APIs – the digital gateway to a modern airline

Taking a transformative journey with a modernized technological foundation based on microservices and API management

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The outlook of a modern airline

We live in a whole new world of travel to which organizations and travelers must adapt. New technologies need to be embraced that enable airlines to overcome roadblocks on the journey. As the world continues to recover from the effects of the pandemic and grapple with ambiguities of the new normal, the travel industry, too, has been evolving, fueled by digitalization and personalization.

However, this dynamic scenario requires airlines to be flexible and quick in implementing these solutions at scale. For instance, the implementation of biometric check-ins has not been an easy feat for airlines, let alone scaling it that requires time and considerable investment. Another example is passengers seeking an end-to-end experience instead of the air travel part. Airlines will need to open to third party providers such as car rentals, hotels etc. to provide a wholesome experience. On the other hand, irregular operations have always been a pressing concern for airlines and now with the need for lean operations and evolved passenger preferences, the imperative to address these concerns has risen considerably.

The rise of New Distribution Capabilities (NDC) is a key strategic imperative in this fast-evolving world of travel technology. It brings countless opportunities in form of innovative and scalable solutions for today and the future. NDC is a game-changer for airlines as it's the language that will help airlines become retailers and deliver a great search, shop, and booking workflow.

The modern age technologies such as AI, cloud, IoT and blockchain offer solutions to all these problems but this transformation is rendered useless if airlines are still thinking in legacy terms. A major enabler for airlines is a revised technical landscape based on microservice architecture and API-first principles that complement existing SOA components, thereby laying the foundations for a modern airline.

The dilemma to move away from legacy systems

Starting late 90s and early 2000s, the airlines industry made the transition to a SOA (Service Oriented Architecture) services to drive re-usability of business function to improve passenger experience and optimize operational efficiencies. However, instead of creating a scalable and flexible architecture, it ended up becoming a closed-knit and complex system as shown in figure 1.

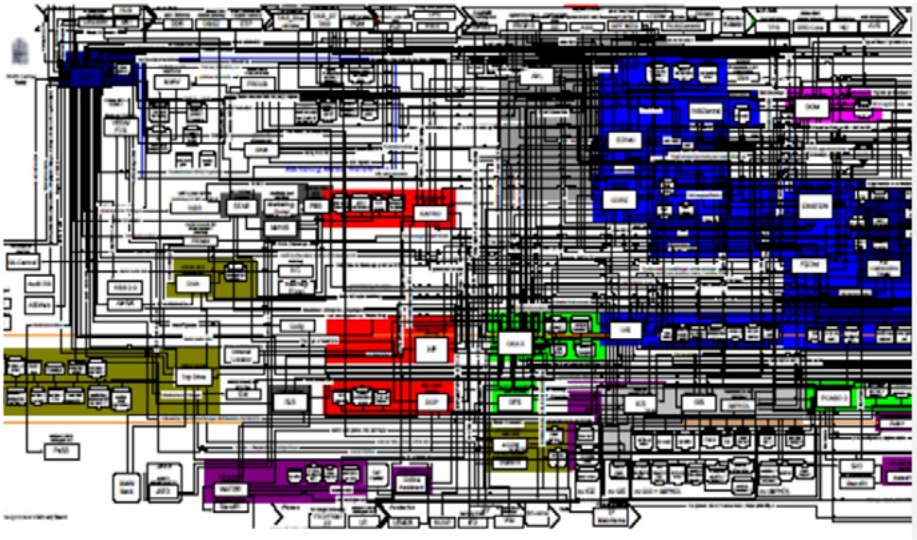

Figure 1: A complex, close-knit SOA-based architecture

Today's cloud-centric, fast moving, app-driven integration and high-risk investment for airlines have paved the urge to reimagine the definition of a "service" to experiment with upcoming technologies such as AI, Robotics, and Blockchain etc. and to handle such end-of-life products. Some of the most important questions, airlines need to contemplate to create a future-proof airline:

1. Are existing services able to absorb and collect data from different sources ?
2. Do they have the potential to reduce congestions by updating data in real time ?
3. Can the services and its data be harnessed as per the standards and compliances that prevail across the nations ?
4. Can they help to transform messages to more modern standards ?
5. Do they support mobile app/IOT devices ?
6. Are they providing a seamless omnichannel experience ? Are they providing a seamless omnichannel experience ?

