



AI-powered BAG-INTEL solution: Transforming customs operations at international airports

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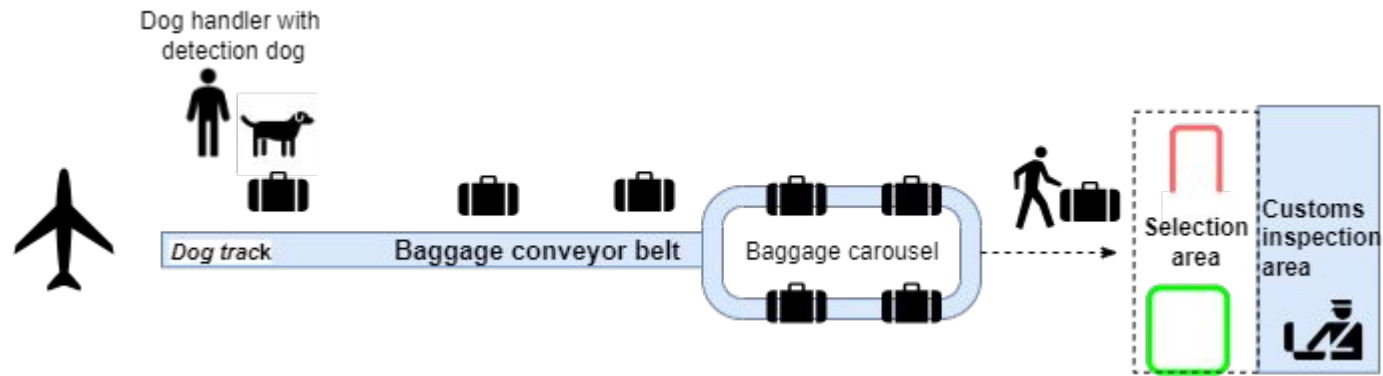
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The BAG-INTEL solution concept

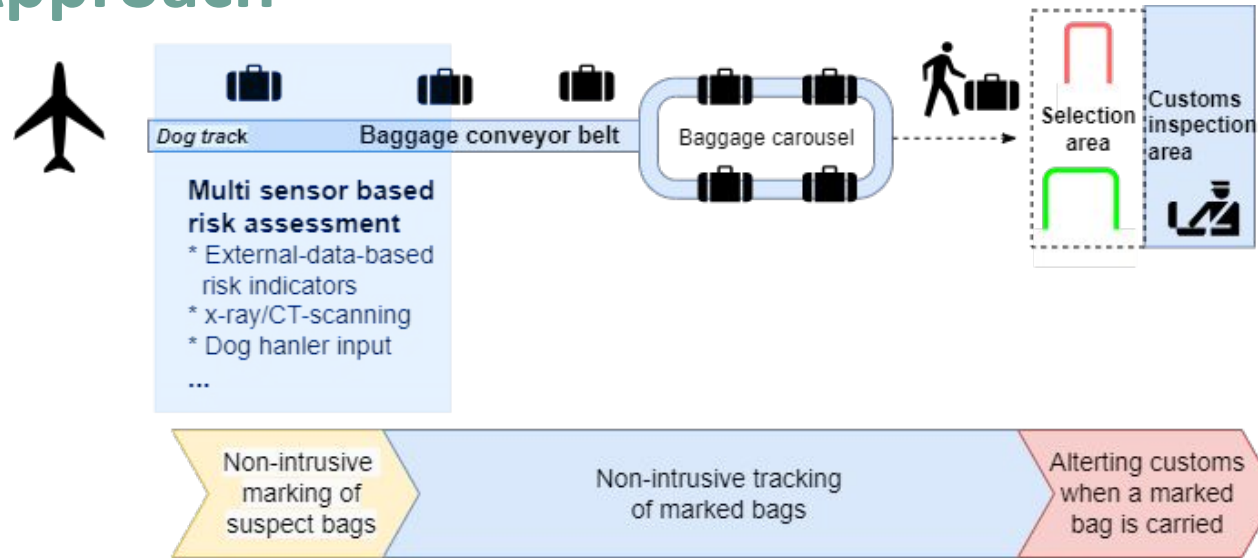


Current Customs Control Practices at International Airports: Drawbacks and Insights



- **Reliance on Human Judgment:** The current customs control process relies heavily on the subjective experience of officers, which can lead to inconsistencies and errors.
- **Smuggler Sophistication:** Skilled smugglers often mimic the behavior and appearance of regular travelers, making it difficult to detect illicit activity through observation alone.
- **Detection Dog Deployment Risks:** While detection dogs are highly effective at identifying suspicious bags, removing a bag from the carousel might inadvertently alert the smuggler.
- **Smuggler Evasion Tactics:** If a smuggler notices their bag is missing, they may abandon it and leave the airport, evading detection and avoiding arrest.

