



Battelle Presentation to ICAO AVSEC 17 Symposium  
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# Digital Imaging and Communications In Security - DICOS

A New Paradigm for Aviation Security Innovation  
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# Battelle mission and purpose

Our mission: To translate scientific discovery and technology advances into societal benefits



Gordon Battelle, Founder

- Nonprofit, charitable trust formed in 1925
- Profits reinvested in science & technology and in charitable causes, making the world better for generations to come
- Knowledge, talents and resources applied to help our customers achieve their most important goals
- Key participant in US aviation security providing research, development, test and evaluation to DHS and TSA since 1996.

# A history of innovation...

Inspiring new industries; revolutionizing products



1949 | NAUTILUS



1965 |  
UNIVERSAL  
PRODUCT CODE

1965 | CRUISE  
CONTROL



1991 | BATTELLE  
TECHNOLOGIES  
IN DESERT  
STORM



1998 | TSA  
Test Kits

2012 | DUAL TECH  
LAG SCANNER



1920

1940

1960

1980

1990

2000



1939 | ARMOR  
PLATING

1959 |  
XEROGRAPHY



1974 |  
COMPACT  
DISCS



1974 |  
PHOTOVOLTAIC  
CELLS FOR  
SOLAR  
ENERGY

2000 | MM WAVE  
BODY SCANNER



2010 | DICOS



2017 | 3D CT  
TRAINER



2016 | ANSI CT  
IQ STANDARD



# Civil Aviation – A Critical Worldwide Asset

Connected, coordinated, cooperative:

- Six world regions, 101 countries
- Over 2,000 airports
- 2016 metrics\*:
  - 35.4M departures
  - 3.796M passengers
  - 205B freight tonne-km

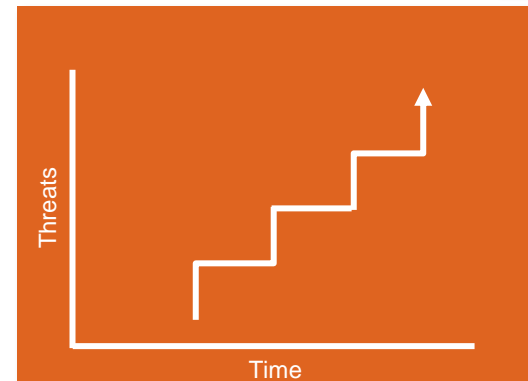
**This criticality makes worldwide civil aviation the prime target for terrorists seeking to disrupt our economies and societies.**

**\*Source – ICAO**

# Threats

Threats to aviation security have evolved over time, taking advantage of the asymmetrical nature of terrorism.

- Guns and knives used to hijack planes and fly them to Cuba – also used to perpetrate 9/11 incident.
- Explosives placed in luggage and loaded in the hold.
- Innovative techniques to secret explosive threats in cargo.
- Suicide bombers bring threats into the cabin hidden on their person
- Novel explosives easily made from household chemicals combined with sophisticated means to hide them in electronics and other items.



# Technical Countermeasures

Developed And Deployed Over Time To Address These Threats:



- Metal detectors.



- Single/dual view X-ray



- Chemical trace detection



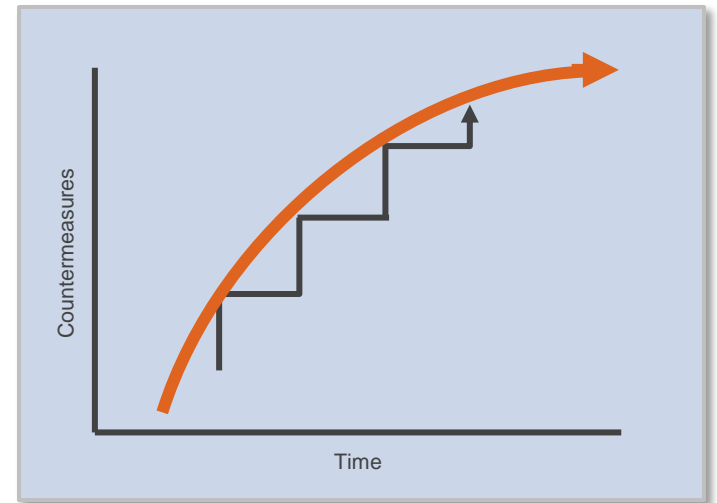
- Computed tomography (CT)  
X-ray with automatic detection  
algorithms (ATD)



