

# Scaling NDC

## for the digital travel players

The NDC Offer Repository

---



# Table of contents



Foreword



Executive Summary



Setting the scene



Inspiring travelers at the top of the search funnel



NDC challenges at the top of the search funnel



Proposed approach: the NDC Offer Repository



Complementing and evolving the current NDC standard



Conclusion and suggested next steps

# Foreword

Amadeus has always strived to lead from the front. This approach shapes our development roadmap and our corporate mindset. It means that we are always anticipating what is ahead while never losing sight of what is behind us.

When it comes to NDC, we are proud that our industry-leading and collaborative approach means that, today, our airline partners are in a better place when it comes to third-party distribution.

However, many potential future benefits of NDC can only be delivered if the standard evolves even further. We've identified a need to extend the standard of NDC so that it is better able to cope with transaction volumes when travelers first begin to search and offers full support for travel seller innovations.

IATA is also aware of the "scalability challenges in the leisure market". Many of our Airlines, Online Travel Agencies, MetaSearch Engines and other Leisure Travel partners have called on Amadeus to find solutions to this. Others have devised their own, and we are seeing some very innovative workarounds in the market.

But the industry needs a fit-for-purpose community-based solution to this, in order for digital travel players to unlock the full potential of NDC. An evolution of the standard, specifically to cope with these searches made at inspiration time, will encourage digital travel players to innovate collaboratively with their airline partners, with airlines remaining in total control of the inventory.

The net result – we believe – is that airlines will generate more revenue from being present earlier in the process; digital travel players will have access to more airline inventory and can better identify specific use cases within their customer base; travelers will have a wider choice and a better digital experience.

This paper introduces our proposed solution, which we're calling the NDC Offer Repository.





Our longstanding relationship with IATA, airlines and digital travel players means we understand their requirements and will invest at scale in developing innovative products and services across the travel ecosystem that benefit these stakeholders.

The NDC Offer Repository is well mapped out but remains a work in progress. We actively encourage feedback to our proposal as outlined in this paper and we look forward to moving this initiative forward in partnership with the industry.

Thanks in advance!



**Angel Gallego**  
Executive Vice President  
Travel Distribution, Amadeus



“We are committed to ensuring the success of NDC. Volumes of search queries have been identified as one of the potential hurdles for a deployment at large scale. Therefore, IATA welcomes initiatives to identify technical solutions and believes industry collaboration is key. Through its active participation in the Think Tank and through this White Paper, Amadeus has taken an interesting and worthwhile approach to finding solutions to this challenge.”

**Yanick Hoyles**

*Director Distribution, IATA*



# Executive Summary



EDIFACT and ATPCO standards served the airline industry well for a number of years, until the emergence of e-commerce led to the introduction of a new distribution capability, NDC.

Across its life span, **NDC has developed into a recognized and accepted standard.** It has started to address many concerns of airlines who were beginning to innovate on their airline dotcoms and wanted to do the same across all channels.

**NDC is already supporting many innovations in the indirect channel, but there is still a need for a better way of working with digital travel players.** As the big online travel agents (OTAs) and metasearch engines (MSEs) grow their footprints, so too does the disconnect between how they would like to access airline content and how airlines can make that content available to them in a cost-efficient way.

**This gap is creating challenges at the inspiration stage,** at the top of the search funnel, where travelers are not necessarily ready to click on the 'book now' button. Instead, they are looking for inspiration, for ideas about where to go and these ideas are often dictated by price.

This **inspiration stage today is owned by the digital travel players,** whose business model is based around converting lookers into bookers. Without a fit-for-purpose industry standard, many OTAs and MSEs have developed workarounds which have some value, but which are not sustainable as traffic and bookings grow.

The challenge is more than just a technical issue – **airlines are missing out on significant revenues** by only having a limited presence with their NDC offering with digital travel players during the inspiration stage.

**IATA has recognized the scalability challenges with NDC,** issuing a white paper in 2019 launching Project Robot, followed In 2022 by Project Robot 2.0. **Amadeus has come up with a proposed solution, which we are calling the “NDC Offer Repository”.** It is a cloud-based evolution of existing NDC standards, specifically designed to give airlines a presence with digital players at the top of the search funnel, on the airlines' terms and within their control. It allows digital travel players to respond to traveler search queries by accessing a repository of offers so they don't have to call the airlines' core IT systems for every query.

