VIA Exchange Platform, a Central Nervous System for Airports
空港オペレーションの中枢を担うデータプラットフォームの開発

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Abstract

VIA Exchange is a state-of-the-art cloud-ready data platform developed to enable real time data processing and connectivity between Vanderlande solutions and various third parties. It is characterized by guaranteed delivery, embedded security, custom transformations with advanced monitoring and alerting features. Multiple new applications can be quickly developed over that platform for diverse use cases. Existing examples include equipment monitoring, passenger flow optimization, and predictive analysis of bags at risk of missing a flight connection.

Keywords: Cloud-native, Separation of Concerns, Real time data processing, Data exchange, Scalability, Flexibility

要 旨

VIA Exchangeは、空港の手荷物搬送に使用される自社製および他社製のシステムと接続し、リアルタイムのデータ処理を可能にするために開発された最先端のクラウド対応データプラットフォームです。高度なモニタリングとアラート機能を備えたデータ配信保証、安全性組込み、カスタム変換を特長としており、様々な用途に対応するアプリケーションの開発を短期間で行うことが可能となります。具体例としては、機器の監視、乗客の流れの最適化、フライト乗り継ぎで紛失リスクのある手荷物の予測分析などがあります。

キーワード：クラウドネイティブ、関心の分離、リアルタイムデータ処理、データ交換、拡張性、柔軟性

製品技術紹介

1 Introduction

The VIA Exchange platform has been designed to offer an open integration platform that easily consolidates data from different systems to enhance real-time operations. It is a response to a need expressed by airports to break down their data silos, enable and/or provide end-to-end (E2E) processes visibility and control, support decision-making capabilities and further optimize airport operations.
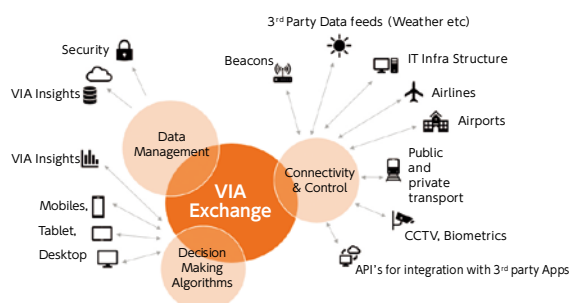

Fig.1 VIA Exchange Concept

2 Features and Benefits

VIA Exchange platform offers the following benefits:

-The framework is available either as a cloud-based (standard and preferred), on-premise or as hybrid solution.

-It is fully integrated with the Vanderlande IT ecosystem and its Cloud Native Application Platform (CNAP) in such a way that it can be provided both as a standalone product as well as an integrated part of the Vanderlande offering.

-It is built for real-time use cases enabling the development of applications targeted for real-time operational decisions.

-It guarantees reliable and secure exchange of data.

-It provides data storage meeting industry standards to allow access and usability.

-It respects the fundamental principle of Separation of Concerns (SoCs). This approach enhances modularity, maintainability, and scalability of systems.

-It allows resource optimization to reduce footprint and rationalize costs.

3 VIA Exchange, a platform approach

The VIA Exchange platform allows heterogeneous systems to be easily connected to each other. Any kind of data application can then easily be developed by focusing on the business needs rather than on the technical aspects. This platform approach, aligned with the Vanderlande Configure To Order (CTO) strategy, allows to rapidly tailor solutions to the customers' needs through modular components and flexible configurations.

The VIA Exchange platform is integrated to the company's IT ecosystem and can be deployed on top of Vanderlande's Container Platform (CP) and Cloud Native Application Platform which provide common capabilities such as Kubernetes, communication tools, identity access management, monitoring, and security.

Figure 2 shows how VIA Exchange, enabling connection to various systems and data processing, is deployed on top of the CP and CNAP platforms.
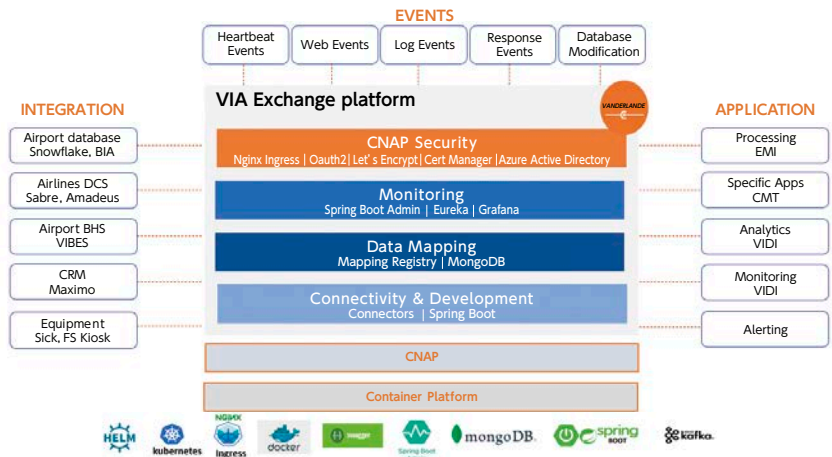

