



XP-DITE : Outcome-focused, system-level approaches for checkpoints

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XP-DITE: Accelerated Checkpoint Design Integration Test and Evaluation



**EU FP7 Security Research Project
2012 - 2017
Total Cost: 14.6M Euro**



Overview

- Topic Area:
 - **Aviation security checkpoints**
- Problem addressed:
 - Checkpoints are inflexible, one size fits all**
 - Dont always work as well as they could**
- How solved:
 - **Certify systems not components**
 - **Design for system level security**
 - **Checkpoint design and evaluation tools**
- So what:
 - **Provides outcome-focused, result-oriented regulation**
 - **More consistent security performance**
 - **Flexibility for airports**



The problem

Regulatory framework focuses on **types of equipment** allowed to be used and their detection performance as components **in isolation**

Complex rules define **checkpoint processes**

Consequences:

- Overall security performance of the **system** is not really known
- **Lack of flexibility**. Hard for airports to adapt checkpoints to meet their individual needs
- Technology innovation is inhibited

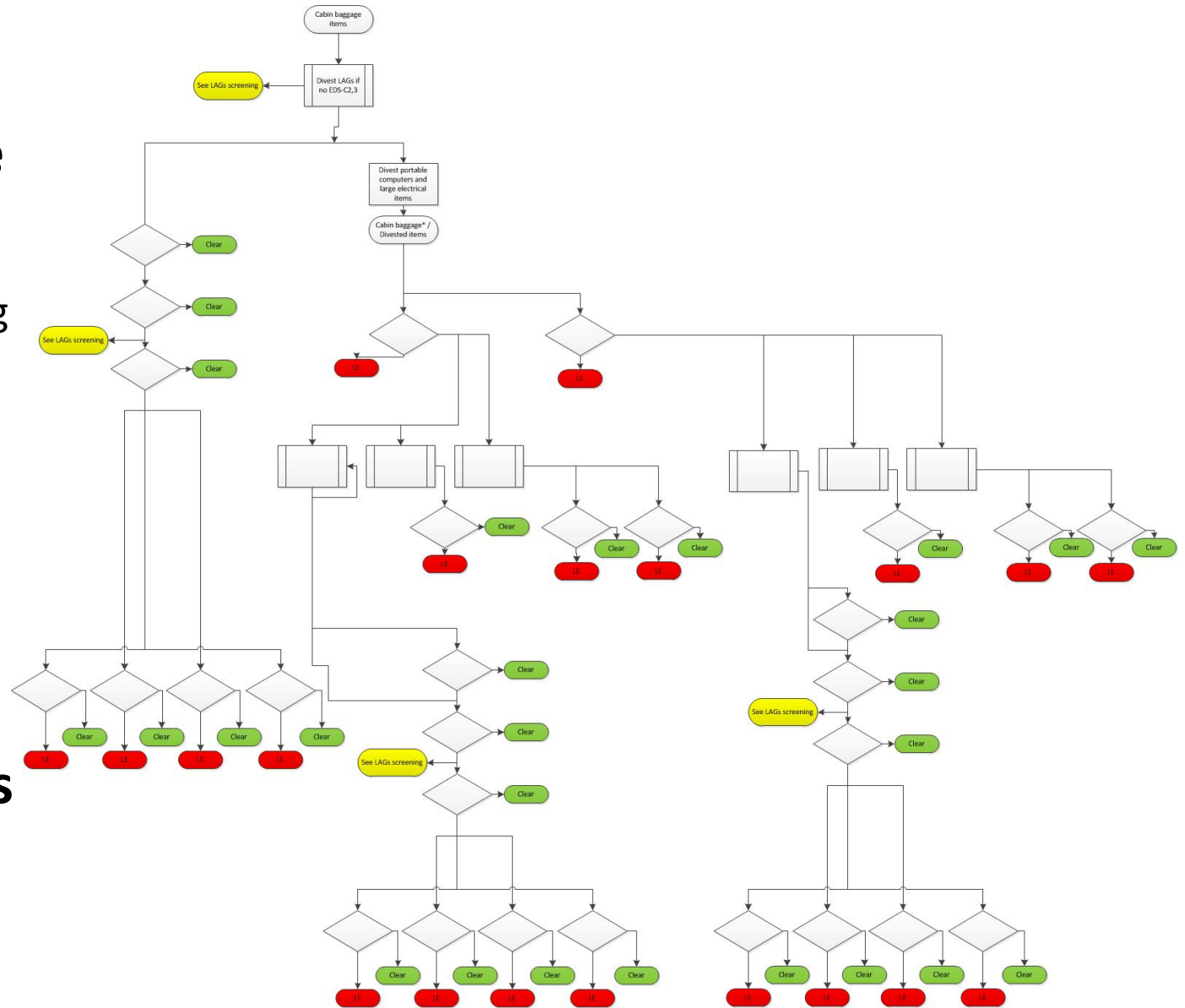
Current regulations – prescriptive and complex