Working groups are being established, and **Amadeus encourages all stakeholders to get involved in the discussions.** Allowing digital travel players to access airline content in a scalable and sustainable way during the traveler's inspiration phase, with airlines in control of the content, is in our opinion fundamental to the future of how flights are bought and sold.

# Setting the scene

Today, most airlines still distribute content via third parties using ATPCO and EDIFACT, developed over the years to give digital travel players centralized access to airline content while allowing those same sellers the ability to develop in-house solutions to target specific traveler needs.

These digital travel players include online travel agents (OTAs) and metasearch engines (MSEs), as well as high street agents with an online presence and dynamic packaging tour operators.

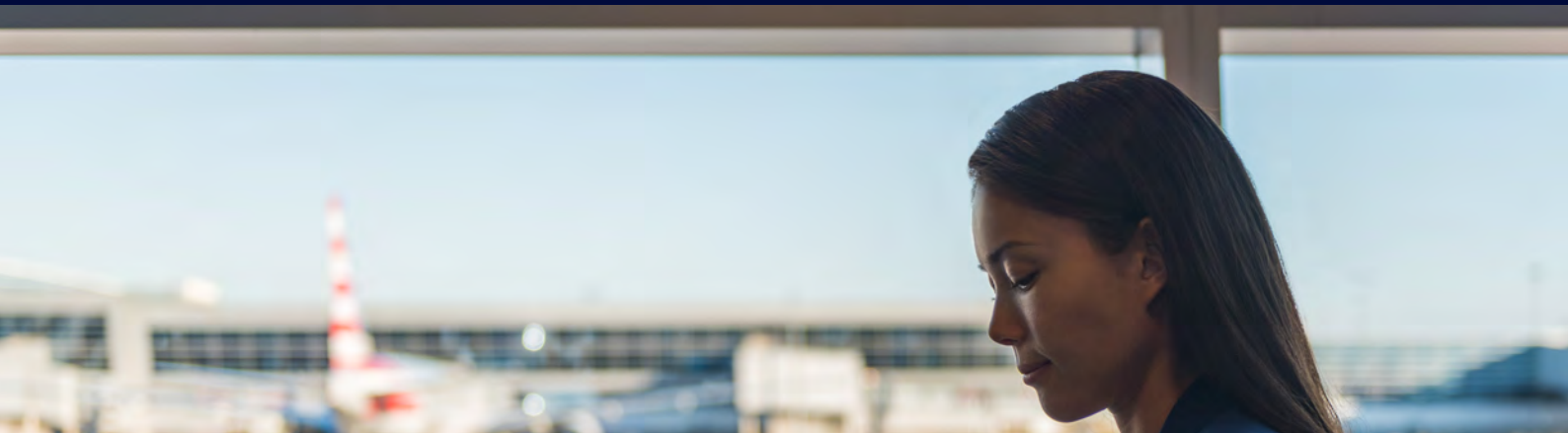
However, the **legacy architecture which supports this centralized access limits how much control airlines have over how their content is sold by third-party digital players.** Meanwhile, new and innovative airline products and services are slow to come-to-market because the booking code to allow third parties to sell, for example, guaranteed in-flight Wi-Fi access, has yet to be developed.

**On airline dotcoms' channels however, airlines have been able to develop new ways to interact directly with the traveler,** creating and controlling the offers via their own IT shopping technology, often built using the latest programming tools and techniques.

NDC was introduced to boost airline distribution capabilities, giving carriers a way not only to control the offer but also accelerate product innovation towards the end consumer across all channels. The NDC standard was developed around airline requirements to support the main consumer shopping flow (shop-order-pay) and many airlines have started to reap the benefits of this new distribution technology.

Having said that, **NDC is still a work in progress and as such there are still some areas where improvements are needed,** including, the impact on airline systems when responding to multi-airline searches from OTAs and MSEs.

**Travelers are spoilt for choice.** When searching for a flight, they might try many different sites and search parameters to find the best deal on a specific flight, or change departure dates to get a better deal, or try different destinations but using the same dates.





**All these options create a cost for the airline,** responding to queries from a range of digital travel players which often have a low chance of conversion. However, these queries still generate value for airlines – the answer is to find ways to manage the increasing volumes of queries, at scale and in a cost-efficient way.

