APIs…. What is Really Out There in Aviation Beyond the Buzz Words?

June 2018, Lufthansa
Frankfurt am Main

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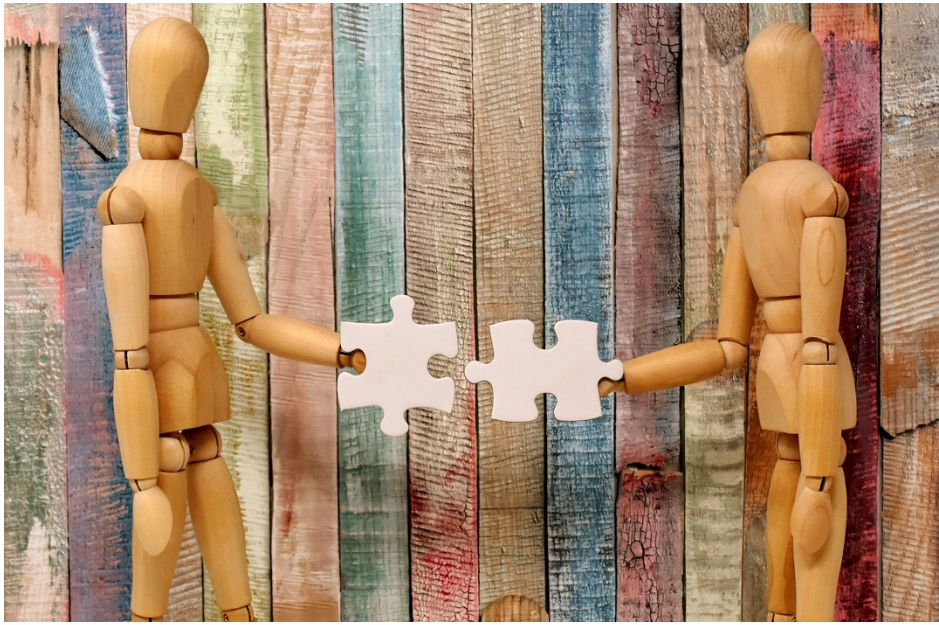
APIs at Lufthansa Group

Coming from SOA and ESB

- Lufthansa Group IT systems inter-connection is using ESB and SOA methods
- Internally connectivity, security and management processes



APIs at Lufthansa Group

APIs

- In 2014 Lufthansa Innovation Hub was founded in Berlin
- To allow interaction with partners, access to data and services was required

⇒ Inception of LH OpenAPI

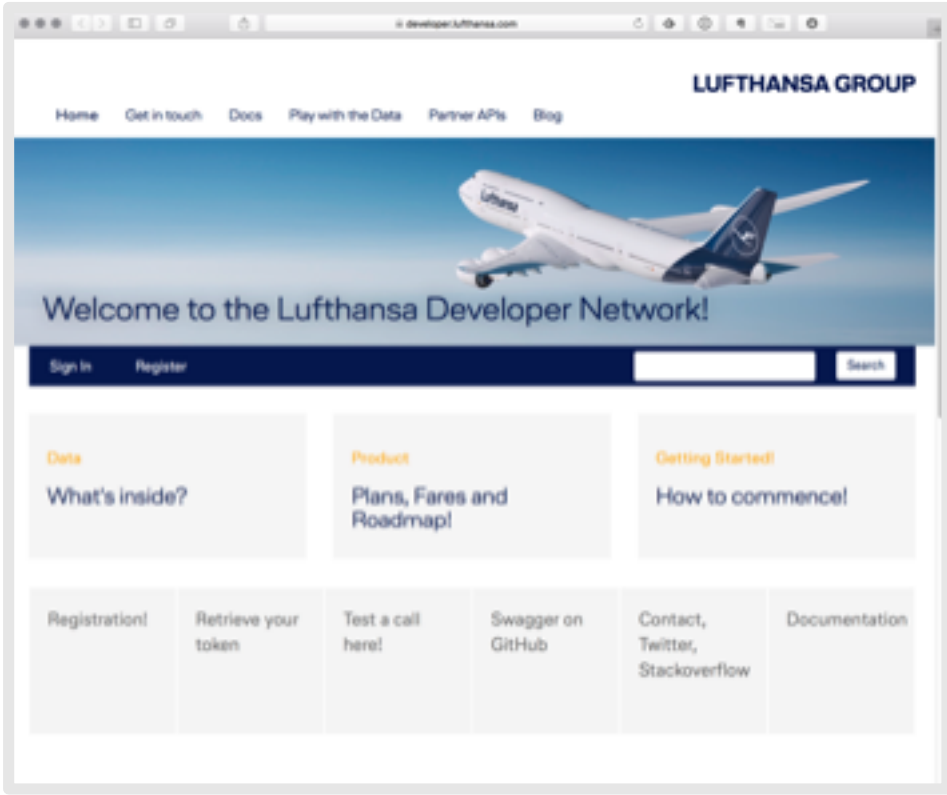
Initial Goals of the LH OpenAPI

Provide controlled access with governance and legal aspects covered

Allow partners to easily connect and consume services

Provide outside reachability

Leverage Internet standards (https, REST, JSON, OAuth)



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Unlocking Potential with APIs – there is more we do now

Put the consumer/developer and its prospective usage in focus

Abstract business processes and reduce complexity to become accessible

Automating all aspect of API creation to support high pace while retaining control

⇒ An API is a managed product and the API provider needs to understand how this product will be used in which context

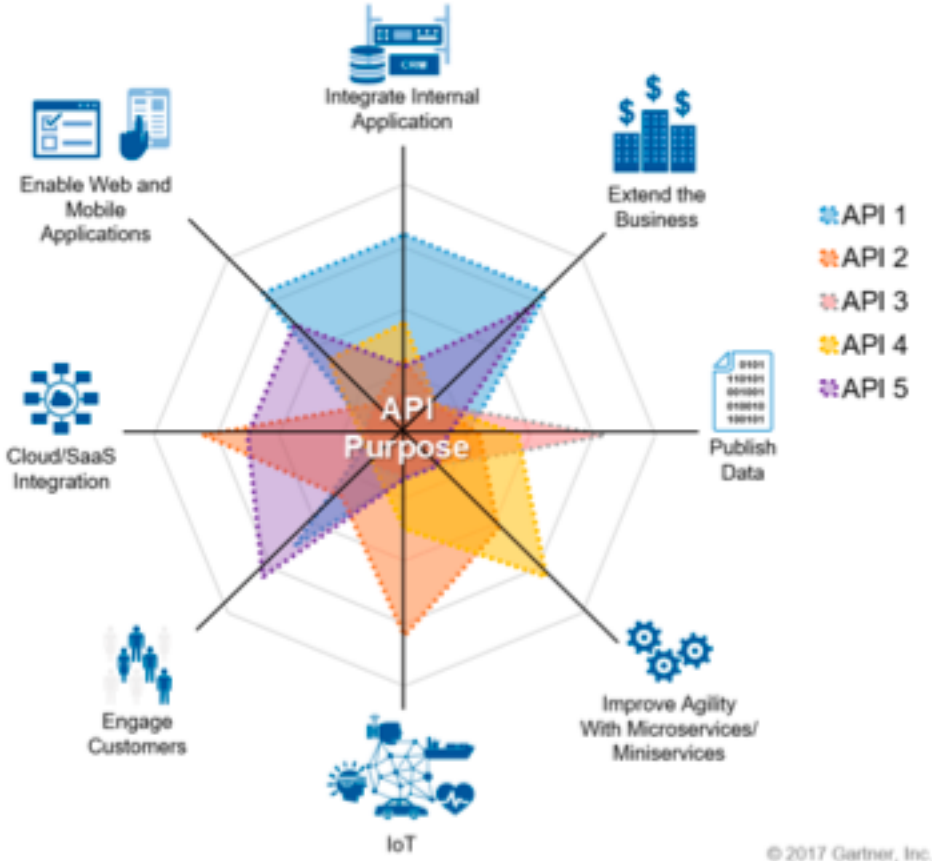
Using APIs at LH Group

Powering new customer channel (http://lufthansa.com/chatbot_en)

Enabling mobile apps for crew and ground staff

Leverage developer portal and API Gateway throughout the Lufthansa Group beyond Hub Airlines

Support fast iteration for new ideas with limited costs



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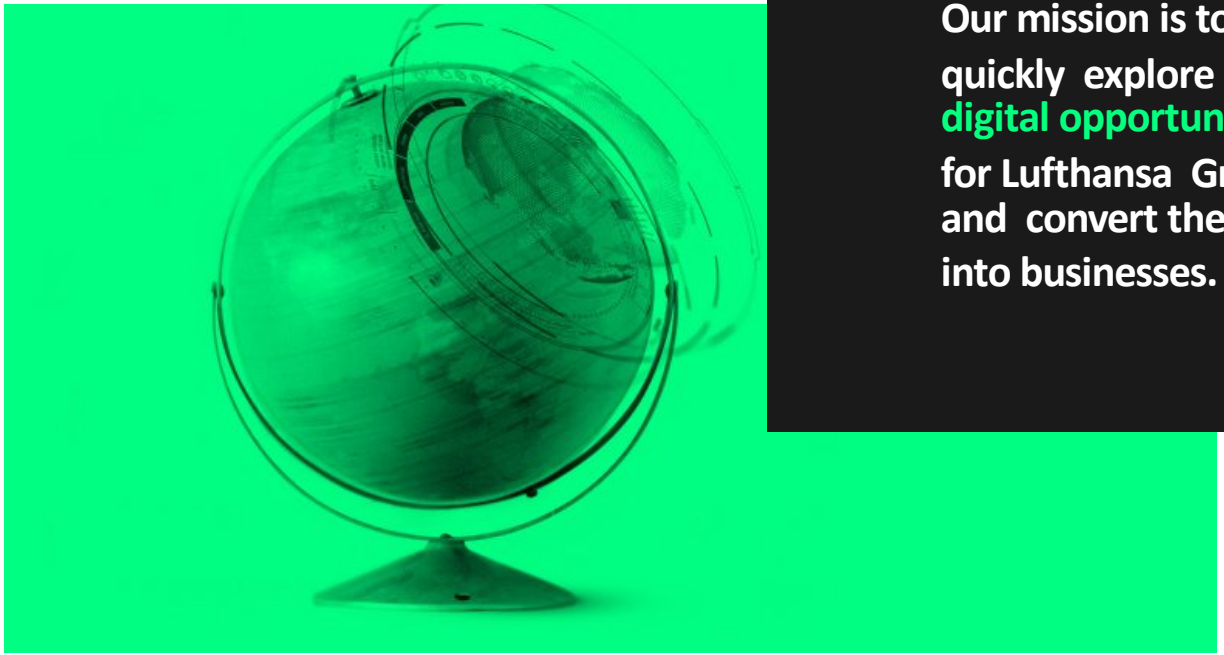
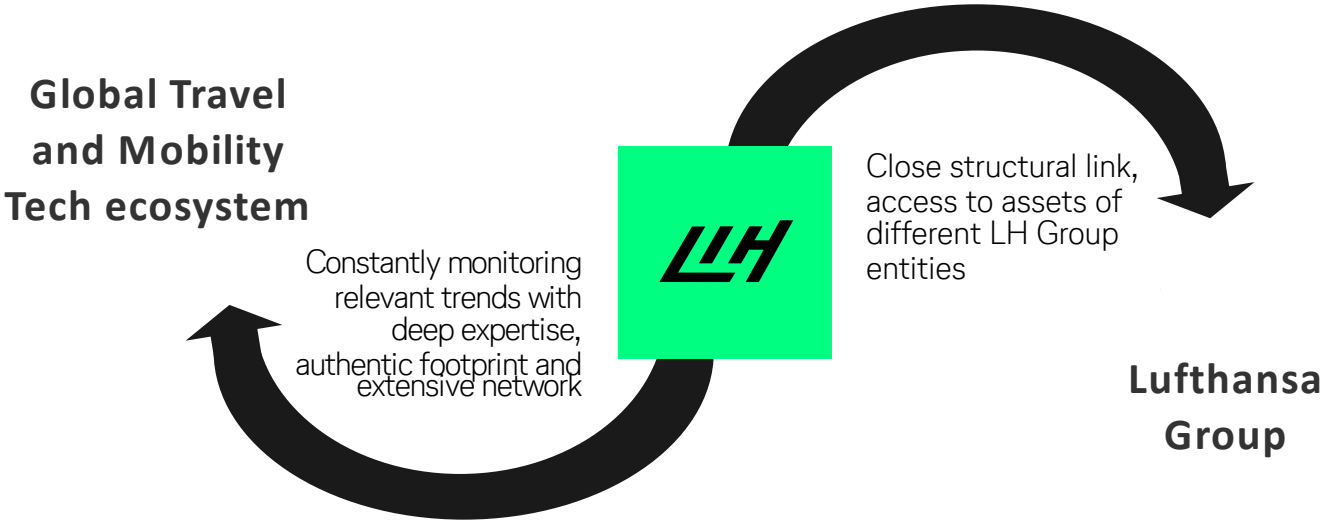
Our Mission



Our mission is to quickly explore new digital opportunities for Lufthansa Group and convert them into businesses.

