RFID solution used in Baggage Management system

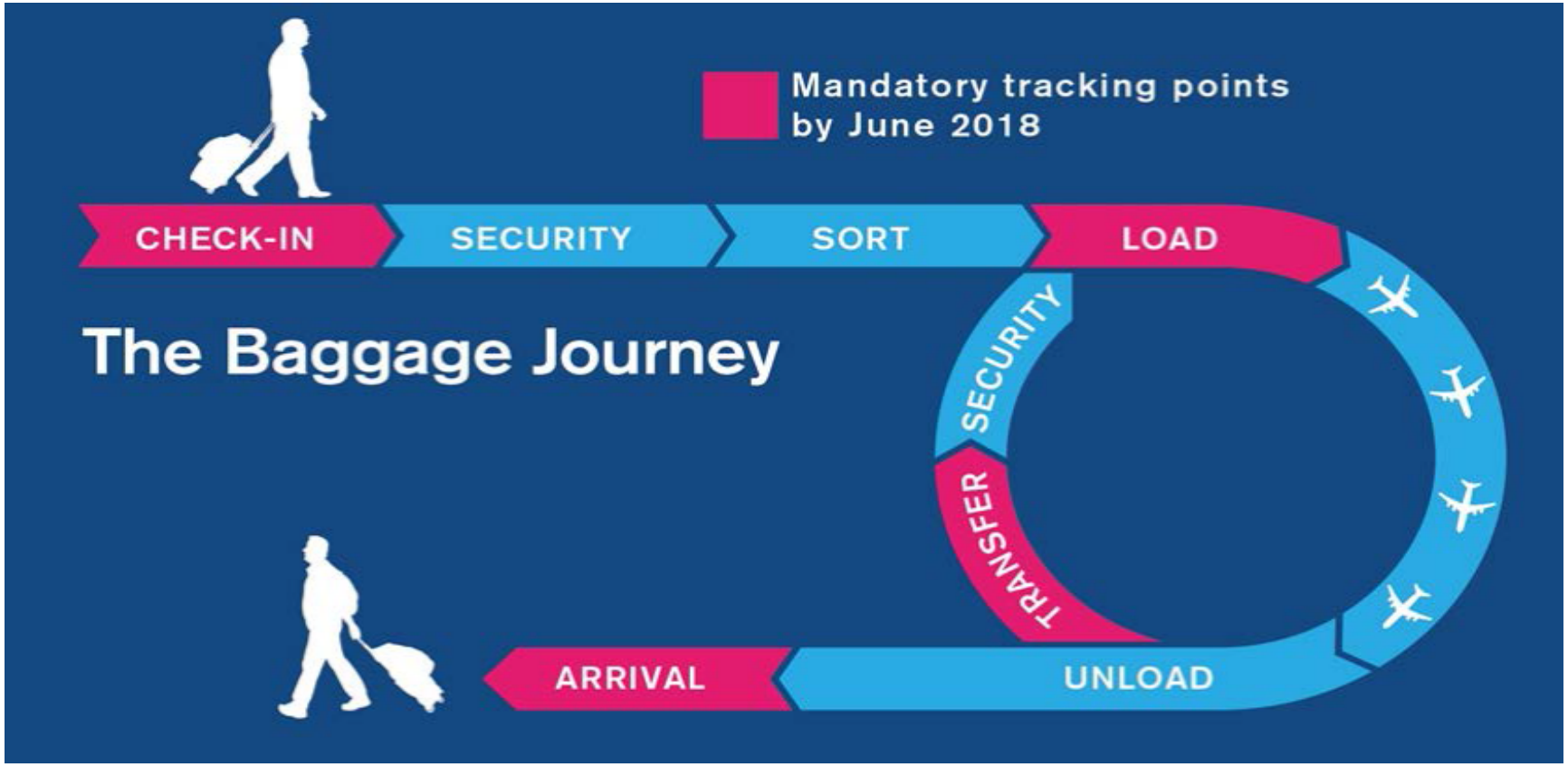
Contents

Background

- Informatization is an inevitable trend in today‘s economic and social development. With the development of civil aviation transportation, the increase in flights and the continuous growth of passengers and baggage, the aviation industry now is facing greater challenges than ever before.
- From June 30, 2018, Resolution 753 issued by the International Aviation Association (IATA) requires all members (including airports, airlines, and agents) to supervise the acceptance and delivery of baggage, provide an accurate list of baggage information, and exchange data with other airlines if necessary to achieve the goal of efficient baggage tracking and inquiries.

MANDATORY TRACKING POINT

Based on the IATA Resolution 753, there are four points that need to be tracked in the whole baggage journey.



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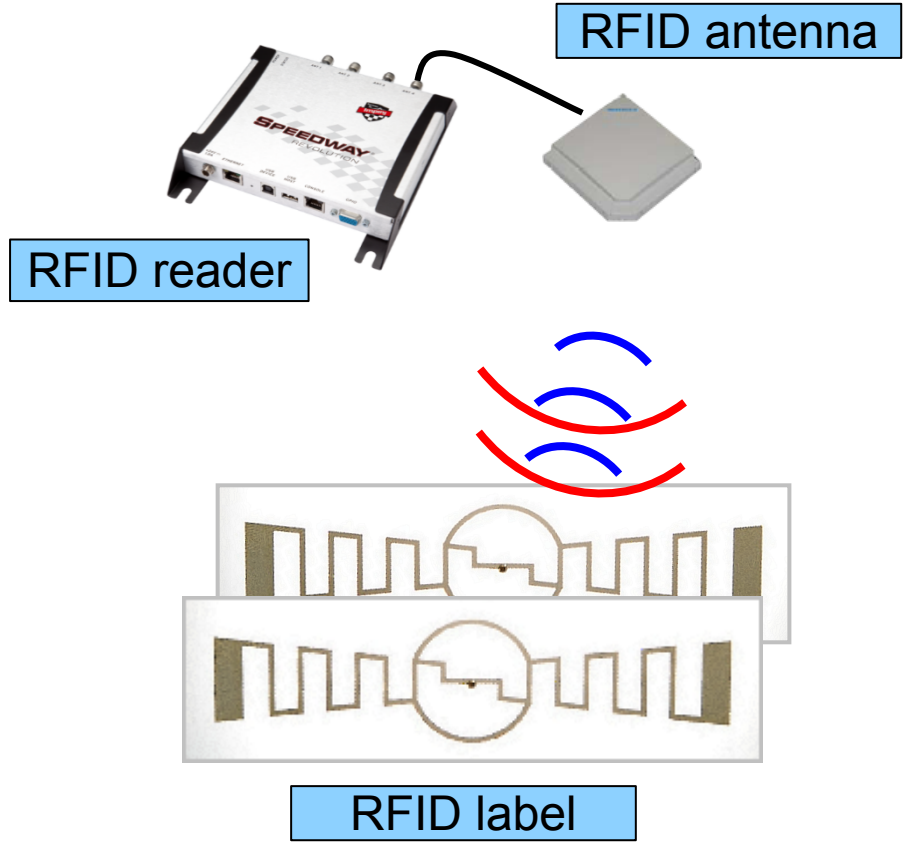
RFID (Radio Frequency Identification) technology introduction

RFID is widely regarded as the most feasible technical solution in baggage tracking.

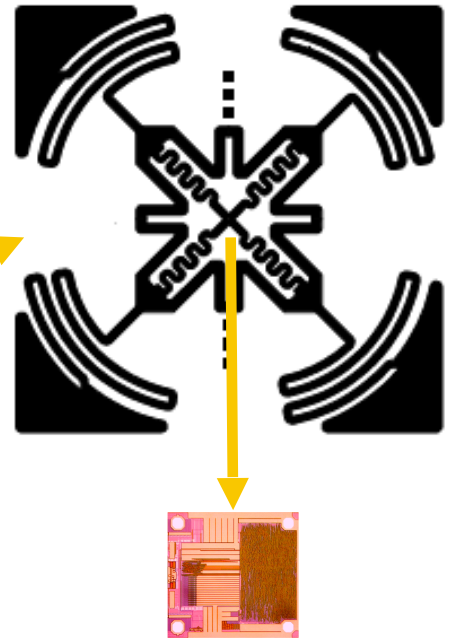
Advantages:

1. RFID label ,as a passive device, can be safely applied for air transportation.
2. Being Non-visually readable.Reading-rate reaches 99.7%.Reading radius is 10 meters.
3. Globally unique ID for each tag.
4. Low production cost for baggage label.
5. Massive data collected and stored by RFID system could be applied together with facial recognition by airport police for security management and anti-terrorism purpose.