Cabin Bag Screening Example

- Branches show options
- Paths show screening process leading to clear/not clear

Further flowcharts for

- LAGS
- People
- Non-passengers



Outcome-focused regulation

- Current Approach
 - Design largely prescribed
 - Permitted screening methods
 - Equipment types e.g. WTMD (approved equipment e.g. Manufacturer xx, version y) *EC300, EC185, approved lists*
 - Procedures (e.g. divesting, alarm resolution...) *EC185, EC Decisions, More Stringent Measures in individual Member States*
- Outcome-focused (system-level, performance based....)
 - Outcome prescribed
 - Provide security level = x
 - Complete, or partial, freedom how this is achieved

XP-DITE enables this paradigm shift

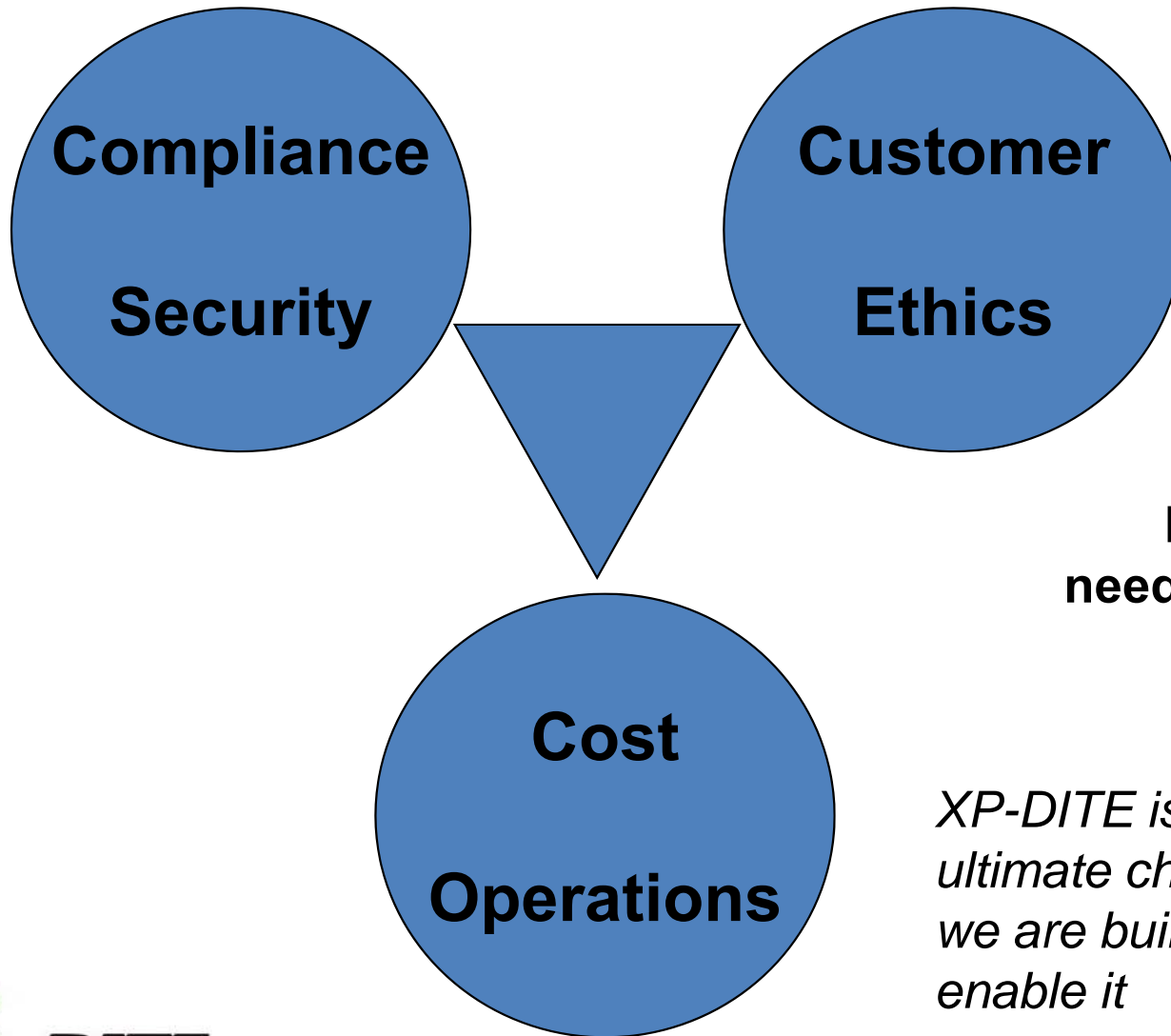
Move from equipment based regulations to