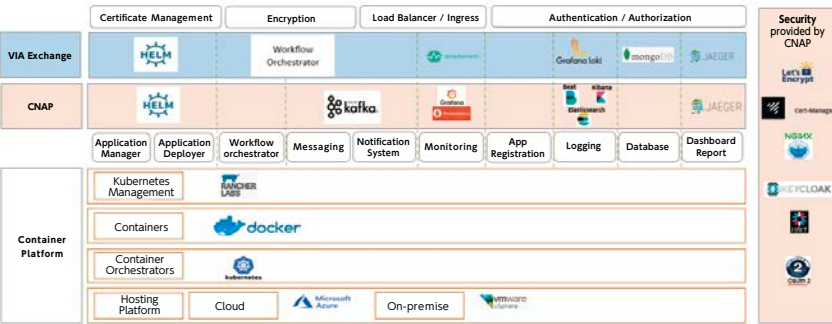Fig.2 VIA Exchange platform overview

Fig.3 Vanderlande Software Technologies Stack

3.1 Components

To meet the new requirements and needs of the customers, the software solutions developed by Vanderlande must be highly scalable and flexible. The software teams are thus moving towards cloud native software architecture and technologies while preserving the capability to deploy the solutions on premise or in the cloud.

The VIA Exchange platform provides cloud-ready components such as MongoDB, as a NoSQL database, an event workflow orchestrator, monitoring capabilities, and Grafana for real-time visualization.

By providing these components already bundled and "Ready to Use" together, the VIA Exchange platform allows the Vanderlande development teams to focus on delivering business value.

Figure 3 shows the different tools and layers of our platforms.

3.2 Orchestration of Data pipelines: The VIA Exchange cornerstone

An important piece of the VIA Exchange platform is its dedicated event workflow orchestrator, which is a cloud-native toolkit designed for quickly and easily building data pipelines and automating their orchestration. It provides the concept of Workflow as a Service (WaaS) that allows the users to automate and manage business processes and workflows without the need to maintain the underlying infrastructure. It simplifies the development and deployment of streaming and batch data processing applications and abstracts the complexities of deploying applications on a cloud platform. As a result, the development team can concentrate all its efforts on developing the business logic specific to each use case as a series of data pipelines, thereby streamlining the process.
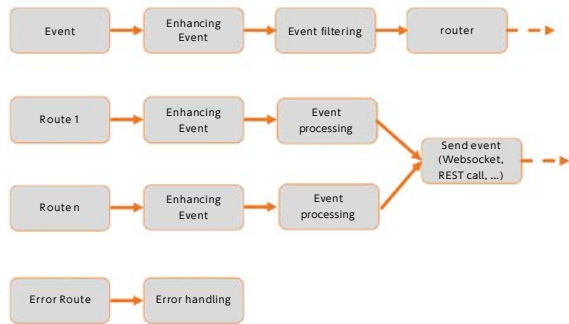

Fig.4 WaaS approach

The orchestrator is built on top of a framework for building highly scalable event-driven microservices connected with shared messaging systems, such as Kafka or RabbitMQ.

The orchestrator autoscaling (Dynamic Scalability) capability manages the IT resources of the applications dynamically. This means that this orchestrator only spins up the applications when needed, otherwise, it will ``scale to zero'' by spinning down and waiting for a new request to come in.

4 Use cases

The VIA Exchange platform is currently powering multiple applications based on cloud, hybrid, and on-premises requirements. Here are a few examples of the developed use cases:

a. **VIBES Transfer Connect** connects to multiple airport systems to predict which bags are at risk of missing their connection flight. It is designed to help airports, airline operations and handling partners rescue these bags more effectively.
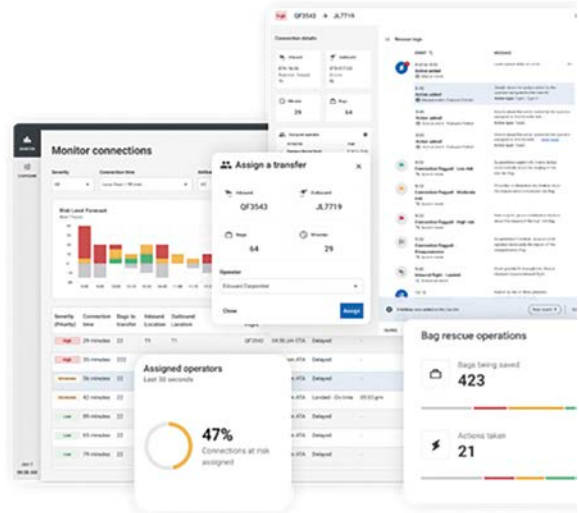

