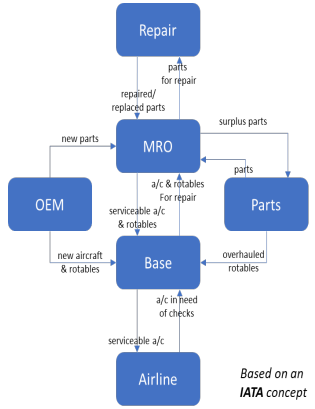
Bio

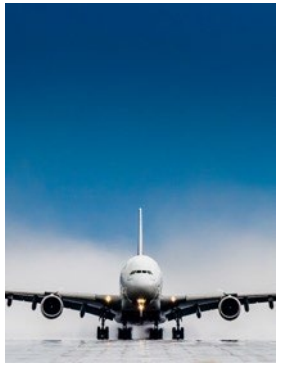
Identify (and Base) Policies on Industry-Relevant Use Cases

Currently Working Groups are working on three of five use cases

- ✓ Parts tracking from birth to disposal
- ✓ Aircraft on Ground (AOG) servicing
- ✓ Diagnosing & predicting maintenance problems common to all operators

- Preserving mandatory aircraft safety data even in areas experiencing conflict
- Lease ownership transfer





UNIVERSITEIT VAN AMSTERDAM

TU Delft

Next: Trust4Data NWO research proposal

Rule definition level
IDCA , EASA, FAA

Part Data Sharing
IDCA Part Tracking WG

Aircraft Operational Data Sharing for safety and maintenance
IDCA Analytics WG

Relevant Environment

Generic Policy Management level
Distributed policy execution and normative reasoning

Generic Data Exchange level:
Data Market and Data Space concepts

Access & usage policy enforcement
Monitoring & Logging, Ex-ante / Ex-post Enforcement,
Data Access & Usage Authorization & Security

Concepts to be Validated and Demonstrated

Disctributed programmable Infrastructure ensuring **data sovereignty**

Global (Research) Infrastructure

Welcome to the Independent Data Consortium for Aviation

THANKS

QUESTIONS?