One search from an OTA or MSE may result in dozens of shopping queries sent to a given airline. An MSE may cascade the user query into up to eighty different search queries, some directly to airlines, others to participating OTAs. And these OTAs may on their side apply a split query logic, leading to several more queries to each airline as it tries to find the best opportunities and address specific use cases.

Each digital travel retailer is addressing a specific group of travelers, so to generate bookings for airlines it needs to provide a shopping experience suited to its audience. For example, online travel agents and Tour Operators like to offer large

calendar pricing displays. These are use cases which airlines can satisfy on their airline.com but which are less easy to replicate on third-party sites using the current versions of NDC; therefore restricting how innovative digital travel players can be.

As the industry moves towards NDC, there is a risk that some use cases which are possible with ATPCO/EDIFACT but not with NDC will be lost along with the revenue that these use cases generate.

The **industry is aware of NDC's scalability challenges** and the impact of ever-increasing search volumes from third parties on airline IT systems and resulting airline costs. While many areas of NDC can be seen as a success, scalability needs to be addressed in order to **accelerate NDC adoption at scale across the industry** and for the standard to achieve critical mass.

NDC is still a **work in progress** and as such there are still some areas where **improvements** are needed, including, the **impact on airline systems** when responding to multi-airline searches from Online Travel Agencies and MetaSearch Engines.





# Inspiring travelers at the top of the search funnel

Digital travel players play a key role in promoting, marketing and generating sales of airline products. They are of value to airlines because they reach out to travelers who need help finding the right destination and flight options at the right price. They have large marketing budgets and technology resources available to attract, engage and inspire travelers from the very early steps of their travel planning journey, or in other words, at the top of the search funnel.

In return, digital travel players need access to airline content in a way that allows them to innovate, to cover many use cases specific to their target audience, from social media posts to niche search requests.

Some of these use cases may only attract a small percentage of travelers, but combined they deliver **significant incremental sales opportunities for airlines participating in these channels**. Airlines however need to consider the cost efficiency of solutions applied when look-to-book ratios are high.



# Some of these use cases include:

- **Destination landing pages**, with detailed information about the best deals to get to this destination at different times of the year, across all airlines flying there.
- **Large calendar displays** for a round-trip use case, proposing the cheapest offer for the specified date and including prices for using different airlines for outbound and inbound.
- **Open date and open destination searches** to find inspiration about where and when to go, for example to take a three-week break in a beach resort, with automatic alerts sent out by the OTA when an airline is launching a promotion for one of these destinations.
- **Browsing of all-inclusive holiday packages**, including the best hotel and best flight options for a two-week family holiday, based on the traveler's preferences from previous interactions with the OTA.
- **Social media posts** such as a weekly post on a traveler's Facebook wall from the OTA based on the traveler's destination wish list, featuring the latest airline promotions on these routes.
- **Multi-city and radius search options** so that OTA customers can build their own customized itinerary for a three-month trip around Africa.

To power these use cases, digital retailers need instant **access to massive amounts of data from many different airlines, in a standardized format**, enabling them to expose options to the traveler in a consistent way. At this stage, at the top of the search funnel, when travelers are looking for inspiration, personalized offers are not needed. These become important once the traveler reaches the booking stage and starts considering the ancillary services available.

NDC-sourced content needs to be available across all these channels and be compatible with these use cases (and others) in order for airlines to maximize their reach and sales opportunities with their key digital retailer partners.

# NDC challenges at the top of the search funnel

Until scalability is achieved, NDC-sourced content will rarely be exposed to travelers during the inspiration stage, creating challenges for digital travel players to convert lookers into bookers while causing airlines to miss out on revenues and the chance to gain new customers.

This low efficiency, specific to traveler activity at the top of the funnel, is due to the channel fragmentation and the corresponding multiplication of calls from OTAs and MSEs to the airlines' systems.

Specifically, digital travel players are facing today the **following drawbacks** addressing the inspiration stage based on NDC offers:

**Inconsistency in capability levels:** With airlines at different stages on their NDC roadmap, digital players are limited in what they can offer travelers, which in turn impacts what they bring to market and how quickly. For example, some airlines have calendar search covering +/- 3 days, others have +/- 7 days. OTAs find it difficult in these instances to offer travelers an easy-to-compare display.

