



Effective **C**ontainer Inspection at
BORDer Control Points

C-BORD Final Public Workshop

9th October
2018

Rotterdam
NL

C-BORD FRAMEWORK AND SCOPE TO IMPROVE DETECTION PERFORMANCE IN MULTI-DEVICE DETECTION ARCHITECTURES

09/10/2018

Final Public Workshop

WP 1

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CONTENT

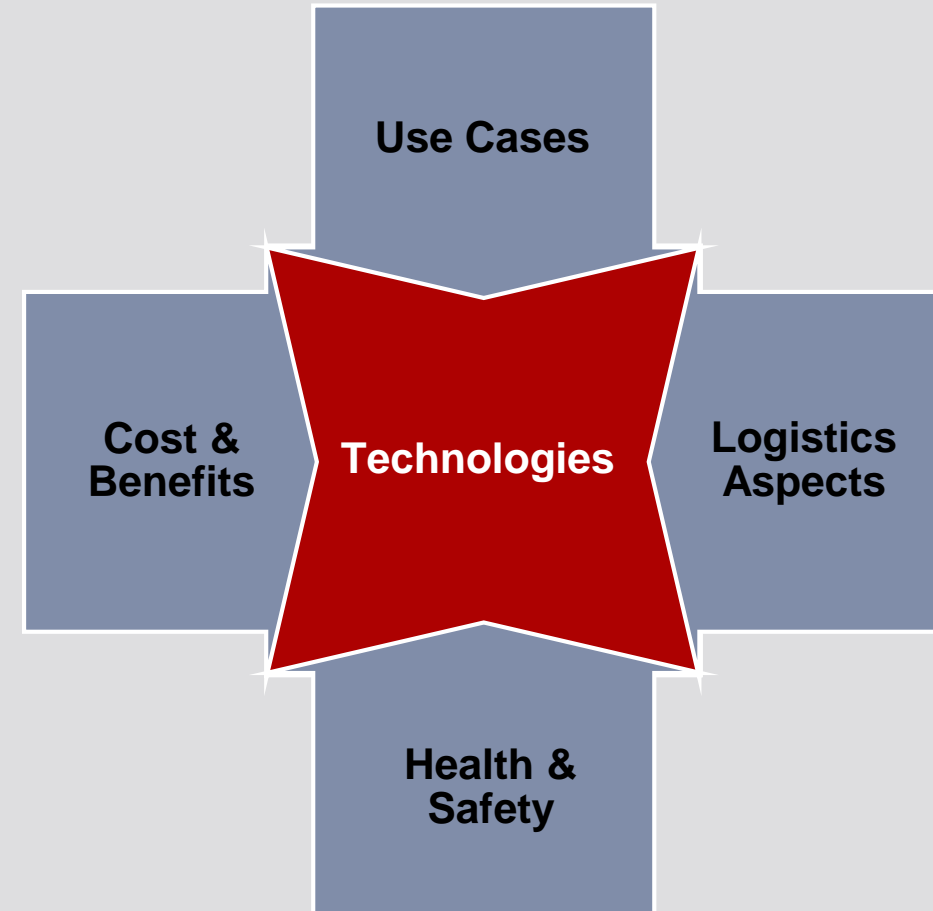
C-BORD FRAMEWORK

HOW CAN COMBINING NII TECHNOLOGIES IMPROVE DETECTION PERFORMANCE?



C-BORD FRAMEWORK

- What is the C-BORD Framework?
- What does the C-BORD Framework focus on?





HOW CAN COMBINING NII TECHNOLOGIES IMPROVE DETECTION PERFORMANCE?

Goals of the C-BORD Project

- *Increase the probability of finding illicit or dangerous content*
- *Keep throughput of containers per time unit at least equal*
- *Reduce the need for manual container inspections by customs officials*
- *Increase the probability of finding illicit materials, in case a container is opened*