Converting

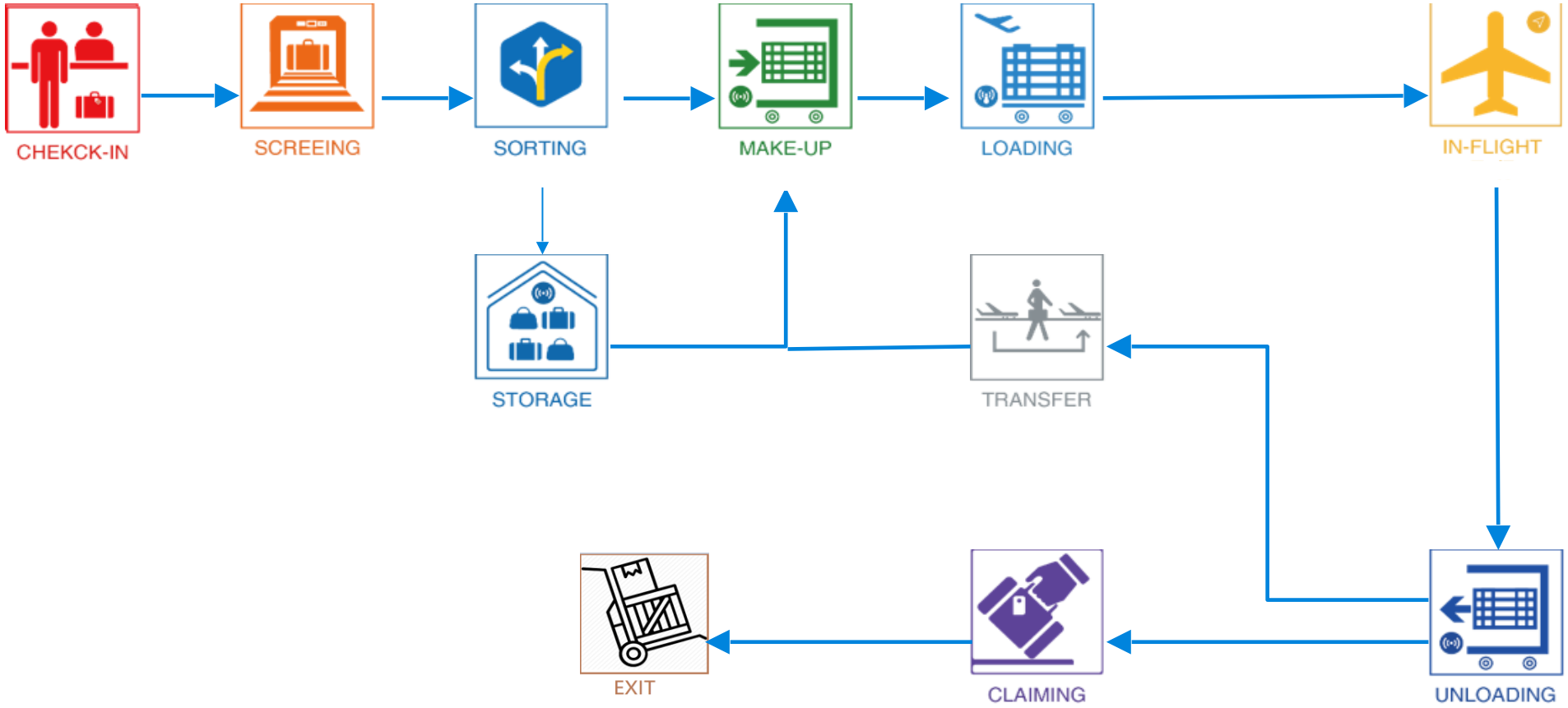
RFID labels can be easily converted in to baggage label, which makes the baggage easily to be tracked.



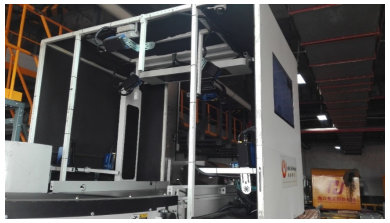
Contents

RFID solution introduction

RFID solution can be used in these process shown below:



RFID solution introduction



Composite & Automatic Sorting System

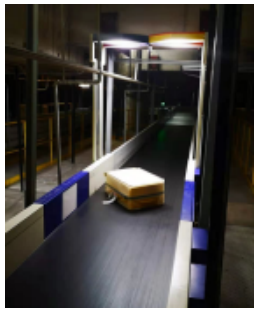
Assistant Manual Sorting System

Automatic Checking & Loading System

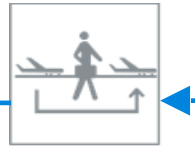
Ceiling Reader & Monitor Device

Carousel Identification Device

Tag Printer



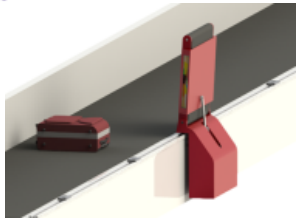
Baggage Photo System



Erecting Identification Device

Exit Monitoring Device

Baggage Position Query Device



Assistant Unloading Device

Composite Arriving Identification System

RFID solution introduction - Information Architecture

Smart Endpoint

Anytime & Anywhere

Data Center

Real Time & High Efficiency

RFID/ATR/Camera/ BLE

Data Collecting

Client

Web System

Mobile System

User Interface Layer

Baggage Positioning

Baggage Photoing

Baggage Video Stream

Baggage Status

Person & Baggage Separation Alert

Suspicious Person Security Check

Suspicious Person Location

Suspicious Person Trajectory

Baggage Tracking

Suspicious person/action AI analyze

Data Processing Layer

Transporting Baggage Management

Baggage Real-time Location

Carry-on Luggage Security Checking

Video Stream Data Mining

Multiple Data Integration

Interactive Layer

Instrument Information

Baggage No.