**Response times:** The current pull model forces an OTA to wait for the slowest airline's answer before it can consolidate content and present options to the traveler during the inspiration phase. Some airline response times are so slow that OTAs effectively cut them off, denying them any chance of a booking and potentially losing business to competitor airlines who get back to the OTA more quickly.

**High costs:** Under current NDC shopping flows (dynamic offer construction with perfect bookability), the IT costs for Sellers, System Providers and Airlines continue to climb, since they are required to explore a large domain of offers in response to different traveler search queries. For example, an open date and destination search (considering





100 destinations, 365 departure dates and 2 to 3 weeks of duration) will require the search player to send 255,500 “Air Shopping” queries to each airline to fulfill the calendar matrix. Costs are incurred despite the low chance of conversion when the traveler is still in the inspiration phase.

**Sustainability:** Future IT solutions should factor in and endeavor to contribute to the fight against the climate emergency. In this instance, digital travel players and airlines need a solution designed to avoid unnecessary CPU utilization. This will help lower not only IT costs but also the energy needed to power the systems.

The current pull model of NDC, which is working effectively for shopping, needs to evolve to cope with the inspiration stage. There needs to be a focus on delivering instant access to a large quantity of offers from many airlines.

In the absence of an airline-controlled solution capable of addressing digital travel players’ needs, **many have developed in-house solutions**, primarily cache-based. The limitations of caching, particularly the complexities around keeping the cache up to date, often impact the traveler experience by surfacing inaccurate or unavailable prices. This has an impact across the full value chain and can **negatively alter travelers’ brand perception of both the airline and the OTA.**

Instead of relying on caching, a different approach is needed, one that will allow airlines, digital travel sellers and the wider ecosystem to innovate together. This would avoid a situation emerging where a limited number of technology giants could end up “owning” the top of the search funnel by building their own proprietary capabilities to effectively manage huge volumes of airline content.



# Proposed approach: “NDC Offer Repository”

As both an aggregator and IT provider, with decades of experience helping airlines and agents serve travelers, Amadeus recommends an industry-wide collaboration to move this scalability challenge forward. After studying different options, we are proposing a solution called “the NDC Offer Repository”: a cloud-based solution, extending the current NDC standards. It is also positioned as an optional solution for airlines.

The proposed solution design relies on two changes in the approach to NDC:

## **1. Not all transactions should be treated equal** (cf. Figure 1).

Using the idea of a funnel to describe shopping behavior can help identify where challenges and opportunities lie. Many transactions sit at the top of the search funnel, characterized by a low intent to book – such as a leisure traveler with a defined budget looking for inspiration for the family summer vacation – while those at the bottom of the funnel are very close to conversion – a business traveler booking their monthly meeting at the corporate HQ.

Today, the NDC shop-order-pay flow is directed to airline APIs and is highly adapted for sellers who want to access content for close-to-conversion, bottom of the funnel requests.

In most other cases, towards the top of the funnel, the standard needs extending to meet the needs of not only airlines but also retailers.

An NDC Offer Repository will open up new business opportunities for airlines, and by extension, travel sellers as well. As things stand, airlines are losing out during the inspiration and exploration stage of a traveler’s search because of the challenges faced by the current NDC standard when it comes to top of the funnel.