Streamlining Customs Operations: The BAG-INTEL Approach



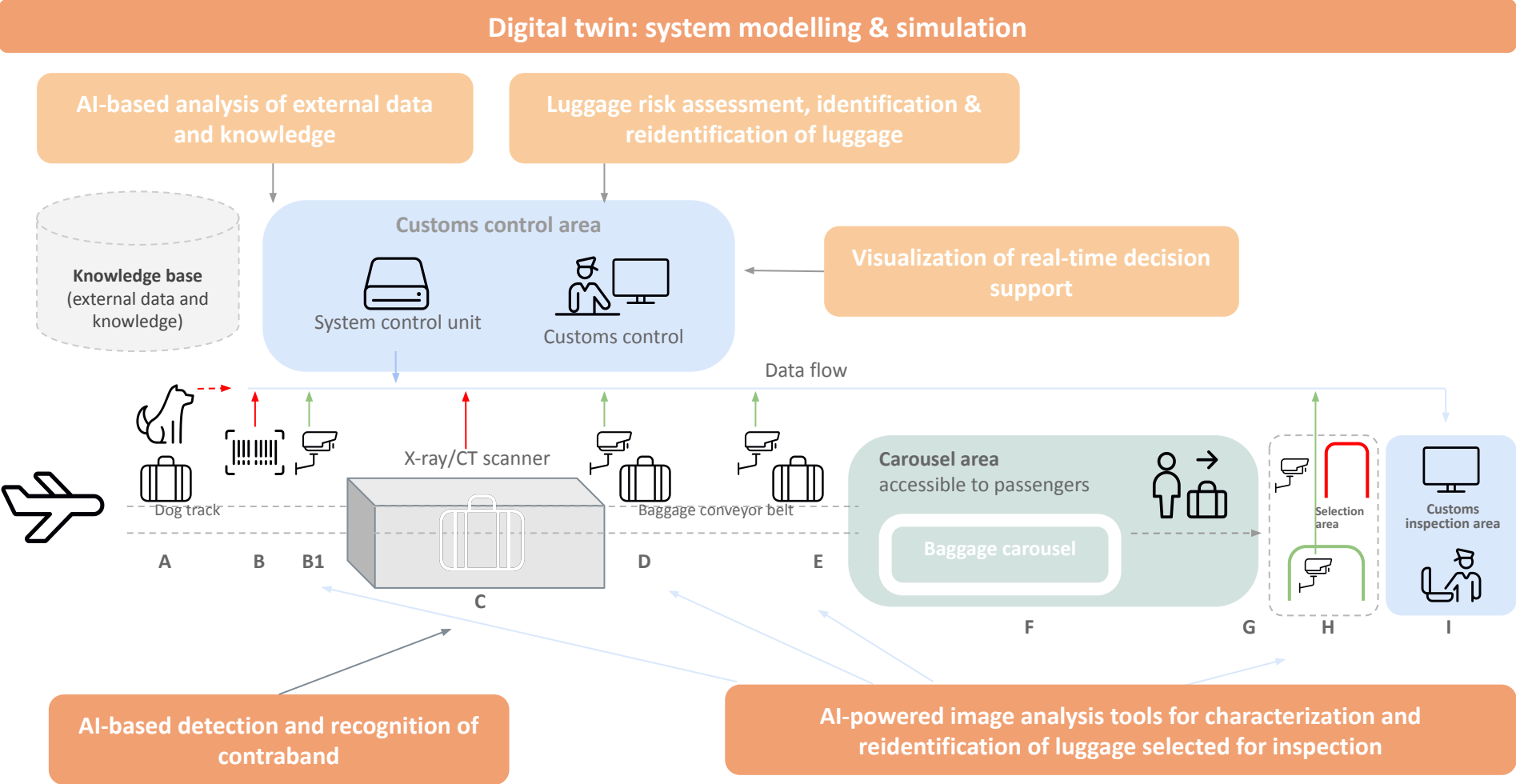
Identification of bags suspected to contain contraband, tracking such bags, and alerting the customs when they are carried into the customs place at the exit of the baggage delivery space

BAG-INTEL aims to deliver an effective, non-intrusive, and environmentally sustainable solution by leveraging advanced technologies, including:

1. **Sensors**, including an AI-enhanced X-ray/CT scanner, for automatic risk assessment of baggage unloaded from incoming international flights.
2. **AI Vision-Based Tracking** of baggage suspected of containing contraband.
3. **Alerts** to notify customs officers when a flagged bag is carried into the customs area.

