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SAND2015-3453C

*DRAFT*

# Open Threat Assessment Platform

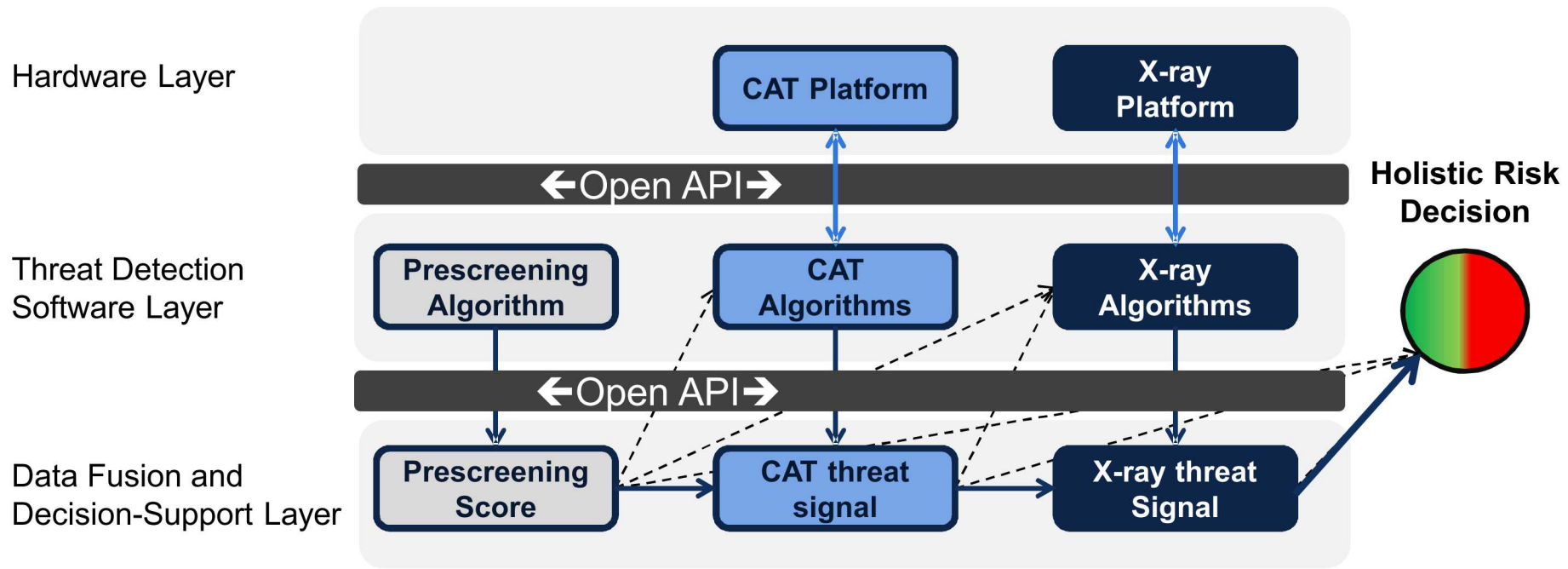


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# Context

- ***TSA Capability Investment Plan is high-level roadmap we'll follow*** (Candid & Accurate)
- RBS: Moving the security/efficiency frontier
  - Lane configurations and staffing inflexibilities limit efficiencies
  - How good are current detection technologies anyway?
- ISIS and Foreign Fighters
  - How long do we have? What new expertise will they have?
- Industry landscape: Proprietary & Inflexible
  - “Currently capabilities qualify for procurement against a very specific set of threat and operational parameters and are highly proprietary solutions. The static and inflexible nature of these capabilities makes it difficult to adapt to changes in the aviation threat landscape in a timely, cost effective manner...”

