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Smart Airlines Baggage Management and improving Customer Experience

Carla Romano
Director - Industry Big Data, IoT Solution
Oracle

Paresh Sansare
Co-CEO / SVP Sales and Projects
eBIW

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Agenda

1. Baggage Handling Processes and Costs
2. Data Consolidation
3. IOT, Streaming and Smart Tracking
4. Maximizing Customer Satisfaction

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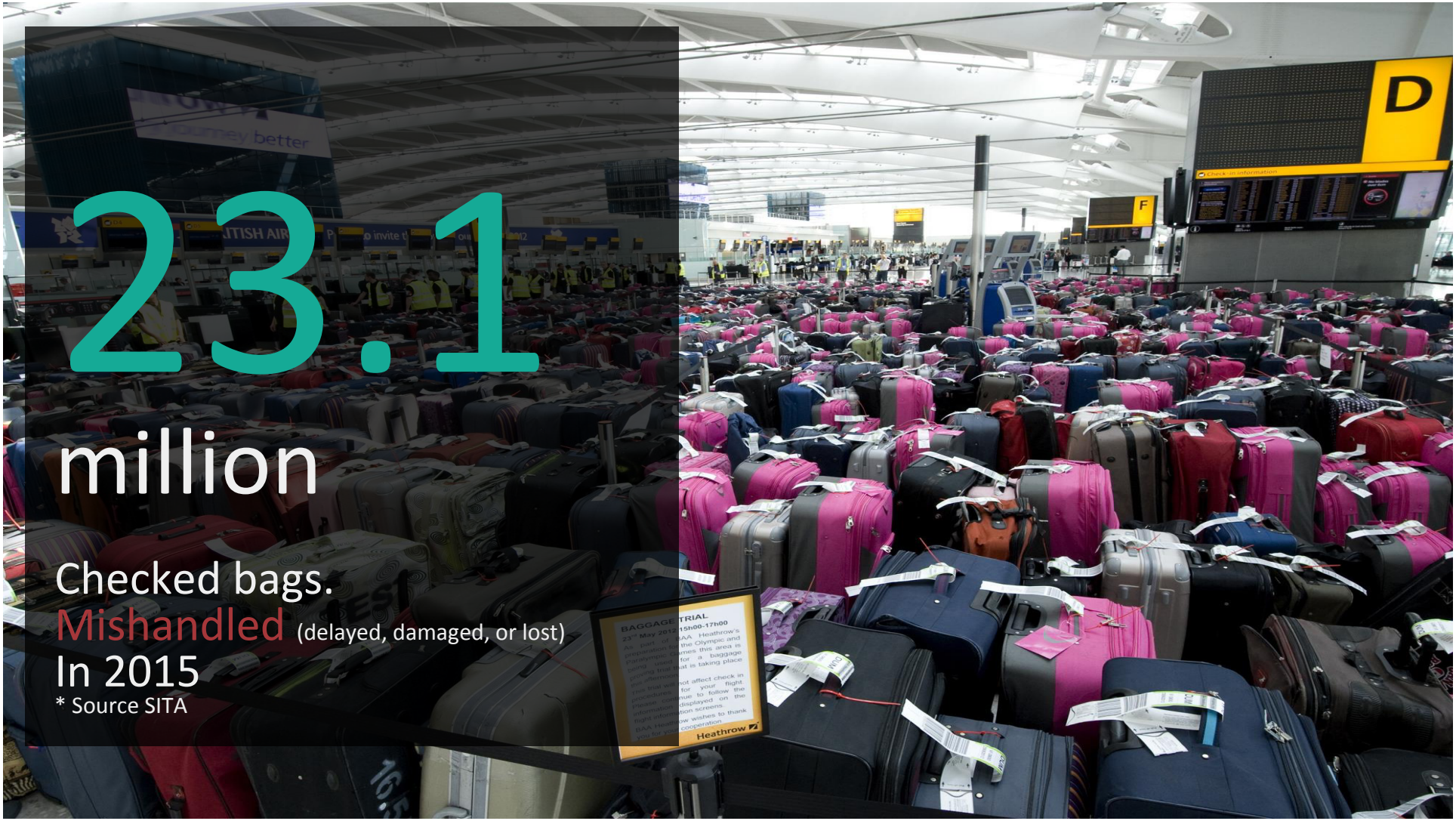
Chicago Airport Lines this summer, up to 3 hours wait time, to board a domestic flight!



23.1 million

Checked bags.
Mishandled (delayed, damaged, or lost)
In 2015
* Source SITA

Costs to Airlines

Break-down of the mishandled bags

NORMAL HANDLING cost / bag = $10	NORMAL OPERATING cost / passenger = $185
DELAYED BAG cost / bag = $100	LOST BAG cost / bag = up to $3300

In addition erosion of Customer Satisfaction due to mishandled bags

Baggage Related Satisfaction

- Among the two-thirds of passengers who check baggage for their flight, **52%** indicate they had to **wait 15 minutes** or longer to receive their baggage, among whom satisfaction is 711, compared with 751 among those who experience a shorter wait time. •
- Satisfaction among passengers who **pay for checked baggage has improved steadily** during the past five years to 700 in 2015 from 637 in 2011.
- The above data implies that other expanded services can be sold to passengers around baggage, provided it reduces/eliminates wait and has lower delays/damages to the bags.

http://www.jdpower.com/sites/default/files/2015057%20NA%20Airline_%20(FINAL).pdf

How Airline Baggage Handling Systems Work

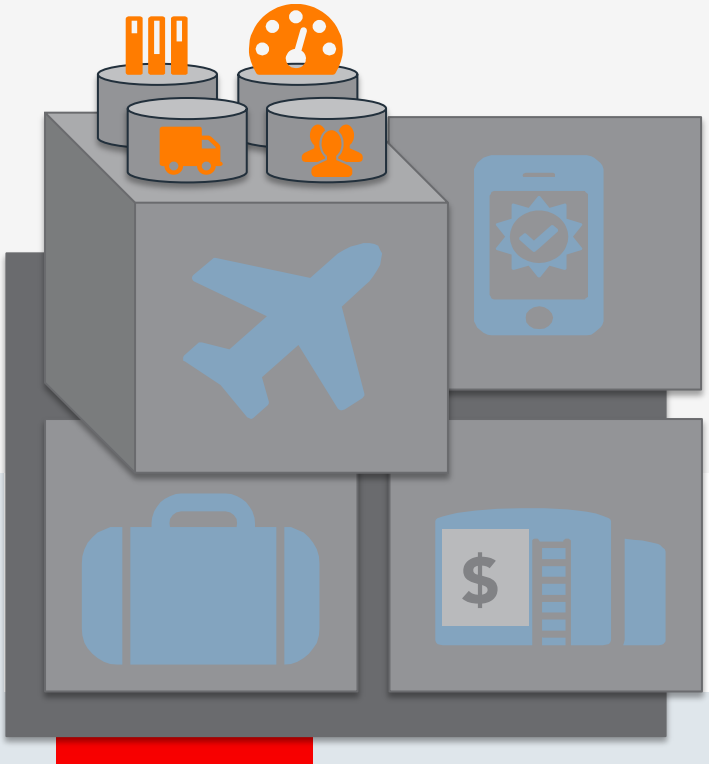
- A baggage-handling system has three main jobs:
  - Move bags from the **check-in** area to the departure gate
  - Move bags from one gate to another during **transfers**
  - Move bags from the **arrival gate** to the baggage-claim area
- The measure of a successful baggage-handling system is simple: Can the bags move from point to point as fast as the travelers can?
- If the bags move slower, you'll have frustrated travelers waiting for bags, or bags failing to make connecting flights on time.
- If the bags move too fast, you might have bags making connecting flights that passengers miss (is that important?)

http://science.howstuffworks.com/transport/flight/modern/baggage-handling.htm

Transparency is #1 Aviation Impediment

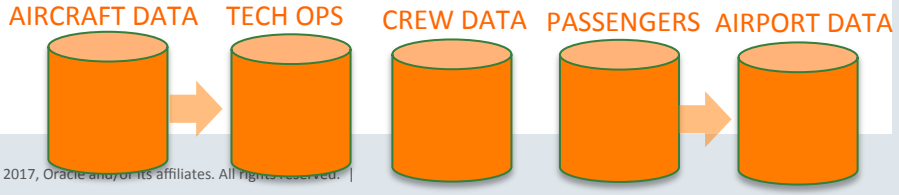
Data Silos, Situational Awareness, Interoperability