This integrated system aims to streamline baggage inspection processes while minimizing disruptions and environmental impact.

The BAG-INTEL system overview



The BAG-INTEL solution

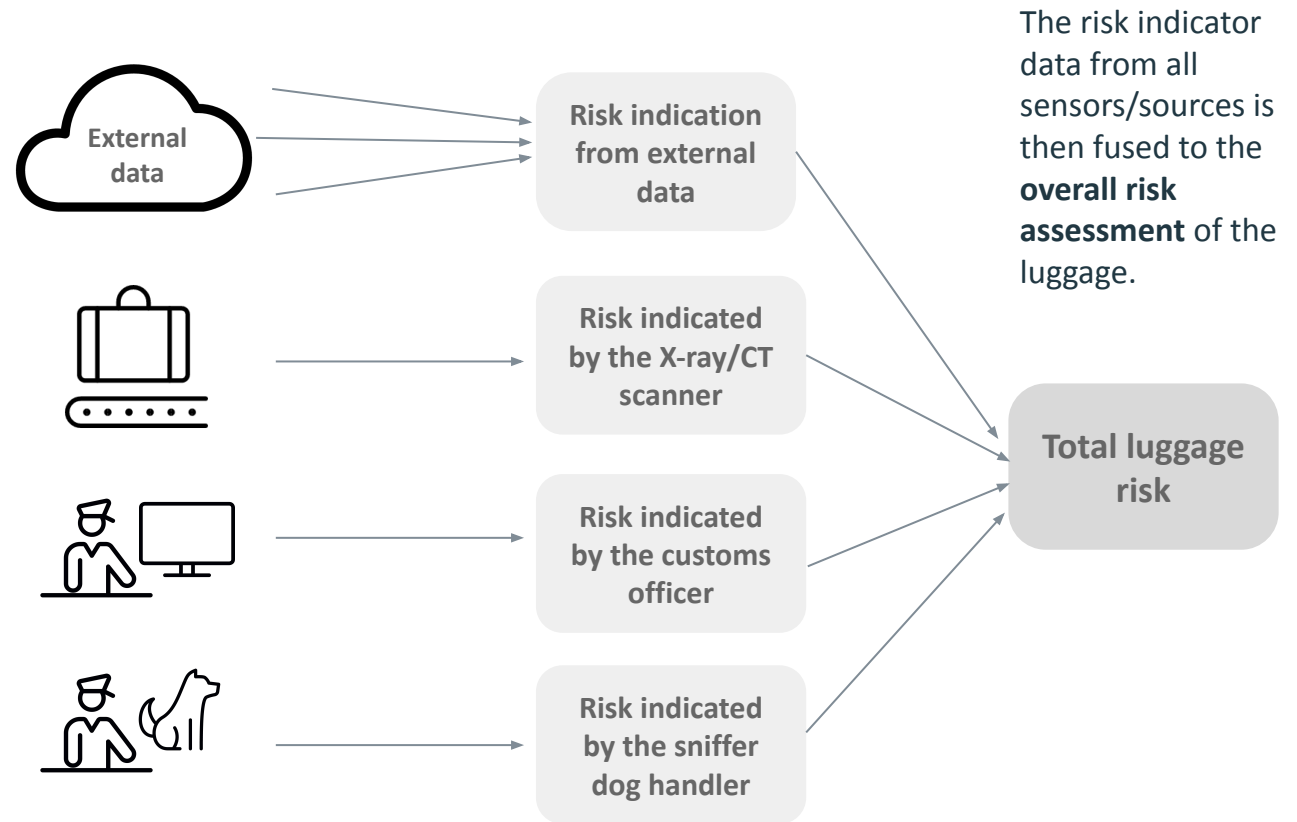
MULTI-SENSOR-BASED LUGGAGE RISK ASSESSMENT



Upon flight arrival, when the luggage is unloaded and placed on the baggage conveyor belt, the **customs risk** of each piece of luggage is **assessed using AI-supported tools** under the supervision of the customs control officer(s).