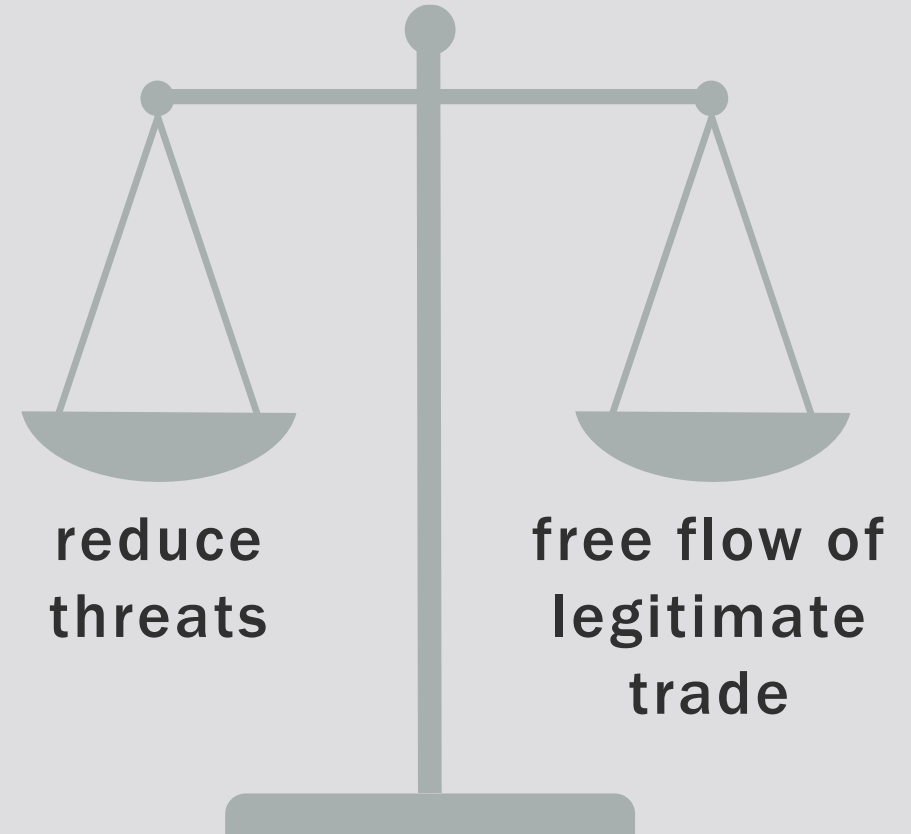
**Improve detection
performance**



VARIOUS MEASURES PROMISE TO IMPROVE DETECTION PERFORMANCE

Measures to improve detection performance:

- Inspect more containers
- Use better technology
- Combine several technologies
(C-BORD Toolbox: five complementary detection technologies)
- ...



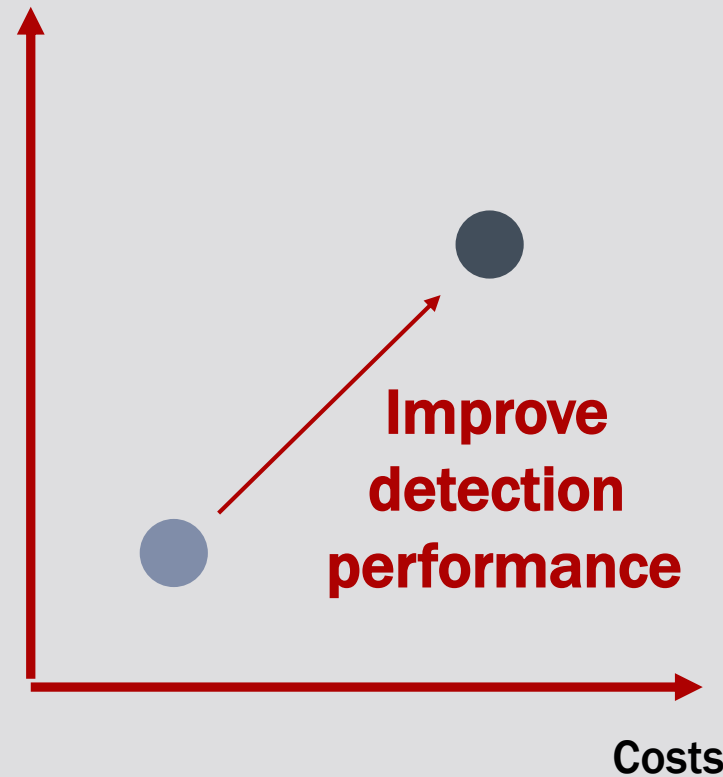


CUSTOMS CONTROLS ARE A COMPROMISE BETWEEN BENEFITS & COSTS

Benefits

- Collection of duties and taxes
- Protection from illicit materials
- Protection from external threats

