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Remote Screening - Overview and Future Outlook

While Centralised Image Processing (CIP) or Remote Screening is widely known and a common approach for Hold Baggage, it has not yet been applied equally for cabin baggage. However, more airports are considering and implementing the remote screening of cabin bags as a component of future planning and security process improvements.

Our objective is to present a summary analysis of how Airport Operators stand to gain from the implementation of CIP in the realm of cabin baggage screening. Additionally, we shed light on the diverse array of risks, benefits, enablers, and performance considerations in the context of regional remote scanning environments.
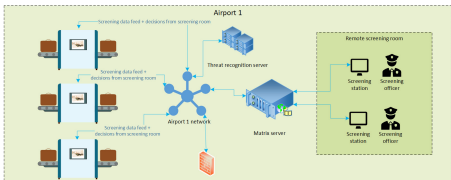

This paper delves into the adaptation of CIP principles to cater to the unique demands of aviation security screening dispersed across various locations. Recognizing that each airport operates within its own distinctive context and configuration, we acknowledge the potential technical, organizational, process, and policy challenges regarding the seamless integration of CIP for cabin baggage.

We welcome any questions, comments, or feedback you may have on the topics covered in this white paper and invite you to reach out to us at info@rheinberry.com.

What is 'Regional' Remote Screening?

Succinctly put, 'Regional' Remote Screening is the concept of transmitting image data originating from connected X-Ray scanning systems across a fully isolated, cyber-secure network and receiving it at a geographically remote facility - where security operators pass or fail each bag - after which any pass/fail result is transmitted back through the network to the specific lane where the bag is in-situ.

Regional Remote Screening Concept
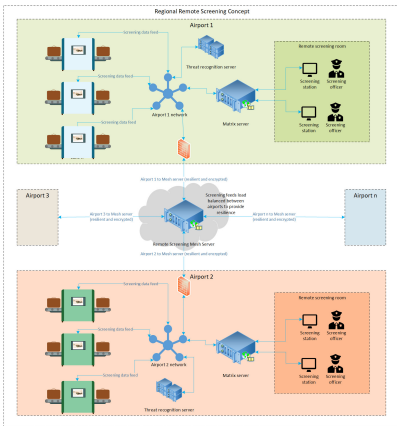
Are any Airports considering 'Regional' Remote Screening?

While several airports and nations are in the early staged of exploring opportunities and benefits of 'regional' remote screening, it is currently not yet implemented to any effective degree. However, as explained below, its core principles are in action now across the globe at local and airport levels.

Today, 'local' remote screening is widely implemented across the airport industry - focused on aircraft hold baggage - bags handed over by the passenger at check in. These bags are transferred into the airports baggage handling system for transport through the scanning system and then routed to the appropriate aircraft, in addition to any manual bag searches required because of failed security scanning results.

The environment within a hold baggage system can best be described as an industrial zone. Therefore, having security screeners at the baggage conveyor systems is not advantageous or supportive for noise levels, concentration, or a healthy and safe environment. Therefore, the use of an isolated 'remote' screening room located either nearby or within the airport campus is essential - creating a quiet, environmentally friendly space for screeners to work and rest, thereby improving efficiency and accuracy.

The cabin baggage system environment, whilst more environmentally friendly for operators and screeners (and passengers), still utilises concepts of 'local' remote screening. Images of bags from one lane are remotely viewed by a screener on another lane. The benefits here is a reduction in the ability of a passenger to exert influence over a screener at their local lane.

'Regional' remote screening implementation can best be understood as taking the concepts of 'local' remote and ramping them up to support geographically distant airport security operations through improved data availability, resource management and retention, load balancing, and failover support.

Approaches and Considerations

Whilst there are many elements to any Remote Screening configuration, the concept is best described as three primary types, namely:

1. Local deployed service: This approach involves setting up the system within a single airport's Central Operator Room. It may also include direct peer-to-peer connections with another airport. This configuration is particularly effective when load sharing is necessary between two airport locations, enabling Remote Screening in a Centralized Image Processing (CIP) environment. The connections between locations are static rather than dynamic.

2. Hub-based (central shared service): In this type of configuration, a single airport encompasses multiple remote terminals, Remote CIP facilities, and possibly serves multiple airports. Think of it as a wheel, where a central hub connects numerous spokes. Load balancing and resource sharing are key features, with the central hub forming the core. It is like a Local Deployed Service but offers greater flexibility in network design due to a broader set of static connections.