# Notional Dynamic RBS Screening Concept

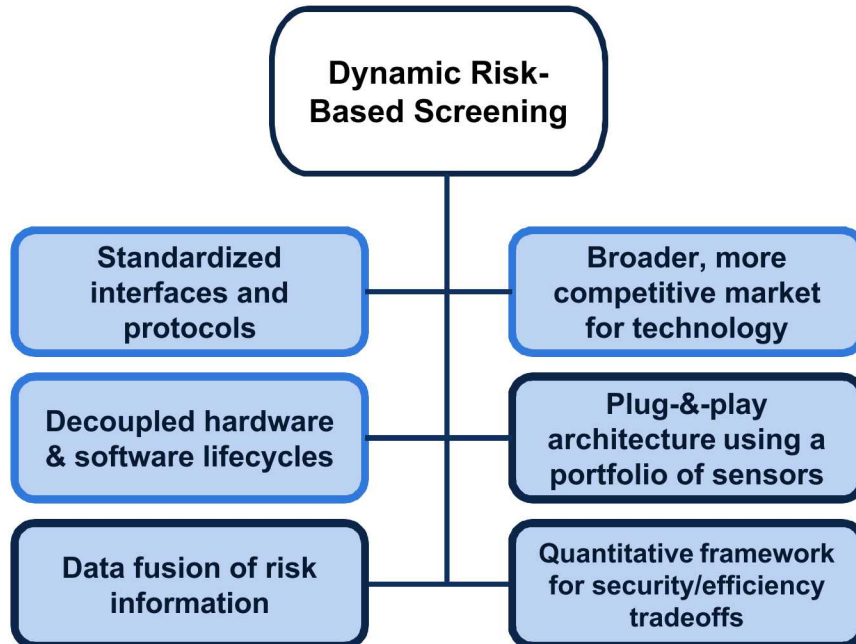


The D-RBS architecture utilizes a common API to enable different logical layers of the system to communicate and dynamically screen passengers in real time. Data from multiple sources inform each successive step in the process, as well as the final risk decision.

# Broad Vision

## Dynamic Risk-Based Screening (D-RBS)

A system that leverages passenger risk information to dynamically screen each passenger at a level commensurate with that person's risk status and the current operational environment.



- Higher-efficiency screening
- Improved security
- Improved passenger experience
- Leverages expert TSOs
- Flexible screening that can be adjusted on the fly