LIH as the interface between the startup ecosystem and Lufthansa Group



Strategic fields of action

Build

Develop and build our own digital products & services.

Partner

Foster selected partnerships between digital players and Lufthansa Group

Invest

Educate and support Lufthansa Group at strategic venture capital investments in startups

BUILD - Flightpass

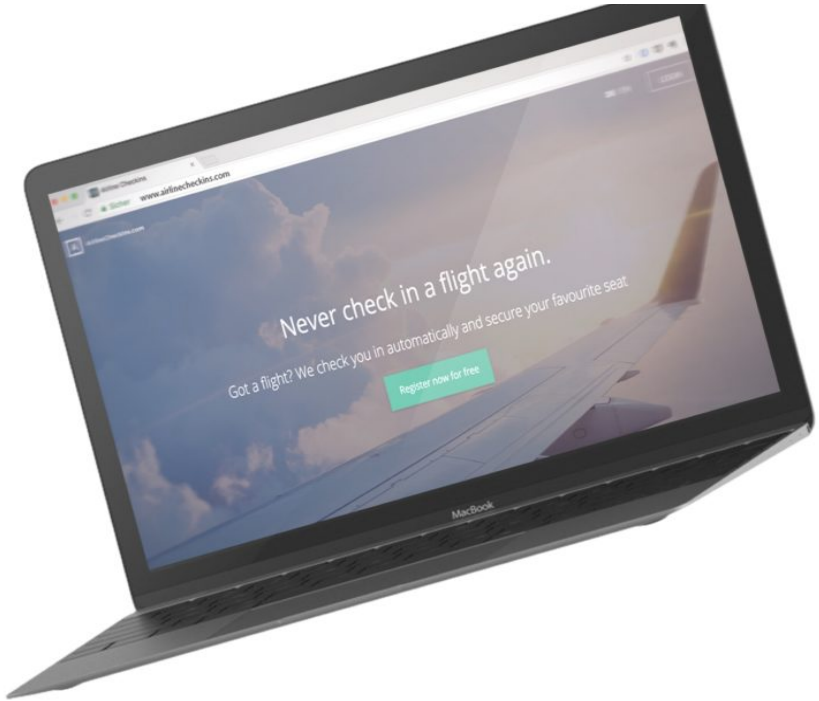
A 10-flight ticket in cooperation with Eurowings, SWISS and Lufthansa Airine

Built, operated and successfully validated by LIH

BUILD - AirlineCheckins.com

Automatic check-in assistant for more than 200 airlines worldwide

Empowered with flight status and reference data



INVEST - Cargo.one

cargo.one offers cargo airlines a fully digital sales channel, attracting new business at lowest transactional cost and higher operational efficiency

cargo.one's customers include two of the largest cargo airlines in Europe as well as several of Europes largest forwarders

OpenAPI provides the LH Cargo data

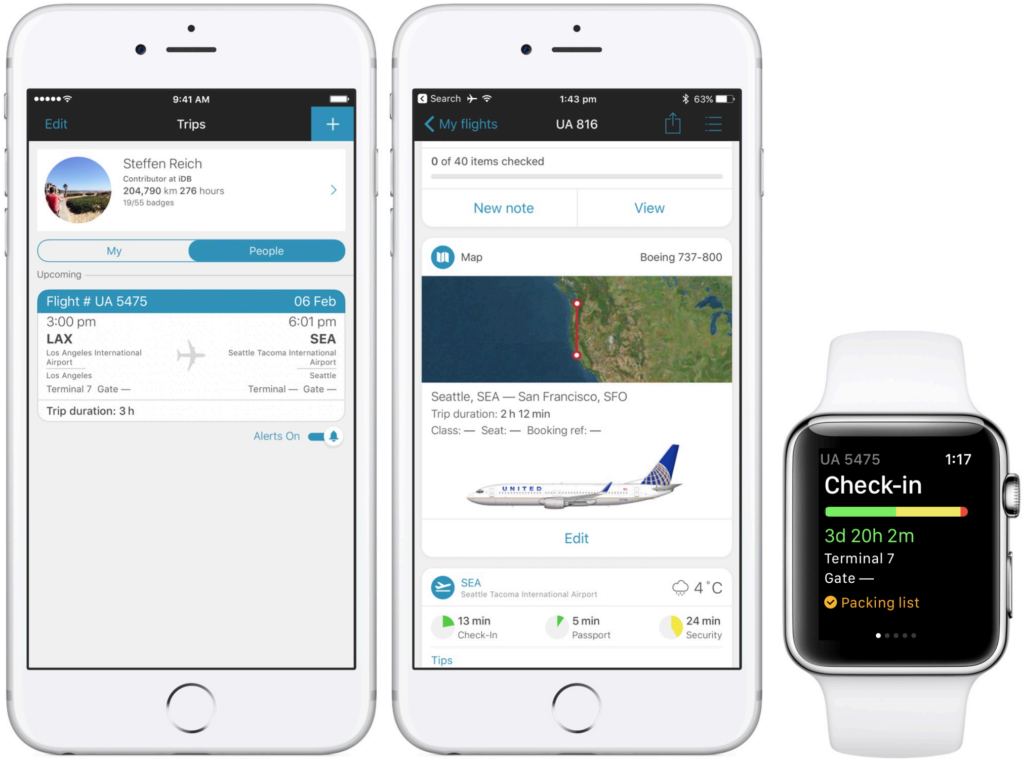
PARTNER - App in the Air

Data exchange with App developer to further enhance a seamless cross airline journey

Aims to be your everyday travel companion.

Got feature on Apple's WWDC 2014

OpenAPI provides flight status plus will enable the app to book flights from LH ticket stock.



Austrian Lufthansa SWISS

LUFTHANSA GROUP

Challenges

Lots of players in API space

- Discoverability of APIs
- 530 travel APIs at programmable web

Diversity, both content and technical

- Standardizing efforts such as IATA OpenAPI Group need to retain flexibility technology is ever evolving and changing

Making good APIs

- Business Process hard to put into APIs
- Manage APIs as a Product

Future

API Thinking is crucial for digitalization with airlines' business

IoT and real-time capabilities are on the rise. Serve your customers in their ecosystem, at the right time.

An holistic API Strategy allows value driven API Product creation


Thank you.
Questions?
Answers!

The Future of Dynamic Pricing

Presentation by *Josef Habdank*,
Chief Data Scientist & Data Platform Architect at INFARE

June 20, 2018

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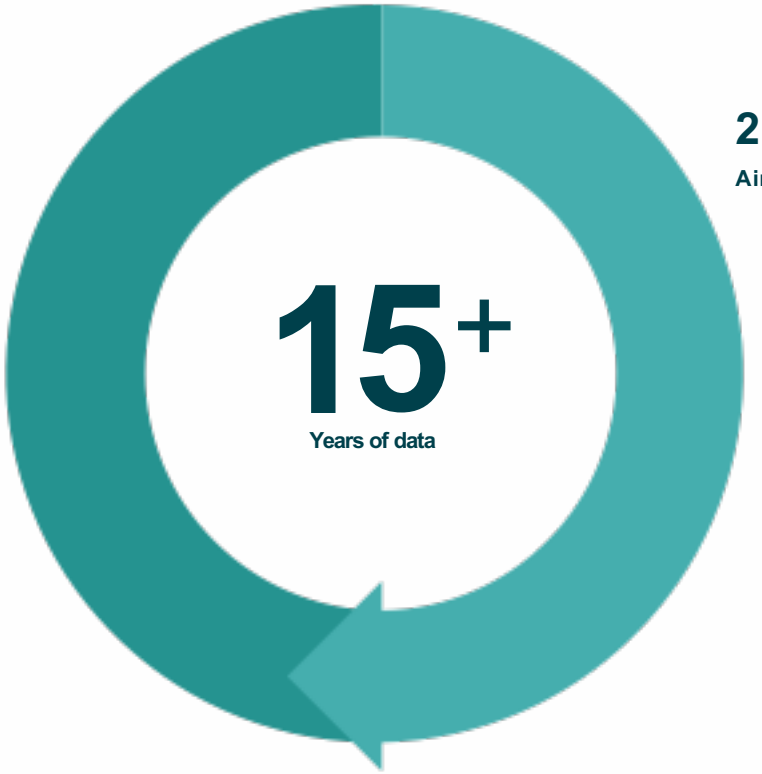
INFARE

Who we are

1.1+ trillion
Web fare records

~2 billion
Records a day

80,000
routes



20+
Airports

240+
Airlines

1000
Online data sources

INFARE

The Holy Grail:

Dynamic Pricing and Marketing

- **Personalized offers** to individual

  specific departure of interest (departure dates, origin and destination) based on shown interest by the customer

- **Market awareness of the offer**

  price offer computed accordingly to the current market state

- Prices reflecting **services most desired** by the individual
- **Individual offer** that can be purchased

INFARE

The Holy Grail:

Dynamic Pricing and Marketing System Architecture

Level 2 Dynamic Pricing

RM forecast automatically enhanced using current market state Prices modified by opening/closing classes
Targeted custom discounts

Level 2 Dynamic Marketing

Real time market aware AD building and servicing system

Dynamic Pricing and Marketing System Architecture

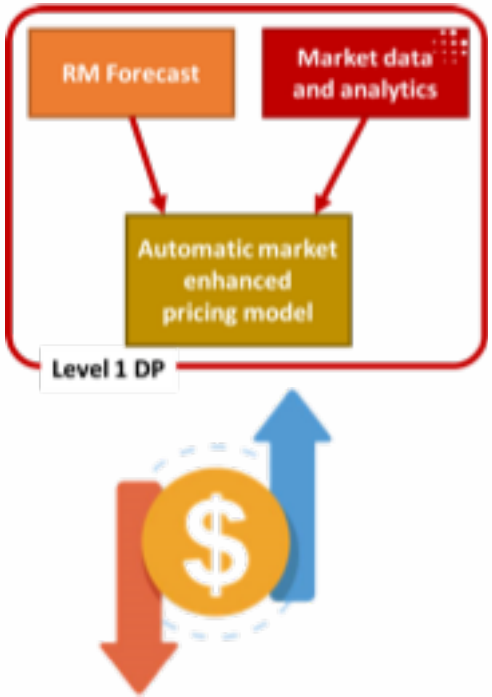
Level 1 Dynamic Pricing

Automatically adjusting the pricing structure (class-seat allocation) based on market state

Level 1 Dynamic Marketing

Real time market aware AD building and servicing system targeted for user searches no individual offers yet

Dynamic Pricing Alerts



Requirements

- continuous market state awareness (dynamic scanning of the competitors prices)
- clear definition of desired market position (e.g. cheapest by min 5%, second cheapest by 2% etc.)