Benefits



Negative effects

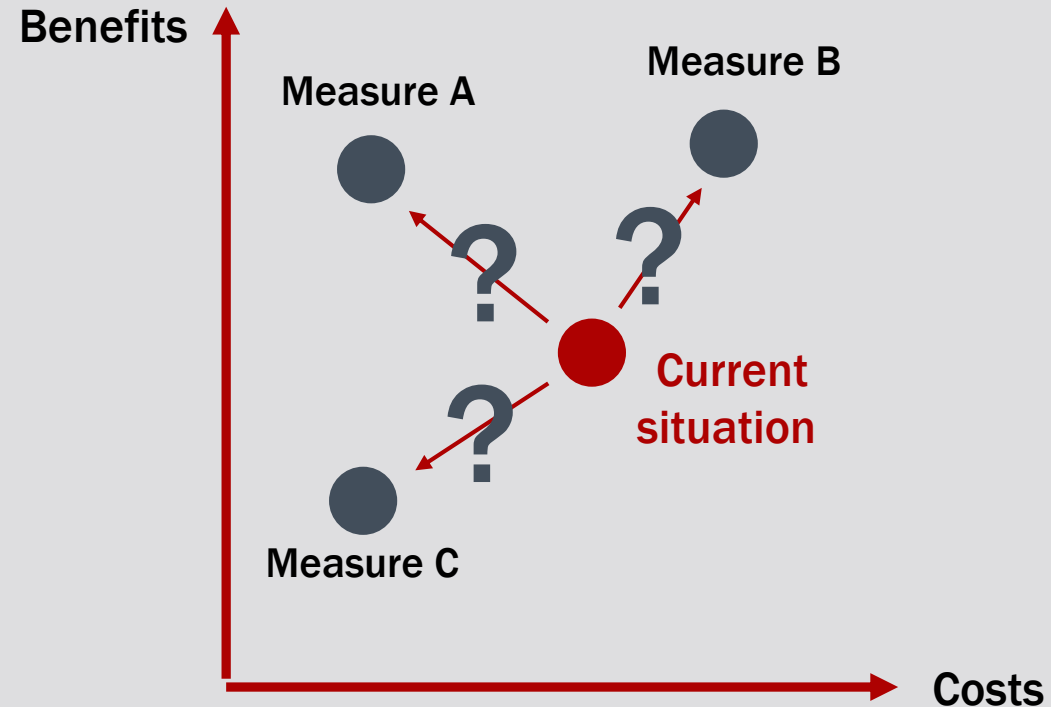
- Cost for customs
- Cost for freight forwarders
- Indirect cost effects



QUANTIFY COSTS & BENEFITS TO COMPARE MEASURES AND SELECT THE BEST OPTION

Measures to improve detection performance:

- Inspect more containers
- Use better technology
- **Combine several technologies** (from C-BORD Toolbox)
- ...



Required → a tool to compare different measures against one another



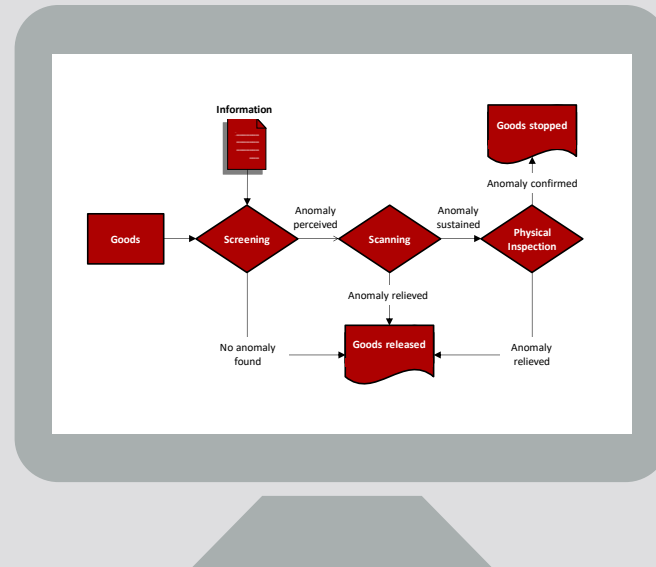
“DECIDE”: DETECTION ARCHITECTURE SIMULATION MODEL