### Key

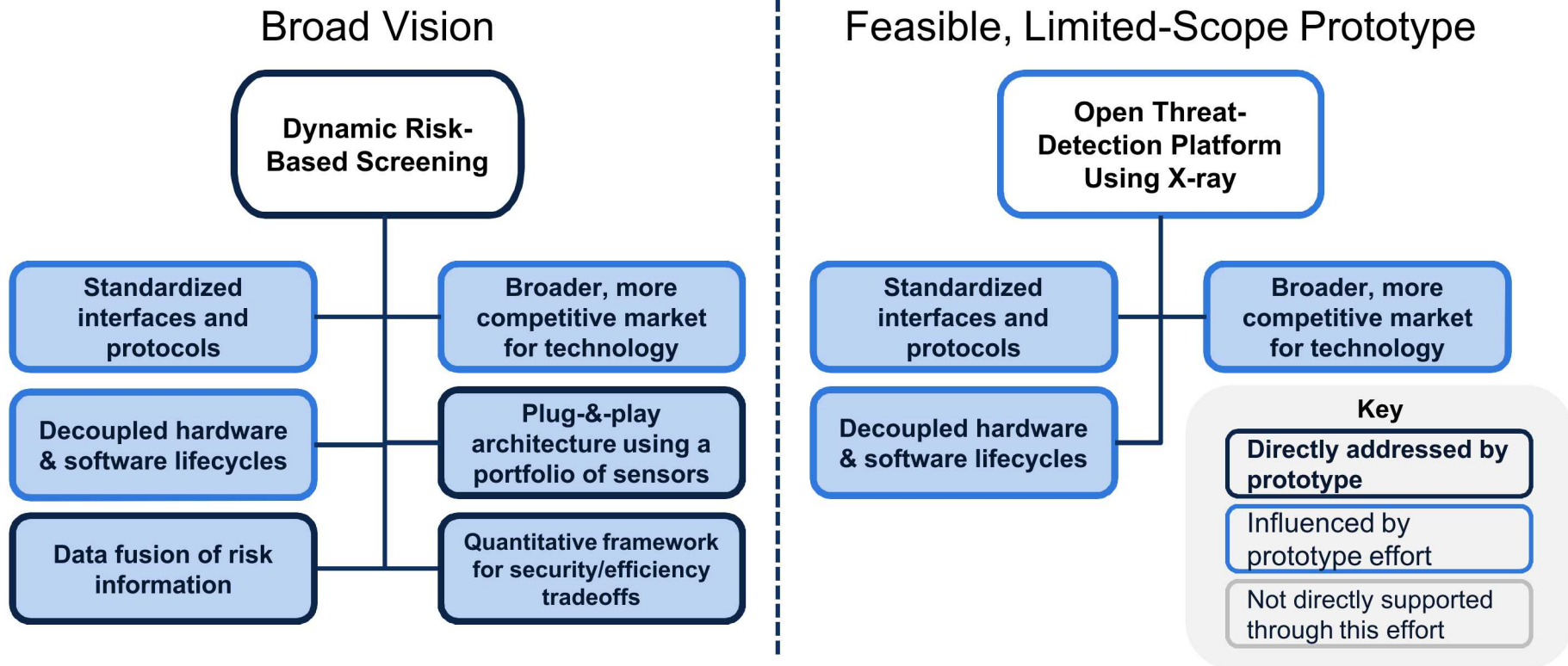
Directly addressed by  
prototype

Not directly supported  
through this effort

Influenced by  
prototype effort



# A Path to D-RBS



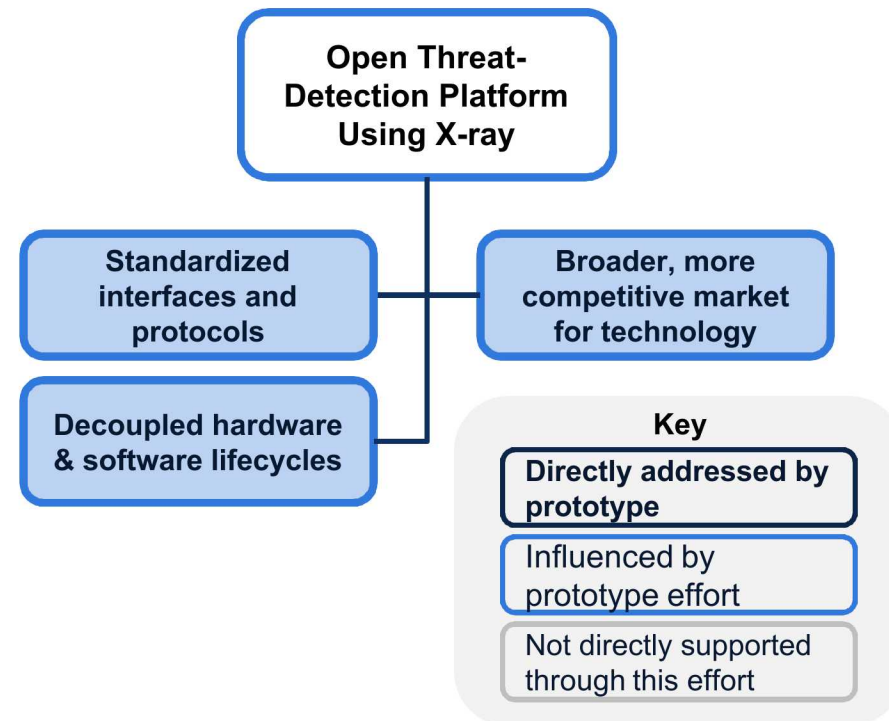
## Prototype Value Proposition

A tactical step towards Dynamic Risk-Based Screening that creates a marketplace for software innovation: The prototype is the first step in decoupling the hardware and software innovation lifecycles, which lowers false positive rates and closes the gap between TSA and adversary innovation cycles.

# Feasible, Limited-Scope Prototype

**Open Threat Detection Platform (O-TDP):** An X-ray detection platform that utilizes an open API, standard data formats, and human-annotated images, to aid machine learning and human factors experts in developing algorithms that assist TSOs.

- Sets the foundational requirements for development of a D-RBS system
- Is a tangible deliverable that will clarify operational requirements
- Utilizes a non-proprietary X-ray sensor, which may be procured via:
  - Vendors currently used by TSA
  - Vendors not currently used by TSA
  - In-house development
  - Adjustments to existing equipment



