

Real-time aeroplane tracking and the Open Data Hub

Using the Open Data Hub as real-time data backbone



Martin Rabanser

- **Business & Technology Consulting**
 - Consulting
 - Coaching startups
 - Business development
 - Project coordination
 - Product development
 - Helping companies getting innovation projects done



A fictive start-up scenario

- Our new start-up
 - Creates a great new sensor
 - Generates a lot of interesting data
 - Collects this data in a database
 - Creates an application that consumes this data
 - Or finds partners consuming the data
- The data must be shared
 - For demo purposes
 - For partners
 - For applications that customers use
- Distributing the data
 - Needs some cloud based infrastructure
 - AWS, Azure, Google Cloud, Digital Ocean, Heroku, ...



The start-up grows

Sales	Development	Accounting
First leads are interested	Prototype is ready	Funding is here
Pilot customers willing to pay and test	Systems are up and running	All according to the plan
A few more customers arrive	Let's pay for a bigger server	Now it get's interesting
Time to promote more the product	Ups, we have to scale up quickly now	That generates some serious costs

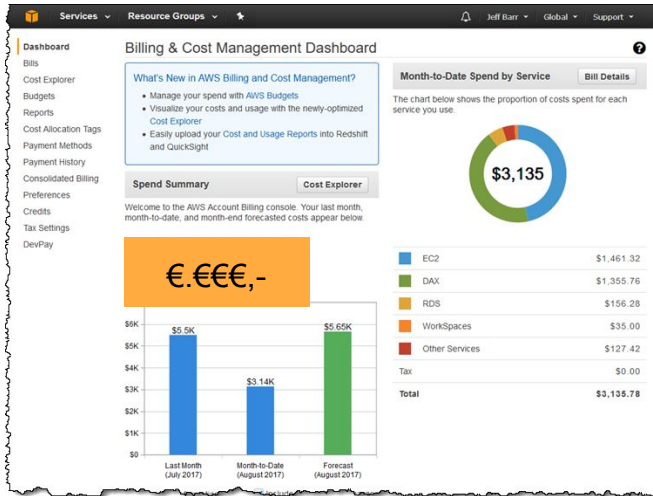
What can possibly go wrong?

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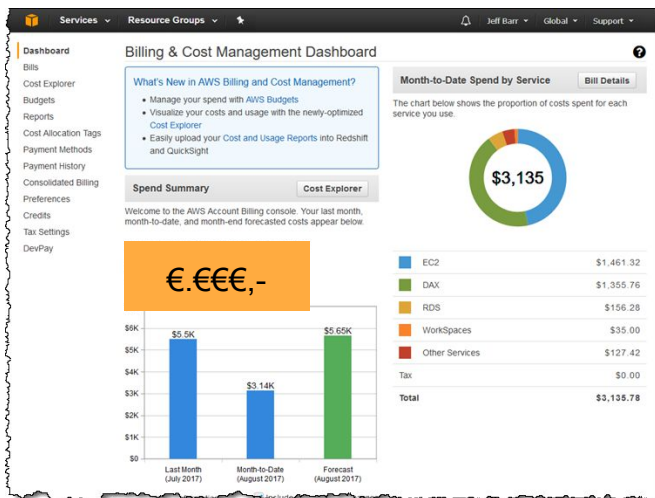
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500. That's an error.

The server encountered an error and could not complete your request.