How to execute

- RM forecast + market distribution + business rules
- have a fine distribution of classes
- adjust the class availability accordingly

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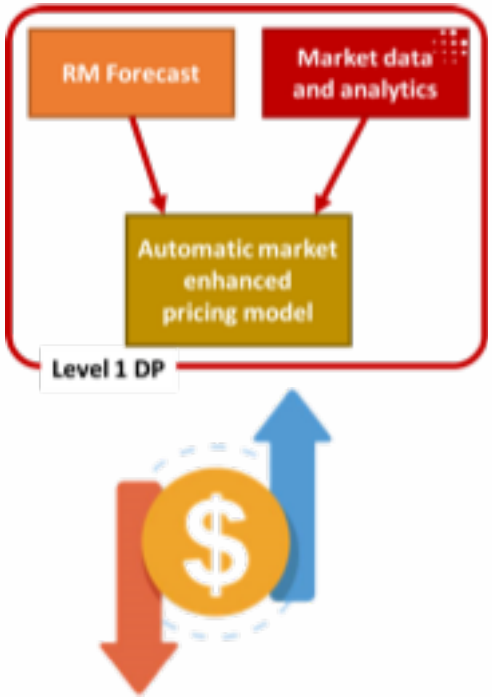
INFARE Dynamic Pricing Alerts:

Continuous Market State Awareness



Goal

- contains **only actionable data**, a list of messages when specific flight departure is not following the business rules
- single message/row contains **all the data needed to take an action**, no need to big IT infrastructure analysing the market as a whole
- **real time notifications**, messages sent immediately when it is found that given flight departure is not following the defined business rules

INFARE Dynamic Pricing Alerts:

System Overview

Flight comparison groups database

Scheduler, optimizes data scanning knows when market is complete

Data pricing feed creation logic

Airline system reacting to the market changes

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INFARE Dynamic Pricing Alerts:

Automatic Creation of Flights Comparison Groups

Why?

- Manual creation of flight comparison requires constant maintenance, as network changes over time
- If done manually does not react to dynamic aspects such as price

Flight comparison groups database

How?

- Created as a Machine Learning Recommender System
- Can be price centric, thus dynamically change as the market evolves. E.g. some flights might not be considered a competition, except when the price difference becomes very large

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INFARE Dynamic Pricing Alerts:

Message Structure

Actionable data only

- Only creates a message when a rule is violated
- Single row in the feed contains all the data required to take an action, no need for BigData system to pivot data

Data Format

- Full airfare observation of your fare
- Full airfare observation of the lowest competitor fare
- Statistics about the flight comparison group
- Possibly predictions about prices in the group

INFARE Dynamic Pricing Alerts:

Integration

Dynamic Pricing Alerts exposed via FTP

real time streaming of alerts

alerts suggest adjusting lowest available fare for a specific flight departure

Practically executed by:

1. pre RM forecast increase of Demand Units in the RM system
2. or post RM forecast manual override with floor/ceiling class setting

market adjusted class structure

class structure sold via Direct Channels or via GDS

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INFARE Dynamic Pricing Alerts:

Summary

2 - 3 years Vision

Level 2 Dynamic Pricing creating individual offers and marketing them online

This year

Level 1 Dynamic Pricing bringing the money from sub-optimally priced markets (both under and over priced)

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Thank you!

Josef Habdank
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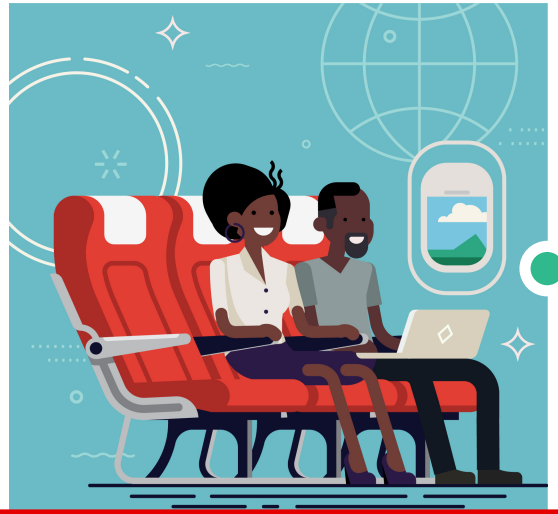
Connecting the enterprise to enable intelligent action

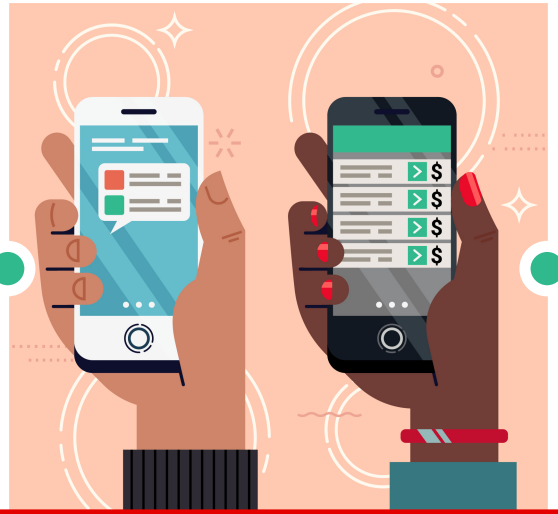
Rodrigo Ramos
Managing Director, Sabre Iceland
Product Head of Intelligence Exchange
Magnus Sigurdsson
Director Delivery Management – IX Managed Services

20 June 2018

Last Minute Upgrades checks for upgrades and automatically notifies qualified customers based on tier or other criteria.



On the day of departure, WorldWide Air identifies that they have unsold seats in a particular cabin.



In order to fill that cabin, WWA decides to offer promotions to qualifying customers to encourage upgrades.

Based on rules in the Micro-App, promotions are sent to customers and front-line agents.

How many hours before departure should we check for upgrade availability?

- 8 hours
- 6 hours
- 5 hours
- 3 hours

On which route should we check for upgrades?

- LHR – AUH
- AUH – SYD
- YYZ – AUH

How many seats need to be available in higher class to make offer?

- 1 seat
- 2 seats
- 3 seats
- 4 seats

How many point/miles should the upgrade cost?

- $500 or 30k points
- $600 or 35k points
- $1,000 or 60k points
- $1,500 or 100k points


Can you
imagine...
...Lazy Susan
Source: wired.com

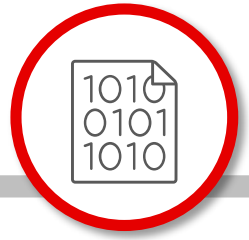
The advent of the PSS System was revolutionary

...it changed the way we travel

Source: wired.com

Key challenges for airline IT and the business

The PSS is not designed for custom business process and sense and respond actions



Complexity of bringing together disparate, data sets to achieve digital transformation

A customer-centric business requires non-core systems to have customer data

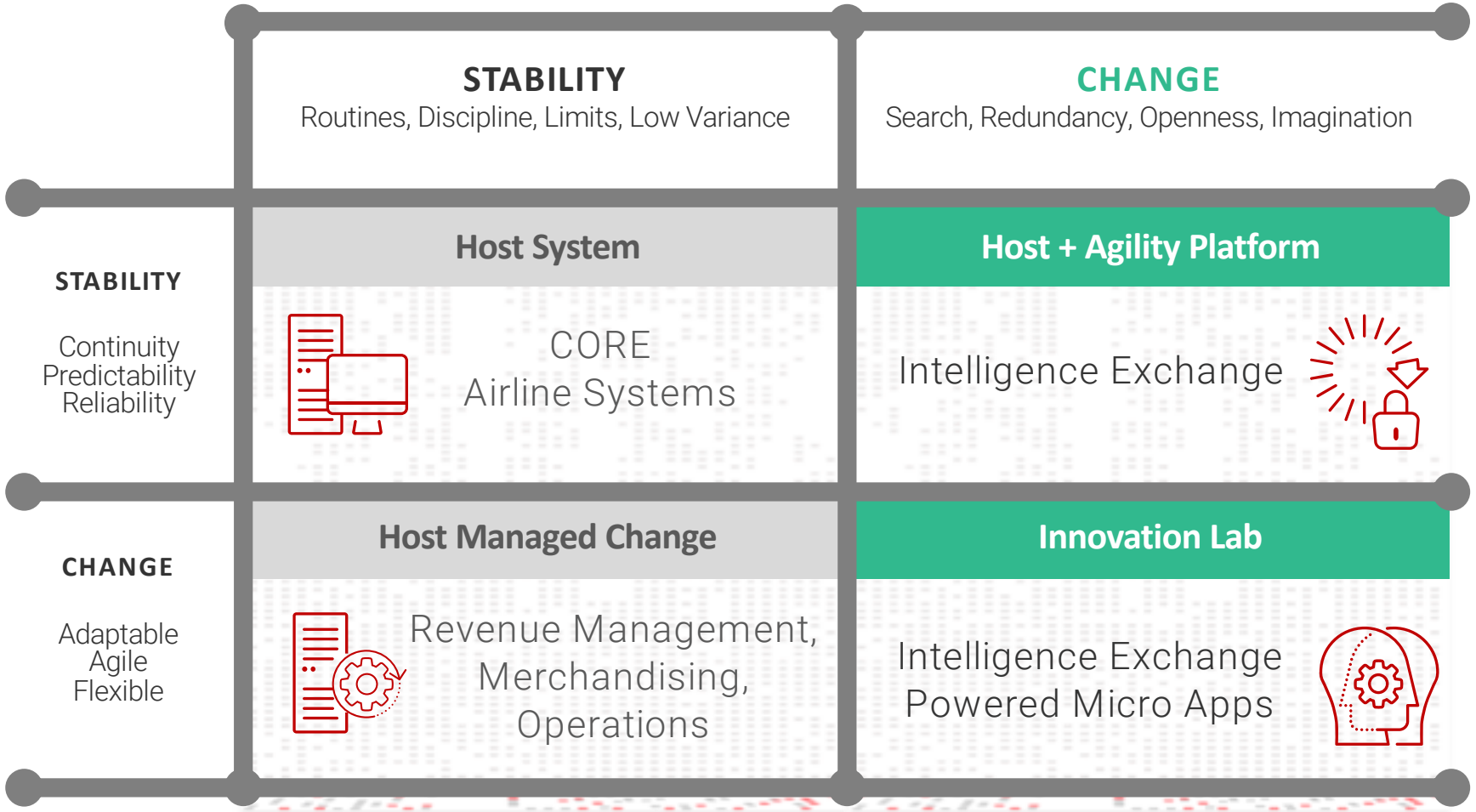
There is a huge need for airlines to leverage more data and a DWH is not enough