The applied **risk indicators** arise from 4 kinds of **sensors/sources**:

- **External data and knowledge**, such as the Passenger Name Record and the databases of Law Enforcement Agencies, where suspicious travel patterns and links to organized crime are recorded.
- **An X-ray/CT scanner** with absorption sensing and object recognition in the scanning image, which will be trained to detect/recognize various kinds of contraband, such as drugs, cigarettes, currency, etc.
- **The customs control officer** who may detect suspicious content that has not been detected and flagged by the scanner itself.
- **Dog handler input**, if the customs apply a sniffer-dog at the dog track before the X-ray/CT scanner.

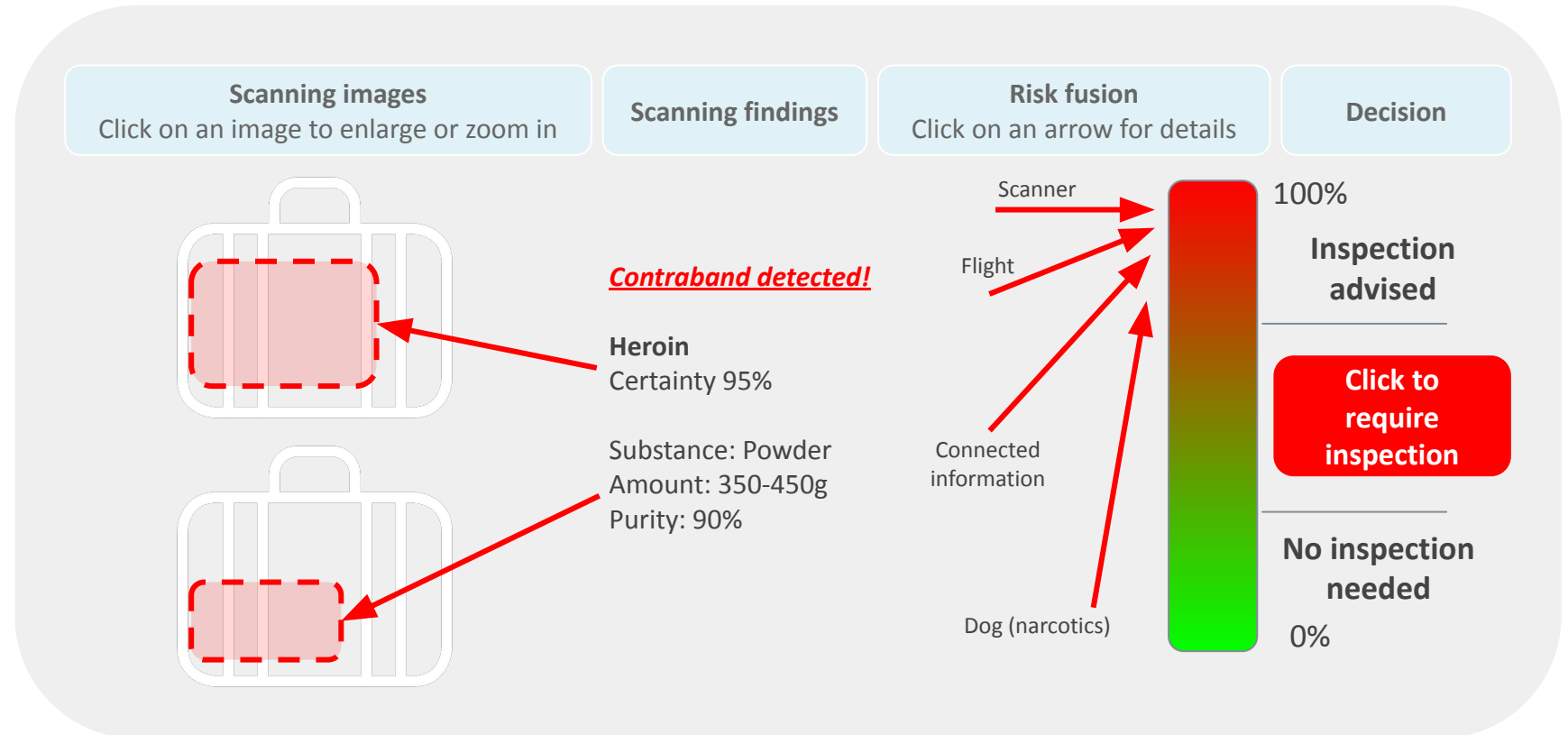


The BAG-INTEL solution

VISUALIZATION FOR THE CUSTOMS CONTROL OFFICER'S DECISION



Based on the **overall risk assessment** of the luggage, a **decision** whether the luggage should undergo **manual inspection** is taken.