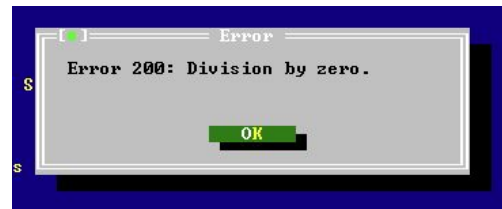
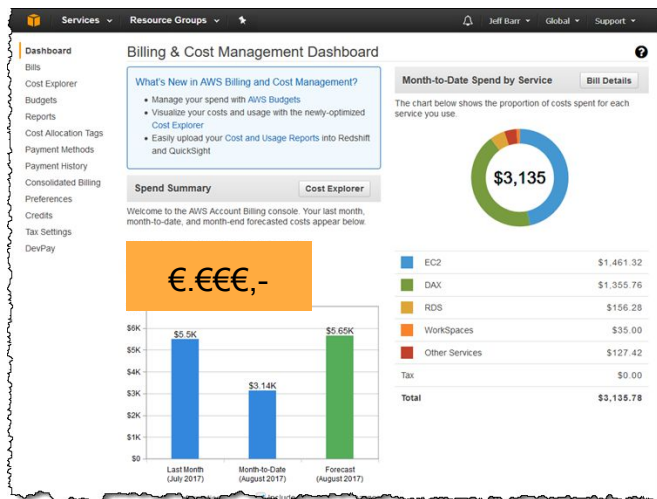
If the problem persists, please [report](#) your problem and mention this error message and the query that caused it. That's all we know.



What can possibly go wrong?

It's the day of your presentation at a conference, the developer is on vacation and your customer calls several times before

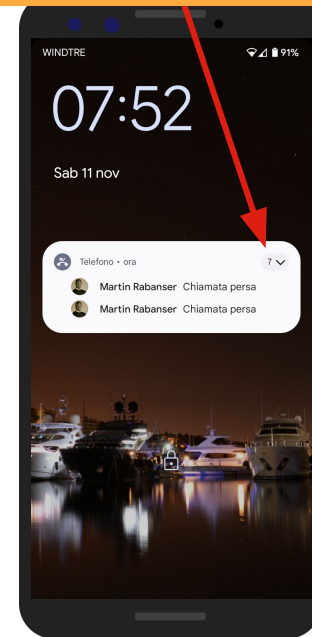
8:00



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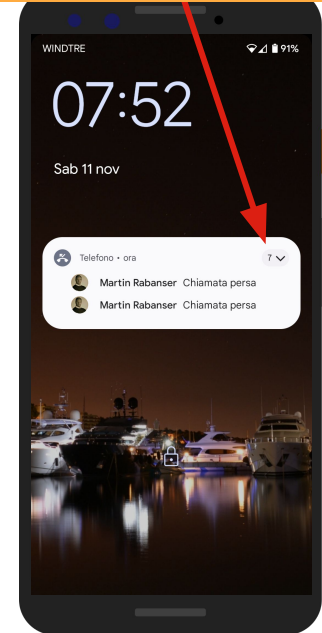
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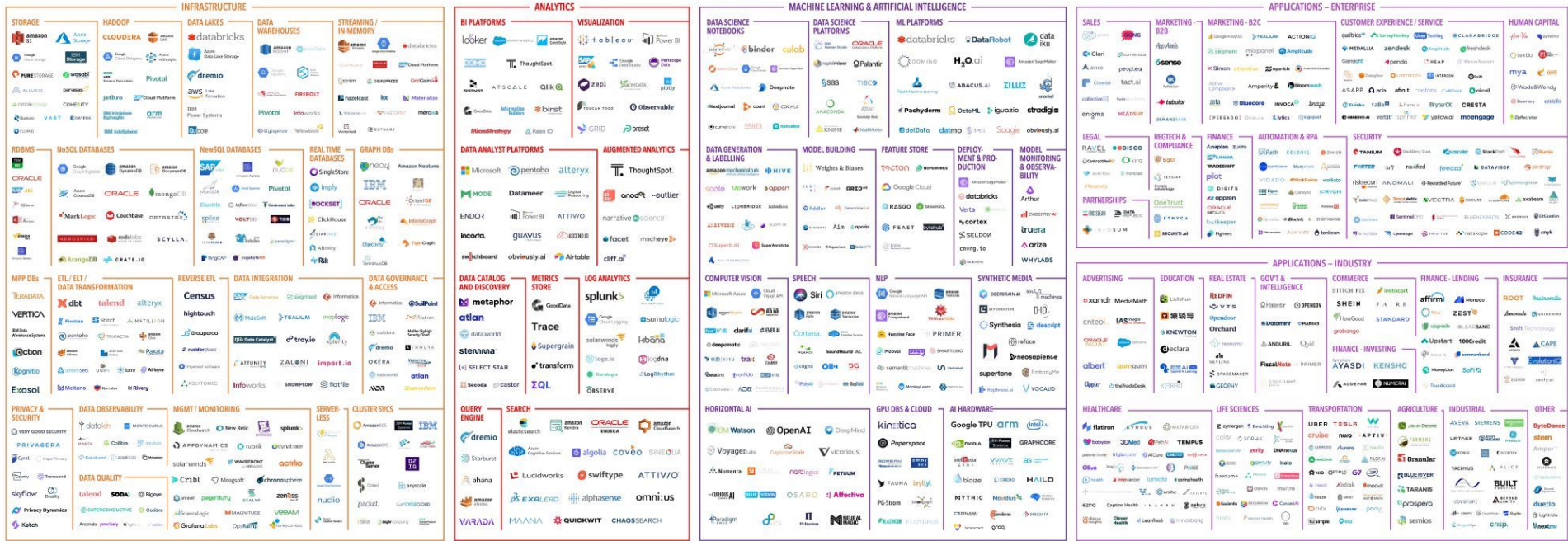
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Before you know it, you are doing a SLA with 24/7 monitoring and service
=> without getting paid for!

