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SAND2019-5909C

# Open Threat Assessment Platform Modular AIT Stream-of-Commerce

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Transportation  
Security  
Administration

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## TSA Strategic Goal 2.2: Reduce the time to field solutions

**2.2.1** Establish strategies that embrace *agile acquisition methods* in order to support **rapid prototyping, incremental development, and cycles of continuous improvement.**

**2.2.2** Develop an integrated countermeasures architecture...integrating countermeasure platforms to enable data fusion and new networked security capabilities

**2.2.3** *Modularize transportation security equipment to **disaggregate sensors from data analytics**, and to improve equipment **upgradeability and interoperability**...Broaden TSA's ability to **incorporate innovations from non-traditional vendors**...*

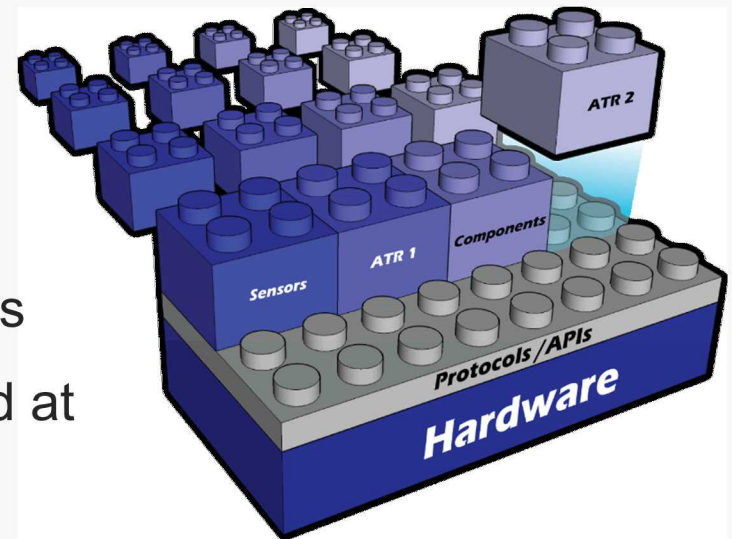
--Transportation Security Administration / Administrator's Intent

# Solution: Modularity Increases the Market for Innovations & Increases the CONOPs Options.

Modularity is the ability of systems to be “plug-and-play” with different add-on capabilities such as new threat detection algorithms or GUIs (among many others).

Modularity also has the potential to

- i. Lower barriers to entry for new vendors
- ii. Introduce new capabilities into the field at a quicker pace
- iii. Allow TSA to reconfigure screening workflows into a variety of CONOPs such as more comprehensive and individualized risk-based screening.



# Open Threat Assessment Platform

**OTAP fulfills TSA Strategic Objective 2.2.3: Modularity.** OTAP enables the implementation of new solutions developed by industry (OEM and 3<sup>rd</sup> parties) by creating the tools to implement an open, modular architecture for aviation security technology.

## Core OTAP Elements

### SOC (Non-Threat Data → lower Pfa)

Large database of carry-on CP-CT bag images; annotated, ground-truthed, & integrated with passenger and flight metadata.

### Tyndall (Threat Data → Higher Pd)

Database of CP-CT threat scans; annotated, ground-truthed, & enhanced with packing/clutter metadata

### Open Platform Software Library (OPSL)

Software package (SDK) of open, commonly available, and standardized data interfaces, exchanges, and formats enabling integration of 3<sup>rd</sup>-party apps

### Passenger Baggage Object Database (PBOD)

Non-Proprietary DICOS DB of CT & AT scanned outputs of potential threats, info on non-threats, & any associated metadata used to train algorithms

### ATR Algorithm Integration

Detection algorithms built independently or from PBOD data and integrated with AT, CT, or AIT platforms via OPSL

### 3rd Party Hardware Component Integration

Integration of 3rd party specialized hardware component on an OTAP-enabled system

# HD-AIT + Prize + OPSL = Modular AIT

- DHS S&T/TSA sponsored the Passenger Screening Algorithm Challenge
  - **Non-proprietary scans** distributed via the Kaggle competition site
  - Hundreds of performers, 8 winners chosen. Variety of advanced methods used.
  - Excellent ATR performance.
- Winning algorithms handed off to S&T
  - Noblis, TSL, JHU-APL, others conducted eval
- Sandia “wrapped” ATRs w/OPSL (& “containerized” for different OS)
- ATRs successfully run via OPSL
- Successful integration w/HD-AIT prototype as of last week