An open API strategy is promising to resolve this conflict, leaving airlines in a dilemma if the existing investment in SOA can be leveraged or is it just best to restart with a microservice and API-based organization?

Enabling seamless data exchange through APIS

The way the technology landscape is changing, and the business model is evolving, APIM and microservice architecture brings in the possibility of data proliferation to explore new channels and better processes. It not only catalyzes innovation but also presents an opportunity to airlines to monetize their data by establishing a controlled environment to register and consume the different airline APIs.

An open API strategy or creating an API-based airline is about easing the data exchange across airline applications and opening the same to the external world. It is about providing a regulated and secure interface to both internal development teams and external stakeholders to access the airline systems and build the next-gen air travel.

Examining the current state of IT architecture in airlines

Starting with the late 90s and early 2000s, the airlines industry made the transition to a SOA (service-oriented architecture) with a focus on reducing integration effort needed to connect across multiple airline applications and create reusable services from business process stand-point which could be readily exposed. The scope of the applications was limited, with airlines primarily adopting a DIY (Do it yourself) approach, thereby also restricting the exposure of these services at enterprise level.

These SOA services were created from various dimensions that were architected from business, functional, process, orchestration, and technical perspective with varied success rates. The airline companies incorporated SOA architecture with a top-down approach that dictated a rip-and-replace strategy and thus caused the projects to take more time (sometime in years) for implementation and resulted in consumption of more resources and budget than planned.

An Enterprise Service Bus (ESB) handled all the communication across the different services, integration across applications, business process orchestration, data routing and transformation, thereby becoming the key element in connecting and integrating the various applications to the legacy systems and business-functions.

Challenges of the existing SOA setup

The focus on opening data for third parties has led to a need of "consumption-centric" model rather than an "exposure-centric" model.

- Single point of failure (SPOF): The high dependency of the existing architecture on ESB increases the risk of failure.
- Scalability: The ESB and SOA caters primarily to a trusted audience of partners and airline employees limiting the industry to scale through third parties.
- Technological shift: Traditional SOA is generally associated with SOAP (XML) Payload, while the advent of mobile revolution has given a new level to REST and JSON payloads that require a new way of thinking.
- Data governance: The current architecture enables common data governance standards making it difficult to modify services to different standards.
- Increased load on reusable service: The group of reusable service at functional level led to additional load on the services. For instance, the entire booking service could have a heavier traffic while the need was to only check for flight availability.
- Validation: Input parameters of the services need to be validated every time the service interacts therefore decreasing the performance and increasing load and response time.
- Monitoring: Service management is complicated since service exchanges millions of messages that are hard to track.
- Security: Limited support not at par with the required standards.

The promise of API management and microservices

From architectural point of view, microservices represents an extension to SOA where API management acts as a bridge to manage the microservices in the airline IT ecosystem.

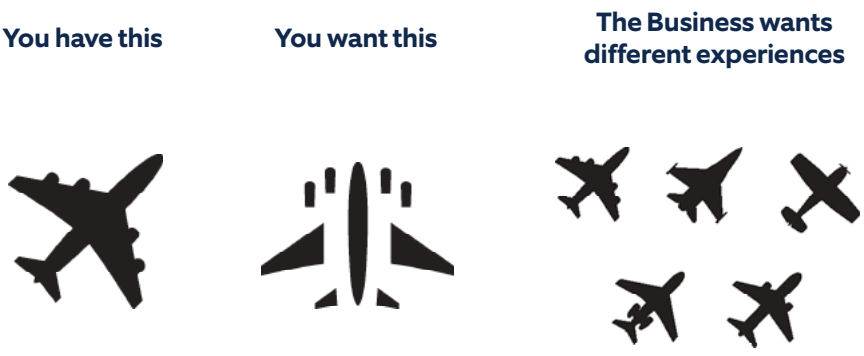

Figure 2: Airlines need to become composable

The need for microservices

The airline industry needs to start decomposing the functional level service architecture in the current setup. With new technology coming up and new channels surfacing, the domain needs the flexibility to provide seamless data that can be readily consumed, for instance, a third-party provider aiming to open a new distribution channel by integrating just the flight availability service across using automobile systems or Alexa. A defined data exchange at the microservice level will ease up the consumption with developers, thus enabling the industry to experiment and create new experiences for the end customers.