**\*90%**  
**Traffic Acquisition**  
Attract traveler with  
basic offer description  
(schedules + attractive prices)

**9%**  
**Airline Shopping**  
Richer content, ancillaries,  
upsell and personalization

**1%**  
**Book**

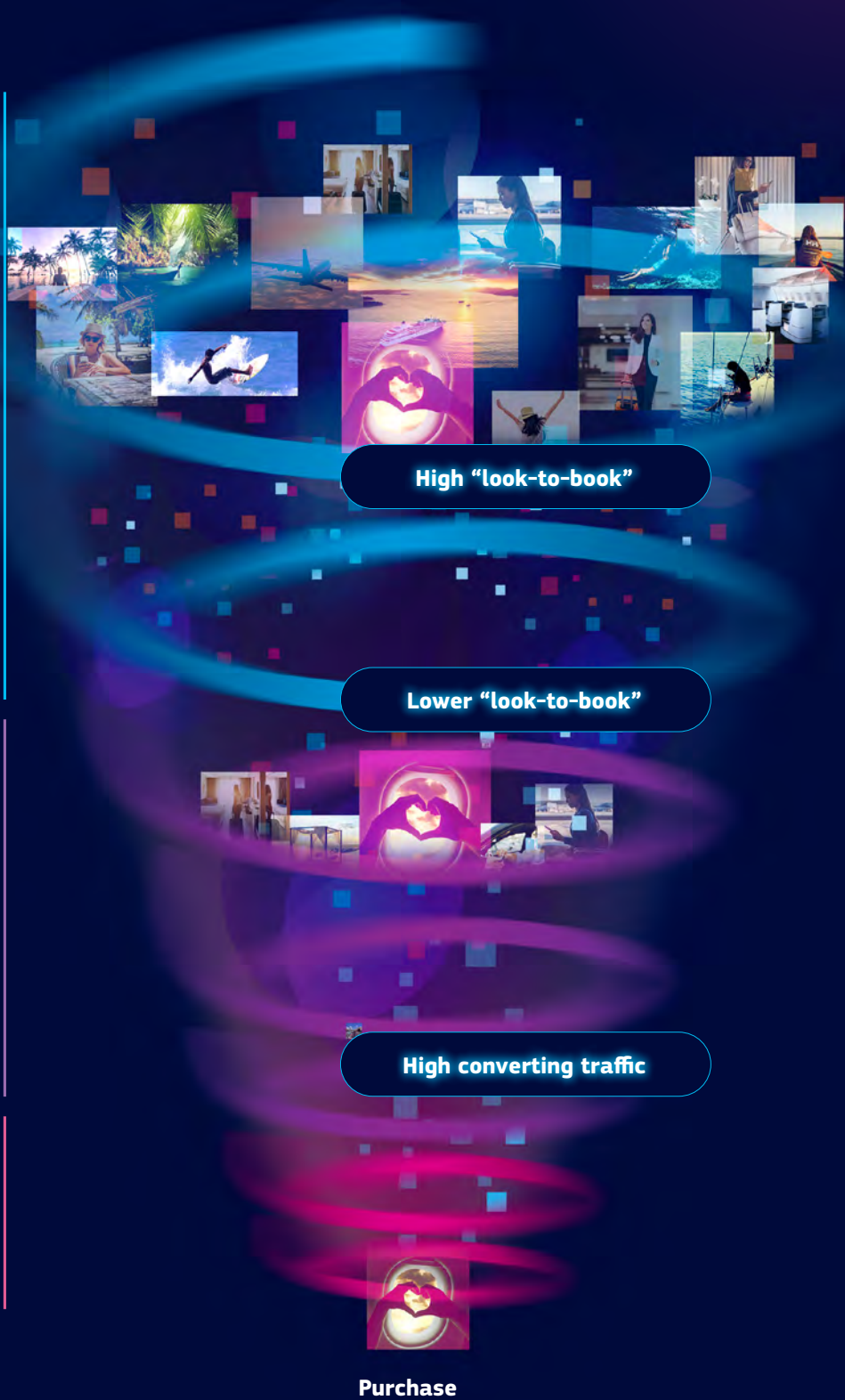


Figure 1: The search funnel

\* Source: Amadeus internal data

## 2. Decorrelate offer generation costs and search traffic.

Airlines and agents can unlock direct and indirect cost efficiencies by promoting an approach which incentivizes airlines and agents to respond to each transaction in a more appropriate way, in line with how close to conversion a traveler is.