12% of enterprise data is typically utilized for analysis

29% of the IT budget is now generated by business unit investment rather than IT

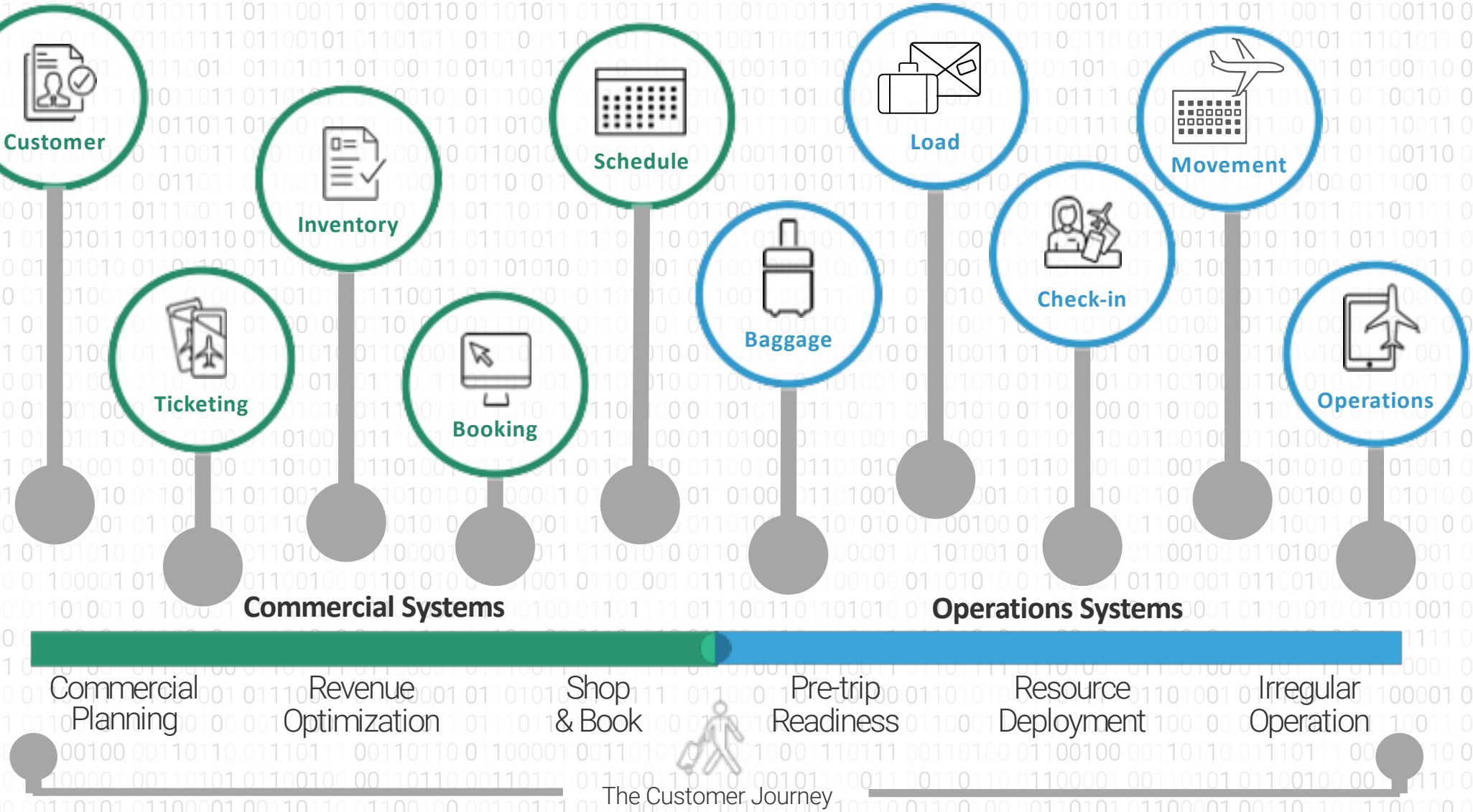
Source: Gartner

PSS are not designed for agility and experimentation

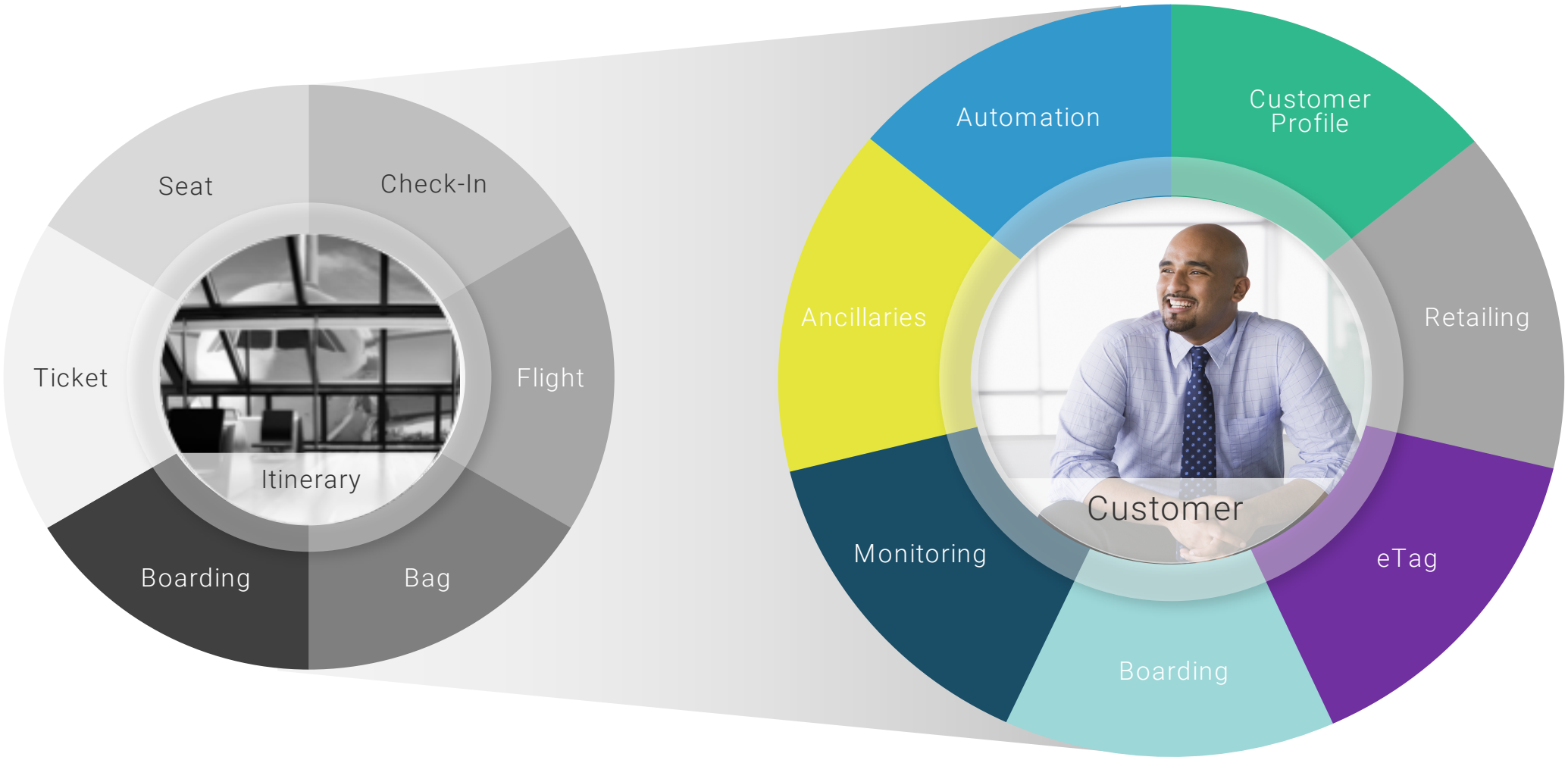


Source: T2RL

Vast amounts of siloed enterprise data are being created



A paradigm shift from an itinerary-centric to a customer-centric focus

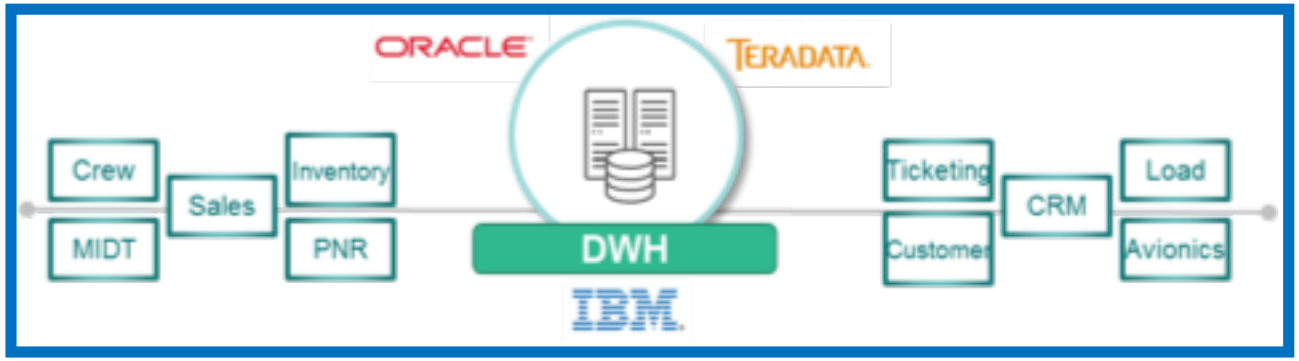


Existing airline architecture has limited ‘sense and respond’ capabilities

- Reliability
- High performance
- Scalability

- Expensive to change
- Siloed data
- Lack of flexibility

- Structured and cleansed
- Inexpensive to access
- Includes non PSS data



- Rear view mirror
- Latency challenges

“IT application development time is highly correlated with IT’s impact on business performance…”

Forrester Research

“The speed… to convert mass amounts of customer data into insights, and insight into action is now a critical differentiator.”

Intelligence Exchange: the open airline enterprise agility platform

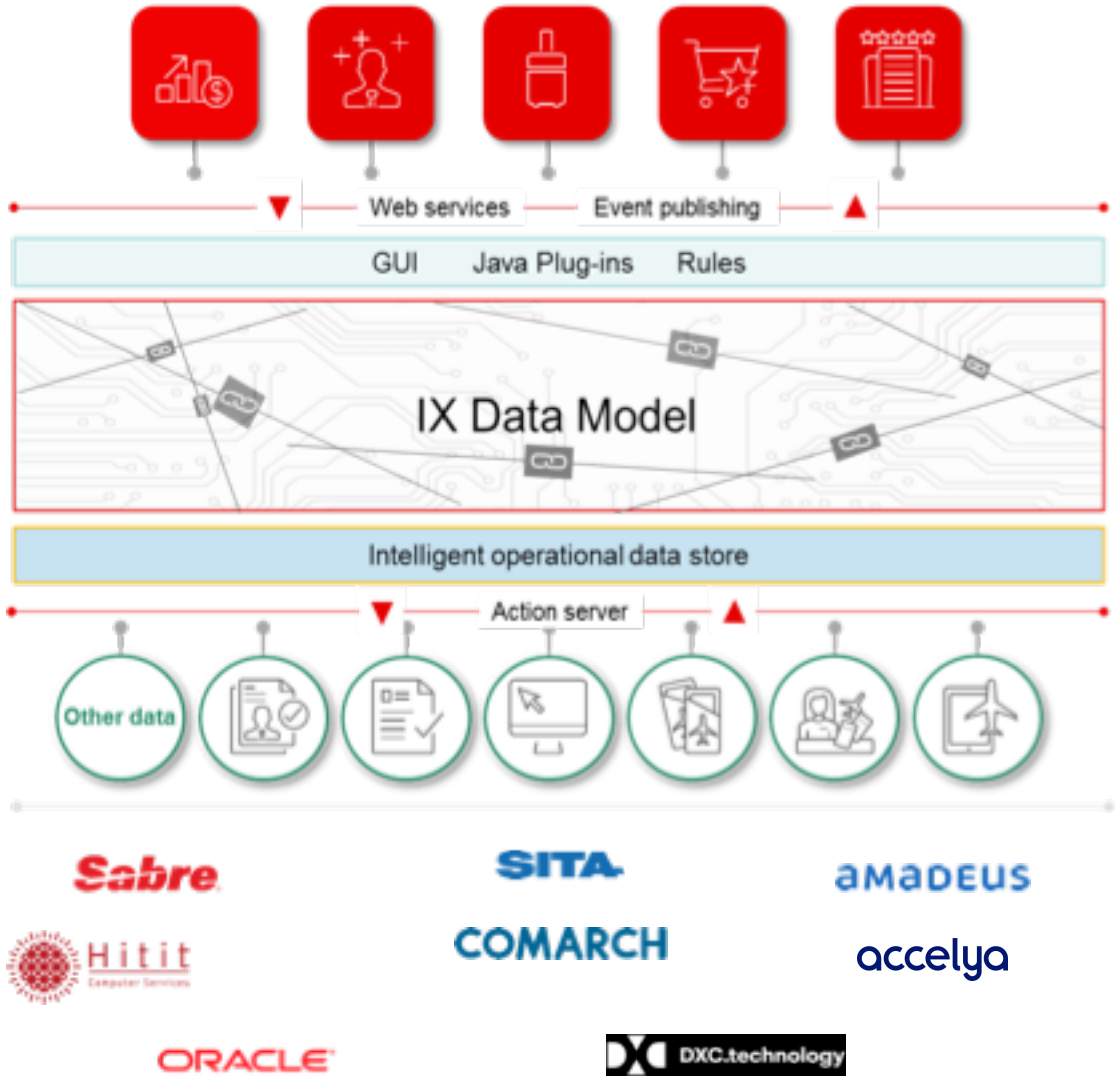
Apps and processes

Sense and respond

User experience

System of reference

System of record



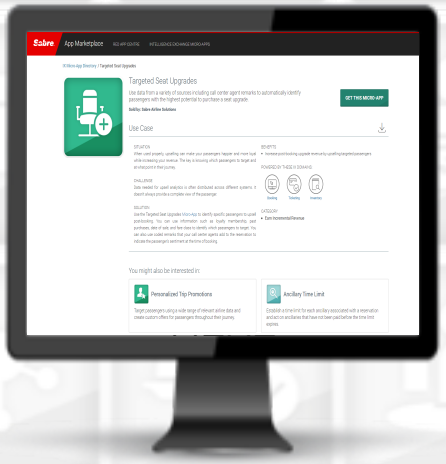

#hackanapp

Intelligence Exchange **MICRO-APPS**

An ecosystem of micro-apps built on the Intelligence Exchange Platform

https://vimeo.com/274572139/50f82f670e

What is a Micro-App?