There must be a cloud service, right?

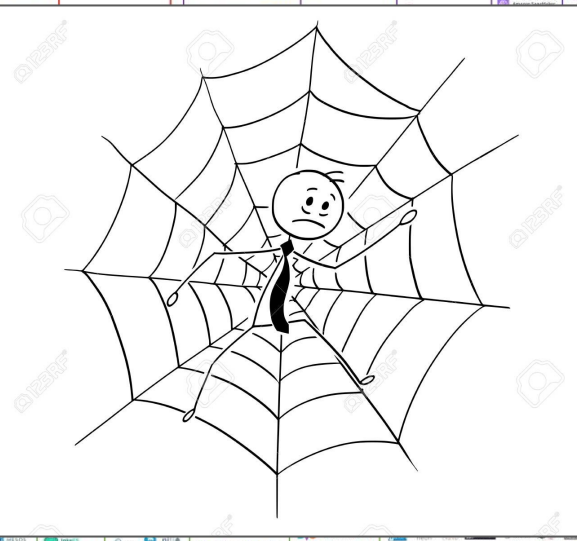
MACHINE LEARNING, ARTIFICIAL INTELLIGENCE, AND DATA (MAD) LANDSCAPE 2021



MACHINE LEARNING, ARTIFICIAL INTELLIGENCE, AND DATA (MAD) LANDSCAPE 2021

The MAD Landscape 2021 is divided into several key categories:

- INFRASTRUCTURE:** Includes STORAGE (Amazon S3, Azure Storage, etc.), HADOOP (Cloudera, Databricks, etc.), DATA LAKES (Databricks, etc.), DATA WAREHOUSES (Amazon Redshift, Snowflake, etc.), STREAMING / IN-MEMORY (Kafka, etc.), RDBMS (Oracle, Microsoft SQL Server, etc.), NoSQL DATABASES (Cassandra, MongoDB, etc.), NewSQL DATABASES (CockroachDB, etc.), REAL TIME DATABASES (CockroachDB, etc.), GRAPH DBS (Neo4j, etc.), MPP DBS (Teradata, etc.), ETL / ELT / DATA TRANSFORMATION (Talend, etc.), REVERSE ETL (Census, etc.), DATA INTEGRATION (Informatica, etc.), DATA GOVERNANCE & ACCESS (Alation, etc.), DATA CATALOG AND DISCOVERY (Alation, etc.), METASTORE (Databricks, etc.), QUERY ENGINE (Dremio, etc.), SEARCH (Elasticsearch, etc.), QUERY ENGINE (Dremio, etc.), PRIVACY & SECURITY (Privasec, etc.), DATA OBSERVABILITY (Datadog, etc.), MGMT / MONITORING (Splunk, etc.), SERVER-LESS (AWS Lambda, etc.), CLUSTER SVCS (Docker, etc.), FRAMEWORKS (PyTorch, TensorFlow, etc.), FORMAT (Parquet, Avro, etc.), QUERY / DATA FLOW (Docker, etc.), DATABASES (PostgreSQL, etc.), ORCHESTRATION (Airflow, etc.), DATA MARKETPLACES & DISCOVERY (DataCamp, etc.), FINANCIAL & ECONOMIC DATA (Bloomberg, etc.), AIR / SPACE / SEA (Airbus, etc.), PEOPLE / ENTITIES (Zoom, etc.), LOCATION INTELLIGENCE (FourSquare, etc.), OTHER (DataCamp, etc.), DATA SERVICES (Kaggle, etc.), INCUBATORS & SCHOOLS (General Assembly, etc.), RESEARCH (OpenAI, etc.).
- ANALYTICS:** BI PLATFORMS (Tableau, Power BI, etc.), VISUALIZATION (Tableau, Power BI, etc.), DATA SCIENCE NOTEBOOKS (Databricks, etc.), DATA SCIENCE PLATFORMS (Databricks, etc.), ML PLATFORMS (DataRobot, etc.), DATA ANALYST PLATFORMS (Alteryx, etc.), AUGMENTED ANALYTICS (ThoughtSpot, etc.), DATA GENERATION & LABELLING (Amazon SageMaker, etc.), MODEL BUILDING (Weights & Biases, etc.), FEATURE STORE (Feast, etc.), DEPLOYMENT & PRODUCTION (Mlops, etc.), MODEL MONITORING & OBSERVABILITY (Arize, etc.).
- MACHINE LEARNING & ARTIFICIAL INTELLIGENCE:** DATA SCIENCE NOTEBOOKS (Databricks, etc.), DATA SCIENCE PLATFORMS (Databricks, etc.), ML PLATFORMS (DataRobot, etc.), DATA ANALYST PLATFORMS (Alteryx, etc.), AUGMENTED ANALYTICS (ThoughtSpot, etc.), DATA GENERATION & LABELLING (Amazon SageMaker, etc.), MODEL BUILDING (Weights & Biases, etc.), FEATURE STORE (Feast, etc.), DEPLOYMENT & PRODUCTION (Mlops, etc.), MODEL MONITORING & OBSERVABILITY (Arize, etc.).
- APPLICATIONS - ENTERPRISE:** SALES (Salesforce, etc.), MARKETING - B2B (HubSpot, etc.), MARKETING - B2C (Facebook, etc.), ACTION (Salesforce, etc.), CUSTOMER EXPERIENCE / SERVICE (Salesforce, etc.), HUMAN CAPITAL (Workday, etc.), LEGAL (Lexipol, etc.), REGTech & COMPLIANCE (ComplyRight, etc.), FINANCE (BlackRock, etc.), AUTOMATION & RPA (UiPath, etc.), SECURITY (Okta, etc.), PARTNERSHIPS (Salesforce, etc.).
- APPLICATIONS - INDUSTRY:** ADVERTISING (Facebook, etc.), EDUCATION (Blackboard, etc.), REAL ESTATE (Zillow, etc.), GOVT & INTELLIGENCE (Palantir, etc.), COMMERCE (Amazon, etc.), FINANCE - LENDING (LendingClub, etc.), INSURANCE (Allstate, etc.), HEALTHCARE (United Therapeutics, etc.), LIFE SCIENCES (Moderna, etc.), TRANSPORTATION (Uber, etc.), AGRICULTURE (John Deere, etc.), INDUSTRIAL (Siemens, etc.), OTHER (Dyson, etc.).
- DATA SOURCES & APIS:** DATA MARKETPLACES & DISCOVERY (DataCamp, etc.), FINANCIAL & ECONOMIC DATA (Bloomberg, etc.), AIR / SPACE / SEA (Airbus, etc.), PEOPLE / ENTITIES (Zoom, etc.), LOCATION INTELLIGENCE (FourSquare, etc.), OTHER (DataCamp, etc.), DATA SERVICES (Kaggle, etc.), INCUBATORS & SCHOOLS (General Assembly, etc.), RESEARCH (OpenAI, etc.).
- DATA RESOURCES:** DATA SERVICES (Kaggle, etc.), INCUBATORS & SCHOOLS (General Assembly, etc.), RESEARCH (OpenAI, etc.).