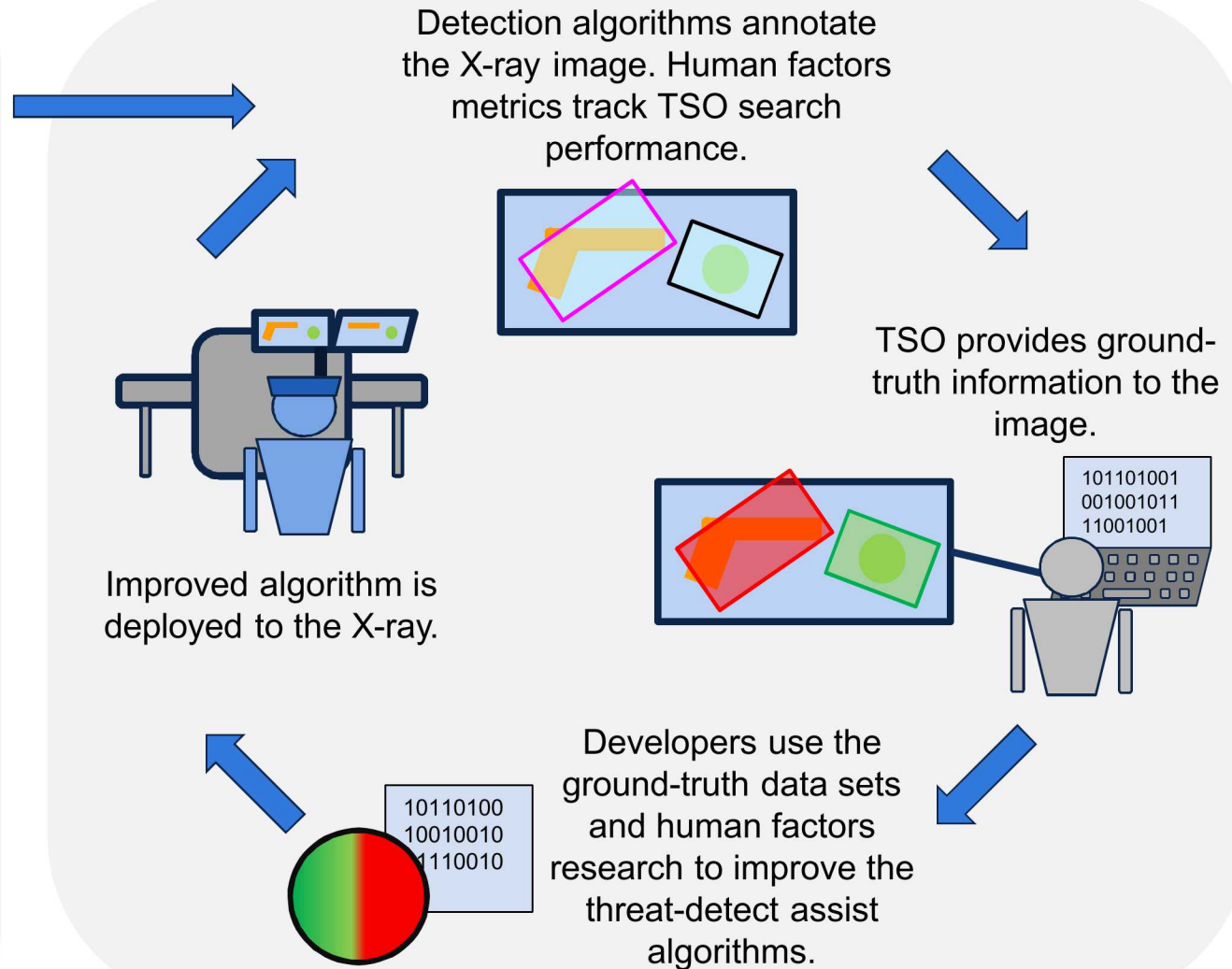
# Prototype Concept

Develop API to a non-proprietary X-ray to decouple the hardware sensor and detection algorithm.