- Millimeter wave and backscatter X-ray whole body imagers



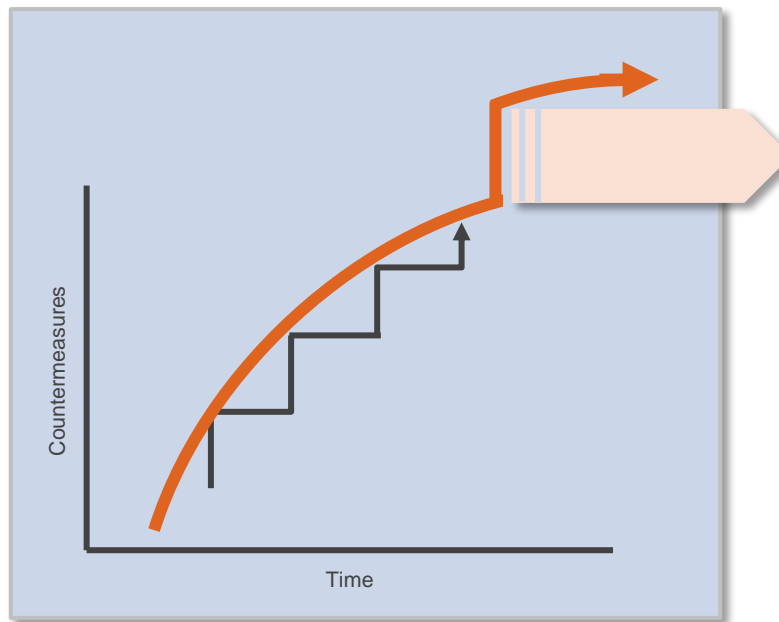
- Liquid, aerosol, and gel (LAG) detection systems (various technologies)



# A Paradigm Shift

A new paradigm in security technology is required to address this trend.

**That new paradigm is system interoperability enabled by Digital Imaging and Communications in Security - DICOS**



**Increased  
countermeasure  
headroom (technical and  
operational), enabled by  
DICOS**

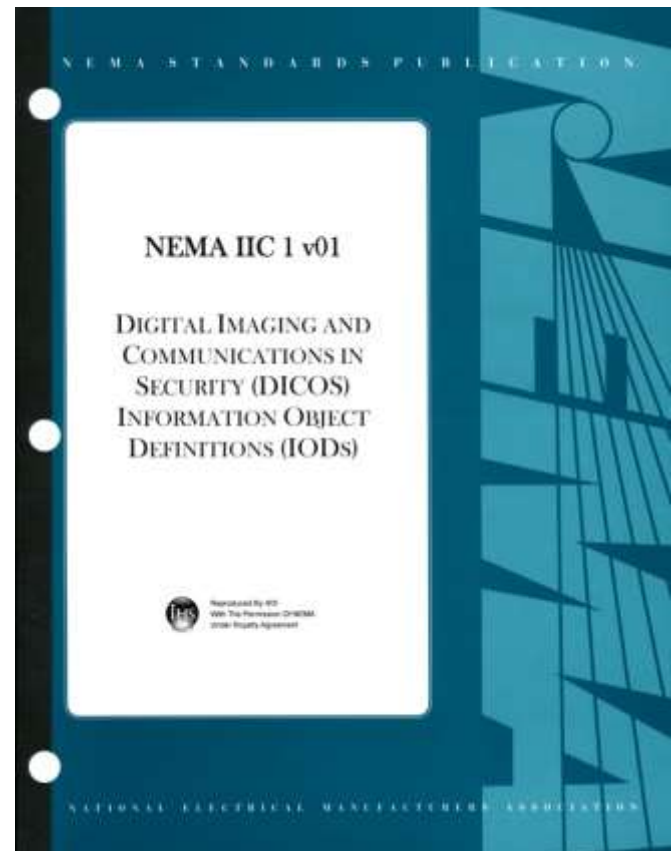


# What is DICOS\*?

Interoperability data standard for security devices that produce digitized imaging data

