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Exceptional service in the national interest



Open Threat Assessment Platform Modular AIT Stream-of-Commerce

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Developing the System-of-Systems



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* 3rd parties) by creating the tools to implement an open, modular architecture for aviation security technology.

Core OTAP Elements



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

Security Administration

Sandia Nationa

Large, Quality Datasets are Critical for ATRs



Machine/Deep Learning (ML/DL) methods can create higher performing ATRs...but <u>only if they</u> have large, high-quality, ground-truthed, metadata-augmented datasets; Large, quality Datasets are the developmental <u>chokepoint</u> 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

Passenger and flight data

Collect image data from all AT/CT CP-CT OEMs in multiple airports during all travel seasons to maximize diversity and scale. Integrate non-PII PAX and flight metadata (age, gender, risk score, flight origin/destination, date and time) from SecureFlight via CAT.

Collected 31k images.

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

TSA ML/DL

Projects

SOC and PBOD are Foundational *Data* Capabilities

- The SOC Data Collection Project is creating a comprehensive large database of carry-on CP-CT bag images integrated with passenger and flight metadata.
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DHS S&T 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 3rd-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 3rd-party ATRs on AT, CT, and HD-AIT machines.

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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



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SOC Equipment Development - SOC Chameleon at CT







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SOC Equipment Development - SOC Lobster at CT