Business process templates

75% standard / 25% configurable

Take action across enterprise systems

Deploy fast to save time and money

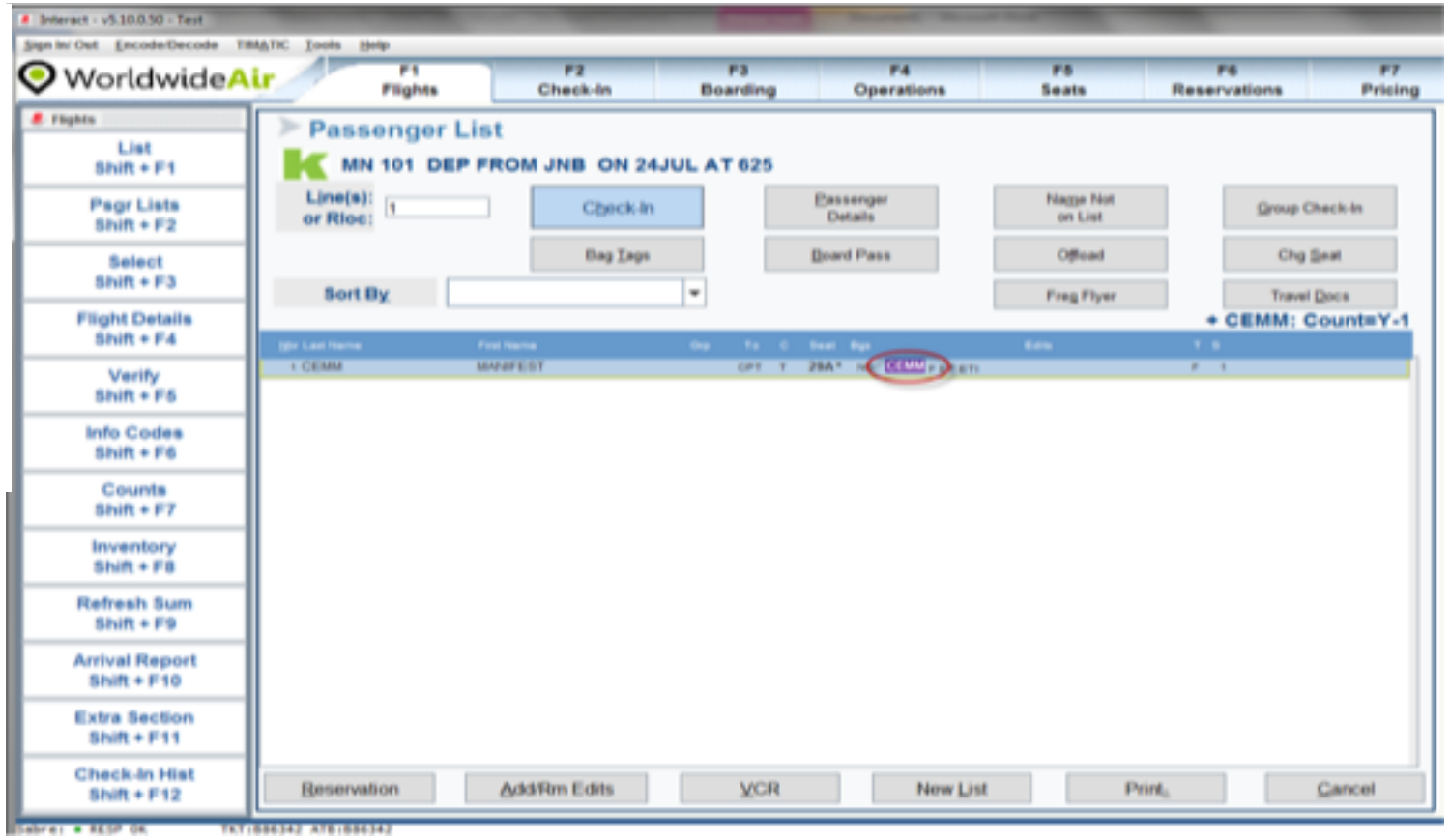
marketplace.sabre.com/IX


#hackanapp

Capture incremental revenue with the Last Minute Upgrades Micro-App

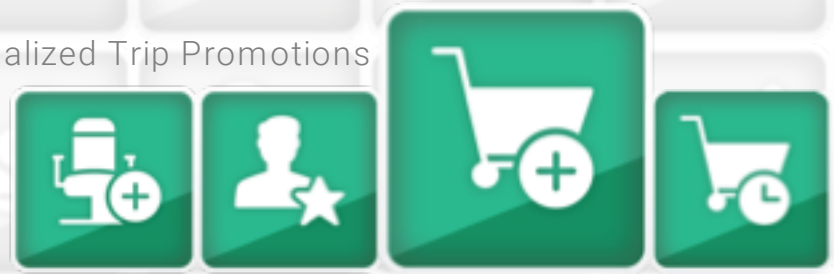
#hackanapp

- Customized parameters to meet unique business needs
- Take action into other core systems out of the box
- Fast deployment for rapid innovation and testing
- Limited IT dependency



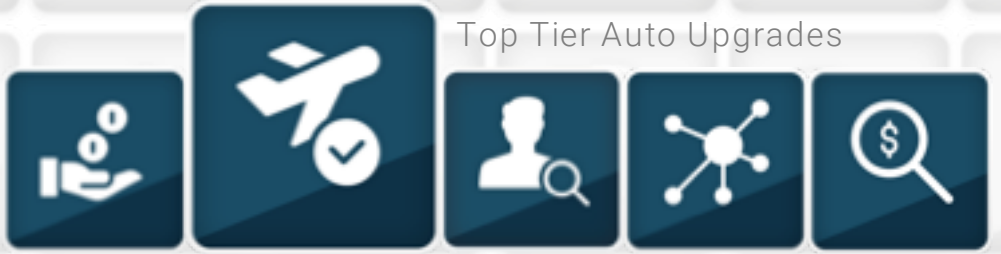
Solve **PERVASIVE BUSINESS CHALLENGES** across the customer journey

Personalized Trip Promotions



Earn incremental revenue

Top Tier Auto Upgrades



Enable customer centricity

Fare Error Detector

Prevent revenue leakage

Real Time Flight Analysis

Streamline airline operations

Customer Centric Strategy (Next Best Action) Overview & Art of the Possible

For More Information about Customer Centric Strategy:

I have a You Tube channel called “Customer Centric Strategies” with several narrated Power Point videos with greater details about this **personalization** approach and the processes

You can access my You Tube “Customer Centric Strategies” channel through my LinkedIn profile page under “publications”

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Agenda

- Customer *Expectations*
- *What* Does Next Best Action (NBA) Do?
- How Does Next Best Action Do This?
- Results
- Appendix: Personalized Pricing and Offers Airline Case Study

Expectations: Customers want it their way or they will leave to find it.

Customers want a *mutually beneficial lifetime* **relationship** not impersonal tactical sales targeting

Do you know

WHAT

Your Customers WANT?

Can You Consistently Give Them What They Want ANYTIME, ANYWHERE

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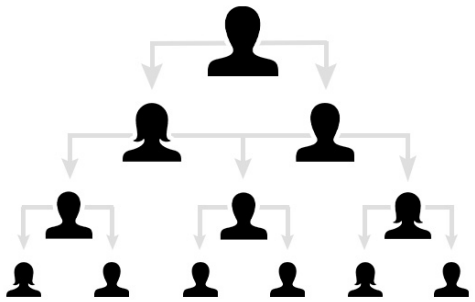
What: NBA adds a *new technique* to the customer communications continuum

Who starts the action	Type of action	Level of personalization

TRADITIONAL MARKETING

Customer Segment Campaigns



company triggered & non-triggered → 

Market Segment

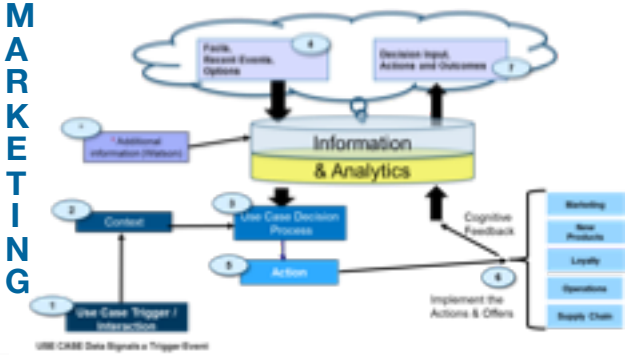
company triggered & non-triggered → 

Behavioral Cluster

Now let's **add** Next Best Action(s)

NEW NBA MARKETING

NBA 1 to 1 Personalized Interactions



customer triggered outgoing batch 1 to 1 NBA *actions* →

customer triggered inbound real time 1 to 1 NBA *interactions* ↔

Individual

Agenda

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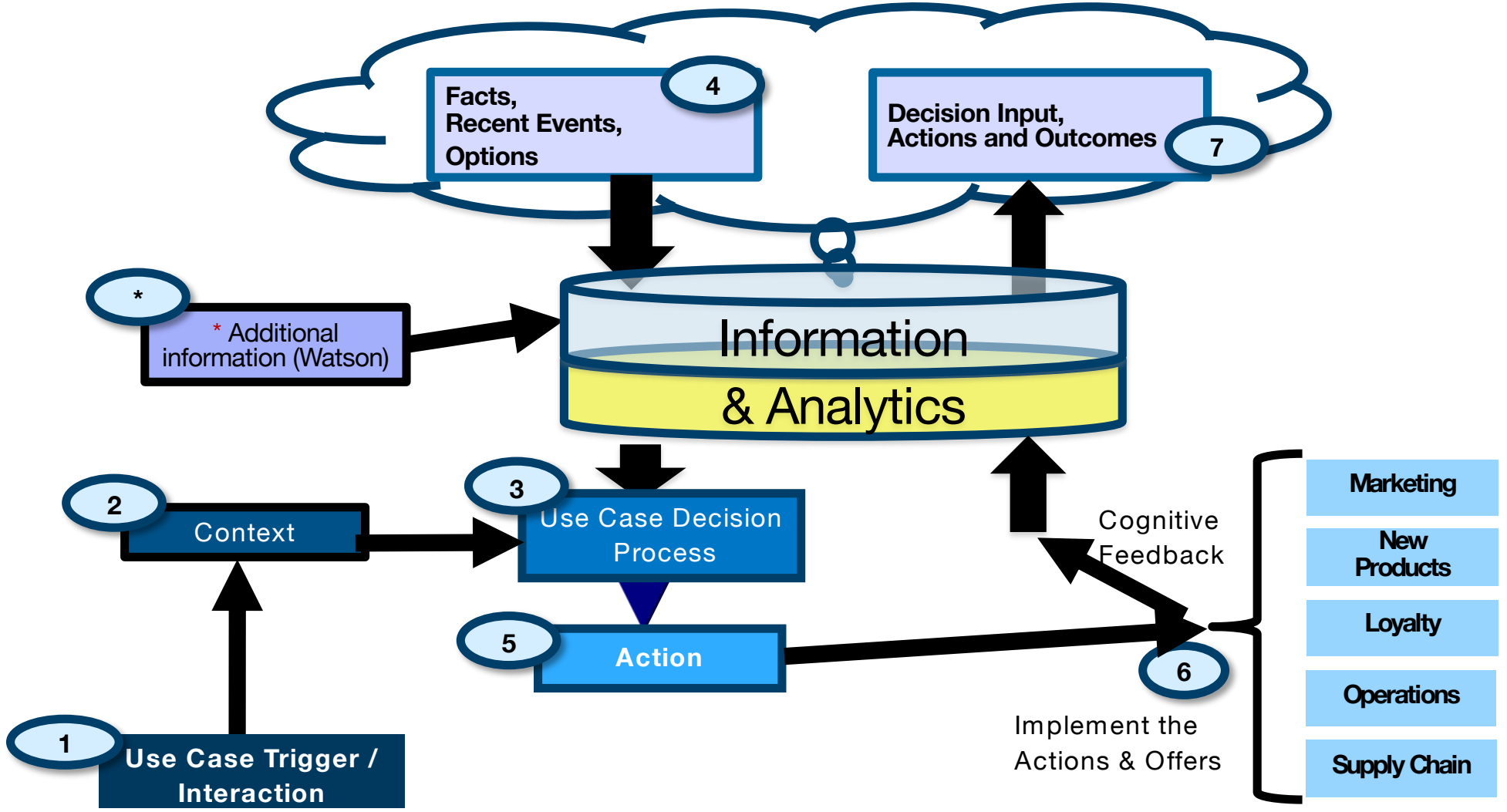
How: NBA's decision process, is called a *Use Case* and is how NBA interacts with customers