Baggage Picture

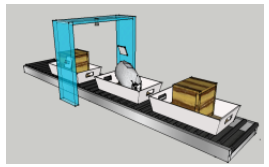
Carry-on Luggage

Security check picture

Video Stream

Person Location

Raw Data Collecting Layer



Check-in Baggage Tracking

Security Face Recognition

Carry-on Luggage Association

Target Trajectory On Video

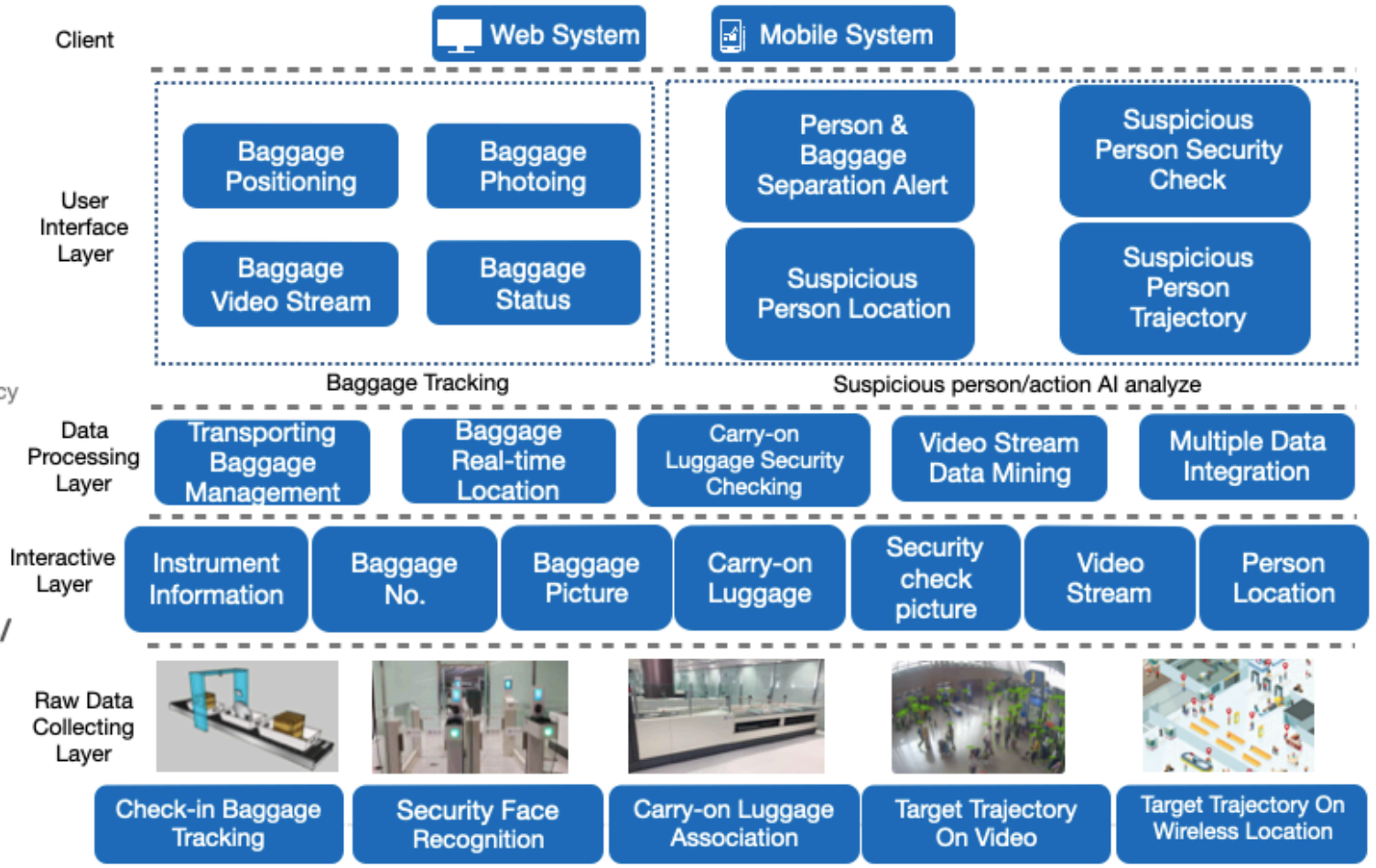
Target Trajectory On Wireless Location

RFID solution introduction - Extensible Information Architecture

Smart Endpoint
Anytime & Anywhere

Data Center
Real Time & High Efficiency

RFID/ATR/Camera/ BLE
Data Collecting



- More and complete data extending more service
- Accurate and efficient service improving journey experience

- Multiple baggage data collecting describing vivid baggage (Weight, 3D model)
- Big data and AI improving baggage manage process

- Combining multiple devices
- Collecting multiple data
- Integrating multiple technology

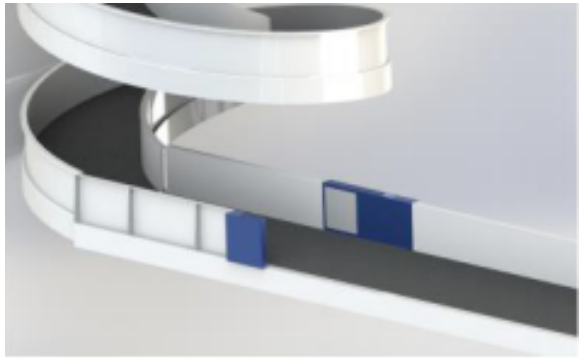
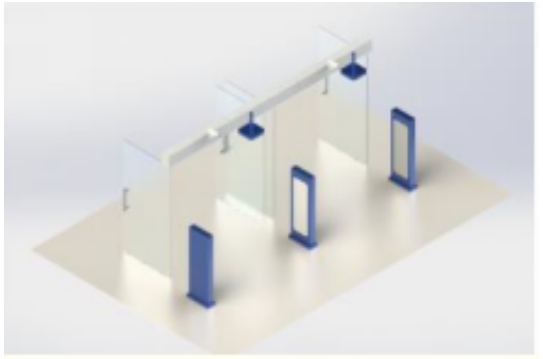
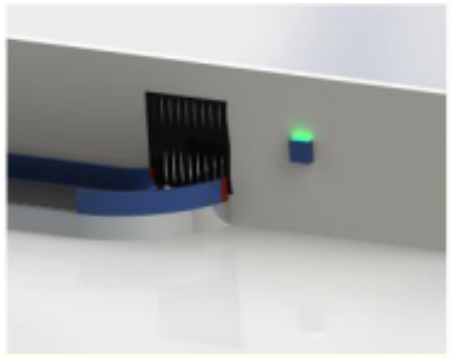
RFID DATA COLLECTION SYSTEM

RFID data collection system are normally fixed in places where the baggages pass, such as elevator door, baggage carousel, passenger exit, etc.

From RFID data collected from key path, it is easy to source and position the baggage that needs to be found.

The fixed RFID data collection system is shown as below.



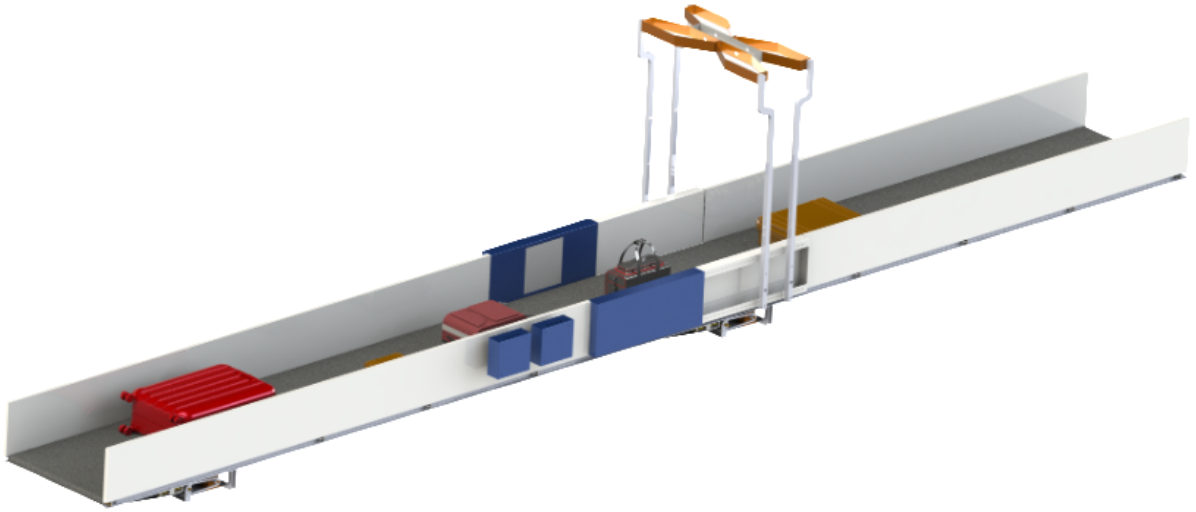




RFID DATA COLLECTION AND PHOTO SYSTEM

RFID data collection and photo system is normally installed on baggage carousel. It can collect RFID data and meanwhile take photos of the same baggage.

Based on an RFID position algorithm, the accuracy rate of RFID-Photo binding can reach 99.5% or more.

RFID data collection and photo system is shown below.