The API gateway advantage

"The API economy is an enabler for turning a business or organization into a platform."

- Kristin R. Moyer

Moving to an API gateway helps airlines to distribute their data in a regulated way. It not only creates an opportunity to fast-track innovation in the industry but also open new business models by monetizing their data through APIs.

What is API and API Gateway?

API are like basic building blocks that connects different services or systems and its functionality needs to be public facing. API Gateway is a runtime component that acts as a decoupler from the client services to the backend applications. Most of the APIs are exposed through API gateways to third party customers. Thus, API Gateway is like a single-entry point for all the different customers with different requirements.

It brings the following benefits :

1. Governance

Manage risks while balancing speed to market requirements. It also provides self-service platform that allows easy transition to different phases of API deployment strategies.

2. Security

Analyze weak points within the system and take actions accordingly. Since API connect to Backend services, it is critical to protect the sensitive data that is being transferred. API Gateway provide variety of authorization and authentication policies using which the data can be transferred securely with encryption enabled. Security is required in several cases, for instance when the API holds the users' personal information or bank details.

Some of the Security policies provided by API Gateways include:

- JWT Token management,

- OAUTH/Open ID connect,

- Zero trust approach

3. Life cycle management

Track the life cycle of each API starting from its inception to retirement at all stages of deployment (for instance If the airlines has different environment such as Sandbox, QA, Pre-prod, Prod).

4. Traffic management

Protect your API from overuse by adding policies such a Rate Limiting and Quota Policies.

5. Analytics & monetization

Analyze how the API are used and by what sector of consumers and choose monetization if you want your API to be connected to the billing system.

Way forward: Leveraging underlying architecture for API adoption

We believe airlines do not need to go for a big bang overhaul of the existing architecture but can leverage the existing system to make the best of both worlds.