USE CASE Data Signals a Trigger Event

* Gather social & external/internal unstructured data & apply it to NBA customer profiles or use it for event or life event triggers

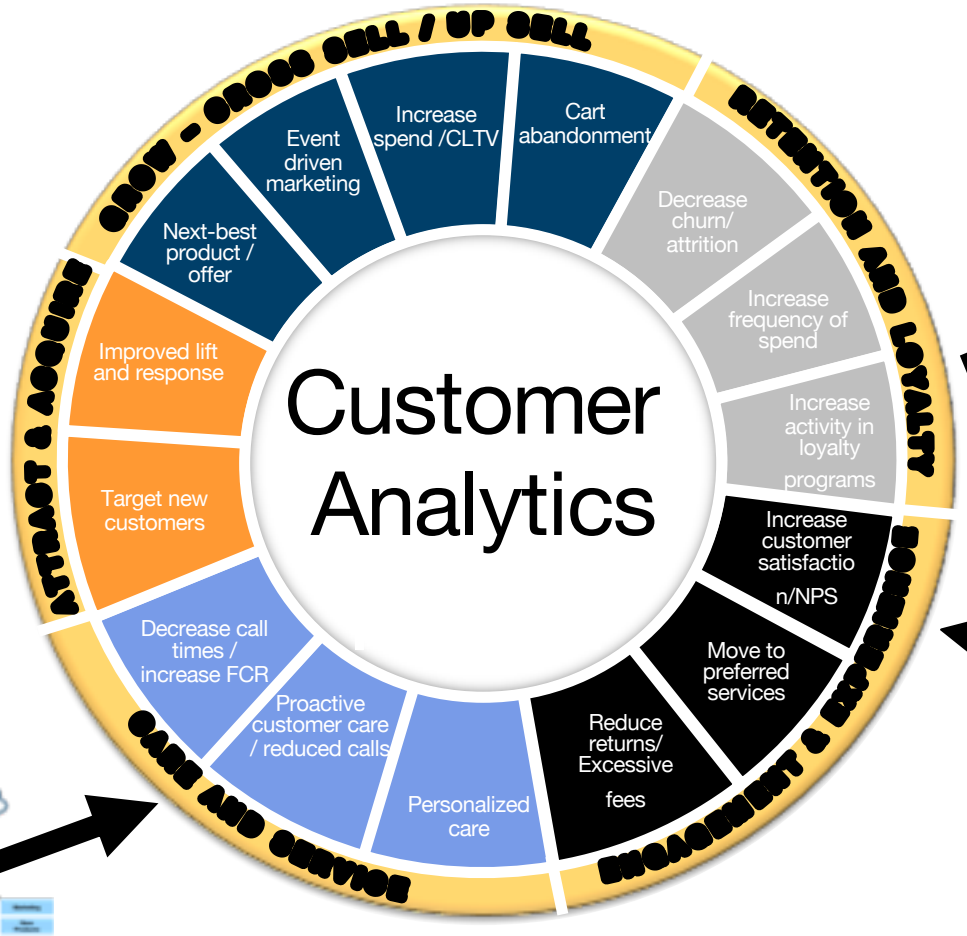
How: NBA is the *analytical engine* between your data and your customer communication channels

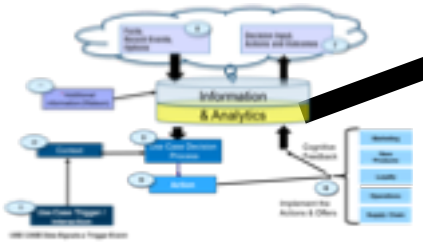
Data Sources
(structured & unstructured)

Chat
Call Center
Mobile Apps
Web
SMS
Transactional Data
External data - social, blog
Customer Interaction History
Customer Demographic Data

Unstructured
Structured

Next Best Action Predictive Analytics Engine & Platform





Multiple Customer touchpoints

Outbound Batch Mode

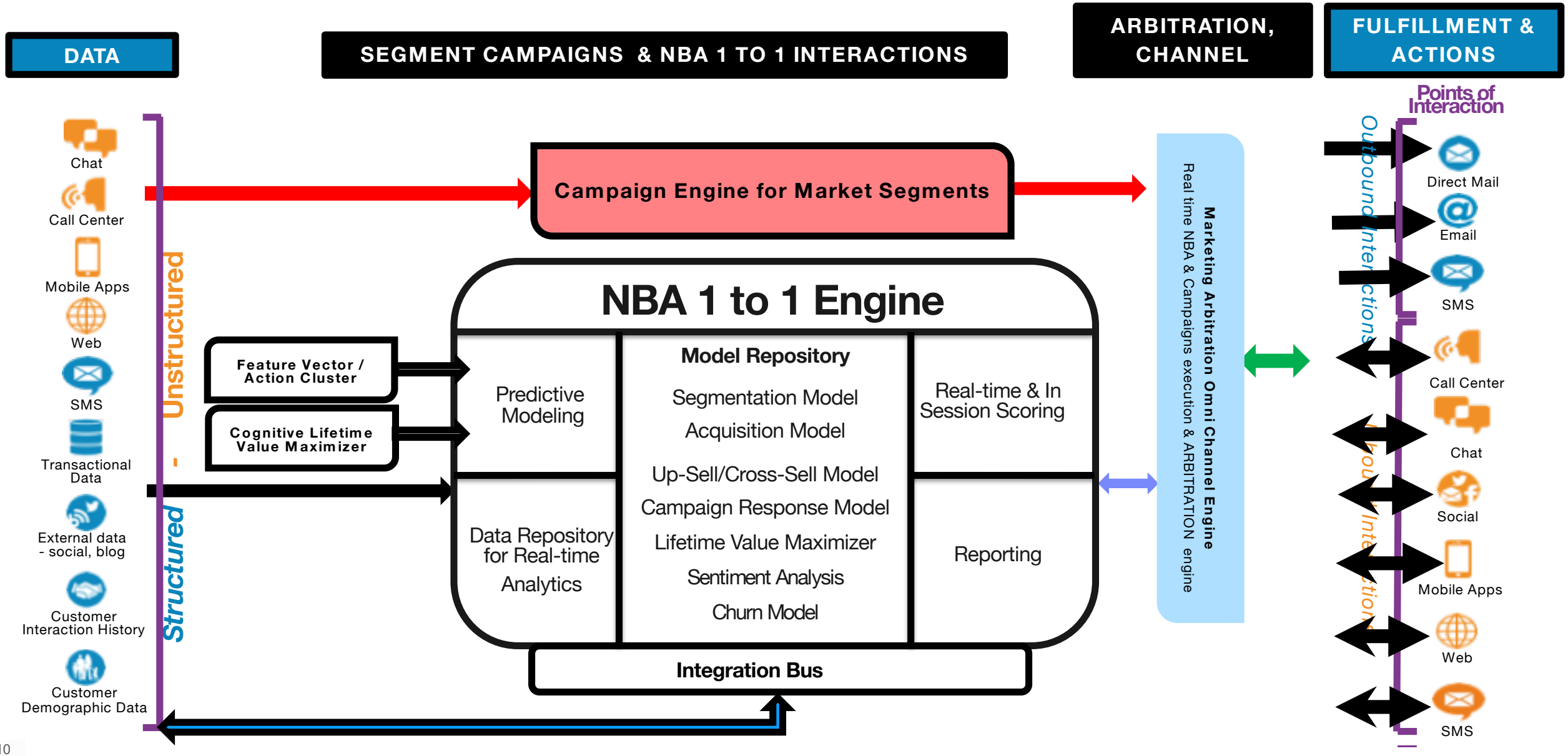
- SMS
- E-mail
- Direct mail
- Social
- Mobile Apps

Inbound Real Time

- Face to face
- Chat
- Call center
- Social
- Mobile Apps
- Web

*Adapted from Forrester, 2014

How: 1 to 1 NBA, and an arbitration layer, sits between data and customer actions



How: Implementing Next Best Action

- YOU - develop the Customer interactions to target
- IBM & YOU Select and align NBA

Next Best Action
"Architecture & Tools"

+

Customer Data
"Building Supplies"

=

Building your "Framework of Optimized Customer Interactions"

+

=

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Results: IBM Customer Successes – Across Multiple Industries Over the Past 5 Years

Use Case	Business Results
Increase Customer Retention	50% reduction in customer churn 25% increase in Loyalty program membership
Increase Customer Acquisition	50% increase in response rate for analytics-driven actions to new customers
Cross-Sell & Up-Sell	270% increase in cross-sales of accessory products; 50% increase in effectiveness of customer retention actions
Next Best Action to Personalize Customer Experience	300% increase in spending among loyalty members; 400% increase in incremental sales to customers receiving personalized offers
eCommerce Real-Time Recommendations	20% increase in on-line purchases, fewer shopping cart abandonment.
Pricing Optimization	10% revenue increase from smarter pricing by category, individual/behavioral clustering, and individual brands
Call Center Optimization	10% increase in call center operations productivity from smarter guided advisement, quicker issue resolution

Thank You!

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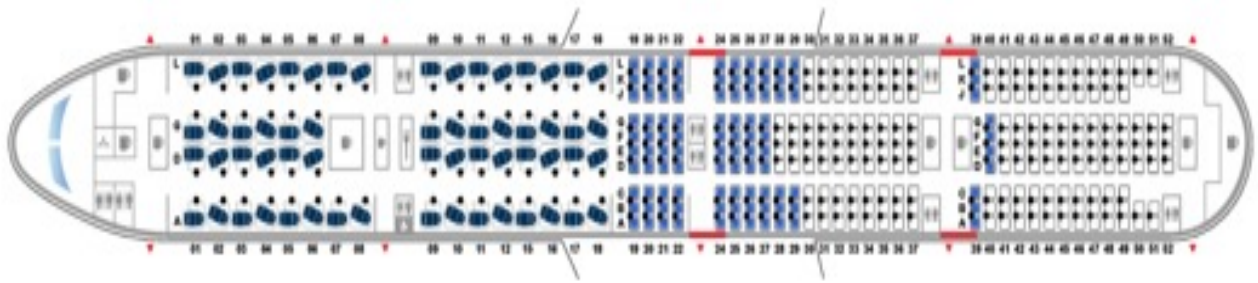
Drive conversion and margin expansion with
Personalized Pricing & Offers

PPO

What is the best personalized offer out of **460,800,000 possibilities?**



The shear scale of possibilities will outstrip the best rules engine. This will require a **cognitive decision platform.**

A platform that's **exceptional at machine learning.**

IBM has developed **patented travel-specific optimization** algorithms that understand travel context, apply past learning to select optimal offers, and learn from offers and orders.

The cognitive engine **NEVER STOPS** learning and adjusting optimization.