DECIDE: A tool to compare different measures

Purpose: Calculate key performance indicators



Source: Google Earth





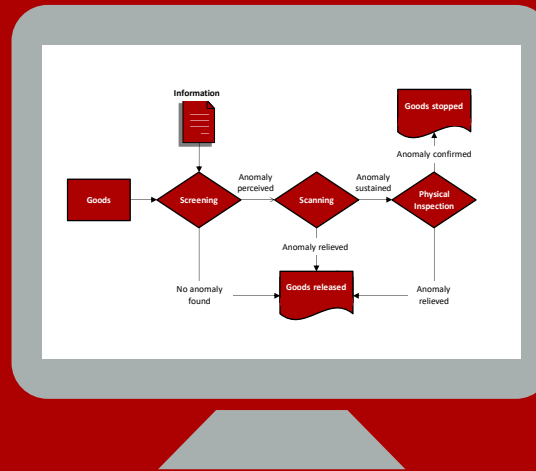
FRAMING OF COST EFFECTIVENESS ANALYSIS PERFORMED WITH “DECIDE”

Input

“DECIDE” input parameters

- Detection architecture configuration
- Costs (operating, personnel, transport, etc.)
- Detection performance of technologies
- Prevalence of non conformities

Detection Architecture Simulation Model



Detection performance and cost KPIs

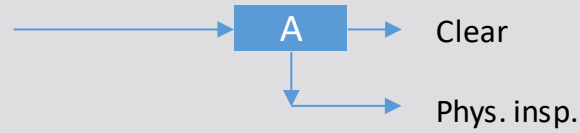
- Threats per million cleared containers
- Number of physical inspections
- System cost per scanned container

Output



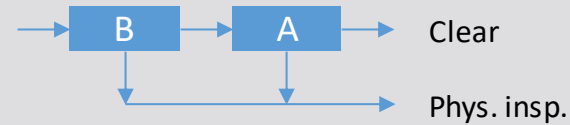
COST EFFECTIVENESS ANALYSIS: CONSIDERED CONFIGURATIONS

Current situation



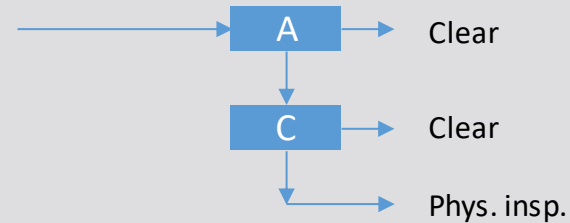
Containers checked with one sensor (e.g. X-Ray). Inconsistency is forwarded to physical inspection

Measure A



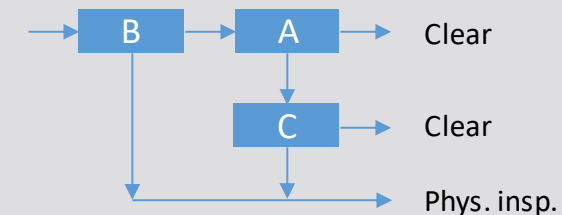
Two sensors in first line (e.g. EBD & X-Ray). System alarm “or condition”: physical inspection if one indicates inconsistency

Measure B



One sensor in first and one sensor in second line (e.g. X-Ray & TNIS). Inconsistency sent for further analysis in second line

Measure C



Two sensors in first (e.g. EBD & X-Ray) and one sensor in second line (e.g. TNIS). First line “or condition”



COST EFFECTIVENESS ANALYSIS: RESULTS

Configuration	Threats per m. cleared containers	Number of physical inspections	System cost per scanned container
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Findings shown are only valid within the scope of the used parameters

Parameters are thought to be representative

However, results don't transfer one-to-one to other cases

Thus, results can not be generalized

A careful determination of system wide and device specific parameters is mandatory

It is a precondition to calculate case specific performance and cost indicators



COST EFFECTIVENESS ANALYSIS: RESULTS

Configuration	Threats per m. cleared containers	Number of physical inspections	System cost per scanned container
Current situation	100%	100%	100%
A: Two sensors in first line	XX%	XX%	XX%
B: One in first and one in second line	YY%	YY%	YY%
C: Two in first and one in second line	ZZ%	ZZ%	ZZ%



COST EFFECTIVENESS ANALYSIS: RESULTS FOR CONFIGURATION A

Configuration	Threats per m. cleared containers	Number of physical inspections	System cost per scanned container
Current situation	100%	100%	100%
A: Two sensors in first line	42%	114%	126%
B: One in first and one in second line	YY%	YY%	YY%
C: Two in first and one in second line	ZZ%	ZZ%	ZZ%