- **Outcome-focused**
 - **Performance-based**
- Regulation**

enabling

- **Risk-based**
 - **Proportionate**
 - **Flexibility for airports**
 - **Technology innovation**
 - **Happier passengers**
- } Security**

Performance Areas



**Security is only one
Performance Area**

**Design and Evaluation
needs to balance requirements
in all three areas**

*XP-DITE is not building the
ultimate checkpoint of the future –
we are building the tools that might
enable it*

What is system level security?

- Overall probability of detecting a threat : $P_d = x$
- But.....

What is system level security?

- Overall probability of detecting a threat : $P_d = x$
- But.....What threat?
 - **P_d averaged over all types of threat?**
 - Guns – large, medium, small, disguised, dismantled, plastic....
 - Knives – large, medium, small
 - Explosives – military, commercial, HME, solid, liquid, powder...
 - » Devices (explosive + detonator + power source...)
 - **Weighted by likelihood of occurrence?**
 - **Weighted according to impact of each threat?**
 - **P_d of all threat sizes or P_d set of minimum threshold threat types & masses?**
 - **Average P_d or threshold minimum P_d on each threat type (avoid 'holes')?**

What is system level security?

- Overall probability of detecting a threat : $P_d=x$
- No single answer to what the threat is – regulators and others must decide
- XP-DITE has developed a flexible approach – and has made some specific choices in the tools to be validated in the proof-of-concept checkpoints

MO approach (Modus Operandi)

Modus Operandi (MO) Approach

Break the threat down into individual components:

MO = Threat object (gun, knife, explosive A....)
+ Vector (bag, person....)
+ Concealment (location, clothing, bag type....)