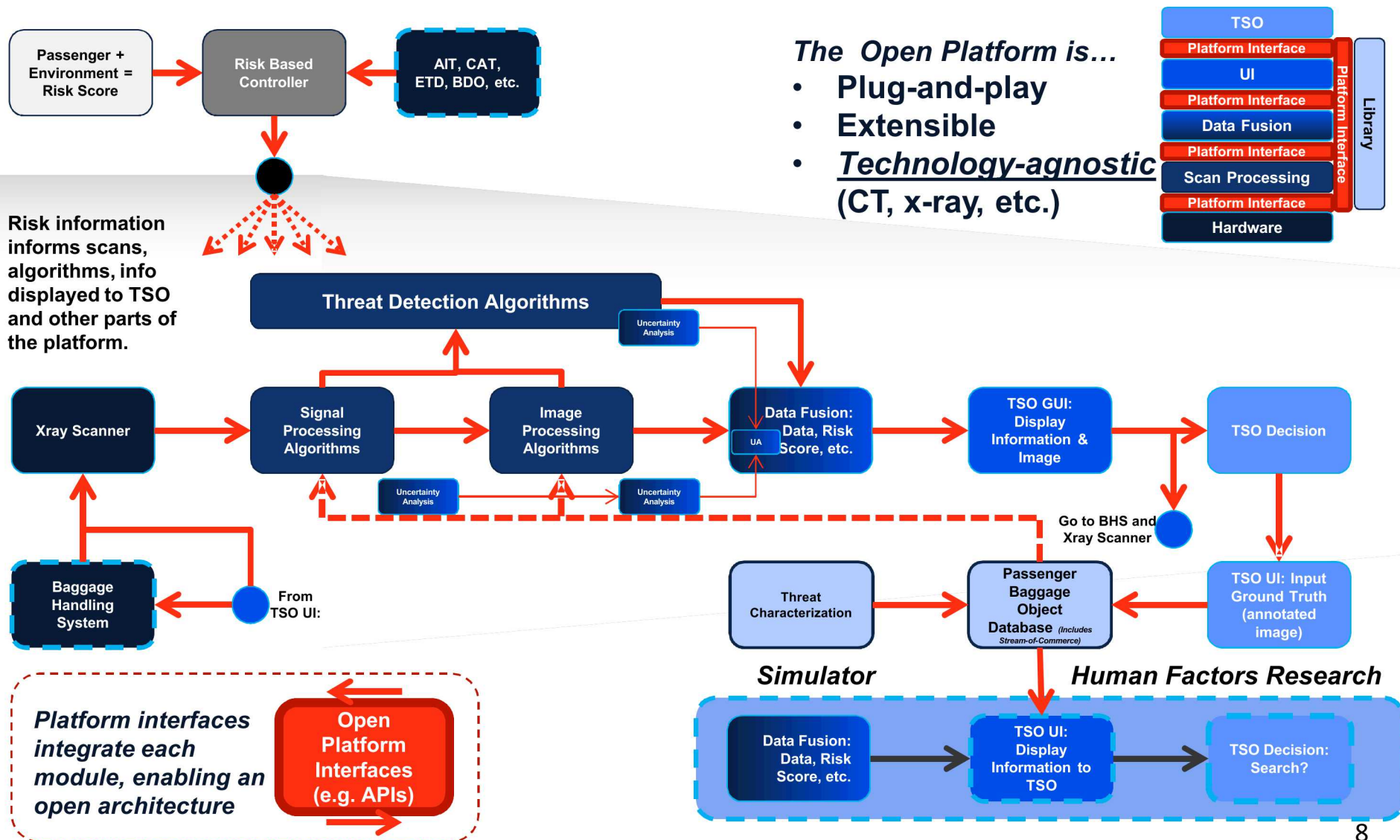


## API

- Get\_image()
- Get\_data()
- Move\_belt()
- Stop\_belt()
- Annotate\_image()
- ...