3. Mesh-based (distributed shared service): In this configuration, all airports connected to the mesh are considered interconnected with all other airports on the same mesh. A mesh control framework allows for load balancing and dynamic connections between airports within technical design requirements. Unlike Local or Hub-based configurations, a Mesh can be reconfigured post-implementation, enabling a more dynamic and flexible network between airports over time.

Selecting and Implementing a Regional Remote Screening approach will likely raise several essential areas of discussion concerning security, network and other configuration considerations unique to each airport.

- Data centre(s) and linkages between centralised services and remote facilities.
- Vendor support for any commercial or technical support discussions centred on system deployment, application, cross-site application availability and secure user/workflow access.
- Maintenance of Cyber-Security integrity must be paramount - vigilance and compliance will remain essential for all aspects of any regional remote screening approach. A separated and dedicated cybersecure network is implicit in the current network and must also be sustained in any future deployed network architecture.

An airport may explore any of the remote screening approaches described above. Additional equipment and reconfiguration may be required and should include a focus on reliable central services deployment and any essential inter-airport service user access requirements.

There will be design decisions and delivery projects needed to support any chosen regional remote screening deployment strategy, including technology, sourcing, or suppliers. This paper is not a platform for the selection of any strategy and is not a definitive single source of information - each airport team must apply the necessary resources to establish their own level of acceptable decision support on this matter.

Benefits for Regional Remote Screening

The reasons for the adoption of traditional CIP or Remote Screening can be summarised as opportunities to improve the capacity or throughput of a security checkpoint whilst simultaneously reducing the number of security officers. Furthermore, there may be regulatory mandates that need to be met.

Regional Remote Screening shares a similar framework of benefits and the same arguments apply, namely:

- Potential for OPEX savings: Regional Remote Screening offers the potential for cost savings, as it allows for more efficient resource allocation and sharing across multiple airport locations.
- Improved collection of security performance data: By implementing Regional Remote Screening, airports can enhance their ability to collect and analyse security performance data, leading to better-informed decisions and optimizations.
- Improved flexibility and adaptability when facing dynamic passenger volumes: One of the key advantages of Regional Remote Screening is its ability to adapt to dynamic passenger volumes. Airports can efficiently adjust their screening operations to match changing demands, ensuring a smoother passenger experience.

That final point is of key importance when it comes to Regional Remote Screening. Firstly, Regional Remote Screening provides an airport operator with economies of scale across multiple sites. This is turn allows that airport operator to load balance screening operations across those sites, routing each screening image to the next available screening officer regardless of their geographic location.

Such an approach opens further options for:

1. Re-deploying all security screening personnel to remote screening rooms;
2. Retaining a reduced number of security screening officers at each airport or;
3. Hybrid - operating a mix of both.

It is safe to assume that technology components will fail at some point, therefore re-deploying all security screening personnel to remote sites will add risk. Any decisions regarding remote screening must be conducted with a strong resilience perspective. Therefore, option 1 reflects a risk management approach retaining a reduced number of security officers at each critical airport location.

This careful consideration of operational strategies is essential to strike a balance between efficiency and reliability in the context of Regional Remote Screening.
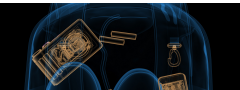
Evolution of CIP and Remote Screening

CIP using remote screening rooms is well established in the hold or checked baggage screening environment. In the cabin, or carry-on, baggage world CIP is becoming more established. For reasons of resilience, airport operators are often choosing to deploy multiplexed screening rather than remote screening rooms for cabin baggage screening. However, where remote screening rooms are implemented, these are commonly co-located near the lanes in order that security screening officers can be rapidly redeployed to the lanes in case of a network failure.

Airport operators that run multiple airports in one country or across multiple countries can benefit from adopting Regional Remote Screening. Point-to-point connections should be avoided, instead deploying a mesh architecture to ensure resilience. Each airport should retain a core onsite team of security screening officers, who can receive screening data from the mesh and return their results. Additionally, the implementation of a small number of dedicated remote screening rooms covering the geographic region(s) should be considered where the business case allows.

The benefits of Regional Remote Screening are not limited to airport operators with multiple airports. A large independent hub may want to offer security screening as a service to other smaller airports. As such a similar model to that described above is appropriate.