## Because:

- S&T collected and curated a non-proprietary scan DB
- S&T accessed a vibrant market of ATR developers via the Passenger Screening Algorithm Challenge
- OPSL allowed HD-AIT to plug in ATRs

**TSA now has the ability to continuously update and improve ATRs using the latest machine-learning methods**

# Large, Quality Datasets are Critical for ATRs

Machine/Deep Learning (ML/DL) methods can create higher performing ATRs...***but only if they have large, high-quality, ground-truthed, metadata-augmented datasets; Large, quality Datasets are the developmental chokepoint*** to deploying better ATRs for CT, AT, and AIT...Not ML skillsets.

- The ***SOC*** Data Collection Project is ***creating a comprehensive large database of carry-on CP-CT bag images*** integrated with passenger and flight metadata.
- The OTAP Tyndall data-collection effort has ***completed voxel-by-voxel annotation of 5 materials for IDSS & Analogic each: ~300 threat scans per material.***

## *SOC Key Current Activity Elements and Deliverables*

### **CP-CT Image Data**

Collect image data from all AT/CT CP-CT OEMs in multiple airports during all travel seasons to maximize diversity and scale.

***Collected 31k images.***

### **Passenger and flight data**

Integrate non-PII PAX and flight metadata (age, gender, risk score, flight origin/destination, date and time) from SecureFlight via CAT.

***Passenger-bag association process & tools.***

### **CP-CT Inspection Results**

Integrate bag alarm information, TSO decisions and other Threat Data Records (TDR) from CP-CT into SOC dbase.

***10TB comprehensive dbase and expanding.***

### **Annotation of Bag Content**

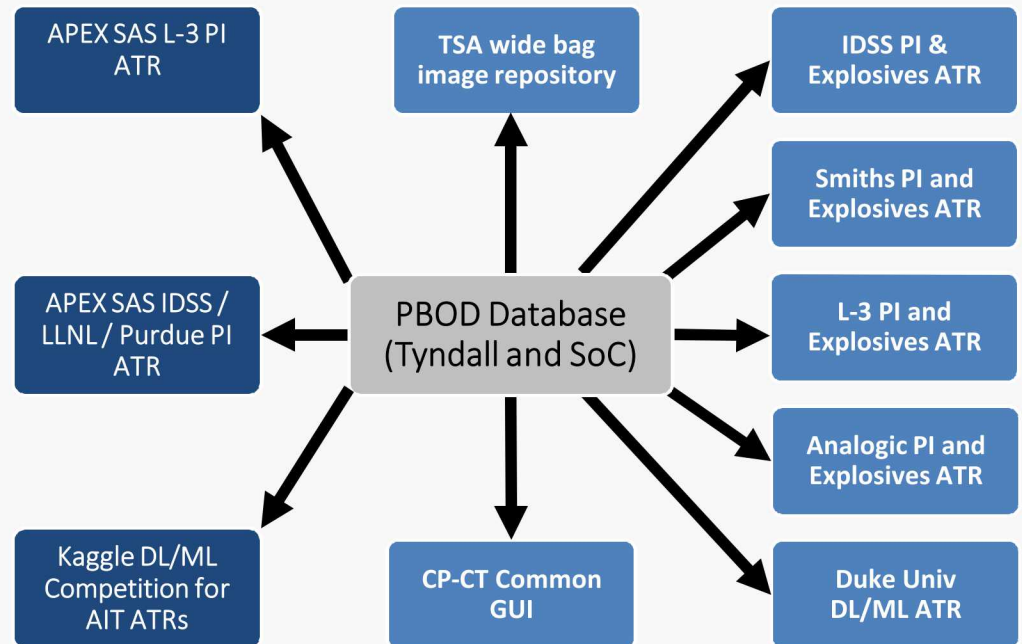
Process images using a Common Viewing Station to annotate and text-label objects and develop a database with searchable (and customizable) categories.