$$P_d = \sum w_i P_d (MO_i)$$

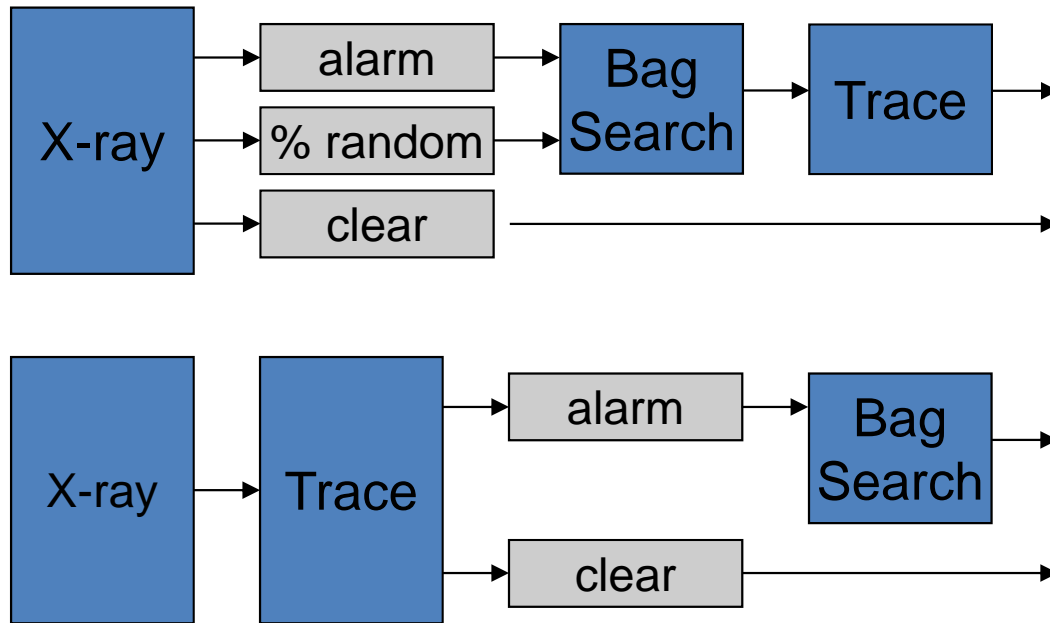
{MO_i, w_i}

chosen by regulator

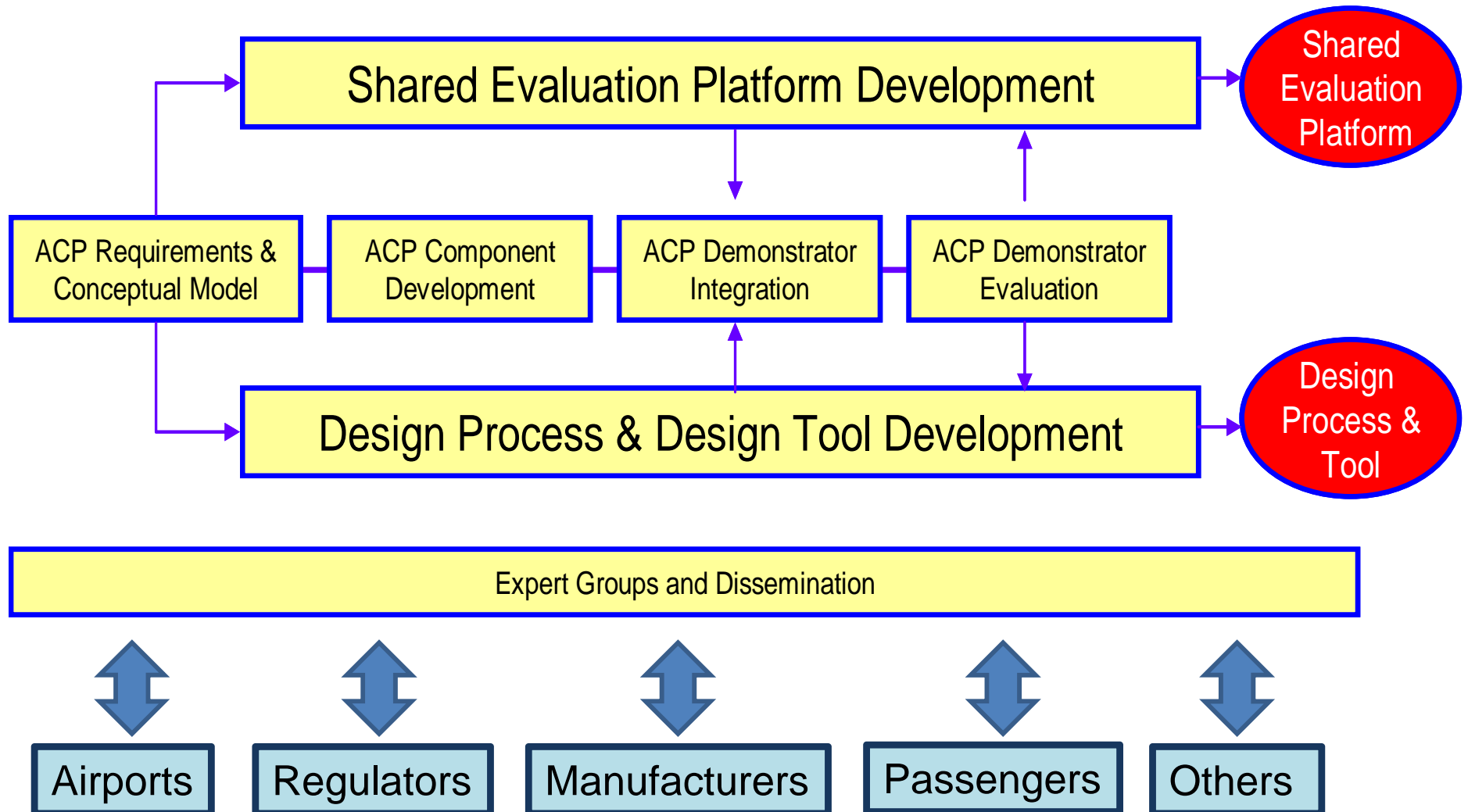
based on threat

Example XP-DITE concept

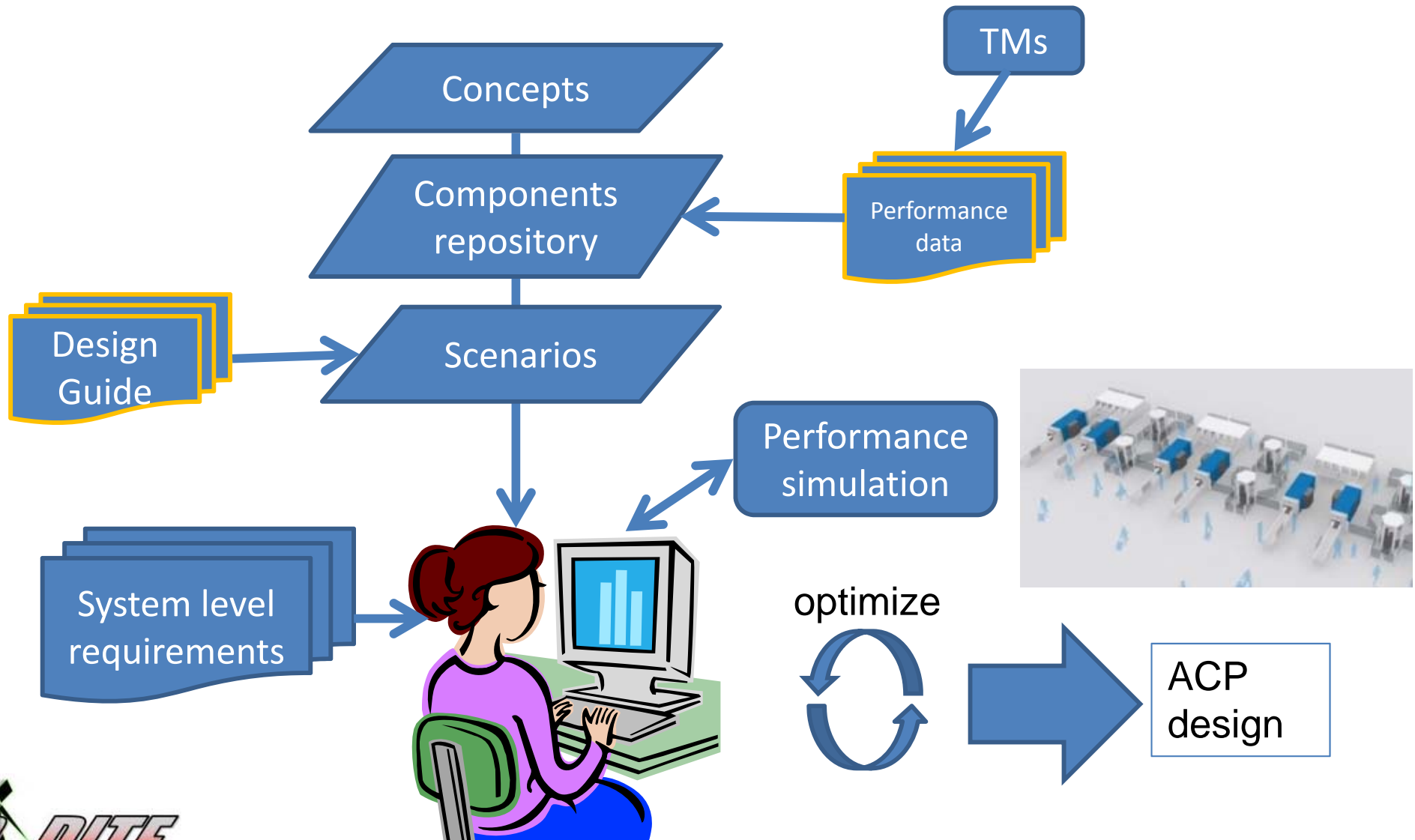
- Replace X-ray + random manual search + random manual trace
- By X-ray + automatic vapour & particle trace on every bag



XP-DITE Project structure



Design tool



Design tool – Repository

The screenshot displays the ACP Design Tool interface, which is a web-based repository for security equipment. The main area shows a grid of 24 equipment items, each with a thumbnail image and a name. The items include various models of Metor (e.g., Metor 28, 6WP, 6S, 6M, 6E, 150), COBRA with ACS, WP2 Line scanning Raman, WP2 aTiX X-ray, WP2 ALFA 3 1-device, WP2 Cascade Baggage, WP2 Fingerprint scanner, HI-SCAN 6040aTiX with ACS, Ionscan 600, Ionscan 500DT, Itemiser 4DX, QS-B220, and De-tector. A detailed view of the HI-SCAN 6040aTiX scanner is shown in the foreground, featuring a 3D model on a grid and a sidebar with technical specifications.