IoT can provide shared, real time awareness & coordination

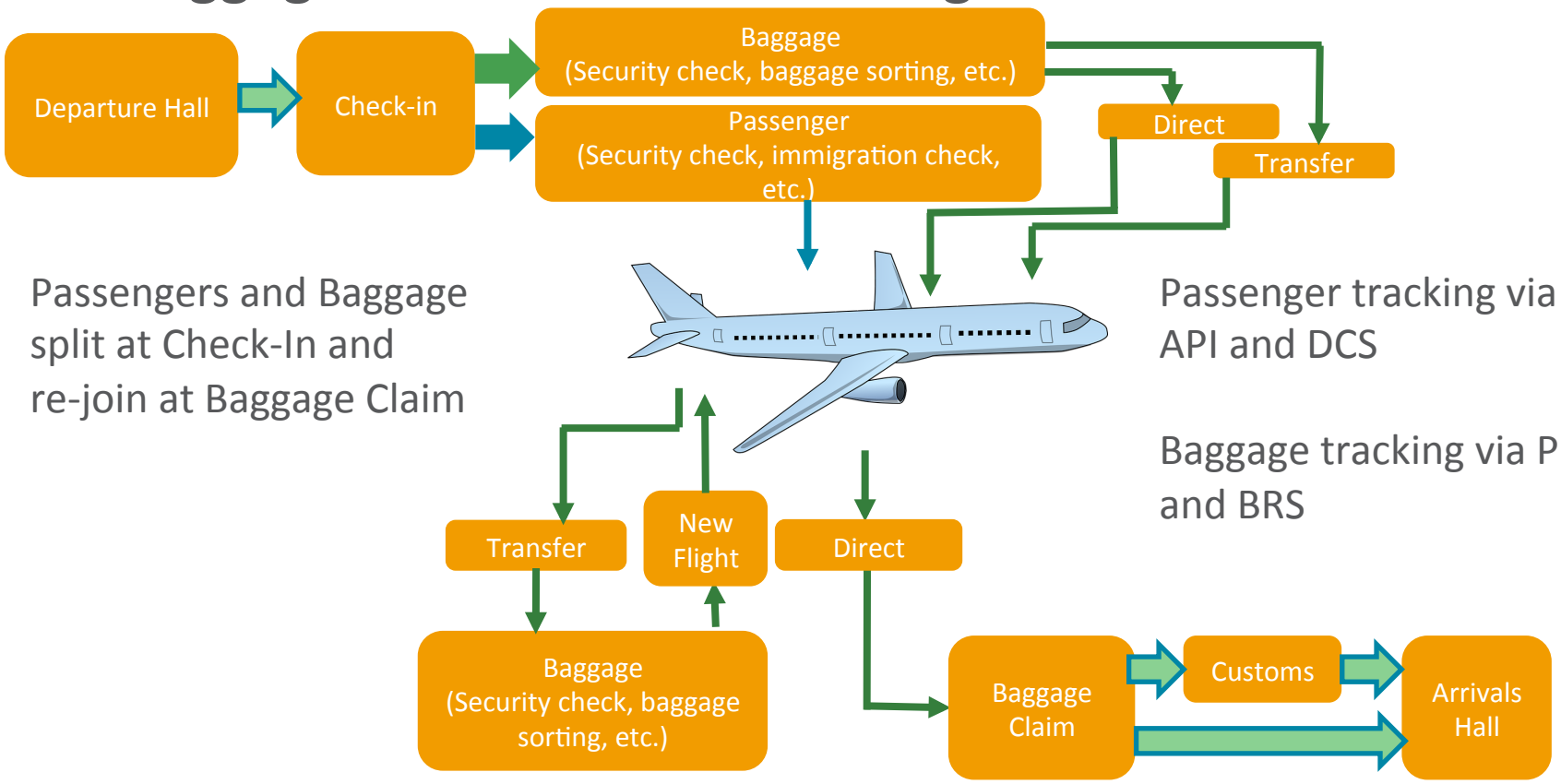


Historical Data Silos have made for a Dysfunctional Ecosystem

Improvement happens at the Interface between Ecosystem Partners



Baggage Flow and Mis-handling



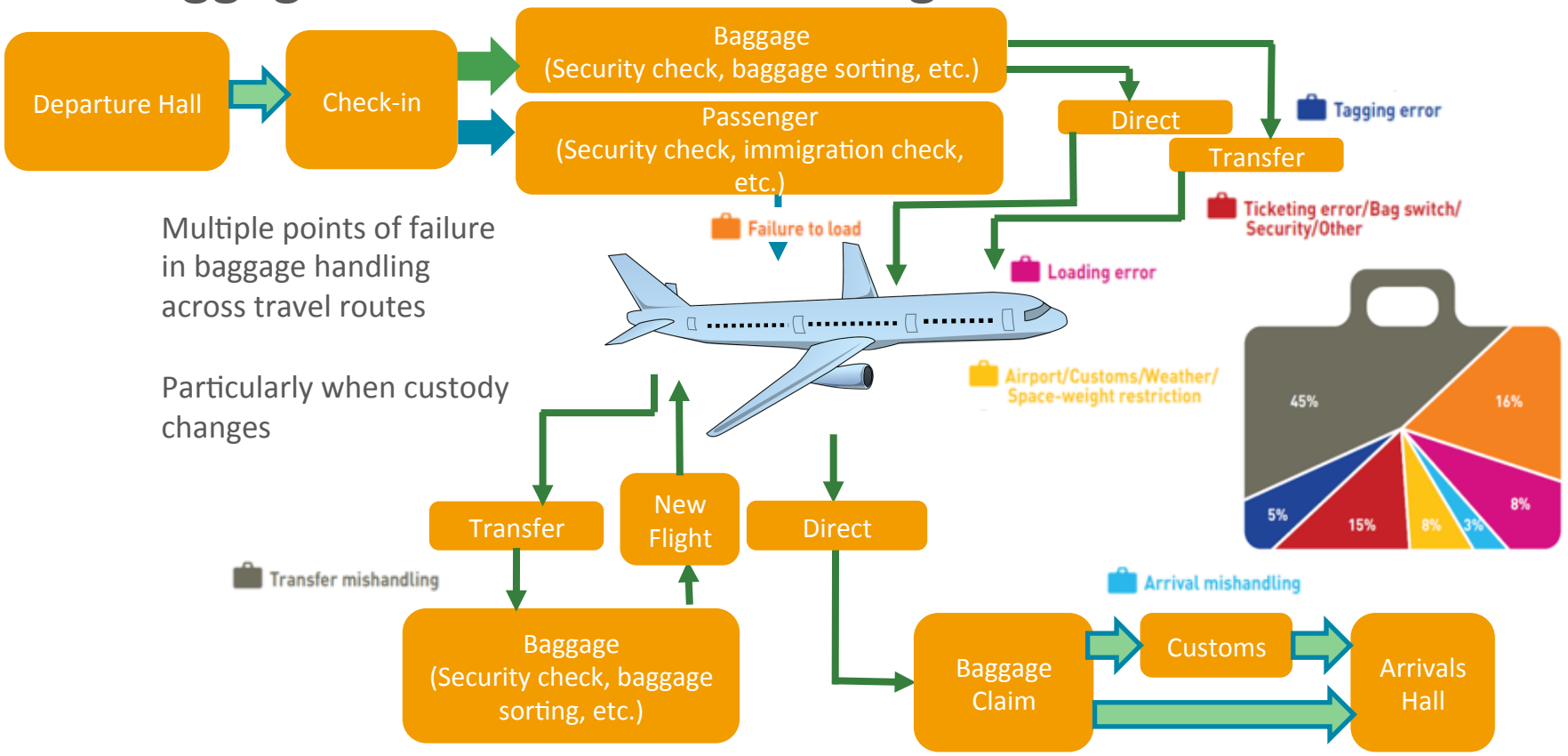
Passengers and Baggage split at Check-In and re-join at Baggage Claim

Passenger tracking via PNR, API and DCS

Baggage tracking via PNR and BRS

PNR = Passenger Name Record API = Advance Passenger Information DCS = Departure Control System BRS = Baggage Reconciliation System

Baggage Flow and Mis-handling



PNR = Passenger Name Record API = Advance Passenger Information DCS = Departure Control System BRS = Baggage Reconciliation System

Baggage Flow and Mis-handling

Resolution 753

- Prevent and reduce mishandling by determining custody of every bag during different phases of the baggage chain
- Demonstrate delivery when custody changes
- Demonstrate acquisition when custody changes
- Reduce the possibility of baggage fraud
- Enable exceptions to be detected
- Provide an accurate inventory of bags on flight departure
- Speed up reconciliation and flight readiness
- Help measure compliance to SLAs
- Exchange events with other airlines as needed
- Increase customer satisfaction as mishandling is reduced

PNR = Passenger Name Record API = Advance Passenger Information DCS = Departure Control System BRS = Baggage Reconciliation System

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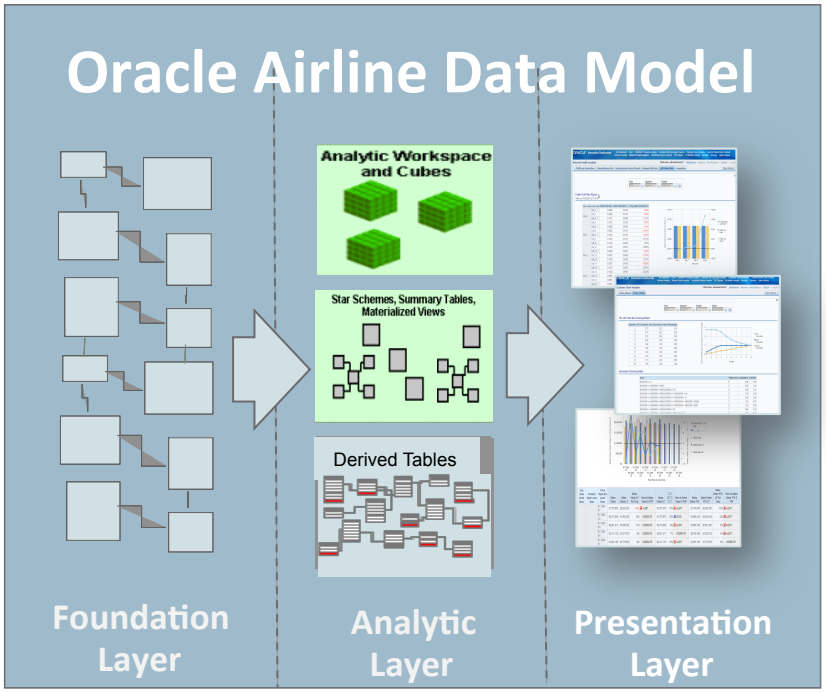
Oracle Airline Data Model

More Than Just a Data Model



- Industry-standard compliant based Enterprise-wide Data Model
- Contains Logical and Physical Data Models Third Normal Atomic, Dimensional Schema
- Industry specific Airlines Measures and KPI
- Automatic Data Movement Among Layers
- Extensive business intelligence metadata
- Easily extensible and customizable
- Usable within any GDS, CRS/DCS Applications
- Central repository for atomic level data
- Pre-built Analytic Models and Reports
- Cloud enabled for DBCS

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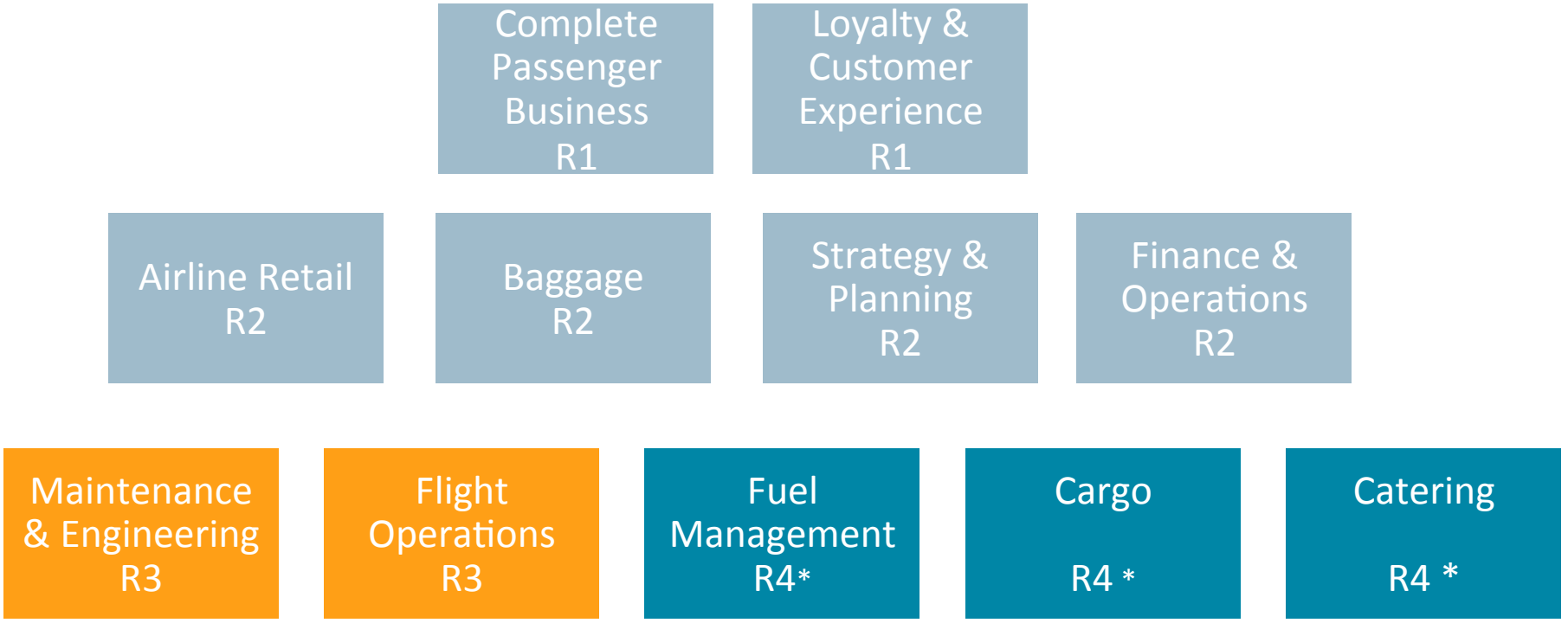
The Oracle Airline Data Model

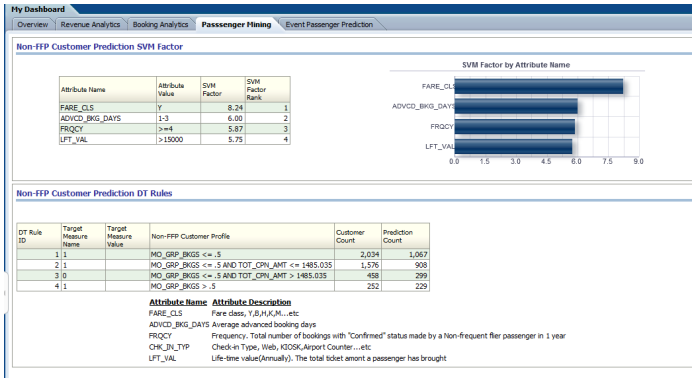
Product Roadmap – by line of business

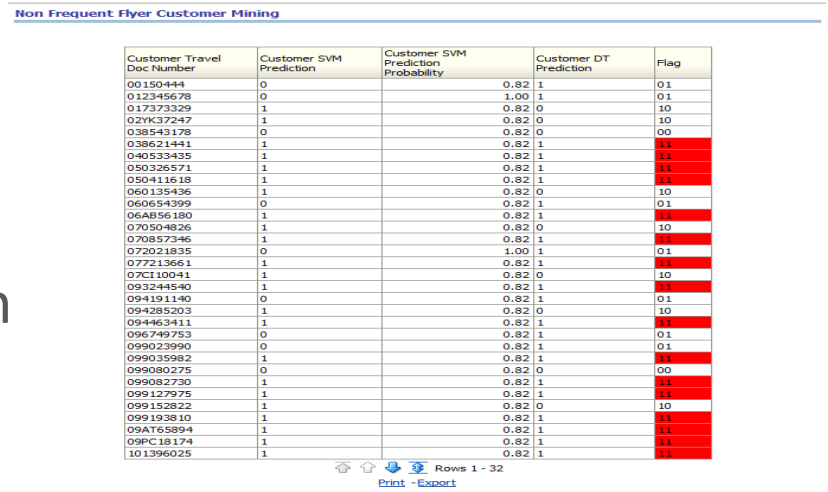


* R4 To Be Confirmed Based Upon OADM CAB Priorities

Pre-Built Mining Models

- Customer Segmentation Analysis
  - FFP
  - Non-FFP
- Customer Loyalty Analysis
- Customer Life Time Value Analysis
- Frequent Flyer Passenger Prediction





Customer Loyalty Analysis

- Identifies factors that may have more influence on customer loyalty to airlines
- Leveraging Support Vector Machine(SVM) algorithm and Decision Tree (DT)
- The output from the model is twofold:
  - The discovered rules provide correlation between the customer loyalty to Airlines and Customer attributes.
  - The prediction can be made on current base customer's data for the next month/quarter/year using the model built on historical data.

