SKYWISE - Big data platform as a foundation of airlines predictive and health monitoring

William Bernard[1], Anthony Hoffmann[2]

[1,2]*Airbus Japan K.K, Tokyo 106-6119, JAPAN*
william.bernard@airbus.com
anthony.hoffmann@airbus.com

ABSTRACT

By abstracting the complexity of data collection, combining engineering and operational data, and enabling collaboration across the industry in a rich analytical environment, airlines overcome intrinsic challenges of the predictive and health monitoring such as data silo's, complex data management and data-driven decision enablers. Make the data visible and understandable through strong and flexible data integration. Make data actionable through digital twin and collaboration. Make data proactive by implementing predictive models and bringing machine learning into operations. Airbus Skywise, powered by Palantir Technologies and fueled by Airbus expertise, provides Airlines with the leading aviation data platform to address aircraft operation challenges.

1. THE ORIGIN

Airbus, in partnership with Palantir Technologies, launched Skywise in June 2017. The platform is designed to handle the ingestion, cleaning and data modeling of massive amounts of data from aircraft operations such as time-series data coming from aircraft sensors, structured data from operational and maintenance systems and unstructured data such as technical documentation. Through the Airbus Skywise Ontology, a unified model representing the airline's operational data landscape, airlines can generate insights on aircraft condition and operations with both code-free and code-based environments.

2. DATA INTEGRATION AND EXPLORATION

The first step to predictive and health monitoring through a big data platform is to break the data silo's within the organization.

Skywise provides transparent, secured and governance means to integrate and structure data coming from multiple sources into an aviation industry data model called the Airbus

Skywise Ontology. This makes data visible, accessible and understandable across the airline organisation, leading to better local decisions. For that purpose, the Skywise Ontology is deeply integrated into Skywise's user-facing analytical and operational tools. The platform empowers users to explore their data and get situational awareness, to drill-down for root cause analysis, to build on-the-fly analytical path and iterate as new questions arise, to create interactive dashboards, to automate repetitive tasks, or to define alerts and to collaborate with other users.

2.1. Publication by the Asia Pacific Conference of the Prognostics and Health Management Society

3. DIGITAL TWIN OF THE AIRCRAFT OPERATIONS

The next step is to break the decisions' silos by creating the digital twin of the aircraft operations to implement predictive and health monitoring in a virtual representation of the aircraft and its operation. Skywise data platform enables the enrichment of the data model with business logic and users are then able to dynamically understand, visualize and simulate impacts over operational scenarios. Decisions are also becoming a digital asset that get recorded, being reassessed and reused as valuable experience to the data model. The platform also enables connectivity capabilities to ease the real-time information propagation within the airline's digital ecosystem.

Figure 1: Skywise data integration

4. OPERATIONAL ARTIFICIAL INTELLIGENCE

Once the aircraft and operational data, processes, scenarios and decisions are fully virtualized, the last step to advanced aircraft predictive and health monitoring is to apply Artificial Intelligence (AI) and Machine Learning (ML) engineering. Skywise as a data platform makes AI/ML models operational by deploying them on top of a trustworthy data foundation and by continuously improving them based on user's decisions and feedback. Data scientists and engineers can customize, deploy, assess, and compare across internal, opensource, and third-party algorithms. Models are tied to objectives that will ensure continuous monitoring, evaluation and accuracy improvements. Models are also bind to concrete values of the Skywise Ontology, allowing a single model to power hundreds of different tasks.