COST EFFECTIVENESS ANALYSIS: RESULTS FOR CONFIGURATION B

Configuration	Threats per m. cleared containers	Number of physical inspections	System cost per scanned container
Current situation	100%	100%	100%
A: Two sensors in first line	42% ↓	114% ↑	126% ↑
B: One in first and one in second line	90% ↓	13% ↓	81% ↓
C: Two in first and one in second line	ZZ%	ZZ%	ZZ%

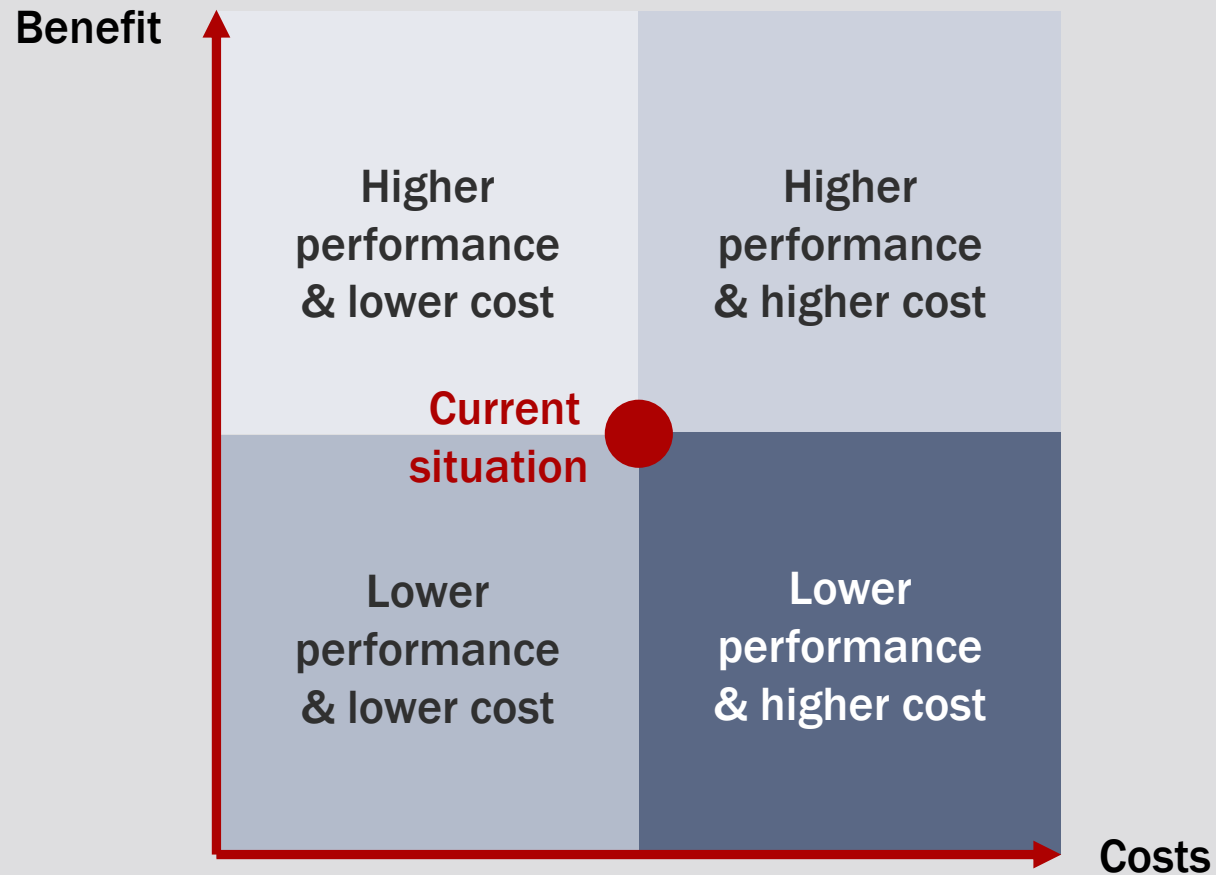


COST EFFECTIVENESS ANALYSIS: RESULTS FOR CONFIGURATION C

Configuration	Threats per m. cleared containers	Number of physical inspections	System cost per scanned container
Current situation	100%	100%	100%
A: Two sensors in first line	42% ↓	114% ↑	126% ↑
B: One in first and one in second line	90% ↓	13% ↓	81% ↓
C: Two in first and one in second line	38% ↓	31% ↓	109% ↑