ACP Design Tool admin

Home / Component

Filter

Component Name
Component Code
Type
Select a Type...
Category
Select a Category...
Tags
Filter by Tag
Version
Released and in progress
All (including deprecated)

Name: Metor 28
Name: Metor 6WP
Name: Metor 6S
Name: Metor 6M
Name: Metor 6E
Name: Metor 150
Name: COBRA with ACS, algorithm: 4.000

Name: WP2 Line scanning Raman
Name: WP2 aTiX X-ray
Name: WP2 ALFA 3 1-device, algorithm: 3.000
Name: WP2 Cascade Baggage
Name: WP2 Fingerprint scanner
Name: HI-SCAN 6040aTiX with ACS, algorithm: 4.000
Name: Ionscan 600

Name: Ionscan 500DT
Name: Itemiser 4DX, algorithm: 3.000
Name: QS-B220, Part nbr: QS-B220-600-1000-1000-1000
Name: De-tector, algorithm: Library

1 2 3 4 5 6 7 8 9 10 ... 18 of 233 items

ACP Design Tool admin

Home / Component / Detail

Version: 1, In Progress

Component: Security Operational Ethical Passenger

Version

Component Basics

Component Code: 10000

Name: HI-SCAN 6040aTiX

Type: Detection Component

Category: Signal sensitive detection

Description: Entry scanner

Manufacturer: Smiths Detection

Component dimension

Width (m): 1.31

Length (m): 3.31

Height (m): 1.4

Weight (kg): 1900

Additional

Speed (m/s): 1.0

Edit

Note: equipment makes and models shown are purely illustrative

Design tool – User Interface

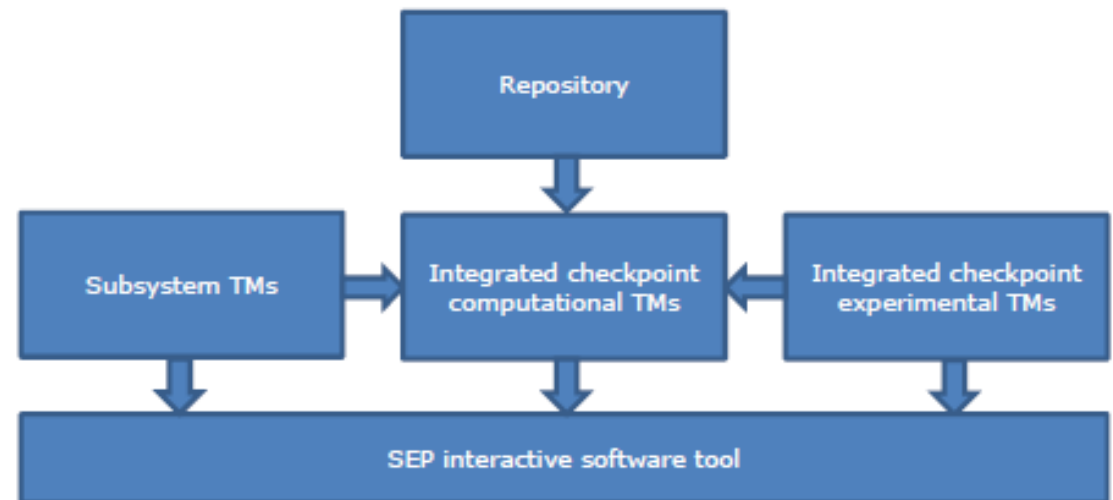
The screenshot displays the ACP Design Tool interface. At the top, there is a blue header with the text "ACP Design Tool" and a user profile "admin". Below the header, a breadcrumb trail shows "Home / Design / Detail / Blueprint".

The main workspace is divided into several sections:

- Component selection:** A sidebar on the left containing input fields for "Component Name" and "Component Code", dropdown menus for "Type" and "Category", a "Tags" section with a "Filter by Tag" input, and a "Version" section with radio buttons for "Released and in progress" (selected) and "All (including deprecated)".
- Component list:** A list of components with icons and IDs: 90000 (General area), 10204 (XP-DITE alarm management system), 10001 (Insight100), 10002 (EMA-3), 10003 (Liquid Explosive Detection Kit), 10004 (FEP ME 640 AMX), and 10005.
- 3D Model:** The central area shows a 3D architectural model of a building layout. It features a grid floor, walls, and various components connected by lines. The model is labeled "version 1" and "InProgress".
- Component Properties:** A sidebar on the right displays the properties of the selected component: "Component ID" (150 - 10019), "Name" (HI-SCAN 6046ai), "Version / link to repository" (v. 1), "Belongs To" (Area51), and "Positioning" (X (m): 11.2, Y (m): 10.19, Rotation (°): 0, Position height (m): 0).