# Open Platform System Architecture

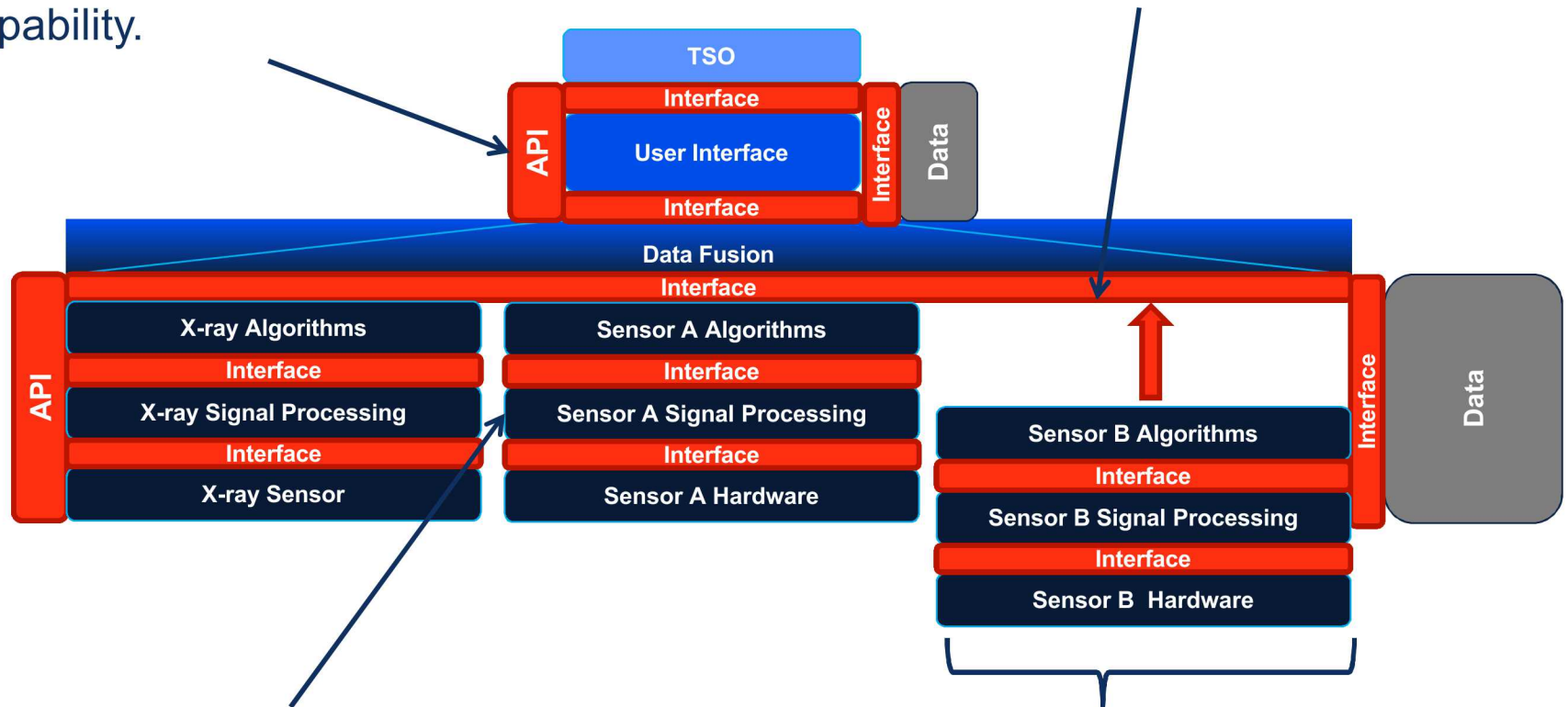




# The Open Platform: Technology Agnostic

A common API and data formats make it easy for 3<sup>rd</sup> party developers to contribute capability.

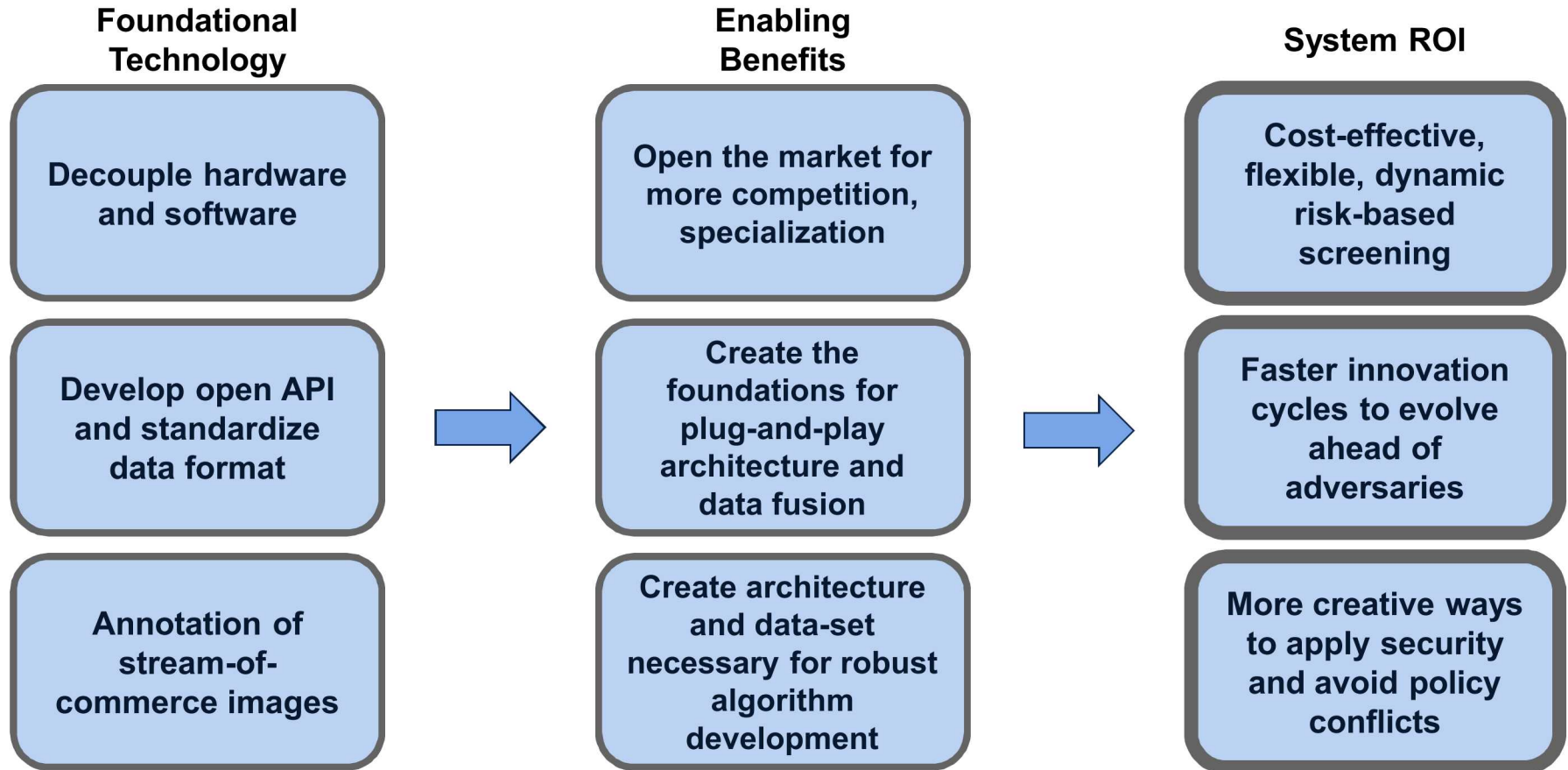
The Platform's interfaces enable modules to communicate with each other. Modules can be swapped in & out.