Advancing the state of the art

CURRENT SOLUTIONS

- The security scanning of outgoing luggage is well-developed but **the customs scanning of incoming luggage is not developed to its full potential**.
- Utilization of external data for the risk assessment is, in general, **not exploited to its full potential** for the customs control.
- While some airports apply radio-frequency identification (RFID) tagging for the customs reidentification of luggage, this method has several **disadvantages**:
 - **the smuggler may find and remove the tag** upon collecting the luggage and before entering the customs area at the exit of the baggage delivery space
 - **tags must be manually placed in/on the luggage and then removed** before the traveller leaves the customs area following the inspection of their luggage
 - it has a relatively **high operation and maintenance cost**
 - it comes with an **environmental impact** due to production and disposal of tags



Advancing the state of the art

THE BAG-INTEL SOLUTION

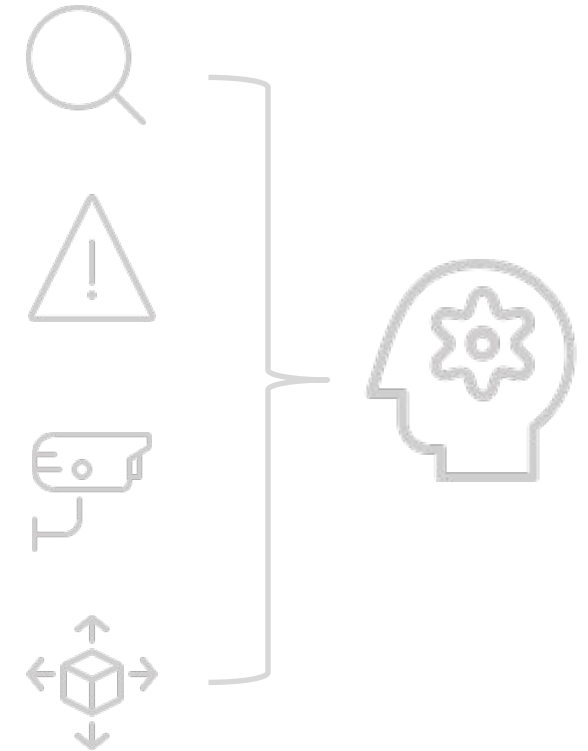


Implementing the BAG-INTEL solution with its advanced features and capabilities, including:

- AI-powered functionality for enhanced detection of contraband in X-ray scanning of luggage,
- AI-powered risk assessment based on the analysis of data from external sources (Passenger Name Record and Law Enforcement Agencies),
- AI-camera-based end-to-end reidentification of luggage, and
- Digital twin for system visualization and performance optimization.

Will lead to greater effectiveness and efficiency of the customs control processes!

- ✓ The cases of manual inspection not leading to finding contraband will decrease as **only luggage containing contraband will be inspected manually**.
- ✓ More contraband will be detected as **more luggages containing contraband will be flagged**.
- ✓ Besides, the **AI-camera-based reidentification is non-intrusive**, avoiding all the disadvantages of alternative solutions.



BAG-INTEL deployment scenarios

- **Billund Airport (Denmark)**
 - AI scanners and cameras for luggage inspection
 - training in a controlled environment
- **Thessaloniki Airport (Greece)**
 - integration with handheld scanners for risk assessment
 - collaboration with customs and border guards
- **Madrid-Barajas Airport (Spain)**
 - stress testing in high-risk, mobile operations with border police