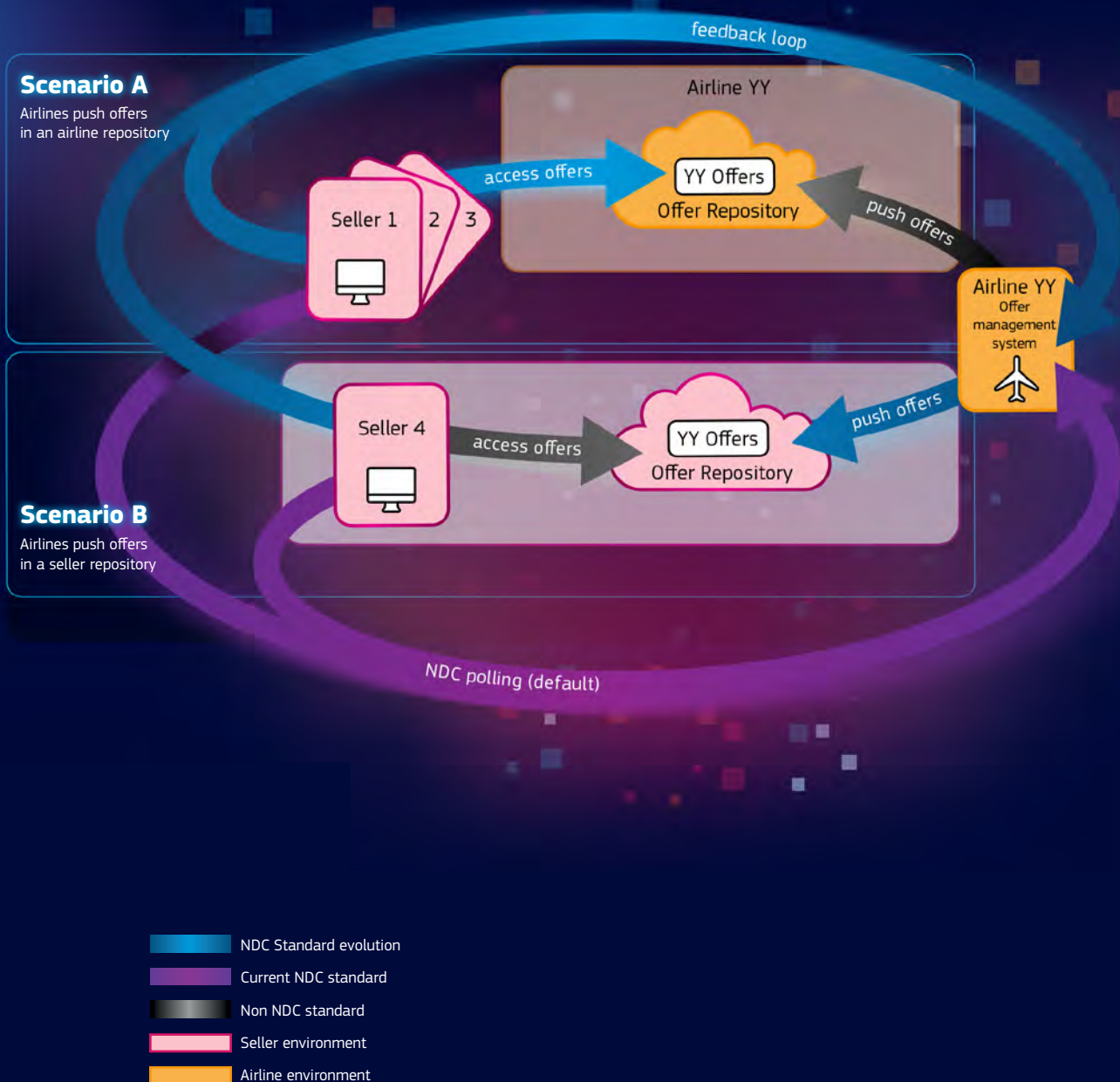
We recommend that the NDC Offer Repository is developed **as a complementary method** of access to airline content for digital travel players, working in conjunction with existing NDC shopping paths. It will use existing industry standards for consistency and will be open, owned and overseen by the airline industry on behalf of the airline industry.



**Figure 2:** Offer Repository solution within the search funnel and in complement to current NDC shopping solution

A NDC Offer Repository will reduce the stress on the airline IT system by storing the content outside the core systems, in a way that the content source remains controlled by the airlines.

**A NDC Offer Repository would address many of the listed concerns** by (1) increasing the speed of access to offers, (2) standardizing the access across airline providers, (3) removing low converting traffic from airline IT systems and (4) improving cost efficiency.



**Figure 3:** Two main scenarios can be envisaged to introduce an Offer Repository serving travel sellers



We would achieve the listed benefits in this proposed setup because of the following reasons:

**Airlines would push offers into a cloud-based environment.** Thanks to the airline's extensive knowledge of its own offer management logic, added to a feedback loop from travel sellers' needs, airlines would allow a steady flow of updates to keep the NDC Offer Repository up-to-date. Potential synergies are expected with IATA's Project Robot which has started to look at ways to alleviate some of the challenges of high look-to-book ratios by decoupling the offer request from the offer creation.