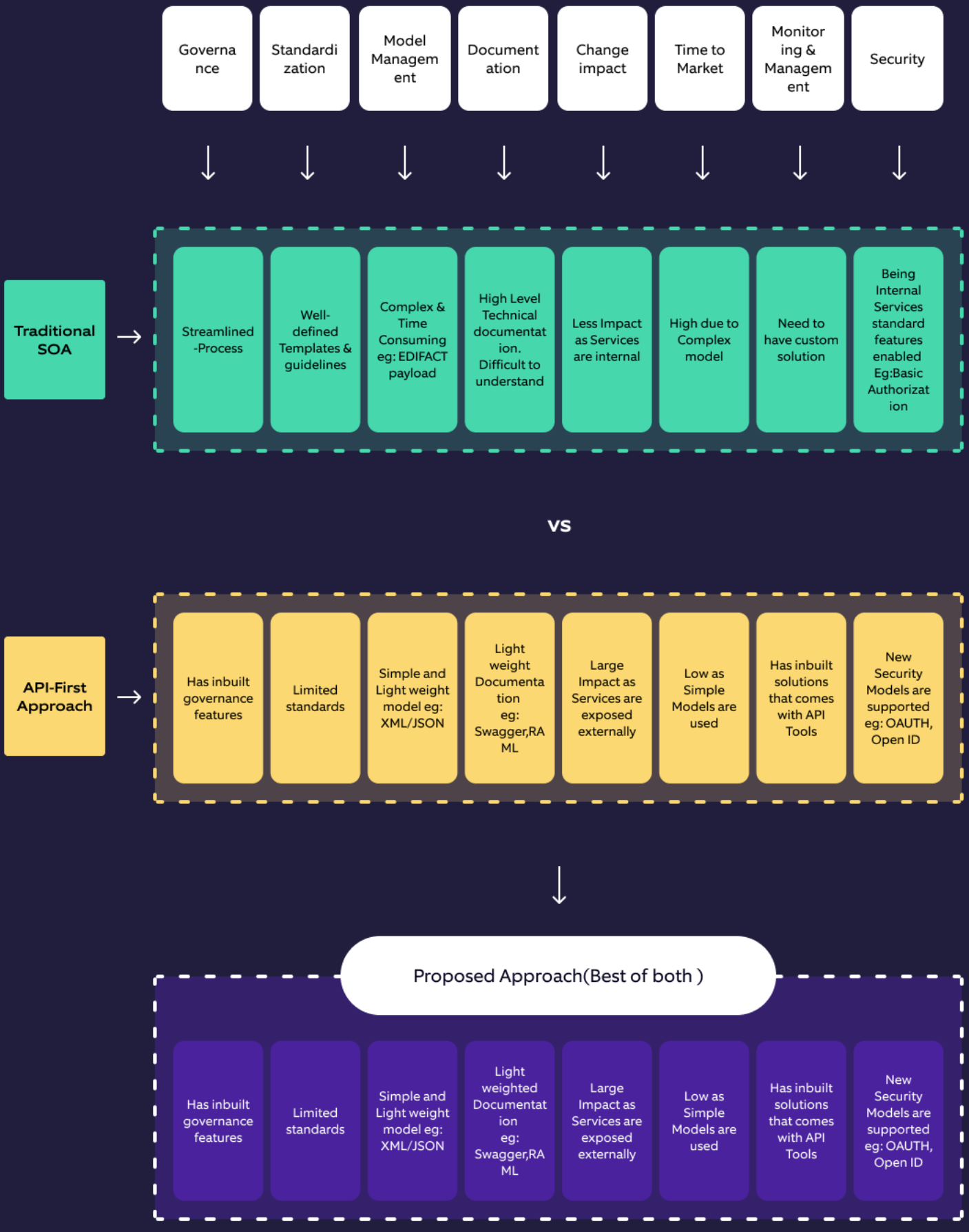

Figure 3: Architecture for API adoption

Transition strategy

The process is to decouple the IT landscape and monoliths and to have a reference architecture (in Figure 6).