Fig.5 VIBES Transfer Connect Key Components

b. **PAX Event Stream Module** processes and publishes PLC information for all passenger lanes in a checkpoint to the airport infrastructure, helping airports to build a real-time status of their checkpoints.
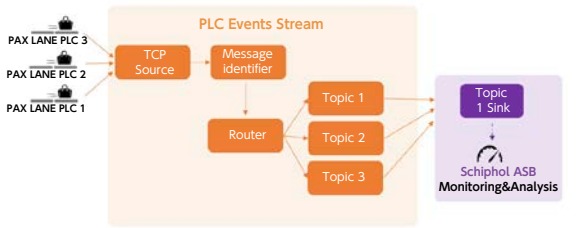

Fig.6 PAX Events Stream High Level Architecture

The PAX Events Stream module enables customers to monitor the activity and performance of the lanes in real-time and in their own dashboarding and analytics environment if required.

Traditional point-to-point communication managers are not sufficiently scalable and flexible. As a standard Vanderlande product, the VIA Exchange platform provides the customer with reliable support and access to future enhancements through updates and upgrades.

c. **The VIA Exchange solution for security checkpoints** will optimize the flow of passengers and resource allocation. This product leverages the VIA Exchange capability to easily collect data from the various devices and systems deployed at the checkpoint (some being Vanderlande's systems and other being from 3rd parties).
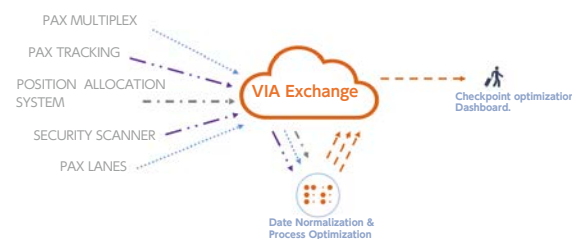

Fig.7 A solution to optimize the checkpoint process.

The platform is drawing interest

While the platform has initially been developed for a data exchange application, Vanderlande is also in the process of integrating it to other solutions that are developed for the airport and warehouse industries and that can benefit from the flexibility and power of the platform.

Due to the platform's popularity, the teams are also putting in place a collaborative model where it will be developed and maintained by a community of teams rather than a single one.

5 Future

The future of cloud-native development framework for airport technologies, solutions, applications, and services is fast-evolving giving the complexity and nature of end-to-end processes (PAX and Bags as examples). VIA Exchange offers a modular approach to configure and scale such processes depending on specific airport requirements.

VIA Exchange can play a leading transformational role in an Airport of the Future concept where a) airport have cyclical staff contingencies, b) increased air traffic, and c) an ever-changing demand from passengers. VIA Exchange will help Vanderlande to develop, prove, support, and service real-time airport applications spanning end-to-end processes in relation to equipment communications, bags and passenger services.
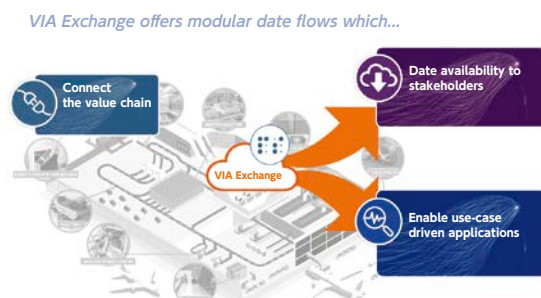

Fig.8 Vision of the Future

6 Conclusion

The cloud enabled VIA Exchange platform is part of the Vanderlande IT stack and is aligned with the Configure To Order approach of the company. It has been built to streamline the development of real-time data-driven applications. It easily provides a series of capabilities such as reliable and secure data exchange, storage, monitoring, and the connections to the Vanderlande CNAP and CP. Having access to all these tools, the development teams can focus on

the business logic of any specific use case rather than on the technical aspects. The VIA Exchange platform has been used to develop a series of applications like VIBES Transfer Connect, Pax Events Stream and other applications to optimize end-to-end passenger & baggage processes.

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