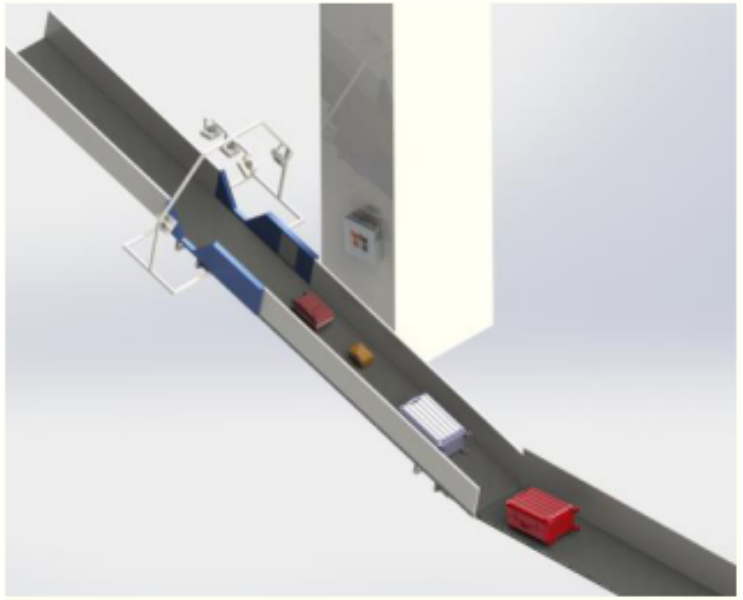


RFID ACQUISITION SYSTEM OF AUTOMATIC SORTING LINE

RFID acquisition system of automatic sorting line is normally installed on baggage carousel. It can collect the RFID data of baggage passing by and transmit the baggage data to automatic sorting system. It can also work together with ATR system.

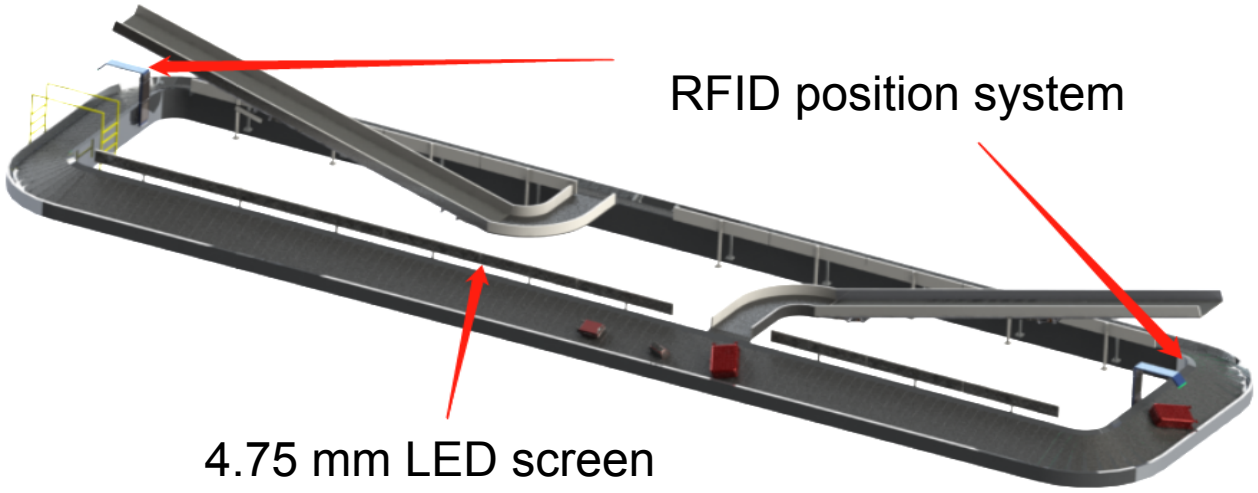
The sorting rate with mix acquisition sorting system can reach 99.5% or more, which is much better than ATR sorting system, of which sorting rate normally lies in between 75% to 94%.

The system is shown below.



ASSISTANT MANUAL SORTING SYSTEM WITH LED ROLLING SCREEN

Assistant manual sorting system is deployed on baggage carousel as well. The system may read and calculate the RFID tags on baggages and show the flight information onto the LED screen. The rate of rolling screen is the same to that of baggage carousel. In this way ,it is easy for porters to know the flight information. The system is shown below.



ASSISTANT MANUAL SORTING SYSTEM WITH LED ROLLING SCREEN

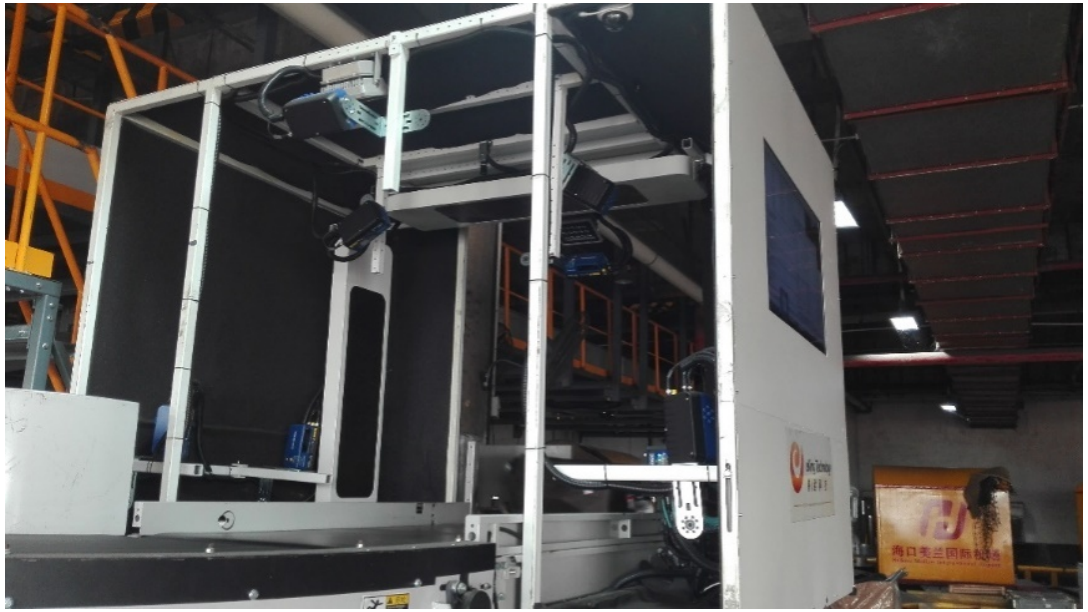
Contents

RFID Baggage Tag Printer

- ✓ Airport Server Connecting Port
- ✓ 152 mm/s Pages Printing
- ✓ EPC and Customer Data Accessing
- ✓ Rechecking Access Data
- ✓ Encrypting Customer Data (Optional SM1 or SM7)

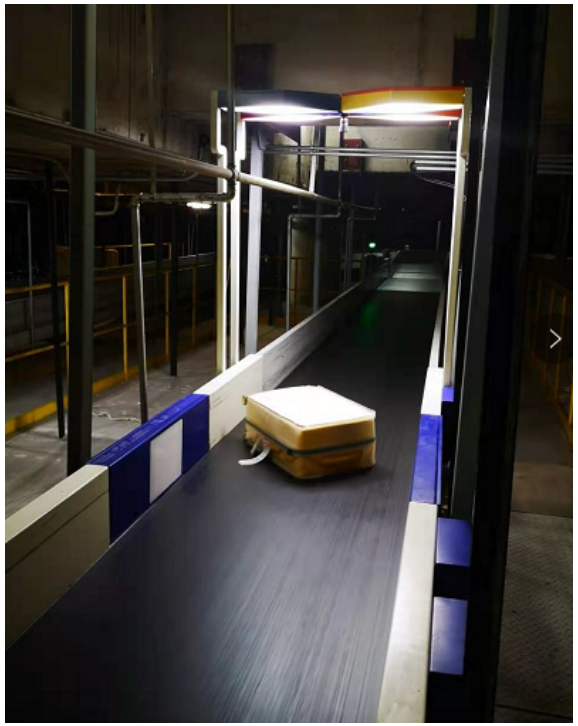
Composite & Automatic Sorting System

The composite & automatic sorting system is automatically sorting and collecting baggage data which supporting minimum distance of each baggage in 30 cm and location accuracy more than 99.5%. It also could be combined the traditional OBR/ATR system in one composite system.