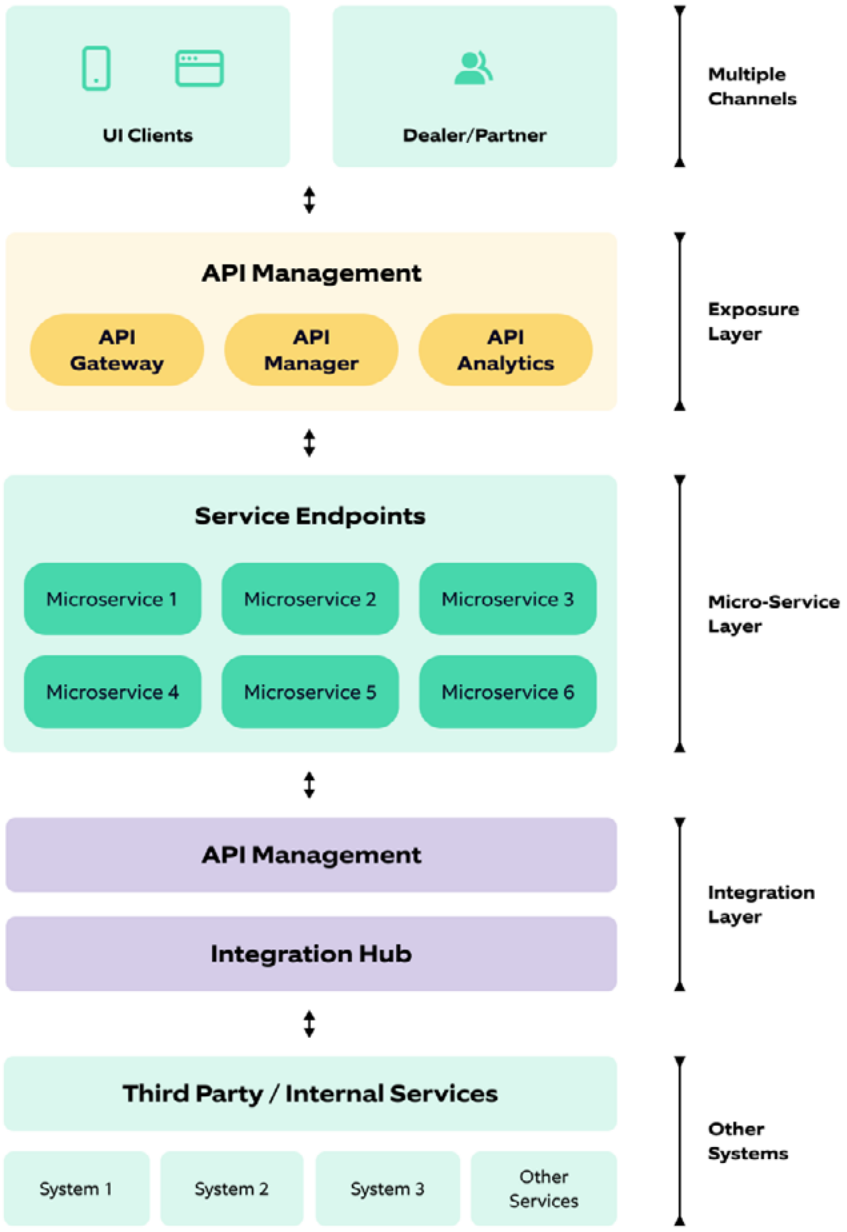

Figure 4 – Reference architecture

A complete revamp of an existing architecture is not the only alternative. We can apply value-based approach based on the importance and exposure level of the interface to identify the hotspot (for instance, an unstable Interface and cross modules) and adopt a hybrid approach (a combination of two or more methodologies).

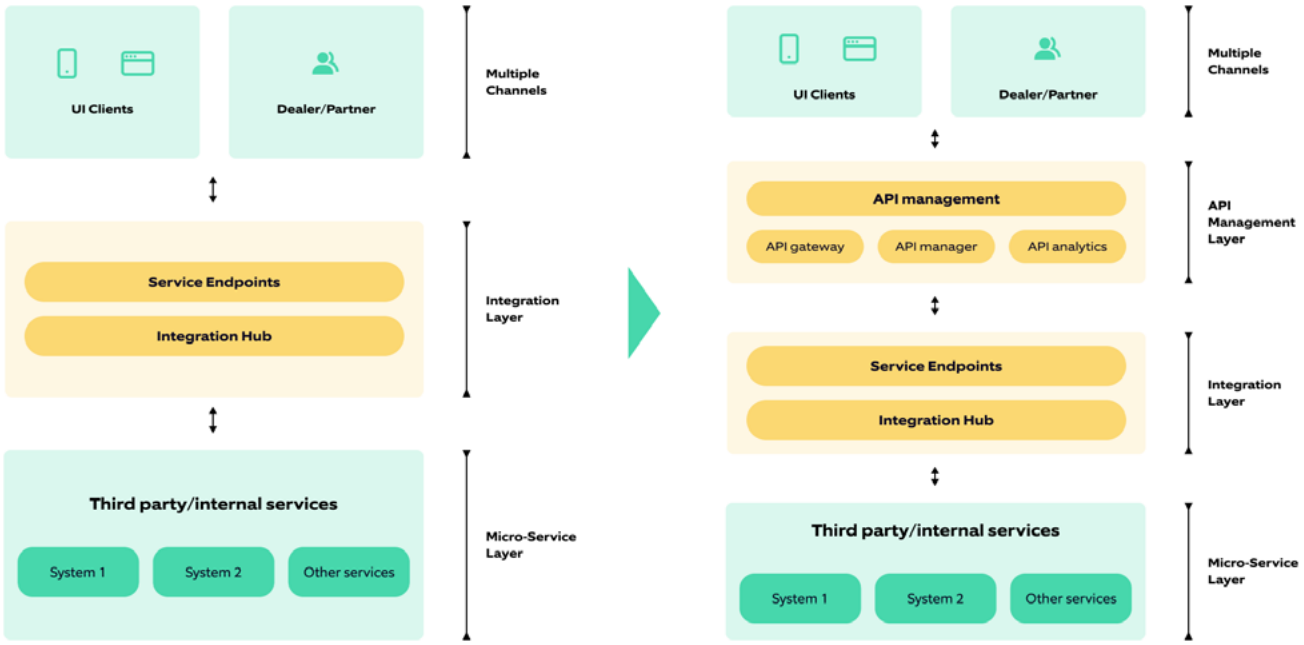

Figure 4.1- API Management + ESB Coexistence

In the referenced architecture (Figure 4.1), an API management layer is added over the existing SOA arhitecture to decouple the IT landscape at macro system level. Similary, at the micro system level, the legacy approach is avoided whenever a new service needs to be created. Microservices are leveraged in a way that allows the system to scale to both scenaros of using existing services or creating a new service to fit into the enterprise architecture of the future.