Finally, screening as a service could be provided to airports by a third-party organisation. Such an approach offers the usual pros and cons associated with outsourcing activities.

The table below summarises the drivers and opportunities associated with a variety of CIP and Remote Screening scenarios.

Scenario	Drivers	Opportunities
Hold Baggage (single site)	- Reduced Opex associated with fewer screening officers - More reliable results and increased security effectiveness - Flexible response to baggage traffic	Operational efficiency and cost reductions for Airport Operators
Cabin Baggage (single site)	- Reduced Opex associated with fewer screening officers - More reliable results and increased security effectiveness - Flexible response to passenger numbers and cabin baggage	Operational efficiency and cost reductions for Airport Operators
Regional Remote Screening (airport operator)	- Increased opportunities for Opex reduction associated with fewer screening officers - Retention of key talent at all locations - More reliable results and increased security effectiveness - Flexible response to baggage traffic	- Operational efficiency and cost reductions for Airport Operators - Airport Operators (especially Major hubs) selling excess Screening capacity to other smaller airports
Regional Remote Screening (third-party)	- Further increased opportunities for Opex reduction associated with fewer screening officers - More reliable results and increased security effectiveness - Flexible response to baggage traffic - Outsourcing of aviation security to specialist providers	- Operational efficiency and cost reductions for Airport Operators - Third parties developing and offering screen as a service across a country or region

Next Steps Toward Regional Remote Screening

Any airport operator considering a regional remote screen strategy should consider a few initial steps to help chart a way forward.

1. **Assess Network Infrastructure Suitability:** Begin by evaluating the existing network infrastructure to determine its suitability for remote screening requirements. Identify potential gaps or upgrades needed to support secure data transmission.

2. **Identify Network and Cyber-Security Requirements:** Clearly define network and cyber-security requirements necessary for the secure transmission of passenger screening data, especially in potential inter-airport screening configurations. Prioritize data protection and resilience.

3. **Evaluate Screening System Connectivity:** Assess the feasibility of connecting screening system outputs from multiple airports to a central operator room or another airport for real-time image screening. Consider various network configuration options, such as direct connections, hub-based designs, or mesh architectures.

4. **Construct an 'As-Is' Network Reference Architecture:** Develop an 'As-Is' network reference architecture to establish a comprehensive understanding of your current network structure. This reference architecture serves as the foundation for informed decision-making when considering Passenger Baggage Screening and CIP service design options.

5. **Create a Specific Implementation Plan:** Craft a specific plan tailored to your airport's unique environment and organizational culture. This plan should have full validation and buy-in from all stakeholders, including technical and non-technical teams. Alongside technical considerations, address the potential impact of changes on organizational structures, processes, policies, and personnel.
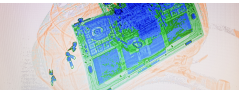
Further Considerations

While this whitepaper primarily delves into the conceptual aspects of regional remote screening, it's crucial to recognize that several additional factors require consideration when making future decisions related to network and inter-airport connections:

- **Effective Communication:** Early socialization of concepts is paramount. Ensure that essential information, explanations, justifications, and benefits are communicated in an easily understandable and compelling manner to all stakeholders. This includes leadership, business units, and IT teams. Accessibility and clarity in communication are key.
- **Tailored Strategies:** Every country, airport group, or individual airport is unique. As such, each entity should develop a strategy for remote screening and network connection design that aligns with their specific needs, circumstances, and operational contexts. One size does not fit all.
- **Business Case Development:** Establish a robust business case that encompasses various aspects, including technology investments, organizational change management, timelines, and financial expectations. Clearly define the anticipated benefits and their quantifiable impact. Consider incorporating "Proof of Concept" or pilot projects where necessary to validate assumptions and mitigate risks.
- **Comprehensive Change Management:** Implement a comprehensive change management plan that focuses on the critical changes involved in adopting regional remote screening. This plan should be aimed at stakeholders across the organization and key personnel responsible for driving changes in processes and policies.

The success of a regional remote screening strategy goes beyond the technical aspects and hinges on effective communication, tailored approaches, sound business justification, and adept change management. By addressing these considerations, airports can pave the way for a smooth transition to a more efficient and resilient screening system.

Not every country or airport group or airport is the same - each should develop a strategy for remote screening and network connection design based on their specific needs.

Finally, the consideration of any "Proof of concept" or pilot projects should be explored if and where appropriate.

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Remote Screening - Outlook and Next Steps

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