Customer Life Time Value Analysis

- Identify/predict the customers who are likely to represent the highest value of revenue over their life time
- Regression model used to find out relationship between customer information and their potential value
- Model can be used to predict future revenue for any new or existing customer over next 1-5 years (# years can be adjusted in the model)
- Leverages Generalized Linear Model (GLM) and SVM algorithm

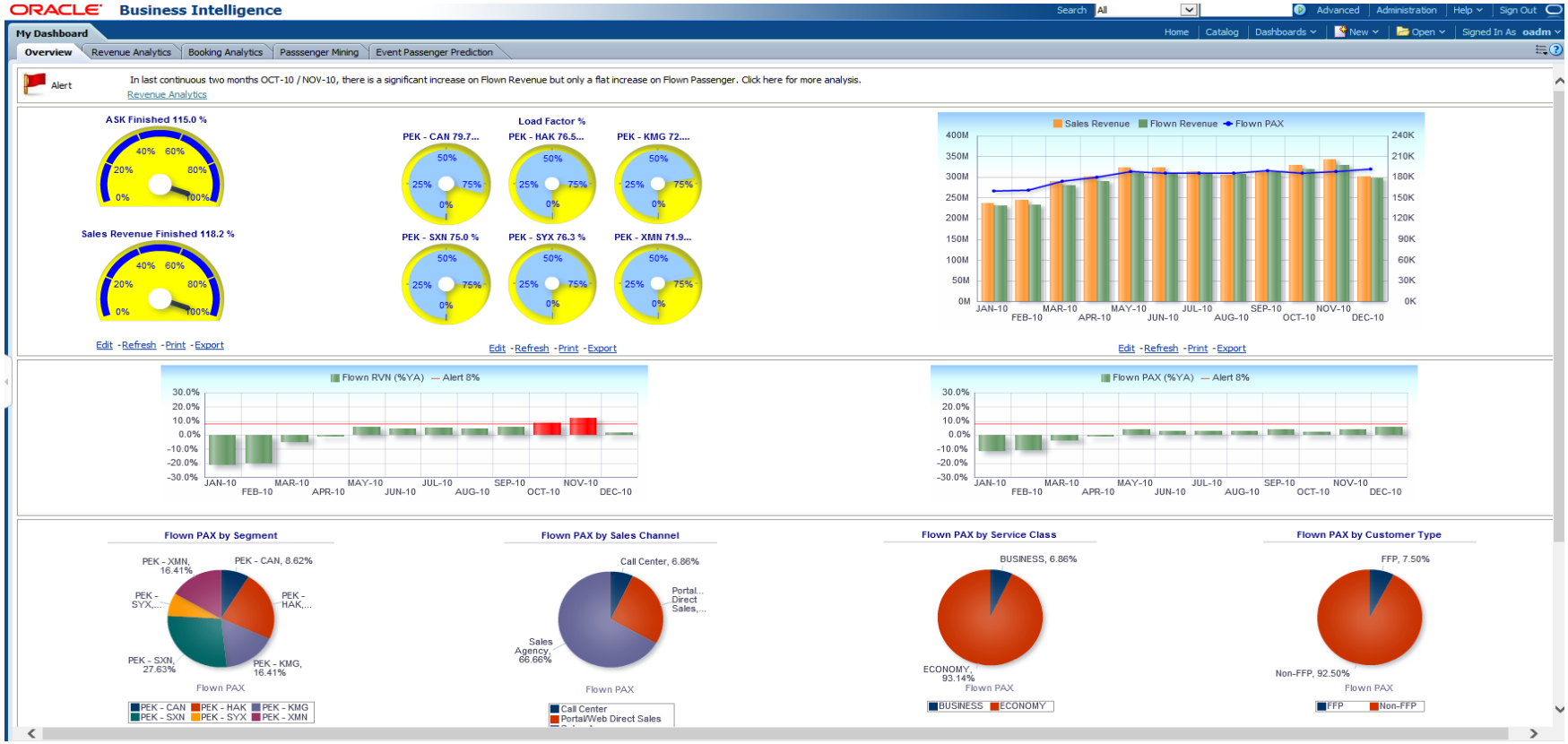
Frequent Flyer Passenger Prediction

- Identify/predict the Non-FFP(Non Frequent Flyer Passenger) customers who are likely to become a FFP
- Classification algorithms, Support Vector Machines (SVM) and Decision Tree (DT) are used in this model
- The training data would be mix of Non-FFP passengers and FFP passengers. FFP passengers are those who became FFP from Non-FFP in the last 1 year time period.

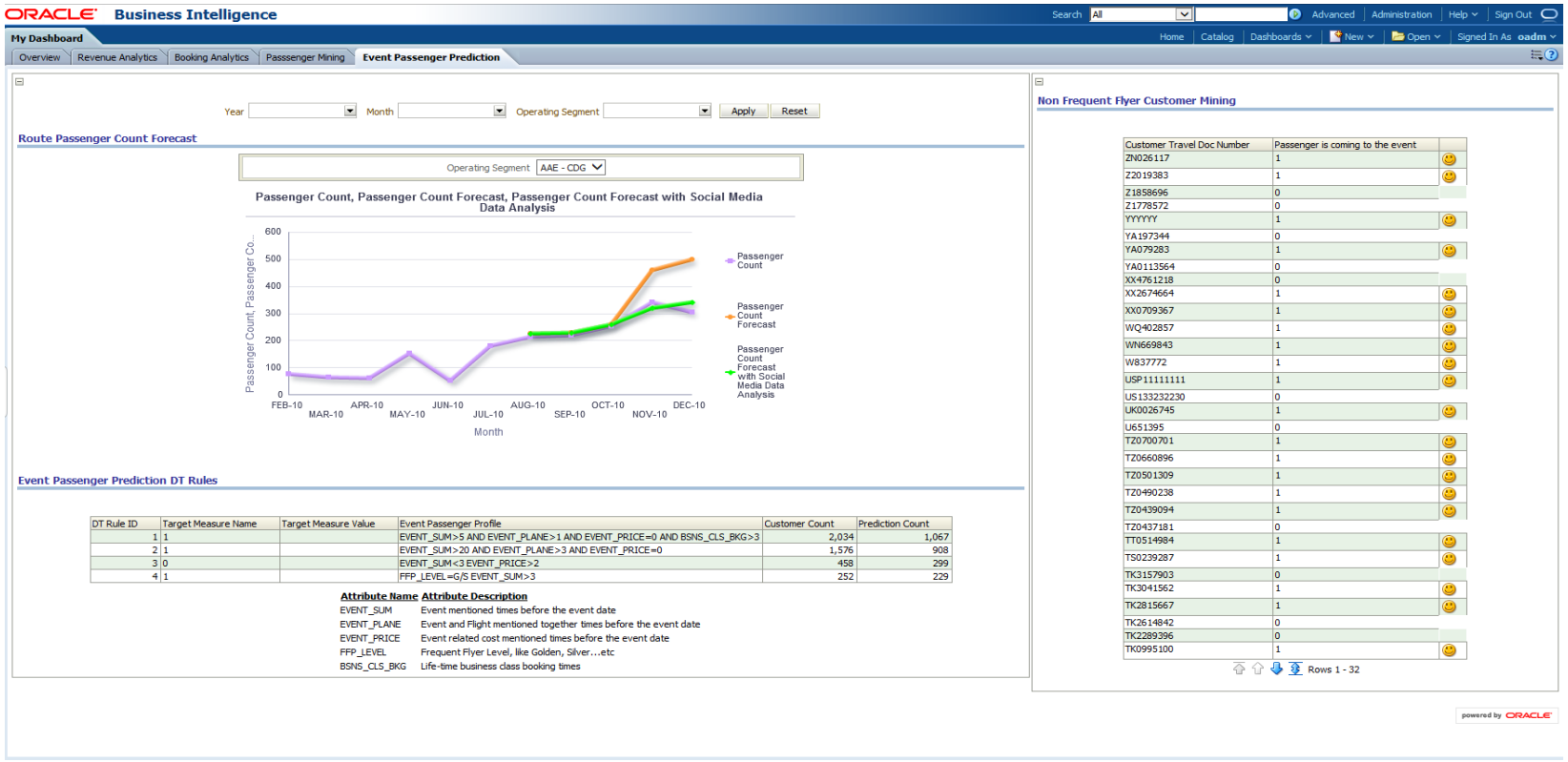
Customer Segmentation Analysis

- Groups customers based on customer demographics, flown history, booking patterns, profitability, etc.
- Business analysts can further look into each identified segment to better understand each customer group
- Clustering rules draw profile of the customers; show most important similar characteristics of each group.
- Leverages K-means clustering algorithm