This cloud-based environment could be **set up at the discretion of the airline**, either in a single location or within several digital travel players' own IT environments. Airlines would decide whether the NDC Offer Repository is part of their offer IT system and accessible through an evolution of

the NDC protocol for inspiration use cases (Figure 3, Scenario A). Alternatively, airlines could directly push an offer feed to digital travel players' environment and let them handle the storage and retrieve functions (Figure 3, Scenario B). The offer feed would need to be standardized across airlines. In any case, each participant airline would remain in control over which offer could be used by the digital travel player and could determine the exact commercial model under which its repository can be accessed.

**Sellers would then be able to tap into the NDC Offer Repository, based on their specific use case and transaction volume requirements.** Thus, a seller wanting to differentiate itself by offering its customers, for example, a year-long search capability would be able to do so and weigh up the costs of NDC Offer Repository access compared with the benefits.





With this approach, **airlines would remain in control of the products made available while digital travel players would be offered additional flexibility to innovate.**

Airlines would decide the type of content made available through the NDC Offer Repository, according to their strategy and in a way which allows them to anticipate the costs. For example, airlines prioritizing customer acquisition could promote a limited set of offers, focusing on ‘starting from...’ prices. This minimum set would prove to be the most cost-effective approach.

At the other end of the spectrum, airlines targeting exhaustivity would push a larger set of offers, keeping the content accurate by syncing the Offer Repository with the offer management system with the option to curate seller access using their business rules.

In either case, the NDC Offer Repository can be treated as a standalone channel within an airline’s overall strategy, distinct from other online channels activity at the top of the funnel.

Consequently, the offers contained in the NDC Offer Repository may not all be bookable as such; the seller would branch back into existing NDC ‘shop-order-pay’ polling flow to closely reunite the traveler with the airline, enable personalized transactions and enrich the display with upsell and cross-sell capabilities through ready-to-book offers.

Therefore, the NDC Offer Repository should be considered as a complementary source of NDC-sourced content, as an alternative to polling, with a different method of access:

**Through an updated version of the NDC Airline Profile, carriers would be able to inform which content is available on the NDC Offer Repository.**

For instance, one way for airlines to start looking at the benefits of the Offer Repository is to only add offers with low volatility (such as long advance purchase) on specific markets (such as airline’s domestic country). Sellers will then know what to be retrieved from the Offer Repository.

**Each digital travel retailer would be able to determine if, how and when it would access the Offer Repository.**

A travel management company (TMC) with excellent conversion rate would be able to ignore the NDC Offer Repository and continue to use NDC polling. Elsewhere, a pure advertising solution with no immediate booking would rely solely on it. Most sellers will use a combination of both, as their content selection would depend on the use case and context. Polling would most likely be used for highly personalized searches (for instance when the traveler shares its Frequent Flyer number) and when the query is identified in the bottom of the search funnel.

To help airlines improve how the NDC Offer Repository is managed, a **feedback loop** could be set up, where retailers would provide valuable indicators on how it is being used - most requested routes, most popular offers etc.

From the pre-built nature of its content, the NDC Offer Repository should also allow a **faster access to the content of the airline**, skipping the offer build processing time. Faster access is a key requirement for digital retailers, not only for their existing features but also for innovations to come.



# Complementing and evolving the current NDC standard

Implementing the proposed solution requires an evolution of NDC. However, the underlying philosophy of NDC – giving airlines control over how their inventory is sold through third parties – remains intact and unchanged. If anything, the proposed NDC Offer Repository enhances the ability of airlines to make self-determined distribution decisions based on their business goals.

The evolution would cover the following aspects:

**a. NDC Offer Repository structure.**

Defining the data model, associated functionalities as well as an associated implementation document and best-practices guideline.

**b. Feed and update processes.**

A new transactional message would be required to push airline content from its offer management system, whether it is a new offer, the update of an existing one, or to remove an offer from the NDC Offer Repository. Such a feed needs to be standardized in the scenarios where the airline does not own the offer repository and directly pushes content to an online channel or partner airline (Figure 3, Scenario B).

**c. Access and control methods.**

This will describe how digital travel players access the NDC Offer Repository content and perform operations within it to extract relevant information applicable to their business needs. This section would also detail the feedback loop used by sellers to share the activity on their side and help airlines adapt the content pushed to the NDC Offer Repository.