- Battelle adapted DICOS from the world-wide medical imaging standard, DICOM, in 2010.
- Family of standards to allow interoperability inter/intra security devices, including LAN/WAN architectures.
- Now managed by NEMA, the same organization that manages the DICOM standard. Current version - VO 2.0A.
- Interfaces “profiles” exist for a range of devices:
  - X-ray CT, DR (checkpoint X-ray), AIT, workstations, etc. VO3 to add more (e.g. biometrics).
- Defines data-tags for screening image information, passenger metadata, and threat data reports (TDRs).
- DICOS provides a means to tie passenger screening images and other metadata into one record which can be exchanged and managed in a real-time network.

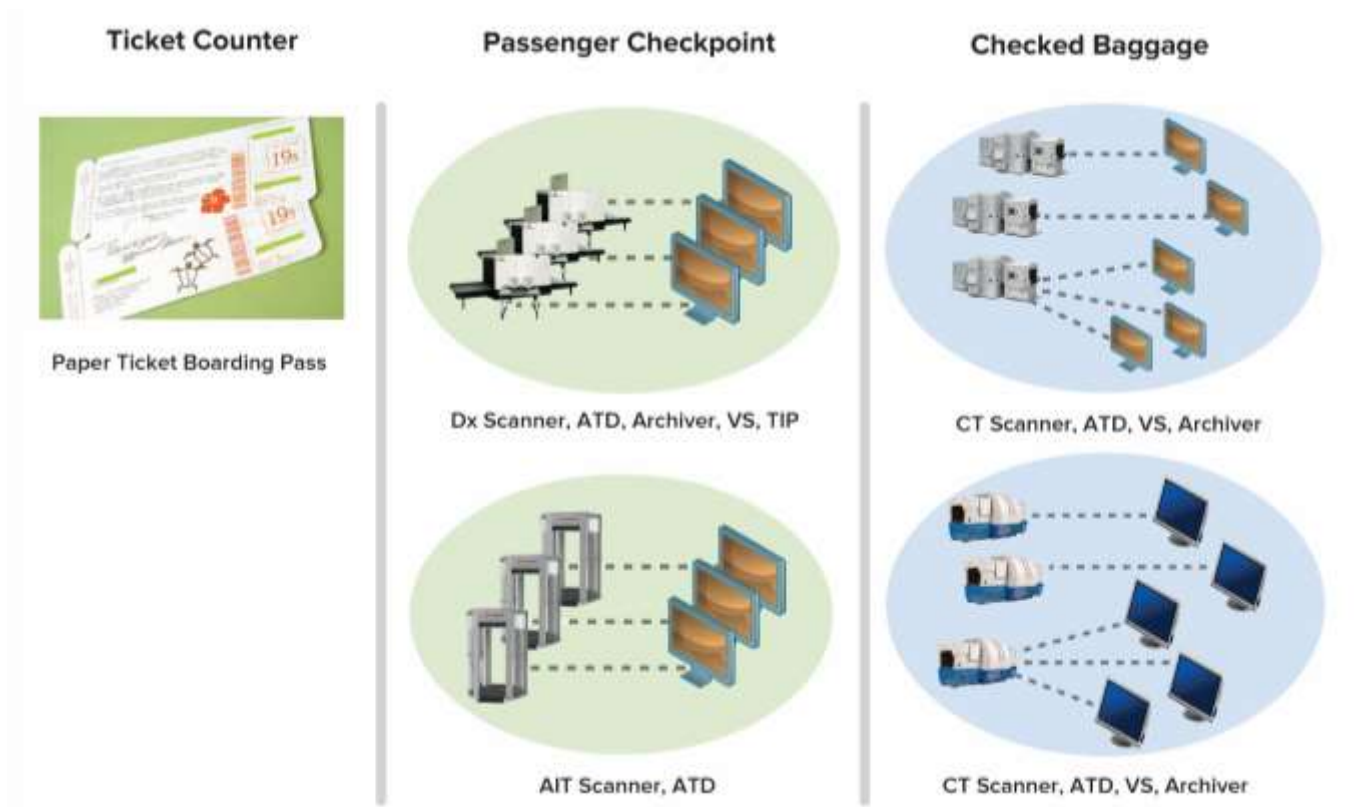
*\*Digital Imaging and Communications in Security*