Sample Reports - Passenger Booking Revenue Report Sample



Sample Reports - Passenger Volume Event Base Prediction



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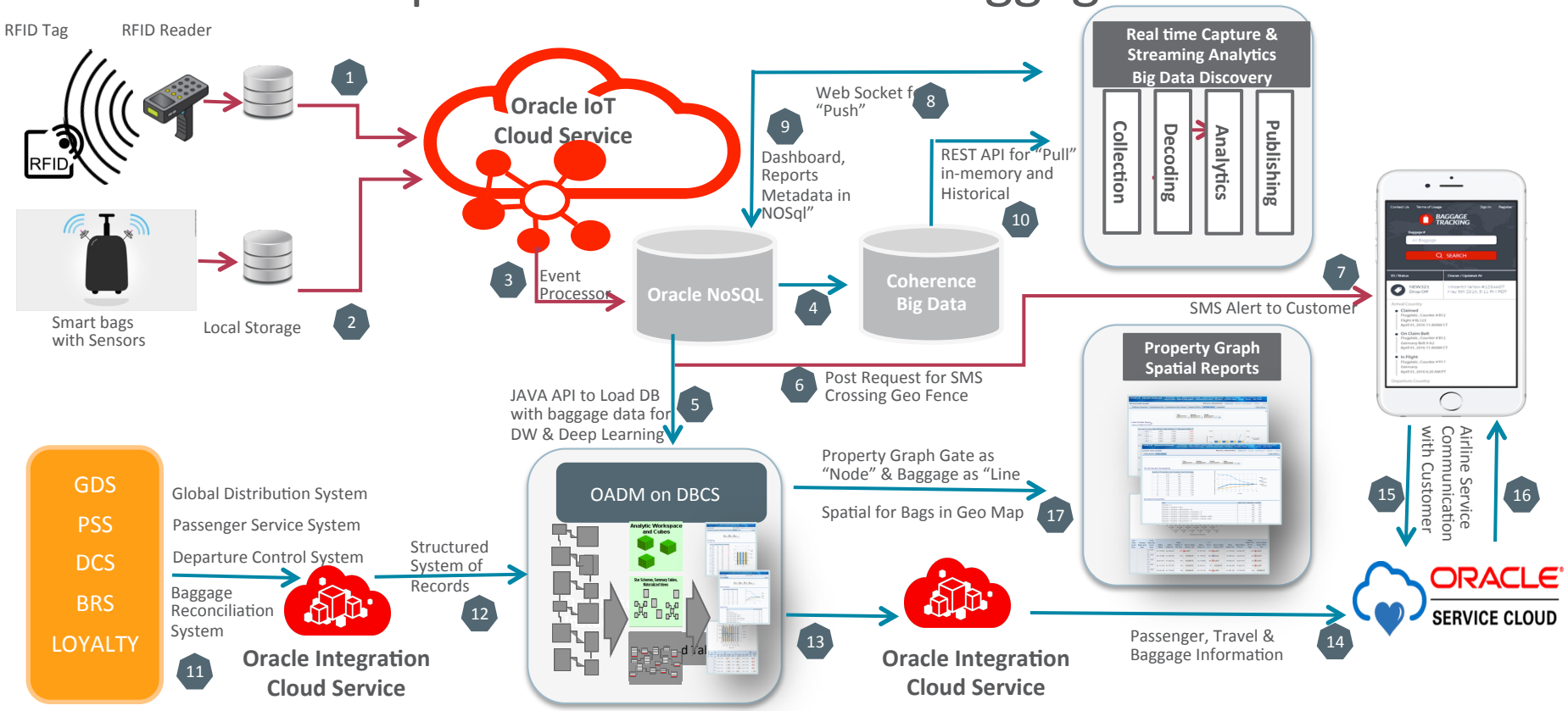
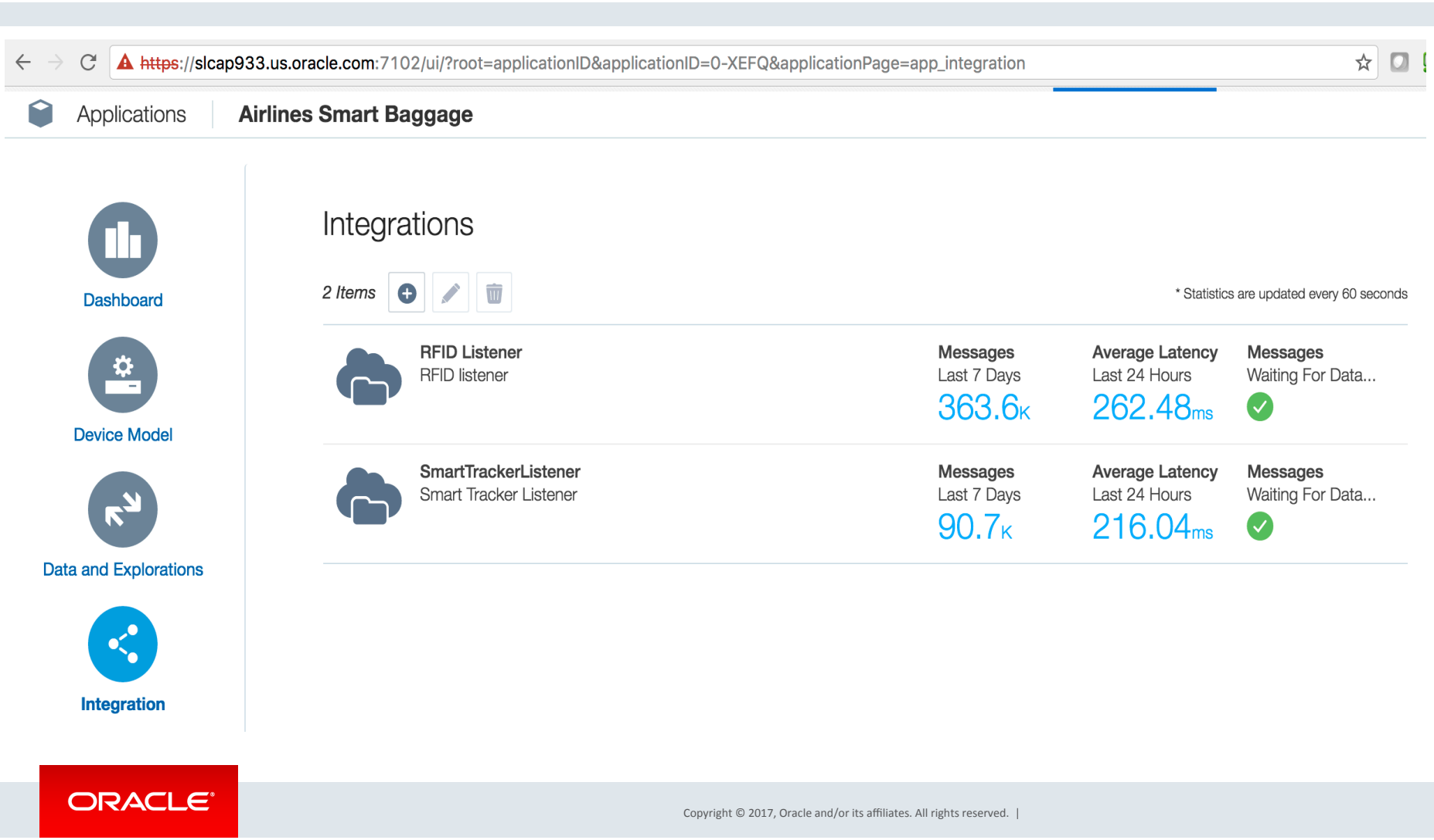
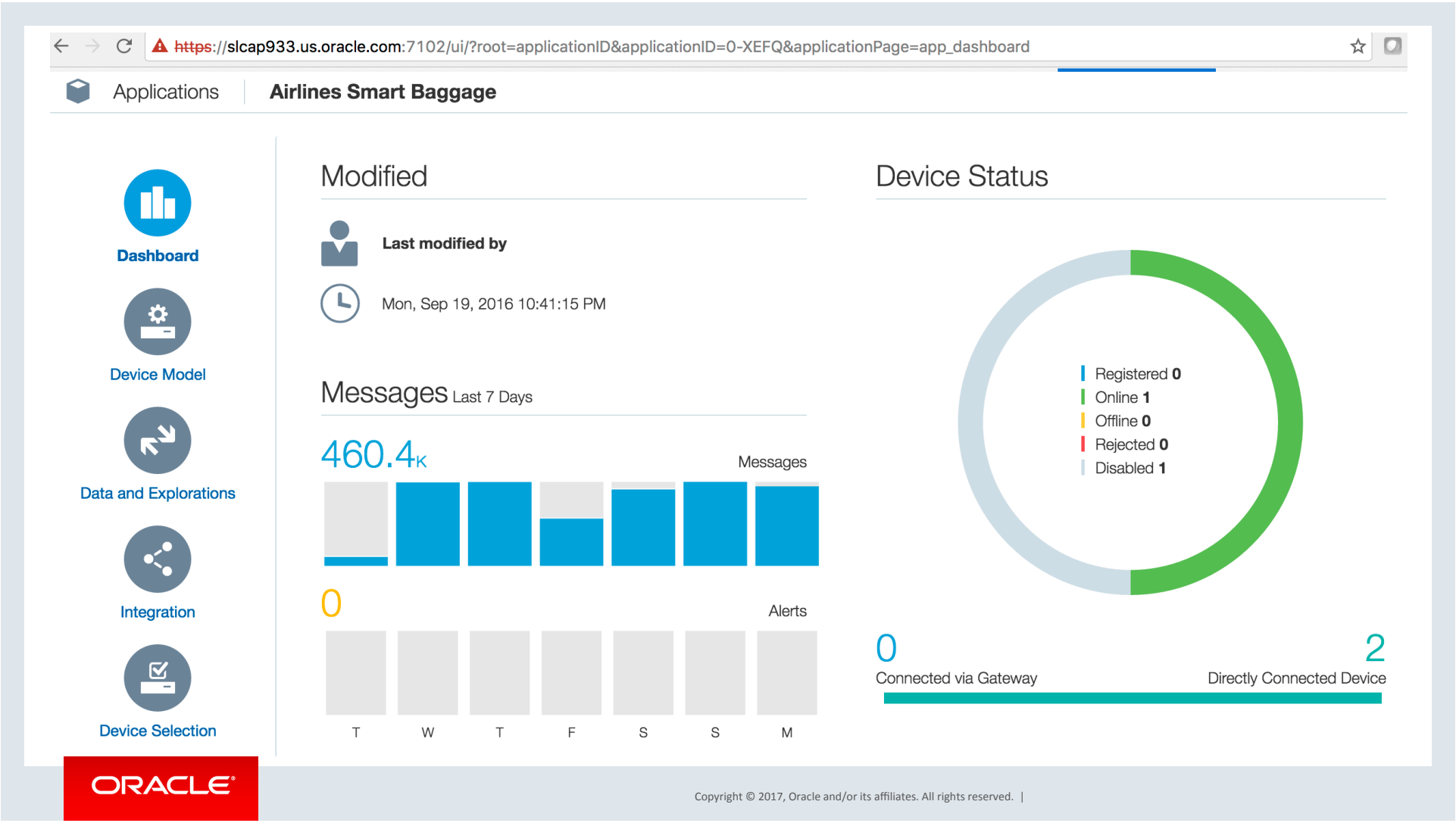
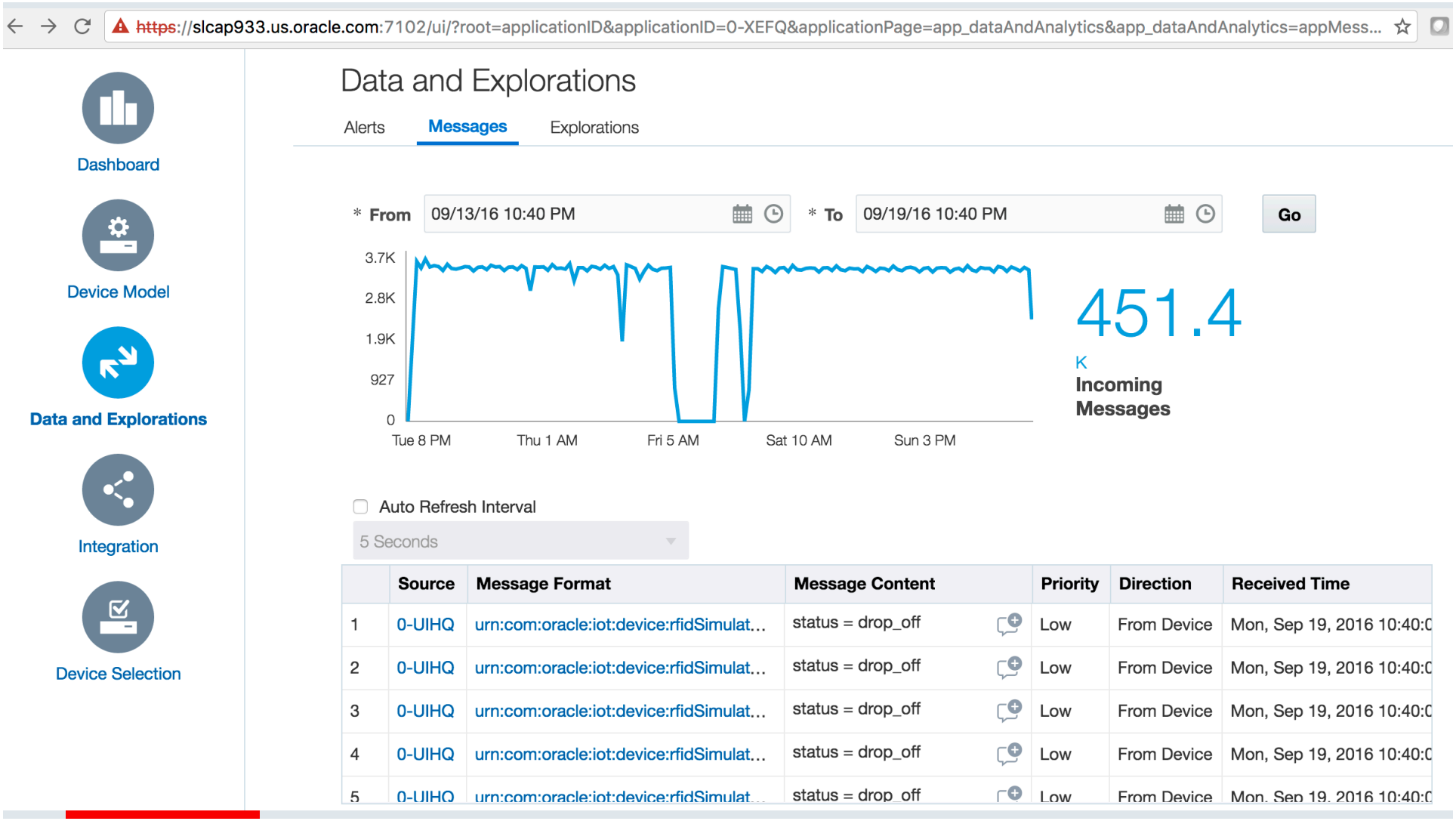
Proof of Concept for Smart Airlines Baggage