**d. NDC Airline Profile update.**

These are additional rules shared by airlines to describe under which conditions their NDC Offer Repository is accessible to sellers.





The technical and commercial complexities involved when defining such elements can only be done at industry level. **IATA is supportive of initiatives to address the scalability challenges, and Amadeus has been collaborating with the organization on establishing a specific working group.**

The proposal also includes adding an NDC Offer Repository component to its Airline Retailing Maturity (ARM) index certification process.

One very important aspect of the proposed solution is that it's **optional**. Airlines and retailers can decide to opt-in or not, which makes its deployment relatively simple. Airlines can ask their IT provider to implement

the solution, and being optional, there will be no adjustments needed from its existing users. Forced migration or mandating the NDC Offer Repository is not on the agenda of this proposal.

There are many sellers and airlines which are not affected by current volume and scalability challenges and would not need to change any of their implemented processes. The NDC Offer Repository will be designed specifically to help airlines capture more opportunities at the top of the funnel by making it easier for digital travel players to access their inventory during the inspiration stage.

# Conclusion and suggested next steps

Globally, the pace of innovation is accelerating, driven by data, artificial intelligence, machine learning and with new technologies such as quantum computing starting to emerge.

At the same time, customer expectations of what technology can do are defined by their B2C experiences across industries, devices, and channels. The bar is set very high. NDC was introduced to help close the customer experience gap in the intermediated channel and has helped airlines to offer a consistent experience to travelers across all channels. But challenges remain when it comes to the customer experience on third-party sites and digital travel players, particularly during the initial phase of a traveler's engagement.

We need innovation across the distribution chain to truly achieve the state-of-the-art

experience expected by travelers. Market and segment expertise is needed to enable digital retailers to differentiate and to **create a holistically optimized distribution chain which serves the needs of airlines, retailers and travelers.**

Our conclusion is that we need to address this in a **collaborative way**, building on investments already made by many airlines and technology providers in their digital transformation and transition to the cloud. The solution needs to be aligned with existing technological strategies while remaining open to new paradigms.



Implementing such a framework in the industry will allow all players to innovate at their own pace, decorrelate sellers' and airlines' operational costs and reduce carbon footprint, all while preserving the underlying condition that airlines need to be in control of how their content is sold via digital travel players.

NDC is already with us and provides a solid foundation for the future, providing that it can be evolved in a way that aligns the inspiration stage with the established and successful NDC flows.

**Such a framework can future-proof the relationship between airlines and digital travel players.** It can foster new collaborative opportunities such as a retrofit of digital retailers' business intelligence to airline systems or enable dynamic adaptation of airline products by optimizing cloud storage.

Looking ahead beyond its application for digital players described in the present document, an evolved NDC standard could also address inspiration scenarios with partner airlines once NDC interlining becomes operational.

**IATA recognizes that NDC needs to evolve** and has worked with stakeholders, including Amadeus, by setting up working groups and think tanks, to which all stakeholders are invited and encouraged to contribute. Airlines understand the need for change and to find better ways to work with digital travel players. The digital retailers themselves are also encouraged to participate and, at the same time, should be advocating the development of an NDC Offer Repository which supports scalability and works in today's multi-channel environment.

**We invite all members of the ecosystem to get involved and let Amadeus know what they make of the proposed NDC Offer Repository. We are confident the solution is viable and will help airlines and digital travel players sell more seats to move travelers in a more cost-effective way.**



## About Amadeus

Travel powers progress. Amadeus powers travel. Amadeus' solutions connect travelers to the journeys they want through travel agents, search engines, tour operators, airlines, airports, hotels, cars and railways.

We have developed our technology in partnership with the travel industry for over 30 years. We combine a deep understanding of how people travel with the ability to design and deliver the most complex, trusted, critical systems our customers need. In 2019, we helped connect over 1.9 billion people to local travel providers in over 190 countries.

We are one company, with a global mindset and a local presence wherever our customers need us. Our purpose is to shape the future of travel. We are passionate in our pursuit of better technology that makes better journeys.

Amadeus is an IBEX 35 company, listed on the Spanish Stock Exchange under AMS.MC. The company has also been recognized by the Dow Jones Sustainability Index for the last ten years.

# amadeus

© Amadeus IT Group SA