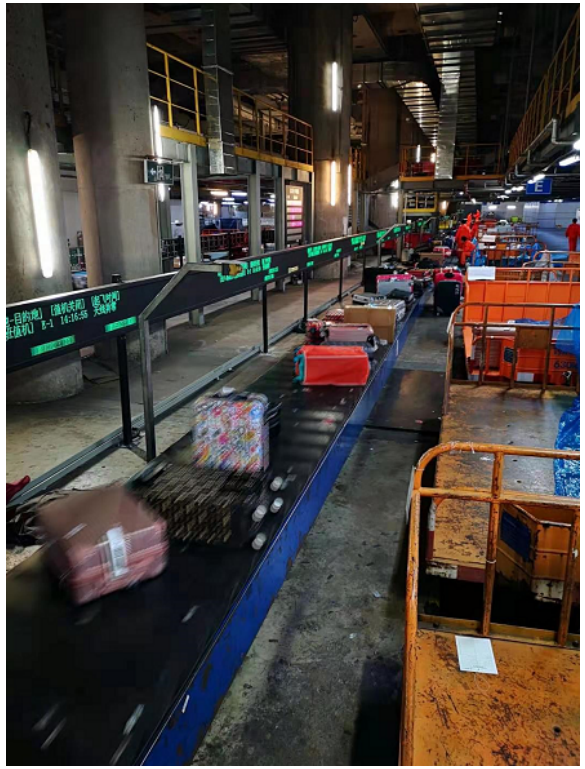
RFID Baggage Photo System

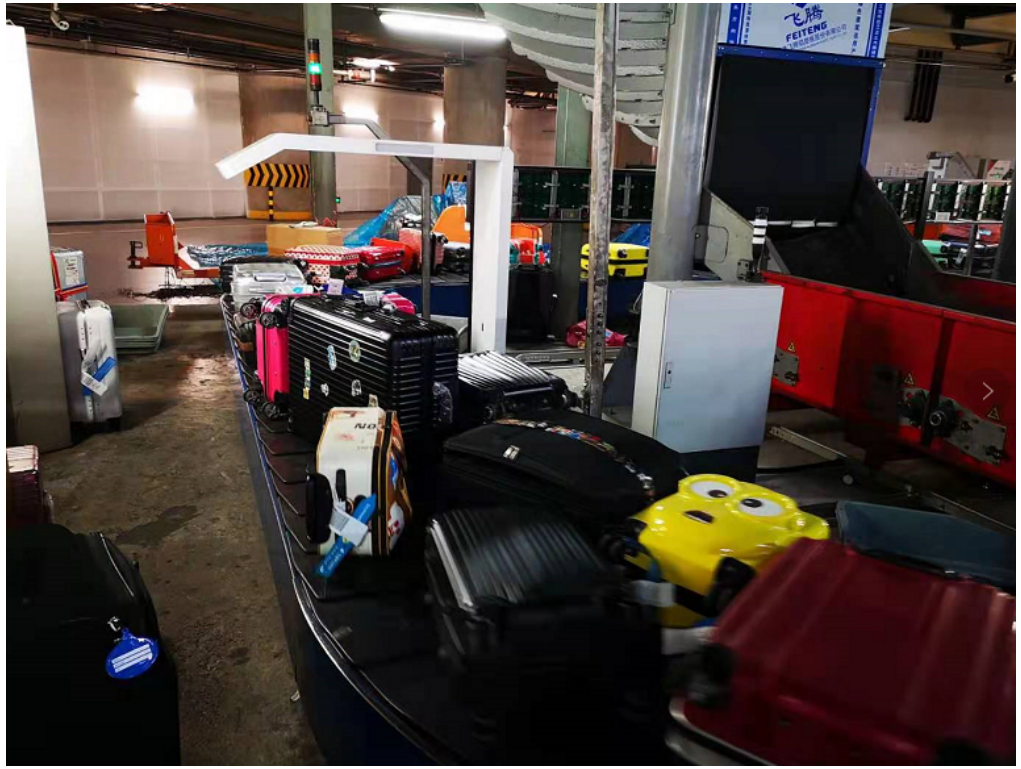
The RFID baggage photo system is automatically photoing baggage appearance and linking the RFID data which supporting minimum distance of each baggage in 30 cm and location accuracy more than 99.5%.



Assistant Manual Sorting System

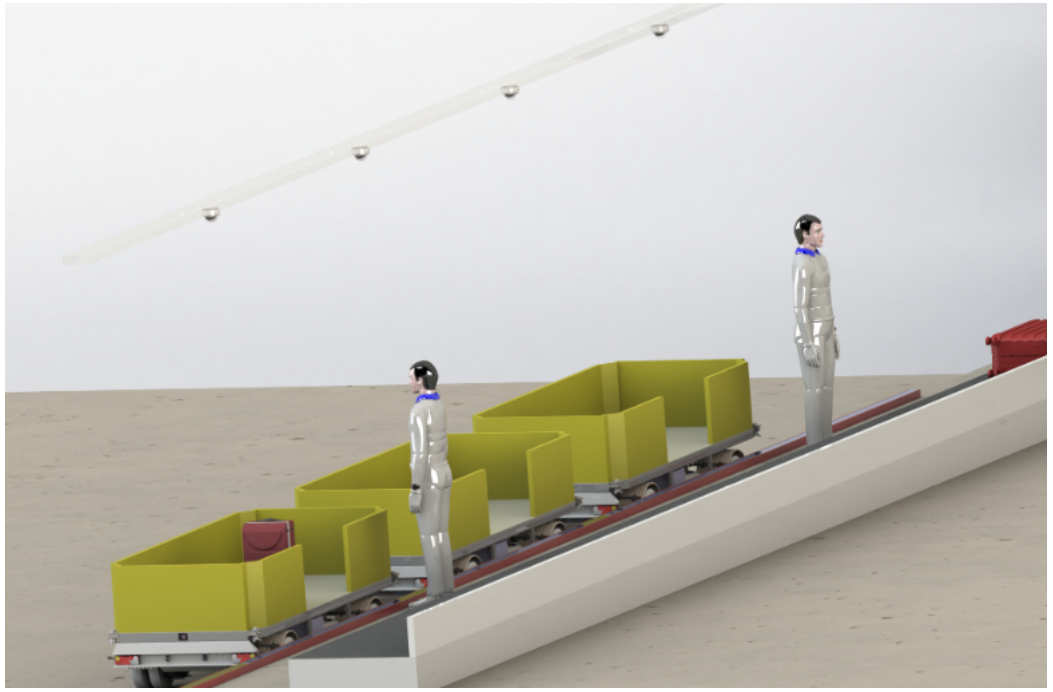
The assistant manual sorting system is combining the wireless positioning and showing the flight information onto LED screen to realize the visualization of assistant manual sorting.





Automatic Checking & Loading System

The automatic checking & loading system is combining the wireless location, short range RFID communication and video recognition to realize the single or multiple belt loaders automatic checking and loading.