***Annotated 11k images***



# SOC and PBOD are Foundational *Data* Capabilities

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DHS S&T ML/DL Projects

TSA ML/DL Projects

***The basic foundations of a modular architecture are now available to TSA across AT, CT, and AIT.***

- OPSL 1.0 Completed, provided to OEMs and 3<sup>rd</sup>-party ATR vendors
- Database of non-proprietary threat scans and stream-of-commerce scans.
  - Tyndall: 1500 threat scans for two OEMs
  - SOC: 33k scans collected; 12k scans annotated
- Scan inventory and annotation tools.
- ATR testing tools (modifying ALERT tools).
- Demonstrations of OPSL and 3<sup>rd</sup>-party ATRs on AT, CT, and HD-AIT machines.

# Contacts

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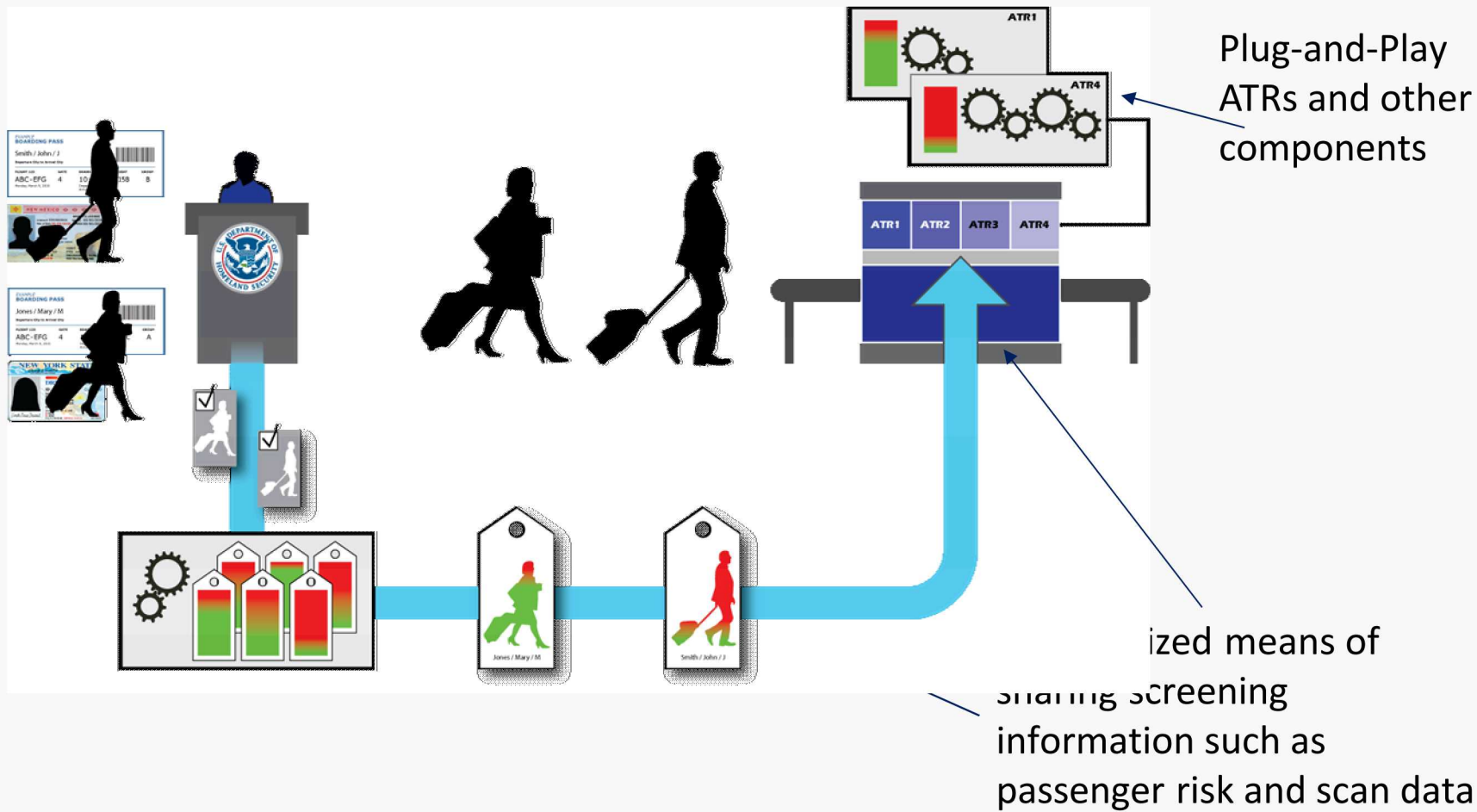
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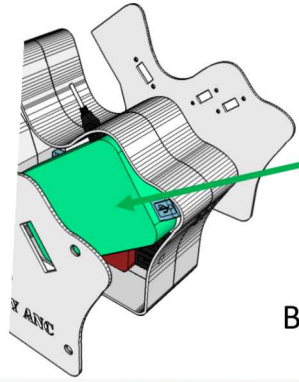
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# Modularity Enables More Flexible CONOPs