And here is yet another service

What about the Open Data Hub?

- Based in the NOI Techpark, Unit **Tech Transfer Digital**
- A team of experts improving it day by day
- Is there for companies
- Has a community
- More than 144 datasets
- More than 70 companies as Data Consumer
- There is a Data Browser
- And an Analytics tools
- 100% FOSS on Github
- ... and much more

- Has a great offer for data providers



What does it offer for a Data Provider?

- Data providers get the following advantages and services
 - Visibility of your data
 - Visibility as a data provider (on website, on events, with web components)
 - Advanced infrastructure to publish my data
 - Documentation
 - Web Component store for demo app
 - Prepared mailing list for regular communications towards consumers
 - Statistical overview on data consumption
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Okay, OAAS is probably not the best name...

Acronym	Definition
OAAS	Orchestration as a Service (<i>computing</i>)
OAAS	Optimization as a Service
OAAS	Ontario Association of Agricultural Societies (<i>Canada</i>)
OAAS	Okanagan Aboriginal AIDS Society (<i>Canada</i>)
OAAS	Ohio Association of Adult Services (<i>Worthington, OH</i>)
OAAS	Observer Assessment of Alertness and Sedation
OAAS	Old Age Allowance Scheme (<i>Bangladesh</i>)

Source: <https://acronyms.thefreedictionary.com/OAAS>

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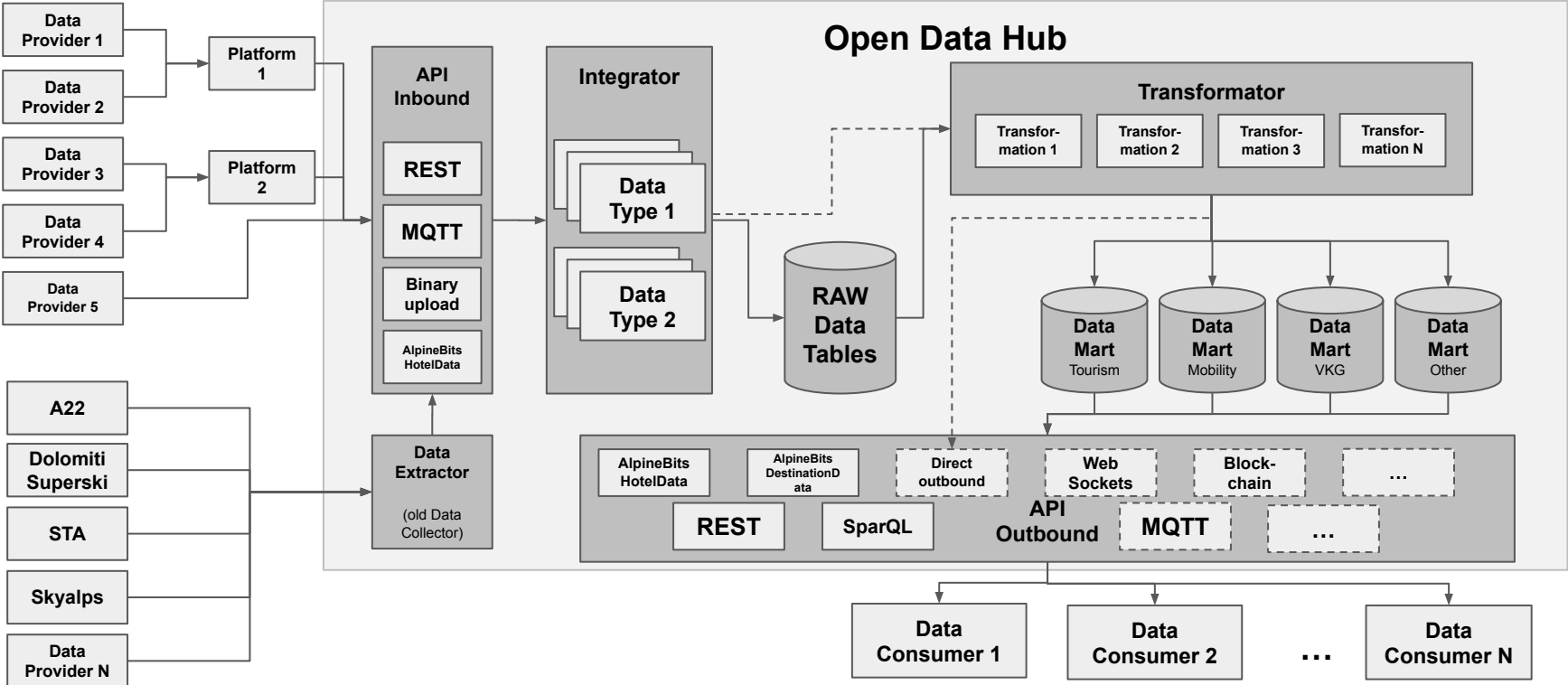
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Data Providers
These Companies and Organisations are official Data Providers for the Open Data Hub and share data with others, to enable the implementation of innovative digital solutions.