The Platform's extensibility simplifies adding in new functionality.

Any sensor using the specified interfaces can be integrated into the Platform.

# Value Chain



A dynamic risk-based screening (D-RBS) vision requires foundational changes in technology and architecture to drive changes in the market and ultimately changes in how a screening system can be assembled. Once achieved, better security, efficiency, passenger experience, lifecycle costs, and industry vitality are possible.

# Strategy

- i. Bring to bear existing private sector technologies in a systems integration effort that produces a working prototype passenger baggage screening Xray**
- ii. No bi-lateral partnerships w/labs, no/few CRADAs; predominantly sub-contracts → ensure accountability and reduce politics**
- iii. Modularize components of the Xray architecture to develop on parallel but coordinated paths; (but need strong systems integration and requirements to ensure they come back together)**
- iv. Expose developing modules to end-user interaction very early in TRL evolution;**

# Strategy

- v. Sandia personnel mirror development for certain modules (ATR) to build formal and tacit knowledge that allows Sandia to be credible expert**
- vi. Ensure key components (esp. API, Data-sets) are open-source or freely available to restructure the marketplace**
- vii. Retain, build, and attract human capital within Sandia for this domain, build robust social network with burgeoning private-sector & academic community and understand how those partnerships *really* work.**
- viii. Utilize TSALT tools to scope requirements and demonstrate bang-for-buck of OTAP**



# Project Status

## Completed

- Internal team has been assembled
- Integration Plan
  - Working Draft Requirements, Project Plan, Project module cost-estimates, Statement of Work
- Partnership with Stratovan

## In Progress

- Integration Plan
  - Interface specifications

## Next Steps

- Hardware partnerships
- Upon receiving bridge funding: threat database, Open Platform Software Library development, Hardware exploration

## Integration Plan =

- Project Plan
- Cost-Estimates
- Functional Requirements
- Interface Specifications,
- Roles & Responsibilities