Shared evaluation platform

- Calculates system performance from component data
- Performance Indicators
 - Security & Compliance
 - Detection performance (MO based)
 - Unpredictability
 - Customer Service
 - Perceived waiting time
 - Peak waiting time
 - Divesting/revesting hassle
 - Privacy
 - Operations
 - Throughput
 - Staff numbers
 - Floor space
 - Cost
- Test methods for components
- Empirical checkpoint evaluation methods



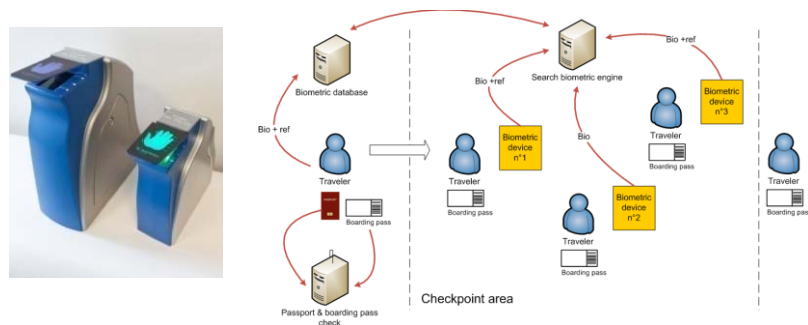
Field testing and evaluation



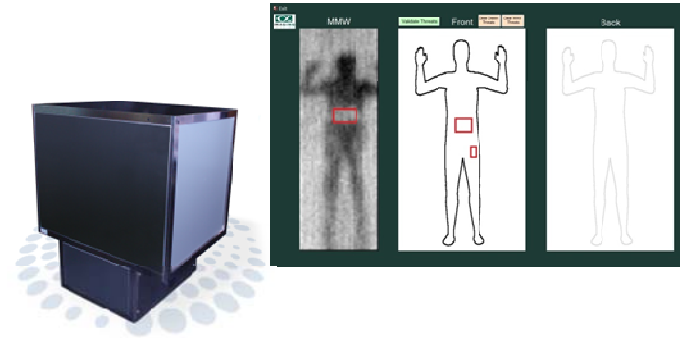
- Validation of system-level concept
- Validation of XP-DITE tools
- Paper designs & evaluations
- Proof-of-principle checkpoints
 - Field trial in Shannon Airport
 - US Pre Clearance
 - Technology Demonstrator evaluated in test-bed and at equipment test labs (TNO, ICT)

Innovative component development

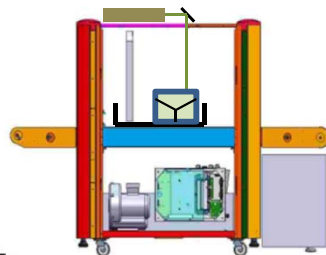
Biometric local tracking



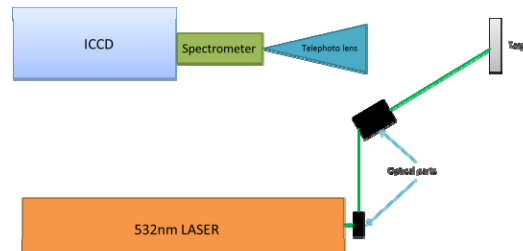
Stand-off passive mm-wave passenger screening



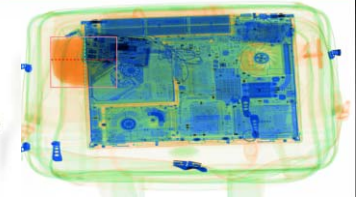
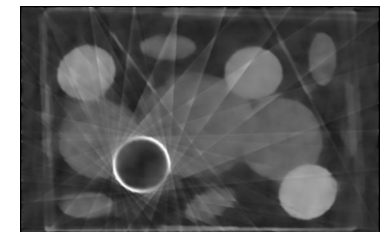
Vapour detection by QCL IR spectroscopy