**Reshape TSA's mode of operation to enhance security, operational efficiency, passenger experience, and cost efficiency.**



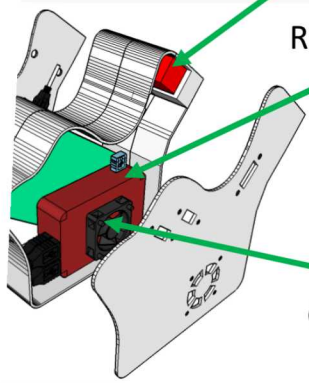
# SOC Equipment Development - SOC Camel at CAT



Battery



Barcode reader



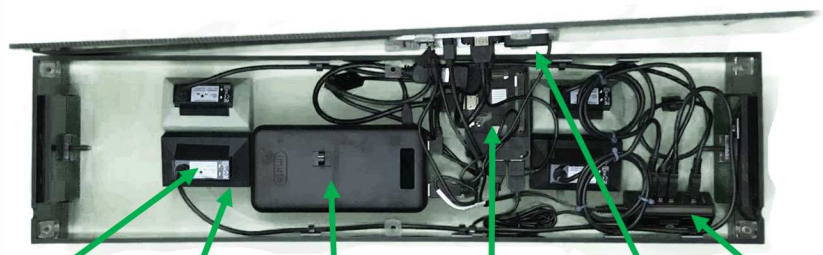
Raspberry Pi

Cooling fan

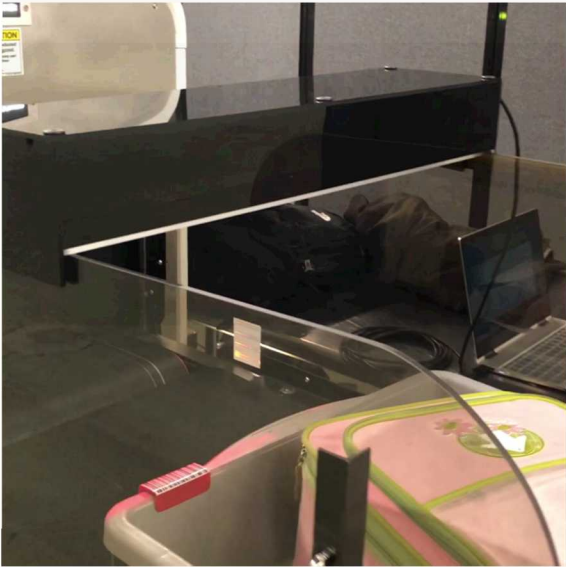
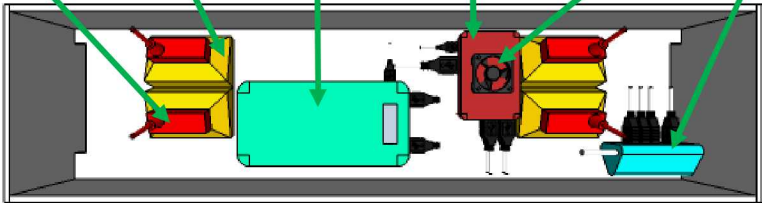


Camel on CAT

# SOC Equipment Development - SOC Chameleon at CT



Barcode reader    Angled mount    Battery    Raspber  
y Pi    Cooling fan    USB hub



# SOC Equipment Development - SOC Lobster at CT