The image displays a collection of logos for various data providers. The logos are arranged in a grid-like fashion. Some logos are for companies like alperia, eurac research, hgv, IDM, innovie, leitner energy, nevicam, Otzi, PAPAN, ROUTE 220, skyalps, systems, TREVILAB, and VION. Others are for public entities or regions, such as AUTONOME PROVINZ BOZEN SÜDTIROL, PROVINCIA AUTONOMA DEL SUD TIROL ALTO ADIGE, Provincia Autonoma di Trento, Città di Bolzano Stadt Bozen, and COMUNE DI TRENTO. There are also logos for car SHARING, ECOGY, ENERGIE MAREO, and skyalps.

Behind the scenes



A real world example

The sensor network

1. Aircraft sending their position via ADS-B
 - a. ADS-B = Automatic Dependent Surveillance - Broadcast
2. Sensors collect this data
3. Pre-process the data
4. Send data to the Open Data Hub
 - a. Sent to INBOUND MQTT
5. Fastlane
 - a. Publish data immediately
 - b. Share in realtime via OUTBOUND websocket or MQTT
6. Transformer
 - a. Postprocess data
 - b. Store in data mart
 - c. Share via OUTBOUND REST API



ADS-B Traffic intercepted

```
MSG,1,1,1,300780,1,2022/04/07,11:34:02.143,2022/04/07,11:34:02.174,DLA1KW,,,,,,0
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MSG,8,1,1,3F8C62,1,2022/04/07,11:34:09.357,2022/04/07,11:34:09.384,,,,,,
MSG,3,1,1,3F8C62,1,2022/04/07,11:34:09.365,2022/04/07,11:34:09.385,,,8150,,,46.52097,11.48011,,,0,,,0
MSG,4,1,1,3F8C62,1,2022/04/07,11:34:09.965,2022/04/07,11:34:09.985,,,88,45,,,1344,,,,,0
```

ICAO Aircraft address (Lufthansa LH9456 from Munich to Venice)
Speed (kt), Course (°), Descent rate (ft/min)
Altitude (PA in ft)

Altitude, Latitude, Longitude

ICAO Aircraft address (Military Helicopter)
Altitude (AMSL in ft)