5. PEOPLE AND DATA

Skywise platform is an accelerator of the digital transformation. To become mainstream, it also requires changes in mindset, empowered user and a strong data governance. Every type of user, whether they can code or not, can use Skywise. From IT administrators, software engineers and data scientists, to technicians and operators, Skywise enables point-and-click analytic to code-based development harnessing interoperability, open-source programming languages and best practices of software development. The platform also provides a complete documentation and training resources. Data quality and its context are required to bring trust on the data. The Skywise Ontology is designed to provide better understanding of the data. the platform also enables exploration and visualisation on the entire data pipeline, each intermediate transformations down to the source, can be navigated. Moreover standard data quality metrics and monitoring rules are continuously added to the Ontology while users can create customized ones. Any data quality issues can also be reported for review and cleaning by the Skywise support team and/or the organisation's technical team. Data accessibility is enforced by extensive data protection requirements. From physical, operation, network or data transfer security to encryption, access control, data management or thread management, Skywise has established security directives and measures ensuring the highest level of data protection as well as compliance to legal and regulatory requirements. Skywise is designed to make data integration, access, and analysis seamless for users while enforcing the highest levels of security and access controls across each level of the platform, from data connection to folder permissions. Skywise provides a highly granular and scalable access control infrastructure where users and groups can be assigned specific permissions that govern how they view and interact with the data within an organisation.

6. EXAMPLES OF USE-CASE

At Airbus, in the Aircraft production process, wings are produced in one factory and the center wing box in another, they eventually need to be joined at the final assembly line in Toulouse, France. Before introducing Skywise, any join-up nonconformity leading to potential production delays were difficult to anticipate before each pre-assembly component reaching the final assembly line. Thanks to Skywise, this assembly line process has been streamlined. Each component, join-up assembly process and quality checks are being digitized. For instance each pre-assembly component is recorded as a 3D scan directly at the production site. The digital model of each pre-assembly components, the assembly requirements and quality checks criteria are integrated into a dedicated application on Skywise. Airbus engineering, quality and production teams can now assess any non-conformity risks and define mitigation strategies to anticipate potential issues from the beginning of the final assembly.

At an airline, heavy maintenance checks are defined with hundreds of maintenance tasks that are standardized in accordance with the operator's maintenance program. During each check, any findings like painting, corrosion, damage would be recorded as free text and will require to perform additional maintenance tasks to be fixed. Unplanned task will imply specific tooling, competencies, material and man-hours which will impact the overall maintenance planning leading to additional cost and work, delays, hangar scheduling. By using Skywise, in few weeks the airline integrates all the maintenance tasks requirements, the planning, the historical records of (un)planned tasks as well as the findings which are classified through Natural Language Processing. The airline is now able to anticipate potential findings and predict the material, tooling and labor requirements in the planning of the heavy maintenance check.

Figure2: Skywise key figures

7. CONCLUSION

Airbus purpose is to pioneer sustainable aerospace for a safe and united world. Aircraft predictive and health monitoring is part of the aviation industry digital transformation journey and today Skywise is addressing its numerous challenges.

Since its launch, in June 2017, Skywise has grown to be the leading open data platform of the aviation industry thanks to a community including Airbus, over 140 Airlines, Suppliers, MRO, Authorities - which represent more than 10,000 aircraft connected and 20,000 users worldwide.

REFERENCES

Airbus. Airbus digital services - skywise. https://aircraft.airbus.com/en/s ervices/enhance/skywise

William Bernard is the Airbus Japan regional representative for Airbus digital services and Skywise data platform. He received his Master's Degree of Electronic and Communication systems at the National Institute of Applied Sciences, Rennes, France, in 2007. Over the past 15 years, he has collaborated on numerous digital projects in the aviation industry, from integrated aircraft systems, aircraft safety monitoring services, aircraft health monitoring solutions, connected aircraft entry into service to aviation digital transformation.

Anthony Hoffmann is Services Business Development Manager in the Skywise for Airlines and Ecosystem team at Airbus Japan. Prior to the role, Anthony worked as Solution Architect at Proximus, the largest telecommunications company in Belgium. Anthony obtained in Master's degree in Computer Science at Universit´e Libre de Bruxelles.

APPENDIX

If the paper has an appendix, the appendix should appear at the end of the paper after the biographies. The appendix section is optional.