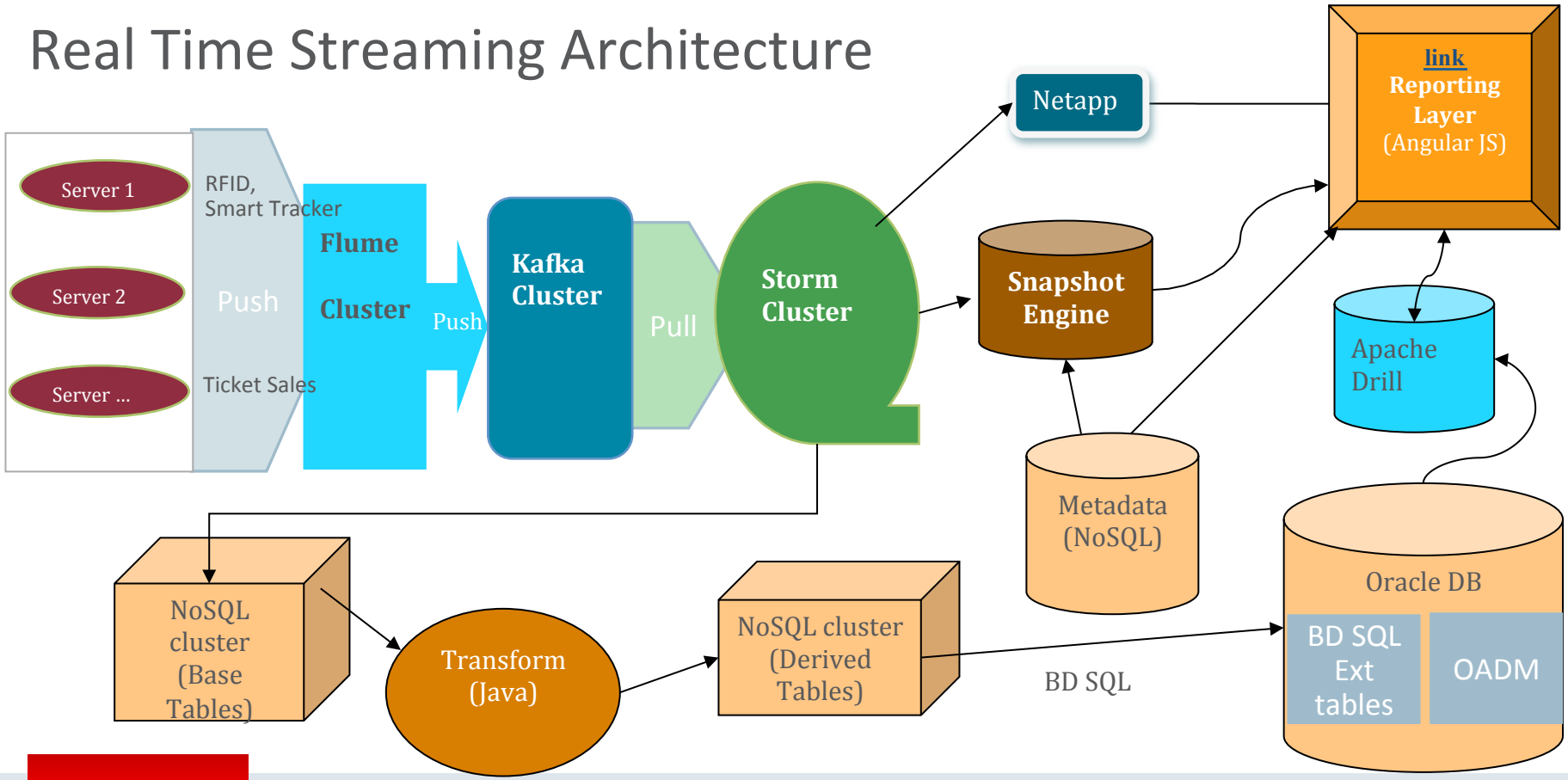






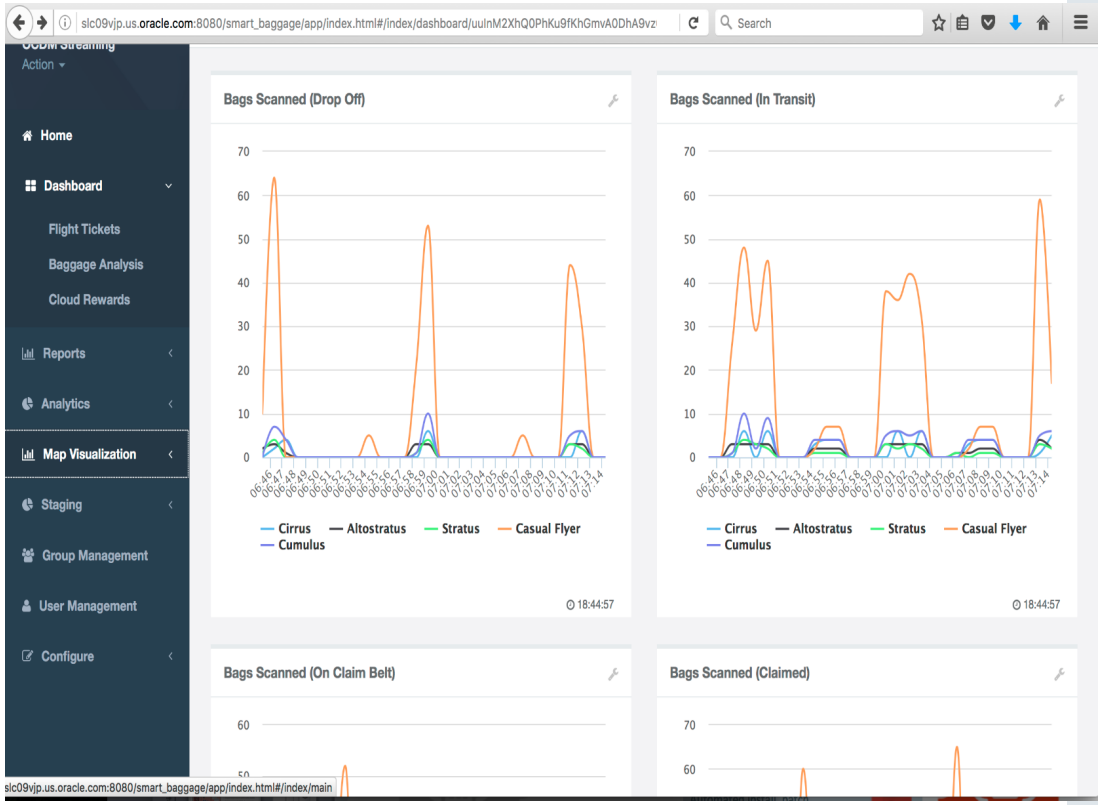

https://slcap933.us.oracle.com:7102/ui/?root=applicationID&applicationID=0-XEFQ&applicationPage=app_dataAndAnalytics&app_dataAndAnalytics=appMess...
Dashboard
Device Model
Data and Explorations
Integration
Device Selection
Data and Explorations
Alerts
Messages
Explorations
* From
09/13/16 10:40 PM
* To
09/19/16 10:40 PM
Go
3.7K
2.8K
1.9K
927
0
Tue 8 PM
Thu 1 AM
Fri 5 AM
Sat 10 AM
Sun 3 PM
451.4
K
Incoming Messages
Auto Refresh Interval
5 Seconds
Source
Message Format
Message Content
Priority
Direction
Received Time
1 0-UIHQ urn:com:oracle:iot:device:rfidSimulat... status = drop_off Low From Device Mon, Sep 19, 2016 10:40:0
2 0-UIHQ urn:com:oracle:iot:device:rfidSimulat... status = drop_off Low From Device Mon, Sep 19, 2016 10:40:0
3 0-UIHQ urn:com:oracle:iot:device:rfidSimulat... status = drop_off Low From Device Mon, Sep 19, 2016 10:40:0
4 0-UIHQ urn:com:oracle:iot:device:rfidSimulat... status = drop_off Low From Device Mon, Sep 19, 2016 10:40:0
5 0-UIHQ urn:com:oracle:iot:device:rfidSimulat... status = drop_off Low From Device Mon, Sep 19, 2016 10:40:0

Real Time Streaming Architecture



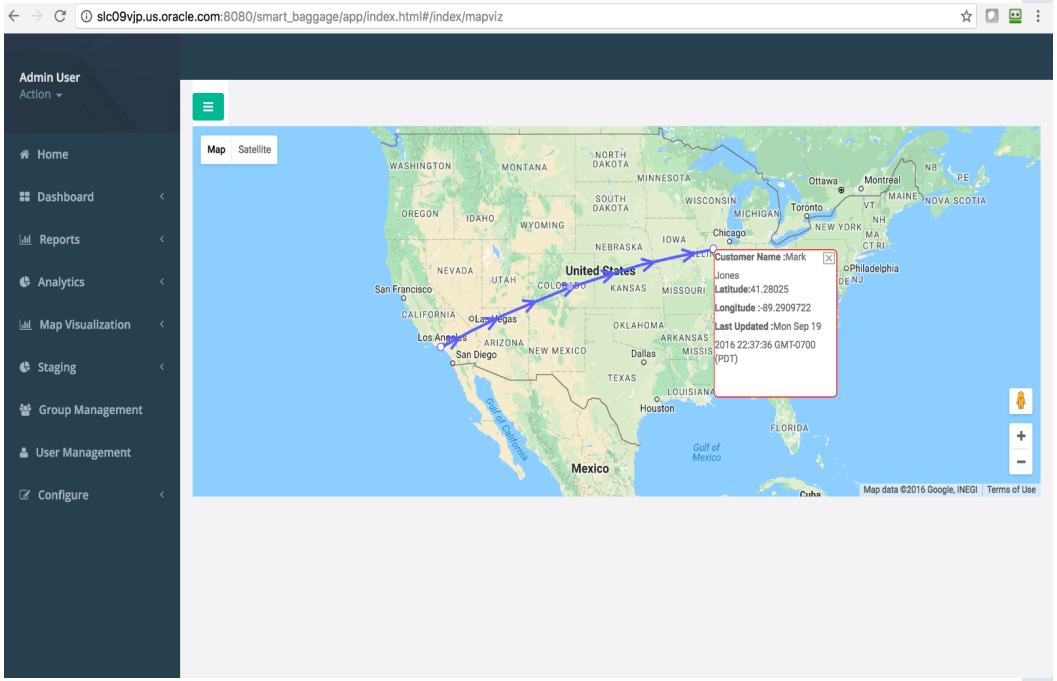
Airline logistics monitor and analyze the flow of bags with real-time streaming analytics

Misrouted or stuck baggage can trigger alerts, and support incidents

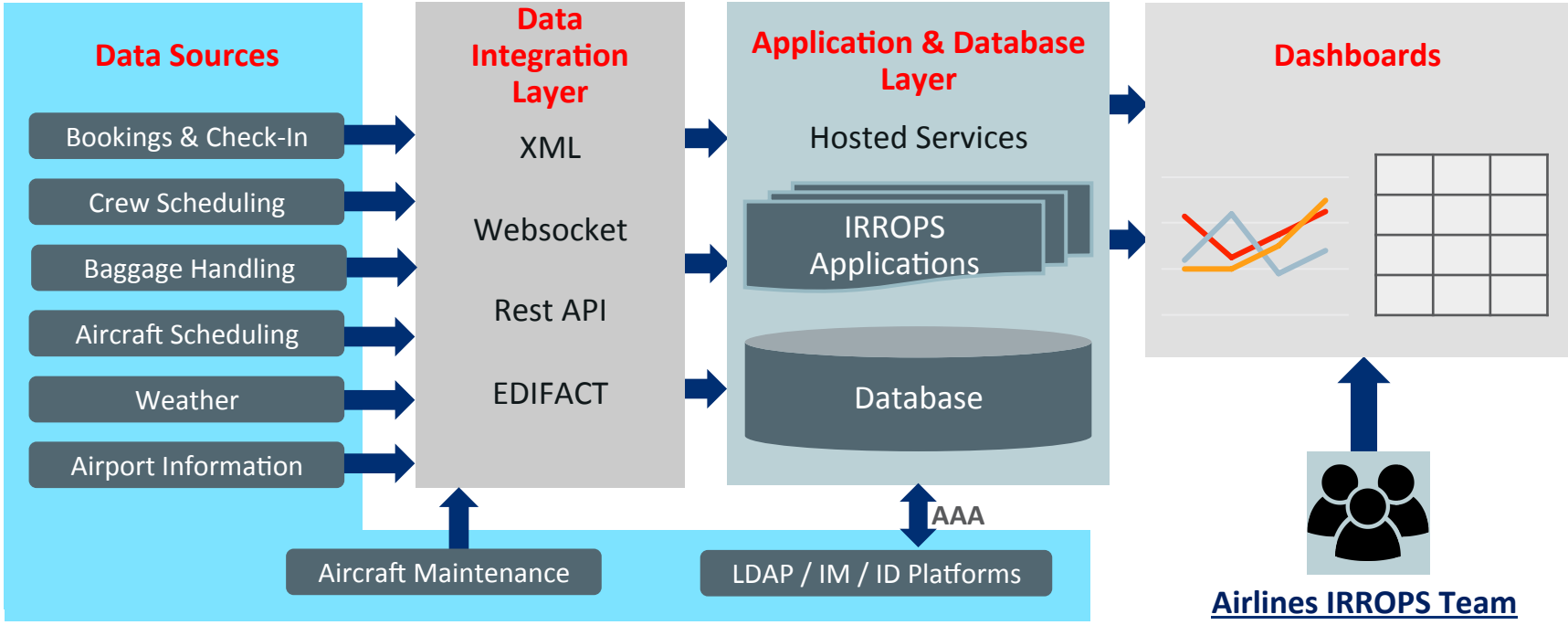


Logistics can also follow the golf bag thru the airport, and across the country*, using real-time maps generated from the tracker's GPS data and Oracle Spatial technologies.