Lufthansa has same speed, same course, still descending

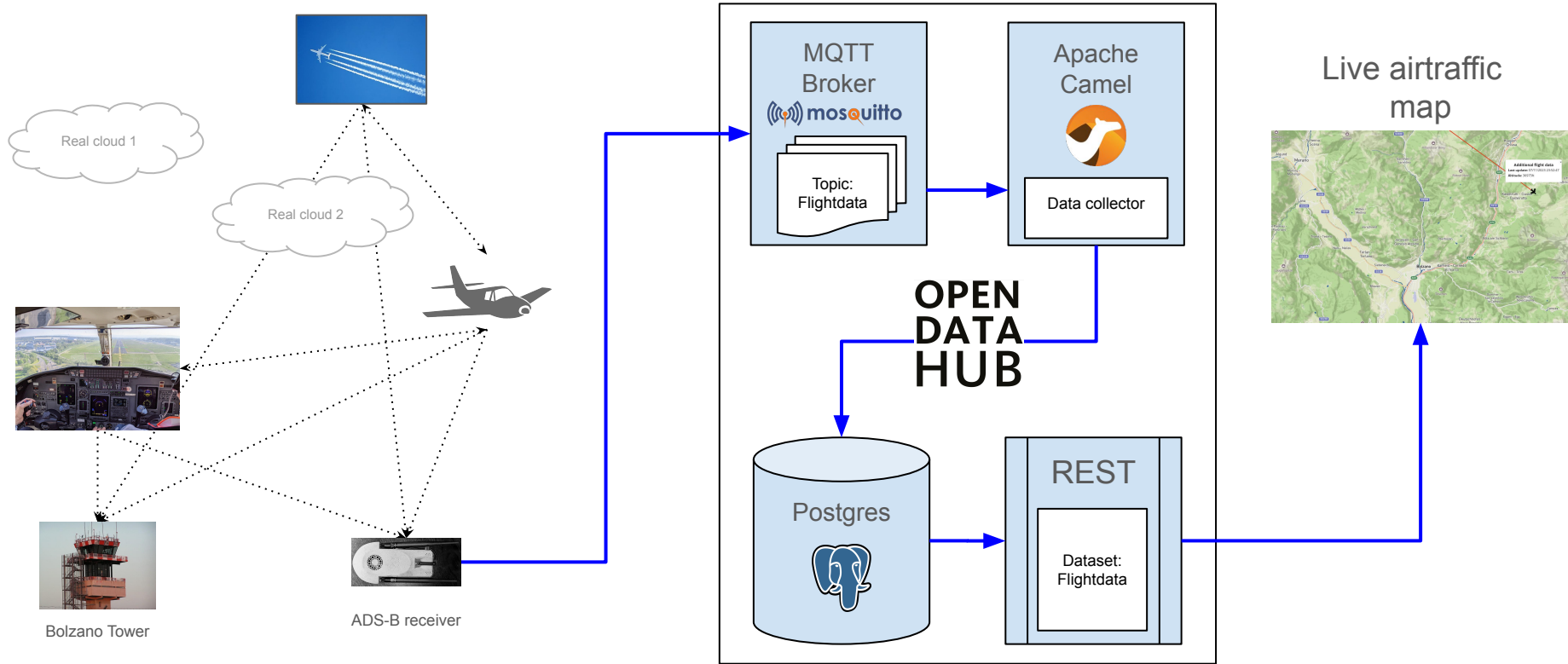
Lufthansa has same speed, same course, descending slower now