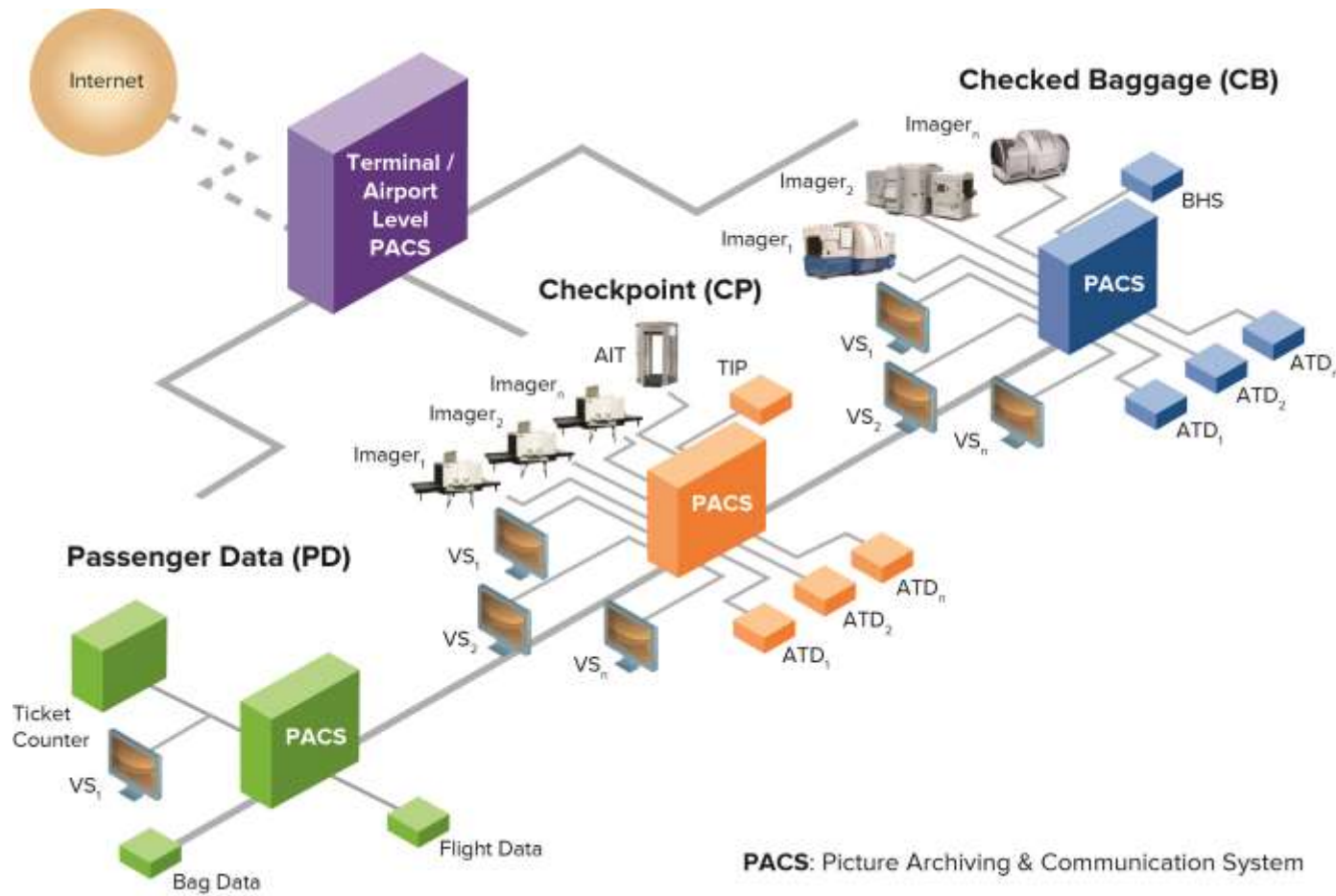


# The Current Security Screening Enterprise Based On Closed Architectures

## Current