Use Case: Booking a flight

Let's consider a use case of airline reservation system which is the core part of the airlines and involves many API interconnected to provide the required information to the customer. The airline booking APIs is used by a wide range of customers such as travel agents, airline partners, commercial sectors, and customers. Consider the login requirement for

booking a flight and depending on the role, respective search and fare prices are to be displayed. A scenario in which a travel agent and customer is logging in to an airline site to do a flight booking, the fare prices and the customized preferences view available for both the user category are different. Now, the main concern is to handle the role-based access control that requires exposure to or connection with different underlying API as per the requirements.

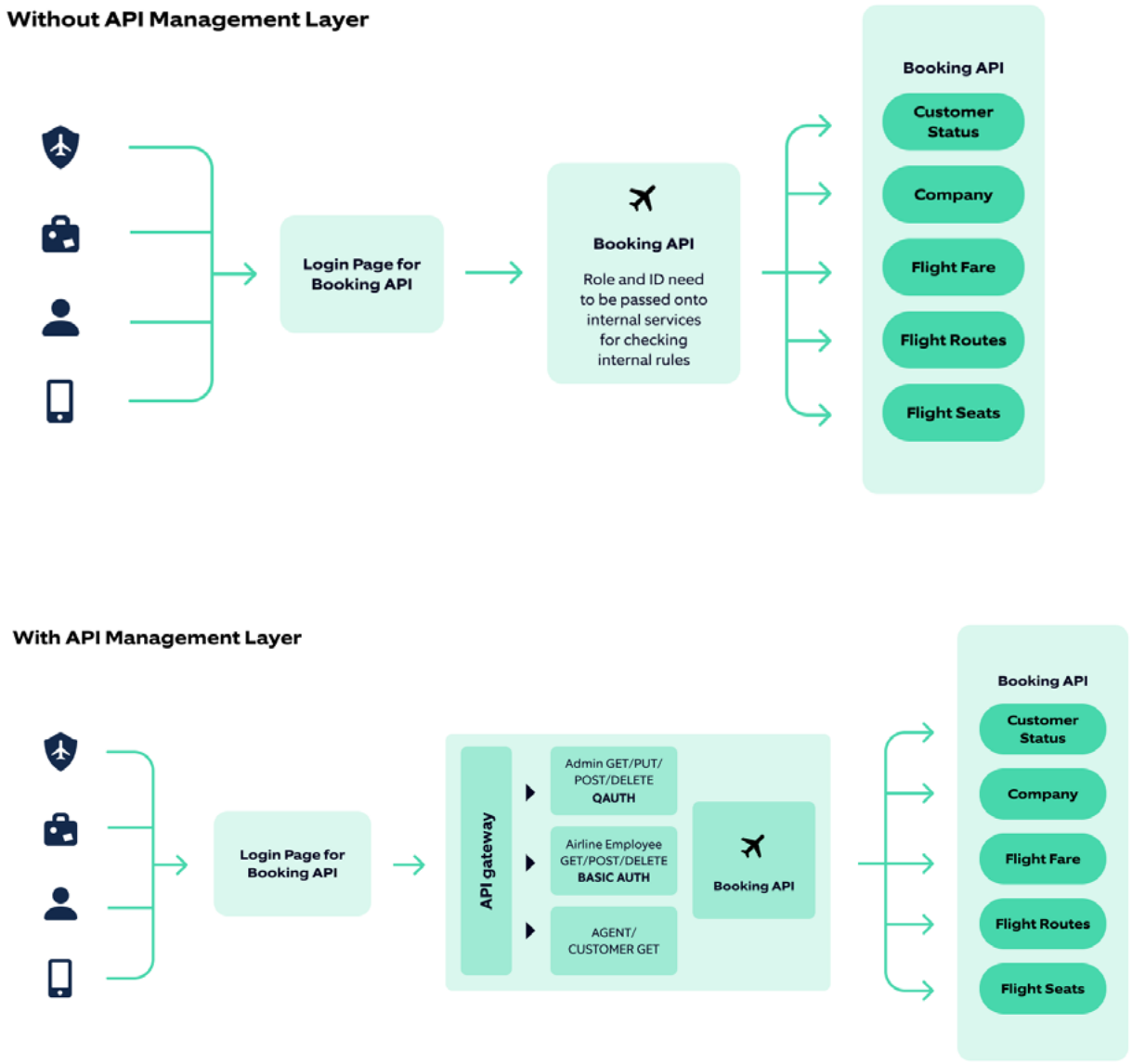

Figure 5: A booking flow with an API management layer

Replacing ESB with Microservices

To scale-up, increase resiliency, and boost the time to market, a strategic roadmap of decomposing the SOA-based services and moving to microservices development planning is required.

For a successful microservices development planning, it is essential to:

- Understand the current existing architecture and models used and the use of Payloads
- Outline the service with the most fluctuating load patterns such as reservation, airline merchandizing and other customer facing services.
- Gather the required documents on how the service is being used
- Check on the review or deployment cycle of the service
- Check on the service that need real time information exchange

Our API strategy matrix (Figure 6) will help airlines strategize the services that should be decomposed into microservices to start their transformation journey.

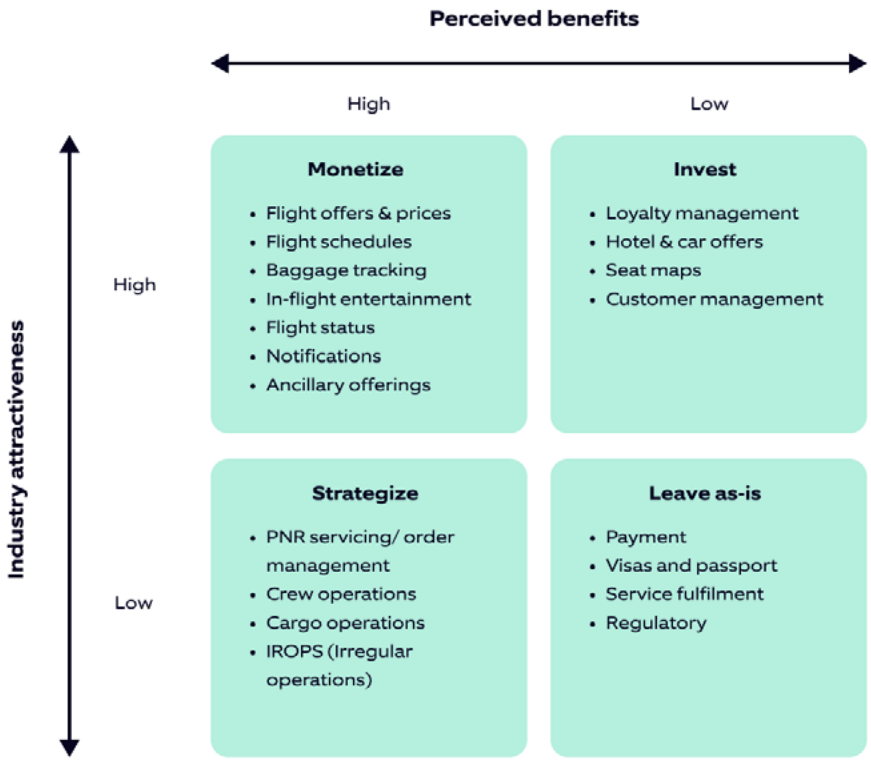

Figure 6: API strategy matrix

- **Monetize**
  Airlines already have some of these microservices existing in the current ecosystem and should be looking on how they can monetize these services using API Management. While other in-flight entertainment or ancillary offerings should be picked up on high priority as these can most benefit.

- **Invest**
  These are high potential "Cash cow" areas and airlines should start investing on decomposing these services.

- **Strategize**
  These functional points have always been in the grey area. Airlines should start looking at them as these microservices can help with the internal development to create meaningful solutions to optimize operations.