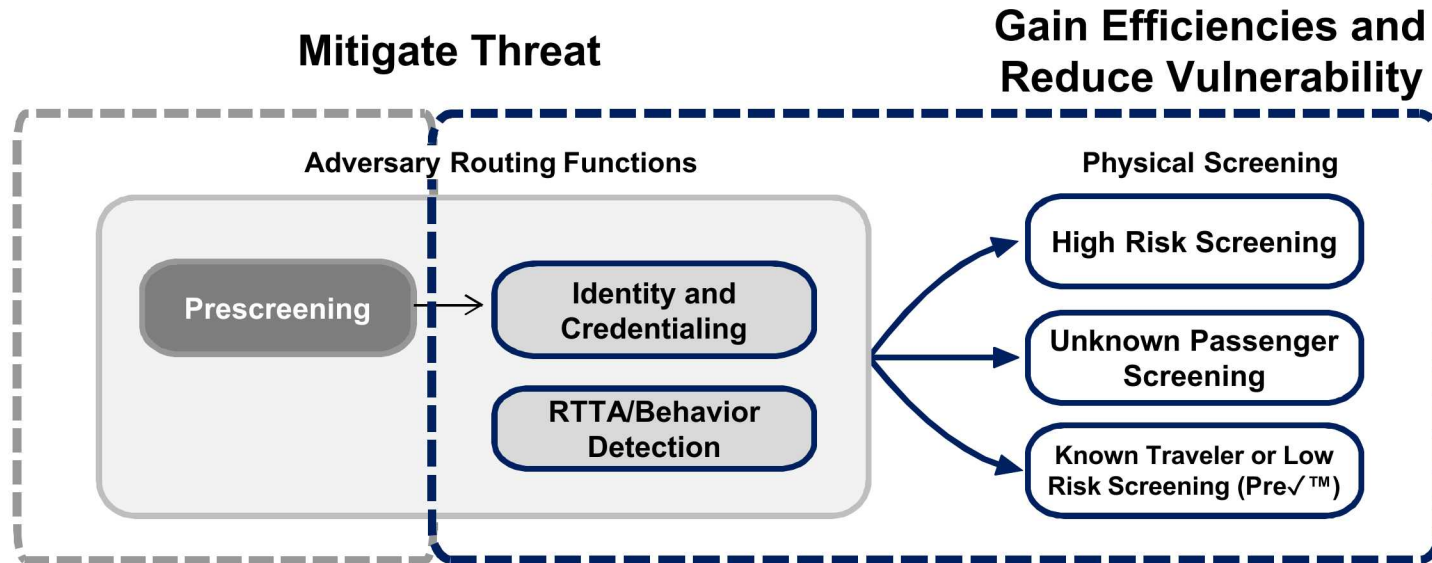
# Team

Top notch team  
assembled and now  
actively working  
together to complete  
integration plan

Sandia Personnel	Expertise
Kyle Thompson	X-Ray & Computer Tomography Radiography
Ed Jimenez	Algorithm Development & GPU Computation
John Parmeter	Chemistry & Explosives Trace Detection
Brandon Gutierrez	Commercial X-Ray Systems & Explosives
Derek Trumbo	Software Development; Interface Development
Dave Stracuzzi	Machine Learning
Ann Speed	Cognitive Psychology & TSO performance
Andrew Cox	PI, Systems Analysis, & Integration
Philip Kegelmeyer	Machine Learning
Paul Smith	Technology Transfer

# Backup Slides

# Current RBS Screening Concept



“Lumpiness” of lane staffing limits efficiencies that can be gained since dedicated PreCheck lane must be manned by minimum number of TSOs

Dedicated lane is manifestation of one-size-fits-all for low-risk pax → no ability to dynamically apply security

No data-persistence across the screening process to adjust screening

No easy, standard way to integrate new sensors → Inflexible architecture

No layer to fuse data and make holistic decision



# Future RBS Screening Concept

## Mitigate Threat

## Gain Efficiencies and Adjust Screening According to Risk

Adversary Routing Functions

Physical Screening

Prescreening

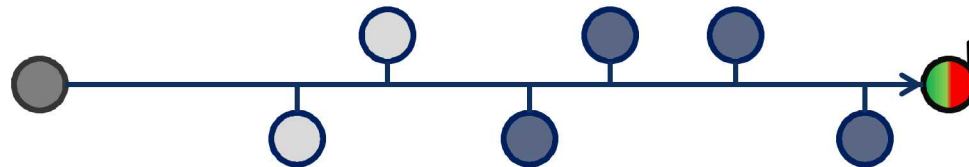
Identity and  
Credentialing

RTTA/Behavior  
Detection

Dynamic Risk-Based  
Screening

Network the security components for data fusion and dynamic screening and create a non-proprietary API to create a plug-and-play architecture

Each security component contributes information to an overall risk decision



Introduce an API and IT architecture which allows for a) data persistence, b) data fusion, and c) dynamic physical screening based on risk. ***These foundational elements will enable the emergence of Dynamic Risk Based Screening.***

# Implementation Case Studies

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- D-RBS v1 (2006)
- BDO Rollout (2006-2011)
- Checkpoint Evolution (2008)
- AIT Rollout (2010)
- AT X-ray Rollout (2011)

***Main Finding: Creating and testing a prototype in the field before investing heavily in a new technology or system is crucial for success.***

- Iterative operational testing of early prototypes uncovers issues—especially human factors issues—that were not predicted by simulations or controlled experiments
- Very early field testing saves time and money, and minimizes policy conflict

# TSA Capability Investment Plan

