ENHANCING AVIATION INDUSTRY EXPERIENCE USING IOT

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Collaborative Problem Solving

• Aviation Industry – Very Infrastructure cost intensive:
  – Aircrafts
  – Jet Engines
  – Airports (Buildings & Ground Assets)

• Room for improvement in Operational Efficiencies in Aviation both in aircrafts and airports (where passengers intersect with airlines)

• Complex eco-system (city, airport, airline, passenger, service providers, regulatory landscape)
Opportunities to Improve Baggage Handling

- Delays (81.2%)
- Damage (15.5%)
- Theft (3.3%)

45% delays due to transfer related issues

Aviation Industry Avg Passenger operating cost=$216
Cost to repatriate a delayed bag=$100

2014 Breakdown

- Majority of bags are returned
- Reason for loss is still due to Transfers

Source: SITA 2014 Baggage Report
A recent Amadeus Study highlights that airline passengers expect significant improvement in their experience around the airport. Note that baggage is a recurrent theme.

In response to such customer needs, the regulatory bodies such as IATA have proposed the Res 753 (Fig 4). We envision such a solution for the airlines and airports to help meet this requirement.

It will improve the passenger experience as well. All the bag related elements of the below survey, can be accomplished by this solution namely:

- Used of a permanent / reusable bag tag
- Remote bag check or bag drop (expanded services)
- Self-service bag drop
- Passenger notification of status of the bag

**Business Value:**

- Reduce by 1% or more, the $2b/yr loss due to baggage exceptions
Testbeds are a major focus and activity of the Industrial Internet Consortium and its members. The Testbed Working Group accelerates and serves as the advisory body for testbed proposal activities for our members. It is the centralized group which collects testbed ideas from members with systematic yet flexible guidance for new testbed proposals. Our testbeds are where the innovation and opportunities of new applications, new products, new services, new processes – can be initiated, thought through, and rigorously tested to ascertain their viability.

Learn more about testbeds in general and specific testbeds below.
Industrial Internet Consortium (IIC), a not-for-profit group of public and private institutions that focuses on:

- Best practices, reference architectures, case studies
- Developing use cases and test beds

"The rise in the Internet of Things (IoT) will see traditional manufacturing companies emerge as credible software vendors in the future", according to Gartner.

Founding members:

- AT&T
- GE
- Intel

Other Members: Boeing, Oracle, M2MI
Oracle, GE team up to digitally connect global industrial internet

News: GE Digital and Oracle will develop and integrate complementary solutions across their product portfolios.

General Electric (GE) and Oracle are to join forces on a new platform which aims to help companies digitally connect industrial assets globally.
Aviation Business productivity

Impact of Unplanned Downtime

Air turnbacks are costly

Airline industry maintenance cost for delays & cancellations

$45MM per day

Loss per cancellation or diversion
$25K - $100K

Loss per delay
$6K - $8K

Benefits of Predictive Maintenance

Effective workforce & reduced maintenance costs
On-time performance
Customer satisfaction
Airplanes are Talking (we’re listening!)
Today - Jet Engine Sensors

* Simplified view of some of the sensors

GE90X in Cathay Pacific
How to Monitor Asset (Things) Performance?
High Level View
Landing Gear and Sensors
Digital Twin – Aircraft Landing Gear

Sensing ex: **Tire pressure, Drag, Side & Vertical Load, Brake Temperature, Brake pressure**

Graphic Provided by Infosys
Baggage Related Satisfaction

Out of 2/3 of passengers who check baggage for their flight, 52 percent 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.

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.
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?)

Airlines mishandled 21.8 million bags, or 6.96 per 1,000 passengers in 2013, according to SITA, an aviation communications and technology company that tracks baggage performance each year.

http://science.howstuffworks.com/transport/flight/modern/baggage-handling.htm
Door-to-Door trip time may actually be more today than in 1937.
Testbed: Functional View

A Solution with an Altitude!
Smart Airline Baggage Management - Platform Architecture

**Edge Tier**
- Edge Devices and Gateway
- Open Communications Protocols

**Platform Tier**
- M2Mi Platform
  - Device Manager
  - Data Handler
  - Connect Manager
  - Privacy
  - InStream Analytics
  - Cyber Security
- Oracle Airline Data Model
- Data Integration
- High Speed Connectivity Testbed

**Enterprise Tier**
- Airline Systems
- OT User
- Biz User

**Connected Bags, Transport Telematics, Airport Baggage Handling Devices**

**Inter-Operability of Vendor Platforms**

**AVIATION ECOSYSTEM DATA & SERVICE API Management**

**Baggage Handling, Flight Planning, Fuel & others Systems**

**Data Shaping / Persistence**

**Data Integration**

**Oracle Airline Data Model**

**GE Predix**
- Data Services
- Aviation Asset / Analytics Services

**Predix Cloud**

**Enterprise Systems and IT infrastructure**

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Wrap Up

Airline industry – challenges and passenger experience

Collaborative problem solving

Smart Baggage Management

Future State – Intelligent Airports
Thank You!