- **Leave-as-is**
  The areas listed would have minimal impact if the airlines leave them in the current state. So do not go about investing in creating microservices for them.

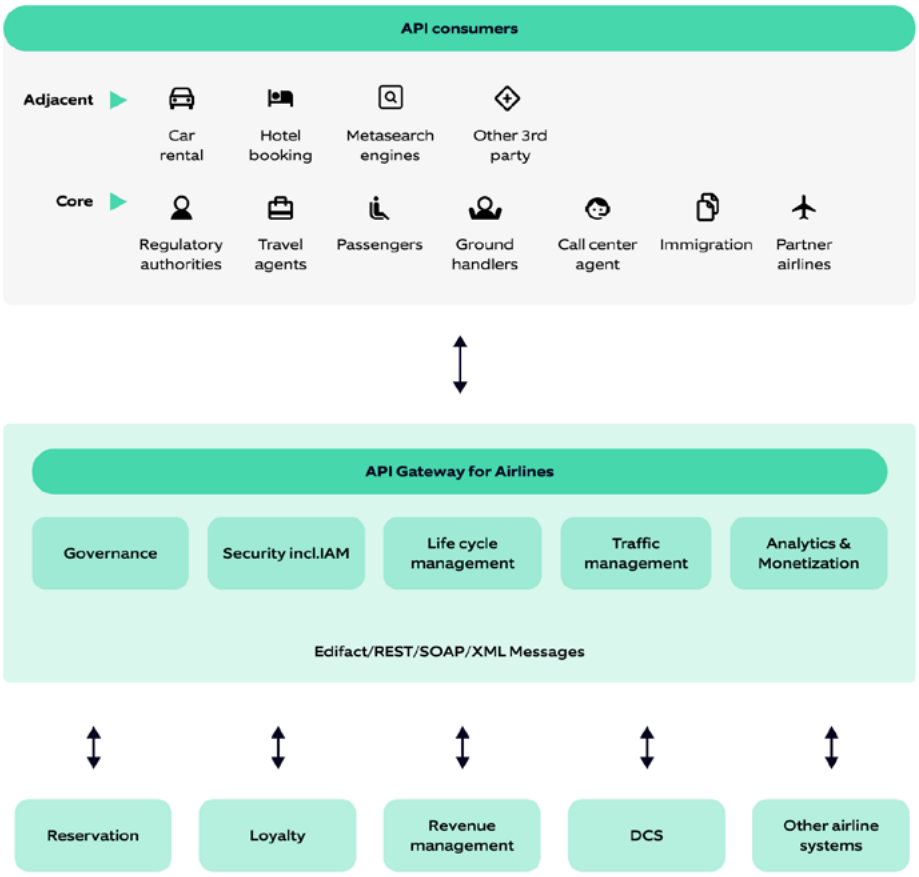

Figure 7: A sample airline landscape post transition

A trusted technology partner to make a seamless transition to API and microservices

To break free from the limitations of the IT landscape, the aviation sector has not yet been producing the desired results. This despite an active role being taken by IATA to create open API standards and guidelines to help airlines make this transition. Nagarro, with over 15+ years of experience of working with leading airlines across the world, brings in both its domain understanding and technology expertise to help airlines transform into an API based airline. Through our proven frameworks to identify the microservices and API that could generate maximum benefit, we help airlines create a transition strategy customized to their business goals. Instead of a big bang approach that makes these transitions an endless investment for airlines, we pick and choose the APIs to demonstrate quick wins and create value from day one.

About the author

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Ashish has over 8 years of experience in the aviation industry and is passionate about solving business challenges using technology. He possesses global experience in working across airline ecosystem in digital advisory, product definition, and implementation. As a domain expert at Nagarro, he is helping airlines adopt emerging technologies and move away from the conventional ways of working.

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About Nagarro
In a changing and evolving world, challenges are ever more unique and complex. Nagarro helps to transform, adapt, and build new ways into the future through a forward thinking, agile and CARING mindset. We excel at digital product engineering and deliver on our promise of thinking breakthroughs. Today, we are 15,000 experts across 28 countries, forming a Nation of Nagarrians, ready to help our customers succeed.