*FAA requires that Smart Tracking devices to be deactivated while onboard the aircraft



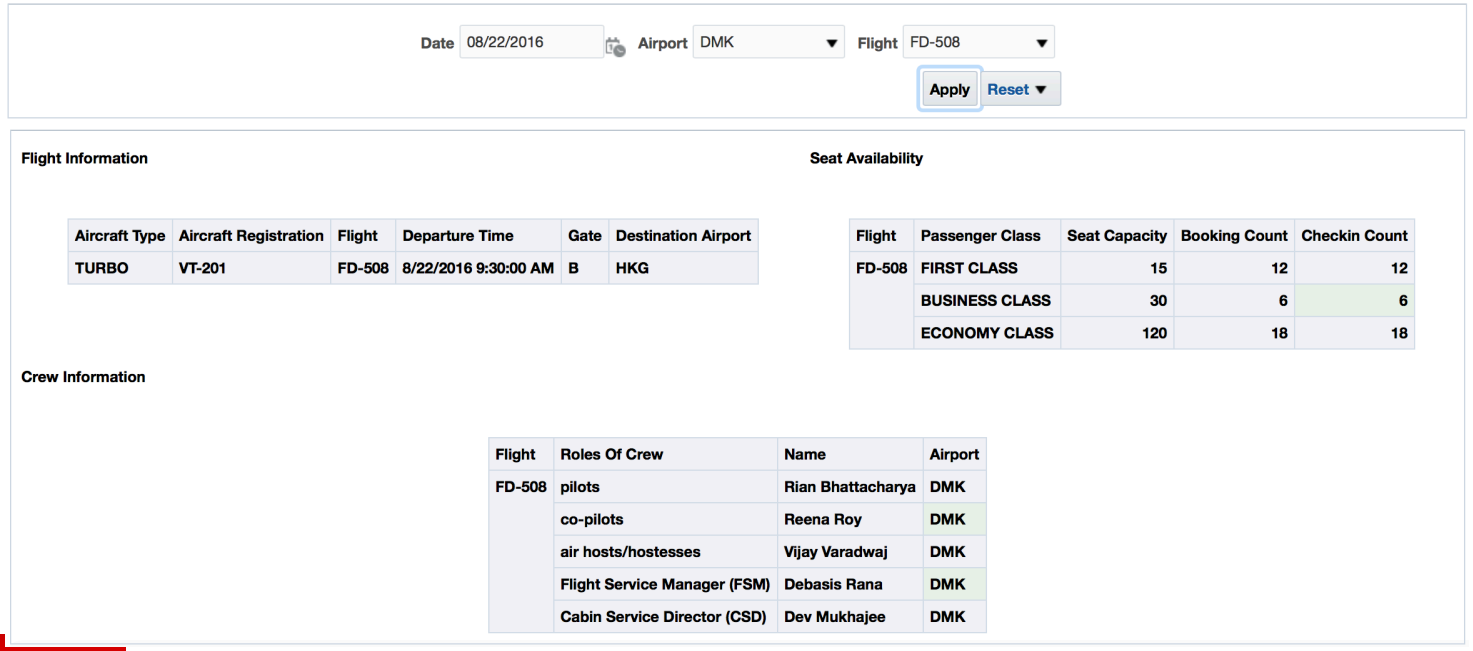
eBIW Solution Architecture



IROPS Dashboard Sample

Single view for Flight, Crew and Seat (Capacity, Check-In, Boarded)

Can be configured to show desired data points, in customized report formats



Cargo Reports

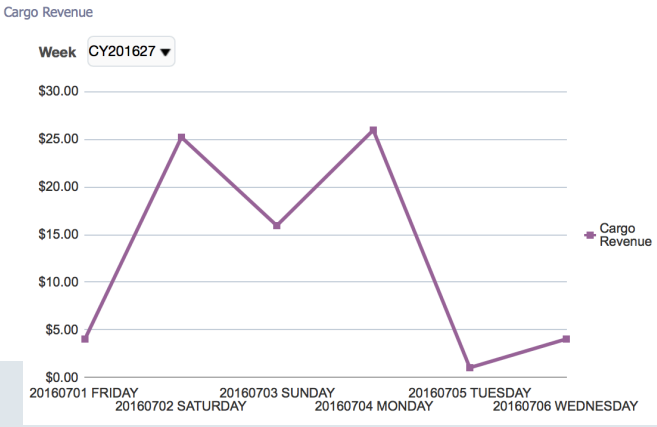
Single view for all Cargo related data.

Drill-down to Month-wise, Week-wise performance.

$666.08
Cargo Revenue

43
Delivery Count

Cargo Revenue by Cargo Category



			PROPELLER	TURBO	
Year	Month	Week	F-GUGJ	VT-100	VT-201
CY 2016	JUL-16	CY201627			$76.20
		CY201628			$96.20
		CY201630			$115.88
		CY201631			$63.00
	AUG-16	CY201631		$1.50	$111.15
		CY201632		$14.40	
		CY201634	$36.00		$51.00
		CY201635			$42.75
	SEP-16	CY201635			$18.00
		CY201639		$14.00	
		CY201640		$5.00	$21.00

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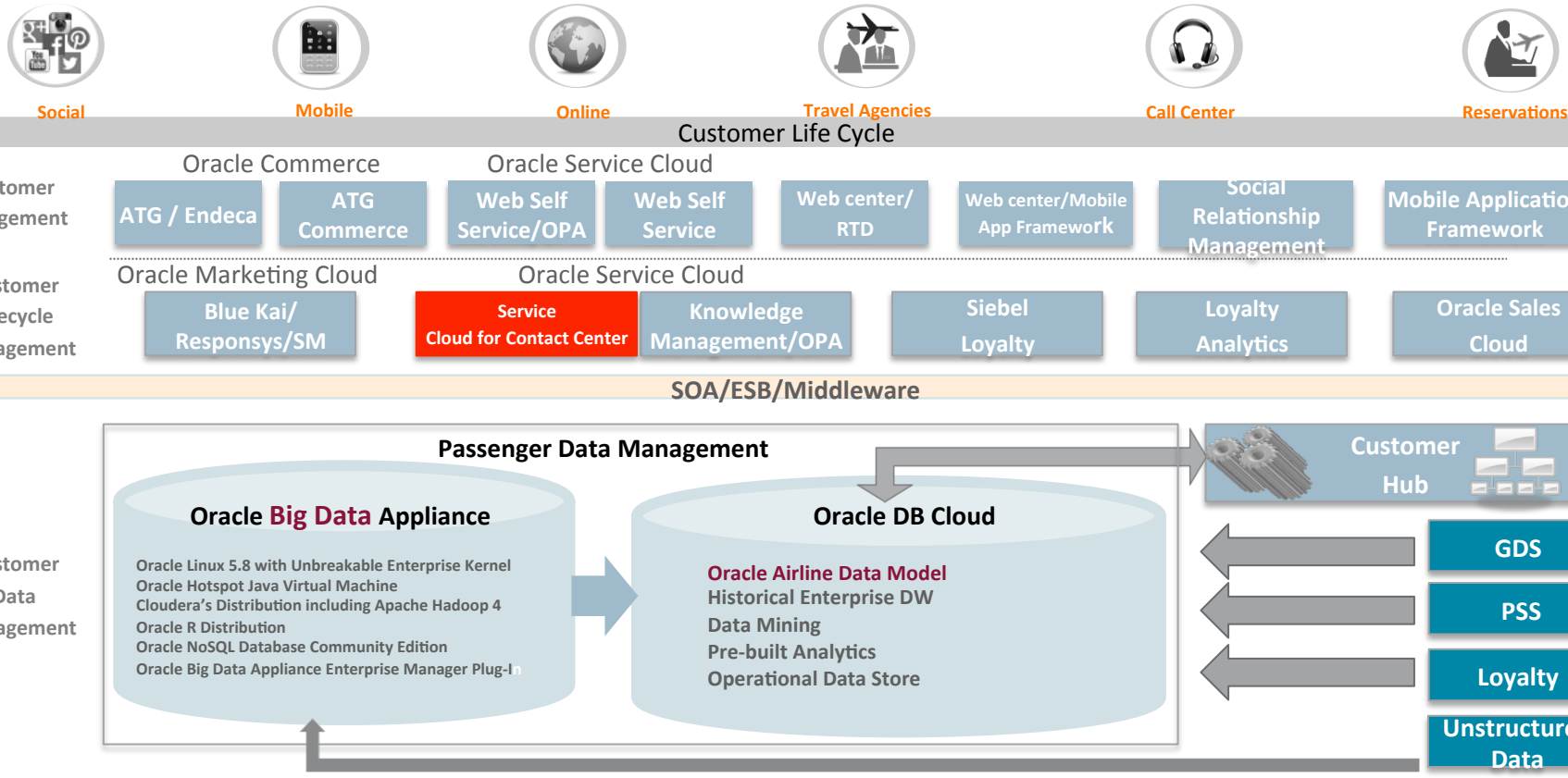
Airline CX & Big Data Architecture for Passenger Business



Mark Purchases his trip…

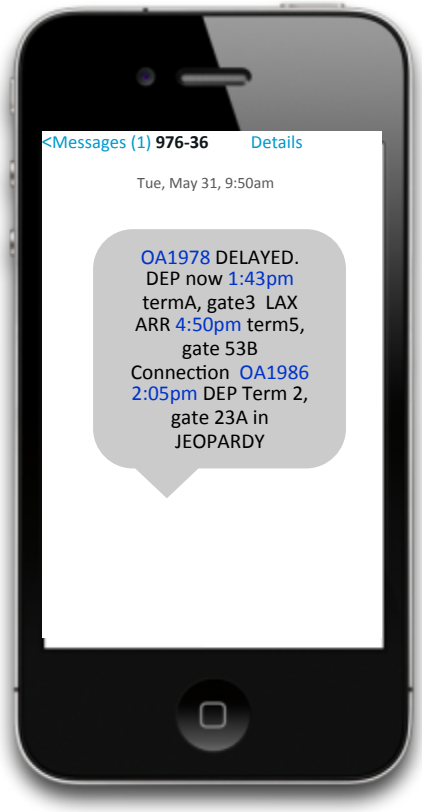
Mark is heading to play golf near Miami, he's planning to use his Smart Tracker to make sure he knows where his golf clubs are at all times during the trip

Mark is ready for his trip!

Mark packs his bags

He includes the Smart Tracker he received from the airlines Loyalty Program in his golf bag. His other bag will use the RFID tracking

Delayed Travel Notification – CX Save

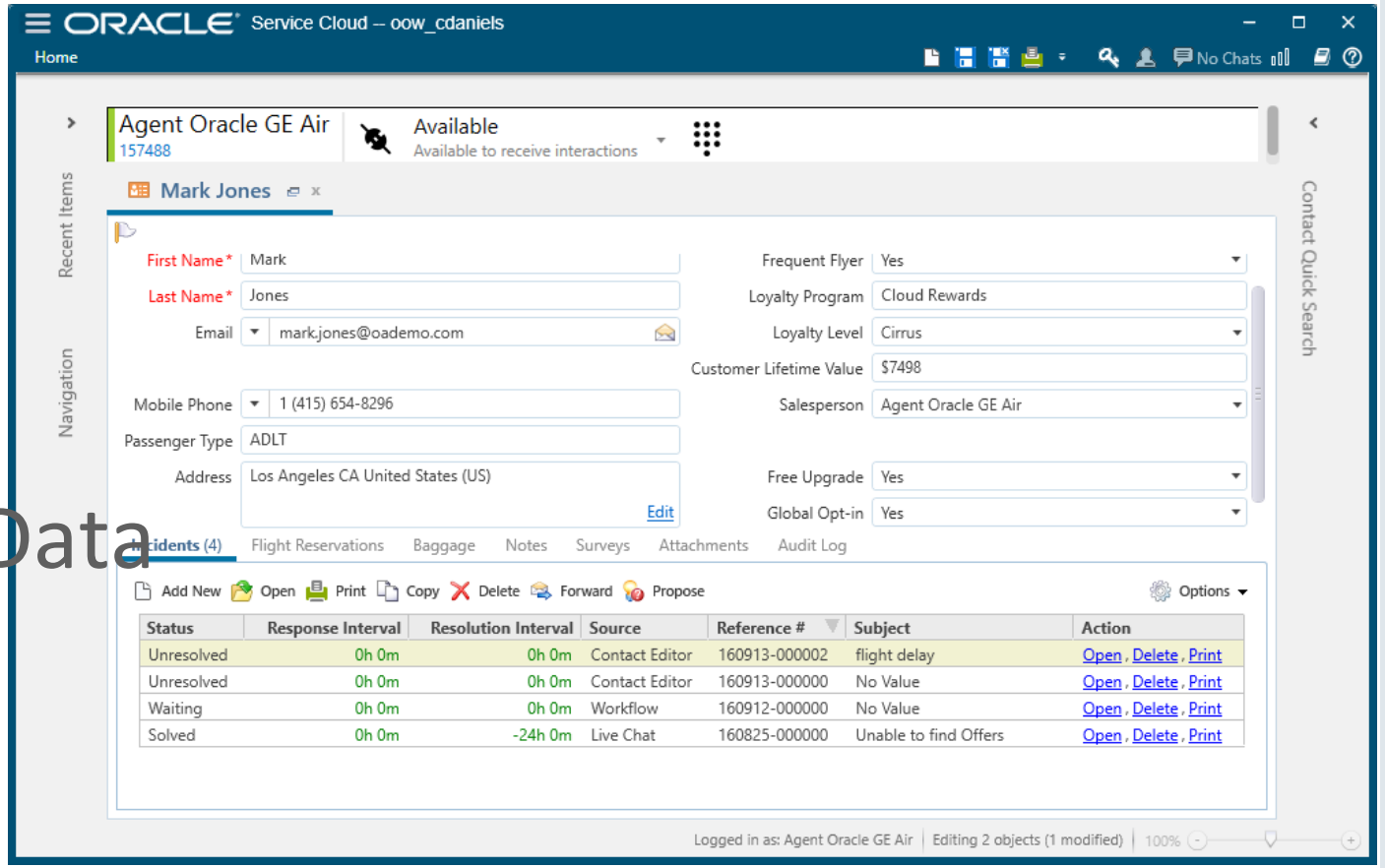


Delayed Travel…

Mark checked in for the flight but as he arrives at the LAX, he receives an alert that the flight is delayed. He's worried about making his connecting flight in Chicago and contacts a service agent