Deployment Scenarios



Billund Airport
Small Airport



Thessaloniki Airport
Medium Airport



Madrid-Barajas Airport
Big Airport

Technical aspects of the BAG-INTEL solution



Technical aspects of the solution

KEY TECHNOLOGIES

- **IoT Devices**

- sensors, cameras, and X-ray/CT scanners for real-time data collection

- **Edge Computing**

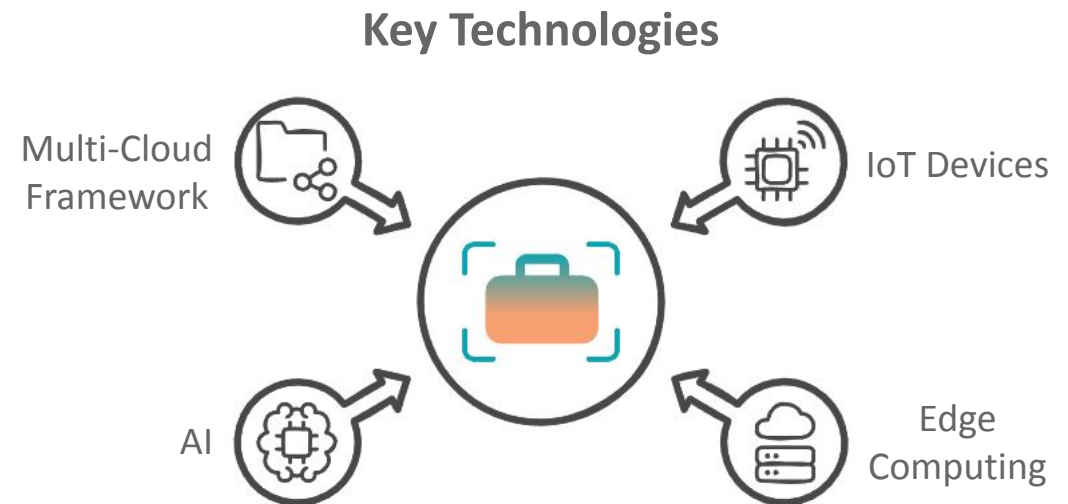
- local data processing for reduced latency

- **AI Integration**

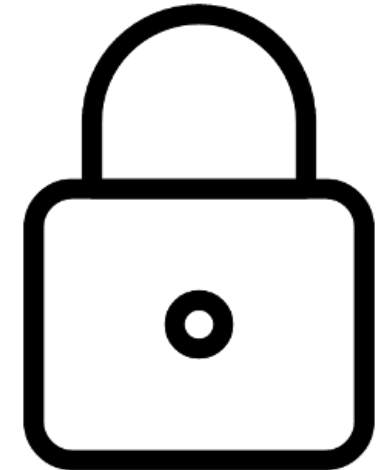
- advanced tools for luggage inspection and threat detection

- **Multi-Cloud Framework**

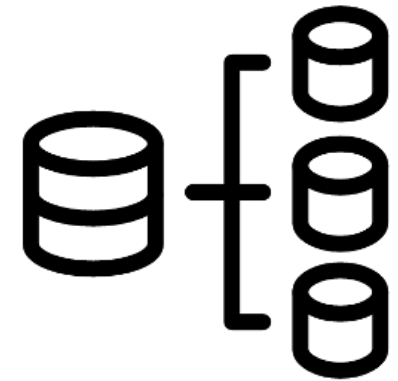
- enhanced security and scalability



- **Security-by-design**
 - integrated from the beginning
- **Data encryption and access control in premises**
 - protect sensitive internal airport data
- **Interim repository**
 - privacy protection before full data integration with external data



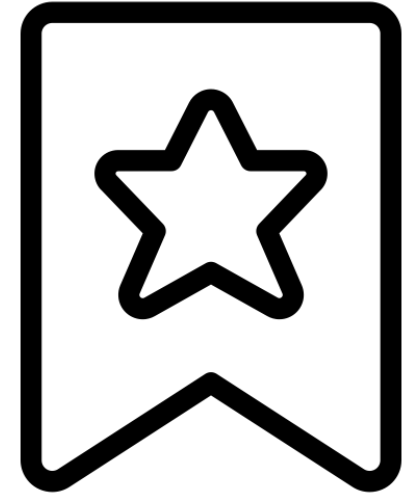
- **Designed for flexibility**
adaptable to other high-security domains (e.g., border control)
- **Possible future enhancements:**
 - global cloud integration for broader scalability
 - AI-driven predictive analytics to anticipate threats



Technical aspects of the solution

BENEFITS AND IMPACT

- **Enhanced security**
multilayer architecture and real-time data processing (reduces threats)
- **Operational efficiency**
automated systems decrease human workload (reidentification and scanning of bags)
- **Scalability**
adaptable to other security-sensitive sectors
- **Proposes a unified model**
which can be used to set the new standards in EU airports and introduce a harmonized solution



Technical aspects of the solution

CONCLUSION



- BAG-INTEL represents a **significant leap in airport security** by leveraging IoT, AI, and multi-cloud technology
- It provides a **scalable and secure solution** to modernise airport operations
- It has a **potential for wider applications** in other high-security environments



Reach out to BAG-INTEL >



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