Think about it…

- More complex view of customer
- More air, non-air and bundle options
- Offered at more journey points
- Through more channels
- AND, be ready to continuously change

Consider One Market:

- 40 routing/flight options
- 3 class of service options
- 80 price points/base products
- 40 air ancillary service options
- 100 non-air ancillary service options
- 12 customer segments

Micro Services

Initial Offer

Post ticket purchase

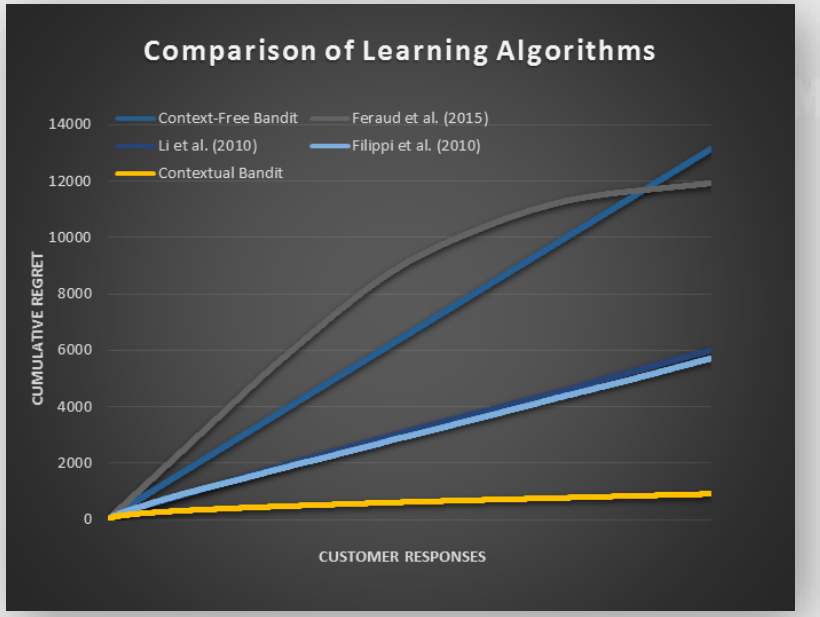
- Personalized Offer: Destination
- Personalized Offer: Conversion Incentive
- Dynamic Pricing: Preferred & Reserved Seats
- Personalized Pricing : Class-of-Service Upgrades
- Personalized Offer: Dynamic Packaging

Cognitive Learning Engine

Proprietary Algorithms outperform state-of-the-art learning methods

Proprietary algorithms

- Recommending personalized offers or promotions based on customer insights (“context”)
- Behavioral progressive profiling of new customers to create fast, relevant engagement
- T&T Specific Algorithms patented



Contextual bandits increase speed of learning and **reduce testing costs**

24

US patents

granted or pending

Case Study: Personalized Destination Offers

Using our patented algorithms, create **personalized destination offer recommendations** for passengers using information from loyalty systems, PNR databases and campaign management systems.

AI features

- Long Short Term Memory Networks (LTSMs) model the temporal dependencies across historical travel history
- Stacked ”deep” LSTMs learn a hierarchy of feature representations across both time and feature space
- Transfer learning (e.g., knowledge distillation) to enable swift deployment

Pilot Results

Personalization leads to higher

conversions & **revenue** during campaigns

Customers that received personalized recommendations made over

20% more bookings

than customers in the control group

54% more bookings

in business class (F, A, J, Z, C, D)

Test Group members created

44% more revenue

compared to Control Group members

Case study: Paid class upgrades

Personalized class-of-service upgrade offers prior to travel

- Develop AI-based dynamic pricing services to identify personalized class upgrade recommendations for select airline customers using information from CRM systems, PNR databases, and campaign management systems.
- Evaluate its efficacy based on agreed upon performance metrics (revenue lift, conversion improvements) during a live test in selected test markets

AI Features

- IBM Research proprietary AI algorithms analyze hundreds of thousands of data points on a continual basis and set prices on what the software believes passengers will be willing to pay.

Pilot results

AI-based pricing leads to higher

conversions & revenue

during promotional campaigns

Pilot deployments show that personalization can deliver over

Up to 35% uplift in top-line revenue

Do you Have Enough Data Already?

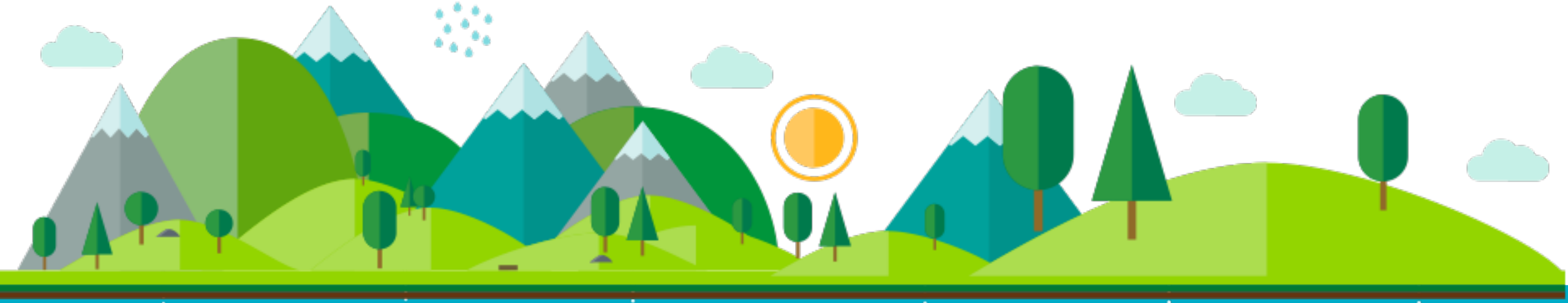
Tom Gregorson
Vice President, Products & Solutions

atpco

routehappy by atpco


EXPLORE Minnesota
999 999
10,000 lakes

Today we are talking about data lakes



1. Legacy databases
2. Website clickstream
3. Production/ performance metrics
4. Organization guidance
5. Location or geospatial data
6. Social media

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Do we have enough data lakes?

- **90%** Of the world's data has been created in the last two years
- **2.5 quintillion** bytes of data a day
- More than **2.5 petabytes** per database

In the travel space

- **1,000 gigabytes** of data generated by the average transatlantic flight
- **200 million** weekly searches
- More than **50 input sources** are used to all available industry data

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In the travel space

- Airlines use as little as 12% of their data
- Some larger carriers housing more than 50 data sources
- Managing and integrating data is the single biggest challenge

Our Fares & Rules system grew from 19 million in 1998 to 186 million in 2018

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Approximately
822 million
tickets were processed by ATPCO in 2016 and
903 million in 2017

Various Data Sources: Industry Sales Record (ISR)

- 118 customers
- 50 carriers provide their TCN data directly to ATPCO
- 75 hosted carriers (TCN)
- 89 carriers (ARC/BSP data)

More than 5.7 billion transactions in the DDS (ARC/IATA) database

World's largest repository of the ticketing data

.

Several data delivery methods: Web-based Tool, Integrated Data Feed, Customized Files

Supports variety of functions: sales, distribution, network planning, and revenue management

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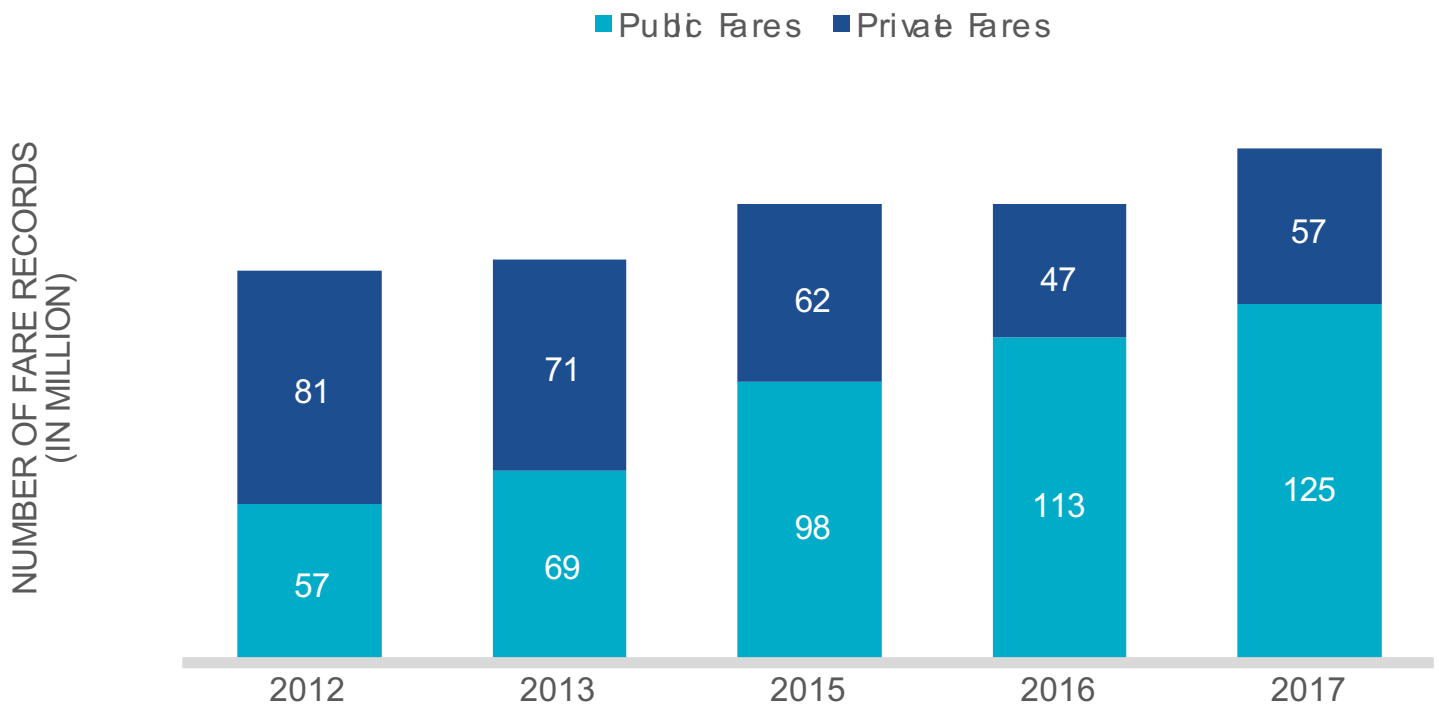
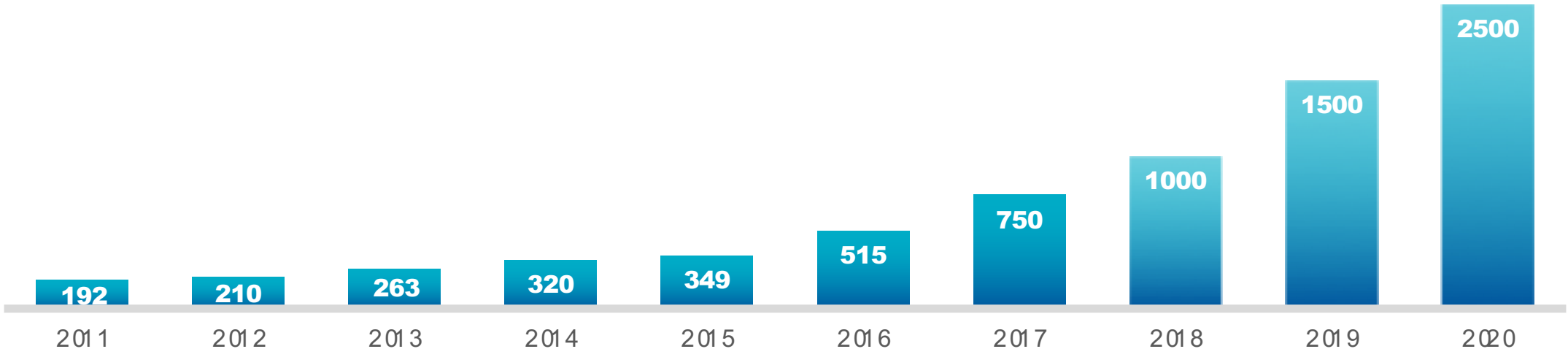
Comprehensive: Fares

87% of all prices – Over 32% growth in last **5** Years



Timely Data
Growth triples the volume within the next 3 years

Hourly updates – 3.9M updates per day



Average (in millions) weekday subs recorded

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Various Data Sources

	2006	2009	2015	2017	2018*
Carrier-Imposed Fees (2005)	282	336	328	348	368
Ticketing Fees (2007)	N/A	24	92	121	135
Optional Services (2008)	N/A	14	137	201	207
Branded Fares (2009)	N/A	1	18	94	97
Baggage Allowance and Charges (2011)	N/A	N/A	397	418	434

*Data is as of May 2018

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3 Keys to Success

- Merge Unstructured & Structured Data
- Data Cleansing and Protection
- Sophisticated Data Processing