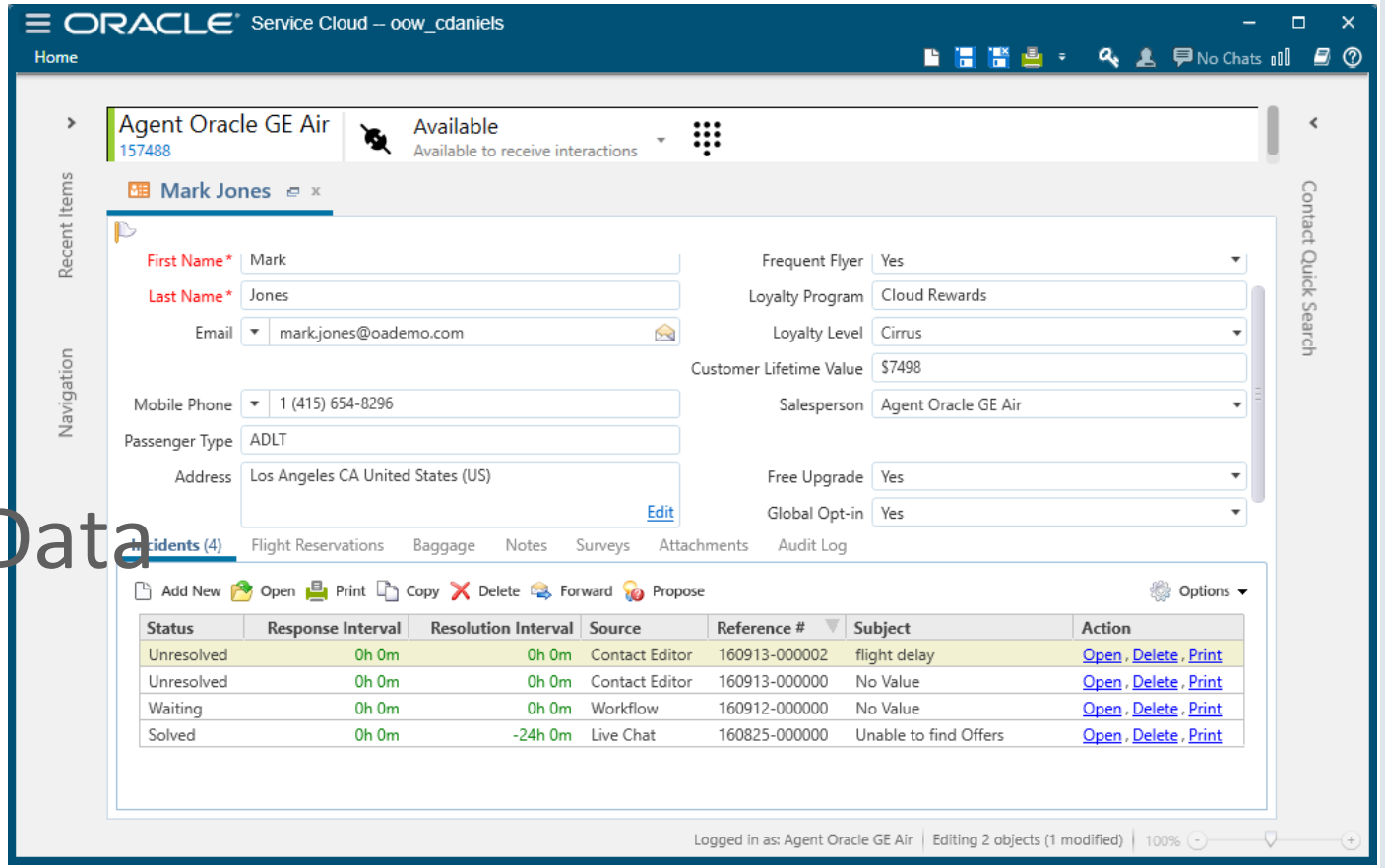
Real-Time Data

Before addressing Mark's concerns, the agent, Sue, can see a snapshot of his reservation



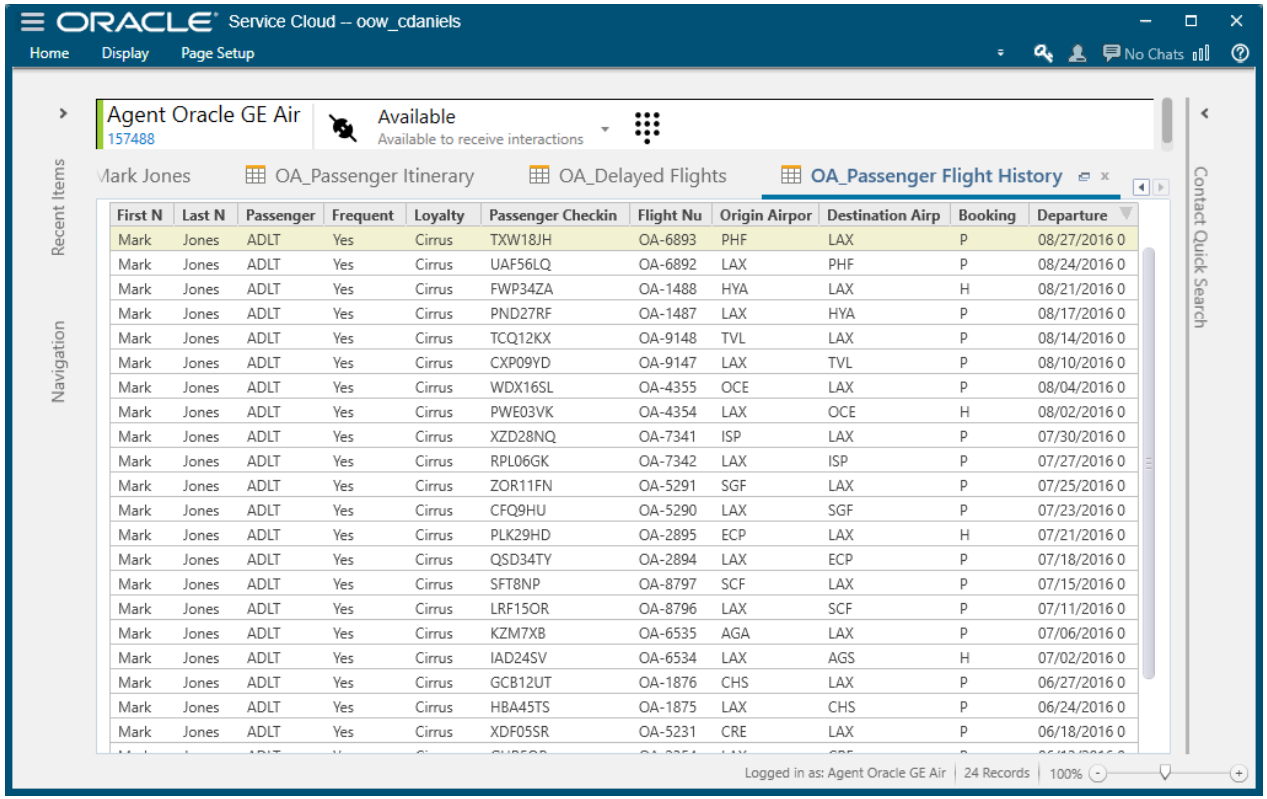
Real-Time Data

Sue sees Mark is an important loyalty customer

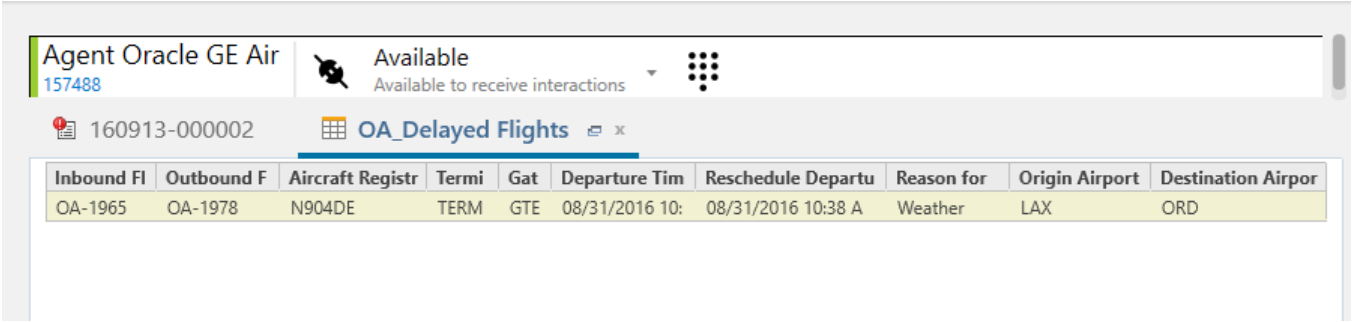


Real-Time D

Sue could also see Mark's flight history, which was used to calculate his Customer Lifetime Value



First N	Last N	Passenger	Frequent	Loyalty	Passenger Checkin	Flight Nu	Origin Airpor	Destination Airp	Booking	Departure
Mark	Jones	ADLT	Yes	Cirrus	TXW18JH	OA-6893	PHF	LAX	P	08/27/2016 0
Mark	Jones	ADLT	Yes	Cirrus	UAF56LQ	OA-6892	LAX	PHF	P	08/24/2016 0
Mark	Jones	ADLT	Yes	Cirrus	FWP34ZA	OA-1488	HYA	LAX	H	08/21/2016 0
Mark	Jones	ADLT	Yes	Cirrus	PND27RF	OA-1487	LAX	HYA	P	08/17/2016 0
Mark	Jones	ADLT	Yes	Cirrus	TCQ12KX	OA-9148	TVL	LAX	P	08/14/2016 0
Mark	Jones	ADLT	Yes	Cirrus	CXP09YD	OA-9147	LAX	TVL	P	08/10/2016 0
Mark	Jones	ADLT	Yes	Cirrus	WDX16SL	OA-4355	OCE	LAX	P	08/04/2016 0
Mark	Jones	ADLT	Yes	Cirrus	PWE03VK	OA-4354	LAX	OCE	H	08/02/2016 0
Mark	Jones	ADLT	Yes	Cirrus	XZD28NQ	OA-7341	ISP	LAX	P	07/30/2016 0
Mark	Jones	ADLT	Yes	Cirrus	RPL06GK	OA-7342	LAX	ISP	P	07/27/2016 0
Mark	Jones	ADLT	Yes	Cirrus	ZOR11FN	OA-5291	SGF	LAX	P	07/25/2016 0
Mark	Jones	ADLT	Yes	Cirrus	CFQ9HU	OA-5290	LAX	SGF	P	07/23/2016 0
Mark	Jones	ADLT	Yes	Cirrus	PLK29HD	OA-2895	ECP	LAX	H	07/21/2016 0
Mark	Jones	ADLT	Yes	Cirrus	QSD34TY	OA-2894	LAX	ECP	P	07/18/2016 0
Mark	Jones	ADLT	Yes	Cirrus	SFT8NP	OA-8797	SCF	LAX	P	07/15/2016 0
Mark	Jones	ADLT	Yes	Cirrus	LRF15OR	OA-8796	LAX	SCF	P	07/11/2016 0
Mark	Jones	ADLT	Yes	Cirrus	KZM7XB	OA-6535	AGA	LAX	P	07/06/2016 0
Mark	Jones	ADLT	Yes	Cirrus	IAD24SV	OA-6534	LAX	AGS	H	07/02/2016 0
Mark	Jones	ADLT	Yes	Cirrus	GCB12UT	OA-1876	CHS	LAX	P	06/27/2016 0
Mark	Jones	ADLT	Yes	Cirrus	HBA45TS	OA-1875	LAX	CHS	P	06/24/2016 0
Mark	Jones	ADLT	Yes	Cirrus	XDF05SR	OA-5231	CRE	LAX	P	06/18/2016 0