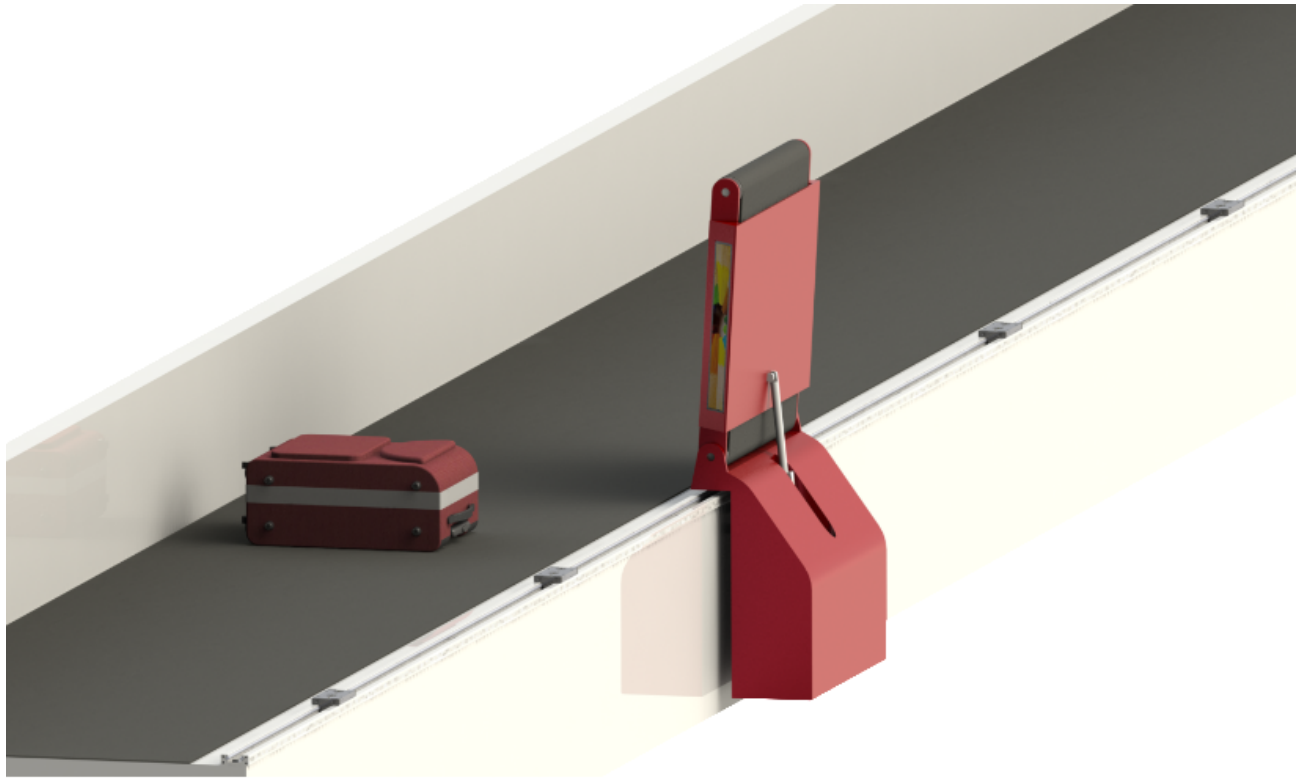
RFID Ceiling Reader & Monitor

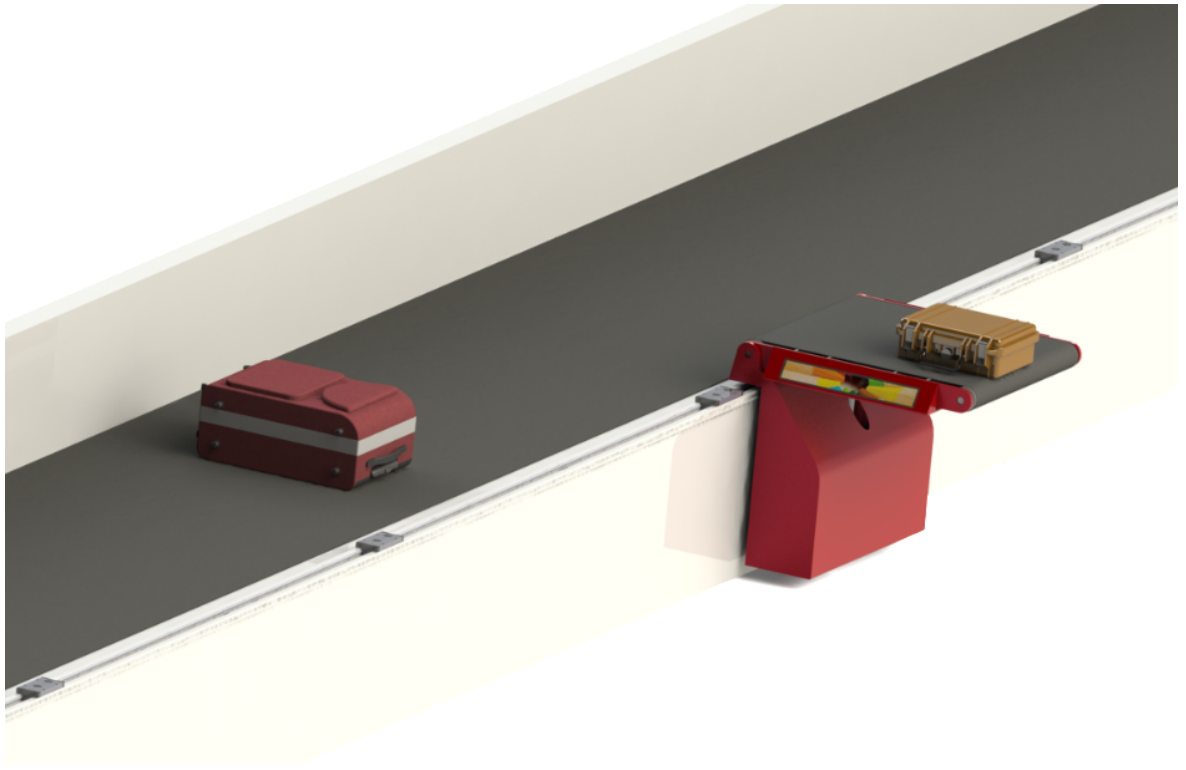
The RFID ceiling reader & monitor is showing baggage information onto ceiling LED screen.

It is easily installed in all checking point.

Assistant Unloading & Identification Device

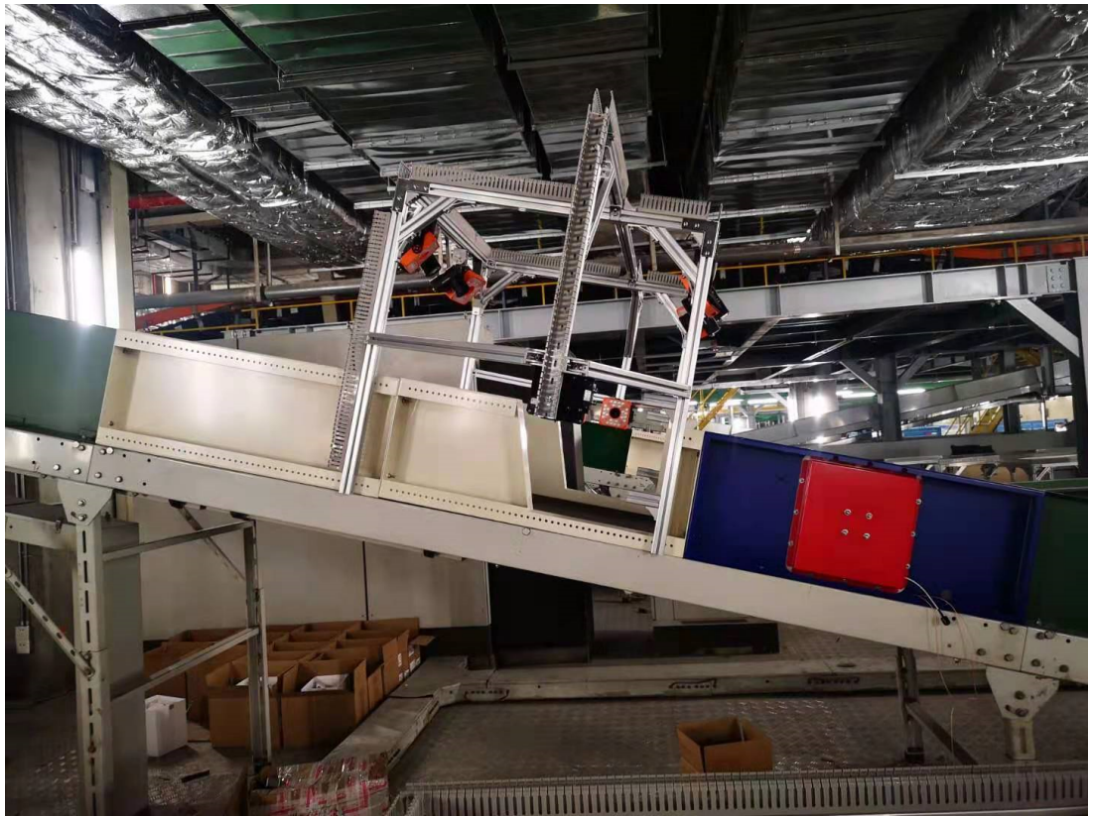
The assistant unloading & identification device is combining RFID identification and unloading mechanism to reduce the loading of belt loaders.