Airport Environment



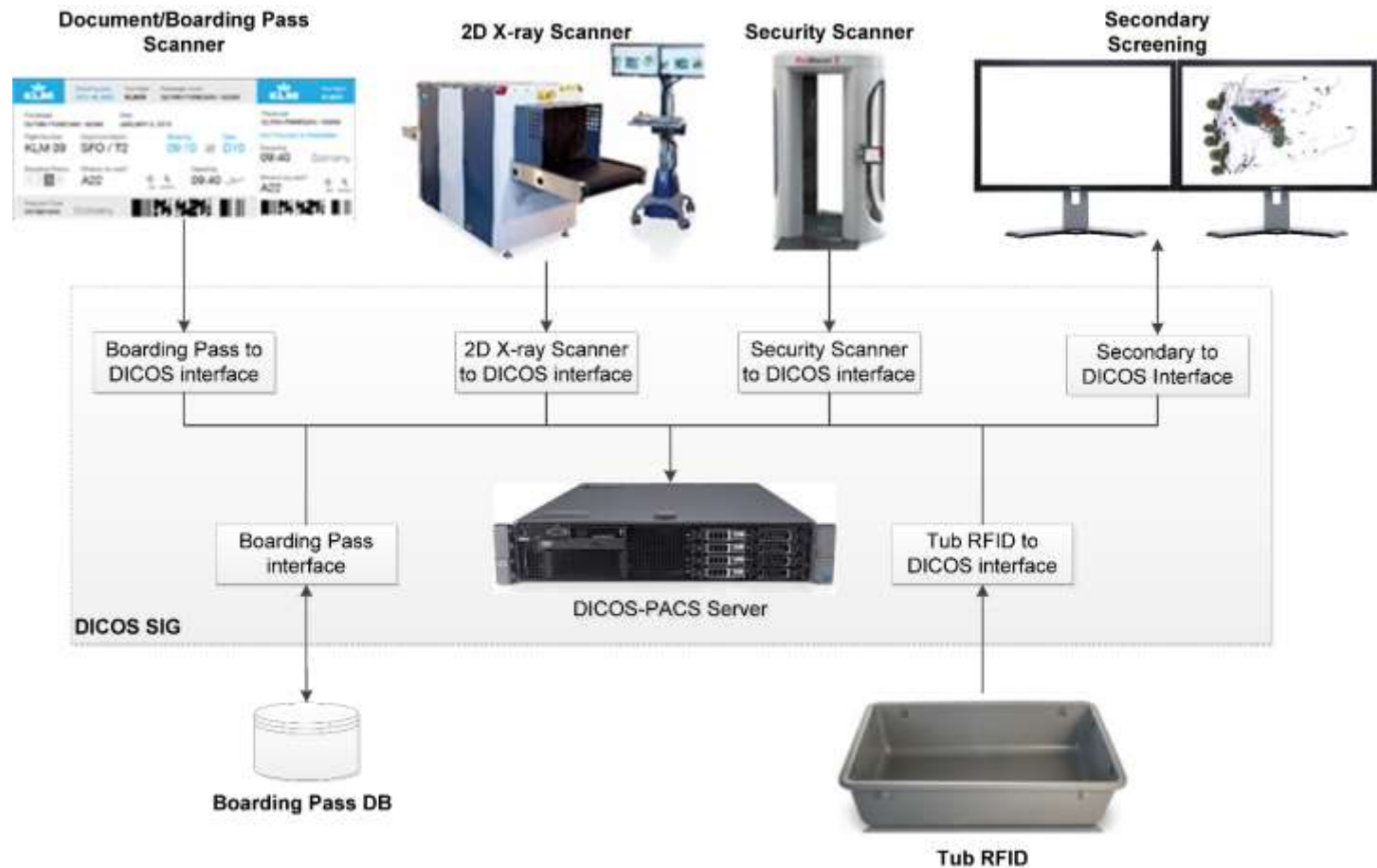
# New Security Screening Enterprise Based on DICOS Open Architecture