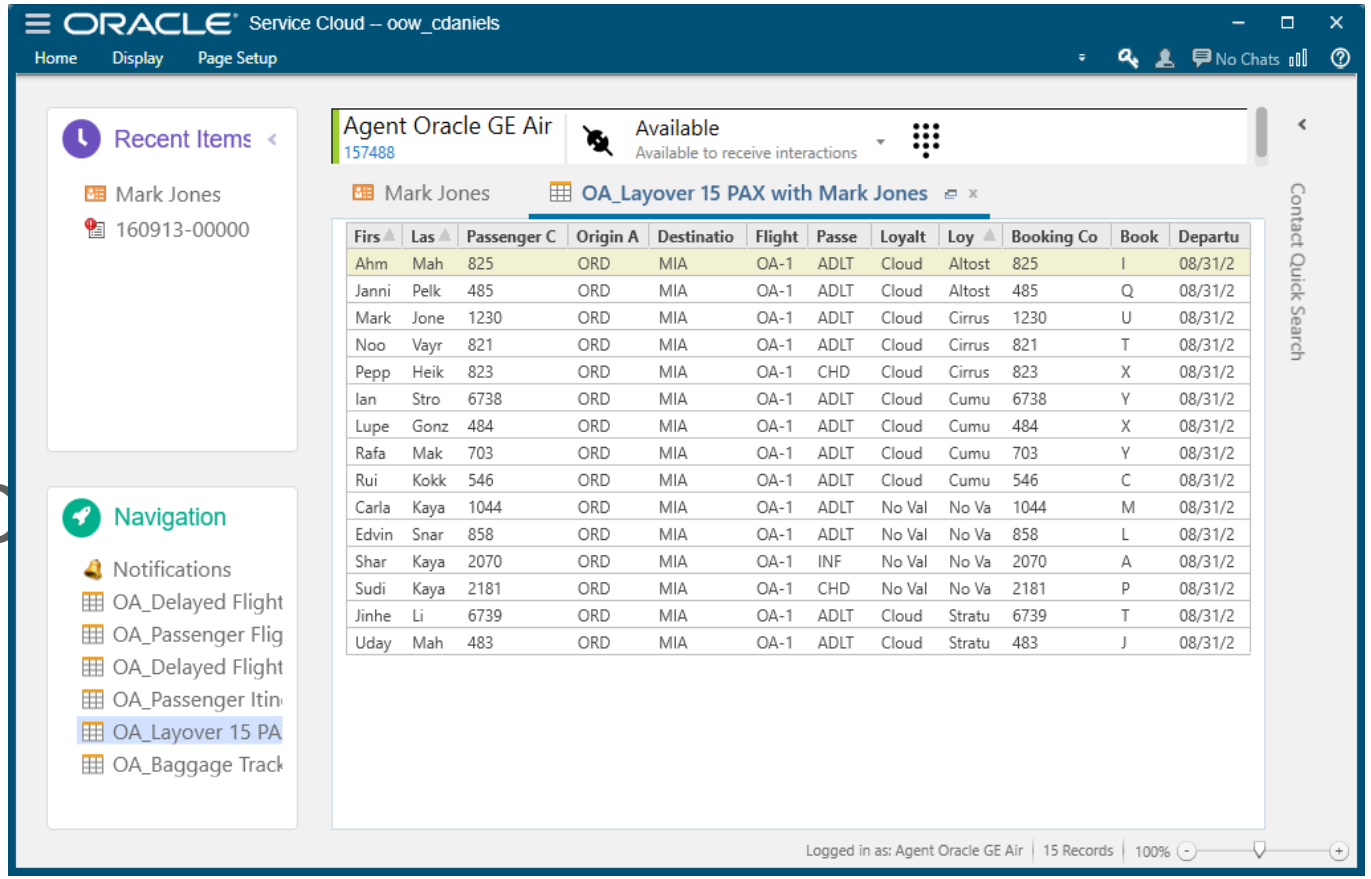
Inbound Fl	Outbound F	Aircraft Registr	Termi	Gat	Departure Tim	Reschedule Departu	Reason for	Origin Airport	Destination Airpor
OA-1965	OA-1978	N904DE	TERM	GTE	08/31/2016 10:	08/31/2016 10:38 A	Weather	LAX	ORD

Real-Time Data

Sue can also get real-time updates around customer concerns, such as flight delays

Real-Time D

Sue also sees there are 15 other passengers with the same connection



Firs	Las	Passenger C	Origin A	Destinatio	Flight	Passe	Loyalt	Loy	Booking Co	Book	Departu
Ahm	Mah	825	ORD	MIA	OA-1	ADLT	Cloud	Altost	825	I	08/31/2
Janni	Pelk	485	ORD	MIA	OA-1	ADLT	Cloud	Altost	485	Q	08/31/2
Mark	Jone	1230	ORD	MIA	OA-1	ADLT	Cloud	Cirrus	1230	U	08/31/2
Noo	Vayr	821	ORD	MIA	OA-1	ADLT	Cloud	Cirrus	821	T	08/31/2
Pepp	Heik	823	ORD	MIA	OA-1	CHD	Cloud	Cirrus	823	X	08/31/2
Ian	Stro	6738	ORD	MIA	OA-1	ADLT	Cloud	Cumu	6738	Y	08/31/2
Lupe	Gonz	484	ORD	MIA	OA-1	ADLT	Cloud	Cumu	484	X	08/31/2
Rafa	Mak	703	ORD	MIA	OA-1	ADLT	Cloud	Cumu	703	Y	08/31/2
Rui	Kokk	546	ORD	MIA	OA-1	ADLT	Cloud	Cumu	546	C	08/31/2
Carla	Kaya	1044	ORD	MIA	OA-1	ADLT	No Val	No Va	1044	M	08/31/2
Edvin	Snar	858	ORD	MIA	OA-1	ADLT	No Val	No Va	858	L	08/31/2
Shar	Kaya	2070	ORD	MIA	OA-1	INF	No Val	No Va	2070	A	08/31/2
Sudi	Kaya	2181	ORD	MIA	OA-1	CHD	No Val	No Va	2181	P	08/31/2
Jinhe	Li	6739	ORD	MIA	OA-1	ADLT	Cloud	Stratu	6739	T	08/31/2
Uday	Mah	483	ORD	MIA	OA-1	ADLT	Cloud	Stratu	483	J	08/31/2

Real-Time Data

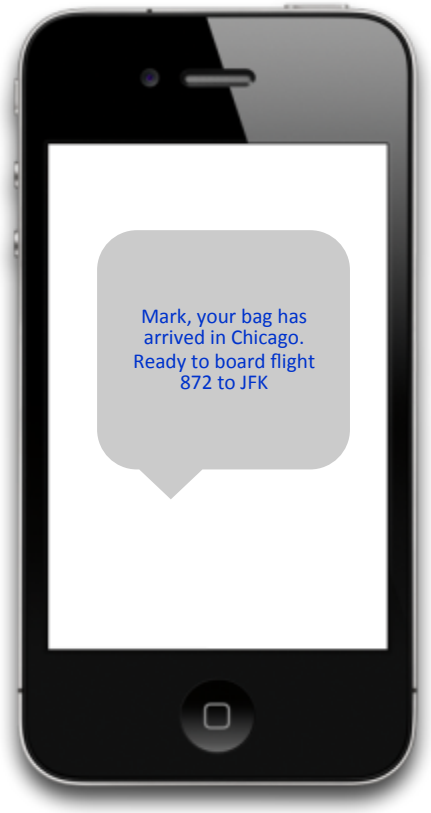
She sends a shuttle to take Mark and the other passengers to their gate

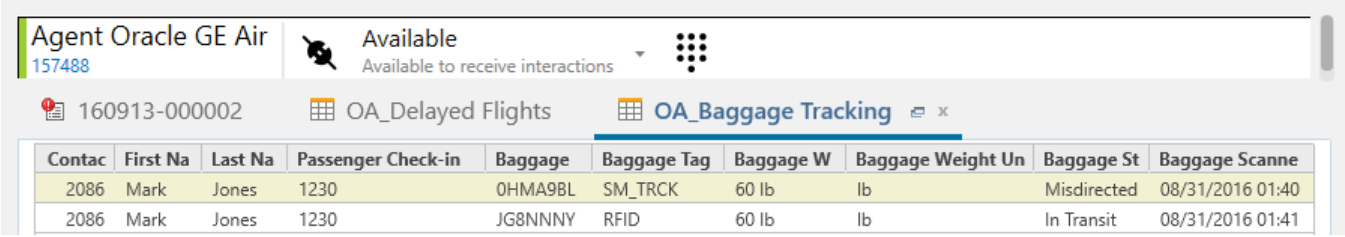
Mark Makes it to Chicago!

Despite the delay, Mark lands in his connection city 15 minutes prior to final boarding for his flight to Miami

Mark Makes the Connection!

He receives an alert that his golf clubs have arrived in Chicago, but are not in the Miami-bound geo-fenced transit area





Contac	First Na	Last Na	Passenger Check-in	Baggage	Baggage Tag	Baggage W	Baggage Weight Un	Baggage St	Baggage Scanne
2086	Mark	Jones	1230	0HMA9BL	SM_TRCK	60 lb	lb	Misdirected	08/31/2016 01:40
2086	Mark	Jones	1230	JG8NNNY	RFID	60 lb	lb	In Transit	08/31/2016 01:41

Instant resolution

Sue also receives an alert about the misdirected bag, and sends

Instant resolution

Sue contacts ground control and is able to route the bag correctly

Agent Oracle GE Air
157488

Available
Available to receive interactions

160913-000002 | OA_Delayed Flights | OA_Baggage Tracking

Contac	First Na	Last Na	Passenger Check-in	Baggage	Baggage Tag	Baggage W	Baggage Weight Un	Baggage St	Baggage Scanne
2086	Mark	Jones	1230	0HMA9BL	SM_TRCK	60 lb	lb	Misdirected	08/31/2016 01:40
2086	Mark	Jones	1230	JG8NNNY	RFID	60 lb	lb	In Transit	08/31/2016 01:41
2086	Mark	Jones	1230	JG8NNNY	RFID	60 lb	lb	In Transist	08/31/2016 01:45
2086	Mark	Jones	1230	0HMA9BL	SM_TRCK	60 lb	lb	On Track	08/31/2016 01:50

Instant resolution

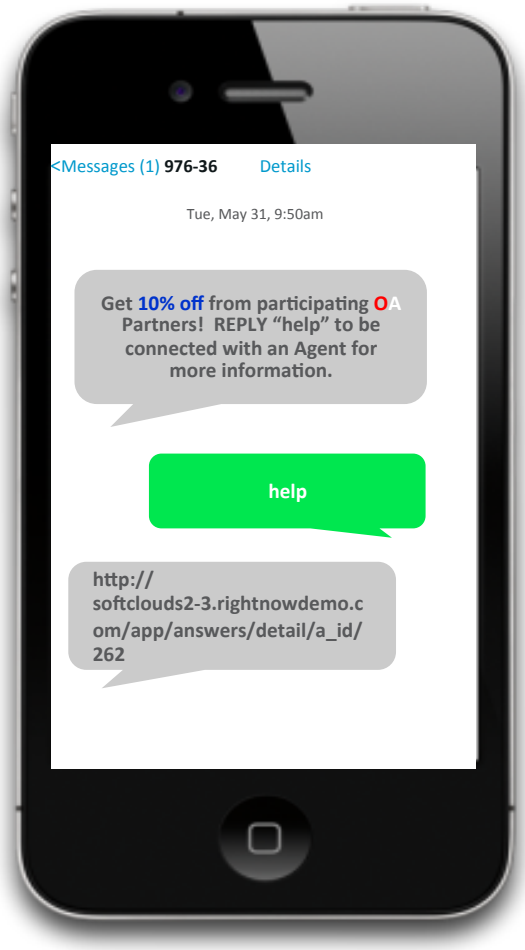
Sue receives confirmation the bag is back on track to Miami

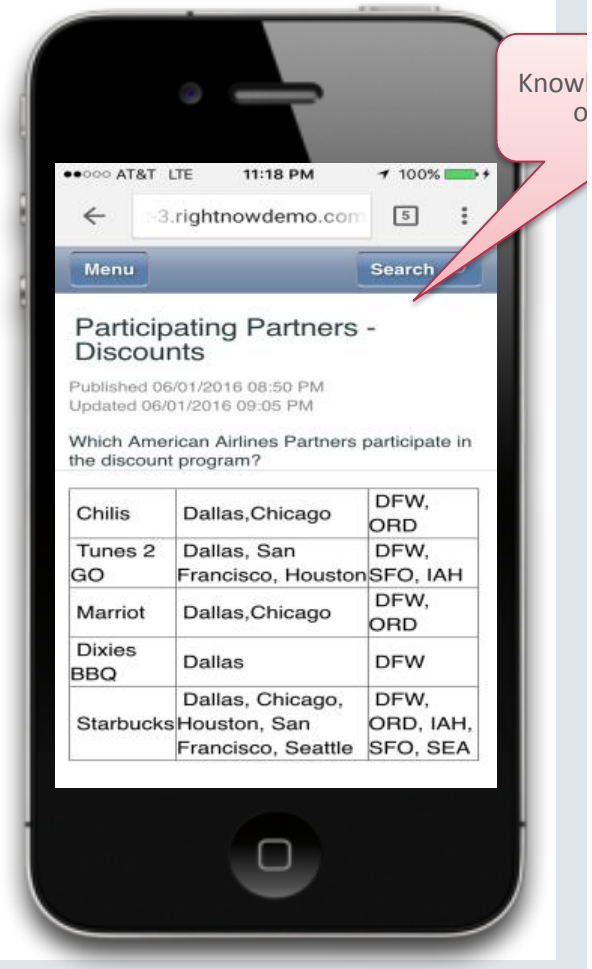
Mark is relieved!

Mark is happy to know exactly where is golf clubs are, and where he can pick them up

Customer Satisfaction

Sue sends Mark some discounts for participating partners





Welcome to Miami!

Advocacy!

Mark Posts his excitement at making it to the Miami.

customer satisfaction

customer effort

Mark is now an Advocate for Oracle Air!

We reduced Mark's customer effort and simultaneously increased his satisfaction, moving him from merely a fan, to a customer advocate.


ORACLE®