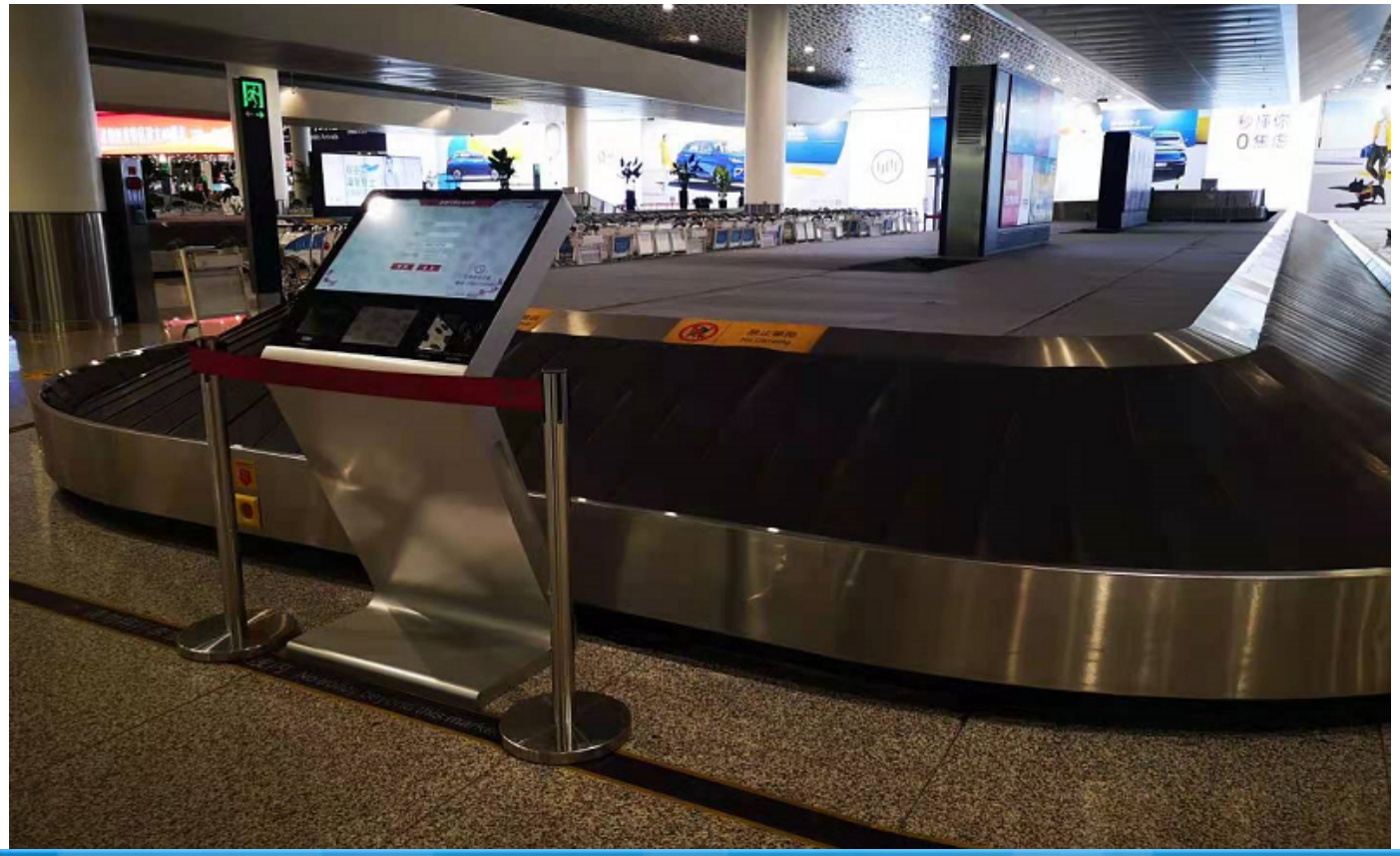
Composite Arriving Identification System

The composite arriving identification system is combining RFID and OCR identification which could identify the arriving RFID or barcode baggage.



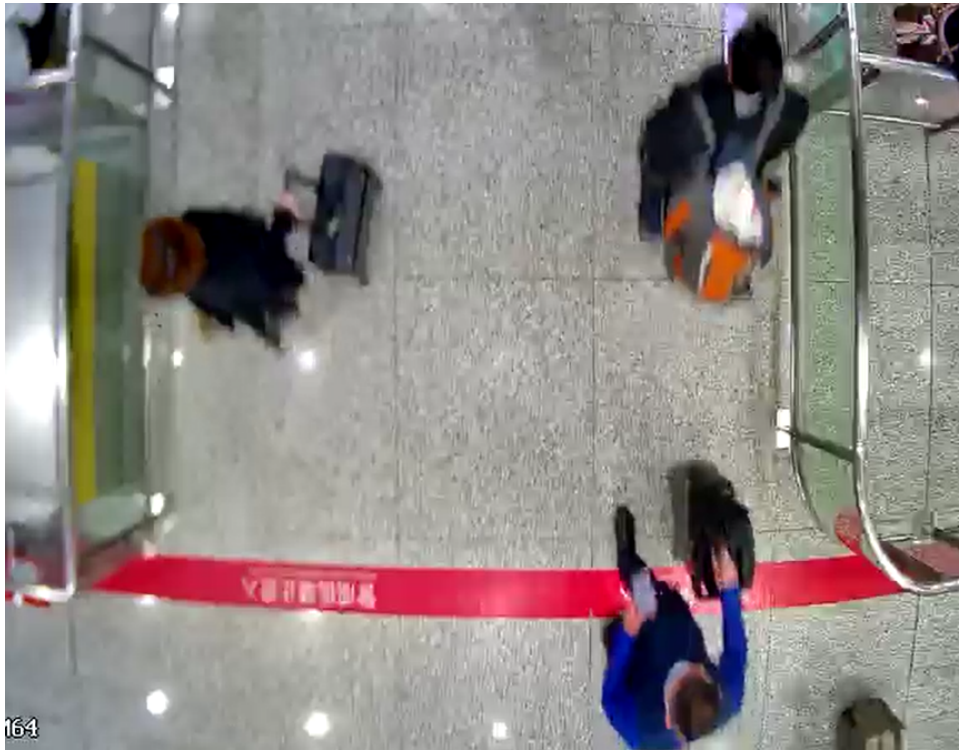
Baggage Position Query Device

The baggage position query device is providing the position of baggage to arriving passenger.



Exit Monitoring Device

The exit monitoring device which could link RFID data and video information which could track mis-taking luggage or baggage when passenger leaving airport.