Structured and Unstructured Data

80%

Unstructured

Vs

20%

Structured

Database

Table

Worldwide Operations

INFARE

- 100 Million records
- 5 Gb compressed data

ATPCO

- 1.200 Million records
- 90 Gb compressed data

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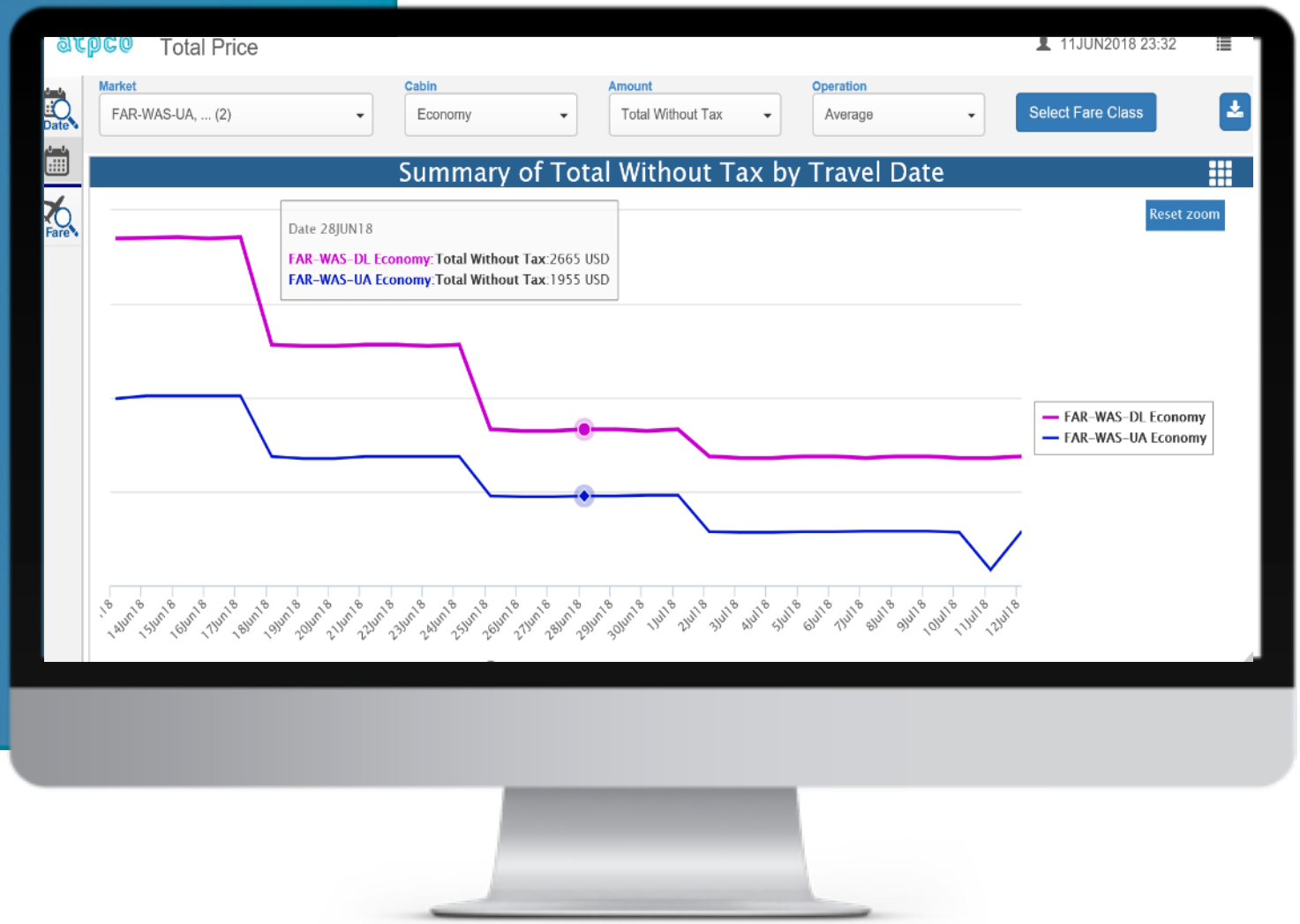
Sophisticated Data Processing



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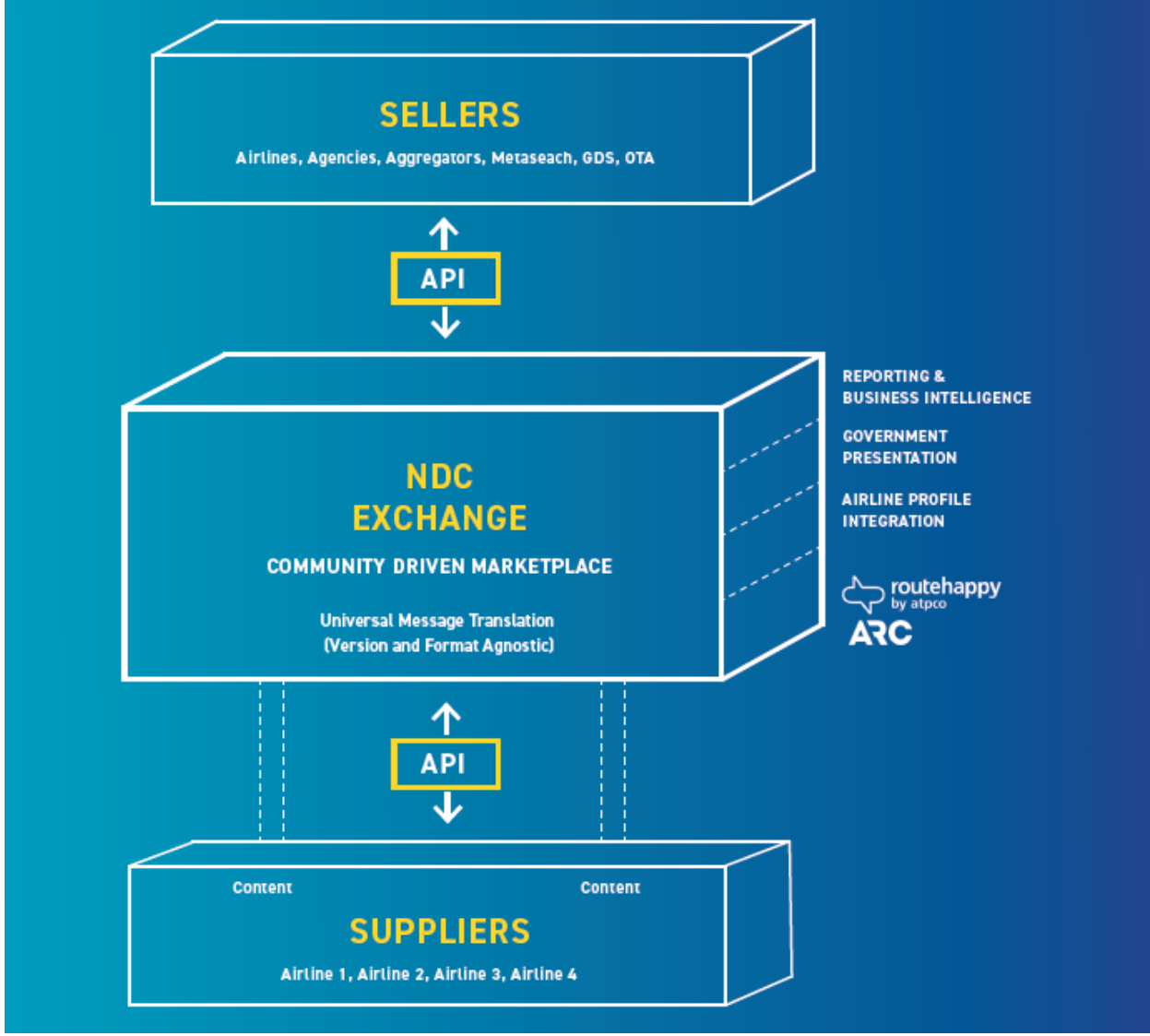
Data Cleansing & Protection:

NDC Exchange



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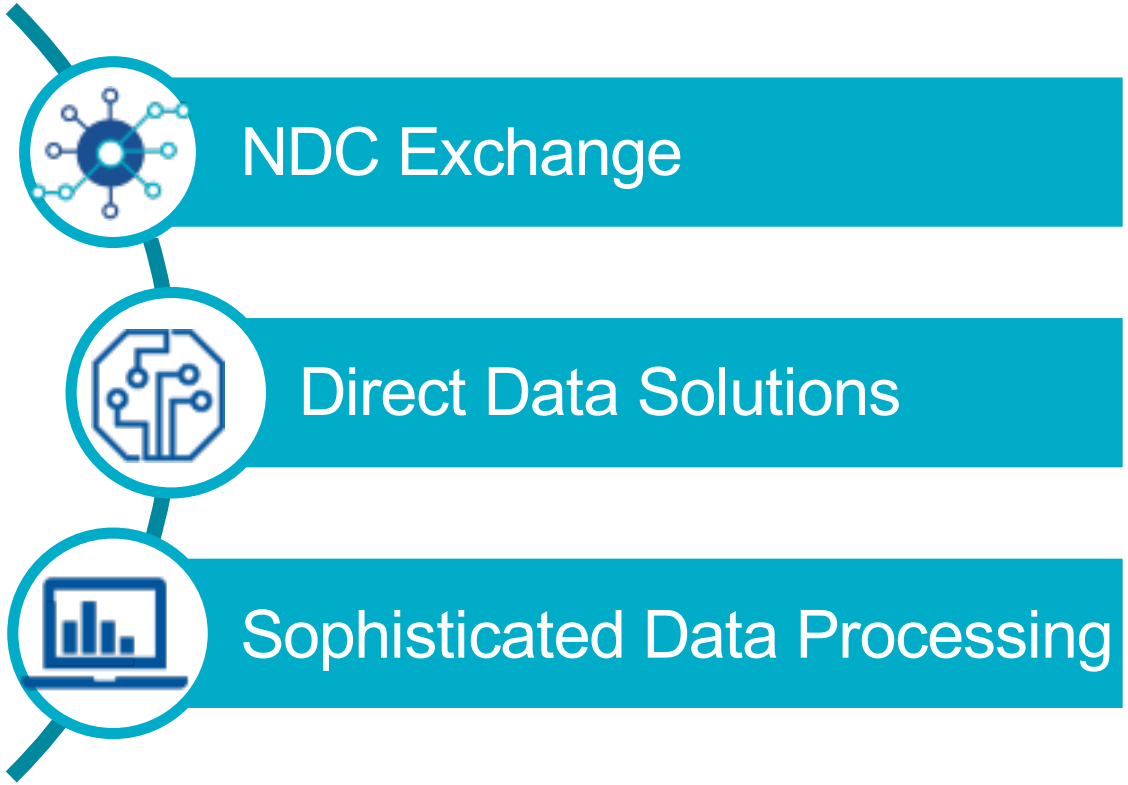
Case Study

Challenge

- Achieve data normalization and cleansing in the Global Ticket Behavior
- Include NDC and non-NDC transactions
- Add value to the published pricing monitoring

ATPCO's Fare Data and DDS

Solution



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Advances in Airline Pricing, Revenue Management, and Distribution

Evolution of airline pricing, revenue management, and distribution

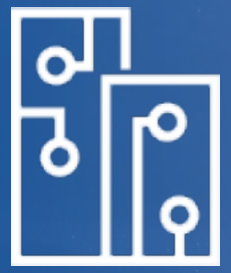
Price selection mechanisms

- Assortment Optimization
- Dynamic Price Adjustment
- Continuous Pricing

Next generation mechanisms

- More frequent updating of fare structures
- Dynamic availability of fare
- Additional RBD capabilities
- Dynamic price adjustments (increments or discounts)
- Continuous pricing
- Dynamic offer generation

Innovation at ATPCO



R&D/Tech

Bridge Labs

Partner Co-Innovation

Open Ecosystem

How Do We Move Forward?

- Stop asking do we have enough data (lakes)…
- Look to find ways to turn data into information:
    - Merge Structured & Unstructured
    - Data Cleansing & Protection
    - Sophisticated Data Processing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