Trace particle detection by Raman spectroscopic imaging



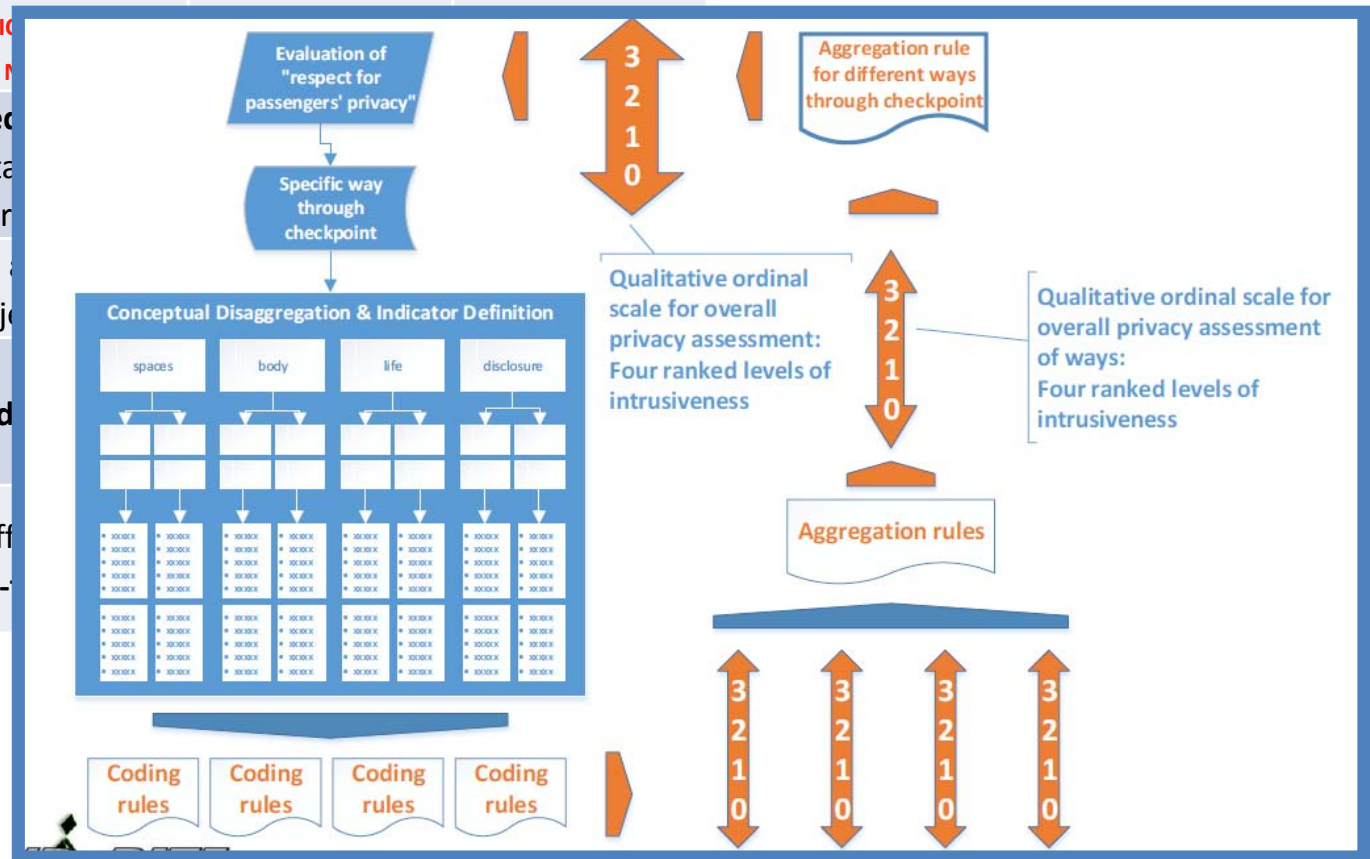
X-ray scanning hand luggage multiple capabilities



Ethical evaluation

Guiding principle	Respect for individual dignity and integrity in ACP screening processes			
Focus	Individual		Society	
Aspect	<u>INTRUSIVENESS</u> PRIVACY	<u>ERROR/DISCRIMINATION</u>	<u>RESTRICTIVENESS</u> ACCEPTABILITY	<u>CHILLING EFFECT</u> ACCEPTANCE
Ethical risks as system-level attributes	Intrusion into spatial privacy	limited		
	Intrusion into bodily privacy	false		
	Intrusion into private life	false		
	Disclosure of Information to others	non-		

Identification of ethical, legal and societal aspects (ELSA)



XP-DITE Outcomes

- **Airport operators and checkpoint designers**
 - Checkpoint design and evaluation tools - on paper and in the field
 - Enable use of innovative procedures and technologies
 - Optimise checkpoints to individual business needs
 - Provide evidence to regulators of security level achieved
- **Regulators**
 - Explore system-level approaches to security performance evaluation
 - Carry out 'what-if' experiments on potential new regulations and impact of new technologies
 - Enable checkpoints that can be more easily adapted to new threats
- **Equipment Manufacturers**
 - Facilitate introduction of new technologies
- **Passengers**
 - Fewer delays & improved convenience whilst ensuring they are kept safe

Thank You



www.xp-dite.eu

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