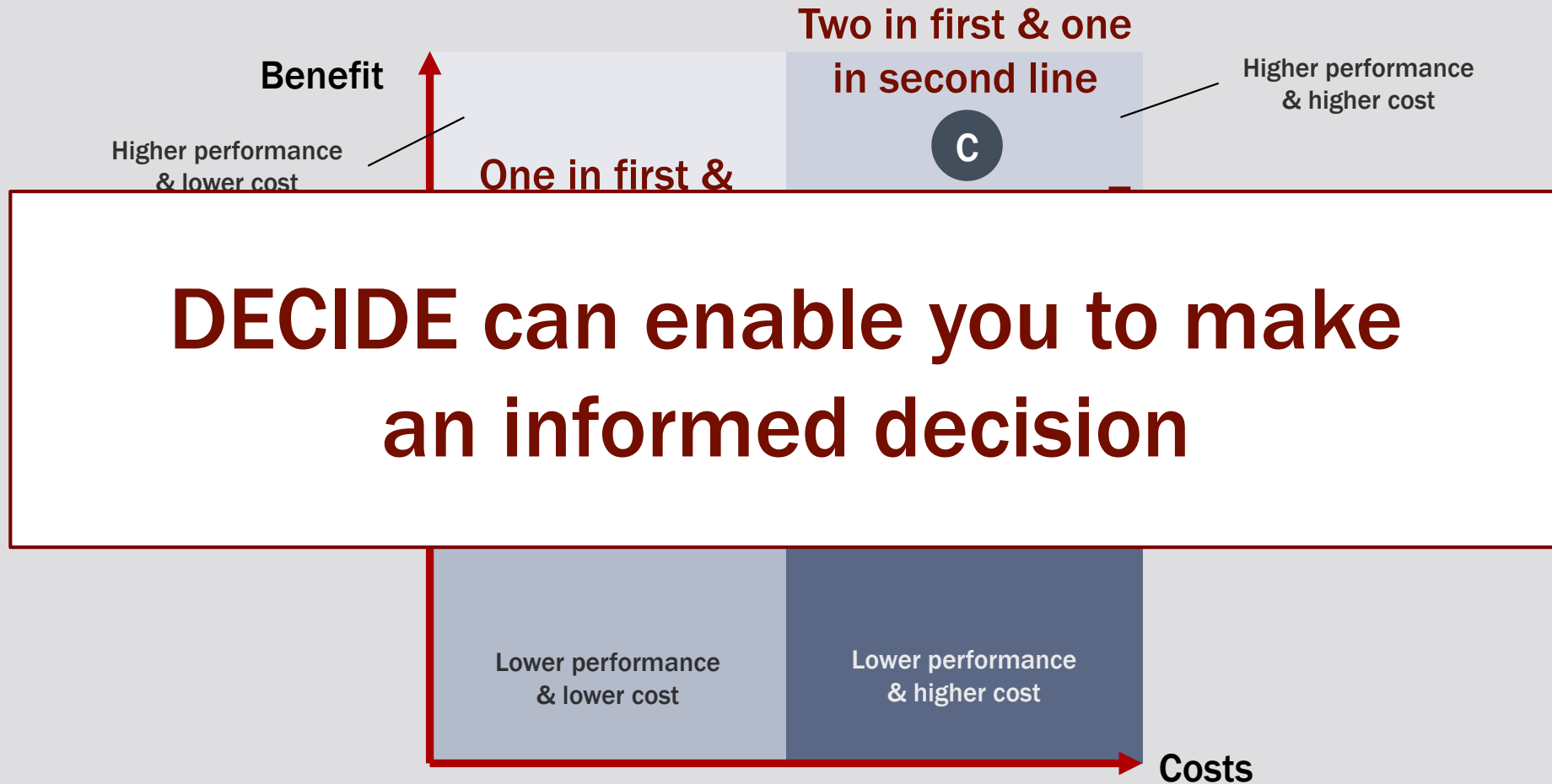


VISUALIZING IMPACT OF MEASURES TO INCREASE DETECTION PERFORMANCE





VISUALIZING IMPACT OF MEASURES ANALYZED IN COST EFFECTIVENESS ANALYSIS





SCOPE TO INCREASE DETECTION PERFORMANCE IN MULTI-DEVICE DETECTION ARCHITECTURES

Results of the case study

- Threats per million cleared containers can be reduced

- Number of physical inspections can be reduced

Goals of the CBORD Project

- Increase the probability of finding illicit materials
- Reduce the need manual container inspections by customs officials
- Increase the probability of finding illicit materials, in case a container is opened



THANK YOU



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