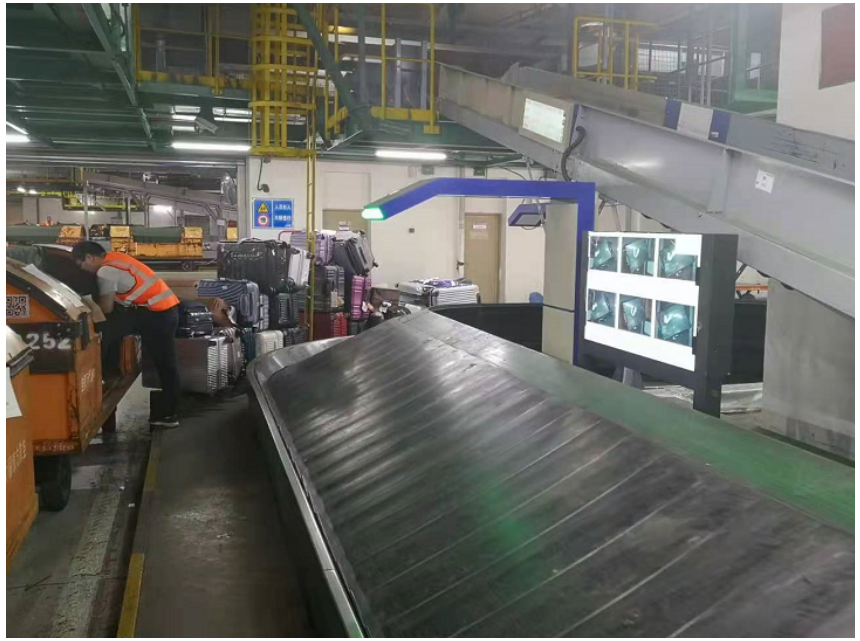


Carousel Identification Device

Ray10 RFID solution provides different types of carousel identification device for various environments and the RFID reading accuracy is more than 99.9%.

Embedded Identification Device

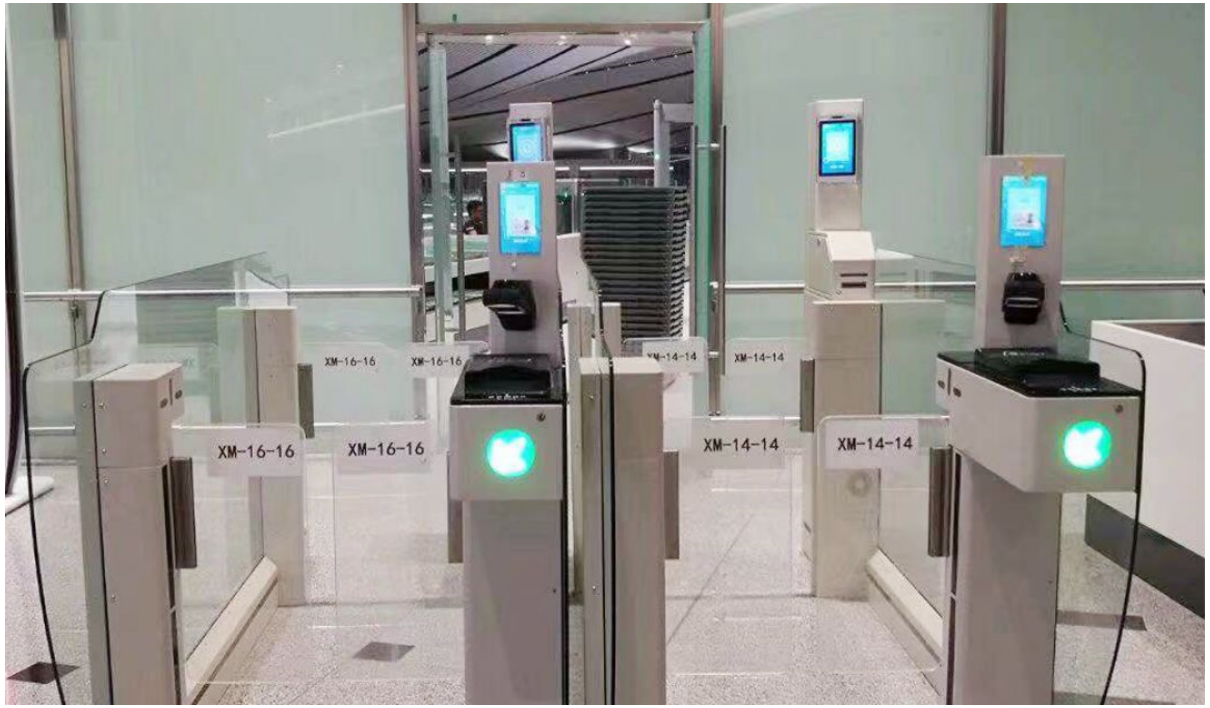
Erecting Identification Device



Single-Arm Identification Device

Face Recognizing Device

The face recognizing device which is using face recognition to accelerate security checking process.

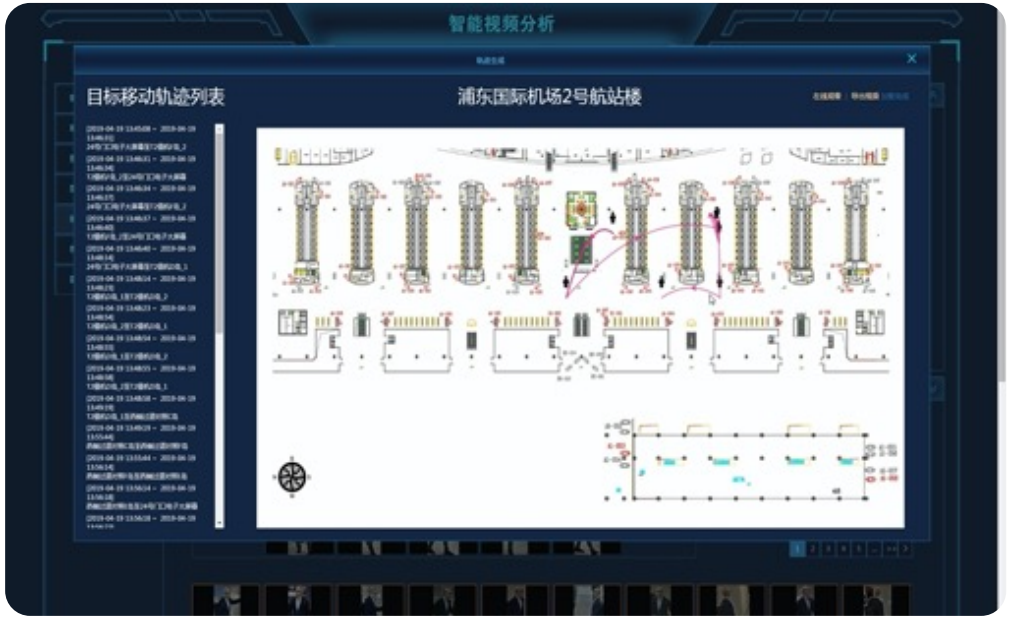


Carry-on Luggage Association

The process is combining the RFID (in basket) and face recognition to create association between carry-on luggage and passenger.

Target Trajectory

The process is combining the face recognition、video analyzing and BLE AOA to create target (passenger) trajectory.



Contents

RFID Airport Projects

Kunming Changshui Airport

Foshan Shadi Airport

Haikou Mellan Airport

Sanya Phoenix Airport

Beijing Nanyuan Airport

Beijing Daxing Airport

Shanghai Pudong Airport

Wuhu Xuanzhou Airport

Shenzhen Baoan Airport

RFID Airport Projects

- ✓ Deployment in 10 airports till now
- ✓ ~100,000,000 baggage tag RFID data collection till now
- ✓ >99.9% real scene RFID read accuracy
- ✓ >99.5% real scene RFID location accuracy in BHS sorting system
- ✓ >99% real scene barcode (based on barcode quality) and RFID mixed reading accuracy

Airport	Throughput(2019)	RFID tag usage (until now)	Online time
PVG	76,153,455	~4,000,000	2019.03
SZX	53,000,000	~40,000,000	2019.09
KMG	48,070,000	~20,000,000	2020.08
PKX	16,000,000	~20,000,000	2019.12
HAK	24,210,000	~8,000,000	2018.12

Contents

Summary

- Combine RFID location、face recognition、video stream analyze、BLE AOA location technologies
- Real-time baggage trajectory in transport-life cycle (multiple data collection, Baggage No., picture and video)
- Real-time carry-on baggage association with person
- Real-time person trajectory based on video stream analyze and BLE AOA location, used for suspicious person association
- High reliability、fully-verification and highly-utilized hardware and software for real airport scene
- Deployment in 10 airports and ~100,000,000 RFID tags data collection

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