Altitude, Latitude, Longitude

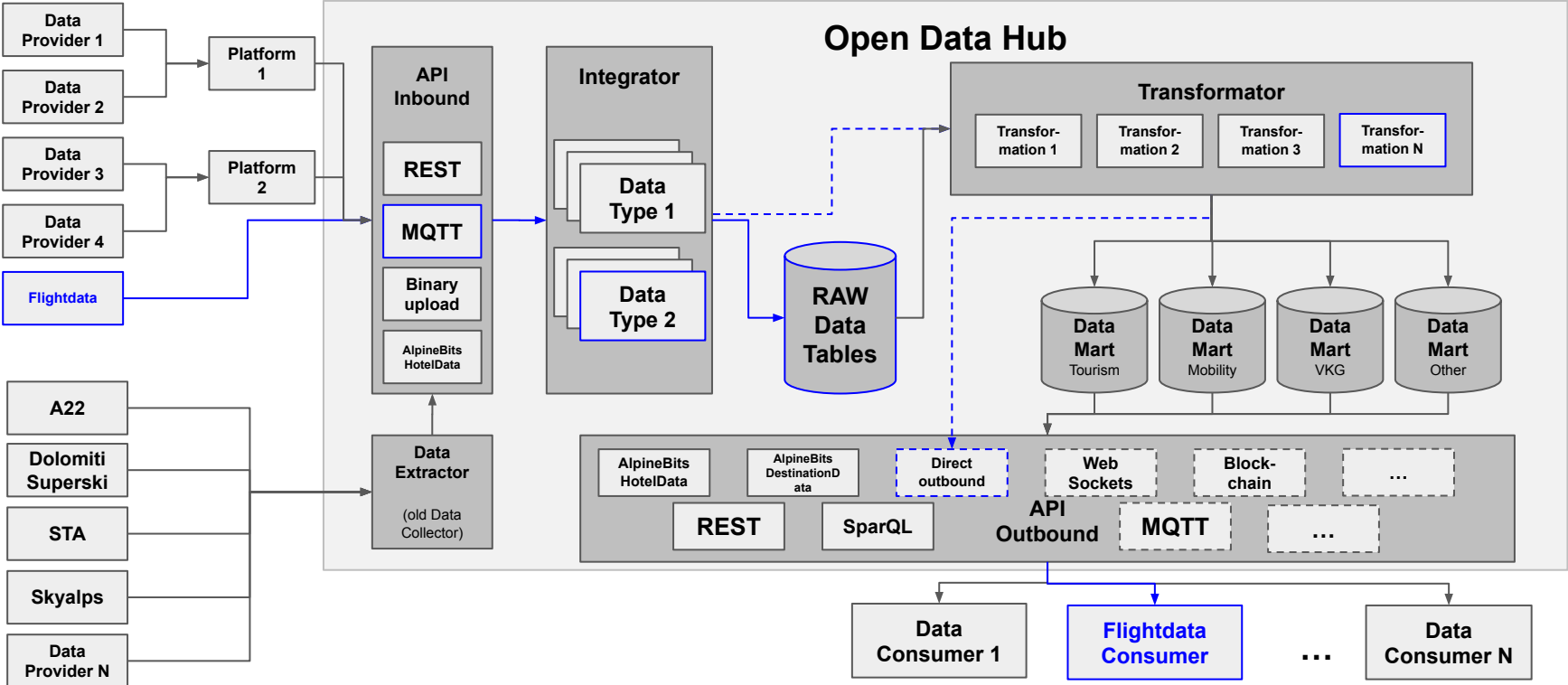
Speed (kt), Course (°), Climb rate (ft/min)
Helicopter is higher now

continued ...
continued ...

Components Architecture



Behind the scenes



Wrap up

- The Open Data Hub can be a great alternative to many cloud services
- It has a very powerful infrastructure
- There are already a lot of datasets and data processing that might be of use
- It can be used both for open data and for restricted data (for a fee)
- Full transparency, it's 100% FOSS
- You can contribute to the development

Open Data Hub links

- Open Data Hub
 - <https://opendatahub.com>
- Open Data Hub - Webcomponent Flightdata
 - <https://webcomponents.opendatahub.com/webcomponent/flightmap>
- Open Data Hub - Data Browser
 - <https://databrowser.opendatahub.com/>
- Open Data Hub - Analytics
 - <https://analytics.opendatahub.com/>

- Get in touch: help@opendatahub.com

Thank you

Questions?

Contact me:

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www.linkedin.com/in/martinrabanser