# DICOS Value Proposition

Feature	Benefits
<b>Interchangeability of a true plug and play open architecture environment</b>	<ul style="list-style-type: none"> <li>• Greater competition drives innovation at reduced prices</li> <li>• More players/resources translates to accelerated development cycles</li> <li>• Innovation gained through non-traditional participants (e.g. algorithm developers)</li> </ul>
<b>Derived from worldwide medical imaging standard (DICOM)</b>	<ul style="list-style-type: none"> <li>• Based on DICOM's proven worldwide experience and use over many decades</li> <li>• Published and non-proprietary, controlled via standards development organization</li> <li>• Strengthened through industry collaboration - NEMA DICOS standards committee</li> <li>• Adaptable over time as needs arise and new technologies emerge</li> </ul>
<b>Networked interconnectivity across all generators and users of security information</b>	<ul style="list-style-type: none"> <li>• System elements share information for prompt and appropriate system response</li> <li>• Images and other metadata can be viewed at any workstation</li> <li>• Centralized system performance data can be analyzed to identify systems improvements</li> </ul>
<b>Risk based security is greatly enabled/enhanced, permitting new concepts of operation</b>	<ul style="list-style-type: none"> <li>• Allows remote/dynamic data entry (e.g. hand-held tablets)</li> <li>• Real time access to all data improves situational awareness and responsiveness</li> <li>• Open security architecture allows enhanced security response (e.g. different algorithms linked to different security risks)</li> </ul>
<b>DICOS records consolidate all passenger security data, improving security enterprise</b>	<ul style="list-style-type: none"> <li>• Centralizes images and metadata; other data (e.g. biometrics) can be added.</li> <li>• Dynamic data updates (e.g. screener response, behavioral officer input, etc.)</li> <li>• Data is stored and retrieved as required for analysis, investigations, and response</li> </ul>
<b>Supports ancillary operational improvements and efficiencies</b>	<ul style="list-style-type: none"> <li>• "Performance over time" analysis of equipment optimizes maintenance</li> <li>• Real time monitoring/analysis of screening process increases efficiency</li> <li>• Real-time monitoring of screeners improves performance</li> <li>• Screening data and metrics collected on-line improves CONOPS flexibility</li> </ul>

# Example DICOS Based Interoperative Screening Lane



# Discussion

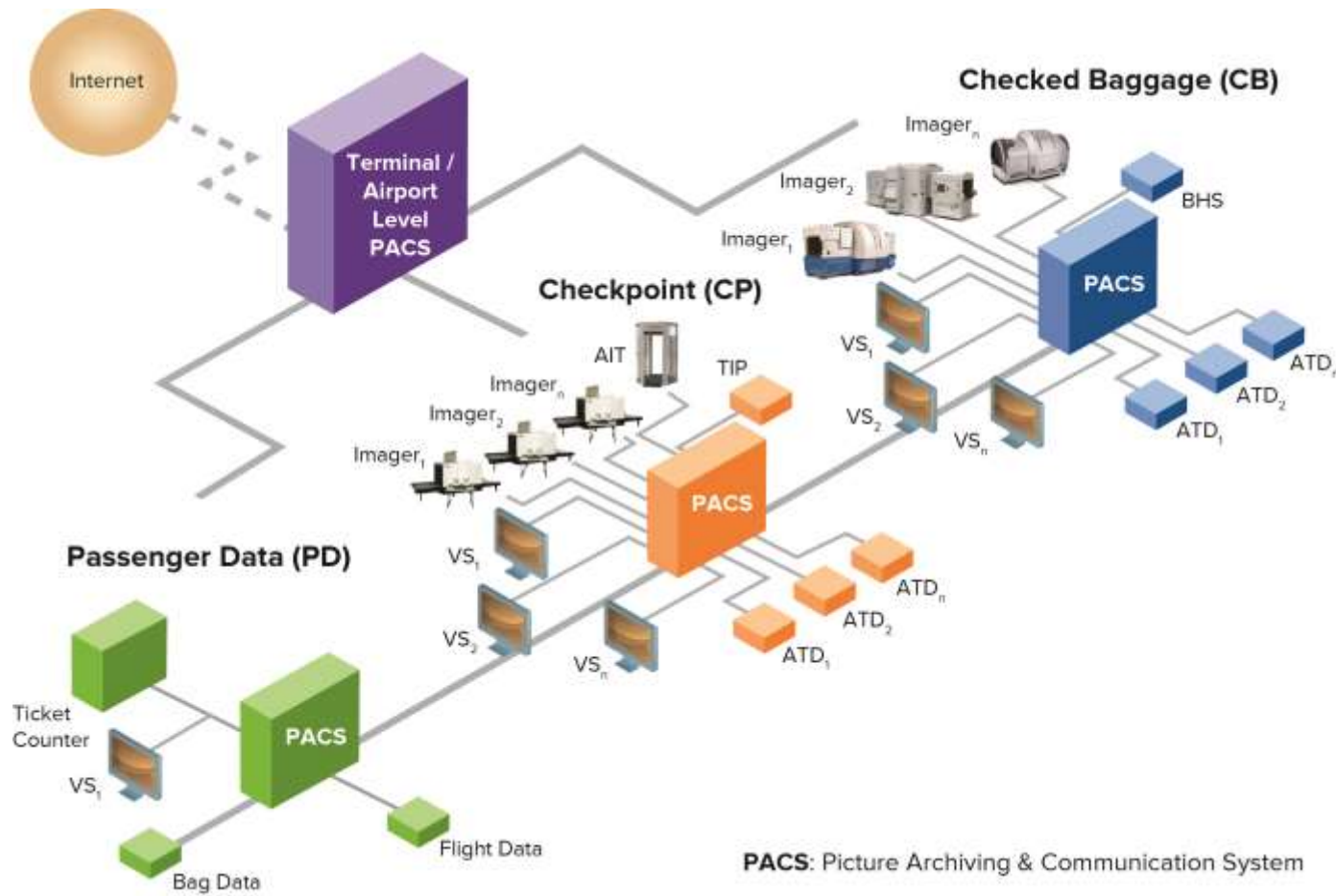


Security Check

How can a DICOS based  
interoperative security  
screening enterprise help  
solve your problems?



# New Security Screening Enterprise Based on DICOS Open Architecture



# Summary and Next Steps

- The DICOS standard enables an interoperable, security screening open architecture that represents a new paradigm in security screening.
- DICOS offers opportunities for improved detection, increased operational flexibility, enhanced CONOPS, accelerated development and introduction of new technology and reduced operational and lifecycle costs.
- To achieve these benefits security regulators and operators must take the next steps.
  - Inform yourselves about DICOS
  - Implement pilots to become familiar with security screening interoperability and its many potential benefits.
  - Require its use.

**Battelle stands ready to help.**



# ***BATTELLE***

**It can be done**